

ROBOTICS

# Product manual

## IRB 1200



Trace back information:  
Workspace 21B version a6  
Checked in 2021-05-31  
Skribenta version 5.4.005

**Product manual**

**IRB 1200-5/0.9**

**IRB 1200-5/0.9 type A**

**IRB 1200-5/0.9 type B**

**IRB 1200-7/0.7**

**IRB 1200-7/0.7 type A**

**IRB 1200-7/0.7 type B**

**IRC5**

**Document ID: 3HAC046983-001**

**Revision: R**

The information in this manual is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this manual.

Except as may be expressly stated anywhere in this manual, nothing herein shall be construed as any kind of guarantee or warranty by ABB for losses, damage to persons or property, fitness for a specific purpose or the like.

In no event shall ABB be liable for incidental or consequential damages arising from use of this manual and products described herein.

This manual and parts thereof must not be reproduced or copied without ABB's written permission.

Keep for future reference.

Additional copies of this manual may be obtained from ABB.

Original instructions.



# Table of contents

|  |           |
|--|-----------|
| Overview of this manual .....  | 9         |
| Product documentation .....  | 16        |
| How to read the product manual .....                                       | 18        |
| <b>1 Safety</b> .....  | <b>19</b> |
| 1.1 Safety information .....   | 19        |
| 1.1.1 Limitation of liability .....  | 19        |
| 1.1.2 Requirements on personnel .....                                      | 20        |
| 1.2 Safety signals and symbols .....                                       | 21        |
| 1.2.1 Safety signals in the manual .....                                   | 21        |
| 1.2.2 Safety symbols on manipulator labels .....                           | 23        |
| 1.3 Robot stopping functions .....   | 29        |
| 1.4 Installation and commissioning .....                                   | 30        |
| 1.5 Operation .....  | 33        |
| 1.5.1 Unexpected movement of robot arm .....                               | 33        |
| 1.6 Maintenance and repair .....   | 34        |
| 1.6.1 Maintenance and repair .....   | 34        |
| 1.6.2 Emergency release of the robot axes .....                            | 37        |
| 1.6.3 Brake testing .....  | 38        |
| 1.7 Troubleshooting .....  | 39        |
| 1.8 Decommissioning .....  | 40        |
| <b>2 Installation and commissioning</b> .....                              | <b>41</b> |
| 2.1 Introduction to installation and commissioning .....                   | 41        |
| 2.2 Unpacking .....  | 42        |
| 2.2.1 Extra O-rings .....  | 42        |
| 2.2.2 Protection covers .....  | 44        |
| 2.2.3 Transportation bracket .....   | 45        |
| 2.2.4 Pre-installation procedure .....                                     | 49        |
| 2.2.5 Dimensions .....   | 54        |
| 2.2.6 Working range .....  | 56        |
| 2.2.7 Risk of tipping/stability .....                                      | 59        |
| 2.2.8 The unit is sensitive to ESD .....                                   | 60        |
| 2.3 On-site installation .....   | 61        |
| 2.3.1 Lifting robot with roundslings .....                                 | 61        |
| 2.3.2 Lifting and turning a suspended mounted robot .....                  | 65        |
| 2.3.3 Manually releasing the brakes .....                                  | 66        |
| 2.3.4 Orienting and securing the robot .....                               | 69        |
| 2.3.5 Setting the system parameters for a suspended or tilted robot .....  | 73        |
| 2.3.6 Loads fitted to the robot, stopping time and braking distances ..... | 78        |
| 2.3.7 Fitting of equipment on the robot .....                              | 79        |
| 2.3.7.1 Introduction to fitting of equipment .....                         | 79        |
| 2.3.7.2 Holes for fitting extra equipment .....                            | 80        |
| 2.4 Installation of options .....  | 84        |
| 2.4.1 Installing the signal lamp .....                                     | 84        |
| 2.5 Restricting the working range .....                                    | 87        |
| 2.5.1 Axes with restricted working range .....                             | 87        |
| 2.5.2 Mechanically restricting the working range .....                     | 88        |
| 2.6 Making robot ready for operation .....                                 | 93        |
| 2.6.1 Additional installation procedure, Clean Room .....                  | 93        |
| 2.7 Electrical connections .....   | 94        |
| 2.7.1 Robot cabling and connection points .....                            | 94        |
| 2.7.2 Customer connections .....   | 98        |
| 2.8 Start of robot in cold environments .....                              | 101       |

|          |  |            |
|----------|--|------------|
| <b>3</b> | <b>Maintenance</b>   | <b>103</b> |
| 3.1      | Introduction .....   | 103        |
| 3.2      | Maintenance schedule .....   | 104        |
| 3.2.1    | Specification of maintenance intervals .....   | 104        |
| 3.2.2    | Maintenance schedule .....   | 105        |
| 3.3      | Inspection activities .....  | 107        |
| 3.3.1    | Inspecting the robot cabling .....   | 107        |
| 3.3.2    | Inspecting the information labels .....  | 108        |
| 3.3.3    | Inspecting mechanical stops .....  | 113        |
| 3.3.4    | Inspecting timing belts .....  | 116        |
| 3.3.5    | Inspecting the signal lamp (option) .....  | 119        |
| 3.4      | Replacement/changing activities .....  | 121        |
| 3.4.1    | Replacing the battery pack .....   | 121        |
| 3.5      | Cleaning activities .....  | 131        |
| 3.5.1    | Cleaning the IRB 1200 .....  | 131        |
| <b>4</b> | <b>Repair</b>  | <b>135</b> |
| 4.1      | Introduction .....   | 135        |
| 4.2      | General procedures .....   | 136        |
| 4.2.1    | Cut the paint or surface on the robot before replacing parts .....                       | 136        |
| 4.2.2    | Mounting instructions for sealings .....   | 138        |
| 4.2.3    | Sealing differences depending on protection class .....                                  | 141        |
| 4.2.4    | Swing sealing plug for Clean Room robots and robots with food grade lubrication .....    | 142        |
| 4.3      | Cable harness .....  | 146        |
| 4.3.1    | Replacing the main cable package .....   | 146        |
| 4.3.2    | Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings ..... | 215        |
| 4.3.3    | Replacing the axis-5 FPC unit .....  | 246        |
| 4.3.4    | Replacing the EIB/SMB unit .....   | 259        |
| 4.4      | Upper and lower arms .....   | 274        |
| 4.4.1    | Replacing the lower arm .....  | 274        |
| 4.4.2    | Replacing the signal lamp .....  | 337        |
| 4.4.3    | Replacing the tubular spare parts .....  | 340        |
| 4.4.4    | Replacing the axis-3 radial sealing and sealing ring .....                               | 373        |
| 4.4.5    | Replacing the axis-2 mechanical stop .....   | 404        |
| 4.4.6    | Replacing the axis-3 mechanical stop .....   | 407        |
| 4.4.7    | Replacing the axis-4 mechanical stop .....   | 410        |
| 4.5      | Swing and base .....   | 441        |
| 4.5.1    | Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve) ...      | 441        |
| 4.5.2    | Replacing the swing spare parts (swing, axis-2 radial sealing) .....                     | 516        |
| 4.5.3    | Replacing the axis-1 mechanical stop .....   | 578        |
| 4.6      | Motors and gearboxes .....   | 581        |
| 4.6.1    | Replacing the axis-1 gear unit .....   | 581        |
| 4.6.2    | Replacing the axis-2 drive unit .....  | 582        |
| 4.6.3    | Replacing the axis-3 drive unit .....  | 603        |
| 4.6.4    | Replacing the axis-4 gearbox, drive shaft and pulley .....                               | 624        |
| 4.6.5    | Replacing the axis-4 motor with pulley .....   | 666        |
| 4.6.6    | Replacing the axis-4 timing belt .....   | 677        |
| 4.6.7    | Replacing the axis-5 motor with pulley .....   | 692        |
| 4.6.8    | Replacing the axis-5 timing belt .....   | 702        |
| 4.6.9    | Replacing the axis-5 and axis-6 drive unit .....   | 708        |
| <b>5</b> | <b>Calibration</b>   | <b>729</b> |
| 5.1      | Introduction to calibration .....  | 729        |
| 5.1.1    | Introduction and calibration terminology .....   | 729        |
| 5.1.2    | Calibration methods .....  | 730        |
| 5.1.3    | When to calibrate .....  | 733        |

---

|              |   |            |
|--------------|---|------------|
| 5.2          | Synchronization marks and axis movement directions .....                        | 734        |
| 5.2.1        | Synchronization marks and synchronization position for axes .....               | 734        |
| 5.2.2        | Calibration movement directions for all axes .....                              | 735        |
| 5.3          | Updating revolution counters .....  | 736        |
| 5.4          | Calibrating with Axis Calibration method .....                                  | 739        |
| 5.4.1        | Description of Axis Calibration .....   | 739        |
| 5.4.2        | Calibration tools for Axis Calibration .....                                    | 742        |
| 5.4.3        | Installation locations for the calibration tools .....                          | 745        |
| 5.4.4        | Axis Calibration - Running the calibration procedure .....                      | 747        |
| 5.4.5        | Reference calibration .....   | 754        |
| 5.5          | Calibrating with Wrist Optimization method .....                                | 756        |
| 5.6          | Calibrating with manual calibration method .....                                | 757        |
| 5.6.1        | Manual calibration method - calibration position .....                          | 757        |
| 5.6.2        | Manual calibration method - content of calibration toolkit 3HAC051256-001 ..... | 758        |
| 5.6.3        | Manual calibration method - calibrating axis 1 .....                            | 759        |
| 5.6.4        | Manual calibration method - calibrating axis 2 .....                            | 766        |
| 5.6.5        | Manual calibration method - calibrating axis 3 .....                            | 770        |
| 5.6.6        | Manual calibration method - calibrating axis 4 .....                            | 775        |
| 5.6.7        | Manual calibration method - calibrating axis 5 and axis 6 .....                 | 781        |
| 5.7          | Verifying the calibration .....   | 785        |
| 5.8          | Checking the synchronization position .....                                     | 786        |
| <b>6</b>     | <b>Decommissioning</b> .....  | <b>787</b> |
| 6.1          | Introduction .....  | 787        |
| 6.2          | Environmental information .....   | 788        |
| 6.3          | Scrapping of robot .....  | 789        |
| <b>7</b>     | <b>Robot description</b> .....  | <b>791</b> |
| 7.1          | Type A of IRB 1200 .....  | 791        |
| 7.2          | Type B of IRB 1200 .....  | 792        |
| 7.3          | Description of spare part versions .....  | 793        |
| 7.3.1        | Spare part versions for the base on IP40/IP67 robots .....                      | 793        |
| 7.3.2        | Spare part versions for the swing on IP40/IP67 robots .....                     | 795        |
| 7.3.3        | Spare part versions for the axis-1 sealing ring on IP40/IP67 robots .....       | 797        |
| 7.3.4        | Spare part versions for the housing on Type A robots .....                      | 799        |
| 7.3.5        | Spare part versions for the tubular on Type A robots .....                      | 800        |
| 7.3.6        | Spare part versions for the tubular cover on Clean Room robots .....            | 801        |
| <b>8</b>     | <b>Reference information</b> .....  | <b>803</b> |
| 8.1          | Introduction .....  | 803        |
| 8.2          | Applicable standards .....  | 804        |
| 8.3          | Unit conversion .....   | 806        |
| 8.4          | Screw joints .....  | 807        |
| 8.5          | Weight specifications .....   | 810        |
| 8.6          | Standard toolkit .....  | 811        |
| 8.7          | Special tools .....   | 812        |
| 8.8          | Lifting accessories and lifting instructions .....                              | 815        |
| <b>9</b>     | <b>Spare parts</b> .....  | <b>817</b> |
| 9.1          | Spare part lists and illustrations .....  | 817        |
| <b>10</b>    | <b>Circuit diagrams</b> .....   | <b>819</b> |
| 10.1         | Circuit diagrams .....  | 819        |
| <b>Index</b> | .....   | <b>821</b> |

---

**This page is intentionally left blank**

# Overview of this manual

---

## About this manual

This manual contains instructions for:

- mechanical and electrical installation of the robot
  - maintenance of the robot
  - mechanical and electrical repair of the robot.
- 

## Usage

This manual should be used during:

- installation, from lifting the robot to its work site and securing it to the foundation, to making it ready for operation
  - maintenance work
  - repair work and calibration.
- 

## Who should read this manual?

This manual is intended for:

- installation personnel
  - maintenance personnel
  - repair personnel.
- 

## Prerequisites

Maintenance/repair/installation personnel working with an ABB Robot must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.
- 

## Product manual scope

The manual covers covers all variants and designs of the IRB 1200. Some variants and designs may have been removed from the business offer and are no longer available for purchase.

---

## Organization of chapters

The manual is organized in the following chapters:

| Chapter                        | Contents  |
|--------------------------------|---|
| Safety, service                | Safety information that must be read through before performing any installation or service work on robot. Contains general safety aspects as well as more specific information on how to avoid personal injuries and damage to the product. |
| Installation and commissioning | Required information about lifting and installation of the robot.   |
| Maintenance                    | Step-by-step procedures that describe how to perform maintenance of the robot. Based on a maintenance schedule that may be used to plan periodical maintenance.   |
| Repair                         | Step-by-step procedures that describe how to perform repair activities of the robot. Based on available spare parts.  |

*Continues on next page*

## Overview of this manual

---

Continued

| Chapter                        | Contents   |
|--------------------------------|--|
| Calibration                    | Calibration procedures and general information about calibration.  |
| Decommissioning                | Environmental information about the robot and its components.  |
| Reference information          | Useful information when performing installation, maintenance or repair work. Includes lists of necessary tools, additional documents, safety standards, etc. |
| Spare parts and exploded views | Reference to the spare part list for the robot.  |
| Circuit diagram                | Reference to the circuit diagram for the robot.  |

---

## References

Documentation referred to in the manual, is listed in the table below.

| Document name  | Document ID           |
|--|-----------------------|
| <i>Product manual, spare parts - IRB 1200</i>  | <i>3HAC046984-001</i> |
| <i>Product specification - IRB 1200</i>  | <i>3HAC046982-001</i> |
| <i>Safety manual for robot - Manipulator and IRC5 or OmniCore controller<sup>i</sup></i> | <i>3HAC031045-001</i> |
| <i>Circuit diagram - IRB 1200</i>  | <i>3HAC046307-003</i> |
| <i>Product manual - IRC5</i>   | <i>3HAC021313-001</i> |
| <i>Product manual - IRC5 Compact</i>   | <i>3HAC047138-001</i> |
| <i>Operating manual - IRC5 with FlexPendant</i>  | <i>3HAC050941-001</i> |
| <i>Technical reference manual - Lubrication in gearboxes</i>                             | <i>3HAC042927-001</i> |
| <i>Technical reference manual - System parameters</i>                                    | <i>3HAC050948-001</i> |

<sup>i</sup> This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

---

## Revisions

| Revision | Description    |
|----------|----------------|
| -        | First edition. |

Continues on next page

| Revision | Description   |
|----------|---|
| A        | <p>Changes made in this revision:</p> <ul style="list-style-type: none"> <li>• Information added about removal of axis-4 mechanical stop and axis-4 FPC unit from housing extender unit, prior to replacing the radial sealing at the housing extender unit. See <a href="#">Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 215</a>.</li> <li>• Information added about disconnecting and reconnecting the air hoses at the tubular, when replacing the axis-4 timing belt. See <a href="#">Replacing the axis-4 timing belt on page 677</a>.</li> <li>• Information added about removing screws that fasten the fix sheet to the inner plastic guide inside housing, when removing axis-3 drive unit, see <a href="#">Creating space for separation of upper and lower arm on page 608</a>. Information also added about refitting the same screws, throughout complete manual.</li> <li>• Information added about releasing the holding brakes prior to rotating axes manually, in calibration procedures, chapter <a href="#">Calibration on page 729</a>.</li> <li>• Working range of axis 6 corrected from <math>\pm 360^\circ</math> to <math>\pm 400^\circ</math>, see <a href="#">Working range on page 56</a>.</li> <li>• Information added about extra o-rings that are enclosed with the robot at delivery, see <a href="#">Installation of extra O-ring on page 70</a> and <a href="#">Installation of extra O-ring on page 95</a>. Also added to repair procedures, where needed.</li> <li>• Changed pin number for 24V connection, see <a href="#">Manually releasing the brakes on page 66</a>.</li> </ul> |

| Revision | Description  |
|----------|--|
| B        | <p>Changes made in this revision:</p> <ul style="list-style-type: none"> <li>• Information regarding how to read the procedures in this product manual are updated, see <a href="#">How to read the product manual on page 18</a>.</li> <li>• Information added about protection covers for water and dust proofing, see <a href="#">Protection covers on page 44</a>.</li> <li>• Information added about transportation bracket that is used during shipping and transport and must be removed before lifting the robot, see <a href="#">Transportation bracket on page 45</a> and <a href="#">Attaching the roundslings on page 61</a>.</li> <li>• Timing belt tension of axis-4 and axis-5 motors changed from 13 N and 15 N to 26 N and 30 N, respectively, in repair procedures, chapter <a href="#">Repair on page 135</a>.</li> <li>• Tightening torque of M3 screws used on plastic materials changed from 1.5 Nm to 0.3 Nm, in repair procedures, chapter <a href="#">Repair on page 135</a>.</li> <li>• Total amount of harmonic grease 4B No.2 changed from 42 g to 32 g, see <a href="#">Replacing the axis-3 drive unit on page 603</a>.</li> <li>• Information added about checking PTFE film before refitting the cable housing cover, see <a href="#">Replacing the EIB/SMB unit on page 259</a>, <a href="#">Replacing the axis-2 drive unit on page 582</a>, <a href="#">Replacing the axis-3 drive unit on page 603</a>, and <a href="#">Replacing the axis-4 timing belt on page 677</a>.</li> <li>• No need to remove and refit cable bracket when removing and refitting the cable package to the axis-1 sealing ring, see <a href="#">Replacing the main cable package on page 146</a>.</li> <li>• No need to remove and refit connector plate when removing and refitting the axis-5 motor with pulley, see <a href="#">Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 215</a>, <a href="#">Replacing the axis-4 gearbox, drive shaft and pulley on page 624</a>, <a href="#">Replacing the axis-5 motor with pulley on page 692</a>.</li> <li>• No need to remove and refit mechanical stop screw when removing the axis-4 mechanical stop, see <a href="#">Replacing the axis-4 mechanical stop on page 410</a>.</li> <li>• Information modified about replacing motor bracket together with motor flange when removing and refitting the axis-4 motor, see <a href="#">Replacing the axis-4 gearbox, drive shaft and pulley on page 624</a> and <a href="#">Replacing the axis-4 motor with pulley on page 666</a>.</li> <li>• No need to remove tilt covers when replacing axis-5 drive unit, see <a href="#">Replacing the axis-5 and axis-6 drive unit on page 708</a>.</li> </ul> |



| Revision | Description   |
|----------|---|
| C        | <p>Changes made in this revision</p> <ul style="list-style-type: none"> <li>• Flange sealing changed from 12340011-116 Loctite 574 to 3HAC026759-002 Sikaflex-521FC for small cover on the housing, see <a href="#">Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 215</a>.</li> <li>• Tightening torque for attachment screws on lifting accessories is changed from 40 Nm to 15 Nm.</li> <li>• Tightening torque for lower arm cable</li> <li>• Tightening torque for the axis-4 FPC unit attachment screws is changed from 1.5 Nm to 0.3 Nm.</li> <li>• Added a tightening torque for the attachment screws of the axis-1 calibration stop pin and the axis-1 calibration pin.</li> <li>• Added a caution note to keep a straight line when fitting the axis-1 calibration pin.</li> <li>• Article number of grease harmonic grease 4B No. 2 changed from 3HAC031695-001 to 3HAC037302-001.</li> <li>• Total amount of harmonic grease 4B No.2 for axis 2 and axis 5 changed from 80 g and 12 g to 60 g and 9 g, respectively,</li> <li>• Maximum revolution of axis 6 corrected to <math>\pm 242^\circ</math>, see <a href="#">Working range on page 58</a>.</li> <li>• Clean Room option added.</li> <li>• Food grade lubrication option added.</li> <li>• Spare part numbers for several gaskets (IP67) updated.</li> <li>• The base, the swing and the axis-1 sealing ring are updated due to IP67 improvements</li> </ul> |
| D        | <p>Published in release R16.2. The following updates are done in this revision:</p> <ul style="list-style-type: none"> <li>• New standard calibration method introduced (Axis Calibration). See <a href="#">Calibration on page 729</a>.</li> <li>• Information about grounding point is added, see <a href="#">Grounding and bonding point on manipulator on page 95</a>.</li> <li>• Foundry Plus option added.</li> </ul>   |
| E        | <p>Published in release R17.1. The following updates are done in this revision:</p> <ul style="list-style-type: none"> <li>• A new standard IEC 61340-5-1:2010 added. See <a href="#">Applicable standards on page 804</a>.</li> <li>• V-ring on axis-1 sealing ring version 3HAC058568-001 added as a spare part.</li> <li>• Notes added for spare part versions. See <a href="#">Description of spare part versions on page 793</a>.</li> <li>• Information about Type B robots supporting SafeMove 2 added.</li> <li>• Plug on base added to options IP67 and Foundry Plus.</li> </ul>   |

Continues on next page

| Revision | Description  |
|----------|--|
| F        | <p>Published in release R17.2. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Caution about removing metal residues added in sections about EIB/SMB boards.</li> <li>• Information about minimum resonance frequency added.</li> <li>• Bending radius for static floor cables added.</li> <li>• Updated list of applicable standards.</li> <li>• Article number for the Calibration tool box, Axis Calibration is changed.</li> <li>• Section <a href="#">Start of robot in cold environments on page 101</a> added.</li> <li>• Tightening torque of screws securing the axis-5 and axis-6 drive unit updated.</li> <li>• Information about mechanically restricting the working range added.</li> <li>• Updated description about Clean Room class.</li> <li>• Label added to remind the fitting of extra o-ring for robots with protection class IP67 and with protection type Foundry Plus.</li> </ul> |
| G        | <p>Published in release R18.1. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Added sections in <a href="#">General procedures on page 136</a></li> <li>• Safety section restructured.</li> <li>• Note added to clarify the usage of the two M4 thread holes on the upper arm.</li> <li>• Added transportation bracket information for robots delivered with a force control package.</li> <li>• Updated extra o-ring fitting information for robots with protection type Clean Room and robots with food grade lubrication.</li> <li>• Note added to calibration chapter to emphasize the requirement of equally dressed robot when using previously created reference calibration values.</li> <li>• Information about myABB Business Portal added.</li> <li>• Spare part number of axis-4 gearbox shaft changed from 3HAC049631-001 to 3HAC044692-001.</li> </ul>                                      |
| H        | <p>Published in release R18.2. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Added customer connection information.</li> <li>• Spare part information about axis-2 drive unit and axis-3 drive unit updated.</li> <li>• Updated axis-4 and -5 timing belt inspection procedure.</li> <li>• Added note for transportation bracket removal procedure.</li> </ul>   |
| J        | <p>Published in release R18.2. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Updated references.</li> </ul>  |
| K        | <p>Published in release 19B. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• New touch up color Graphite White available. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</li> <li>• New article numbers for manipulator cables in section <a href="#">Robot cables on page 94</a>.</li> </ul>   |

| Revision | Description   |
|----------|---|
| L        | <p>Published in release 19D. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Spare part version of axis-1 sealing ring updated. See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797</a>.</li> <li>• Compatibility between cable harness and axis-1 sealing ring added. See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797</a>.</li> <li>• Note added about the need to calibrate if the robot is other than floor mounted. See <a href="#">When to calibrate on page 733</a>.</li> </ul>   |
| M        | <p>Published in release 20B. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Clarified and added information in mounting instructions for rotating sealings, see <a href="#">Mounting instructions for sealings on page 138</a>.</li> <li>• Clarified text about position of robot and added table with dependencies between axes during Axis Calibration.</li> <li>• Article number of Calibration tool box, Axis Calibration is changed from 3HAC062326-001 to 3HAC074119-001.</li> <li>• Replaced article number and name of grease, previously 3HAB3537-1.</li> <li>• Added information about Wrist Optimization in calibration chapter.</li> </ul> |
| N        | <p>Published in release 20C. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Flange sealing changed from 12340011-116 Loctite 574 to 3HAC026759-003 Sikaflex 521FC for tubular covers for robots with protection class IP67 and protection type Clean Room.</li> <li>• Updated the figure of customer connection information.</li> </ul>  |
| P        | <p>Published in release 20D. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Added information about maintenance activity of robot overhaul.</li> </ul>   |
| Q        | <p>Published in release 21A. The following updates are made in this revision:</p> <ul style="list-style-type: none"> <li>• Added step about applying Loctite 243 to screws securing the cable housing cover on lower arm for robots with protection class IP67, protection types Clean Room and Foundry Plus and food grade lubrication.</li> </ul>   |
| R        | <p>Published in release 21B. The following updates are done in this revision:</p> <ul style="list-style-type: none"> <li>• Text regarding fastener quality is updated, see <a href="#">Fastener quality on page 83</a>.</li> <li>• Text regarding diameter of air hoses is updated, see <a href="#">Customer connections on page 98</a>.</li> </ul>   |

# Product documentation

---

### Categories for user documentation from ABB Robotics

The user documentation from ABB Robotics is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.



#### Tip

All documents can be found via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

---

### Product manuals

Manipulators, controllers, DressPack/SpotPack, and most other hardware is delivered with a **Product manual** that generally contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation or electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals and expected life time of parts).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Calibration.
- Decommissioning.
- Reference information (safety standards, unit conversions, screw joints, lists of tools).
- Spare parts list with corresponding figures (or references to separate spare parts lists).
- References to circuit diagrams.

---

### Technical reference manuals

The technical reference manuals describe reference information for robotics products, for example lubrication, the RAPID language, and system parameters.

---

### Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, software).
- How to install included or required hardware.
- How to use the application.
- Examples of how to use the application.

*Continues on next page*

---

**Operating manuals**

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and troubleshooters.

# How to read the product manual

---

### Reading the procedures

The procedures contain all information required for the installation or service activity and can be printed out separately when needed for a certain service procedure.

### Safety information

The manual includes a separate safety chapter that must be read through before proceeding with any service or installation procedures. All procedures also include specific safety information when dangerous steps are to be performed.

Read more in the chapter [Safety on page 19](#).

### Illustrations

The product is illustrated with general figures that does not take painting or protection type in consideration.

Likewise, certain work methods or general information that is valid for several product models, can be illustrated with illustrations that show a different product model than the one that is described in the current manual.

# 1 Safety

## 1.1 Safety information

### 1.1.1 Limitation of liability

---

#### Limitation of liability

Any information given in this manual regarding safety must not be construed as a warranty by ABB that the industrial robot will not cause injury or damage even if all safety instructions are complied with.

The information does not cover how to design, install and operate a robot system, nor does it cover all peripheral equipment that can influence the safety of the robot system.

In particular, liability cannot be accepted if injury or damage has been caused for any of the following reasons:

- Use of the robot in other ways than intended.
- Incorrect operation or maintenance.
- Operation of the robot when the safety devices are defective, not in their intended location or in any other way not working.
- When instructions for operation and maintenance are not followed.
- Non-authorized design modifications of the robot.
- Repairs on the robot and its spare parts carried out by in-experienced or non-qualified personnel.
- Foreign objects.
- Force majeure.

---

#### Spare parts and equipment

ABB supplies original spare parts and equipment which have been tested and approved. The installation and/or use of non-original spare parts and equipment can negatively affect the safety, function, performance, and structural properties of the robot. ABB is not liable for damages caused by the use of non-original spare parts and equipment.

# 1 Safety

---

## 1.1.2 Requirements on personnel

### 1.1.2 Requirements on personnel

---

#### General

Only personnel with appropriate training are allowed to install, maintain, service, repair, and use the robot. This includes electrical, mechanical, hydraulics, pneumatics, and other hazards identified in the risk assessment.

Persons who are under the influence of alcohol, drugs or any other intoxicating substances are not allowed to install, maintain, service, repair, or use the robot.

The plant liable must make sure that the personnel is trained on the robot, and on responding to emergency or abnormal situations.

---

#### Personal protective equipment

Use personal protective equipment, as stated in the instructions.



## 1.2 Safety signals and symbols

### 1.2.1 Safety signals in the manual

#### Introduction to safety signals







This section specifies all safety signals used in the user manuals. Each signal consists of:

- A caption specifying the hazard level (DANGER, WARNING, or CAUTION) and the type of hazard.
- Instruction about how to reduce the hazard to an acceptable level.
- A brief description of remaining hazards, if not adequately reduced.

#### Hazard levels

The table below defines the captions specifying the hazard levels used throughout this manual.

For more information, see standard ISO 13849.

| Symbol  | Designation                   | Significance  |
|---|-------------------------------|---|
|   | DANGER                        | Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in serious injury.                                |
|  | WARNING                       | Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in serious injury.                               |
|  | ELECTRICAL SHOCK              | Signal word used to indicate a potentially hazardous situation related to electrical hazards which, if not avoided, could result in serious injury. |
|  | CAUTION                       | Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in slight injury.                                |
|  | ELECTROSTATIC DISCHARGE (ESD) | Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in severe damage to the product.                 |
|  | NOTE                          | Signal word used to indicate important facts and conditions.  |


*Continues on next page*

# 1 Safety

---

## 1.2.1 Safety signals in the manual

*Continued*

| Symbol  | Designation | Significance  |
|---|-------------|---|
|  | TIP         | Signal word used to indicate where to find additional information or how to do an operation in an easier way. |

## 1.2.2 Safety symbols on manipulator labels

### Introduction to symbols

This section describes safety symbols used on labels (stickers) on the manipulator. Symbols are used in combinations on the labels, describing each specific warning. The descriptions in this section are generic, the labels can contain additional information such as values.



#### Note

The symbols on the labels on the product must be observed. Additional symbols added by the integrator must also be observed.




### Types of symbols

Both the manipulator and the controller are marked with symbols, containing important information about the product. This is important for all personnel handling the robot, for example during installation, service, or operation.

The safety labels are language independent, they only use graphics. See [Symbols on safety labels on page 23](#).

The information labels can contain information in text.

### Symbols on safety labels

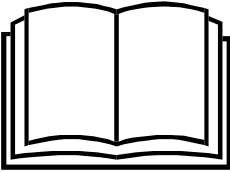
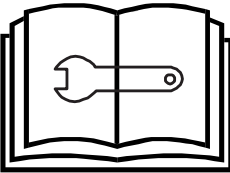
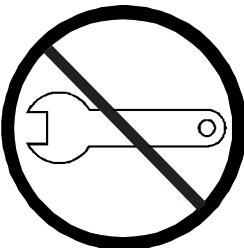
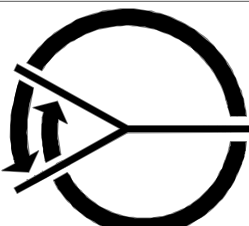

| Symbol  | Description  |
|---|--|
| <br>xx0900000812 | <b>Warning!</b><br>Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.  |
| <br>xx0900000811 | <b>Caution!</b><br>Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment where there is a risk of damaging the product or causing a breakdown. |
| <br>xx0900000839 | <b>Prohibition</b><br>Used in combinations with other symbols.   |

*Continues on next page*

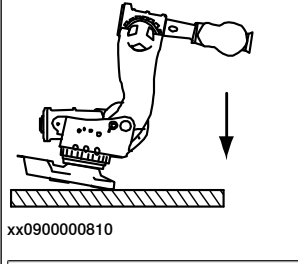

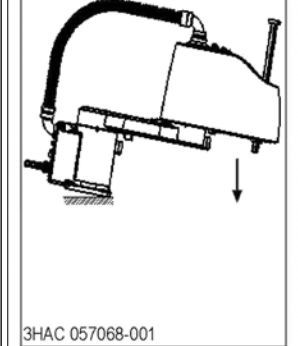


# 1 Safety

## 1.2.2 Safety symbols on manipulator labels

Continued

| Symbol  | Description  |
|---|--|
| <br>xx0900000813   | <b>See user documentation</b><br>Read user documentation for details.<br>Which manual to read is defined by the symbol: <ul style="list-style-type: none"><li>• No text: <i>Product manual</i>.</li><li>• EPS: <i>Application manual - Electronic Position Switches</i>.</li></ul> |
| <br>xx0900000816   | <b>Before disassembly, see product manual</b>  |
| <br>xx0900000815  | <b>Do not disassemble</b><br>Disassembling this part can cause injury.   |
| <br>xx0900000814 | <b>Extended rotation</b><br>This axis has extended rotation (working area) compared to standard.   |
| <br>xx0900000808 | <b>Brake release</b><br>Pressing this button will release the brakes. This means that the robot arm can fall down.   |



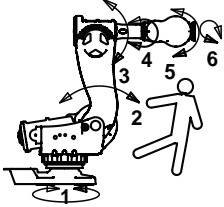
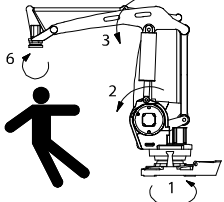
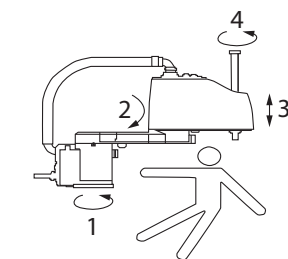
Continues on next page

| Symbol  | Description  |
|---|--|
|  <p>xx0900000810</p>   <p>3HAC 057068-001</p> <p>xx1500002402</p> | <p><b>Tip risk when loosening bolts</b><br/>The robot can tip over if the bolts are not securely fastened.</p> |
|   <p>xx0900000817</p>   | <p><b>Crush</b><br/>Risk of crush injuries.</p>  |

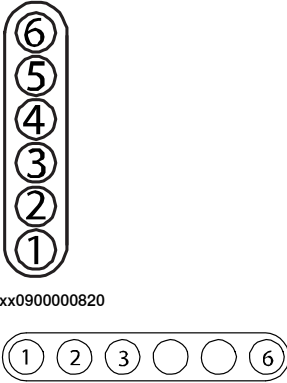

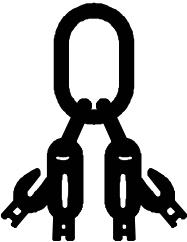



# 1 Safety

## 1.2.2 Safety symbols on manipulator labels

Continued

| Symbol   | Description   |
|--|---|
|  <p>xx0900000818</p>  <p>xx1300001087</p>  | <p><b>Heat</b><br/>Risk of heat that can cause burns. (Both signs are used)</p> |
|  <p>xx0900000819</p>  <p>xx1000001141</p>  <p>xx1500002616</p> | <p><b>Moving robot</b><br/>The robot can move unexpectedly.</p>                 |

Continues on next page



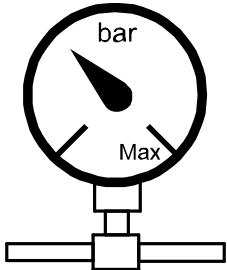
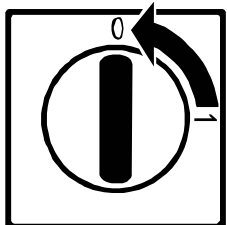

| Symbol  | Description  |
|---|--|
|  <p>xx0900000820</p> <p>xx1000001140</p> | <p><b>Brake release buttons</b></p>  |
|  <p>xx0900000821</p>                     | <p><b>Lifting bolt</b></p>   |
|  <p>xx1000001242</p>                    | <p><b>Chain sling with shortener</b></p>   |
|  <p>xx0900000822</p>                   | <p><b>Lifting of robot</b></p>   |
|  <p>xx0900000823</p>                   | <p><b>Oil</b><br/>Can be used in combination with prohibition if oil is not allowed.</p> |
|  <p>xx0900000824</p>                   | <p><b>Mechanical stop</b></p>  |

*Continues on next page*

# 1 Safety

## 1.2.2 Safety symbols on manipulator labels

Continued

| Symbol  | Description  |
|---|--|
| <br>xx1000001144   | <b>No mechanical stop</b>  |
| <br>xx0900000825   | <b>Stored energy</b><br>Warns that this part contains stored energy.<br>Used in combination with <i>Do not disassemble</i> symbol. |
| <br>xx0900000826  | <b>Pressure</b><br>Warns that this part is pressurized. Usually contains additional text with the pressure level.                  |
| <br>xx0900000827 | <b>Shut off with handle</b><br>Use the power switch on the controller.   |
| <br>xx1400002648 | <b>Do not step</b><br>Warns that stepping on these parts can cause damage to the parts.  |



### 1.3 Robot stopping functions

---

#### Protective stop and emergency stop

The protective stops and emergency stops are described in the product manual for the controller.

For more information see:

- *Product manual - IRC5 Compact*

# 1 Safety

---

## 1.4 Installation and commissioning

### 1.4 Installation and commissioning

---

#### National or regional regulations

The integrator of the robot system is responsible for the safety of the robot system.

The integrator is responsible that the robot system is designed and installed in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.

The integrator of the robot system is required to perform an assessment of the hazards and risks.

---

#### Layout

The robot integrated to a robot system shall be designed to allow safe access to all areas during installation, operation, maintenance, and repair.

If robot movement can be initiated from an external control panel then an emergency stop must also be available.

If the manipulator is delivered with mechanical stops, these can be used for reducing the working area.

A perimeter safeguarding, for example a fence, shall be dimensioned to withstand the following:

- The force of the manipulator.
- The force of the load handled by the robot if dropped or released at maximum speed.
- The maximum possible impact caused by a breaking or malfunctioning rotating tool or other device fitted to the robot.

The maximum TCP speed and the maximum velocity of the robot axes are detailed in the section *Robot motion* in the product specification for the respective manipulator.

Consider exposure to hazards, such as slipping, tripping, and falling.

Hazards due to the working position and posture for a person working with or near the robot shall be considered.

Consider hazards from other equipment in the robot system, for example, that guards remain active until identified hazards are reduced to an acceptable level.

---

#### Allergenic material

See [Environmental information on page 788](#) for specification of allergenic materials in the product, if any.

---

#### Securing the robot to the foundation

The robot must be properly fixed to its foundation/support, as described in the product manual.

When the robot is installed at a height, hanging, or other than mounted directly on the floor, there will be additional hazards.

---

*Continues on next page*

### Electrical safety

The mains power must be installed to fulfill national regulations.

The power supply wiring to the robot must be sufficiently fused and if necessary, it must be possible to disconnect it manually from the mains power.

The power to the robot must be turned off with the main switch and the mains power disconnected when performing work inside the controller cabinet. Lock and tag shall be considered.

Harnesses between controller and manipulator shall be fixed and protected to avoid tripping and wear.

Wherever possible, power on/off or rebooting the robot controller shall be performed with all persons outside the safeguarded space.



#### Note

Use a CARBON DIOXIDE (CO<sub>2</sub>) extinguisher in the event of a fire in the robot.

### Safety devices

The integrator is responsible for that the safety devices necessary to protect people working with the robot system are designed and installed correctly.

When integrating the robot with external devices to a robot system:

- The integrator of the robot system must ensure that emergency stop functions are interlocked in accordance with applicable standards.
- The integrator of the robot system must ensure that safety functions are interlocked in accordance with applicable standards.

### Other hazards



#### WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



#### WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

The risk assessment should also consider other hazards arising from the application, such as, but not limited to:

- Water
- Compressed air
- Hydraulics

*Continues on next page*

# 1 Safety

---

## 1.4 Installation and commissioning

*Continued*

---

### Pneumatic or hydraulic related hazards



#### Note

The pressure in the complete pneumatic or hydraulic systems must be released before service and maintenance.

All components in the robot system that remain pressurized after switching off the power to the robot must be marked with clearly visible drain facilities and a warning sign that indicates the hazard of stored energy.

Loss of pressure in the robot system may cause parts or objects to drop.

Dump valves should be used in case of emergency.

Shot bolts should be used to prevent tools, etc., from falling due to gravity.

All pipes, hoses, and connections have to be inspected regularly for leaks and damage. Damage must be repaired immediately.

---

### Verify the safety functions

Before the robot system is put into operation, verify that the safety functions are working as intended and that any remaining hazards identified in the risk assessment are mitigated to an acceptable level.

## 1.5 Operation

### 1.5.1 Unexpected movement of robot arm

#### Unexpected movement of robot arm



#### **WARNING**

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



#### **WARNING**

Manipulator movements can cause serious injuries on users and may damage equipment.

# 1 Safety

## 1.6.1 Maintenance and repair

## 1.6 Maintenance and repair

### 1.6.1 Maintenance and repair

#### General

Corrective maintenance must only be carried out by personnel trained on the robot. Maintenance or repair must be done with all electrical, pneumatic, and hydraulic power switched off, that is, no remaining hazards.

Hazards due to stored mechanical energy in the manipulator for the purpose of counterbalancing axes must be considered before maintenance or repair.

Never use the robot as a ladder, which means, do not climb on the controller, manipulator, including motors, or other parts. There are hazards of slipping and falling. The robot might be damaged.

Make sure that there are no loose screws, turnings, or other unexpected parts remaining after work on the robot has been performed.


When the work is completed, verify that the safety functions are working as intended.

#### Hot surfaces

Surfaces can be hot after running the robot. Touching the surfaces may result in burns.

Allow the parts to cool down before maintenance or repair.

#### Allergic reaction

| Warning  | Description   | Elimination/Action  |
|--|---|---|
| <br>Allergic reaction | When working with lubricants there is a risk of an allergic reaction. | Make sure that protective gear like goggles and gloves are always worn. |


#### Gearbox lubricants (oil or grease)

When handling oil, grease, or other chemical substances the safety information of the respective manufacturer must be observed.








#### Note

Take special care when handling hot lubricants.

| Warning  | Description  | Elimination/Action   |
|--|--|--|
| <br>Hot oil or grease | Changing and draining gearbox oil or grease may require handling hot lubricant heated up to 90 °C. | Make sure that protective gear like goggles and gloves are always worn during this activity. |

*Continues on next page*

| Warning   | Description   | Elimination/Action  |
|---|---|---|
| <br><b>Allergic reaction</b>                           | When working with lubricants there is a risk of an allergic reaction.   | Make sure that protective gear like goggles and gloves are always worn.   |
| <br><b>Possible pressure build-up in gearbox</b>       | When opening the oil or grease plug, there may be pressure present in the gearbox, causing lubricant to spray from the opening.   | Open the plug carefully and keep away from the opening. Do not overfill the gearbox when filling.                             |
| <br><b>Do not overfill</b>                             | Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: <ul style="list-style-type: none"> <li>• damage seals and gaskets</li> <li>• completely press out seals and gaskets</li> <li>• prevent the robot from moving freely.</li> </ul> | Make sure not to overfill the gearbox when filling it with oil or grease.<br>After filling, verify that the level is correct. |
| <br><b>Specified amount depends on drained volume</b> | The specified amount of oil or grease is based on the total volume of the gearbox. When changing the lubricant, the amount refilled may differ from the specified amount, depending on how much has previously been drained from the gearbox.   | After filling, verify that the level is correct.  |
| <br><b>Contaminated oil in gearboxes</b>             | For lifetime reasons always drain as much oil as possible from the gearbox. The magnetic oil plugs will gather residual metal chips.  |   |

### Hazards related to batteries

Under rated conditions, the electrode materials and liquid electrolyte in the batteries are sealed and not exposed to the outside.

There is a hazard in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery container. As a result under certain circumstances, electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow.

Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion.

Operating temperatures are listed in [Operating conditions, robot on page 52](#).

See safety instructions for the batteries in *Material/product safety data sheet - Battery pack (3HAC043118-001)*.

*Continues on next page*

# 1 Safety

---

## 1.6.1 Maintenance and repair

*Continued*

---

### Unexpected movement of robot arm



#### **WARNING**

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



#### **WARNING**

Manipulator movements can cause serious injuries on users and may damage equipment.

---

### Related information

See also the safety information related to installation and operation.



### 1.6.2 Emergency release of the robot axes

#### Description

In an emergency situation, the brakes on a robot axis can be released manually by pushing a brake release button.

How to release the brakes is described in the section:

- [Manually releasing the brakes on page 66](#).

The robot may be moved manually on smaller robot models, but larger models may require using an overhead crane or similar equipment.

#### Increased injury

Before releasing the brakes, make sure that the weight of the manipulator does not result in additional hazards, for example, even more severe injuries on a trapped person.



#### **DANGER**

When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways.

Make sure no personnel is near or beneath the robot.

# 1 Safety

---

## 1.6.3 Brake testing

### 1.6.3 Brake testing

---

#### When to test

During operation, the holding brake of each axis normally wears down. A test can be performed to determine whether the brake can still perform its function.

---

#### How to test

The function of the holding brake of each axis motor may be verified as described below:

- 1 Run each axis to a position where the combined weight of the manipulator and any load is maximized (maximum static load).
- 2 Switch the motor to the MOTORS OFF.
- 3 Inspect and verify that the axis maintains its position.

If the manipulator does not change position as the motors are switched off, then the brake function is adequate.



#### Note

For robots with the option SafeMove, the *Cyclic Brake Check* routine is recommended. See the manual for SafeMove in [References on page 10](#).

### 1.7 Troubleshooting

#### General

When troubleshooting requires work with power switched on, special considerations must be taken:

- Safety circuits might be muted or disconnected.
- Electrical parts must be considered as *live*.
- The manipulator can move unexpectedly at any time.



#### **DANGER**

Troubleshooting on the controller while powered on must be performed by personnel trained by ABB or by ABB field engineers.

A risk assessment must be done to address both robot and robot system specific hazards.



#### **WARNING**

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



#### **WARNING**

Manipulator movements can cause serious injuries on users and may damage equipment.

#### Related information

See also the safety information related to installation, operation, maintenance, and repair.

# 1 Safety

---

## 1.8 Decommissioning

### 1.8 Decommissioning

---

#### General

See section [Decommissioning on page 787](#).

---

#### Unexpected movement of robot arm



#### WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



#### WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

## 2 Installation and commissioning

### 2.1 Introduction to installation and commissioning

#### General

This chapter contains assembly instructions and information for installing the IRB 1200 at the working site.

See also the product manual for the robot controller.

The installation must be done by qualified installation personnel in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.

#### Safety information

Before any installation work is commenced, it is extremely important that all safety information is observed.

There are general safety aspects that must be read through, as well as more specific safety information that describes the danger and safety risks when performing the procedures. Read the chapter [Safety on page 19](#) before performing any installation work.



#### Note

If the IRB 1200 is connected to power, always make sure that the robot is connected to protective earth and a residual current device (RCD) before starting any installation work.

For more information see:

- *Product manual - IRC5 Compact*

## 2 Installation and commissioning

### 2.2.1 Extra O-rings

## 2.2 Unpacking

### 2.2.1 Extra O-rings

#### Installation of extra O-rings

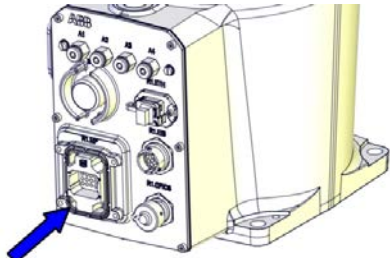
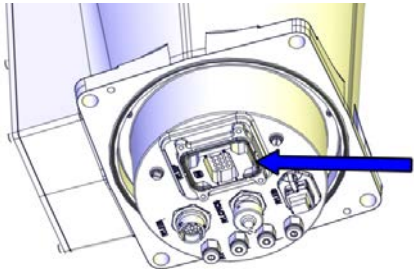
For robots with protection class IP67 (option 287-10)

For robots with protection type Foundry Plus (option 287-3)

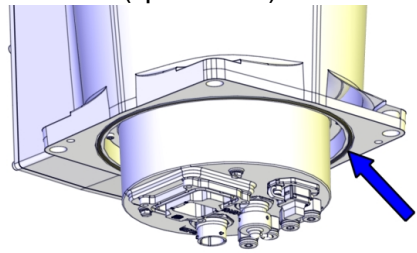
For robots with protection type Clean Room (option 287-1)

For robots with food grade lubrication (option 777-1)

Two extra O-rings are delivered together with the robot and must be fitted to the robot during installation.

| Equipment | Art. no.    | Note   |
|-----------|-------------|--|
| O-ring    | 3HAB3772-19 | <p>For robots with protection class IP67<br/>Used with protection type Foundry Plus<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Used to seal between the main power cable and the connector.<br/>Robots with manipulator cables routed from the rear of the base:</p>  <p>xx1500000243</p> <p>Robots with manipulator cables routed from below (option 996-1):</p>  <p>xx1500000242</p> |

*Continues on next page*

| Equipment | Art. no.     | Note  |
|-----------|--------------|---|
| O-ring    | 3HAB3772-141 | <p>For robots with protection class IP67 (option 287-10)</p> <p>Used with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Used with manipulator cables routed from below (option 996-1)</p>  <p>xx1500000241</p> |

A label, showing in the following figure, is fitted on the connector to remind the fitting of extra O-ring 3HAB3772-19. The label must be removed before the O-ring and main cable is fitted.

Extra O-ring 3HAB3772-19 (delivered in Accessories) for protection class IP67, protection type Foundry Plus and Clean Room must be fitted .

3HAC063211-001

xx1700001298

#### Further information

For installation information, see [Orienting and securing the robot on page 69](#) and [Electrical connections on page 94](#).

## 2 Installation and commissioning

### 2.2.2 Protection covers

### 2.2.2 Protection covers

#### Protection covers for water and dust proofing

A dust cap and two protectors (used with option 803-2) are delivered together with the robot and must be well fitted to the connectors in any application requiring water and dust proofing.

| Equipment       | Art. no.       | Note  |
|-----------------|----------------|---|
| Dust cap        | 3HEA800897-002 | Used to cover unused connectors for water and dust proofing. Replace if damaged.                            |
| M12 protector   | 3HAC047543-001 | Used with option 803-2.<br>Used to cover unused connectors for water and dust proofing. Replace if damaged. |
| RJ 45 protector | 3HAC047539-001 | Used with option 803-2.<br>Used to cover unused connectors for water and dust proofing. Replace if damaged. |

#### Protection covers for Foundry Plus robots

##### For robots with protection type Foundry Plus (option 287-3)

Extra protection covers, sealing and plugs are delivered together with Foundry Plus robots and must be fitted to the robot during installation.

| Equipment                                | Art. no.       | Note   |
|--|----------------|--|
| Protection bracket for CP/CS connectors  | 3HAC058350-001 | Used with protection type Foundry Plus.<br>Replace if damaged. |
| Protection cover for axis-6 turning disk | 3HAC044666-001 | Used with protection type Foundry Plus.<br>Replace if damaged. |
| T40 variseal sealing                     | 3HAC044641-012 | Used with protection type Foundry Plus.<br>Replace if damaged. |
| Protection plug for lifting holes        | 3HAC4836-24    | Used with protection type Foundry Plus.<br>Replace if damaged. |



2.2.3 Transportation bracket

Location of the transportation bracket

A transportation bracket is installed and delivered together with the robot for securing the robot position during shipping and transport. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.



Note

If the robot is delivered with option 636-1 Force Control Package, the transportation bracket is installed on the force sensor.

| IRB 1200-7/0.7                |                            | IRB 1200-5/0.9                |                            |
|-------------------------------|----------------------------|-------------------------------|----------------------------|
| Without force control package | With force control package | Without force control package | With force control package |
| <p>xx1500001605</p>           | <p>xx1800000004</p>        | <p>xx1800000003</p>           | <p>xx1800000002</p>        |
| 3HAC051896-001                | 3HAC064317-001             | 3HAC051897-001                | 3HAC064318-001             |

Removing the transportation bracket

Use this procedure to remove the bracket.



Note


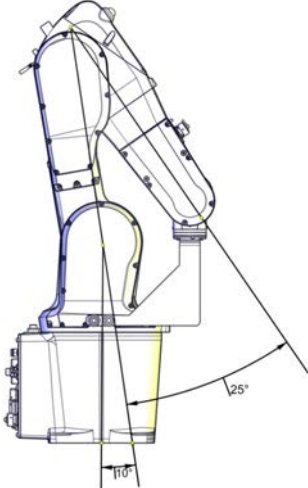

The bracket must be kept for reuse after removal. Once robot shipping and transportation are required, the transportation bracket has to be reinstalled for securing the robot position.

Continues on next page


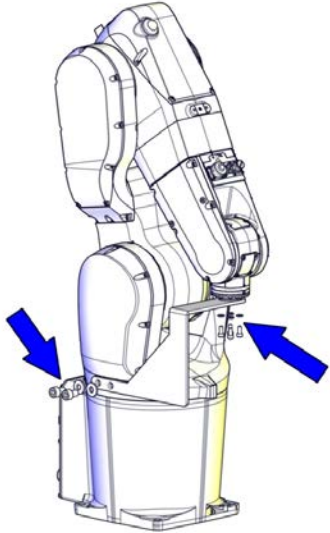
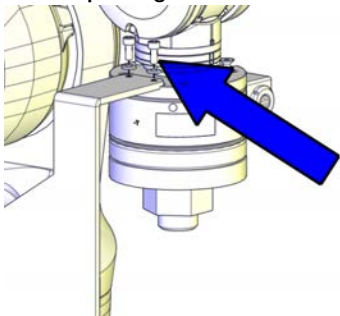
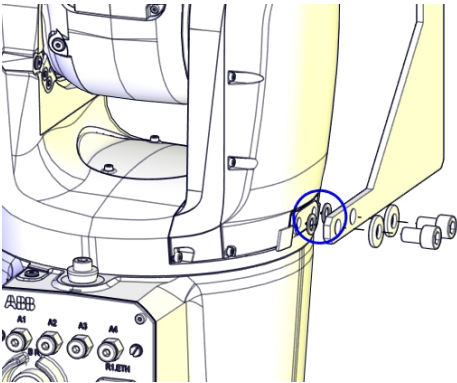
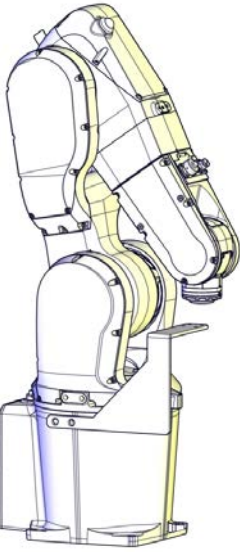
## 2 Installation and commissioning

### 2.2.3 Transportation bracket

Continued

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Move the robot to an appropriate position.</p> <p> <b>WARNING</b></p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p> |  <p>xx1500001399</p> |
| 2 | <p> <b>CAUTION</b></p> <p>For Clean Room robots, it is important not to rub against the paint of the robot while performing any service work on the robot.</p>    |   |

Continues on next page

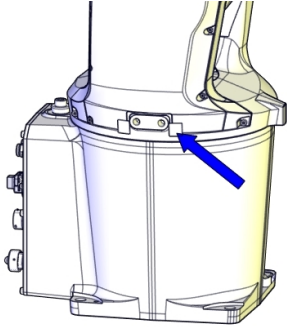
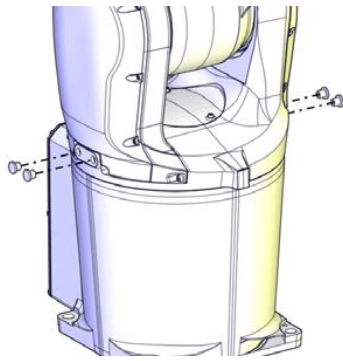
|   | Action   | Note  |
|---|--|---|
| 3 | <p>Remove the screws and washers.</p> <p> <b>CAUTION</b></p> <p>Do not remove the force sensor if the robot is delivered with a force control package.</p>  |  <p>xx1500001604</p> <p>For robots delivered with force control package</p>  <p>xx1800000005</p> |
| 4 | <p>Remove the bracket.</p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Remove the two M10 rubber washers, as circled in the figure, together with the bracket and reserve them for further use.</p>  <p>xx1600001178</p> |  <p>xx1500001400</p>   |

*Continues on next page*

## 2 Installation and commissioning

### 2.2.3 Transportation bracket

Continued

|   | Action   | Note   |
|---|--|--|
| 5 | <p><b>For robots with protection type Clean Room</b><br/><b>For robots with food grade lubrication</b></p> <p>Make sure the swing sealing plug is intact and the sealant around fully covers the joint.</p> <p>If not, replace the swing sealing plug and seal the joint. See <a href="#">Swing sealing plug for Clean Room robots and robots with food grade lubrication on page 142</a>.</p> <p>After the replacement, wipe clean.</p> | <p>Swing sealing plug: 3HAC053687-001</p>  <p>xx160000205</p>               |
| 6 | <p><b>For robots with protection type Foundry Plus</b></p> <p>Fit protection plugs to the lifting holes.</p>   | <p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001147</p> |

## 2.2.4 Pre-installation procedure

### Introduction


This section is intended for use when unpacking and installing the robot for the first time. It also contains information useful during later re-installation of the robot.

### Prerequisites for installation personnel

Installation personnel working with an ABB product must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/maintenance/repair work
- conform to all national and local codes.

### Checking the pre-requisites for installation

|    | Action  |
|----|---|
| 1  | Make a visual inspection of the packaging and make sure that nothing is damaged.  |
| 2  | Remove the packaging.   |
| 3  | Check for any visible transport damage.<br><br> <b>Note</b><br>Stop unpacking and contact ABB if transport damages are found.   |
| 4  | Clean the unit with a lint-free cloth, if necessary.  |
| 5  | Make sure that the lifting accessory used (if required) is suitable to handle the weight of the robot as specified in: <a href="#">Weight, robot on page 49</a>   |
| 6  | If the robot is not installed directly, it must be stored as described in: <a href="#">Storage conditions, robot on page 52</a>   |
| 7  | Make sure that the expected operating environment of the robot conforms to the specifications as described in: <a href="#">Operating conditions, robot on page 52</a>   |
| 8  | Before taking the robot to its installation site, make sure that the site conforms to: <ul style="list-style-type: none"> <li>• <a href="#">Loads on foundation, robot on page 50</a></li> <li>• <a href="#">Protection classes, robot on page 53</a></li> <li>• <a href="#">Requirements, foundation on page 51</a></li> </ul> |
| 9  | Before moving the robot, please observe the stability of the robot: <a href="#">Risk of tipping/stability on page 59</a>  |
| 10 | When these prerequisites are met, the robot can be taken to its installation site as described in section: <a href="#">On-site installation on page 61</a>  |
| 11 | Install required equipment, if any. <ul style="list-style-type: none"> <li>• <a href="#">Installing the signal lamp on page 84</a></li> </ul>   |

### Weight, robot

The table shows the weight of the robot.

| Robot model | Weight   |
|-------------|--|
| IRB 1200    | IRB 1200-5/0.9: 54 kg<br>IRB 1200-7/0.7: 52 kg |

*Continues on next page*

## 2 Installation and commissioning

### 2.2.4 Pre-installation procedure

Continued



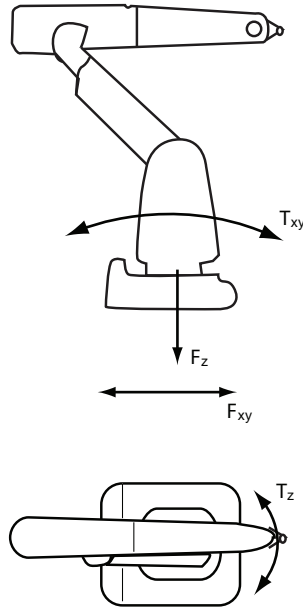
#### Note

The weight does not include tools and other equipment fitted on the robot.

#### Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

The directions are valid for all floor mounted, suspended and inverted robots.



xx1100000521

|          |   |
|----------|---|
| $F_{xy}$ | Force in any direction in the XY plane          |
| $F_z$    | Force in the Z plane                            |
| $T_{xy}$ | Bending torque in any direction in the XY plane |
| $T_z$    | Bending torque in the Z plane                   |

The table shows the various forces and torques working on the robot during different kinds of operation.



#### Note

These forces and torques are extreme values that are rarely encountered during operation. The values also never reach their maximum at the same time!



#### WARNING

The robot installation is restricted to the mounting options given in following load table(s).

#### Floor mounted

| Force    | Endurance load (in operation) | Max. load (emergency stop) |
|----------|-------------------------------|----------------------------|
| Force xy | ±910 N                        | ±1620 N                    |

Continues on next page

| Force     | Endurance load (in operation) | Max. load (emergency stop) |
|-----------|-------------------------------|----------------------------|
| Force z   | -550 ±980 N                   | -550 ±1610 N               |
| Torque xy | ±570 Nm                       | ±1550 Nm                   |
| Torque z  | ±280 Nm                       | ±580 Nm                    |

#### Wall mounted

| Force     | Endurance load (in operation) | Max. load (emergency stop) |
|-----------|-------------------------------|----------------------------|
| Force xy  | ±1210 N                       | ±1940 N                    |
| Force z   | 0 ±900 N                      | 0 ±1340 N                  |
| Torque xy | ±700 Nm                       | ±1650 Nm                   |
| Torque z  | ±300 Nm                       | ±610 Nm                    |

#### Suspended

| Force     | Endurance load (in operation) | Max. load (emergency stop) |
|-----------|-------------------------------|----------------------------|
| Force xy  | ±910 N                        | ±1620 N                    |
| Force z   | +550 ±980 N                   | +550 ±1610 N               |
| Torque xy | ±570 Nm                       | ±1550 Nm                   |
| Torque z  | ±280 Nm                       | ±580 Nm                    |

#### Requirements, foundation

The table shows the requirements for the foundation where the weight of the installed robot is included:


| Requirement                    | Value      | Note  |
|--------------------------------|------------|---|
| Flatness of foundation surface | 0.1/500 mm | Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB.<br>The value for levelness aims at the circumstance of the anchoring points in the robot base.<br>In order to compensate for an uneven surface, the robot can be recalibrated during installation. If resolver/encoder calibration is changed this will influence the absolute accuracy. |
| Maximum tilt                   | 5°         | The limit for the maximum payload on the robot is reduced if the robot is tilted from 0°. Contact ABB for further information about acceptable loads.   |

*Continues on next page*

## 2 Installation and commissioning

### 2.2.4 Pre-installation procedure

Continued

| Requirement                 | Value  | Note  |
|-----------------------------|--|---|
| Minimum resonance frequency | 22 Hz<br> <b>Note</b><br>It may affect the manipulator lifetime to have a lower resonance frequency than recommended. | The value is recommended for optimal performance.<br>Due to foundation stiffness, consider robot mass including equipment. <sup>i</sup><br>For information about compensating for foundation flexibility, see <i>Application manual - Controller software IRC5</i> , section <i>Motion Process Mode</i> . |

<sup>i</sup> The minimum resonance frequency given should be interpreted as the frequency of the robot mass/inertia, robot assumed stiff, when a foundation translational/torsional elasticity is added, i.e., the stiffness of the pedestal where the robot is mounted. The minimum resonance frequency should not be interpreted as the resonance frequency of the building, floor etc. For example, if the equivalent mass of the floor is very high, it will not affect robot movement, even if the frequency is well below the stated frequency. The robot should be mounted as rigid as possible to the floor.

Disturbances from other machinery will affect the robot and the tool accuracy. The robot has resonance frequencies in the region 10 – 20 Hz and disturbances in this region will be amplified, although somewhat damped by the servo control. This might be a problem, depending on the requirements from the applications. If this is a problem, the robot needs to be isolated from the environment.

### Storage conditions, robot

The table shows the allowed storage conditions for the robot:

| Parameter                                      | Value                                      |
|--|--|
| Minimum ambient temperature                    | -25°C                                      |
| Maximum ambient temperature                    | +55°C                                      |
| Maximum ambient temperature (less than 24 hrs) | +70°C                                      |
| Maximum ambient humidity                       | 95% at constant temperature (gaseous only) |

### Operating conditions, robot

The table shows the allowed operating conditions for the robot:

| Parameter  | Value                       |
|--|-----------------------------|
| Minimum ambient temperature  | +5°C <sup>i</sup>           |
| Maximum ambient temperature  | +45°C                       |
| Maximum ambient temperature for robots with food grade lubrication | +35°C <sup>ii</sup>         |
| Maximum ambient humidity   | 95% at constant temperature |

<sup>i</sup> At low environmental temperature < 10°C is, as with any other machine, a warm-up phase recommended to be run with the robot. Otherwise there is a risk that the robot stops or run with lower performance due to temperature dependent oil and grease viscosity.

<sup>ii</sup> For robots with food grade lubrication, if environment temperature > 35°C, contact ABB for further information.

Continues on next page



#### Protection classes, robot

The table shows the available protection types of the robot, with the corresponding protection class.

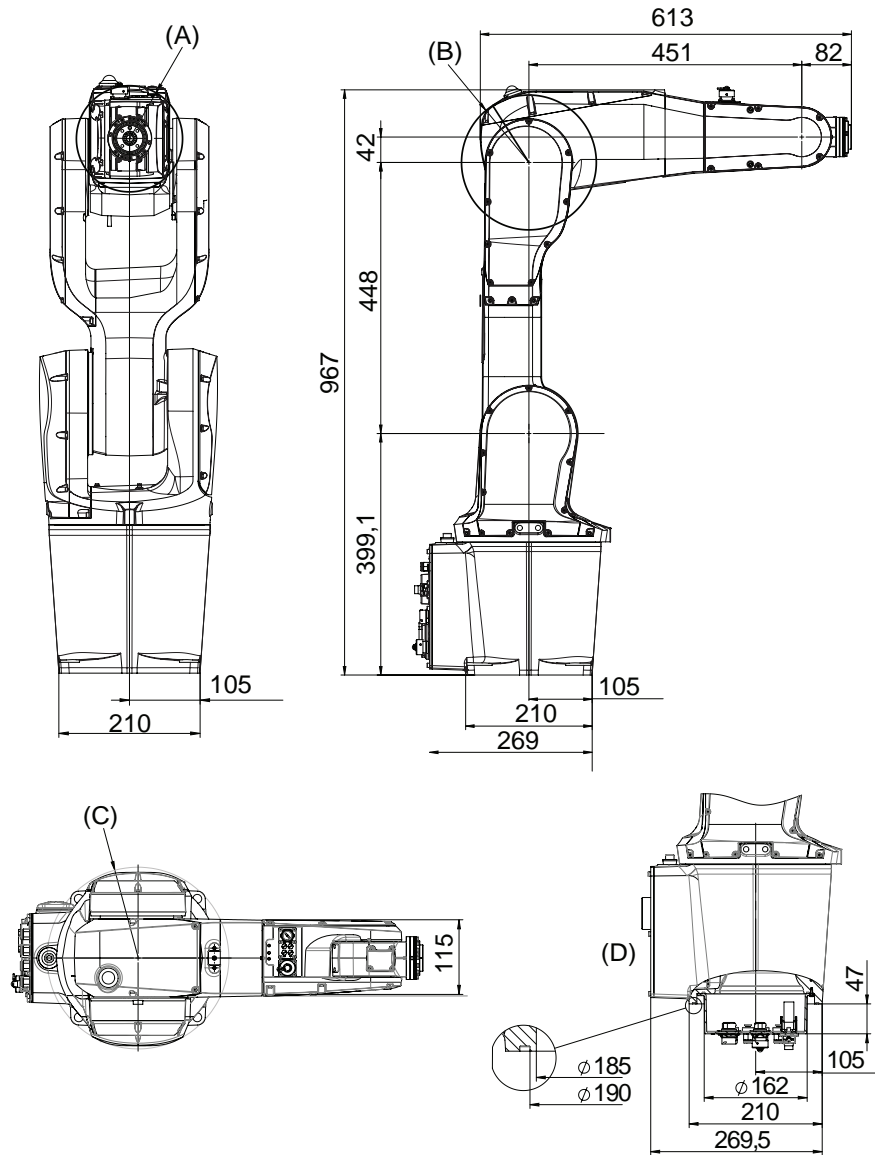
| Protection type                           | Protection class             |
|---|------------------------------|
| Manipulator, protection type Standard     | IP40<br>IP67 (option 287-10) |
| Manipulator, protection type Foundry Plus | Not available                |
| Manipulator, protection type Clean Room   | Not available                |

## 2 Installation and commissioning

### 2.2.5 Dimensions

### 2.2.5 Dimensions

#### Dimensions IRB 1200-5/0.9

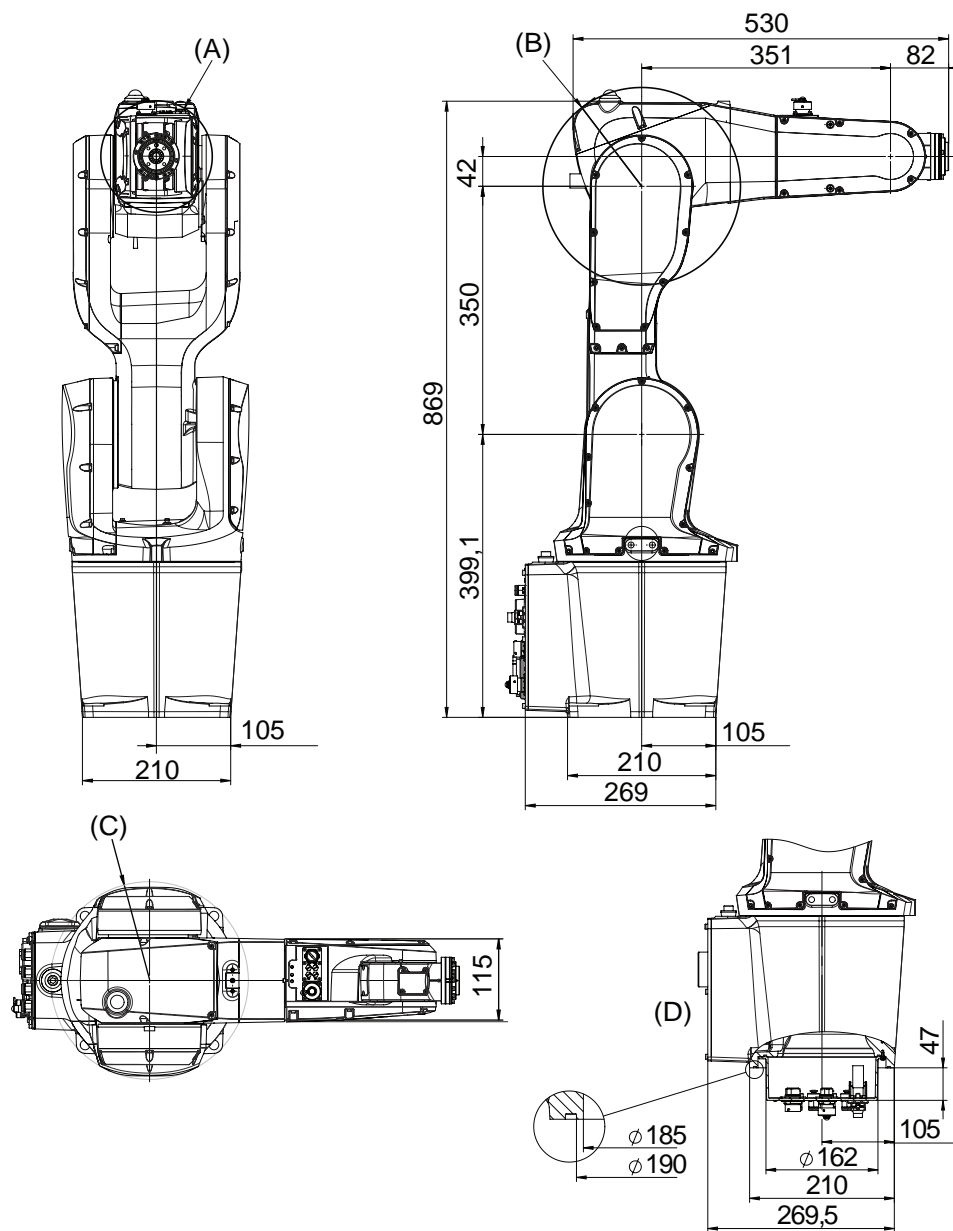


xx1400000339

| Pos | Description  |
|-----|--|
| A   | Minimum turning radius axis 4 R=79 mm                    |
| B   | Minimum turning radius axis 3 R=111 mm                   |
| C   | Minimum turning radius axis 1 R=138 mm                   |
| D   | Valid for option Robot cabling routing, 966-1 From below |

Continues on next page

#### Dimensions IRB 1200-7/0.7



xx1300000366

| Position | Description  |
|----------|--|
| A        | Minimum turning radius axis 4 R=79 mm                    |
| B        | Minimum turning radius axis 3 R=139 mm                   |
| C        | Minimum turning radius axis 1 R=138 mm                   |
| D        | Valid for option Robot cabling routing, 966-1 From below |

## 2 Installation and commissioning

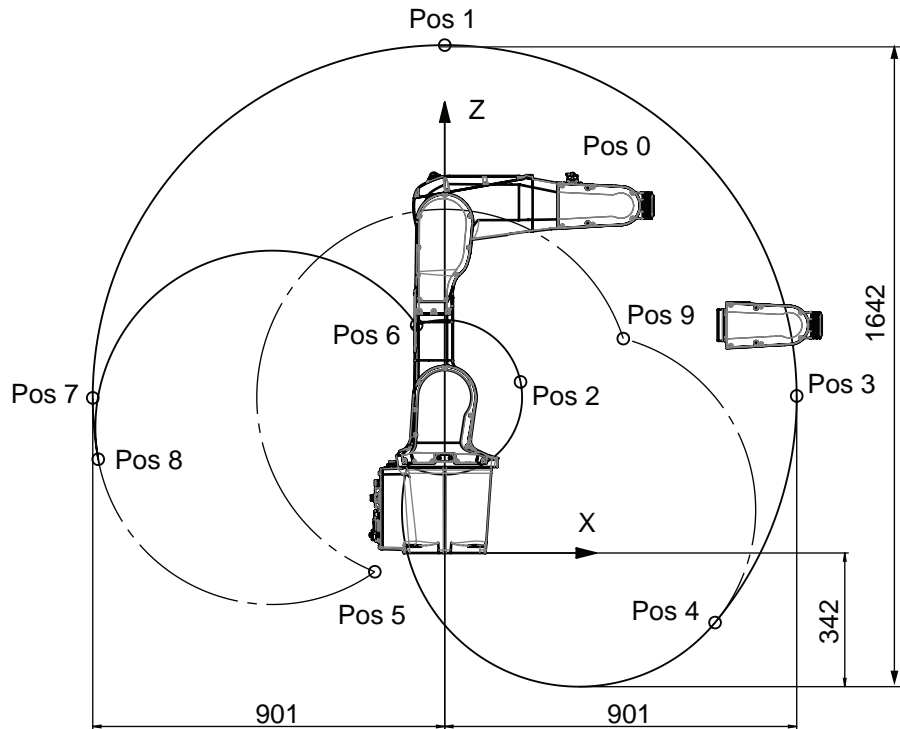
### 2.2.6 Working range

### 2.2.6 Working range

#### Illustration, working range IRB 1200-5/0.9

IRB 1200-5/0.9 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.



xx1300000387

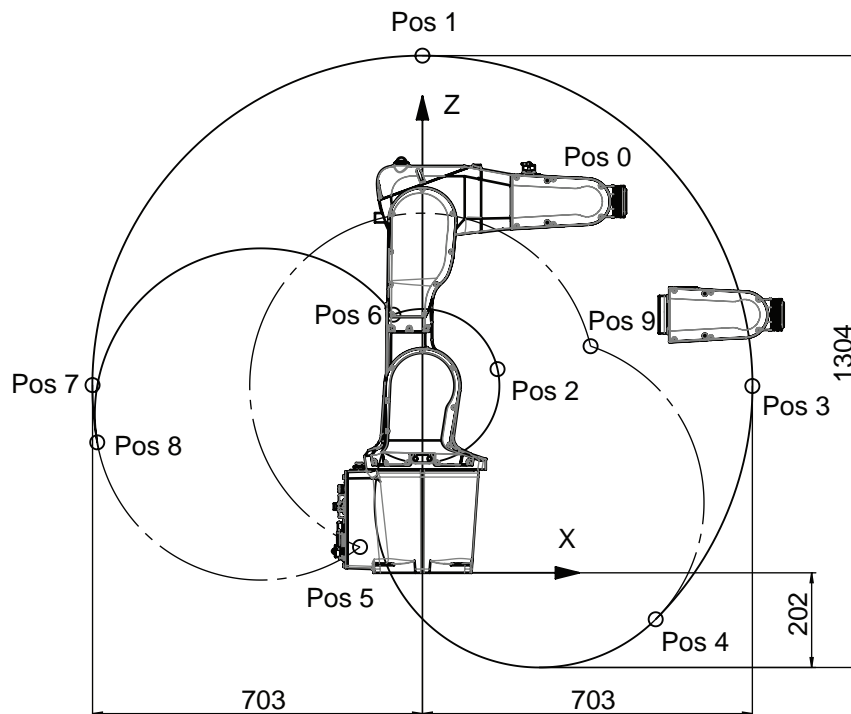
| Position in the figure | Positions at wrist center (mm) |      | Angle (degrees) |        |
|------------------------|--------------------------------|------|-----------------|--------|
|                        | X                              | Z    | Axis 2          | Axis 3 |
| Pos0                   | 451                            | 889  | 0°              | 0°     |
| Pos1                   | 0                              | 1300 | 0°              | -85°   |
| Pos2                   | 194                            | 438  | 0°              | +70°   |
| Pos3                   | 901                            | 402  | +90°            | -85°   |
| Pos4                   | 692                            | -178 | +130°           | -85°   |
| Pos5                   | -179                           | -48  | -100°           | -200°  |
| Pos6                   | -72                            | 583  | -100°           | +70°   |
| Pos7                   | -901                           | 397  | -90°            | -85°   |
| Pos8                   | -887                           | 240  | -100°           | -85°   |
| Pos9                   | 458                            | 549  | +130°           | -200°  |

Continues on next page

#### Illustration, working range IRB 1200-7/0.7

IRB 1200-7/0.7 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.



xx130000386

| Position in the figure | Positions at wrist center (mm) |      | Angle (degrees) |        |
|------------------------|--------------------------------|------|-----------------|--------|
|                        | X                              | Z    | Axis 2          | Axis 3 |
| Pos0                   | 351                            | 791  | 0°              | 0°     |
| Pos1                   | 0                              | 1102 | 0°              | -83°   |
| Pos2                   | 160                            | 434  | 0°              | +70°   |
| Pos3                   | 703                            | 398  | +90°            | -83°   |
| Pos4                   | 497                            | -99  | +135°           | -83°   |
| Pos5                   | -133                           | 55   | -100°           | -200°  |
| Pos6                   | -62                            | 550  | -100°           | +70°   |
| Pos7                   | -703                           | 400  | -90°            | -83°   |
| Pos8                   | -693                           | 278  | -100°           | -83°   |
| Pos9                   | 358                            | 488  | +135°           | -200°  |

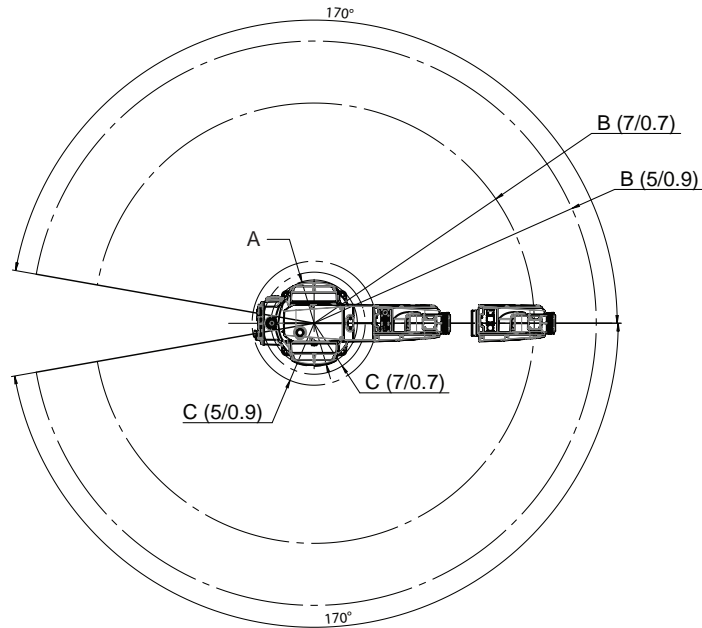
Continues on next page

## 2 Installation and commissioning

### 2.2.6 Working range

Continued

#### Minimum turning radius of axis 1



xx140000681

| Robot variant  | Radius A            | Radius B | Radius C |
|----------------|---------------------|----------|----------|
| IRB 1200-5/0.9 | 138 mm <sup>i</sup> | 901 mm   | 198 mm   |
| IRB 1200-7/0.7 | 138 mm <sup>i</sup> | 703 mm   | 163 mm   |

<sup>i</sup> Maximum turning radius of axis 1.

#### Working range

| Axis   | Type of motion  | IRB 1200-7/0.7   | IRB 1200-5/0.9   |
|--------|-----------------|--|--|
| Axis 1 | Rotation motion | +170° to -170°   | +170° to -170°   |
| Axis 2 | Arm motion      | +135° to -100°   | +130° to -100°   |
| Axis 3 | Arm motion      | +70° to -200°  | +70° to -200°  |
| Axis 4 | Wrist motion    | +270° to -270°   | +270° to -270°   |
| Axis 5 | Bend motion     | +130° to -130°   | +130° to -130°   |
| Axis 6 | Turn motion     | Default: +400° to -400°<br>Maximum revolution: ±242 <sup>i</sup> | Default: +400° to -400°<br>Maximum revolution: ±242 <sup>i</sup> |

<sup>i</sup> The default working range for axis 6 can be extended by changing parameter values in the software. Option 610-1 Independent axis can be used for resetting the revolution counter after the axis has been rotated (no need for "rewinding" the axis).

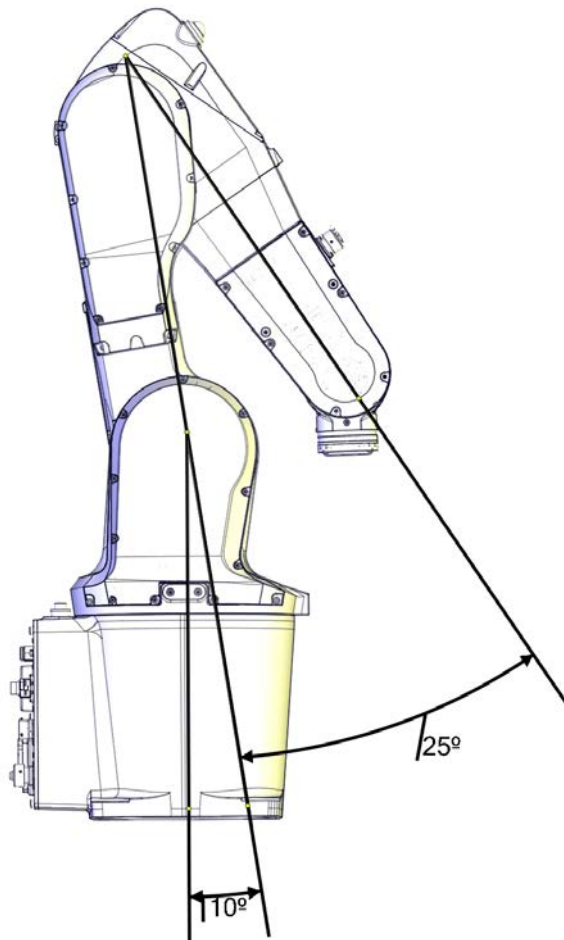
#### 2.2.7 Risk of tipping/stability

##### Risk of tipping

Do not change the robot position before securing it to the foundation.  
The shipping position is the most stable position.

##### Shipping and transportation position

This figure shows the robot in its shipping position and transportation position.



xx140000500

##### Transportation bracket

A transportation bracket is installed and delivered together with the robot for securing the robot position during shipping and transportation. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.

For details, see [Transportation bracket on page 45](#).



##### WARNING

The robot will be mechanically unstable if not properly secured to the foundation.

## 2 Installation and commissioning

---

### 2.2.8 The unit is sensitive to ESD

### 2.2.8 The unit is sensitive to ESD

---

#### Description

ESD (electrostatic discharge) is the transfer of electrical static charge between two bodies at different potentials, either through direct contact or through an induced electrical field. When handling parts or their containers, personnel not grounded may potentially transfer high static charges. This discharge may destroy sensitive electronics.

#### Safe handling

Use one of the following alternatives:

- Use a wrist strap.

Wrist straps must be tested frequently to ensure that they are not damaged and are operating correctly.

- Use an ESD protective floor mat.

The mat must be grounded through a current-limiting resistor.

- Use a dissipative table mat.

The mat should provide a controlled discharge of static voltages and must be grounded.



## 2.3 On-site installation

### 2.3.1 Lifting robot with roundslings

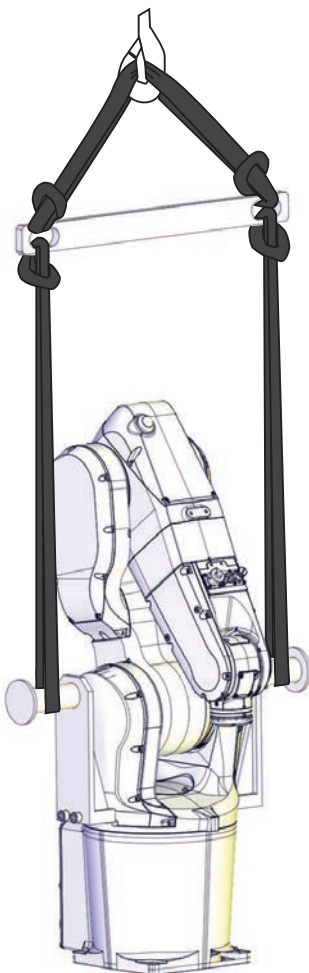
#### Attaching the roundslings



#### Note

A transportation bracket is installed and delivered together with the robot for securing the robot position during shipping and transport. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.

For details, see [Transportation bracket on page 45](#).



xx140000501

#### Required equipment

| Equipment, etc. | Article number | Note |
|-----------------|----------------|------|
| Overhead crane  | -              |      |

*Continues on next page*

## 2 Installation and commissioning


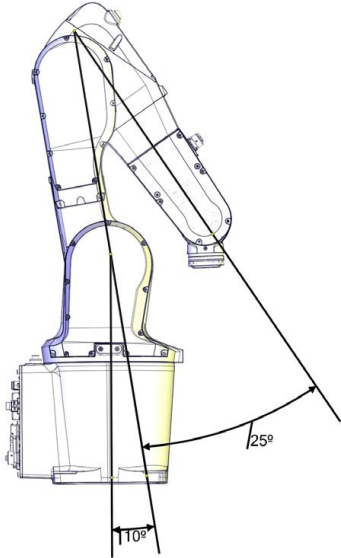

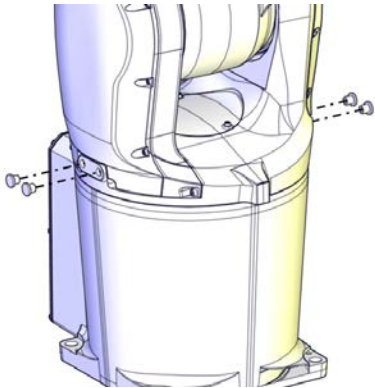
### 2.3.1 Lifting robot with roundslings

Continued

| Equipment, etc.          | Article number | Note   |
|--------------------------|----------------|--|
| Roundsling, 0.6 m        | -              | 2 pcs. Length: 0.6 m. Lifting capacity: 60 kg.         |
| Roundsling, 1.5 m        | -              | 2 pcs. Length: 1.5 m. Lifting capacity: 60 kg.         |
| Lifting accessory, robot | 3HAC049711-001 | Includes lifting accessories, lifting beam and screws. |

### Lifting and turning the robot with roundslings

Use this procedure to lift the robot with roundslings.

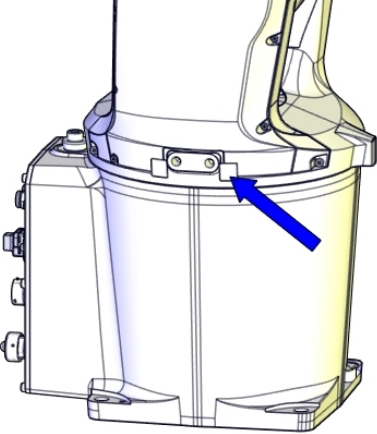
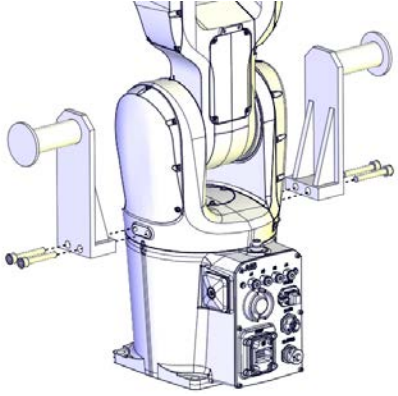
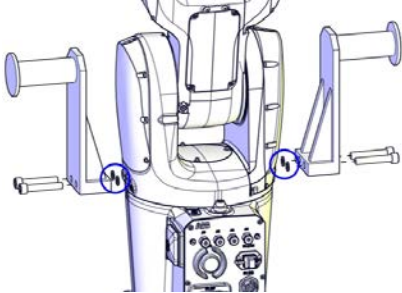
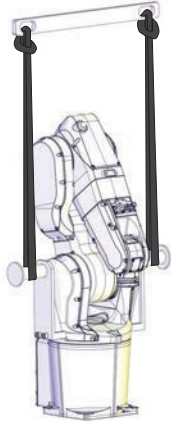
|   | Action   | Note  |
|---|--|---|
| 1 | <p>Move the robot to an appropriate lifting position.</p> <p> <b>WARNING</b></p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p> |  <p>xx1400000500</p>  |
| 2 | <p> <b>CAUTION</b></p> <p>For Clean Room robots, it is important not to rub against the paint of the robot while fitting and lifting.</p>                               |   |
| 3 | <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Remove the protection plugs in lifting holes.</p>   |  <p>xx1600001147</p> |

Continues on next page

## 2 Installation and commissioning

### 2.3.1 Lifting robot with roundslings

Continued

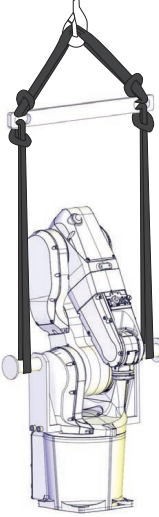



|   | Action   | Note   |
|---|--|--|
| 4 | <p>Fit the lifting tools to the robot.<br/>Use the enclosed screws.</p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b><br/>Use two M10 rubber washers, as circled in the figure, on the lifting holes at each side of the robot (4 pcs in total) for protection when fitting the lifting tools.</p> <p><b>For robots with protection type Clean Room</b><br/>Pay attention not to damage the swing sealing plug and the sealant covering the joint when fitting the lifting tools.</p>  <p>xx1600000205</p> <p>Replace the swing sealing plug if damaged and seal the joint. See <a href="#">Swing sealing plug for Clean Room robots and robots with food grade lubrication on page 142</a>.</p> <p>After the replacement, wipe clean.</p> | <p>Lifting accessory, robot: 3HAC049711-001</p>  <p>xx1400000498</p> <p>Tightening torque: 15 Nm</p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p>  <p>xx1600001177</p> |
| 5 | <p>Fit the roundslings to the lifting tools and attach them to the lifting beam.</p>   | <p>Make sure the roundslings has free space and does not wear against any part of the robot.</p> <p>Roundslings, 1.5 m</p>  <p>xx1400000511</p>   |

Continues on next page

## 2 Installation and commissioning

### 2.3.1 Lifting robot with roundslings

Continued

|    | Action   | Note   |
|----|--|--|
| 6  | Fit the roundslings to the lifting beam and to the overhead crane.   | Roundslings, 0.6 m<br><br><small>xx1400000501</small> |
| 7  |  <b>CAUTION</b><br>The IRB 1200 robot weighs .<br>IRB 1200-5/0.9: 54 kg<br>IRB 1200-7/0.7: 52 kg<br>All lifting accessories used must be sized accordingly! |  |
| 8  |  <b>WARNING</b><br>Personnel must not, under any circumstances, be present under the suspended load!  |  |
| 9  | Raise the overhead crane to lift the robot.  |  |
| 10 | If the manipulator should be mounted on a wall, or in a suspended position the manipulator can now be tilted slowly by hand.   | <br><small>xx1600000005</small>                     |

### 2.3.2 Lifting and turning a suspended mounted robot

---

#### Introduction

How to lift and turn the robot to a suspended position using the turning accessory is described in the lifting instruction delivered with the turning accessory. Article numbers for the accessory and the instruction is specified in [Special tools on page 812](#). Any additional equipment required is specified in the instruction for the lifting accessory. Contact ABB for more information.

How to lift and turn the robot into position for wall position: Contact ABB for more information.

How to lift and turn the robot into position for tilted position: Contact ABB for more information.

## 2 Installation and commissioning

---

### 2.3.3 Manually releasing the brakes

### 2.3.3 Manually releasing the brakes

---

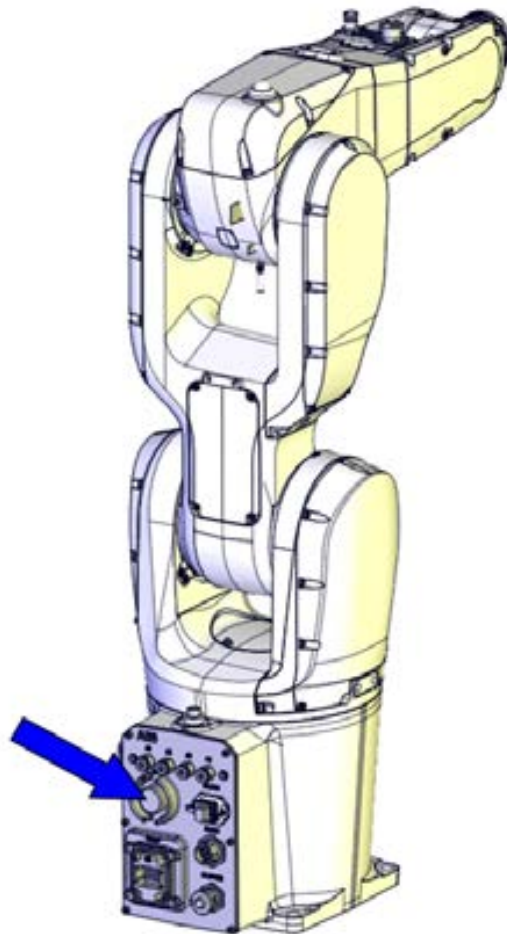
#### Introduction to manually releasing the brakes

This section describes how to release the holding brakes for the motors of each axis.

---

#### Location of brake release unit

The internal brake release unit is located as shown in the figure.

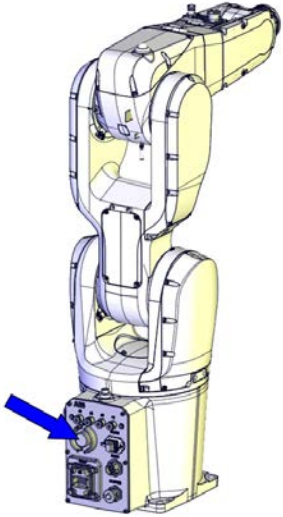



xx140000030

*Continues on next page*


#### Releasing the brakes

This procedure details how to release the holding brakes when the robot is equipped with an internal brake release unit.

|   | Action  | Note   |
|---|---|--|
| 1 | <p>The internal brake release unit is equipped with a button for controlling the axes brakes. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to the section <a href="#">Supplying power to connector R1.MP on page 67</a>.</p>  |  <p>xx140000030</p> |
| 2 | <p> <b>DANGER</b></p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!</p> <p>Make sure no personnel is near or beneath the robot arm!</p> |  |
| 3 | <p>Release the holding brake on all robot axes by pressing the button on the internal brake release unit.</p> <p>The brake will function again as soon as the button is released.</p>   |  |

#### Supplying power to connector R1.MP

If the robot is not connected to the controller, power must be supplied to connector R1.MP on the robot in order to enable the brake release buttons.


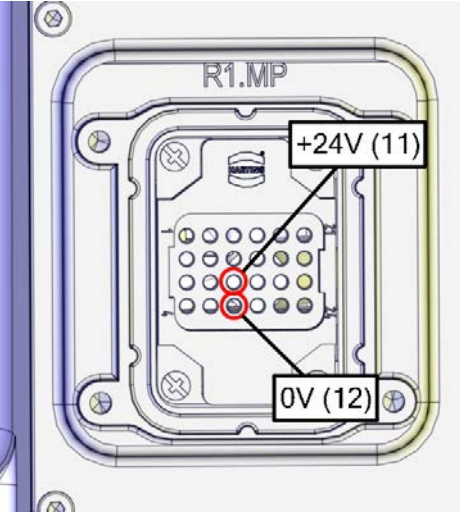
|   | Action   | Note |
|---|--|------|
| 1 | <p> <b>DANGER</b></p> <p>Incorrect connections, such as supplying power to the wrong pin, may cause all brakes to be released simultaneously!</p> |      |

*Continues on next page*

## 2 Installation and commissioning

### 2.3.3 Manually releasing the brakes

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Supply +24V on pin 11 and 0V on pin 12.</p> <p> <b>Note</b></p> <p>Do not interchange the 24V and 0V pins. If they are mixed up, damage can be caused to the brake release unit and to the system board.</p> |  <p>xx140000031</p> |



#### 2.3.4 Orienting and securing the robot

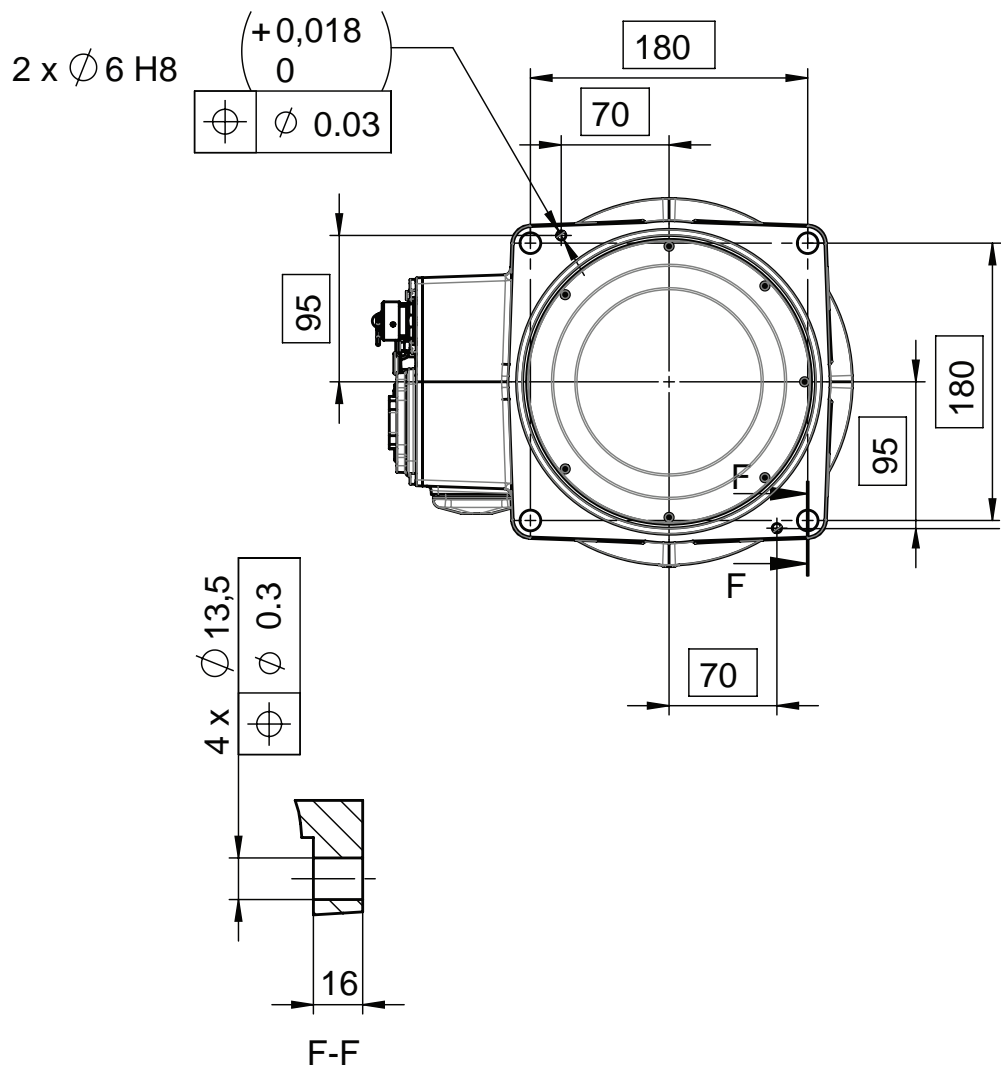
##### Introduction

This section details how to orient and secure the robot to the foundation or base plate in order to run the robot safely. The requirements made on the foundation are shown in sections:

- [Loads on foundation, robot on page 50](#)
- [Requirements, foundation on page 51.](#)

##### Hole configuration, base

The illustration shows the hole configuration used when securing the robot.



xx130000368

*Continues on next page*

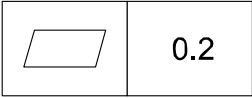
## 2 Installation and commissioning

### 2.3.4 Orienting and securing the robot

*Continued*

#### Specification, attachment screws and pins

The table specifies the type of securing screws and washers to be used to secure the robot directly to the foundation. It also specifies the type of pins to be used.

|                            |  |
|----------------------------|--|
| Suitable screws            | M12x35 (robot installation directly on foundation)   |
| Quantity                   | 4 pcs  |
| Quality                    | 8.8  |
| Suitable washer            | 13 x 20 x 2, steel hardness class 300HV  |
| Guide pins                 | 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1   |
| Tightening torque          | 55 Nm $\pm$ 5 Nm   |
| Level surface requirements | <br>xx0900000643 |

#### Installation of extra O-ring

**For robots with protection class IP67 (option 287-10)**

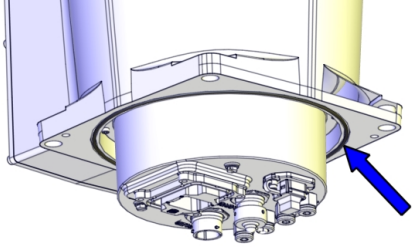
**For robots with protection type FoundryPlus (option 287-3)**

**For robots with protection type Clean Room (option 287-1)**

**For robots with food grade lubrication (option 777-1)**

**Manipulator cables routed from below (option 996-1)**



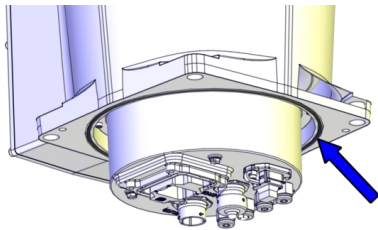
The O-ring specified below is delivered together with the robot and must be installed to the bottom of the base during installation.

| Equipment | Art. no.     | Note   |
|-----------|--------------|--|
| O-ring    | 3HAB3772-141 | For robots with protection class IP67 (option 287-10)<br>Used with protection type Foundry Plus<br>For robots with protection type Clean Room<br>For robots with food grade lubrication<br>Used with manipulator cables routed from below (option 996-1)<br><br>xx1500000241 |

*Continues on next page*

#### Orienting and securing the robot

Use this procedure to orient and secure the robot.

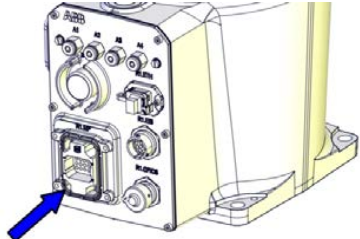
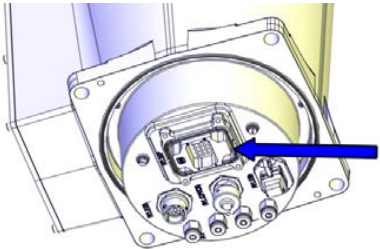
|    | Action   | Information   |
|----|--|---|
| 1  | Make sure the installation site for the robot conforms to the specifications in section: <ul style="list-style-type: none"> <li>• <a href="#">Pre-installation procedure on page 49.</a></li> </ul>  |   |
| 2  | Prepare the installation site with attachment holes.   | The hole configuration of the base is shown in the figure in: <ul style="list-style-type: none"> <li>• <a href="#">Hole configuration, base on page 69</a></li> </ul> |
| 3  |  <b>CAUTION</b><br>The robot weighs . All lifting equipment must be sized accordingly!<br>IRB 1200-5/0.9: 54 kg<br>IRB 1200-7/0.7: 52 kg  |   |
| 4  |  <b>CAUTION</b><br>When the robot is put down after being lifted or transported, there is a risk of it tipping, if not properly secured.  |   |
| 5  | Lift the robot to its installation site.   | How to lift the robot is described in section: <ul style="list-style-type: none"> <li>• <a href="#">Lifting robot with roundslings on page 61</a></li> </ul>          |
| 6  | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br><b>For robots with protection type Clean Room (option 287-1)</b><br><b>For robots with food grade lubrication (option 777-1)</b><br><b>Cabling routed from below (option 996-1)</b><br>Fit the O-ring 3HAB3772-141 to underneath the robot base. | <br><small>xx1500000241</small>  |
| 7  | Fit two <i>pins</i> to the holes in the base.  | 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1  |
| 8  | Guide the robot gently, using the attachment screws while lowering it into its mounting position.  | Make sure the robot base is correctly fitted onto the pins.   |
| 9  | Fit the <i>securing screws</i> and <i>washers</i> in the attachment holes of the base.   | Screws: M12x35 (robot installation directly on foundation), quality: 8.8  |
| 10 | Tighten the bolts in a criss-cross pattern to ensure that the base is not distorted.   | Tightening torque:<br>55 Nm ± 5 Nm  |

*Continues on next page*

## 2 Installation and commissioning

### 2.3.4 Orienting and securing the robot

Continued

|    | Action   | Information   |
|----|--|---|
| 11 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room (option 287-1)</p> <p>For robots with food grade lubrication (option 777-1)</p> <p>Fit the O-ring 3HAB3772-19 to the main power connector on the robot base.</p> | <p>Robots with manipulator cables routed from the rear of the base:</p>  <p>xx150000243</p> <p>Robots with manipulator cables routed from below (option 996-1):</p>  <p>xx150000242</p> |

#### Securing robot on a mounting plate

When bolting a mounting plate or frame to a concrete floor, follow the general instructions for expansion-shell bolts.

Screw joints must be able to withstand the stress loads defined in section [Loads on foundation, robot on page 50](#).

### 2.3.5 Setting the system parameters for a suspended or tilted robot

#### General

The robot is configured for mounting parallel to the floor, without tilting, on delivery. The method for mounting the robot in a suspended (upside down) or tilted position is basically the same as for floor mounting, but the system parameters that describe the mounting angle (how the robot is oriented relative to the gravity) must be re-defined.



#### Note

With suspended installation, make sure that the gantry or corresponding structure is rigid enough to prevent unacceptable vibrations and deflections, so that optimum performance can be achieved.



#### Note

The allowed mounting positions are described in the product specification for the robot. The requirements on the foundation are described in [Requirements, foundation on page 51](#).

#### System parameters



#### Note

The mounting angle must be configured correctly in the system parameters so that the robot system can control the movements in the best possible way. An incorrect definition of the mounting angle will result in:

- Overloading the mechanical structure.
- Lower path performance and path accuracy.
- Some functions will not work properly, for example *Load Identification* and *Collision detection*.

#### Gravity Beta

If the robot is mounted upside down or on a wall (rotated around the y-axis), then the robot base frame and the system parameter *Gravity Beta* must be redefined. *Gravity Beta* should then be  $\pi$  (+3.141593) if the robot is mounted upside down (suspended), or  $\pm\pi/2$  ( $\pm 1.570796$ ) if mounted on a wall.

The *Gravity Beta* is a positive rotation direction around the y-axis in the base coordinate system. The value is set in radians.

#### Gravity Alpha

If the robot is mounted on a wall (rotated around the x-axis), then the robot base frame and the system parameter *Gravity Alpha* must be redefined. The value of *Gravity Alpha* should then be  $\pm\pi/2$  ( $\pm 1.570796$ ).

*Continues on next page*

## 2 Installation and commissioning

---

### 2.3.5 Setting the system parameters for a suspended or tilted robot

*Continued*

The *Gravity Alpha* is a positive rotation direction around the x-axis in the base coordinate system. The value is set in radians.



#### Note

The system parameter *Gravity Alpha* is not supported for all robot types. It is not supported for IRB 140, IRB 1410, IRB 1600ID, IRB 2400, IRB 4400, IRB 6400R, IRB 6400 (except for IRB 6400 200/2.5 and IRB 6400 200/2.8), IRB 6600, IRB 6650, IRB 6650S and IRB 7600 (except for IRB 7600 325/3.1).

If the robot does not support *Gravity Alpha*, then use *Gravity Beta* along with the recalibration of axis 1 to define the rotation of the robot around the x-axis.



#### Note

The parameter is supported for all robots on track when the system parameter *7 axes high performance motion* is set, see *Technical reference manual - System parameters*.

#### Gamma Rotation

*Gamma Rotation* defines the orientation of the robot foot on the travel carriage (track motion).

---

#### Mounting angles and values

The parameter *Gravity Beta* (or *Gravity Alpha*) specifies the mounting angle of the robot in radians. It is calculated in the following way.

$\text{Gravity Beta} = A^\circ \times 3.141593/180 = B \text{ radians}$ , where **A** is the mounting angle in degrees and **B** is the mounting angle in radians.

| Example of position | Mounting angle (A °) | Gravity Beta       |
|---------------------|----------------------|--------------------|
| Floor mounted       | 0°                   | 0.000000 (Default) |
| Tilted mounting     | 45°                  | 0.785398           |
| Wall mounting       | 90°                  | 1.570796           |
| Suspended mounting  | 180°                 | 3.141593           |

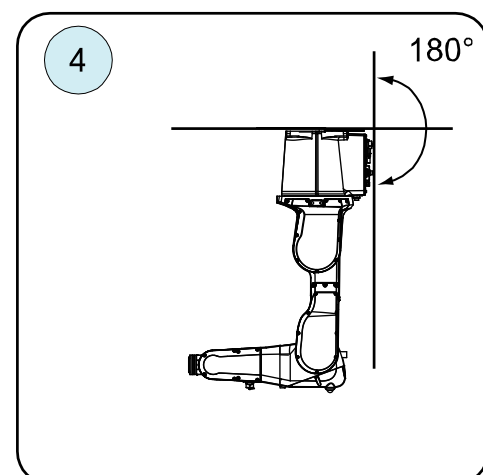
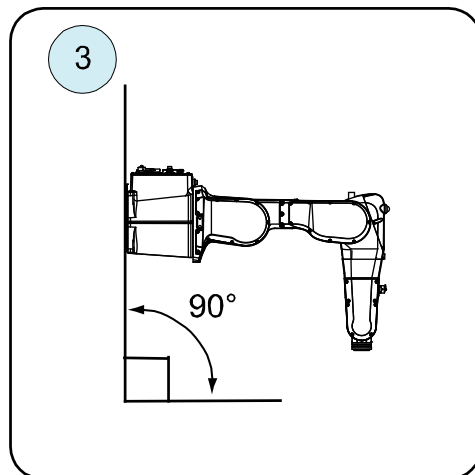
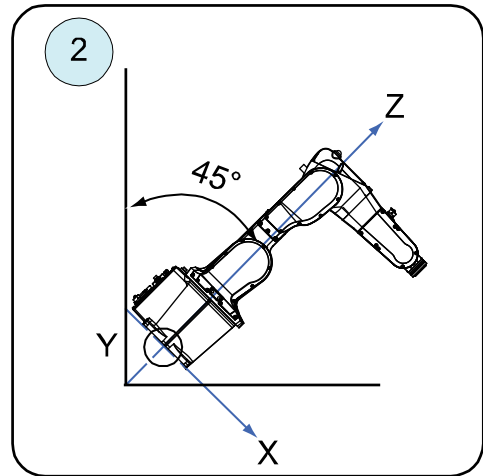
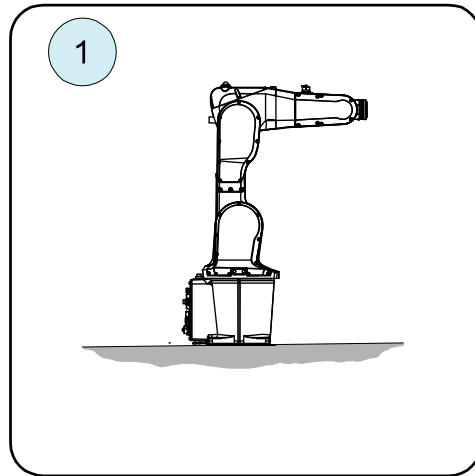
*Continues on next page*

## 2 Installation and commissioning

### 2.3.5 Setting the system parameters for a suspended or tilted robot

*Continued*

Examples of mounting angles tilted around the Y axis (*Gravity Beta*)



xx140000682

|       |                                 |
|-------|---------------------------------|
| Pos 1 | Floor mounted                   |
| Pos 2 | Mounting angle 45° (Tilted)     |
| Pos 3 | Mounting angle 90° (Wall)       |
| Pos 4 | Mounting angle 180° (Suspended) |

*Continues on next page*

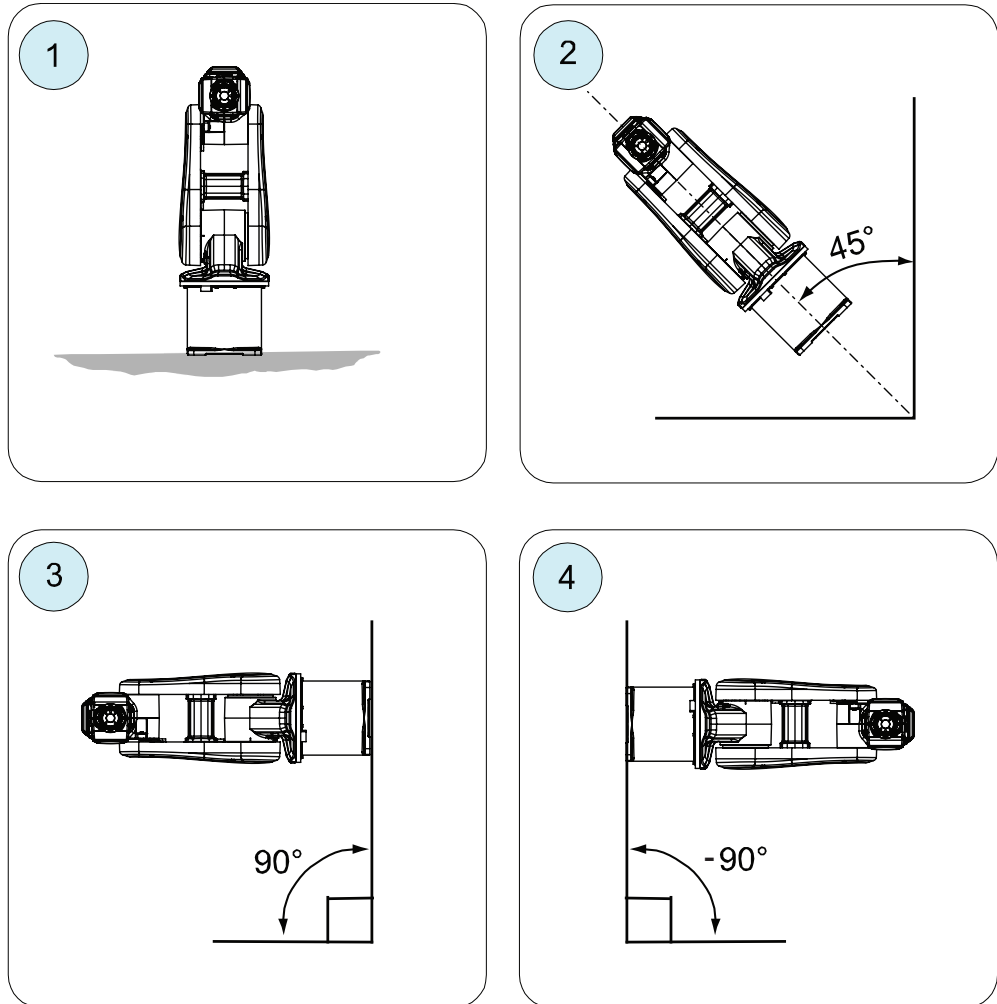
## 2 Installation and commissioning

### 2.3.5 Setting the system parameters for a suspended or tilted robot

Continued

Examples of mounting angles tilted around the X axis (*Gravity Alpha*)

The following illustration shows the IRB 120, but the same principle applies for all robots.



xx1500000532

| Pos | Mounting angle     | Gravity Alpha |
|-----|--------------------|---------------|
| 1   | 0° (Floor mounted) | 0             |
| 2   | 45° (Tilted)       | 0.785398      |
| 3   | 90° (Wall)         | 1.570796      |
| 4   | -90° (Wall)        | -1.570796     |



#### Note

For suspended robots (180°), it is recommended to use *Gravity Beta* instead of *Gravity Alpha*.

Continues on next page



#### Defining the parameter in the IRC5 software

The value of the system parameters that define the mounting angle must be redefined when changing the mounting angle of the robot. The parameters belong to the type *Robot*, in the topic *Motion*.

How to calculate a new value is detailed in [Mounting angles and values on page 74](#).

The system parameters are described in *Technical reference manual - System parameters*.

The system parameters are configured in RobotStudio or on the FlexPendant.

## 2 Installation and commissioning

---

### 2.3.6 Loads fitted to the robot, stopping time and braking distances

### 2.3.6 Loads fitted to the robot, stopping time and braking distances

---

#### General

Any loads mounted on the robot must be defined correctly and carefully (with regard to the position of center of gravity and mass moments of inertia) in order to avoid jolting movements and overloading motors, gears and structure.



#### CAUTION

Incorrectly defined loads may result in operational stops or major damage to the robot.

#### References

Load diagrams, permitted extra loads (equipment) and their positions are specified in the product specification. The loads must be defined in the software.

- *Operating manual - IRC5 with FlexPendant*

#### Stopping time and braking distances

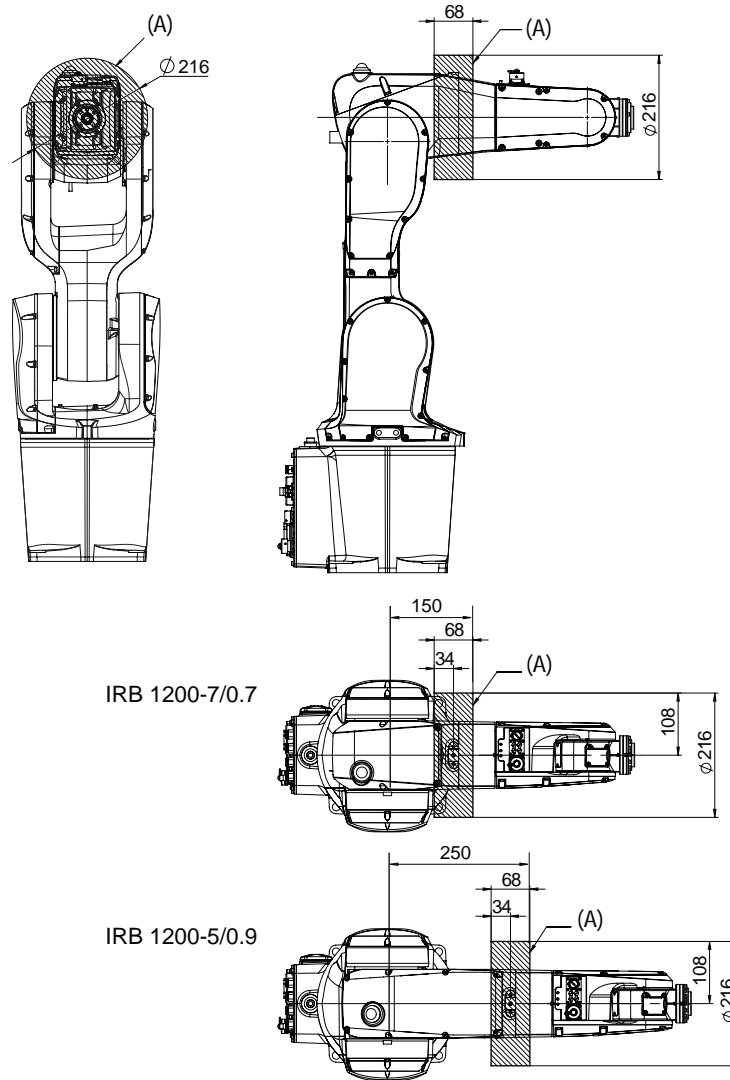
The performance of the motor brake depends on if there are any loads attached to the robot. For more information, see product specification for the robot.

2.3.7 Fitting of equipment on the robot

2.3.7.1 Introduction to fitting of equipment

General

Extra loads can be mounted on to the upper arm. Definitions of load area and permitted load are shown in figure below. The center of gravity of the extra load shall be within the marked load areas. The robot is supplied with holes for fitting of extra equipment. (See [Holes for fitting extra equipment on page 80](#)).



xx130000384

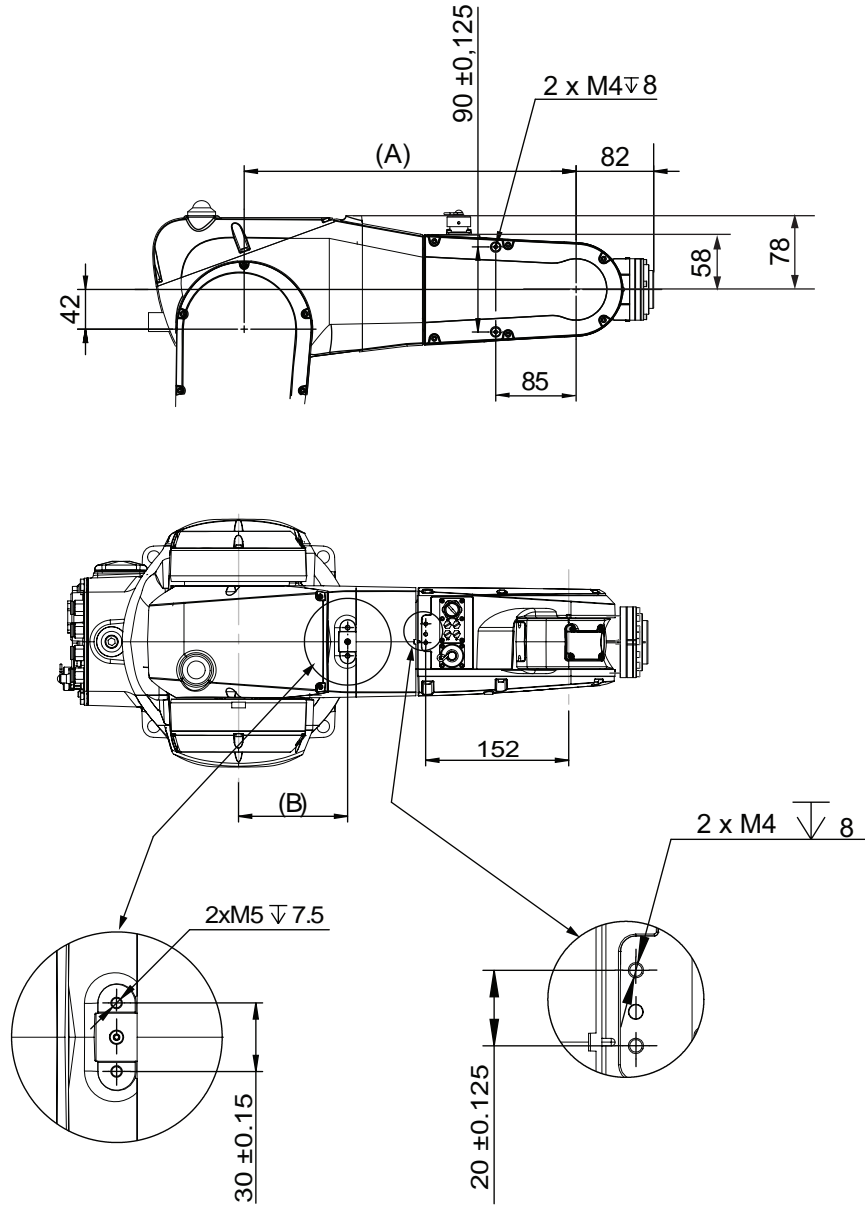
| Load area (A)  | Max load |
|----------------|----------|
| IRB 1200-5/0.9 | 0.3 kg   |
| IRB 1200-7/0.7 |          |

## 2 Installation and commissioning

### 2.3.7.2 Holes for fitting extra equipment

#### 2.3.7.2 Holes for fitting extra equipment

##### Upper arm



xx1300000381

| Pos | Description                                      |
|-----|--|
| A   | IRB 1200-5/0.9 = 451 mm, IRB 1200-7/0.7 = 351 mm |
| B   | IRB 1200-5/0.9 = 216 mm, IRB 1200-7/0.7 = 116 mm |

Continues on next page

## 2 Installation and commissioning

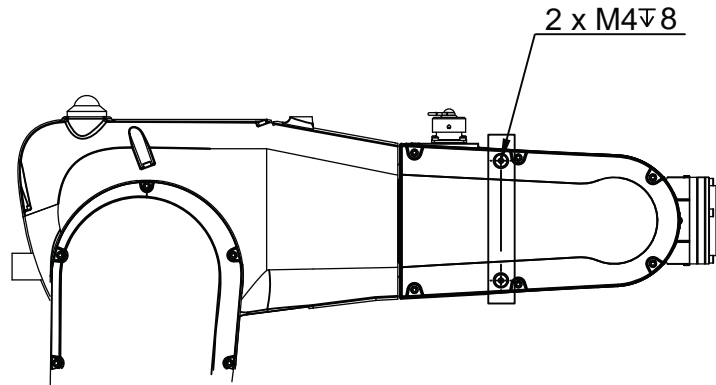
### 2.3.7.2 Holes for fitting extra equipment

*Continued*



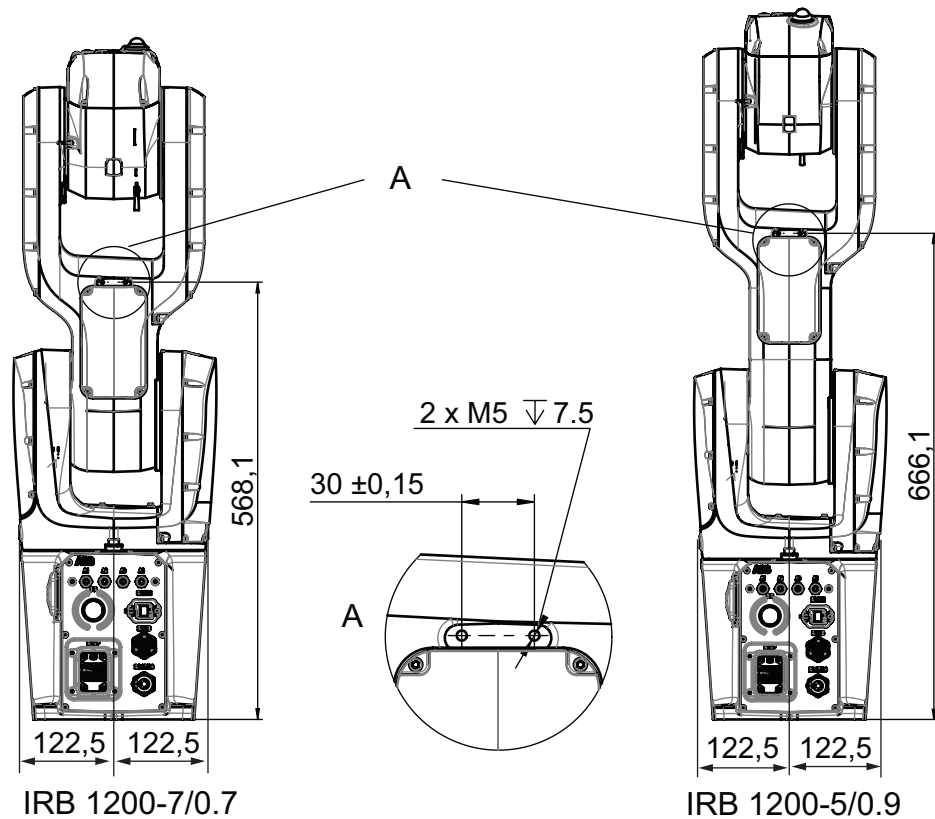
#### Note

The two M4 thread holes shown in the following figure are used for fitting the cable harness or air hoses of the tools rather than fitting extra equipment.



xx1700002331

#### Lower arm



xx1300000382

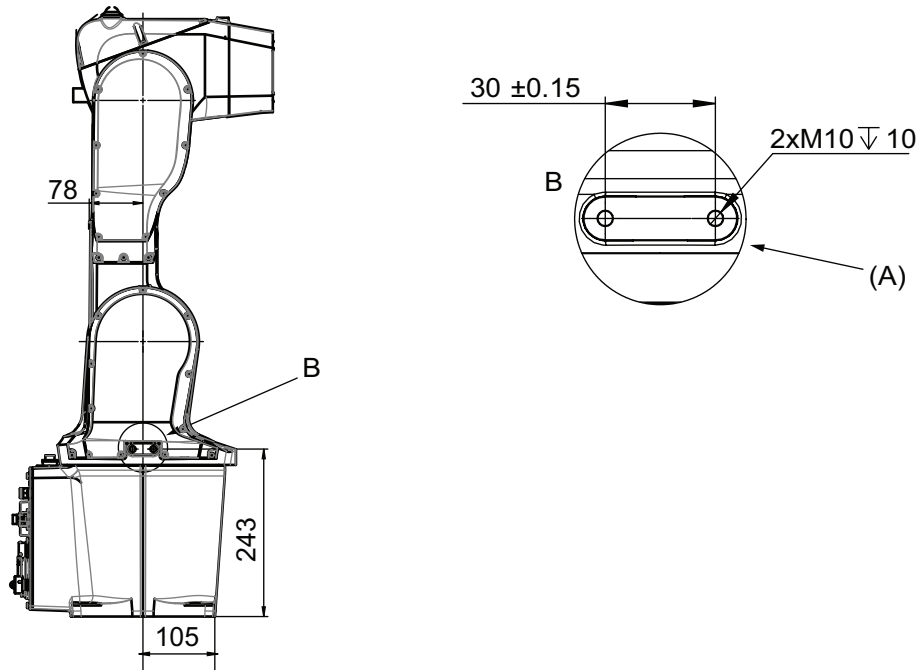
*Continues on next page*

## 2 Installation and commissioning

### 2.3.7.2 Holes for fitting extra equipment

Continued

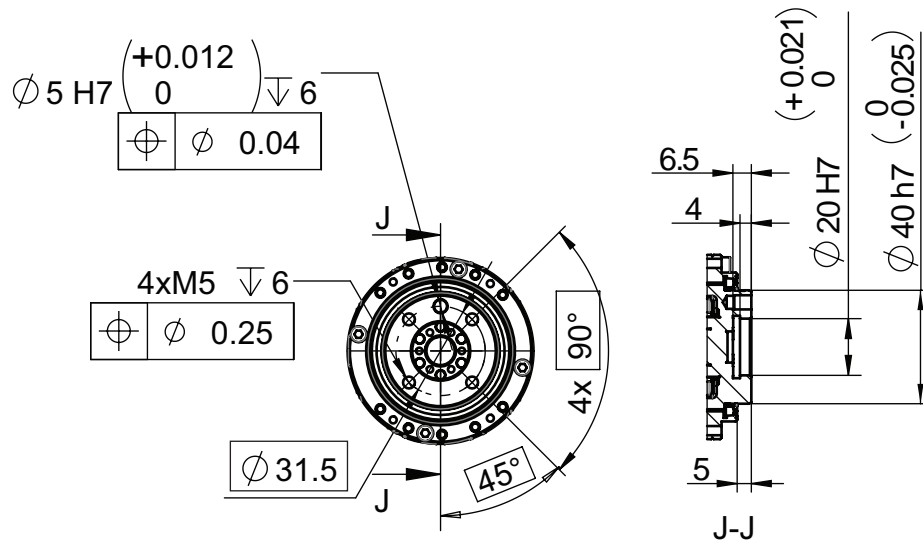
#### Frame



xx1400000590

| Pos | Description         |
|-----|---------------------|
| A   | Holes on both sides |

#### Robot tool flange



xx1300000383

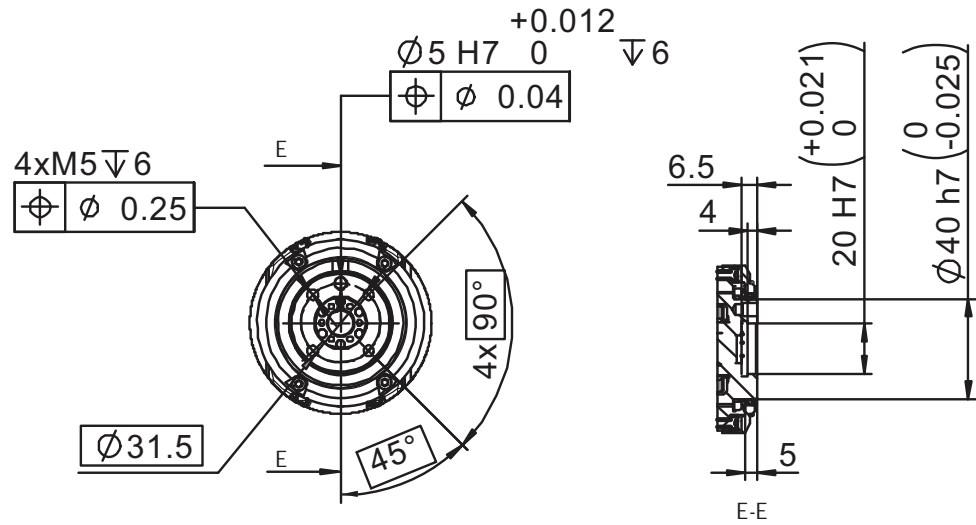
Continues on next page

## 2 Installation and commissioning

### 2.3.7.2 Holes for fitting extra equipment

*Continued*

#### Robot tool flange for Foundry Plus robots



xx1600001322

#### Fastener quality

When fitting tools on the tool flange, only use screws with quality 12.9. For other equipment use suitable screws and tightening torque for your application.

## 2 Installation and commissioning

---

### 2.4.1 Installing the signal lamp

## 2.4 Installation of options

### 2.4.1 Installing the signal lamp

---

#### General

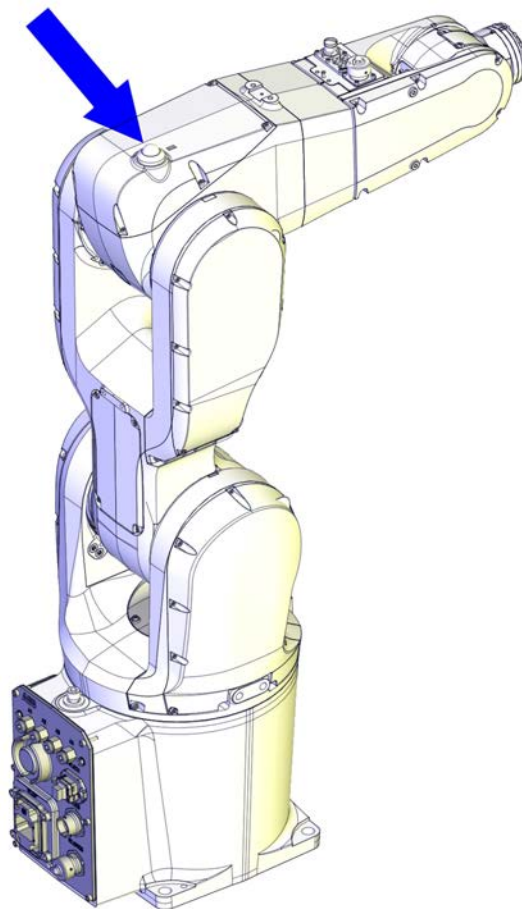
A signal lamp with an yellow fixed light can be mounted on the robot, as a safety device. The signal lamp is required on an UL/UR approved robot.

The lamp is active in MOTORS ON mode.

---

#### Location of signal lamp

The signal lamp is located as shown in the figure.



xx1300000455

#### Required spare parts

| Spare part  | Article number | Note |
|-------------|----------------|------|
| Signal lamp | 3HAC16738-1    |      |



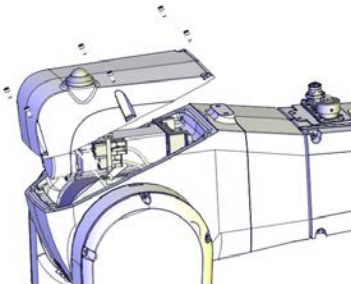
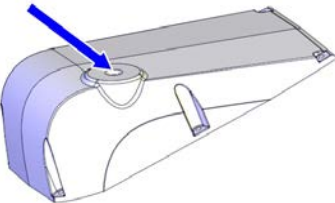
*Continues on next page*



#### Required tools

| Equipment, etc.  | Article number | Note   |
|------------------|----------------|--|
| Standard toolkit | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

#### Installing the signal lamp

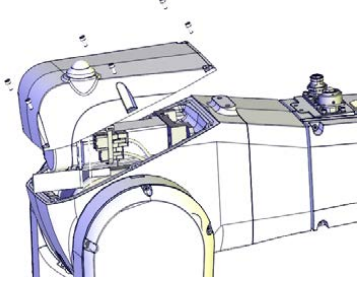


|   | Action   | Note  |
|---|--|---|
| 1 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .                              |   |
| 3 | Remove the cover from the upper arm housing.   | <br>xx1300000464 |
| 4 | Drill a hole with a diameter of 22.5 mm in the center of the raised platform.  | <br>xx1300000465 |
| 5 | Fit the lamp and tighten the nut.  |   |
| 6 | Connect the two lamp cables connectors (R3.H1 and R3.H2) to the cable harness lamp connectors (H1 and H2).   |   |

Continues on next page

## 2 Installation and commissioning

### 2.4.1 Installing the signal lamp

Continued

|   | Action  | Note  |
|---|---|---|
| 7 | Refit the cover on the upper arm housing.   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 8 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |
| 9 | The signal lamp is now ready for use and is lit in MOTORS ON mode.  |   |

## 2.5 Restricting the working range

### 2.5.1 Axes with restricted working range

#### General

When installing the robot, make sure that it can move freely within its entire working space. If there is a risk that it may collide with other objects, its working space should be limited.

The working range of the following axes may be restricted:

- Axis 1, hardware (mechanical stop) and software. **Note!** The axis 1 stop is a fixed stop that must be installed during operation of robot!
- Axis 2, hardware (mechanical stop) and software. **Note!** The axis 2 stop is a fixed stop that must be installed during operation of robot!
- Axis 3, hardware (mechanical stop) and software. **Note!** The axis 3 stop is a fixed stop that must be installed during operation of robot!
- Axis 4, hardware (mechanical stop) and software. **Note!** The axis 4 stop is a fixed stop that must be installed during operation of robot!
- Axis 5, hardware (mechanical stop) and software
- Axis 6, software

This section describes how to install hardware that restricts the working range.



#### Note

Adjustments must also be made in the robot configuration software (system parameters). References to relevant manuals are included in the installation procedures.

## 2 Installation and commissioning

---

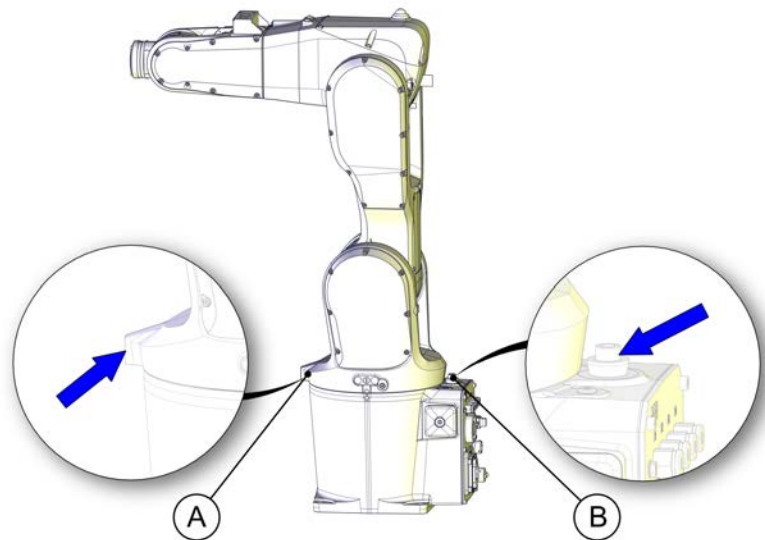
### 2.5.2 Mechanically restricting the working range

### 2.5.2 Mechanically restricting the working range

---

#### Location of mechanical stops

The figures shows where the mechanical stops are placed on the robot.



xx1700001293

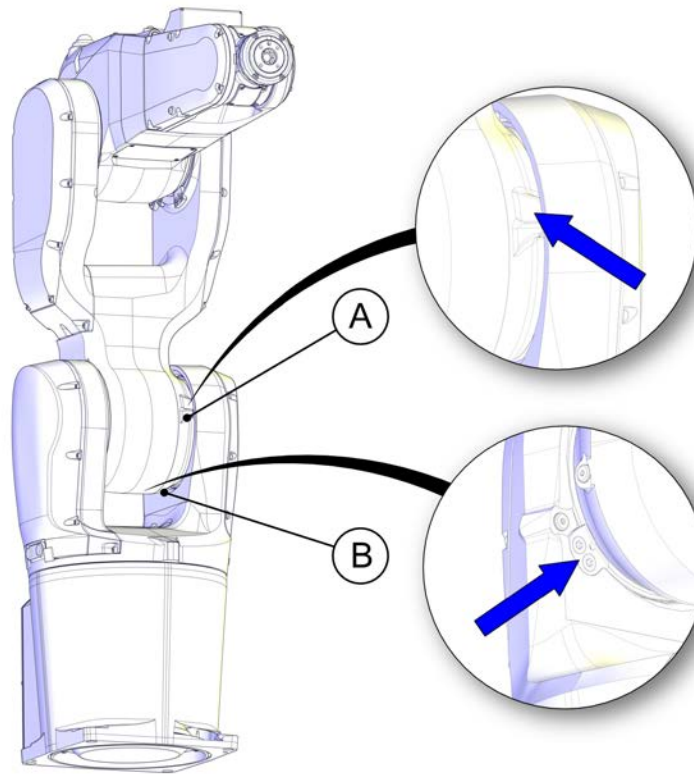
|   |                                |
|---|--------------------------------|
| A | Mechanical stop axis 1 (swing) |
| B | Mechanical stop axis 1 (base)  |

*Continues on next page*

## 2 Installation and commissioning

### 2.5.2 Mechanically restricting the working range

*Continued*



xx1700001294

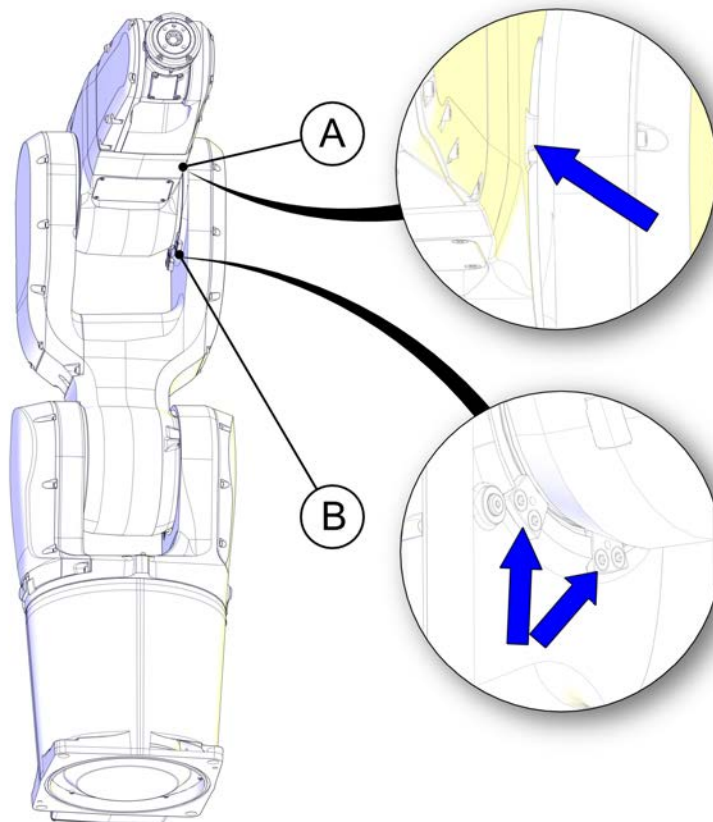
|   |                                    |
|---|------------------------------------|
| A | Mechanical stop axis 2 (lower arm) |
| B | Mechanical stop axis 2 (swing)     |

*Continues on next page*

## 2 Installation and commissioning

### 2.5.2 Mechanically restricting the working range

*Continued*



xx1700001295

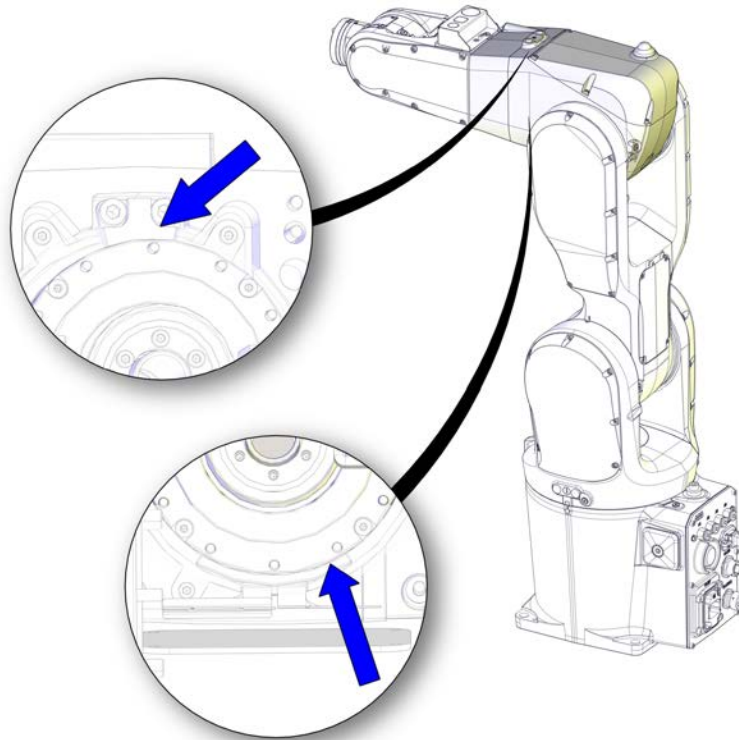
|   |                                    |
|---|------------------------------------|
| A | Mechanical stop axis 3 (lower arm) |
| B | Mechanical stop axis 3 (tubular)   |

*Continues on next page*

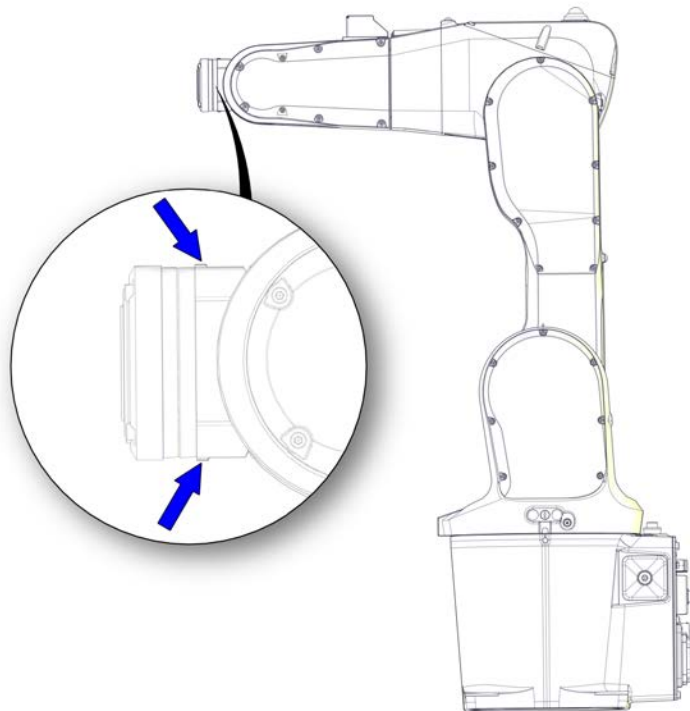
## 2 Installation and commissioning

### 2.5.2 Mechanically restricting the working range

*Continued*



xx1700001296



xx1700001297

*Continues on next page*

## 2 Installation and commissioning

---

### 2.5.2 Mechanically restricting the working range

*Continued*

The axis-1, axis-2, axis-3, and axis-4 stops are fixed stops that must be installed during operation of robot. For details about how to install the stops, see:

- [Replacing the axis-1 mechanical stop on page 578](#)
- [Replacing the axis-2 mechanical stop on page 404](#)
- [Replacing the axis-3 mechanical stop on page 407](#)
- [Replacing the axis-4 mechanical stop on page 410](#)



## 2.6 Making robot ready for operation

### 2.6.1 Additional installation procedure, Clean Room

#### General

Robots with protection type Clean Room are specially designed to work in a clean room environment.

Clean Room robots are designed to prevent from particle emission from the robot. For example, the maintenance work possible to perform without cracking the paint. The robot is painted with four layers of polyurethane paint. The last layer being a varnish over labels to simplify cleaning. The paint has been tested regarding outgassing of Volatile Organic Compounds (VOC) and been classified in accordance with ISO 14644-8.

Any Clean Room parts that are replaced must be replaced with parts designed for use in Clean Room environments.

#### Clean Room class 3

According to IPA test result, the robot IRB 1200 is suitable for use in Clean Room environment.

#### Classification of airborne molecular contamination

| Parameter              |                   |           |                | Outgassing amount   |   |   |
|------------------------|-------------------|-----------|----------------|---------------------|---|---|
| Area (m <sup>2</sup> ) | Test duration (s) | Temp (°C) | Performed test | Total detected (ng) | Norm based on 1m <sup>2</sup> and 1s(g) | Classification in accordance to ISO 14644-8 |
| 4.5E-03                | 3600              | 23        | TVOC           | 2848                | 1.7E-07                                 | -6.8  |
| 4.5E-03                | 60                | 90        | TVOC           | 46524               | 1.7E-04                                 | -3.8  |

#### Preparations before commissioning a Clean Room robot

During transport and handling of a Clean Room robot, it is likely that the robot has been contaminated with particles of different kinds. Therefore the robot must be carefully cleaned before installation.

Do not apply force on the plastic covers when lifting the robot! This may result in damage or cracks in the paint around the plastic cover.

## 2 Installation and commissioning

### 2.7.1 Robot cabling and connection points

## 2.7 Electrical connections

### 2.7.1 Robot cabling and connection points

#### Introduction

Connect the robot and controller to each other after securing them to the foundation. The lists below specify which cables to use for each respective application.

#### Main cable categories

All cables between the robot and controller are divided into the following categories:

| Cable category           | Description   |
|--------------------------|---|
| Robot cables             | Handles power supply to and control of the robot's motors as well as feedback from the encoder interface board. Specified in the table <a href="#">Robot cables on page 94</a> .  |
| Customer cables (option) | Handles communication with equipment fitted on the robot by the customer (low voltage signals). The customer cables also handle Ethernet communication. See the product manual for the controller, see document number in <a href="#">References on page 10</a> . |

#### Robot cables

These cables are included in the standard delivery. They are completely pre-manufactured and ready to plug in.

| Cable sub-category   | Description  | Connection point, cabinet | Connection point, robot |
|----------------------|--|---------------------------|-------------------------|
| Robot cable, power   | Transfers drive power from the drive units in the control cabinet to the robot motors.   | XS1                       | R1.MP                   |
| Robot cable, signals | Transfers encoder data from and power supply to the encoder interface board.<br>Transfers resolver data from and power supply to the serial measurement board. | XS2                       | R1.EIB                  |

#### Robot cable, power

| Power cable length | Article number |
|--------------------|----------------|
| 3 m                | 3HAC040503-007 |
| 7 m                | 3HAC040503-001 |
| 15 m               | 3HAC040503-002 |
| 22 m               | 3HAC040503-003 |
| 30 m               | 3HAC040503-004 |

#### Robot cable, signals

| Signal cable length | Article number |
|---------------------|----------------|
| 3 m                 | 3HAC068916-001 |

*Continues on next page*

## 2 Installation and commissioning

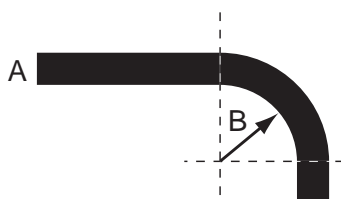
### 2.7.1 Robot cabling and connection points

*Continued*

| Signal cable length | Article number |
|---------------------|----------------|
| 7 m                 | 3HAC068917-001 |
| 15 m                | 3HAC068918-001 |
| 22 m                | 3HAC068919-001 |
| 30 m                | 3HAC068920-001 |

#### Bending radius for static floor cables

The minimum bending radius is 10 times the cable diameter for static floor cables.

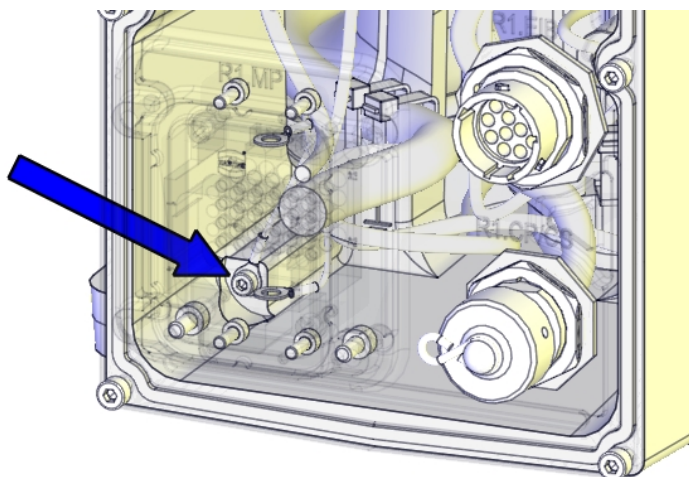


xx1600002016

|   |              |
|---|--------------|
| A | Diameter     |
| B | Diameter x10 |

#### Grounding and bonding point on manipulator

There is a grounding/bonding point on the manipulator base. The grounding/bonding point is used for potential equalizing between control cabinet, manipulator and any peripheral devices.



xx1600001081

#### Installation of extra O-ring

For robots with protection class IP67 (option 287-10)

For robots with protection type FoundryPlus (option 287-3)

For robots with protection type Clean Room (option 287-1)

For robots with food grade lubrication (option 777-1)

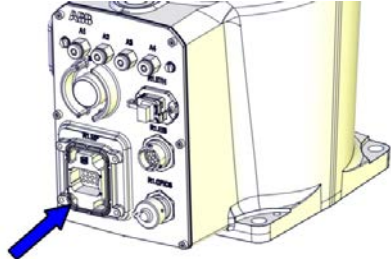
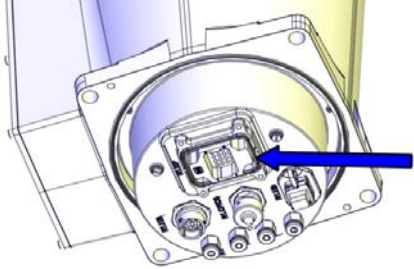
*Continues on next page*

## 2 Installation and commissioning

### 2.7.1 Robot cabling and connection points

Continued

The O-ring specified below is delivered together with the robot and must be installed to the main power connector during electrical installation.

| Equipment | Art. no.    | Note   |
|-----------|-------------|--|
| O-ring    | 3HAB3772-19 | <p>For robots with protection class IP67<br/>Used with protection type Foundry Plus<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Used to seal between the main power cable and the connector.<br/>Robots with manipulator cables routed from the rear of the base:</p>  <p>xx1500000243</p> <p>Robots with manipulator cables routed from below (option 996-1):</p>  <p>xx1500000242</p> |

#### Customer cables - CP/CS cable (option)

| CP/CS cable length | Article number |
|--------------------|----------------|
| 3 m (IRC5)         | 3HAC049089-001 |
| 7 m (IRC5)         | 3HAC049089-004 |
| 15 m (IRC5)        | 3HAC049089-005 |
| 22 m (IRC5)        | 3HAC049089-006 |
| 30 m (IRC5)        | 3HAC049089-007 |
| 3 m (IRC5C)        | 3HAC049186-001 |
| 7 m (IRC5C)        | 3HAC049186-004 |
| 15 m (IRC5C)       | 3HAC049186-005 |
| 22 m (IRC5C)       | 3HAC049186-006 |
| 30 m (IRC5C)       | 3HAC049186-007 |

Continues on next page

## 2 Installation and commissioning

### 2.7.1 Robot cabling and connection points

*Continued*

#### Customer cables - Ethernet floor cable (option)

| Ethernet floor cable length | Article number |
|-----------------------------|----------------|
| 3 m                         | 3HAC055518-001 |
| 7 m                         | 3HAC055518-002 |
| 15 m                        | 3HAC055518-003 |
| 22 m                        | 3HAC055518-004 |
| 30 m                        | 3HAC055518-005 |

## 2 Installation and commissioning

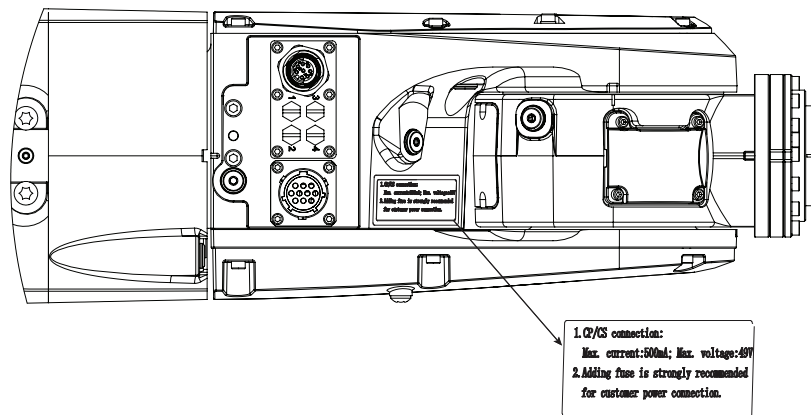
### 2.7.2 Customer connections

#### 2.7.2 Customer connections

##### Introduction to customer connections

The cables for customer connection are integrated in the robot and the connectors are placed on the tubular housing (upper arm) and one at the base. There is one connector R4.CP/CS at the tubular housing. Corresponding connector R1.CP/CS is located at the base.

It is recommended to use a fuse protector for customer connection; otherwise, application overload will burn out the CP/CS cables in the robot. Detailed information about the CP/CS connection is provided in a warning label on the tubular housing.

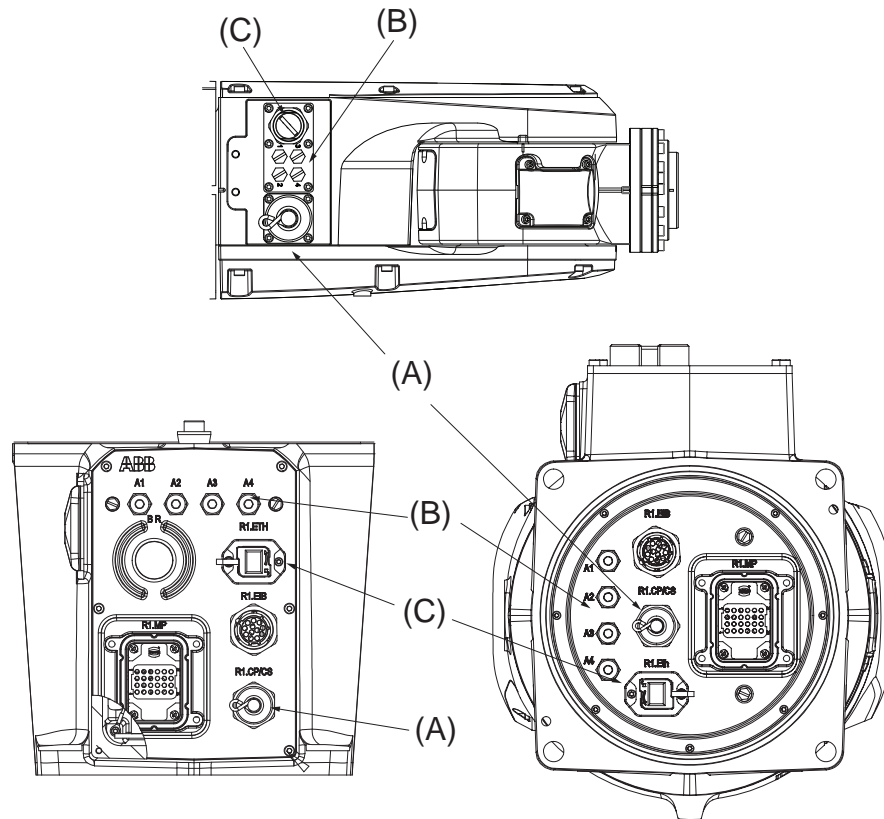


xx1600001687

There is also connections for Ethernet, one connector R4.Ethernet at the tubular housing and the corresponding connector R1.Ethernet located at the base.

*Continues on next page*

Hose for compressed air is also integrated into the manipulator. There are 4 inlets (R1/8") and 4 outlets (M5) on the tubular housing.



xx130000385

| Position | Connection      | Description           | Number | Value                            |
|----------|-----------------|-----------------------|--------|----------------------------------|
| A        | (R1)R4.CP/CS    | Customer power/signal | 10     | 49 V, 500 mA                     |
| B        | Air             | Max. 5 bar            | 4      | Outer diameter of air hose: 4 mm |
| C        | (R1)R4.Ethernet | Customer Ethernet     | 8      | 100/10 Base-TX                   |

### Connectors

The tables describes the connectors on base and tubular housing (upper arm).

#### Connectors, base

| Position           | Description                 | Art. no.       |
|--------------------|-----------------------------|----------------|
| Robot              | Pin connector 10p, bulkhead | 3HAC022117-002 |
| Customer connector | Connector set R1.CP/CS      | 3HAC037038-001 |

#### Connectors, tubular housing

| Position           | Description                          | Art. no.       |
|--------------------|--------------------------------------|----------------|
| Robot              | Socket connector 10p, flange mounted | 3HAC023624-002 |
| Customer connector | Connector set R3.CP/CS               | 3HAC037070-001 |

*Continues on next page*

## 2 Installation and commissioning

---

### 2.7.2 Customer connections

*Continued*

Air, connector

| Position       | Description   | Art. no.       |
|----------------|---------------|----------------|
| Robot          | 4xM5          |                |
| Customer cable | Air connector | 3HAC032049-001 |



## 2.8 Start of robot in cold environments

### Introduction

This section describes how to start the robot in a cold environment if it is not starting the normal way.

### Problems with starting the robot

#### Event message from Motion Supervision

Use this procedure if an event message indicates a problem with Motion supervision at start-up. More information about Motion Supervision is found in *Technical reference manual - System parameters*.

|   | Action  | Note |
|---|---|------|
| 1 | Turn off Motion Supervision.  |      |
| 2 | Start the robot.  |      |
| 3 | When the robot has reached normal working temperature, the Motion Supervision can be turned on again. |      |

#### Robot stopping with other event message

Use this procedure if the robot is not starting.

|   | Action  | Note  |
|---|---|---|
| 1 | Start the robot with its normal program but with reduced speed. | The speed can be regulated with the RAPID instruction <code>VelSet</code> . |

### Adjusting the speed and acceleration during warm-up

Depending on how cold the environment is and what program is being used, the speed might need to be ramped up until reached maximum. The table shows examples of how to adjust the speed:

| Work cycles             | AccSet   | Speed/velocity    |
|-------------------------|----------|-------------------|
| 3 Work cycles           | 20, 20   | v100 (100 mm/s)   |
| 5 Work cycles           | 40, 40   | v400 (400 mm/s)   |
| 5 Work cycles           | 60, 60   | v600 (600 mm/s)   |
| 5 Work cycles           | 100, 100 | v1000 (1000 mm/s) |
| More than 5 Work cycles | 100, 100 | Max.              |

If the program consists of large wrist movements, it is possible that the reorientation velocity, which is always high in predefined velocities, needs to be included in the ramping up.

**This page is intentionally left blank**

## 3 Maintenance

### 3.1 Introduction

---

#### Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 1200.

It is based on the maintenance schedule found at the beginning of the chapter. The schedule contains information about required maintenance activities including intervals, and refers to procedures for the activities.

Each procedure contains all the information required to perform the activity, including required tools and materials.

The procedures are gathered in different sections and divided according to the maintenance activity.

---

#### Safety information

Observe all safety information before conducting any service work.

There are general safety aspects that must be read through, as well as more specific safety information that describes the danger and safety risks when performing the procedures. Read the chapter [Safety on page 19](#) before performing any service work.

The maintenance must be done by qualified personnel in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.



#### Note

If the IRB 1200 is connected to power, always make sure that the IRB 1200 is connected to protective earth and a residual current device (RCD) before starting any maintenance work.

For more information see:

- *Product manual - IRC5 Compact*
- [Robot cabling and connection points on page 94.](#)

## 3 Maintenance

---

### 3.2.1 Specification of maintenance intervals

## 3.2 Maintenance schedule

### 3.2.1 Specification of maintenance intervals

---

#### Introduction

The intervals are specified in different ways depending on the type of maintenance activity to be carried out and the working conditions of the IRB 1200:

- Calendar time: specified in months regardless of whether the system is running or not.
- Operating time: specified in operating hours. More frequent running means more frequent maintenance activities.

Robots with the functionality *Service Information System* activated can show active counters in the device browser in RobotStudio, or on the FlexPendant.

---

#### Overhaul

Depending on application and operational environment a complete overhaul may be necessary in average around 30000 hours.

ABB Connected Services and its Assessment tools can help you to identify the real stress level of your robot, and define the optimal ABB support to maintain your robot working.

Contact your local ABB Customer Service to get more information.

3.2.2 Maintenance schedule

Scheduled and non-predictable maintenance

The robot must be maintained regularly to ensure proper function. The maintenance activities and intervals are specified in the table below.

Non-predictable situations also give rise to inspections of the robot. Any damages must be attended to immediately!

Life of each component

The inspection intervals *do not* specify the life of each component.

Activities and intervals, standard equipment

The table below specifies the required maintenance activities and intervals:

| Maintenance activities                     | Regularly <sup>i</sup> | Every 12 months | Every 36 months | Reference  |
|--|------------------------|-----------------|-----------------|--|
| <i>Cleaning activities</i>                 |                        |                 |                 |  |
| Cleaning the robot                         | x                      |                 |                 | <a href="#">Cleaning the IRB 1200 on page 131</a>  |
| <i>Inspection activities</i>               |                        |                 |                 |  |
| Inspecting the robot                       | x                      |                 |                 | Check for abnormal wear or contamination.<br>For robots with protection type Clean Room: Inspect daily |
| Inspecting the robot cabling <sup>ii</sup> | x <sup>iii</sup>       |                 |                 | <a href="#">Inspecting the robot cabling on page 107</a>   |
| Inspecting the information labels          |                        | x               |                 | <a href="#">Inspecting the information labels on page 108</a>  |
| Inspecting the axis-1 mechanical stop pin  | x <sup>iv</sup>        |                 |                 | <a href="#">Inspecting mechanical stops on page 113</a>  |
| Inspecting the axis-2 mechanical stop      | x <sup>iv</sup>        |                 |                 | <a href="#">Inspecting mechanical stops on page 113</a>  |
| Inspecting the axis-3 mechanical stop      | x <sup>iv</sup>        |                 |                 | <a href="#">Inspecting mechanical stops on page 113</a>  |
| Inspecting the axis-4 mechanical stop      | - <sup>v</sup>         |                 |                 |  |
| Inspecting the timing belts                |                        |                 | x               | <a href="#">Inspecting timing belts on page 116</a>  |
| <i>Replacement/changing activities</i>     |                        |                 |                 |  |

Continues on next page

### 3 Maintenance

#### 3.2.2 Maintenance schedule

Continued

| Maintenance activities                   |                        |                 |                 | Reference  |
|--|------------------------|-----------------|-----------------|--|
|  | Regularly <sup>i</sup> | Every 12 months | Every 36 months |  |
| Replacing the battery pack <sup>vi</sup> |                        |                 |                 | <a href="#">Replacing the battery pack on page 121</a> |

- <sup>i</sup> "Regularly" implies that the activity is to be performed regularly, but the actual interval may not be specified by the robot manufacturer. The interval depends on the operation cycle of the robot, its working environment and movement pattern. Generally, the more contaminated environment, the shorter intervals. The more demanding movement pattern (sharper bending cable harness), the shorter intervals.
- <sup>ii</sup> The robot cabling comprises the cabling between the robot and controller cabinet.
- <sup>iii</sup> Replace when damage or cracks is detected or life limit is approaching.
- <sup>iv</sup> Inspect immediately if the mechanical stop is hit.
- <sup>v</sup> Inspect immediately if the mechanical stop is hit.  
The robot needs to be disassembled according to section [Replacing the axis-4 mechanical stop on page 410](#) in order to get access to and inspect the mechanical stop.
- <sup>vi</sup> The battery low alert (38213 **Battery charge low**) is displayed when remaining backup capacity (robot powered off) is less than 2 months. Typical life of a new battery is 36 months if the robot is powered off 2 days/week, or 18 months if the robot is powered off 16 hours/day. The life can be extended (approximately 3 times) for longer production breaks by a battery shutdown service routine. See *Operating manual - IRC5 with FlexPendant*.  
See the replacement instruction for more details.

#### Activities and intervals, optional equipment

The table below specifies the required maintenance activities and intervals:

| Maintenance activities       |                 |  | Reference   |
|------------------------------|-----------------|--|---|
|                              | Every 12 months |  |   |
| <i>Inspection activities</i> |                 |  |   |
| Inspecting the signal lamp   | x               |  | <a href="#">Inspecting the signal lamp (option) on page 119</a> |

### 3.3 Inspection activities

#### 3.3.1 Inspecting the robot cabling

##### Introduction



#### CAUTION

Always read the specific instructions if the robot has protection type Clean Room, before doing any repair work, see [Cut the paint or surface on the robot before replacing parts on page 136](#)

##### Location of robot cabling

The robot cabling comprises the cabling between the robot and controller cabinet.

##### Required tools and equipment

Visual inspection, no tools are required.

Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.

##### Inspection, robot cabling

Use this procedure to inspect the robot cabling.

|   | Action  | Note |
|---|---|------|
| 1 | <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply to the robot</li> <li>• hydraulic pressure supply to the robot</li> <li>• air pressure supply to the robot</li> </ul> Before entering the robot working area. |      |
| 2 | Visually inspect: <ul style="list-style-type: none"> <li>• the control cabling between the robot and control cabinet</li> </ul> Look for abrasions, cuts or crush damage.   |      |
| 3 | Replace the cabling if wear or damage is detected.  |      |

### 3 Maintenance

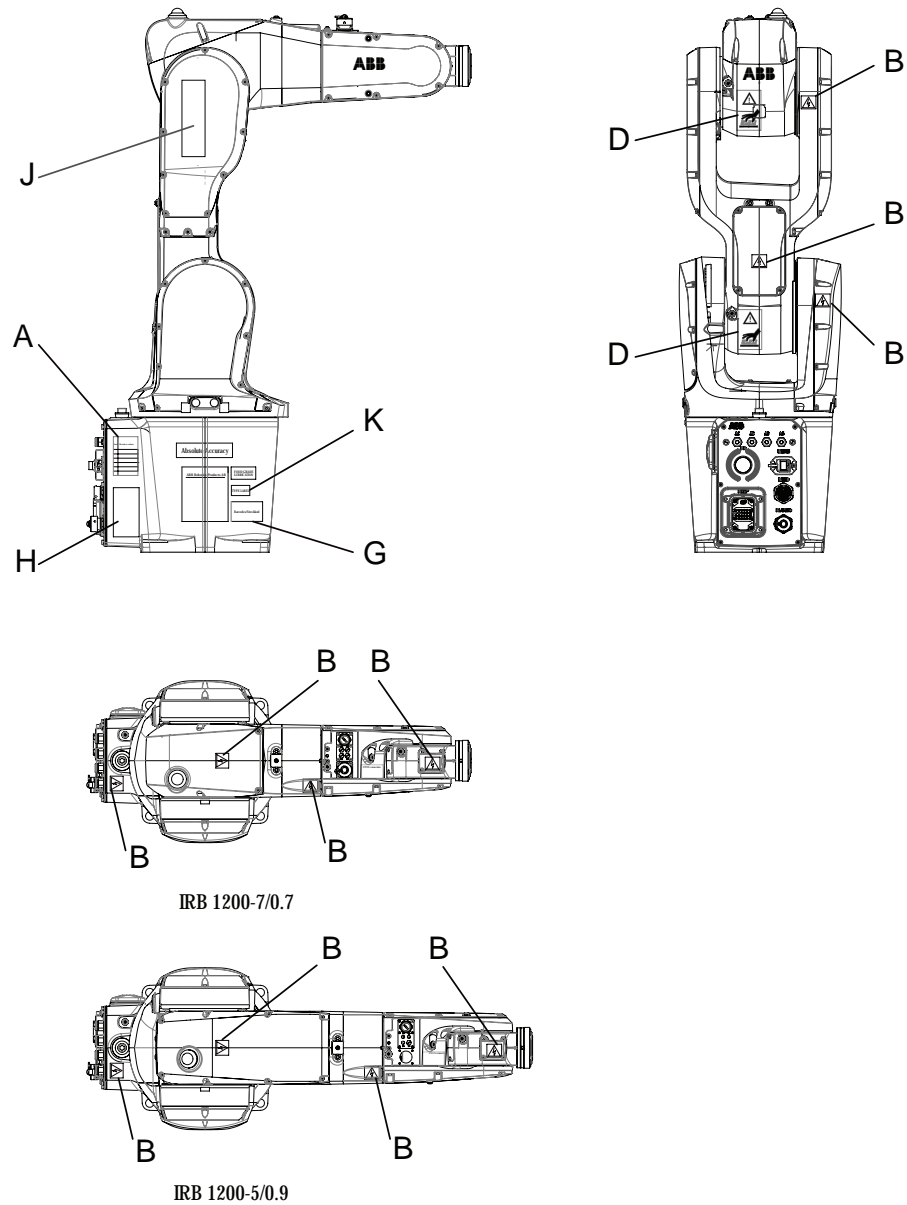
#### 3.3.2 Inspecting the information labels

#### 3.3.2 Inspecting the information labels

##### Location of labels

These figures show the location of the information labels to be inspected. The symbols are described in section [Safety symbols on manipulator labels on page 23](#).

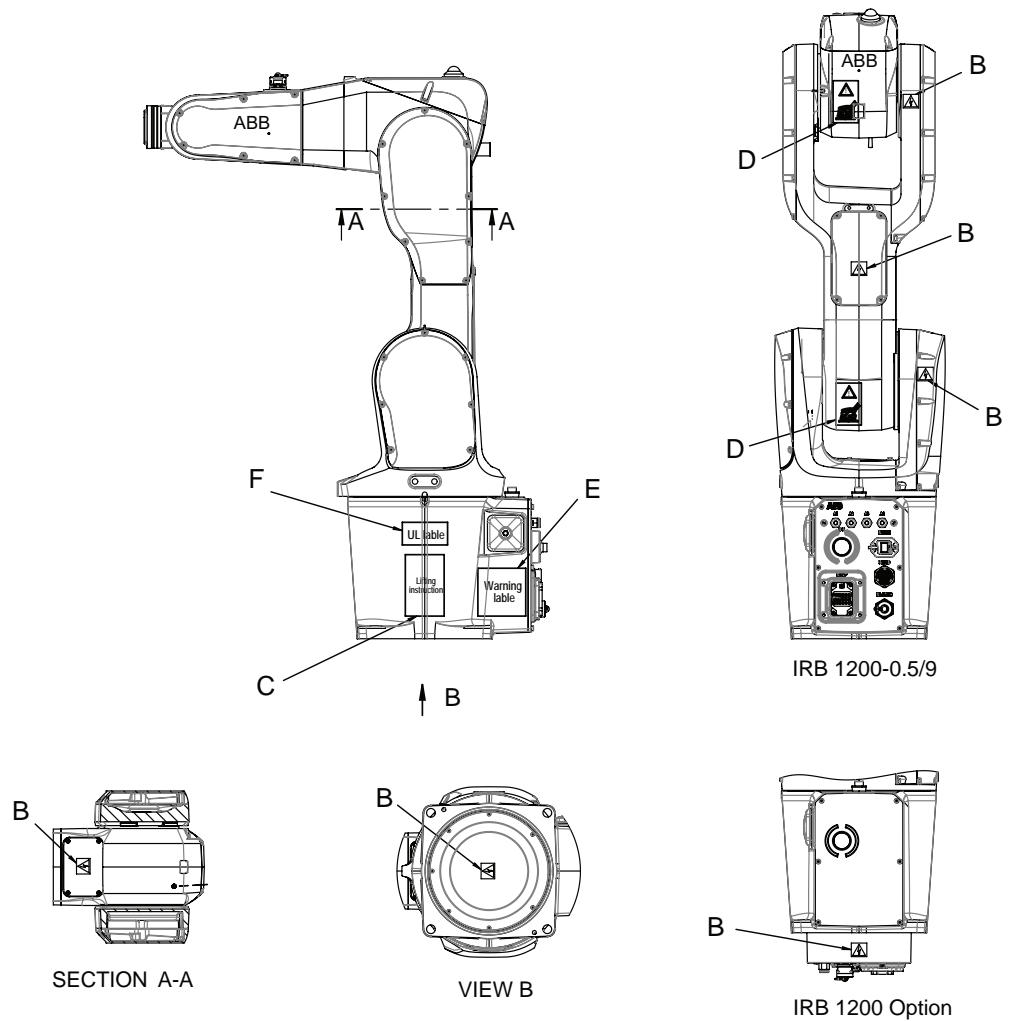
Illustration 1 of 2




Continues on next page



Illustration 2 of 2

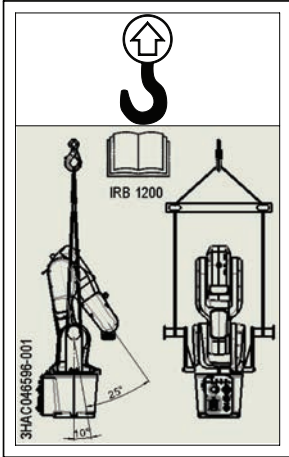
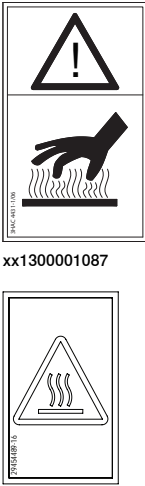
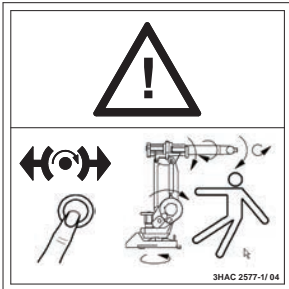


|   | Description            | Illustration  |
|---|------------------------|---|
| A | Calibration label      |   |
| B | Warning label<br>Flash | <br>xx1300001091 |

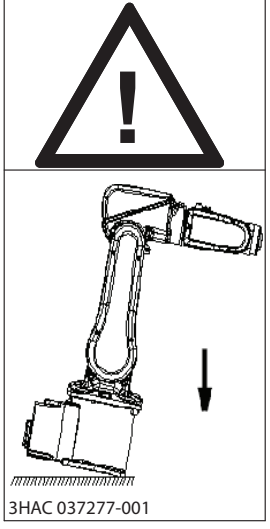


### 3 Maintenance

#### 3.3.2 Inspecting the information labels

Continued

|   |   |  |
|---|---|--|
| C | <p>Instruction label<br/>Lifting of robot</p>   |  <p>xx140000518</p>                       |
| D | <p>Warning label<br/>Heat</p>   |  <p>xx1300001087</p> <p>xx1700000984</p> |
| E | <p>Instruction label<br/>Brake release<br/>Moving robot<br/>Brake release buttons</p> |  <p>xx140000519</p>                     |
| F | <p>UL label</p>   |  |
| G | <p>Rating label</p>   |  |

Continues on next page

|          |  |  |
|----------|--|--|
| <p>H</p> | <p>Warning label<br/>Tip risk when loosening bolts</p> |  <p>3HAC 037277-001</p> <p>xx1400000527</p> |
| <p>J</p> | <p>Clean Room label</p>                                |  <p>xx1600001074</p>                       |
|          | <p>Foundry Plus label</p>                              |  <p>xx1600001075</p>                      |

### 3 Maintenance

#### 3.3.2 Inspecting the information labels

Continued

|   |              |   |
|---|--------------|---|
| K | Type A label |  |
|   | Type B label |  |

#### Required spare parts



#### Note


The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part           | Article number | Note  |
|----------------------|----------------|---|
| Labels and plate set | 3HAC051417-001 | Includes all safety and information labels required for the robot. Missing, damaged or illegible labels must be replaced. |

#### Required tools and equipment

Visual inspection, no tools are required.

#### Inspecting, labels

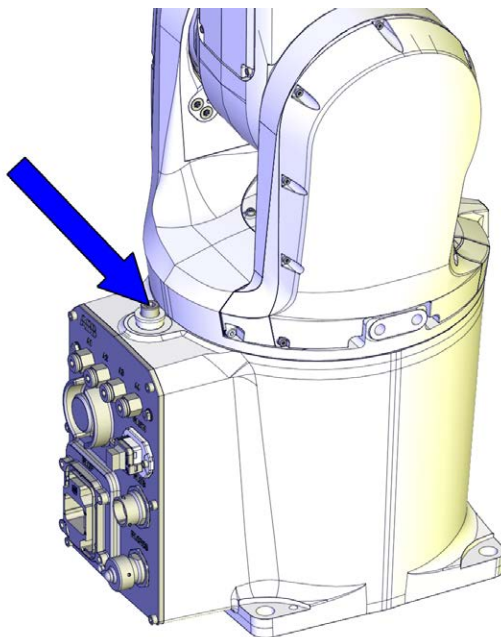
|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the safeguarded space. |  |
| 2 | Inspect the labels, located as shown in the figures.  |  |
| 3 | Replace any missing or damaged labels.  | Article numbers for the labels and plate set is specified in <a href="#">Spare parts on page 817</a> . |

### 3.3.3 Inspecting mechanical stops

#### Location of mechanical stops

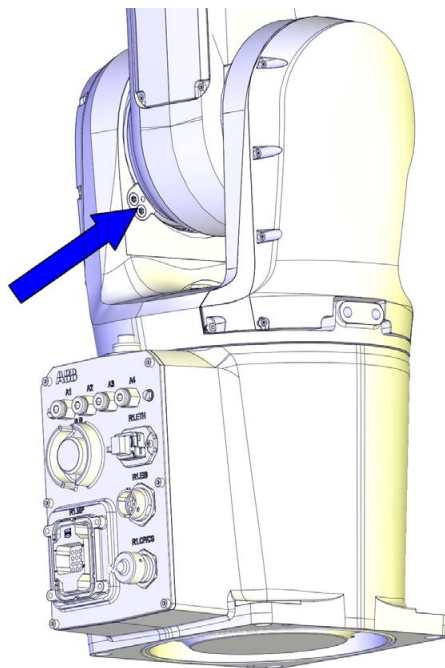
The mechanical stops on axes 1, 2 and 3 are located as shown in the figures.

#### Axis 1



xx140000391

#### Axis 2



xx140000389

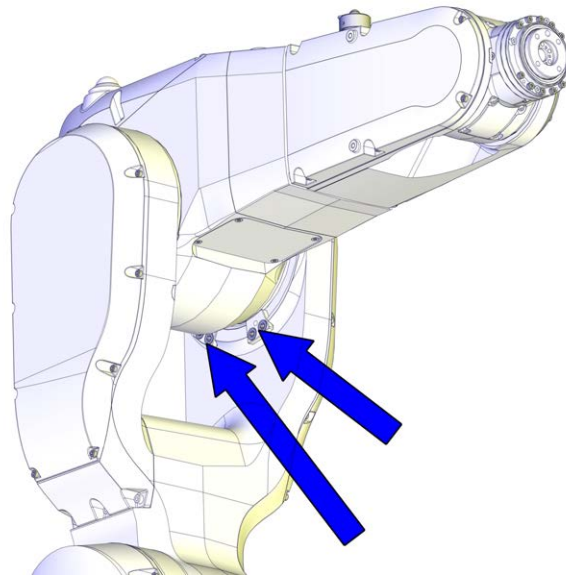
*Continues on next page*

## 3 Maintenance

### 3.3.3 Inspecting mechanical stops

*Continued*

#### Axis 3



xx140000386

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                  | Article number | Note   |
|-----------------------------|----------------|--|
| Mechanical stop set, axis 1 | 3HAC049630-001 | Includes mechanical stop pin (1 pc), washer and screw. |
| Mechanical stop set, axis 2 | 3HAC049637-001 | Includes mechanical stop pin (1 pc) and screws.        |
| Mechanical stop set, axis 3 | 3HAC049644-001 | Includes mechanical stop pin (1 pc) and screws.        |

#### Required tools and equipment



Visual inspection, no tools are required.

Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.

*Continues on next page*

#### Inspecting mechanical stops

Use this procedure to inspect mechanical stops on axes 1, 2 and 3.

|   | Action   | Information  |
|---|--|--|
| 1 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area.                   |  |
| 2 | Inspect the <i>mechanical stops</i> .  | See the figures in: <ul style="list-style-type: none"> <li>• <a href="#">Location of mechanical stops on page 113</a></li> </ul> |
| 3 | Replace if the mechanical stop is: <ul style="list-style-type: none"> <li>• bent</li> <li>• loose</li> <li>• damaged.</li> </ul><br> <b>Note</b><br>The expected life of gearboxes can be reduced as a result of collisions with the mechanical stop. |  |

## 3 Maintenance

---

### 3.3.4 Inspecting timing belts

### 3.3.4 Inspecting timing belts

---

#### Introduction



#### CAUTION

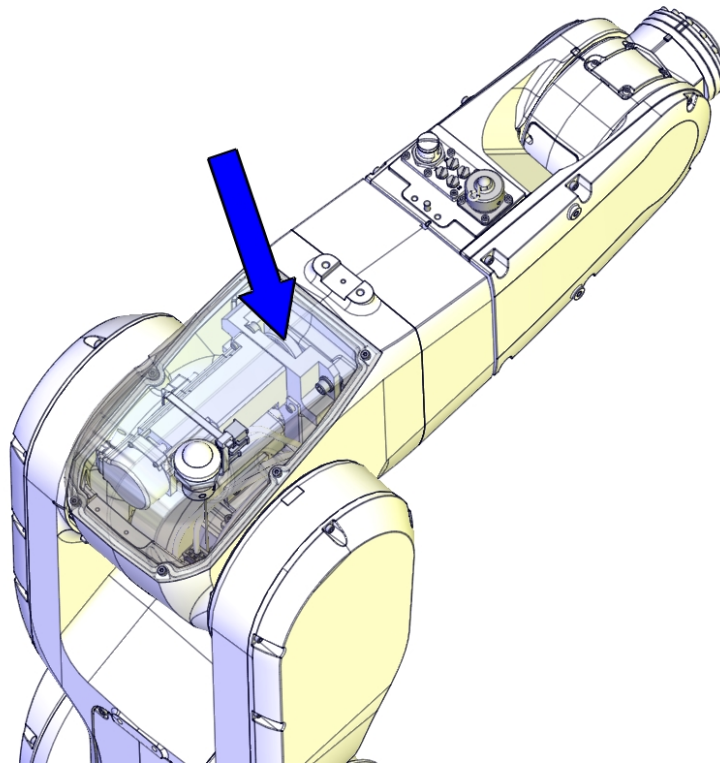
Always read the section "General procedures" before doing any repair work.  
*Cut the paint or surface on the robot before replacing parts on page 136.*

---

#### Location of timing belts

The timing belts are located as shown in the figures.

#### Axis 4

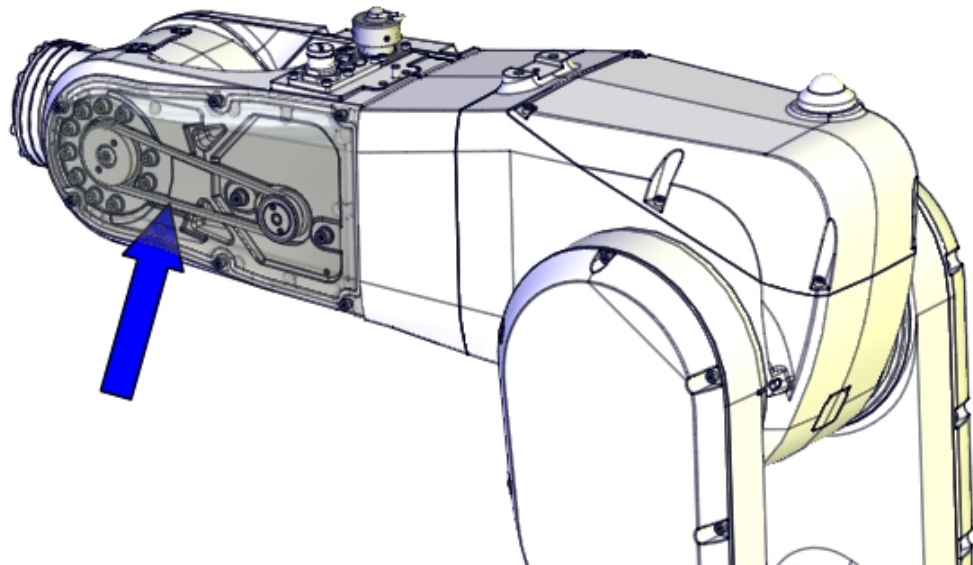


xx140000036

*Continues on next page*



#### Axis 5




xx140000032

#### Required tools and equipment

| Equipment  | Note   |
|--|--|
| Standard toolkit   | The content is defined in the section <a href="#">Standard toolkit on page 811</a> . |
| Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure. |  |

#### Inspecting timing belts

Use this procedure to inspect timing belts.

|   | Action   | Information |
|---|--|-------------|
| 1 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |             |
| 2 | Gain access to each <i>timing belt</i> by removing the cover.  |             |
| 3 | Check the timing belts for damage or wear.   |             |
| 4 | Check the <i>timing belt pulleys</i> for damage.   |             |
| 5 | If any damage or wear is detected, the part must be replaced!  |             |

*Continues on next page*

### 3 Maintenance

---

#### 3.3.4 Inspecting timing belts

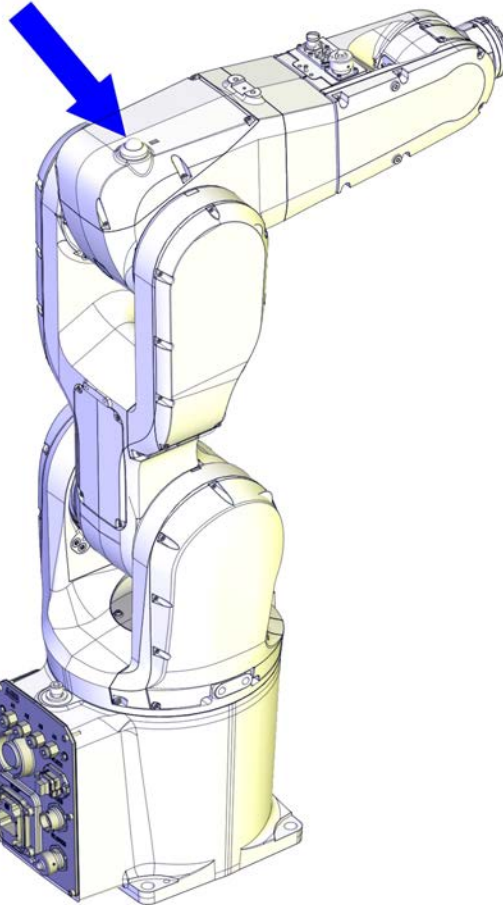
*Continued*

|   | Action   | Information |
|---|--|-------------|
| 6 | Check whether timing belts are slack manually.<br>If the belt has no tension, adjust it! |             |

### 3.3.5 Inspecting the signal lamp (option)

#### Location of signal lamp

The signal lamp is located as shown in this figure.



xx130000455

#### Required tools and equipment

| Equipment        | Article number                                | Note   |
|------------------|---|--|
| Signal lamp kit  | See <a href="#">Spare parts on page 817</a> . | To be replaced if damage is detected.  |
| Standard toolkit | -   | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

#### Inspecting, signal lamp

Use this procedure to inspect the function of the signal lamp.

|   | Action  | Note |
|---|---|------|
| 1 | Inspect that signal lamp is lit when motors are put in operation ("MOTORS ON"). |      |


*Continues on next page*

## 3 Maintenance

---

### 3.3.5 Inspecting the signal lamp (option)

*Continued*

|   | Action  | Note  |
|---|---|---|
| 2 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"><li>• electric power supply</li><li>• hydraulic pressure supply</li><li>• air pressure supply</li></ul> to the robot, before entering the safeguarded space. |   |
| 3 | If the lamp is not lit, trace the fault by: <ul style="list-style-type: none"><li>• inspecting whether the signal lamp is broken. If so, replace it.</li><li>• inspecting cable connections.</li><li>• inspecting the cabling. Replace the cabling if a fault is detected.</li></ul>                            | Article number is specified in <a href="#">Required tools and equipment on page 119</a> . |

## 3.4 Replacement/changing activities

### 3.4.1 Replacing the battery pack

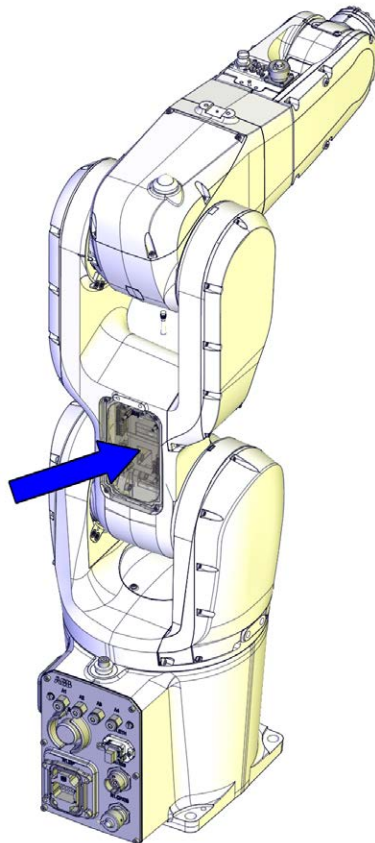


#### Note

The battery low alert (38213 Battery charge low) is displayed when remaining backup capacity (robot powered off) is less than 2 months. Typical life of a new battery is 36 months if the robot is powered off 2 days/week, or 18 months if the robot is powered off 16 hours/day. The life can be extended (approximately 3 times) for longer production breaks by a battery shutdown service routine. See *Operating manual - IRC5 with FlexPendant*.

#### Location of battery pack

The battery pack is located as shown in the figure.



xx1300002574

*Continues on next page*

## 3 Maintenance

### 3.4.1 Replacing the battery pack

*Continued*

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                         | Article number | Note   |
|------------------------------------|----------------|--|
| Battery pack                       | 3HAC051036-001 | Battery includes protection circuits. Only replace with a specified spare part or an ABB-approved equivalent.  |
| Battery pack, SafeMove 2-supported | 3HAC044075-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> . Battery includes protection circuits. Only replace with a specified spare part or an ABB-approved equivalent. |
| Gasket on EIB/SMB cover            | 3HAC056728-001 | Not used with protection class IP40.<br>Replace if damaged.  |

#### Required tools and equipment

| Equipment, etc.     | Article number | Note   |
|---------------------|----------------|--|
| 24 VDC power supply | -              | Used to release the motor brakes.  |
| Standard toolkit    | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |



#### CAUTION

Always cut the paint with a knife and grind the paint edge when disassembling parts. See [Cut the paint or surface on the robot before replacing parts on page 136](#).

#### Required consumables

| Consumable   | Article number | Note |
|--------------|----------------|------|
| Cable straps | -              |      |


#### Removing the battery pack

Use this procedure to remove the battery pack.






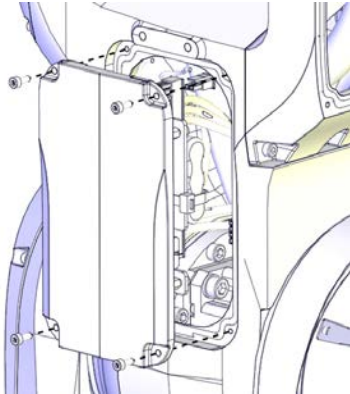
#### Preparations before removing the battery pack

|   | Action                               | Note  |
|---|--------------------------------------|---|
| 1 | Move the robot to its zero position. | This is done in order to facilitate updating of the revolution counter. |

*Continues on next page*

|   | Action   | Note |
|---|--|------|
| 2 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |      |

#### Removing the battery pack

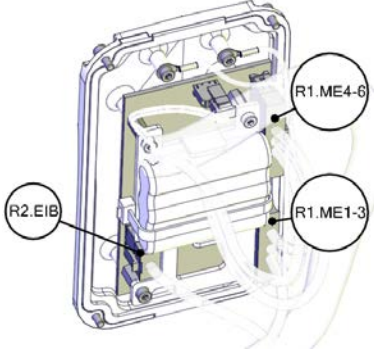
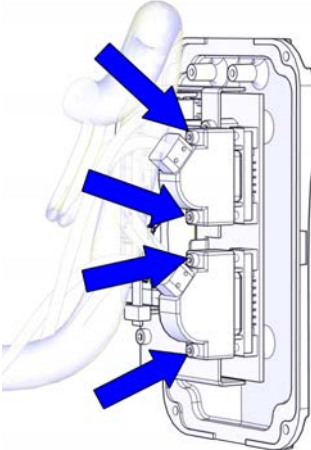
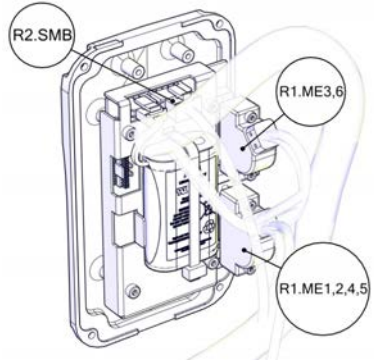
|   | Action   | Note   |
|---|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |  |
| 2 |  <b>ELECTROSTATIC DISCHARGE (ESD)</b><br>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 60</i>   |  |
| 3 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> .   |  |
| 4 | Remove the connector cover attachment screws on the lower arm and carefully open the cover.<br> <b>CAUTION</b><br>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.<br> <b>CAUTION</b><br>Be aware of the cabling that is attached to the cover! | <br><small>xx1300002427</small> |

*Continues on next page*

### 3 Maintenance

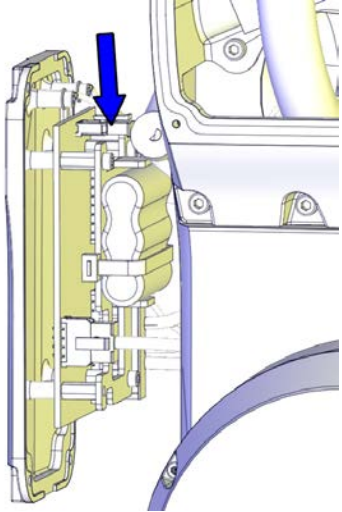
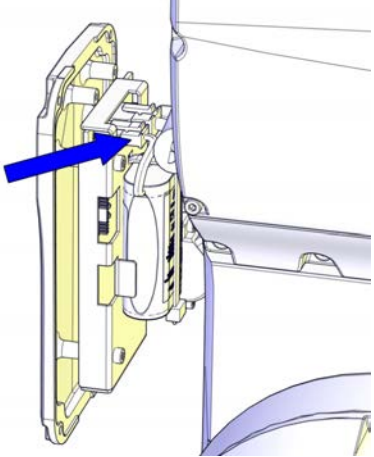
#### 3.4.1 Replacing the battery pack

Continued

|   | Action   | Note   |
|---|--|--|
| 5 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the connectors on the EIB unit.</p> <ul style="list-style-type: none"><li>• R1.ME1-3</li><li>• R1.ME4-6</li><li>• R2.EIB</li></ul> |  <p>xx140000812</p>   |
| 6 | <p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>  |  <p>xx170000004</p>  |
| 7 | <p>Valid for IRB 1200 Type B</p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"><li>• R1.ME1,2,4,5</li><li>• R1.ME3,6</li><li>• R2.SMB</li></ul>                              |  <p>xx170000005</p> |

Continues on next page


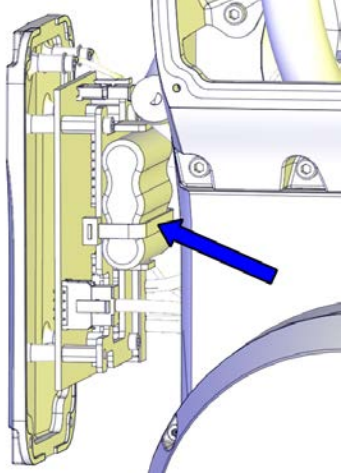
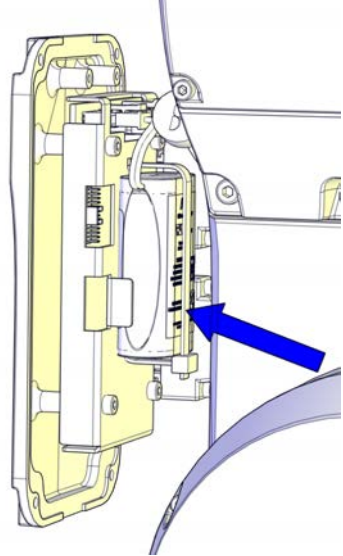


|   | Action                        | Note  |
|---|-------------------------------|---|
| 8 | Disconnect the battery cable. | <p><b>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</b></p>  <p>xx1300002571</p> <p><b>Valid for IRB 1200 Type B</b></p>  <p>xx1700000006</p> |

### 3 Maintenance

#### 3.4.1 Replacing the battery pack


Continued

|   | Action  | Note  |
|---|---|---|
| 9 | <p>Cut the cable strap that secures the battery and remove the battery.</p> <p> <b>Note</b></p> <p>Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.</p> | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p>  <p>xx1300002579</p> <p>Valid for IRB 1200 Type B</p>  <p>xx1700000007</p> |



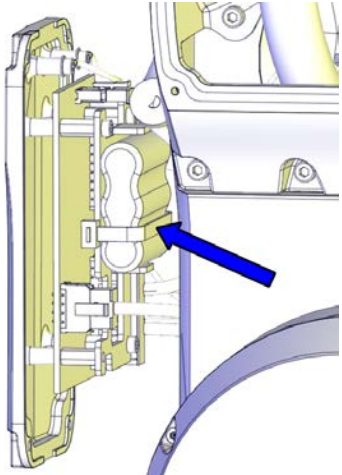
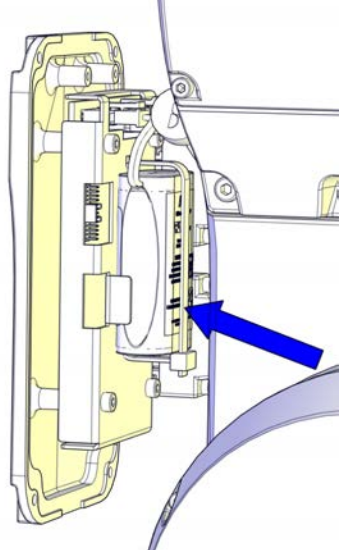
#### Refitting the battery pack

Use these procedures to refit the battery pack.

#### Refitting the battery pack

|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a></p> |      |

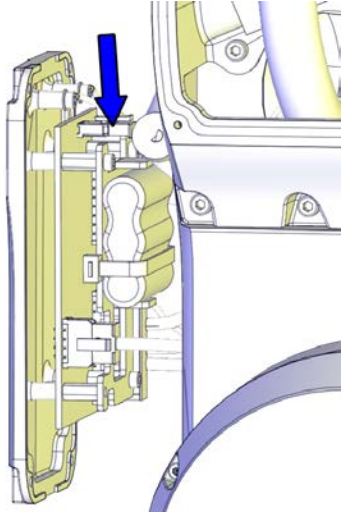
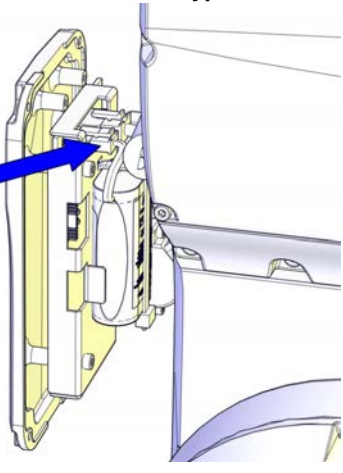

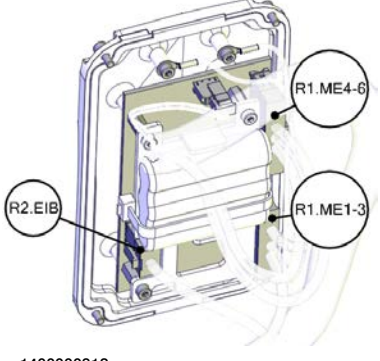
Continues on next page

|   | Action  | Note  |
|---|---|---|
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | <p>Fit the battery and and secure it with a cable strap.</p> <p> <b>Note</b></p> <p>Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.</p>      | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p>  <p>xx1300002579</p> <p>Valid for IRB 1200 Type B</p>  <p>xx1700000007</p> |


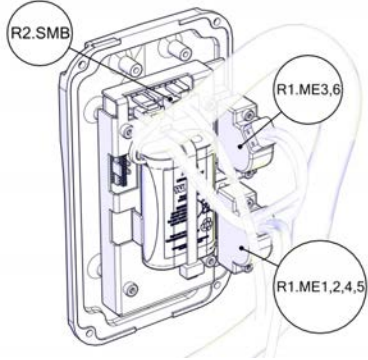
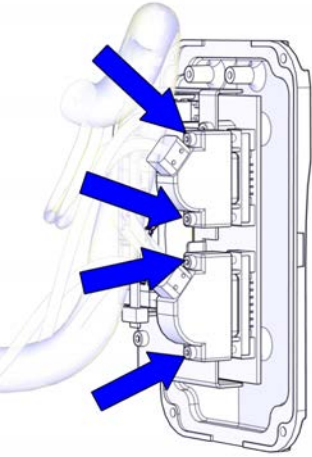
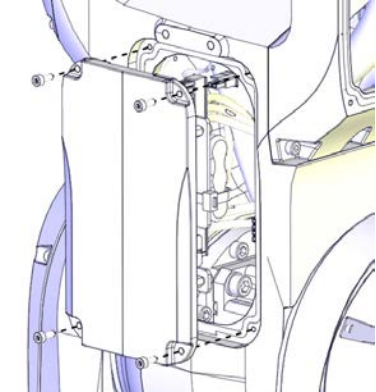

### 3 Maintenance

#### 3.4.1 Replacing the battery pack

Continued

|   | Action   | Note  |
|---|--|---|
| 4 | Connect the battery cable.   | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p>  <p>xx1300002571</p> <p>Valid for IRB 1200 Type B</p>  <p>xx1700000006</p> |
| 5 | <p>Valid for IRB 1200 (not type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p> |  <p>xx1400000812</p>   |

Continues on next page


|   | Action  | Note   |
|---|---|--|
| 6 | <p><b>Valid for IRB 1200 Type B</b></p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p> |  <p>xx1700000005</p>  |
| 7 | <p><b>Valid for IRB 1200 Type B</b></p> <p>Tighten the connector screws.</p>  | <p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>  |
| 8 | <p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p>   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

*Continues on next page*




### 3 Maintenance

#### 3.4.1 Replacing the battery pack

Continued

|   | Action   | Note |
|---|--|------|
| 9 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |      |

#### Concluding procedure

|   | Action   | Note   |
|---|--|--|
| 1 | <p>Update the revolution counters.</p>   | <p>See <a href="#">Updating revolution counters on page 736</a>.</p> |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |  |
| 3 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |  |

## 3.5 Cleaning activities

### 3.5.1 Cleaning the IRB 1200



#### DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

#### General

To secure high uptime it is important that the IRB 1200 is cleaned regularly. The frequency of cleaning depends on the environment in which the product works. Different cleaning methods are allowed depending on the type of protection of the IRB 1200.



#### Note

Always verify the protection type of the robot before cleaning.

#### Special cleaning considerations

This section specifies some special considerations when cleaning the robot.

- Always use cleaning equipment as specified. Any other cleaning equipment may shorten the life of the robot.
- Always check that all protective covers are fitted to the robot before cleaning.
- Never point the water jet at connectors, joints, sealings, or gaskets.
- Do not use compressed air to clean the robot.
- Never use solvents that are not approved by ABB to clean the robot.
- Do not spray from a distance closer than 0.4 m.
- Do not remove any covers or other protective devices before cleaning the robot.

#### Cleaning methods

The following table defines what cleaning methods are allowed depending on the protection type.

| Protection type | Cleaning method |                                     |                  |                              |
|-----------------|-----------------|-------------------------------------|------------------|------------------------------|
|                 | Vacuum cleaner  | Wipe with cloth                     | Rinse with water | High pressure water or steam |
| Standard IP40   | Yes             | Yes. With light cleaning detergent. | No               | No                           |

*Continues on next page*

## 3 Maintenance

### 3.5.1 Cleaning the IRB 1200

Continued

| Protection type | Cleaning method |  |  |   |
|-----------------|-----------------|--|--|---|
|                 | Vacuum cleaner  | Wipe with cloth  | Rinse with water   | High pressure water or steam  |
| IP67 (option)   | Yes             | Yes. With light cleaning detergent.                              | Yes. It is highly recommended that the water contains a rust-prevention solution and that the manipulator is dried afterwards. | No  |
| Foundry Plus    | Yes             | Yes. With light cleaning detergent or spirit.                    | Yes. It is highly recommended that the water contains a rust-prevention solution.  | Yes <sup>i</sup> . It is highly recommended that the water and steam contains rust preventive, without cleaning detergents. |
| Clean room      | Yes             | Yes. With light cleaning detergent, spirit or isopropyl alcohol. | No   | No  |

<sup>i</sup> Perform according to section [Cleaning with water and steam on page 132](#).

#### Wiping with cloth

Additional cleaning instructions for robots with food grade lubrication

Make sure that no liquid flows into the robot or stagnates in any gap or surface after cleaning.

#### Cleaning with water and steam

Instructions for rinsing with water

IRB 1200 with protection class IP67 (option) and with protection type *Foundry Plus* can be cleaned by rinsing with water (water cleaner).<sup>1</sup>

The following list defines the prerequisites:

- Maximum water pressure at the nozzle: 700 kN/m<sup>2</sup> (7 bar)<sup>1</sup>
- Fan jet nozzle should be used, min. 45° spread
- Minimum distance from nozzle to encapsulation: 0.4 meters
- Maximum flow: 20 liters/min<sup>1</sup>

<sup>1</sup> Typical tap water pressure and flow

Instructions for steam or high pressure water cleaning

ABB robots with protection types *Foundry Plus*, *Wash*, or *Foundry Prime* can be cleaned using a steam cleaner or high pressure water cleaner.<sup>2</sup>

The following list defines the prerequisites:

- Maximum water pressure at the nozzle: 2500 kN/m<sup>2</sup> (25 bar)
- Fan jet nozzle should be used, min. 45° spread
- Minimum distance from nozzle to encapsulation: 0.4 meters

<sup>1</sup> See [Cleaning methods on page 131](#) for exceptions.

<sup>2</sup> See [Cleaning methods on page 131](#) for exceptions.

Continues on next page



- Maximum water temperature: 80° C
- 

#### **Cables**

Movable cables need to be able to move freely:

- Remove waste material, such as sand, dust and chips, if it prevents cable movement.
- Clean the cables if they have a crusty surface, for example from dry release agents.

**This page is intentionally left blank**

## 4 Repair

### 4.1 Introduction

#### Structure of this chapter

This chapter describes repair activities for the IRB 1200. Each procedure contains the information required to perform the activity, for example spare parts numbers, required special tools, and materials.



#### WARNING

Repair activities not described in this chapter must only be carried out by ABB.

#### Report replaced units



#### Note

When replacing a part on the IRB 1200, report to your local ABB the serial number, the article number, and the revision of both the replaced unit and the replacement unit.

This is particularly important for safety equipment to maintain the safety integrity of the installation.

#### Safety information

Make sure to read through the chapter [Safety on page 19](#) before commencing any service work.



#### Note

If the IRB 1200 is connected to power, always make sure that the IRB 1200 is connected to protective earth and a residual current device (RCD) before starting any repair work.

For more information see:

- *Product manual - IRC5 Compact*

## 4 Repair

### 4.2.1 Cut the paint or surface on the robot before replacing parts

## 4.2 General procedures

### 4.2.1 Cut the paint or surface on the robot before replacing parts

#### General

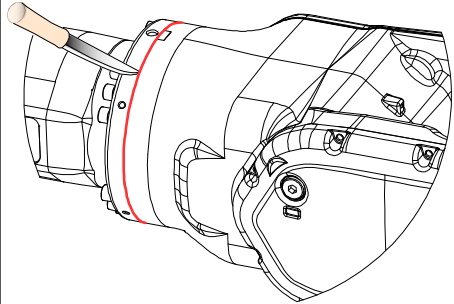
Follow the procedures in this section whenever breaking the paint of the robot during replacement of parts.

When replacing parts on a robot with protection type Clean Room, it is important to make sure that after the replacement, no particles will be emitted from the joint between the structure and the new part, and that the easy cleaned surface is retained.

#### Required equipment

| Equipment                            | Spare parts    | Note                          |
|--------------------------------------|----------------|-------------------------------|
| Sealing compound                     |                | Sikaflex 521 FC. Color white. |
| Tooling pin                          |                | Width 6-9 mm, made of wood.   |
| Cleaning agent                       |                | Ethanol                       |
| Knife                                |                |                               |
| Lint free cloth                      |                |                               |
| Touch up paint Clean Room            | 3HAC036639-001 | White                         |
| Touch up paint Standard/Foundry Plus | 3HAC067974-001 | Graphite White                |

#### Removing

| Action   | Description  |
|--|--|
| 1 Cut the paint with a knife in the joint between the part that will be removed and the structure, to avoid that the paint cracks. | <br>xx0900000121 |
| 2 Carefully grind the paint edge that is left on the structure to a smooth surface.  |  |

#### Refitting



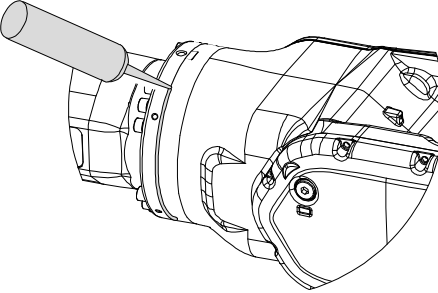
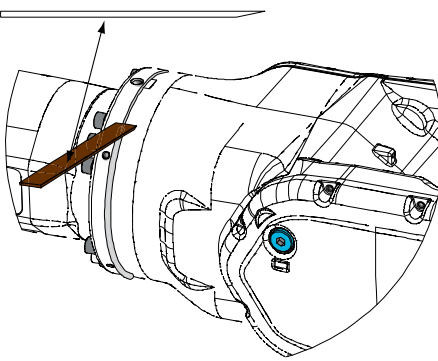

#### Note

Refitting is required only for robots with protection type Clean Room.

*Continues on next page*

### 4.2.1 Cut the paint or surface on the robot before replacing parts

*Continued*

|   | Action  | Description  |
|---|---|--|
| 1 | Before the parts are refitted, clean the joint so that it is free from oil and grease.  | Use ethanol on a lint free cloth.  |
| 2 | Place the tooling pin in hot water.   |  |
| 3 | Seal all refitted joints with sealing compound.   |  <p>xx0900000122</p>    |
| 4 | Use the tooling pin to even out the surface of the sealing compound.  |  <p>xx0900000125</p> |
| 5 | Use Touch up paint Clean Room, white to paint any damaged surfaces.<br><br> <b>Note</b><br><br>Always read the instruction in the product data sheet in the paint repair kit for Clean Room. | 3HAC036639-001   |



#### Note

After all repair work, wipe the robot free from particles with spirit on a lint free cloth.

## 4 Repair

### 4.2.2 Mounting instructions for sealings

### 4.2.2 Mounting instructions for sealings

#### General

This section describes how to mount different types of sealings.

#### Equipment

| Consumable | Article number | Note  |
|------------|----------------|---|
| Grease     | 3HAC042536-001 | Shell Gadus S2  |
| Grease     | 3HAC043771-001 | LUBRIPLATE SYNXTREME FG-0<br>Used for robots with food grade lubrication. |

#### Rotating sealings

The procedure below describes how to fit rotating sealings.



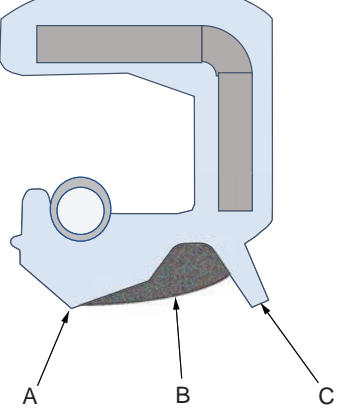
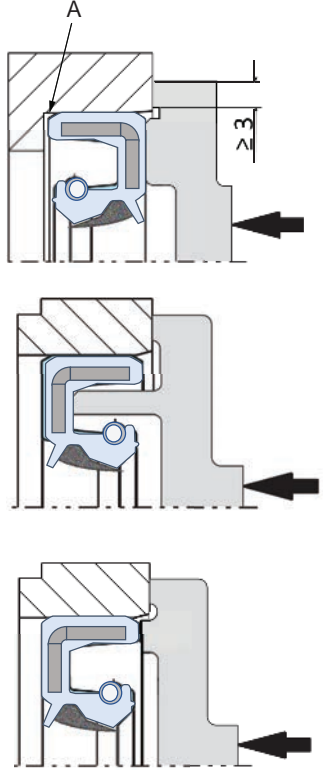
#### CAUTION

Please observe the following before commencing any assembly of sealings:

- Protect the sealing during transport and mounting, especially the main lip.
- Keep the sealing in its original wrappings or protect it well before actual mounting.
- The fitting of sealings and gears must be carried out on clean workbenches.
- Use a protective sleeve for the main lip during mounting, when sliding over threads, keyways or other sharp edges.

|   | Action   | Note |
|---|--|------|
| 1 | Check the sealing to ensure that: <ul style="list-style-type: none"><li>• The sealing is of the correct type.</li><li>• There is no damage on the main lip.</li></ul>  |      |
| 2 | Inspect the shaft surface before mounting. If scratches or damage are found, the shaft must be replaced since it may result in future leakage. Do not try to grind or polish the shaft surface to get rid of the defect. |      |

*Continues on next page*

|   | Action  | Note  |
|---|---|---|
| 3 | <p>Lubricate the sealing with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the sealing.)</p> <p>Fill 2/3 of the space between the dust lip and the main lip with grease. If the sealing is without dust lip, just lubricate the main lip with a thin layer of grease.</p> | <p>Article number is specified in <a href="#">Equipment on page 138</a>.</p>  <p>xx200000071</p> <p>A Main lip<br/>B Grease<br/>C Dust lip</p> |
| 4 | <p>Mount the sealing correctly with a mounting tool. Never hammer directly on the sealing as this may result in leakage.</p>  |  <p>xx200000072</p> <p>A Gap</p>  |
| 5 | <p>Make sure that no grease is left on the robot surface.</p>   |   |

Continues on next page

## 4 Repair

### 4.2.2 Mounting instructions for sealings

*Continued*

#### Flange sealings and static sealings

The following procedure describes how to fit flange sealings and static sealings.

|   | Action  |
|---|---|
| 1 | Check the flange surfaces. They must be even and free from pores.<br>It is easy to check flatness using a gauge on the fastened joint (without sealing compound).<br>If the flange surfaces are defective, the parts may not be used because leakage could occur. |
| 2 | Clean the surfaces properly in accordance with the recommendations of ABB.  |
| 3 | Distribute the sealing compound evenly over the surface, preferably with a brush.   |
| 4 | Tighten the screws evenly when fastening the flange joint.  |

#### O-rings

The following procedure describes how to fit o-rings.

|   | Action  | Note   |
|---|---|--|
| 1 | Ensure that the correct o-ring size is used.  |  |
| 2 | Check the o-ring for surface defects, burrs, shape accuracy, or deformation.  | Defective o-rings, including damaged or deformed o-rings, may not be used. |
| 3 | Check the o-ring grooves.<br>The grooves must be geometrically correct and should be free of pores and contamination. |  |
| 4 | Lubricate the o-ring with grease.   |  |
| 5 | Tighten the screws evenly while assembling.   |  |
| 6 | Check that the o-ring is not squashed outside the o-ring groove.  |  |
| 7 | Make sure that no grease is left on the robot surface.  |  |



### 4.2.3 Sealing differences depending on protection class

---

#### Standard IP40 vs optional IP67

The IRB 1200 has IP40 as standard protection class. If the robot is delivered with option IP67, many of the covers are equipped with gaskets, several components has been applied with locking liquid etc.

This means that there are differences in the repair procedures depending on the robot protection class. These are clearly stated in the step-by-step procedures.

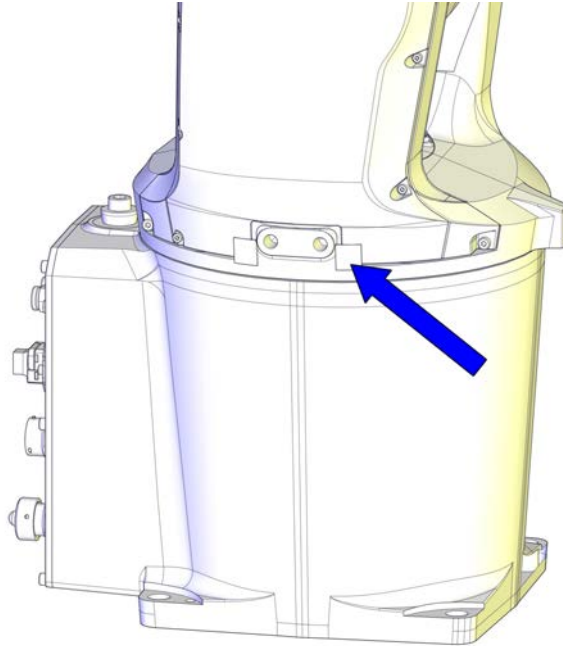
## 4 Repair

### 4.2.4 Swing sealing plug for Clean Room robots and robots with food grade lubrication

#### 4.2.4 Swing sealing plug for Clean Room robots and robots with food grade lubrication

##### Location of the swing sealing plug

The swing sealing plug is located as shown in the figure.



xx160000264

##### Required spare parts



##### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part         | Article number | Note   |
|--------------------|----------------|--|
| Swing sealing plug | 3HAC053687-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |

##### Required tools and equipment

| Equipment, etc.  | Article number | Note   |
|------------------|----------------|--|
| Standard toolkit | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

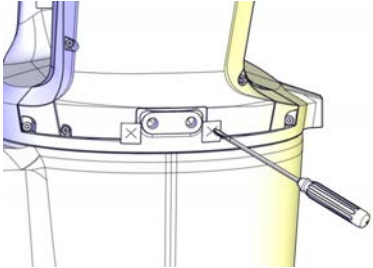
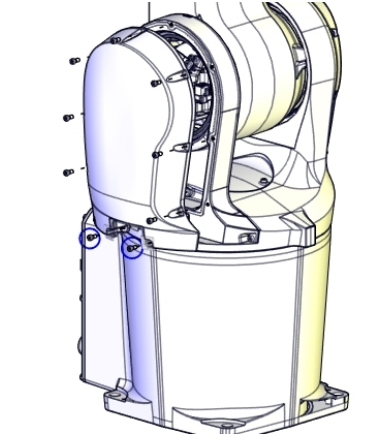
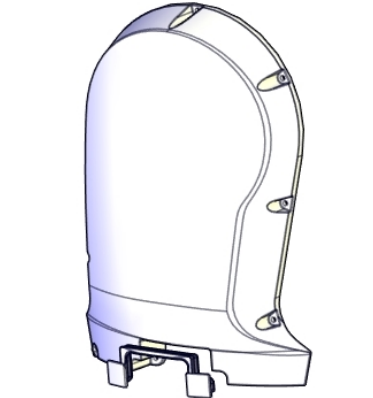
Continues on next page

4.2.4 Swing sealing plug for Clean Room robots and robots with food grade lubrication  
*Continued*

**Required consumables**

| Consumable | Art. no.       | Note  |
|------------|----------------|---|
| Sealant    | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type<br>Clean Room |

**Removing the swing sealing plug**

|   | Action  | Note  |
|---|---|---|
| 1 | Cut the swing sealing plug through with a sharp object to get access to the screws. |  <p>xx1600000206</p>   |
| 2 | Remove the cable housing cover of the swing by removing the screws.                 |  <p>xx1600000207</p>  |
| 3 | Detach the swing sealing plug from the cable housing cover.                         |  <p>xx1600000208</p> |

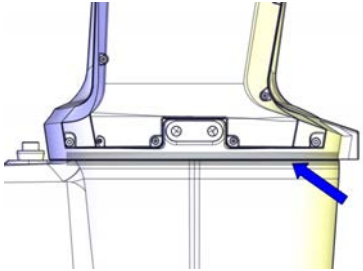
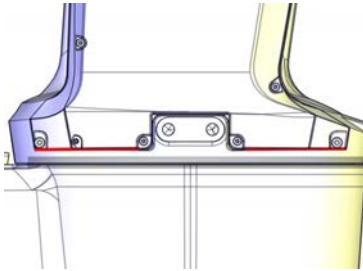

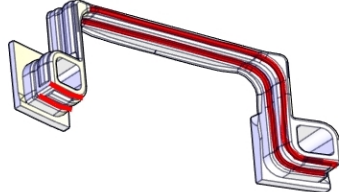
*Continues on next page*

## 4 Repair

### 4.2.4 Swing sealing plug for Clean Room robots and robots with food grade lubrication

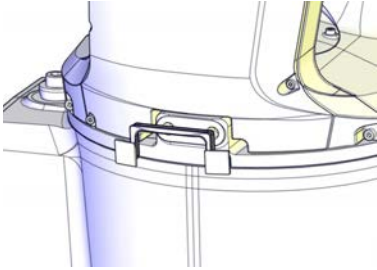
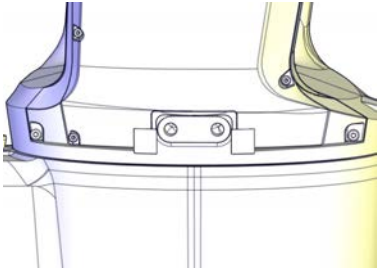
*Continued*

#### Refitting the swing sealing plug

|   | Action   | Note   |
|---|--|--|
| 1 | Mask the gap between the swing and the base.   | <br>xx1600000209  |
| 2 | Apply a string of the sealant Sikaflex 521FC to the joint of the swing cable housing cover.  | <br>xx1600000210  |
| 3 | Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint. Make sure the sealant fully covers the gap but is not applied to the screw cavities. |  |
| 4 | Wait at least 30 minutes for Sikaflex 521FC to dry and then remove the mask.   | Sikaflex 521FC skin dry time: 30 minutes   |
| 5 | Apply a little sealant Sikaflex 521FC to the inner surface of the swing sealing plug.  | <br>xx1600000211<br><br><br>xx1600000261 |

*Continues on next page*

**4.2.4 Swing sealing plug for Clean Room robots and robots with food grade lubrication**  
*Continued*

|   | <b>Action</b>  | <b>Note</b>   |
|---|--|---|
| 6 | Refit the swing sealing plug.  |  <p>xx1600000212</p> |
| 7 | <p>If there is any overflowing sealant, remove and clean it.</p> <p>Make sure no space exists between the swing sealing plug and the robot casting, and the sealant string is fully jointed with the plug.</p> |  <p>xx1600000213</p> |

## 4 Repair

---

### 4.3.1 Replacing the main cable package

## 4.3 Cable harness

### 4.3.1 Replacing the main cable package

---

#### Location of the main cable package

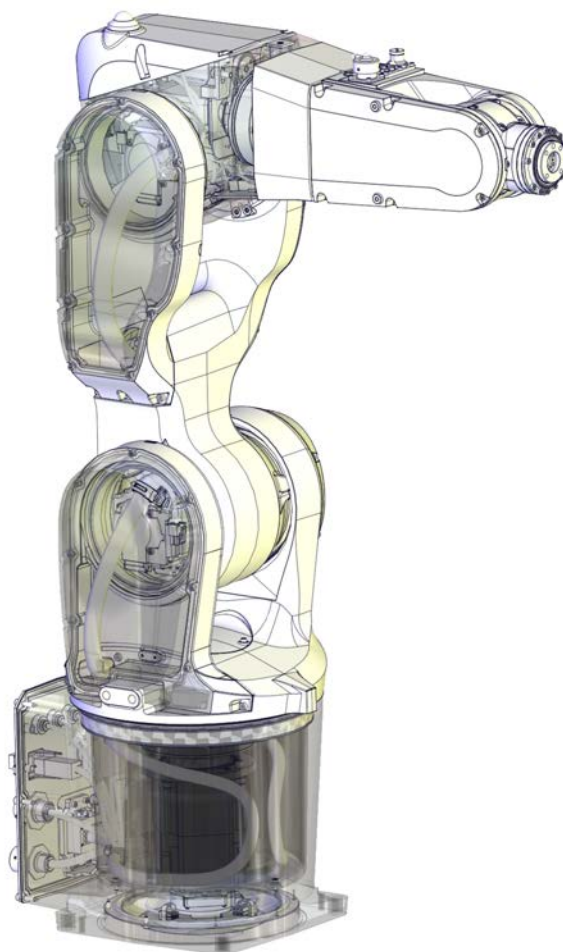
The main cable package runs from the base, up through the swing, up through the lower arm and into the housing. Inside the housing there is a division point for the axis-5 and axis-6 motor cables.

The main cable package includes the air hoses and the cabling for all the six motors. Optional Ethernet cabling can also be included.

The air hoses and optional Ethernet must be disconnected inside the wrist unit before the cable package can be removed.

As standard feature, the connector interface is located at the rear of the base. The interface can also be bottom mounted, as an option. This section describes both configurations.

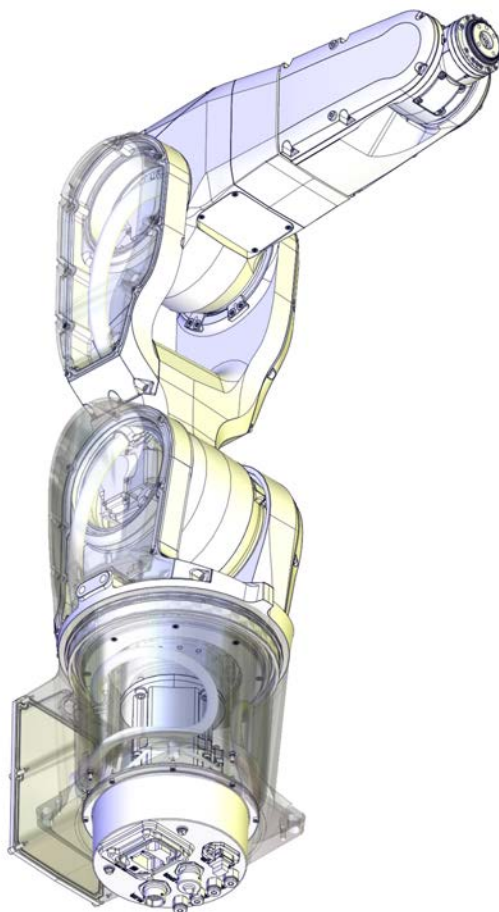
#### Connector interface at the rear of the base (standard)



xx1300002414

*Continues on next page*

Connector interface at the bottom of the base (option)



xx140000410

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part   | Article number | Note   |
|--|----------------|--|
| Manipulator cable harness with Ethernet (rear interface)   | 3HAC059673-001 | With connector interface at rear of the base.  |
| Manipulator cable harness without Ethernet (rear interface)  | 3HAC059674-001 | With connector interface at rear of the base.  |
| Manipulator cable harness with Ethernet (rear interface), Clean Room<br>Manipulator cable harness with Ethernet (rear interface), food grade lubrication | 3HAC056219-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>With connector interface at rear of the base. |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

Continued

| Spare part   | Article number | Note   |
|--|----------------|--|
| Manipulator cable harness without Ethernet (rear interface), Clean Room<br>Manipulator cable harness without Ethernet (rear interface), food grade lubrication   | 3HAC056220-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>With connector interface at rear of the base.   |
| Manipulator cable harness with Ethernet (bottom interface)   | 3HAC051415-001 | With connector interface at bottom of the base.  |
| Manipulator cable harness without Ethernet (bottom interface)  | 3HAC051416-001 | With connector interface at bottom of the base.  |
| Manipulator cable harness with Ethernet (rear interface), SafeMove 2-supported   | 3HAC061282-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>With connector interface at rear of the base.  |
| Manipulator cable harness without Ethernet (rear interface), SafeMove 2-supported  | 3HAC061283-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>With connector interface at rear of the base.  |
| Manipulator cable harness with Ethernet (rear interface), Clean Room and SafeMove 2-supported<br>Manipulator cable harness with Ethernet (rear interface), food grade lubrication and SafeMove 2-supported       | 3HAC061286-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>With connector interface at rear of the base. |
| Manipulator cable harness without Ethernet (rear interface), Clean Room and SafeMove 2-supported<br>Manipulator cable harness without Ethernet (rear interface), food grade lubrication and SafeMove 2-supported | 3HAC061287-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>With connector interface at rear of the base. |
| Manipulator cable harness with Ethernet (bottom interface), SafeMove 2-supported   | 3HAC061284-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>With connector interface at bottom of the base.  |
| Manipulator cable harness without Ethernet (bottom interface), SafeMove 2-supported  | 3HAC061285-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>With connector interface at bottom of the base.  |
| Cable harness material set   | 3HAC049663-001 | Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.   |
| Air connector set with Ethernet hole in flange   | 3HAC049664-001 | Includes tubular flange, air connectors and seal bolts.<br>Replace if damaged.   |

Continues on next page



4.3.1 Replacing the main cable package  
*Continued*

| Spare part   | Article number                                  | Note   |
|--|---|--|
| Air connector set without Ethernet hole in flange  | 3HAC049665-001                                  | Includes tubular flange, air connectors and seal bolts.<br>Replace if damaged.   |
| Base bottom cover (standard configuration)   | 3HAC049667-001                                  | Replace if damaged.  |
| Base rear cover, without connector interface   | 3HAC059675-001                                  | Replace if damaged.  |
| Base rear cover, without connector interface, Clean Room<br>Base rear cover, without connector interface, food grade lubrication | 3HAC056147-001                                  | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged.   |
| Gasket for rear base cover   | 3HAC058566-001                                  | Not used with protection class IP40.<br>Replace if damaged.  |
| O-ring   | 3HAB3772-86                                     | Not used with protection class IP40.<br>Replace if damaged.  |
| Radial sealing with dust lip   | 3HAB3701-47                                     | Not used with protection class IP40.<br>Replace if damaged.  |
| M2 variseal sealing  | 3HAC044641-002                                  | Used with protection class IP67.<br>Used only on base 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a> .<br>Replace if damaged.  |
| Axis-1 sealing ring  | 3HAC044676-001 /<br>3HAC068107-001 <sup>i</sup> | Replace if damaged.  |
| V-ring   | 3HAB3732-34                                     | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Only on swing version 3HAC058000-001 and 3HAC059554-001. See <a href="#">Spare part versions for the swing on IP40/IP67 robots on page 795</a> .<br>Replace if damaged. |
| Axis-2 sealing ring  | 3HAC044677-001                                  | Replace if damaged.  |
| Gasket of axis-2 sealing ring  | 3HAC045688-001                                  | Not used with protection class IP40.<br>Replace if damaged.  |
| Radial sealing with dust lip   | 3HAB3701-41                                     | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket of plastic plate  | 3HAC044894-001                                  | Not used with protection class IP40.<br>Replace if damaged.  |
| Cable protection   | 3HAC044691-001                                  | Replace if damaged.  |

*Continues on next page*

## 4 Repair

### 4.3.1 Replacing the main cable package

*Continued*

| Spare part   | Article number | Note   |
|--|----------------|--|
| Torx countersunk head screw<br>M3x5  | 3HAC14286-4    | Replace if damaged.  |
| Cover on top of swing  | 3HAC059679-001 | Replace if damaged.  |
| Cover on top of swing, Clean<br>Room<br>Cover on top of swing, food<br>grade lubrication                       | 3HAC056133-001 | Used with protection type Clean<br>Room.<br>Used for robots with food grade<br>lubrication.<br>Replace if damaged. |
| Gasket on top swing cover  | 3HAC056696-001 | Not used with protection class<br>IP40.<br>Replace if damaged.   |
| M2 variseal sealing  | 3HAC044641-004 | Used with protection class IP67.<br>Used with protection type<br>Foundry Plus.<br>Replace if damaged.              |
| Cable housing cover of the<br>swing  | 3HAC059678-001 | Replace if damaged.  |
| Cable housing cover of the<br>swing, Clean Room<br>Cable housing cover of the<br>swing, food grade lubrication | 3HAC056214-001 | Used with protection type Clean<br>Room.<br>Used for robots with food grade<br>lubrication.<br>Replace if damaged. |
| Gasket on cable housing cover  | 3HAC056726-001 | Not used for robots with protec-<br>tion class IP40.<br>Replace if damaged.  |
| PTFE film on cable housing<br>cover  | 3HAC044660-001 | Replace if damaged.  |
| Gasket on cable housing cover  | 3HAC056724-001 | Not used with protection class<br>IP40.<br>Replace if damaged.   |
| EIB/SMB cover  | 3HAC059692-001 | Replace if damaged.  |
| EIB/SMB cover, Clean Room<br>EIB/SMB cover, food grade lub-<br>rication  | 3HAC056137-001 | Used with protection type Clean<br>Room.<br>Used for robots with food grade<br>lubrication.<br>Replace if damaged. |
| Gasket on EIB/SMB cover  | 3HAC056728-001 | Not used with protection class<br>IP40.<br>Replace if damaged.   |
| Motor bracket  | 3HAC044689-001 | Replace if damaged.  |
| Housing small cover  | 3HAC059684-001 | Replace if damaged.  |
| Housing small cover, Clean<br>Room<br>Housing small cover, food grade<br>lubrication                           | 3HAC056142-001 | Used with protection type Clean<br>Room.<br>Used for robots with food grade<br>lubrication.<br>Replace if damaged. |

*Continues on next page*

4.3.1 Replacing the main cable package  
*Continued*

| Spare part                             | Article number | Note  |
|--|----------------|---|
| Gasket on cable housing cover          | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Gasket for tubular cover               | 3HAC058822-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Gasket for tubular cable housing cover | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Housing cover gasket (IRB 1200-7/0.7 ) | 3HAC056698-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Housing cover gasket (IRB 1200-5/0.9 ) | 3HAC056697-001 | Not used with protection class IP40.<br>Replace if damaged. |

<sup>i</sup> For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797](#).

**Required tools and equipment**

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Roundslings, 2 m                        | -              | Length: 2 m. Lifting capacity: 100 kg.   |
| Guide pin for axis-1 gear unit          | 3HAC049703-001 | Always use three guide pins together!  |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |

<sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory. Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant. If no data is found related to standard calibration, manual calibration is used as default.

**CAUTION**

Always cut the paint with a knife and grind the paint edge when disassembling parts. See [Cut the paint or surface on the robot before replacing parts on page 136](#).

**Required consumables**

| Equipment    | Article number | Note  |
|--------------|----------------|---|
| Cable straps | -              |   |
| Grease       | 3HAC042536-001 | Used for lubrication of cable contact areas.  |
| Grease       | 3HAC029132-001 | Used for lubrication of cable contact areas for robots with food grade lubrication. |

*Continues on next page*

## 4 Repair


### 4.3.1 Replacing the main cable package

Continued

| Equipment      | Article number | Note  |
|----------------|----------------|---|
| Locking liquid | 3HAB7116-1     | Loctite 243   |
| Cleaning agent | -              | Loctite 7063  |
| Flange sealing | 12340011-116   | Loctite 574<br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3) |
| Sealant        | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room  |

#### Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action  | Note  |
|---|---|---|
| 1 | Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.                |
|   | <b>If the robot is to be calibrated with reference calibration:</b><br>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.<br><br>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible. | Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.<br>Creating new values requires possibility to move the robot.<br>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a> . |
|   | <b>If the robot is to be calibrated with fine calibration:</b><br>Remove all external cable packages (DressPack) and tools from the robot.  |   |

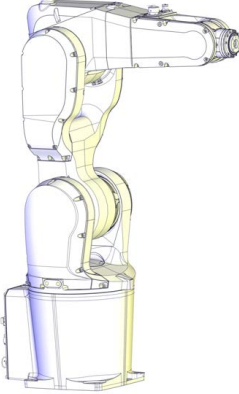

#### Removing the main cable package

Use these procedures to remove the main cable package from the robot.



#### Preparations before removing the main cable package

|   | Action   | Note |
|---|--|------|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure. |      |

Continues on next page

|   | Action   | Note  |
|---|--|---|
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 3 |  <p><b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |   |

Getting access to inside of the wrist unit



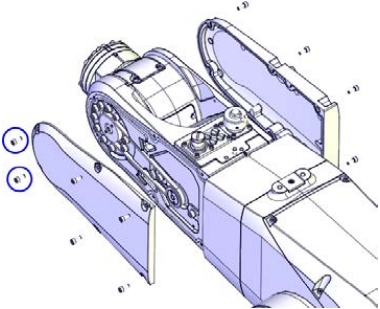
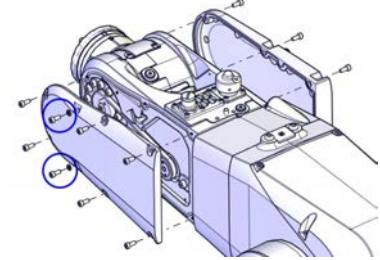
|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page




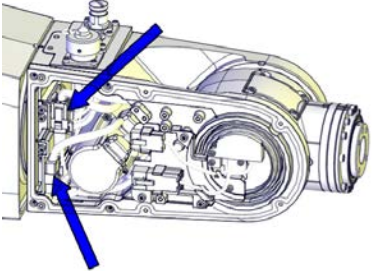
## 4 Repair

### 4.3.1 Replacing the main cable package

Continued



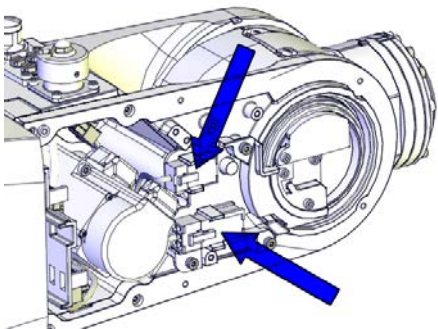
|   | Action  | Note   |
|---|---|--|
| 3 | <p>Remove the covers on each side of the wrist by removing their screws.</p> <p> <b>Note</b></p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.</p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> <p> <b>Note</b></p> <p><b>For robots with protection type Clean Room</b></p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |

### Disconnecting the axis-5 motor connectors



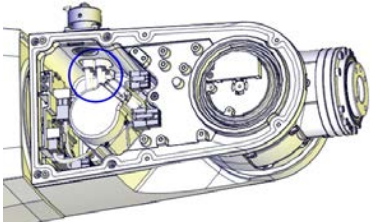
|   | Action   | Note  |
|---|--|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002360</p> |

Continues on next page


Disconnecting the axis-5 FPC connectors

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 | Snap loose and disconnect the axis-5 FPC connectors.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002390 |

Disconnecting the air hoses

|   | Action   | Note  |
|---|--|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |   |
| 2 | Disconnect the air hoses.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1400000738 |

Disconnecting the axis-4 FPC connectors


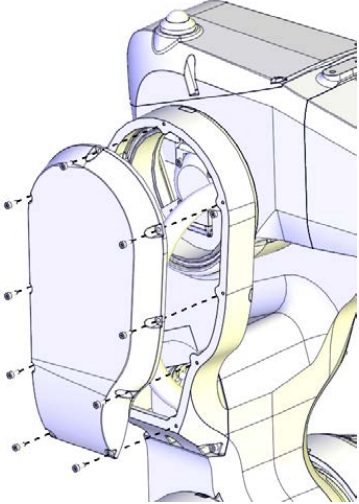
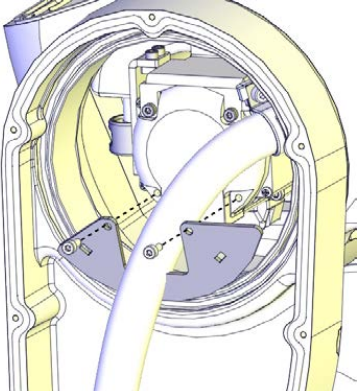
|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off. |      |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

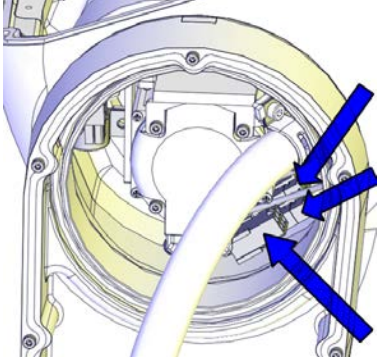
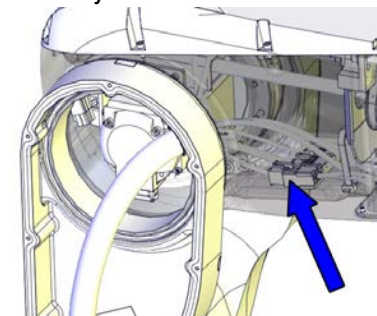
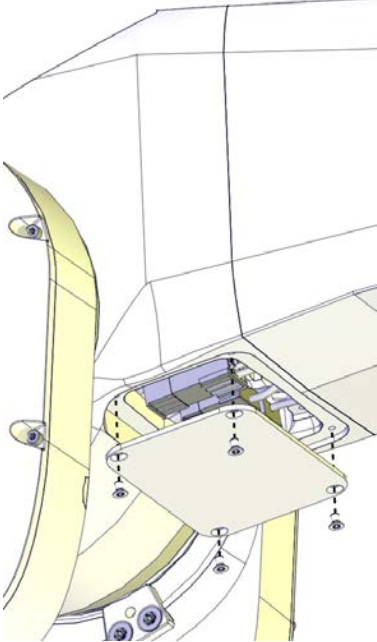
Continued

|   | Action  | Note  |
|---|---|---|
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Remove the cable housing cover.   | <br>xx1300002400  |
| 4 | Remove the plate.   | <br>xx1300002413 |

Continues on next page



**4.3.1 Replacing the main cable package**  
*Continued*

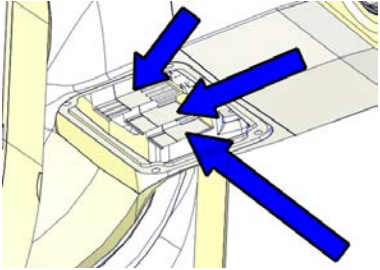
|   | <b>Action</b>   | <b>Note</b>  |
|---|---|--|
| 5 | Pull out the FPC connectors from the housing and disconnect them. | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 6 | Remove the small cover of the housing.                            |  <p>xx1300002398</p>  |

*Continues on next page*




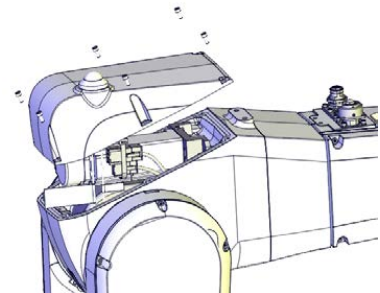
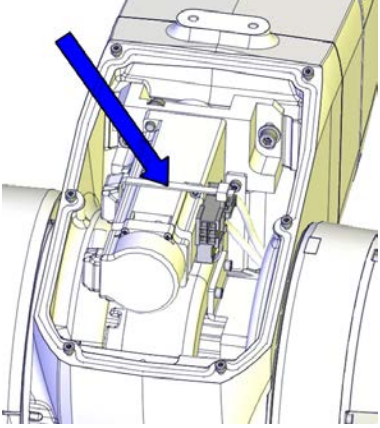
## 4 Repair

### 4.3.1 Replacing the main cable package

Continued


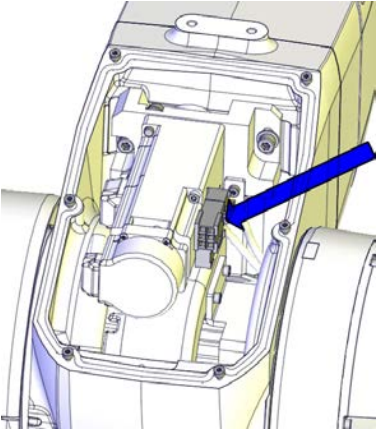
|   | Action                                   | Note  |
|---|--|---|
| 7 | Disconnect the remaining FPC connectors. | <br>xx1300002399 |

#### Disconnecting the axis-4 motor connectors



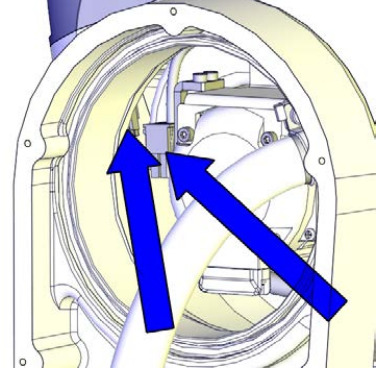
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .  |   |
| 3 | Remove the cover from the upper arm housing.<br> <b>CAUTION</b><br><b>For robots with safety lamp (option)</b><br>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely. | <br>xx1300000456 |
| 4 | Cut the strap that holds the connectors.  | <br>xx1300002494 |

Continues on next page


4.3.1 Replacing the main cable package  
Continued

|   | Action  | Note  |
|---|---|---|
| 5 | <p>Disconnect the motor connectors.</p> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> |  <p>xx1300002495</p> |

Disconnecting the axis-3 motor connectors

|   | Action  | Note  |
|---|---|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |   |
| 2 | <p>Pull out the axis-3 motor connectors from the housing and disconnect them.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002420</p> |

Removing the cable package in the housing


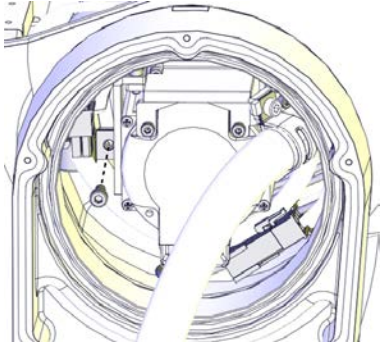
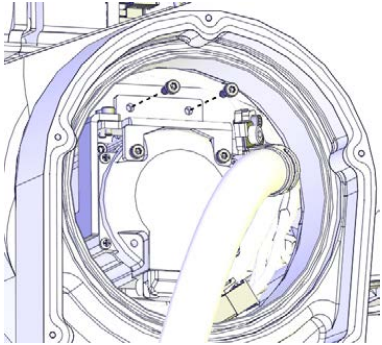
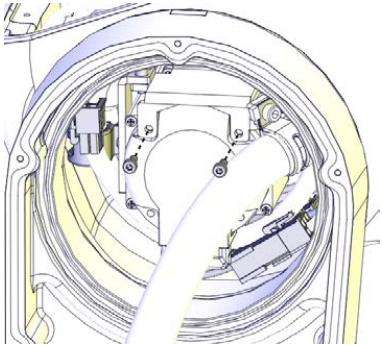

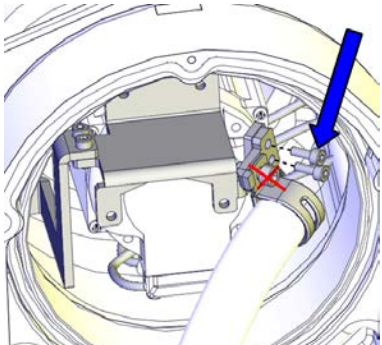
|   | Action   | Note |
|---|--|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |      |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

Continued






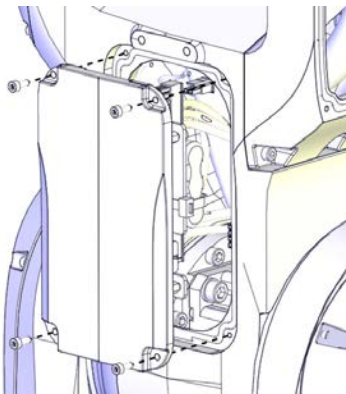
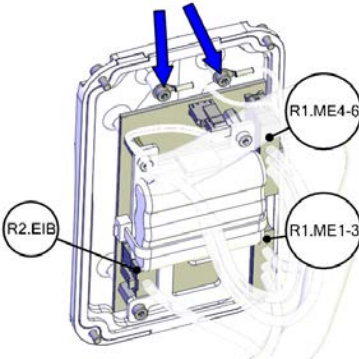
|   | Action   | Note  |
|---|--|---|
| 2 | <p>Remove the screw that fastens the air hose holder.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>  |  <p>xx1300002422</p>   |
| 3 | <p>Remove the screws that fasten the fix sheet to the inner plastic guide.</p>   |  <p>xx1300002421</p>  |
| 4 | <p>Remove the screws that fasten the fix sheet to the motor.</p>   |  <p>xx1300002423</p> |
| 5 | <p>Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet.</p> <p>Loosen the bracket from the sheet by removing the two screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p> |  <p>xx1300002424</p> |

Continues on next page

### 4.3.1 Replacing the main cable package *Continued*

|   | Action   | Note |
|---|--|------|
| 6 | Valid for IRB 1200-5/0.9<br>Cut the cable straps at the bottom of the housing. |      |

#### Disconnecting the cabling in the lower arm

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |  |
| 2 |  <b>ELECTROSTATIC DISCHARGE (ESD)</b><br>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 60</i>  |  |
| 3 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> .   |  |
| 4 | Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.<br><br> <b>CAUTION</b><br>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.<br><br> <b>CAUTION</b><br>Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step. | <br><small>xx1300002427</small> |
| 5 | <b>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</b><br>Disconnect the connectors on the EIB unit. <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> Remove the EIB/SMB cover completely from the lower arm.   | <br><small>xx1300002428</small> |
| 6 | <b>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</b><br>Disconnect the lugs on the EIB/SMB cover.   |  |

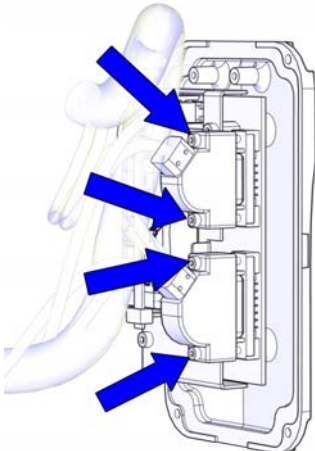
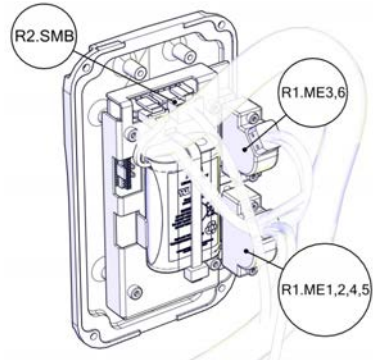
*Continues on next page*





## 4 Repair

### 4.3.1 Replacing the main cable package

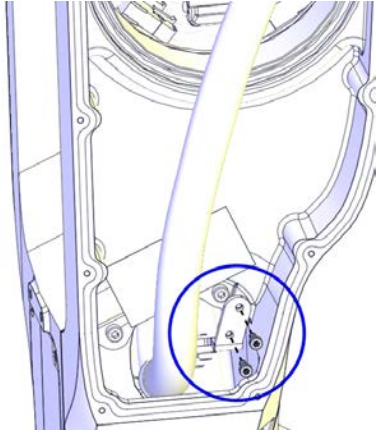

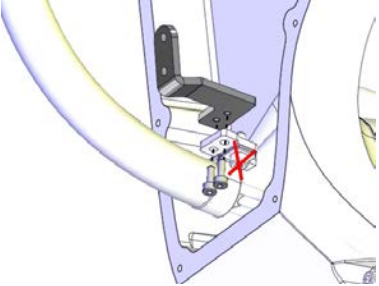
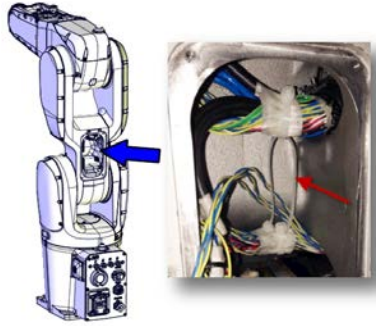
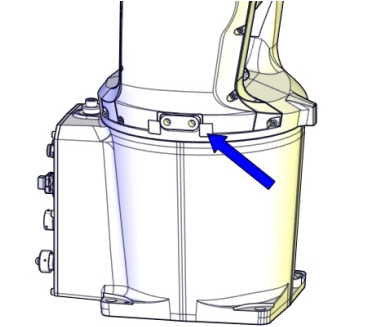
Continued

|   | Action   | Note   |
|---|--|--|
| 7 | <p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>  |  <p>xx1700000004</p>  |
| 8 | <p>Valid for IRB 1200 Type B</p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p>Remove the EIB/SMB cover completely from the lower arm.</p> |  <p>xx1700000005</p> |

### Removing the cable package in the lower arm

|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |
| 3 | <p>Pull the cable package out from the upper arm housing.</p>   |      |

Continues on next page

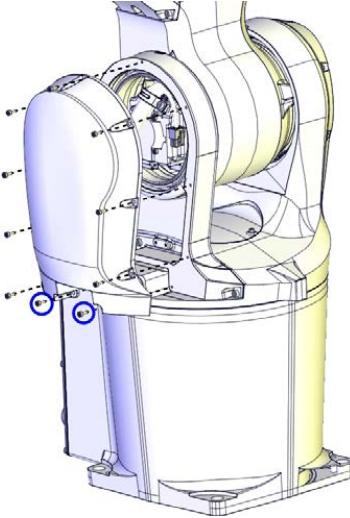
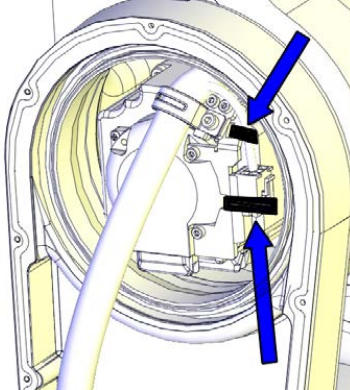
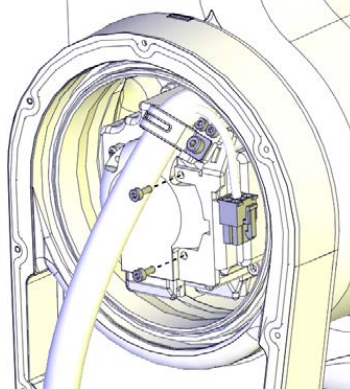
|   | Action  | Note  |
|---|---|---|
| 4 | Remove the fix sheet attachment screws in the lower arm.  |  <p>xx1300002426</p>   |
| 5 | Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws.<br><br> <b>CAUTION</b><br><br>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. |  <p>xx1300002430</p>  |
| 6 | Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.  |  <p>xx1400001130</p> |
| 7 | <b>For robots with protection type Clean Room</b><br>Remove the swing sealing plug.<br>Follow the procedure specified in <a href="#">Removing the swing sealing plug on page 143</a> .  |  <p>xx1600000205</p> |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package


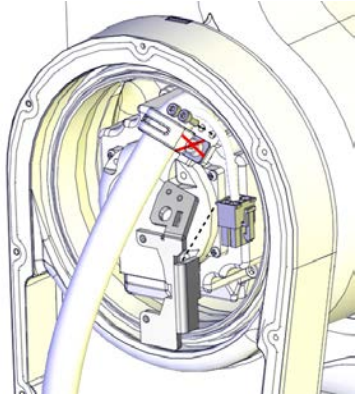
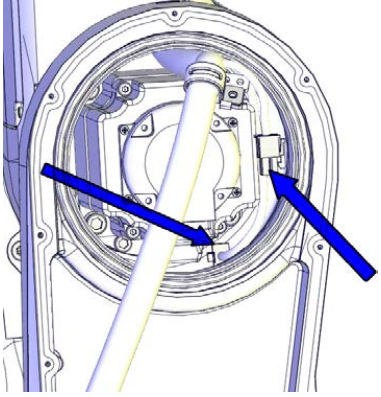
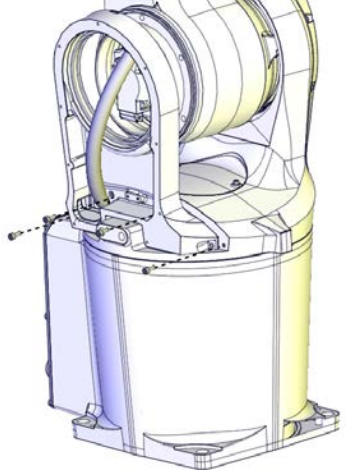
*Continued*

|    | Action   | Note  |
|----|--|---|
| 8  | Remove the swing cable housing cover by removing the screws. | <br>xx1300002431   |
| 9  | Cut the cable straps.  | <br>xx1400001528  |
| 10 | Remove the axis-2 motor bracket screws.                      | <br>xx1300002432 |

*Continues on next page*



4.3.1 Replacing the main cable package  
Continued

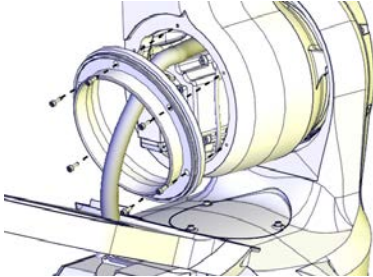

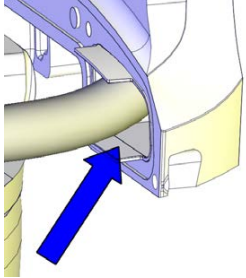
|    | Action  | Note  |
|----|---|---|
| 11 | <p>Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p> |  <p>xx1300002433</p>   |
| 12 | <p>Disconnect the motor connectors.</p> <ul style="list-style-type: none"> <li>• R2.ME2</li> <li>• R2.MP2</li> </ul>  |  <p>xx1300002434</p>  |
| 13 | <p>Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.</p>   |  <p>xx1300002435</p> |

Continues on next page




## 4 Repair

### 4.3.1 Replacing the main cable package


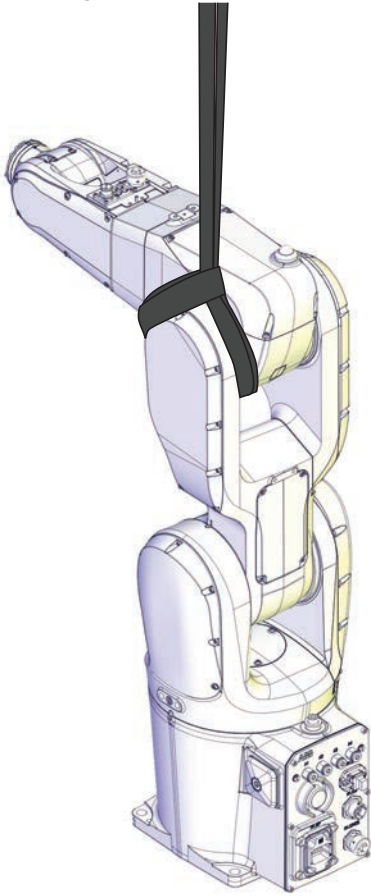


Continued

|    | Action  | Note  |
|----|---|---|
| 14 | Remove the axis-2 sealing ring by removing the screws.  | <br>xx140000020  |
| 15 | Pull out the cable package from the lower arm.<br> <b>Tip</b><br>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand. |   |
| 16 | Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .   | <br>xx140000023 |

#### Putting the robot on its side

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |
| 3 |  <b>CAUTION</b><br>The robot weighs .<br>IRB 1200-5/0.9: 54 kg<br>IRB 1200-7/0.7: 52 kg<br>All lifting accessories used must be sized accordingly!   |      |

Continues on next page

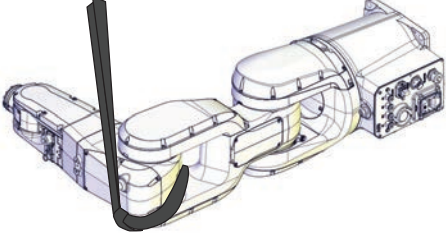
|   | Action  | Note   |
|---|---|--|
| 4 | <p>Run a roundsling between the housing and the lower arm.</p> <p> <b>CAUTION</b></p> <p>Put the sling on the lower arm side and <b>not</b> on the cable arm side, which would damage the robot.</p> | <p>Roundsling, 2 m</p>  <p>xx140000679</p> |
| 5 | <p> <b>WARNING</b></p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p>  |  |
| 6 | <p> <b>CAUTION</b></p> <p>The robot weighs .</p> <p>IRB 1200-5/0.9: 54 kg</p> <p>IRB 1200-7/0.7: 52 kg</p> <p>All lifting accessories used must be sized accordingly!</p>                          |  |

*Continues on next page*



## 4 Repair

### 4.3.1 Replacing the main cable package

*Continued*

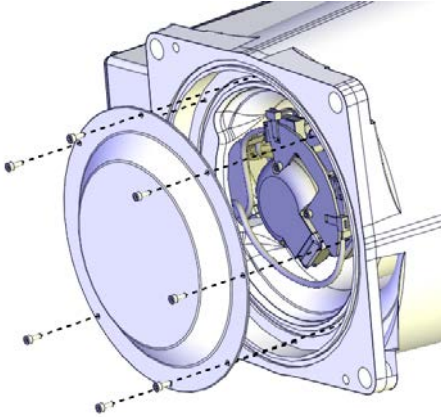
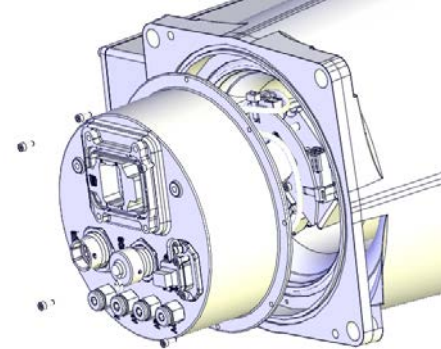
|   | Action   | Note  |
|---|--|---|
| 7 | Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side. | <br>xx140000680 |

### Disconnecting the axis-1 motor connectors

|   | Action   | Note |
|---|--|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

*Continues on next page*

**4.3.1 Replacing the main cable package**  
*Continued*

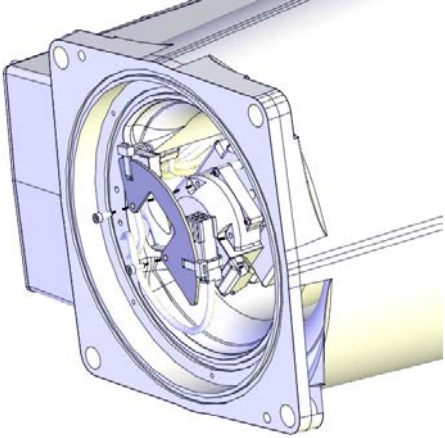
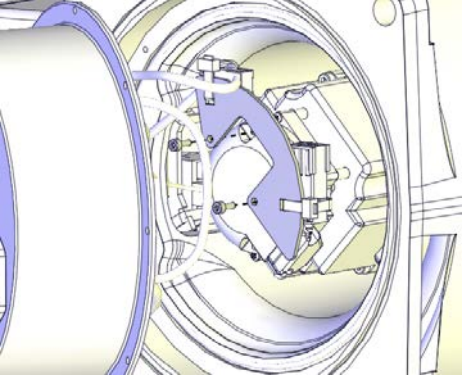
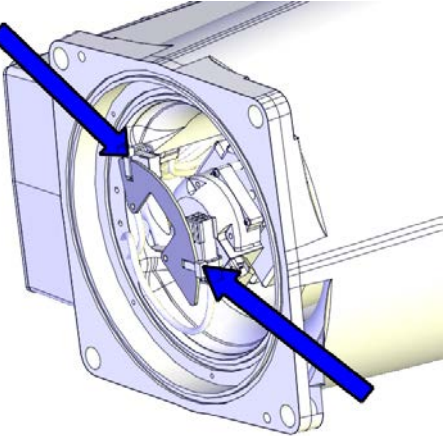
|   | <b>Action</b>            | <b>Note</b>  |
|---|--------------------------|--|
| 3 | Remove the bottom cover. | <p>Rear connector interface:</p>  <p>xx130000469</p> <p>Bottom connector interface:</p>  <p>xx140000403</p> |

*Continues on next page*

## 4 Repair




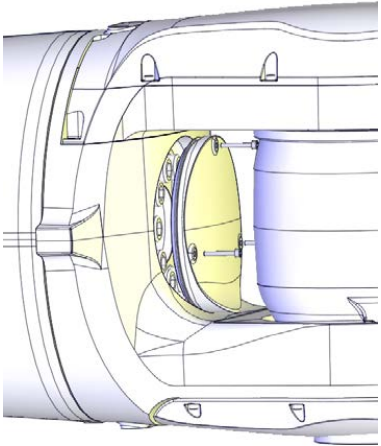
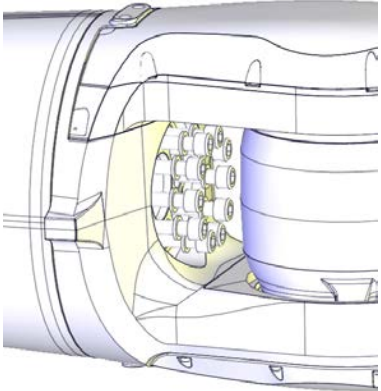
### 4.3.1 Replacing the main cable package

*Continued*

|   | Action   | Note   |
|---|--|--|
| 4 | Remove the axis-1 motor bracket.   | <p>Rear connector interface:</p>  <p>xx130000470</p> <p>Bottom connector interface:</p>  <p>xx140000404</p> |
| 5 | Loosen the connectors from the bracket by cutting the cable straps, and disconnect the connectors. |  <p>xx1300002496</p>  |

*Continues on next page*

Separating the arm system from base

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .           |   |
| 3 | Remove the swing top cover by removing the screws.<br><br> <b>Tip</b><br>Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads. |  <p>xx1300000467</p>  |
| 4 | Remove the screws and washers.  |  <p>xx1300000471</p> |


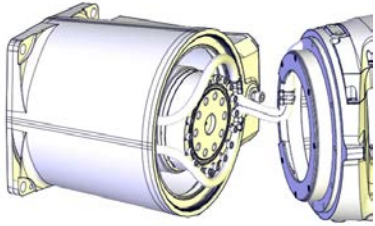
Continues on next page




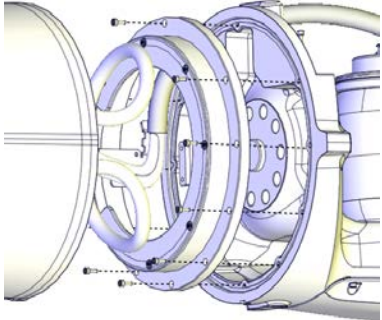
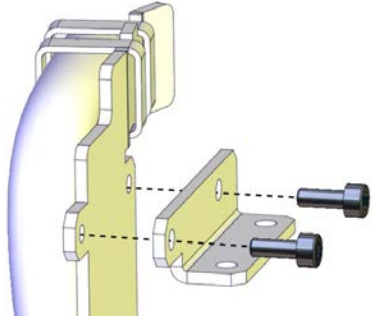
## 4 Repair

### 4.3.1 Replacing the main cable package

Continued

|   | Action   | Note  |
|---|--|---|
| 5 | <p>Pull out the base slightly and turn it aside.</p> <p> <b>Tip</b></p> <p>Remember the cable layout in the base. The cabling must be positioned and angled in the same way during refitting.</p> |  <p>xx1300000472</p> |

### Removing the cable package from the axis-1 sealing ring

|   | Action  | Note  |
|---|---|---|
| 1 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 2 | <p>Remove the axis-1 sealing ring from the swing and carefully run the cable package out from the swing.</p>  |  <p>xx1300002438</p>  |
| 3 | <p>Remove the swing (including arm system) completely from the base and lay it aside on a safe location.</p>  |   |
| 4 | <p>Remove the cable bracket from the cabling, if the cable package is to be replaced with a new spare part.</p>   |  <p>xx1300002446</p> |

Continues on next page



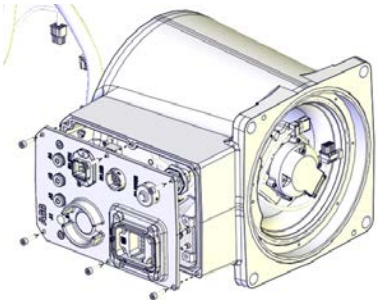
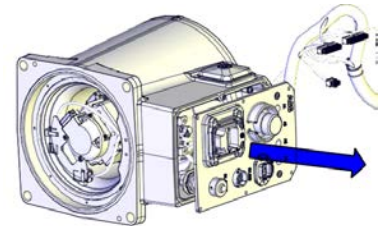


Removing the cable package from the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Open the base cover.  | <br>xx1300002448  |
| 4 | Disconnect the earth cable.   |   |
| 5 | Pull the cable package out from the base, through the rear.   | <br>xx1300002456 |

Continues on next page



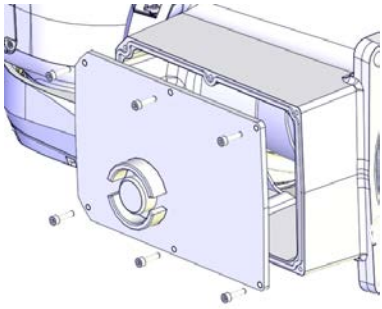
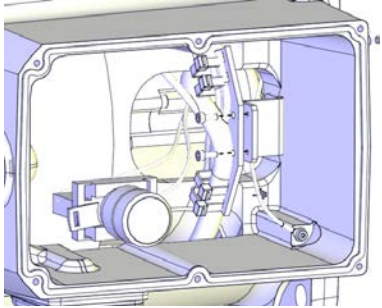
## 4 Repair

### 4.3.1 Replacing the main cable package

*Continued*

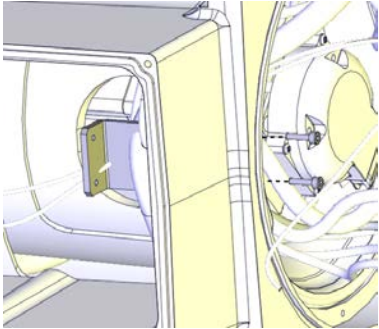
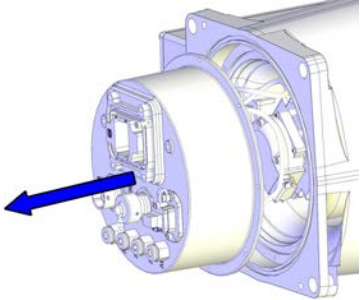
Cabling with bottom interface, and cabling routed from below (option 996-1)

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Open the base cover.  | <br>xx1400000405  |
| 4 | Remove the brake release button from the base cover.  |   |
| 5 | Disconnect the earth cable.   |   |
| 6 | Remove the cable bracket by removing the screws.  | <br>xx1400000406 |

*Continues on next page*


### 4.3.1 Replacing the main cable package Continued

|   | Action  | Note  |
|---|---|---|
| 7 | Remove the bracket inside the base by removing the screws.    | <br>xx1400000407 |
| 8 | Pull the cable package out from the base, through the bottom. | <br>xx1400000411 |

#### Refitting the main cable package

Use these procedures to refit the cable package.

#### Adjusting the air hose length for IRB 1200-7/0.7

|   | Action  | Note |
|---|---|------|
| 1 | <p><b>Valid for IRB 1200-7/0.7</b></p> <p>If the cable harness is a new spare part, cut off 100 mm length of each air hose at the upper end.</p> <p> <b>Note</b></p> <p>The same cable harness spare part is used for IRB 1200-5/0.9 .</p> |      |

#### Refitting the cable package to the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

#### Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

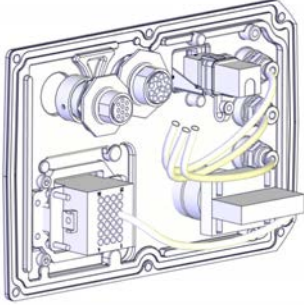
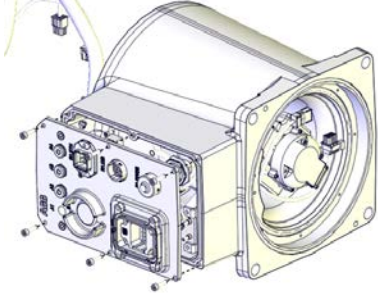

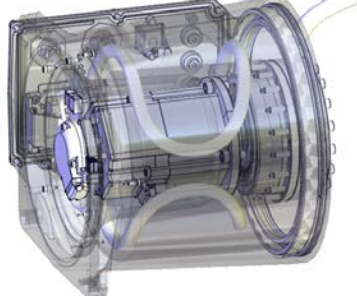

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

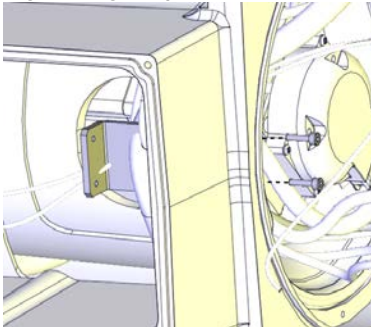
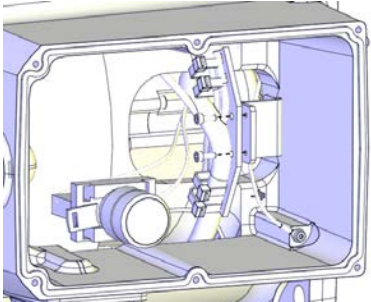
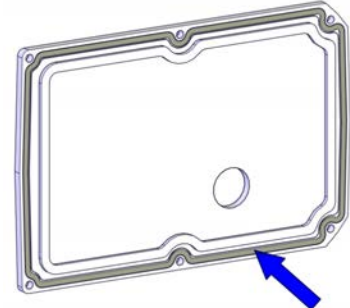
Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket on the base cover.</p> <p>Replace if damaged.</p>  | <p>Gasket for rear base cover: 3HAC058566-001</p>  <p>xx1400000741</p>   |
| 3 | <p>Insert the cable package in and up through the base, through the rear.</p>  |   |
| 4 | <p>Reconnect the earth cable.</p>  |   |
| 5 | <p>Refit the base cover with the attachment screws.</p>  | <p>Screws: 3HAB3409-212 (M4x16).<br/>Tightening torque: 4 Nm.</p>  <p>xx1300002448</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 6 | <p>Route the cable package inside the base as shown in the figure.</p> <p>Apply grease to the cable package, cover all moving area of the package.</p>   |  <p>xx1400000480</p>   |
| 7 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

Continues on next page

Cabling with bottom interface, cabling routed from below (option 996-1)

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

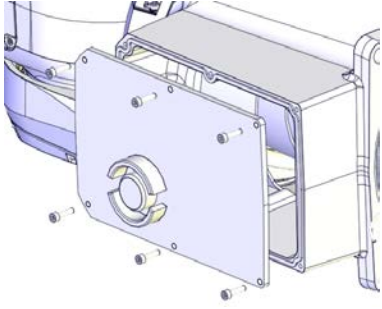

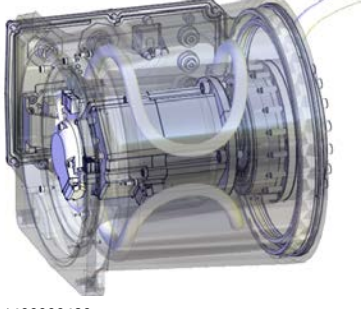

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | Insert the cable package in and up through the base, through the bottom.  |  |
| 3 | Refit the bracket inside the base with the screws.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000407</p>                                  |
| 4 | Refit the cable bracket with the screws.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000406</p>                                |
| 5 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           For robots with protection type Clean Room<br/>           For robots with food grade lubrication<br/>           Check the gasket of the base cover.<br/>           Replace if damaged.</p> | <p>Gasket for rear base cover:<br/>           3HAC058566-001</p>  <p>xx1400000413</p> |
| 6 | Reconnect the earth cable.  |  |
| 7 | Refit the brake release button to the base cover.   |  |

*Continues on next page*

## 4 Repair

### 4.3.1 Replacing the main cable package

Continued

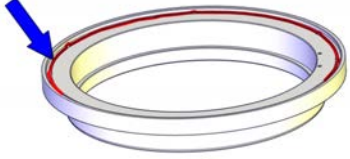



|    | Action   | Note  |
|----|--|---|
| 8  | Refit the base cover.  | <p>Screws: 3HAB3409-212 (M4x16).<br/>Tightening torque: 4 Nm.</p>  <p>xx1400000405</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 9  | Route the cable package inside the base as shown in the figure.<br>Apply grease to the cable package, cover all moving area of the package.      |  <p>xx1400000480</p>  |
| 10 | Seal and paint the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> | <p> <b>Note</b><br/>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |

#### Refitting the cable package to the axis-1 sealing ring

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |   |
| 2 | Check the axis-1 sealing ring.<br>Replace if damaged.  | Axis-1 sealing ring: 3HAC044676-001 / 3HAC068107-001 <sup>i</sup> |

Continues on next page

4.3.1 Replacing the main cable package  
Continued

|   | Action  | Note   |
|---|---|--|
| 3 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/>On axis-1 sealing ring version 3HAC056658-001:<br/>Add sealant to the axis-1 sealing ring.<br/>(See <i>Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</i>)</p>  | <p>Sealant: Sikaflex 521FC.</p>  <p>xx1600001125</p>  |
| 4 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/>On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001:<br/><b>For robots with protection type Foundry Plus (option 287-3)</b><br/>On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:<br/>Check the gasket on the axis-1 sealing ring.<br/>(See <i>Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</i>)<br/>Replace if damaged.</p> | <p>On axis-1 sealing ring version 3HAC044676-001:<br/>Axis-1 sealing ring gasket: 3HAC045685-001</p>  <p>xx1400000458</p> <p>On axis-1 sealing ring version 3HAC058568-001:<br/>Axis-1 sealing ring gasket: 3HAC058349-001</p>  <p>xx1600001149</p> <p>On axis-1 sealing ring version 3HAC068107-001:<br/>Axis-1 sealing ring gasket: 3HAC058349-001</p>  <p>xx1900001735</p> |



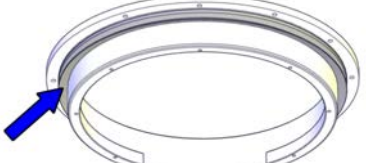

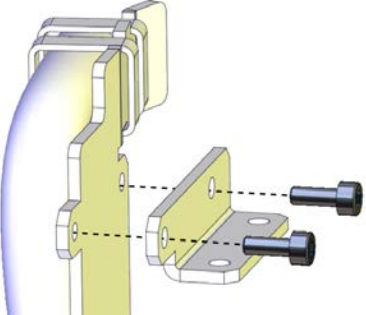
Continues on next page



## 4 Repair

### 4.3.1 Replacing the main cable package

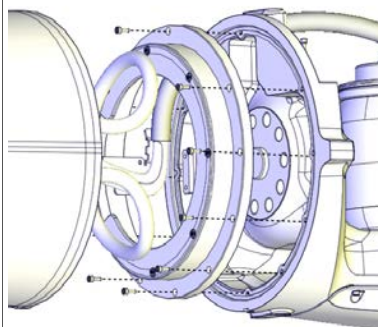

Continued

|   | Action   | Note  |
|---|--|---|
| 5 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/>           On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001:</p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b><br/>           On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:</p> <p>Check the V-ring on the axis-1 sealing ring.<br/>           (See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</a>)</p> <p>Replace if damaged.</p> | <p>V-ring: 3HAB3732-34<br/>           On axis-1 sealing ring version 3HAC056658-001:</p>  <p>xx1600001124</p> <p>On axis-1 sealing ring version 3HAC058568-001:</p>  <p>xx1600001150</p> <p>On axis-1 sealing ring version 3HAC068107-001:</p>  <p>xx1900001736</p> |
| 6 | <p>Check the cable protection on the axis-1 sealing ring.<br/>           Replace if damaged.</p> <p>If replacing the cable protection, use locking liquid Loctite 243 on the screws.</p>   | <p>Cable protection: 3HAC044691-001<br/>           Torx countersunk head screw M3x5: 3HAC14286-4<br/>           Tightening torque: 0.3 Nm</p>  <p>xx1400000456</p>   |
| 7 | <p>Refit the cable bracket to the cabling, if removed.<br/>           Use Loctite 243 on the screw threads.</p>  | <p>Tightening torque: 1 Nm.</p>  <p>xx1300002446</p>   |

Continues on next page



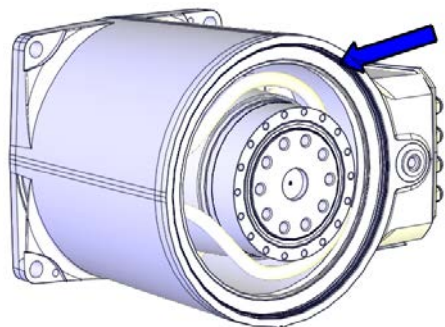


### 4.3.1 Replacing the main cable package Continued

|   | Action   | Note  |
|---|--|---|
| 8 | Refit the axis-1 sealing ring to the swing and carefully run the cabling into the swing.   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002438</p> |
| 9 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

<sup>i</sup> For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797](#).

#### Assembling the swing and base

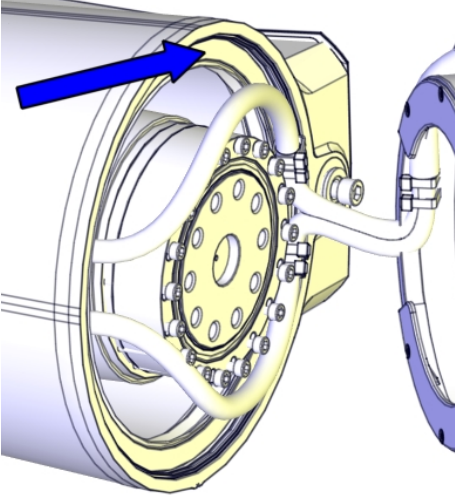
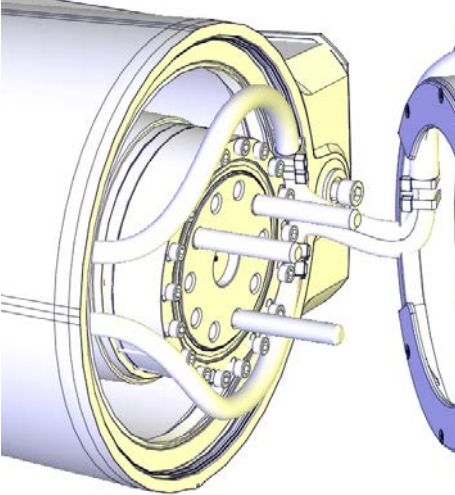

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | <p>Check the axis-1 radial sealing and the M2 variseal sealing in the base. Replace if damaged.</p> <p> <b>Note</b></p> <p>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a>.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>Radial sealing with dust lip: 3HAB3701-47<br/>M2 variseal sealing: 3HAC044641-002</p>  <p>xx1400000472</p> <p>Replacement is detailed in <a href="#">Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve) on page 441</a>.</p> |

Continues on next page

## 4 Repair

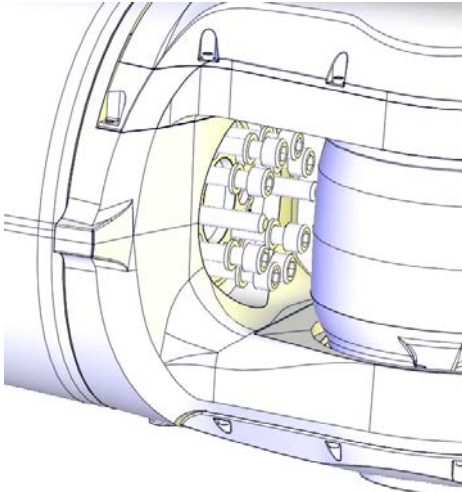

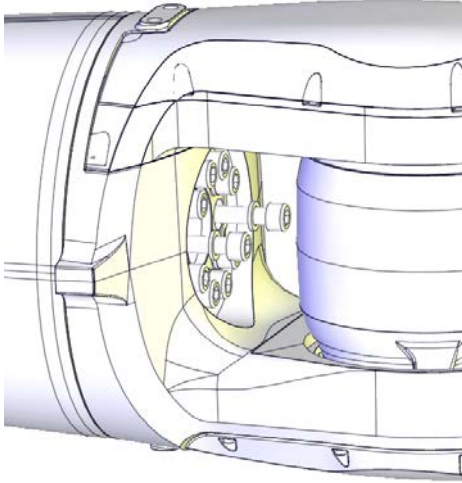
### 4.3.1 Replacing the main cable package

Continued

|   | Action  | Note   |
|---|---|--|
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Apply grease to the radial sealing surface.</p>  | <p>Grease: 3HAC058065-001.</p>  <p>xx160000170</p>   |
| 4 | <p>Fit the guide pins to the drive unit.</p>  | <p>Guide pin for axis-1 gear unit:<br/>3HAC049703-001</p>  <p>xx1300002566</p> <p>Always use three guide pins together!</p> |
| 5 | <p>Refit the swing to the base with guidance from the guide pins while running the cabling up through the swing.<br/>Position and angle the cabling inside the base as it was positioned during removal.</p> <p> <b>CAUTION</b></p> <p>Be careful not to squeeze any cabling during the refitting procedure.</p> |  |

Continues on next page

### 4.3.1 Replacing the main cable package Continued

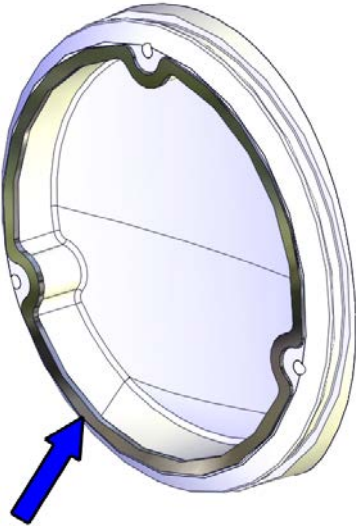
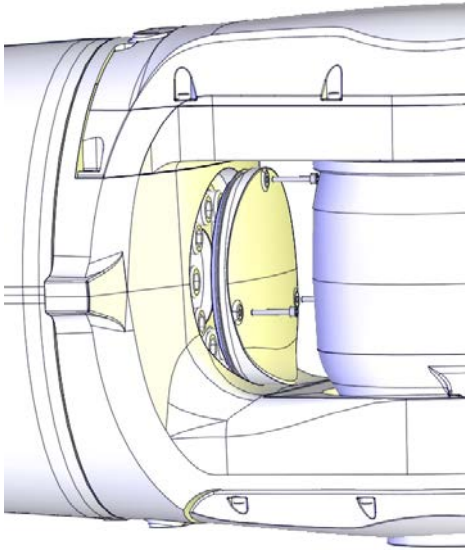

|   | Action   | Note   |
|---|--|--|
| 6 | Secure with attachment screws and washers, but do not tighten yet.           | <p>Screws: 3HAB3409-52 (M10x35).</p>  <p>xx1300002567</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 7 | Remove the guide pins and refit the remaining attachment screws and washers. |  <p>xx1300000523</p>   |
| 8 | Tighten all screws.  | Tightening torque: 40 Nm.  |

*Continues on next page*

## 4 Repair


### 4.3.1 Replacing the main cable package

Continued

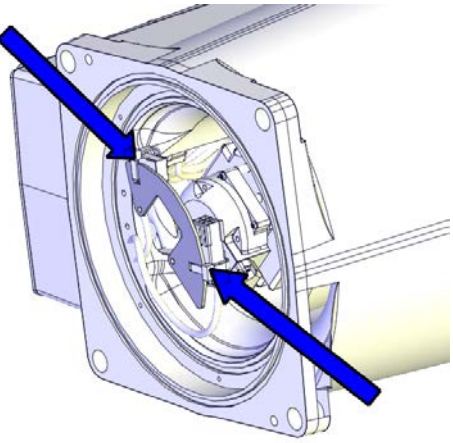
|    | Action  | Note   |
|----|---|--|
| 9  | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p> | <p>Gasket on top swing cover: 3HAC056696-001</p>  <p>xx1400000425</p>  |
| 10 | <p>Refit the swing top cover with the screws.</p> <p>Replace if damaged.</p>  | <p>Cover on top of swing: 3HAC059679-001<br/>: 3HAC056133-001 (used with protection type Clean Room)</p> <p>Cover on top of swing, Clean Room</p> <p>Cover on top of swing, food grade lubrication</p> <p>Screws: 3HAB3409-209 (M3x20).</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300000467</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

Continues on next page

4.3.1 Replacing the main cable package  
Continued

|    | Action   | Note |
|----|--|------|
| 11 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |      |

Connecting the axis-1 motor connectors

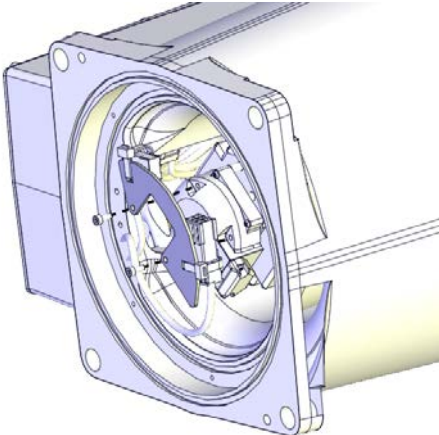
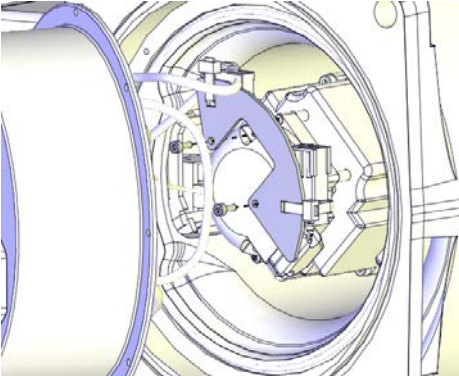
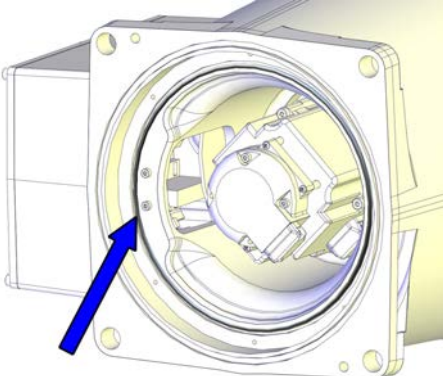
|   | Action  | Note  |
|---|---|---|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> |   |
| 2 | <p>Reconnect the connectors and secure the connectors to the bracket with cable straps.</p>   |  <p>xx1300002496</p> |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

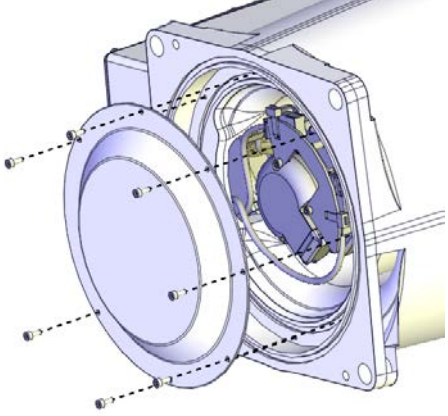
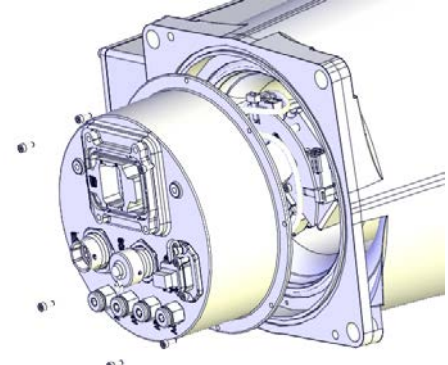


*Continued*

|   | Action   | Note  |
|---|--|---|
| 3 | Refit the axis-1 motor bracket.  | <p>Tightening torque: 1.5 Nm.<br/>Rear connector interface:</p>  <p>xx1300000470</p> <p>Bottom connector interface:</p>  <p>xx1400000404</p> |
| 4 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the O-ring.<br/>Replace if damaged.</p> | <p>O-ring: 3HAB3772-86</p>  <p>xx1400000412</p>   |

*Continues on next page*



4.3.1 Replacing the main cable package  
Continued

|   | Action  | Note  |
|---|---|---|
| 5 | Refit the bottom cover.   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.<br/>Rear connector interface:</p>  <p>xx130000469</p> <p>Bottom connector interface:</p>  <p>xx140000403</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 6 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b><br/>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |


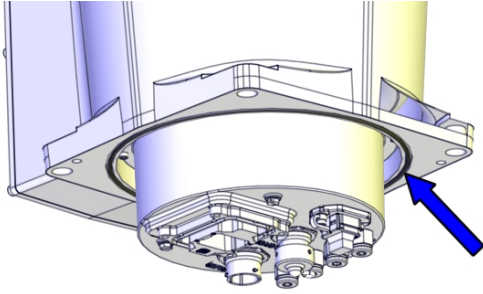

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

Continued

#### Securing the robot to the foundation

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>The robot weighs .<br>IRB 1200-5/0.9: 54 kg<br>IRB 1200-7/0.7: 52 kg<br>All lifting accessories used must be sized accordingly!   |   |
| 2 | <b>For robots with:</b><br><b>protection class IP67 (option 287-10),</b><br><b>protection type Foundry Plus (option 287-3),</b><br><b>and manipulator cables routed from below (option 996-1)</b><br>Check the gasket at the bottom of the base.<br>Replace if damaged.   | O-ring: 3HAB3772-141<br>For robots with protection class IP67 (option 287-10)<br>Used with protection type Foundry Plus<br>For robots with protection type Clean Room<br>For robots with food grade lubrication<br>Used with manipulator cables routed from below (option 996-1) <br><small>xx1500000241</small> |
| 3 | Raise the robot to standing and secure to the foundation with the attachment screws and washers.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | Attachment screws: M12x35 (robot installation directly on foundation), quality: 8.8.<br>Washers: 13 x 20 x 2, steel hardness class 300HV.<br>Pin: 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1.<br>Tightening Torque: 55 Nm ± 5 Nm.   |


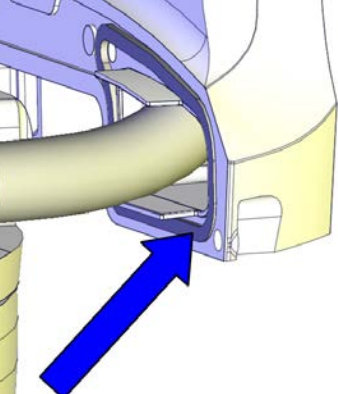
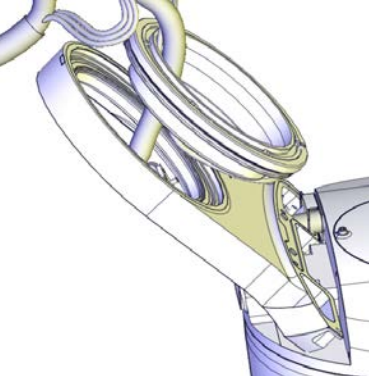
#### Refitting the cable package in the lower arm

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page



4.3.1 Replacing the main cable package  
Continued

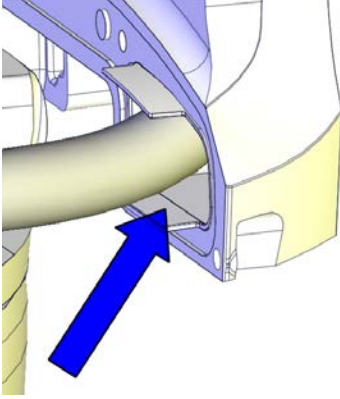

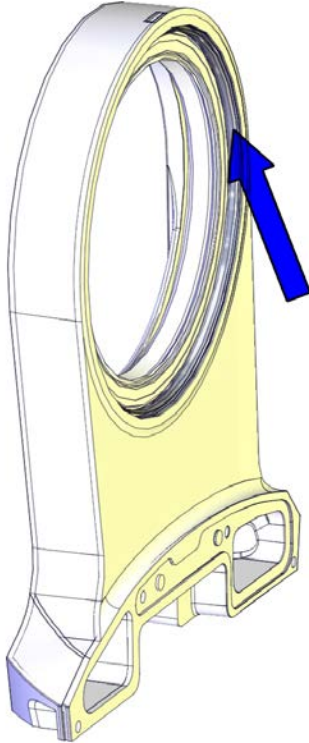
|   | Action  | Note  |
|---|---|---|
| 2 | <p>Check the axis-2 sealing ring.<br/> <b>For robots with protection class IP67 (option 287-10)</b><br/> <b>For robots with protection type Foundry Plus (option 287-3)</b><br/> <b>For robots with protection type Clean Room</b><br/> <b>For robots with food grade lubrication</b><br/>                     Check the gasket.<br/>                     Replace if damaged.</p> | <p>Axis-2 sealing ring: 3HAC044677-001<br/>                     Gasket of axis-2 sealing ring: 3HAC045688-001</p>  <p>xx1400000476</p> |
| 3 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/> <b>For robots with protection type Foundry Plus (option 287-3)</b><br/> <b>For robots with protection type Clean Room</b><br/> <b>For robots with food grade lubrication</b><br/>                     Check the gasket of the cable housing plastic plate.<br/>                     Replace if damaged.</p>  | <p>Gasket of plastic plate: 3HAC044894-001</p>  <p>xx1400000457</p>  |
| 4 | <p>Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.</p>   |  <p>xx1400000025</p>   |

Continues on next page


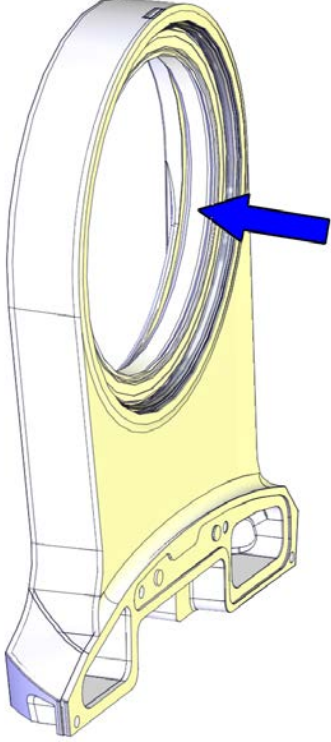

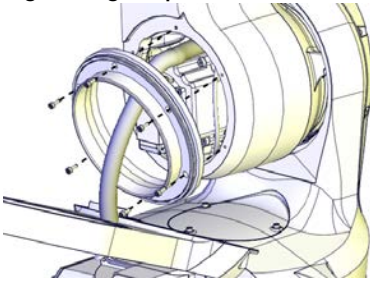
## 4 Repair

### 4.3.1 Replacing the main cable package

Continued

|   | Action  | Note  |
|---|---|---|
| 5 | Fasten the plastic plate to the cable housing, if removed.<br>Replace if damaged.   | The plastic plate is included in:<br>Cable harness material set:<br>3HAC049663-001.<br><br>xx140000023 |
| 6 | For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)<br>Check the sealing.<br>Replace if damaged.<br><br> <b>CAUTION</b><br><br>Do not fit M2 variseal sealing on Clean Room robots. | M2 variseal sealing: 3HAC044641-004<br><br>xx1400000454   |

Continues on next page

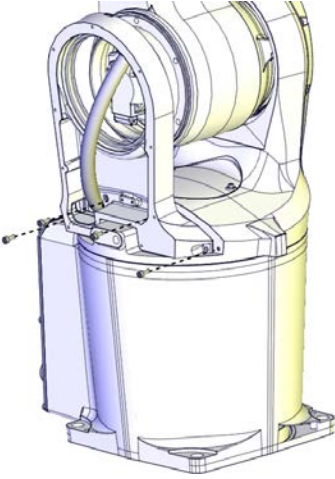

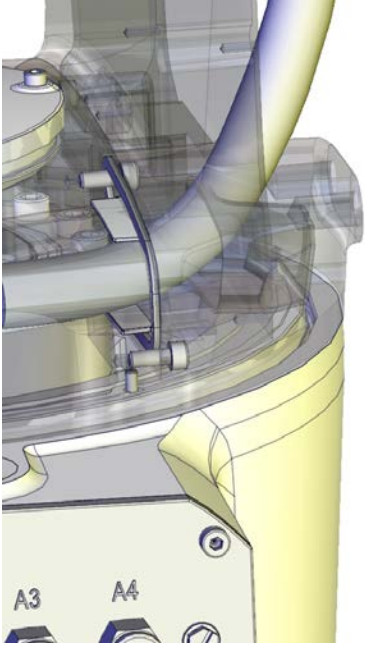
|   | Action  | Note  |
|---|---|---|
| 7 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the radial sealing.<br/>                     Replace if damaged.</p> <p> <b>Note</b></p> <p>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> | <p>Radial sealing with dust lip: 3HAB3701-41</p>  <p>xx1400000753</p> <p>Replacement is detailed in <a href="#">Replacing the swing spare parts (swing, axis-2 radial sealing)</a> on page 516.</p> |
| 8 | <p>Guide the cable package into the lower arm.</p> <p> <b>Tip</b></p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>   |   |
| 9 | <p>Refit the axis-2 sealing ring with the screws.</p>   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000020</p>   |

Continues on next page

## 4 Repair

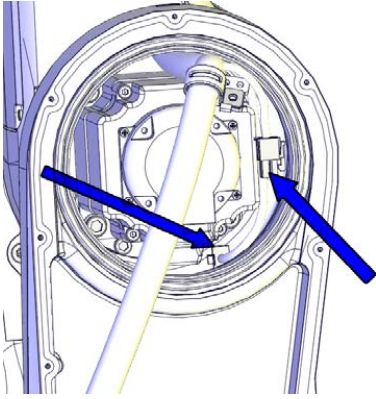

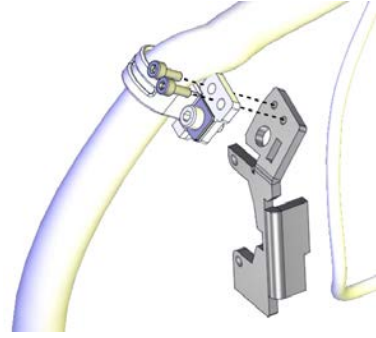
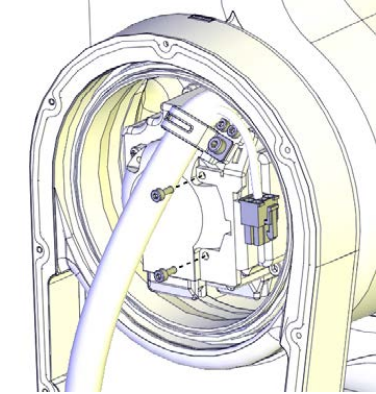
### 4.3.1 Replacing the main cable package

*Continued*

|    | Action   | Note   |
|----|--|--|
| 10 | Refit the cable housing with the screws.                                 | <p>Screws: 3HAB3409-236 (M4x10).<br/>Tightening torque: 3 Nm.</p>  <p>xx1300002435</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 11 | Apply grease to the cable package, cover all moving area of the package. |  <p>xx1400000481</p>  |

*Continues on next page*

4.3.1 Replacing the main cable package  
Continued

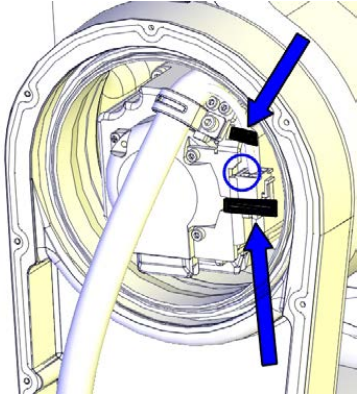
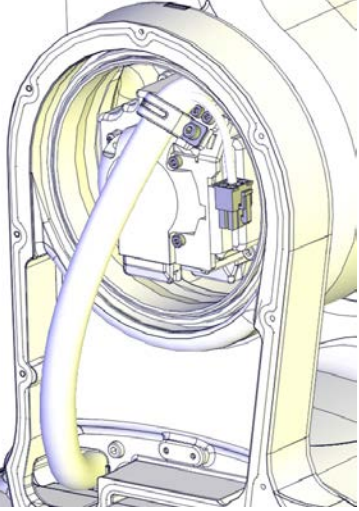
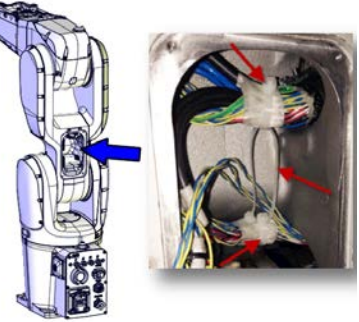
|    | Action  | Note  |
|----|---|---|
| 12 | Reconnect the motor connectors. <ul style="list-style-type: none"> <li>• R2.ME2</li> <li>• R2.MP2</li> </ul>  |  <p>xx1300002434</p>                             |
| 13 | Refit the axis-2 motor bracket to the cable package with the two screws. <p> <b>CAUTION</b></p> Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. | Tightening torque: 1.5 Nm.  <p>xx1400000021</p> |
| 14 | Refit the axis-2 motor bracket to the motor.  |  <p>xx1300002432</p>                           |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

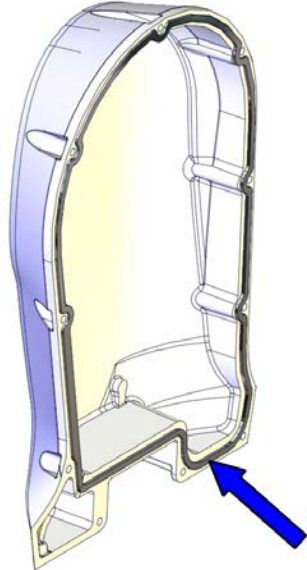
Continued

|    | Action  | Note  |
|----|---|---|
| 15 | Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.   | <br>xx1400001529   |
| 16 | Apply grease to the cable package, cover all moving area of the package.  | <br>xx1400000482  |
| 17 | <p>In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity:</p> <ol style="list-style-type: none"><li>1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location.</li><li>2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place.</li></ol> <p>See the figure.</p> | <br>xx1400001131 |

Continues on next page



**4.3.1 Replacing the main cable package**  
*Continued*


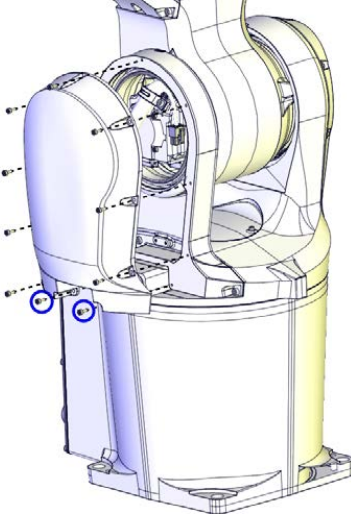

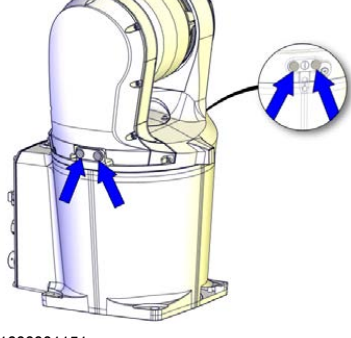
|    | <b>Action</b>  | <b>Note</b>   |
|----|--|---|
| 18 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the gasket of the cable housing cover.<br/>                     Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>                     3HAC056726-001</p>  <p>xx1400000424</p> |
| 19 | <p>Check the PTFE film.<br/>                     Replace if damaged.</p>   | <p>PTFE film on cable housing cover:<br/>                     3HAC044660-001</p>  |
| 20 | <p>Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.</p>  |   |

*Continues on next page*

## 4 Repair

### 4.3.1 Replacing the main cable package

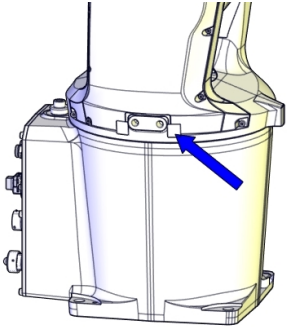

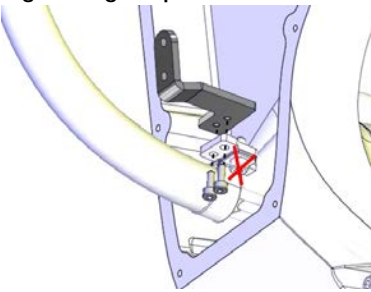

Continued

|    | Action   | Note   |
|----|--|--|
| 21 | <p>Refit the cable housing cover.<br/>Replace if damaged.</p> <p> <b>Note</b><br/>Remember to refit the two lower screws shown in the figure.</p> | <p>Cable housing cover of the swing: 3HAC059678-001<br/>: 3HAC056214-001 (used with protection type Clean Room)<br/>Cable housing cover of the swing, Clean Room<br/>Cable housing cover of the swing, food grade lubrication<br/>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 22 | <p>For robots with protection type Foundry Plus (option 287-3)<br/>Check the protection plugs for lifting holes.<br/>Replace if damaged.</p>   | <p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>  |


Continues on next page



### 4.3.1 Replacing the main cable package Continued

|    | Action   | Note   |
|----|--|--|
| 23 | <p>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Refit the swing sealing plug.<br/>Follow the procedure specified in <a href="#">Refitting the swing sealing plug on page 144</a>.</p>   | <p>Swing sealing plug:3HAC053687-001</p>  <p>xx1600000205</p> |
| 24 | <p>Refit the lower arm bracket to the cable package.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>                                   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002430</p>       |
| 25 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

#### Connecting the cabling in the lower arm

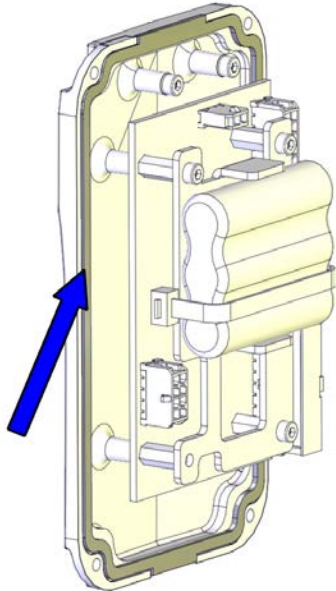

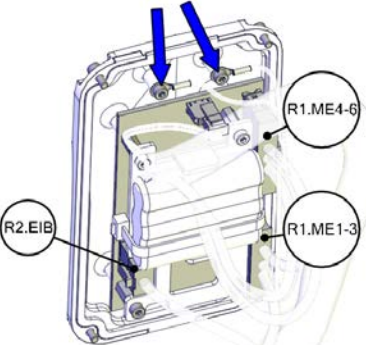

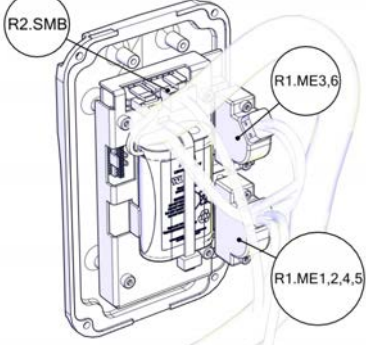
|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a></p> |      |
| 2 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>   |      |

Continues on next page

## 4 Repair

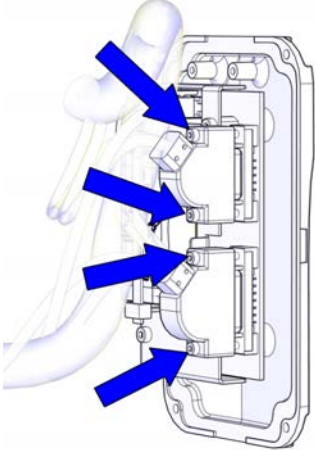
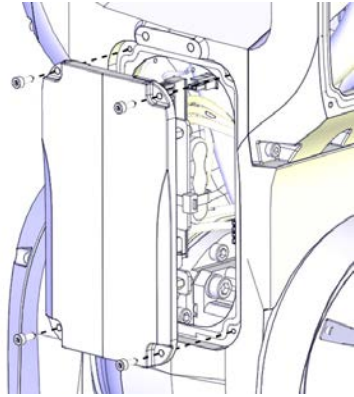

### 4.3.1 Replacing the main cable package

Continued

|   | Action  | Note  |
|---|---|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           For robots with protection type Clean Room<br/>           For robots with food grade lubrication<br/>           Check the EIB/SMB cover gasket.<br/>           Replace if damaged.</p>   | <p>Gasket on EIB/SMB cover:<br/>           3HAC056728-001</p>  <p>xx1400000475</p> |
| 4 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p> |  <p>xx1300002428</p>   |
| 5 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>   |   |
| 6 | <p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>                              |  <p>xx1700000005</p>   |

Continues on next page

4.3.1 Replacing the main cable package  
Continued

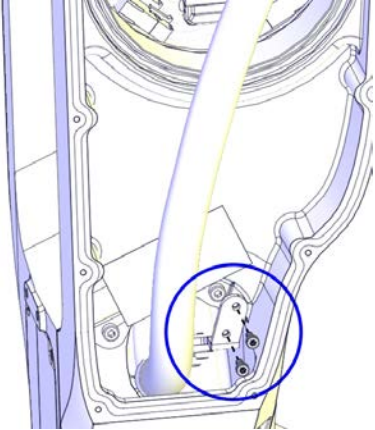

|   | Action  | Note   |
|---|---|--|
| 7 | <p>Valid for IRB 1200 Type B<br/>Tighten the connector screws.</p>          | <p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>   |
| 8 | <p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p> | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |

Continues on next page

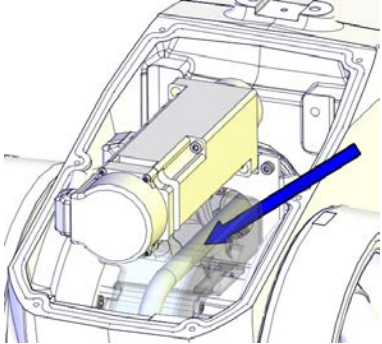
## 4 Repair

### 4.3.1 Replacing the main cable package

Continued



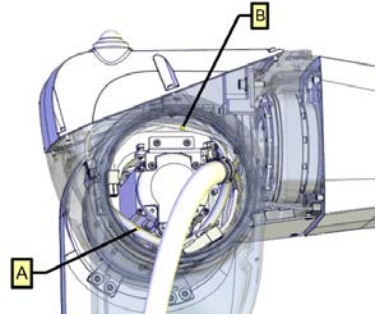

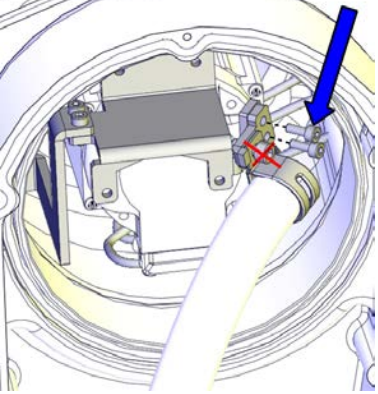
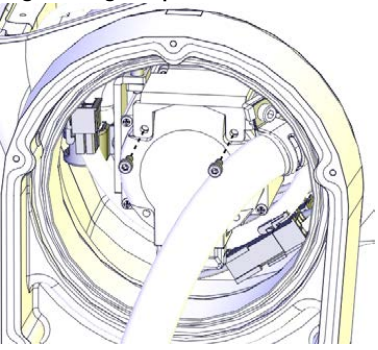
|    | Action   | Note  |
|----|--|---|
| 9  | Refit the fix sheet attachment screws in the lower arm.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p> |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Refitting the cable package in the housing

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package. | <p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p> |

Continues on next page

4.3.1 Replacing the main cable package  
Continued

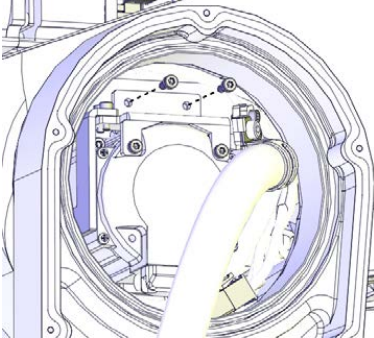

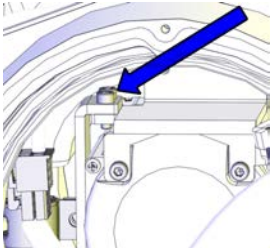
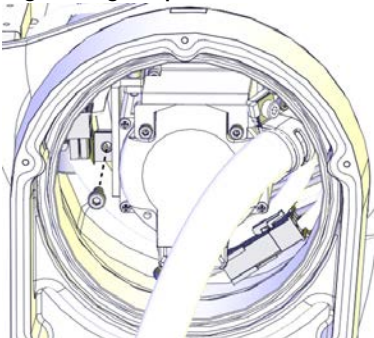
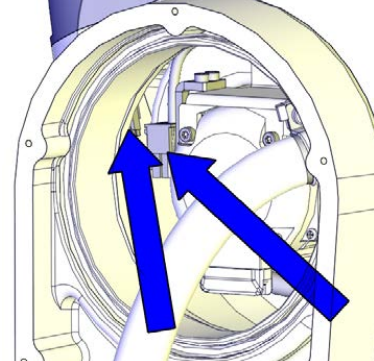
|   | Action  | Note  |
|---|---|---|
| 3 | <p>Guide the cable package into the upper arm, through the housing.</p> <p> <b>Note</b></p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> <b>Note</b></p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p> |  <p>xx1400001472</p>                                     |
| 4 | <p>Refit the bracket to the sheet with two screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>  |
| 5 | <p>Refit the fix sheet to the motor.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p> |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

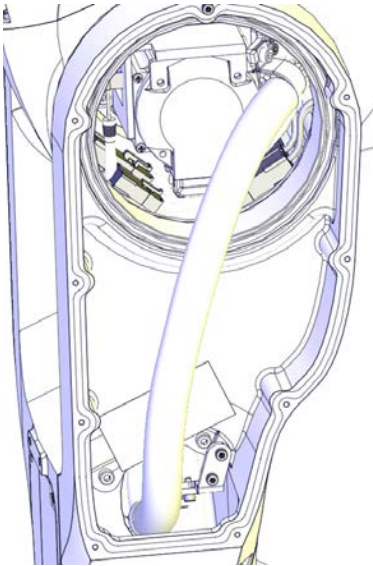

Continued

|   | Action   | Note   |
|---|--|--|
| 6 | Refit the fix sheet to the inner plastic guide.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>  |
| 7 | <p>Fit the air hose holder to the bracket.<br/>Replace the holder, if damaged.</p> <p> <b>Tip</b></p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p> | <p>Air hose holders are included in Cable harness material set (3HAC049663-001).<br/>Tightening torque: 4 Nm.</p>  <p>xx1300002422</p> |
| 8 | Reconnect the axis-3 motor connectors.   |  <p>xx1300002420</p>  |


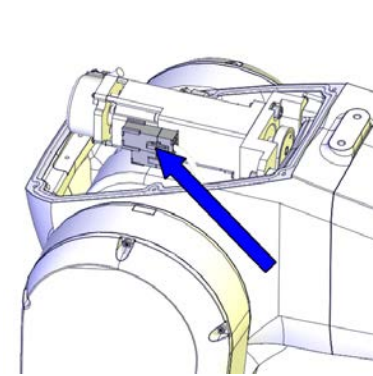
Continues on next page



### 4.3.1 Replacing the main cable package Continued

|    | Action  | Note   |
|----|---|--|
| 9  | Apply grease to the cable package, cover all moving area of the package.  |  <p>xx140000754</p> |
| 10 | <b>Valid for IRB 1200-5/0.9</b><br>Secure the cable package at the bottom of the housing with cable straps.   |  |
| 11 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .<br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

#### Connecting the axis-4 motor connectors

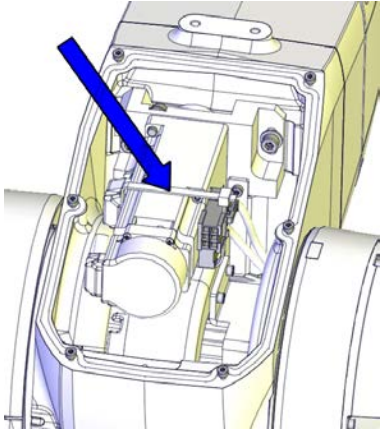
|   | Action   | Note  |
|---|--|---|
| 1 | Reconnect the motor connectors.<br><br> <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  <p>xx1300002371</p> |

Continues on next page


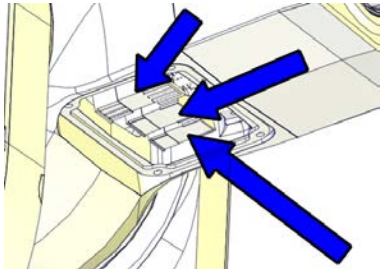
## 4 Repair

### 4.3.1 Replacing the main cable package

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | Secure the connectors to the motor with a cable strap. | <br>xx1300002494 |


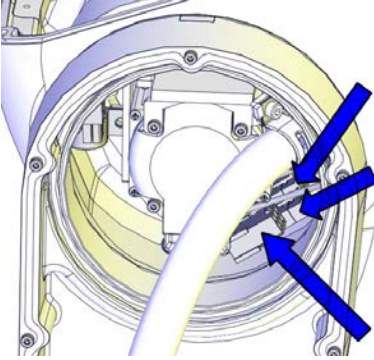
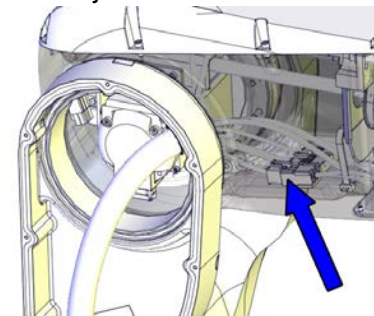
### Connecting the axis-4 FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Reconnect the FPC connectors.<br> <b>Tip</b><br>See the number markings on the connectors for help to find the corresponding connector. | <br>xx1300002399 |

Continues on next page



4.3.1 Replacing the main cable package  
Continued

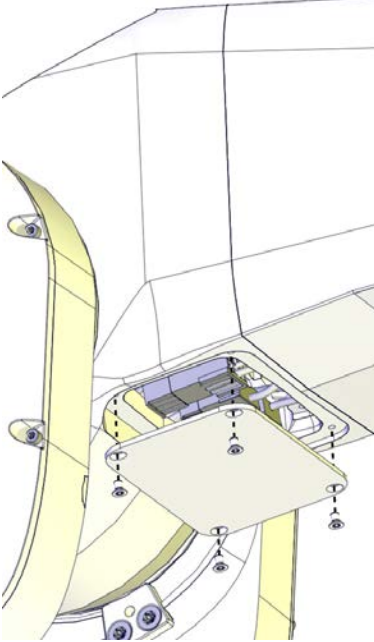
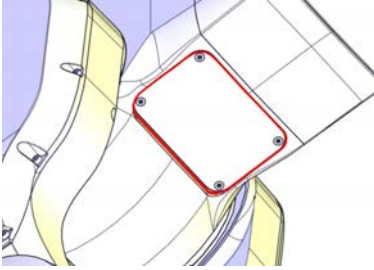
|   | Action  | Note   |
|---|---|--|
| 3 | <p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>  |  |

Continues on next page

## 4 Repair

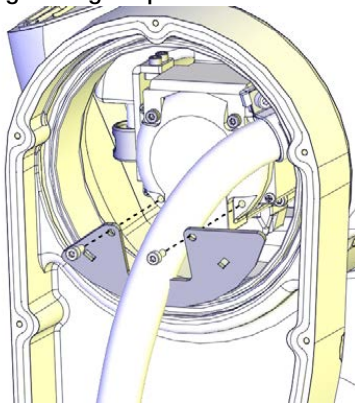
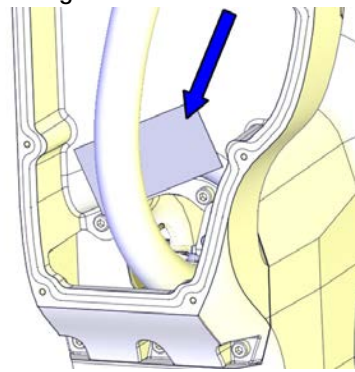
### 4.3.1 Replacing the main cable package

Continued

|   | Action  | Note   |
|---|---|--|
| 5 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>  |   |
| 6 | <p>Refit the small cover to the housing.</p> <p>Replace if damaged.</p>   | <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001</p> <p>: 3HAC056142-001 (used with protection type Clean Room)</p> <p>Housing small cover, Clean Room</p> <p>Housing small cover, food grade lubrication</p> <p>Screws: 3HAC14286-4 (M3X5).</p> <p>Tightening torque: 1 Nm.</p> |
| 7 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the small cover on the housing.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx1600000214</p>  |

Continues on next page

**4.3.1 Replacing the main cable package**  
*Continued*

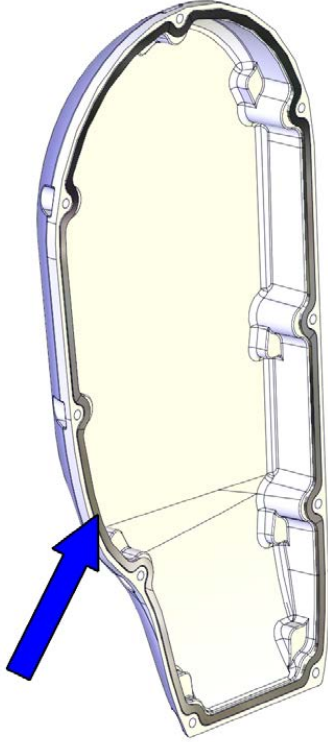
|   | <b>Action</b>  | <b>Note</b>  |
|---|--|--|
| 8 | Refit the plate.   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                            |
| 9 | Check the PTFE film on the cable housing.<br>Replace if damaged. | <p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p> |

*Continues on next page*

## 4 Repair

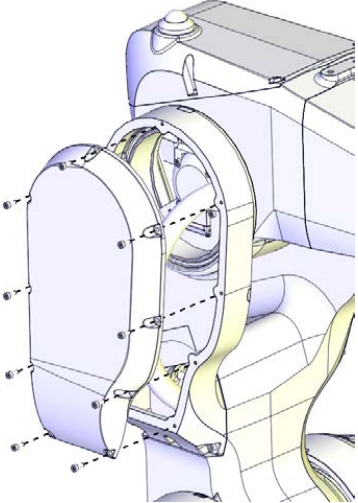


### 4.3.1 Replacing the main cable package

*Continued*


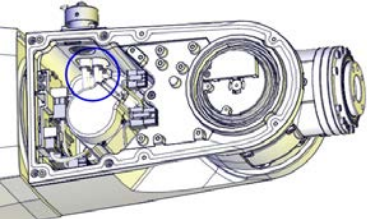
|    | Action   | Note  |
|----|--|---|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           For robots with protection type Clean Room<br/>           For robots with food grade lubrication<br/>           Check the gasket of the cable housing cover.<br/>           Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>           3HAC056724-001<br/>           PTFE film on cable housing cover:<br/>           3HAC044660-001</p>  <p>xx1400000048</p> |
| 11 | <p>Check the PTFE film on the cable housing cover.<br/>           Replace if damaged.</p>  |   |
| 12 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>   |   |

*Continues on next page*

4.3.1 Replacing the main cable package  
Continued

|    | Action  | Note   |
|----|---|--|
| 13 | <p>Refit the cable housing cover.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 14 | <p>Seal and paint the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Connecting the air hoses and CP/CS cabling (if equipped)

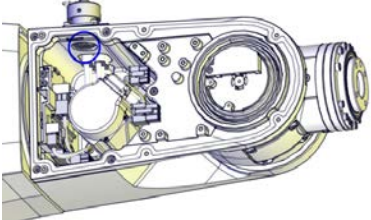
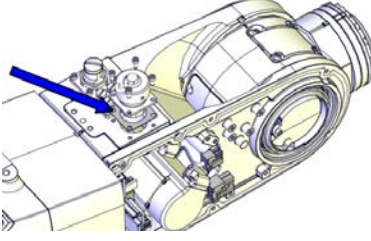
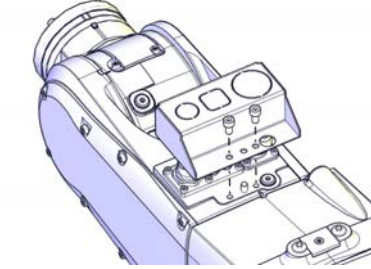
|   | Action   | Note   |
|---|--|--|
| 1 | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>.</p> | <p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p> |

Continues on next page


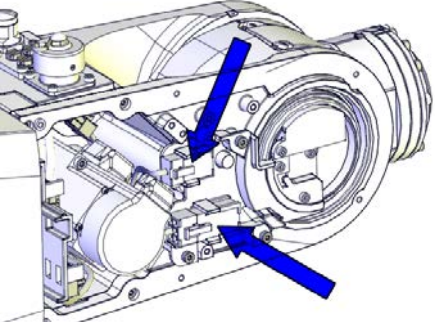
## 4 Repair

### 4.3.1 Replacing the main cable package

Continued

|   | Action  | Note   |
|---|---|--|
| 2 | <p>If equipped, reconnect the CP/CS connector.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <ol style="list-style-type: none"> <li>1 Check the gasket.</li> <li>2 Replace if damaged.</li> </ol> <p><b>For robots with protection type Clean Room:</b></p> <ol style="list-style-type: none"> <li>1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</li> <li>2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.</li> </ol> |  <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p> |
| 3 | <p><b>For robots with protection type Foundry Plus</b></p> <p>If required, fit the protection bracket for CP/CS connectors.</p>   | <p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>   |


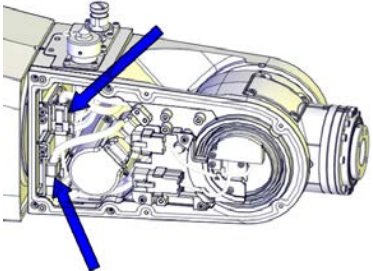
### Connecting the axis-5 motor FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | <p>Connect the axis-5 FPC connectors and snap them to their holders.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002390</p> |

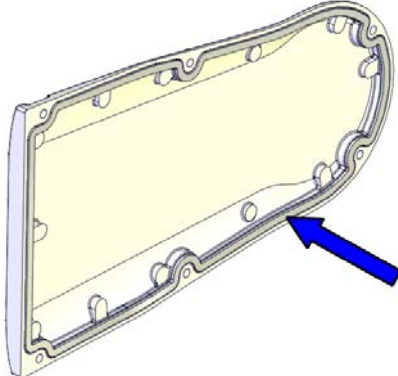
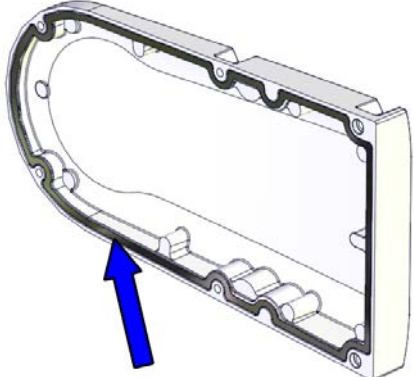
Continues on next page



### Connecting the axis-5 motor connectors

|   | Action  | Note  |
|---|---|---|
| 1 | <p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002360</p> |

### Refitting the wrist covers

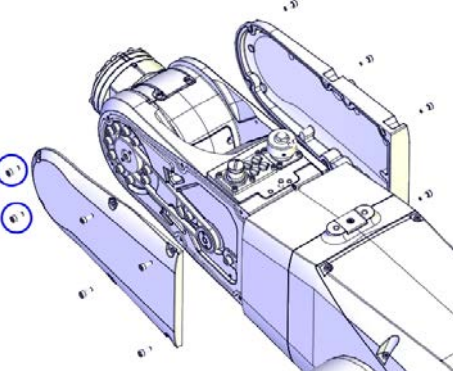
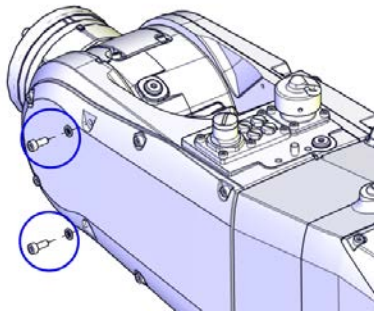


|   | Action   | Note   |
|---|--|--|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>  |  |
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cover gasket. Replace if damaged.</p>               | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx1400000034</p>               |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx1400000345</p> |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

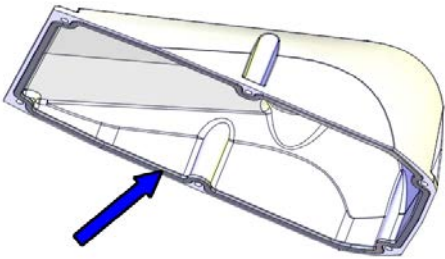

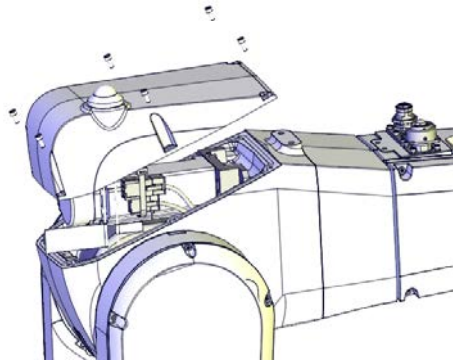

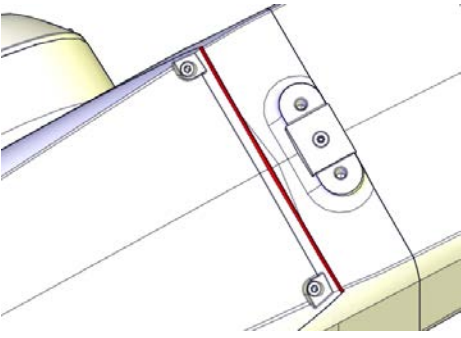
Continued

|   | Action  | Note  |
|---|---|---|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p><b>For robots with protection type Clean Room</b></p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |   |

Continues on next page



Concluding procedure



|   | Action   | Note  |
|---|--|---|
| 1 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the gasket.<br/>Replace if damaged.</p>   | <p>Housing cover gasket (IRB 1200-7/0.7 ): 3HAC056698-001<br/>Housing cover gasket (IRB 1200-5/0.9 ): 3HAC056697-001</p>  <p>xx140000477</p>  |
| 2 | <p>Refit the upper arm housing cover with the screws.</p> <p> <b>CAUTION</b></p> <p>For robots with safety lamp (option)<br/>Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>                             | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx130000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 3 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the upper arm housing cover.<br/>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.<br/>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx160000215</p>   |

Continues on next page

## 4 Repair

### 4.3.1 Replacing the main cable package

*Continued*

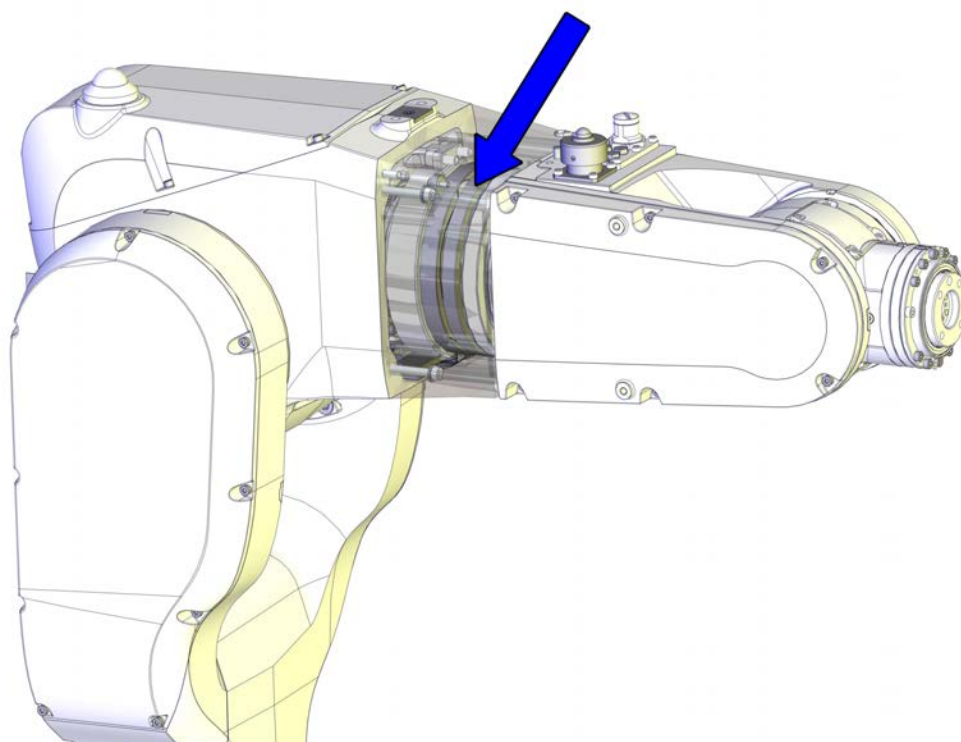
|   | Action   | Note   |
|---|--|--|
| 4 | <p>For robots with protection type Clean Room:<br/>Clean and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |  |
| 5 | <p>Recalibrate the robot.</p>  | <p>Calibration is detailed in section <a href="#">Calibration on page 729</a>.</p> |
| 6 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |  |

## 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

## 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

## Location of the FPC unit

The axis-4 FPC unit and the housing extender sealings are located inside the housing extender unit, as shown in the figure.



xx1300002419

## Required spare parts

**Note**

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                   | Article number | Note   |
|------------------------------|----------------|--|
| FPC unit, axis 4             | 3HAC055517-001 |  |
| Radial sealing with dust lip | 3HAB3701-48    | Not used with protection class IP40.<br>Replace if damaged.  |
| M2 variseal sealing          | 3HAC044641-007 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged. |
| Housing extender unit        | 3HAC059686-001 | Replace if damaged.  |

*Continues on next page*

## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

| Spare part   | Article number | Note   |
|--|----------------|--|
| Housing extender unit, Clean Room<br>Housing extender unit, food grade lubrication | 3HAC059703-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on cable housing cover  | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| PTFE film on cable housing cover   | 3HAC044660-001 | Replace if damaged.  |
| Washer   | 3HAC044869-001 | Replace if damaged   |
| Housing small cover  | 3HAC059684-001 | Replace if damaged.  |
| Housing small cover, Clean Room<br>Housing small cover, food grade lubrication     | 3HAC056142-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket for tubular cover   | 3HAC058822-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket for tubular cable housing cover   | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.  |

#### Required tools and equipment

| Equipment, etc.                  | Article number | Note   |
|----------------------------------|----------------|--|
| Axis-4 sealing assembly tool set | 3HAC049699-001 | Used to refit the radial sealing, if replacement is needed.                  |
| 24 VDC power supply              | -              | Used to release the motor brakes.  |
| Standard toolkit                 | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

#### Required consumables

| Consumable     | Art. no.       | Note  |
|----------------|----------------|---|
| Cleaning agent | -              | Loctite 7063  |
| Flange sealing | 12340011-116   | Loctite 574<br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3) |
| Locking liquid | 3HAB7116-1     | Loctite 243   |
| Sealant        | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room  |


Continues on next page

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

*Continued*

#### Deciding calibration routine


Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action  | Note  |
|---|---|---|
| 1 | Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.                        |
|   | <b>If the robot is to be calibrated with reference calibration:</b><br>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.<br><br>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible. | Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.<br><br>Creating new values requires possibility to move the robot.<br><br>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a> . |
|   | <b>If the robot is to be calibrated with fine calibration:</b><br>Remove all external cable packages (DressPack) and tools from the robot.  |   |

#### Removing the FPC unit and the housing extender sealings

Use these procedures to remove the axis-4 FPC unit and the housing extender sealings.

#### Preparations before removing the axis-4 FPC unit

|   | Action   | Note |
|---|--|------|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.   |      |
| 2 | Jog axis 4 to zero position.   |      |
| 3 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>electric power supply</li> <li>hydraulic pressure supply</li> <li>air pressure supply</li> </ul> to the robot, before entering the robot working area. |      |





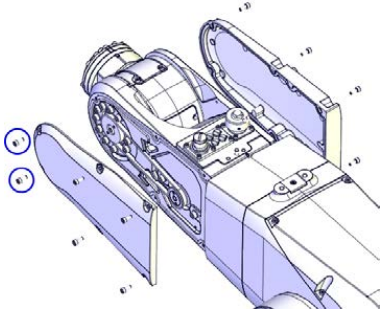
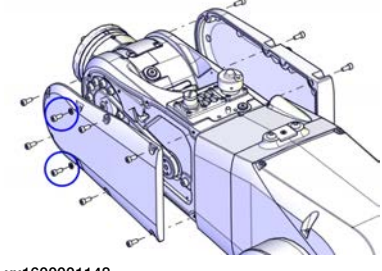
*Continues on next page*

## 4 Repair


### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

#### Getting access to inside of the wrist unit



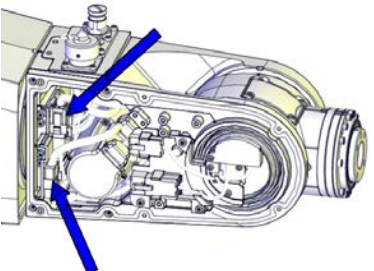
|   | Action   | Note  |
|---|--|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .  |   |
| 3 | Remove the covers on each side of the wrist by removing their screws.<br><br> <b>Note</b><br><b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.<br>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.<br><br> <b>Note</b><br><b>For robots with protection type Clean Room</b><br>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure. | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |

#### Disconnecting the axis-5 motor connectors



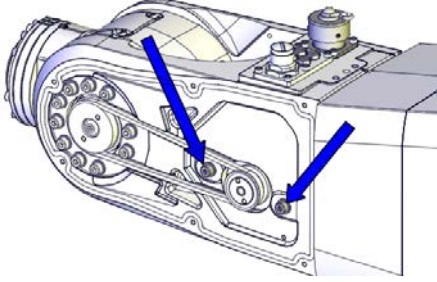
|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off. |      |

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002360</p> |

Removing the axis-5 motor with pulley

|   | Action  | Note   |
|---|---|--|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |  |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  |
| 3 | <p>Loosen the screws so that the motor can be moved sideways.</p>   |  <p>xx1300002350</p> |

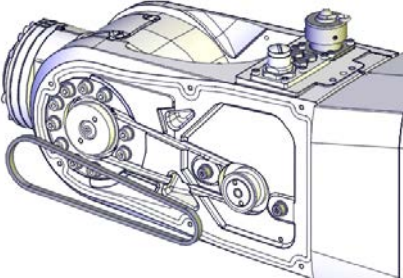
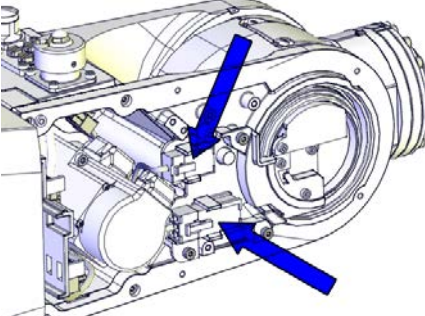
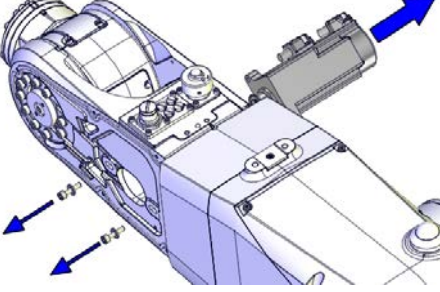
Continues on next page





## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

|   | Action   | Note   |
|---|--|--|
| 4 | Remove the timing belt.                              |  <p>xx1300002351</p>   |
| 5 | Snap loose and disconnect the axis-5 FPC connectors. |  <p>xx1300002390</p>  |
| 6 | Remove the screws and pull out the motor.            |  <p>xx1300002352</p> |

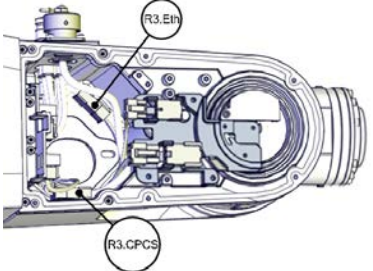
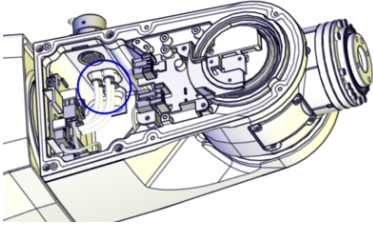
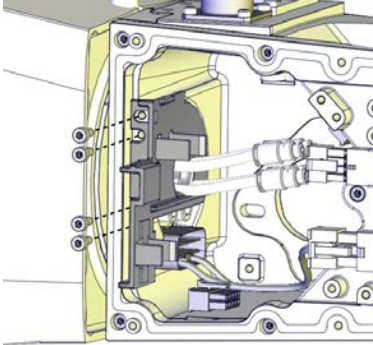
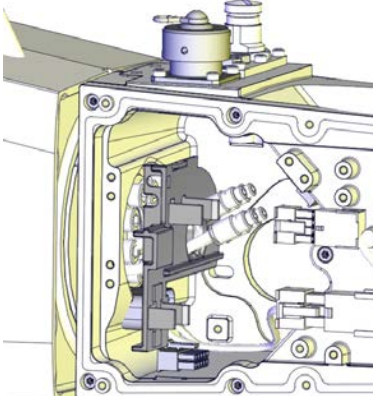
### Removing the wrist

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page



4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
*Continued*

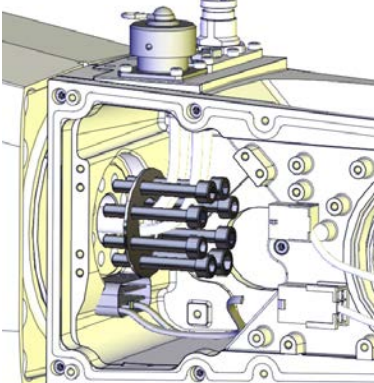
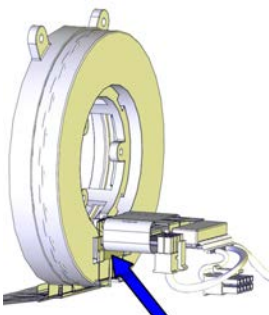
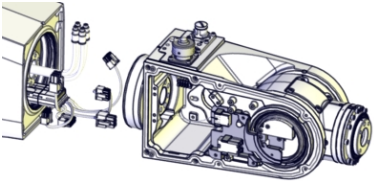
|   | Action   | Note  |
|---|--|---|
| 3 | Disconnect the connectors shown in the figure.               |  <p>xx1300002353</p>   |
| 4 | Disconnect the air hoses.                                    |  <p>xx1300002355</p>   |
| 5 | Remove the connector plate attachment screws.                |  <p>xx1300002356</p>  |
| 6 | Guide the hoses through the plate hole and remove the plate. |  <p>xx1300002357</p> |

*Continues on next page*

## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

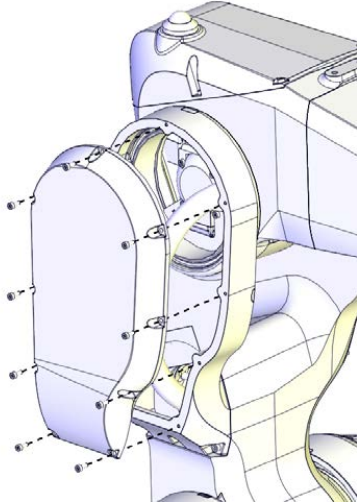
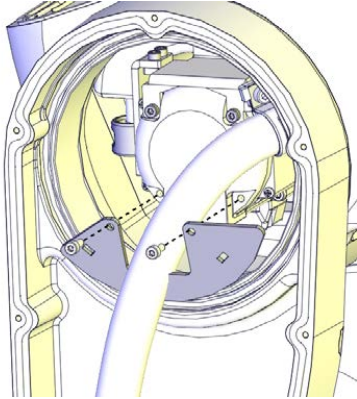
|   | Action   | Note   |
|---|--|--|
| 7 | Support the weight of the wrist and remove the screws and the washer.  |  <p>xx1300002358</p>  |
| 8 | <p>Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p><b>!</b> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p> |  <p>xx1300002359</p> |

#### Disconnecting the axis-4 FPC connectors

|   | Action   | Note |
|---|--|------|
| 1 | <p><b>!</b> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 | <p><b>!</b> CAUTION</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

**4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings**  
*Continued*

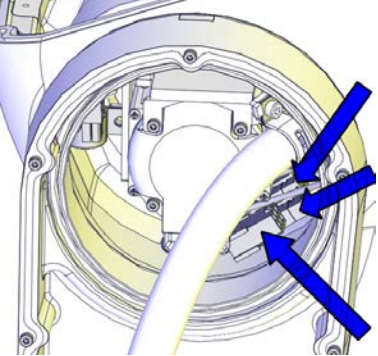
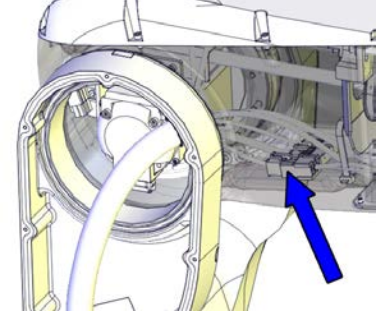
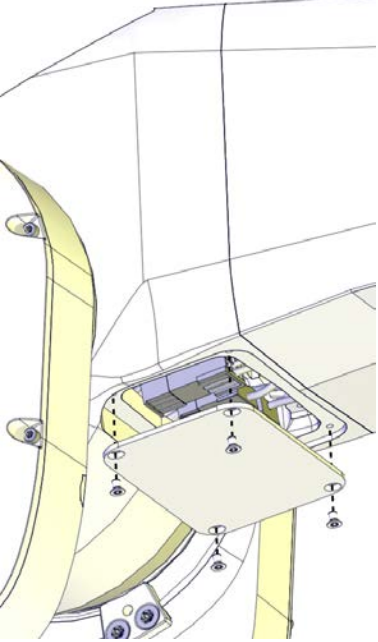
|   | <b>Action</b>                   | <b>Note</b>  |
|---|---------------------------------|--|
| 3 | Remove the cable housing cover. |  <p>xx1300002400</p>  |
| 4 | Remove the plate.               |  <p>xx1300002413</p> |

*Continues on next page*

## 4 Repair

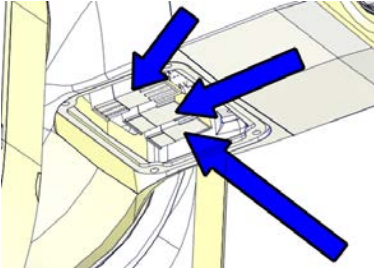
### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

*Continued*


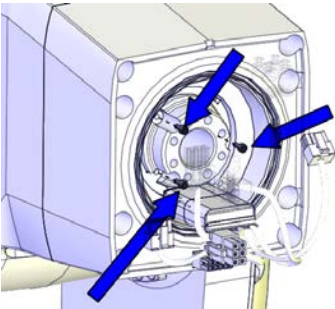
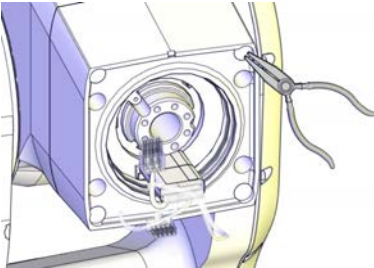
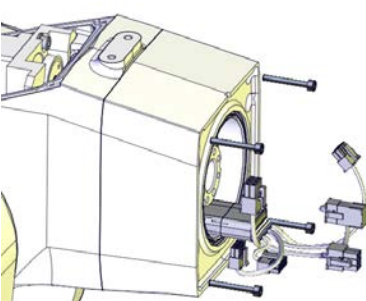
|   | Action  | Note   |
|---|---|--|
| 5 | Pull out the FPC connectors from the housing and disconnect them. | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 6 | Remove the small cover of the housing.                            |  <p>xx1300002398</p>  |

*Continues on next page*

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
Continued

|   | Action                                   | Note  |
|---|--|---|
| 7 | Disconnect the remaining FPC connectors. |  <p>xx1300002399</p> |

Removing the housing extender unit

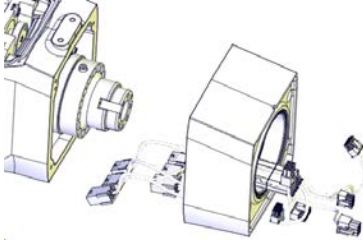
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i> |   |
| 2 | Remove the axis-4 FPC unit screws.  |  <p>xx1300002373</p>  |
| 3 | <b>For robots with protection type Clean Room</b><br><b>For robots with protection type Foundry Plus</b><br>Remove the plugs covering the extender unit screws with a needle-nose plier.  |  <p>xx1600000262</p> |
| 4 | Remove the extender unit screws.  |  <p>xx1300002372</p> |

Continues on next page


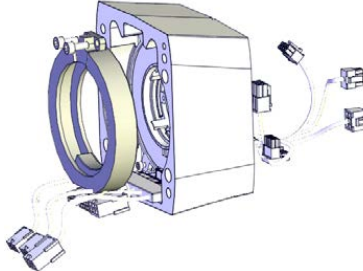
## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings


Continued

|   | Action   | Note  |
|---|--|---|
| 5 | Remove the housing extender unit.<br>Be careful not to damage the cabling. | <br>xx1300002374 |

#### Removing the axis-4 mechanical stop

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 2 | Remove the mechanical stop assembly from the housing extender unit by removing the screws.  | <br>xx1300002415 |


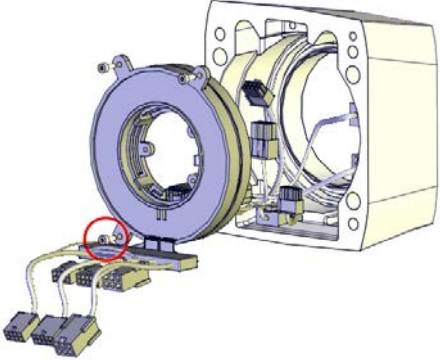
#### Removing the axis-4 FPC unit

|   | Action  | Note |
|---|---|------|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page




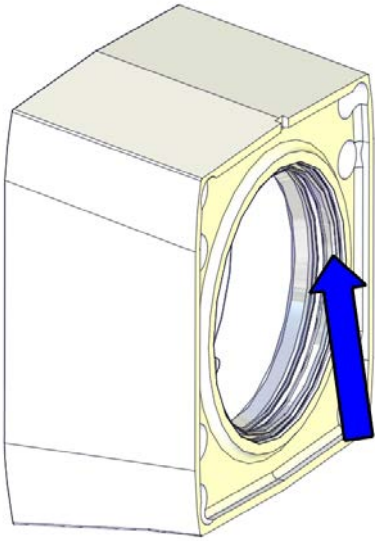
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
*Continued*

|   | Action  | Note   |
|---|---|--|
| 2 | <p>Remove the FPC unit from the housing extender unit by removing the screws.</p> <p> <b>CAUTION</b></p> <p>The lower screw, highlighted with a ring in the figure, is very closely located to the cabling. Be careful not to damage the cabling with the screwdriver when removing/refitting the screw.</p> |  <p>xx1300002417</p> |

**Refitting the FPC unit and the housing extender sealings**

Use these procedures to refit the FPC unit and the housing extender sealings.

Checking the housing extender sealings

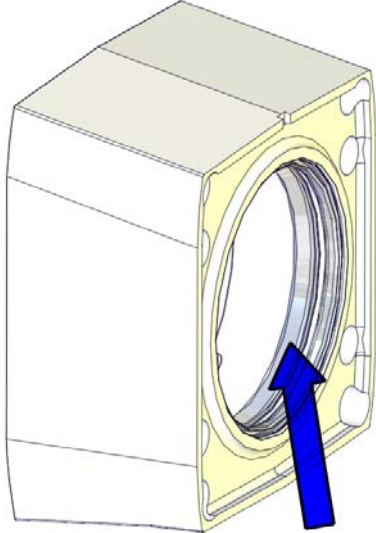
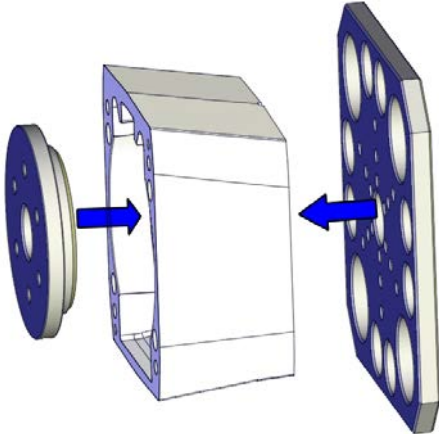
|   | Action   | Note   |
|---|--|--|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>  |  |
| 2 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           Check the sealing.<br/>           Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-007</p>  <p>xx1300002418</p> |

*Continues on next page*

## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

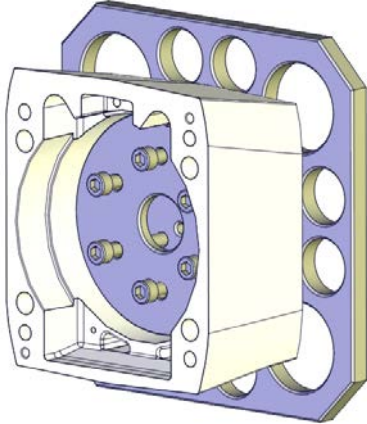

Continued

|   | Action   | Note  |
|---|--|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the radial sealing.</p> <p>Replace if damaged, as described below.</p> <p>In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.</p> | <p>Radial sealing with dust lip: 3HAB3701-48</p>  <p>xx1400000438</p> |
| 4 | <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>  |   |
| 5 | <p>Fit the radial sealing into the housing extender unit.</p>  |   |
| 6 | <p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>   | <p>Axis-4 sealing assembly tool set: 3HAC049699-001</p>   |
| 7 | <p>Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.</p>  |  <p>xx1400000436</p>  |

Continues on next page



4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
*Continued*

|    | Action  | Note   |
|----|---|--|
| 8  | Screw the screws, little by little, to press the sealing into place.  |  <p>xx140000437</p>  |
| 9  | Remove the assembly tool.   |  |
| 10 | Check that the sealing is undamaged and properly fitted.  |  |
| 11 | Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.   |  |
| 12 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |

Refitting the axis-4 FPC unit



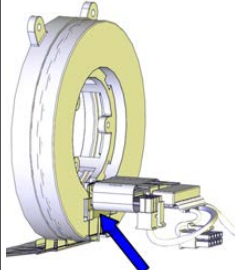
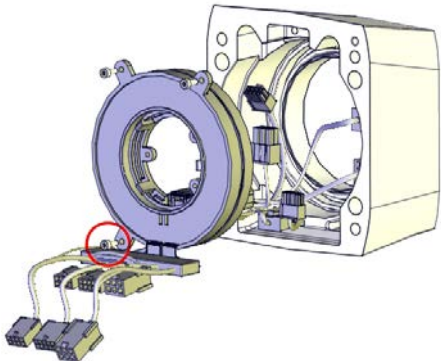

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

*Continues on next page*


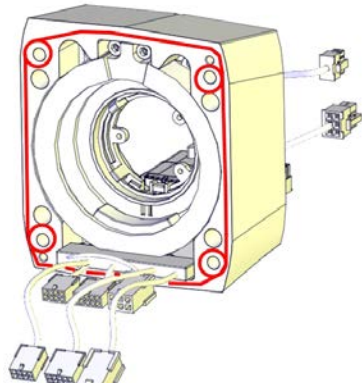
## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

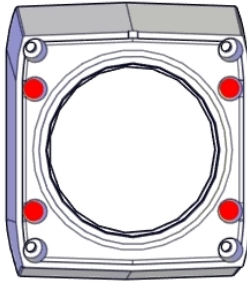


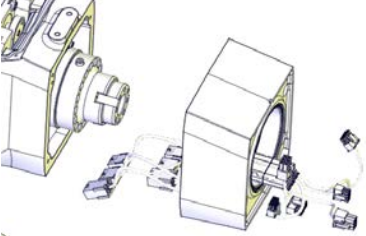
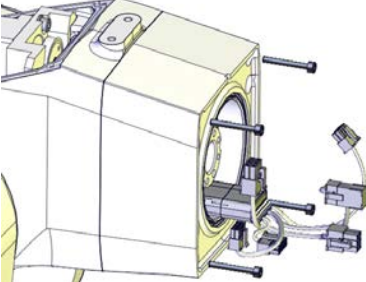
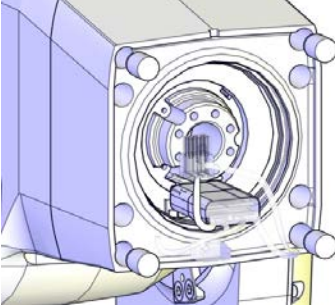
|   | Action   | Note   |
|---|--|--|
| 2 | <p>Refit the FPC unit to the housing extender unit and secure with the screws.</p> <p> <b>CAUTION</b></p> <p>The lower screw, highlighted with a ring in the figure, is very closely located to the cabling. Be careful not to damage the cabling with the screwdriver when removing/refitting the screw.</p> <p> <b>CAUTION</b></p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p> | <p>Tightening torque: 0.5 Nm.</p>  <p>xx1300002417</p> |
| 3 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>   |  |

#### Refitting the housing extender unit

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>  |   |
| 2 | <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1300002613</p> |

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
*Continued*

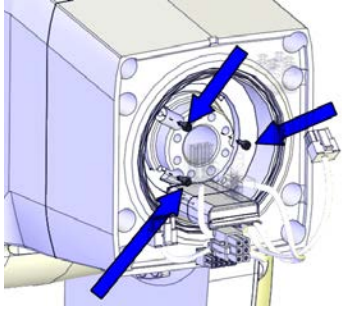

|   | Action   | Note  |
|---|--|---|
| 3 | <p>For robots with protection type Clean Room<br/>                     For robots with protection type Foundry Plus<br/>                     Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.</p>   |  <p>xx160000216</p>  |
| 4 | <p>Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling.</p> <p> <b>CAUTION</b></p> <p>Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit.</p> <p> <b>Note</b></p> <p>Mate the unit to the two locating pins attached to the housing.</p> |  <p>xx1300002374</p>   |
| 5 | <p>Secure with screws and washers, using locking liquid Loctite 243.</p>   | <p>Screws: M4x30.<br/>                     Tightening torque: 2.7 Nm.</p>  <p>xx1300002372</p> |
| 6 | <p>For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Press in screw sealing plugs to cover the screws.</p>  | <p>Screw sealing plug: 3HAC053685-001</p>  <p>xx160000263</p>                                  |

*Continues on next page*


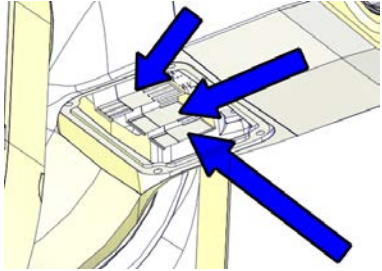
## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued


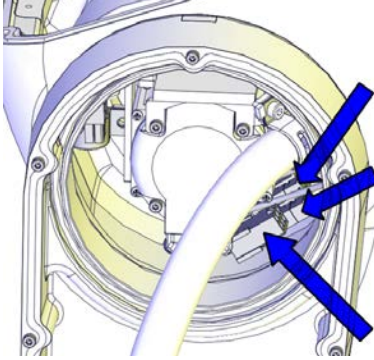
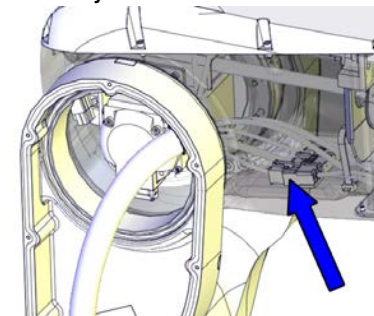
|   | Action   | Note  |
|---|--|---|
| 7 | Fit and secure the axis-4 FPC unit screws.   | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002373</p> |
| 8 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Connecting the axis-4 FPC connectors

|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |   |
| 2 | <p>Reconnect the FPC connectors.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> |  <p>xx1300002399</p> |

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
Continued

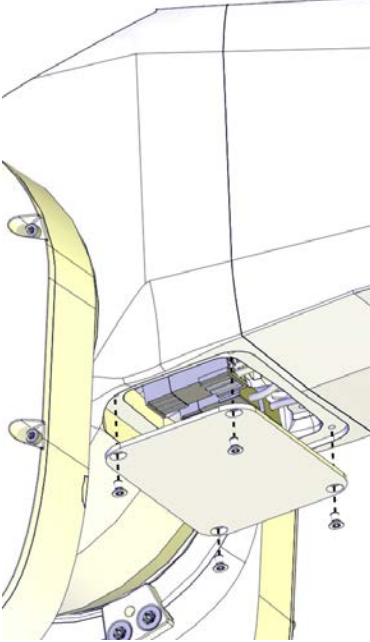
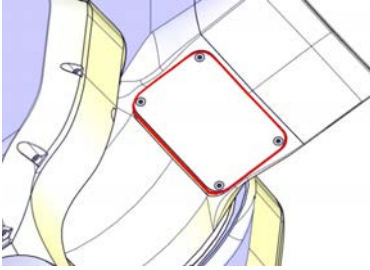
|   | Action  | Note   |
|---|---|--|
| 3 | <p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>  |  |

Continues on next page

## 4 Repair

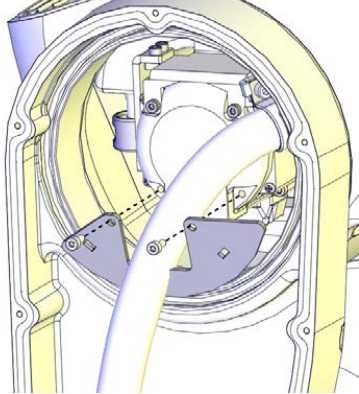
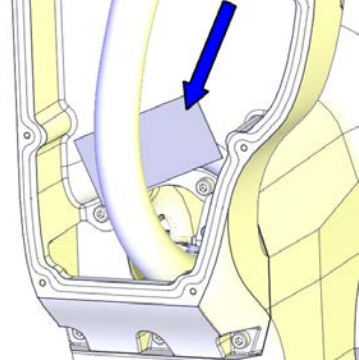
### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

|   | Action  | Note   |
|---|---|--|
| 5 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>  |   |
| 6 | <p>Refit the small cover to the housing.</p> <p>Replace if damaged.</p>   | <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001</p> <p>: 3HAC056142-001 (used with protection type Clean Room)</p> <p>Housing small cover, Clean Room</p> <p>Housing small cover, food grade lubrication</p> <p>Screws: 3HAC14286-4 (M3X5).</p> <p>Tightening torque: 1 Nm.</p> |
| 7 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the small cover on the housing.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx1600000214</p>  |

Continues on next page

**4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings**  
*Continued*

|   | <b>Action</b>  | <b>Note</b>  |
|---|--|--|
| 8 | Refit the plate.   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                            |
| 9 | Check the PTFE film on the cable housing.<br>Replace if damaged. | <p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p> |

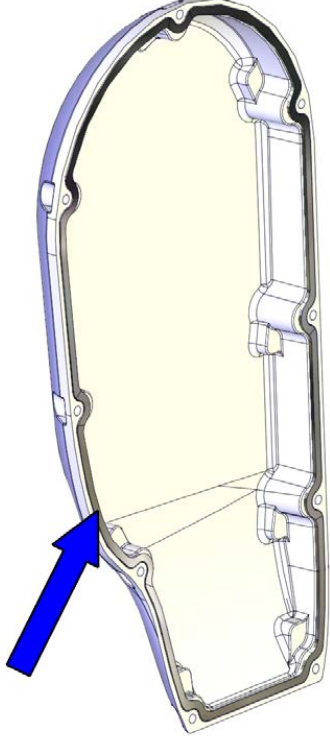
*Continues on next page*



## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

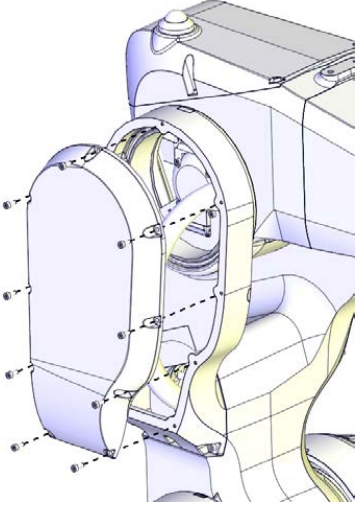


*Continued*

|    | Action   | Note  |
|----|--|---|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           For robots with protection type Clean Room<br/>           For robots with food grade lubrication<br/>           Check the gasket of the cable housing cover.<br/>           Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>           3HAC056724-001<br/>           PTFE film on cable housing cover:<br/>           3HAC044660-001</p>  <p>xx1400000048</p> |
| 11 | <p>Check the PTFE film on the cable housing cover.<br/>           Replace if damaged.</p>  |   |
| 12 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>   |   |

*Continues on next page*



4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
Continued

|    | Action   | Note   |
|----|--|--|
| 13 | <p>Refit the cable housing cover.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>            | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 14 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Refitting the wrist


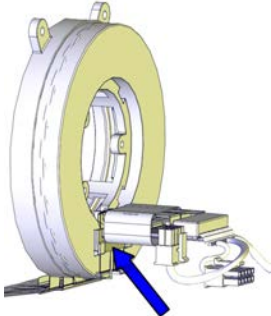
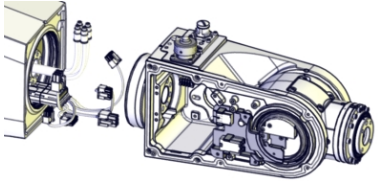
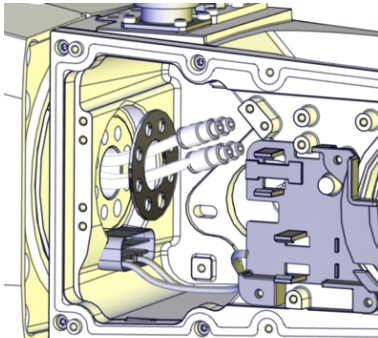
|   | Action  | Note |
|---|---|------|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> |      |

Continues on next page

## 4 Repair

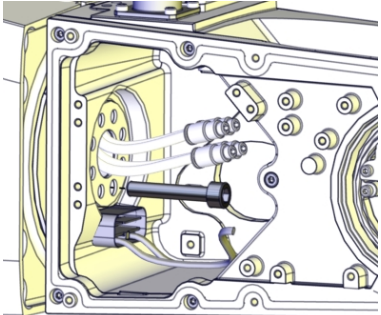

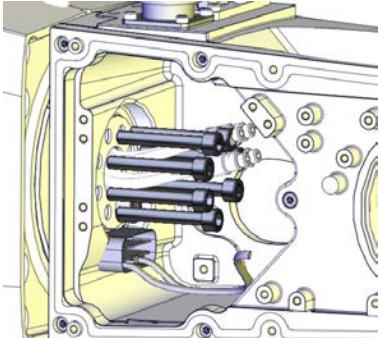

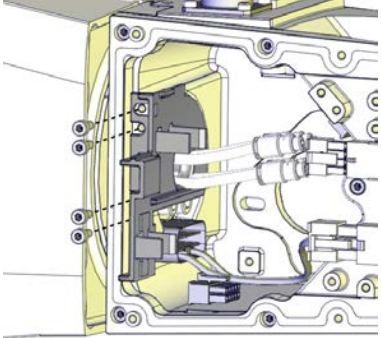
### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

|   | Action  | Note  |
|---|---|---|
| 2 | <p>Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit.<br/>Be careful not to damage the FPC cabling and the connectors.</p> <p> <b>CAUTION</b></p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p> <br>xx1300002611 | <br>xx1300002359                                 |
| 3 | <p>Refit the washer while at the same time putting the cables through its center.<br/>Replace washer, if damaged.</p>   | <p>Washer: 3HAC044869-001</p> <br>xx1400000001 |

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
Continued


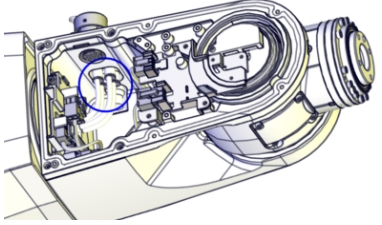
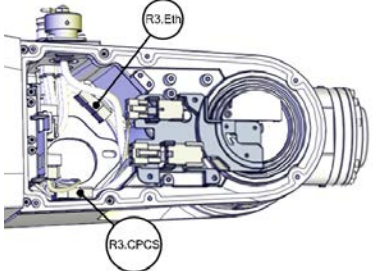

|   | Action   | Note  |
|---|--|---|
| 4 | Refit the screw M6x35 (1 pc). Do not tighten yet.          | <p>Screw: 3HAB3409-238 (M6x35 (1 pc)).</p>  <p>xx140000002</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p>     |
| 5 | Refit the rest of the screws (M5x35 (7 pcs)).              | <p>Screw: 3HAB3409-237 (M5x35 (7 pcs)).</p>  <p>xx140000003</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 6 | Tighten all screws.  | Tightening torque: 8 Nm.  |
| 7 | Put the cables through the plate hole and refit the plate. | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002356</p>   |

Continues on next page


## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

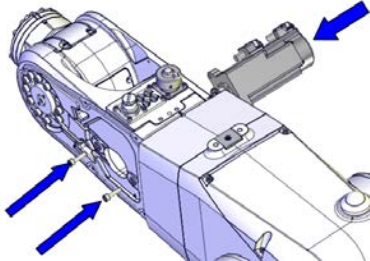

|    | Action   | Note  |
|----|--|---|
| 8  | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.</p>   |  <p>xx1300002355</p> |
| 9  | <p>Reconnect the connectors.</p> <ul style="list-style-type: none"> <li>• R3.Eth</li> <li>• R3.CPCS</li> </ul>   |  <p>xx1300002353</p> |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Preparations before securing the axis-5 motor

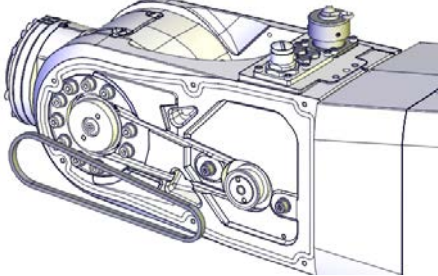

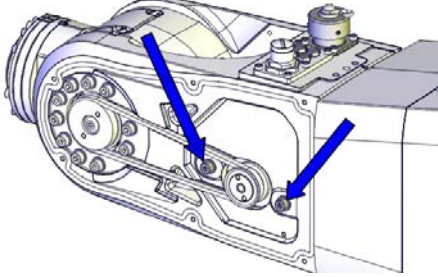
|   | Action  | Note |
|---|---|------|
| 1 | <p>Check that:</p> <ul style="list-style-type: none"> <li>• all assembly surfaces are clean and without damages</li> <li>• the motor is clean and undamaged.</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
Continued

|   | Action  | Note   |
|---|---|--|
| 2 | Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor. | <p>Screws: 3HAB3409-212 (M4x16).</p>  <p>xx1300002463</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |

Securing the axis-5 motor and timing belt


|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> |  |
| 2 | Refit the timing belt on the pulley.  |  <p>xx1300002351</p>   |
| 3 | Move the motor to a position where a good timing belt tension is reached ( $F = 26\text{ N}$ ).                             | <p> <b>Note</b><br/>Do not stretch the timing belt too much!</p> |
| 4 | Secure the motor with its attachment screws.  |  <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p>           |

Continues on next page


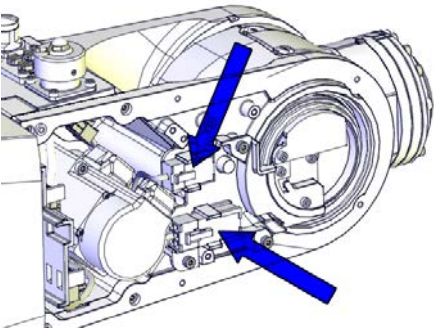
## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings


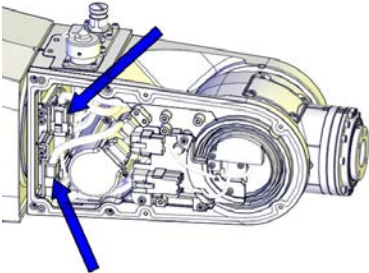
Continued

|   | Action  | Note |
|---|---|------|
| 5 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |      |

#### Connecting the axis-5 motor FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | Connect the axis-5 FPC connectors and snap them to their holders.<br><br> <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br><br><small>xx1300002390</small> |

#### Connecting the axis-5 motor connectors

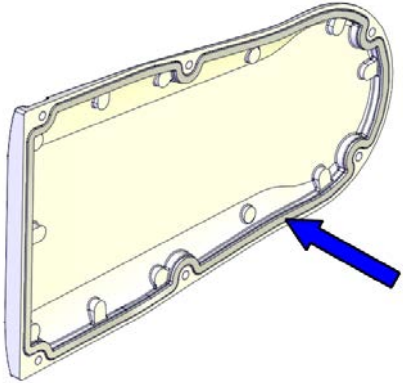
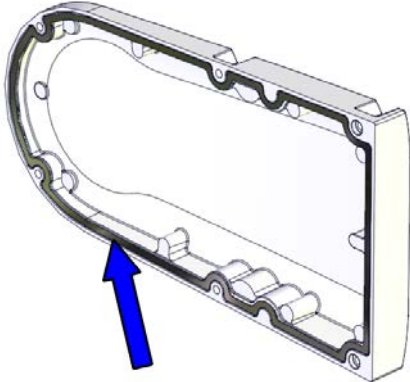
|   | Action   | Note   |
|---|--|--|
| 1 | Reconnect the motor cables. <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul>  <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br><br><small>xx1300002360</small> |

#### Refitting the wrist covers

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings  
*Continued*

|   | Action  | Note  |
|---|---|---|
| 2 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the tubular cover gasket.<br/>                     Replace if damaged.</p>               | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx140000034</p>                |
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the tubular cable housing cover gasket.<br/>                     Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx1400000345</p> |

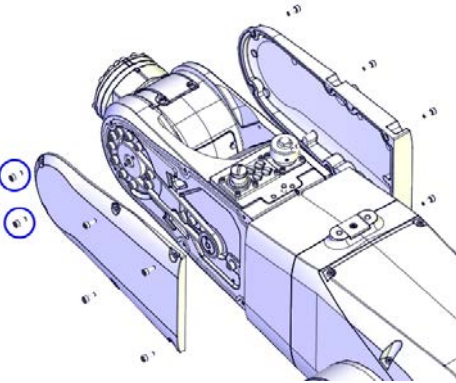
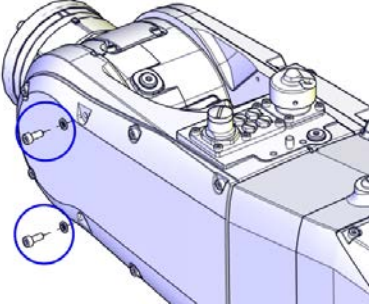


*Continues on next page*



## 4 Repair

### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

|   | Action  | Note   |
|---|---|--|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |  |




Continues on next page



### 4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

*Continued*

#### Concluding procedure

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> .<br><br> <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth. |   |
| 2 | Recalibrate the robot.  | Calibration information is included in section <i>Calibration on page 729</i> . |
| 3 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run.  |   |

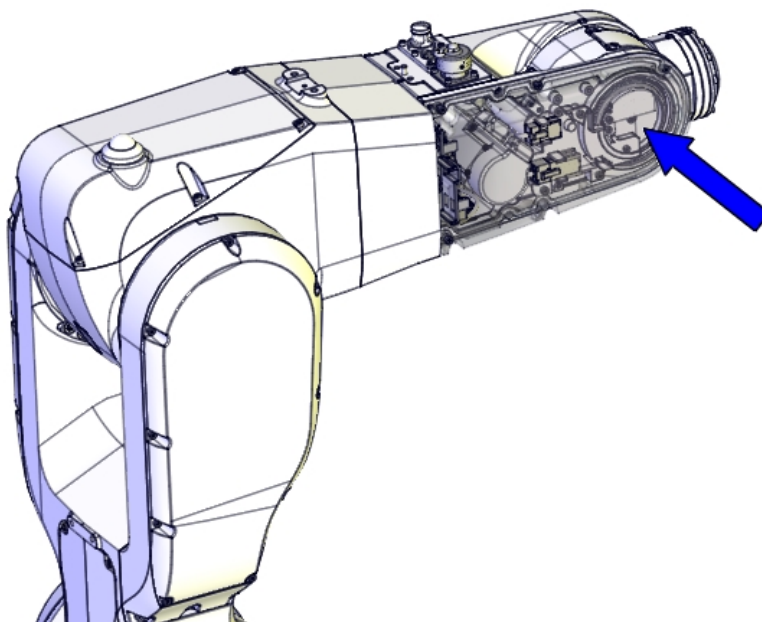
## 4 Repair

### 4.3.3 Replacing the axis-5 FPC unit

### 4.3.3 Replacing the axis-5 FPC unit

#### Location of axis-5 FPC unit

The axis-5 FPC unit is located as shown in the figure.



xx1300002397

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                             | Article number | Note  |
|--|----------------|---|
| FPC unit, axis 5                       | 3HAC045743-001 |   |
| M2 variseal sealing                    | 3HAC044641-009 | Replace if damaged.   |
| Radial sealing                         | 3HAB3701-42    | Not used with protection class IP40.<br>Replace if damaged. |
| Gasket for tubular cable housing cover | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged. |

#### Required tools and equipment

| Equipment, etc.                  | Article number | Note  |
|----------------------------------|----------------|---|
| Axis-5 sealing assembly tool set | 3HAC049701-001 | Used to refit the radial sealing, if replacement is needed. |
| 24 VDC power supply              | -              | Used to release the motor brakes.                           |

Continues on next page

| Equipment, etc.  | Article number | Note   |
|------------------|----------------|--|
| Standard toolkit | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

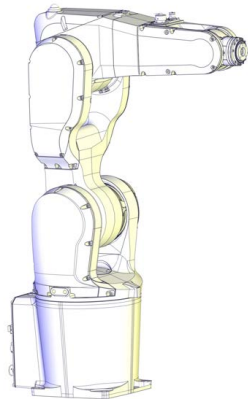

#### Required consumables

| Consumable     | Art. no.       | Note   |
|----------------|----------------|--|
| Cleaning agent | -              | Loctite 7063   |
| Flange sealing | 12340011-116   | For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)<br>Loctite 574    |
| Flange sealing | 3HAC026759-003 | For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)<br>Sikaflex 521FC |

#### Removing the FPC unit

Use these procedures to remove the FPC unit.

#### Preparations before removing the axis-5 FPC unit


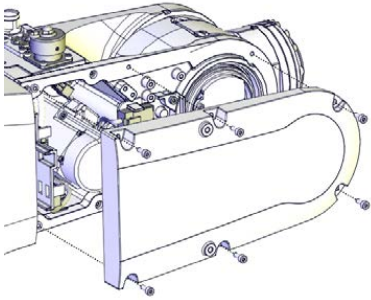
|   | Action   | Note  |
|---|--|---|
| 1 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 2 |  <p><b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |   |

*Continues on next page*


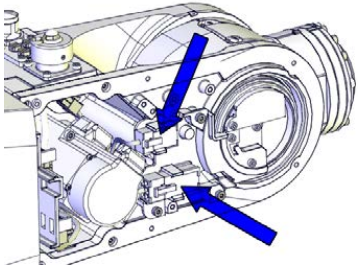
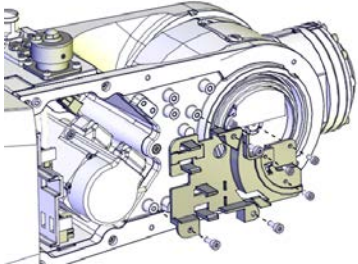
## 4 Repair

### 4.3.3 Replacing the axis-5 FPC unit


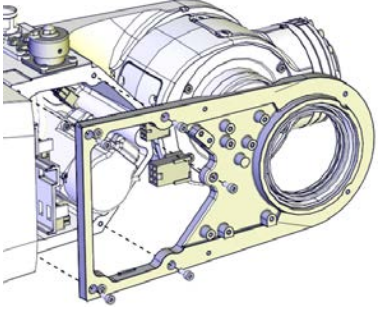
Continued

|   | Action  | Note  |
|---|---|---|
| 3 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 4 | Remove the tubular cable housing cover.   | <br>xx1300002389 |


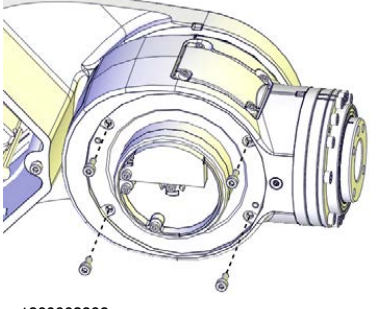
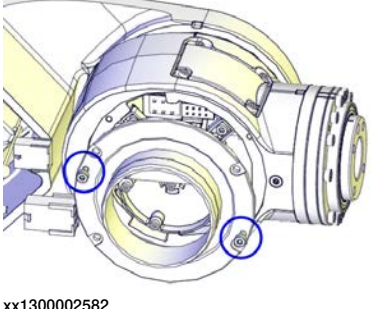
#### Removing the tubular cable housing

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 2 | Snap loose and disconnect the axis-5 FPC connectors.  | <br>xx1300002390 |
| 3 | Remove the connector plate by first removing the screws.  | <br>xx1300002391 |

Continues on next page

|   | Action   | Note  |
|---|--|---|
| 4 | <p>Remove the cable housing of the tubular by first removing the screws.</p> <p> <b>Note</b></p> <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     The frame is glued and needs to be pried off.</p> |  <p>xx1300002392</p> |

Removing the axis-5 FPC unit

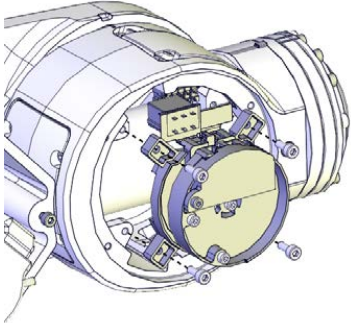
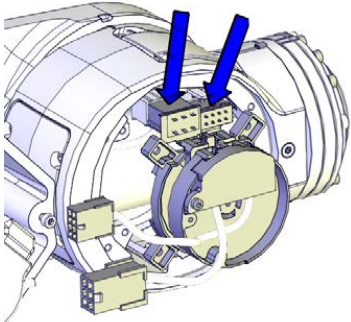
|   | Action  | Note  |
|---|---|---|
| 1 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 2 | <p>Remove the sleeve screws.</p>  |  <p>xx1300002393</p> |
| 3 | <p>Remove the sleeve by screwing in two of the screws into the press out holes to force the sleeve out.</p>   |  <p>xx1300002582</p> |

Continues on next page

## 4 Repair

### 4.3.3 Replacing the axis-5 FPC unit


*Continued*

|   | Action   | Note   |
|---|--|--|
| 4 | Remove the FPC unit attachment screws and pull out the FPC unit as far as required for the axis-6 motor connectors to be accessed. | <br>xx1300002394  |
| 5 | Disconnect the axis-6 motor connectors and remove the FPC unit completely.   | <br>xx1300002395 |

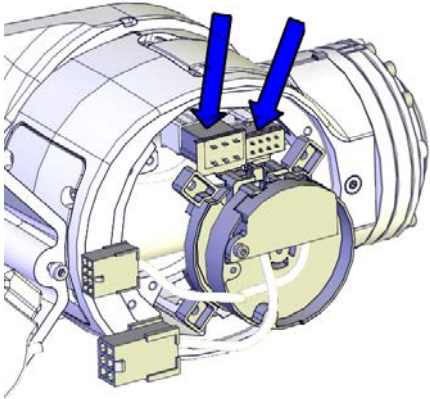

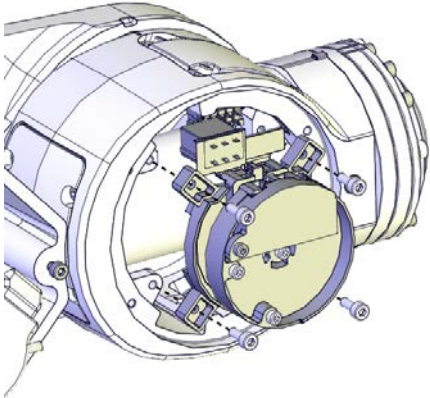

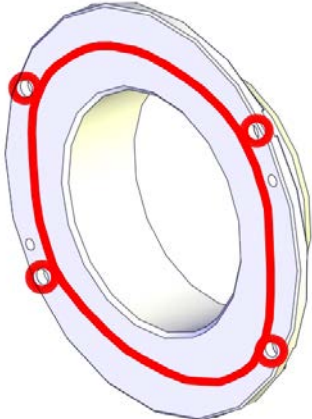
#### Refitting the FPC unit

Use these procedures to refit the FPC unit.

#### Refitting the axis-5 FPC unit

|   | Action  | Note |
|---|---|------|
| 1 |  <b>WARNING</b><br>It is important that axis 5 is in zero position when fitting the FPC unit.<br>Make sure that the FPC is in zero position and does not get twisted during refitting. |      |
| 2 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |      |

*Continues on next page*

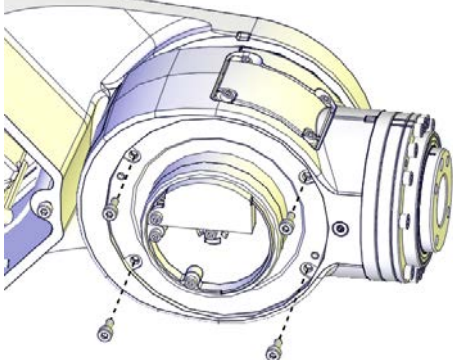

|   | Action  | Note  |
|---|---|---|
| 3 | <p>Reconnect the axis-6 motor connectors to the FPC unit.</p>   |  <p>xx1300002395</p>                                    |
| 4 | <p>Carefully refit the FPC unit and secure with screws.</p> <p> <b>Note</b></p> <p>Check that the FPC unit is at the zero position when refitting it.</p>  | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002394</p> |
| 5 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br/>Apply flange sealing Loctite 574 on the mounting surfaces of the sleeve.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1300002609</p>                                 |




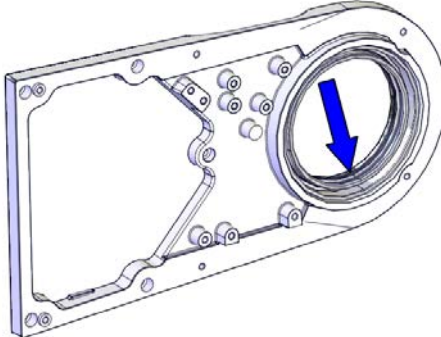
## 4 Repair

### 4.3.3 Replacing the axis-5 FPC unit

Continued

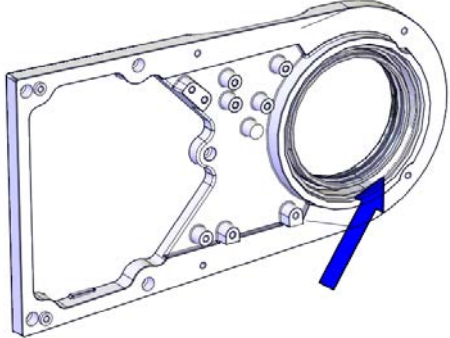
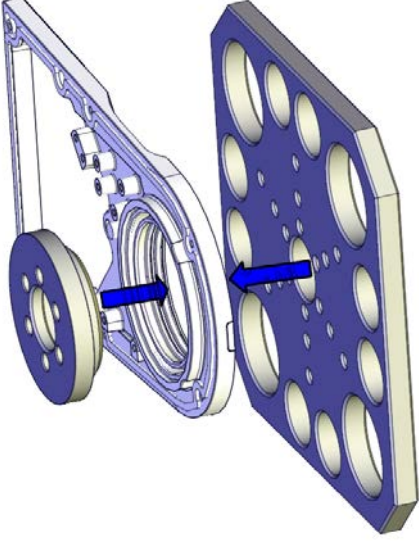
|   | Action  | Note   |
|---|---|--|
| 6 | Refit the sleeve and secure with screws.<br>Replace if damaged.   | Sleeve: 3HAC044661-001<br>Tightening torque: 1.5 Nm.<br><br>xx1300002393 |
| 7 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

### Checking the tubular cable housing sealings

|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | Check the sealing.<br>Replace if damaged.<br> <b>CAUTION</b><br>Do not fit M2 variseal sealing on Clean Room robots. | M2 variseal sealing: 3HAC044641-009<br><br>xx1300002396 |

Continues on next page



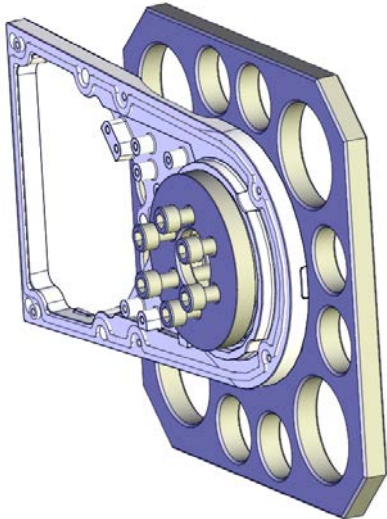

|   | Action   | Note  |
|---|--|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the radial sealing.</p> <p>Replace if damaged, as described below.</p> <p>If undamaged and properly seated, skip to the next procedure table.</p> | <p>Radial sealing: 3HAB3701-42</p>  <p>xx1300002608</p> |
| 4 | <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>  |   |
| 5 | <p>Fit the radial sealing into the tubular cable housing.</p>  |   |
| 6 | <p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>   | <p>Axis-5 sealing assembly tool set: 3HAC049701-001</p>   |
| 7 | <p>Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.</p>  |  <p>xx1400000485</p>                                 |

Continues on next page

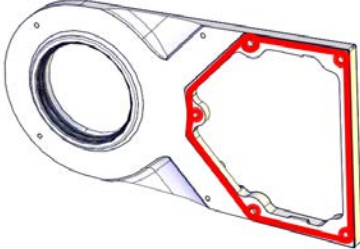

## 4 Repair

### 4.3.3 Replacing the axis-5 FPC unit

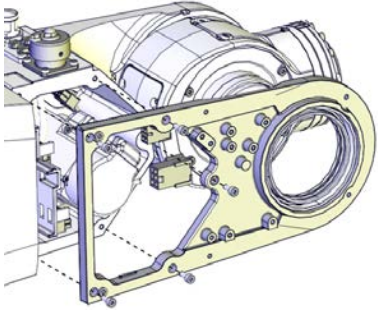

Continued

|    | Action  | Note   |
|----|---|--|
| 8  | Screw the screws, little by little, to press the sealing into place.  |  <p>xx140000486</p>   |
| 9  | Remove the assembly tool.   |  |
| 10 | Check that the sealing is undamaged and properly fitted.  |  |
| 11 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |

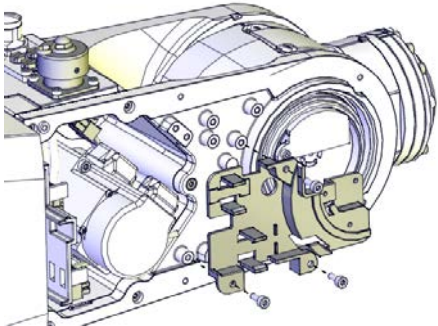
### Refitting the tubular cable housing

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the tubular cable housing. |  <p>xx1300002610</p>  <b>Note</b><br>For Clean Room robots, wipe clean the overflowing Sikaflex 521FC if there is any. |

Continues on next page

|   | Action   | Note   |
|---|--|--|
| 3 | Refit the tubular cable housing with the screws.   | <p>Tightening torque: 1.5 Nm.<br/>                     Tubular cable housing:<br/>                     3HAC059695-001<br/>                     : 3HAC056143-001 (used with protection type Clean Room)<br/>                     Tubular cable housing, Clean Room<br/>                     Tubular cable housing, food grade lubrication</p>  <p>xx1300002392</p> |
| 4 | <p>Seal and paint the joints that have been opened.<br/>                     See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Refitting the connector plate

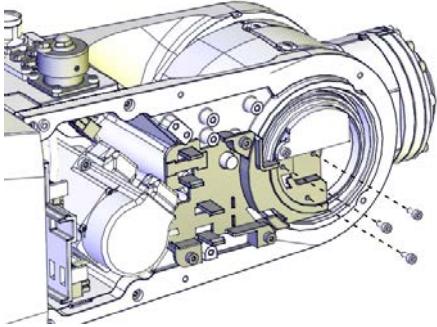

|   | Action  | Note   |
|---|---|--|
| 1 | <p>Clean the joints that have been opened.<br/>                     See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p> |  |
| 2 | <p>Refit the connector plate and secure with the M3 screws.</p>   | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1400001401</p> |

Continues on next page


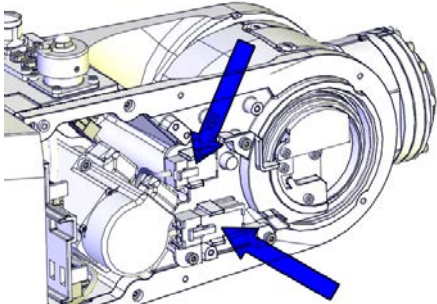
## 4 Repair

### 4.3.3 Replacing the axis-5 FPC unit

Continued

|   | Action  | Note  |
|---|---|---|
| 3 | Secure the three M2.5 screws.   | Tightening torque: 0.3 Nm.<br><br><small>xx1400001402</small> |
| 4 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |   |

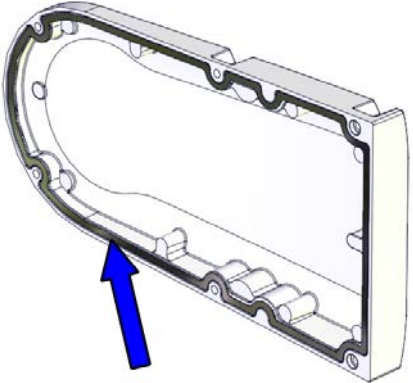
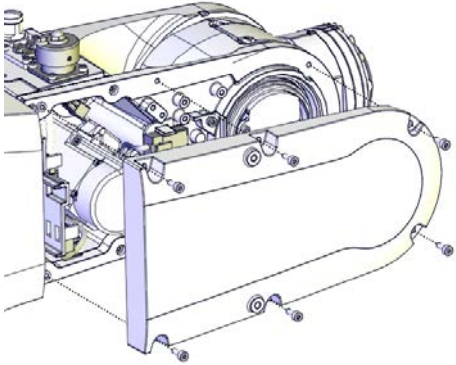


#### Connecting the axis-5 motor FPC connectors

|   | Action   | Note  |
|---|--|---|
| 1 | Connect the axis-5 FPC connectors and snap them to their holders.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br><small>xx1300002390</small> |

#### Refitting the tubular cable housing cover

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page

|   | Action   | Note   |
|---|--|--|
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket.</p> <p>Replace if damaged.</p>  | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx140000345</p>  |
| 3 | <p>Refit the cover to the cable housing.</p>   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |




Continues on next page

## 4 Repair

### 4.3.3 Replacing the axis-5 FPC unit

*Continued*

Concluding procedure

|   | Action   | Note |
|---|--|------|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i><br> <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth. |      |
| 2 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run.   |      |

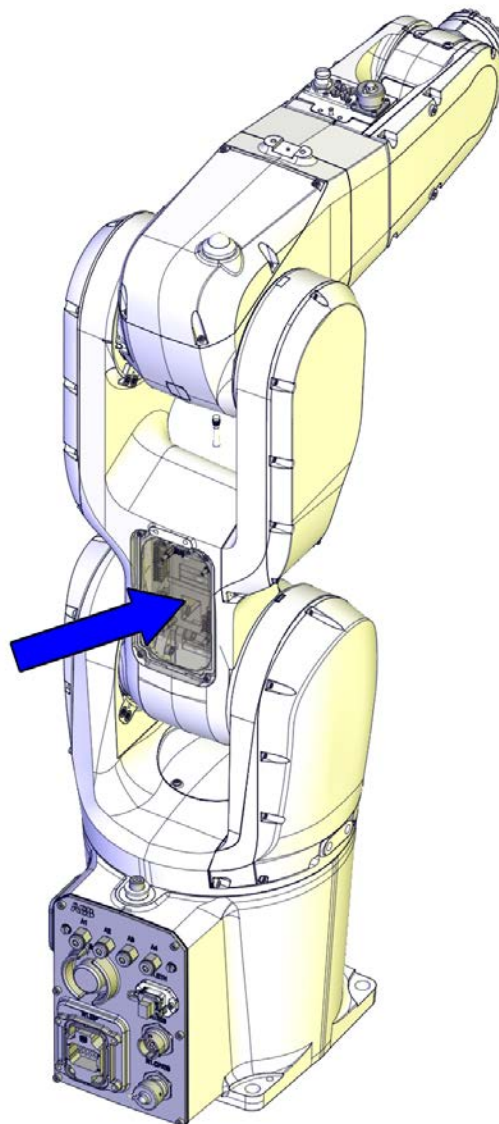
### 4.3.4 Replacing the EIB/SMB unit

#### Location of EIB/SMB unit

The EIB/SMB unit is located as shown in the figure.

**Note**

The EIB unit is used for IRB 1200 no type specified and IRB 1200 Type A.  
The SMB unit is used for IRB 1200 Type B.



xx1300002574

*Continues on next page*



## 4 Repair

### 4.3.4 Replacing the EIB/SMB unit

Continued

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                    | Article number | Note   |
|-------------------------------|----------------|--|
| EIB unit                      | 3HAC045759-001 |  |
| SMB unit                      | 3HAC059122-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> . |
| Gasket on EIB/SMB cover       | 3HAC056728-001 | Not used with protection class IP40.<br>Replace if damaged.                    |
| Gasket on cable housing cover | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.                    |

#### Required tools and equipment

| Equipment, etc.     | Article number | Note   |
|---------------------|----------------|--|
| 24 VDC power supply | -              | Used to release the motor brakes.  |
| Standard toolkit    | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |



#### CAUTION

Always cut the paint with a knife and grind the paint edge when disassembling parts. See [Cut the paint or surface on the robot before replacing parts on page 136](#).

#### Required consumables

| Equipment      | Article number | Note        |
|----------------|----------------|-------------|
| Locking liquid | 3HAB7116-1     | Loctite 243 |

#### Removing the EIB/SMB unit


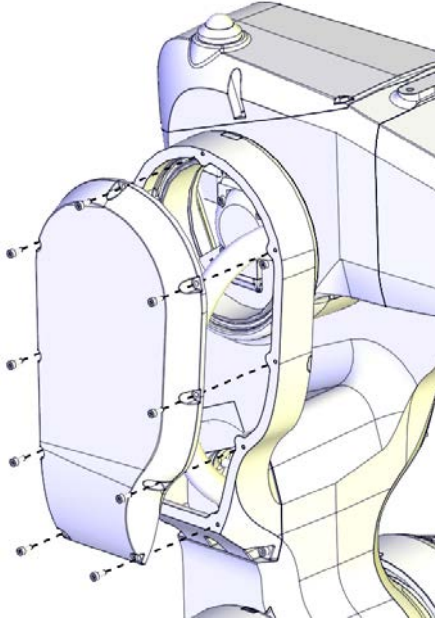
Use these procedures to remove the EIB/SMB unit.

#### Preparations before removing the EIB/SMB unit




| Action  | Note |
|---|------|
| 1<br><b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"><li>• electric power supply</li><li>• hydraulic pressure supply</li><li>• air pressure supply</li></ul> to the robot, before entering the robot working area. |      |

Continues on next page



|   | Action  | Note  |
|---|---|---|
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | <p>Remove the lower arm cable housing cover.</p>  |  <p>xx1300002400</p> |

Disconnecting the cabling in the lower arm



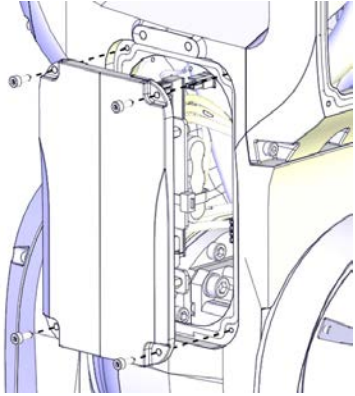
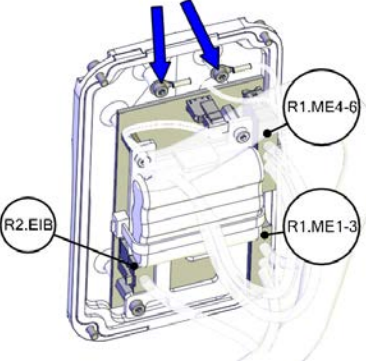

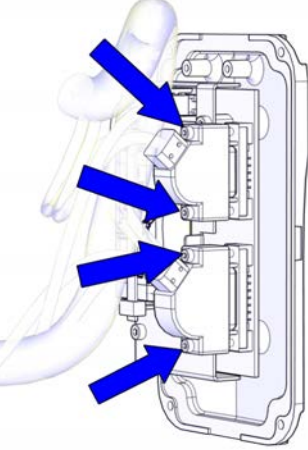
|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 | <p> <b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a></p> |      |
| 3 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>     |      |

Continues on next page

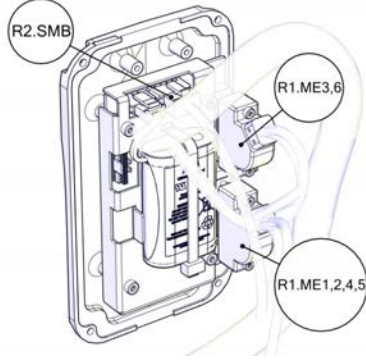
## 4 Repair

### 4.3.4 Replacing the EIB/SMB unit



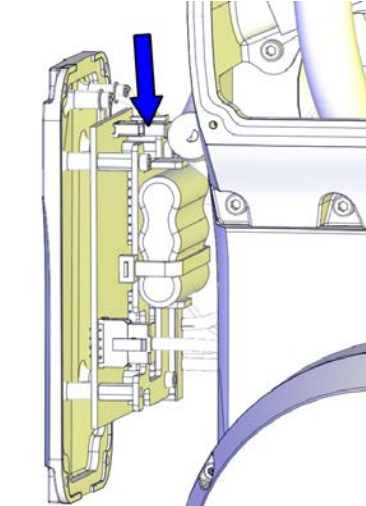
Continued

|   | Action  | Note  |
|---|---|---|
| 4 | <p>Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.</p> <p> <b>CAUTION</b></p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p> <p> <b>CAUTION</b></p> <p>Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.</p> |  <p>xx1300002427</p>   |
| 5 | <p><b>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</b></p> <p>Disconnect the connectors on the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p>Remove the EIB/SMB cover completely from the lower arm.</p>  |  <p>xx1300002428</p>  |
| 6 | <p><b>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</b></p> <p>Disconnect the lugs on the EIB/SMB cover.</p>   |  <p>xx1300002428</p> |
| 7 | <p><b>Valid for IRB 1200 Type B</b></p> <p>Loose the connector screws.</p>  |  <p>xx1700000004</p> |

Continues on next page

|   | Action  | Note  |
|---|---|---|
| 8 | <p><b>Valid for IRB 1200 Type B</b></p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p>Remove the EIB/SMB cover completely from the lower arm.</p> |  <p>xx1700000005</p> |

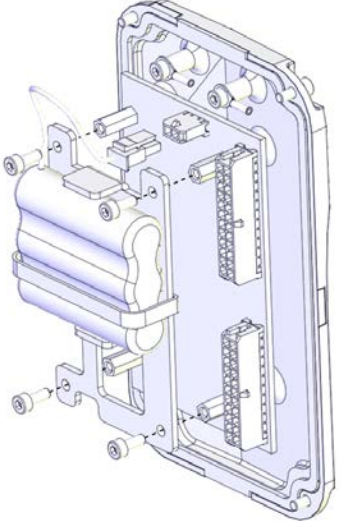
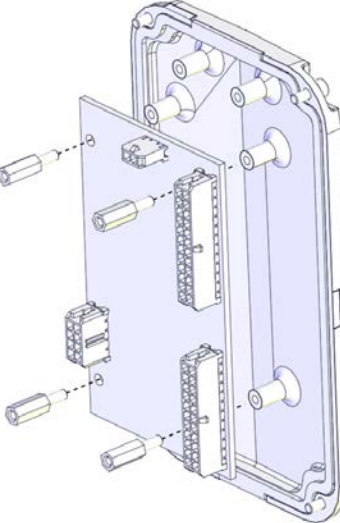
Removing the EIB unit (IRB 1200 no type specified and IRB 1200 Type A)

|   | Action  | Note  |
|---|---|---|
| 1 |  <p><b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a></p> |   |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>   |   |
| 3 | <p>Disconnect the battery cable.</p>  |  <p>xx1300002571</p> |



## 4 Repair

### 4.3.4 Replacing the EIB/SMB unit

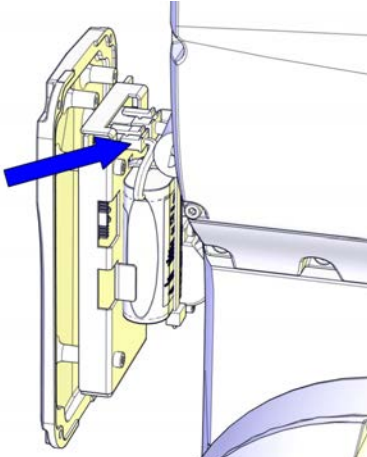
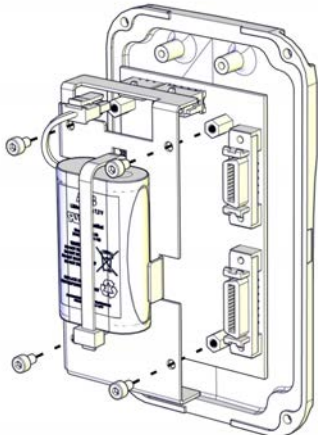
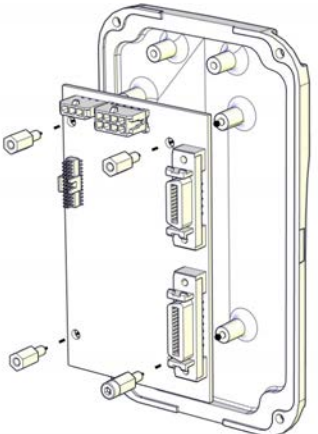
Continued

|   | Action  | Note   |
|---|---|--|
| 4 | Remove the battery pack plate by removing the screws. |  <p>xx1300002572</p>    |
| 5 | Remove the EIB unit by removing the distance screws.  |  <p>xx1300002573</p> |

### Removing the SMB unit (IRB 1200 Type B)

|   | Action   | Note |
|---|--|------|
| 1 |  <p><b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 60</i></p> |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p>      |      |

Continues on next page

|   | Action  | Note   |
|---|---|--|
| 3 | Disconnect the battery cable.                         |  <p>xx170000006</p>     |
| 4 | Remove the battery pack plate by removing the screws. |  <p>xx170000008</p>  |
| 5 | Remove the SMB unit by removing the distance screws.  |  <p>xx170000009</p> |

*Continues on next page*

## 4 Repair


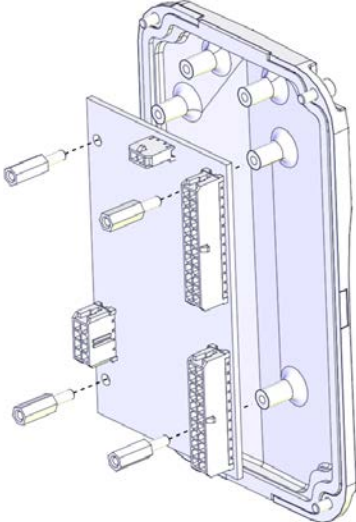
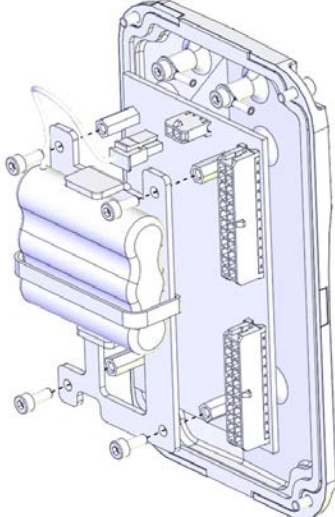
### 4.3.4 Replacing the EIB/SMB unit

*Continued*

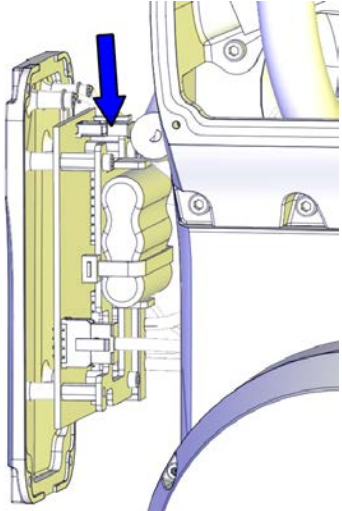

#### Refitting the EIB/SMB unit

Use these procedures to refit the EIB/SMB unit.


#### Refitting the EIB unit (IRB 1200 no type specified and IRB 1200 Type A)

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>ELECTROSTATIC DISCHARGE (ESD)</b><br>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 60</i> |   |
| 2 | Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>   |   |
| 3 | Refit the EIB unit with the distance screws.  | <br>xx1300002573                                |
| 4 | Refit the battery pack plate with the screws.   | Tightening torque: 1.5 Nm.<br><br>xx1300002572 |

*Continues on next page*

|   | Action  | Note  |
|---|---|---|
| 5 | Reconnect the battery cable.  |  <p>xx1300002571</p> |
| 6 | Seal and paint the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>  |   |
|   |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |   |

#### Refitting the SMB unit (IRB 1200 Type B)

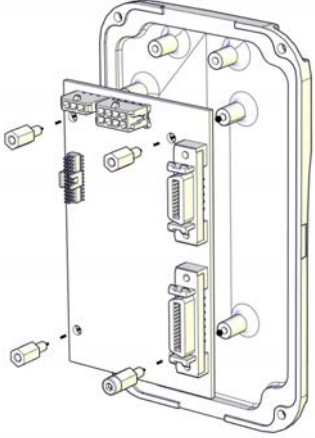
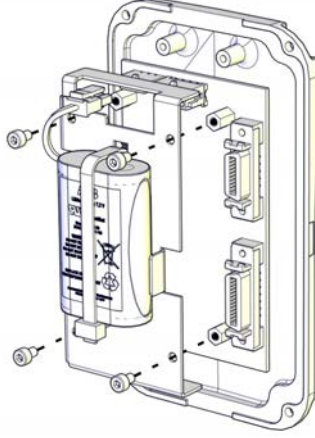
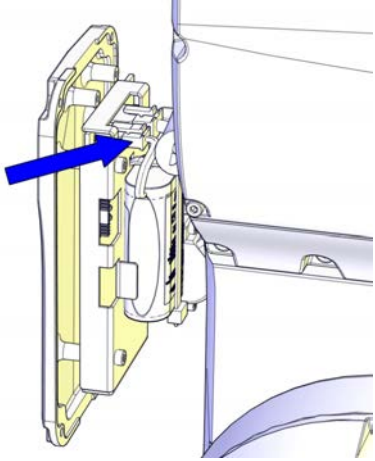
|   | Action  | Note |
|---|---|------|
| 1 |  <b>ELECTROSTATIC DISCHARGE (ESD)</b><br>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 60</i> |      |
| 2 | Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>   |      |



## 4 Repair


### 4.3.4 Replacing the EIB/SMB unit

Continued


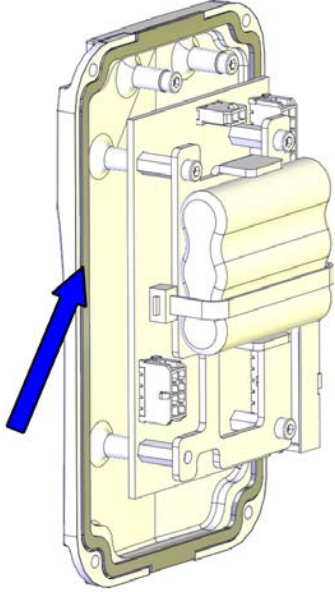
|   | Action  | Note  |
|---|---|---|
| 3 | Refit the SMB unit with the distance screws.  |  <p>xx170000009</p>                                    |
| 4 | Refit the battery pack plate with the screws. | <p>Tightening torque: 1.5 Nm.</p>  <p>xx170000008</p> |
| 5 | Reconnect the battery cable.                  |  <p>xx170000006</p>                                  |

Continues on next page



|   | Action   | Note |
|---|--|------|
| 6 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |      |

Connecting the cabling in the lower arm


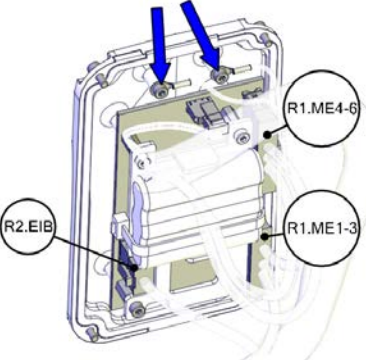

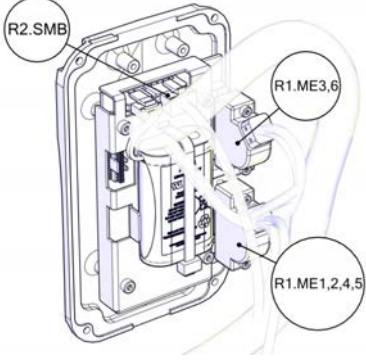
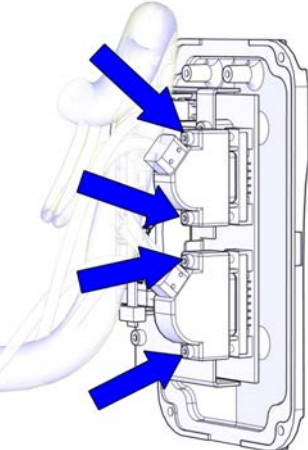
|   | Action   | Note   |
|---|--|--|
| 1 | <p> <b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a></p>                      |  |
| 2 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>  |  |
| 3 | <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p><b>For robots with protection type Clean Room</b></p> <p><b>For robots with food grade lubrication</b></p> <p>Check the EIB/SMB cover gasket.<br/>Replace if damaged.</p> | <p>Gasket on EIB/SMB cover:<br/>3HAC056728-001</p>  <p>xx1400000475</p> |

Continues on next page

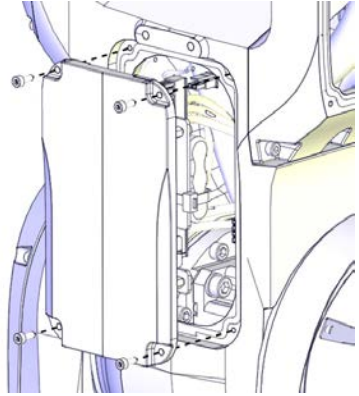

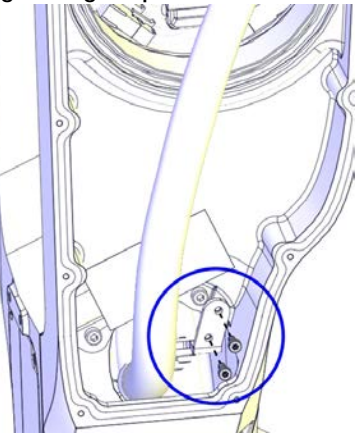

## 4 Repair

### 4.3.4 Replacing the EIB/SMB unit

Continued

|   | Action  | Note   |
|---|---|--|
| 4 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p> |   |
| 5 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>   | <p>xx1300002428</p>  |
| 6 | <p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>                             |  <p>xx1700000005</p>                                   |
| 7 | <p>Valid for IRB 1200 Type B</p> <p>Tighten the connector screws.</p>   | <p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p> |

Continues on next page

|    | Action  | Note  |
|----|---|---|
| 8  | Refit the EIB/SMB cover to the lower arm with the attachment screws.  | Screws: 3HAB3409-207 (M3x8).<br>Tightening torque: 1.5 Nm<br><br>xx1300002427<br> <b>Note</b><br>Only use specified screws, never replace them with other screws. |
| 9  | Refit the fix sheet attachment screws in the lower arm.   | Tightening torque: 1.5 Nm.<br><br>xx1300002426   |
| 10 | Seal and paint the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |   |

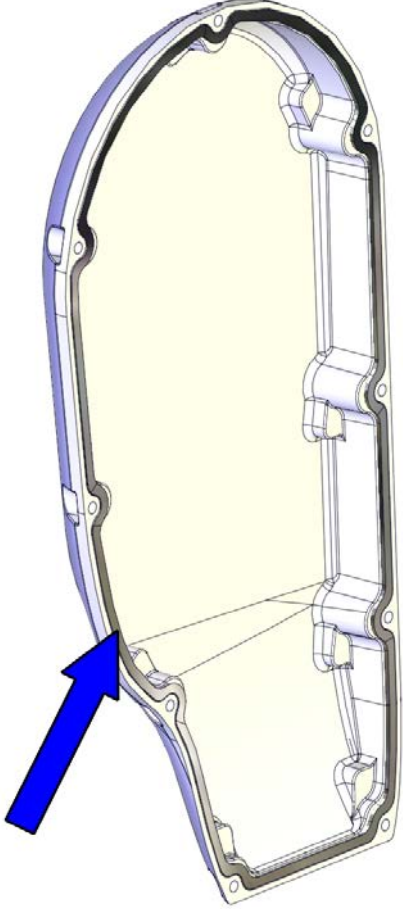
*Continues on next page*

## 4 Repair

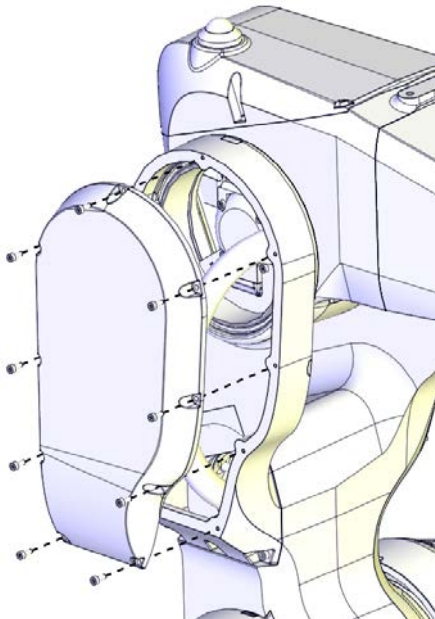




### 4.3.4 Replacing the EIB/SMB unit

*Continued*

Concluding procedure

|   | Action   | Note  |
|---|--|---|
| 1 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket of the cable housing cover.</p> <p>Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001</p>  <p>xx140000048</p> |
| 2 | <p>Check the PTFE film on the cable housing cover.</p> <p>Replace if damaged.</p>  | <p>PTFE film on cable housing cover:<br/>3HAC044660-001</p>   |
| 3 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>   |   |

*Continues on next page*

|   | Action   | Note  |
|---|--|---|
| 4 | <p>Refit the cable housing cover.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p><b>For robots with protection type Clean Room</b></p> <p><b>For robots with food grade lubrication</b></p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Update the revolution counters.</p>   | <p>See <a href="#">Updating revolution counters on page 736</a>.</p>  |
| 6 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |   |
| 7 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |   |

## 4 Repair

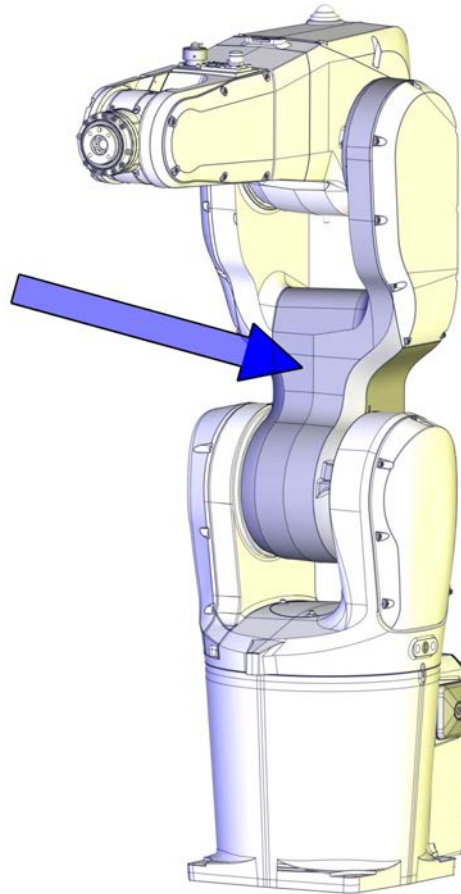
### 4.4.1 Replacing the lower arm

## 4.4 Upper and lower arms

### 4.4.1 Replacing the lower arm

#### Location of the lower arm

The lower arm is located as shown in the figure.



xx140000423

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                  | Article number | Note                |
|-----------------------------|----------------|---------------------|
| Lower arm (IRB 1200-7/0.7 ) | 3HAC059687-001 | Includes guide pin. |

*Continues on next page*

## 4.4.1 Replacing the lower arm

*Continued*

| Spare part   | Article number | Note   |
|--|----------------|--|
| Lower arm, Clean Room (IRB 1200-7/0.7 )<br>Lower arm, food grade lubrication (IRB 1200-7/0.7 )       | 3HAC059704-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Includes guide pin. |
| Lower arm (IRB 1200-5/0.9 )  | 3HAC059688-001 | Includes guide pin.  |
| Lower arm, Clean Room (IRB 1200-5/0.9 )<br>Lower arm, food grade lubrication (IRB 1200-5/0.9 )       | 3HAC059705-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Includes guide pin. |
| M2 variseal sealing  | 3HAC044641-005 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.           |
| Cable housing of the lower arm   | 3HAC059690-001 | Replace if damaged.  |
| Cable housing of the lower arm, Clean Room<br>Cable housing of the lower arm, food grade lubrication | 3HAC056135-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on lower arm cable housing  | 3HAC044895-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| M2 variseal sealing  | 3HAC044641-006 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.           |
| Radial sealing   | 3HAC024865-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Axis-2 sealing ring  | 3HAC044677-001 | Replace if damaged.  |
| Gasket of axis-2 sealing ring  | 3HAC045688-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket of plastic plate  | 3HAC044894-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Lower arm cover  | 3HAC059689-001 | Replace if damaged.  |
| Lower arm cover, Clean Room<br>Lower arm cover, food grade lubrication                               | 3HAC056136-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on lower arm cover  | 3HAC056725-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Cable housing of the swing   | 3HAC059677-001 | Replace if damaged.  |

*Continues on next page*

## 4 Repair

### 4.4.1 Replacing the lower arm

*Continued*

| Spare part   | Article number | Note   |
|--|----------------|--|
| Cable housing of the swing, Clean Room<br>Cable housing of the swing, food grade lubrication             | 3HAC056213-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Cable housing cover of the swing   | 3HAC059678-001 | Replace if damaged.  |
| Cable housing cover of the swing, Clean Room<br>Cable housing cover of the swing, food grade lubrication | 3HAC056214-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on cable housing cover  | 3HAC056726-001 | Not used for robots with protection class IP40.<br>Replace if damaged.                                       |
| M2 variseal sealing  | 3HAC044641-003 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.           |
| M2 variseal sealing  | 3HAC044641-004 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.           |
| Radial sealing with dust lip   | 3HAB3701-41    | Not used with protection class IP40.<br>Replace if damaged.  |
| O-ring   | 3HAC048939-001 | Replace if damaged.  |
| Swing cover  | 3HAC059676-001 | Replace if damaged.  |
| Swing cover, Clean Room<br>Swing cover, food grade lubrication   | 3HAC056215-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on swing cover  | 3HAC056727-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Cable harness material set   | 3HAC049663-001 | Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular. |
| Housing small cover  | 3HAC059684-001 | Replace if damaged.  |
| Housing small cover, Clean Room<br>Housing small cover, food grade lubrication                           | 3HAC056142-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on cable housing cover  | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.  |

*Continues on next page*



| Spare part                             | Article number | Note  |
|--|----------------|---|
| PTFE film on cable housing cover       | 3HAC044660-001 | Replace if damaged.   |
| Gasket for tubular cover               | 3HAC058822-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Gasket for tubular cable housing cover | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Housing cover gasket (IRB 1200-7/0.7 ) | 3HAC056698-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Housing cover gasket (IRB 1200-5/0.9 ) | 3HAC056697-001 | Not used with protection class IP40.<br>Replace if damaged. |

## Required consumables

| Consumable     | Art. no.       | Note  |
|----------------|----------------|---|
| Cable straps   | -              |   |
| Cleaning agent | -              | Loctite 7063  |
| Locking liquid | 3HAB7116-1     | Loctite 243   |
| Flange sealing | 12340011-116   | Loctite 574   |
| Grease         | 3HAC042536-001 | Used for lubrication of cable contact areas.  |
| Grease         | 3HAC029132-001 | Used for lubrication of cable contact areas for robots with food grade lubrication. |
| Sealant        | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room                        |

## Required tools and equipment

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Guide pin for axis-2 gear unit          | 3HAC049704-001 | Always use three guide pins together!  |
| Guide pin for upper arm                 | 3HAC049705-001 | Always use three guide pins together!  |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |

<sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

Continues on next page


## 4 Repair

### 4.4.1 Replacing the lower arm

*Continued*

#### Deciding calibration routine

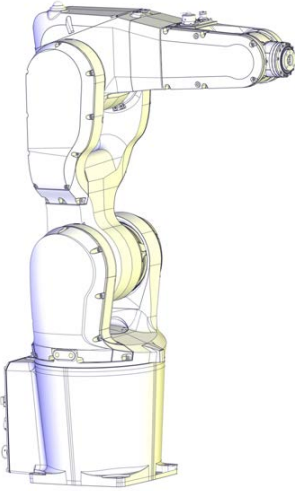
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  | <p> <b>Note</b></p> <p>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.</p>                   |
|   | <p><b>If the robot is to be calibrated with reference calibration:</b></p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |
|   | <p><b>If the robot is to be calibrated with fine calibration:</b></p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>  |   |


#### Removing the lower arm

Use this procedure to remove the lower arm.





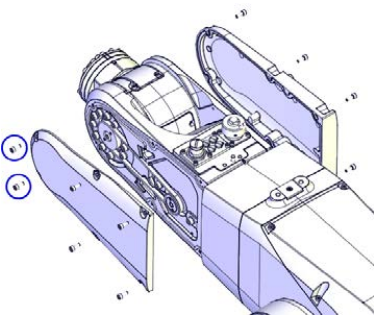
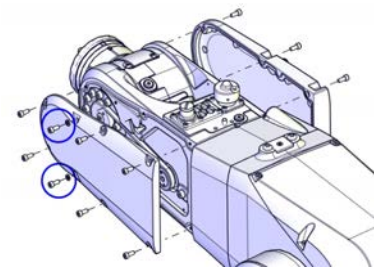
#### Preparations before removing the lower arm

|   | Action   | Note   |
|---|--|--|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure. |  |
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |

*Continues on next page*

|   | Action   | Note |
|---|--|------|
| 3 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |      |

### Getting access to inside of the wrist unit

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .  |   |
| 3 | <p>Remove the covers on each side of the wrist by removing their screws.</p> <p> <b>Note</b></p> <p><b>For robots with protection class IP67 (option 287-10)</b><br/> <b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.</p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> <p> <b>Note</b></p> <p><b>For robots with protection type Clean Room</b></p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |




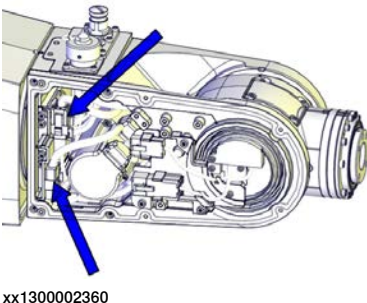
Continues on next page

## 4 Repair



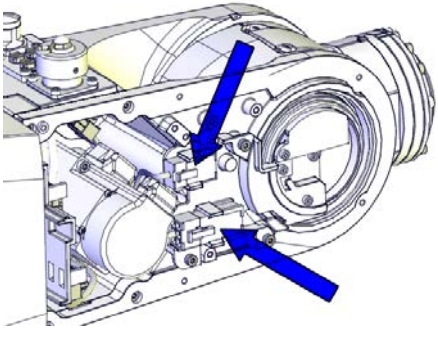
### 4.4.1 Replacing the lower arm

Continued

#### Disconnecting the axis-5 motor connectors



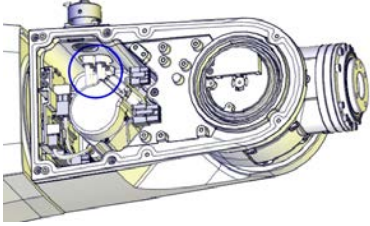
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 | Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul>  <b>Tip</b><br>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002360 |

#### Disconnecting the axis-5 FPC connectors



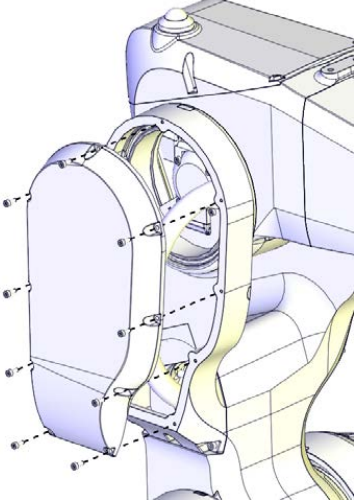
|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 | Snap loose and disconnect the axis-5 FPC connectors.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002390 |

Continues on next page

Disconnecting the air hoses

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |  |
| 2 | Disconnect the air hoses.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx140000738 |

Disconnecting the axis-4 FPC connectors

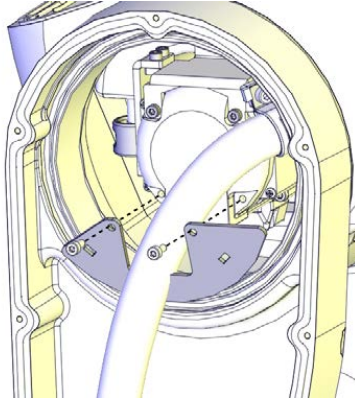
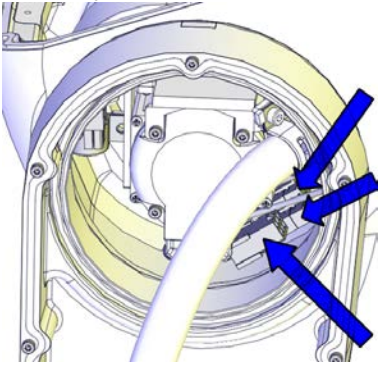
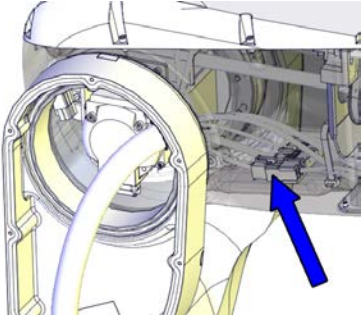
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Remove the cable housing cover.   | <br>xx1300002400 |

Continues on next page

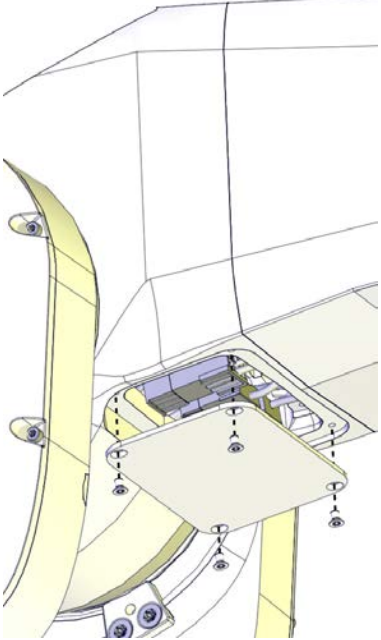
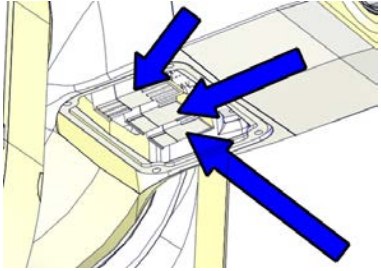
## 4 Repair

### 4.4.1 Replacing the lower arm



*Continued*

|   | Action  | Note  |
|---|---|---|
| 4 | Remove the plate.   | <br>xx1300002413   |
| 5 | Pull out the FPC connectors from the housing and disconnect them. | <p>Cable layout in IRB 1200-7/0.7 :</p> <br>xx1300002412<br><p>Cable layout in IRB 1200-5/0.9 :</p> <br>xx1400001471 |

*Continues on next page*

|   | Action                                   | Note  |
|---|--|---|
| 6 | Remove the small cover of the housing.   |  <p>xx1300002398</p>   |
| 7 | Disconnect the remaining FPC connectors. |  <p>xx1300002399</p> |

Disconnecting the axis-4 motor connectors

|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |


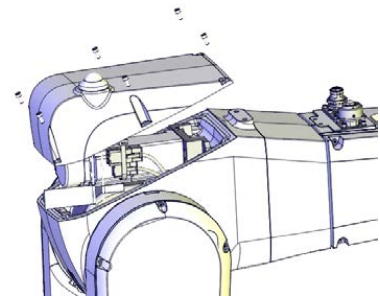
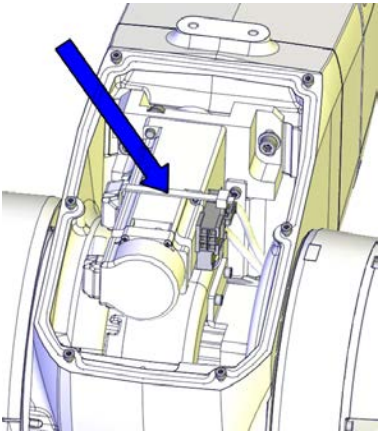

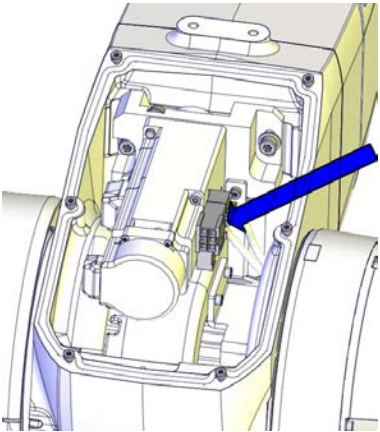
Continues on next page




## 4 Repair

### 4.4.1 Replacing the lower arm

Continued


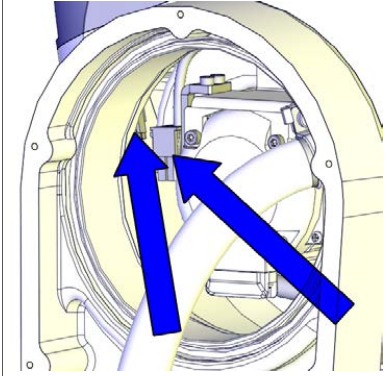
|   | Action  | Note  |
|---|---|---|
| 3 | <p>Remove the cover from the upper arm housing.</p> <p> <b>CAUTION</b></p> <p><b>For robots with safety lamp (option)</b><br/>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p> |  <p>xx1300000456</p>   |
| 4 | <p>Cut the strap that holds the connectors.</p>   |  <p>xx1300002494</p>  |
| 5 | <p>Disconnect the motor connectors.</p> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>   |  <p>xx1300002495</p> |

#### Disconnecting the axis-3 motor connectors



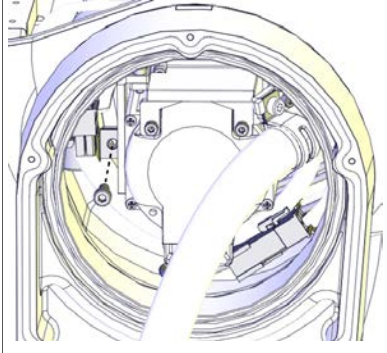
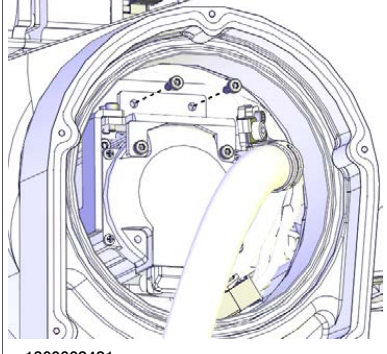
|   | Action   | Note |
|---|--|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |      |

Continues on next page



|   | Action   | Note  |
|---|--|---|
| 2 | <p>Pull out the axis-3 motor connectors from the housing and disconnect them.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>.</p> |  <p>xx1300002420</p> |

#### Removing the cable package in the housing

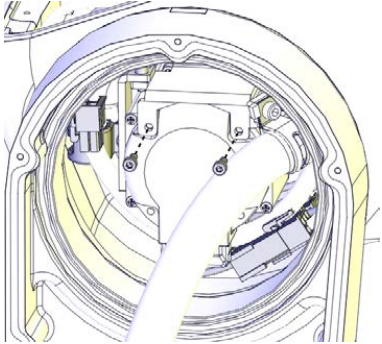

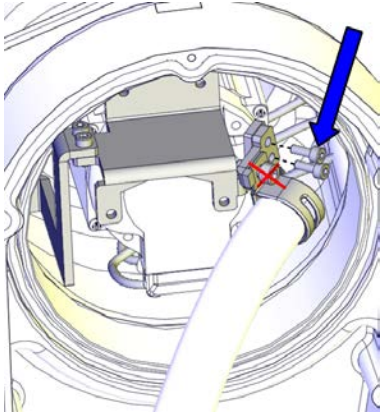
|   | Action   | Note  |
|---|--|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p>Remove the screw that fastens the air hose holder.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>.</p> |  <p>xx1300002422</p> |
| 3 | <p>Remove the screws that fasten the fix sheet to the inner plastic guide.</p>   |  <p>xx1300002421</p> |

*Continues on next page*




## 4 Repair

### 4.4.1 Replacing the lower arm



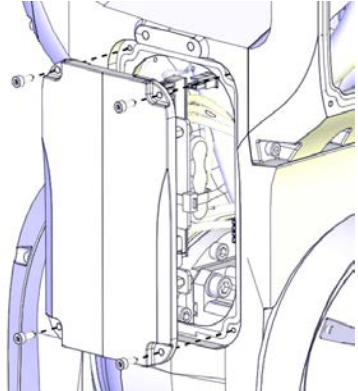
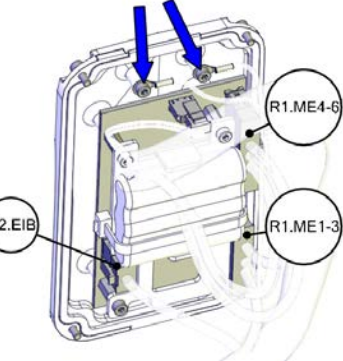
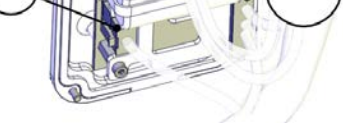
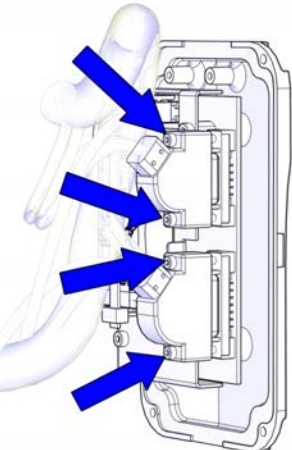
Continued

|   | Action  | Note   |
|---|---|--|
| 4 | Remove the screws that fasten the fix sheet to the motor.   | <br>xx1300002423  |
| 5 | Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet.<br>Loosen the bracket from the sheet by removing the two screws.<br><br> <b>CAUTION</b><br><br>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. | <br>xx1300002424 |
| 6 | <b>Valid for IRB 1200-5/0.9</b><br>Cut the cable straps at the bottom of the housing.   |  |

### Disconnecting the cabling in the lower arm

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>ELECTROSTATIC DISCHARGE (ESD)</b><br><br>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 60</i> |      |
| 3 |  <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> .    |      |

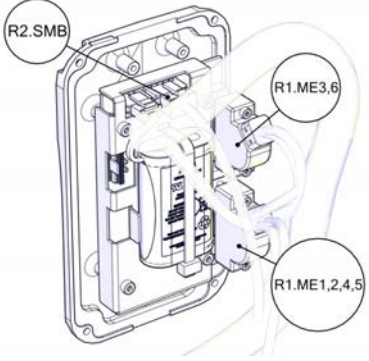
Continues on next page

|   | Action  | Note  |
|---|---|---|
| 4 | <p>Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.</p> <p> <b>CAUTION</b></p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p> <p> <b>CAUTION</b></p> <p>Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.</p> |  <p>xx1300002427</p>   |
| 5 | <p><b>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</b></p> <p>Disconnect the connectors on the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p>Remove the EIB/SMB cover completely from the lower arm.</p>  |  <p>xx1300002428</p>  |
| 6 | <p><b>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</b></p> <p>Disconnect the lugs on the EIB/SMB cover.</p>   |  <p>xx1300002428</p> |
| 7 | <p><b>Valid for IRB 1200 Type B</b></p> <p>Loose the connector screws.</p>  |  <p>xx1700000004</p> |



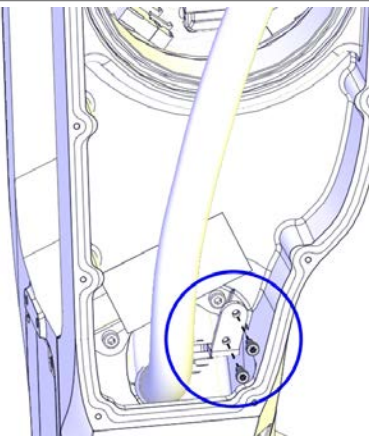
## 4 Repair

### 4.4.1 Replacing the lower arm


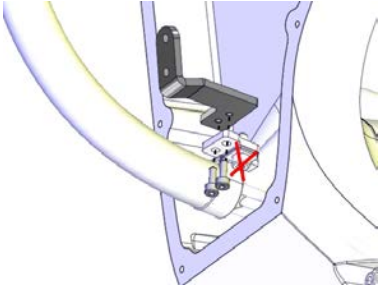
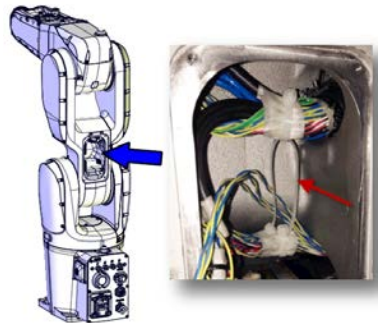
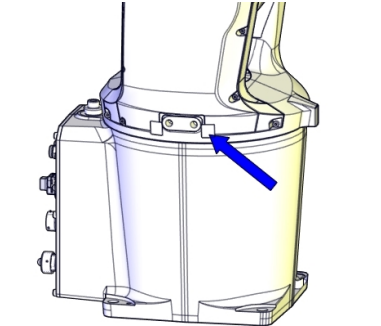
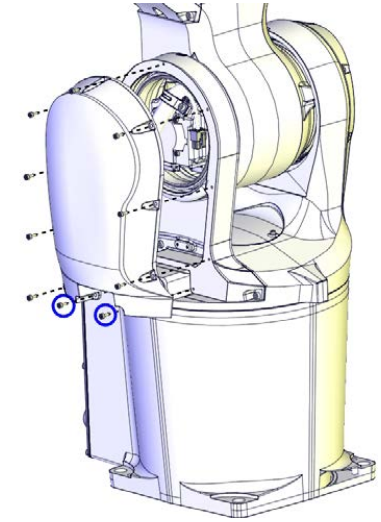
Continued

|   | Action  | Note   |
|---|---|--|
| 8 | <p><b>Valid for IRB 1200 Type B</b></p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p>Remove the EIB/SMB cover completely from the lower arm.</p> |  <p>xx170000005</p> |

### Removing the cable package in the lower arm

|   | Action  | Note  |
|---|---|---|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |   |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | <p>Pull the cable package out from the upper arm housing.</p>   |   |
| 4 | <p>Remove the fix sheet attachment screws in the lower arm.</p>   |  <p>xx1300002426</p> |

Continues on next page

|   | Action   | Note  |
|---|--|---|
| 5 | <p>Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p> |  <p>xx1300002430</p>   |
| 6 | <p>Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.</p>  |  <p>xx1400001130</p>   |
| 7 | <p>For robots with protection type Clean Room</p> <p>Remove the swing sealing plug.</p> <p>Follow the procedure specified in <a href="#">Removing the swing sealing plug on page 143</a>.</p>  |  <p>xx1600000205</p> |
| 8 | <p>Remove the swing cable housing cover by removing the screws.</p>  |  <p>xx1300002431</p> |

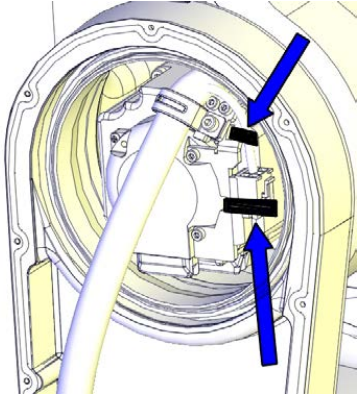
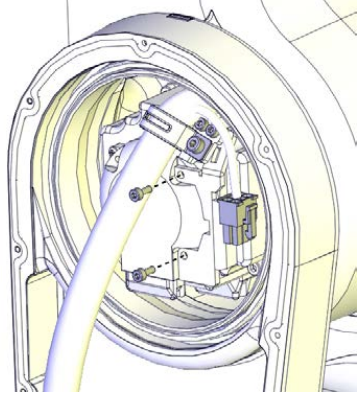

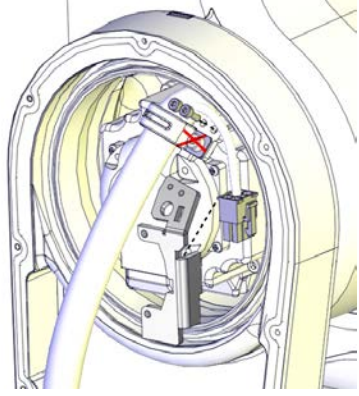
*Continues on next page*



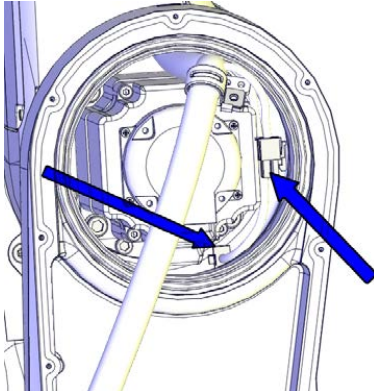
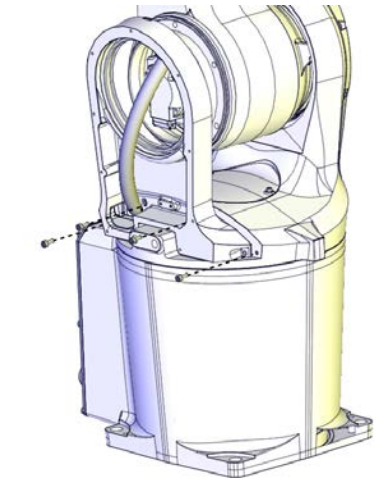
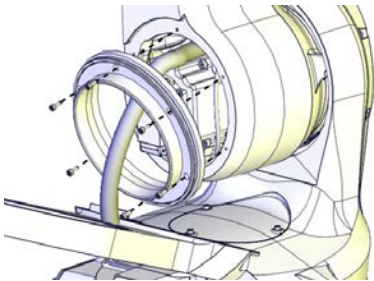

## 4 Repair

### 4.4.1 Replacing the lower arm

Continued

|    | Action  | Note  |
|----|---|---|
| 9  | Cut the cable straps.   | <br>xx1400001528   |
| 10 | Remove the axis-2 motor bracket screws.   | <br>xx1300002432  |
| 11 | <p>Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p> | <br>xx1300002433 |

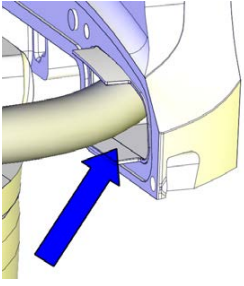
Continues on next page

|    | Action  | Note  |
|----|---|---|
| 12 | Disconnect the motor connectors. <ul style="list-style-type: none"> <li>• R2.ME2</li> <li>• R2.MP2</li> </ul>   |  <p>xx1300002434</p>   |
| 13 | Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.  |  <p>xx1300002435</p>  |
| 14 | Remove the axis-2 sealing ring by removing the screws.  |  <p>xx1400000020</p> |
| 15 | Pull out the cable package from the lower arm.<br> <b>Tip</b><br>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand. |   |



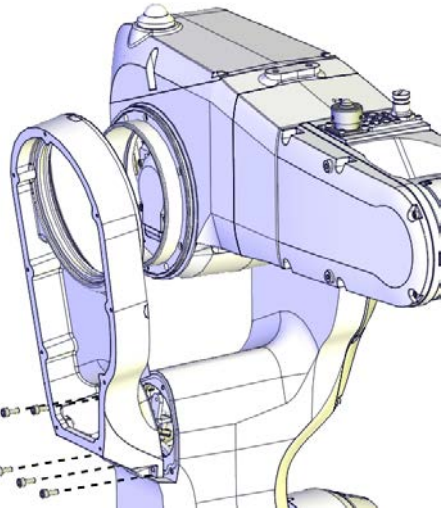
## 4 Repair

### 4.4.1 Replacing the lower arm

*Continued*

|    | Action  | Note   |
|----|---|--|
| 16 | Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package . |  <p>xx140000023</p> |



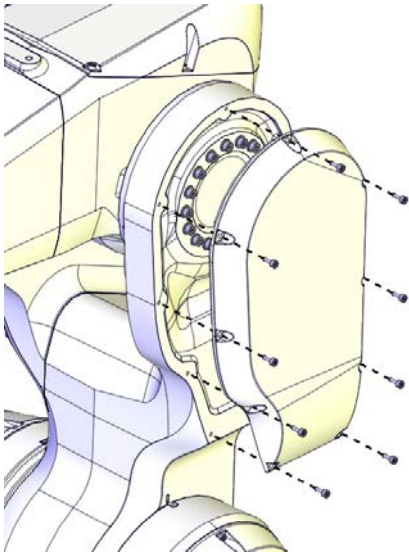

### Removing the lower arm cable housing

|   | Action   | Note  |
|---|--|---|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | Remove the cable housing of the lower arm by removing the screws.  |  <p>xx130002529</p> |

*Continues on next page*



#### Removing the upper arm


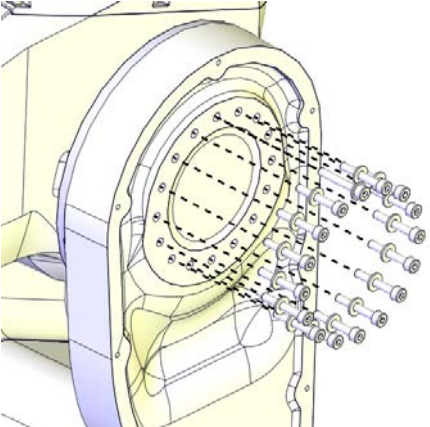
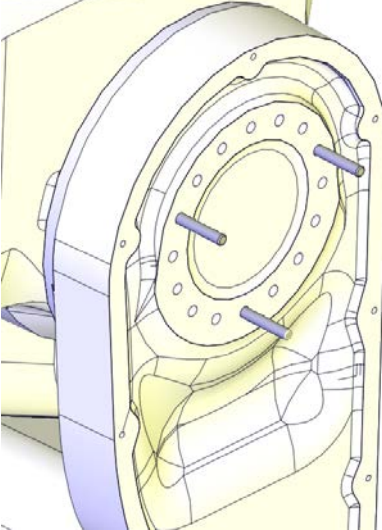
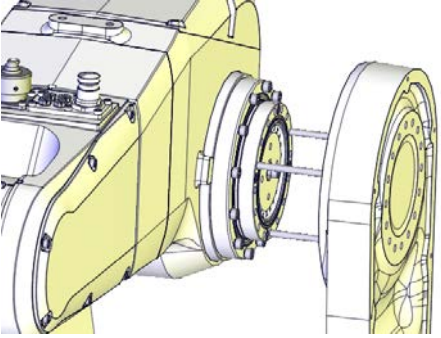
|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 3 | Remove the lower arm cover.   | <br><small>xx1300002528</small> |
| 4 |  <b>CAUTION</b><br>The upper arm weighs 17 kg. All lifting accessories used must be sized accordingly!   |  |
| 5 | Fit lifting slings to the upper arm to support the weight of the arm. (no force)  |  |

*Continues on next page*

## 4 Repair



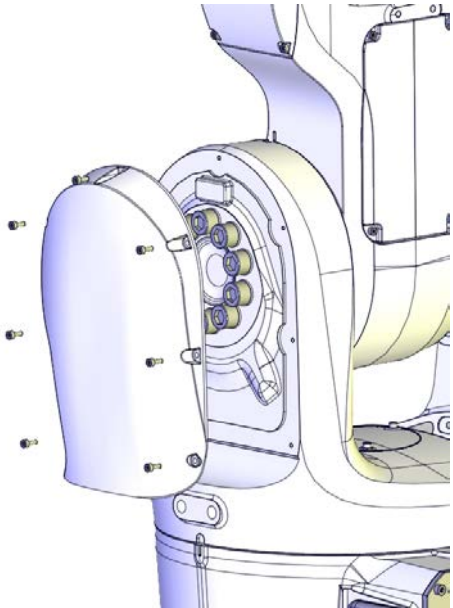

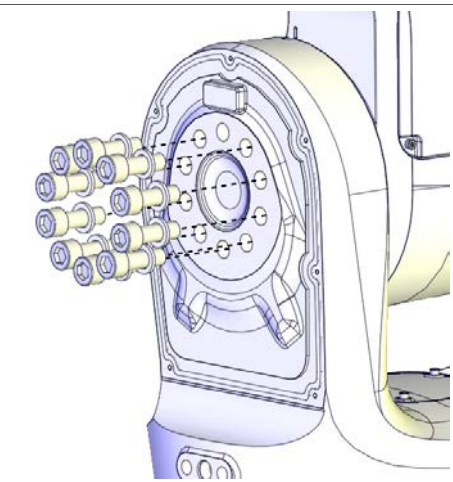
### 4.4.1 Replacing the lower arm

Continued

|   | Action  | Note   |
|---|---|--|
| 6 | <p>Remove the upper arm screws.</p> <p> <b>WARNING</b></p> <p>This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured by the lifting slings.</p> |  <p>xx1300002531</p>   |
| 7 | <p>Fit guide pins to the upper arm.</p>   | <p>Guide pin for upper arm: 3HAC049705-001<br/>Always use three guide pins together!</p>  <p>xx1400000771</p> |
| 8 | <p>Separate the upper and lower arm with guidance from the guide pins.</p>  |  <p>xx1300002533</p>   |

Continues on next page

Removing the lower arm

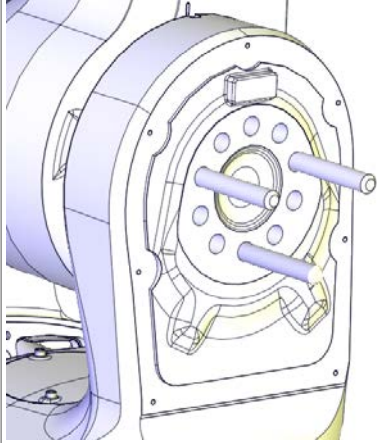

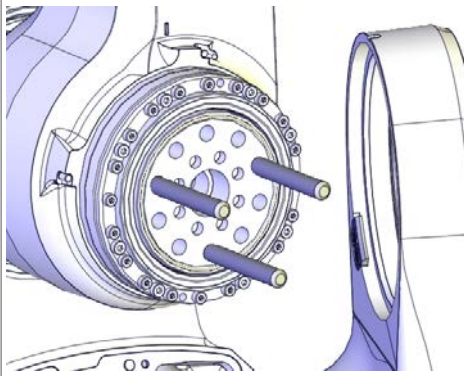
|   | Action  | Note   |
|---|---|--|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |  |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>   |  |
| 3 | <p>Remove the swing cover.</p>  |  <p>xx1300002551</p>  |
| 4 | <p>Remove the lower arm screws and washers.</p> <p> <b>WARNING</b></p> <p>This releases the lower arm from the swing. Make sure the weight of the arm is properly secured.</p> <p>The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.</p> |  <p>xx1300002552</p> |

Continues on next page



## 4 Repair

### 4.4.1 Replacing the lower arm


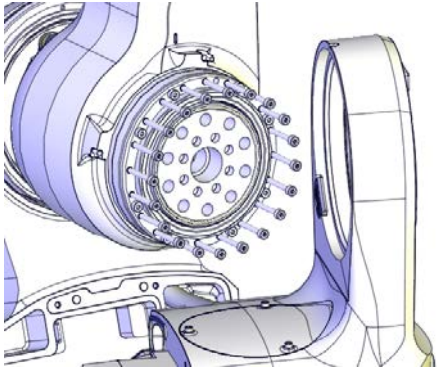

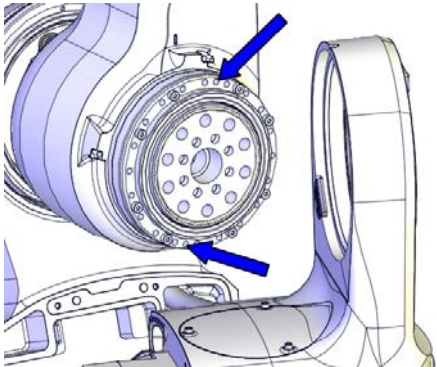
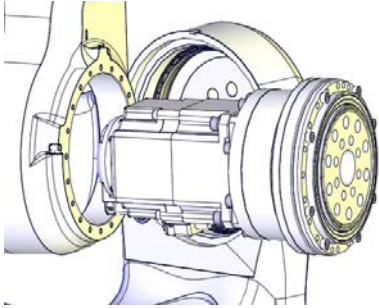
Continued

|   | Action  | Note  |
|---|---|---|
| 5 | Fit guide pins to the gearbox.  | <p>Guide pin for axis-2 gear unit:<br/>3HAC049704-001</p> <p>Always use three guide pins together!</p>  <p>xx1300002563</p> |
| 6 | <p>Separate the lower arm from the swing.</p> <p> <b>Tip</b></p> <p>If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.</p> |  <p>xx1300002553</p>   |

### Removing the axis-2 drive unit

|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

|   | Action  | Note   |
|---|---|--|
| 3 | <p> <b>CAUTION</b></p> <p>The lower and upper arms together weigh 30 kg.<br/>All lifting accessories used must be sized accordingly!</p>   |  |
| 4 | <p>If there is enough space on the site, lay down the lower arm on a workbench. Make sure to support the gravity center of the lower arm.</p> <p>If the site is cramped, the procedure can be performed having the lower arm hanging in the lifting slings.</p> <p>If removing the axis-2 drive unit from a hanging lower arm, it is best performed by two persons working together:</p> <ul style="list-style-type: none"> <li>• Person 1: Hold the lower arm still.</li> <li>• Person 2: Remove the drive unit screws according to step below.</li> </ul> |  <p>xx1300002554</p>   |
| 5 | <p>Remove the grey screws from the drive unit.</p> <p> <b>WARNING</b></p> <p>Keep the eight black screws fitted. They hold the gearbox together. Removing them can damage the gearbox severely.</p>  |  |
| 6 | <p>Insert two M4 screws to the press out holes and press out the drive unit.</p>  |  <p>xx140000008</p>  |
| 7 | <p>Carefully pull out the complete drive unit.</p>  |  <p>xx1300002555</p> |

*Continues on next page*

## 4 Repair


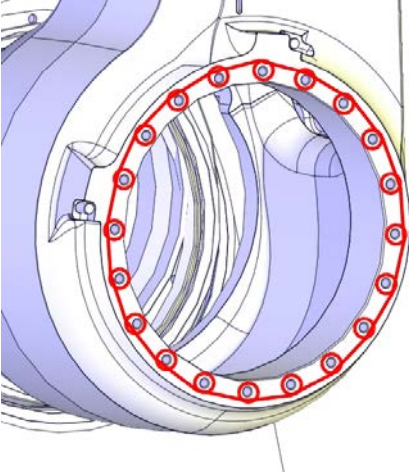
### 4.4.1 Replacing the lower arm

*Continued*

#### Refitting the lower arm


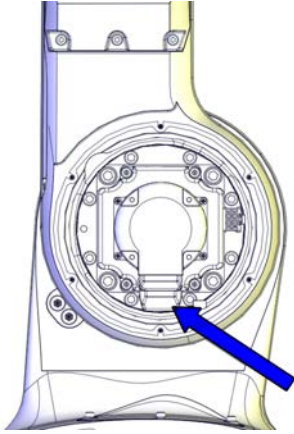
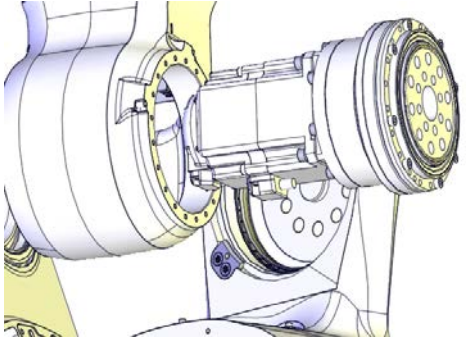
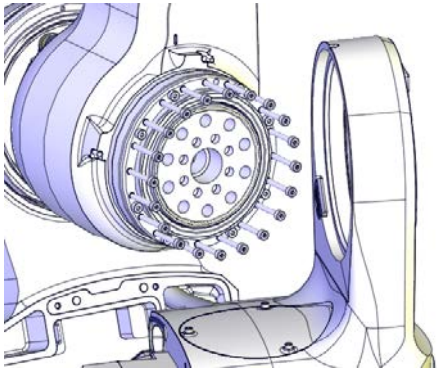

Use these procedures to refit the lower arm.

#### Refitting the axis-2 drive unit

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Check if there is a sufficient amount of grease on the gear. Apply more grease, if needed.  | Harmonic grease 4B No. 2: 3HAC037302-001.<br>LUBRIPLATE SYNXTREME FG-0: 3HAC043771-001 (for robots with food grade lubrication). |
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br/>Apply flange sealing Loctite 574 on the mounting surfaces of the lower arm.</p> <p> <b>Note</b><br/>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1400000006</p>                          |

*Continues on next page*




|   | Action   | Note   |
|---|--|--|
| 4 | <p>Carefully insert the complete drive unit.</p> <p> <b>Note</b></p> <p>Pay attention to the relative position between the motor connector block and the lower arm, so that the drive unit is positioned correctly inside the lower arm.</p>  <p>xx1400000795</p> <p>The figure shows the position of the motor connector block when axis 2 is in position 0°.</p> |  <p>xx1300002580</p>   |
| 5 | <p>If the gear is refitted in a hanging lower arm, this step requires two persons.</p> <ul style="list-style-type: none"> <li>• Person 1: Hold the lower arm still.</li> <li>• Person 2: Refit the drive unit screws.</li> </ul> <p>Secure the screws but do not tighten yet.</p>  | <p>Screws: 3HAB3409-239 ( M4x35).</p>  <p>xx1300002554</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 6 | <p>If the drive unit is refitted in a hanging lower arm, this step requires two persons.</p> <ul style="list-style-type: none"> <li>• Person 1: Hold the lower arm still.</li> <li>• Person 2: Tighten the screws.</li> </ul>  | <p>Tightening torque: 5 Nm</p>   |

Continues on next page

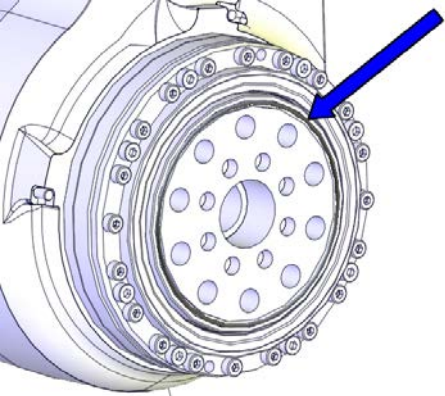

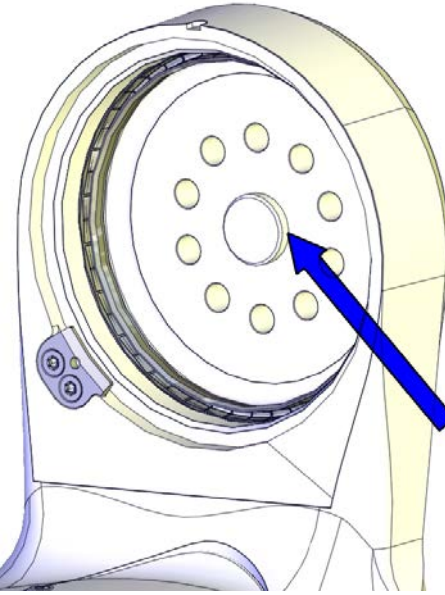
## 4 Repair

### 4.4.1 Replacing the lower arm

Continued

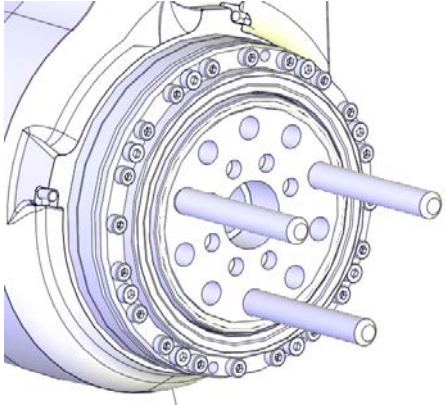

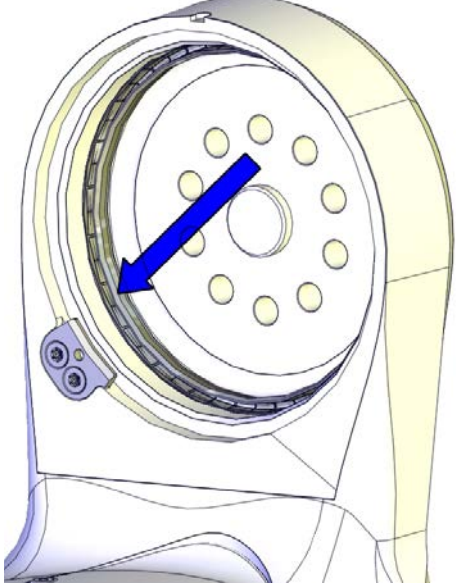
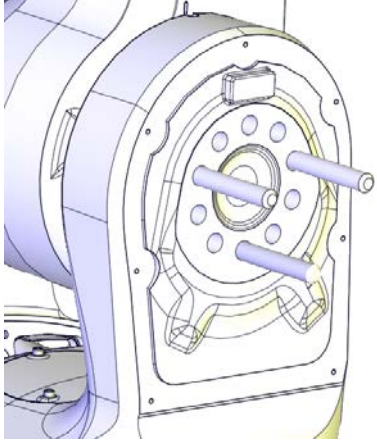
|   | Action   | Note |
|---|--|------|
| 7 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |      |
|   | <div style="display: inline-block; vertical-align: middle;">  </div> <div style="display: inline-block; vertical-align: middle;"> <b>Note</b> </div> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |      |

### Refitting the lower arm

|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |   |
| 2 | Check the o-ring.<br>Replace if damaged.  | <p>O-ring: 3HAC048939-001</p>  <p>xx1300002556</p> |
| 3 | Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 to the cylindrical surface in the swing. <div style="display: inline-block; vertical-align: middle;">  </div> <div style="display: inline-block; vertical-align: middle;"> <b>Note</b> </div> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1400001403</p>   |

Continues on next page



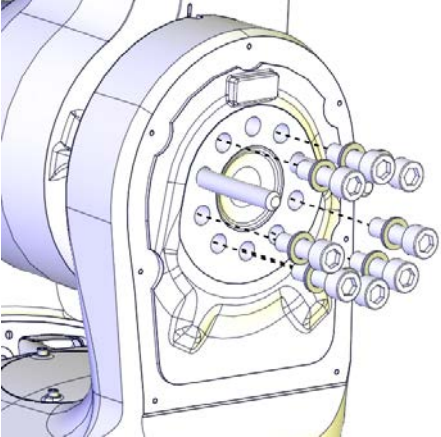

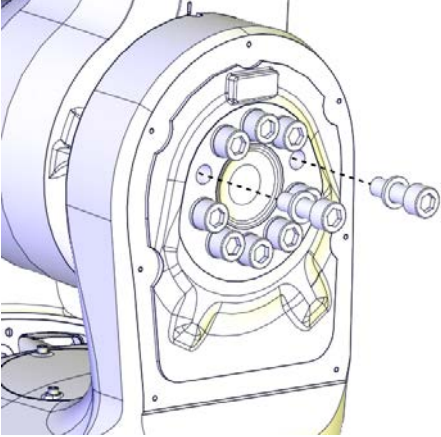
|   | Action  | Note  |
|---|---|---|
| 4 | Fit guide pins to the gearbox.  | <p>Guide pin for axis-2 gear unit:<br/>3HAC049704-001</p>  <p>xx1300002562</p> <p>Always use three guide pins together!</p> |
| 5 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-003</p>  <p>xx140000453</p>   |
| 6 | Fit the lower arm to the swing, with guidance from the guide pins.  |  <p>xx1300002563</p>  |

Continues on next page

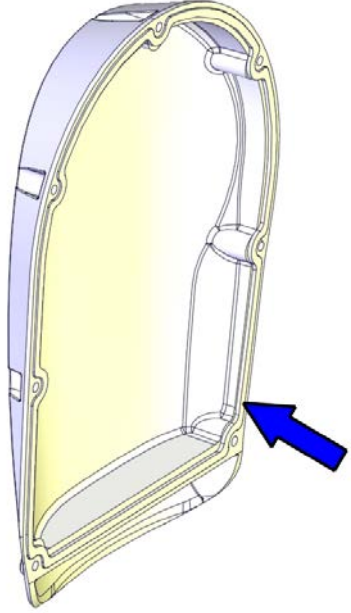
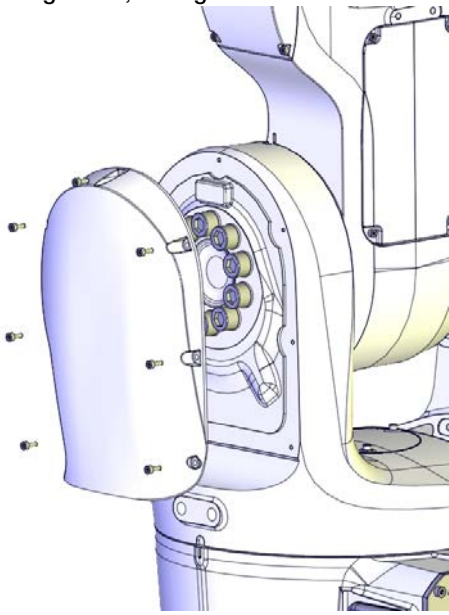
## 4 Repair

### 4.4.1 Replacing the lower arm

Continued

|   | Action  | Note  |
|---|---|---|
| 7 | Refit the lower arm screws and washers, using locking liquid Loctite 243. Secure the screws but do not tighten yet. | <p>Screws: 3HAB3409-51 (M10x30).</p>  <p>xx1300002564</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 8 | Remove the guide pins and refit the remaining screws and washers using locking liquid Loctite 243.                  |  <p>xx1300002565</p>  |
| 9 | Tighten all screws.   | Tightening torque: 45 Nm  |

Continues on next page

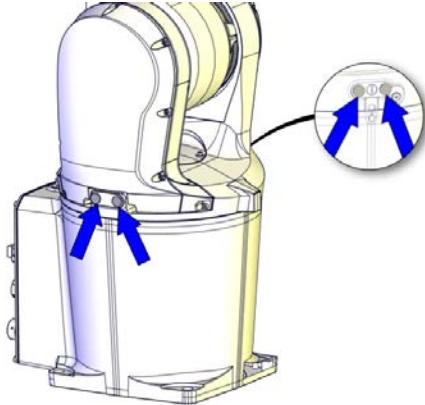
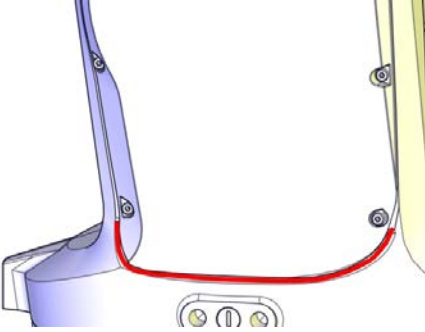
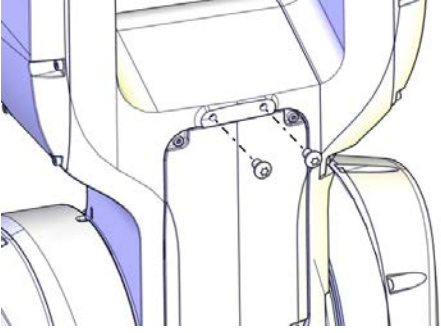

|    | Action  | Note   |
|----|---|--|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the swing cover gasket.<br/>                     Replace if damaged.</p> | <p>Gasket on swing cover: 3HAC056727-001</p>  <p>xx140000007</p>  |
| 11 | <p>Refit the swing cover.<br/>                     Replace if damaged.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>                     Tightening torque: 1.5 Nm.<br/>                     Swing cover: 3HAC059676-001<br/>                     : 3HAC056215-001 (used with protection type Clean Room)<br/>                     Swing cover, Clean Room<br/>                     Swing cover, food grade lubrication</p>  <p>xx1300002551</p> |

Continues on next page

## 4 Repair

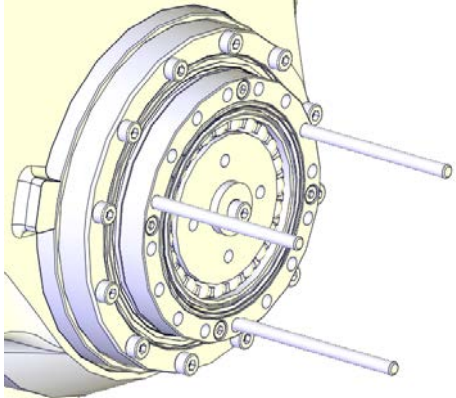

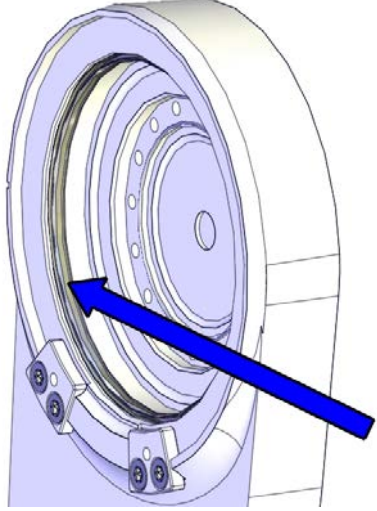
### 4.4.1 Replacing the lower arm

Continued

|    | Action   | Note   |
|----|--|--|
| 12 | <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Check the protection plugs for lifting holes. Replace if damaged.</p>  | <p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p> |
| 13 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the swing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>   |  <p>xx1600000217</p>  |
| 14 | <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>If required, fit two screws for protection.</p>  |  <p>xx1600001154</p>   |
| 15 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Continues on next page

Refitting the upper arm

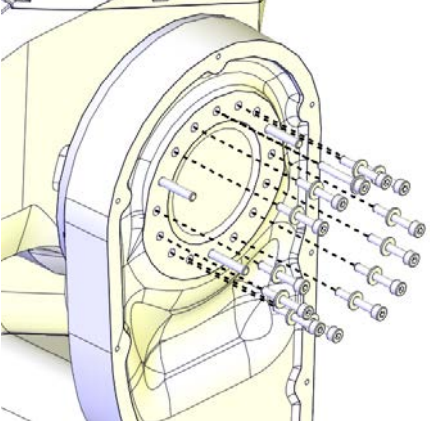

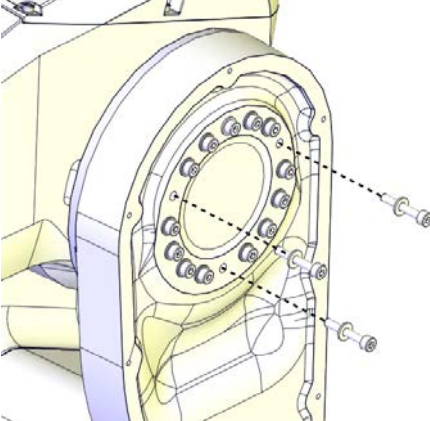
|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>  |  |
| 2 | Fit guide pins to the axis-3 gear unit.   | <p>Guide pin for upper arm: 3HAC049705-001<br/>Always use three guide pins together!</p>  <p>xx140000027</p> |
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-005</p>  <p>xx1400000474</p>   |

Continues on next page

## 4 Repair

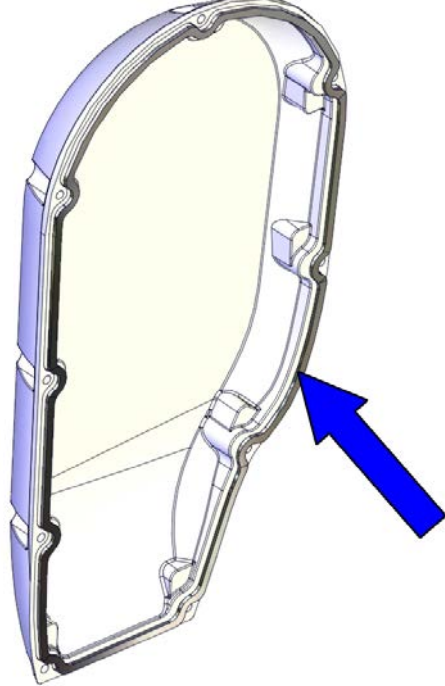
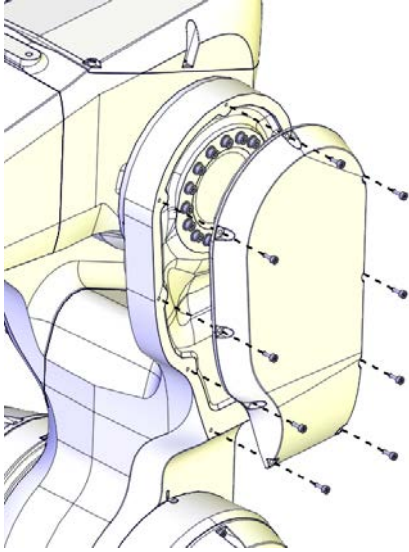

### 4.4.1 Replacing the lower arm

Continued

|   | Action   | Note  |
|---|--|---|
| 4 | Refit the upper arm to the lower arm and secure with the upper arm screws and washers. Do not tighten yet. | <p>Screws: 3HAB3409-213 (M4x25).</p>  <p>xx140000028</p> <p></p> <p><b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | Remove the guide pins and refit the remaining screws and washers.  |  <p>xx140000029</p>   |
| 6 | Tighten all screws.  | Tightening torque: 4.5 Nm.  |

Continues on next page



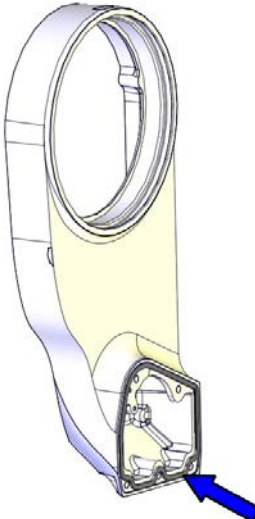



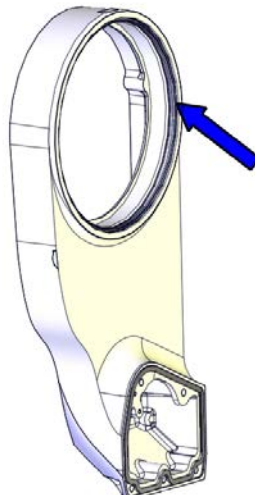
|   | Action   | Note  |
|---|--|---|
| 7 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the lower arm cover gasket. Replace if damaged.</p> | <p>Gasket on lower arm cover: 3HAC056725-001</p>  <p>xx140000047</p>   |
| 8 | <p>Refit the lower arm cover.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002528</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

Continues on next page

## 4 Repair

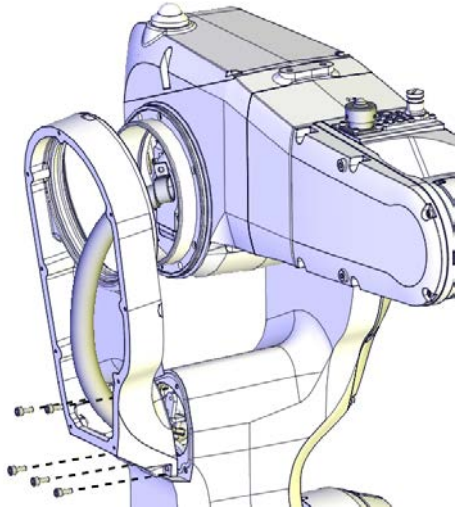

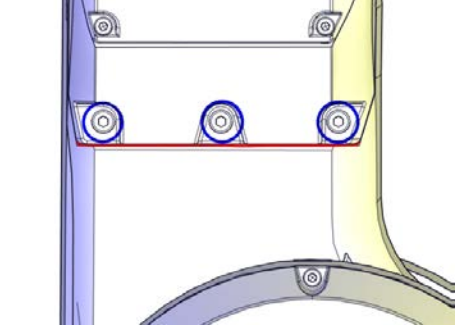
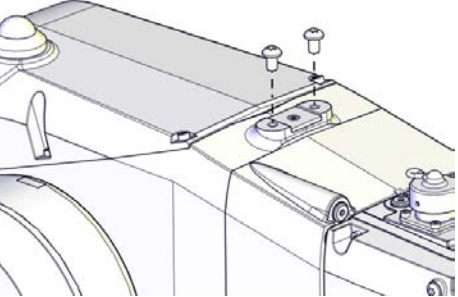

### 4.4.1 Replacing the lower arm

Continued

|    | Action   | Note  |
|----|--|---|
| 9  | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the cable housing gasket.<br/>Replace if damaged.</p>   | <p>Gasket on lower arm cable housing:<br/>3HAC044895-001</p>  <p>xx1400000414</p>  |
| 10 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the axis-3 radial sealing and the M2 variseal sealing in the cable housing.<br/>Replace if damaged.</p> <p> <b>Note</b></p> <p>The M2 variseal sealing does not used for robots with protection type Clean room and with food grade lubrication.</p> <p> <b>Note</b></p> <p>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-006<br/>Radial sealing: 3HAC024865-001</p>  <p>xx1400000473</p> <p>Replacement is detailed in <a href="#">Replacing the axis-3 radial sealing and sealing ring on page 373</a>.</p> |

Continues on next page



|    | Action  | Note  |
|----|---|---|
| 11 | Refit the cable housing of the lower arm.   | <p>Tightening torque: 3 Nm</p>  <p>xx1400000785</p> |
| 12 | <p><b>For robots with protection type Clean Room</b></p> <p>Apply a string of the sealant Sikaflex 521 FC to the joint of the cable housing of the lower arm.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> <p> <b>Note</b></p> <p>No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure.</p> |  <p>xx1600000218</p>                               |
| 13 | <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>If required, fit two screws for protection.</p>  |  <p>xx1600001155</p>                              |
| 14 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |   |

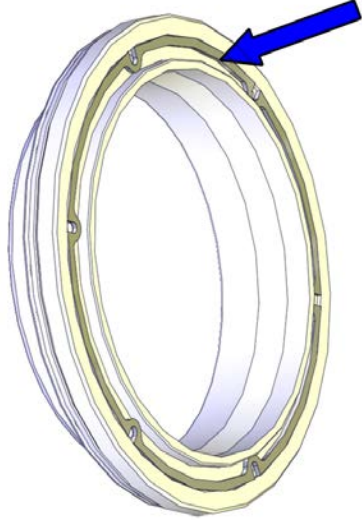
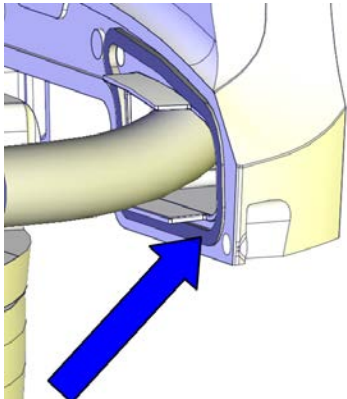
Continues on next page

## 4 Repair

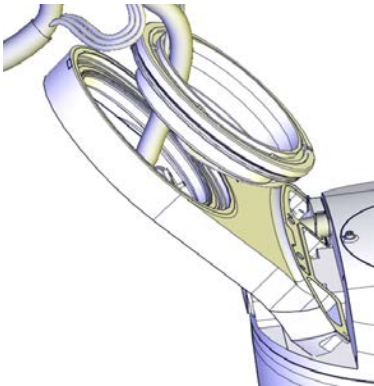
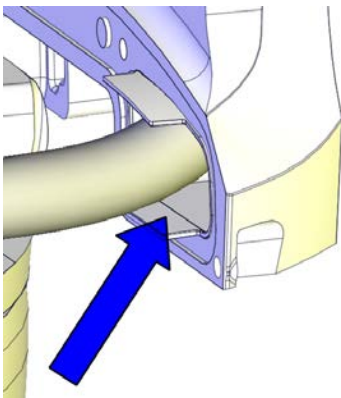
### 4.4.1 Replacing the lower arm

*Continued*

Refitting the cable package in the lower arm

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | <p>Check the axis-2 sealing ring.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p> | <p>Axis-2 sealing ring: 3HAC044677-001</p> <p>Gasket of axis-2 sealing ring: 3HAC045688-001</p>  <p>xx1400000476</p> |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket of the cable housing plastic plate.</p> <p>Replace if damaged.</p>    | <p>Gasket of plastic plate: 3HAC044894-001</p>  <p>xx1400000457</p>   |

*Continues on next page*


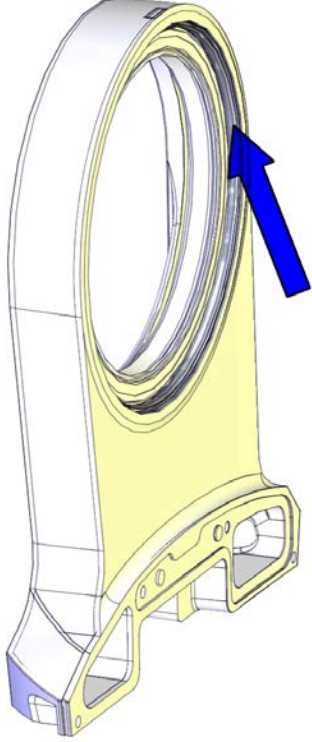
|   | Action   | Note   |
|---|--|--|
| 4 | Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them. |  <p>xx140000025</p>   |
| 5 | Fasten the plastic plate to the cable housing, if removed.<br>Replace if damaged.                              | <p>The plastic plate is included in:<br/>Cable harness material set:<br/>3HAC049663-001.</p>  <p>xx140000023</p> |

*Continues on next page*


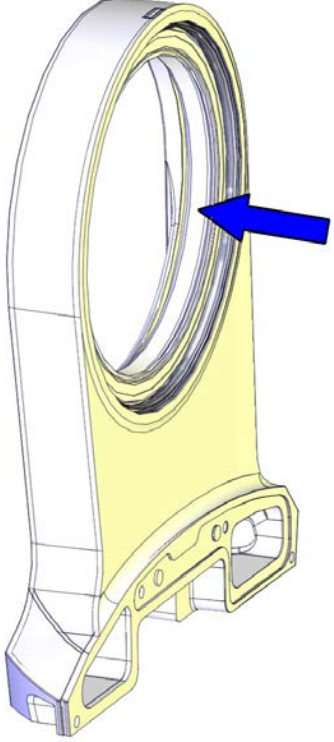

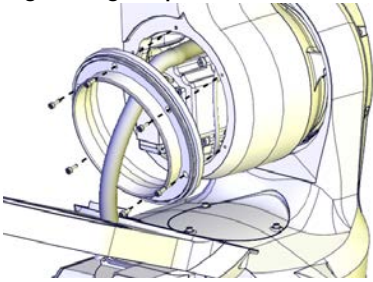
## 4 Repair

### 4.4.1 Replacing the lower arm

*Continued*

|   | Action  | Note  |
|---|---|---|
| 6 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-004</p>  <p>xx1400000454</p> |

*Continues on next page*

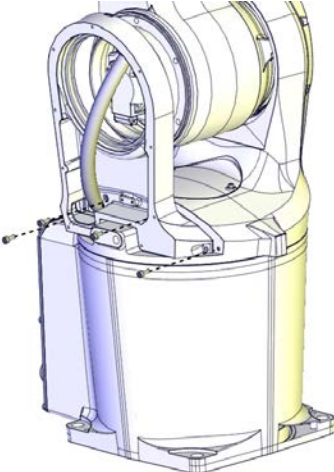

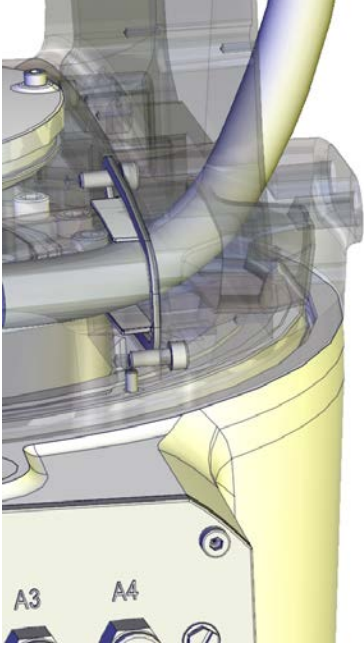
|   | Action  | Note  |
|---|---|---|
| 7 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication</p> <p>Check the radial sealing.<br/>Replace if damaged.</p> <p> <b>Note</b></p> <p>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> | <p>Radial sealing with dust lip: 3HAB3701-41</p>  <p>xx1400000753</p> <p>Replacement is detailed in <a href="#">Replacing the swing spare parts (swing, axis-2 radial sealing)</a> on page 516.</p> |
| 8 | <p>Guide the cable package into the lower arm.</p> <p> <b>Tip</b></p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>   |   |
| 9 | <p>Refit the axis-2 sealing ring with the screws.</p>   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000020</p>   |

Continues on next page

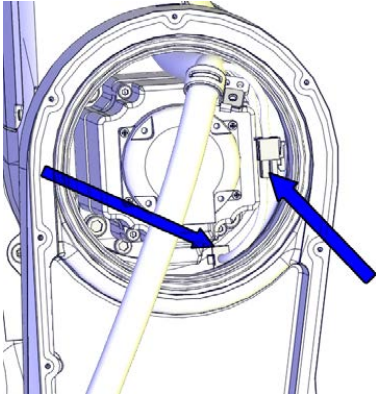

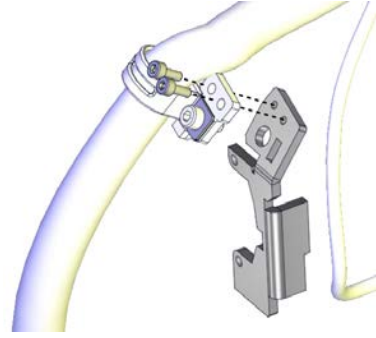
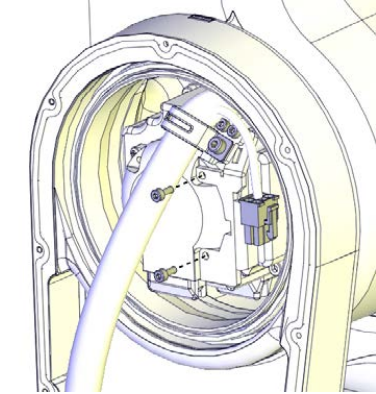
## 4 Repair

### 4.4.1 Replacing the lower arm

Continued

|    | Action   | Note   |
|----|--|--|
| 10 | Refit the cable housing with the screws.                                 | <p>Screws: 3HAB3409-236 (M4x10).<br/>Tightening torque: 3 Nm.</p>  <p>xx1300002435</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 11 | Apply grease to the cable package, cover all moving area of the package. |  <p>xx1400000481</p>  |

Continues on next page

|    | Action   | Note   |
|----|--|--|
| 12 | Reconnect the motor connectors. <ul style="list-style-type: none"> <li>• R2.ME2</li> <li>• R2.MP2</li> </ul>   |  <p>xx1300002434</p>                                    |
| 13 | Refit the axis-2 motor bracket to the cable package with the two screws.<br><br> <b>CAUTION</b><br>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. | Tightening torque: 1.5 Nm.<br><br> <p>xx1400000021</p> |
| 14 | Refit the axis-2 motor bracket to the motor.   |  <p>xx1300002432</p>                                  |

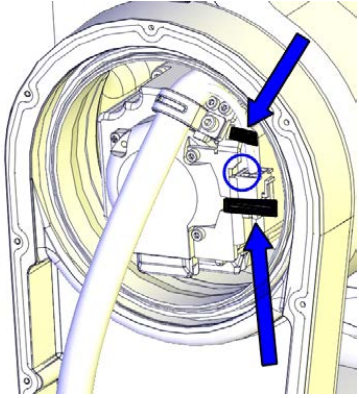
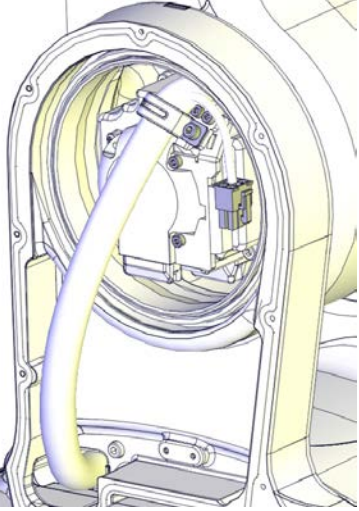
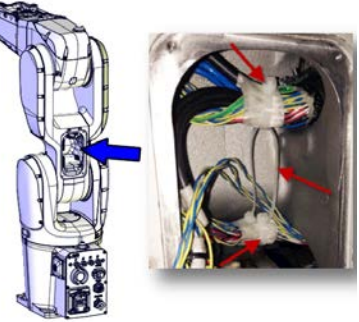
Continues on next page



## 4 Repair

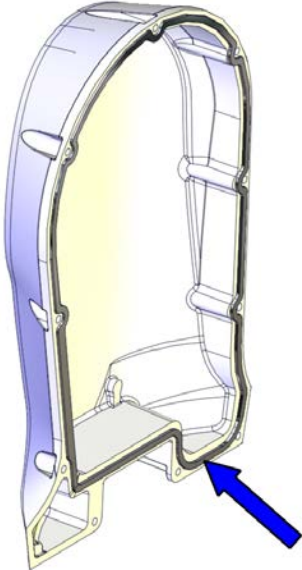
### 4.4.1 Replacing the lower arm

Continued

|    | Action  | Note  |
|----|---|---|
| 15 | Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.   | <br>xx1400001529   |
| 16 | Apply grease to the cable package, cover all moving area of the package.  | <br>xx1400000482  |
| 17 | <p>In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity:</p> <ol style="list-style-type: none"><li>1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location.</li><li>2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place.</li></ol> <p>See the figure.</p> | <br>xx1400001131 |

Continues on next page


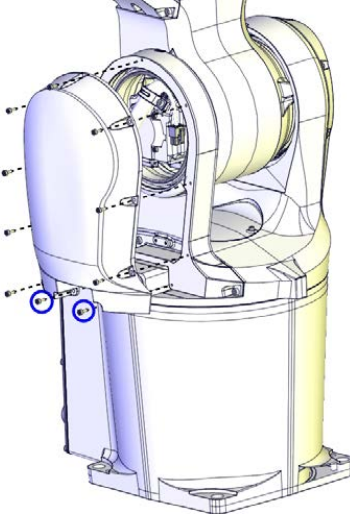

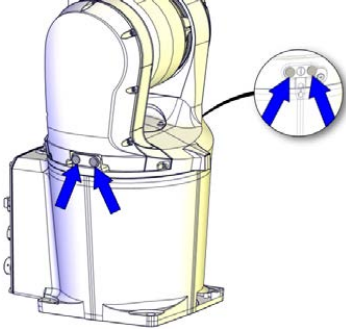


|    | Action   | Note  |
|----|--|---|
| 18 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           For robots with protection type Clean Room<br/>           For robots with food grade lubrication<br/>           Check the gasket of the cable housing cover.<br/>           Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>           3HAC056726-001</p>  <p>xx1400000424</p> |
| 19 | <p>Check the PTFE film.<br/>           Replace if damaged.</p>   | <p>PTFE film on cable housing cover:<br/>           3HAC044660-001</p>  |
| 20 | <p>Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.</p>  |   |

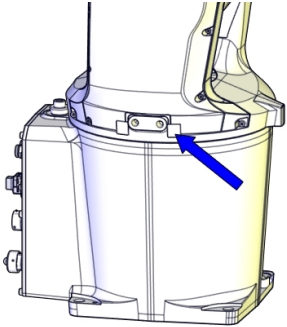

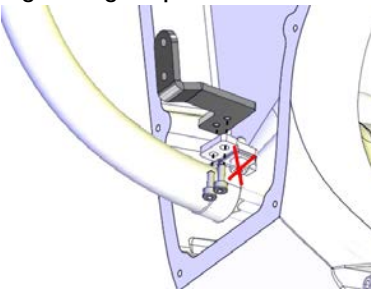

## 4 Repair

### 4.4.1 Replacing the lower arm


Continued

|    | Action  | Note  |
|----|---|---|
| 21 | <p>Refit the cable housing cover.<br/>Replace if damaged.</p> <p> <b>Note</b></p> <p>Remember to refit the two lower screws shown in the figure.</p> | <p>Cable housing cover of the swing: 3HAC059678-001<br/>: 3HAC056214-001 (used with protection type Clean Room)<br/>Cable housing cover of the swing, Clean Room<br/>Cable housing cover of the swing, food grade lubrication<br/>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 22 | <p>For robots with protection type Foundry Plus (option 287-3)<br/>Check the protection plugs for lifting holes.<br/>Replace if damaged.</p>  | <p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>   |

Continues on next page

|    | Action   | Note  |
|----|--|---|
| 23 | <p>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Refit the swing sealing plug.<br/>Follow the procedure specified in <a href="#">Refitting the swing sealing plug on page 144</a>.</p>   | <p>Swing sealing plug:3HAC053687-001</p>  <p>xx160000205</p> |
| 24 | <p>Refit the lower arm bracket to the cable package.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>                                   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002430</p>      |
| 25 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Connecting the cabling in the lower arm

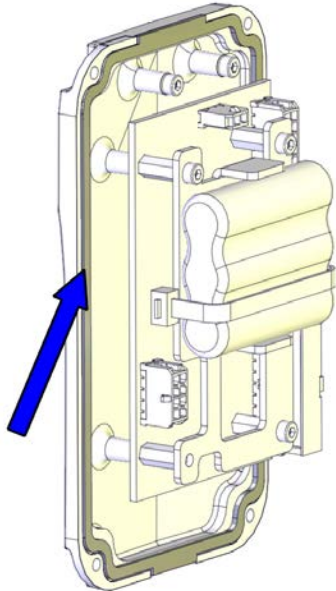

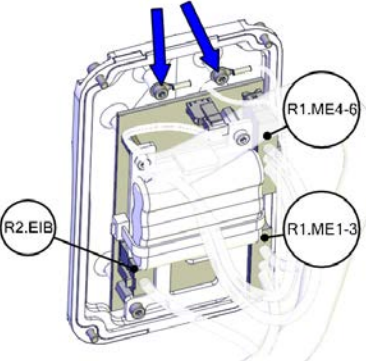

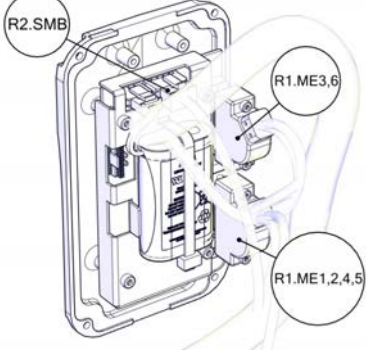
|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a></p> |      |
| 2 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>   |      |

*Continues on next page*

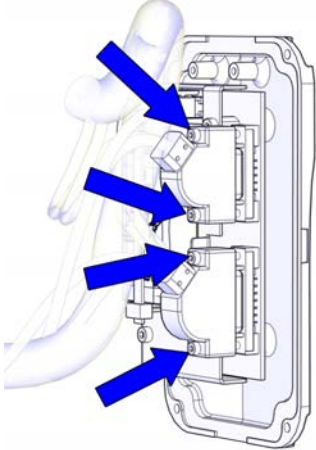
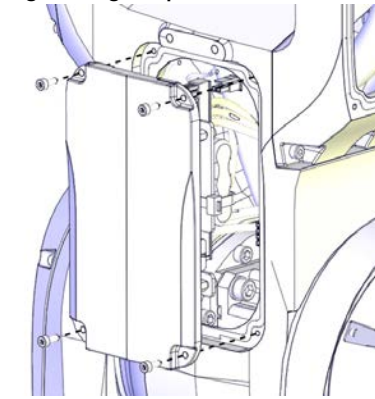

## 4 Repair

### 4.4.1 Replacing the lower arm

Continued

|   | Action  | Note   |
|---|---|--|
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the EIB/SMB cover gasket.</p> <p>Replace if damaged.</p>   | <p>Gasket on EIB/SMB cover:<br/>3HAC056728-001</p>  <p>xx1400000475</p> |
| 4 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p> |  <p>xx1300002428</p>  |
| 5 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>   |  |
| 6 | <p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>                              |  <p>xx1700000005</p>  |

Continues on next page

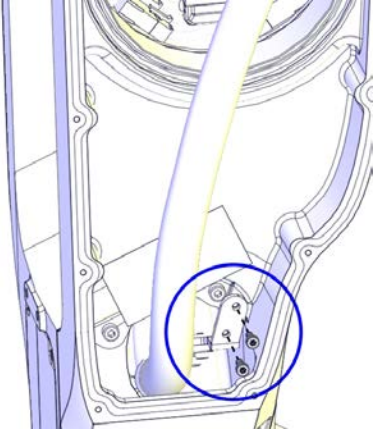

|   | Action  | Note  |
|---|---|---|
| 7 | <p><b>Valid for IRB 1200 Type B</b><br/>Tighten the connector screws.</p>   | <p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>  |
| 8 | <p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p> | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

*Continues on next page*

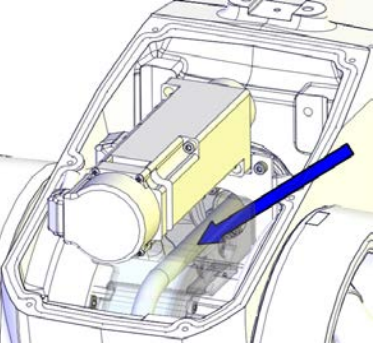
## 4 Repair

### 4.4.1 Replacing the lower arm



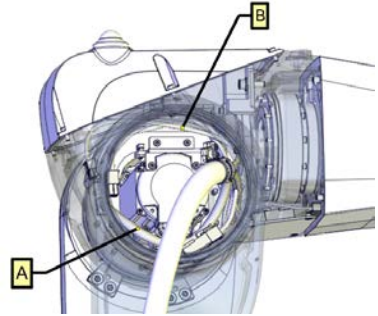

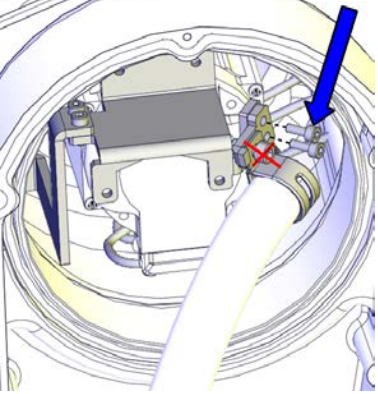
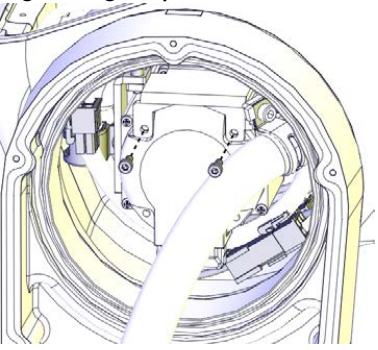
Continued

|    | Action   | Note  |
|----|--|---|
| 9  | Refit the fix sheet attachment screws in the lower arm.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p> |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

### Refitting the cable package in the housing

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package. | <p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p> |

Continues on next page

|   | Action  | Note  |
|---|---|---|
| 3 | <p>Guide the cable package into the upper arm, through the housing.</p> <p> <b>Note</b></p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> <b>Note</b></p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p> |  <p>xx1400001472</p>                                     |
| 4 | <p>Refit the bracket to the sheet with two screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>  |
| 5 | <p>Refit the fix sheet to the motor.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p> |

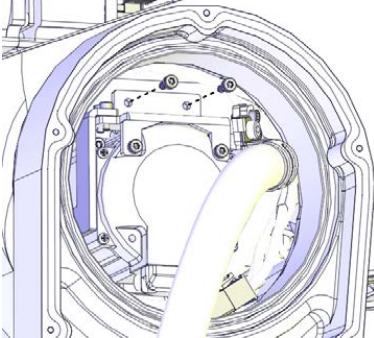

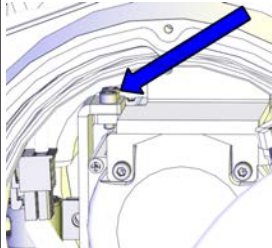
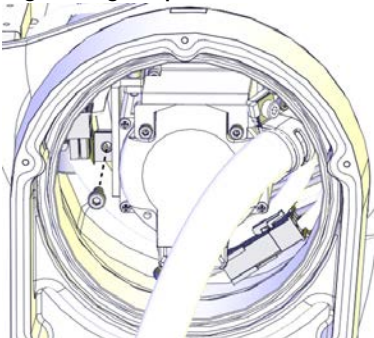
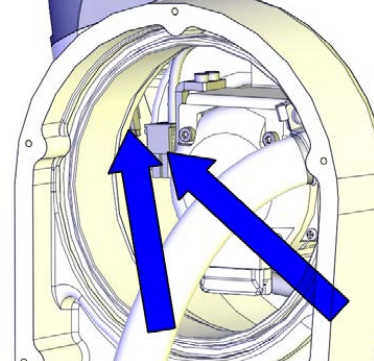
Continues on next page



## 4 Repair

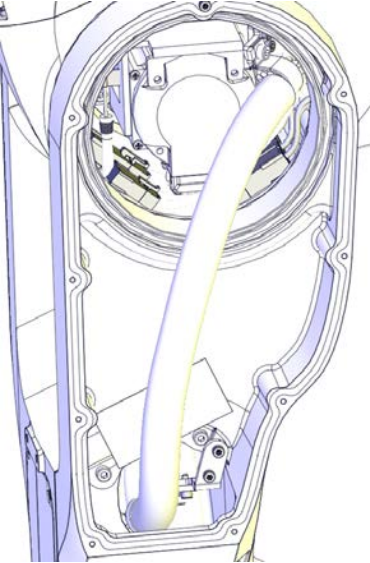

### 4.4.1 Replacing the lower arm

Continued


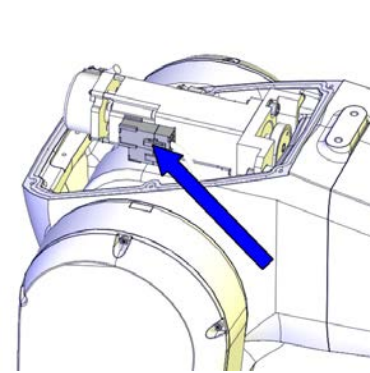
|   | Action   | Note  |
|---|--|---|
| 6 | Refit the fix sheet to the inner plastic guide.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>   |
| 7 | <p>Fit the air hose holder to the bracket.<br/>Replace the holder, if damaged.</p> <p> <b>Tip</b></p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p> | <p>Air hose holders are included in Cable harness material set (3HAC049663-001).</p> <p>Tightening torque: 4 Nm.</p>  <p>xx1300002422</p> |
| 8 | Reconnect the axis-3 motor connectors.   |  <p>xx1300002420</p>   |

Continues on next page



|    | Action  | Note   |
|----|---|--|
| 9  | Apply grease to the cable package, cover all moving area of the package.  |  <p>xx140000754</p> |
| 10 | <b>Valid for IRB 1200-5/0.9</b><br>Secure the cable package at the bottom of the housing with cable straps.   |  |
| 11 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

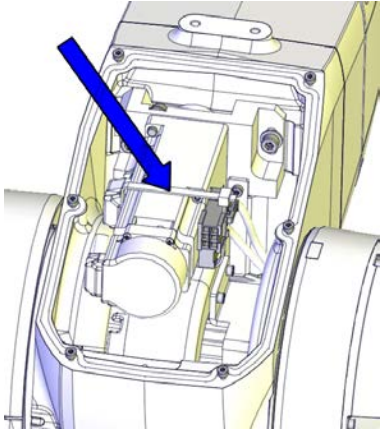
#### Connecting the axis-4 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | Reconnect the motor connectors.<br><br> <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  <p>xx1300002371</p> |


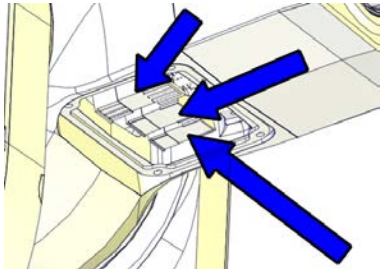
## 4 Repair

### 4.4.1 Replacing the lower arm


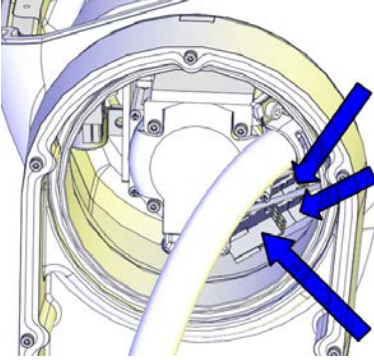
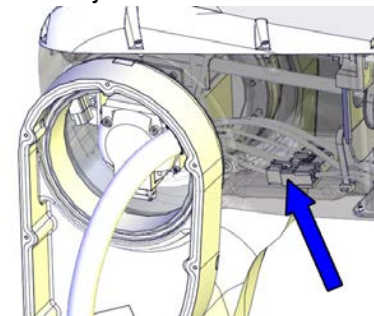
*Continued*

|   | Action   | Note  |
|---|--|---|
| 2 | Secure the connectors to the motor with a cable strap. | <br>xx1300002494 |

### Connecting the axis-4 FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Reconnect the FPC connectors.<br> <b>Tip</b><br>See the number markings on the connectors for help to find the corresponding connector. | <br>xx1300002399 |

*Continues on next page*

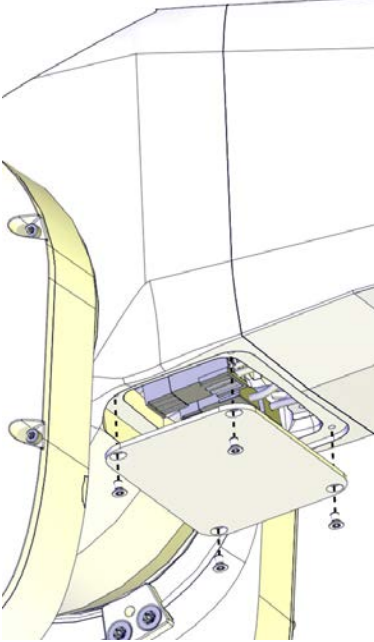
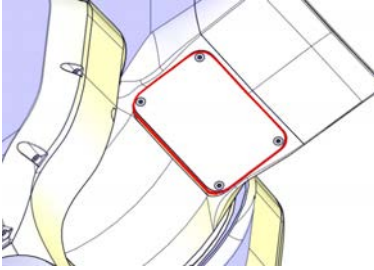
|   | <b>Action</b>   | <b>Note</b>  |
|---|---|--|
| 3 | <p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>  |  |

*Continues on next page*

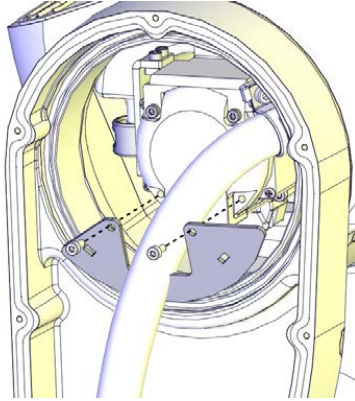
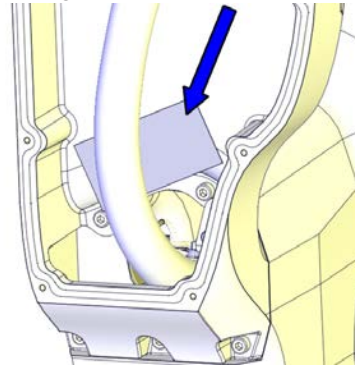
## 4 Repair

### 4.4.1 Replacing the lower arm

Continued

|   | Action  | Note   |
|---|---|--|
| 5 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>  |   |
| 6 | <p>Refit the small cover to the housing.</p> <p>Replace if damaged.</p>   | <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001</p> <p>: 3HAC056142-001 (used with protection type Clean Room)</p> <p>Housing small cover, Clean Room</p> <p>Housing small cover, food grade lubrication</p> <p>Screws: 3HAC14286-4 (M3X5).</p> <p>Tightening torque: 1 Nm.</p> |
| 7 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the small cover on the housing.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx1600000214</p>  |

Continues on next page

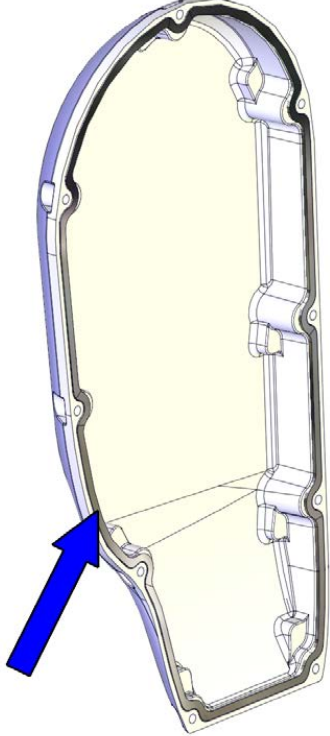
|   | Action  | Note   |
|---|---|--|
| 8 | Refit the plate.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                            |
| 9 | Check the PTFE film on the cable housing. Replace if damaged. | <p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p> |

*Continues on next page*

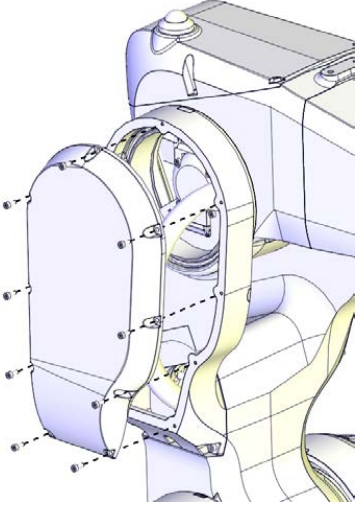


## 4 Repair

### 4.4.1 Replacing the lower arm


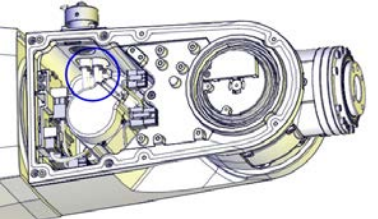
*Continued*

|    | Action  | Note  |
|----|---|---|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the gasket of the cable housing cover.<br/>Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001<br/>PTFE film on cable housing cover:<br/>3HAC044660-001</p>  <p>xx140000048</p> |
| 11 | <p>Check the PTFE film on the cable housing cover.<br/>Replace if damaged.</p>  |   |
| 12 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>  |   |

*Continues on next page*

|    | Action   | Note   |
|----|--|--|
| 13 | <p>Refit the cable housing cover.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>            | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 14 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

#### Connecting the air hoses and CP/CS cabling (if equipped)

|   | Action  | Note   |
|---|---|--|
| 1 | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> | <p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p> |

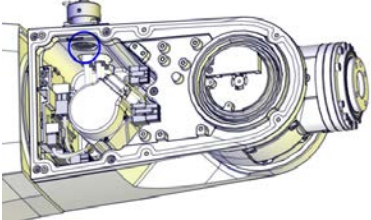
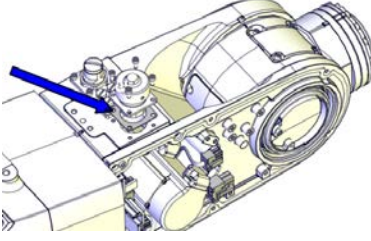
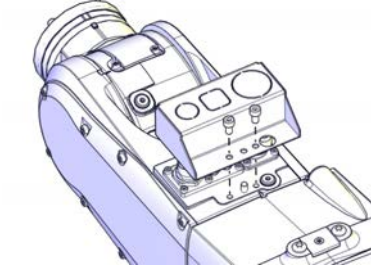
*Continues on next page*




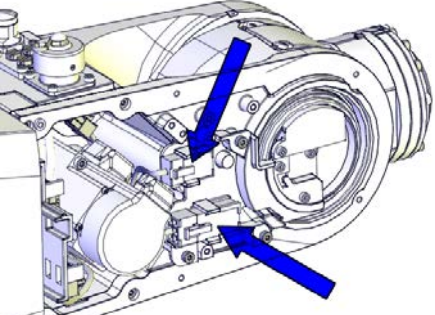
## 4 Repair

### 4.4.1 Replacing the lower arm

Continued

|   | Action  | Note   |
|---|---|--|
| 2 | <p>If equipped, reconnect the CP/CS connector.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <ol style="list-style-type: none"> <li>1 Check the gasket.</li> <li>2 Replace if damaged.</li> </ol> <p><b>For robots with protection type Clean Room:</b></p> <ol style="list-style-type: none"> <li>1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</li> <li>2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.</li> </ol> |  <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p> |
| 3 | <p><b>For robots with protection type Foundry Plus</b></p> <p>If required, fit the protection bracket for CP/CS connectors.</p>   | <p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>   |


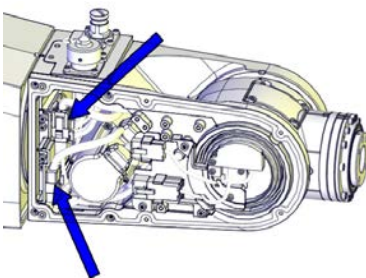
### Connecting the axis-5 motor FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | <p>Connect the axis-5 FPC connectors and snap them to their holders.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002390</p> |

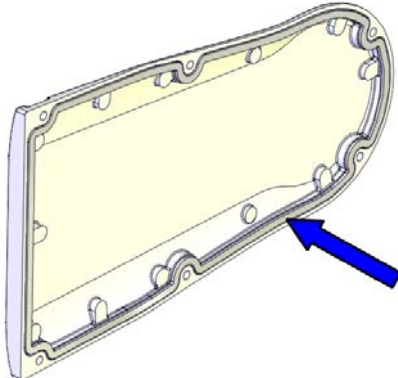
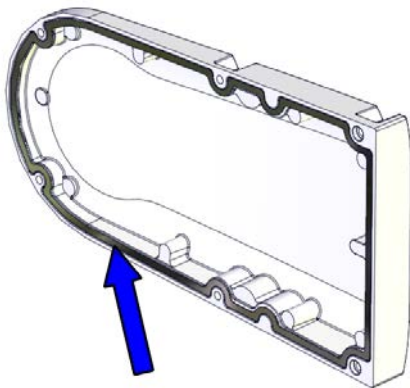
Continues on next page



### Connecting the axis-5 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>.</p> |  <p>xx1300002360</p> |

### Refitting the wrist covers

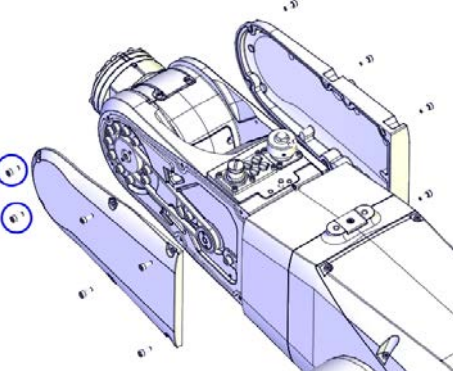
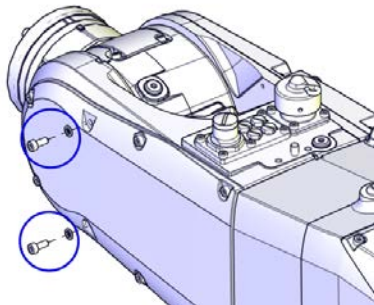


|   | Action   | Note   |
|---|--|--|
| 1 | <p>Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p>   |  |
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cover gasket. Replace if damaged.</p>               | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx1400000034</p>               |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx1400000345</p> |

*Continues on next page*

## 4 Repair

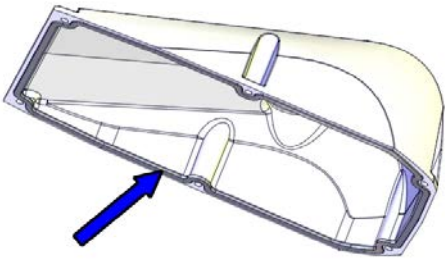

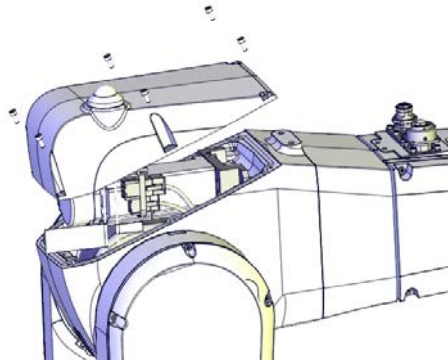

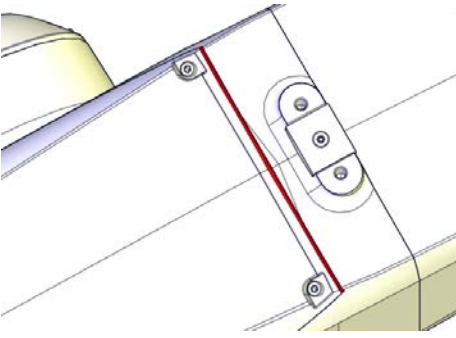
### 4.4.1 Replacing the lower arm

Continued

|   | Action  | Note   |
|---|---|--|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |  |

Continues on next page

#### Concluding procedure




|   | Action   | Note   |
|---|--|--|
| 1 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>  | <p>Housing cover gasket (IRB 1200-7/0.7 ): 3HAC056698-001</p> <p>Housing cover gasket (IRB 1200-5/0.9 ): 3HAC056697-001</p>  <p>xx140000477</p>  |
| 2 | <p>Refit the upper arm housing cover with the screws.</p> <p> <b>CAUTION</b></p> <p>For robots with safety lamp (option)</p> <p>Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>                                | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx130000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 3 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx160000215</p>  |

*Continues on next page*

## 4 Repair

### 4.4.1 Replacing the lower arm

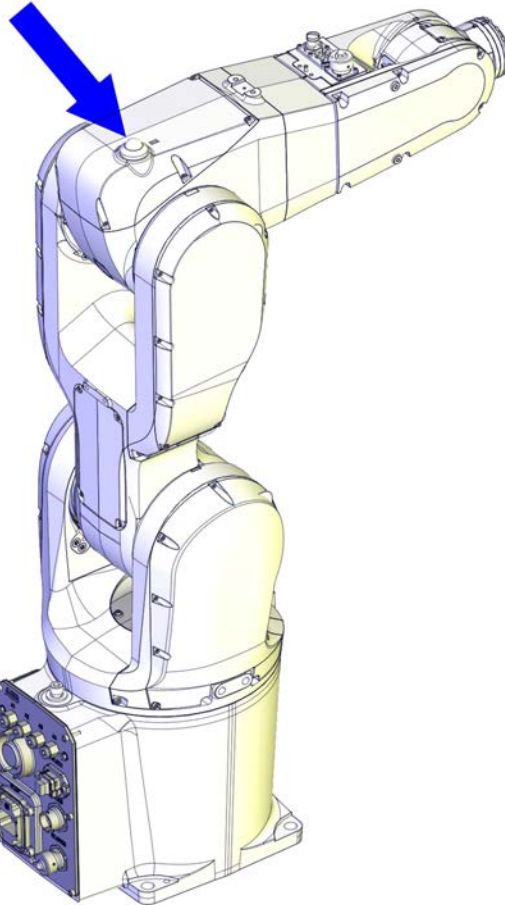
*Continued*

|   | Action   | Note   |
|---|--|--|
| 4 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .<br><br> <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth. |  |
| 5 | Recalibrate the robot.   | Calibration is detailed in section <a href="#">Calibration on page 729</a> . |
| 6 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run.   |  |

## 4.4.2 Replacing the signal lamp

### Location of signal lamp

The signal lamp is located as shown in the figure.



xx130000455

### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                             | Article number | Note  |
|--|----------------|---|
| Signal lamp                            | 3HAC16738-1    |   |
| Housing cover gasket (IRB 1200-7/0.7 ) | 3HAC056698-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Housing cover gasket (IRB 1200-5/0.9 ) | 3HAC056697-001 | Not used with protection class IP40.<br>Replace if damaged. |

*Continues on next page*

## 4 Repair



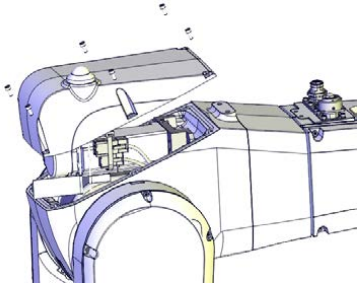
### 4.4.2 Replacing the signal lamp

Continued

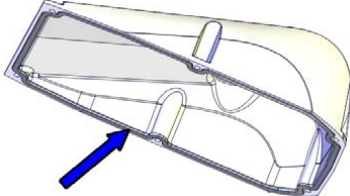


#### Required tools and equipment

| Equipment, etc.     | Article number | Note   |
|---------------------|----------------|--|
| 24 VDC power supply | -              | Used to release the motor brakes.  |
| Standard toolkit    | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

#### Replacing the signal lamp

|   | Action   | Note  |
|---|--|---|
| 1 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .                              |   |
| 3 | Remove the attachment screws of the upper arm housing cover and lift the cover carefully until the connectors of the signal lamp can be reached.   | <br>xx1300000456 |
| 4 | Disconnect the connectors and remove the cover from the robot.   |   |
| 5 | Remove the nut from the lamp and pull out the lamp from the cover.   |   |
| 6 | Fit the new lamp to the cover and tighten the nut.   |   |
| 7 | Find the lamp connectors in the cable harness inside the upper arm housing. <ul style="list-style-type: none"> <li>• Connect lamp connector R3.H1 to cable harness connector H1.</li> <li>• Connect lamp connector R3.H2 to cable harness connector H2.</li> </ul>   |   |
| 8 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |

Continues on next page

|    | Action   | Note   |
|----|--|--|
| 9  | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>  | <p>Housing cover gasket (IRB 1200-7/0.7 ): 3HAC056698-001</p> <p>Housing cover gasket (IRB 1200-5/0.9 ): 3HAC056697-001</p>  <p>xx1400000477</p>                  |
| 10 | <p>Refit the cover on the upper arm housing.</p>   | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 11 | <p>The signal lamp is now ready for use and is lit in MOTORS ON mode.</p>  |  |
| 12 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |



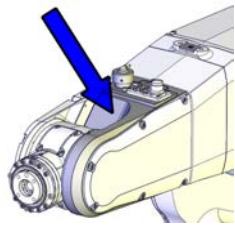
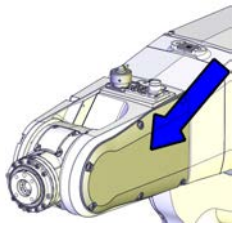
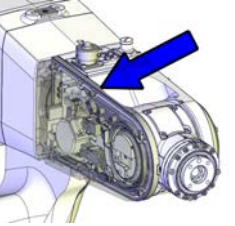
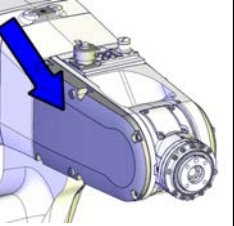
## 4 Repair

### 4.4.3 Replacing the tubular spare parts

#### 4.4.3 Replacing the tubular spare parts

##### Location of tubular spare parts

The tubular parts that are considered spare parts are located as shown in the figure.

| Tubular with sleeve   | Tubular cover   | Tubular cable housing   | Tubular cable housing cover  |
|---|---|---|--|
| <br>xx1400000432                   | <br>xx1400000433   | <br>xx1400000434                  | <br>xx1400000435  |
| 3HAC059693-001 /<br>3HAC059723-001 <sup>i</sup> :   | 3HAC049656-001  | 3HAC059695-001  | 3HAC059694-001   |
| 3HAC059706-001:<br>Used with protection<br>type Clean Room.<br>Used for robots with<br>food grade lubrica-<br>tion. | 3HAC056144-001 /<br>3HAC059708-001 <sup>ii</sup> :<br>Used with protection<br>type Clean Room.<br>Used for robots with<br>food grade lubrica-<br>tion.<br>Replace if damaged. | 3HAC056143-001:<br>Used with protection<br>type Clean Room.<br>Used for robots with<br>food grade lubrica-<br>tion. | 3HAC056145-001:<br>Used with protection<br>type Clean Room.<br>Used for robots with<br>food grade lubrica-<br>tion.<br>Replace if damaged. |

<sup>i</sup> For information on which tubular to be ordered, see [Spare part versions for the tubular on Type A robots on page 800](#).

<sup>ii</sup> For information on which tubular cover for Clean Room robots to be ordered, see [Spare part versions for the tubular cover on Clean Room robots on page 801](#).

##### Required spare parts



##### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part   | Article number                                   | Note   |
|--|--|--|
| Tubular with sleeve  | 3HAC059693-001 /<br>3HAC059723-001 <sup>i</sup>  |  |
| Tubular with sleeve, Clean Room<br>Tubular with sleeve, food grade lubrication | 3HAC059706-001                                   | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.                        |
| Tubular cover  | 3HAC049656-001                                   | Replace if damaged.  |
| Tubular cover, Clean Room<br>Tubular cover, food grade lubrication             | 3HAC056144-001 /<br>3HAC059708-001 <sup>ii</sup> | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |

Continues on next page



4.4.3 Replacing the tubular spare parts  
*Continued*

| Spare part  | Article number | Note   |
|---|----------------|--|
| Gasket for tubular cover                            | 3HAC058822-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Tubular cable housing                               | 3HAC059695-001 |  |
| Tubular cable housing, Clean Room                   | 3HAC056143-001 | Used with protection type Clean Room.  |
| Tubular cable housing, food grade lubrication       |                | Used for robots with food grade lubrication.   |
| M2 variseal sealing                                 | 3HAC044641-009 | Replace if damaged.  |
| Radial sealing                                      | 3HAB3701-42    | Not used with protection class IP40.<br>Replace if damaged.  |
| Tubular cable housing cover                         | 3HAC059694-001 | Replace if damaged.  |
| Tubular cable housing cover, Clean Room             | 3HAC056145-001 | Used with protection type Clean Room.  |
| Tubular cable housing cover, food grade lubrication |                | Used for robots with food grade lubrication.<br>Replace if damaged.                                |
| Gasket for tubular cable housing cover              | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Washer  | 3HAC044869-001 | Replace if damaged   |
| M2 variseal sealing                                 | 3HAC044641-008 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged. |

- <sup>i</sup> For information on which tubular to be ordered, see [Spare part versions for the tubular on Type A robots on page 800](#).
- <sup>ii</sup> For information on which tubular cover for Clean Room robots to be ordered, see [Spare part versions for the tubular cover on Clean Room robots on page 801](#).

**Required tools and equipment**

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Axis-5 sealing assembly tool set        | 3HAC049701-001 | Used to refit the radial sealing, if replacement is needed.  |
| Guide pin for tilt unit (axis 5)        | 3HAC049706-001 | Always use three guide pins together!  |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |

- <sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

*Continues on next page*

## 4 Repair

### 4.4.3 Replacing the tubular spare parts


Continued

#### Required consumables

| Consumable     | Art. no.       | Note           |
|----------------|----------------|----------------|
| Cable straps   | -              |                |
| Cleaning agent | -              | Loctite 7063   |
| Flange sealing | 3HAC026759-003 | Sikaflex 521FC |
| Locking liquid | 3HAB7116-1     | Loctite 243    |

#### Deciding calibration routine

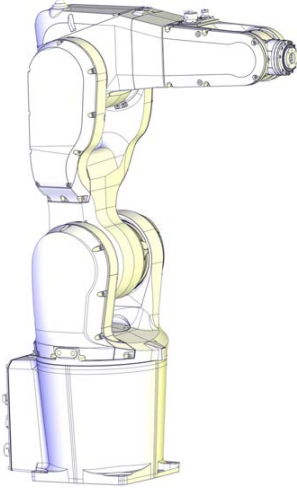

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action  | Note  |
|---|---|---|
| 1 | Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"><li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li><li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li></ul>   |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.                |
|   | <b>If the robot is to be calibrated with reference calibration:</b><br>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.<br>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible. | Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.<br>Creating new values requires possibility to move the robot.<br>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a> . |
|   | <b>If the robot is to be calibrated with fine calibration:</b><br>Remove all external cable packages (DressPack) and tools from the robot.  |   |

#### Preparations before removing the tubular spare parts

|   | Action   | Note |
|---|--|------|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure. |      |



Continues on next page

|   | Action   | Note   |
|---|--|--|
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 3 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |  |

**Replacing the tubular cable housing**

Use these procedures to replace the tubular cable housing.

**Getting access to inside of the wrist unit**



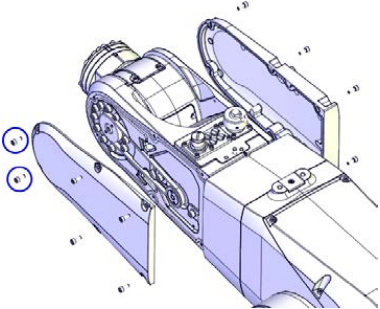
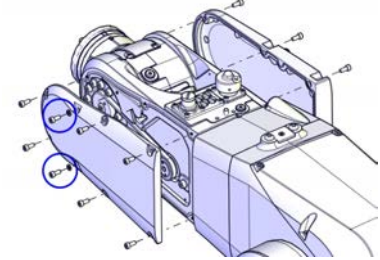
|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page


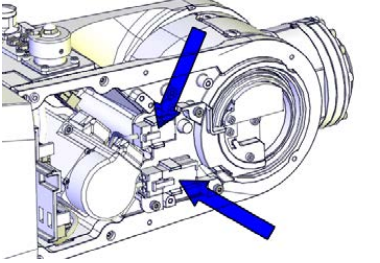
## 4 Repair

### 4.4.3 Replacing the tubular spare parts

Continued

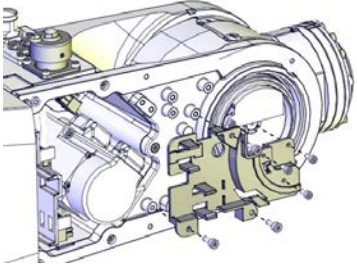

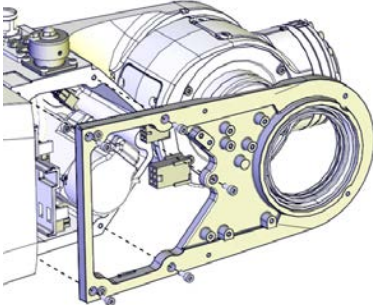
|   | Action   | Note   |
|---|--|--|
| 3 | <p>Remove the covers on each side of the wrist by removing their screws.</p> <p> <b>Note</b></p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.</p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> <p> <b>Note</b></p> <p>For robots with protection type Clean Room</p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |

### Removing the tubular cable housing


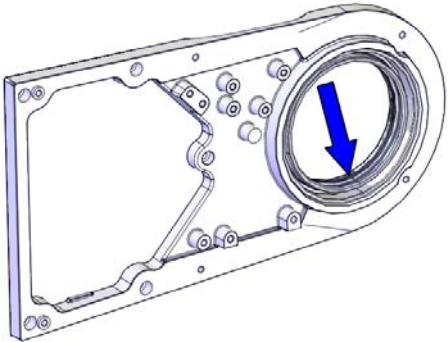
|   | Action  | Note  |
|---|---|---|
| 1 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 2 | <p>Snap loose and disconnect the axis-5 FPC connectors.</p>   |  <p>xx1300002390</p> |

Continues on next page

4.4.3 Replacing the tubular spare parts  
Continued

|   | Action  | Note  |
|---|---|---|
| 3 | Remove the connector plate by first removing the screws.  |  <p>xx1300002391</p> |
| 4 | Remove the cable housing of the tubular by first removing the screws.<br><br> <b>Note</b><br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)<br>The frame is glued and needs to be pried off. |  <p>xx1300002392</p> |

Checking the tubular cable housing sealings

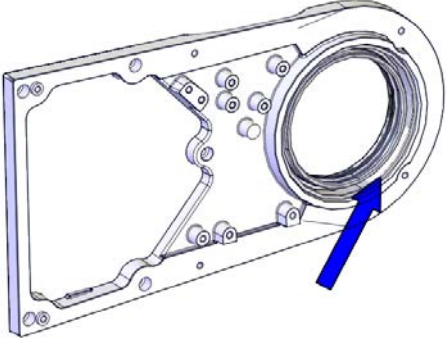
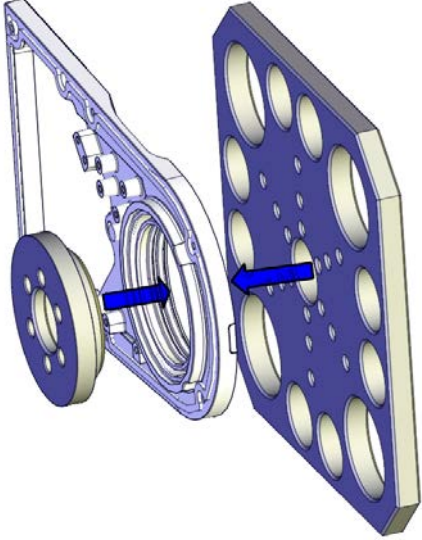
|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>  |   |
| 2 | Check the sealing.<br>Replace if damaged.<br><br> <b>CAUTION</b><br>Do not fit M2 variseal sealing on Clean Room robots. | M2 variseal sealing: 3HAC044641-009<br><br> <p>xx1300002396</p> |

Continues on next page

## 4 Repair

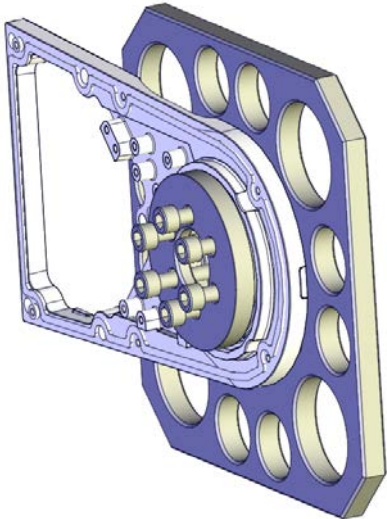

### 4.4.3 Replacing the tubular spare parts

*Continued*

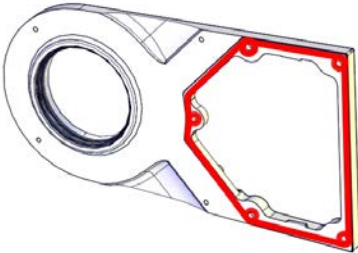

|   | Action   | Note  |
|---|--|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the radial sealing.<br/>Replace if damaged, as described below.<br/>If undamaged and properly seated, skip to the next procedure table.</p> | <p>Radial sealing: 3HAB3701-42</p>  <p>xx1300002608</p> |
| 4 | <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>  |   |
| 5 | <p>Fit the radial sealing into the tubular cable housing.</p>  |   |
| 6 | <p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>   | <p>Axis-5 sealing assembly tool set: 3HAC049701-001</p>   |
| 7 | <p>Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.</p>  |  <p>xx1400000485</p>                                  |

*Continues on next page*

4.4.3 Replacing the tubular spare parts  
Continued

|    | Action  | Note   |
|----|---|--|
| 8  | Screw the screws, little by little, to press the sealing into place.  |  <p>xx140000486</p>  |
| 9  | Remove the assembly tool.   |  |
| 10 | Check that the sealing is undamaged and properly fitted.  |  |
| 11 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |

Refitting the tubular cable housing

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the tubular cable housing. |  <p>xx1300002610</p>  <b>Note</b><br>For Clean Room robots, wipe clean the overflowing Sikaflex 521FC if there is any. |

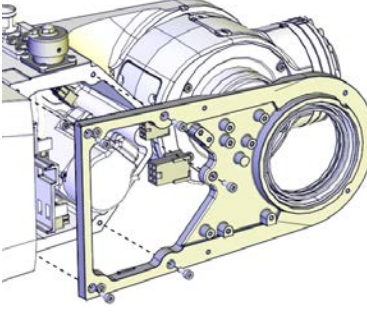

Continues on next page



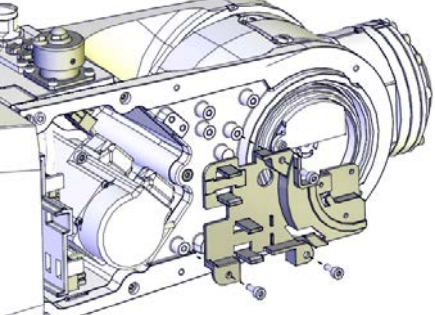
## 4 Repair

### 4.4.3 Replacing the tubular spare parts

Continued

|   | Action   | Note   |
|---|--|--|
| 3 | Refit the tubular cable housing with the screws.   | <p>Tightening torque: 1.5 Nm.</p> <p>Tubular cable housing:<br/>3HAC059695-001<br/>: 3HAC056143-001 (used with protection type Clean Room)<br/>Tubular cable housing, Clean Room<br/>Tubular cable housing, food grade lubrication</p>  <p>xx1300002392</p> |
| 4 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

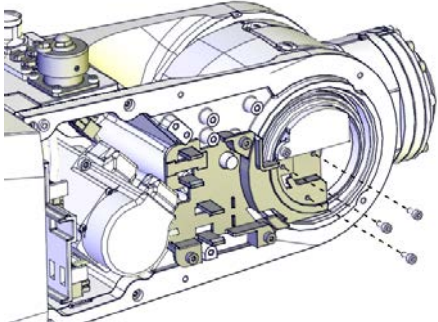

### Refitting the connector plate

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |  |
| 2 | Refit the connector plate and secure with the M3 screws.  | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1400001401</p> |


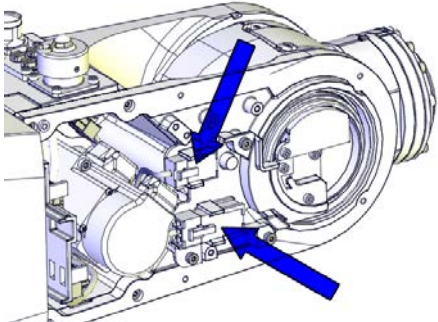
Continues on next page



4.4.3 Replacing the tubular spare parts  
Continued

|   | Action  | Note   |
|---|---|--|
| 3 | Secure the three M2.5 screws.   | Tightening torque: 0.3 Nm.<br> |
| 4 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

Connecting the axis-5 motor FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | Connect the axis-5 FPC connectors and snap them to their holders.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |

Refitting the wrist covers

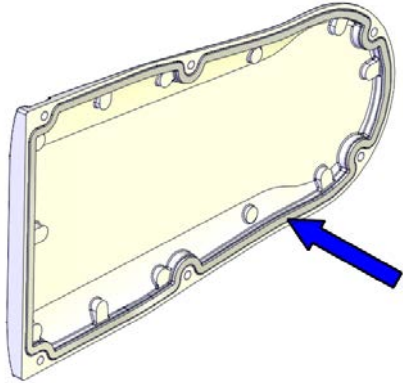
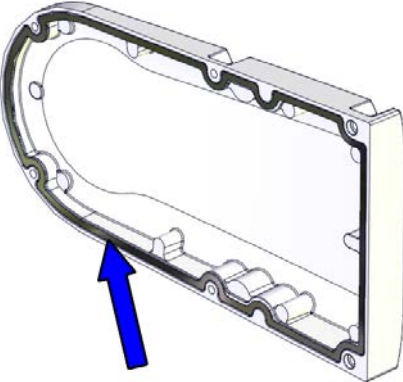
|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page

## 4 Repair

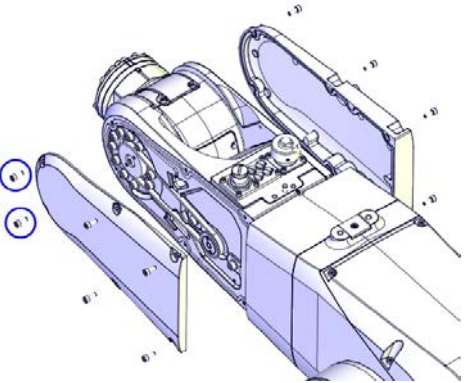
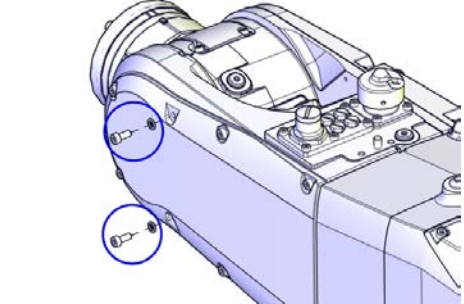


### 4.4.3 Replacing the tubular spare parts

*Continued*

|   | Action  | Note  |
|---|---|---|
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cover gasket.</p> <p>Replace if damaged.</p>               | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx140000034</p>                 |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket.</p> <p>Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx1400000345</p> |

*Continues on next page*

4.4.3 Replacing the tubular spare parts  
Continued

|   | Action  | Note  |
|---|---|---|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |   |

Continues on next page

## 4 Repair





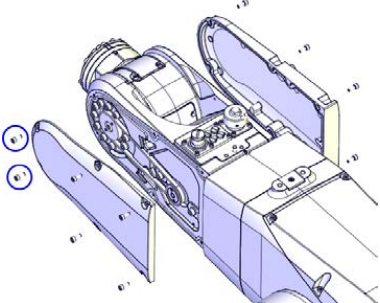
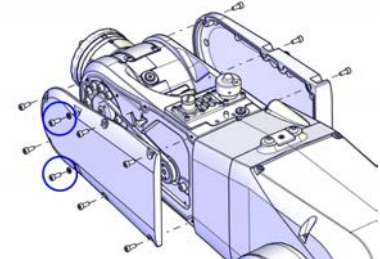
### 4.4.3 Replacing the tubular spare parts

Continued

#### Removing the tubular




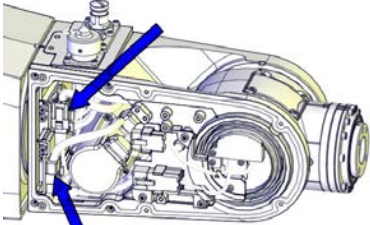
Use these procedures to remove the tubular.

#### Getting access to inside of the wrist unit



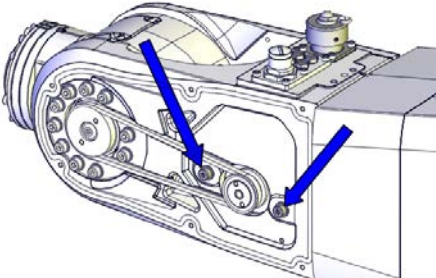
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .   |   |
| 3 | Remove the covers on each side of the wrist by removing their screws.<br><br> <b>Note</b><br><b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.<br>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.<br><br> <b>Note</b><br><b>For robots with protection type Clean Room</b><br>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure. | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |

Continues on next page

Disconnecting the axis-5 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul>  <p><b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002360</p> |

Removing the axis-5 motor with pulley

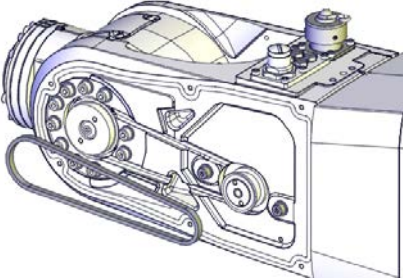
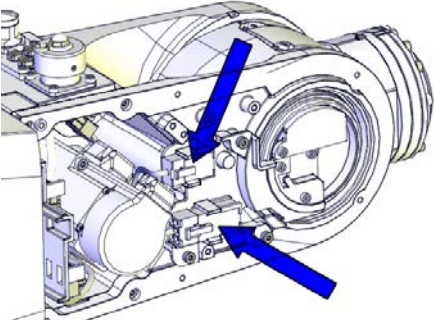
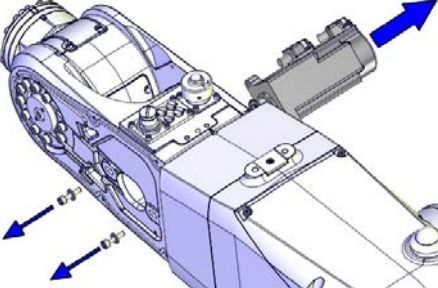
|   | Action  | Note   |
|---|---|--|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |  |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  |
| 3 | <p>Loosen the screws so that the motor can be moved sideways.</p>   |  <p>xx1300002350</p> |

Continues on next page



## 4 Repair

### 4.4.3 Replacing the tubular spare parts

Continued

|   | Action   | Note   |
|---|--|--|
| 4 | Remove the timing belt.                              |  <p>xx1300002351</p>   |
| 5 | Snap loose and disconnect the axis-5 FPC connectors. |  <p>xx1300002390</p>  |
| 6 | Remove the screws and pull out the motor.            |  <p>xx1300002352</p> |

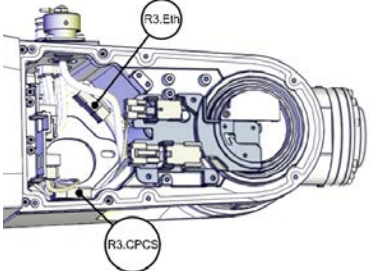
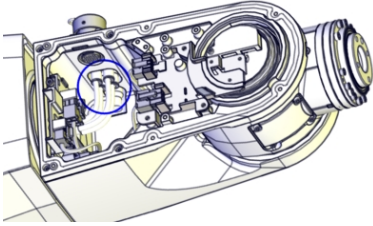
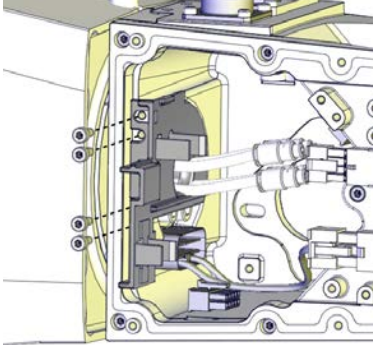
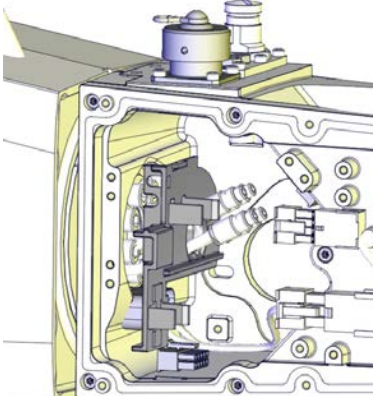
### Removing the wrist

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page



4.4.3 Replacing the tubular spare parts  
Continued

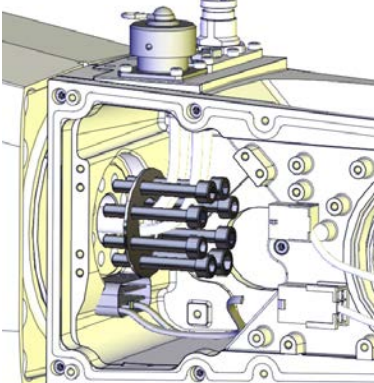
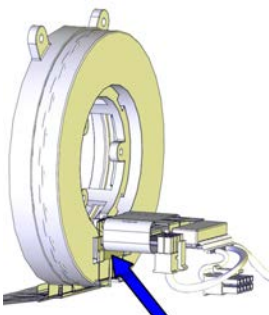
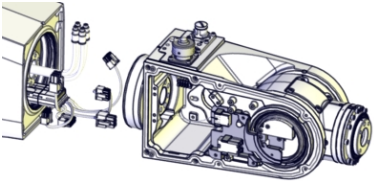
|   | Action   | Note  |
|---|--|---|
| 3 | Disconnect the connectors shown in the figure.               |  <p>xx1300002353</p>   |
| 4 | Disconnect the air hoses.                                    |  <p>xx1300002355</p>   |
| 5 | Remove the connector plate attachment screws.                |  <p>xx1300002356</p>  |
| 6 | Guide the hoses through the plate hole and remove the plate. |  <p>xx1300002357</p> |

Continues on next page

## 4 Repair

### 4.4.3 Replacing the tubular spare parts

Continued

|   | Action   | Note   |
|---|--|--|
| 7 | Support the weight of the wrist and remove the screws and the washer.  |  <p>xx1300002358</p>  |
| 8 | <p>Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p><b>!</b> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p> |  <p>xx1300002359</p> |


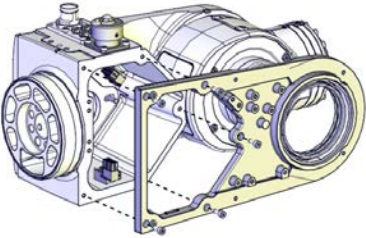
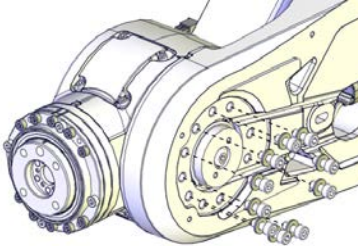
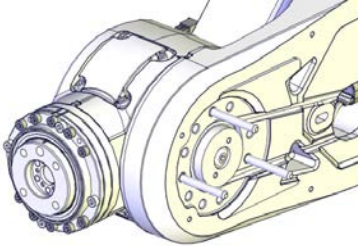
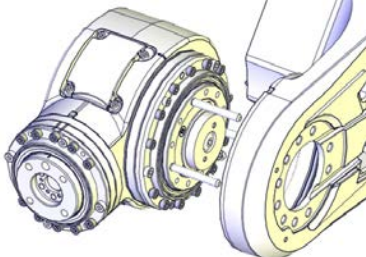
### Separating the tilt unit from the tubular

|   | Action   | Note |
|---|--|------|
| 1 | <p><b>!</b> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 | <p><b>!</b> CAUTION</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page



4.4.3 Replacing the tubular spare parts  
Continued

|   | Action  | Note   |
|---|---|--|
| 3 | Remove the cable housing of the tubular by first removing the screws.<br><br> <b>Note</b><br><b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>The frame is glued and needs to be pried off. | <br>xx1400000774  |
| 4 | Support the weight of the tilt unit and remove the screws.  | <br>xx1300002469  |
| 5 | Fit guide pins to the gearbox.  | <b>Guide pin for tilt unit (axis 5):</b><br><b>3HAC049706-001</b><br><b>Always use three guide pins together!</b><br><br><br>xx1400000775 |
| 6 | Remove the tilt unit.   | <br>xx1300002470  |

Continues on next page

## 4 Repair

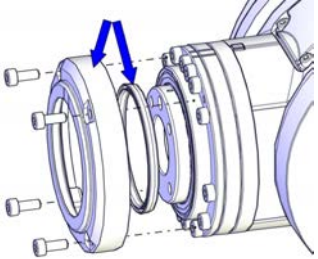

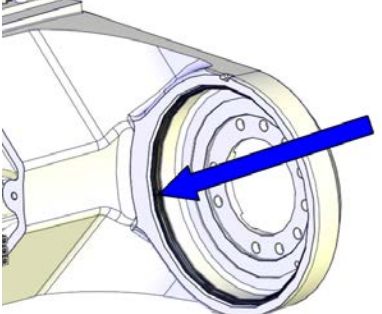

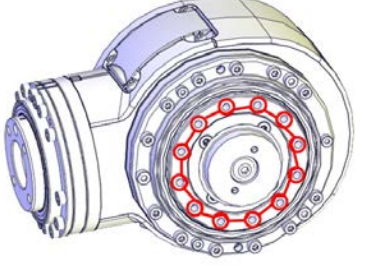
### 4.4.3 Replacing the tubular spare parts

*Continued*

#### Refitting the tubular

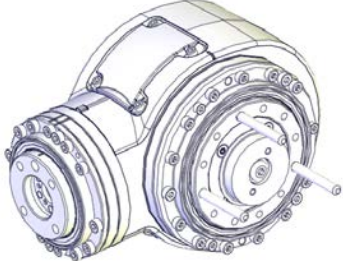
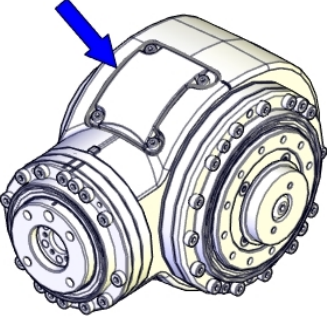
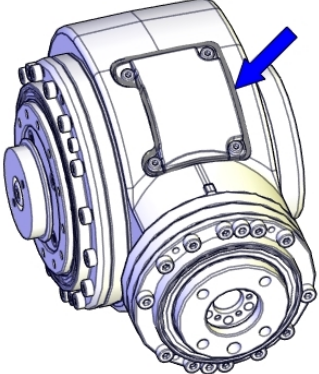
Use these procedures to refit the tubular.

#### Refitting the axis-5 and axis-6 drive unit

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Check the protection cover for turning disk and T40 variseal sealing.<br/>Replace if damaged.</p>  | <p>Protection cover for axis-6 turning disk: 3HAC044666-001<br/>T40 variseal sealing: 3HAC044641-012</p>  <p>xx1600001126</p> |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p>                    | <p>M2 variseal sealing: 3HAC044641-008</p>  <p>xx1300002493</p>   |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br/>Apply flange sealing Loctite 574 on the mounting surfaces of the drive unit.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1400001404</p>  |

*Continues on next page*

4.4.3 Replacing the tubular spare parts  
Continued


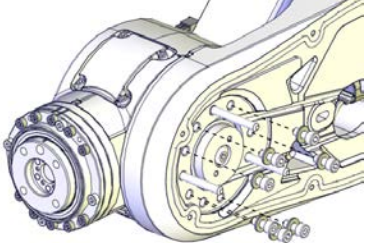

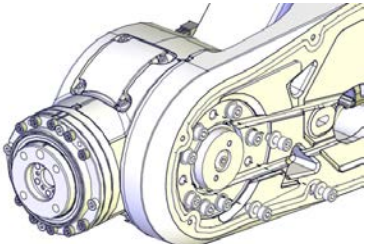

|   | Action  | Note   |
|---|---|--|
| 5 | Fit guide pins to the axis-5 gearbox.   | <p>Guide pin for tilt unit (axis 5):<br/>3HAC049706-001</p>  <p>xx1300002568</p>  |
| 6 | <p><b>For robots with protection type Clean Room</b><br/>Make sure the sealing to the tilt covers is intact before the refitting.</p> |  <p>xx1600000219</p>  <p>xx1600000220</p> |

Continues on next page

## 4 Repair

### 4.4.3 Replacing the tubular spare parts

Continued


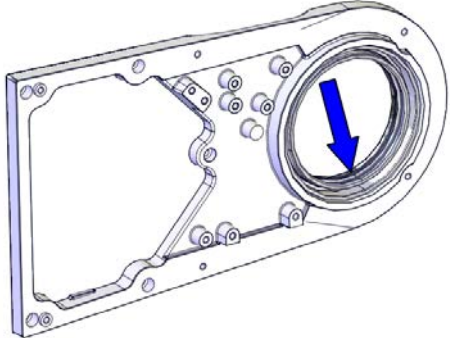
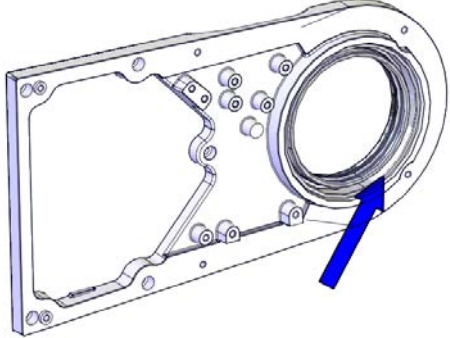
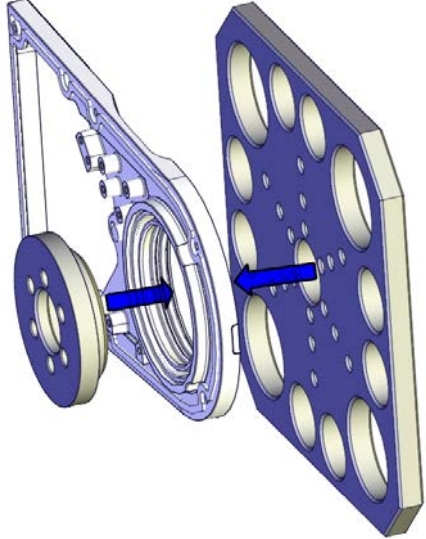
|    | Action   | Note   |
|----|--|--|
| 7  | <p>Refit the drive unit and secure with the screws and washers.<br/>Secure the screws but do not tighten yet.</p> <p> <b>Note</b></p> <p>If there is glue on the screw, please clean it or replace it with a new one.</p>   | <p>Attachment screws: 3HAB3409-236 (M4x10).</p>  <p>xx1300002569</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 8  | <p>Remove the guide pins and refit the remaining screws and washers.</p>   |  <p>xx1300002570</p>   |
| 9  | <p>Cross-tighten all the screws with torque 1 Nm first, then with 2 Nm, with 4 Nm, and finally with 4.5 Nm.</p>  |  |
| 10 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

#### Checking the tubular cable housing sealings

|   | Action  | Note |
|---|---|------|
| 1 | <p>Clean the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> |      |

Continues on next page

4.4.3 Replacing the tubular spare parts  
Continued

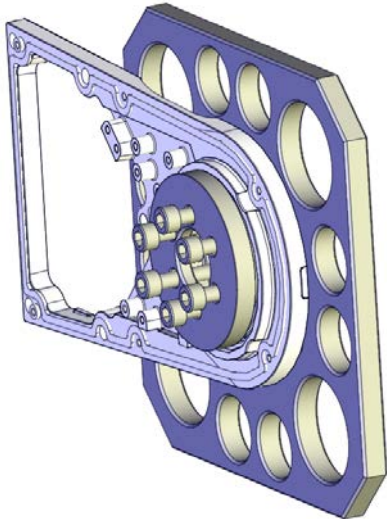

|   | Action  | Note  |
|---|---|---|
| 2 | <p>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p>   | <p>M2 variseal sealing: 3HAC044641-009</p>  <p>xx1300002396</p> |
| 3 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/><b>For robots with protection type Foundry Plus (option 287-3)</b><br/><b>For robots with protection type Clean Room</b><br/><b>For robots with food grade lubrication</b></p> <p>Check the radial sealing.<br/>Replace if damaged, as described below.<br/>If undamaged and properly seated, skip to the next procedure table.</p> | <p>Radial sealing: 3HAB3701-42</p>  <p>xx1300002608</p>        |
| 4 | <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>   |   |
| 5 | <p>Fit the radial sealing into the tubular cable housing.</p>   |   |
| 6 | <p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>  | <p>Axis-5 sealing assembly tool set: 3HAC049701-001</p>   |
| 7 | <p>Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.</p>   |  <p>xx1400000485</p>  |

Continues on next page

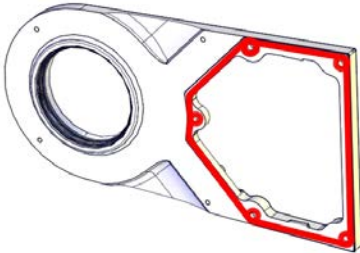

## 4 Repair

### 4.4.3 Replacing the tubular spare parts

Continued

|    | Action   | Note   |
|----|--|--|
| 8  | Screw the screws, little by little, to press the sealing into place.   |  <p>xx1400000486</p> |
| 9  | Remove the assembly tool.  |  |
| 10 | Check that the sealing is undamaged and properly fitted.   |  |
| 11 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
|    |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

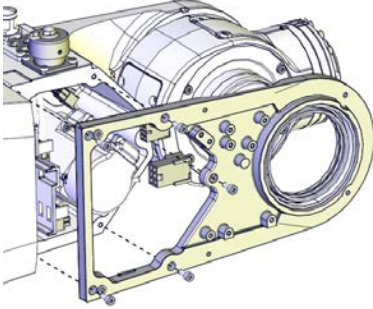

### Refitting the tubular cable housing

|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |   |
| 2 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the tubular cable housing. |  <p>xx1300002610</p> |
|   |  <b>Note</b><br>For Clean Room robots, wipe clean the overflowing Sikaflex 521FC if there is any.  |   |

Continues on next page



4.4.3 Replacing the tubular spare parts  
Continued

|   | Action   | Note   |
|---|--|--|
| 3 | Refit the tubular cable housing with the screws.   | <p>Tightening torque: 1.5 Nm.</p> <p>Tubular cable housing:<br/>3HAC059695-001<br/>: 3HAC056143-001 (used with protection type Clean Room)<br/>Tubular cable housing, Clean Room<br/>Tubular cable housing, food grade lubrication</p>  <p>xx1300002392</p> |
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

## Refitting the wrist


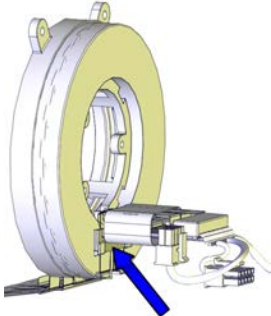
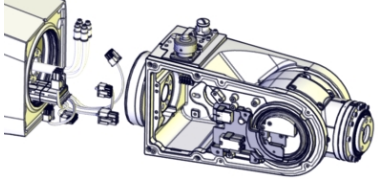
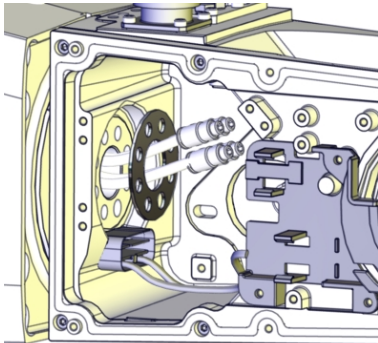
|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page

## 4 Repair

### 4.4.3 Replacing the tubular spare parts

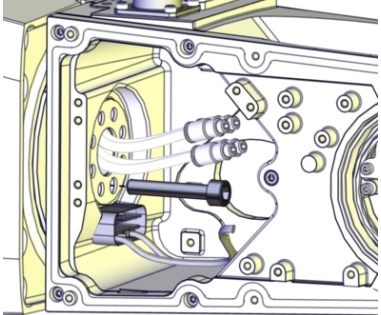

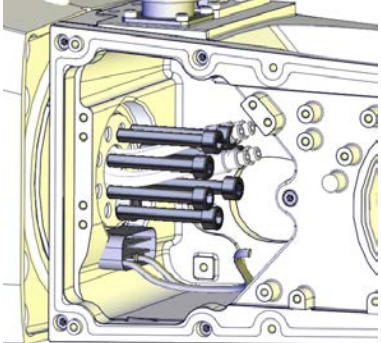

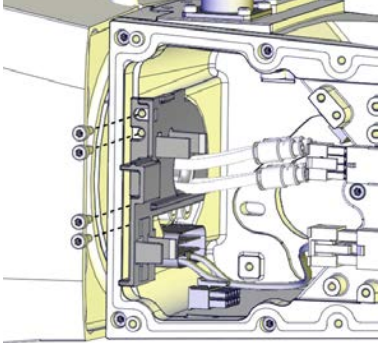
Continued

|   | Action  | Note  |
|---|---|---|
| 2 | <p>Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit.<br/>Be careful not to damage the FPC cabling and the connectors.</p> <p> <b>CAUTION</b></p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p> |  <p>xx1300002359</p>                                 |
| 3 | <p>Refit the washer while at the same time putting the cables through its center.<br/>Replace washer, if damaged.</p>   | <p>Washer: 3HAC044869-001</p>  <p>xx1400000001</p> |

Continues on next page



4.4.3 Replacing the tubular spare parts  
Continued


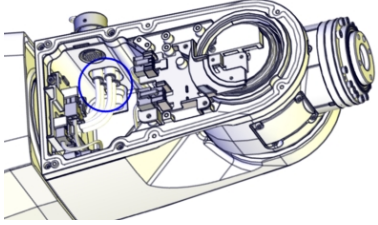
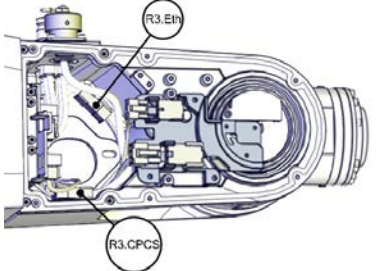

|   | Action   | Note   |
|---|--|--|
| 4 | Refit the screw M6x35 (1 pc). Do not tighten yet.          | <p>Screw: 3HAB3409-238 (M6x35 (1 pc)).</p>  <p>xx140000002</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p>     |
| 5 | Refit the rest of the screws (M5x35 (7 pcs)).              | <p>Screw: 3HAB3409-237 (M5x35 (7 pcs)).</p>  <p>xx140000003</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 6 | Tighten all screws.  | Tightening torque: 8 Nm.   |
| 7 | Put the cables through the plate hole and refit the plate. | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002356</p>  |

Continues on next page


## 4 Repair

### 4.4.3 Replacing the tubular spare parts

Continued

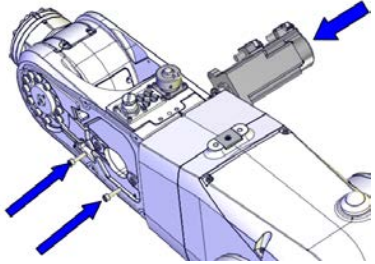

|    | Action   | Note  |
|----|--|---|
| 8  | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.</p>   |  <p>xx1300002355</p> |
| 9  | <p>Reconnect the connectors.</p> <ul style="list-style-type: none"> <li>• R3.Eth</li> <li>• R3.CPCS</li> </ul>   |  <p>xx1300002353</p> |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Preparations before securing the axis-5 motor

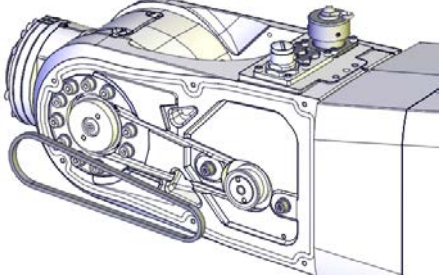

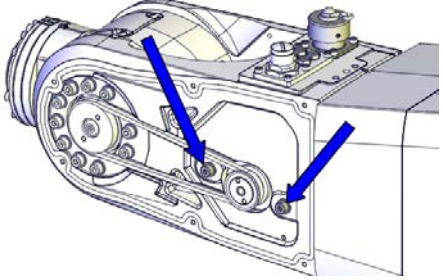
|   | Action  | Note |
|---|---|------|
| 1 | <p>Check that:</p> <ul style="list-style-type: none"> <li>• all assembly surfaces are clean and without damages</li> <li>• the motor is clean and undamaged.</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

### 4.4.3 Replacing the tubular spare parts Continued

|   | Action  | Note   |
|---|---|--|
| 2 | Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor. | <p>Screws: 3HAB3409-212 (M4x16).</p>  <p>xx1300002463</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |

#### Securing the axis-5 motor and timing belt


|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |  |
| 2 | Refit the timing belt on the pulley.  |  <p>xx1300002351</p>   |
| 3 | Move the motor to a position where a good timing belt tension is reached ( $F = 26\text{ N}$ ).   | <p> <b>Note</b><br/>Do not stretch the timing belt too much!</p> |
| 4 | Secure the motor with its attachment screws.  |  <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p>           |

Continues on next page

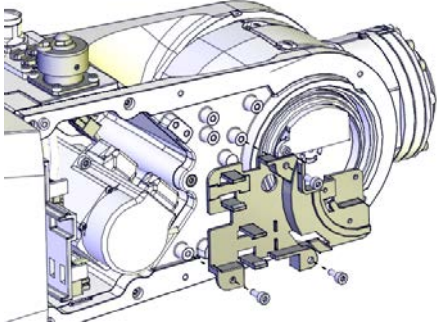
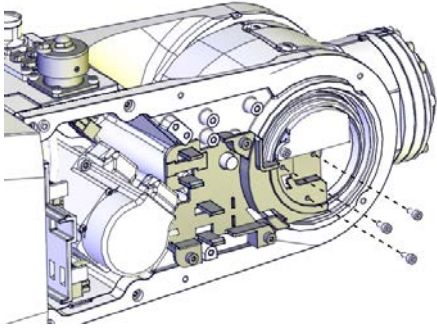

## 4 Repair

### 4.4.3 Replacing the tubular spare parts

Continued


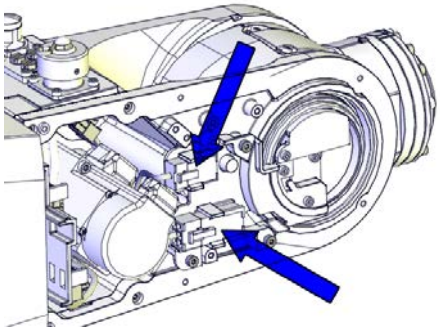
|   | Action  | Note |
|---|---|------|
| 5 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |      |

#### Refitting the connector plate


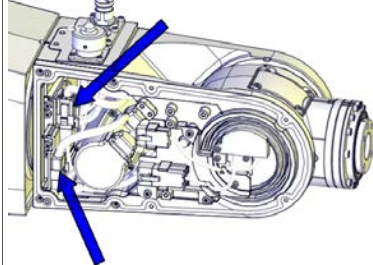
|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | Refit the connector plate and secure with the M3 screws.  | Tightening torque: 0.3 Nm.<br><br><br>xx1400001401  |
| 3 | Secure the three M2.5 screws.   | Tightening torque: 0.3 Nm.<br><br><br>xx1400001402 |
| 4 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

Continues on next page

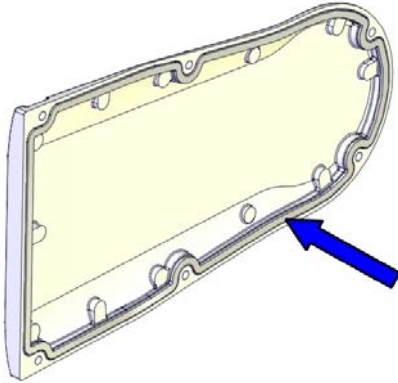
Connecting the axis-5 motor FPC connectors

|   | Action  | Note   |
|---|---|--|
| 1 | <p>Connect the axis-5 FPC connectors and snap them to their holders.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002390</p> |

Connecting the axis-5 motor connectors

|   | Action  | Note   |
|---|---|--|
| 1 | <p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002360</p> |

Refitting the wrist covers

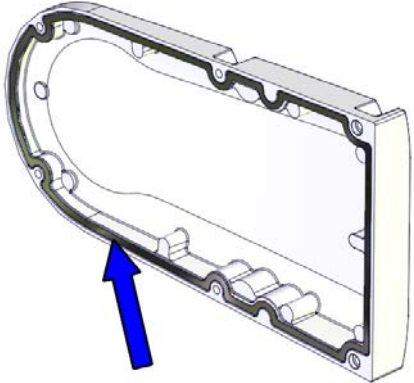
|   | Action   | Note  |
|---|--|---|
| 1 | <p>Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p>  |   |
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cover gasket. Replace if damaged.</p> | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx1400000034</p> |

Continues on next page

## 4 Repair

### 4.4.3 Replacing the tubular spare parts

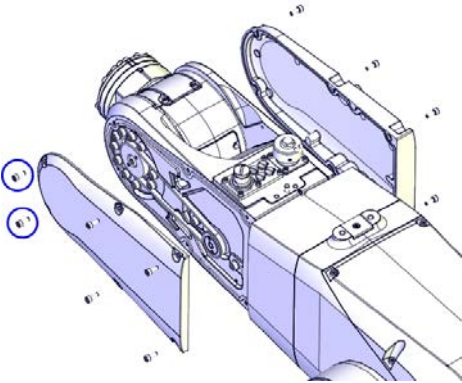
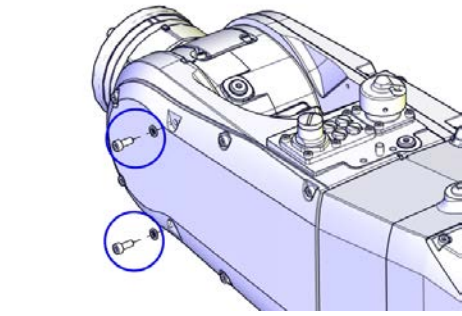


*Continued*

|   | Action  | Note  |
|---|---|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket.</p> <p>Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx140000345</p> |

*Continues on next page*



4.4.3 Replacing the tubular spare parts  
Continued

|   | Action  | Note  |
|---|---|---|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.<br/>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |   |



Continues on next page

## 4 Repair

### 4.4.3 Replacing the tubular spare parts

*Continued*

#### Concluding procedures

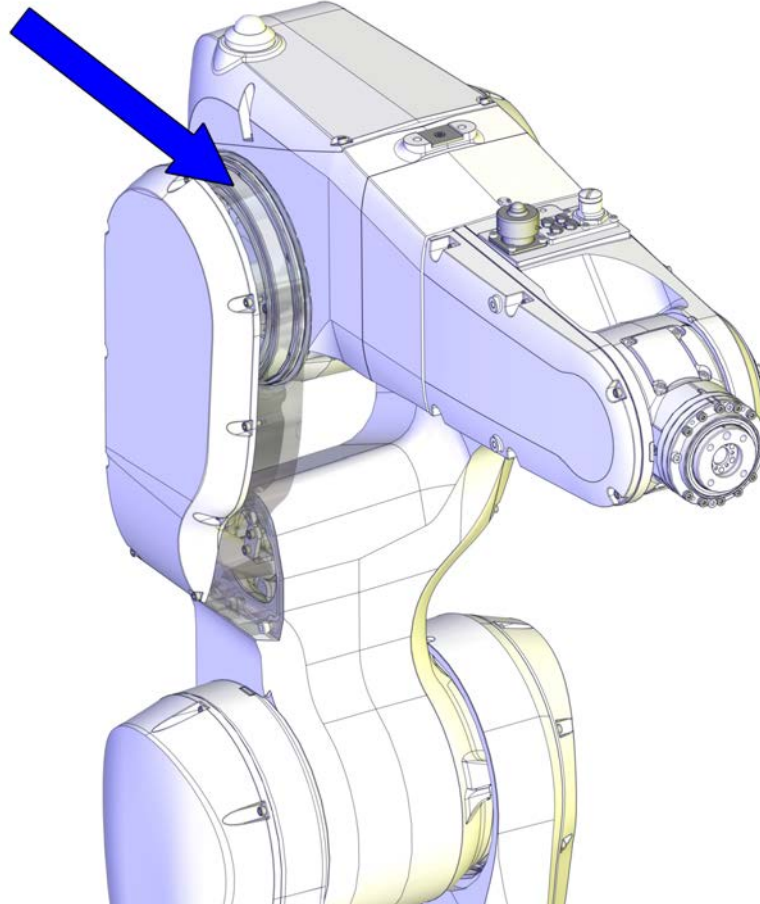
|   | Action   | Note   |
|---|--|--|
| 1 | <p>Clean and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |  |
| 2 | <p>Recalibrate the robot.</p>  | <p>Calibration information is included in section <a href="#">Calibration on page 729</a>.</p> |
| 3 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |  |



#### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

##### Location of the sealings

The axis-3 radial sealing and sealing ring are located as shown in the figure.



xx140000336

##### Required spare parts



##### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part          | Article number | Note   |
|---------------------|----------------|--|
| Radial sealing      | 3HAC024865-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| M2 variseal sealing | 3HAC044641-006 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged. |

*Continues on next page*

## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

| Spare part                             | Article number | Note   |
|--|----------------|--|
| Axis-3 sealing ring                    | 3HAC044678-001 | Replace if damaged.  |
| Gasket on lower arm cable housing      | 3HAC044895-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Cable harness material set             | 3HAC049663-001 | Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular. |
| Gasket on cable housing cover          | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket for tubular cable housing cover | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.  |

#### Required tools and equipment

| Equipment, etc.                  | Article number | Note   |
|----------------------------------|----------------|--|
| Axis-3 sealing assembly tool set | 3HAC049697-001 | Used to refit the axis-3 radial sealing.                                     |
| 24 VDC power supply              | -              | Used to release the motor brakes.  |
| Standard toolkit                 | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

#### Required consumables

| Consumable     | Art. no.       | Note  |
|----------------|----------------|---|
| Cable straps   | -              |   |
| Cleaning agent | -              | Loctite 7063  |
| Locking liquid | 3HAB7116-1     | Loctite 243   |
| Flange sealing | 12340011-116   | Loctite 574<br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3) |
| Sealant        | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room  |

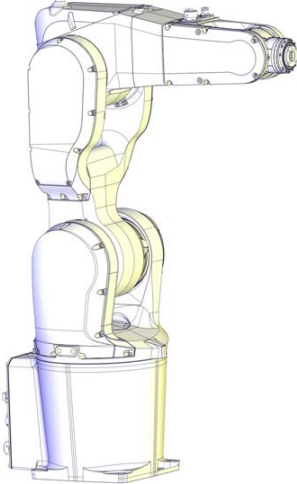


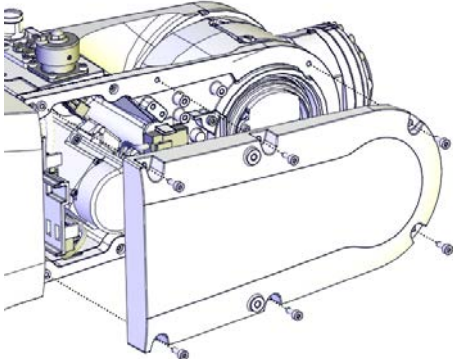
Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

Removing the sealings

Use these procedures to remove the axis-3 radial sealing and/or axis-3 sealing ring.

Preparations before removing the sealings

|   | Action   | Note   |
|---|--|--|
| 1 | Jog all axes to zero position.   |  <p>xx1300002581</p>   |
| 2 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |  |
| 3 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .                              |  |
| 4 | Remove the wrist cover.  |  <p>xx1300002389</p> |




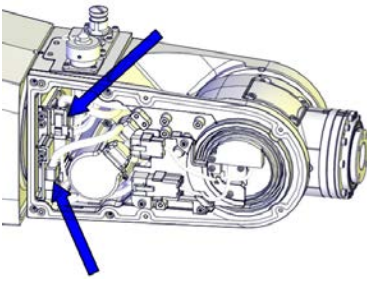
Continues on next page

## 4 Repair



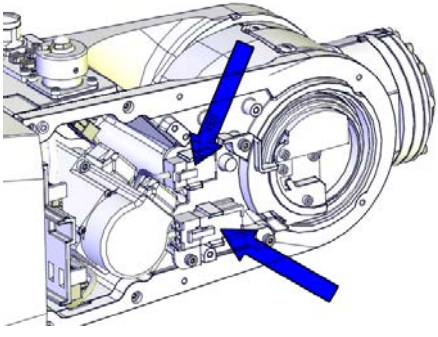
### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

#### Disconnecting the axis-5 motor connectors

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 | Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul>  <b>Tip</b><br>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002360 |

#### Disconnecting the axis-5 FPC connectors



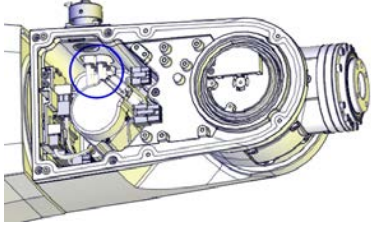
|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 | Snap loose and disconnect the axis-5 FPC connectors.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002390 |

Continues on next page



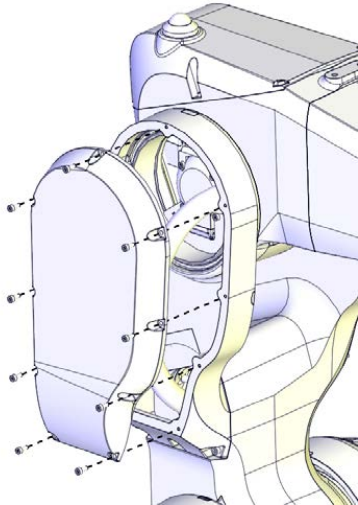
4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

Disconnecting the air hoses

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |  |
| 2 | Disconnect the air hoses.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx140000738 |

Disconnecting the axis-4 FPC connectors

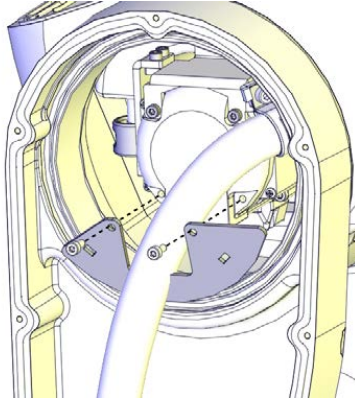
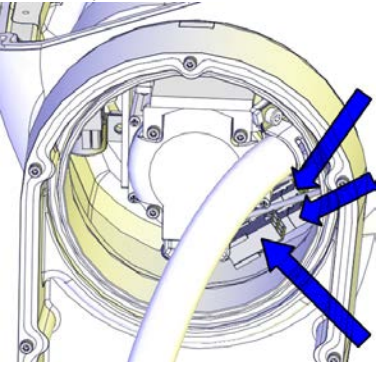
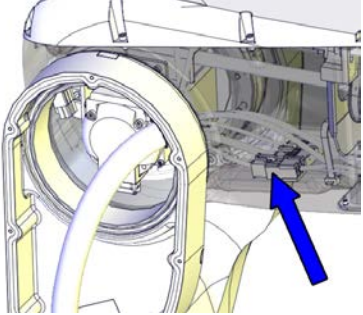
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Remove the cable housing cover.   | <br>xx1300002400 |

Continues on next page

## 4 Repair

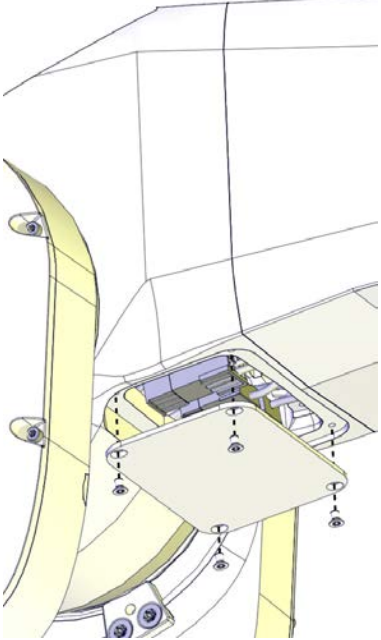
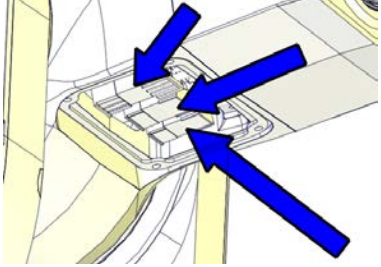
### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

*Continued*



|   | Action  | Note   |
|---|---|--|
| 4 | Remove the plate.   |  <p>xx1300002413</p>  |
| 5 | Pull out the FPC connectors from the housing and disconnect them. | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |

*Continues on next page*

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

|   | Action                                   | Note  |
|---|--|---|
| 6 | Remove the small cover of the housing.   |  <p>xx1300002398</p>   |
| 7 | Disconnect the remaining FPC connectors. |  <p>xx1300002399</p> |

Disconnecting the axis-4 motor connectors

|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |


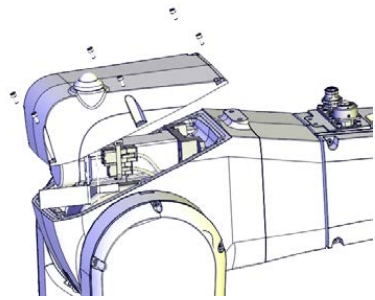
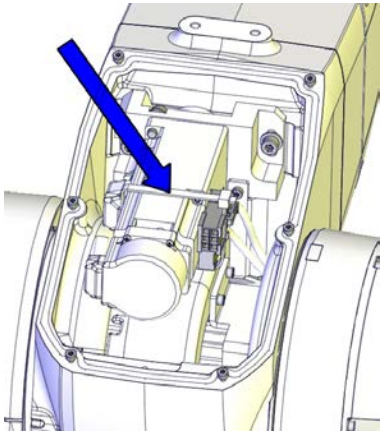

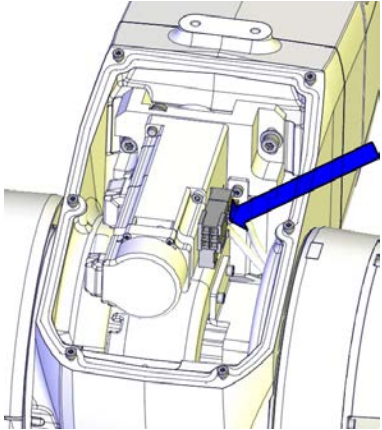
Continues on next page




## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|   | Action  | Note  |
|---|---|---|
| 3 | <p>Remove the cover from the upper arm housing.</p> <p> <b>CAUTION</b></p> <p><b>For robots with safety lamp (option)</b><br/>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p> |  <p>xx1300000456</p>   |
| 4 | <p>Cut the strap that holds the connectors.</p>   |  <p>xx1300002494</p>  |
| 5 | <p>Disconnect the motor connectors.</p> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>   |  <p>xx1300002495</p> |

#### Disconnecting the axis-3 motor connectors


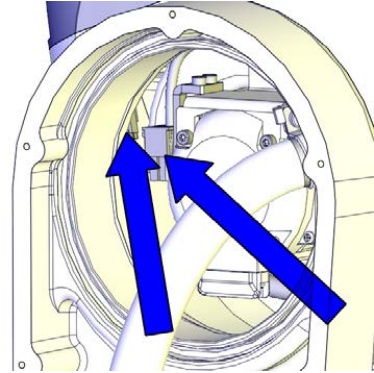
|   | Action   | Note |
|---|--|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |      |

Continues on next page



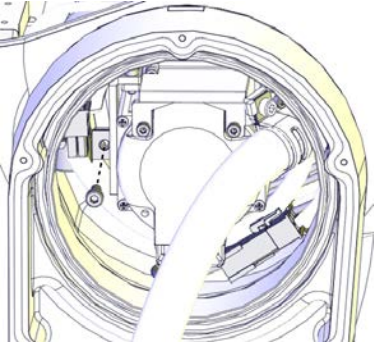
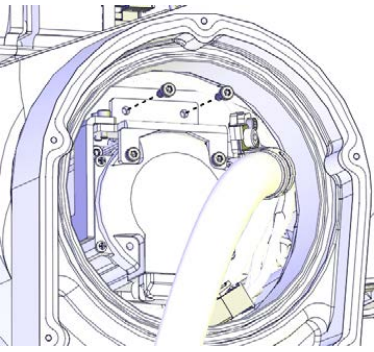


4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Pull out the axis-3 motor connectors from the housing and disconnect them.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002420</p> |

Removing the cable package in the housing

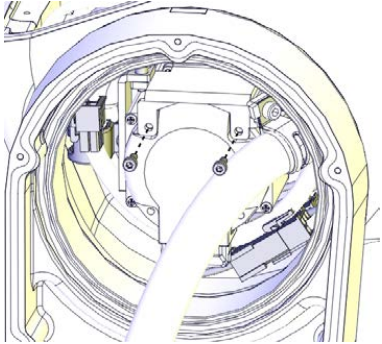

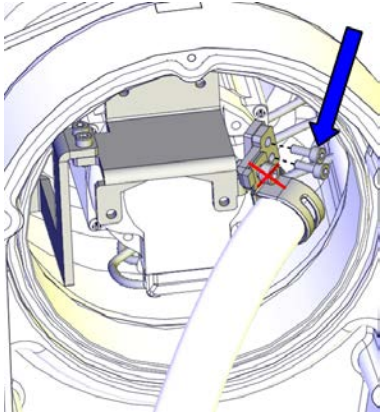
|   | Action   | Note  |
|---|--|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p>Remove the screw that fastens the air hose holder.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002422</p> |
| 3 | <p>Remove the screws that fasten the fix sheet to the inner plastic guide.</p>   |  <p>xx1300002421</p> |

Continues on next page



## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|   | Action  | Note   |
|---|---|--|
| 4 | Remove the screws that fasten the fix sheet to the motor.   | <br>xx1300002423  |
| 5 | Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet.<br>Loosen the bracket from the sheet by removing the two screws.<br><br> <b>CAUTION</b><br><br>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. | <br>xx1300002424 |
| 6 | <b>Valid for IRB 1200-5/0.9</b><br>Cut the cable straps at the bottom of the housing.   |  |

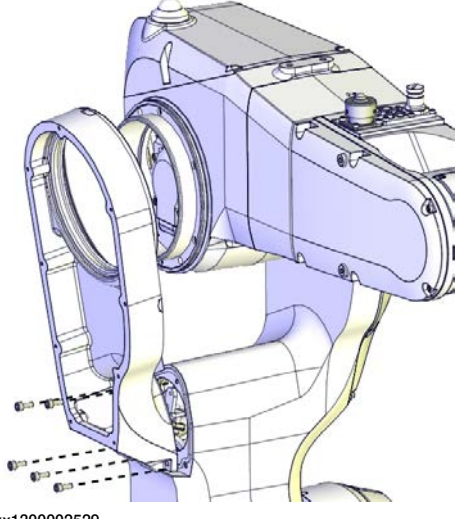
### Removing the lower arm cable housing

|   | Action   | Note |
|---|--|------|
| 1 |  <b>DANGER</b><br><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |      |
| 2 |  <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |
| 3 | Pull the cable harness out from the upper arm housing.   |      |

Continues on next page



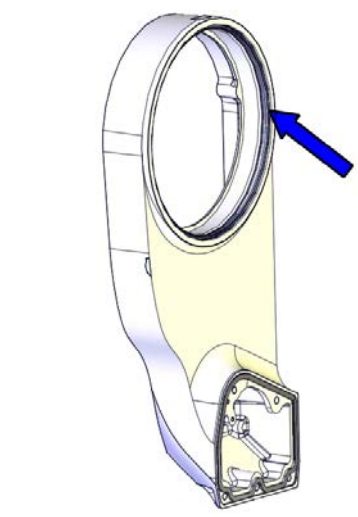
4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|   | Action  | Note   |
|---|---|--|
| 4 | Remove the cable housing of the lower arm by removing the screws. |  <p>xx1300002529</p> |

Removing the axis-3 radial sealing

Use this procedure if the axis-3 radial sealing is to be removed.

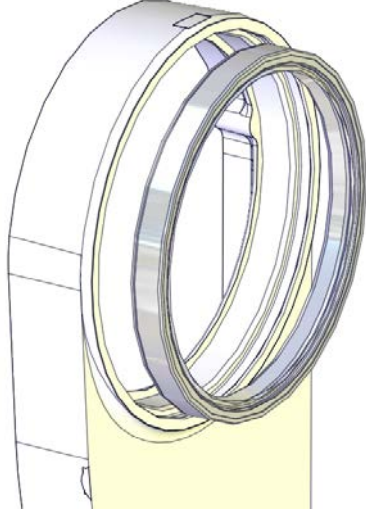
|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 3 | For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)<br>Remove the M2 variseal sealing.   |  <p>xx1400000473</p> |

Continues on next page

## 4 Repair



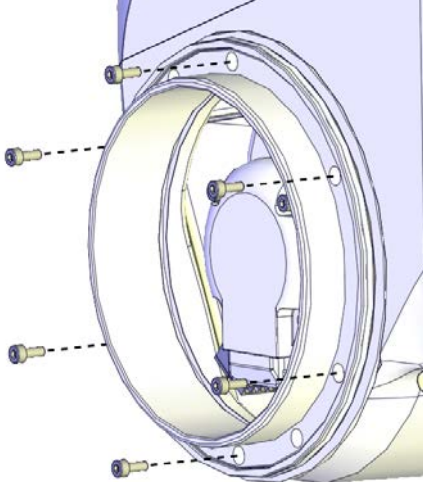
### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|   | Action                            | Note   |
|---|-----------------------------------|--|
| 4 | Remove the axis-3 radial sealing. |  <p>xx140000334</p> |

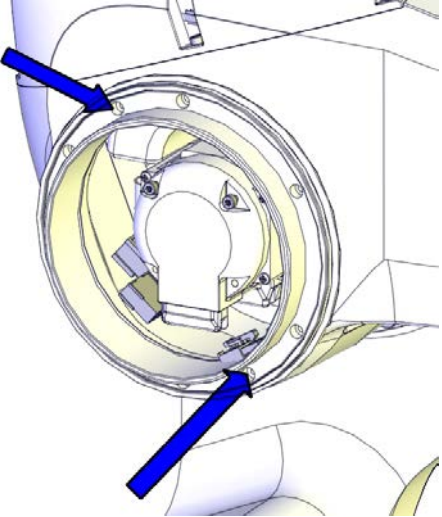
#### Removing the axis-3 sealing ring

Use this procedure if the axis-3 sealing ring is to be removed.

|   | Action  | Note   |
|---|---|--|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |  |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  |
| 3 | Remove the screws.  |  <p>xx140000332</p> |

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued


|   | Action   | Note   |
|---|--|--|
| 4 | Use screws in the two press out holes to press the sealing ring out. |  <p>xx1400000333</p> |

**Refitting the sealings**

Use these procedures to refit the axis-3 radial sealing and/or axis-3 sealing ring.

**Refitting the axis-3 sealing ring**

Use this procedure if the axis-3 sealing ring needs to be refitted.


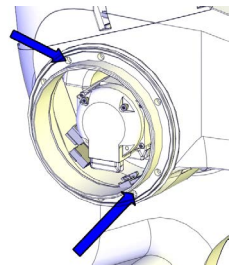
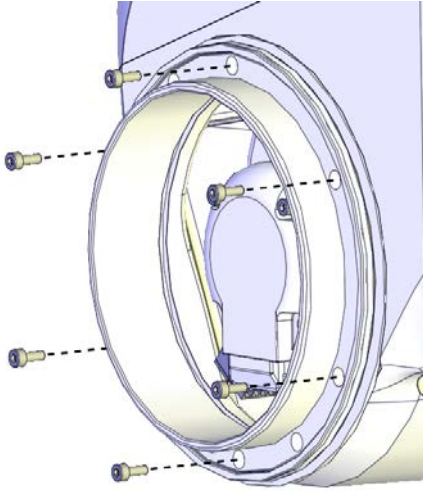

|   | Action  | Note |
|---|---|------|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |      |
| 2 | <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing Loctite 574 on the mounting surfaces of the sealing ring.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |      |

Continues on next page

## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|   | Action   | Note  |
|---|--|---|
| 3 | <p>Refit the axis-3 sealing ring by securing the screws.</p> <p> <b>Note</b></p> <p>Make sure to use the correct screw holes. The two holes shown in the figure are only used for pressing out the ring during removal.</p>  <p>xx1400000333</p> | <p>Tightening torque: 1.5 Nm</p>  <p>xx1400000332</p> |
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>   |   |

#### Refitting the axis-3 radial sealing

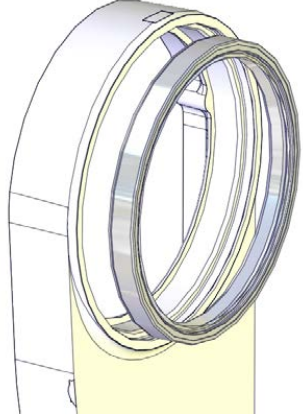
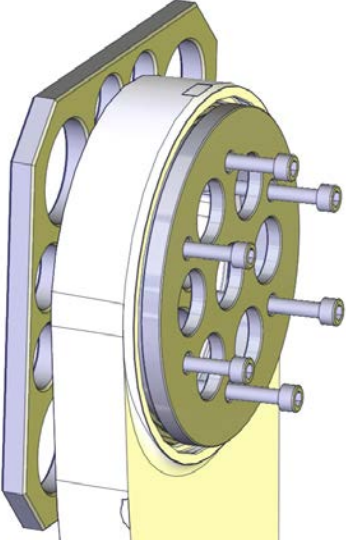
Use this procedure if the axis-3 radial sealing needs to be refitted.

|   | Action   | Note |
|---|--|------|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>                                  |      |
| 2 | <p><b>For robots with protection type Clean Room</b></p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> |      |

Continues on next page



**4.4.4 Replacing the axis-3 radial sealing and sealing ring**  
*Continued*


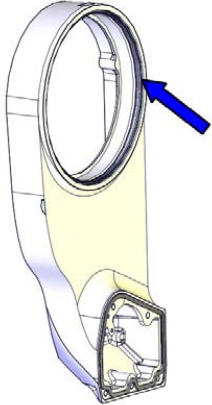

|   | <b>Action</b>   | <b>Note</b>  |
|---|---|--|
| 3 | Fit the axis-3 radial sealing to the cable housing.   | Radial sealing: 3HAC024865-001<br><br>xx1400000334                    |
| 4 | Put the assembly tool on both sides of the cable housing, circular part against the sealing, and then slowly press the sealing into the housing by screwing the six screws (M6X50) into the plate little by little.<br>Fit the circular part of the radial sealing fitting tool against the radial sealing. | Axis-3 sealing assembly tool set: 3HAC049697-001<br><br>xx1400000335 |
| 5 | Fit the tool plate to the other side of the cable housing with the six screws M6X50.  |  |
| 6 | Screw the screws, little by little, to press the sealing into place.  |  |
| 7 | Remove the assembly tool.   |  |

*Continues on next page*

## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|    | Action   | Note   |
|----|--|--|
| 8  | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Fit a new M2 variseal sealing.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p>                                | <p>M2 variseal sealing: 3HAC044641-006</p>  <p>xx1400000473</p> |
| 9  | Check that the sealings are undamaged and properly fitted.   |  |
| 10 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

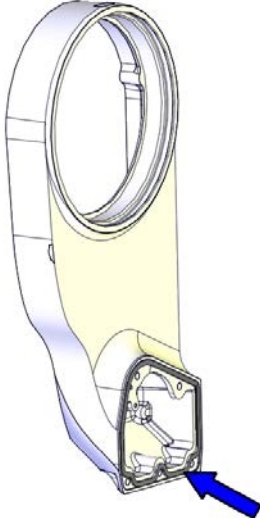



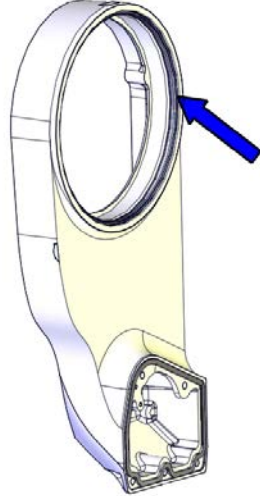
### Refitting the lower arm cable housing

|   | Action  | Note |
|---|---|------|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page



4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

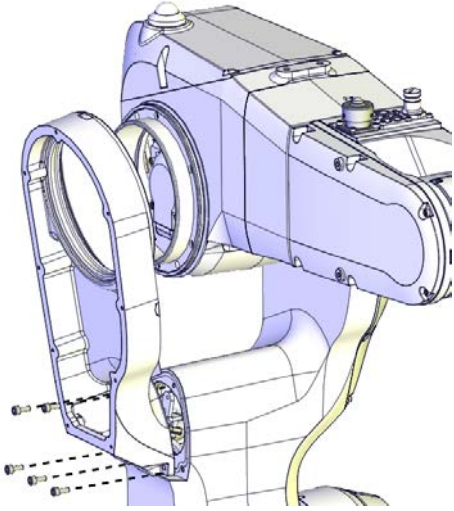

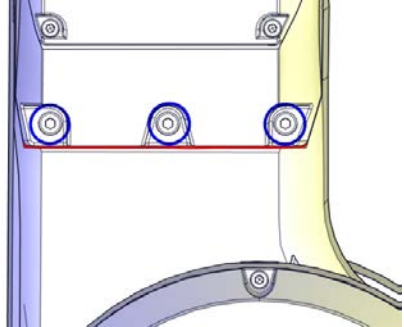

|   | Action  | Note   |
|---|---|--|
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the cable housing gasket.</p> <p>Replace if damaged.</p>   | <p>Gasket on lower arm cable housing: 3HAC044895-001</p>  <p>xx1400000414</p>   |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the radial sealing and the M2 variseal sealing.</p> <p>Replace if damaged.</p> <p> <b>Note</b></p> <p>The M2 variseal sealing does not used for robots with protection type Clean room and with food grade lubrication.</p> <p> <b>Note</b></p> <p>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>Radial sealing: 3HAC024865-001</p> <p>M2 variseal sealing: 3HAC044641-006</p>  <p>xx1400000473</p> <p>Replacement of the radial sealing is detailed in previous section.</p> |

Continues on next page

## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

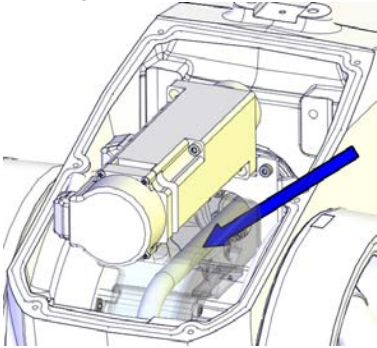


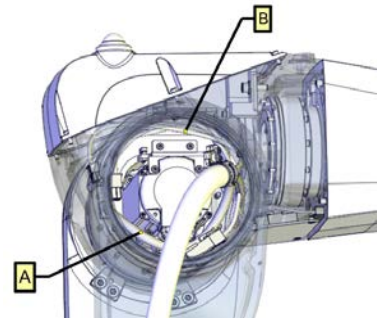

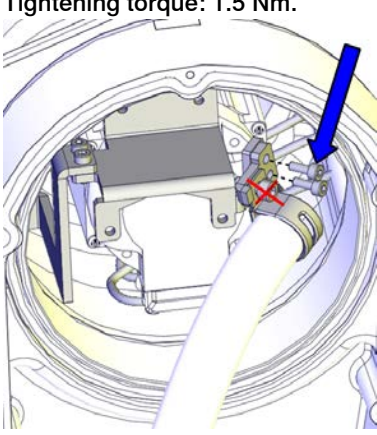
|   | Action  | Note   |
|---|---|--|
| 4 | Refit the cable housing of the lower arm.   | Tightening torque: 4 Nm.<br><br>xx1300002529 |
| 5 | <b>For robots with protection type Clean Room</b><br>Apply a string of the sealant Sikaflex 521FC to the joint of the cable housing of the lower arm.<br>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.<br>If necessary, add extra sealant to get a full cover joint.<br> <b>Note</b><br>No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure. | <br>xx1600000218                           |
| 6 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.   |  |

#### Refitting the cable package in the housing

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

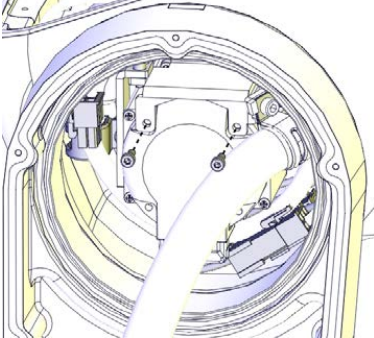
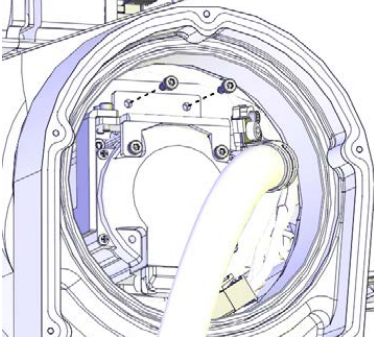

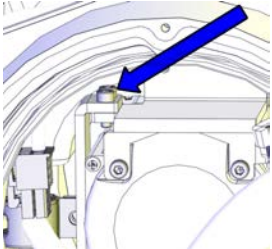
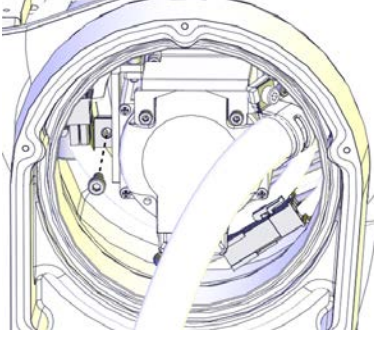
|   | Action  | Note  |
|---|---|---|
| 2 | <p>Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.</p>   | <p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p> |
| 3 | <p>Guide the cable package into the upper arm, through the housing.</p> <p> <b>Note</b></p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> <b>Note</b></p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p> |  <p>xx1400001472</p>  |
| 4 | <p>Refit the bracket to the sheet with two screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>   |

Continues on next page

## 4 Repair

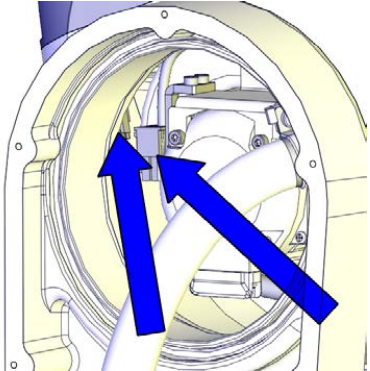
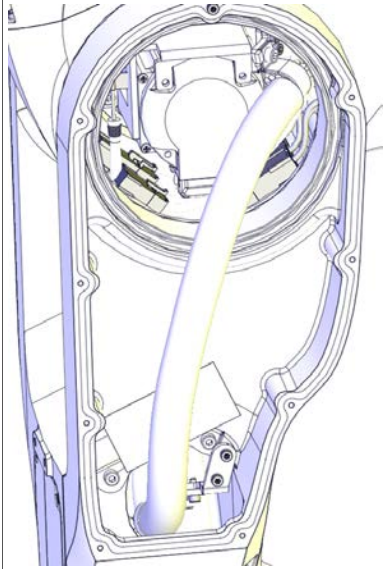

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|   | Action   | Note   |
|---|--|--|
| 5 | Refit the fix sheet to the motor.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p>  |
| 6 | Refit the fix sheet to the inner plastic guide.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>   |
| 7 | <p>Fit the air hose holder to the bracket.<br/>Replace the holder, if damaged.</p> <p> <b>Tip</b></p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p> | <p>Air hose holders are included in Cable harness material set (3HAC049663-001).</p> <p>Tightening torque: 4 Nm.</p>  <p>xx1300002422</p> |

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

|    | Action  | Note  |
|----|---|---|
| 8  | Reconnect the axis-3 motor connectors.  |  <p>xx1300002420</p>   |
| 9  | Apply grease to the cable package, cover all moving area of the package.  |  <p>xx1400000754</p>  |
| 10 | <b>Valid for IRB 1200-5/0.9</b><br>Secure the cable package at the bottom of the housing with cable straps.                             |   |
| 11 | Seal and paint the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> | <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |

Continues on next page


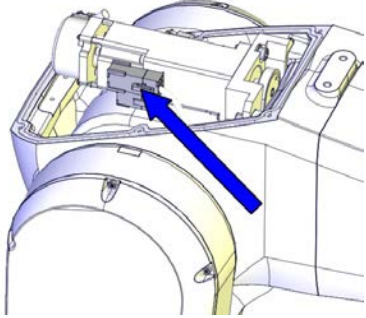
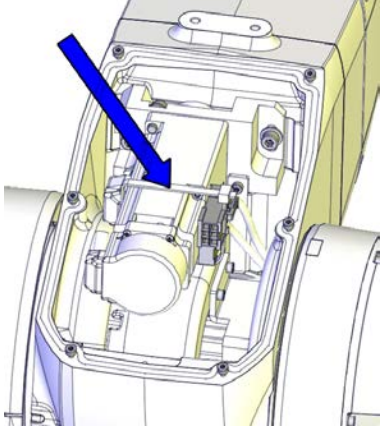


## 4 Repair


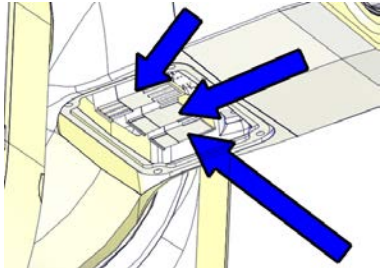
### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

#### Connecting the axis-4 motor connectors


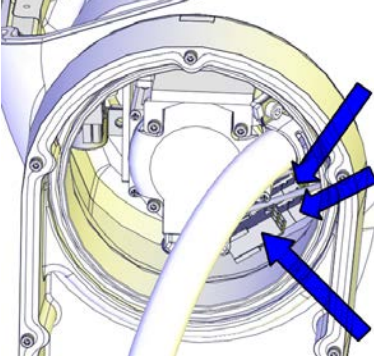
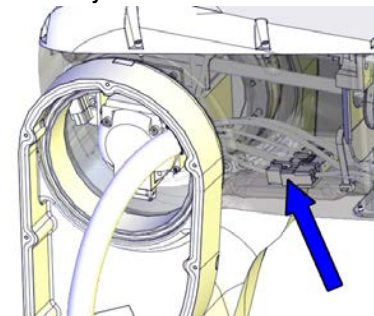
|   | Action   | Note   |
|---|--|--|
| 1 | <p>Reconnect the motor connectors.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002371</p>  |
| 2 | <p>Secure the connectors to the motor with a cable strap.</p>  |  <p>xx1300002494</p> |

#### Connecting the axis-4 FPC connectors

|   | Action  | Note  |
|---|---|---|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>   |   |
| 2 | <p>Reconnect the FPC connectors.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> |  <p>xx1300002399</p> |

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

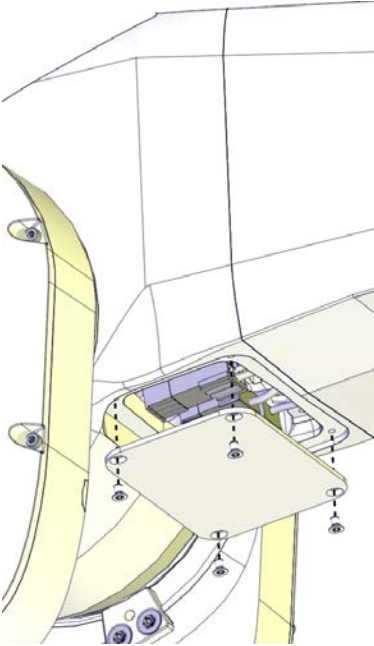
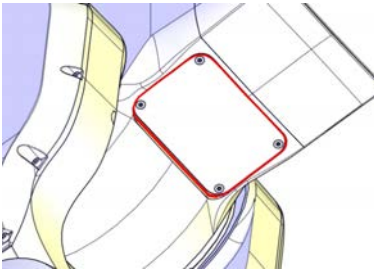
|   | Action  | Note   |
|---|---|--|
| 3 | <p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>  |  |

Continues on next page

## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

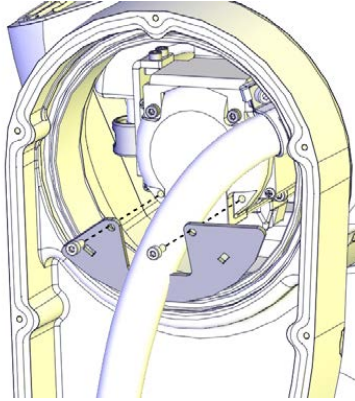
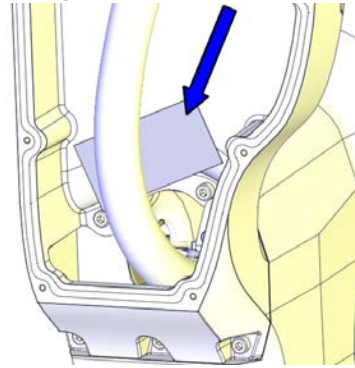
Continued

|   | Action  | Note   |
|---|---|--|
| 5 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>  |   |
| 6 | <p>Refit the small cover to the housing.</p> <p>Replace if damaged.</p>   | <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001</p> <p>: 3HAC056142-001 (used with protection type Clean Room)</p> <p>Housing small cover, Clean Room</p> <p>Housing small cover, food grade lubrication</p> <p>Screws: 3HAC14286-4 (M3X5).</p> <p>Tightening torque: 1 Nm.</p> |
| 7 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the small cover on the housing.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx1600000214</p>  |

Continues on next page



**4.4.4 Replacing the axis-3 radial sealing and sealing ring**  
*Continued*

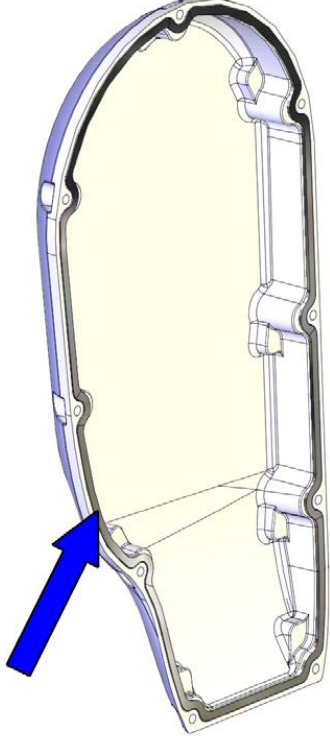
|   | <b>Action</b>  | <b>Note</b>  |
|---|--|--|
| 8 | Refit the plate.   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                            |
| 9 | Check the PTFE film on the cable housing.<br>Replace if damaged. | <p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p> |

*Continues on next page*

## 4 Repair

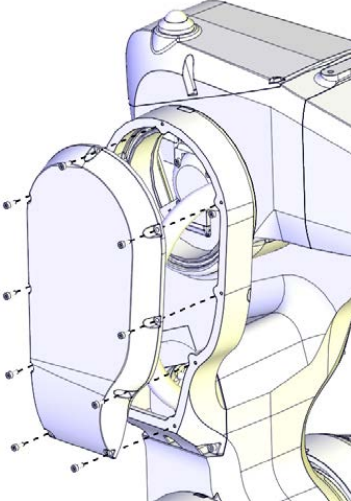


### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

*Continued*


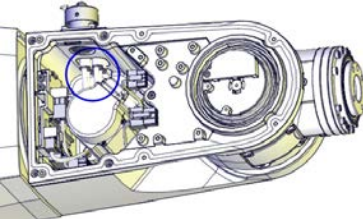
|    | Action  | Note   |
|----|---|--|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the gasket of the cable housing cover.<br/>Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001<br/>PTFE film on cable housing cover:<br/>3HAC044660-001</p>  <p>xx1400000048</p> |
| 11 | <p>Check the PTFE film on the cable housing cover.<br/>Replace if damaged.</p>  |  |
| 12 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>  |  |

*Continues on next page*

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

|    | Action  | Note   |
|----|---|--|
| 13 | <p>Refit the cable housing cover.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 14 | <p>Seal and paint the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Connecting the air hoses and CP/CS cabling (if equipped)

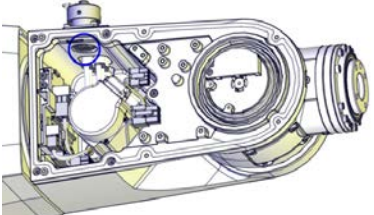
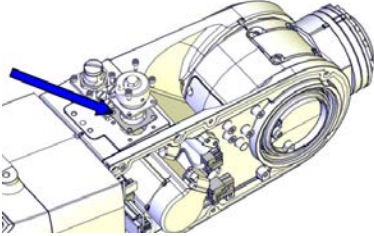
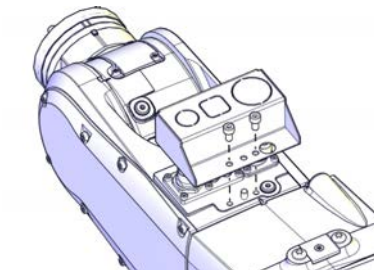
|   | Action   | Note   |
|---|--|--|
| 1 | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>.</p> | <p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p> |

Continues on next page


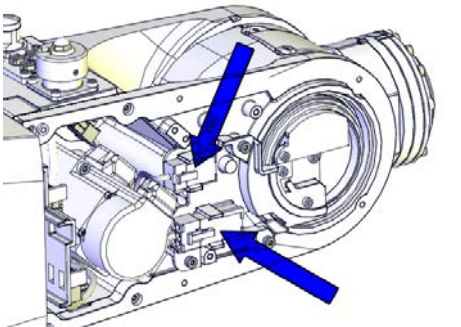
## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

|   | Action  | Note   |
|---|---|--|
| 2 | <p>If equipped, reconnect the CP/CS connector.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <ol style="list-style-type: none"> <li>1 Check the gasket.</li> <li>2 Replace if damaged.</li> </ol> <p><b>For robots with protection type Clean Room:</b></p> <ol style="list-style-type: none"> <li>1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</li> <li>2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.</li> </ol> |  <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p> |
| 3 | <p><b>For robots with protection type Foundry Plus</b></p> <p>If required, fit the protection bracket for CP/CS connectors.</p>   | <p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>   |


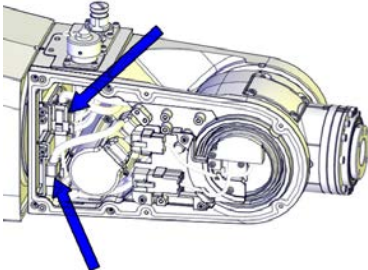
### Connecting the axis-5 motor FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | <p>Connect the axis-5 FPC connectors and snap them to their holders.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002390</p> |

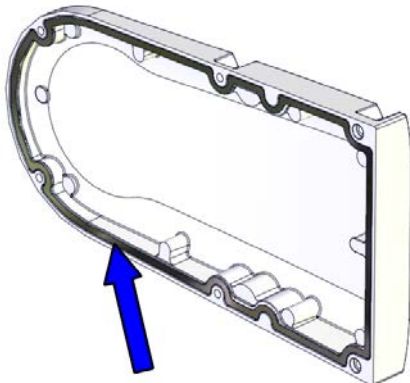
Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

Connecting the axis-5 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | Reconnect the motor cables. <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul>  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i> |  <p>xx1300002360</p> |

Refitting the tubular cable housing cover

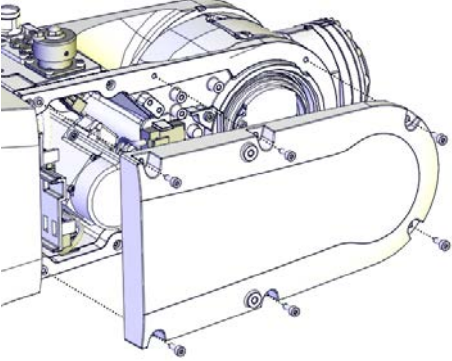


|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>   |  |
| 2 | For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)<br>For robots with protection type Clean Room<br>For robots with food grade lubrication<br>Check the tubular cable housing cover gasket.<br>Replace if damaged. | Gasket for tubular cable housing cover:<br>3HAC056707-001<br> <p>xx1400000345</p> |

Continues on next page

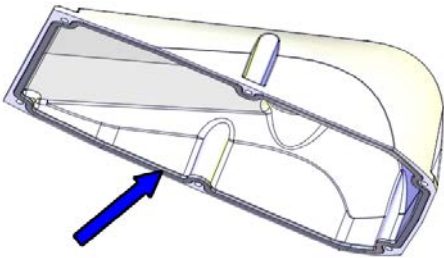
## 4 Repair

### 4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued


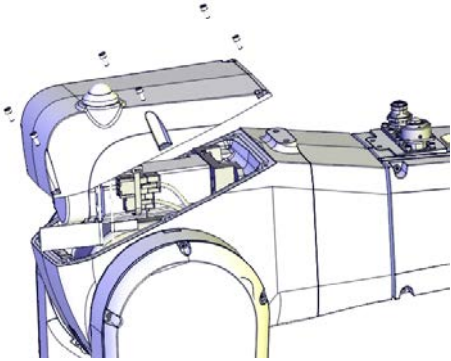

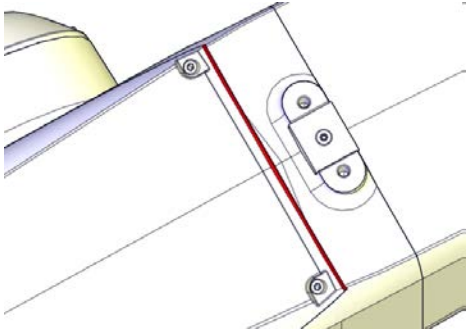



|   | Action   | Note  |
|---|--|---|
| 3 | Refit the cover to the cable housing.  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Concluding procedure

|   | Action  | Note   |
|---|---|--|
| 1 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p> | <p>Housing cover gasket (IRB 1200-7/0.7 ): 3HAC056698-001</p> <p>Housing cover gasket (IRB 1200-5/0.9 ): 3HAC056697-001</p>  <p>xx1400000477</p> |

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring  
Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Refit the upper arm housing cover with the screws.</p> <p> <b>CAUTION</b></p> <p><b>For robots with safety lamp (option)</b><br/>Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 3 | <p><b>For robots with protection type Clean Room</b></p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>   |  <p>xx1600000215</p>   |
| 4 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |   |
| 5 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |   |



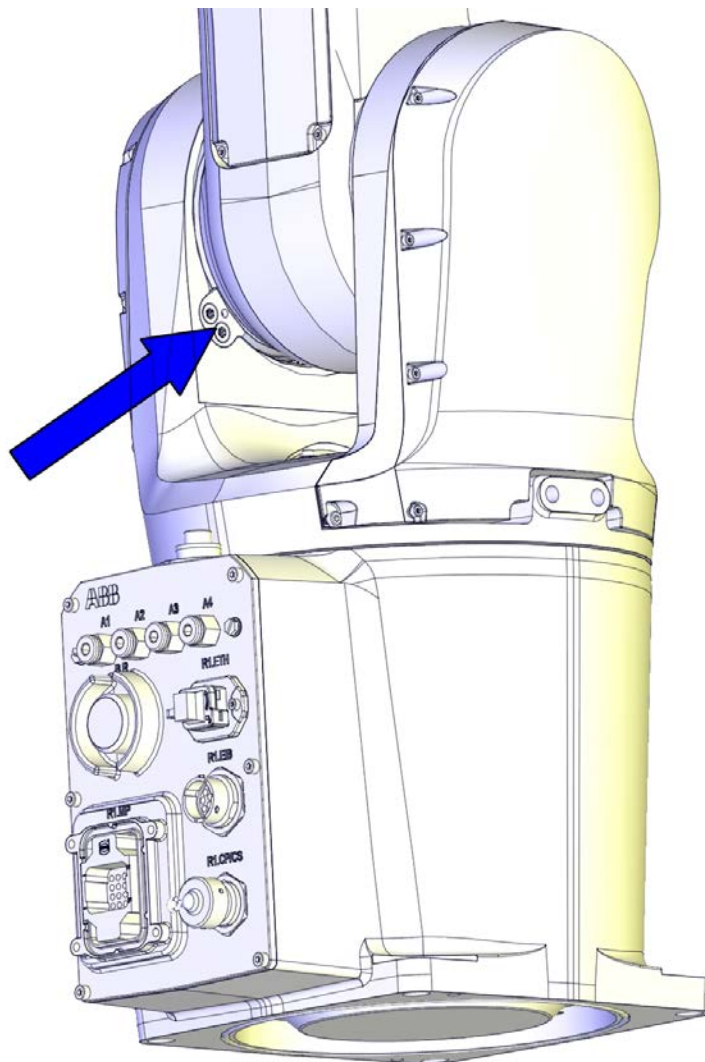
## 4 Repair

### 4.4.5 Replacing the axis-2 mechanical stop

### 4.4.5 Replacing the axis-2 mechanical stop

#### Location of the mechanical stop

The axis-2 mechanical stop is located as shown in the figure.



xx140000389

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                  | Article number | Note  |
|-----------------------------|----------------|---|
| Mechanical stop set, axis 2 | 3HAC049637-001 | Includes mechanical stop pin (1 pc) and screws. |

Continues on next page




## Required tools and equipment

| Equipment, etc.     | Article number | Note   |
|---------------------|----------------|--|
| 24 VDC power supply | -              | Used to release the motor brakes.  |
| Standard toolkit    | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |



## Replacing the mechanical stop

Use these procedures to remove the axis-2 mechanical stop.

## Preparations before removing the mechanical stop

|   | Action   | Note |
|---|--|------|
| 1 | Jog the robot to a position where the mechanical stop is most easily accessed.   |      |
| 2 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |      |

## Replacing the axis-2 mechanical stop

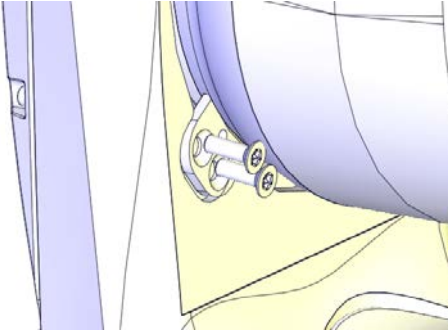


|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page

## 4 Repair

### 4.4.5 Replacing the axis-2 mechanical stop

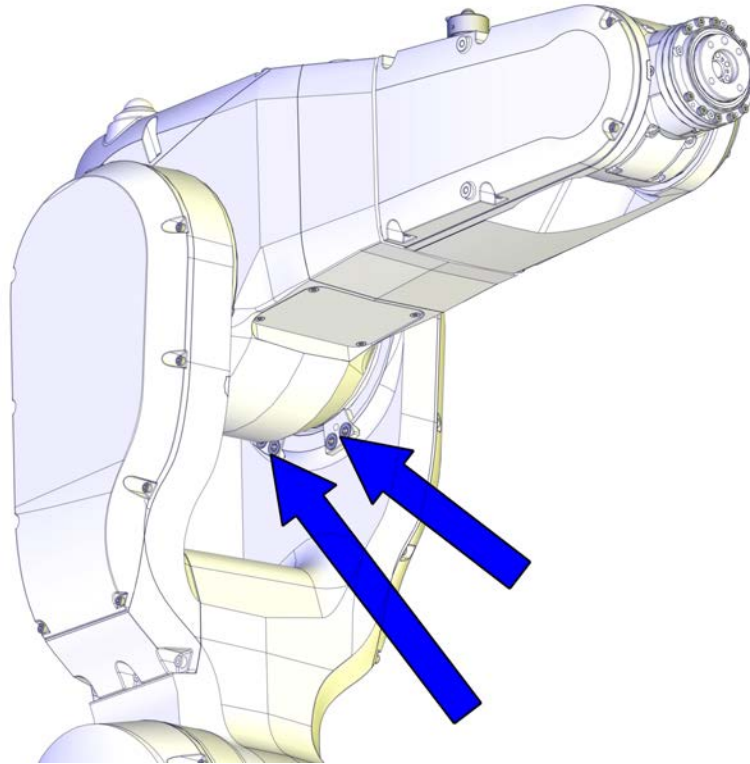
Continued

|   | Action  | Note   |
|---|---|--|
| 3 | Remove the mechanical stop by removing the screws.  |  <p>xx1400000390</p> <p>Screws: 9ADA624-45 (M5x16).<br/>Tightening torque: 4 Nm.</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 4 | Discard the old screws.   |  |
| 5 | Refit and secure the new stop with the enclosed screws.   |  |
| 6 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run. |  |

## 4.4.6 Replacing the axis-3 mechanical stop

### Location of the mechanical stop

The axis-3 mechanical stop is located as shown in the figure.



xx1400000386

### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                  | Article number | Note  |
|-----------------------------|----------------|---|
| Mechanical stop set, axis 3 | 3HAC049644-001 | Includes mechanical stop pin (1 pc) and screws. |

### Required tools and equipment

| Equipment, etc.     | Article number | Note   |
|---------------------|----------------|--|
| 24 VDC power supply | -              | Used to release the motor brakes.  |
| Standard toolkit    | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

*Continues on next page*

## 4 Repair


### 4.4.6 Replacing the axis-3 mechanical stop

*Continued*



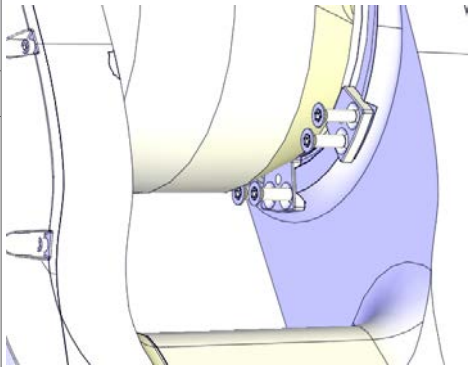

#### Replacing the mechanical stop

Use these procedures to replace the axis-3 mechanical stop.


#### Preparations before removing the mechanical stop

|   | Action   | Note |
|---|--|------|
| 1 | Jog the robot to a position where the mechanical stops are most easily accessed.   |      |
| 2 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |      |

#### Replacing the axis-3 mechanical stop

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 3 | Remove the mechanical stop to be replaced by removing the screws.   |  <p>xx1400000387</p> <p>Screws: 9ADA624-45 (M5x16).<br/>Tightening torque: 4 Nm</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 4 | Discard the old screws.   |  |
| 5 | Refit and secure the new stop with the enclosed screws.   |  |

*Continues on next page*

|   | Action   | Note |
|---|--|------|
| 6 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run. |      |

## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

#### 4.4.7 Replacing the axis-4 mechanical stop

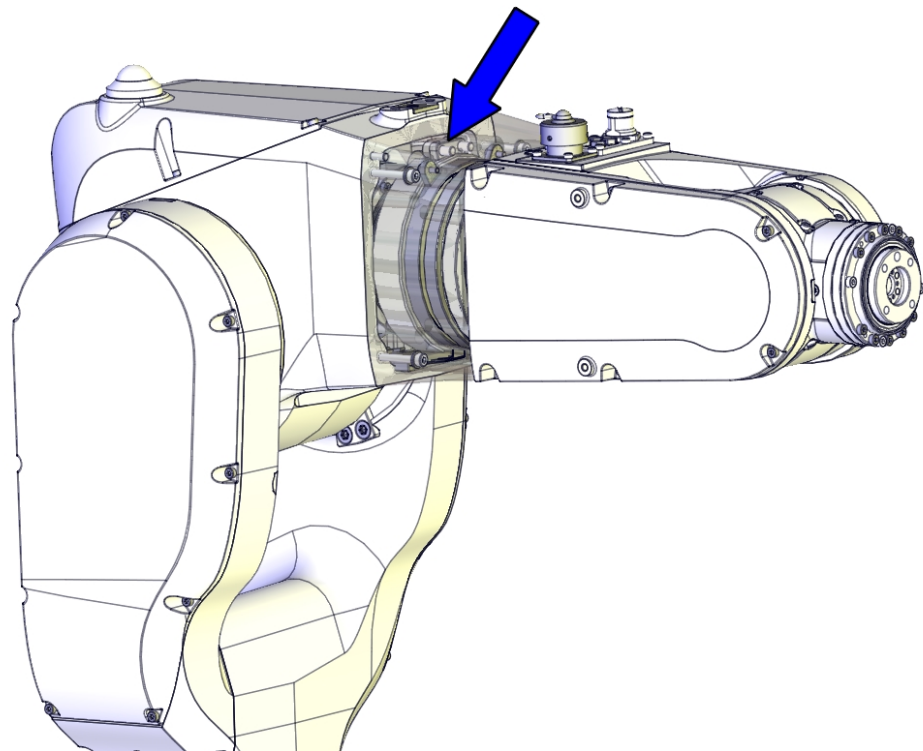


#### WARNING

The mechanical stop needs to be inspected immediately if it gets hit. Replace the mechanical stop if damage is detected. Access to and inspection of the stop requires disassembly of the robot according to this section.

#### Location of the mechanical stop

The axis-4 mechanical stop is located inside the housing extender unit, as shown in the figure.



xx1300002416

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part          | Article number | Note  |
|---------------------|----------------|---|
| Mechanical stop set | 3HAC049652-001 | Includes mechanical stop pin, guide, slider and screws. |

*Continues on next page*

4.4.7 Replacing the axis-4 mechanical stop  
*Continued*

| Spare part   | Article number | Note   |
|--|----------------|--|
| M2 variseal sealing  | 3HAC044641-007 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.           |
| Radial sealing with dust lip   | 3HAB3701-48    | Not used with protection class IP40.<br>Replace if damaged.  |
| Housing small cover  | 3HAC059684-001 | Replace if damaged.  |
| Housing small cover, Clean Room<br>Housing small cover, food grade lubrication | 3HAC056142-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| PTFE film on lower arm cable housing   | 3HAC044710-001 | Replace if damaged.  |
| Gasket on cable housing cover  | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| PTFE film on cable housing cover   | 3HAC044660-001 | Replace if damaged.  |
| Washer   | 3HAC044869-001 | Replace if damaged   |
| Gasket for tubular cover   | 3HAC058822-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket for tubular cable housing cover   | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.  |

**Required tools and equipment**

| Equipment, etc.                  | Article number | Note   |
|----------------------------------|----------------|--|
| Axis-4 sealing assembly tool set | 3HAC049699-001 | Used to refit the radial sealing, if replacement is needed.                  |
| 24 VDC power supply              | -              | Used to release the motor brakes.  |
| Standard toolkit                 | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

**Required consumables**

| Consumable     | Art. no.       | Note   |
|----------------|----------------|--|
| Cleaning agent | -              | Loctite 7063   |
| Flange sealing | 12340011-116   | Loctite 574<br>Used with protection class IP67.<br>Used with protection type Foundry Plus. |
| Flange sealing | 3HAC026759-001 | Sikaflex 521FC   |
| Locking liquid | 3HAB7116-1     | Loctite 243  |

*Continues on next page*


## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

*Continued*

#### Deciding calibration routine

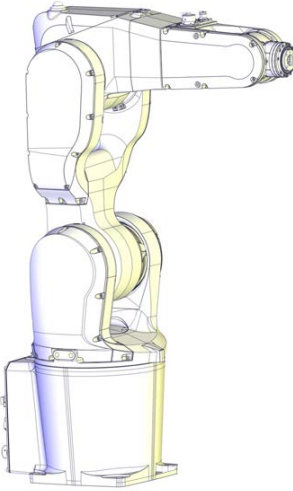
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  | <p> <b>Note</b></p> <p>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.</p>                   |
|   | <p><b>If the robot is to be calibrated with reference calibration:</b></p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |
|   | <p><b>If the robot is to be calibrated with fine calibration:</b></p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>  |   |

#### Removing the mechanical stop


Use these procedures to remove the mechanical stop.

#### Preparations before removing the axis-4 mechanical stop





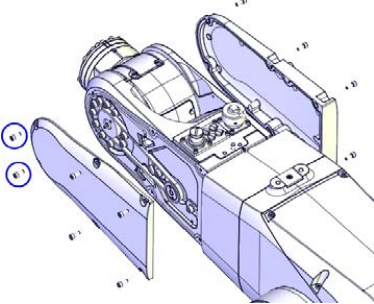
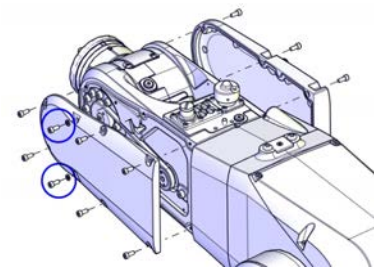
|   | Action   | Note   |
|---|--|--|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure. |  |
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |

*Continues on next page*



|   | Action   | Note |
|---|--|------|
| 3 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |      |

Getting access to inside of the wrist unit

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .   |   |
| 3 | <p>Remove the covers on each side of the wrist by removing their screws.</p> <p> <b>Note</b></p> <p><b>For robots with protection class IP67 (option 287-10)</b><br/> <b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.</p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> <p> <b>Note</b></p> <p><b>For robots with protection type Clean Room</b></p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |




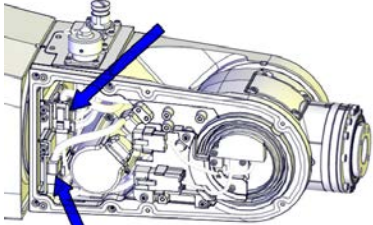
Continues on next page

## 4 Repair



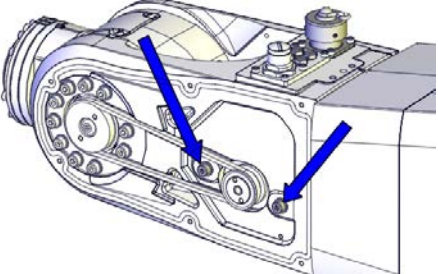
### 4.4.7 Replacing the axis-4 mechanical stop

Continued

#### Disconnecting the axis-5 motor connectors

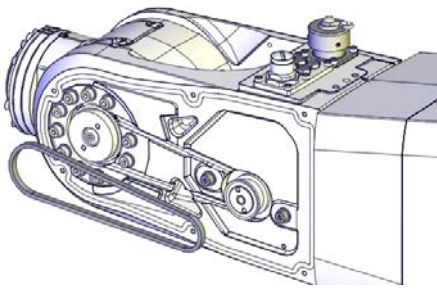
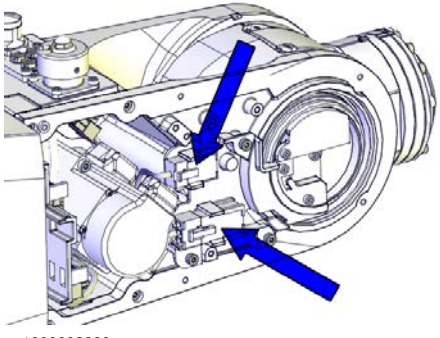
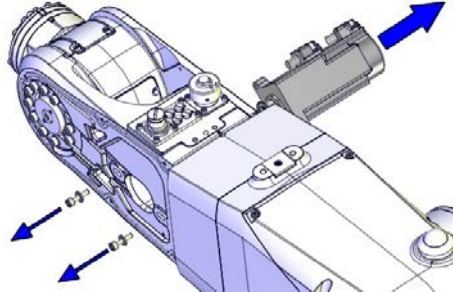
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 | Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul>  <b>Tip</b><br>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002360 |

#### Removing the axis-5 motor with pulley



|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 3 | Loosen the screws so that the motor can be moved sideways.  | <br>xx1300002350 |

Continues on next page

4.4.7 Replacing the axis-4 mechanical stop  
Continued

|   | Action   | Note   |
|---|--|--|
| 4 | Remove the timing belt.                              |  <p>xx1300002351</p>   |
| 5 | Snap loose and disconnect the axis-5 FPC connectors. |  <p>xx1300002390</p>  |
| 6 | Remove the screws and pull out the motor.            |  <p>xx1300002352</p> |

Removing the wrist

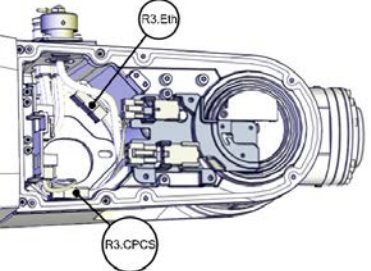
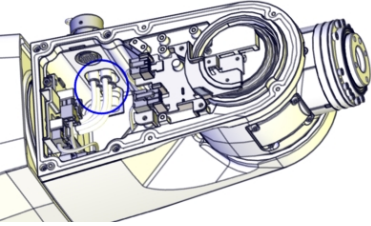
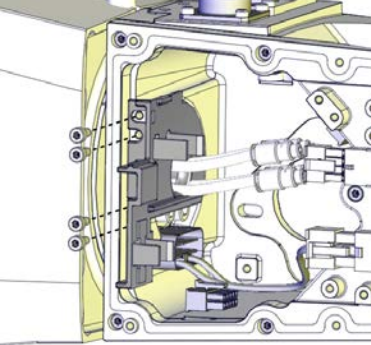
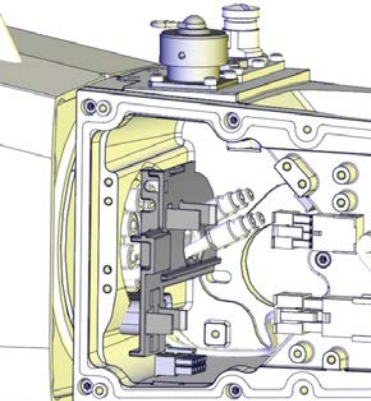
|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

## 4 Repair

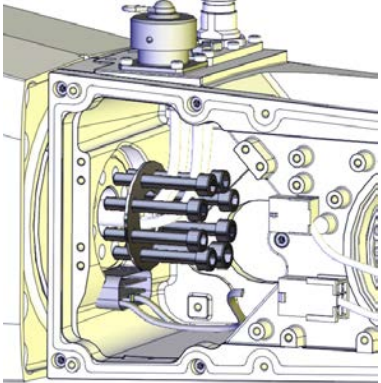

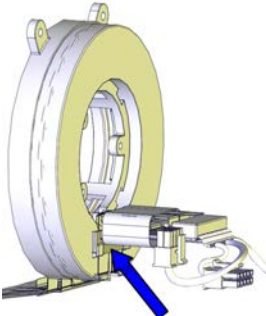
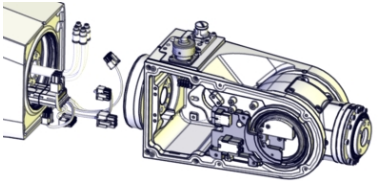
### 4.4.7 Replacing the axis-4 mechanical stop

Continued



|   | Action   | Note  |
|---|--|---|
| 3 | Disconnect the connectors shown in the figure.               |  <p>xx1300002353</p>   |
| 4 | Disconnect the air hoses.                                    |  <p>xx1300002355</p>   |
| 5 | Remove the connector plate attachment screws.                |  <p>xx1300002356</p>  |
| 6 | Guide the hoses through the plate hole and remove the plate. |  <p>xx1300002357</p> |

Continues on next page

4.4.7 Replacing the axis-4 mechanical stop  
Continued

|   | Action  | Note  |
|---|---|---|
| 7 | Support the weight of the wrist and remove the screws and the washer.   |  <p>xx1300002358</p> |
| 8 | <p>Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> <b>CAUTION</b></p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p> |  <p>xx1300002359</p> |

Disconnecting the axis-4 FPC connectors

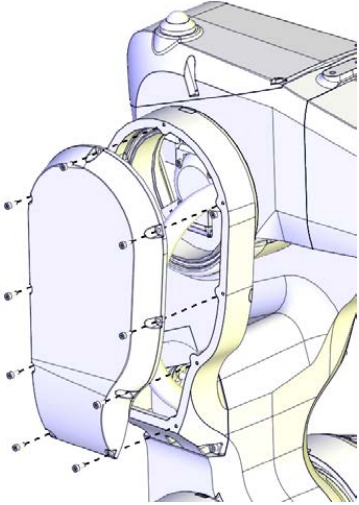
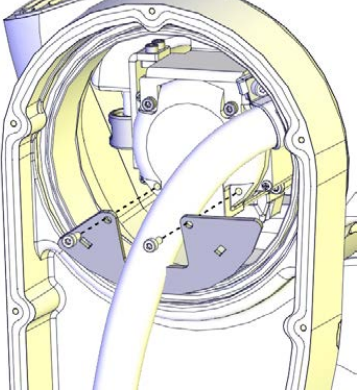
|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

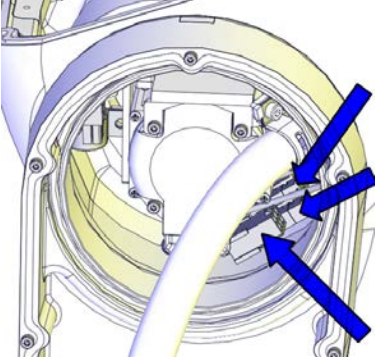
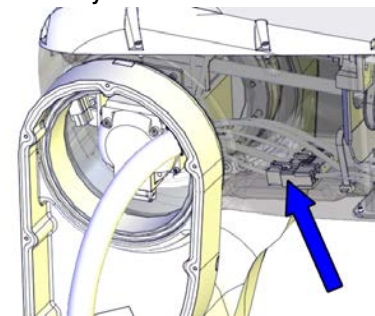
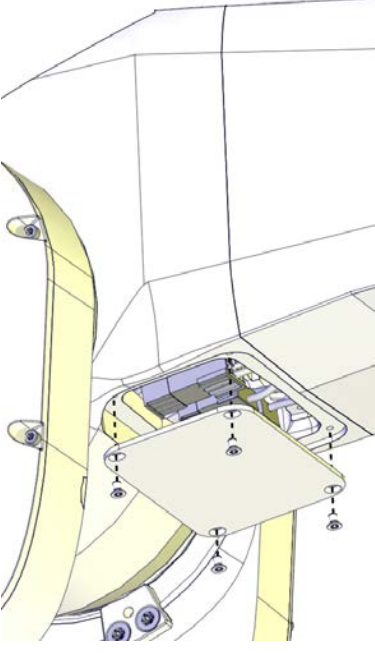
*Continued*

|   | Action                          | Note   |
|---|---------------------------------|--|
| 3 | Remove the cable housing cover. | <br>xx1300002400  |
| 4 | Remove the plate.               | <br>xx1300002413 |

*Continues on next page*



**4.4.7 Replacing the axis-4 mechanical stop**  
*Continued*

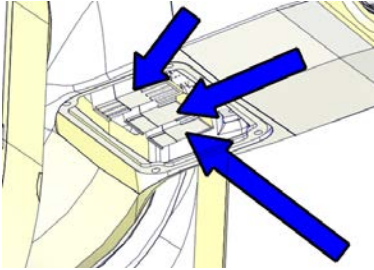
|   | <b>Action</b>   | <b>Note</b>  |
|---|---|--|
| 5 | Pull out the FPC connectors from the housing and disconnect them. | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 6 | Remove the small cover of the housing.                            |  <p>xx1300002398</p>  |

*Continues on next page*


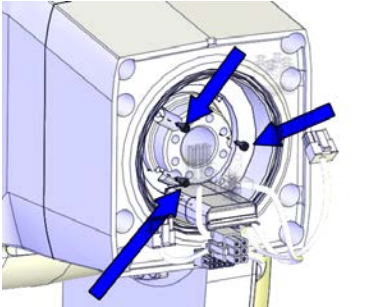
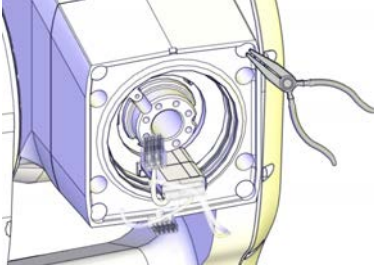
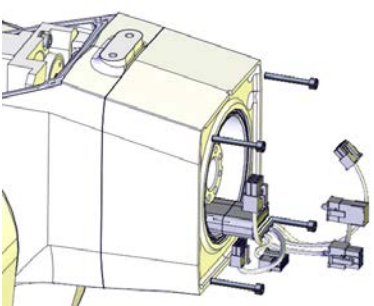
## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

Continued

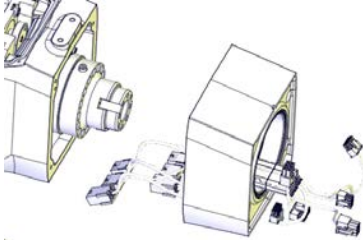
|   | Action                                   | Note  |
|---|--|---|
| 7 | Disconnect the remaining FPC connectors. |  <p>xx1300002399</p> |

### Removing the housing extender unit


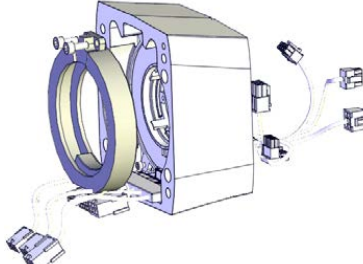
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 2 | Remove the axis-4 FPC unit screws.  |  <p>xx1300002373</p>  |
| 3 | <b>For robots with protection type Clean Room</b><br><b>For robots with protection type Foundry Plus</b><br>Remove the plugs covering the extender unit screws with a needle-nose plier.  |  <p>xx1600000262</p> |
| 4 | Remove the extender unit screws.  |  <p>xx1300002372</p> |

Continues on next page



|   | Action   | Note  |
|---|--|---|
| 5 | Remove the housing extender unit.<br>Be careful not to damage the cabling. | <br>xx1300002374 |

#### Removing the axis-4 mechanical stop

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 2 | Remove the mechanical stop assembly from the housing extender unit by removing the screws.  | <br>xx1300002415 |

#### Refitting the mechanical stop

Use these procedures to refit the mechanical stop.

#### Checking the housing extender sealings


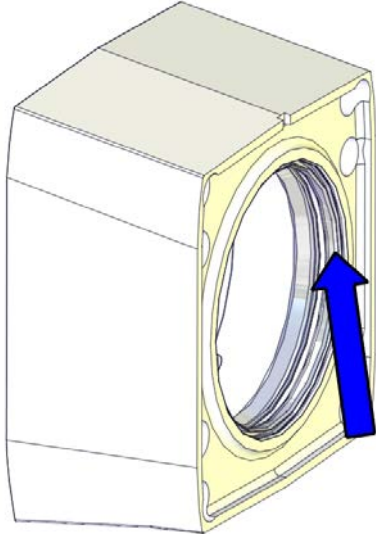
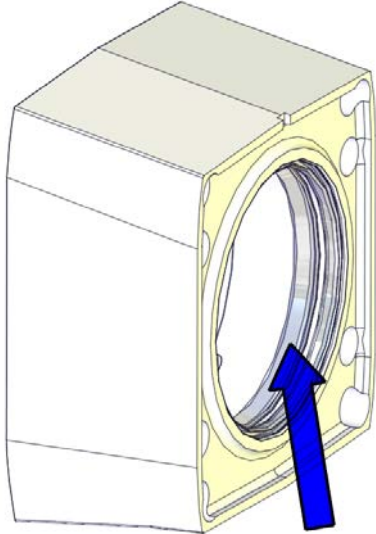
|   | Action  | Note |
|---|---|------|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

*Continues on next page*

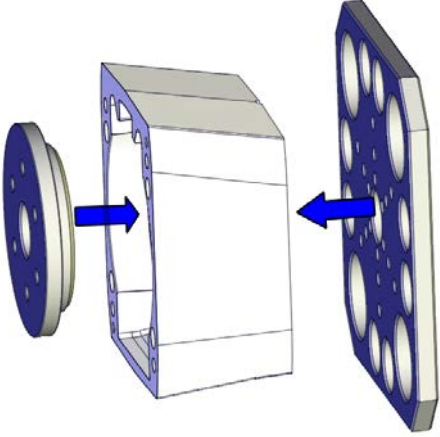
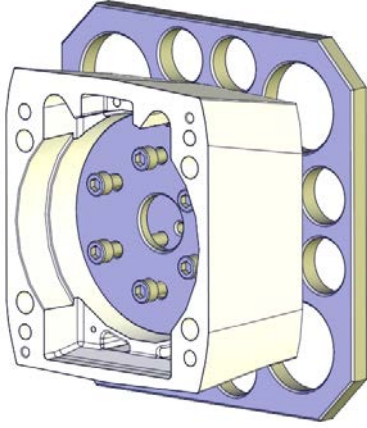

## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           Check the sealing.<br/>           Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p>   | <p>M2 variseal sealing: 3HAC044641-007</p>  <p>xx1300002418</p>         |
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           For robots with protection type Clean Room<br/>           For robots with food grade lubrication<br/>           Check the radial sealing.<br/>           Replace if damaged, as described below.<br/>           In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.</p> | <p>Radial sealing with dust lip: 3HAB3701-48</p>  <p>xx1400000438</p> |
| 4 | <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>  |   |
| 5 | <p>Fit the radial sealing into the housing extender unit.</p>  |   |

Continues on next page

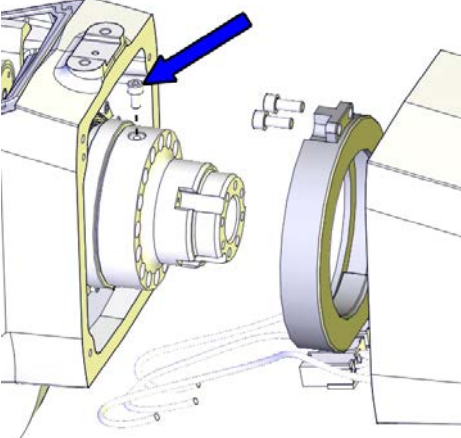
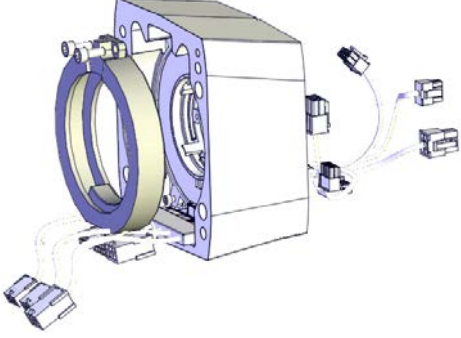


|    | Action  | Note   |
|----|---|--|
| 6  | Fit the circular part of the radial sealing assembly tool against the radial sealing.   | Axis-4 sealing assembly tool set: 3HAC049699-001   |
| 7  | Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.  |  <p>xx1400000436</p>  |
| 8  | Screw the screws, little by little, to press the sealing into place.  |  <p>xx1400000437</p>  |
| 9  | Remove the assembly tool.   |  |
| 10 | Check that the sealing is undamaged and properly fitted.  |  |
| 11 | Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.   |  |
| 12 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |

## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop


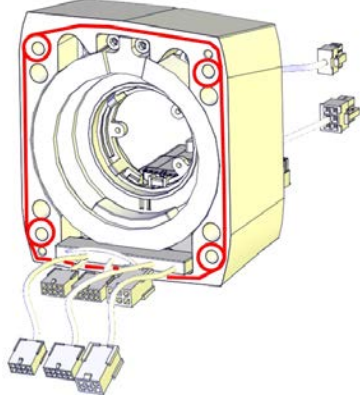
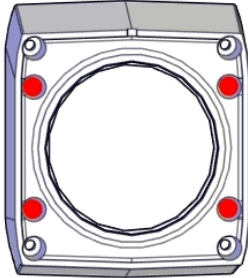


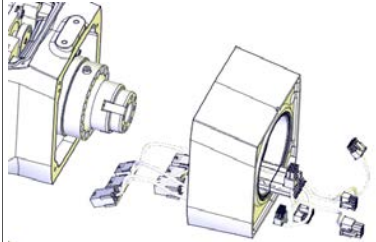
*Continued*

#### Refitting the axis-4 mechanical stop

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Fit the mechanical stop screw to the axis-4 shaft.   | <p>Screws: 3HAB3409-231 (M4x8).<br/>Tightening torque: 4 Nm.</p>  <p>xx1400000393</p>  |
| 3 | Fit the mechanical stop assembly to the housing extender unit and secure with screws.  | <p>Screws: 3HAB3409-216 (M5x12).<br/>Tightening torque: 4 Nm.</p>  <p>xx1300002415</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

*Continues on next page*

#### Refitting the housing extender unit

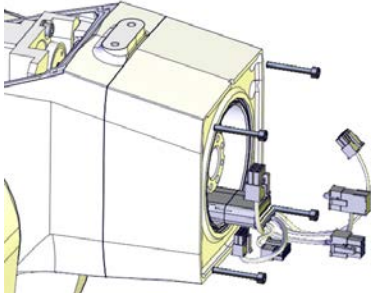
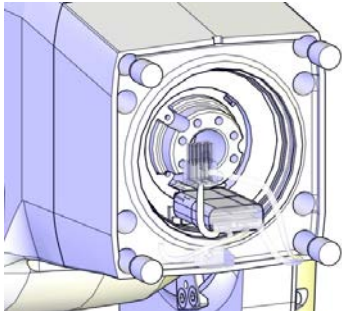
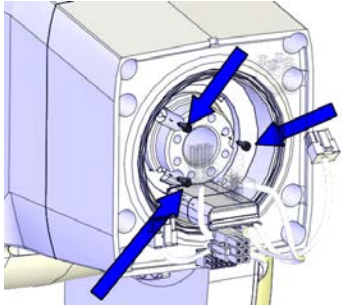

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p>   |  <p>xx1300002613</p>   |
| 3 | <p><b>For robots with protection type Clean Room</b></p> <p><b>For robots with protection type Foundry Plus</b></p> <p>Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.</p>   |  <p>xx1600000216</p>  |
| 4 | <p>Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling.</p> <p> <b>CAUTION</b></p> <p>Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit.</p> <p> <b>Note</b></p> <p>Mate the unit to the two locating pins attached to the housing.</p> |  <p>xx1300002374</p> |

Continues on next page

## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

Continued


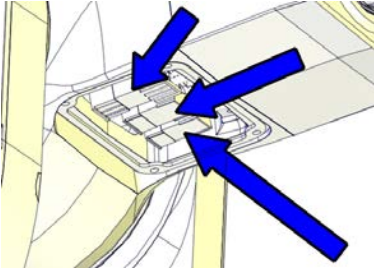

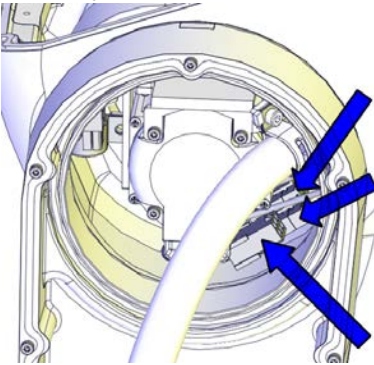
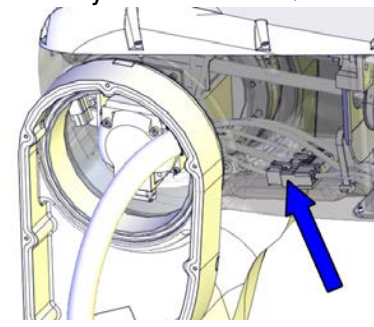
|   | Action   | Note   |
|---|--|--|
| 5 | Secure with screws and washers, using locking liquid Loctite 243.  | <p>Screws: M4x30.<br/>Tightening torque: 2.7 Nm.</p>  <p>xx1300002372</p> |
| 6 | <p>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Press in screw sealing plugs to cover the screws.</p>   | <p>Screw sealing plug: 3HAC053685-001</p>  <p>xx1600000263</p>           |
| 7 | Fit and secure the axis-4 FPC unit screws.   | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002373</p>                  |
| 8 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

### Connecting the axis-4 FPC connectors

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page

4.4.7 Replacing the axis-4 mechanical stop  
Continued

|   | Action  | Note   |
|---|---|--|
| 2 | <p>Reconnect the FPC connectors.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>   |  <p>xx1300002399</p>  |
| 3 | <p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>  |  |

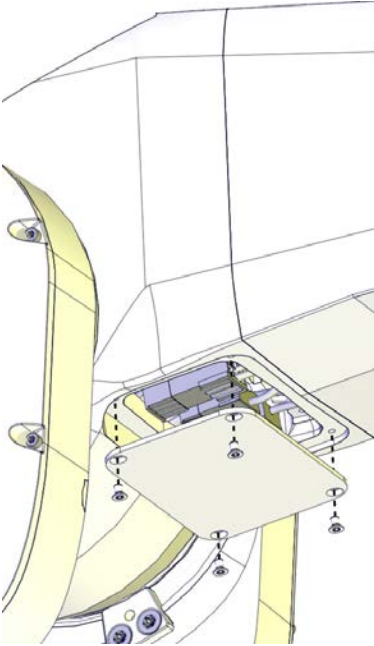
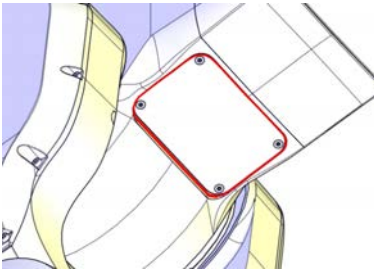
Continues on next page



## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

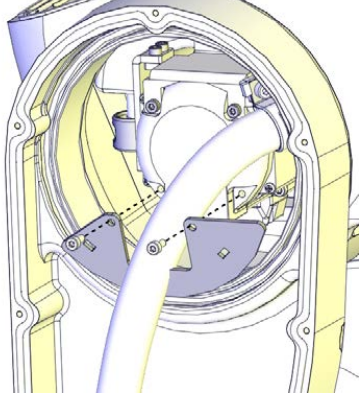
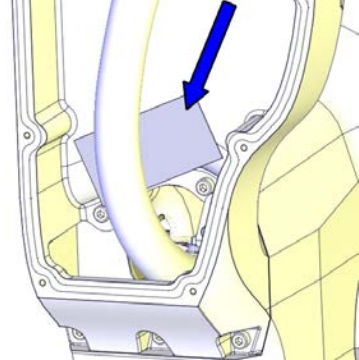
Continued

|   | Action  | Note   |
|---|---|--|
| 5 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>  |   |
| 6 | <p>Refit the small cover to the housing.</p> <p>Replace if damaged.</p>   | <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001</p> <p>: 3HAC056142-001 (used with protection type Clean Room)</p> <p>Housing small cover, Clean Room</p> <p>Housing small cover, food grade lubrication</p> <p>Screws: 3HAC14286-4 (M3X5).</p> <p>Tightening torque: 1 Nm.</p> |
| 7 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the small cover on the housing.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx1600000214</p>  |

Continues on next page



**4.4.7 Replacing the axis-4 mechanical stop**  
*Continued*

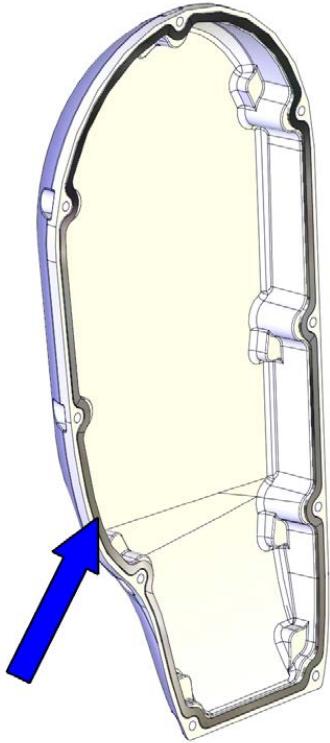
|   | <b>Action</b>  | <b>Note</b>  |
|---|--|--|
| 8 | Refit the plate.   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                            |
| 9 | Check the PTFE film on the cable housing.<br>Replace if damaged. | <p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p> |

*Continues on next page*

## 4 Repair

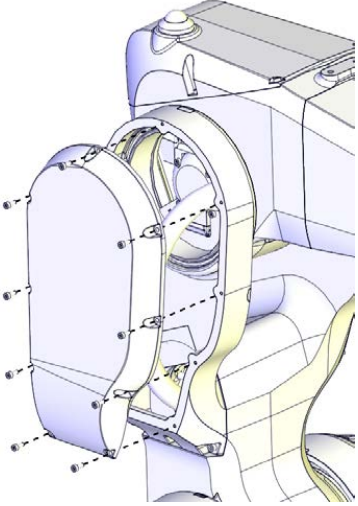


### 4.4.7 Replacing the axis-4 mechanical stop

*Continued*

|    | Action  | Note   |
|----|---|--|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the gasket of the cable housing cover.<br/>Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001<br/>PTFE film on cable housing cover:<br/>3HAC044660-001</p>  <p>xx1400000048</p> |
| 11 | <p>Check the PTFE film on the cable housing cover.<br/>Replace if damaged.</p>  |  |
| 12 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>  |  |

*Continues on next page*

4.4.7 Replacing the axis-4 mechanical stop  
Continued

|    | Action   | Note   |
|----|--|--|
| 13 | <p>Refit the cable housing cover.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>            | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 14 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Refitting the wrist


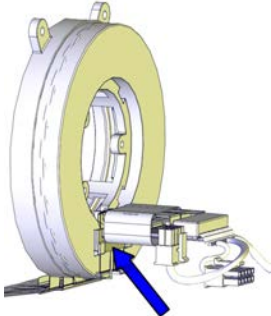
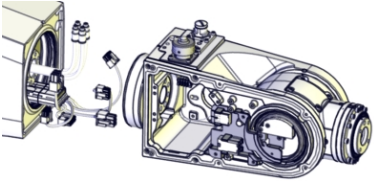
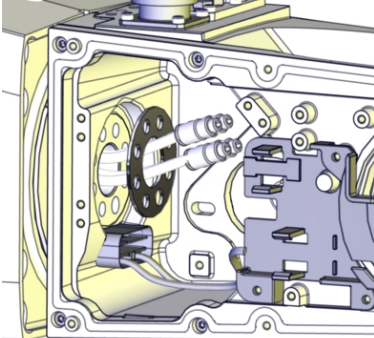
|   | Action  | Note |
|---|---|------|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> |      |

Continues on next page

## 4 Repair

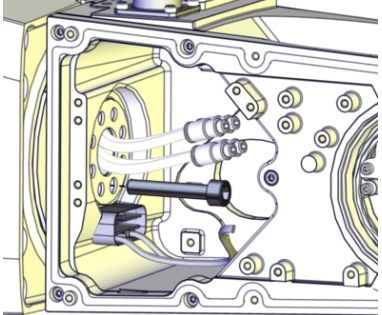

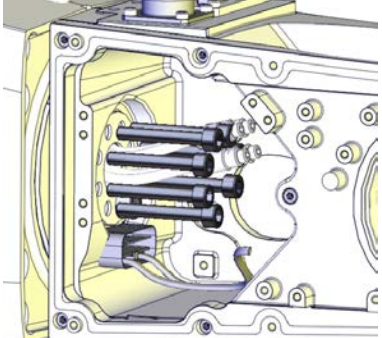

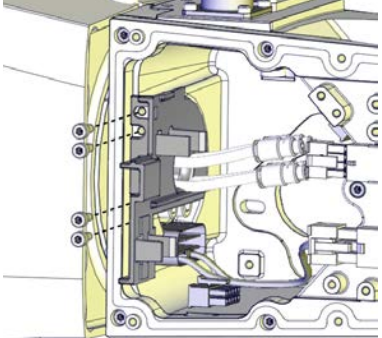
### 4.4.7 Replacing the axis-4 mechanical stop

Continued

|   | Action  | Note  |
|---|---|---|
| 2 | <p>Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit.<br/>Be careful not to damage the FPC cabling and the connectors.</p> <p> <b>CAUTION</b></p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p> <br>xx1300002611 | <br>xx1300002359                                 |
| 3 | <p>Refit the washer while at the same time putting the cables through its center.<br/>Replace washer, if damaged.</p>   | <p>Washer: 3HAC044869-001</p> <br>xx1400000001 |

Continues on next page

### 4.4.7 Replacing the axis-4 mechanical stop Continued


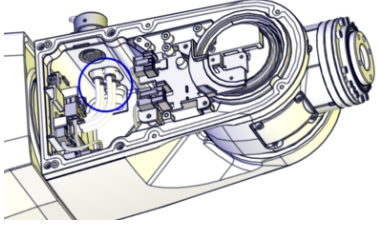
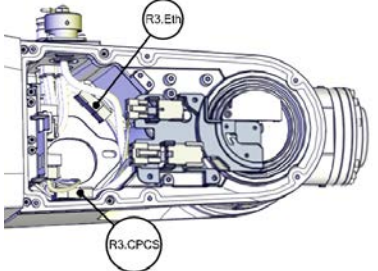

|   | Action   | Note  |
|---|--|---|
| 4 | Refit the screw M6x35 (1 pc). Do not tighten yet.          | <p>Screw: 3HAB3409-238 (M6x35 (1 pc)).</p>  <p>xx140000002</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p>     |
| 5 | Refit the rest of the screws (M5x35 (7 pcs)).              | <p>Screw: 3HAB3409-237 (M5x35 (7 pcs)).</p>  <p>xx140000003</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 6 | Tighten all screws.  | Tightening torque: 8 Nm.  |
| 7 | Put the cables through the plate hole and refit the plate. | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002356</p>   |

Continues on next page


## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

Continued

|    | Action   | Note  |
|----|--|---|
| 8  | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.</p>   |  <p>xx1300002355</p> |
| 9  | <p>Reconnect the connectors.</p> <ul style="list-style-type: none"> <li>• R3.Eth</li> <li>• R3.CPCS</li> </ul>   |  <p>xx1300002353</p> |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

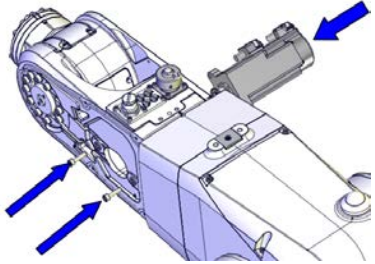

### Preparations before securing the axis-5 motor

|   | Action  | Note |
|---|---|------|
| 1 | <p>Check that:</p> <ul style="list-style-type: none"> <li>• all assembly surfaces are clean and without damages</li> <li>• the motor is clean and undamaged.</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

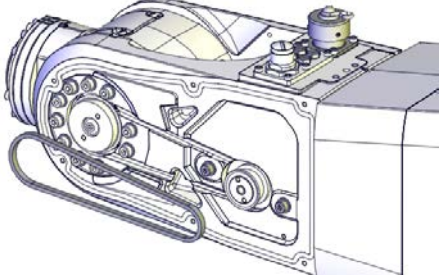

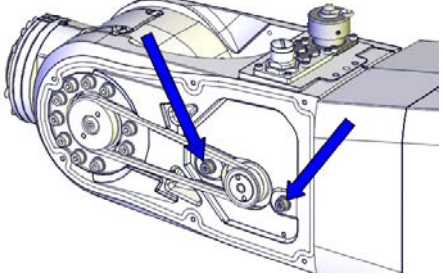
Continues on next page

### 4.4.7 Replacing the axis-4 mechanical stop

*Continued*

|   | Action  | Note  |
|---|---|---|
| 2 | Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor. | <p>Screws: 3HAB3409-212 (M4x16).</p>  <p>xx1300002463</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

### Securing the axis-5 motor and timing belt

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |   |
| 2 | Refit the timing belt on the pulley.   |  <p>xx1300002351</p>  |
| 3 | Move the motor to a position where a good timing belt tension is reached ( $F = 26 \text{ N}$ ).                                     | <p> <b>Note</b></p> <p>Do not stretch the timing belt too much!</p> |
| 4 | Secure the motor with its attachment screws.   |  <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p>              |


*Continues on next page*



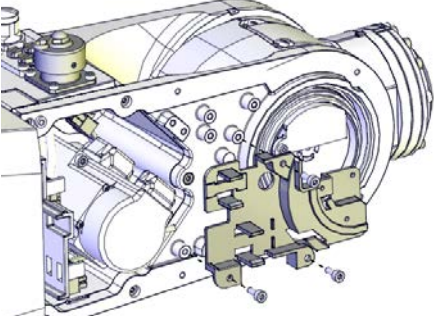
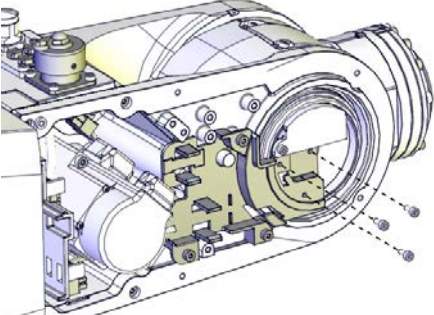

## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

Continued

|   | Action  | Note |
|---|---|------|
| 5 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |      |


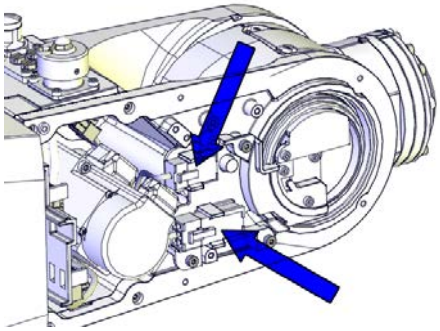
#### Refitting the connector plate

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | Refit the connector plate and secure with the M3 screws.  | Tightening torque: 0.3 Nm.<br><br><br>xx1400001401  |
| 3 | Secure the three M2.5 screws.   | Tightening torque: 0.3 Nm.<br><br><br>xx1400001402 |
| 4 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |


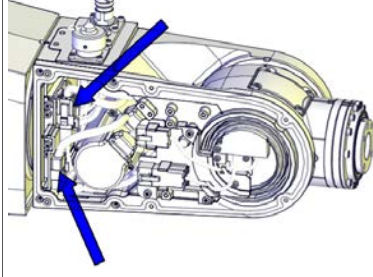
Continues on next page



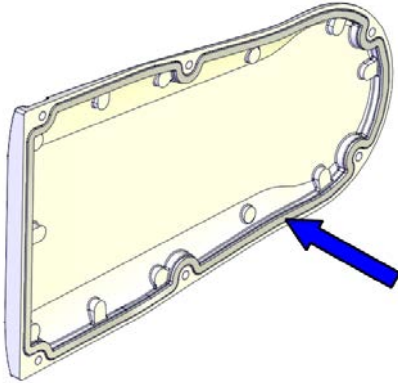
Connecting the axis-5 motor FPC connectors

|   | Action  | Note   |
|---|---|--|
| 1 | <p>Connect the axis-5 FPC connectors and snap them to their holders.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002390</p> |

Connecting the axis-5 motor connectors

|   | Action  | Note   |
|---|---|--|
| 1 | <p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002360</p> |

Refitting the wrist covers

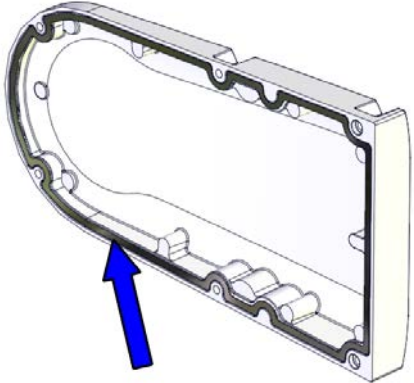
|   | Action   | Note  |
|---|--|---|
| 1 | <p>Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p>  |   |
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cover gasket. Replace if damaged.</p> | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx1400000034</p> |

Continues on next page

## 4 Repair

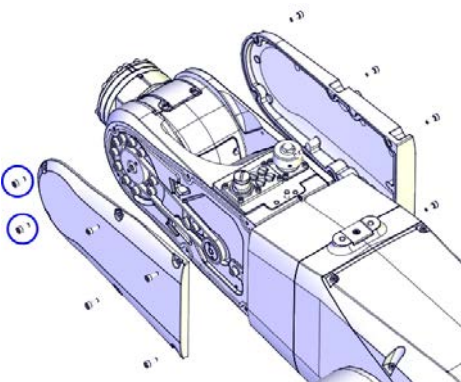
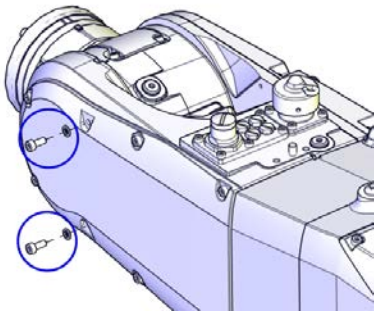


### 4.4.7 Replacing the axis-4 mechanical stop

*Continued*

|   | Action   | Note  |
|---|--|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the tubular cable housing cover gasket.<br/>Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx140000345</p> |

*Continues on next page*

4.4.7 Replacing the axis-4 mechanical stop  
Continued

|   | Action  | Note  |
|---|---|---|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |   |



Continues on next page

## 4 Repair

### 4.4.7 Replacing the axis-4 mechanical stop

*Continued*

#### Concluding procedure

|   | Action   | Note   |
|---|--|--|
| 1 | <p>Clean and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |  |
| 2 | <p>Recalibrate the robot.</p>  | <p>Calibration is detailed in section <a href="#">Calibration on page 729</a>.</p> |
| 3 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |  |

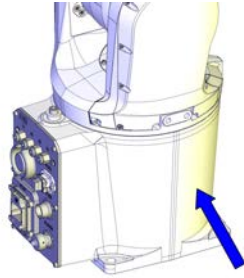

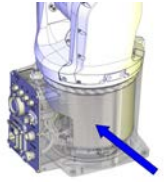
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

4.5 Swing and base

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Location of the base spare parts

The base parts that are considered spare parts are located as shown in the figure.

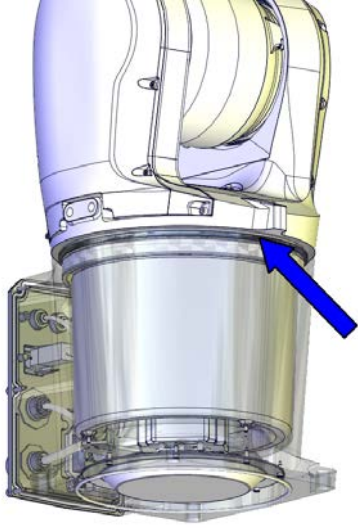
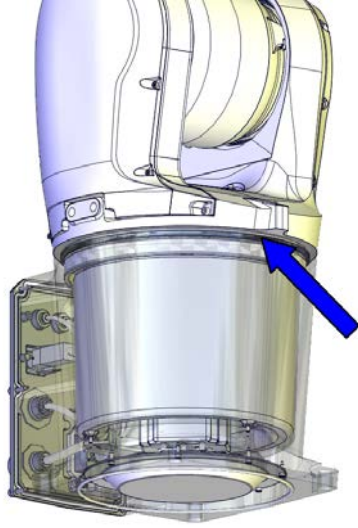
| Base  | Base, SafeMove 2-supported   | Radial sealing with dust lip  | Cable protection sleeve inside base   |
|---|--|---|---|
|  <p>xx1400000396</p>   |  |  <p>xx1400000269</p> |  <p>xx1400000395</p> |
| <p>3HAC059553-001<br/>Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface.<br/>Incompatible with swing 3HAC049632-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a>.</p> | <p>3HAC061270-001<br/>Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a>.<br/>Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.</p> | <p>3HAB3701-47<br/>Not used with protection class IP40.<br/>Replace if damaged.</p>                     | <p>3HAC044690-001</p>   |
| <p>3HAC059699-001<br/>Used with protection type Clean Room.</p>   | <p>3HAC061271-001<br/>Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a>.<br/>Used with protection type Clean Room.</p>  |   |   |
| <p>3HAC057906-001<br/>Used for robots with food grade lubrication.</p>  | <p>3HAC061272-001<br/>Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a>.<br/>Used for robots with food grade lubrication.</p>   |   |   |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

| M2 variseal sealing  | Sealing ring (IP40) /<br>Sealing ring, gasket and V-ring (IP67)  |
|--|--|
|  <p>xx1400000471</p>  |  <p>xx1400000471</p>   |
| <p>3HAC044641-002<br/>Used with protection class IP67.<br/>Used only on base 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a>. Replace if damaged.</p> | <p>Sealing ring: 3HAC068107-001 (IP40)<br/>Sealing ring, gasket and V-ring: 3HAC059791-001 (IP67)<br/>Used with protection class IP67.<br/>Replace if damaged.</p> |

### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                   | Article number | Note  |
|------------------------------|----------------|---|
| Base                         | 3HAC059553-001 | Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface.<br>Incompatible with swing 3HAC049632-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a> . |
| Base, Clean Room             | 3HAC059699-001 | Used with protection type Clean Room.<br>Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface.  |
| Base, food grade lubrication | 3HAC057906-001 | Used for robots with food grade lubrication.<br>Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface.   |

Continues on next page

## 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

| Spare part  | Article number | Note  |
|---|----------------|---|
| Base, SafeMove 2-supported                            | 3HAC061270-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> . Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.   |
| Base, Clean Room and SafeMove 2-supported             | 3HAC061271-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> . Used with protection type Clean Room. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.                                   |
| Base, food grade lubrication and SafeMove 2-supported | 3HAC061272-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> . Used for robots with food grade lubrication. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.                            |
| Radial sealing with dust lip                          | 3HAB3701-47    | Not used with protection class IP40. Replace if damaged.  |
| Axis-1 sealing ring gasket                            | 3HAC045685-001 | Used with protection class IP67. Only on axis-1 sealing ring version 3HAC044676-001. See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797</a> . Replace if damaged.                                |
| Axis-1 sealing ring gasket                            | 3HAC058349-001 | Not used with protection class IP40. Only on axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001. See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797</a> . Replace if damaged.          |
| V-ring  | 3HAB3732-34    | Used with protection class IP67. Used with protection type Foundry Plus. Only on swing version 3HAC058000-001 and 3HAC059554-001. See <a href="#">Spare part versions for the swing on IP40/IP67 robots on page 795</a> . Replace if damaged. |
| M2 variseal sealing                                   | 3HAC044641-002 | Used with protection class IP67. Used only on base 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a> . Replace if damaged.   |

*Continues on next page*

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

| Spare part                             | Article number | Note   |
|--|----------------|--|
| Sealing ring                           | 3HAC068107-001 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Used only on base 3HAC059553-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a> .<br>Replace if damaged. |
| Sealing ring, gasket and V-ring        | 3HAC059791-001 | Used with protection class IP67.<br>Replace if damaged.  |
| Protection plug                        | 3HAC051199-001 | Protection plug for the calibration hole in the swing (the hole is used during calibration of axis 1 with the manual calibration method).<br>Replace if damaged.   |
| Cable protection sleeve inside base    | 3HAC044690-001 |  |
| O-ring                                 | 3HAB3772-86    | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket for rear base cover             | 3HAC058566-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| M2 variseal sealing                    | 3HAC044641-004 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.   |
| Cable harness material set             | 3HAC049663-001 | Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.   |
| Gasket on cable housing cover          | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket for tubular cable housing cover | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.  |

### Required tools and equipment

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Roundsling, 2 m                         | -              | Length: 2 m. Lifting capacity: 100 kg.   |
| Axis-1 sealing assembly tool set        | 3HAC049692-001 | Used to refit the axis-1 radial sealing.   |
| Guide pin for axis-1 gear unit          | 3HAC049703-001 | Always use three guide pins together!  |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |

Continues on next page



## 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

| Equipment, etc.  | Article number | Note   |
|------------------|----------------|--|
| Standard toolkit | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |


- i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

## Required consumables

| Equipment      | Art. no.       | Note  |
|----------------|----------------|---|
| Cable straps   | -              |   |
| Grease         | 3HAC042536-001 | Used for lubrication of cable contact areas.  |
| Locking liquid | 3HAB7116-1     | Loctite 243   |
| Grease         | 3HAC029132-001 | Used for lubrication of cable contact areas for robots with food grade lubrication.   |
| Grease         | 3HAC058065-001 | Used for lubrication of radial sealing surface between base and swing.<br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3). |
| Sealant        | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room.<br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3).          |

## Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action   | Note   |
|---|--|--|
| 1 | Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul> |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool. |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

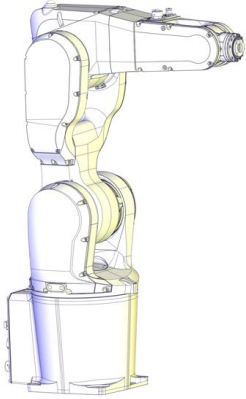

Continued

| Action  | Note  |
|---|---|
| <p><b>If the robot is to be calibrated with reference calibration:</b><br/>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |
| <p><b>If the robot is to be calibrated with fine calibration:</b><br/>Remove all external cable packages (DressPack) and tools from the robot.</p>  |   |

#### Removing the cabling


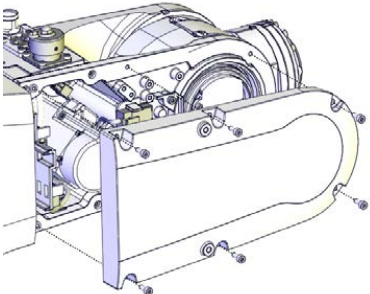
Before the spare parts of the base can be removed, the cable harness must be removed from upper arm and down to the base. Use these procedures to remove the cabling in order to access the base spare parts.

#### Preparations before removing the cabling




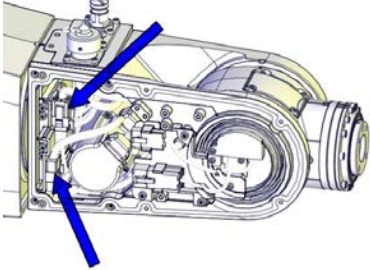
|   | Action   | Note  |
|---|--|---|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.   |   |
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 3 |  <p><b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |   |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)  
Continued

|   | Action  | Note  |
|---|---|---|
| 4 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 5 | Remove the wrist cover.   |  <p>xx1300002389</p> |

Disconnecting the axis-5 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002360</p> |



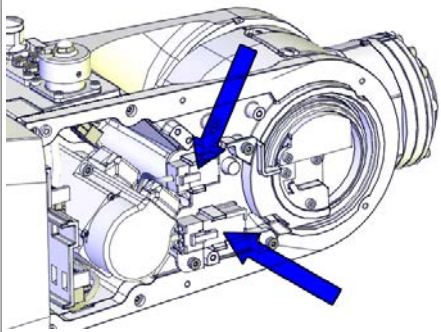
Continues on next page

## 4 Repair



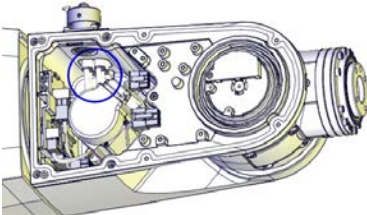
### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued


#### Disconnecting the axis-5 FPC connectors

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 | Snap loose and disconnect the axis-5 FPC connectors.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002390 |

#### Disconnecting the air hoses


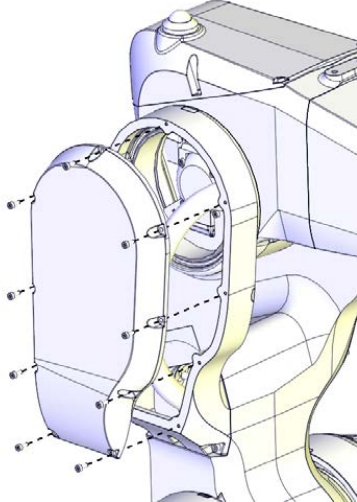
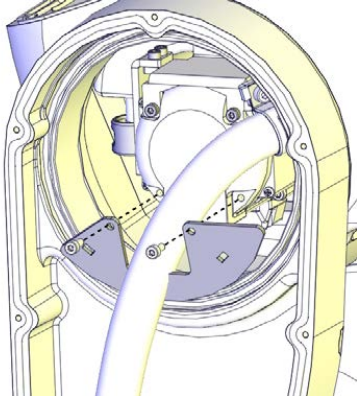
|   | Action   | Note  |
|---|--|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |   |
| 2 | Disconnect the air hoses.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1400000738 |

#### Disconnecting the axis-4 FPC connectors

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off. |      |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)  
*Continued*

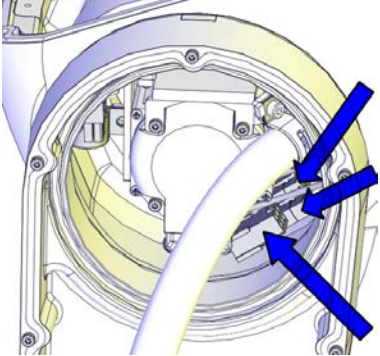
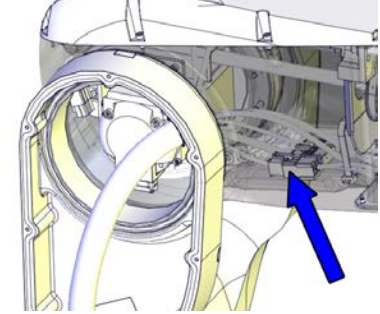
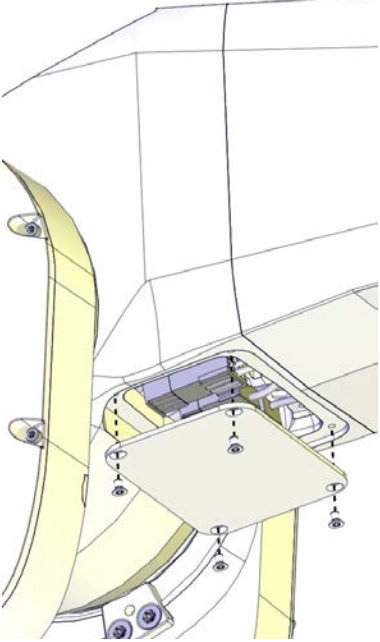
|   | Action  | Note  |
|---|---|---|
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | Remove the cable housing cover.   |  <p>xx1300002400</p>  |
| 4 | Remove the plate.   |  <p>xx1300002413</p> |

*Continues on next page*

## 4 Repair

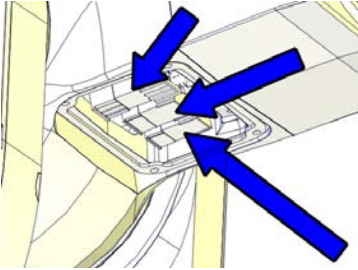
### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued




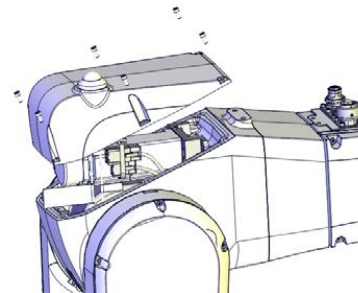
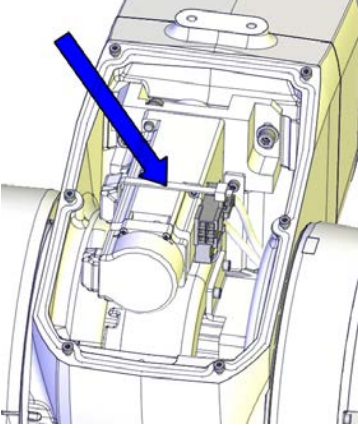
|   | Action  | Note   |
|---|---|--|
| 5 | Pull out the FPC connectors from the housing and disconnect them. | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 6 | Remove the small cover of the housing.                            |  <p>xx1300002398</p>  |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)  
Continued

|   | Action                                   | Note  |
|---|--|---|
| 7 | Disconnect the remaining FPC connectors. |  <p>xx1300002399</p> |

Disconnecting the axis-4 motor connectors

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .  |   |
| 3 | Remove the cover from the upper arm housing.<br> <b>CAUTION</b><br><b>For robots with safety lamp (option)</b><br>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely. |  <p>xx1300000456</p> |
| 4 | Cut the strap that holds the connectors.  |  <p>xx1300002494</p> |


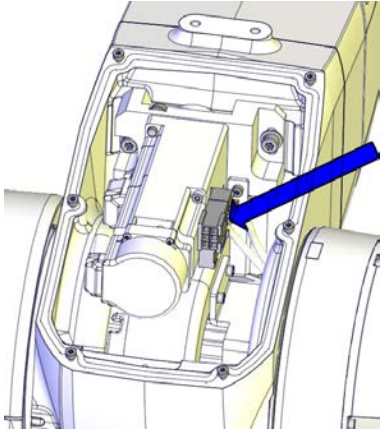
Continues on next page





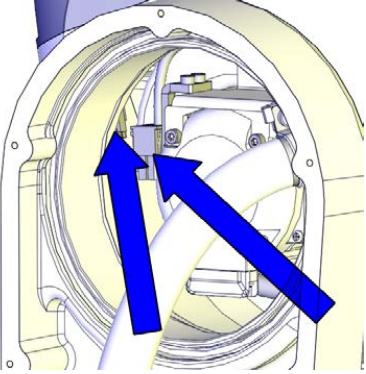
## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)


Continued

|   | Action  | Note  |
|---|---|---|
| 5 | <p>Disconnect the motor connectors.</p> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> |  <p>xx1300002495</p> |

#### Disconnecting the axis-3 motor connectors

|   | Action  | Note  |
|---|---|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |   |
| 2 | <p>Pull out the axis-3 motor connectors from the housing and disconnect them.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002420</p> |

#### Removing the cable package in the housing


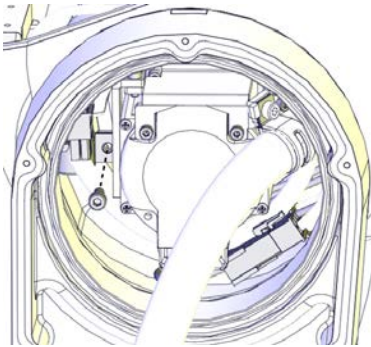
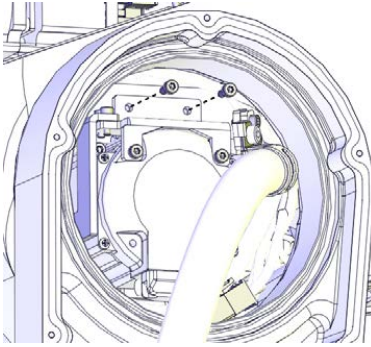
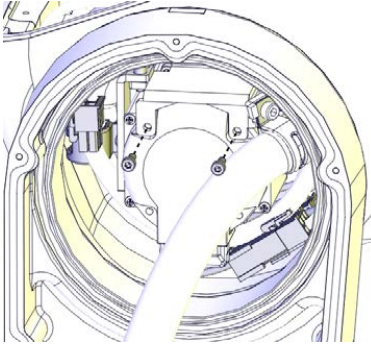

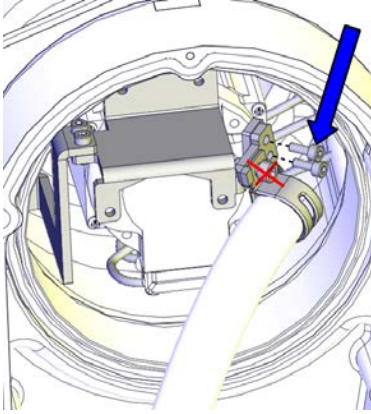
|   | Action   | Note |
|---|--|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |      |

Continues on next page



## 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action  | Note  |
|---|---|---|
| 2 | <p>Remove the screw that fastens the air hose holder.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>   |  <p>xx1300002422</p>   |
| 3 | <p>Remove the screws that fasten the fix sheet to the inner plastic guide.</p>  |  <p>xx1300002421</p>  |
| 4 | <p>Remove the screws that fasten the fix sheet to the motor.</p>  |  <p>xx1300002423</p> |
| 5 | <p>Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p> |  <p>xx1300002424</p> |

Continues on next page






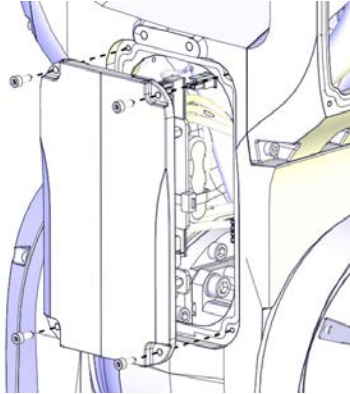
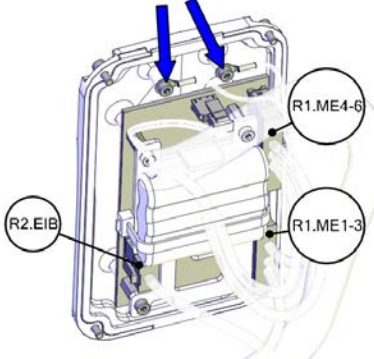
## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action   | Note |
|---|--|------|
| 6 | Valid for IRB 1200-5/0.9<br>Cut the cable straps at the bottom of the housing. |      |

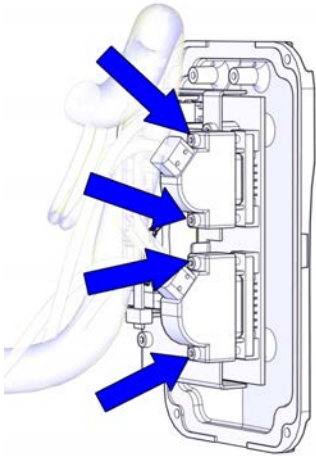
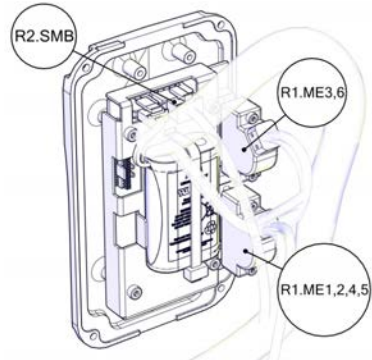
#### Disconnecting the cabling in the lower arm

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |  |
| 2 |  <b>ELECTROSTATIC DISCHARGE (ESD)</b><br>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a>   |  |
| 3 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .  |  |
| 4 | Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.<br><br> <b>CAUTION</b><br>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.<br><br> <b>CAUTION</b><br>Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step. | <br><small>xx1300002427</small> |
| 5 | Valid for IRB 1200 (no type specified) and IRB 1200 Type A<br>Disconnect the connectors on the EIB unit. <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> Remove the EIB/SMB cover completely from the lower arm.  | <br><small>xx1300002428</small> |
| 6 | Valid for IRB 1200 (no type specified) and IRB 1200 Type A<br>Disconnect the lugs on the EIB/SMB cover.  |  |



Continues on next page

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

|   | Action   | Note   |
|---|--|--|
| 7 | <p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>  |  <p>xx1700000004</p>  |
| 8 | <p>Valid for IRB 1200 Type B</p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p>Remove the EIB/SMB cover completely from the lower arm.</p> |  <p>xx1700000005</p> |

#### Removing the cable package in the lower arm

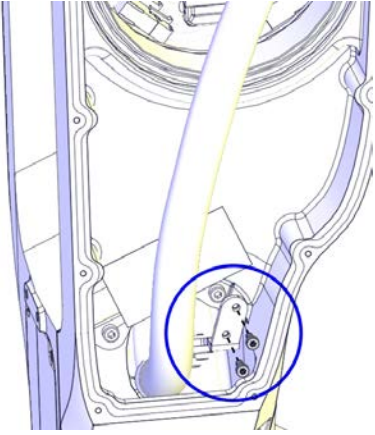

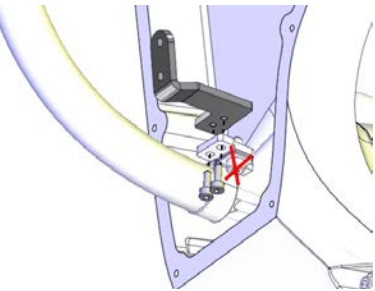
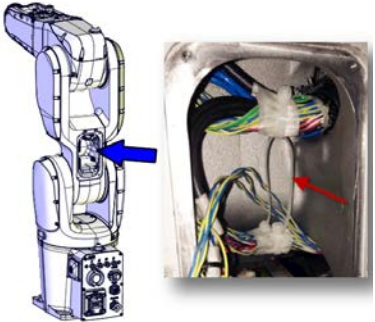
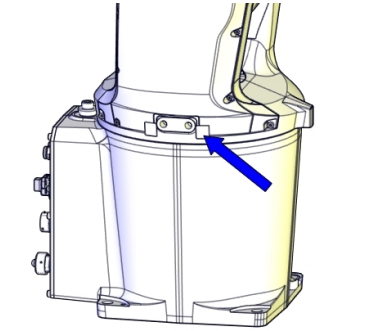
|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |
| 3 | <p>Pull the cable package out from the upper arm housing.</p>   |      |

*Continues on next page*

## 4 Repair

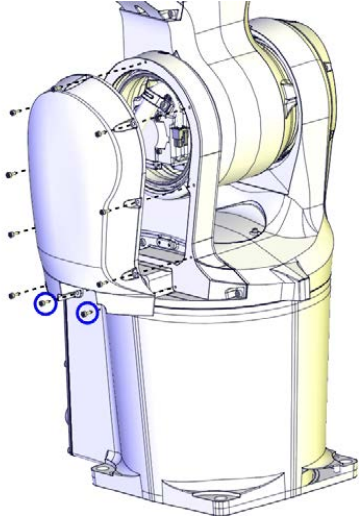
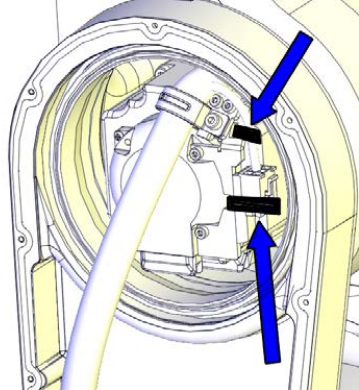
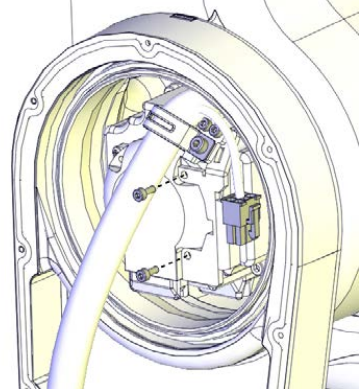
### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action  | Note  |
|---|---|---|
| 4 | Remove the fix sheet attachment screws in the lower arm.  |  <p>xx1300002426</p>   |
| 5 | Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws.<br><br> <b>CAUTION</b><br><br>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. |  <p>xx1300002430</p>  |
| 6 | Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.  |  <p>xx1400001130</p> |
| 7 | <b>For robots with protection type Clean Room</b><br>Remove the swing sealing plug.<br>Follow the procedure specified in <a href="#">Removing the swing sealing plug on page 143</a> .  |  <p>xx1600000205</p> |

Continues on next page

**4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)**  
*Continued*

|    | <b>Action</b>  | <b>Note</b>   |
|----|--|---|
| 8  | Remove the swing cable housing cover by removing the screws. |  <p>xx1300002431</p>   |
| 9  | Cut the cable straps.  |  <p>xx1400001528</p>  |
| 10 | Remove the axis-2 motor bracket screws.                      |  <p>xx1300002432</p> |


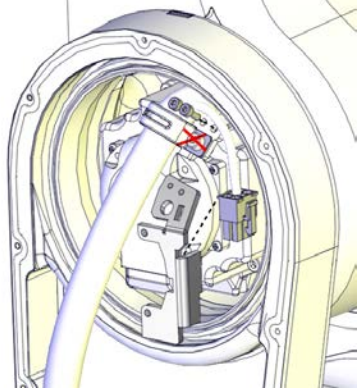
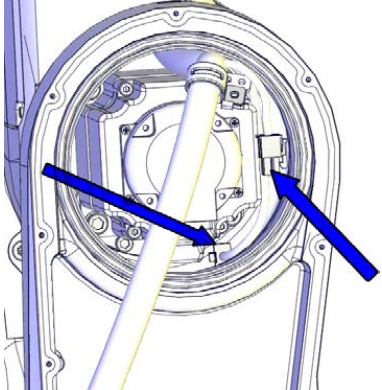
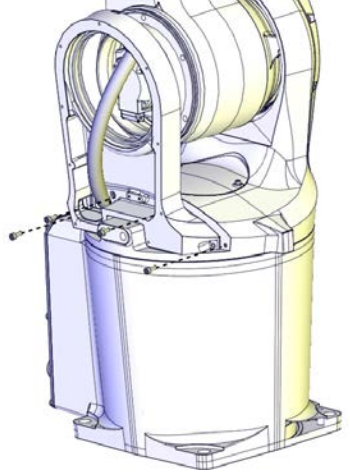
*Continues on next page*



## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

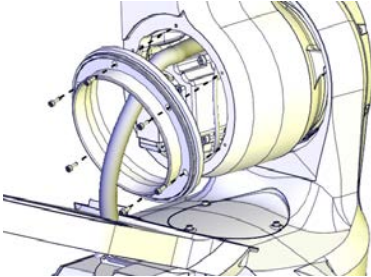

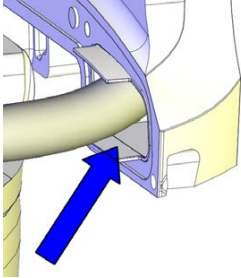
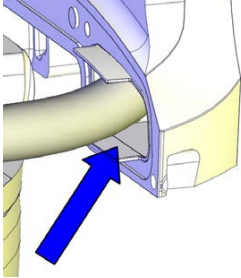
Continued

|    | Action  | Note  |
|----|---|---|
| 11 | <p>Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p> |  <p>xx1300002433</p>   |
| 12 | <p>Disconnect the motor connectors.</p> <ul style="list-style-type: none"><li>• R2.ME2</li><li>• R2.MP2</li></ul>   |  <p>xx1300002434</p>  |
| 13 | <p>Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.</p>   |  <p>xx1300002435</p> |




Continues on next page

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

|    | Action  | Note  |
|----|---|---|
| 14 | Remove the axis-2 sealing ring by removing the screws.  |  <p style="text-align: right; font-size: small;">xx1400000020</p>  |
| 15 | Pull out the cable package from the lower arm.<br><br> <b>Tip</b><br><br>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand. |  <p style="text-align: right; font-size: small;">xx1400000023</p> |
| 16 | Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .   |  <p style="text-align: right; font-size: small;">xx1400000023</p> |

#### Putting the robot on its side


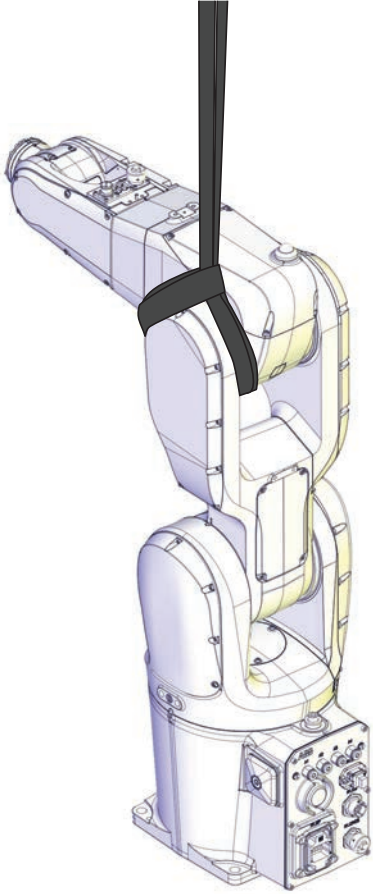


|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i> |      |
| 3 |  <b>CAUTION</b><br><br>The robot weighs .<br>IRB 1200-5/0.9: 54 kg<br>IRB 1200-7/0.7: 52 kg<br>All lifting accessories used must be sized accordingly!   |      |

*Continues on next page*

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

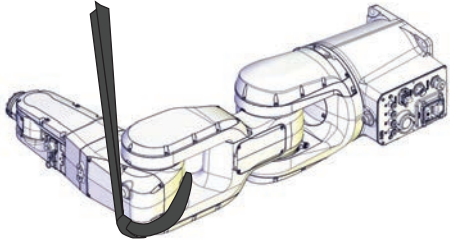
|   | Action  | Note  |
|---|---|---|
| 4 | <p>Run a roundsling between the housing and the lower arm.</p> <p> <b>CAUTION</b></p> <p>Put the sling on the lower arm side and <b>not</b> on the cable arm side, which would damage the robot.</p> | <p>Roundsling, 2 m</p>  <p>xx140000679</p> |
| 5 | <p> <b>WARNING</b></p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p>  |   |
| 6 | <p> <b>CAUTION</b></p> <p>The robot weighs .</p> <p>IRB 1200-5/0.9: 54 kg</p> <p>IRB 1200-7/0.7: 52 kg</p> <p>All lifting accessories used must be sized accordingly!</p>                          |   |

Continues on next page




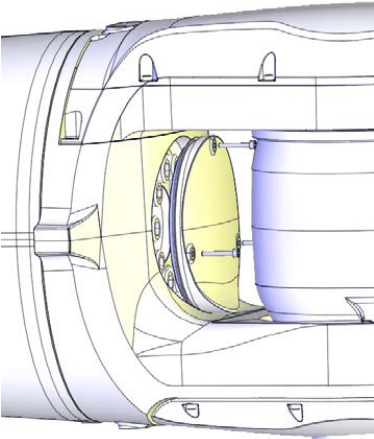


4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action   | Note  |
|---|--|---|
| 7 | Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side. |  <p>xx140000680</p> |

Separating the arm system from base

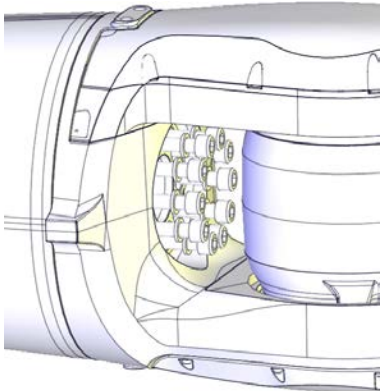

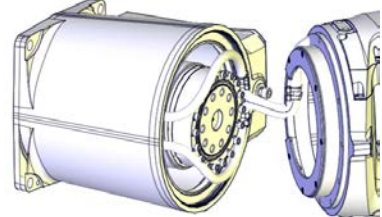
|   | Action   | Note   |
|---|--|--|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |  |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>             |  |
| 3 | <p>Remove the swing top cover by removing the screws.</p>  <p><b>Tip</b></p> <p>Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads.</p> |  <p>xx130000467</p> |

Continues on next page


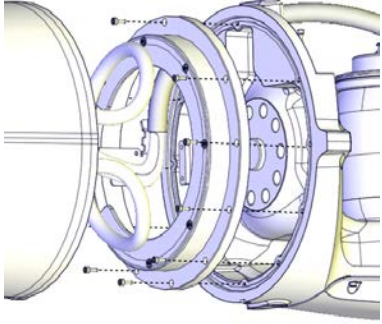
## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action  | Note   |
|---|---|--|
| 4 | Remove the screws and washers.  | <br>xx1300000471  |
| 5 | Pull out the base slightly and turn it aside.<br><br> <b>Tip</b><br>Remember the cable layout in the base. The cabling must be positioned and angled in the same way during refitting. | <br>xx1300000472 |

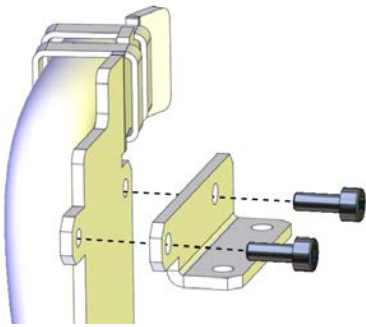
#### Removing the cable package from the axis-1 sealing ring

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 2 | Remove the axis-1 sealing ring from the swing and carefully run the cable package out from the swing.   | <br>xx1300002438 |
| 3 | Remove the swing (including arm system) completely from the base and lay it aside on a safe location.   |   |

Continues on next page

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*


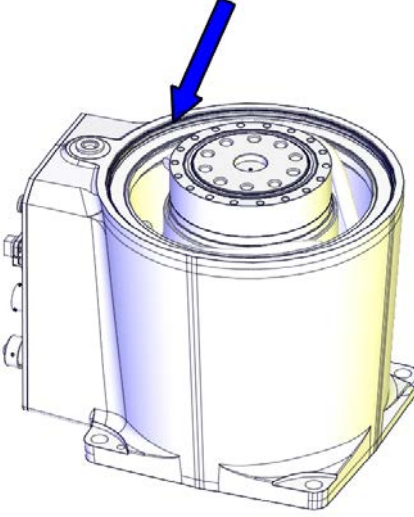
|   | Action   | Note   |
|---|--|--|
| 4 | Remove the cable bracket from the cabling, if the cable package is to be replaced with a new spare part. |  <p style="text-align: right; font-size: small;">xx1300002446</p> |

#### Replacing the radial sealing (IP67 and Foundry Plus)

First remove the cabling according to [Removing the cabling on page 446](#), then use this procedure to replace the axis-1 radial sealing.

The sealing is only used for robots with protection class IP67 (option 287-10) and protection type Foundry Plus (option 287-3).

#### Removing the axis-1 radial sealing and M2 variseal sealing


|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 2 | Raise the base into standing and put most of the cable harness, including the sealing ring bracket, into the base (in the space of the protection sleeve).  |   |
| 3 | Remove the M2 variseal sealing.<br>The M2 variseal sealing is only installed on base version 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a> .   |  <p style="text-align: right; font-size: small;">xx1400000780</p> |

*Continues on next page*


## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

|   | Action                     | Note   |
|---|----------------------------|--|
| 4 | Remove the radial sealing. |  <p>xx140000270</p> |

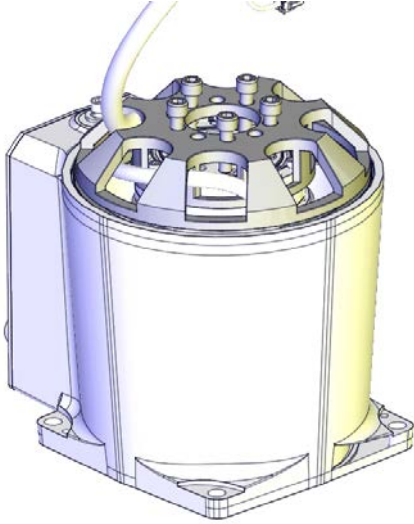

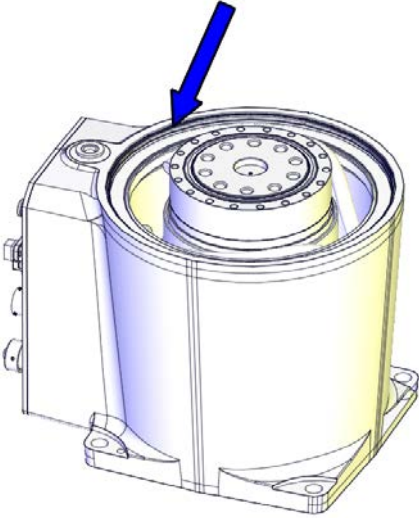

### Refitting the axis-1 radial sealing and M2 variseal sealing

|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>                              |   |
| 2 | <b>For robots with protection type Clean Room</b><br>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement. |   |
| 3 | Fit the new sealing in its groove in the base.  | Radial sealing with dust lip: 3HAB3701-47<br> <p>xx140000270</p> |

*Continues on next page*

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action   | Note   |
|---|--|--|
| 4 | <p>Put the assembly tool against the axis-1 gear and slowly press the sealing into the base by screwing the five screws (M10X35) into the axis-1 gear screws little by little.</p>   | <p>Axis-1 sealing assembly tool set: 3HAC049692-001</p>  <p>xx140000271</p> |
| 5 | <p>Remove the assembly tool.</p>   |  |
| 6 | <p>Fit a new M2 variseal sealing in its groove in the base.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a>.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> |  <p>xx140000780</p> <p>M2 variseal sealing: 3HAC044641-002</p>             |
| 7 | <p>Check that the sealings are undamaged and properly fitted.</p>  |  |
| 8 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>   |  |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

#### Replacing the M2 variseal sealing (IP67)

The M2 variseal sealing is only installed on base version 3HAC049628-001. See [Spare part versions for the base on IP40/IP67 robots on page 793](#).


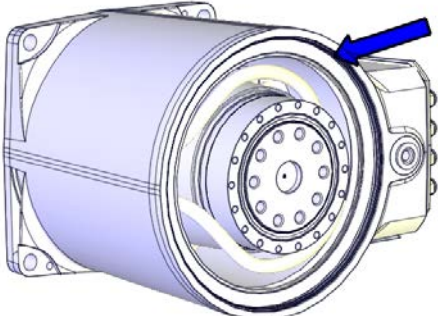


First remove the cabling according to [Removing the cabling on page 446](#), then use this procedure to replace the M2 variseal sealing.



#### Note

The sealing is only used for robots with protection class IP67 (option 287-10) but not for Clean Room robots. Do not fit the sealing to Clean Room robots.

#### Replacing the axis-1 M2 variseal sealing (IP67)

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .   |  |
| 2 | Remove the sealing.   |  |
| 3 | Clean Room robots: clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   | <br><small>xx1400000472</small><br><b>M2 variseal sealing: 3HAC044641-002</b> |
| 4 | Fit the new sealing in its groove in the base.<br><br> <b>CAUTION</b><br>Do not fit M2 variseal sealing on Clean Room robots.  |  |
| 5 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

Continues on next page


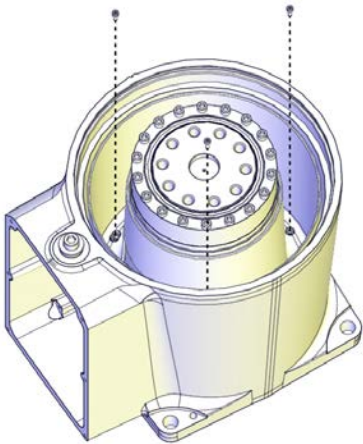
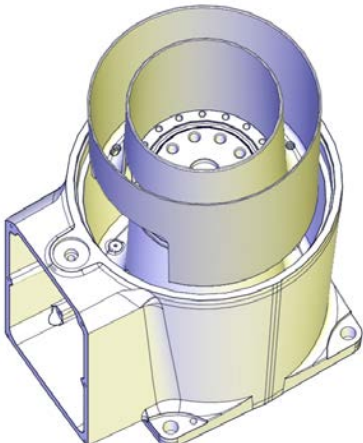
## 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

## Replacing the cable protection sleeve

First remove the cabling according to [Removing the cabling on page 446](#), then use this procedure to replace the protection sleeve.

## Replacing the cable protection sleeve

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 2 | Remove the cabling from the base.   |   |
| 3 | Remove the screws.  | <br>xx1400000776  |
| 4 | Pull up the protection sleeve.  | <br>xx1400000777 |
| 5 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |   |
| 6 | Fit the new protection sleeve and secure with screws.   | Tightening torque: 0.3 Nm.  |

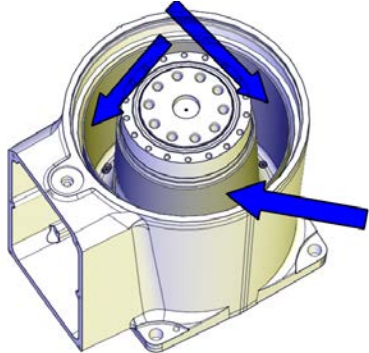

Continues on next page



## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)



Continued

|   | Action   | Note   |
|---|--|--|
| 7 | Apply grease on the inner surface of the protection sleeve, also on the bottom surface.  |  <p>xx140000778</p> |
| 8 | Seal and paint the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
|   |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

### Replacing the base

Use these procedures to replace the base.

#### Disconnecting the axis-1 motor connectors

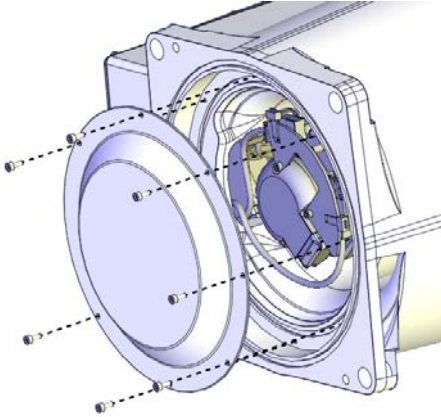
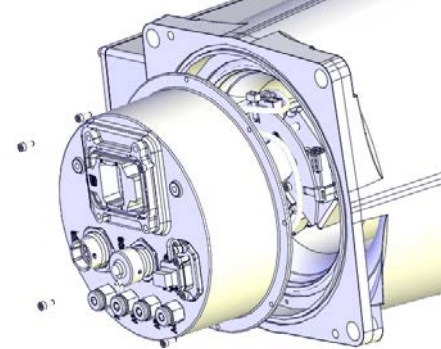
|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page



**4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)**

*Continued*

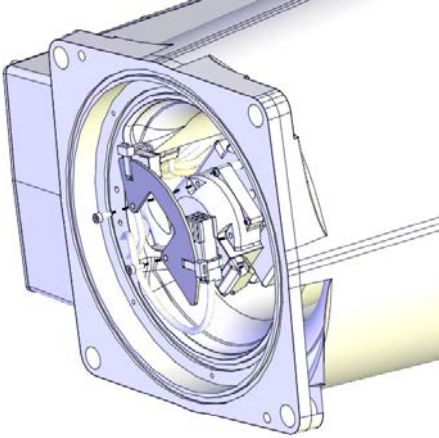
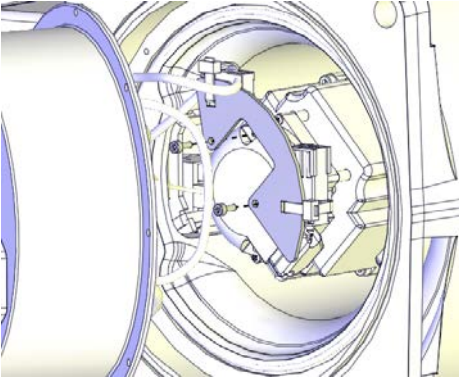
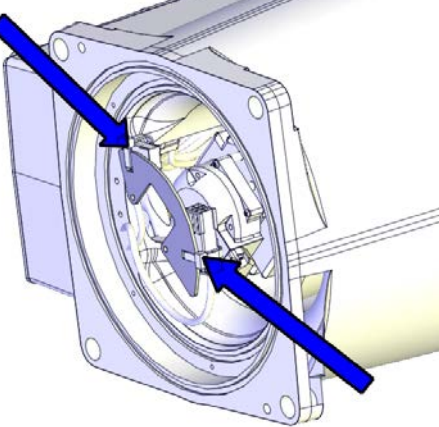
|   | <b>Action</b>            | <b>Note</b>  |
|---|--------------------------|--|
| 3 | Remove the bottom cover. | <p>Rear connector interface:</p>  <p>xx130000469</p> <p>Bottom connector interface:</p>  <p>xx140000403</p> |

*Continues on next page*

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action   | Note   |
|---|--|--|
| 4 | Remove the axis-1 motor bracket.   | <p>Rear connector interface:</p>  <p>xx130000470</p> <p>Bottom connector interface:</p>  <p>xx140000404</p> |
| 5 | Loosen the connectors from the bracket by cutting the cable straps, and disconnect the connectors. |  <p>xx1300002496</p>   |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)



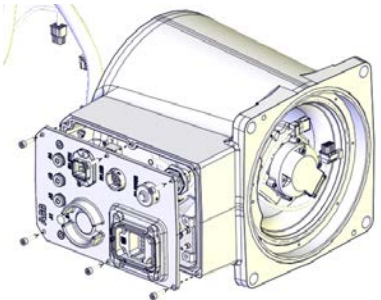
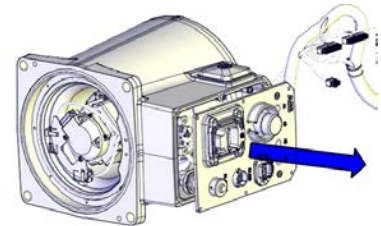
Continued

Removing the cable package from the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Open the base cover.  | <br>xx1300002448  |
| 4 | Disconnect the earth cable.   |   |
| 5 | Pull the cable package out from the base, through the rear.   | <br>xx1300002456 |

Continues on next page



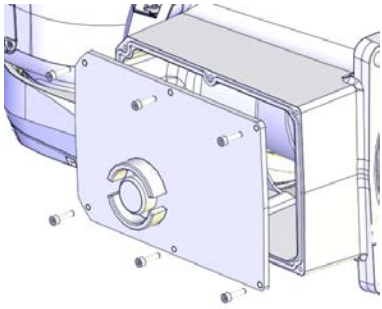
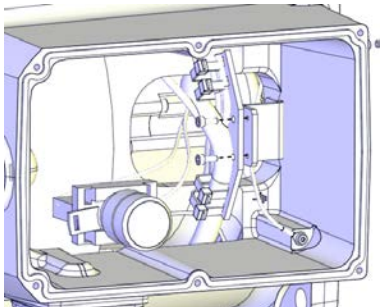
## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

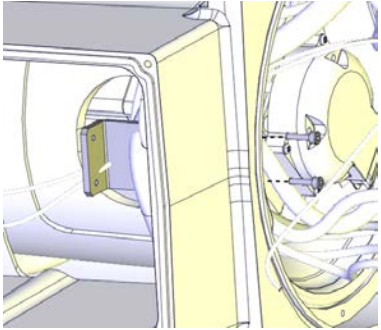
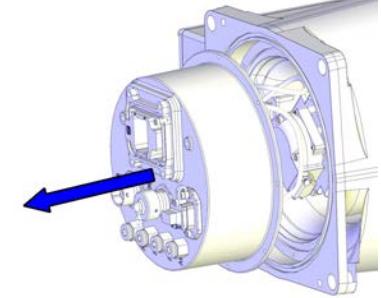
Cabling with bottom interface, and cabling routed from below (option 996-1)

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.


|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Open the base cover.  | <br>xx1400000405  |
| 4 | Remove the brake release button from the base cover.  |   |
| 5 | Disconnect the earth cable.   |   |
| 6 | Remove the cable bracket by removing the screws.  | <br>xx1400000406 |

*Continues on next page*

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)  
Continued

|   | Action  | Note  |
|---|---|---|
| 7 | Remove the bracket inside the base by removing the screws.    |  <p>xx1400000407</p> |
| 8 | Pull the cable package out from the base, through the bottom. |  <p>xx1400000411</p> |

Removing the axis-1 radial sealing and M2 variseal sealing

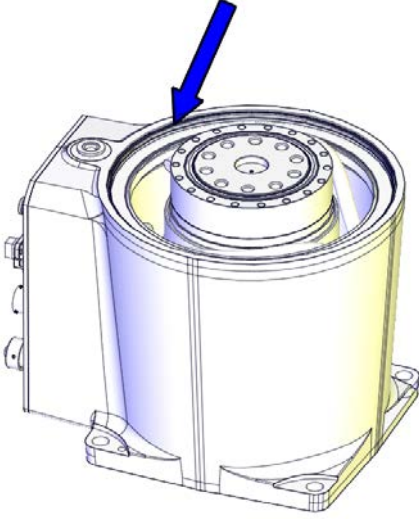

|   | Action  | Note |
|---|---|------|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |
| 2 | Raise the base into standing and put most of the cable harness, including the sealing ring bracket, into the base (in the space of the protection sleeve).  |      |

Continues on next page


## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action  | Note  |
|---|---|---|
| 3 | <p>Remove the M2 variseal sealing.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a>.</p> |  <p>xx1400000780</p>  |
| 4 | <p>Remove the radial sealing.</p>   |  <p>xx1400000270</p> |

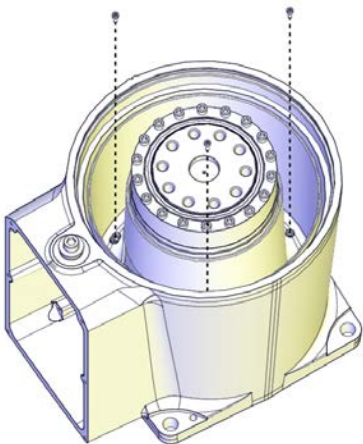
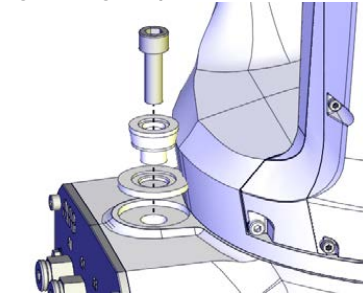
### Replacing the base

|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

|   | Action  | Note  |
|---|---|---|
| 2 | Move the protection sleeve from the old base to the new.                              | Tightening torque: 0.3 Nm.<br><br>xx1400000776 |
| 3 | Move the axis-1 mechanical stop set from the old base to the new. Replace if damaged. | Tightening torque: 12 Nm.<br><br>xx1400000392 |

#### Refitting the axis-1 radial sealing and M2 variseal sealing

|   | Action  | Note |
|---|---|------|
| 1 | Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>                                       |      |
| 2 | <b>For robots with protection type Clean Room</b><br>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement. |      |

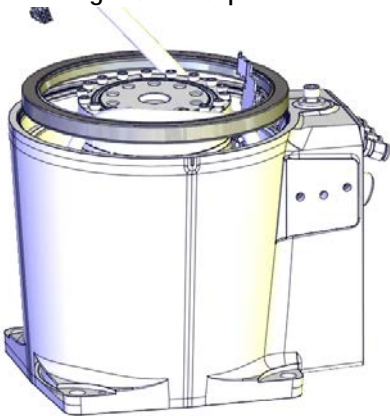
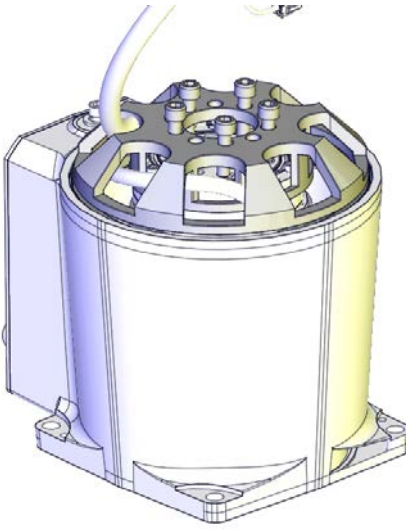
*Continues on next page*



## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued


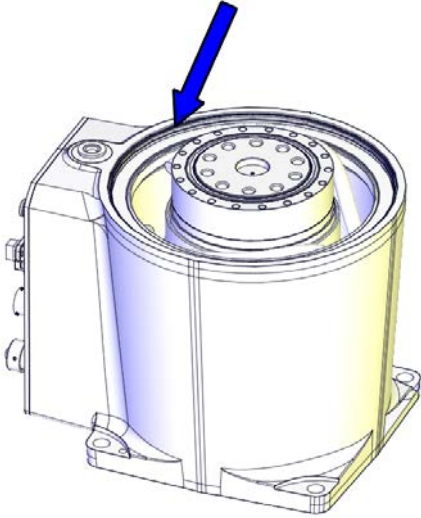

|   | Action  | Note   |
|---|---|--|
| 3 | Fit the new sealing in its groove in the base.  | <p>Radial sealing with dust lip: 3HAB3701-47</p>  <p>xx140000270</p>         |
| 4 | Put the assembly tool against the axis-1 gear and slowly press the sealing into the base by screwing the five screws (M10X35) into the axis-1 gear screws little by little. | <p>Axis-1 sealing assembly tool set: 3HAC049692-001</p>  <p>xx140000271</p> |
| 5 | Remove the assembly tool.   |  |

Continues on next page



### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action   | Note   |
|---|--|--|
| 6 | <p>Fit a new M2 variseal sealing in its groove in the base.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a>.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> |  <p>xx140000780</p> <p>M2 variseal sealing: 3HAC044641-002</p> |
| 7 | <p>Check that the sealings are undamaged and properly fitted.</p>  |  |
| 8 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>   |  |

#### Refitting the cable package to the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

#### Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

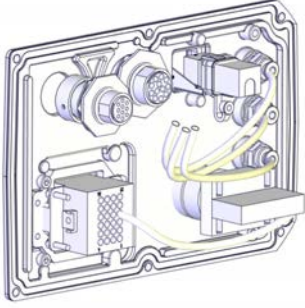
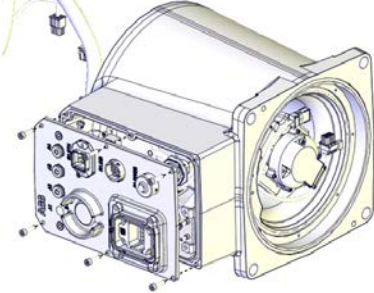

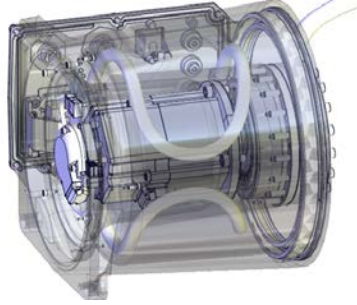

|   | Action  | Note |
|---|---|------|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> |      |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action  | Note  |
|---|---|---|
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket on the base cover.</p> <p>Replace if damaged.</p>   | <p>Gasket for rear base cover: 3HAC058566-001</p>  <p>xx1400000741</p>   |
| 3 | <p>Insert the cable package in and up through the base, through the rear.</p>   |   |
| 4 | <p>Reconnect the earth cable.</p>   |   |
| 5 | <p>Refit the base cover with the attachment screws.</p>   | <p>Screws: 3HAB3409-212 (M4x16).<br/>Tightening torque: 4 Nm.</p>  <p>xx1300002448</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 6 | <p>Route the cable package inside the base as shown in the figure.</p> <p>Apply grease to the cable package, cover all moving area of the package.</p>  |  <p>xx1400000480</p>   |
| 7 | <p>Seal and paint the joints that have been opened.</p> <p>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

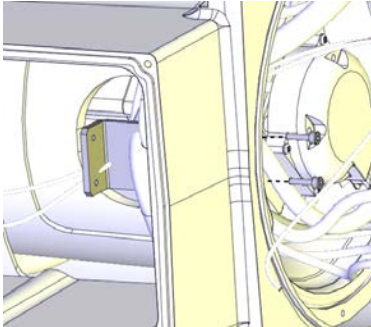
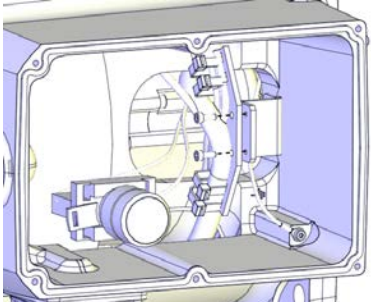
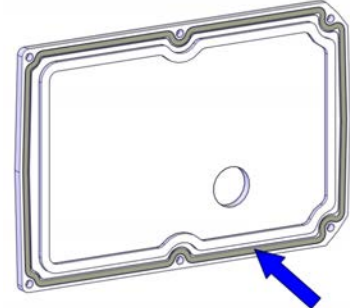
Continues on next page

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

Cabling with bottom interface, cabling routed from below (option 996-1)

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

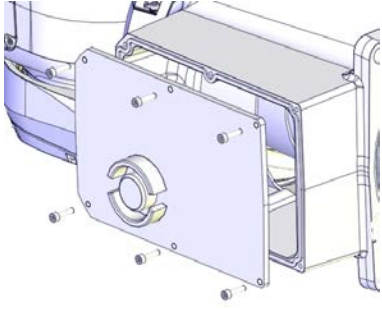

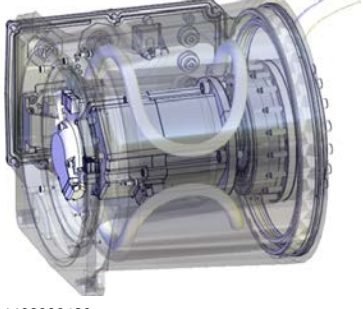

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Insert the cable package in and up through the base, through the bottom.   |  |
| 3 | Refit the bracket inside the base with the screws.   | Tightening torque: 1.5 Nm.<br><br>xx1400000407                      |
| 4 | Refit the cable bracket with the screws.   | Tightening torque: 1.5 Nm.<br><br>xx1400000406                    |
| 5 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br><b>For robots with protection type Clean Room</b><br><b>For robots with food grade lubrication</b><br>Check the gasket of the base cover.<br>Replace if damaged. | Gasket for rear base cover:<br>3HAC058566-001<br><br>xx1400000413 |
| 6 | Reconnect the earth cable.   |  |
| 7 | Refit the brake release button to the base cover.  |  |

*Continues on next page*

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|    | Action  | Note  |
|----|---|---|
| 8  | Refit the base cover.   | <p>Screws: 3HAB3409-212 (M4x16).<br/>Tightening torque: 4 Nm.</p>  <p>xx1400000405</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 9  | <p>Route the cable package inside the base as shown in the figure.</p> <p>Apply grease to the cable package, cover all moving area of the package.</p>  |  <p>xx1400000480</p>  |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b><br/>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Refitting the cabling

Use these procedures to refit the cabling, after the base part in question has been replaced.

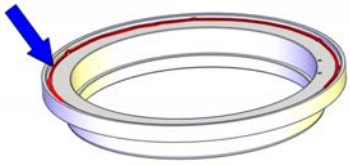



#### Refitting the cable package to the axis-1 sealing ring

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |   |
| 2 | Check the axis-1 sealing ring. Replace if damaged.   | Axis-1 sealing ring: 3HAC044676-001 / 3HAC068107-001 <sup>1</sup> |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued



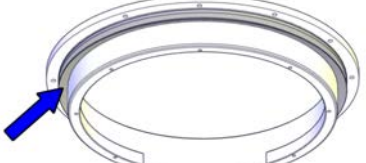

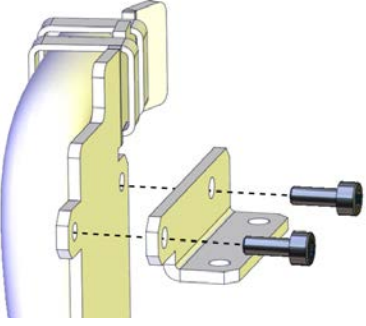
|   | Action  | Note   |
|---|---|--|
| 3 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/>                     On axis-1 sealing ring version 3HAC056658-001:<br/>                     Add sealant to the axis-1 sealing ring.<br/>                     (See <i>Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</i>)</p>   | <p>Sealant: Sikaflex 521FC.</p>  <p>xx1600001125</p>  |
| 4 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/>                     On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001:<br/> <b>For robots with protection type Foundry Plus (option 287-3)</b><br/>                     On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:<br/>                     Check the gasket on the axis-1 sealing ring.<br/>                     (See <i>Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</i>)<br/>                     Replace if damaged.</p> | <p>On axis-1 sealing ring version 3HAC044676-001:<br/>                     Axis-1 sealing ring gasket:<br/>                     3HAC045685-001</p>  <p>xx1400000458</p> <p>On axis-1 sealing ring version 3HAC058568-001:<br/>                     Axis-1 sealing ring gasket:<br/>                     3HAC058349-001</p>  <p>xx1600001149</p> <p>On axis-1 sealing ring version 3HAC068107-001:<br/>                     Axis-1 sealing ring gasket:<br/>                     3HAC058349-001</p>  <p>xx1900001735</p> |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

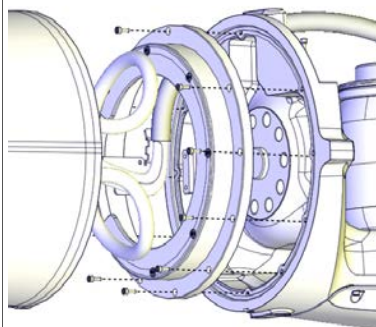

|   | Action  | Note  |
|---|---|---|
| 5 | <p>For robots with protection class IP67 (option 287-10)<br/>           On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001:<br/> <b>For robots with protection type Foundry Plus (option 287-3)</b><br/>           On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:<br/>           Check the V-ring on the axis-1 sealing ring.<br/>           (See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</a>)<br/>           Replace if damaged.</p> | <p>V-ring: 3HAB3732-34<br/>           On axis-1 sealing ring version 3HAC056658-001:</p>  <p>xx1600001124</p> <p>On axis-1 sealing ring version 3HAC058568-001:</p>  <p>xx1600001150</p> <p>On axis-1 sealing ring version 3HAC068107-001:</p>  <p>xx1900001736</p> |
| 6 | <p>Check the cable protection on the axis-1 sealing ring.<br/>           Replace if damaged.<br/>           If replacing the cable protection, use locking liquid Loctite 243 on the screws.</p>  | <p>Cable protection: 3HAC044691-001<br/>           Torx countersunk head screw M3x5: 3HAC14286-4<br/>           Tightening torque: 0.3 Nm</p>  <p>xx1400000456</p>   |
| 7 | <p>Refit the cable bracket to the cabling, if removed.<br/>           Use Loctite 243 on the screw threads.</p>   | <p>Tightening torque: 1 Nm.</p>  <p>xx1300002446</p>   |

Continues on next page





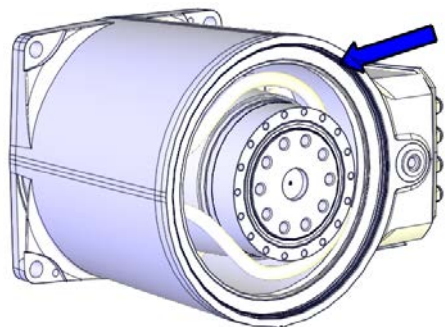
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action  | Note  |
|---|---|---|
| 8 | Refit the axis-1 sealing ring to the swing and carefully run the cabling into the swing.  | Tightening torque: 1.5 Nm.<br><br>xx1300002438 |
| 9 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |   |

<sup>i</sup> For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797](#).

Assembling the swing and base

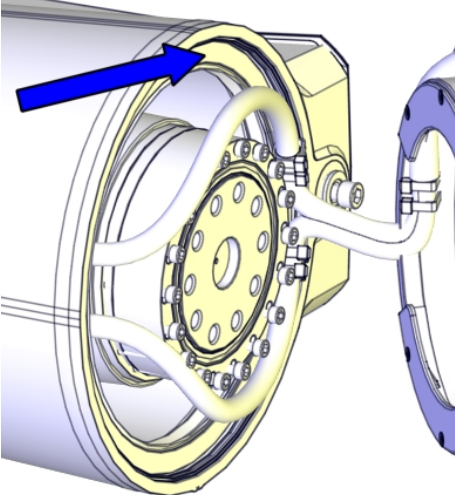
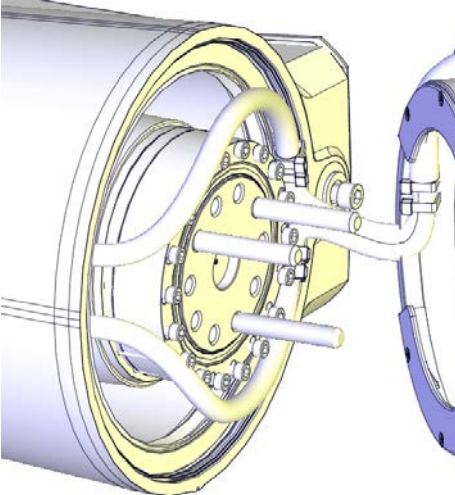

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | Check the axis-1 radial sealing and the M2 variseal sealing in the base.<br>Replace if damaged.<br> <b>Note</b><br>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.<br>The M2 variseal sealing is only installed on base version 3HAC049628-001. See <a href="#">Spare part versions for the base on IP40/IP67 robots on page 793</a> .<br> <b>CAUTION</b><br>Do not fit M2 variseal sealing on Clean Room robots. | Radial sealing with dust lip: 3HAB3701-47<br>M2 variseal sealing: 3HAC044641-002<br><br>xx1400000472<br>Replacement is detailed in <a href="#">Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve) on page 441</a> . |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

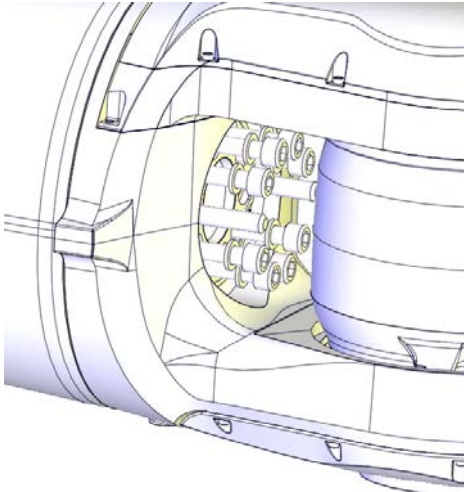

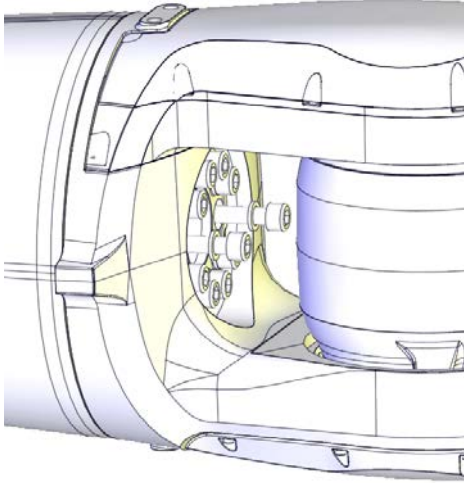
|   | Action  | Note   |
|---|---|--|
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Apply grease to the radial sealing surface.</p>  | <p>Grease: 3HAC058065-001.</p>  <p>xx160000170</p>   |
| 4 | <p>Fit the guide pins to the drive unit.</p>  | <p>Guide pin for axis-1 gear unit:<br/>3HAC049703-001</p>  <p>xx1300002566</p> <p>Always use three guide pins together!</p> |
| 5 | <p>Refit the swing to the base with guidance from the guide pins while running the cabling up through the swing.<br/>Position and angle the cabling inside the base as it was positioned during removal.</p> <p> <b>CAUTION</b></p> <p>Be careful not to squeeze any cabling during the refitting procedure.</p> |  |

Continues on next page



4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

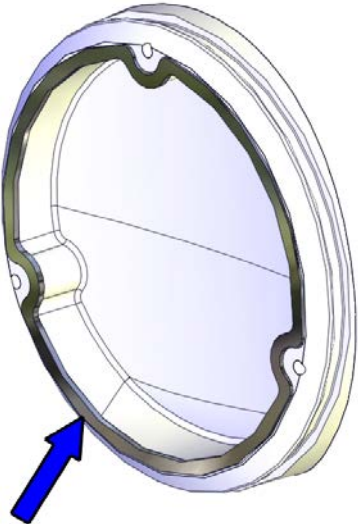
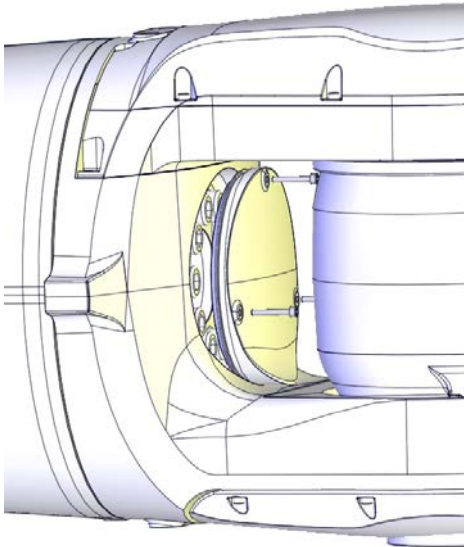

|   | Action   | Note   |
|---|--|--|
| 6 | Secure with attachment screws and washers, but do not tighten yet.           | <p>Screws: 3HAB3409-52 (M10x35).</p>  <p>xx1300002567</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 7 | Remove the guide pins and refit the remaining attachment screws and washers. |  <p>xx1300000523</p>   |
| 8 | Tighten all screws.  | Tightening torque: 40 Nm.  |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)


Continued

|    | Action  | Note   |
|----|---|--|
| 9  | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p> | <p>Gasket on top swing cover: 3HAC056696-001</p>  <p>xx1400000425</p>  |
| 10 | <p>Refit the swing top cover with the screws.</p> <p>Replace if damaged.</p>  | <p>Cover on top of swing: 3HAC059679-001<br/>: 3HAC056133-001 (used with protection type Clean Room)</p> <p>Cover on top of swing, Clean Room</p> <p>Cover on top of swing, food grade lubrication</p> <p>Screws: 3HAB3409-209 (M3x20).</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300000467</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

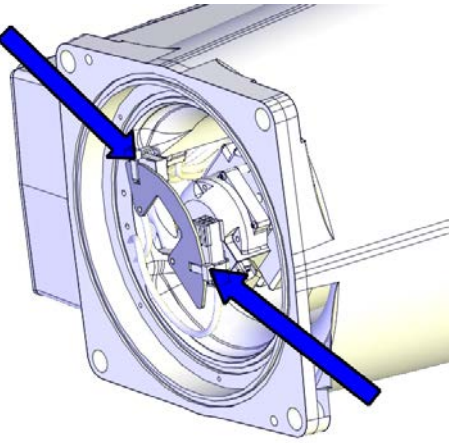
Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|    | Action   | Note |
|----|--|------|
| 11 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |      |

Connecting the axis-1 motor connectors

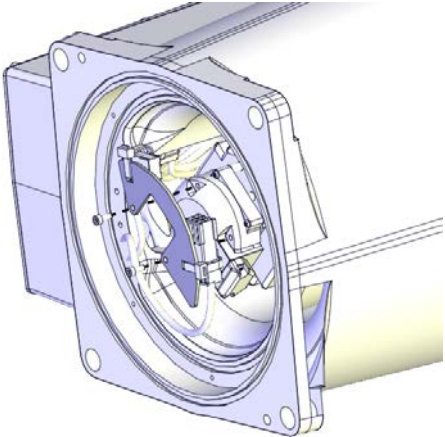
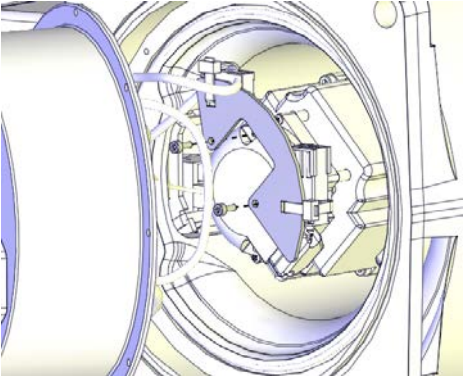
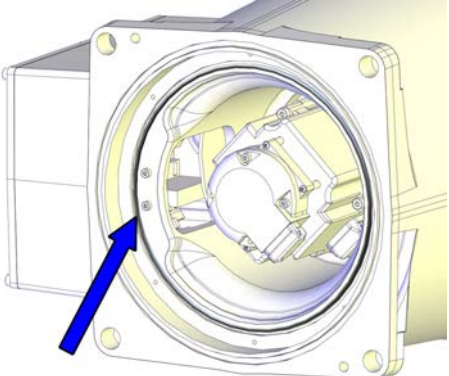
|   | Action  | Note  |
|---|---|---|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> |   |
| 2 | <p>Reconnect the connectors and secure the connectors to the bracket with cable straps.</p>   |  <p>xx1300002496</p> |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

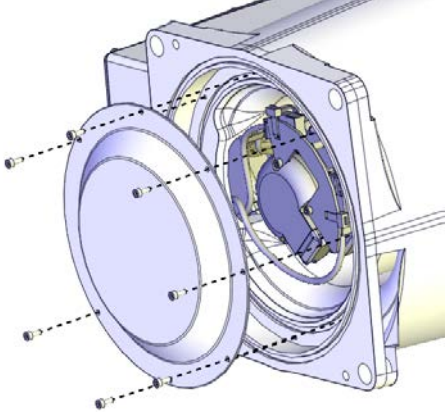
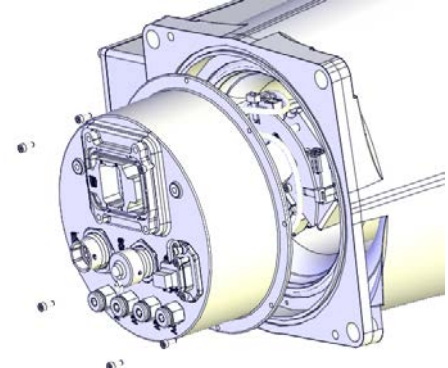


Continued

|   | Action   | Note  |
|---|--|---|
| 3 | Refit the axis-1 motor bracket.  | <p>Tightening torque: 1.5 Nm.<br/>Rear connector interface:</p>  <p>xx1300000470</p> <p>Bottom connector interface:</p>  <p>xx1400000404</p> |
| 4 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the O-ring.<br/>Replace if damaged.</p> | <p>O-ring: 3HAB3772-86</p>  <p>xx1400000412</p>   |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action  | Note  |
|---|---|---|
| 5 | Refit the bottom cover.   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.<br/>Rear connector interface:</p>  <p>xx130000469</p> <p>Bottom connector interface:</p>  <p>xx140000403</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 6 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b><br/>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |


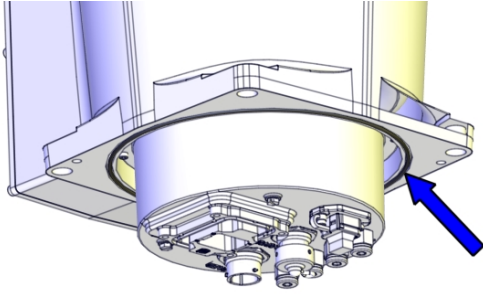

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

#### Securing the robot to the foundation

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>The robot weighs .<br>IRB 1200-5/0.9: 54 kg<br>IRB 1200-7/0.7: 52 kg<br>All lifting accessories used must be sized accordingly!   |   |
| 2 | <b>For robots with:</b><br><b>protection class IP67 (option 287-10),</b><br><b>protection type Foundry Plus (option 287-3),</b><br><b>and manipulator cables routed from below (option 996-1)</b><br>Check the gasket at the bottom of the base.<br>Replace if damaged.   | O-ring: 3HAB3772-141<br>For robots with protection class IP67 (option 287-10)<br>Used with protection type Foundry Plus<br>For robots with protection type Clean Room<br>For robots with food grade lubrication<br>Used with manipulator cables routed from below (option 996-1) <br><small>xx1500000241</small> |
| 3 | Raise the robot to standing and secure to the foundation with the attachment screws and washers.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | Attachment screws: M12x35 (robot installation directly on foundation), quality: 8.8.<br>Washers: 13 x 20 x 2, steel hardness class 300HV.<br>Pin: 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1.<br>Tightening Torque: 55 Nm ± 5 Nm.   |


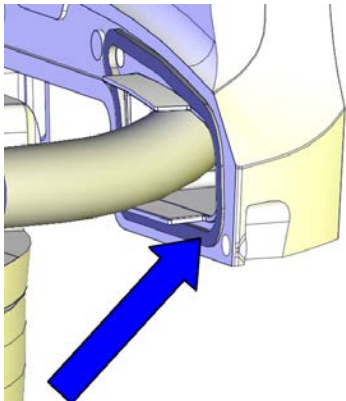
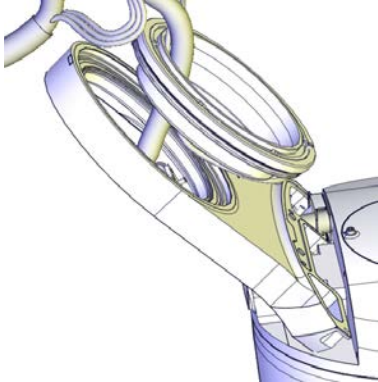
#### Refitting the cable package in the lower arm

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page



4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)  
*Continued*

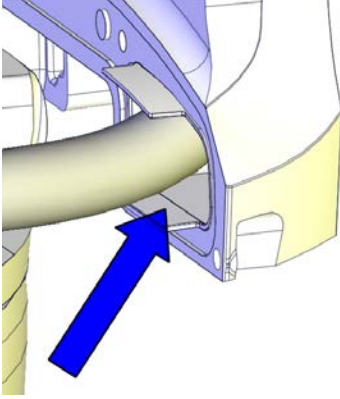

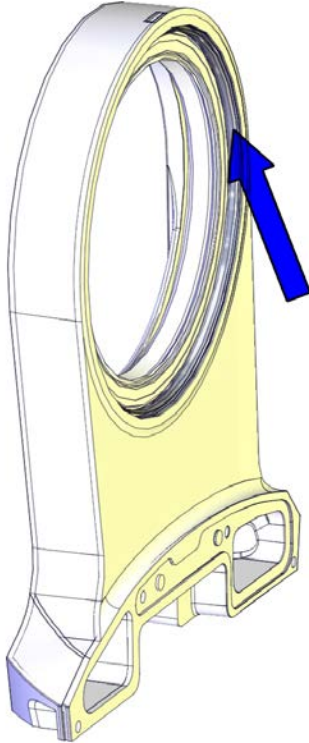
|   | Action  | Note  |
|---|---|---|
| 2 | <p>Check the axis-2 sealing ring.<br/> <b>For robots with protection class IP67 (option 287-10)</b><br/> <b>For robots with protection type Foundry Plus (option 287-3)</b><br/> <b>For robots with protection type Clean Room</b><br/> <b>For robots with food grade lubrication</b><br/>                     Check the gasket.<br/>                     Replace if damaged.</p> | <p>Axis-2 sealing ring: 3HAC044677-001<br/>                     Gasket of axis-2 sealing ring: 3HAC045688-001</p>  <p>xx1400000476</p> |
| 3 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/> <b>For robots with protection type Foundry Plus (option 287-3)</b><br/> <b>For robots with protection type Clean Room</b><br/> <b>For robots with food grade lubrication</b><br/>                     Check the gasket of the cable housing plastic plate.<br/>                     Replace if damaged.</p>  | <p>Gasket of plastic plate: 3HAC044894-001</p>  <p>xx1400000457</p>  |
| 4 | <p>Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.</p>   |  <p>xx1400000025</p>   |

*Continues on next page*

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued


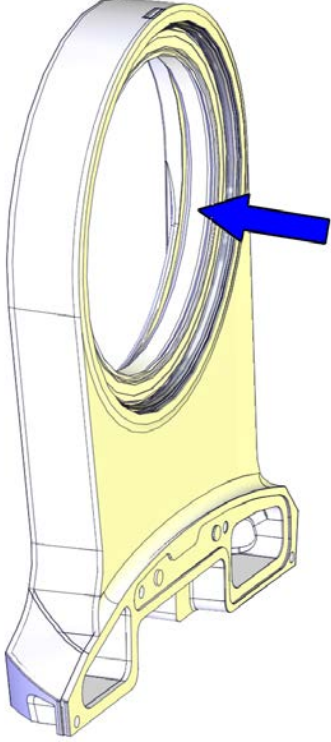

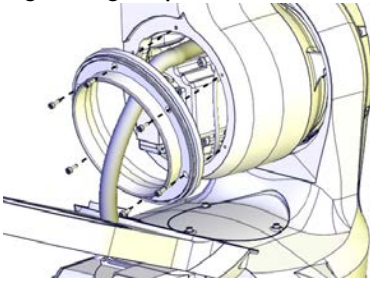
|   | Action  | Note  |
|---|---|---|
| 5 | Fasten the plastic plate to the cable housing, if removed.<br>Replace if damaged.   | The plastic plate is included in:<br>Cable harness material set:<br>3HAC049663-001.<br><br>xx140000023 |
| 6 | For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)<br>Check the sealing.<br>Replace if damaged.<br><br> <b>CAUTION</b><br><br>Do not fit M2 variseal sealing on Clean Room robots. | M2 variseal sealing: 3HAC044641-004<br><br>xx1400000454   |

Continues on next page



4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

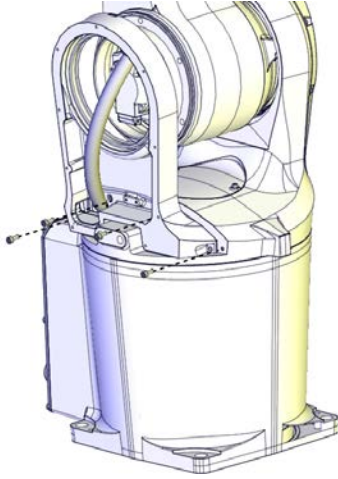

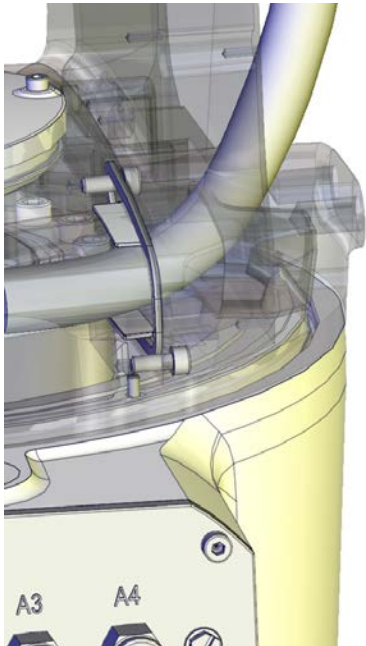
|   | Action  | Note  |
|---|---|---|
| 7 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the radial sealing.<br/>                     Replace if damaged.</p> <p> <b>Note</b></p> <p>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> | <p>Radial sealing with dust lip: 3HAB3701-41</p>  <p>xx1400000753</p> <p>Replacement is detailed in <a href="#">Replacing the swing spare parts (swing, axis-2 radial sealing)</a> on page 516.</p> |
| 8 | <p>Guide the cable package into the lower arm.</p> <p> <b>Tip</b></p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>   |   |
| 9 | <p>Refit the axis-2 sealing ring with the screws.</p>   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000020</p>   |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

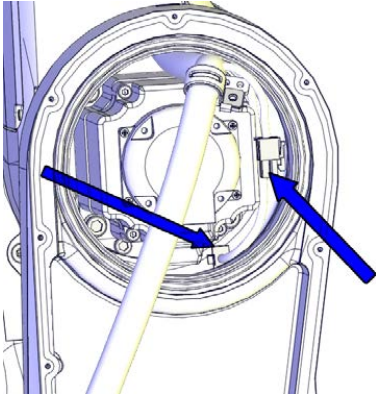

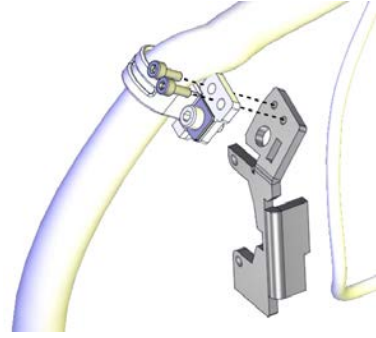
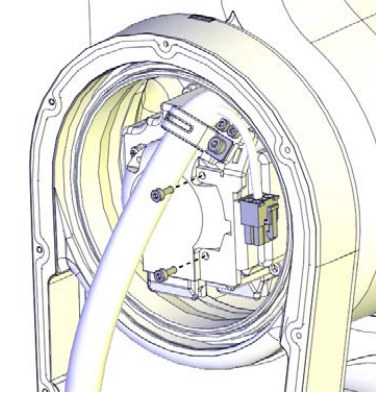
Continued

|    | Action   | Note   |
|----|--|--|
| 10 | Refit the cable housing with the screws.                                 | <p>Screws: 3HAB3409-236 (M4x10).<br/>Tightening torque: 3 Nm.</p>  <p>xx1300002435</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 11 | Apply grease to the cable package, cover all moving area of the package. |  <p>xx1400000481</p>  |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

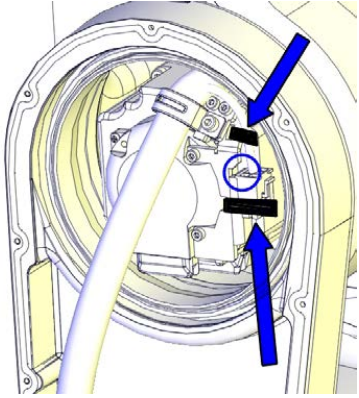
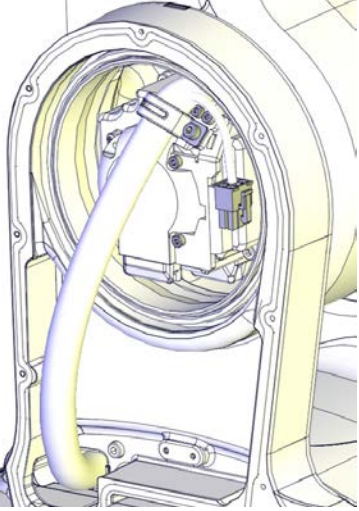
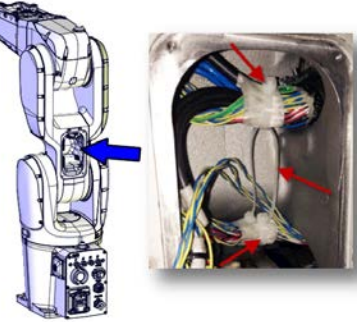
|    | Action   | Note   |
|----|--|--|
| 12 | Reconnect the motor connectors. <ul style="list-style-type: none"> <li>• R2.ME2</li> <li>• R2.MP2</li> </ul>   |  <p>xx1300002434</p>                                    |
| 13 | Refit the axis-2 motor bracket to the cable package with the two screws.<br><br> <b>CAUTION</b><br>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. | Tightening torque: 1.5 Nm.<br><br> <p>xx1400000021</p> |
| 14 | Refit the axis-2 motor bracket to the motor.   |  <p>xx1300002432</p>                                  |

Continues on next page

## 4 Repair

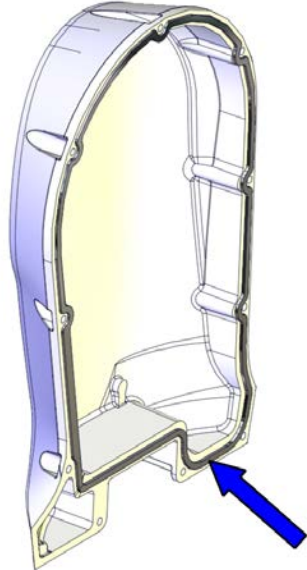
### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|    | Action   | Note  |
|----|--|---|
| 15 | Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.  | <br>xx1400001529   |
| 16 | Apply grease to the cable package, cover all moving area of the package.   | <br>xx1400000482  |
| 17 | In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity:<br><ol style="list-style-type: none"><li>1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location.</li><li>2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place.</li></ol> See the figure. | <br>xx1400001131 |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)  
*Continued*


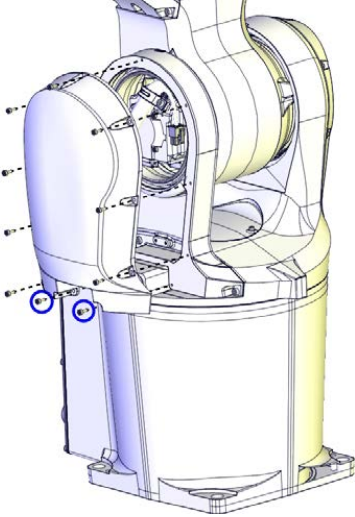

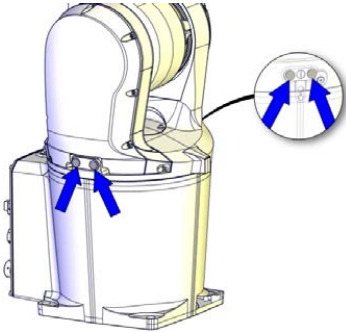
|    | Action   | Note  |
|----|--|---|
| 18 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the gasket of the cable housing cover.<br/>                     Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>                     3HAC056726-001</p>  <p>xx1400000424</p> |
| 19 | <p>Check the PTFE film.<br/>                     Replace if damaged.</p>   | <p>PTFE film on cable housing cover:<br/>                     3HAC044660-001</p>  |
| 20 | <p>Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.</p>  |   |

*Continues on next page*

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

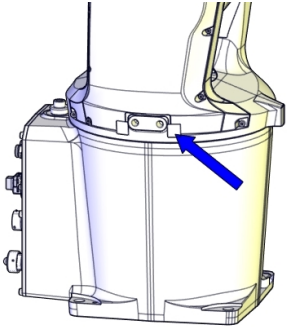

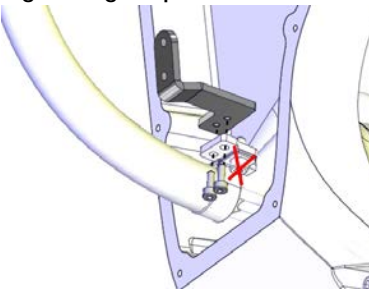

Continued

|    | Action  | Note  |
|----|---|---|
| 21 | <p>Refit the cable housing cover.<br/>Replace if damaged.</p> <p> <b>Note</b></p> <p>Remember to refit the two lower screws shown in the figure.</p> | <p>Cable housing cover of the swing:<br/>3HAC059678-001<br/>: 3HAC056214-001 (used with protection type Clean Room)<br/>Cable housing cover of the swing, Clean Room<br/>Cable housing cover of the swing, food grade lubrication<br/>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 22 | <p>For robots with protection type Foundry Plus (option 287-3)<br/>Check the protection plugs for lifting holes.<br/>Replace if damaged.</p>  | <p>Protection plug for lifting holes:<br/>3HAC4836-24</p>  <p>xx1600001151</p>   |


Continues on next page

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

|    | Action   | Note  |
|----|--|---|
| 23 | <p>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Refit the swing sealing plug.<br/>Follow the procedure specified in <a href="#">Refitting the swing sealing plug on page 144</a>.</p>   | <p>Swing sealing plug:3HAC053687-001</p>  <p style="text-align: right; font-size: small;">xx1600000205</p> |
| 24 | <p>Refit the lower arm bracket to the cable package.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>                                   | <p>Tightening torque: 1.5 Nm.</p>  <p style="text-align: right; font-size: small;">xx1300002430</p>       |
| 25 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Connecting the cabling in the lower arm

|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a></p> |      |
| 2 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>   |      |

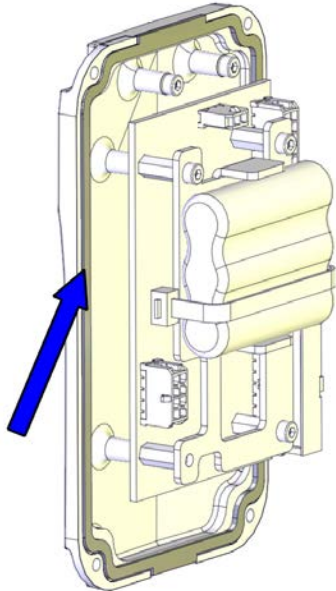

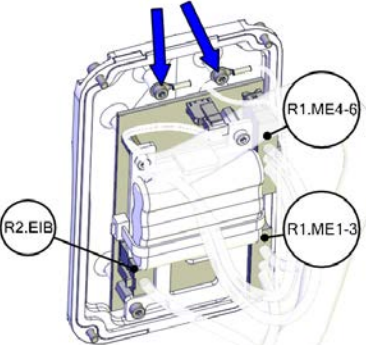

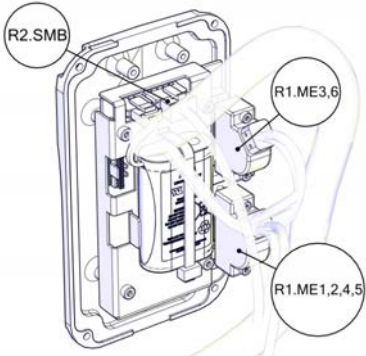
*Continues on next page*



## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

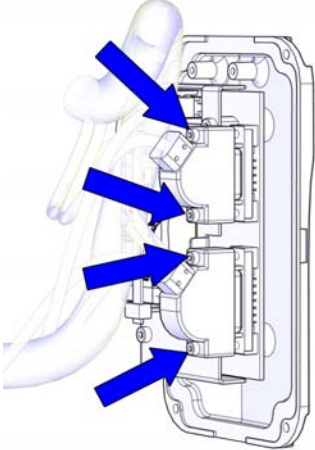
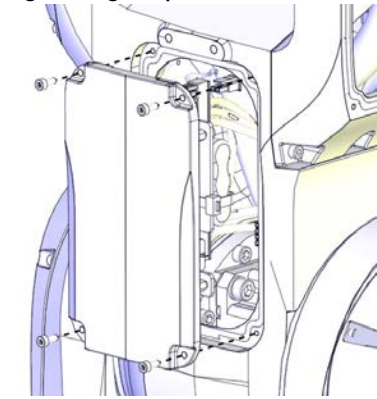

|   | Action  | Note   |
|---|---|--|
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the EIB/SMB cover gasket.</p> <p>Replace if damaged.</p>   | <p>Gasket on EIB/SMB cover:<br/>3HAC056728-001</p>  <p>xx1400000475</p> |
| 4 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p> |  <p>xx1300002428</p>  |
| 5 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>   |  |
| 6 | <p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>                              |  <p>xx1700000005</p>  |

Continues on next page



**4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)**

*Continued*

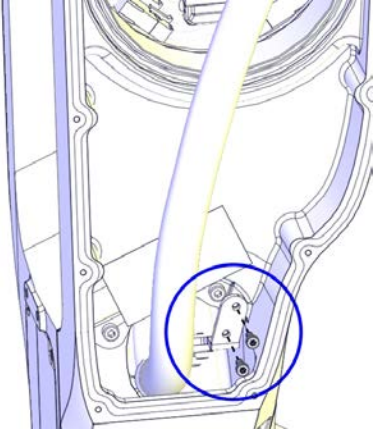

|   | <b>Action</b>   | <b>Note</b>   |
|---|---|---|
| 7 | <p><b>Valid for IRB 1200 Type B</b><br/>Tighten the connector screws.</p>   | <p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>  |
| 8 | <p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p> | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

*Continues on next page*

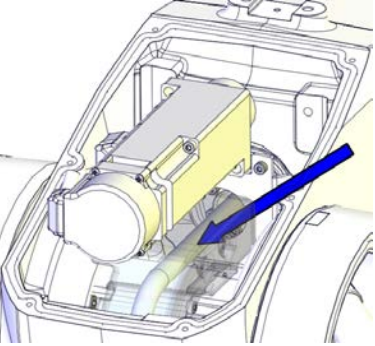
## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|    | Action   | Note  |
|----|--|---|
| 9  | Refit the fix sheet attachment screws in the lower arm.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p> |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |



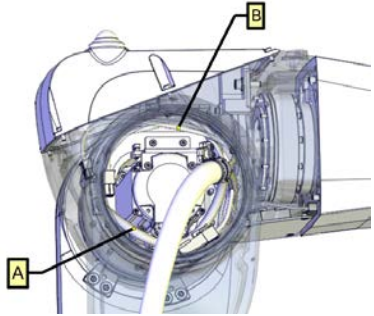

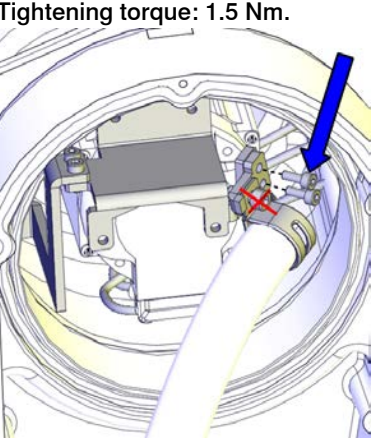
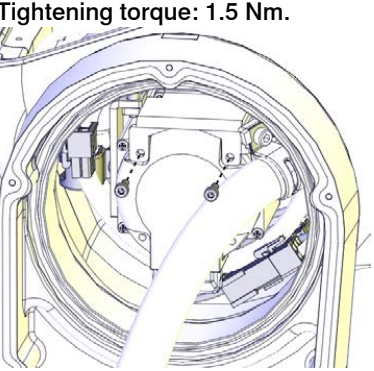
### Refitting the cable package in the housing

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package. | <p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p> |

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

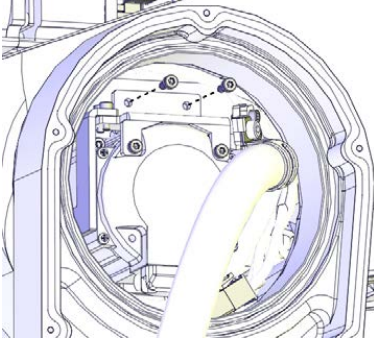

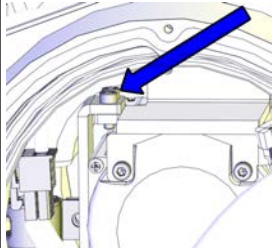
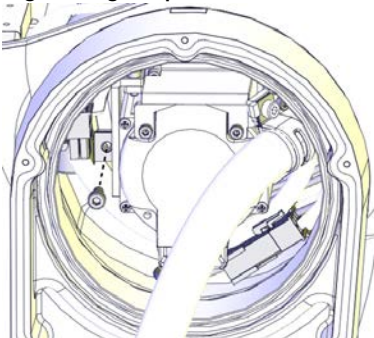
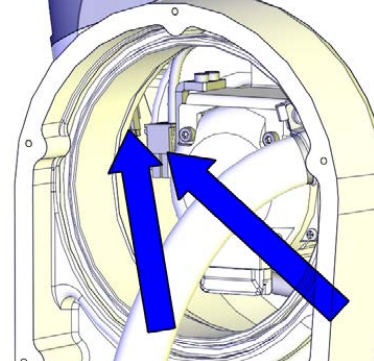
|   | Action  | Note  |
|---|---|---|
| 3 | <p>Guide the cable package into the upper arm, through the housing.</p> <p> <b>Note</b></p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> <b>Note</b></p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p> |  <p>xx1400001472</p>                                     |
| 4 | <p>Refit the bracket to the sheet with two screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>  |
| 5 | <p>Refit the fix sheet to the motor.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p> |

Continues on next page

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

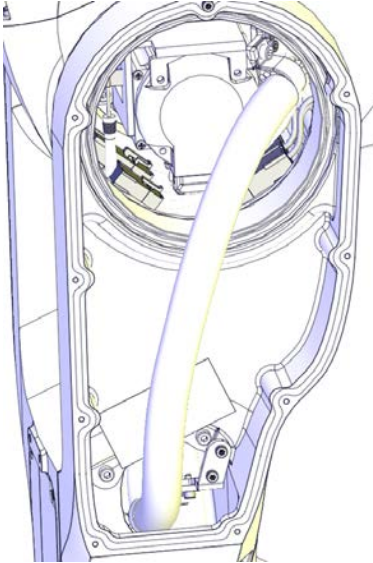

Continued

|   | Action   | Note  |
|---|--|---|
| 6 | Refit the fix sheet to the inner plastic guide.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>   |
| 7 | <p>Fit the air hose holder to the bracket.<br/>Replace the holder, if damaged.</p> <p> <b>Tip</b></p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p> | <p>Air hose holders are included in Cable harness material set (3HAC049663-001).</p> <p>Tightening torque: 4 Nm.</p>  <p>xx1300002422</p> |
| 8 | Reconnect the axis-3 motor connectors.   |  <p>xx1300002420</p>   |


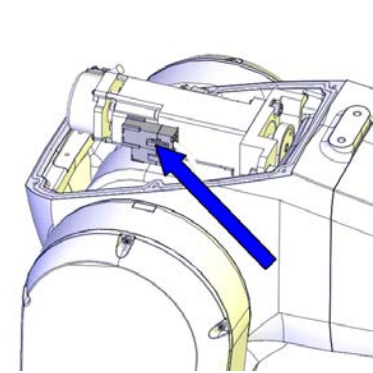
Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|    | Action   | Note   |
|----|--|--|
| 9  | Apply grease to the cable package, cover all moving area of the package.   |  <p>xx140000754</p> |
| 10 | <b>Valid for IRB 1200-5/0.9</b><br>Secure the cable package at the bottom of the housing with cable straps.  |  |
| 11 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
|    |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

Connecting the axis-4 motor connectors

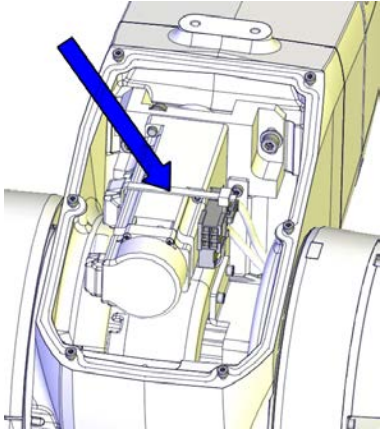
|   | Action   | Note  |
|---|--|---|
| 1 | Reconnect the motor connectors.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  <p>xx1300002371</p> |

Continues on next page


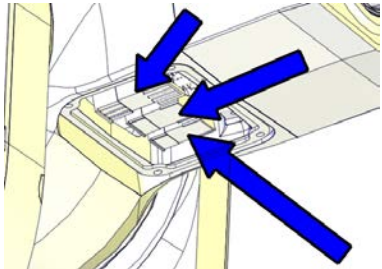
## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | Secure the connectors to the motor with a cable strap. | <br>xx1300002494 |


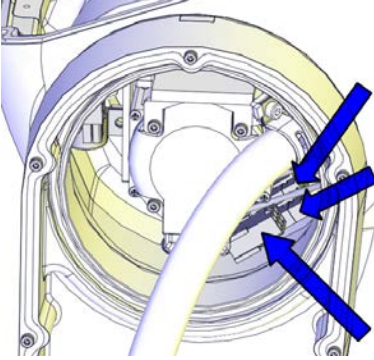
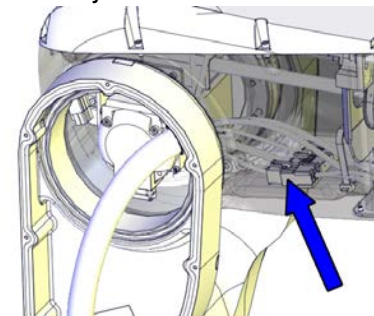
### Connecting the axis-4 FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Reconnect the FPC connectors.<br> <b>Tip</b><br>See the number markings on the connectors for help to find the corresponding connector. | <br>xx1300002399 |

Continues on next page



4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)  
*Continued*

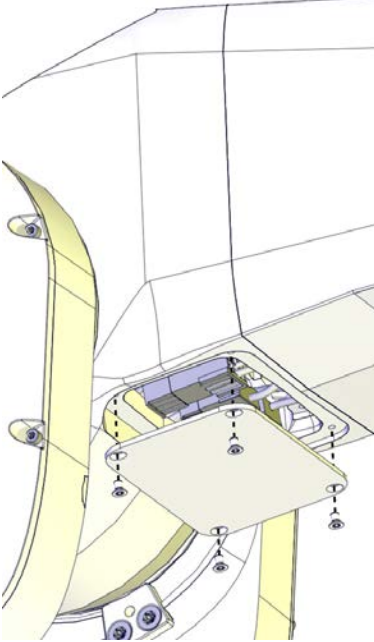
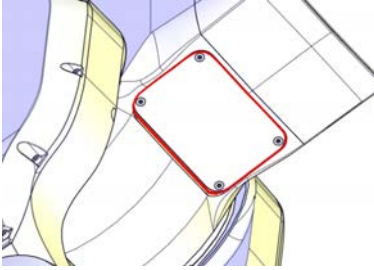
|   | Action  | Note   |
|---|---|--|
| 3 | <p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>  |  |

*Continues on next page*

## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

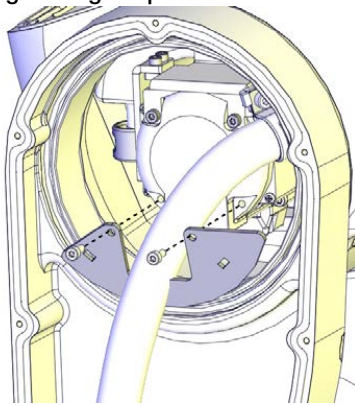
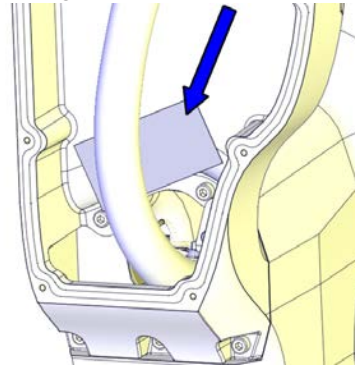
|   | Action  | Note   |
|---|---|--|
| 5 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>  |   |
| 6 | <p>Refit the small cover to the housing.</p> <p>Replace if damaged.</p>   | <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001</p> <p>: 3HAC056142-001 (used with protection type Clean Room)</p> <p>Housing small cover, Clean Room</p> <p>Housing small cover, food grade lubrication</p> <p>Screws: 3HAC14286-4 (M3X5).</p> <p>Tightening torque: 1 Nm.</p> |
| 7 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the small cover on the housing.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx1600000214</p>  |

Continues on next page



4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

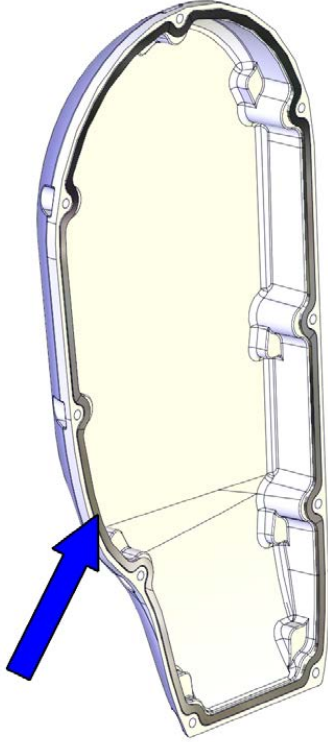
|   | Action  | Note   |
|---|---|--|
| 8 | Refit the plate.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                            |
| 9 | Check the PTFE film on the cable housing. Replace if damaged. | <p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p> |

*Continues on next page*

## 4 Repair

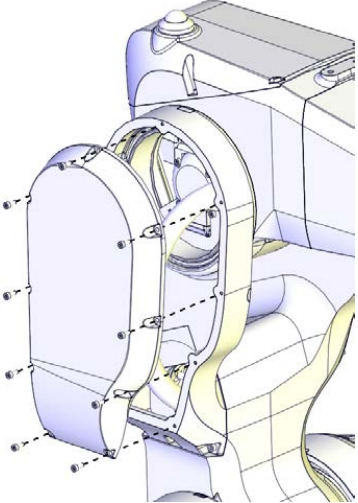


### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*


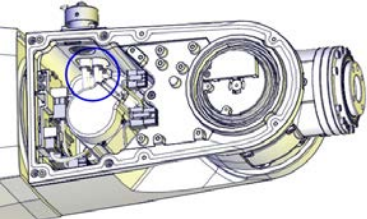
|    | Action   | Note  |
|----|--|---|
| 10 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket of the cable housing cover.</p> <p>Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001</p> <p>PTFE film on cable housing cover:<br/>3HAC044660-001</p>  <p>xx1400000048</p> |
| 11 | <p>Check the PTFE film on the cable housing cover.</p> <p>Replace if damaged.</p>  |   |
| 12 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>   |   |

*Continues on next page*

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)  
Continued

|    | Action  | Note   |
|----|---|--|
| 13 | <p>Refit the cable housing cover.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 14 | <p>Seal and paint the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Connecting the air hoses and CP/CS cabling (if equipped)

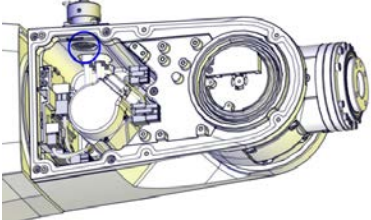
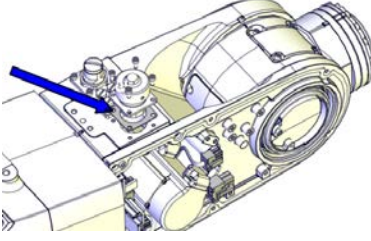
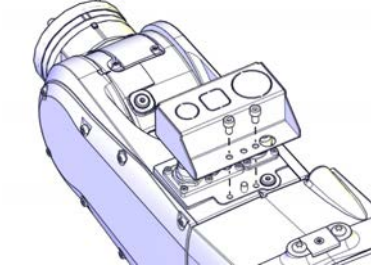
|   | Action   | Note   |
|---|--|--|
| 1 | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>.</p> | <p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p> |

Continues on next page


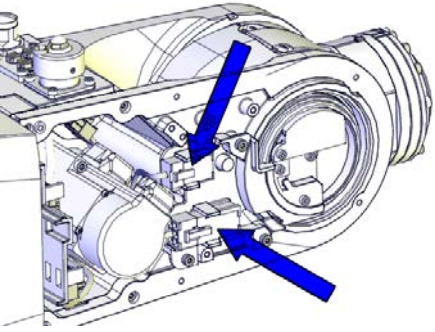
## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action  | Note   |
|---|---|--|
| 2 | <p>If equipped, reconnect the CP/CS connector.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <ol style="list-style-type: none"> <li>1 Check the gasket.</li> <li>2 Replace if damaged.</li> </ol> <p><b>For robots with protection type Clean Room:</b></p> <ol style="list-style-type: none"> <li>1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</li> <li>2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.</li> </ol> |  <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p> |
| 3 | <p><b>For robots with protection type Foundry Plus</b></p> <p>If required, fit the protection bracket for CP/CS connectors.</p>   | <p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>   |

### Connecting the axis-5 motor FPC connectors


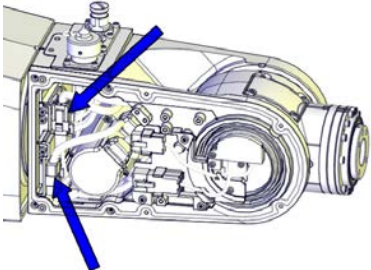
|   | Action   | Note   |
|---|--|--|
| 1 | <p>Connect the axis-5 FPC connectors and snap them to their holders.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002390</p> |

Continues on next page

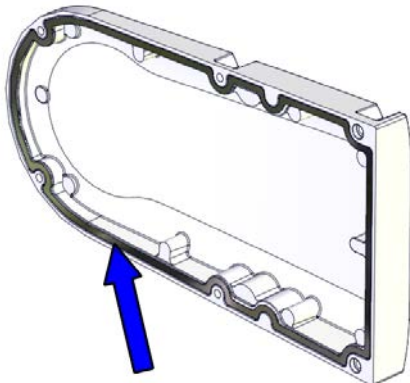
### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

*Continued*

#### Connecting the axis-5 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>.</p> |  <p>xx1300002360</p> |

#### Refitting the tubular cable housing cover

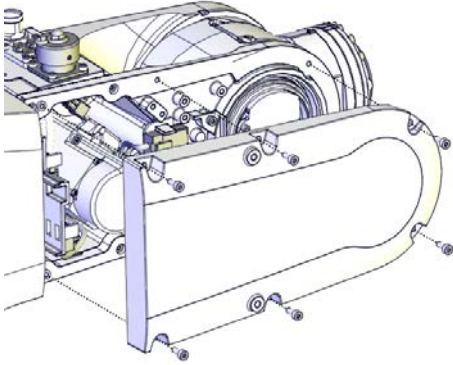


|   | Action  | Note  |
|---|---|---|
| 1 | <p>Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p>  |   |
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket.</p> <p>Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx1400000345</p> |

*Continues on next page*

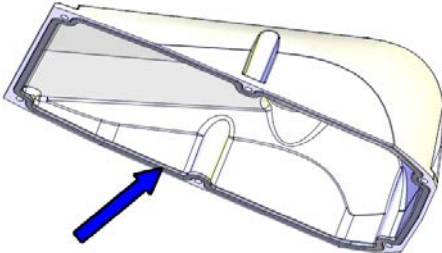
## 4 Repair

### 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action   | Note  |
|---|--|---|
| 3 | Refit the cover to the cable housing.  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |


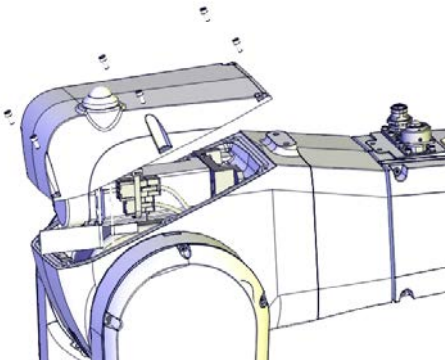

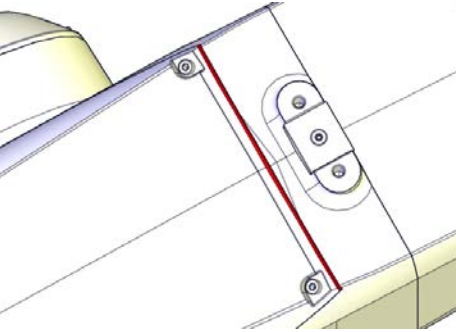


### Concluding procedure

|   | Action  | Note   |
|---|---|--|
| 1 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p> | <p>Housing cover gasket (IRB 1200-7/0.7):<br/>3HAC056698-001</p> <p>Housing cover gasket (IRB 1200-5/0.9):<br/>3HAC056697-001</p>  <p>xx1400000477</p> |

Continues on next page

## 4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Refit the upper arm housing cover with the screws.</p> <p> <b>CAUTION</b></p> <p><b>For robots with safety lamp (option)</b><br/>Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 3 | <p><b>For robots with protection type Clean Room</b></p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>   |  <p>xx1600000215</p>   |
| 4 | <p>Clean and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |   |
| 5 | Recalibrate the robot.   | Calibration information is included in section <a href="#">Calibration on page 729</a> .  |
| 6 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |   |



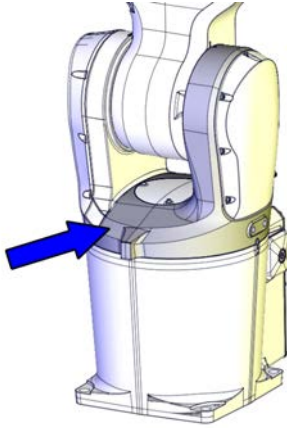
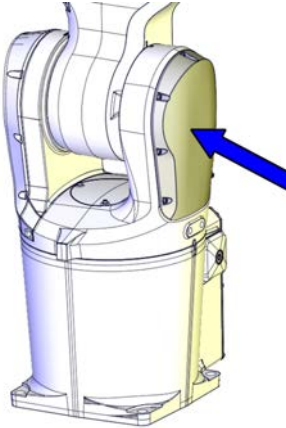
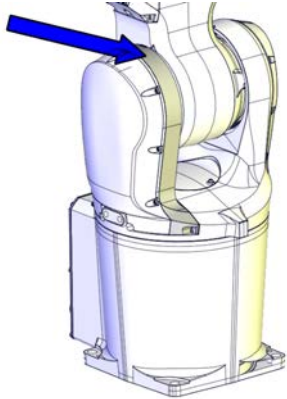
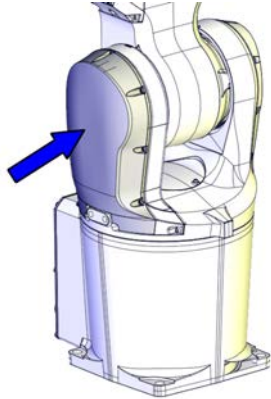
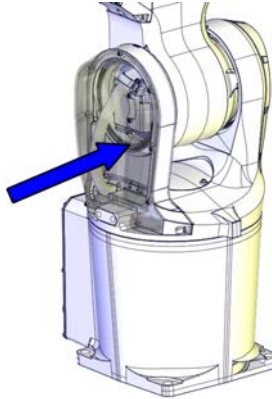
## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

#### Location of the swing spare parts

The swing parts that are considered spare parts are located as shown in the figures.

| Swing  | Swing cover   |  |
|--|---|--|
|  <p>xx140000442</p>     |  <p>xx140000443</p>    |  |
| 3HAC059554-001   | 3HAC059676-001  |  |
| 3HAC059700-001<br>Used with protection type Clean Room.<br>Used for robots with food grade lubrication.                              | 3HAC056215-001<br>Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged.        |  |
| Cable housing of the swing   | Cable housing cover of the swing  | Radial sealing with dust lip   |
|  <p>xx140000446</p> |  <p>xx140000445</p> |  <p>xx140000444</p> |
| 3HAC059677-001   | 3HAC059678-001  | 3HAB3701-41  |
| 3HAC056213-001<br>Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged.       | 3HAC056214-001<br>Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged.        | Not used with protection class IP40.<br>Replace if damaged.  |

Continues on next page



## 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

## Required spare parts



## Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part   | Article number                                  | Note   |
|--|---|--|
| Swing  | 3HAC059554-001                                  | If the swing 3HAC049632-001 or 3HAC058000-001 is previously installed on the robot, also a new sealing ring and, for IP67 and Foundry Plus, a gasket and a V-ring is required. See <a href="#">Spare part versions for the swing on IP40/IP67 robots on page 795</a> . |
| Swing, Clean Room<br>Swing, food grade lubrication | 3HAC059700-001                                  | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.  |
| Axis-1 sealing ring                                | 3HAC044676-001 /<br>3HAC068107-001 <sup>i</sup> | Replace if damaged.  |
| Axis-1 sealing ring gasket                         | 3HAC045685-001                                  | Used with protection class IP67. Only on axis-1 sealing ring version 3HAC044676-001. See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797</a> . Replace if damaged.   |
| Axis-1 sealing ring gasket                         | 3HAC058349-001                                  | Not used with protection class IP40.<br>Only on axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001. See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797</a> . Replace if damaged.                                |
| Sealing ring, gasket and V-ring                    | 3HAC059791-001                                  | Used with protection class IP67. Replace if damaged.   |
| V-ring   | 3HAB3732-34                                     | Used with protection class IP67. Used with protection type Foundry Plus.<br>Only on swing version 3HAC058000-001 and 3HAC059554-001. See <a href="#">Spare part versions for the swing on IP40/IP67 robots on page 795</a> . Replace if damaged.                       |
| Cable protection                                   | 3HAC044691-001                                  | Replace if damaged.  |
| Torx countersunk head screw<br>M3x5                | 3HAC14286-4                                     | Replace if damaged.  |
| Cover on top of swing                              | 3HAC059679-001                                  | Replace if damaged.  |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

| Spare part   | Article number | Note   |
|--|----------------|--|
| Cover on top of swing, Clean Room<br>Cover on top of swing, food grade lubrication                       | 3HAC056133-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on top swing cover  | 3HAC056696-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Swing cover  | 3HAC059676-001 | Replace if damaged.  |
| Swing cover, Clean Room<br>Swing cover, food grade lubrication   | 3HAC056215-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on swing cover  | 3HAC056727-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Radial sealing with dust lip   | 3HAB3701-41    | Not used with protection class IP40.<br>Replace if damaged.  |
| Cable housing of the swing   | 3HAC059677-001 | Replace if damaged.  |
| Cable housing of the swing, Clean Room<br>Cable housing of the swing, food grade lubrication             | 3HAC056213-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Cable housing cover of the swing   | 3HAC059678-001 | Replace if damaged.  |
| Cable housing cover of the swing, Clean Room<br>Cable housing cover of the swing, food grade lubrication | 3HAC056214-001 | Used with protection type Clean Room.<br>Used for robots with food grade lubrication.<br>Replace if damaged. |
| Gasket on cable housing cover  | 3HAC056726-001 | Not used for robots with protection class IP40.<br>Replace if damaged.                                       |
| Axis-2 sealing ring  | 3HAC044677-001 | Replace if damaged.  |
| M2 variseal sealing  | 3HAC044641-003 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.           |
| O-ring   | 3HAC048939-001 | Replace if damaged.  |
| M2 variseal sealing  | 3HAC044641-004 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.           |

Continues on next page

## 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

| Spare part                             | Article number | Note   |
|--|----------------|--|
| Cable harness material set             | 3HAC049663-001 | Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular. |
| Gasket on cable housing cover          | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket for tubular cable housing cover | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Housing cover gasket (IRB 1200-7/0.7 ) | 3HAC056698-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Housing cover gasket (IRB 1200-5/0.9 ) | 3HAC056697-001 | Not used with protection class IP40.<br>Replace if damaged.  |

<sup>i</sup> For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797](#).

## Required tools and equipment

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Roundslings, 2 m                        | -              | Length: 2 m. Lifting capacity: 100 kg.   |
| Axis-2 sealing assembly tool set        | 3HAC049694-001 | Used to refit the radial sealing, if replacement is needed.  |
| Guide pin for axis-1 gear unit          | 3HAC049703-001 | Always use three guide pins together!  |
| Guide pin for axis-2 gear unit          | 3HAC049704-001 | Always use three guide pins together!  |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |

<sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

## Required consumables

| Consumable     | Art. no.     | Note         |
|----------------|--------------|--------------|
| Cable straps   | -            |              |
| Locking liquid | 3HAB7116-1   | Loctite 243  |
| Cleaning agent | -            | Loctite 7063 |
| Flange sealing | 12340011-116 | Loctite 574  |

Continues on next page

## 4 Repair


### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

| Consumable | Art. no.       | Note   |
|------------|----------------|--|
| Sealant    | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Clean Room<br>For robots with protection type Foundry Plus (option 287-3) |

#### Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action  | Note  |
|---|---|---|
| 1 | Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.                |
|   | <b>If the robot is to be calibrated with reference calibration:</b><br>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.<br>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible. | Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.<br>Creating new values requires possibility to move the robot.<br>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a> . |
|   | <b>If the robot is to be calibrated with fine calibration:</b><br>Remove all external cable packages (DressPack) and tools from the robot.  |   |

#### Removing the swing parts

Use these procedures to remove the swing spare parts.

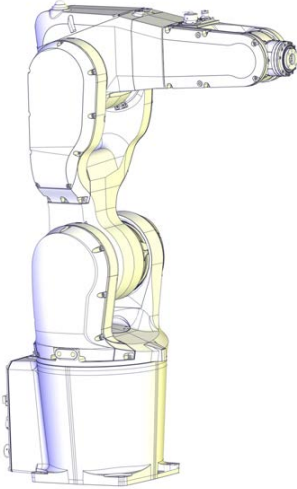


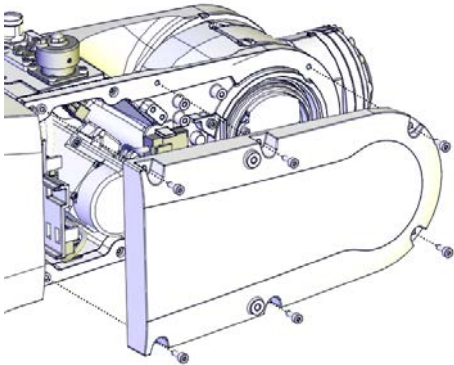
#### Preparations before removing the swing spare parts

|   | Action   | Note |
|---|--|------|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure. |      |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action   | Note   |
|---|--|--|
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p>   |
| 3 | <p> <b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |  |
| 4 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p>   |  |
| 5 | Remove the wrist cover.  |  <p>xx1300002389</p> |




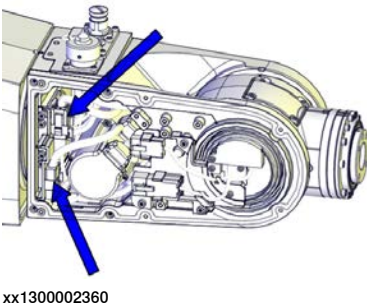
Continues on next page

## 4 Repair



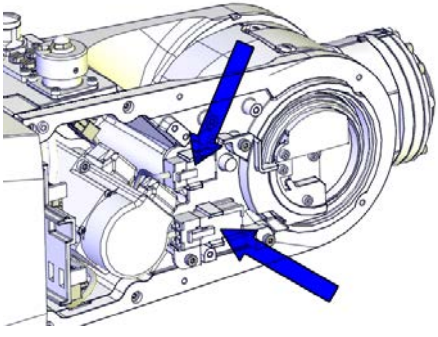
### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

#### Disconnecting the axis-5 motor connectors

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |   |
| 2 | Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul>  <b>Tip</b><br>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002360 |

#### Disconnecting the axis-5 FPC connectors



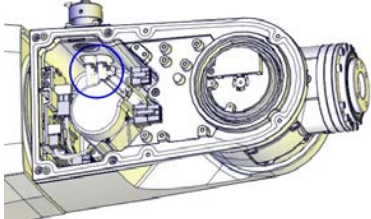
|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 | Snap loose and disconnect the axis-5 FPC connectors.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx1300002390 |

Continues on next page



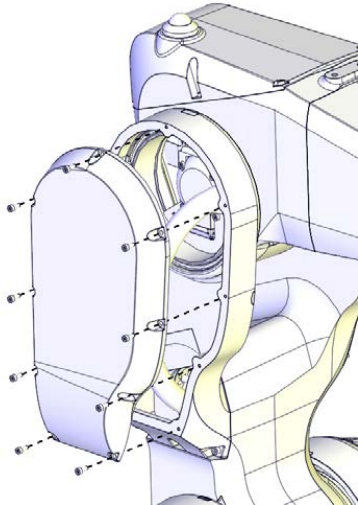
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

Disconnecting the air hoses

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |  |
| 2 | Disconnect the air hoses.<br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br>xx140000738 |

Disconnecting the axis-4 FPC connectors

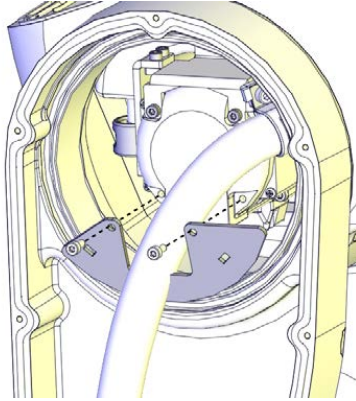
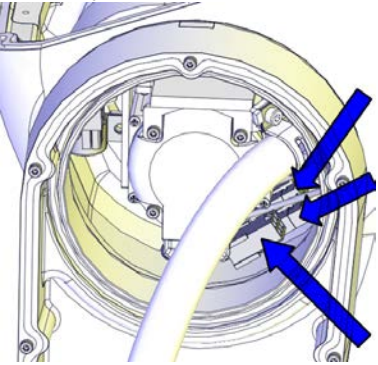
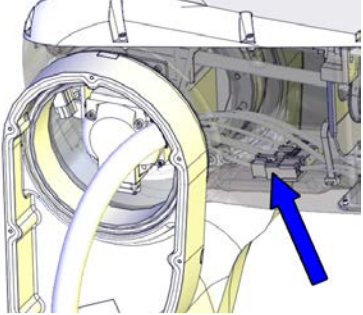
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Remove the cable housing cover.   | <br>xx1300002400 |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

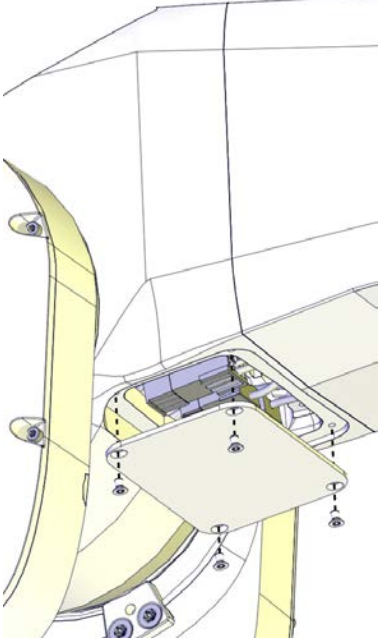
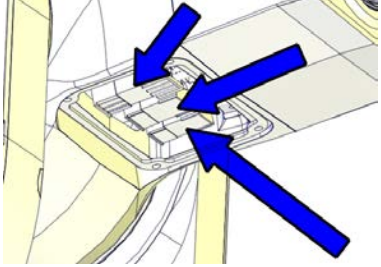
|   | Action  | Note  |
|---|---|---|
| 4 | Remove the plate.   | <br>xx1300002413   |
| 5 | Pull out the FPC connectors from the housing and disconnect them. | <p>Cable layout in IRB 1200-7/0.7 :</p> <br>xx1300002412<br><p>Cable layout in IRB 1200-5/0.9 :</p> <br>xx1400001471 |

Continues on next page





4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action                                   | Note  |
|---|--|---|
| 6 | Remove the small cover of the housing.   |  <p>xx1300002398</p>   |
| 7 | Disconnect the remaining FPC connectors. |  <p>xx1300002399</p> |

Disconnecting the axis-4 motor connectors


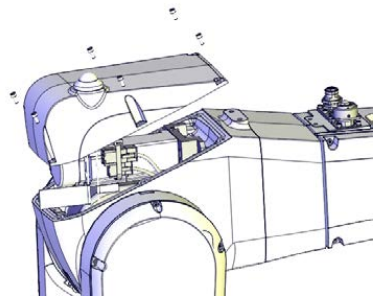
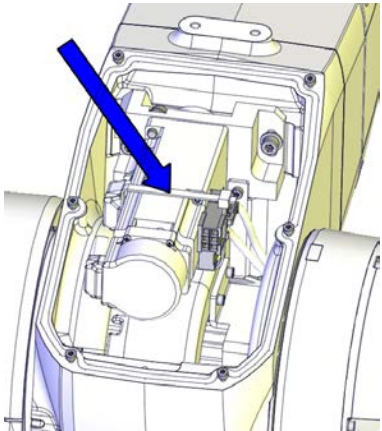

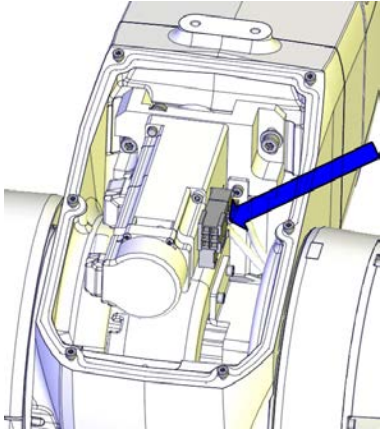
|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page


## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action  | Note  |
|---|---|---|
| 3 | <p>Remove the cover from the upper arm housing.</p> <p> <b>CAUTION</b></p> <p><b>For robots with safety lamp (option)</b><br/>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p> |  <p>xx1300000456</p>   |
| 4 | <p>Cut the strap that holds the connectors.</p>   |  <p>xx1300002494</p>  |
| 5 | <p>Disconnect the motor connectors.</p> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>   |  <p>xx1300002495</p> |


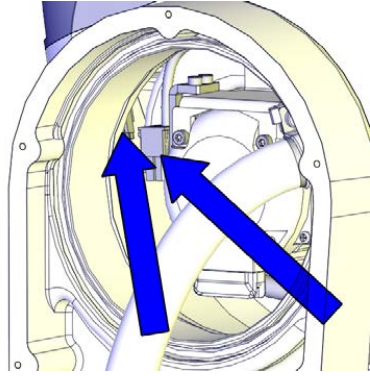
#### Disconnecting the axis-3 motor connectors

|   | Action   | Note |
|---|--|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |      |



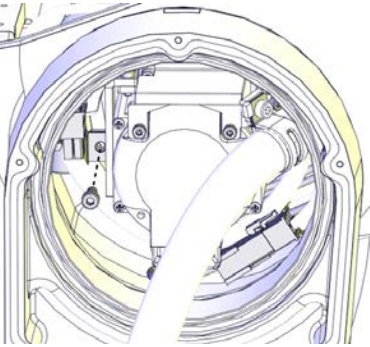
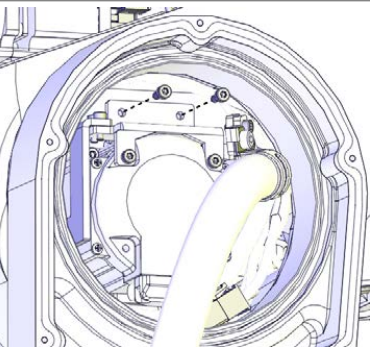
Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Pull out the axis-3 motor connectors from the housing and disconnect them.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002420</p> |

Removing the cable package in the housing

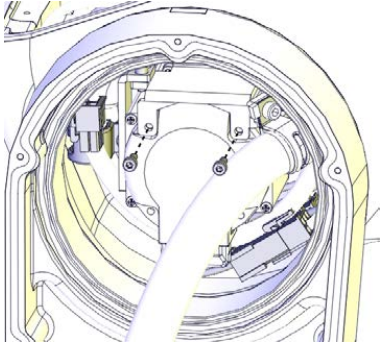

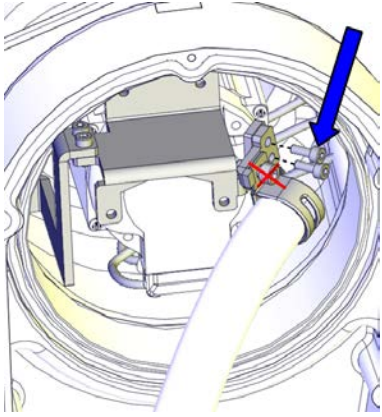
|   | Action   | Note  |
|---|--|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p>Remove the screw that fastens the air hose holder.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002422</p> |
| 3 | <p>Remove the screws that fasten the fix sheet to the inner plastic guide.</p>   |  <p>xx1300002421</p> |

Continues on next page




## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action  | Note   |
|---|---|--|
| 4 | Remove the screws that fasten the fix sheet to the motor.   | <br>xx1300002423  |
| 5 | Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet.<br>Loosen the bracket from the sheet by removing the two screws.<br><br> <b>CAUTION</b><br><br>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. | <br>xx1300002424 |
| 6 | <b>Valid for IRB 1200-5/0.9</b><br>Cut the cable straps at the bottom of the housing.   |  |



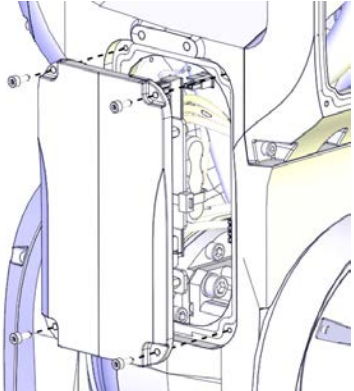
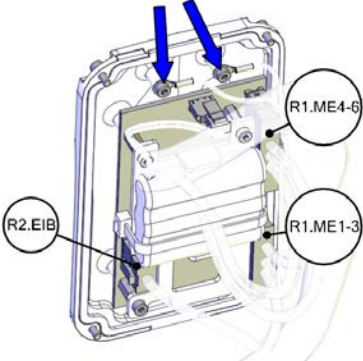
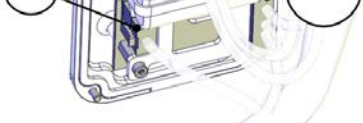
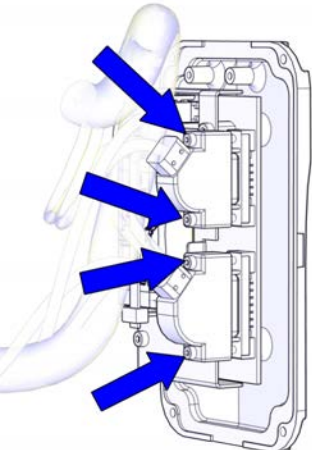
#### Disconnecting the cabling in the lower arm

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>ELECTROSTATIC DISCHARGE (ESD)</b><br><br>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 60</i> |      |
| 3 |  <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> .    |      |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

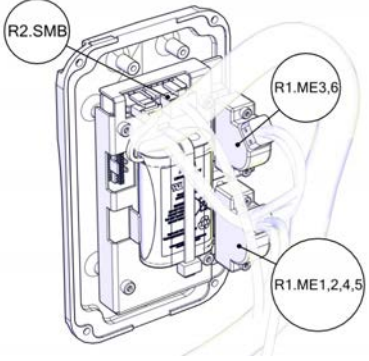
|   | Action  | Note  |
|---|---|---|
| 4 | <p>Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.</p> <p> <b>CAUTION</b></p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p> <p> <b>CAUTION</b></p> <p>Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.</p> |  <p>xx1300002427</p>   |
| 5 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the connectors on the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p>Remove the EIB/SMB cover completely from the lower arm.</p>   |  <p>xx1300002428</p>  |
| 6 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the lugs on the EIB/SMB cover.</p>  |  <p>xx1700000004</p> |
| 7 | <p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>   |  <p>xx1700000004</p> |

Continues on next page



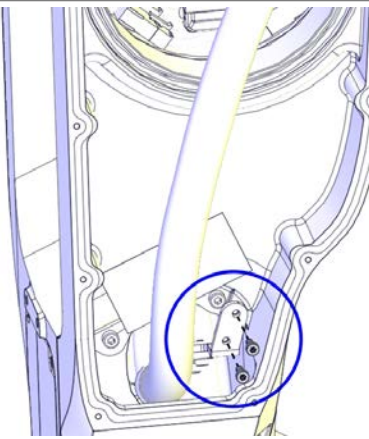
## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action  | Note   |
|---|---|--|
| 8 | <p><b>Valid for IRB 1200 Type B</b></p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p>Remove the EIB/SMB cover completely from the lower arm.</p> |  <p>xx170000005</p> |

### Removing the cable package in the lower arm


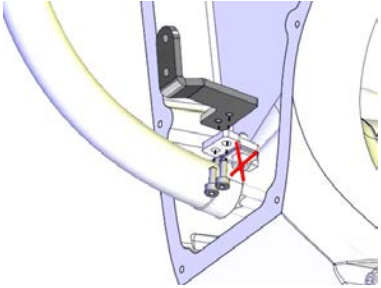
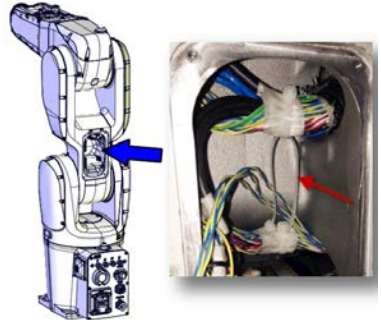
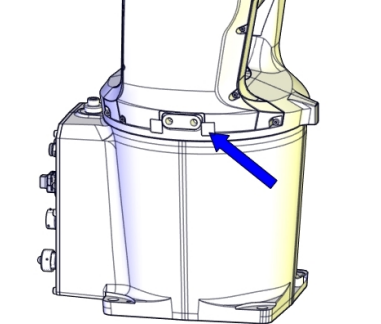
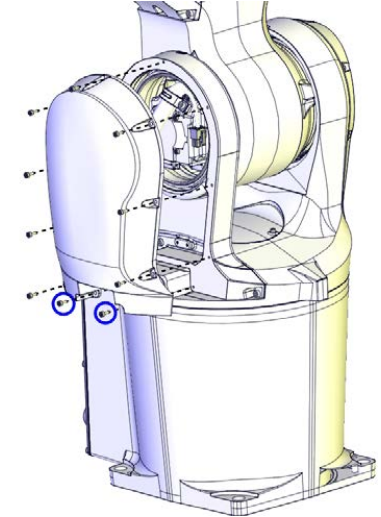
|   | Action  | Note  |
|---|---|---|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |   |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | <p>Pull the cable package out from the upper arm housing.</p>   |   |
| 4 | <p>Remove the fix sheet attachment screws in the lower arm.</p>   |  <p>xx1300002426</p> |

Continues on next page



4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

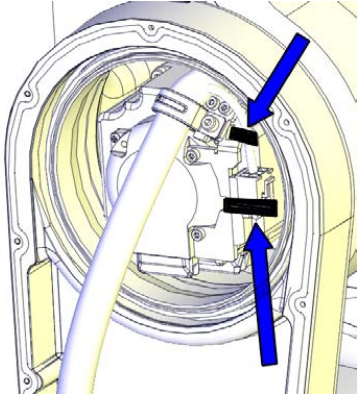
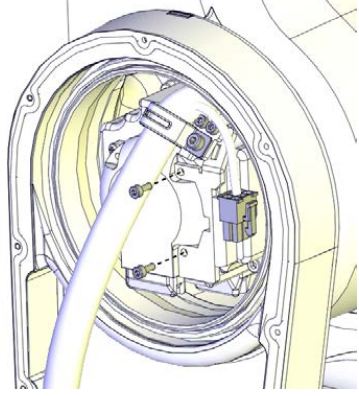

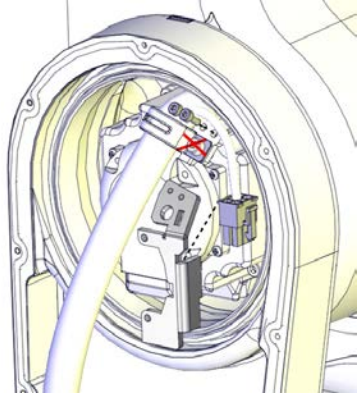
|   | Action   | Note  |
|---|--|---|
| 5 | <p>Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p> |  <p>xx1300002430</p>   |
| 6 | <p>Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.</p>  |  <p>xx1400001130</p>   |
| 7 | <p>For robots with protection type Clean Room</p> <p>Remove the swing sealing plug.</p> <p>Follow the procedure specified in <a href="#">Removing the swing sealing plug on page 143</a>.</p>  |  <p>xx1600000205</p> |
| 8 | <p>Remove the swing cable housing cover by removing the screws.</p>  |  <p>xx1300002431</p> |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

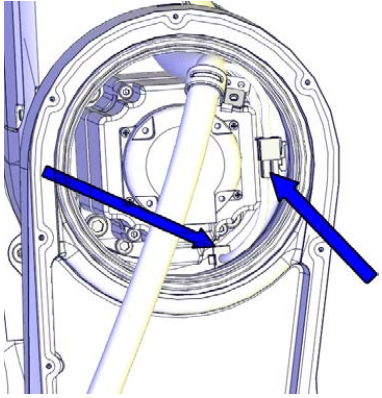
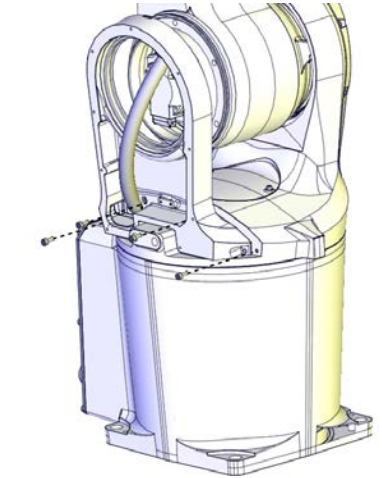
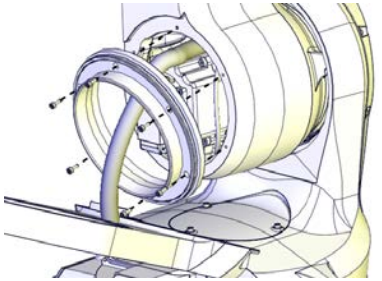

|    | Action  | Note  |
|----|---|---|
| 9  | Cut the cable straps.   | <br>xx1400001528   |
| 10 | Remove the axis-2 motor bracket screws.   | <br>xx1300002432  |
| 11 | <p>Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p> | <br>xx1300002433 |

Continues on next page



4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

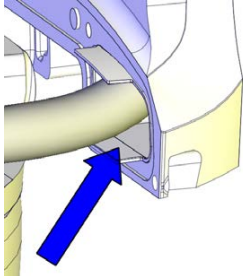
|    | Action  | Note  |
|----|---|---|
| 12 | Disconnect the motor connectors. <ul style="list-style-type: none"> <li>• R2.ME2</li> <li>• R2.MP2</li> </ul>   |  <p>xx1300002434</p>   |
| 13 | Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.  |  <p>xx1300002435</p>  |
| 14 | Remove the axis-2 sealing ring by removing the screws.  |  <p>xx1400000020</p> |
| 15 | Pull out the cable package from the lower arm.<br> <b>Tip</b><br>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand. |   |

Continues on next page



## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)



Continued

|    | Action  | Note   |
|----|---|--|
| 16 | Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package . | <br>xx140000023 |

#### Fitting lifting equipment to the upper and lower arm

|   | Action  | Note            |
|---|---|-----------------|
| 1 |  <b>CAUTION</b><br>The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!  |                 |
| 2 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |                 |
| 3 | Fit lifting slings to the upper and lower arm.  | Roundsling, 2 m |
| 4 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |                 |

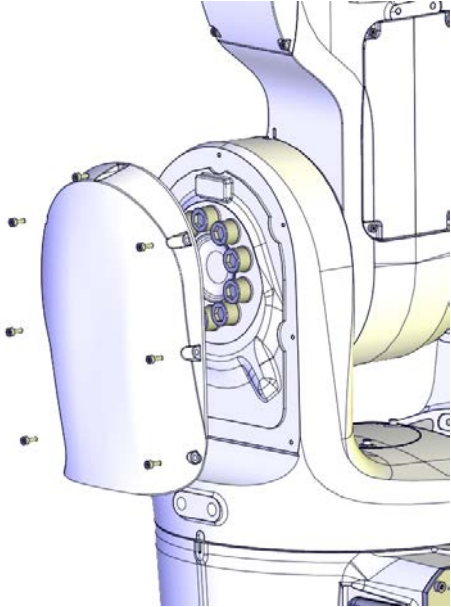

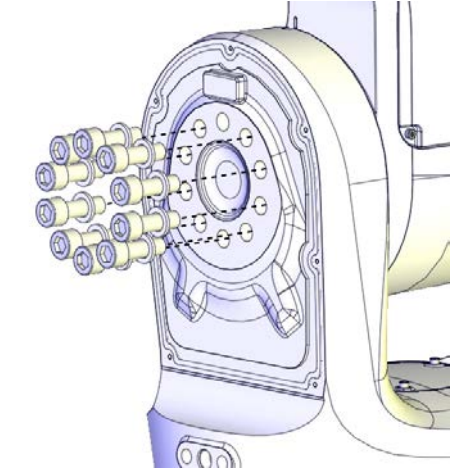
#### Removing the lower arm

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

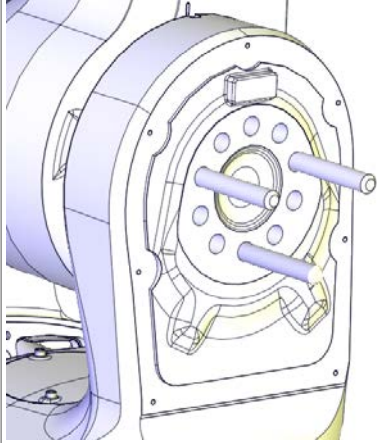

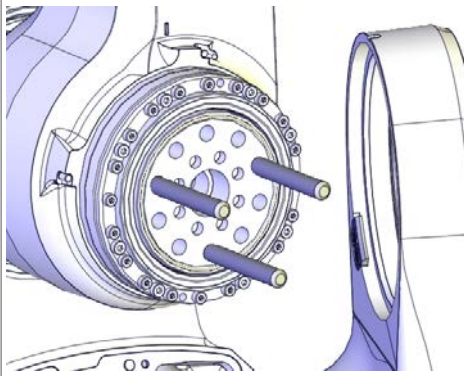
|   | Action  | Note  |
|---|---|---|
| 3 | Remove the swing cover.   |  <p>xx1300002551</p>  |
| 4 | <p>Remove the lower arm screws and washers.</p> <p> <b>WARNING</b></p> <p>This releases the lower arm from the swing. Make sure the weight of the arm is properly secured.</p> <p>The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.</p> |  <p>xx1300002552</p> |

Continues on next page

## 4 Repair



### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action  | Note  |
|---|---|---|
| 5 | Fit guide pins to the gearbox.  | <p>Guide pin for axis-2 gear unit:<br/>3HAC049704-001</p> <p>Always use three guide pins together!</p>  <p>xx1300002563</p> |
| 6 | <p>Separate the lower arm from the swing.</p> <p> <b>Tip</b></p> <p>If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.</p> |  <p>xx1300002553</p>   |

#### Removing the swing


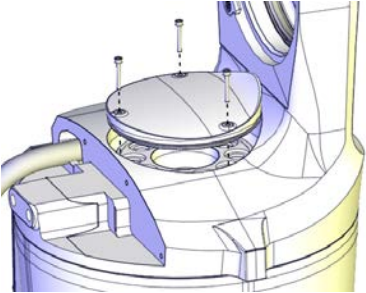
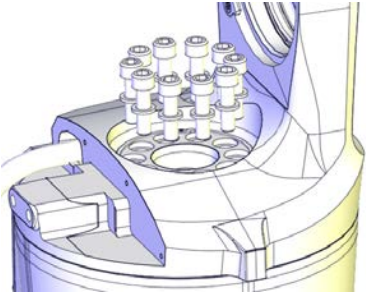

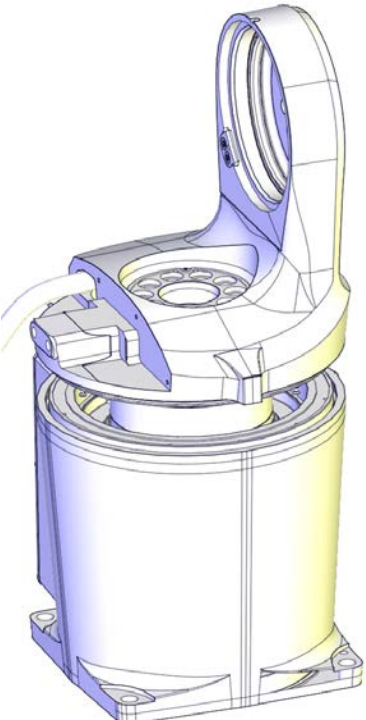
Use this procedure if replacing the swing.

|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

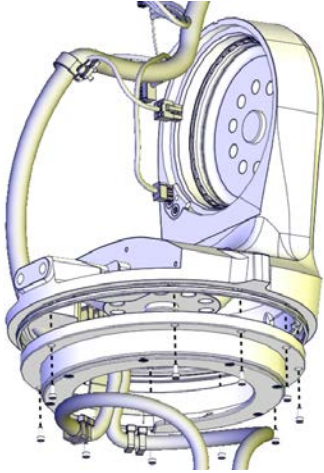
|   | Action  | Note   |
|---|---|--|
| 3 | <p>Remove the swing top cover by removing the screws.</p> <p> <b>Tip</b></p> <p>Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads.</p>  |  <p>xx140000447</p>   |
| 4 | <p>Remove the swing attachment screws and washers.</p>  |  <p>xx140000448</p>   |
| 5 | <p>Lift the swing upwards to access the axis-1 sealing ring.</p> <p> <b>CAUTION</b></p> <p>Be aware of the cabling that is attached to the sealing ring fitted to the swing! The swing can not be removed completely until the axis-1 sealing ring is removed, as shown in following step.</p> |  <p>xx140000449</p> |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)



Continued

|   | Action  | Note  |
|---|---|---|
| 6 | Remove the axis-1 sealing ring from the swing and carefully run the cabling out from the swing. |  <p>xx1400000455</p> |

#### Removing the axis-2 radial sealing (IP67 and Foundry Plus)

Use this procedure if replacing the axis-2 radial sealing.

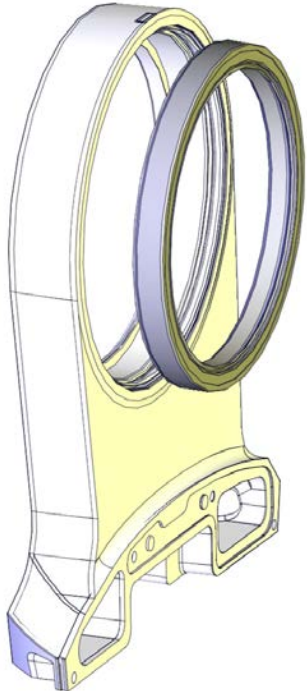
The sealing is only used for robots with protection class IP67 (option 287-10) and with protection type Foundry Plus (option 287-3).

|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

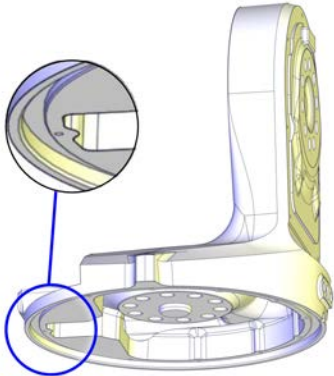
|   | Action   | Note   |
|---|--|--|
| 3 | Remove the axis-2 radial sealing from the cable housing. |  <p>xx1400000450</p> |

**Refitting the swing spare parts**

Use these procedures to refit the swing spare parts.

**Refitting the swing**

Use this procedure if replacing the swing.

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>On swing version 3HAC058000-001:<br/>Add sealant to the swing groove.</p> | <p>Sealant: Sikaflex 521FC.</p>  <p>xx1600000053</p> |

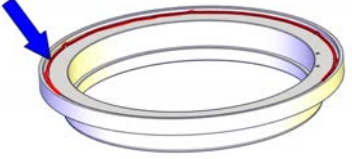



Continues on next page



## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued





|   | Action   | Note  |
|---|--|---|
| 3 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/>           On axis-1 sealing ring version 3HAC056658-001:<br/>           Add sealant to the axis-1 sealing ring.<br/>           (See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</a>)</p>   | <p>Sealant: Sikaflex 521FC.</p>  <p>xx1600001125</p>   |
| 4 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/>           On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001:<br/> <b>For robots with protection type Foundry Plus (option 287-3)</b><br/>           On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:<br/>           Check the gasket on the axis-1 sealing ring.<br/>           Replace if damaged.<br/>           (See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</a>)</p> | <p>On axis-1 sealing ring version 3HAC044676-001:<br/>           Axis-1 sealing ring gasket: 3HAC045685-001</p>  <p>xx1400000458</p> <p>On axis-1 sealing ring version 3HAC058568-001:<br/>           Axis-1 sealing ring gasket: 3HAC058349-001</p>  <p>xx1600001149</p> <p>On axis-1 sealing ring version 3HAC068107-001:<br/>           Axis-1 sealing ring gasket: 3HAC058349-001</p>  <p>xx1900001735</p> |

Continues on next page



4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

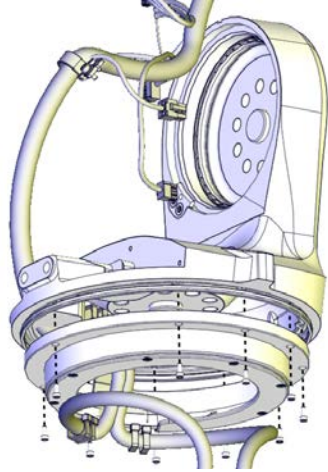
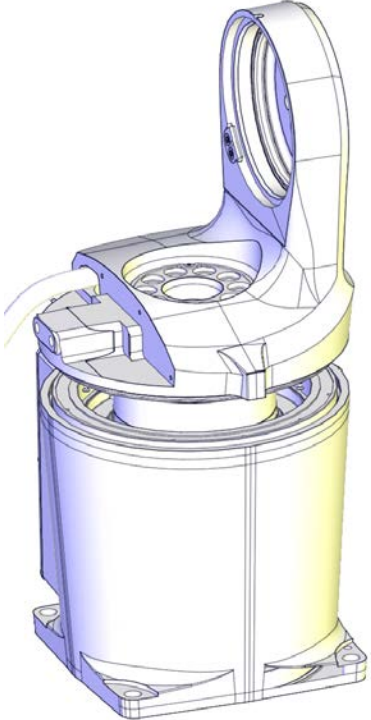
|   | Action   | Note  |
|---|--|---|
| 5 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/>                     On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001:</p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b><br/>                     On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:</p> <p>Check the V-ring on the axis-1 sealing ring.<br/>                     (See <a href="#">Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797.</a>)</p> <p>Replace if damaged.</p> | <p>V-ring: 3HAB3732-34<br/>                     On axis-1 sealing ring version 3HAC056658-001:</p>  <p>xx1600001124</p> <p>On axis-1 sealing ring version 3HAC058568-001:</p>  <p>xx1600001150</p> <p>On axis-1 sealing ring version 3HAC068107-001:</p>  <p>xx1900001736</p> |
| 6 | <p>Check the cable protection on the axis-1 sealing ring.<br/>                     Replace if damaged.</p> <p>If replacing the cable protection, use locking liquid Loctite 243 on the screws.</p>   | <p>Cable protection: 3HAC044691-001<br/>                     Torx countersunk head screw M3x5: 3HAC14286-4<br/>                     Tightening torque: 0.3 Nm</p>  <p>xx1400000456</p>   |

Continues on next page

## 4 Repair

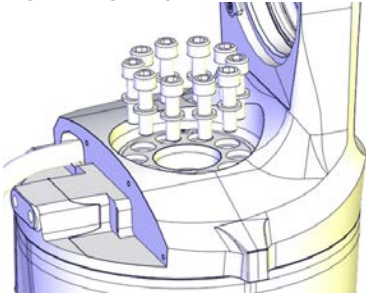

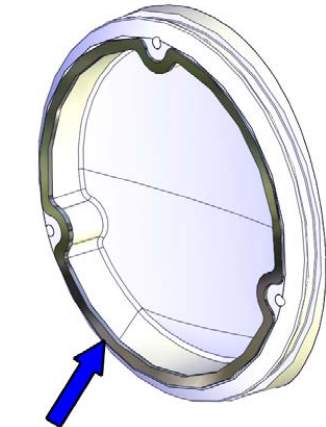
### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

*Continued*

|   | Action   | Note   |
|---|--|--|
| 7 | Fit the axis-1 sealing ring to the swing with the screws and carefully run the cabling out up through the swing. | <p>Axis-1 sealing ring: 3HAC044676-001 / 3HAC068107-001 <sup>i</sup></p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000455</p> |
| 8 | Lower the swing down into place while at the same time guiding the cabling through the cable hole.               |  <p>xx1400000449</p>   |

*Continues on next page*

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)  
Continued

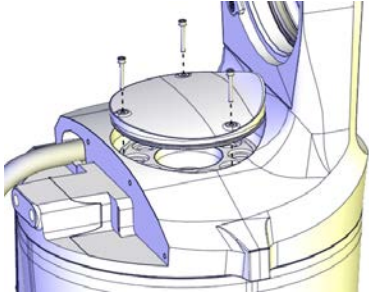
|    | Action   | Note   |
|----|--|--|
| 9  | Refit the swing attachment screws and washers.   | <p>Screws: 3HAB3409-52 (M10x35).<br/>Tightening torque: 40 Nm.</p>  <p>xx1400000448</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the gasket.<br/>Replace if damaged.</p> | <p>Gasket on top swing cover:<br/>3HAC056696-001</p>  <p>xx1400000425</p>  |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|    | Action  | Note  |
|----|---|---|
| 11 | Refit the swing top cover with the screws.<br>Replace if damaged.   | <p>Cover on top of swing:<br/>3HAC059679-001<br/>: 3HAC056133-001 (used with protection type Clean Room)<br/>Cover on top of swing, Clean Room<br/>Cover on top of swing, food grade lubrication<br/>Screws: 3HAB3409-209 (M3x20).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1400000447</p> <p><b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 12 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p><b>Note</b><br/>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

<sup>i</sup> For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 797](#).

### Refitting the axis-2 radial sealing (IP67, Foundry Plus, Clean Room, food grade lubrication)

Use this procedure if replacing the axis-2 radial sealing.

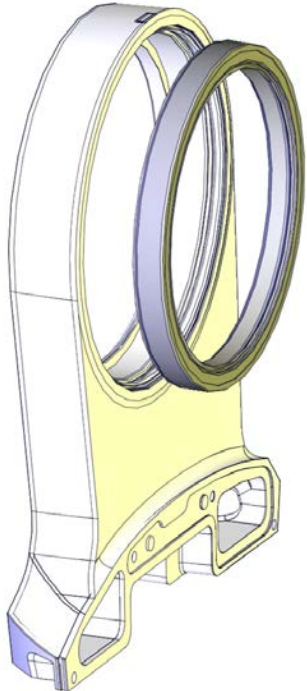
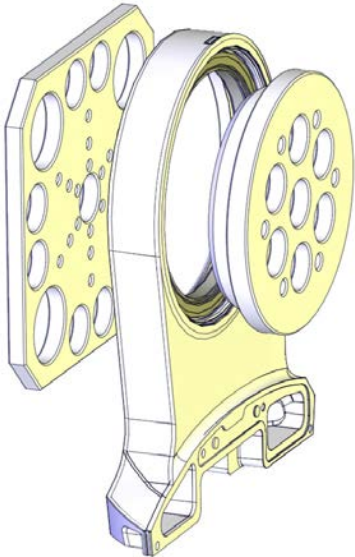
The sealing is only used for robots with protection class IP67 (option 287-10), with protection type Foundry Plus (option 287-3), with protection type Clean Room and with food grade lubrication.

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |
| 2 | <b>For robots with protection type Clean Room</b><br>Apply a little grease to the sealing and wipe clean after the refitting.        |      |

Continues on next page

**4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)**

*Continued*

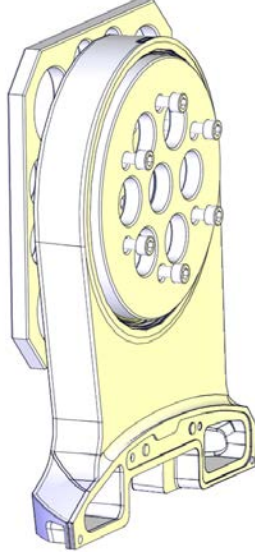

|   | <b>Action</b>  | <b>Note</b>  |
|---|--|--|
| 3 | Fit the axis-2 radial sealing into the cable housing.                                | Radial sealing with dust lip:<br>3HAB3701-41<br><br>xx1400000450 |
| 4 | Fit the circular part of the radial sealing fitting tool against the radial sealing. | Axis-2 sealing assembly tool set:<br>3HAC049694-001  |
| 5 | Fit the tool plate to the other side of the cable housing with the six screws M6X50. | <br>xx1400000451  |

*Continues on next page*



## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action   | Note  |
|---|--|---|
| 6 | Screw the screws, little by little, to press the sealing into place.   | <br>xx1400000452 |
| 7 | Remove the assembly tool.  |   |
| 8 | Check that the sealing is undamaged and properly fitted.   |   |
| 9 | Seal and paint the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
|   |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |   |

#### Fitting lifting equipment to the upper and lower arm

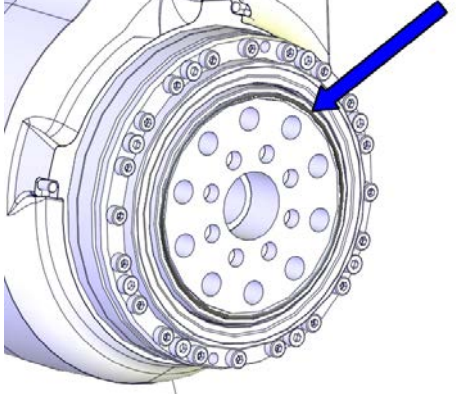

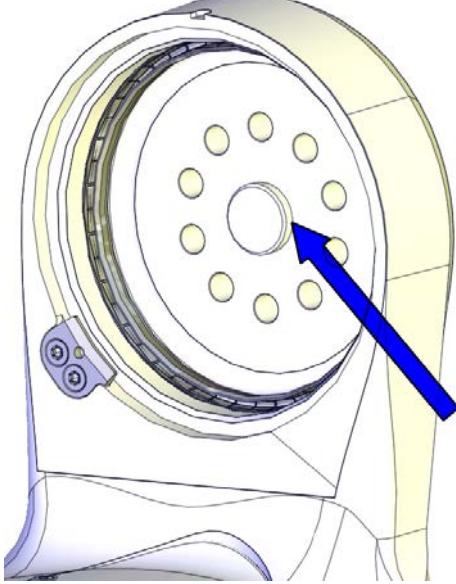
|   | Action  | Note            |
|---|---|-----------------|
| 1 |  <b>CAUTION</b><br>The lower and upper arms together weigh 30 kg.<br>All lifting accessories used must be sized accordingly! |                 |
| 2 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |                 |
| 3 | Fit lifting slings to the upper and lower arm.  | Roundsling, 2 m |
| 4 | Seal and paint the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |                 |
|   |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.                  |                 |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

Refitting the lower arm

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>  |  |
| 2 | Check the o-ring.<br>Replace if damaged.  | <p>O-ring: 3HAC048939-001</p>  <p>xx1300002556</p> |
| 3 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 to the cylindrical surface in the swing.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1400001403</p>                              |

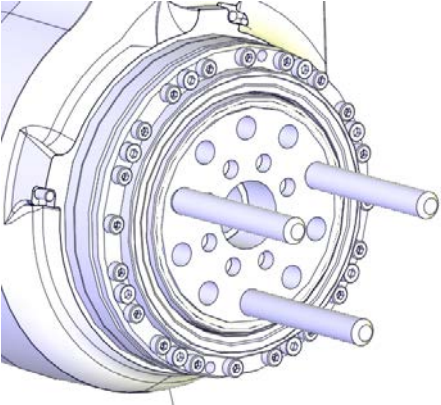

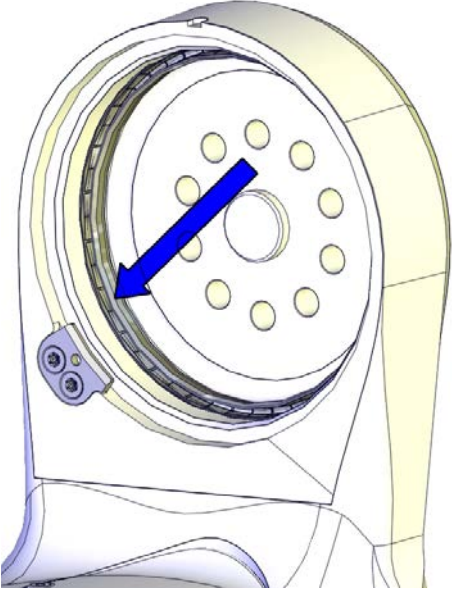
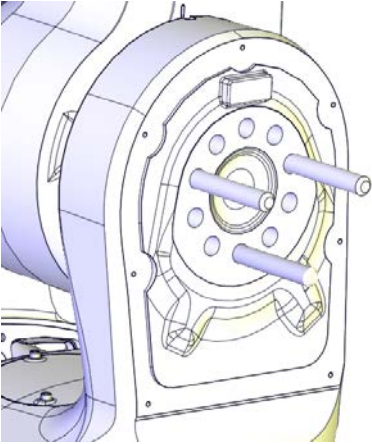
Continues on next page



## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

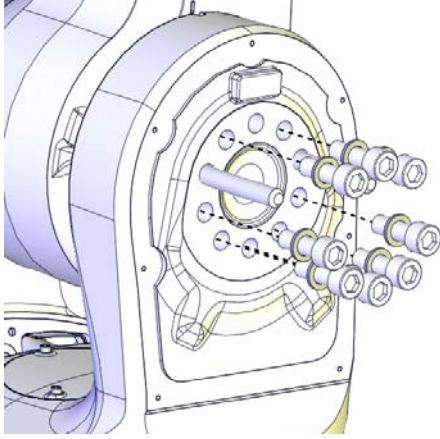

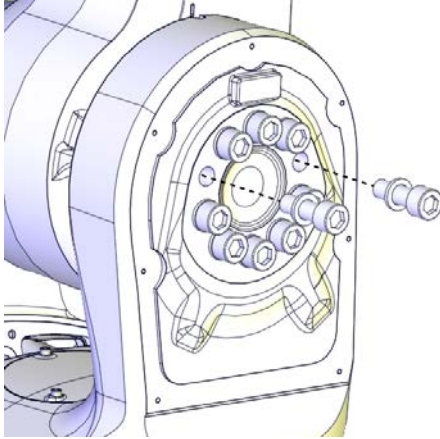
|   | Action  | Note  |
|---|---|---|
| 4 | Fit guide pins to the gearbox.  | <p>Guide pin for axis-2 gear unit:<br/>3HAC049704-001</p>  <p>xx1300002562</p> <p>Always use three guide pins together!</p> |
| 5 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-003</p>  <p>xx1400000453</p>  |
| 6 | Fit the lower arm to the swing, with guidance from the guide pins.  |  <p>xx1300002563</p>  |

Continues on next page



4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

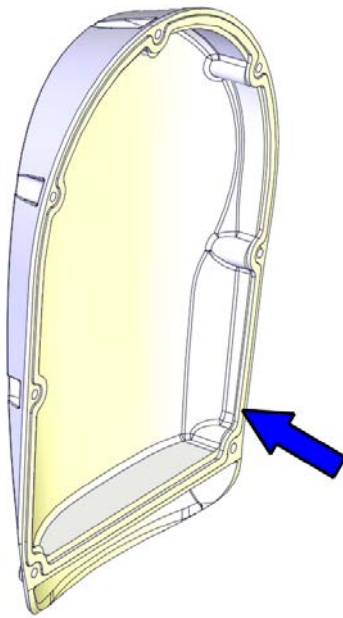
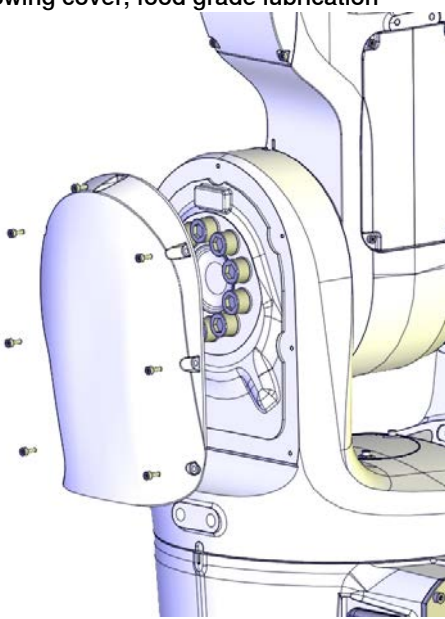
|   | Action   | Note  |
|---|--|---|
| 7 | <p>Refit the lower arm screws and washers, using locking liquid Loctite 243. Secure the screws but do not tighten yet.</p> | <p>Screws: 3HAB3409-51 (M10x30).</p>  <p>xx1300002564</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 8 | <p>Remove the guide pins and refit the remaining screws and washers using locking liquid Loctite 243.</p>                  |  <p>xx1300002565</p>   |
| 9 | <p>Tighten all screws.</p>   | <p>Tightening torque: 45 Nm</p>   |

Continues on next page

## 4 Repair

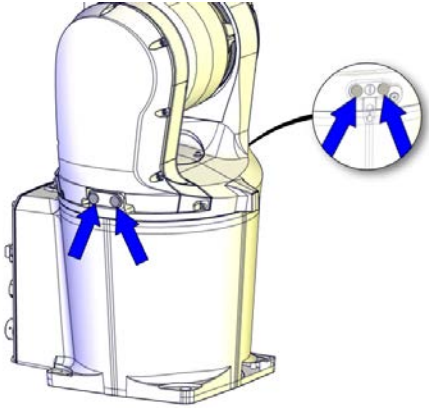
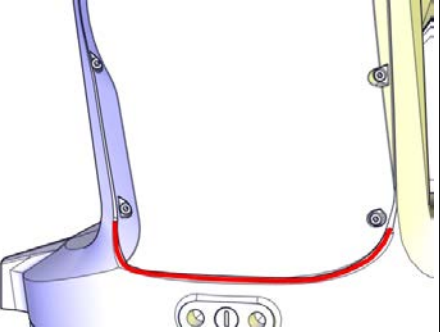
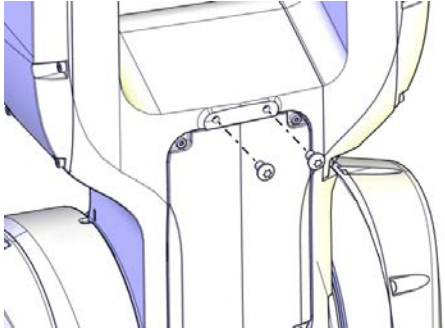

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|    | Action   | Note  |
|----|--|---|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the swing cover gasket.<br/>Replace if damaged.</p> | <p>Gasket on swing cover: 3HAC056727-001</p>  <p>xx140000007</p>   |
| 11 | <p>Refit the swing cover.<br/>Replace if damaged.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.<br/>Swing cover: 3HAC059676-001<br/>: 3HAC056215-001 (used with protection type Clean Room)<br/>Swing cover, Clean Room<br/>Swing cover, food grade lubrication</p>  <p>xx1300002551</p> |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)  
Continued

|    | Action   | Note  |
|----|--|---|
| 12 | <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Check the protection plugs for lifting holes. Replace if damaged.</p>  | <p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p> |
| 13 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the swing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>   |  <p>xx1600000217</p>  |
| 14 | <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>If required, fit two screws for protection.</p>  |  <p>xx1600001154</p>  |
| 15 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

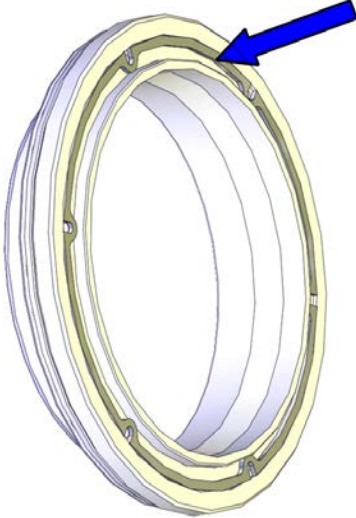
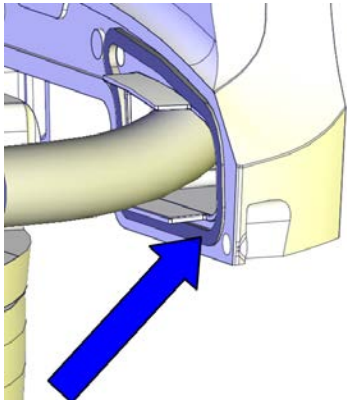
Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

*Continued*

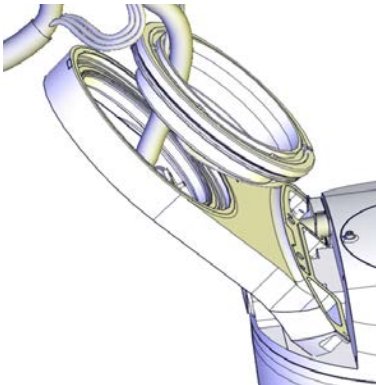
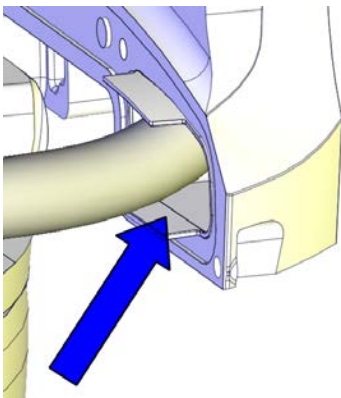
Refitting the cable package in the lower arm

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | <p>Check the axis-2 sealing ring.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p> | <p>Axis-2 sealing ring: 3HAC044677-001</p> <p>Gasket of axis-2 sealing ring: 3HAC045688-001</p>  <p>xx1400000476</p> |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket of the cable housing plastic plate.</p> <p>Replace if damaged.</p>    | <p>Gasket of plastic plate: 3HAC044894-001</p>  <p>xx1400000457</p>   |

*Continues on next page*

**4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)**

*Continued*


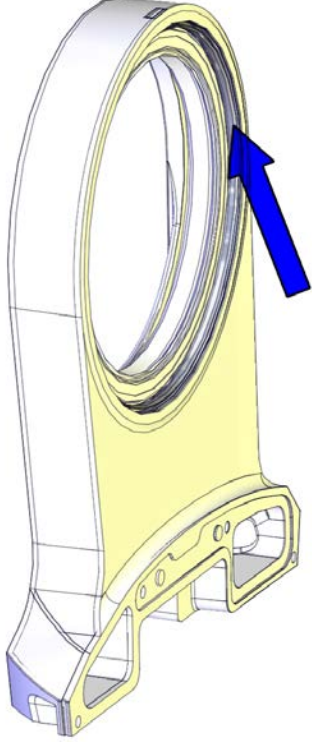
|   | <b>Action</b>  | <b>Note</b>  |
|---|--|--|
| 4 | Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them. |  <p>xx140000025</p>   |
| 5 | Fasten the plastic plate to the cable housing, if removed.<br>Replace if damaged.                              | <p>The plastic plate is included in:<br/>Cable harness material set:<br/>3HAC049663-001.</p>  <p>xx140000023</p> |

*Continues on next page*

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)


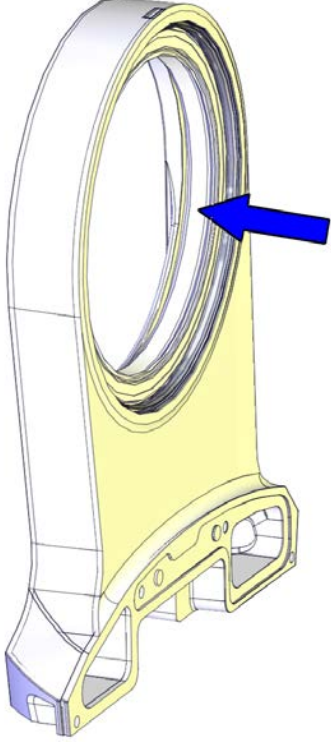

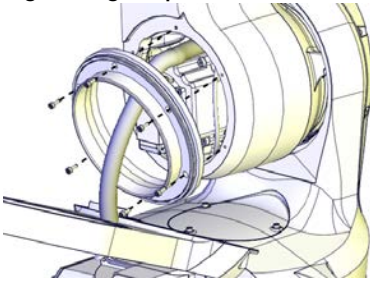
*Continued*

|   | Action  | Note  |
|---|---|---|
| 6 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-004</p>  <p>xx1400000454</p> |

*Continues on next page*

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action  | Note  |
|---|---|---|
| 7 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the radial sealing.<br/>                     Replace if damaged.</p> <p> <b>Note</b></p> <p>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> | <p>Radial sealing with dust lip: 3HAB3701-41</p>  <p>xx1400000753</p> <p>Replacement is detailed in <a href="#">Replacing the swing spare parts (swing, axis-2 radial sealing)</a> on page 516.</p> |
| 8 | <p>Guide the cable package into the lower arm.</p> <p> <b>Tip</b></p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>   |   |
| 9 | <p>Refit the axis-2 sealing ring with the screws.</p>   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000020</p>   |

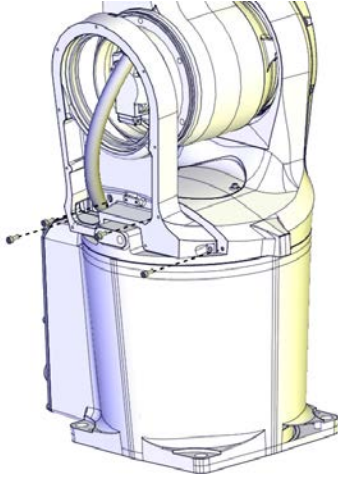

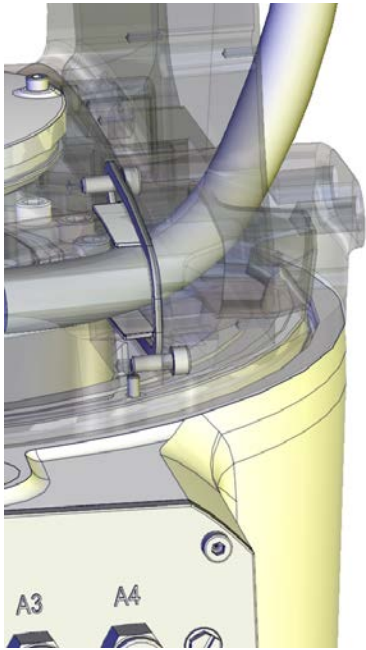
Continues on next page



## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

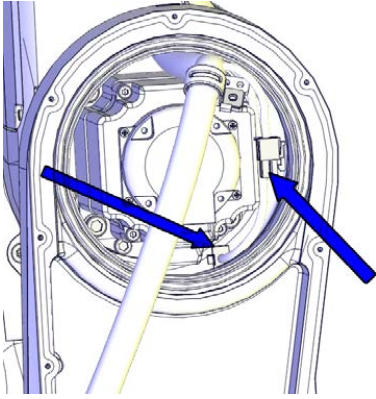

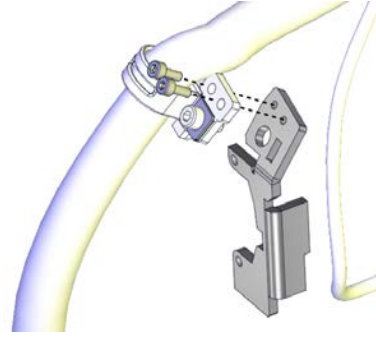
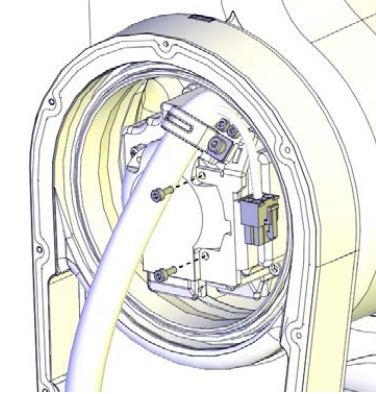
|    | Action   | Note   |
|----|--|--|
| 10 | Refit the cable housing with the screws.                                 | <p>Screws: 3HAB3409-236 (M4x10).<br/>Tightening torque: 3 Nm.</p>  <p>xx1300002435</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 11 | Apply grease to the cable package, cover all moving area of the package. |  <p>xx1400000481</p>  |

Continues on next page



4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

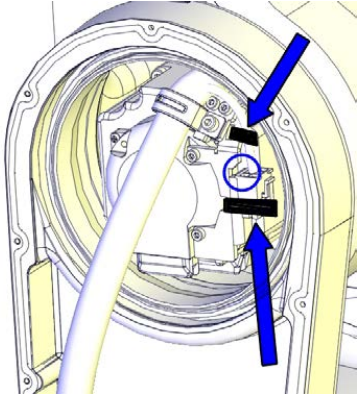
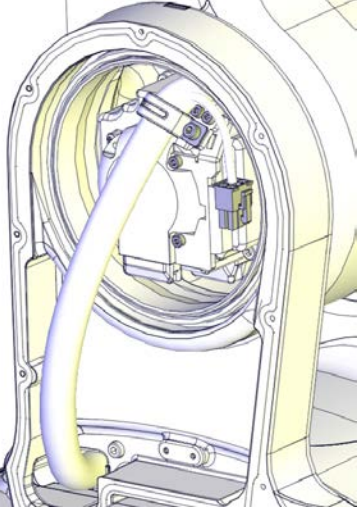
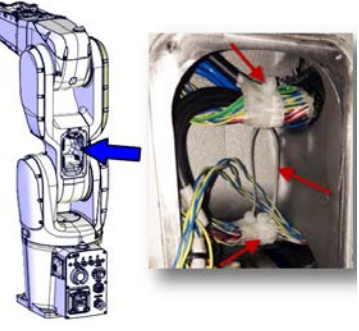
|    | Action   | Note   |
|----|--|--|
| 12 | Reconnect the motor connectors. <ul style="list-style-type: none"> <li>• R2.ME2</li> <li>• R2.MP2</li> </ul>   |  <p>xx1300002434</p>                                    |
| 13 | Refit the axis-2 motor bracket to the cable package with the two screws.<br><br> <b>CAUTION</b><br>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness. | Tightening torque: 1.5 Nm.<br><br> <p>xx1400000021</p> |
| 14 | Refit the axis-2 motor bracket to the motor.   |  <p>xx1300002432</p>                                  |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

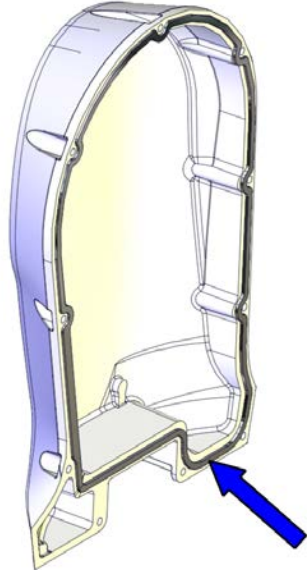
Continued

|    | Action  | Note  |
|----|---|---|
| 15 | Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.   | <br>xx1400001529   |
| 16 | Apply grease to the cable package, cover all moving area of the package.  | <br>xx1400000482  |
| 17 | <p>In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity:</p> <ol style="list-style-type: none"><li>1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location.</li><li>2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place.</li></ol> <p>See the figure.</p> | <br>xx1400001131 |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued


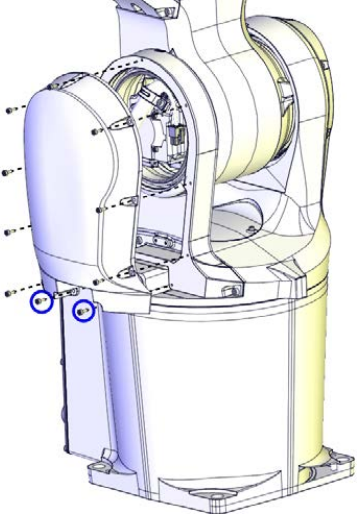

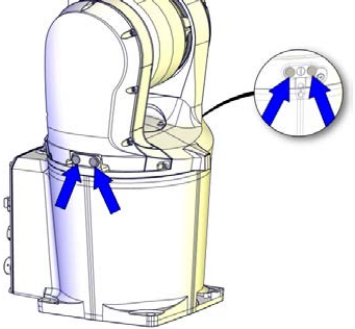
|    | Action   | Note  |
|----|--|---|
| 18 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the gasket of the cable housing cover.<br/>                     Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>                     3HAC056726-001</p>  <p>xx1400000424</p> |
| 19 | <p>Check the PTFE film.<br/>                     Replace if damaged.</p>   | <p>PTFE film on cable housing cover:<br/>                     3HAC044660-001</p>  |
| 20 | <p>Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.</p>  |   |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

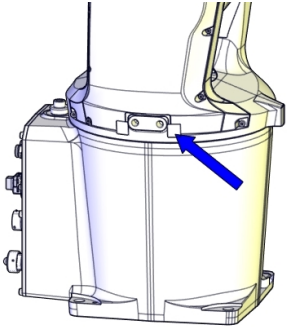

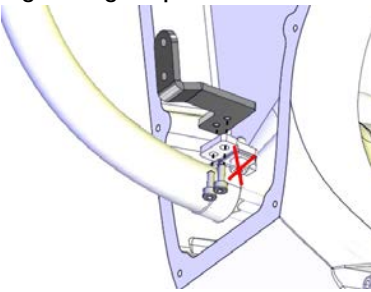

Continued

|    | Action  | Note  |
|----|---|---|
| 21 | <p>Refit the cable housing cover.<br/>Replace if damaged.</p> <p> <b>Note</b></p> <p>Remember to refit the two lower screws shown in the figure.</p> | <p>Cable housing cover of the swing:<br/>3HAC059678-001<br/>: 3HAC056214-001 (used with protection type Clean Room)<br/>Cable housing cover of the swing, Clean Room<br/>Cable housing cover of the swing, food grade lubrication<br/>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 22 | <p>For robots with protection type Foundry Plus (option 287-3)<br/>Check the protection plugs for lifting holes.<br/>Replace if damaged.</p>  | <p>Protection plug for lifting holes:<br/>3HAC4836-24</p>  <p>xx1600001151</p>   |


Continues on next page

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

*Continued*

|    | Action   | Note  |
|----|--|---|
| 23 | <p>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Refit the swing sealing plug.<br/>Follow the procedure specified in <a href="#">Refitting the swing sealing plug on page 144</a>.</p>   | <p>Swing sealing plug:3HAC053687-001</p>  <p style="text-align: right; font-size: small;">xx1600000205</p> |
| 24 | <p>Refit the lower arm bracket to the cable package.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>                                   | <p>Tightening torque: 1.5 Nm.</p>  <p style="text-align: right; font-size: small;">xx1300002430</p>       |
| 25 | <p>Seal and paint the joints that have been opened.<br/>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Connecting the cabling in the lower arm

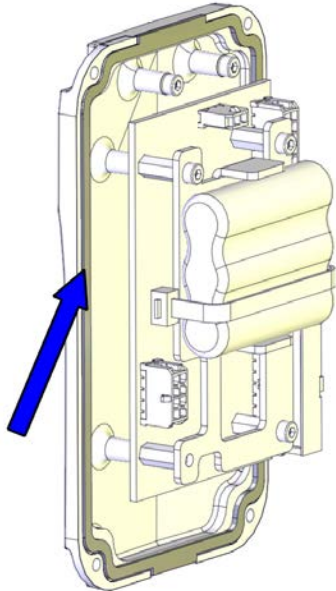

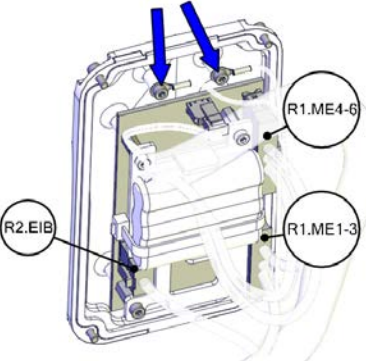

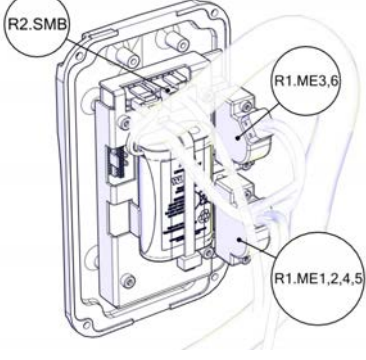
|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>ELECTROSTATIC DISCHARGE (ESD)</b></p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <a href="#">The unit is sensitive to ESD on page 60</a></p> |      |
| 2 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>   |      |

*Continues on next page*

## 4 Repair

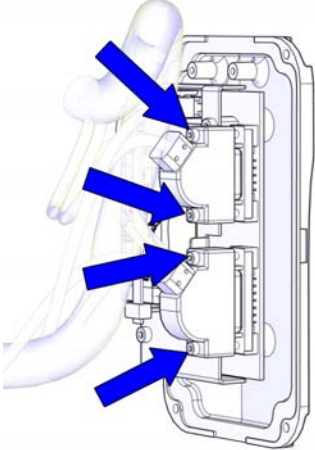
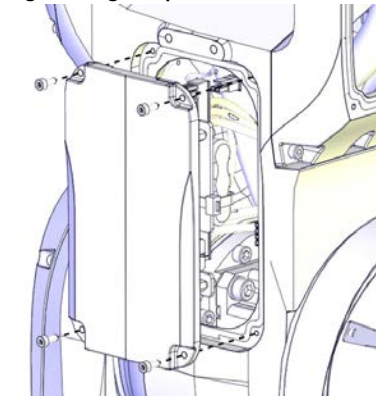

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action  | Note   |
|---|---|--|
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the EIB/SMB cover gasket.</p> <p>Replace if damaged.</p>   | <p>Gasket on EIB/SMB cover:<br/>3HAC056728-001</p>  <p>xx1400000475</p> |
| 4 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1-3</li> <li>• R1.ME4-6</li> <li>• R2.EIB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p> |  <p>xx1300002428</p>  |
| 5 | <p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>   |  |
| 6 | <p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> <li>• R1.ME1,2,4,5</li> <li>• R1.ME3,6</li> <li>• R2.SMB</li> </ul> <p> <b>WARNING</b></p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>                              |  <p>xx1700000005</p>  |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)  
*Continued*

|   | Action   | Note   |
|---|--|--|
| 7 | <p><b>Valid for IRB 1200 Type B</b><br/>                     Tighten the connector screws.</p> | <p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>   |
| 8 | <p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p>                    | <p>Screws: 3HAB3409-207 (M3x8).<br/>                     Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> <b>Note</b><br/>                     Only use specified screws, never replace them with other screws.</p> |

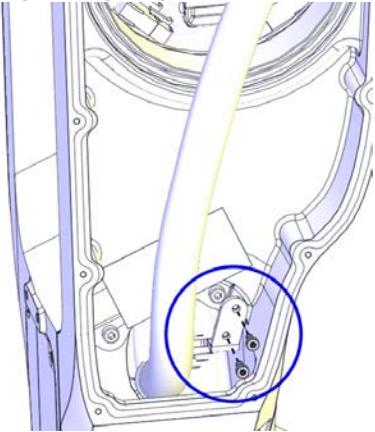

*Continues on next page*



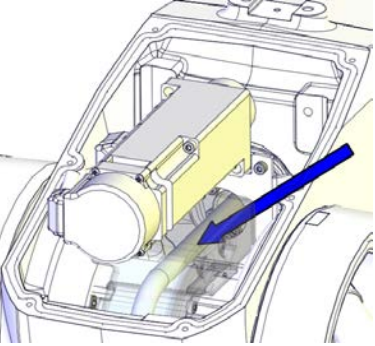
## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|    | Action   | Note  |
|----|--|---|
| 9  | Refit the fix sheet attachment screws in the lower arm.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p> |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Refitting the cable package in the housing



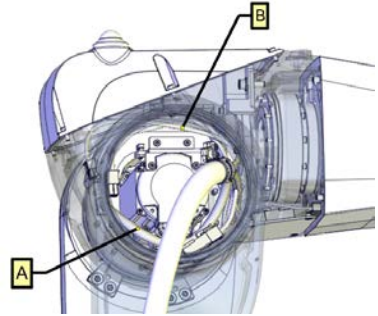

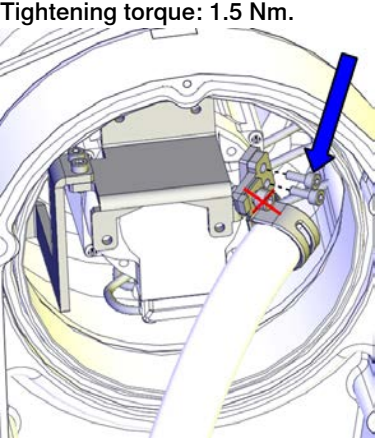
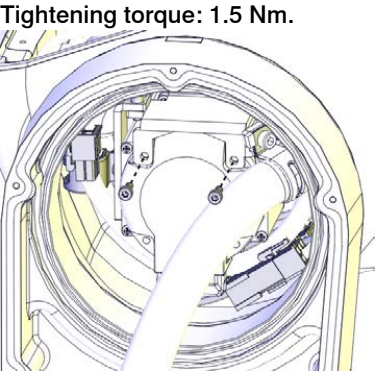
|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package. | <p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p> |

Continues on next page



4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

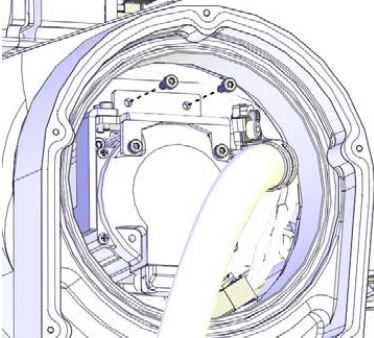

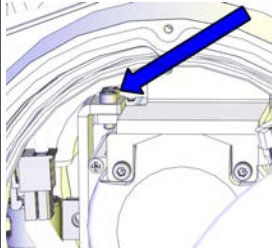
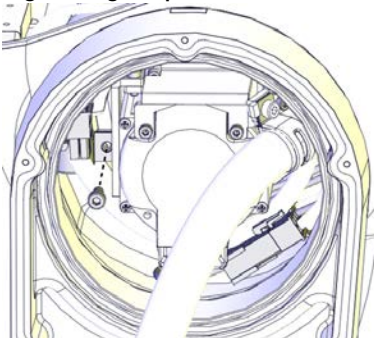
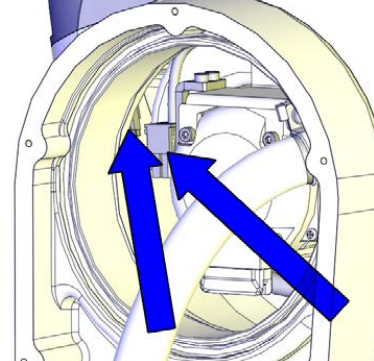
|   | Action  | Note  |
|---|---|---|
| 3 | <p>Guide the cable package into the upper arm, through the housing.</p> <p> <b>Note</b></p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> <b>Note</b></p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p> |  <p>xx1400001472</p>                                     |
| 4 | <p>Refit the bracket to the sheet with two screws.</p> <p> <b>CAUTION</b></p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>  |
| 5 | <p>Refit the fix sheet to the motor.</p>  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p> |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

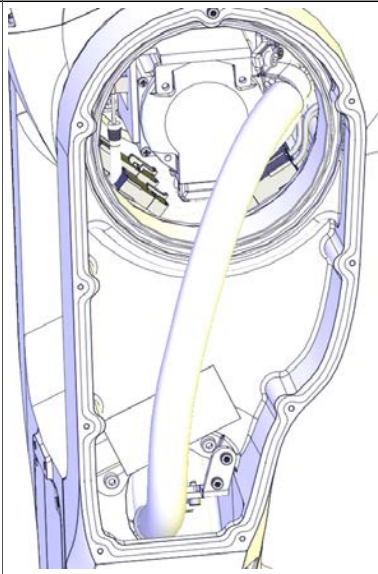

Continued

|   | Action   | Note   |
|---|--|--|
| 6 | Refit the fix sheet to the inner plastic guide.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>  |
| 7 | <p>Fit the air hose holder to the bracket.<br/>Replace the holder, if damaged.</p> <p> <b>Tip</b></p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p> | <p>Air hose holders are included in Cable harness material set (3HAC049663-001).<br/>Tightening torque: 4 Nm.</p>  <p>xx1300002422</p> |
| 8 | Reconnect the axis-3 motor connectors.   |  <p>xx1300002420</p>  |


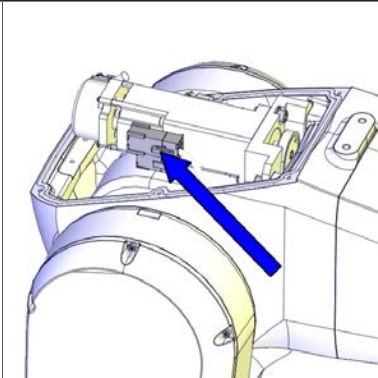
Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|    | Action   | Note   |
|----|--|--|
| 9  | Apply grease to the cable package, cover all moving area of the package.   |  <p>xx140000754</p> |
| 10 | <b>Valid for IRB 1200-5/0.9</b><br>Secure the cable package at the bottom of the housing with cable straps.  |  |
| 11 | Seal and paint the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

Connecting the axis-4 motor connectors

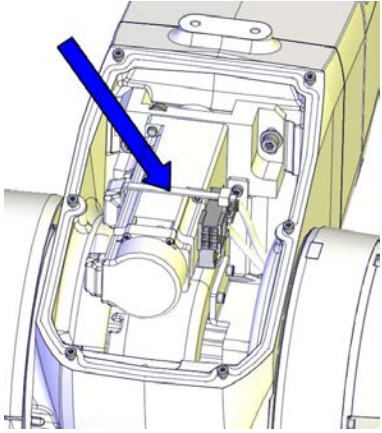
|   | Action  | Note  |
|---|---|---|
| 1 | Reconnect the motor connectors.<br><br> <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> . |  <p>xx1300002371</p> |

Continues on next page


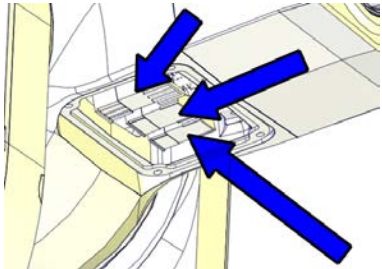
## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | Secure the connectors to the motor with a cable strap. | <br>xx1300002494 |


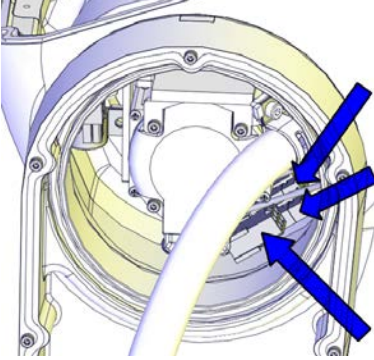
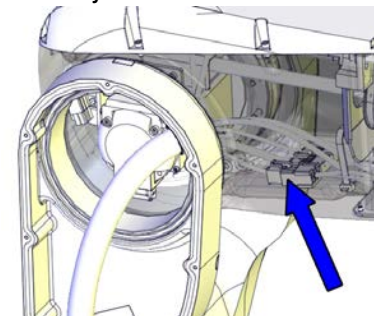
### Connecting the axis-4 FPC connectors

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Reconnect the FPC connectors.<br> <b>Tip</b><br>See the number markings on the connectors for help to find the corresponding connector. | <br>xx1300002399 |

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

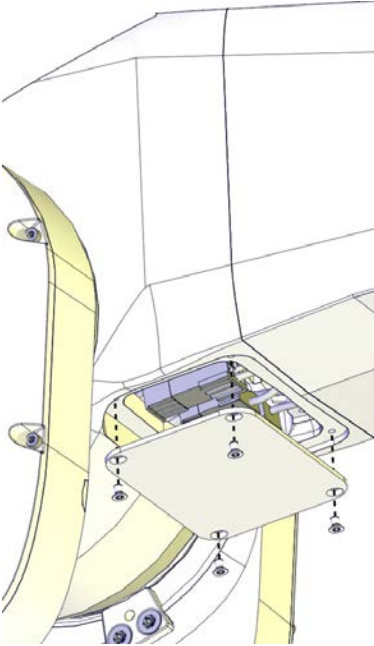
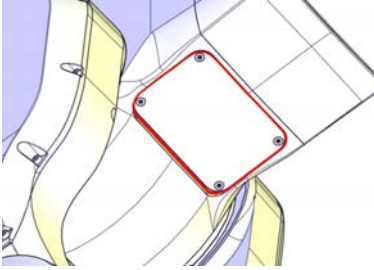
|   | Action  | Note   |
|---|---|--|
| 3 | <p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>  |  |

Continues on next page

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

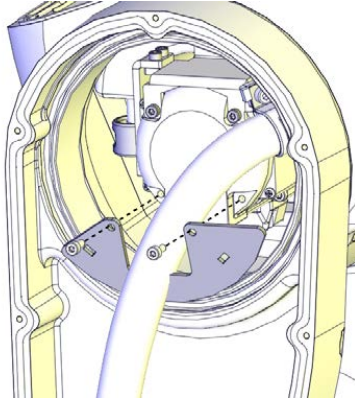
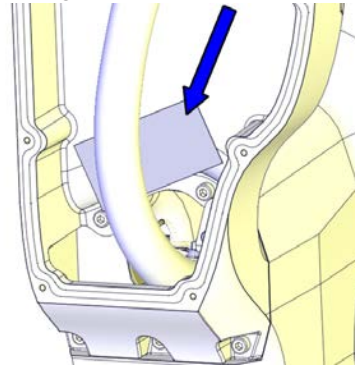
|   | Action  | Note   |
|---|---|--|
| 5 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>  |   |
| 6 | <p>Refit the small cover to the housing.</p> <p>Replace if damaged.</p>   | <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001</p> <p>: 3HAC056142-001 (used with protection type Clean Room)</p> <p>Housing small cover, Clean Room</p> <p>Housing small cover, food grade lubrication</p> <p>Screws: 3HAC14286-4 (M3X5).</p> <p>Tightening torque: 1 Nm.</p> |
| 7 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the small cover on the housing.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx1600000214</p>  |

Continues on next page



**4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)**

*Continued*

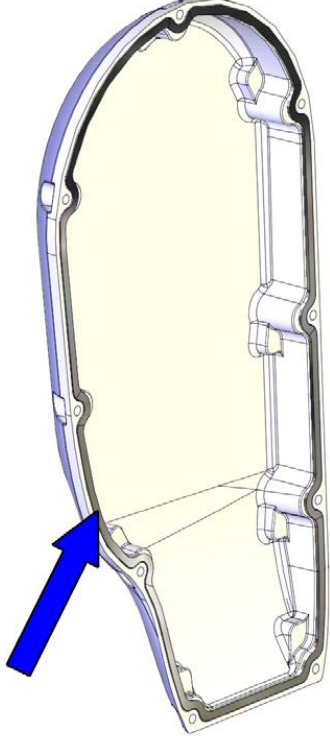
|   | <b>Action</b>   | <b>Note</b>  |
|---|---|--|
| 8 | Refit the plate.  | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                            |
| 9 | Check the PTFE film on the cable housing. Replace if damaged. | <p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p> |

*Continues on next page*

## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

*Continued*

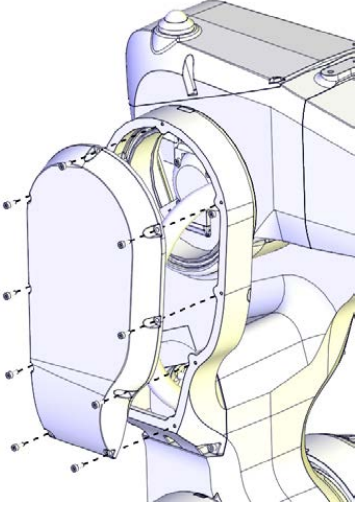


|    | Action  | Note   |
|----|---|--|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the gasket of the cable housing cover.<br/>Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001<br/>PTFE film on cable housing cover:<br/>3HAC044660-001</p>  <p>xx1400000048</p> |
| 11 | <p>Check the PTFE film on the cable housing cover.<br/>Replace if damaged.</p>  |  |
| 12 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>  |  |

*Continues on next page*


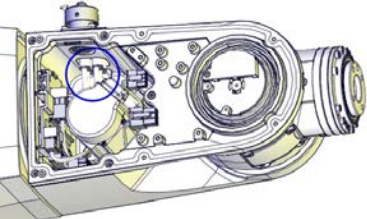


4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|    | Action   | Note   |
|----|--|--|
| 13 | <p>Refit the cable housing cover.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>            | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 14 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Connecting the air hoses and CP/CS cabling (if equipped)

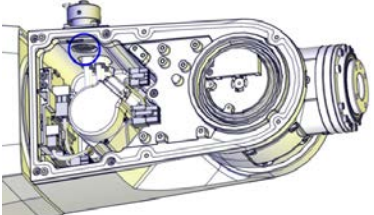
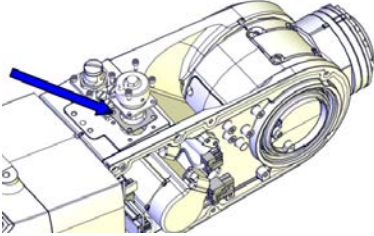
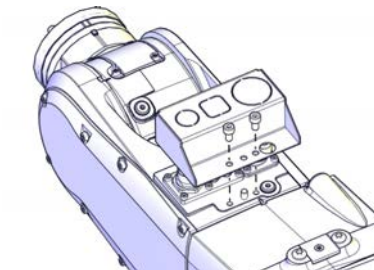
|   | Action  | Note   |
|---|---|--|
| 1 | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> | <p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p> |

Continues on next page


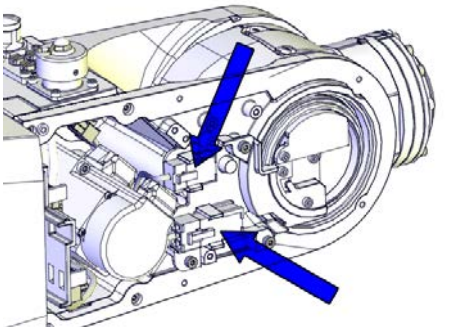
## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued


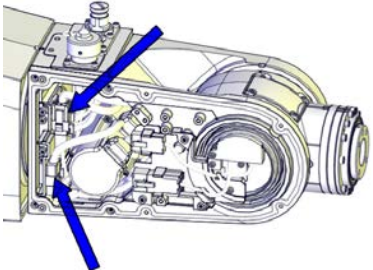
|   | Action  | Note   |
|---|---|--|
| 2 | <p>If equipped, reconnect the CP/CS connector.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <ol style="list-style-type: none"> <li>1 Check the gasket.</li> <li>2 Replace if damaged.</li> </ol> <p><b>For robots with protection type Clean Room:</b></p> <ol style="list-style-type: none"> <li>1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</li> <li>2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.</li> </ol> |  <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p> |
| 3 | <p><b>For robots with protection type Foundry Plus</b></p> <p>If required, fit the protection bracket for CP/CS connectors.</p>   | <p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>   |

### Connecting the axis-5 motor FPC connectors

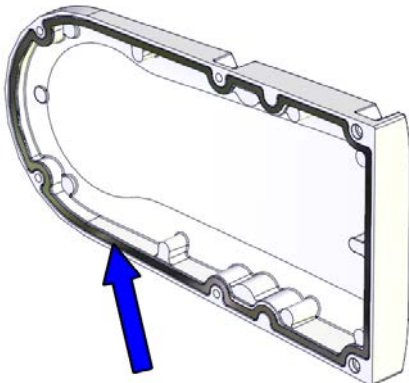
|   | Action   | Note   |
|---|--|--|
| 1 | <p>Connect the axis-5 FPC connectors and snap them to their holders.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002390</p> |

Continues on next page

Connecting the axis-5 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>.</p> |  <p>xx1300002360</p> |

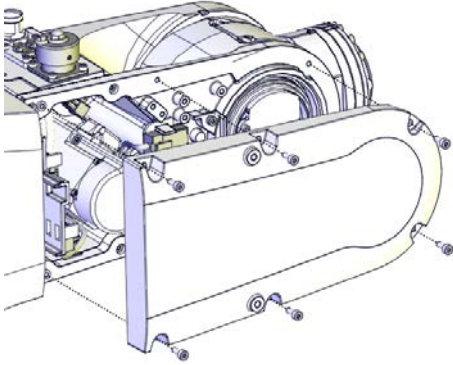


Refitting the tubular cable housing cover

|   | Action  | Note  |
|---|---|---|
| 1 | <p>Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p>  |   |
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket.</p> <p>Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx1400000345</p> |

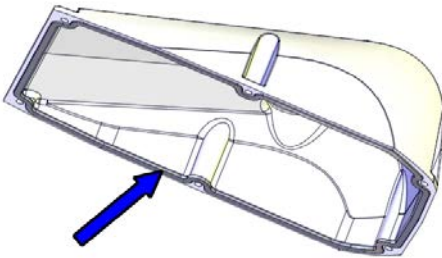
## 4 Repair

### 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action   | Note  |
|---|--|---|
| 3 | Refit the cover to the cable housing.  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |


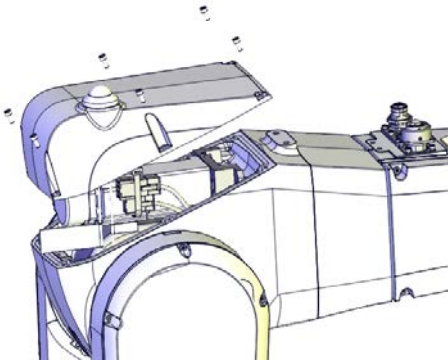

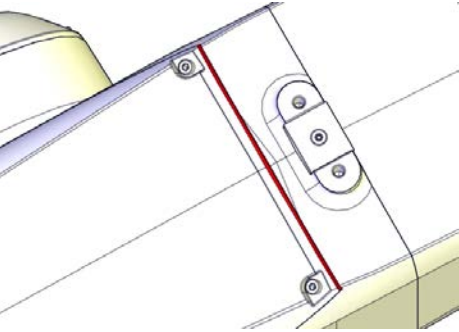



#### Concluding procedure

|   | Action  | Note   |
|---|---|--|
| 1 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p> | <p>Housing cover gasket (IRB 1200-7/0.7 ): 3HAC056698-001</p> <p>Housing cover gasket (IRB 1200-5/0.9 ): 3HAC056697-001</p>  <p>xx1400000477</p> |

Continues on next page

## 4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Refit the upper arm housing cover with the screws.</p> <p> <b>CAUTION</b></p> <p><b>For robots with safety lamp (option)</b><br/>Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 3 | <p><b>For robots with protection type Clean Room</b></p> <p>Apply a string of the sealant Sikaflex 521 FC to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>  |  <p>xx1600000215</p>   |
| 4 | Recalibrate the robot.   | Calibration is detailed in section <a href="#">Calibration on page 729</a> .  |
| 5 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |   |
| 6 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |   |

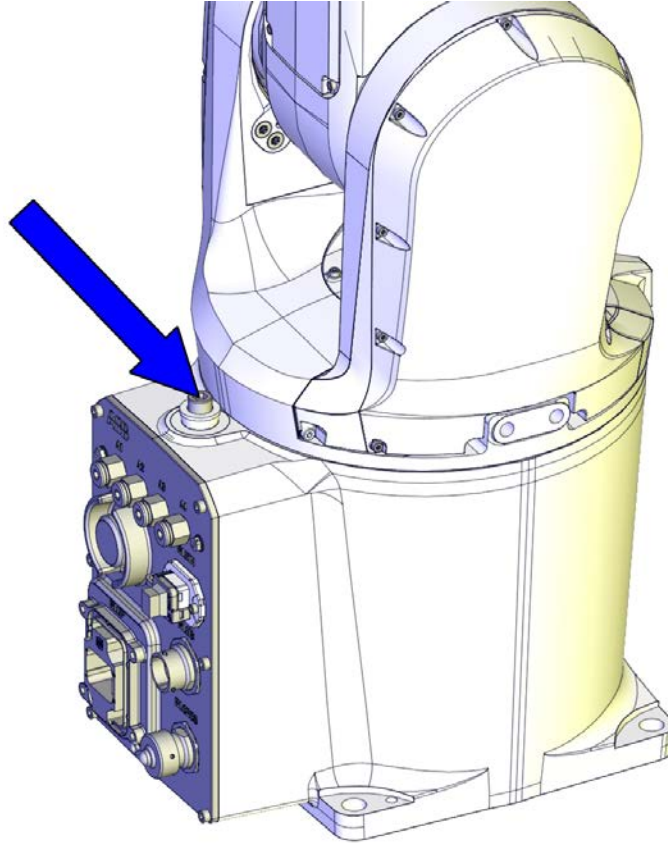
## 4 Repair

### 4.5.3 Replacing the axis-1 mechanical stop

### 4.5.3 Replacing the axis-1 mechanical stop

#### Location of the mechanical stop

The axis-1 mechanical stop is located as shown in the figure.



xx140000391

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                  | Article number | Note   |
|-----------------------------|----------------|--|
| Mechanical stop set, axis 1 | 3HAC049630-001 | Includes mechanical stop pin (1 pc), washer and screw. |

#### Required tools and equipment

| Equipment, etc.  | Article number | Note   |
|------------------|----------------|--|
| Standard toolkit | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |


Continues on next page




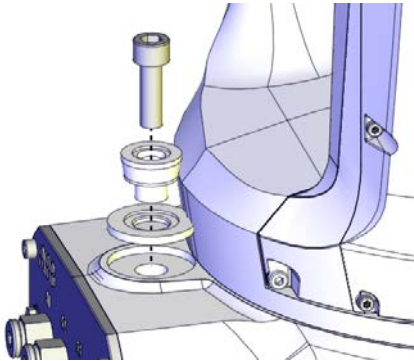



**Replacing the mechanical stop**

Use these procedures to remove the axis-1 mechanical stop.

**Preparations before removing the mechanical stop**

|   | Action   | Note |
|---|--|------|
| 1 | Jog the robot to a position where the mechanical stop is most easily accessed.   |      |
| 2 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |      |

**Replacing the axis-1 mechanical stop**

|   | Action   | Note   |  |
|---|--|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |  |
| 2 | Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>  |  |  |
| 3 | Remove the mechanical stop by removing the screw.  |  <p>xx140000392</p> <p>Screw: 9ADA183-37 (M8x25).<br/>Tightening torque: 12 Nm.</p> |  |
| 4 | Discard the old screw and washer.  |  |  |
| 5 | Refit and secure the new stop with the enclosed screw and washer.  |  |  |
| 6 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> . |  |  |
|   |  <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.  |  |  <b>Note</b><br>Only use specified screws, never replace them with other screws. |


Continues on next page

## 4 Repair

---

### 4.5.3 Replacing the axis-1 mechanical stop

*Continued*

|   | Action   | Note |
|---|--|------|
| 7 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run. |      |



## 4.6 Motors and gearboxes

### 4.6.1 Replacing the axis-1 gear unit

---

#### Part of complete base

The axis-1 gear unit and axis-1 motor is part of the complete base spare part assembly, see [Replacing the base spare parts \(base, axis-1 radial sealing, protection sleeve\) on page 441](#).

## 4 Repair

---

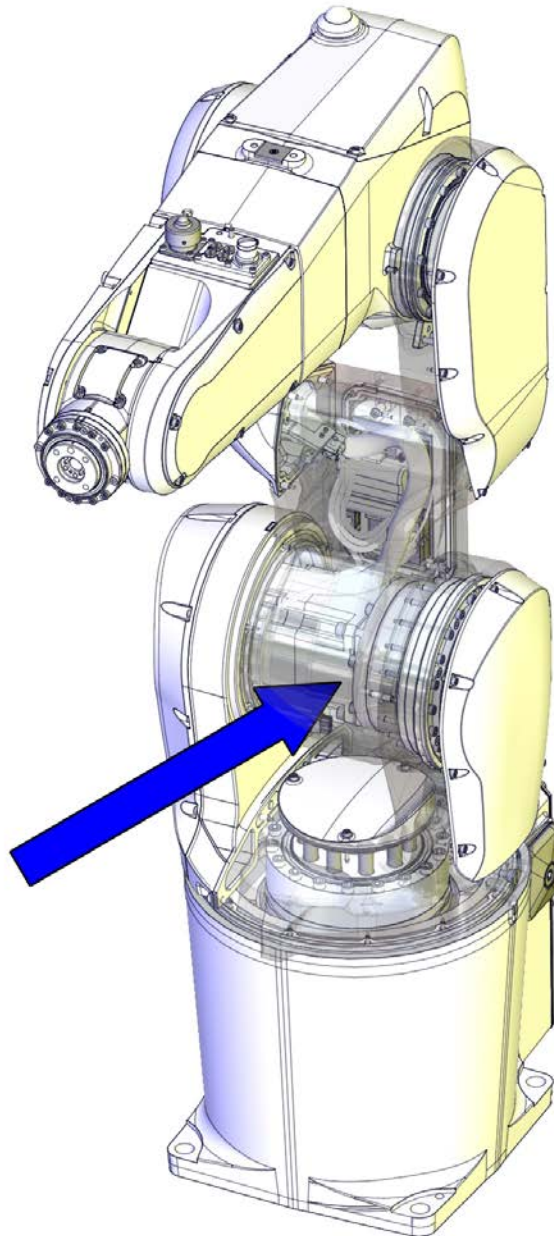
### 4.6.2 Replacing the axis-2 drive unit

#### 4.6.2 Replacing the axis-2 drive unit

---

##### Location of the drive unit

The axis-2 drive unit is located as shown in the figure.



xx1300002547

---

##### Required spare parts



##### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

*Continues on next page*

| Spare part   | Article number | Note  |
|--|----------------|---|
| Drive unit   | 3HAC049645-001 | Includes axis-2 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-001).  |
| Drive unit, food grade lubrication                           | 3HAC057903-001 | Used for robots with food grade lubrication.<br>Includes axis-2 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-001).  |
| Drive unit, SafeMove 2-supported                             | 3HAC061273-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Includes axis-2 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-001).   |
| Drive unit, food grade lubrication and SafeMove 2-supported. | 3HAC061274-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Used for robots with food grade lubrication.<br>Includes axis-2 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-001). |
| O-ring   | 3HAC048939-001 | Replace if damaged.   |
| M2 variseal sealing  | 3HAC044641-003 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.  |
| Gasket on swing cover  | 3HAC056727-001 | Not used with protection class IP40.<br>Replace if damaged.   |
| Gasket on cable housing cover                                | 3HAC056726-001 | Not used for robots with protection class IP40.<br>Replace if damaged.  |

### Required tools and equipment

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Roundsling, 2 m                         | -              | Length: 2 m. Lifting capacity: 100 kg.   |
| Guide pin for axis-2 gear unit          | 3HAC049704-001 | Always use three guide pins together!  |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |

<sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

Continues on next page

## 4 Repair

### 4.6.2 Replacing the axis-2 drive unit


Continued

#### Required consumables

| Consumable                | Art. no.       | Note   |
|---------------------------|----------------|--|
| Cable straps              | -              |  |
| Cleaning agent            | -              | Loctite 7063   |
| Flange sealing            | 12340011-116   | Loctite 574  |
| Locking liquid            | 3HAB7116-1     | Loctite 243  |
| Harmonic grease 4B No. 2  | 3HAC037302-001 | Total amount: 60 g.<br>Used to lubricate the gearbox.<br>The gear is pre-filled at delivery but grease may need to be added depending on the actual condition.                                       |
| LUBRIPLATE SYNXTREME FG-0 | 3HAC043771-001 | Total amount: 60 g.<br>Used to lubricate the gearbox of robots with food grade lubrication.<br>The gear is pre-filled at delivery but grease may need to be added depending on the actual condition. |

#### Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

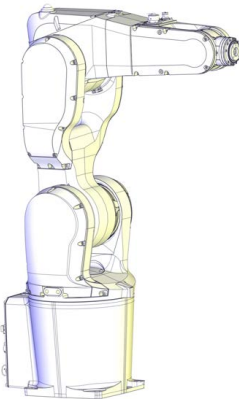


|   | Action   | Note  |
|---|--|---|
| 1 | <p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.                            |
|   | <p><b>If the robot is to be calibrated with reference calibration:</b></p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |
|   | <p><b>If the robot is to be calibrated with fine calibration:</b></p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>  |   |

Continues on next page


#### Removing the drive unit

Use these procedures to remove the axis-2 drive unit.

#### Preparations before removing the axis-2 drive unit

|   | Action   | Note  |
|---|--|---|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.   |   |
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 3 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |   |
| 4 |  <b>CAUTION</b><br>The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!   |   |
| 5 | Fit a roundsling to the upper arm to support the weight of the upper and lower arm. (no force)   |   |

#### Loosening the cabling in the swing


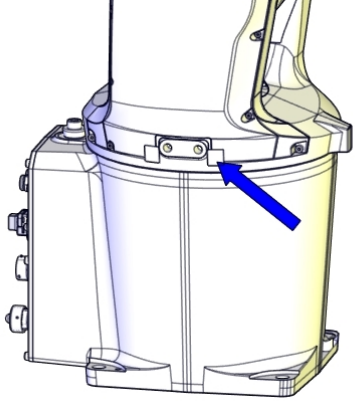
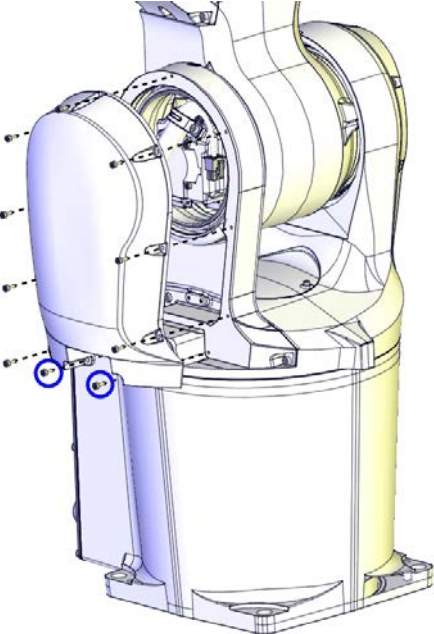
|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off. |      |

*Continues on next page*

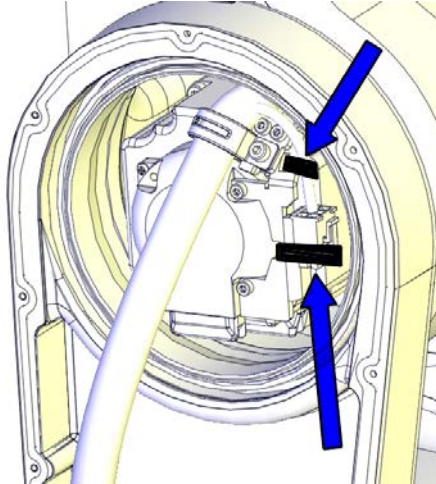
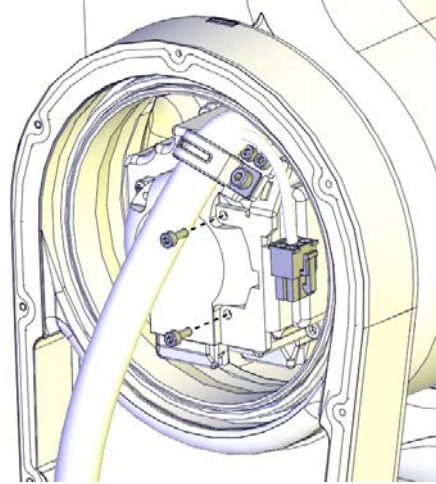
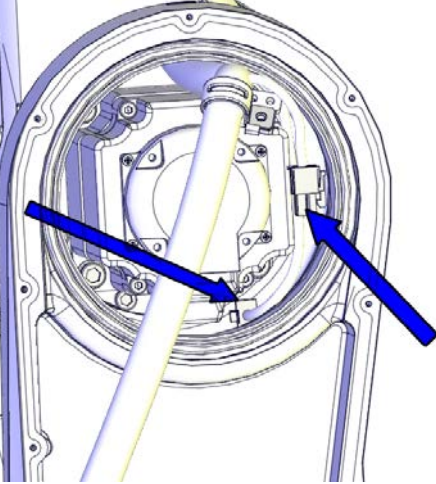
## 4 Repair

### 4.6.2 Replacing the axis-2 drive unit

Continued

|   | Action  | Note  |
|---|---|---|
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | <p><b>For robots with protection type Clean Room</b></p> <p>Remove the swing sealing plug.</p> <p>Follow the procedure specified in <a href="#">Removing the swing sealing plug on page 143</a>.</p>  |  <p>xx160000205</p>   |
| 4 | <p>Remove the cable housing cover of the swing by removing the screws.</p>  |  <p>xx1300002431</p> |

Continues on next page

|   | Action  | Note   |
|---|---|--|
| 5 | Cut the cable straps.   |  <p>xx1400001528</p>   |
| 6 | Remove the axis-2 motor bracket screws.   |  <p>xx1300002432</p>  |
| 7 | Disconnect the motor connectors. <ul style="list-style-type: none"> <li>• R2.ME2</li> <li>• R2.MP2</li> </ul> |  <p>xx1300002434</p> |


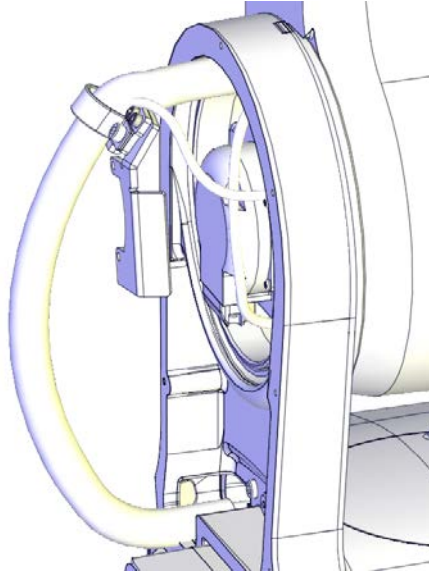

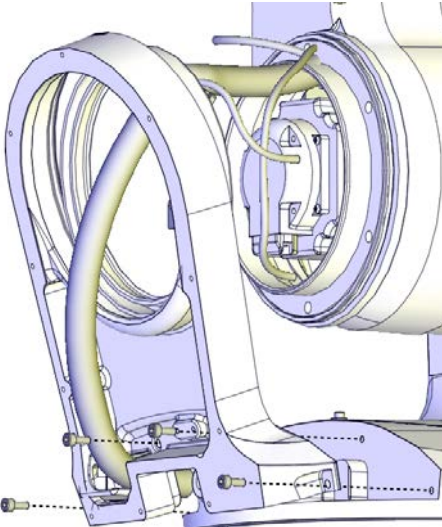
Continues on next page




## 4 Repair

### 4.6.2 Replacing the axis-2 drive unit

Continued


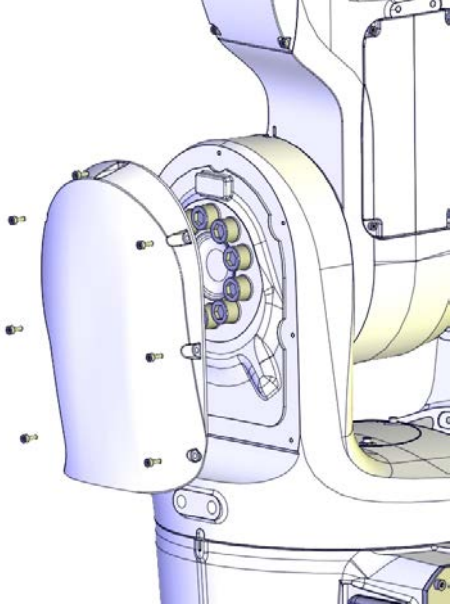

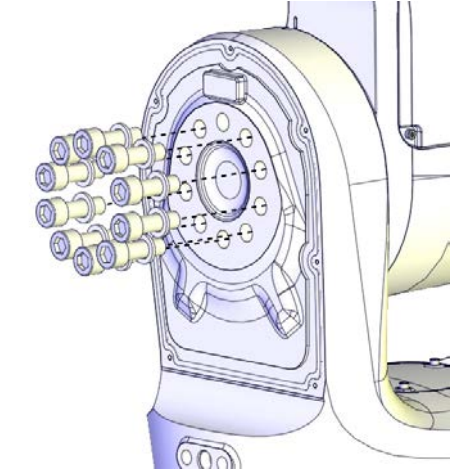
|   | Action   | Note  |
|---|--|---|
| 8 | <p>Pull out the cable harness slightly from the lower arm housing.</p> <p> <b>Note</b></p> <p>The cabling is still connected inside the robot, so be careful not to strain the cables!</p>  |  <p>xx1300002548</p>  |
| 9 | <p>Loosen the cable housing of the swing by removing the screws, and tilt it outwards.</p> <p> <b>CAUTION</b></p> <p>Make sure that the sealing in the cable housing does not get damaged when the cable housing is hanging on the cable.</p> |  <p>xx1300002549</p> |

#### Removing the lower arm

|   | Action   | Note |
|---|--|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |      |

Continues on next page



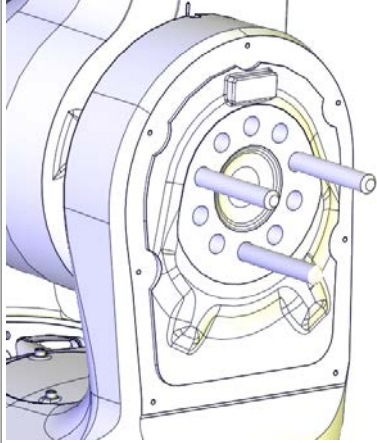

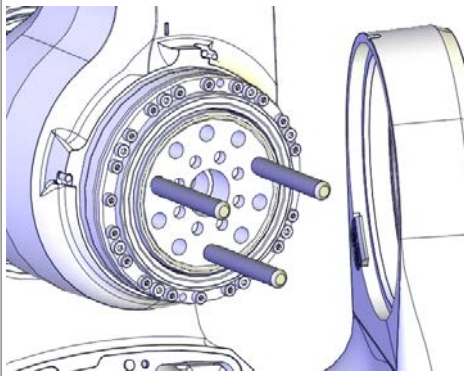
|   | Action  | Note   |
|---|---|--|
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p>  |  |
| 3 | <p>Remove the swing cover.</p>  |  <p>xx1300002551</p>  |
| 4 | <p>Remove the lower arm screws and washers.</p> <p> <b>WARNING</b></p> <p>This releases the lower arm from the swing. Make sure the weight of the arm is properly secured.</p> <p>The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.</p> |  <p>xx1300002552</p> |

Continues on next page



## 4 Repair

### 4.6.2 Replacing the axis-2 drive unit


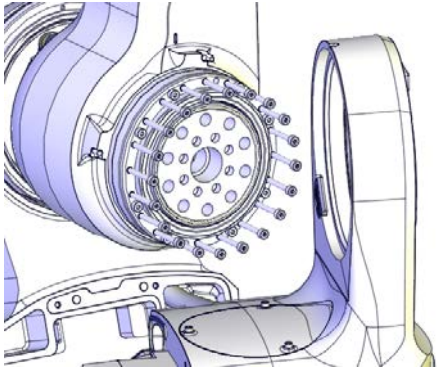

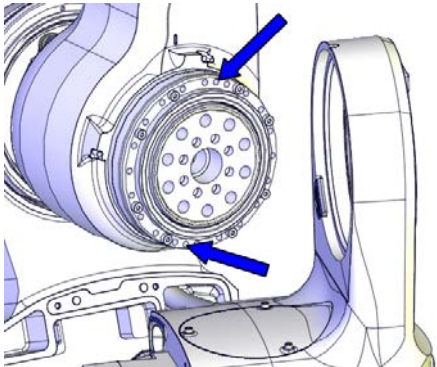
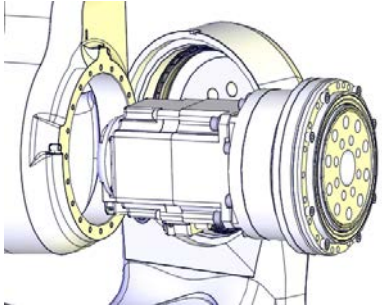
Continued

|   | Action  | Note  |
|---|---|---|
| 5 | Fit guide pins to the gearbox.  | <p>Guide pin for axis-2 gear unit:<br/>3HAC049704-001</p> <p>Always use three guide pins together!</p>  <p>xx1300002563</p> |
| 6 | <p>Separate the lower arm from the swing.</p> <p> <b>Tip</b></p> <p>If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.</p> |  <p>xx1300002553</p>   |

### Removing the axis-2 drive unit

|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page

|   | Action  | Note   |
|---|---|--|
| 3 | <p> <b>CAUTION</b></p> <p>The lower and upper arms together weigh 30 kg.<br/>All lifting accessories used must be sized accordingly!</p>   |  |
| 4 | <p>If there is enough space on the site, lay down the lower arm on a workbench. Make sure to support the gravity center of the lower arm.</p> <p>If the site is cramped, the procedure can be performed having the lower arm hanging in the lifting slings.</p> <p>If removing the axis-2 drive unit from a hanging lower arm, it is best performed by two persons working together:</p> <ul style="list-style-type: none"> <li>• Person 1: Hold the lower arm still.</li> <li>• Person 2: Remove the drive unit screws according to step below.</li> </ul> |  <p>xx1300002554</p>   |
| 5 | <p>Remove the grey screws from the drive unit.</p> <p> <b>WARNING</b></p> <p>Keep the eight black screws fitted. They hold the gearbox together. Removing them can damage the gearbox severely.</p>  |  |
| 6 | <p>Insert two M4 screws to the press out holes and press out the drive unit.</p>  |  <p>xx1400000008</p> |
| 7 | <p>Carefully pull out the complete drive unit.</p>  |  <p>xx1300002555</p> |

Continues on next page

## 4 Repair


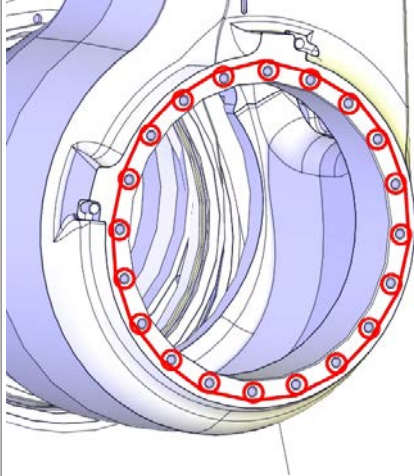
### 4.6.2 Replacing the axis-2 drive unit

*Continued*


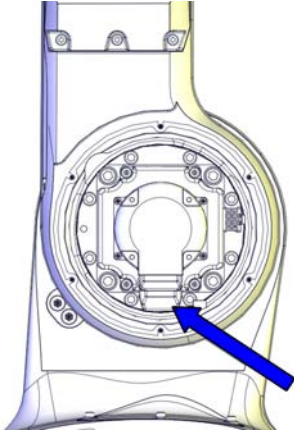
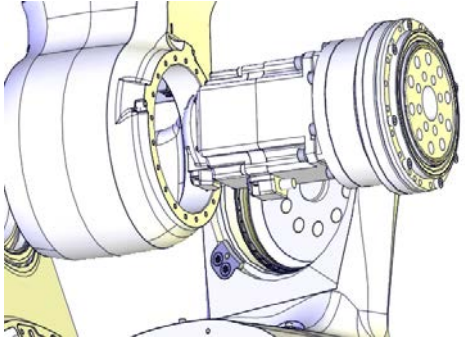
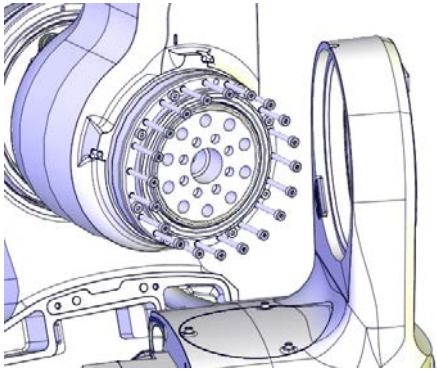

#### Refitting the drive unit

Use these procedures to refit the axis-2 drive unit.

#### Refitting the axis-2 drive unit

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
| 2 | Check if there is a sufficient amount of grease on the gear. Apply more grease, if needed.   | Harmonic grease 4B No. 2: 3HAC037302-001.<br>LUBRIPLATE SYNXTREME FG-0: 3HAC043771-001 (for robots with food grade lubrication). |
| 3 | <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br/>Apply flange sealing Loctite 574 on the mounting surfaces of the lower arm.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx140000006</p>                           |

*Continues on next page*

|   | Action   | Note   |
|---|--|--|
| 4 | <p>Carefully insert the complete drive unit.</p> <p> <b>Note</b></p> <p>Pay attention to the relative position between the motor connector block and the lower arm, so that the drive unit is positioned correctly inside the lower arm.</p>  <p>xx1400000795</p> <p>The figure shows the position of the motor connector block when axis 2 is in position 0°.</p> |  <p>xx1300002580</p>   |
| 5 | <p>If the gear is refitted in a hanging lower arm, this step requires two persons.</p> <ul style="list-style-type: none"> <li>• Person 1: Hold the lower arm still.</li> <li>• Person 2: Refit the drive unit screws.</li> </ul> <p>Secure the screws but do not tighten yet.</p>  | <p>Screws: 3HAB3409-239 ( M4x35).</p>  <p>xx1300002554</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 6 | <p>If the drive unit is refitted in a hanging lower arm, this step requires two persons.</p> <ul style="list-style-type: none"> <li>• Person 1: Hold the lower arm still.</li> <li>• Person 2: Tighten the screws.</li> </ul>  | <p>Tightening torque: 5 Nm</p>   |


Continues on next page



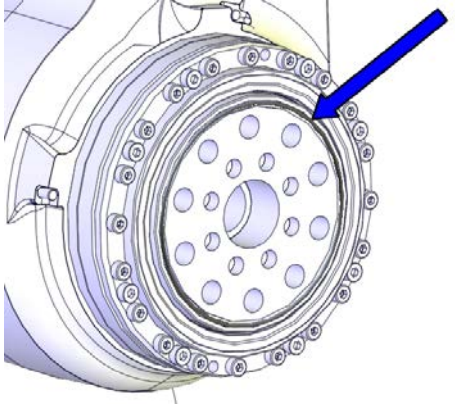

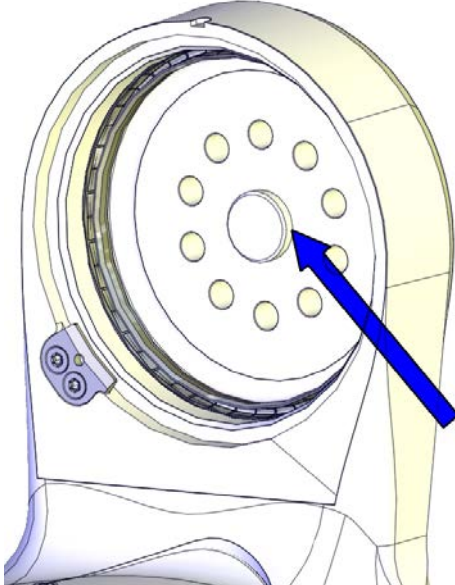
## 4 Repair

### 4.6.2 Replacing the axis-2 drive unit

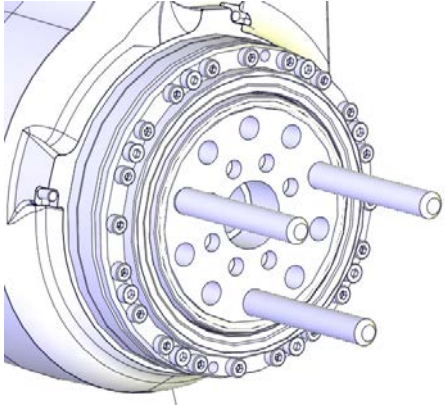

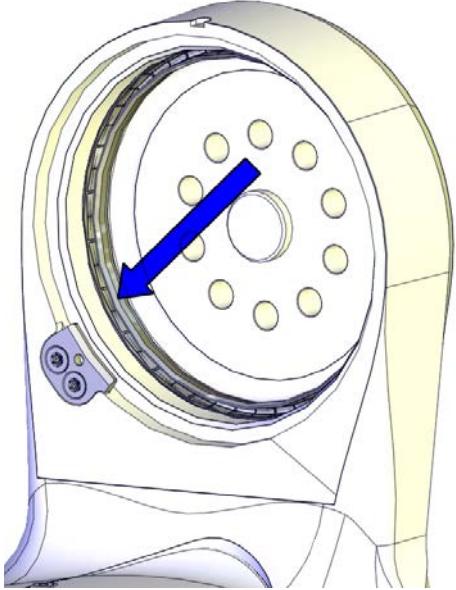
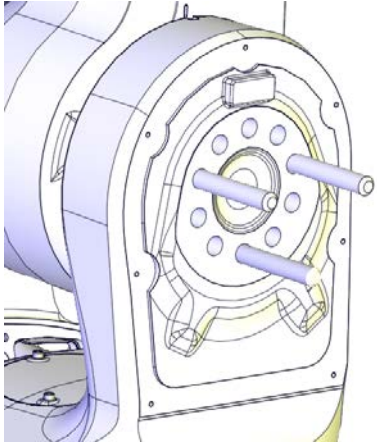
Continued

|   | Action   | Note |
|---|--|------|
| 7 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |      |
|   |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |      |

#### Refitting the lower arm

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Check the o-ring.<br>Replace if damaged.   | O-ring: 3HAC048939-001<br><br><small>xx1300002556</small> |
| 3 | Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 to the cylindrical surface in the swing.<br> <b>Note</b><br>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any. | <br><small>xx1400001403</small>                          |

Continues on next page

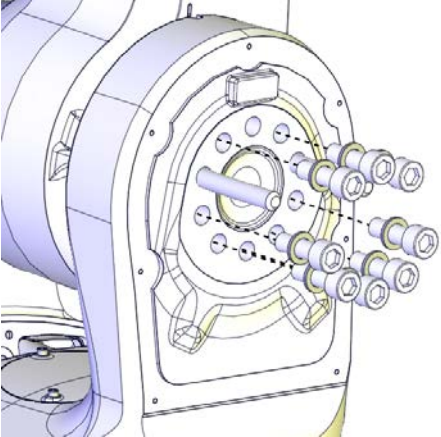

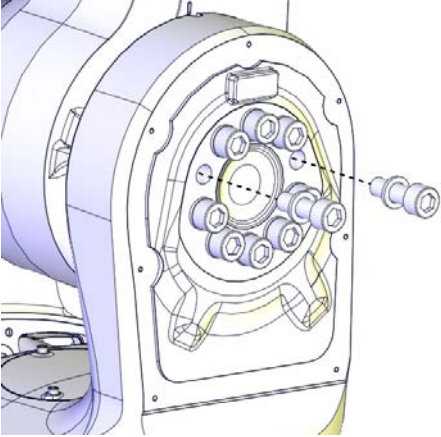
|   | Action  | Note  |
|---|---|---|
| 4 | Fit guide pins to the gearbox.  | <p>Guide pin for axis-2 gear unit:<br/>3HAC049704-001</p>  <p>xx1300002562</p> <p>Always use three guide pins together!</p> |
| 5 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-003</p>  <p>xx140000453</p>   |
| 6 | Fit the lower arm to the swing, with guidance from the guide pins.  |  <p>xx1300002563</p>  |

Continues on next page

## 4 Repair

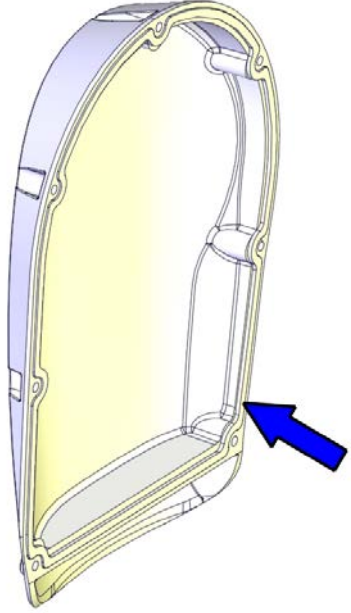
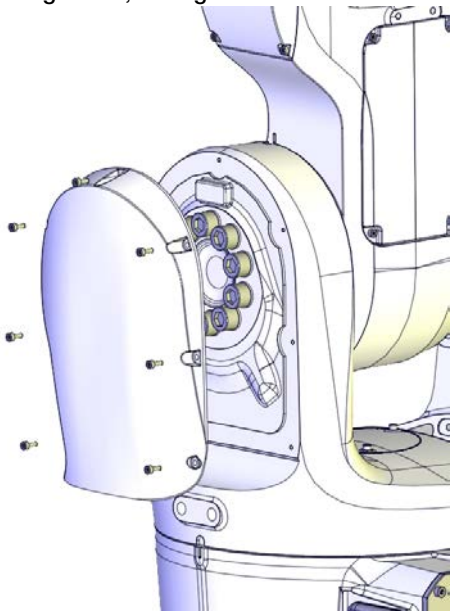
### 4.6.2 Replacing the axis-2 drive unit

Continued

|   | Action   | Note  |
|---|--|---|
| 7 | Refit the lower arm screws and washers, using locking liquid Loctite 243.<br>Secure the screws but do not tighten yet. | <p>Screws: 3HAB3409-51 (M10x30).</p>  <p>xx1300002564</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 8 | Remove the guide pins and refit the remaining screws and washers using locking liquid Loctite 243.                     |  <p>xx1300002565</p>  |
| 9 | Tighten all screws.  | Tightening torque: 45 Nm  |

Continues on next page



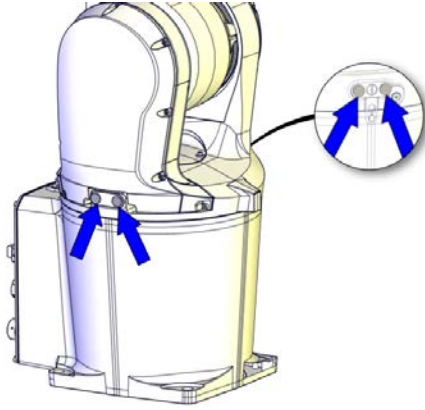
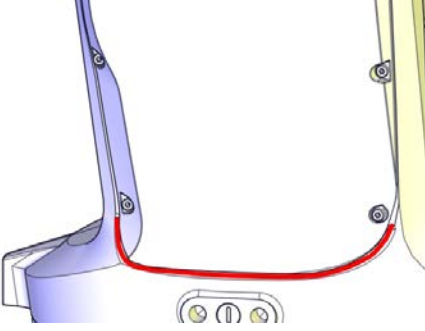
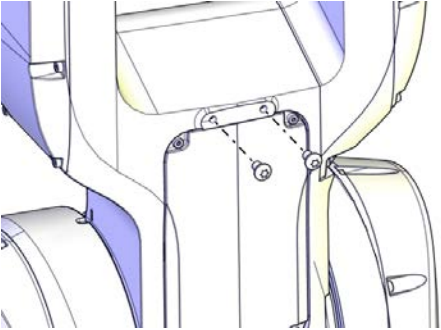

|    | Action  | Note   |
|----|---|--|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the swing cover gasket.<br/>                     Replace if damaged.</p> | <p>Gasket on swing cover: 3HAC056727-001</p>  <p>xx140000007</p>  |
| 11 | <p>Refit the swing cover.<br/>                     Replace if damaged.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>                     Tightening torque: 1.5 Nm.<br/>                     Swing cover: 3HAC059676-001<br/>                     : 3HAC056215-001 (used with protection type Clean Room)<br/>                     Swing cover, Clean Room<br/>                     Swing cover, food grade lubrication</p>  <p>xx1300002551</p> |

Continues on next page

## 4 Repair

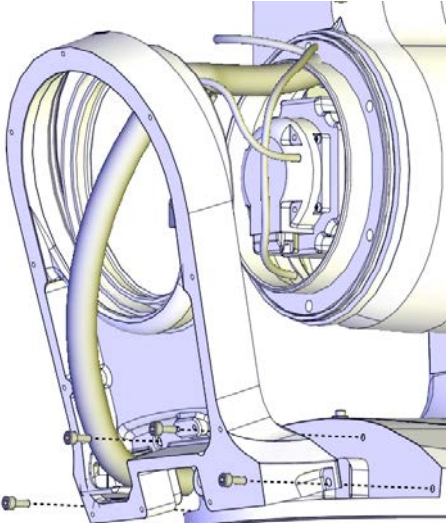
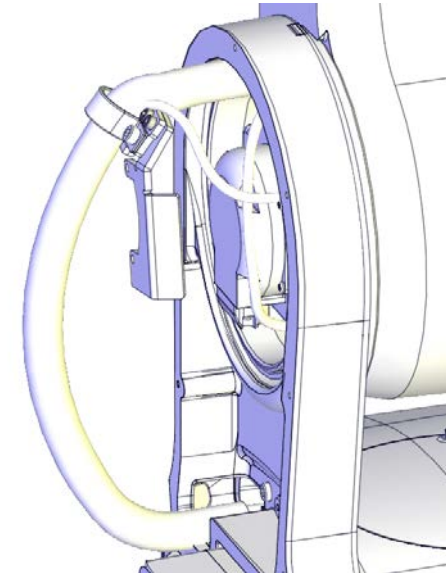
### 4.6.2 Replacing the axis-2 drive unit

Continued

|    | Action   | Note   |
|----|--|--|
| 12 | <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Check the protection plugs for lifting holes. Replace if damaged.</p>  | <p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p> |
| 13 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the swing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>   |  <p>xx1600000217</p>  |
| 14 | <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>If required, fit two screws for protection.</p>  |  <p>xx1600001154</p>   |
| 15 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Continues on next page

Securing the cabling to the swing

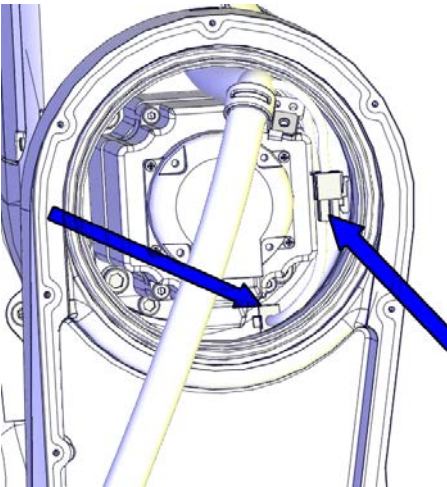
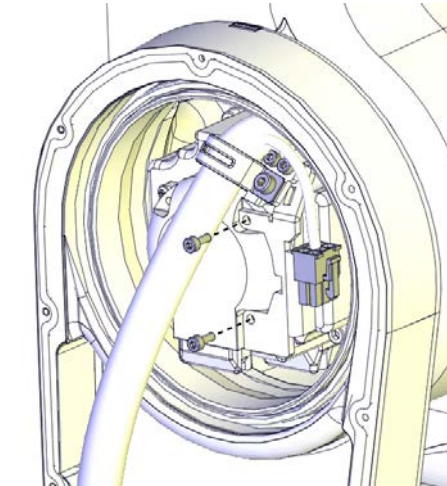
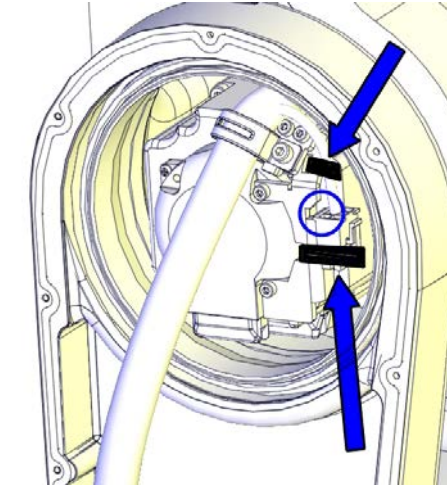
|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> |   |
| 2 | Refit the cable housing to the swing with the screws.   | <p>Tightening torque: 3 Nm.</p>  <p>xx1300002549</p> |
| 3 | Insert the cable harness into the lower arm.  |  <p>xx1300002548</p>                                |

Continues on next page


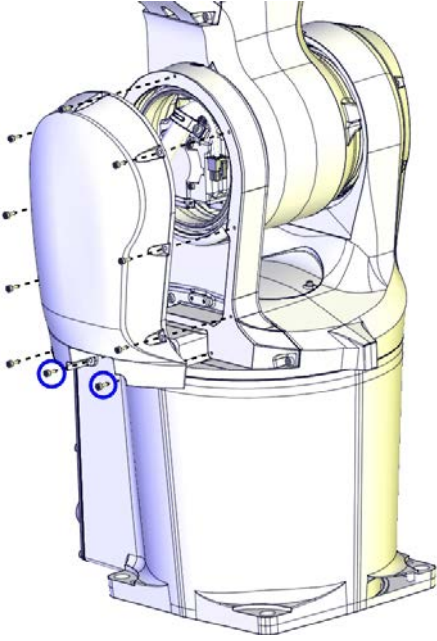

## 4 Repair

### 4.6.2 Replacing the axis-2 drive unit

Continued

|   | Action   | Note   |
|---|--|--|
| 4 | <p>Reconnect the motor connectors.</p> <ul style="list-style-type: none"><li>• R2.ME2</li><li>• R2.MP2</li></ul>                                       |  <p>xx1300002434</p>   |
| 5 | <p>Refit the axis-2 motor bracket with the screws.</p>   |  <p>xx1300002432</p>  |
| 6 | <p>Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.</p> |  <p>xx1400001529</p> |

Continues on next page

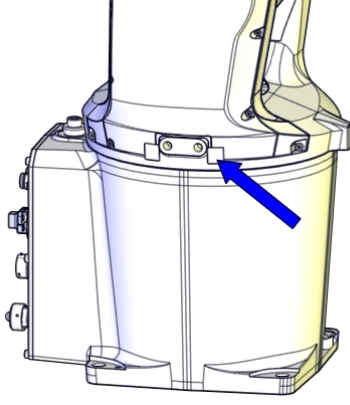

|    | Action   | Note  |
|----|--|---|
| 7  | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket of the cable housing cover.</p> <p>Replace if damaged.</p> | <p>Gasket on cable housing cover: 3HAC056726-001</p>  |
| 8  | <p>Check the PTFE film.</p> <p>Replace if damaged.</p>   | <p>PTFE film on cable housing cover: 3HAC044660-001</p>   |
| 9  | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>   |   |
| 10 | <p>Refit the cable housing cover with the screws.</p> <p> <b>Note</b></p> <p>Remember to refit the two lower screws shown in the figure.</p>  | <p>Cable housing cover of the swing: 3HAC059678-001</p> <p>: 3HAC056214-001 (used with protection type Clean Room)</p> <p>Cable housing cover of the swing, Clean Room</p> <p>Cable housing cover of the swing, food grade lubrication</p> <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

Continues on next page




## 4 Repair

### 4.6.2 Replacing the axis-2 drive unit

Continued

|    | Action   | Note   |
|----|--|--|
| 11 | <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication Refit the swing sealing plug.</p> <p>Follow the procedure specified in <a href="#">Refitting the swing sealing plug on page 144</a>.</p>   | <p>Swing sealing plug:3HAC053687-001</p>  <p>xx160000205</p> |
| 12 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

#### Concluding procedure

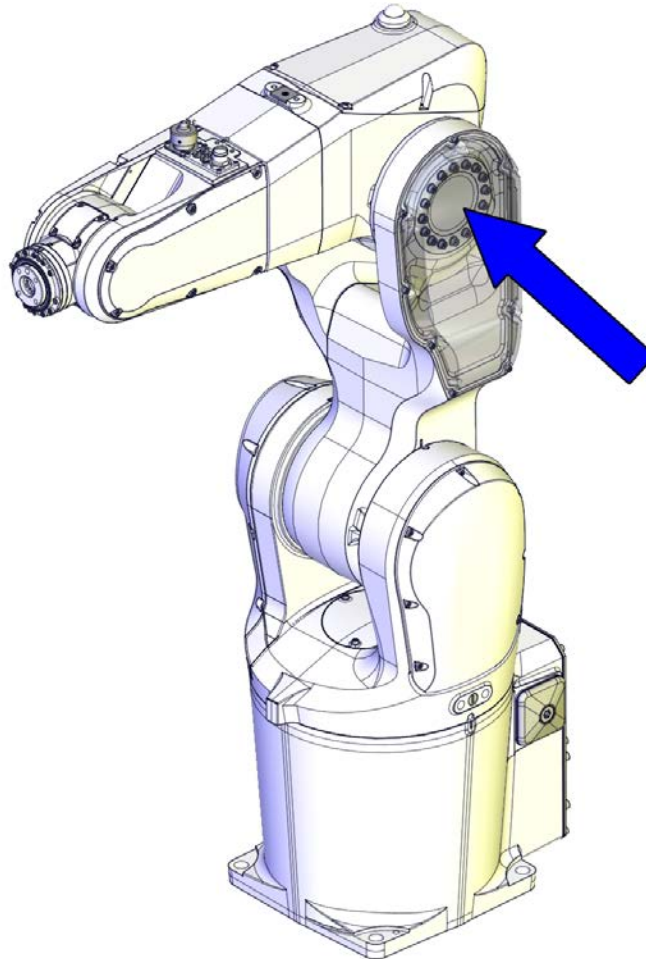
|   | Action   | Note   |
|---|--|--|
| 1 | Remove the lifting slings from the robot.  |  |
| 2 | Recalibrate the robot.   | Calibration is detailed in section <a href="#">Calibration on page 729</a> . |
| 3 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |  |
| 4 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |  |



### 4.6.3 Replacing the axis-3 drive unit

#### Location of drive unit

The axis-3 drive unit is located as shown in the figure.



xx1300002527

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part | Article number | Note   |
|------------|----------------|--|
| Drive unit | 3HAC061403-001 | Includes axis-3 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-002). |

*Continues on next page*

## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit

Continued

| Spare part   | Article number | Note  |
|--|----------------|---|
| Drive unit, food grade lubrication                           | 3HAC057905-001 | Used for robots with food grade lubrication.<br>Includes axis-3 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-002).  |
| Drive unit, SafeMove 2-supported                             | 3HAC061275-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Includes axis-3 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-002).   |
| Drive unit, food grade lubrication and SafeMove 2-supported. | 3HAC061276-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Used for robots with food grade lubrication.<br>Includes axis-3 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-002). |
| O-ring   | 3HAC048939-002 | Replace if damaged.   |
| M2 variseal sealing  | 3HAC044641-005 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.  |
| M2 variseal sealing  | 3HAC044641-006 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.  |
| Radial sealing   | 3HAC024865-001 | Not used with protection class IP40.<br>Replace if damaged.   |
| Gasket on lower arm cover                                    | 3HAC056725-001 | Not used with protection class IP40.<br>Replace if damaged.   |
| Gasket on lower arm cable housing                            | 3HAC044895-001 | Not used with protection class IP40.<br>Replace if damaged.   |
| Gasket on cable housing cover                                | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.   |

#### Required tools and equipment

| Equipment, etc.         | Article number | Note                                   |
|-------------------------|----------------|--|
| Guide pin for upper arm | 3HAC049705-001 | Always use three guide pins together!  |
| Roundsling, 2 m         | -              | Length: 2 m. Lifting capacity: 100 kg. |
| 24 VDC power supply     | -              | Used to release the motor brakes.      |

Continues on next page



| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |


- <sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

### Required consumables

| Consumable                | Art. no.       | Note   |
|---------------------------|----------------|--|
| Cleaning agent            | -              | Isopropanol  |
| Locking liquid            | 3HAB7116-1     | Loctite 243  |
| Flange sealing            | 12340011-116   | Loctite 574<br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)  |
| Sealant                   | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room   |
| Harmonic grease 4B No. 2  | 3HAC037302-001 | Total amount: 32 g.<br>Used to lubricate the gearbox.<br>The gear is pre-filled at delivery but grease may need to be added depending on the actual condition.                                       |
| LUBRIPLATE SYNXTREME FG-0 | 3HAC043771-001 | Total amount: 32 g.<br>Used to lubricate the gearbox of robots with food grade lubrication.<br>The gear is pre-filled at delivery but grease may need to be added depending on the actual condition. |

### Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action   | Note   |
|---|--|--|
| 1 | Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul> |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool. |

Continues on next page

## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit

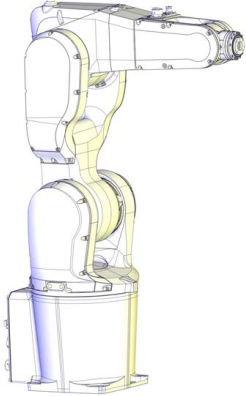

Continued

| Action  | Note  |
|---|---|
| <p><b>If the robot is to be calibrated with reference calibration:</b><br/>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |
| <p><b>If the robot is to be calibrated with fine calibration:</b><br/>Remove all external cable packages (DressPack) and tools from the robot.</p>  |   |


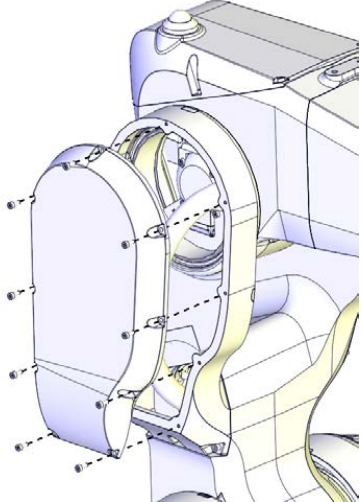
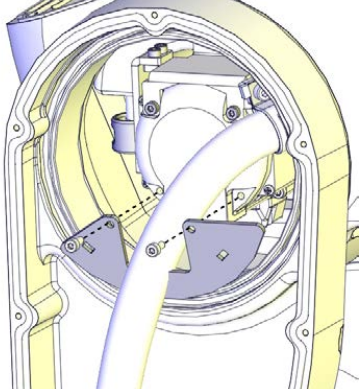
### Removing the drive unit

Use these procedures to remove the axis-3 drive unit.


#### Preparations before removing the axis-3 drive unit

|   | Action   | Note  |
|---|--|---|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.   |   |
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 3 |  <p><b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |   |

Continues on next page

|   | Action  | Note  |
|---|---|---|
| 4 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 5 | Remove the cable housing cover.   |  <p>xx1300002400</p>  |
| 6 | Remove the plate.   |  <p>xx1300002413</p> |

Disconnecting the axis-3 motor connectors


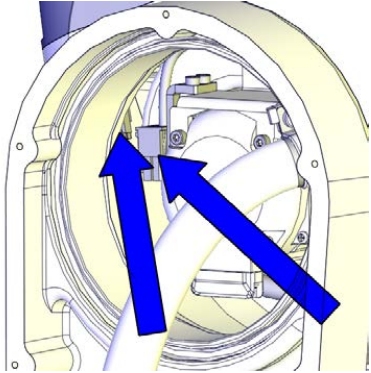
|   | Action   | Note |
|---|--|------|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |      |

Continues on next page



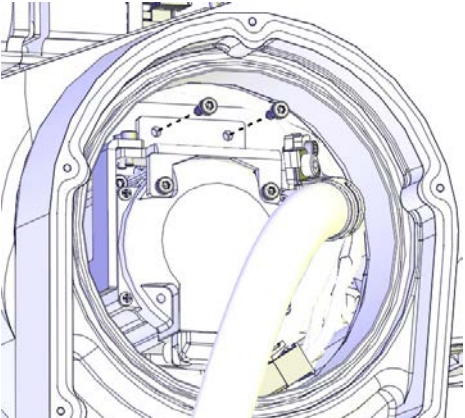
## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit

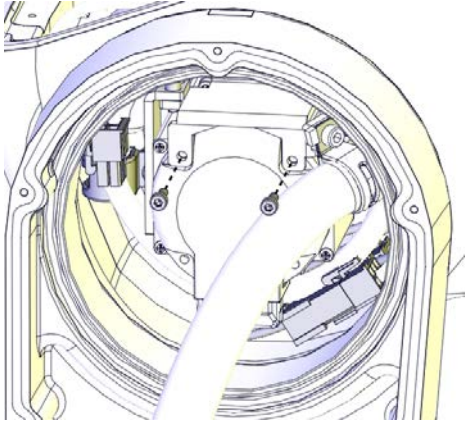

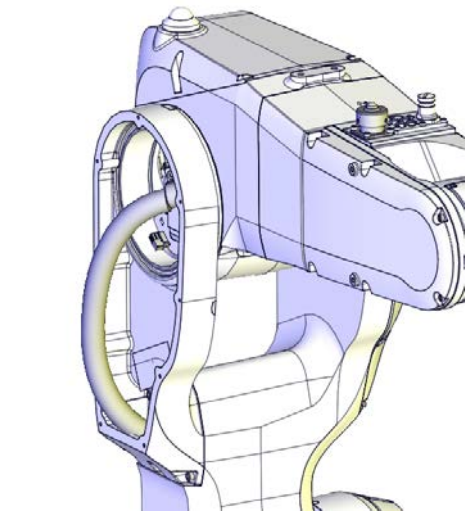
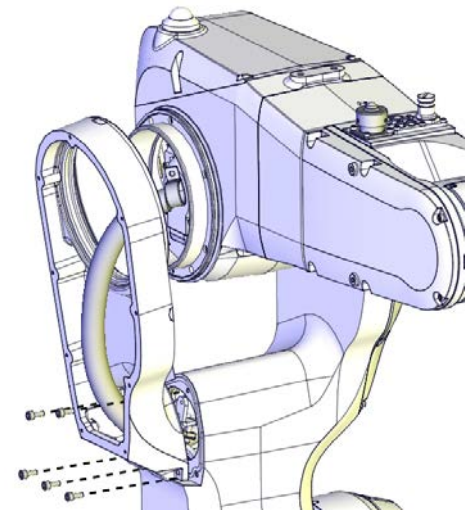
Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Pull out the axis-3 motor connectors from the housing and disconnect them.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  <p>xx1300002420</p> |

Creating space for separation of upper and lower arm

|   | Action   | Note   |
|---|--|--|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |  |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i></p> |  |
| 3 | <p>Remove the screws that fasten the fix sheet to the inner plastic guide.</p>   |  <p>xx1300002421</p> |

Continues on next page

|   | Action  | Note   |
|---|---|--|
| 4 | Remove the screws that fasten the fix sheet to the motor.   |  <p>xx1300002423</p>   |
| 5 | Pull out the cable harness slightly from the upper arm housing and from the lower arm.<br><br> <b>Note</b><br>The cabling is still connected inside the robot, so be careful not to strain the cables! |  <p>xx1300002530</p>  |
| 6 | Remove the cable housing of the lower arm by removing the screws, and tilt it outwards.   |  <p>xx1400000785</p> |



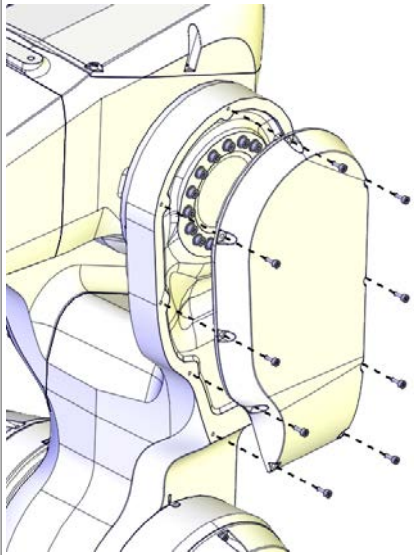

Continues on next page

## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit


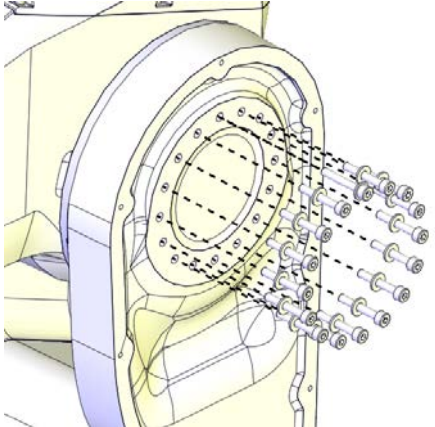
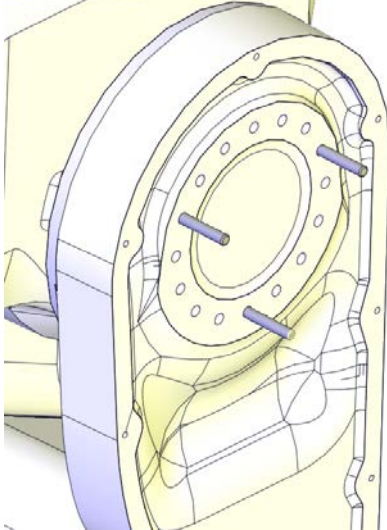
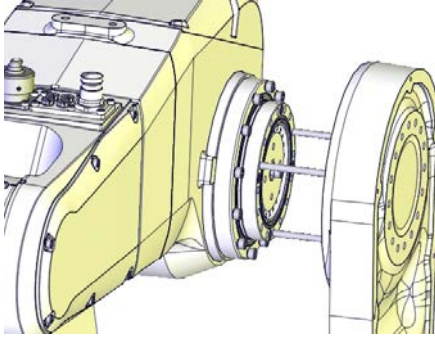
*Continued*

#### Removing the upper arm

|   | Action   | Note  |
|---|--|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 3 | Remove the lower arm cover.  | <br>xx1300002528 |
| 4 |  <b>CAUTION</b><br>The upper arm weighs 17 kg.<br>All lifting accessories used must be sized accordingly!   |   |
| 5 | Fit lifting slings to the upper arm to support the weight of the arm. (no force)   |   |

*Continues on next page*



|   | Action  | Note   |
|---|---|--|
| 6 | <p>Remove the upper arm screws.</p> <p> <b>WARNING</b></p> <p>This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured by the lifting slings.</p> |  <p>xx1300002531</p>   |
| 7 | <p>Fit guide pins to the upper arm.</p>   | <p>Guide pin for upper arm: 3HAC049705-001<br/>Always use three guide pins together!</p>  <p>xx1400000771</p> |
| 8 | <p>Separate the upper and lower arm with guidance from the guide pins.</p>  |  <p>xx1300002533</p>   |

Continues on next page


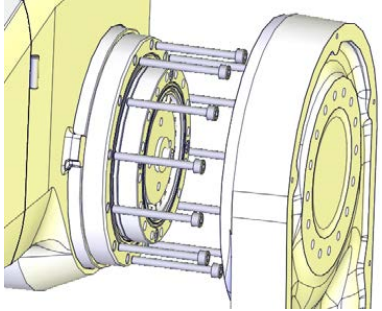

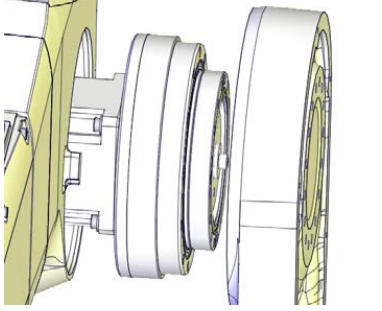


## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit

Continued

#### Removing the axis-3 drive unit

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 2 | Remove the drive unit screws.   | <br>xx1300002532  |
| 3 | Carefully pull out the complete drive unit.<br> <b>CAUTION</b><br>The axis-3 gear unit and motor adapter are not secured to each other with screws! Be careful when handling the drive unit.          | <br>xx1300002534 |

#### Refitting the drive unit

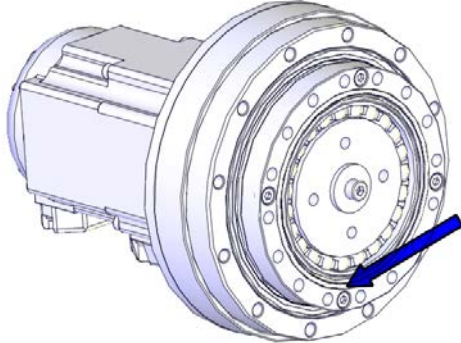

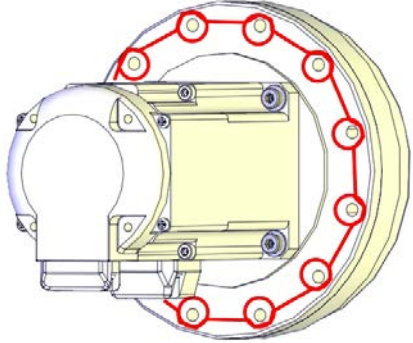

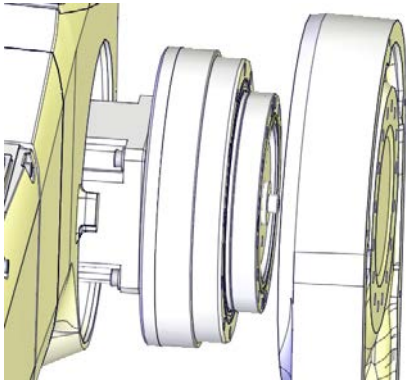
Use this procedure to refit the axis-3 drive unit.

#### Refitting the axis-3 drive unit

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |  |
| 2 | Check if there is a sufficient amount of grease on the gear. Apply more grease, if needed.   | Harmonic grease 4B No. 2: 3HAC037302-001.<br>LUBRIPLATE SYNXTREME FG-0: 3HAC043771-001 (for robots with food grade lubrication). |

Continues on next page

4.6.3 Replacing the axis-3 drive unit  
Continued

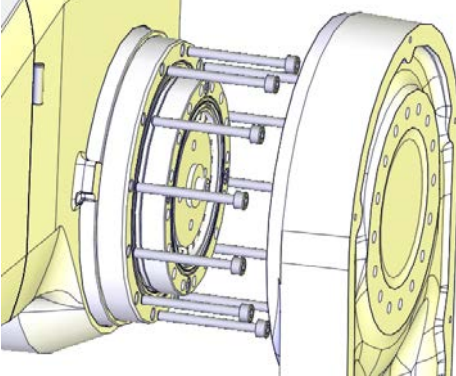


|   | Action   | Note  |
|---|--|---|
| 3 | Check the o-ring for damage. Replace if damaged.   | <p>O-ring: 3HAC048939-002</p>  <p>xx140000004</p> |
| 4 | Remove the two screws and nuts that secure the axis-3 motor adapter and gear unit to each other during transport.  |   |
| 5 | <p><b>For robots with protection class IP67 (option 287-10)</b><br/> <b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br/>           Apply flange sealing Loctite 574 on the mounting surfaces of the motor adapter.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1400000784</p>                            |
| 6 | <p>Refit the drive unit into the upper arm.</p> <p> <b>Note</b></p> <p>Make sure to refit the drive unit correctly oriented. When the upper arm is in its zero position (horizontal), the motor connectors should point downwards.</p>  |  <p>xx1300002534</p>                            |

Continues on next page

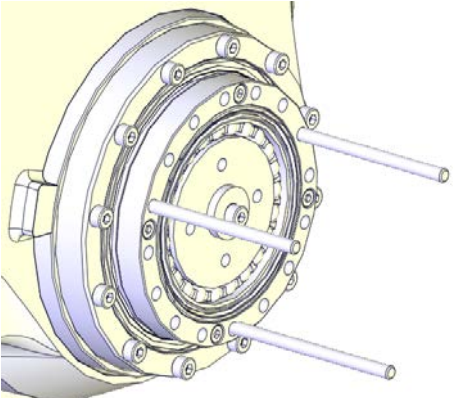
## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit


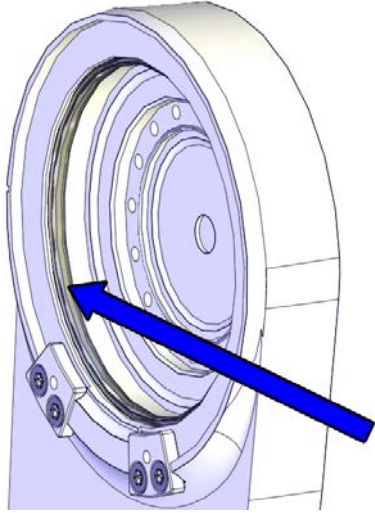
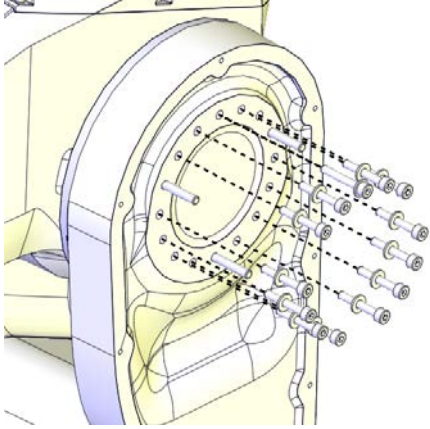

Continued

|   | Action   | Note   |
|---|--|--|
| 7 | Refit the drive unit screws.   | <p>Screws: 3HAB3409-214 (M4x40)<br/>Tightening torque: 4.5 Nm</p>  <p>xx1300002532</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 8 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

### Refitting the upper arm

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |   |
| 2 | Fit guide pins to the axis-3 gear unit.  | <p>Guide pin for upper arm: 3HAC049705-001<br/>Always use three guide pins together!</p>  <p>xx1400000027</p> |

Continues on next page

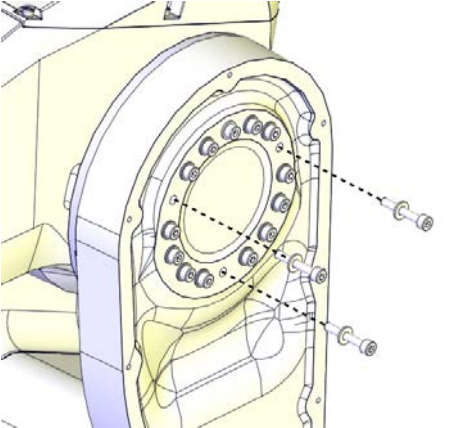
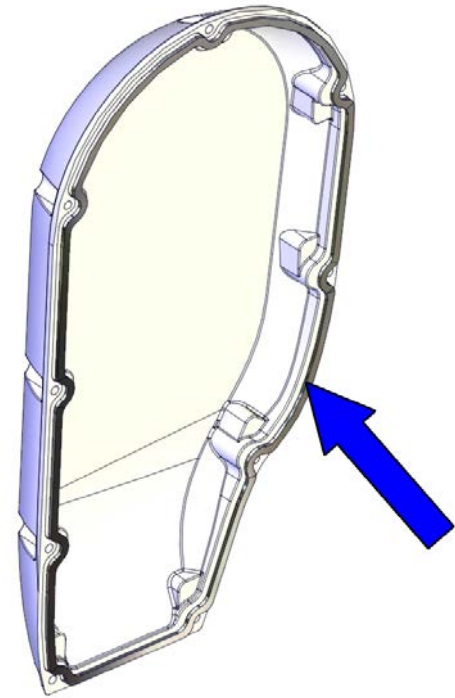
|   | Action  | Note  |
|---|---|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>Check the sealing.<br/>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-005</p>  <p>xx1400000474</p>  |
| 4 | <p>Refit the upper arm to the lower arm and secure with the upper arm screws and washers. Do not tighten yet.</p>   | <p>Screws: 3HAB3409-213 (M4x25).</p>  <p>xx140000028</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

Continues on next page

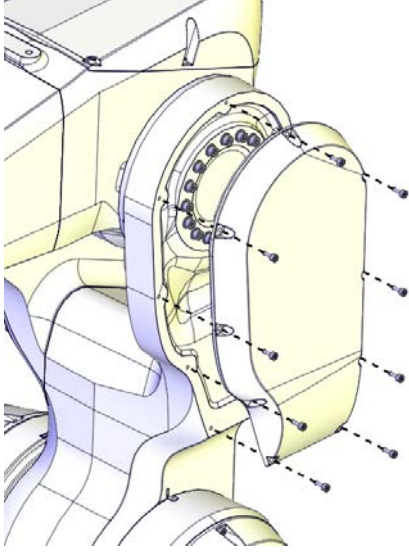

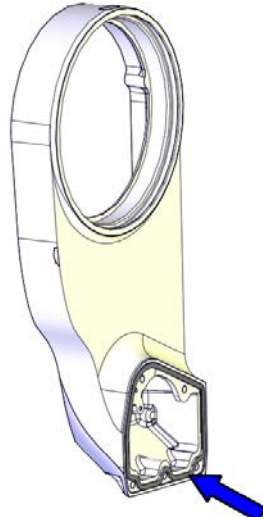
## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit

Continued

|   | Action   | Note  |
|---|--|---|
| 5 | Remove the guide pins and refit the remaining screws and washers.  | <br>xx140000029   |
| 6 | Tighten all screws.  | Tightening torque: 4.5 Nm.  |
| 7 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the lower arm cover gasket.<br/>Replace if damaged.</p> | <p>Gasket on lower arm cover: 3HAC056725-001</p> <br>xx140000047 |

Continues on next page

|   | Action   | Note  |
|---|--|---|
| 8 | Refit the lower arm cover.   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002528</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 9 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the cable housing gasket.<br/>Replace if damaged.</p> | <p>Gasket on lower arm cable housing:<br/>3HAC044895-001</p>  <p>xx1400000414</p>  |




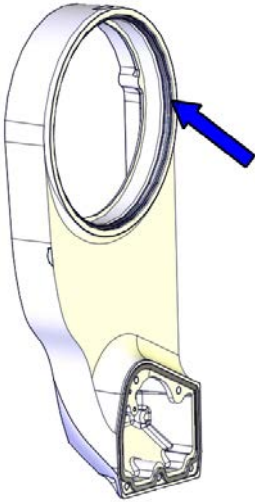
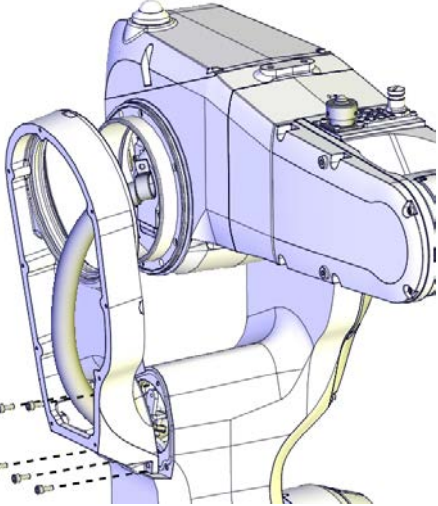
Continues on next page



## 4 Repair


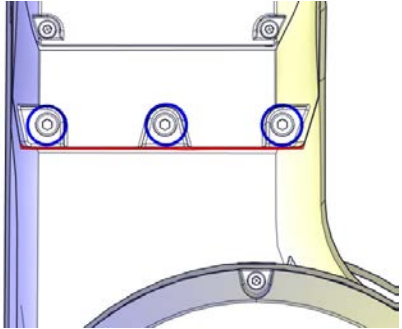
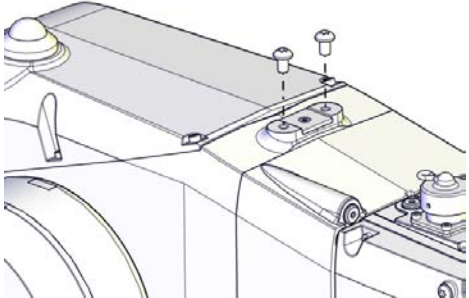

### 4.6.3 Replacing the axis-3 drive unit

Continued

|    | Action  | Note  |
|----|---|---|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           For robots with protection type Clean Room<br/>           For robots with food grade lubrication</p> <p>Check the axis-3 radial sealing and the M2 variseal sealing in the cable housing.<br/>           Replace if damaged.</p> <p> <b>Note</b></p> <p>The M2 variseal sealing does not used for robots with protection type Clean room and with food grade lubrication.</p> <p> <b>Note</b></p> <p>For Clean Room robots, apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p> | <p>M2 variseal sealing: 3HAC044641-006<br/>           Radial sealing: 3HAC024865-001</p>  <p>xx140000473</p> <p>Replacement is detailed in <a href="#">Replacing the axis-3 radial sealing and sealing ring on page 373</a>.</p> |
| 11 | <p>Refit the cable housing of the lower arm.</p>  | <p>Tightening torque: 3 Nm</p>  <p>xx140000785</p>  |

Continues on next page



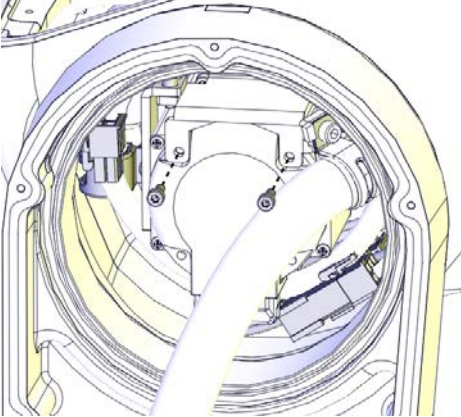
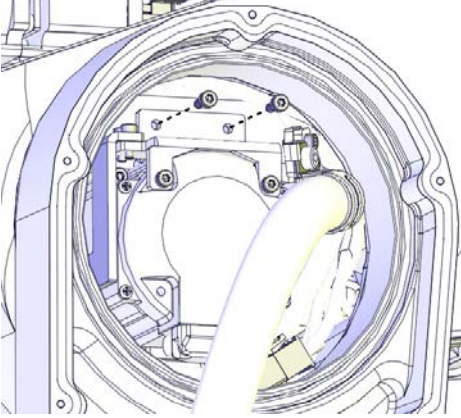
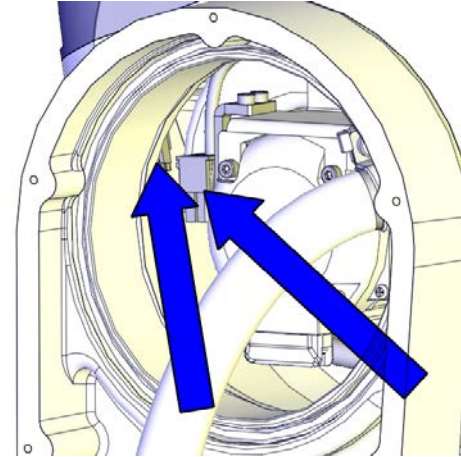
| Action   | Note  |
|--|---|
| <p>12 <b>For robots with protection type Clean Room</b></p> <p>Apply a string of the sealant Sikaflex 521 FC to the joint of the cable housing of the lower arm.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> <p> <b>Note</b></p> <p>No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure.</p> |  <p>xx1600000218</p> |
| <p>13 <b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>If required, fit two screws for protection.</p>  |  <p>xx1600001155</p> |
| <p>14 Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |   |

## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit

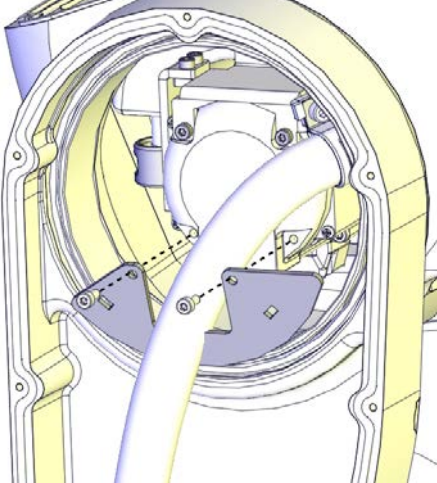
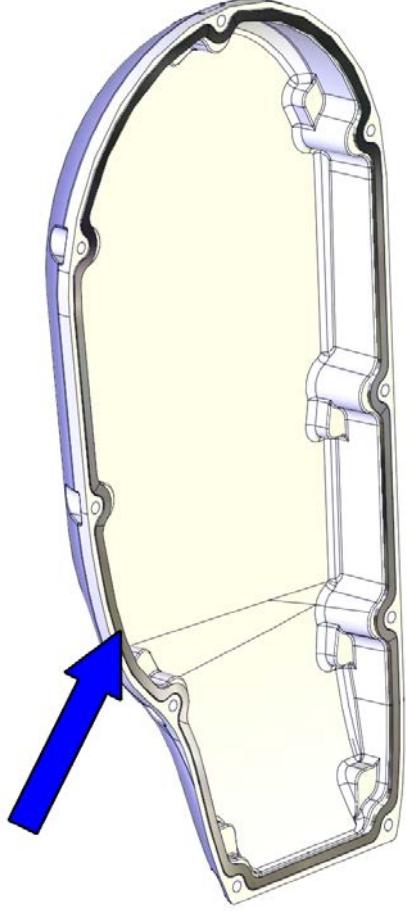
*Continued*

#### Concluding procedure

|   | Action  | Note  |
|---|---|---|
| 1 | Refit the fix sheet to the motor.               | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p>  |
| 2 | Refit the fix sheet to the inner plastic guide. | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p> |
| 3 | Reconnect the axis-3 motor connectors.          |  <p>xx1300002420</p>                                  |

*Continues on next page*

4.6.3 Replacing the axis-3 drive unit  
Continued

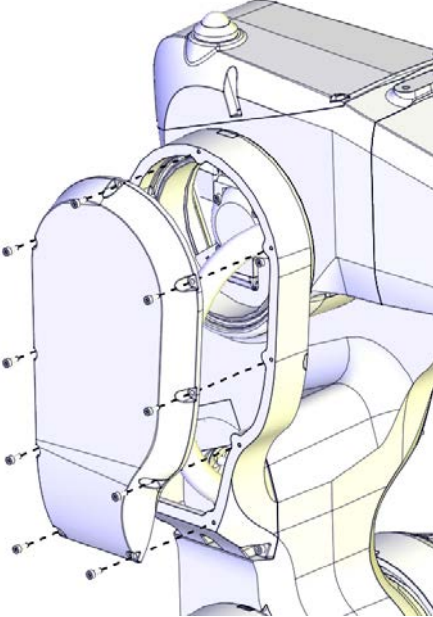



|   | Action   | Note   |
|---|--|--|
| 4 | Refit the plate.   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                         |
| 5 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the gasket of the cable housing cover.<br/>                     Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001</p>  <p>xx1400000048</p> |

Continues on next page


## 4 Repair

### 4.6.3 Replacing the axis-3 drive unit

Continued

|    | Action   | Note   |
|----|--|--|
| 6  | Check the PTFE film on the cable housing cover.<br>Replace if damaged.   | PTFE film on cable housing cover:<br>3HAC044660-001  |
| 7  | Apply grease to the inner surface of the cable housing cover and the PTFE film surface.  |  |
| 8  | Refit the cable housing cover.<br><b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br><b>For robots with protection type Clean Room</b><br><b>For robots with food grade lubrication</b><br>Apply locking liquid Loctite 243 to all the screws securing the cover.   | Screws: 3HAB3409-207 (M3x8).<br>Tightening torque: 1.5 Nm<br><br>xx1300002400<br> <b>Note</b><br>Only use specified screws, never replace them with other screws. |
| 9  |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .<br> <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth. |  |
| 10 | Recalibrate the robot.   | Calibration is detailed in section <a href="#">Calibration on page 729</a> .   |

Continues on next page

|    | Action   | Note |
|----|--|------|
| 11 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run. |      |

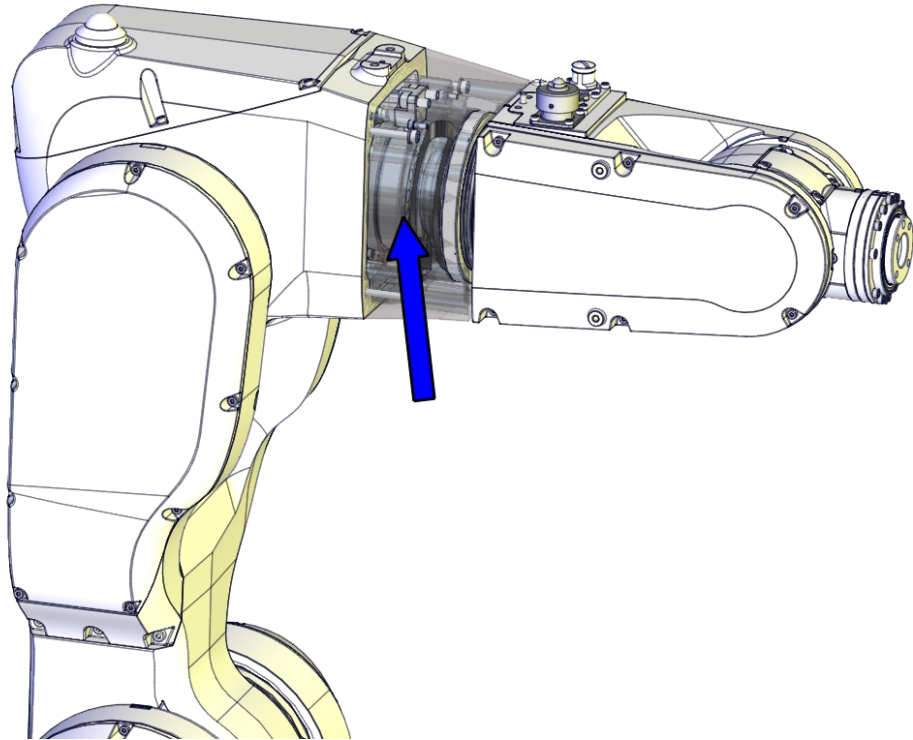
## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

#### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

##### Location of gearbox, drive shaft and pulley

The axis-4 gearbox, including drive shaft and pulley, is located as shown in the figure.



xx1300002462

##### Required spare parts



##### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                      | Article number | Note   |
|---------------------------------|----------------|--|
| Gearbox                         | 3HAC049629-001 |  |
| Gearbox, food grade lubrication | 3HAC057904-001 | Used for robots with food grade lubrication. |
| Shaft                           | 3HAC044692-001 |  |
| Pulley                          | 3HAC044687-001 |  |
| Motor bracket                   | 3HAC044689-001 | Replace if damaged.                          |
| Gearbox sleeve                  | 3HAC044685-001 |  |

*Continues on next page*

#### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

*Continued*

| Spare part                             | Article number | Note   |
|--|----------------|--|
| M2 variseal sealing                    | 3HAC044641-007 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged. |
| Radial sealing with dust lip           | 3HAB3701-48    | Not used with protection class IP40.<br>Replace if damaged.  |
| Washer                                 | 3HAC044869-001 | Replace if damaged   |
| Gasket on cable housing cover          | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Washer                                 | 3HAC044869-001 | Replace if damaged   |
| Gasket for tubular cover               | 3HAC058822-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket for tubular cable housing cover | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Housing cover gasket (IRB 1200-7/0.7 ) | 3HAC056698-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Housing cover gasket (IRB 1200-5/0.9 ) | 3HAC056697-001 | Not used with protection class IP40.<br>Replace if damaged.  |

#### Required tools and equipment

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Axis-4 sealing assembly tool set        | 3HAC049699-001 | Used to refit the radial sealing, if replacement is needed.  |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |

<sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

#### Required consumables

| Consumable     | Art. no. | Note         |
|----------------|----------|--------------|
| Cable straps   | -        |              |
| Cleaning agent | -        | Loctite 7063 |

*Continues on next page*



## 4 Repair


### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

| Consumable     | Art. no.       | Note  |
|----------------|----------------|---|
| Flange sealing | 12340011-116   | Loctite 574<br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3) |
| Locking liquid | 3HAB7116-1     | Loctite 243   |
| Sealant        | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room  |

#### Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action  | Note  |
|---|---|---|
| 1 | Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"><li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li><li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li></ul>   |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.                        |
|   | <b>If the robot is to be calibrated with reference calibration:</b><br>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.<br><br>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible. | Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.<br><br>Creating new values requires possibility to move the robot.<br><br>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a> . |
|   | <b>If the robot is to be calibrated with fine calibration:</b><br>Remove all external cable packages (DressPack) and tools from the robot.  |   |

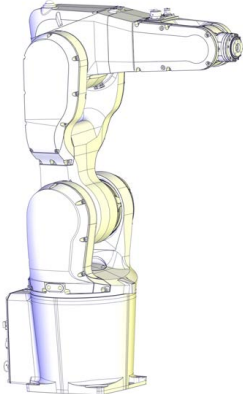

#### Removing the gear unit

Preparations before removing the axis-4 gear unit



|   | Action   | Note |
|---|--|------|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure. |      |

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action   | Note  |
|---|--|---|
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 3 |  <p><b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |   |

Getting access to inside of the wrist unit



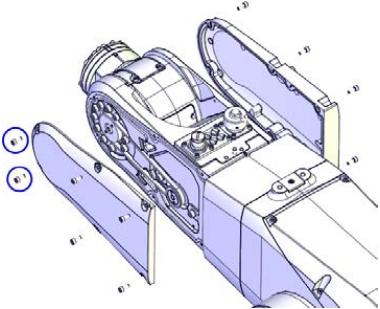
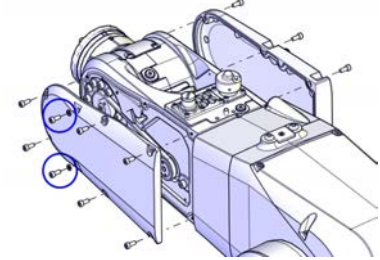
|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |      |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |      |

Continues on next page




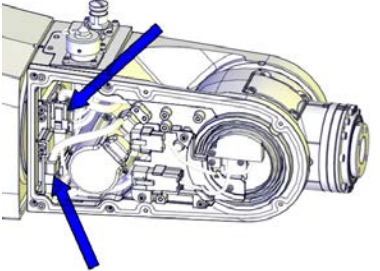
## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

|   | Action  | Note   |
|---|---|--|
| 3 | <p>Remove the covers on each side of the wrist by removing their screws.</p> <p> <b>Note</b></p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.</p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> <p> <b>Note</b></p> <p><b>For robots with protection type Clean Room</b></p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |



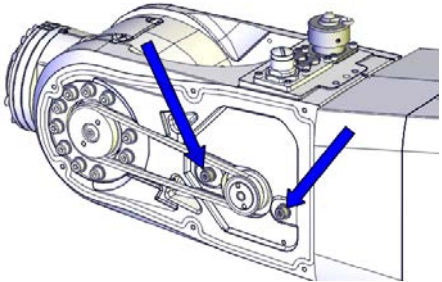
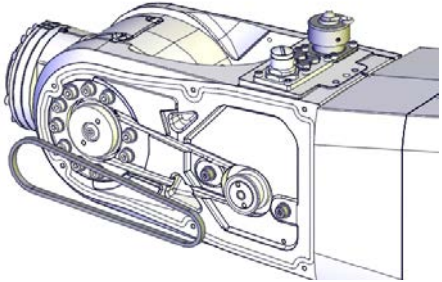
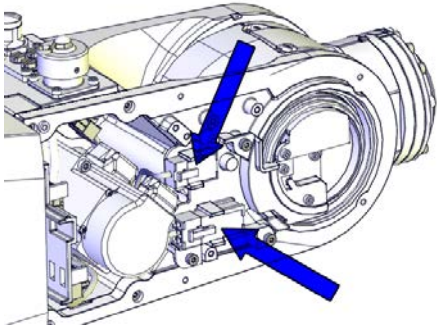
### Disconnecting the axis-5 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002360</p> |

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

Removing the axis-5 motor with pulley

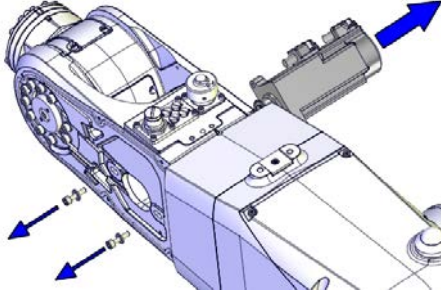
|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 3 | Loosen the screws so that the motor can be moved sideways.  |  <p>xx1300002350</p>  |
| 4 | Remove the timing belt.   |  <p>xx1300002351</p> |
| 5 | Snap loose and disconnect the axis-5 FPC connectors.  |  <p>xx1300002390</p> |

Continues on next page



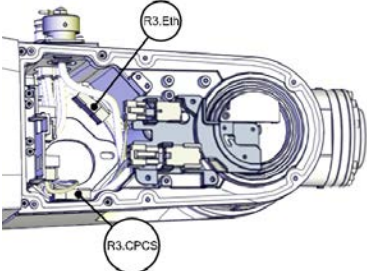
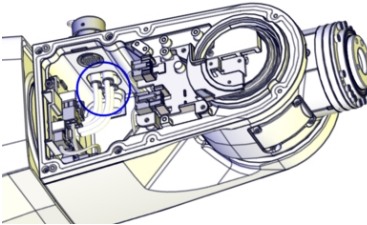
## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

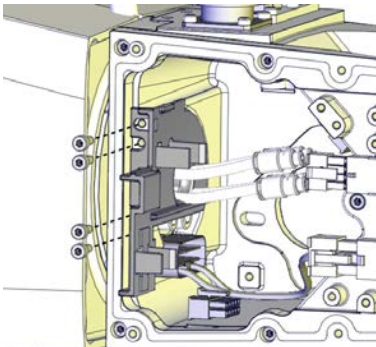
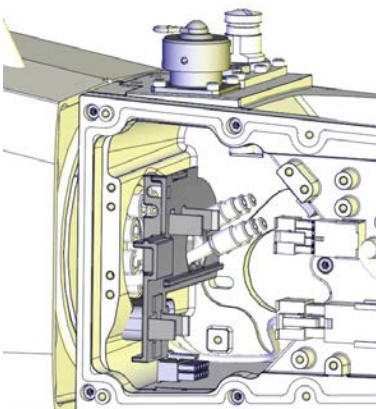
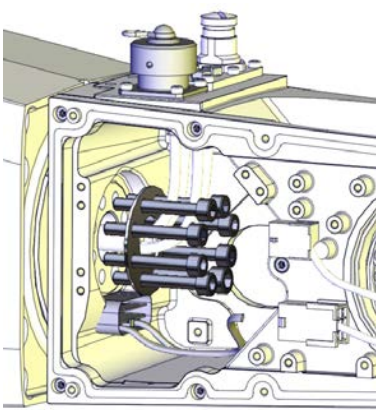
|   | Action                                    | Note   |
|---|---|--|
| 6 | Remove the screws and pull out the motor. |  <p>xx1300002352</p> |

### Removing the wrist

|   | Action  | Note  |
|---|---|---|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |   |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | Disconnect the connectors shown in the figure.  |  <p>xx1300002353</p> |
| 4 | Disconnect the air hoses.   |  <p>xx1300002355</p> |

Continues on next page

**4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley**  
*Continued*

|   | <b>Action</b>   | <b>Note</b>   |
|---|---|---|
| 5 | Remove the connector plate attachment screws.                         |  <p>xx1300002356</p>   |
| 6 | Guide the hoses through the plate hole and remove the plate.          |  <p>xx1300002357</p>  |
| 7 | Support the weight of the wrist and remove the screws and the washer. |  <p>xx1300002358</p> |


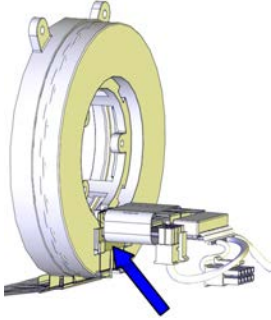
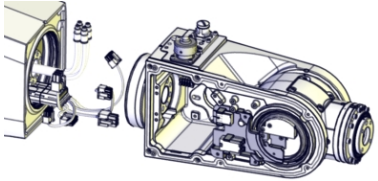
*Continues on next page*






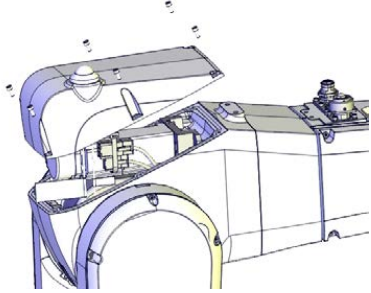
## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

|   | Action   | Note  |
|---|--|---|
| 8 | <p>Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> <b>CAUTION</b></p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p> |  <p>xx1300002359</p> |

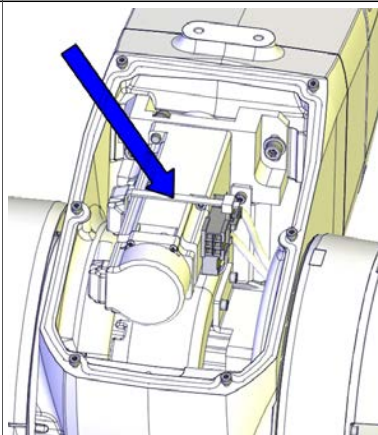

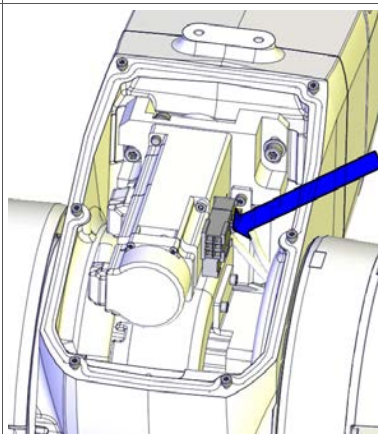
### Disconnecting the axis-4 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>  |   |
| 3 | <p>Remove the cover from the upper arm housing.</p> <p> <b>CAUTION</b></p> <p><b>For robots with safety lamp (option)</b></p> <p>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p> |  <p>xx1300000456</p> |



Continues on next page



4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action   | Note   |
|---|--|--|
| 4 | Cut the strap that holds the connectors.   |  <p>xx1300002494</p>  |
| 5 | Disconnect the motor connectors.<br><br> <b>Tip</b><br><br>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. |  <p>xx1300002495</p> |

Disconnecting the axis-4 FPC connectors

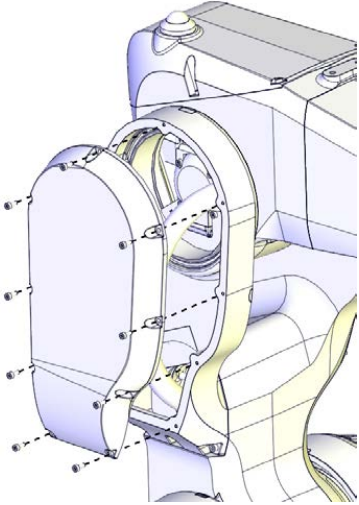
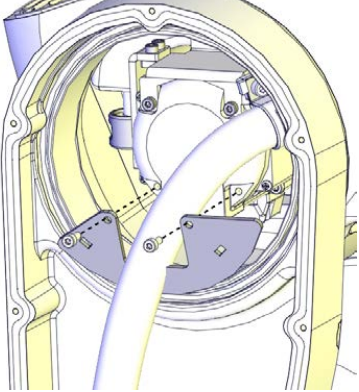
|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page

## 4 Repair

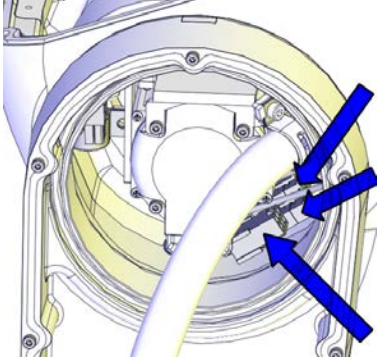
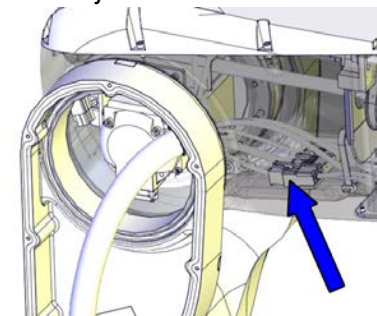
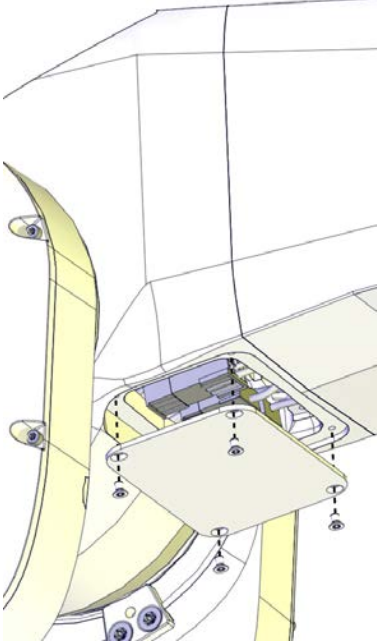
### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

*Continued*

|   | Action                          | Note   |
|---|---------------------------------|--|
| 3 | Remove the cable housing cover. | <br>xx1300002400  |
| 4 | Remove the plate.               | <br>xx1300002413 |

*Continues on next page*

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

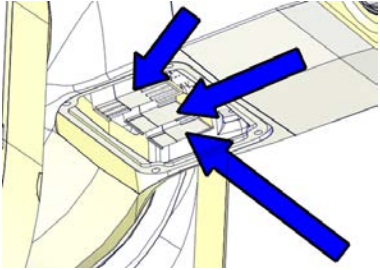
|   | Action  | Note   |
|---|---|--|
| 5 | Pull out the FPC connectors from the housing and disconnect them. | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 6 | Remove the small cover of the housing.                            |  <p>xx1300002398</p>  |

Continues on next page



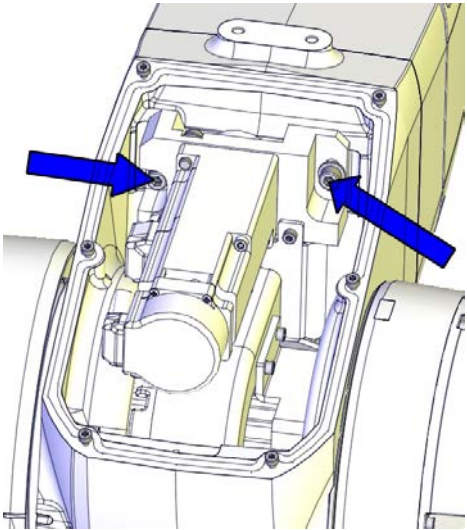
## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

|   | Action                                   | Note  |
|---|--|---|
| 7 | Disconnect the remaining FPC connectors. | <br>xx1300002399 |

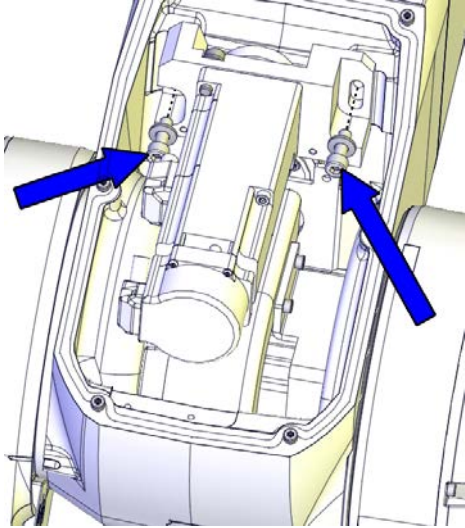
### Removing the axis-4 motor

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 3 | Loosen the two attachment screws and move the motor downwards to slacken the timing belt.  | <br>xx1300002524 |


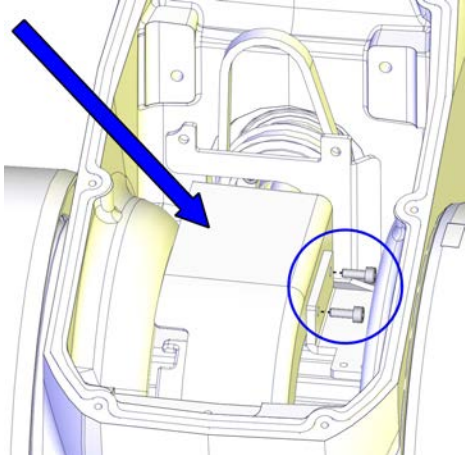
Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

|   | Action   | Note   |
|---|--|--|
| 4 | Remove the motor screws and washers and carefully lift out the motor and the pulley. |  <p>xx1300002522</p> |
| 5 | Remove the timing belt from its groove on the motor.                                 |  |

Removing the air hoses

|   | Action   | Note   |
|---|--|--|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |  |
| 2 |  |  |
| 3 | Remove the plastic protection plate by removing its screws.  |  <p>xx1400000797</p> |
| 4 | Pull in the air hoses into the housing, out from the housing extender unit.  |  |


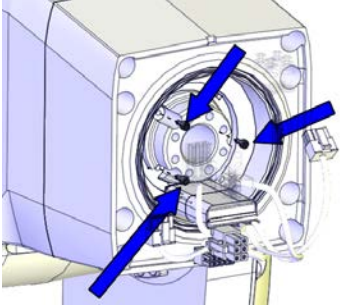
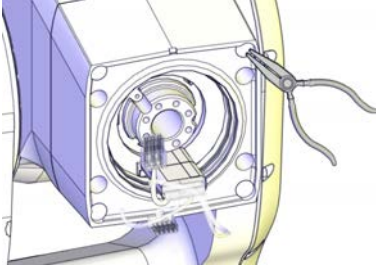
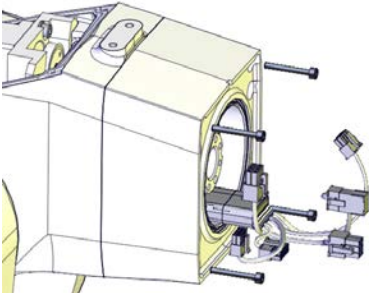
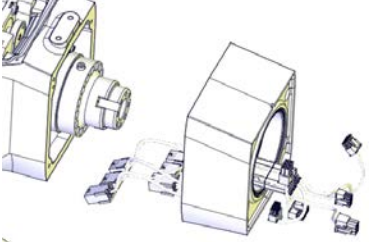
Continues on next page

## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

#### Removing the housing extender unit


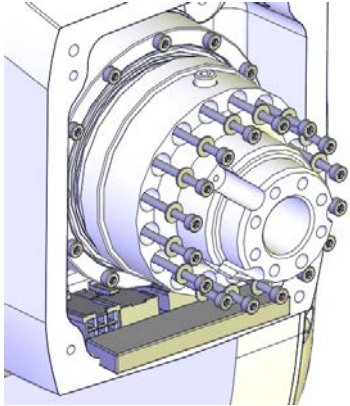
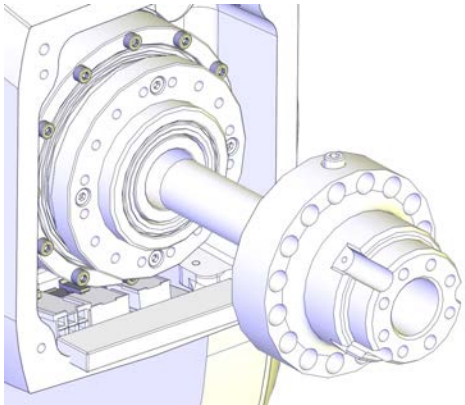
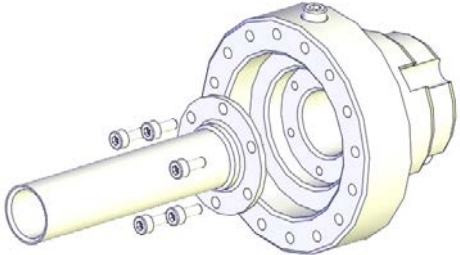
|   | Action  | Note  |
|---|---|---|
| 1 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 2 | Remove the axis-4 FPC unit screws.  |  <p>xx1300002373</p>   |
| 3 | <p><b>For robots with protection type Clean Room</b><br/> <b>For robots with protection type Foundry Plus</b><br/>           Remove the plugs covering the extender unit screws with a needle-nose plier.</p>   |  <p>xx1600000262</p>  |
| 4 | Remove the extender unit screws.  |  <p>xx1300002372</p> |
| 5 | Remove the housing extender unit. Be careful not to damage the cabling.   |  <p>xx1300002374</p> |

Continues on next page



4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

Removing the axis-4 drive shaft

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off. |  |
| 2 |   |  |
| 3 | Remove the screws and washers.  |  <p>xx1300002376</p>  |
| 4 | Remove the shaft.   |  <p>xx1400002400</p> |
| 5 | If replacing the drive shaft with a new spare part, remove the sleeve from the shaft and fit it to the new shaft.   |  <p>xx1300002387</p> |

Continues on next page


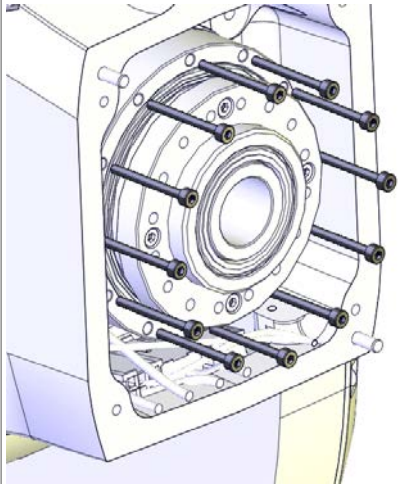
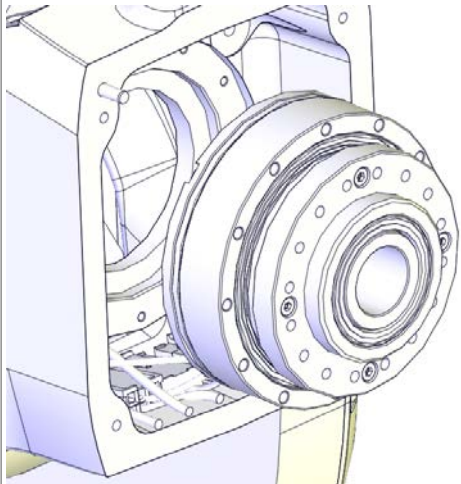


## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

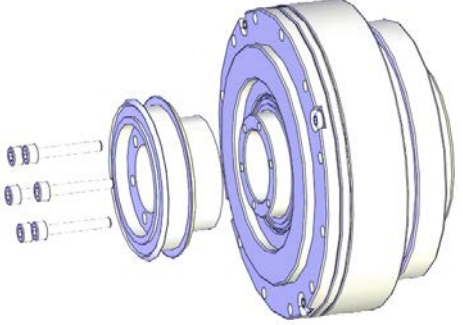
*Continued*

#### Removing the axis-4 gear unit and pulley

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off. |  |
| 2 |   |  |
| 3 | Remove the gear attachment screws.  | <br>xx1300002378  |
| 4 | Pull out the gear.  | <br>xx1300002379 |

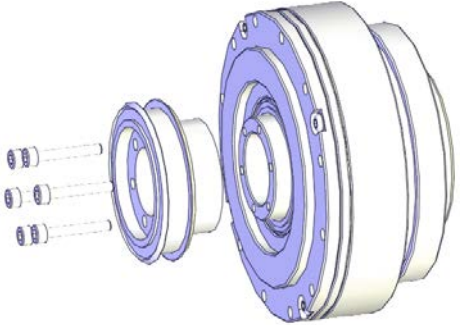

*Continues on next page*

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action   | Note   |
|---|--|--|
| 5 | Remove the pulley from the gear by removing its attachment screws. |  <p>xx1300002380</p> |

Refitting the gear unit

Refitting the axis-4 gear unit and pulley

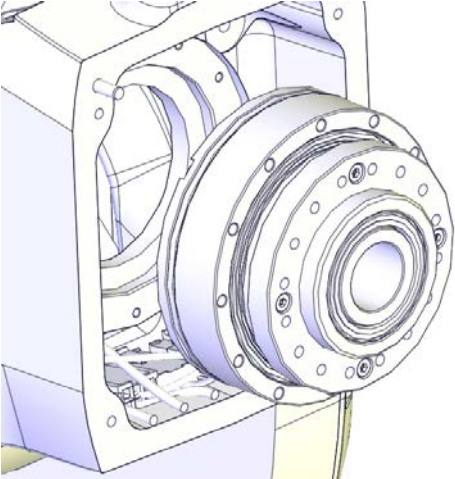
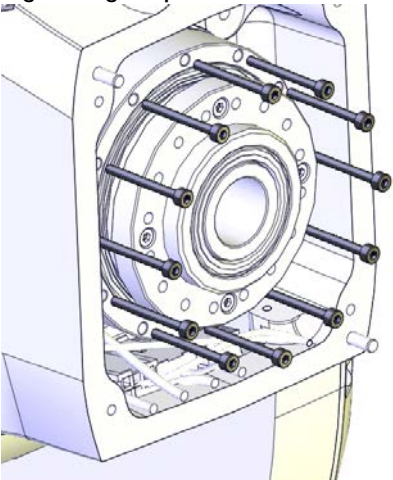


|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> |   |
| 2 | Refit the pulley to the gear and secure with its attachment screws.   | <p>Screws: 3HAB3409-209 (M3x20).<br/>Tightening torque: 1.1 Nm.</p>  <p>xx1300002380</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |

Continues on next page

## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

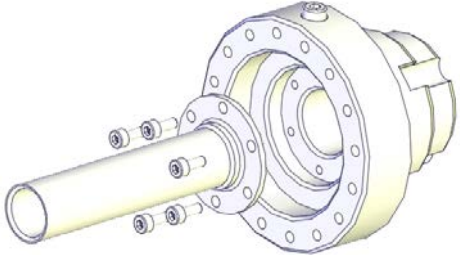
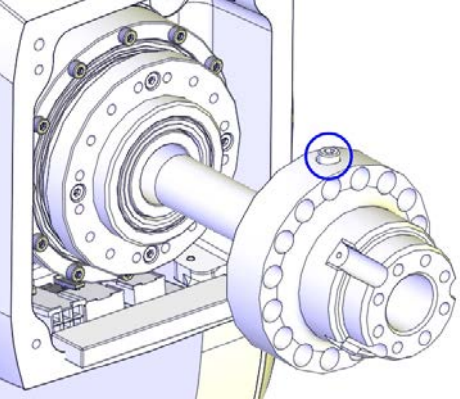
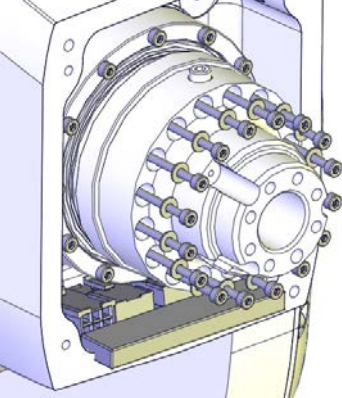

Continued

|   | Action   | Note  |
|---|--|---|
| 3 | Refit the gear to the housing.   | <br>xx1300002379  |
| 4 | Secure with the attachment screws.   | <p>Screws: 3HAB3409-211 (M3x30).<br/>Tightening torque: 1.8 Nm.</p> <br>xx1300002378         |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> | <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

Refitting the axis-4 drive shaft


|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>   |   |
| 2 | If replacing the drive shaft with a new spare part, remove the sleeve from the old shaft and fit it to the new shaft.<br>Also move the screw on top of the old drive shaft to the new shaft. | Screws: 3HAB3409-207 (M3x8).<br>Tightening torque: 1.5 Nm.<br><br>xx1300002387  |
| 3 | Position the shaft so that the encircled screw is on top, then refit the shaft.  | <br>xx1300002377   |
| 4 | Secure with screws and washers.  | Screws: 3HAB3409-210 (M3x25).<br>Tightening torque: 1.8 Nm.<br><br>xx1300002376<br> <b>Note</b><br>Only use specified screws, never replace them with other screws. |

Continues on next page


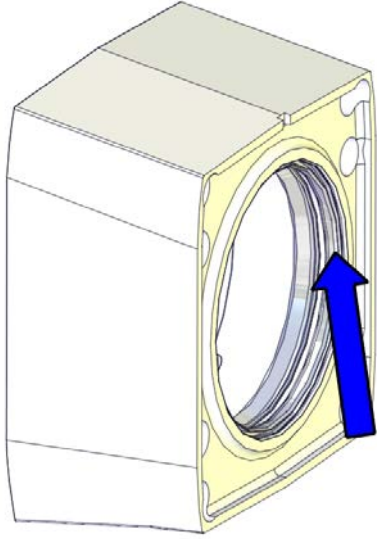
## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

*Continued*

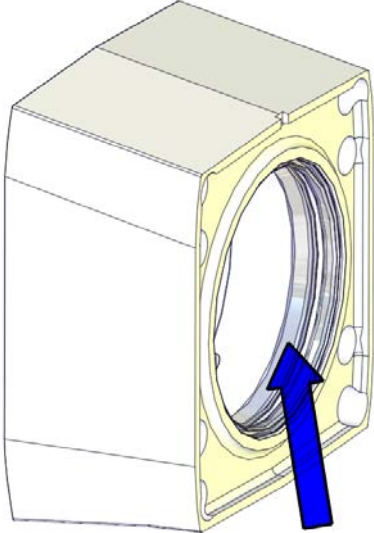
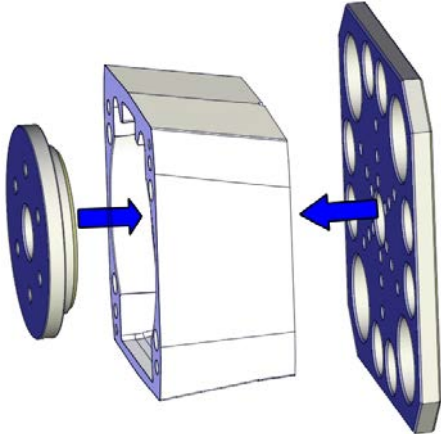
|   | Action  | Note |
|---|---|------|
| 5 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |      |

#### Checking the housing extender sealings

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>Check the sealing.<br>Replace if damaged.<br><br> <b>CAUTION</b><br><br>Do not fit M2 variseal sealing on Clean Room robots. | M2 variseal sealing: 3HAC044641-007<br><br><br><br>xx1300002418 |

*Continues on next page*

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action   | Note  |
|---|--|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Check the radial sealing.<br/>Replace if damaged, as described below.<br/>In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.</p> | <p>Radial sealing with dust lip: 3HAB3701-48</p>  <p>xx140000438</p> |
| 4 | <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>  |   |
| 5 | <p>Fit the radial sealing into the housing extender unit.</p>  |   |
| 6 | <p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>   | <p>Axis-4 sealing assembly tool set: 3HAC049699-001</p>   |
| 7 | <p>Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.</p>  |  <p>xx140000436</p>   |

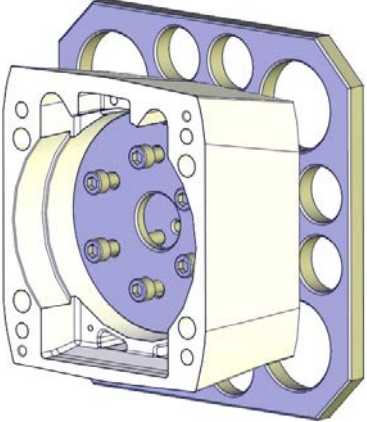

Continues on next page



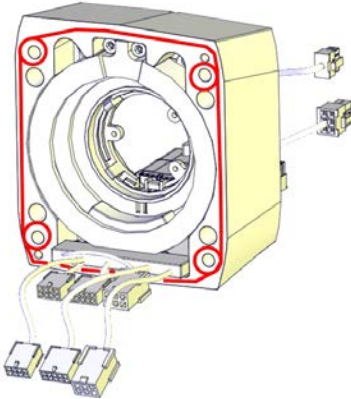

## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

|    | Action  | Note   |
|----|---|--|
| 8  | Screw the screws, little by little, to press the sealing into place.  |  <p>xx140000437</p>   |
| 9  | Remove the assembly tool.   |  |
| 10 | Check that the sealing is undamaged and properly fitted.  |  |
| 11 | Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.   |  |
| 12 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |

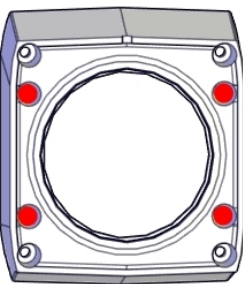


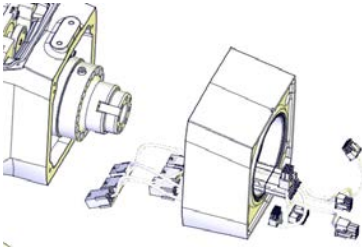
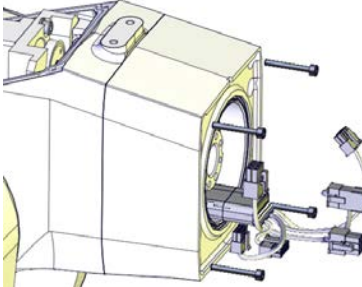
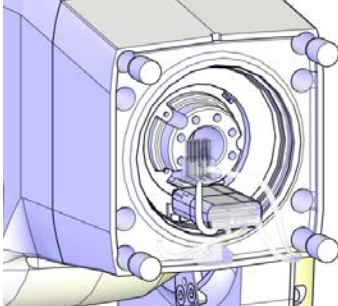
#### Refitting the housing extender unit

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br>Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit. |  <p>xx1300002613</p>  <b>Note</b><br>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any. |

Continues on next page



4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

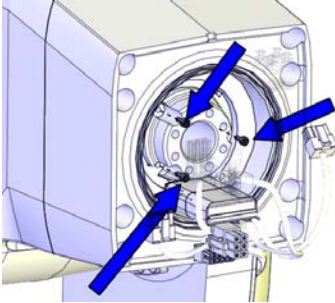

|   | Action   | Note   |
|---|--|--|
| 3 | <p>For robots with protection type Clean Room<br/>For robots with protection type Foundry Plus<br/>Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.</p>   |  <p>xx160000216</p>   |
| 4 | <p>Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling.</p> <p> <b>CAUTION</b></p> <p>Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit.</p> <p> <b>Note</b></p> <p>Mate the unit to the two locating pins attached to the housing.</p> |  <p>xx1300002374</p>  |
| 5 | <p>Secure with screws and washers, using locking liquid Loctite 243.</p>   | <p>Screws: M4x30.<br/>Tightening torque: 2.7 Nm.</p>  <p>xx1300002372</p> |
| 6 | <p>For robots with protection type Foundry Plus (option 287-3)<br/>For robots with protection type Clean Room<br/>For robots with food grade lubrication<br/>Press in screw sealing plugs to cover the screws.</p>   | <p>Screw sealing plug: 3HAC053685-001</p>  <p>xx160000263</p>             |

Continues on next page


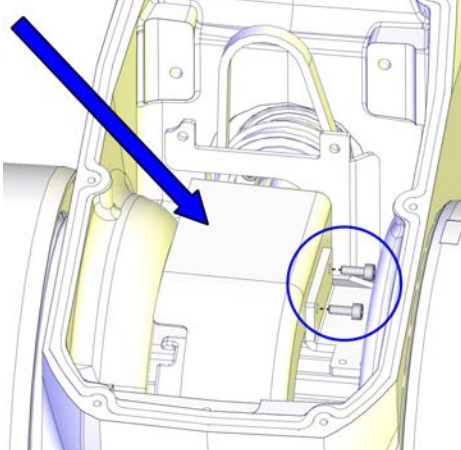
## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued


|   | Action   | Note  |
|---|--|---|
| 7 | Fit and secure the axis-4 FPC unit screws.   | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002373</p> |
| 8 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

### Refitting the axis-4 timing belt and the air hoses

|   | Action   | Note  |
|---|--|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |   |
| 2 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 3 | Place the timing belt at the gear pulley and run the air hoses through the belt.   |   |
| 4 | Install the air hoses in and through the housing extender unit.  |   |
| 5 | Refit the plastic protection plate with its screws.  |  <p>xx140000797</p> |

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action   | Note |
|---|--|------|
| 6 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |      |

## Securing the axis-4 motor

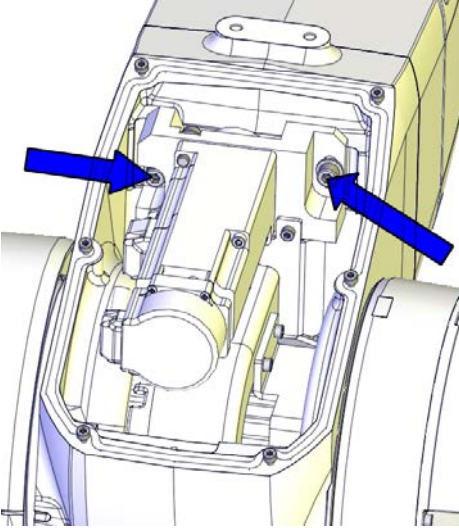

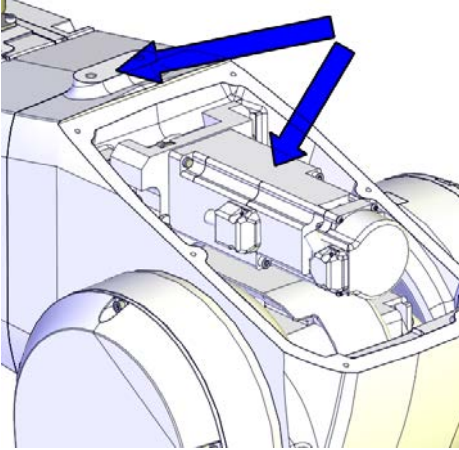
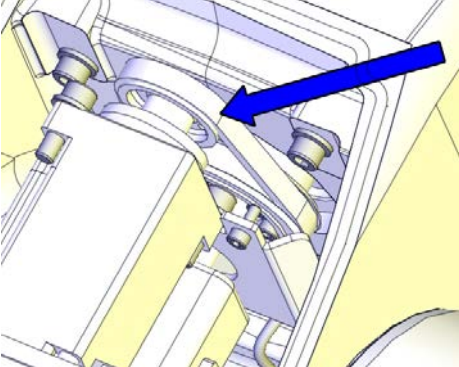
|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>                               |      |
| 2 | <p>Check that:</p> <ul style="list-style-type: none"> <li>• all assembly surfaces are clean and undamaged.</li> <li>• the motor is clean and undamaged.</li> </ul> |      |
| 3 | Fit the timing belt to the motor pulley.   |      |

Continues on next page

## 4 Repair


### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued


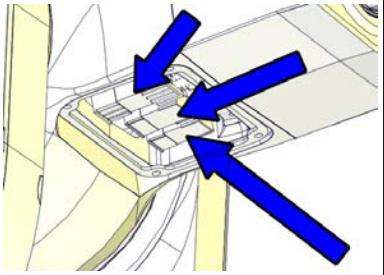
|   | Action  | Note  |
|---|---|---|
| 4 | <p>Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.</p> <p>Position the robot with the connectors directed as shown in the figure.</p> <p>Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.</p> | <p>Screws: 3HAB3409-14 (M5x16).</p>  <p>xx1300002524</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p>  <p>xx1300002612</p> |
| 5 | <p>Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.</p>  |  <p>xx1300002525</p>  |

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action   | Note                               |
|---|--|------------------------------------|
| 6 | Move the motor to achieve correct belt tension ( $F = 30\text{ N}$ ).  | Belt tension: $F = 30\text{ N}$ .  |
| 7 | Secure the motor with its attachment screws.   | Tightening torque: $6\text{ Nm}$ . |
| 8 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |                                    |

Connecting the axis-4 FPC connectors


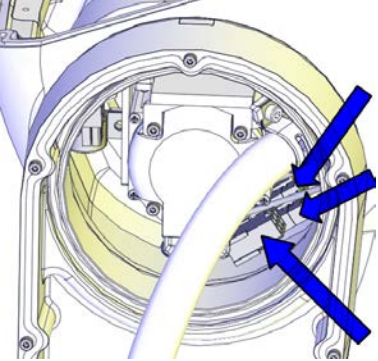
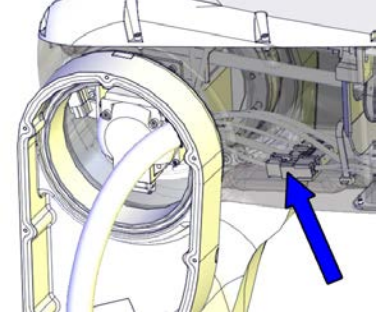
|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | <p>Reconnect the FPC connectors.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> |  <p>xx1300002399</p> |

Continues on next page

## 4 Repair

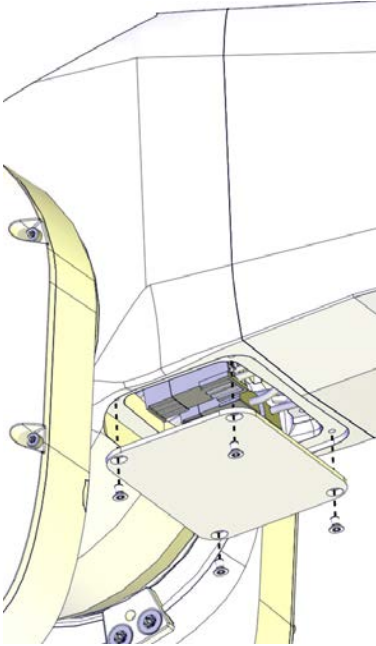
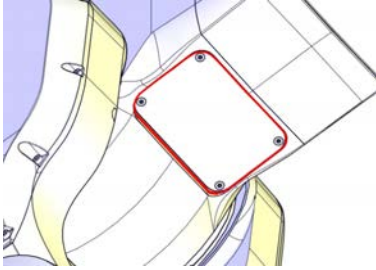
### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

*Continued*

|   | Action  | Note   |
|---|---|--|
| 3 | <p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> <b>Tip</b></p> <p>See the number markings on the connectors for help to find the corresponding connector.</p> | <p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p> |
| 4 | Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.   |  |

*Continues on next page*

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action  | Note   |
|---|---|--|
| 5 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>  |  <p>xx1300002398</p>  |
| 6 | <p>Refit the small cover to the housing.</p> <p>Replace if damaged.</p>   | <p>Housing small cover: 3HAC059684-001</p> <p>: 3HAC056142-001 (used with protection type Clean Room)</p> <p>Housing small cover, Clean Room</p> <p>Housing small cover, food grade lubrication</p> <p>Screws: 3HAC14286-4 (M3X5).</p> <p>Tightening torque: 1 Nm.</p> |
| 7 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the small cover on the housing.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx1600000214</p>  |

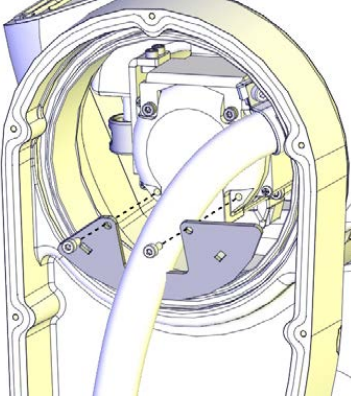
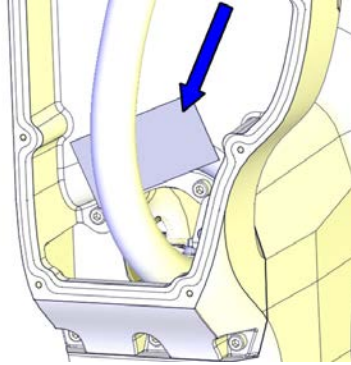
Continues on next page



## 4 Repair

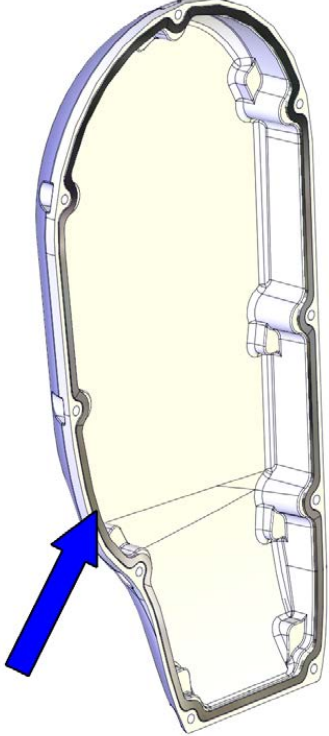
### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

*Continued*

|   | Action   | Note   |
|---|--|--|
| 8 | Refit the plate.   | <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>                            |
| 9 | Check the PTFE film on the cable housing.<br>Replace if damaged. | <p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p> |

*Continues on next page*

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

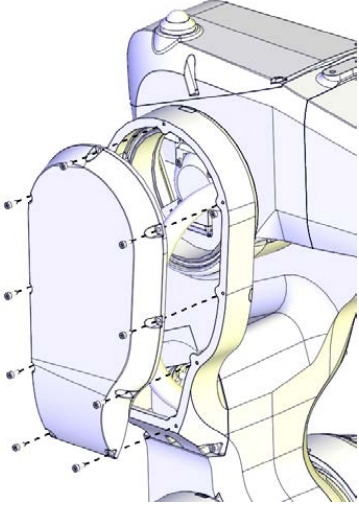


|    | Action   | Note   |
|----|--|--|
| 10 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the gasket of the cable housing cover.<br/>                     Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001<br/>                     PTFE film on cable housing cover:<br/>3HAC044660-001</p>  <p>xx140000048</p> |
| 11 | <p>Check the PTFE film on the cable housing cover.<br/>                     Replace if damaged.</p>  |  |
| 12 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>   |  |

Continues on next page


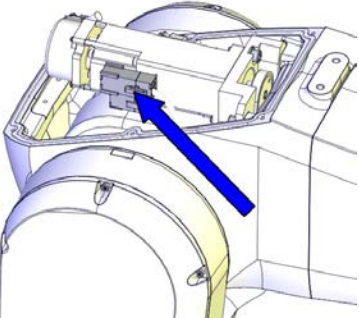
## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

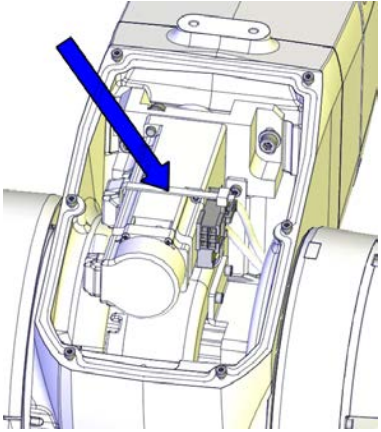
|    | Action  | Note   |
|----|---|--|
| 13 | <p>Refit the cable housing cover.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p><b>For robots with protection type Clean Room</b></p> <p><b>For robots with food grade lubrication</b></p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 14 | <p>Seal and paint the joints that have been opened.</p> <p>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>           |  |

### Connecting the axis-4 motor connectors


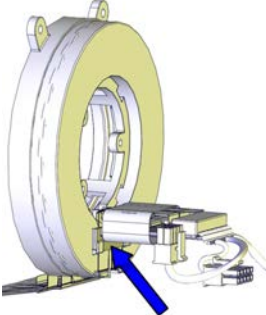
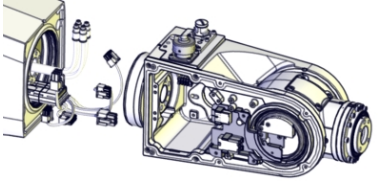
|   | Action   | Note  |
|---|--|---|
| 1 | <p>Reconnect the motor connectors.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002371</p> |

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action   | Note  |
|---|--|---|
| 2 | Secure the connectors to the motor with a cable strap. |  <p>xx1300002494</p> |

Refitting the wrist

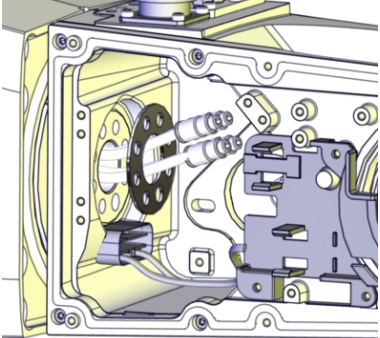
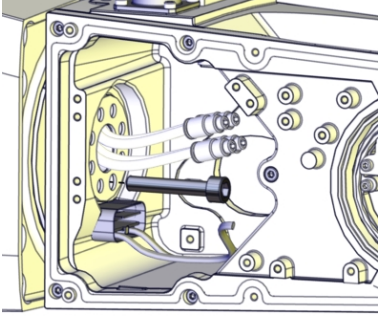

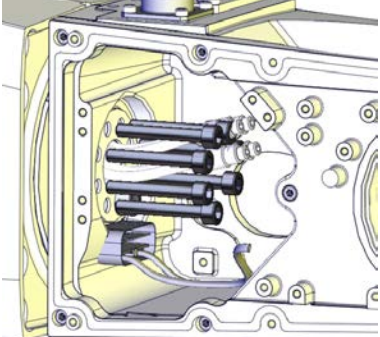

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | <p>Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> <b>CAUTION</b></p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p> |  <p>xx1300002359</p> |

Continues on next page

## 4 Repair

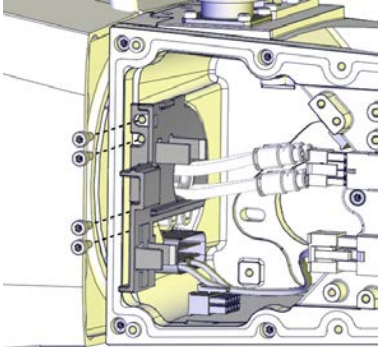

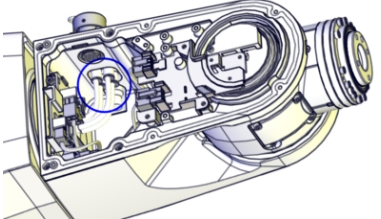
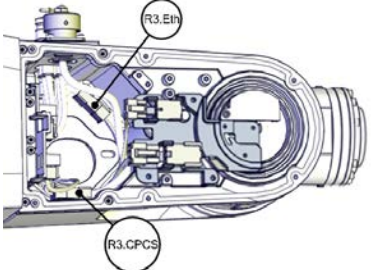

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

|   | Action  | Note  |
|---|---|---|
| 3 | <p>Refit the washer while at the same time putting the cables through its center.<br/>Replace washer, if damaged.</p> | <p>Washer: 3HAC044869-001</p>  <p>xx140000001</p>  |
| 4 | <p>Refit the screw M6x35 (1 pc). Do not tighten yet.</p>  | <p>Screw: 3HAB3409-238 (M6x35 (1 pc)).</p>  <p>xx140000002</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p>   |
| 5 | <p>Refit the rest of the screws (M5x35 (7 pcs)).</p>  | <p>Screw: 3HAB3409-237 (M5x35 (7 pcs)).</p>  <p>xx140000003</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 6 | <p>Tighten all screws.</p>  | <p>Tightening torque: 8 Nm.</p>   |

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|    | Action  | Note  |
|----|---|---|
| 7  | Put the cables through the plate hole and refit the plate.  | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002356</p> |
| 8  | <p>Reconnect the air hoses.</p> <p> <b>CAUTION</b></p> <p>Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.</p>  |  <p>xx1300002355</p>                                   |
| 9  | <p>Reconnect the connectors.</p> <ul style="list-style-type: none"> <li>• R3.Eth</li> <li>• R3.CPCS</li> </ul>  |  <p>xx1300002353</p>                                 |
| 10 | <p>Seal and paint the joints that have been opened. See <i>Cut the paint or surface on the robot before replacing parts on page 136</i></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |


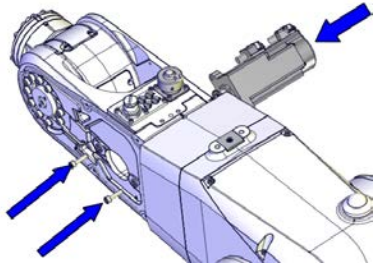

Continues on next page

## 4 Repair

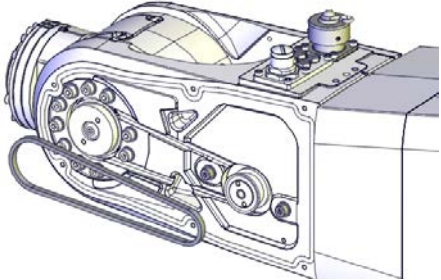

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

#### Preparations before securing the axis-5 motor

|   | Action  | Note  |
|---|---|---|
| 1 | <p>Check that:</p> <ul style="list-style-type: none"> <li>• all assembly surfaces are clean and without damages</li> <li>• the motor is clean and undamaged.</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 2 | <p>Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.</p>  | <p>Screws: 3HAB3409-212 (M4x16).</p>  <p>xx1300002463</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

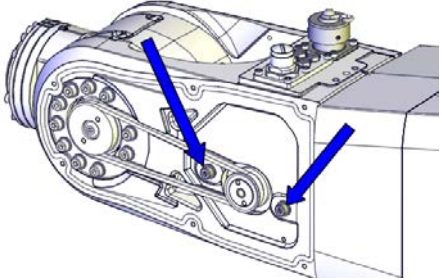

#### Securing the axis-5 motor and timing belt

|   | Action  | Note  |
|---|---|---|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> |   |
| 2 | <p>Refit the timing belt on the pulley.</p>   |  <p>xx1300002351</p>  |
| 3 | <p>Move the motor to a position where a good timing belt tension is reached (<math>F = 26 \text{ N}</math>).</p>                            | <p> <b>Note</b></p> <p>Do not stretch the timing belt too much!</p> |


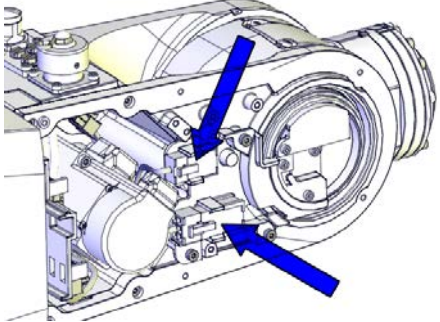
Continues on next page




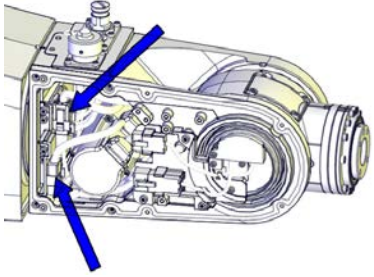
4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action  | Note   |
|---|---|--|
| 4 | Secure the motor with its attachment screws.  |  <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p> |
| 5 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

Connecting the axis-5 motor FPC connectors

|   | Action   | Note  |
|---|--|---|
| 1 | Connect the axis-5 FPC connectors and snap them to their holders.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  <p>xx1300002390</p> |

Connecting the axis-5 motor connectors

|   | Action  | Note  |
|---|---|---|
| 1 | Reconnect the motor cables. <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  <p>xx1300002360</p> |

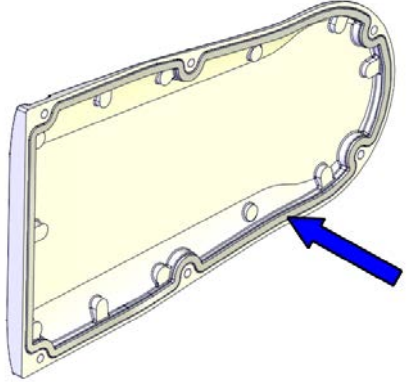
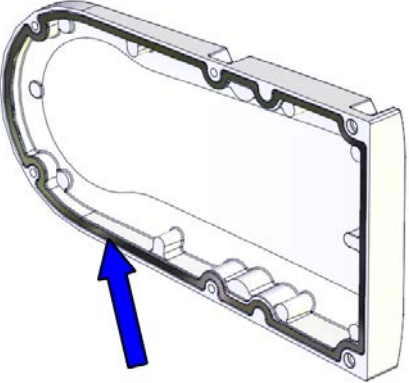
Continues on next page

## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

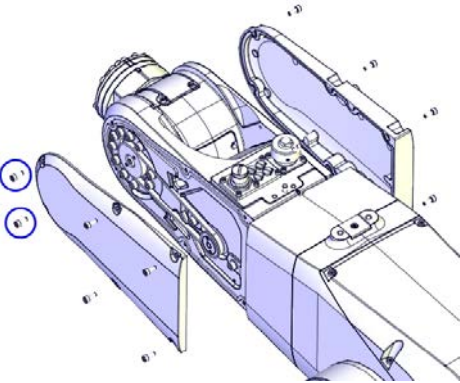
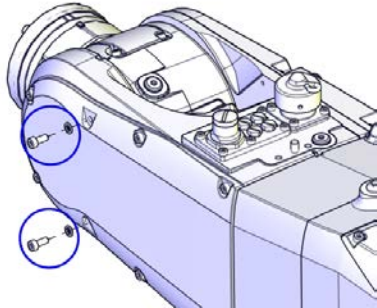


*Continued*

#### Refitting the wrist covers

|   | Action   | Note   |
|---|--|--|
| 1 | Clean the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i>   |  |
| 2 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br><b>For robots with protection type Clean Room</b><br><b>For robots with food grade lubrication</b><br>Check the tubular cover gasket.<br>Replace if damaged.               | Gasket for tubular cover: 3HAC058822-001<br><br>xx140000034                  |
| 3 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br><b>For robots with protection type Clean Room</b><br><b>For robots with food grade lubrication</b><br>Check the tubular cable housing cover gasket.<br>Replace if damaged. | Gasket for tubular cable housing cover: 3HAC056707-001<br><br>xx1400000345 |

*Continues on next page*

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley  
Continued

|   | Action  | Note  |
|---|---|---|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |   |

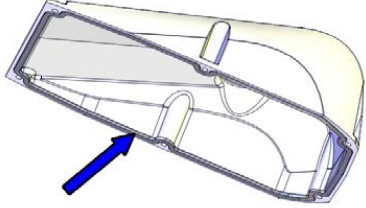
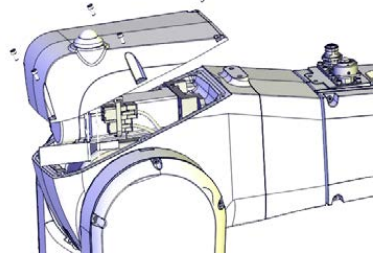

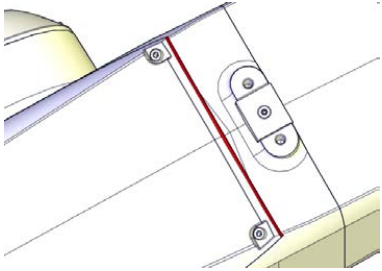


Continues on next page

## 4 Repair

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley


Continued

#### Concluding procedure

|   | Action   | Note  |
|---|--|---|
| 1 | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)<br/>           For robots with protection type Clean Room<br/>           For robots with food grade lubrication<br/>           Check the gasket.<br/>           Replace if damaged.</p>  | <p>Housing cover gasket (IRB 1200-7/0.7 ): 3HAC056698-001<br/>           Housing cover gasket (IRB 1200-5/0.9 ): 3HAC056697-001</p>  <p>xx1400000477</p>   |
| 2 | <p>Refit the upper arm housing cover with the screws.</p>  | <p>Screws: 3HAB3409-207 (M3x8).<br/>           Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 3 | <p>For robots with protection type Clean Room<br/>           Apply a string of the sealant Sikaflex 521FC to the joint of the upper arm housing cover.<br/>           Smooth out the sealant string using a finger tip.<br/>           Use washing-up on finger tips to get a smooth joint.<br/>           If necessary, add extra sealant to get a full cover joint.</p>  |  <p>xx1600000215</p>   |
| 4 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |   |

Continues on next page

### 4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley *Continued*

|   | Action   | Note   |
|---|--|--|
| 5 | Recalibrate the robot.   | Calibration is detailed in section <a href="#">Calibration on page 729</a> . |
| 6 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run. |  |

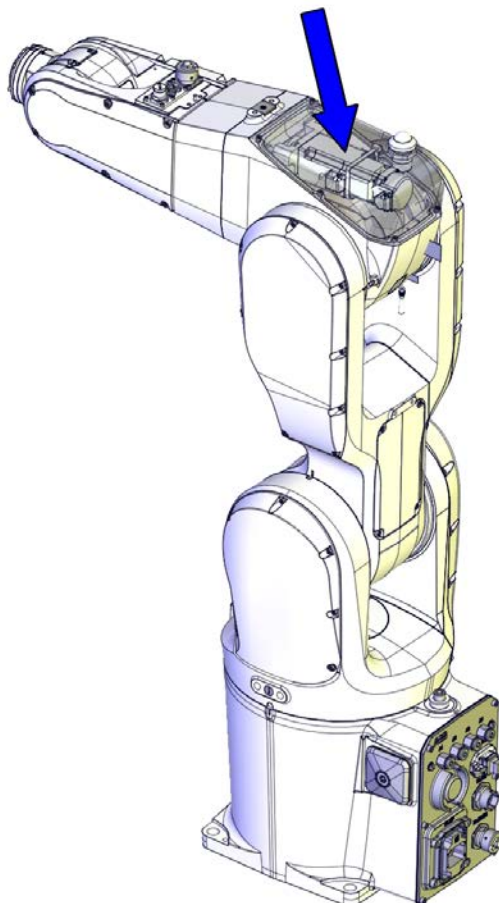
## 4 Repair

### 4.6.5 Replacing the axis-4 motor with pulley

### 4.6.5 Replacing the axis-4 motor with pulley

#### Location of motor

The axis-4 motor is located as shown in the figure.



xx1300002474

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                               | Article number | Note   |
|--|----------------|--|
| Motor with pulley                        | 3HAC045827-001 |  |
| Motor with pulley, SafeMove 2-supported. | 3HAC061277-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> . |
| Motor flange                             | 3HAC047479-001 | Replace if damaged.  |
| Motor bracket                            | 3HAC044689-001 | Replace if damaged.  |

Continues on next page

4.6.5 Replacing the axis-4 motor with pulley  
*Continued*

| Spare part                             | Article number | Note  |
|--|----------------|---|
| Housing cover gasket (IRB 1200-7/0.7 ) | 3HAC056698-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Housing cover gasket (IRB 1200-5/0.9 ) | 3HAC056697-001 | Not used with protection class IP40.<br>Replace if damaged. |

**Required tools and equipment**

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |


- <sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

**Required consumables**

| Consumable     | Art. no.       | Note   |
|----------------|----------------|--|
| Cleaning agent | -              | Isopropanol  |
| Cable straps   | -              |  |
| Sealant        | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room |

**Deciding calibration routine**

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action   | Note   |
|---|--|--|
| 1 | Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul> |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool. |

*Continues on next page*



## 4 Repair

### 4.6.5 Replacing the axis-4 motor with pulley


*Continued*

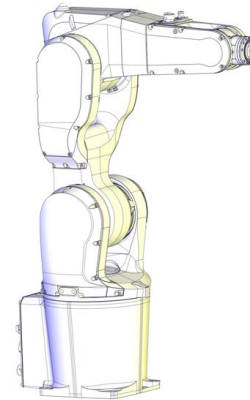
| Action  | Note  |
|---|---|
| <p><b>If the robot is to be calibrated with reference calibration:</b><br/>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |
| <p><b>If the robot is to be calibrated with fine calibration:</b><br/>Remove all external cable packages (DressPack) and tools from the robot.</p>  |   |

### Removing the motor with pulley

Use these procedures to remove the motor.

#### Preparations before removing the axis-4 motor




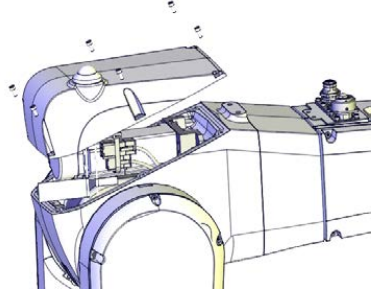
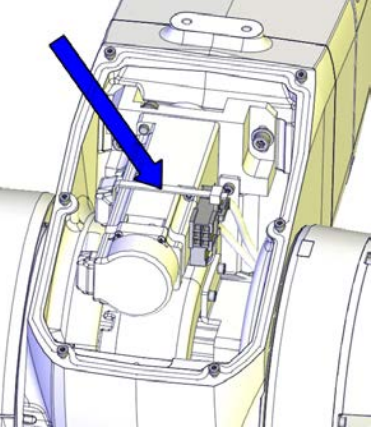
| Action | Note   |
|--------|--|
| 1      | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.   |
| 2      | Jog all axes to zero position.   |
| 3      |  <p><b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |



xx1300002581

*Continues on next page*

Disconnecting the axis-4 motor connectors


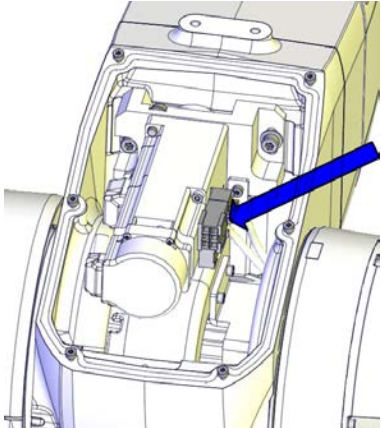
|   | Action   | Note  |
|---|--|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |   |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .  |   |
| 3 | Remove the cover from the upper arm housing.<br><br> <b>CAUTION</b><br>For robots with safety lamp (option)<br>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely. |  <p>xx1300000456</p>  |
| 4 | Cut the strap that holds the connectors.   |  <p>xx1300002494</p> |

Continues on next page



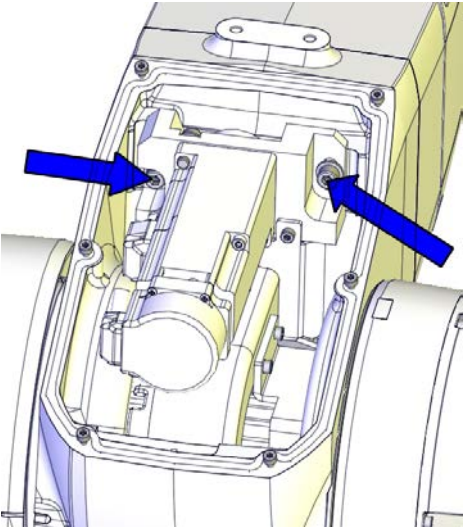
## 4 Repair

### 4.6.5 Replacing the axis-4 motor with pulley

Continued

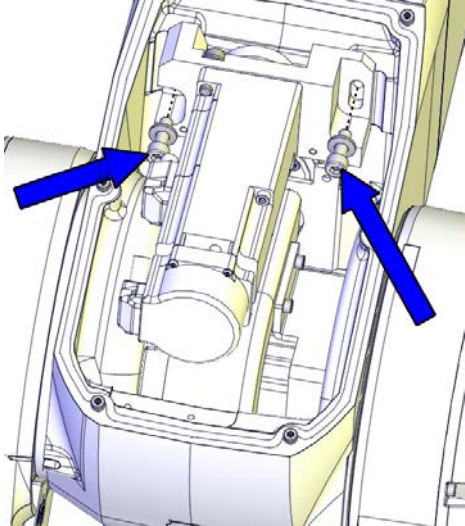
|   | Action  | Note  |
|---|---|---|
| 5 | <p>Disconnect the motor connectors.</p> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> |  <p>xx1300002495</p> |

### Removing the axis-4 motor



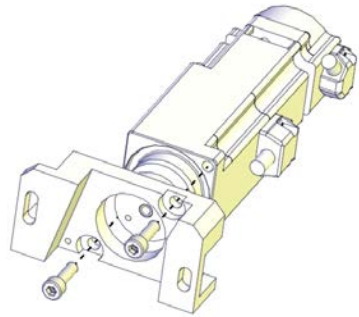
|   | Action  | Note   |
|---|---|--|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |  |
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  |
| 3 | <p>Loosen the two attachment screws and move the motor downwards to slacken the timing belt.</p>  |  <p>xx1300002524</p> |

Continues on next page

4.6.5 Replacing the axis-4 motor with pulley  
Continued

|   | Action   | Note   |
|---|--|--|
| 4 | Remove the motor screws and washers and carefully lift out the motor and the pulley. |  <p>xx1300002522</p> |
| 5 | Remove the timing belt from its groove on the motor.                                 |  |

Separating the axis-4 motor from the motor flange

|   | Action  | Note  |
|---|---|---|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>  |   |
| 2 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |   |
| 3 | Remove the motor flange and bracket from the motor by removing the screws.  |  <p>xx1300002523</p> |

Continues on next page

## 4 Repair

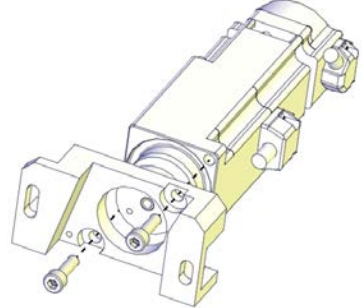


### 4.6.5 Replacing the axis-4 motor with pulley

*Continued*

#### Refitting the motor with pulley

Use these procedures to refit the motor.

#### Fitting the axis-4 motor to the motor flange

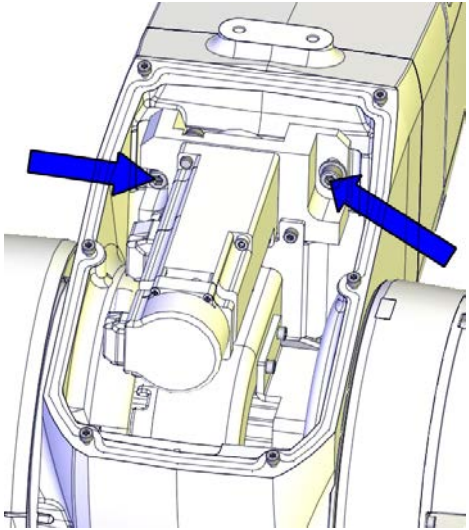

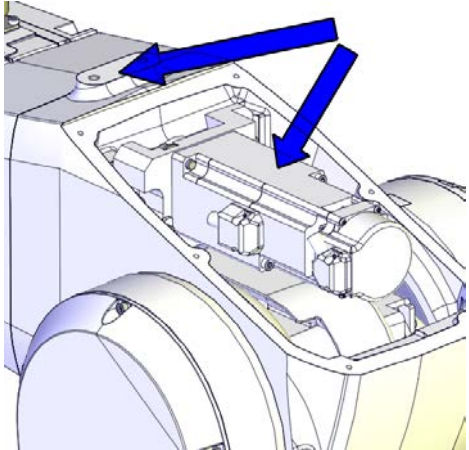
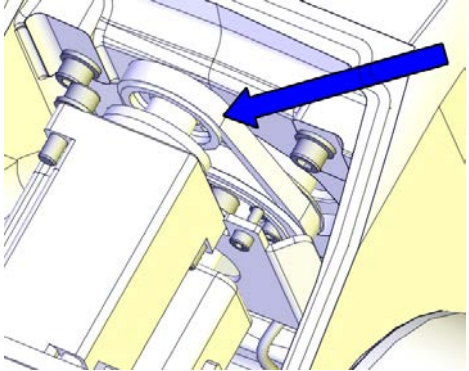
|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |   |
| 2 | Refit the motor flange and bracket to the motor with the screws.<br>Replace the flange if damaged.   | <p>Motor flange: 3HAC047479-001<br/>Screws: 3HAB3409-14 (M5x16).<br/>Tightening torque: 6 Nm.</p>  <p>xx1300002523</p> <p> <b>Note</b><br/>Only use specified screws, never replace them with other screws.</p> |
| 3 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |   |
|   | <p> <b>Note</b><br/>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |   |

#### Securing the axis-4 motor

|   | Action  | Note |
|---|---|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>                        |      |
| 2 | Check that: <ul style="list-style-type: none"> <li>• all assembly surfaces are clean and undamaged.</li> <li>• the motor is clean and undamaged.</li> </ul> |      |
| 3 | Fit the timing belt to the motor pulley.  |      |

*Continues on next page*

4.6.5 Replacing the axis-4 motor with pulley  
Continued

|   | Action  | Note   |
|---|---|--|
| 4 | <p>Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.</p> <p>Position the robot with the connectors directed as shown in the figure.</p> <p>Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.</p> | <p>Screws: 3HAB3409-14 (M5x16).</p>  <p>xx130000254</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p>  <p>xx1300002612</p> |
| 5 | <p>Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.</p>  |  <p>xx1300002525</p>   |


Continues on next page




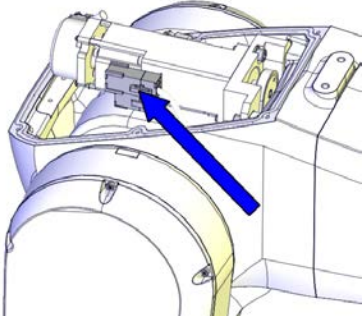
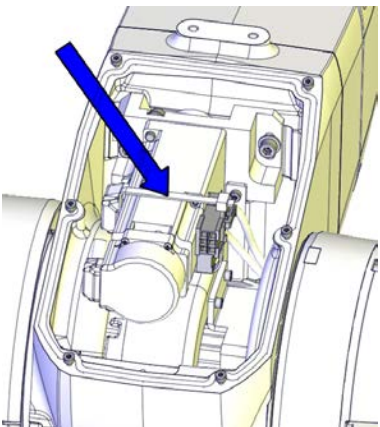
## 4 Repair

### 4.6.5 Replacing the axis-4 motor with pulley

Continued

|   | Action  | Note                               |
|---|---|------------------------------------|
| 6 | Move the motor to achieve correct belt tension ( $F = 30\text{ N}$ ).   | Belt tension: $F = 30\text{ N}$ .  |
| 7 | Secure the motor with its attachment screws.  | Tightening torque: $6\text{ Nm}$ . |
| 8 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |                                    |

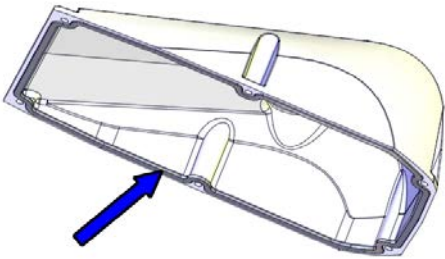
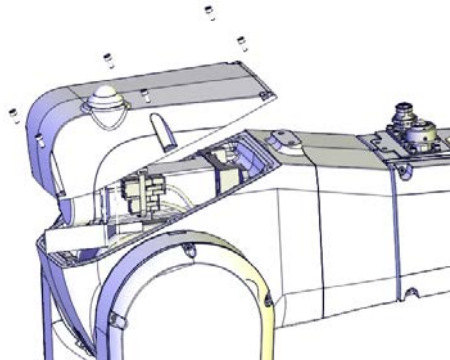

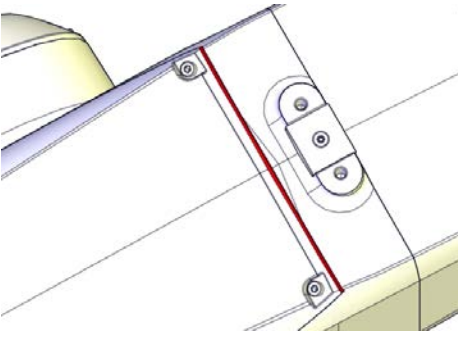
#### Connecting the axis-4 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | Reconnect the motor connectors.<br><br> <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br><br>xx1300002371  |
| 2 | Secure the connectors to the motor with a cable strap.   | <br><br>xx1300002494 |

Continues on next page



Concluding procedure




|   | Action   | Note   |
|---|--|--|
| 1 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>  | <p>Housing cover gasket (IRB 1200-7/0.7 ): 3HAC056698-001</p> <p>Housing cover gasket (IRB 1200-5/0.9 ): 3HAC056697-001</p>  <p>xx140000477</p>  |
| 2 | <p>Refit the upper arm housing cover with the screws.</p>  | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx130000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 3 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx160000215</p>  |

Continues on next page

## 4 Repair

### 4.6.5 Replacing the axis-4 motor with pulley

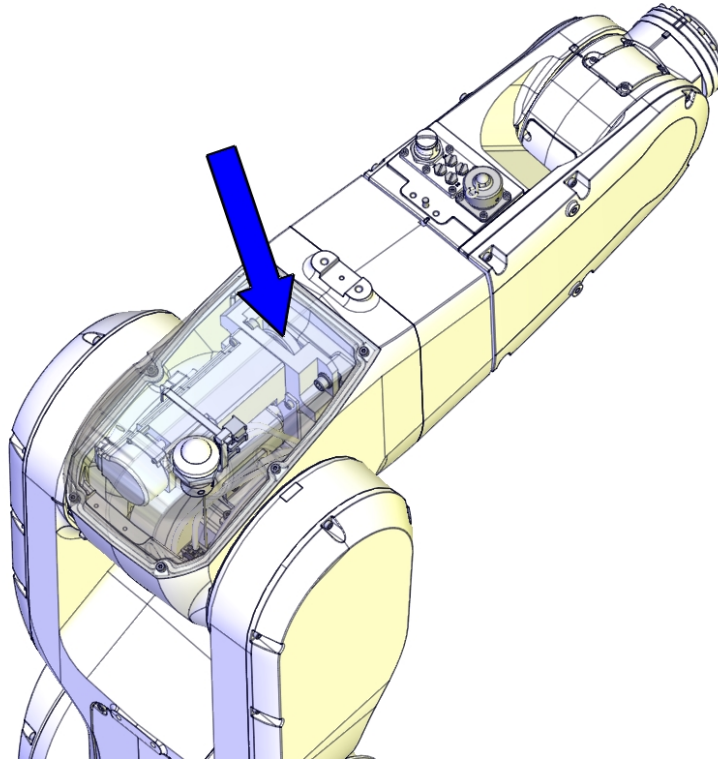
*Continued*

|   | Action   | Note   |
|---|--|--|
| 4 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .<br><br> <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth. |  |
| 5 | Recalibrate the robot.   | Calibration information is included in section <a href="#">Calibration on page 729</a> . |
| 6 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run.   |  |

## 4.6.6 Replacing the axis-4 timing belt

### Location of timing belt

The axis-4 timing belt is located as shown in the figure.



xx140000036

### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part                             | Article number | Note  |
|--|----------------|---|
| Timing belt                            | 3HAC044694-001 |   |
| Gasket on cable housing cover          | 3HAC056724-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Housing cover gasket (IRB 1200-7/0.7 ) | 3HAC056698-001 | Not used with protection class IP40.<br>Replace if damaged. |
| Housing cover gasket (IRB 1200-5/0.9 ) | 3HAC056697-001 | Not used with protection class IP40.<br>Replace if damaged. |

*Continues on next page*

## 4 Repair

### 4.6.6 Replacing the axis-4 timing belt

Continued

| Spare part  | Article number | Note   |
|---|----------------|--|
| Gasket for tubular cable housing cover            | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.                    |
| Air connector set with Ethernet hole in flange    | 3HAC049664-001 | Includes tubular flange, air connectors and seal bolts.<br>Replace if damaged. |
| Air connector set without Ethernet hole in flange | 3HAC049665-001 | Includes tubular flange, air connectors and seal bolts.<br>Replace if damaged. |

#### Required tools and equipment


| Equipment, etc.     | Article number | Note   |
|---------------------|----------------|--|
| 24 VDC power supply | -              | Used to release the motor brakes.  |
| Standard toolkit    | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

#### Required consumables

| Consumable     | Art. no.       | Note   |
|----------------|----------------|--|
| Cleaning agent | -              | Isopropanol  |
| Cable straps   | -              |  |
| Sealant        | 3HAC026759-001 | Sikaflex 521FC<br>For robots with protection type Clean Room |
| Locking liquid | 3HAB7116-1     | Loctite 243  |

#### Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.                            |
|   | <p><b>If the robot is to be calibrated with reference calibration:</b></p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |

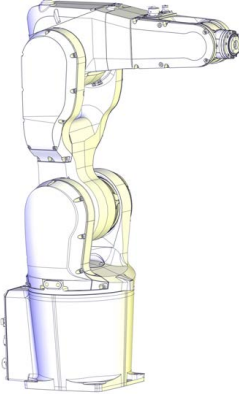


Continues on next page

| Action   | Note |
|--|------|
| <p><b>If the robot is to be calibrated with fine calibration:</b><br/>Remove all external cable packages (DressPack) and tools from the robot.</p> |      |

#### Removing the timing belt

Use these procedures to remove the axis-4 timing belt.

#### Preparations before removing the axis-4 timing belt

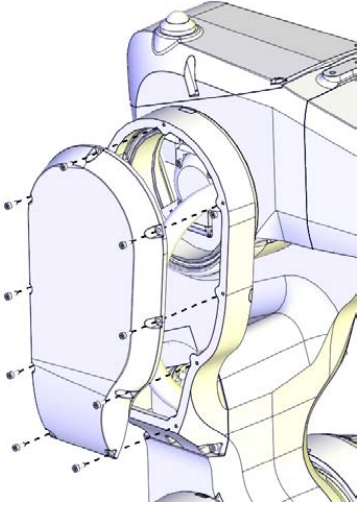
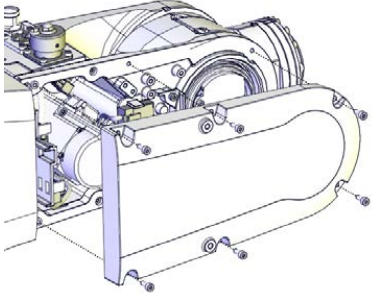
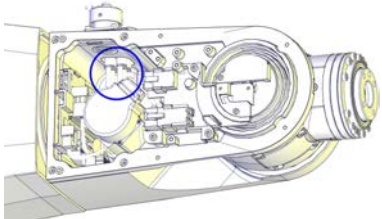
|   | Action   | Note   |
|---|--|--|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.   |  |
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 3 |  <p><b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |  |
| 4 |  <p><b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>                                      |  |

*Continues on next page*


## 4 Repair

### 4.6.6 Replacing the axis-4 timing belt



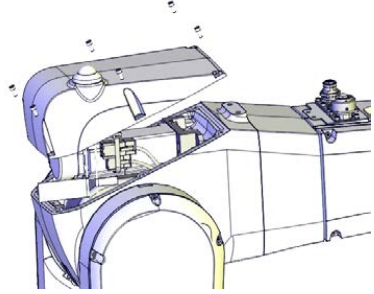
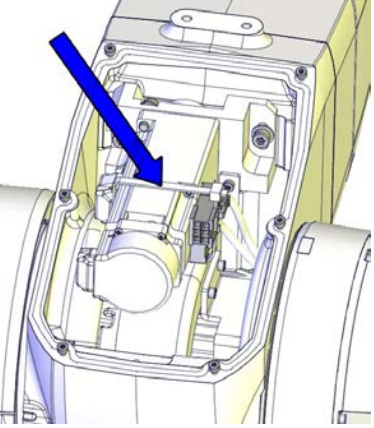

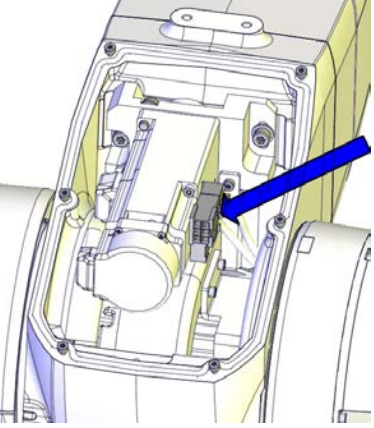
*Continued*

|   | Action                                    | Note  |
|---|---|---|
| 5 | Remove the lower arm cable housing cover. |  <p>xx1300002400</p>   |
| 6 | Remove the tubular cable housing cover.   |  <p>xx1300002389</p>  |
| 7 | Disconnect the air hoses.                 |  <p>xx1400002327</p> |

#### Disconnecting the axis-4 motor connectors

|   | Action   | Note |
|---|--|------|
| 1 |  <p><b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |      |

*Continues on next page*

|   | Action  | Note  |
|---|---|---|
| 2 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>   |   |
| 3 | <p>Remove the cover from the upper arm housing.</p> <p> <b>CAUTION</b></p> <p><b>For robots with safety lamp (option)</b><br/>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p> |  <p>xx130000456</p>    |
| 4 | <p>Cut the strap that holds the connectors.</p>   |  <p>xx1300002494</p>  |
| 5 | <p>Disconnect the motor connectors.</p> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>   |  <p>xx1300002495</p> |

Continues on next page



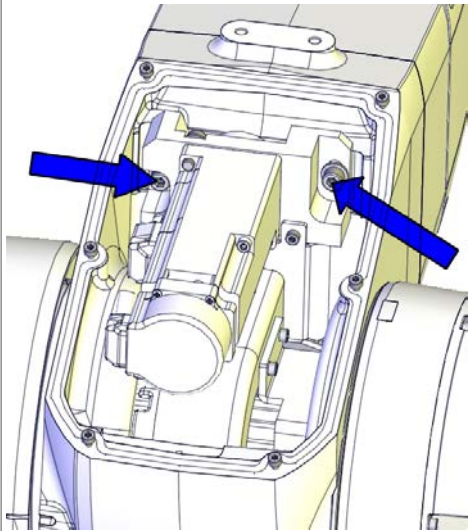
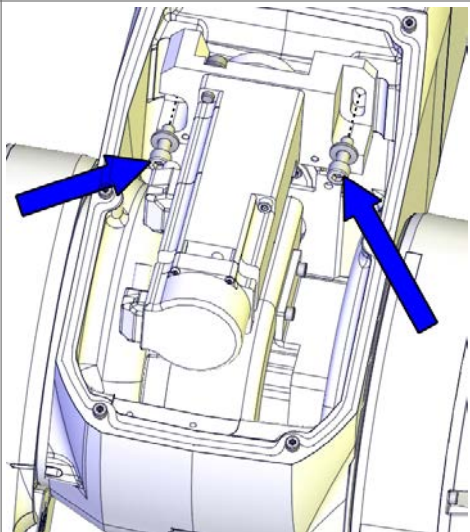


## 4 Repair

### 4.6.6 Replacing the axis-4 timing belt


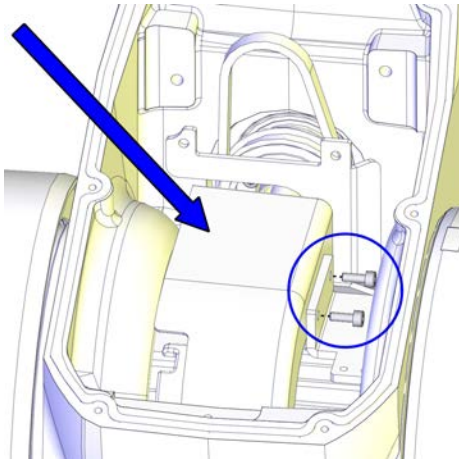
*Continued*

#### Removing the axis-4 motor


|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 3 | Loosen the two attachment screws and move the motor downwards to slacken the timing belt.   | <br>xx1300002524  |
| 4 | Remove the motor screws and washers and carefully lift out the motor and the pulley.  | <br>xx1300002522 |
| 5 | Remove the timing belt from its groove on the motor.  |  |

*Continues on next page*

Removing the air hoses

|   | Action  | Note  |
|---|---|---|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off. |   |
| 2 |   |   |
| 3 | Remove the plastic protection plate by removing its screws.   | <br>xx1400000797 |
| 4 | Pull in the air hoses into the housing, out from the housing extender unit.   |   |


Removing the axis-4 timing belt

|   | Action  | Note |
|---|---|------|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |
| 2 | Remove the axis-4 timing belt.  |      |

Refitting the timing belt

Use these procedures to refit the axis-4 timing belt.

Refitting the axis-4 timing belt and the air hoses

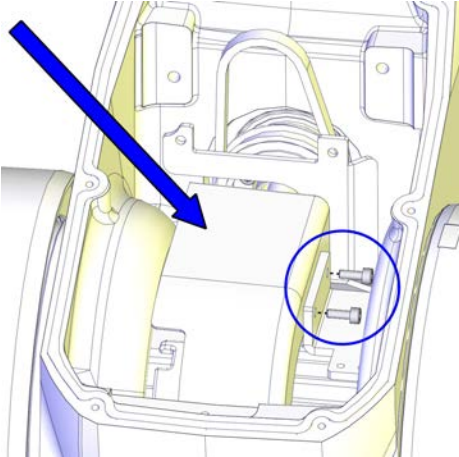

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off. |      |

Continues on next page

## 4 Repair

### 4.6.6 Replacing the axis-4 timing belt

*Continued*

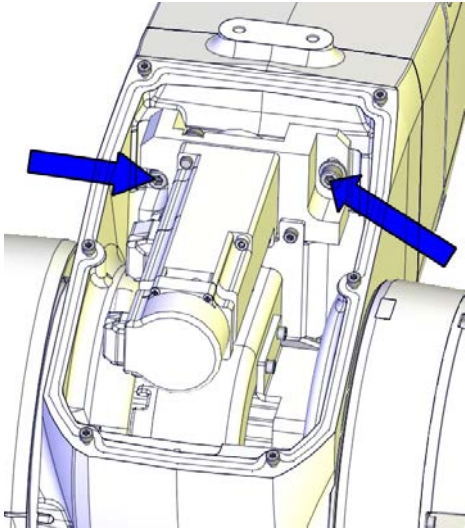

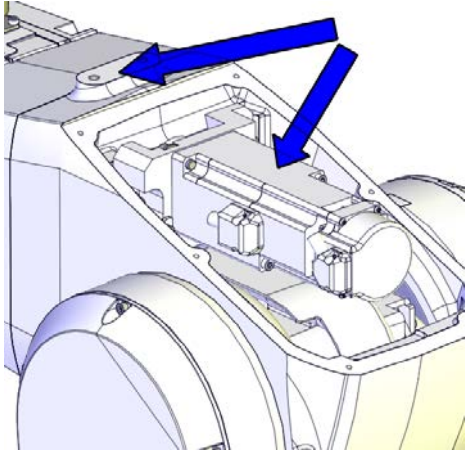
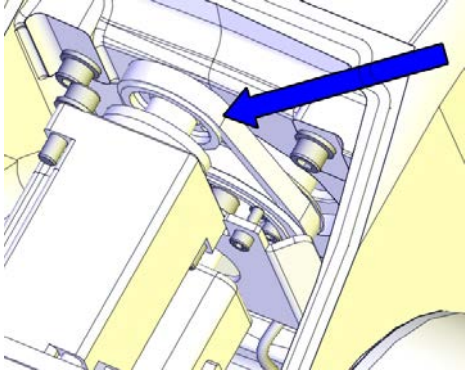
|   | Action  | Note  |
|---|---|---|
| 2 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |   |
| 3 | Place the timing belt at the gear pulley and run the air hoses through the belt.  |   |
| 4 | Install the air hoses in and through the housing extender unit.   |   |
| 5 | Refit the plastic protection plate with its screws.   |  <p>xx140000797</p> |
| 6 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |   |

### Securing the axis-4 motor

|   | Action  | Note |
|---|---|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>                        |      |
| 2 | Check that: <ul style="list-style-type: none"> <li>• all assembly surfaces are clean and undamaged.</li> <li>• the motor is clean and undamaged.</li> </ul> |      |
| 3 | Fit the timing belt to the motor pulley.  |      |

*Continues on next page*

4.6.6 Replacing the axis-4 timing belt  
Continued


|   | Action  | Note   |
|---|---|--|
| 4 | <p>Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.</p> <p>Position the robot with the connectors directed as shown in the figure.</p> <p>Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.</p> | <p>Screws: 3HAB3409-14 (M5x16).</p>  <p>xx130000254</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p>  <p>xx1300002612</p> |
| 5 | <p>Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.</p>  |  <p>xx1300002525</p>   |

Continues on next page


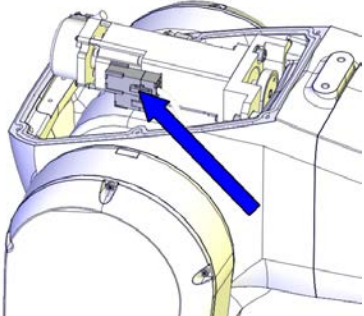
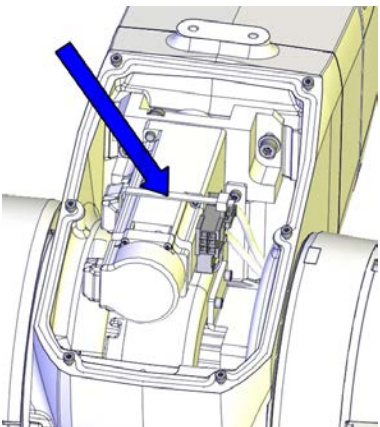
## 4 Repair

### 4.6.6 Replacing the axis-4 timing belt

Continued

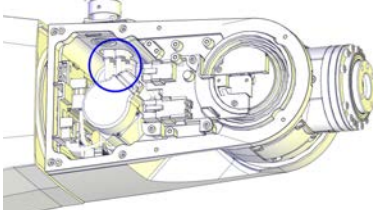
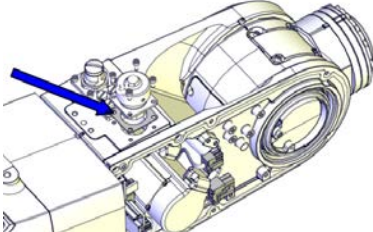
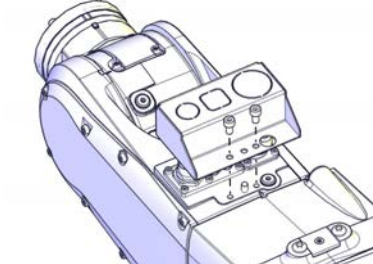
|   | Action  | Note                               |
|---|---|------------------------------------|
| 6 | Move the motor to achieve correct belt tension ( $F = 30\text{ N}$ ).   | Belt tension: $F = 30\text{ N}$ .  |
| 7 | Secure the motor with its attachment screws.  | Tightening torque: $6\text{ Nm}$ . |
| 8 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |                                    |

#### Connecting the axis-4 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | Reconnect the motor connectors.<br><br> <b>CAUTION</b><br><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . | <br><br>xx1300002371  |
| 2 | Secure the connectors to the motor with a cable strap.   | <br><br>xx1300002494 |

Continues on next page

Connecting the air hoses

|   | Action  | Note  |
|---|---|---|
| 1 | Reconnect the air hoses.  | <p>Air connector set with Ethernet hole in flange: 3HAC049664-001<br/>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400002327</p> |
| 2 | <p>If equipped, reconnect the CP/CS cables.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <ol style="list-style-type: none"> <li>1 Check the gasket.</li> <li>2 Replace if damaged.</li> </ol> <p><b>For robots with protection type Clean Room:</b></p> <ol style="list-style-type: none"> <li>1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</li> <li>2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector.</li> </ol> | <p>On robots with protection class IP67<br/>On robots with protection type Foundry Plus<br/>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p>                     |
| 3 | <p><b>For robots with protection type Foundry Plus</b></p> <p>If required, fit the protection bracket for CP/CS connectors.</p>   | <p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>  |

Refitting the tubular cable housing cover

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened.<br>See <i>Cut the paint or surface on the robot before replacing parts on page 136</i> |      |

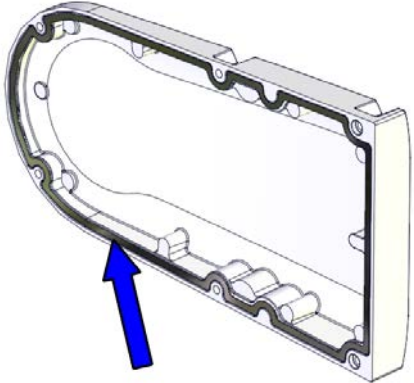
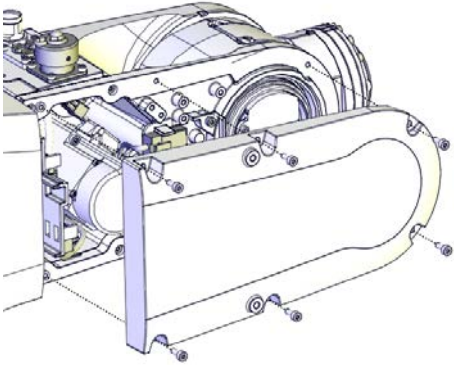


Continues on next page



## 4 Repair

### 4.6.6 Replacing the axis-4 timing belt

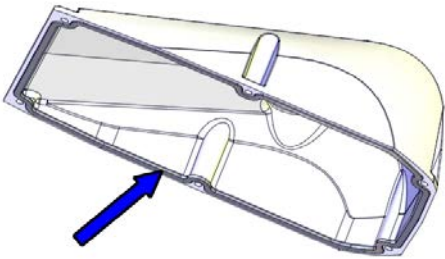
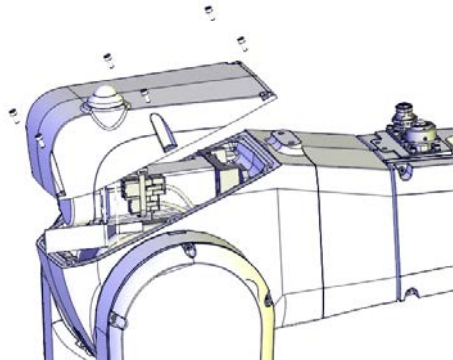

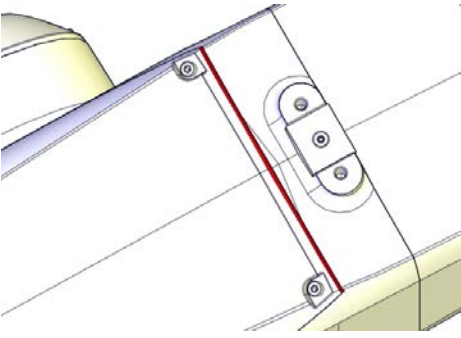
Continued

|   | Action   | Note   |
|---|--|--|
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket.</p> <p>Replace if damaged.</p>  | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx1400000345</p>   |
| 3 | <p>Refit the cover to the cable housing.</p>   | <p>Screws: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Continues on next page



Concluding procedure

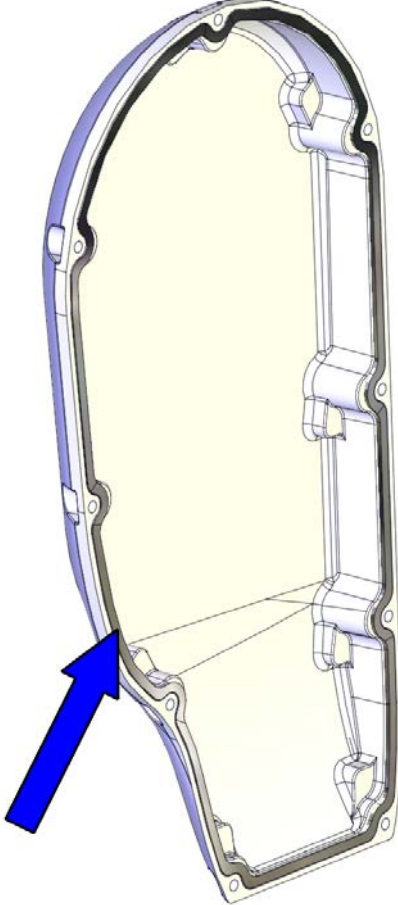
|   | Action   | Note   |
|---|--|--|
| 1 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>  | <p>Housing cover gasket (IRB 1200-7/0.7 ): 3HAC056698-001</p> <p>Housing cover gasket (IRB 1200-5/0.9 ): 3HAC056697-001</p>  <p>xx140000477</p>  |
| 2 | <p>Refit the upper arm housing cover with the screws.</p>  | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx130000456</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 3 | <p>For robots with protection type Clean Room</p> <p>Apply a string of the sealant Sikaflex 521FC to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> |  <p>xx160000215</p>  |

Continues on next page

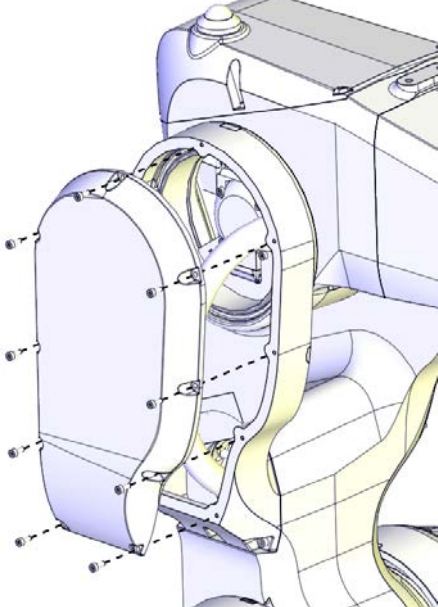




## 4 Repair

### 4.6.6 Replacing the axis-4 timing belt

*Continued*

|   | Action   | Note  |
|---|--|---|
| 4 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket of the cable housing cover.</p> <p>Replace if damaged.</p> | <p>Gasket on cable housing cover:<br/>3HAC056724-001</p>  <p>xx140000048</p> |
| 5 | <p>Check the PTFE film on the cable housing cover.</p> <p>Replace if damaged.</p>  | <p>PTFE film on cable housing cover:<br/>3HAC044660-001</p>   |
| 6 | <p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>   |   |

*Continues on next page*

|    | Action   | Note  |
|----|--|---|
| 7  | <p>Refit the cable housing cover.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p><b>For robots with protection type Clean Room</b></p> <p><b>For robots with food grade lubrication</b></p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>  | <p>Tightening torque: 3HAB3409-207 (M3x8).<br/>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 8  | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> <p> <b>Note</b></p> <p>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.</p> |   |
| 9  | <p>Recalibrate the robot.</p>  | <p>Calibration information is included in section <a href="#">Calibration on page 729</a>.</p>  |
| 10 | <p> <b>DANGER</b></p> <p>Make sure all safety requirements are met when performing the first test run.</p>  |   |

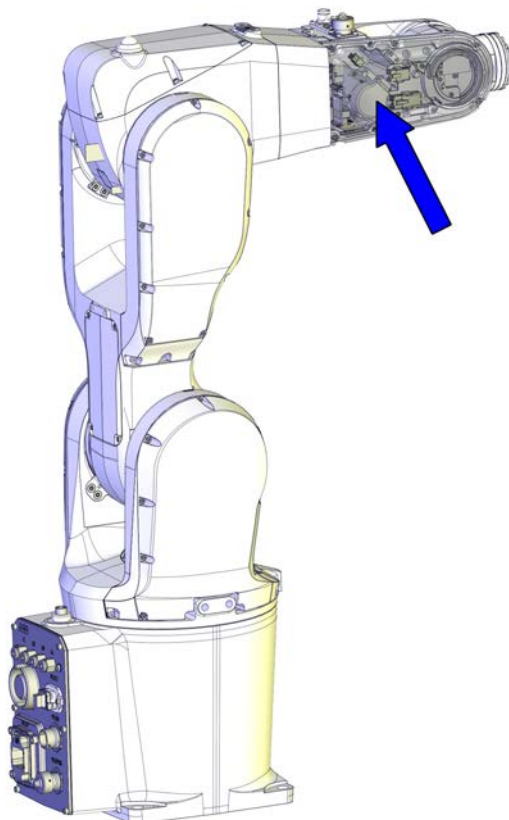
## 4 Repair

### 4.6.7 Replacing the axis-5 motor with pulley

### 4.6.7 Replacing the axis-5 motor with pulley

#### Location of motor

The axis-5 motor is located as shown in the figure.



xx1300002473

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Equipment, etc.                          | Article number | Note   |
|--|----------------|--|
| Motor with pulley                        | 3HAC045978-001 |  |
| Motor with pulley, SafeMove 2-supported. | 3HAC061278-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> . |
| Gasket for tubular cover                 | 3HAC058822-001 | Not used with protection class IP40. Replace if damaged.                       |
| Gasket for tubular cable housing cover   | 3HAC056707-001 | Not used with protection class IP40. Replace if damaged.                       |

*Continues on next page*

## Required tools and equipment

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |


- <sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

## Required consumables

| Consumable     | Art. no.   | Note        |
|----------------|------------|-------------|
| Cleaning agent | -          | Isopropanol |
| Locking liquid | 3HAB7116-1 | Loctite 243 |

## Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

| Action  | Note  |
|---|---|
| 1 Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  |  <b>Note</b><br>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.              |
| <b>If the robot is to be calibrated with reference calibration:</b><br>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.<br>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible. | Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.<br>Creating new values requires possibility to move the robot.<br>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a> . |
| <b>If the robot is to be calibrated with fine calibration:</b><br>Remove all external cable packages (DressPack) and tools from the robot.  |   |

Continues on next page

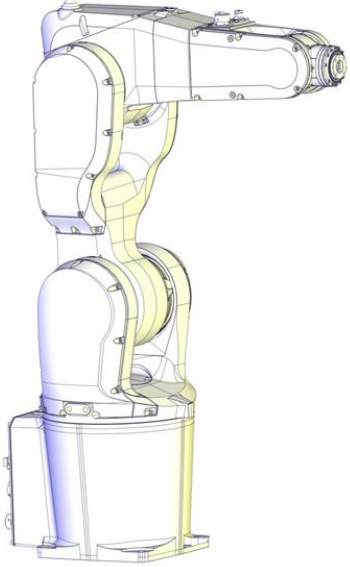

## 4 Repair

### 4.6.7 Replacing the axis-5 motor with pulley



*Continued*

#### Removing the motor with pulley

Preparations before removing the axis-5 motor, pulley or shaft



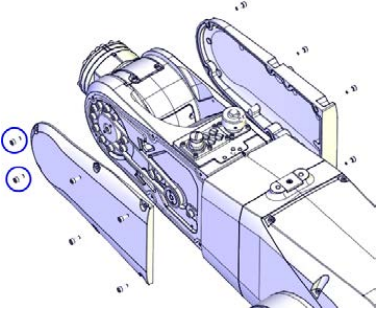
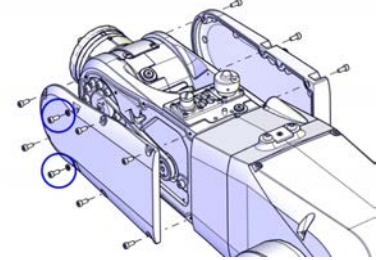
|   | Action   | Note   |
|---|--|--|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.   |  |
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |
| 3 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |  |

Getting access to inside of the wrist unit




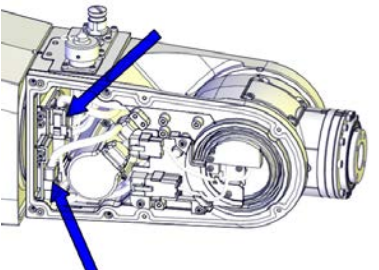
|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

*Continues on next page*

4.6.7 Replacing the axis-5 motor with pulley  
Continued

|   | Action   | Note   |
|---|--|--|
| 3 | <p>Remove the covers on each side of the wrist by removing their screws.</p> <p> <b>Note</b></p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.</p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> <p> <b>Note</b></p> <p>For robots with protection type Clean Room</p> <p>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p> | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |

Disconnecting the axis-5 motor connectors

|   | Action   | Note  |
|---|--|---|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>   |   |
| 2 | <p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>Tip</b></p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002360</p> |

Continues on next page



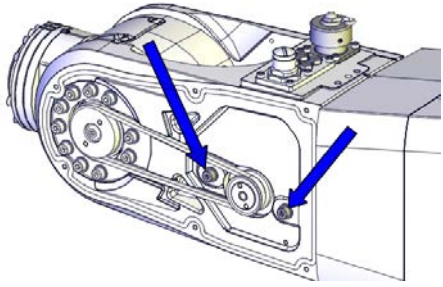
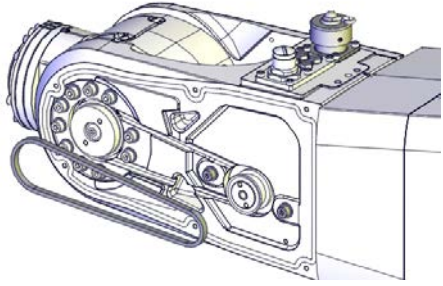
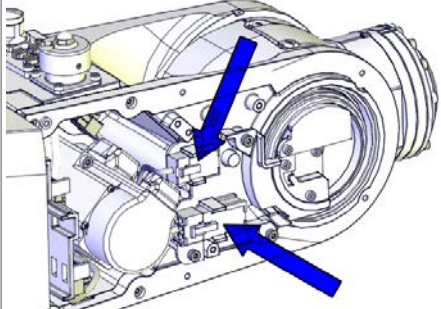


## 4 Repair

### 4.6.7 Replacing the axis-5 motor with pulley

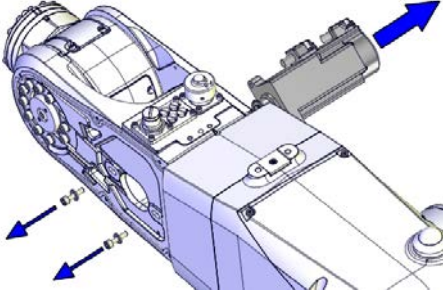
*Continued*

#### Removing the axis-5 motor with pulley

|   | Action  | Note   |
|---|---|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 3 | Loosen the screws so that the motor can be moved sideways.  | <br>xx1300002350  |
| 4 | Remove the timing belt.   | <br>xx1300002351 |
| 5 | Snap loose and disconnect the axis-5 FPC connectors.  | <br>xx1300002390 |


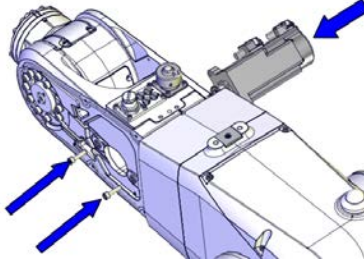

*Continues on next page*

### 4.6.7 Replacing the axis-5 motor with pulley Continued

|   | Action                                    | Note   |
|---|---|--|
| 6 | Remove the screws and pull out the motor. |  <p>xx1300002352</p> |

#### Refitting the motor with pulley

##### Preparations before securing the axis-5 motor

|   | Action  | Note   |
|---|---|--|
| 1 | Check that: <ul style="list-style-type: none"> <li>all assembly surfaces are clean and without damages</li> <li>the motor is clean and undamaged.</li> </ul>  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 2 | Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.   | Screws: 3HAB3409-212 (M4x16).<br> <p>xx1300002463</p>  <b>Note</b><br>Only use specified screws, never replace them with other screws. |

##### Securing the axis-5 motor and timing belt

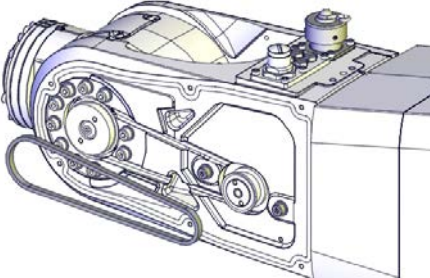

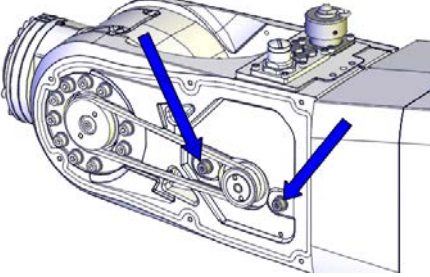

|   | Action   | Note |
|---|--|------|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |      |

Continues on next page


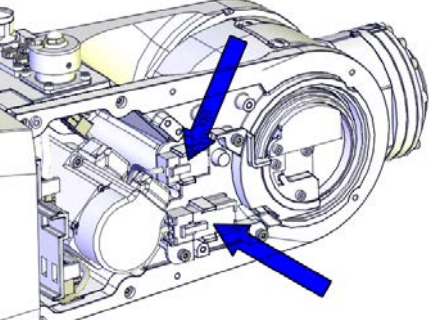
## 4 Repair

### 4.6.7 Replacing the axis-5 motor with pulley

Continued


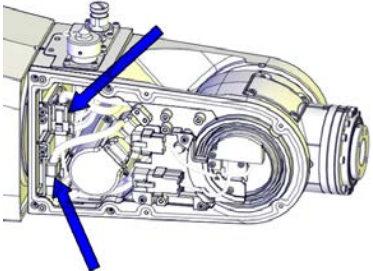
|   | Action  | Note   |
|---|---|--|
| 2 | Refit the timing belt on the pulley.  |  <p>xx1300002351</p>                                     |
| 3 | Move the motor to a position where a good timing belt tension is reached ( $F = 26 \text{ N}$ ).  |  <b>Note</b><br>Do not stretch the timing belt too much! |
| 4 | Secure the motor with its attachment screws.  |  <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p>  |
| 5 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

### Connecting the axis-5 motor FPC connectors

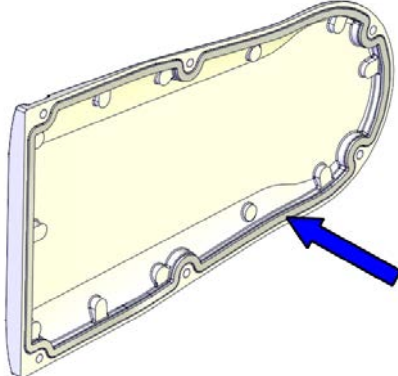
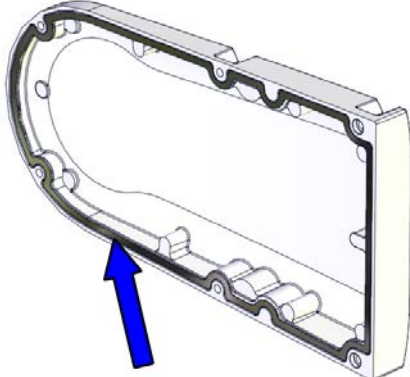
|   | Action   | Note   |
|---|--|--|
| 1 | Connect the axis-5 FPC connectors and snap them to their holders.<br><br> <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  <p>xx1300002390</p> |

Continues on next page

### Connecting the axis-5 motor connectors

|   | Action  | Note  |
|---|---|---|
| 1 | <p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> <li>• R3.MP5</li> <li>• R3.ME5</li> </ul> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002360</p> |

### Refitting the wrist covers

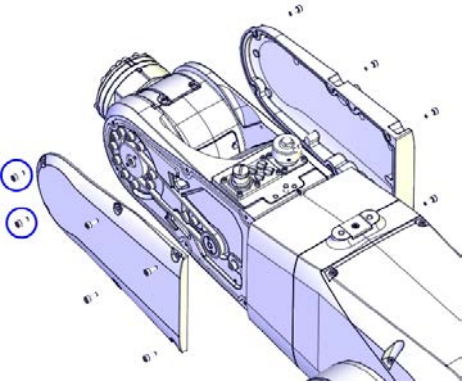
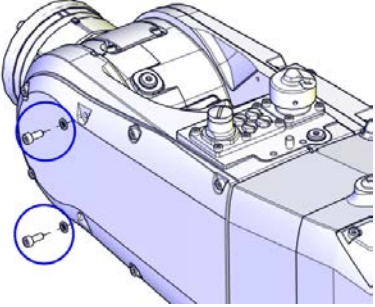


|   | Action   | Note   |
|---|--|--|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>  |  |
| 2 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cover gasket. Replace if damaged.</p>               | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx1400000034</p>               |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx1400000345</p> |

Continues on next page

## 4 Repair




### 4.6.7 Replacing the axis-5 motor with pulley

Continued

|   | Action  | Note   |
|---|---|--|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |  |

Continues on next page

## Concluding procedure

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <i>Cut the paint or surface on the robot before replacing parts on page 136.</i><br> <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth. |  |
| 2 | Recalibrate the robot.   | Calibration information is included in section <i>Calibration on page 729.</i> |
| 3 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run.   |  |



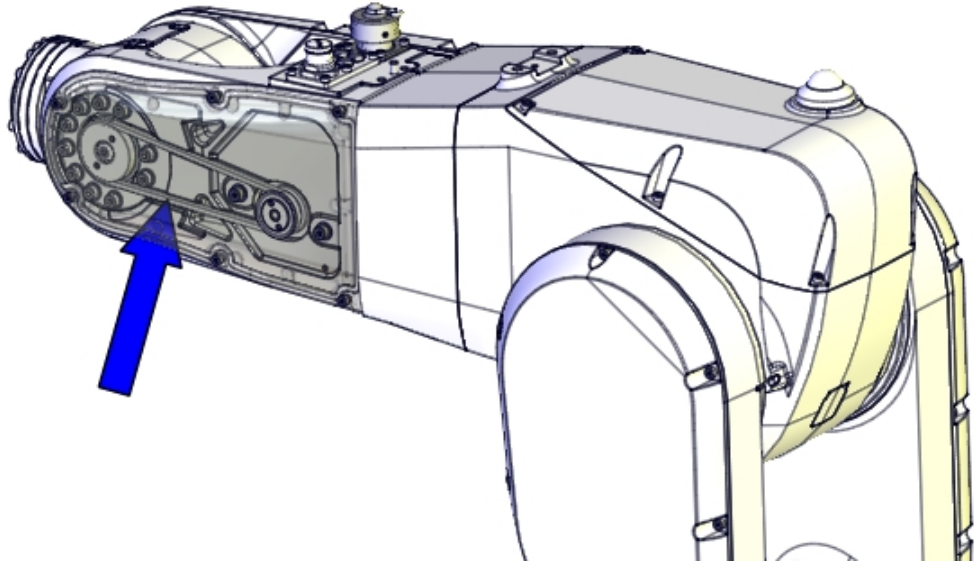
## 4 Repair

### 4.6.8 Replacing the axis-5 timing belt

### 4.6.8 Replacing the axis-5 timing belt

#### Location of the timing belt

The axis-5 timing belt is located as shown in the figure.



xx140000032

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part               | Article number | Note  |
|--------------------------|----------------|---|
| Timing belt              | 3HAC044657-001 |   |
| Gasket for tubular cover | 3HAC058822-001 | Not used with protection class IP40.<br>Replace if damaged. |

#### Required tools and equipment

| Equipment, etc.     | Article number | Note   |
|---------------------|----------------|--|
| 24 VDC power supply | -              | Used to release the motor brakes.  |
| Standard toolkit    | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> . |

#### Required consumables


| Consumable     | Art. no.   | Note        |
|----------------|------------|-------------|
| Cleaning agent | -          | Isopropanol |
| Locking liquid | 3HAB7116-1 | Loctite 243 |

Continues on next page



**Deciding calibration routine**

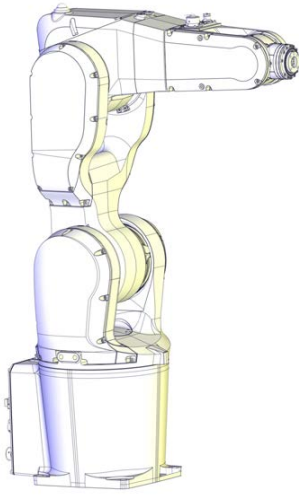
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> <li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li> <li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li> </ul>  | <p> <b>Note</b></p> <p>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.</p>                   |
|   | <p><b>If the robot is to be calibrated with reference calibration:</b></p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |
|   | <p><b>If the robot is to be calibrated with fine calibration:</b></p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>  |   |

**Removing the timing belt**

Use these procedures to remove the axis-5 timing belt.

**Preparations before removing the timing belt**



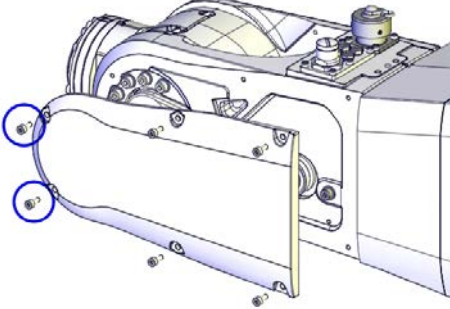
|   | Action   | Note   |
|---|--|--|
| 1 | Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure. |  |
| 2 | Jog all axes to zero position.   |  <p>xx1300002581</p> |

Continues on next page


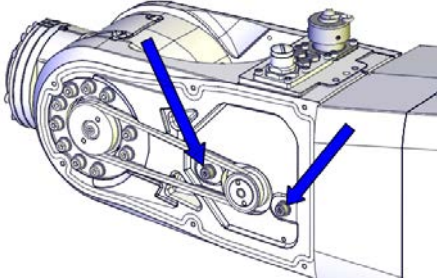
## 4 Repair

### 4.6.8 Replacing the axis-5 timing belt


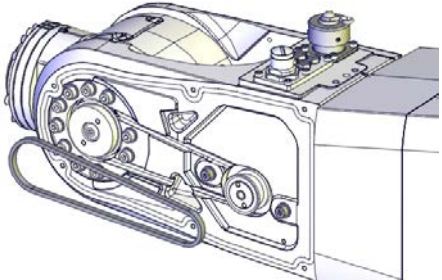
Continued

|   | Action   | Note   |
|---|--|--|
| 3 | <p> <b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |  |
| 4 | <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p>                                      |  |
| 5 | Remove the left hand side wrist cover.   |  <p>xx140000033</p> |

### Removing the axis-5 timing belt

|   | Action   | Note   |
|---|--|--|
| 1 | <p> <b>DANGER</b></p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p> |  |
| 2 | Loosen the screws so that the motor can be moved sideways.   |  <p>xx1300002350</p> |

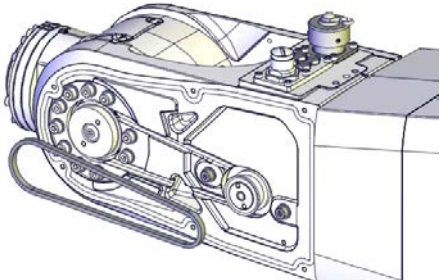
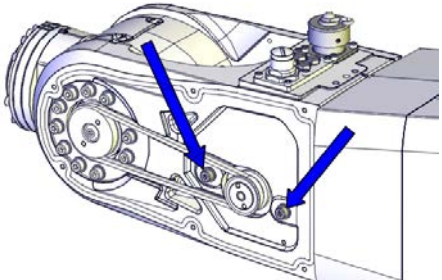
Continues on next page

|   | Action  | Note   |
|---|---|--|
| 3 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |  |
| 4 | Remove the timing belt.   |  <p>xx1300002351</p> |

#### Refitting the timing belt

Use these procedures to refit the axis-5 timing belt.

#### Refitting the axis-5 timing belt


|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |   |
| 2 | Refit the timing belt on the pulley.   |  <p>xx1300002351</p>  |
| 3 | Move the motor to achieve correct belt tension ( $F = 26\text{ N}$ ).  | <b>Belt tension: <math>F = 26\text{ N}</math>.</b>  |
| 4 | Secure the motor with its attachment screws.   |  <p>xx1300002350</p> <p><b>Tightening torque: 3.5 Nm.</b></p> |

*Continues on next page*

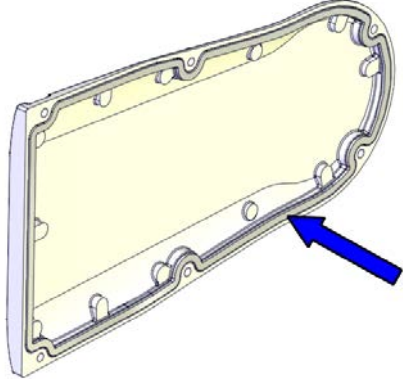
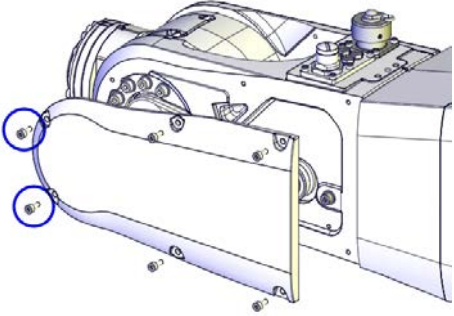

## 4 Repair

### 4.6.8 Replacing the axis-5 timing belt




Continued

|   | Action   | Note |
|---|--|------|
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |      |

#### Concluding procedure

|   | Action   | Note  |
|---|--|---|
| 1 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the gasket of the wrist cover.</p> <p>Replace if damaged.</p> | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx140000034</p>  |
| 2 | <p>Refit the cover to the wrist.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p>             | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx140000033</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |

Continues on next page

|   | Action   | Note   |
|---|--|--|
| 3 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .<br> <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth. |  |
| 4 | Recalibrate the robot.   | Calibration information is included in section <a href="#">Calibration on page 729</a> . |
| 5 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run.   |  |

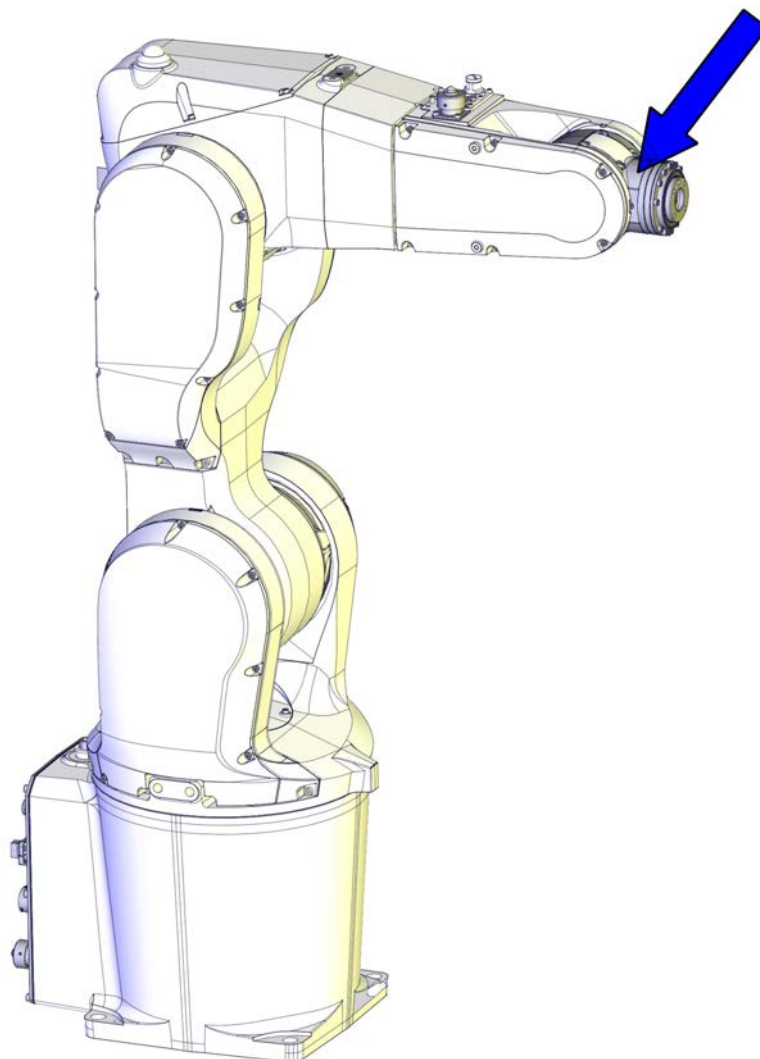
## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

#### Location of the drive unit

The drive unit of axis-5 and axis-6 is located as shown in the figure.



xx1300002467

#### Required spare parts



#### Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

| Spare part | Art. no.       | Note   |
|------------|----------------|--|
| Drive unit | 3HAC059696-001 | Includes axis-5 gear unit and axis-6 drive train unit. |

*Continues on next page*

## 4.6.9 Replacing the axis-5 and axis-6 drive unit

*Continued*

| Spare part                                      | Art. no.       | Note   |
|---|----------------|--|
| Drive unit, Clean Room                          | 3HAC059707-001 | Used with protection type Clean Room.<br>Includes axis-5 gear unit and axis-6 drive train unit.  |
| Drive unit, food grade lubrication              | 3HAC057907-001 | Used for robots with food grade lubrication.<br>Includes axis-5 gear unit and axis-6 drive train unit.   |
| Drive unit, SafeMove 2-supported                | 3HAC061279-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Includes axis-5 gear unit and axis-6 drive train unit.   |
| Drive unit, Clean Room and SafeMove 2-supported | 3HAC061280-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Used with protection type Clean Room.<br>Includes axis-5 gear unit and axis-6 drive train unit.        |
| Drive unit, food grade lubrication              | 3HAC061281-001 | Used for IRB 1200 Type B. See <a href="#">Type B of IRB 1200 on page 792</a> .<br>Used for robots with food grade lubrication.<br>Includes axis-5 gear unit and axis-6 drive train unit. |
| M2 variseal sealing                             | 3HAC044641-008 | Used with protection class IP67.<br>Used with protection type Foundry Plus.<br>Replace if damaged.   |
| M2 variseal sealing                             | 3HAC044641-009 | Replace if damaged.  |
| Radial sealing                                  | 3HAB3701-42    | Not used with protection class IP40.<br>Replace if damaged.  |
| Sleeve  | 3HAC044661-001 | Replace if damaged.  |
| Gasket for tubular cover                        | 3HAC058822-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Gasket for tubular cable housing cover          | 3HAC056707-001 | Not used with protection class IP40.<br>Replace if damaged.  |
| Protection cover for axis-6 turning disk        | 3HAC044666-001 | Used with protection type Foundry Plus.<br>Replace if damaged.   |
| T40 variseal sealing                            | 3HAC044641-012 | Used with protection type Foundry Plus.<br>Replace if damaged.   |

*Continues on next page*



## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

#### Required tools and equipment

| Equipment, etc.                         | Article number | Note   |
|---|----------------|--|
| Guide pin for tilt unit (axis 5)        | 3HAC049706-001 | Always use three guide pins together!  |
| Axis-5 sealing assembly tool set        | 3HAC049701-001 | Used to refit the radial sealing, if replacement is needed.  |
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |
| 24 VDC power supply                     | -              | Used to release the motor brakes.  |
| Standard toolkit                        | -              | Content is defined in section <a href="#">Standard toolkit on page 811</a> .                       |


- <sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory. Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant. If no data is found related to standard calibration, manual calibration is used as default.

#### Required consumables

| Consumable     | Art. no.       | Note           |
|----------------|----------------|----------------|
| Cleaning agent | -              | Loctite 7063   |
| Locking liquid | 3HAB7116-1     | Loctite 243    |
| Flange sealing | 12340011-116   | Loctite 574    |
| Flange sealing | 3HAC026759-003 | Sikaflex 521FC |

#### Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"><li>Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.</li><li>Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.</li></ul>   | <p> <b>Note</b></p> <p>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.</p>                 |
|   | <p><b>If the robot is to be calibrated with reference calibration:</b></p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p> | <p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in <a href="#">Reference calibration routine on page 740</a>.</p> |

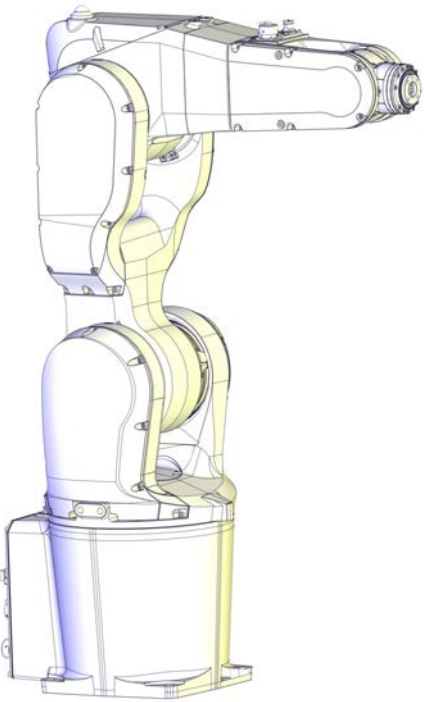

Continues on next page

| Action   | Note |
|--|------|
| <p><b>If the robot is to be calibrated with fine calibration:</b><br/>Remove all external cable packages (DressPack) and tools from the robot.</p> |      |

**Removing the drive unit**

Use these procedures to remove the drive unit.

**Preparations before removing the axis-5 and axis-6 drive unit**

| Action | Note   |
|--------|--|
| 1      | <p>Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.</p>  |
| 2      | <p>Jog all axes to zero position.</p>  <p>xx1300002581</p>   |
| 3      | <p> <b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p> |





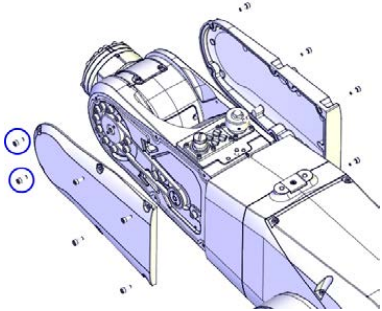
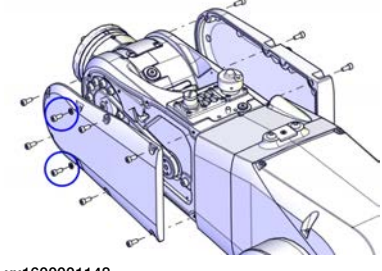
Continues on next page

## 4 Repair


### 4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

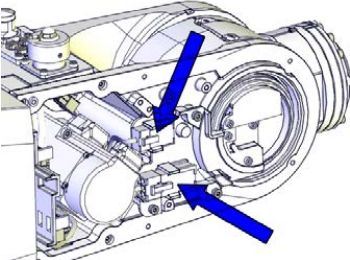
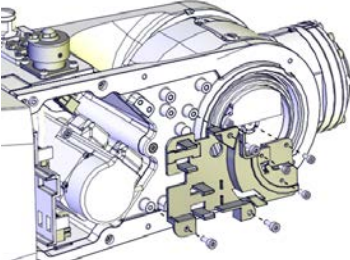

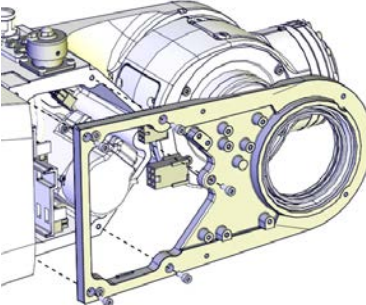
#### Getting access to inside of the wrist unit

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.  |  |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .  |  |
| 3 | Remove the covers on each side of the wrist by removing their screws.<br><br> <b>Note</b><br><b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid.<br>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.<br><br> <b>Note</b><br><b>For robots with protection type Clean Room</b><br>The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure. | <p>For robots with protection class IP67 (option 287-10)<br/>           For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001148</p> |


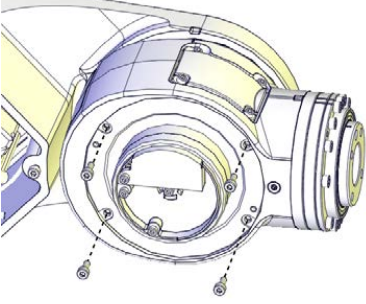
#### Removing the tubular cable housing

|   | Action  | Note |
|---|---|------|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page

|   | Action  | Note   |
|---|---|--|
| 2 | Snap loose and disconnect the axis-5 FPC connectors.  |  <p>xx1300002390</p>  |
| 3 | Remove the connector plate by first removing the screws.  |  <p>xx1300002391</p>  |
| 4 | Remove the cable housing of the tubular by first removing the screws.<br> <b>Note</b><br>For robots with protection class IP67 (option 287-10)<br>For robots with protection type Foundry Plus (option 287-3)<br>The frame is glued and needs to be pried off. |  <p>xx1300002392</p> |

Removing the axis-5 FPC unit

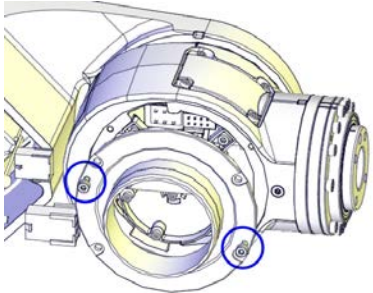
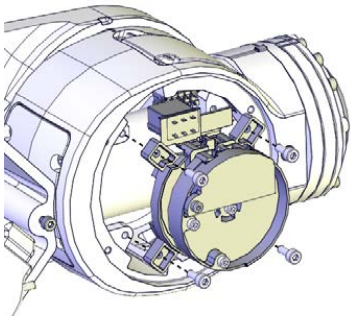
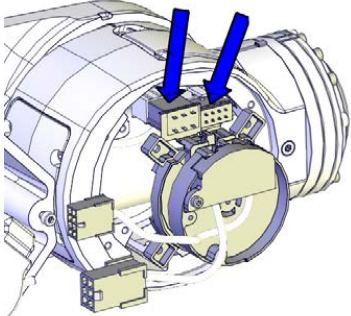
|   | Action  | Note  |
|---|---|---|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |   |
| 2 | Remove the sleeve screws.   |  <p>xx1300002393</p> |

Continues on next page



## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

|   | Action   | Note  |
|---|--|---|
| 3 | Remove the sleeve by screwing in two of the screws into the press out holes to force the sleeve out.                               | <br>xx1300002582   |
| 4 | Remove the FPC unit attachment screws and pull out the FPC unit as far as required for the axis-6 motor connectors to be accessed. | <br>xx1300002394   |
| 5 | Disconnect the axis-6 motor connectors and remove the FPC unit completely.   | <br>xx1300002395 |

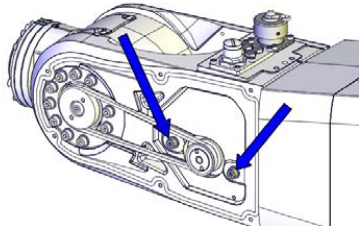
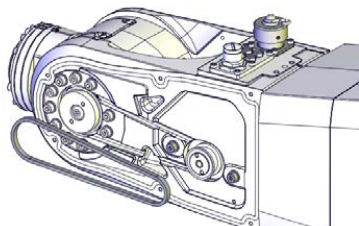
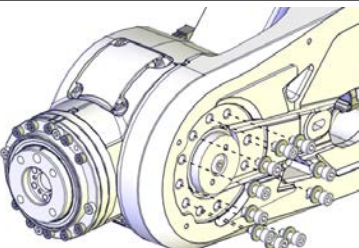
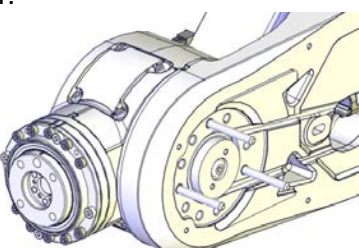
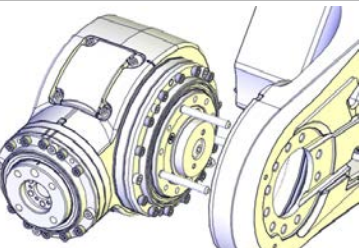
#### Removing the drive unit

|   | Action  | Note |
|---|---|------|
| 1 |  <b>DANGER</b><br>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.   |      |
| 2 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> . |      |

Continues on next page

4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

|   | Action  | Note   |
|---|---|--|
| 3 | Loosen the attachment screws of the axis-5 motor so that the motor can slide sideways.          |  <p>xx1300002350</p>  |
| 4 | Slide the motor sideways to release the tension of the timing belt, and remove the timing belt. |  <p>xx1300002351</p>  |
| 5 | Support the weight of the drive unit and remove the screws.                                     |  <p>xx1300002469</p>   |
| 6 | Fit guide pins to the gearbox.  | <p>Guide pin for tilt unit (axis 5):<br/>3HAC049706-001</p> <p>Always use three guide pins together!</p>  <p>xx1400000775</p> |
| 7 | Remove the drive unit.  |  <p>xx1300002470</p>  |

Continues on next page



## 4 Repair

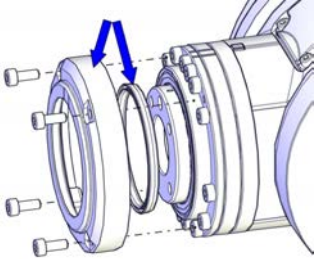

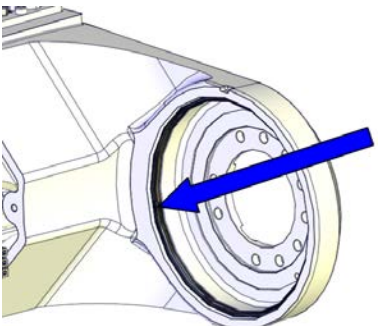

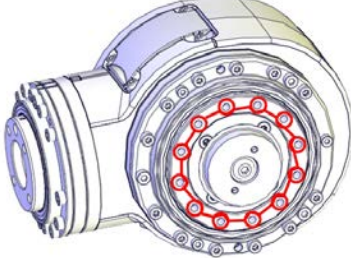
### 4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

#### Refitting the drive unit

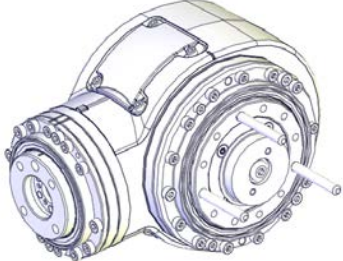
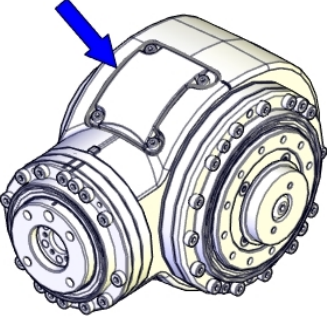
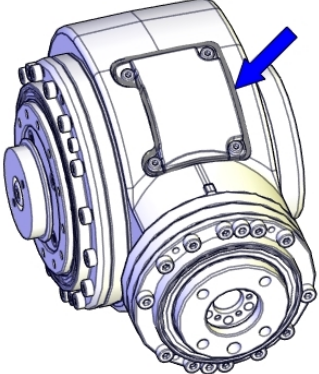
Use these procedures to refit the drive unit.

#### Refitting the axis-5 and axis-6 drive unit

|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |   |
| 2 | <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Check the protection cover for turning disk and T40 variseal sealing.</p> <p>Replace if damaged.</p>  | <p>Protection cover for axis-6 turning disk: 3HAC044666-001</p> <p>T40 variseal sealing: 3HAC044641-012</p>  <p>xx1600001126</p> |
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>Check the sealing.</p> <p>Replace if damaged.</p> <p> <b>CAUTION</b></p> <p>Do not fit M2 variseal sealing on Clean Room robots.</p>                    | <p>M2 variseal sealing: 3HAC044641-008</p>  <p>xx1300002493</p>  |
| 4 | <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing Loctite 574 on the mounting surfaces of the drive unit.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1400001404</p>   |

Continues on next page


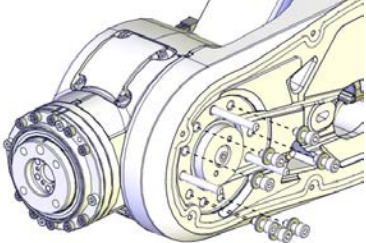

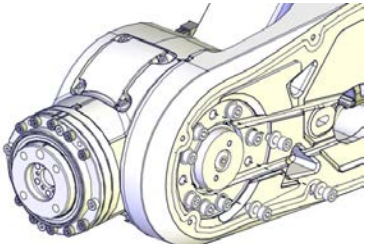



|   | Action  | Note   |
|---|---|--|
| 5 | Fit guide pins to the axis-5 gearbox.   | <p>Guide pin for tilt unit (axis 5):<br/>3HAC049706-001</p>  <p>xx1300002568</p>  |
| 6 | <p><b>For robots with protection type Clean Room</b><br/>Make sure the sealing to the tilt covers is intact before the refitting.</p> |  <p>xx1600000219</p>  <p>xx1600000220</p> |


## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

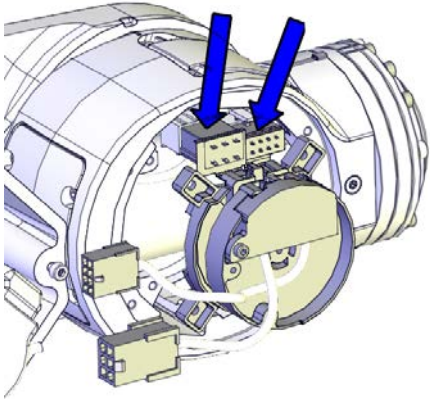

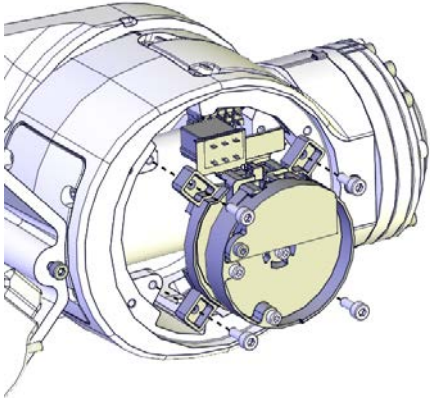

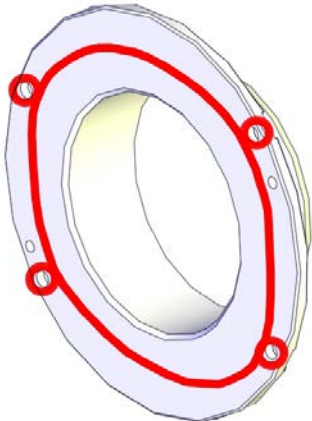
Continued

|    | Action   | Note   |
|----|--|--|
| 7  | <p>Refit the drive unit and secure with the screws and washers.<br/>Secure the screws but do not tighten yet.</p> <p> <b>Note</b></p> <p>If there is glue on the screw, please clean it or replace it with a new one.</p>   | <p>Attachment screws: 3HAB3409-236 (M4x10).</p>  <p>xx1300002569</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 8  | <p>Remove the guide pins and refit the remaining screws and washers.</p>   |  <p>xx1300002570</p>   |
| 9  | <p>Cross-tighten all the screws with torque 1 Nm first, then with 2 Nm, with 4 Nm, and finally with 4.5 Nm.</p>  |  |
| 10 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

#### Refitting the axis-5 FPC unit

|   | Action  | Note |
|---|---|------|
| 1 | <p> <b>WARNING</b></p> <p>It is important that axis 5 is in zero position when fitting the FPC unit.<br/>Make sure that the FPC is in zero position and does not get twisted during refitting.</p> |      |
| 2 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>   |      |

Continues on next page

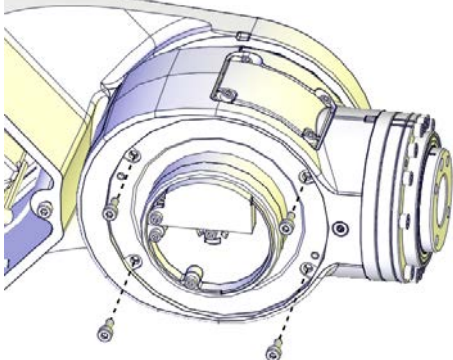

|   | Action  | Note  |
|---|---|---|
| 3 | <p>Reconnect the axis-6 motor connectors to the FPC unit.</p>   |  <p>xx1300002395</p>                                    |
| 4 | <p>Carefully refit the FPC unit and secure with screws.</p> <p> <b>Note</b></p> <p>Check that the FPC unit is at the zero position when refitting it.</p>  | <p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002394</p> |
| 5 | <p>For robots with protection class IP67 (option 287-10)<br/>For robots with protection type Foundry Plus (option 287-3)</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br/>Apply flange sealing Loctite 574 on the mounting surfaces of the sleeve.</p> <p> <b>Note</b></p> <p>For Clean Room robots, wipe clean the overflowing Loctite 574 if there is any.</p> |  <p>xx1300002609</p>                                 |

Continues on next page


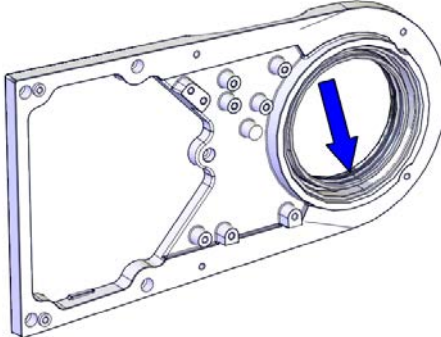
## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

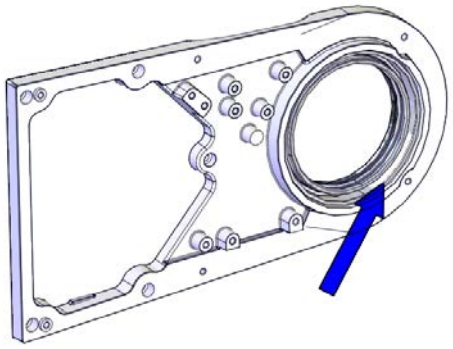
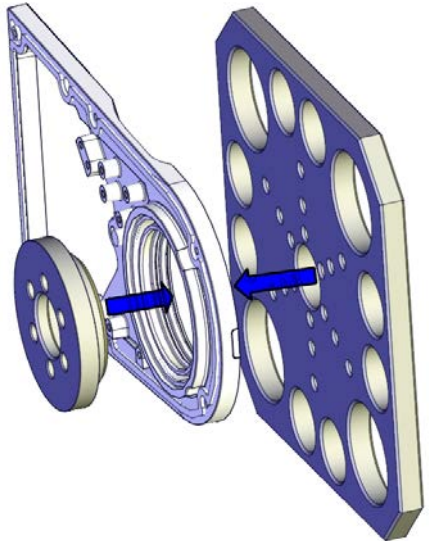
Continued

|   | Action  | Note  |
|---|---|---|
| 6 | Refit the sleeve and secure with screws.<br>Replace if damaged.   | Sleeve: 3HAC044661-001<br>Tightening torque: 1.5 Nm.<br><br><small>xx1300002393</small> |
| 7 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |   |

### Checking the tubular cable housing sealings

|   | Action  | Note   |
|---|---|--|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>   |  |
| 2 | Check the sealing.<br>Replace if damaged.<br> <b>CAUTION</b><br>Do not fit M2 variseal sealing on Clean Room robots. | M2 variseal sealing: 3HAC044641-009<br><br><small>xx1300002396</small> |

Continues on next page

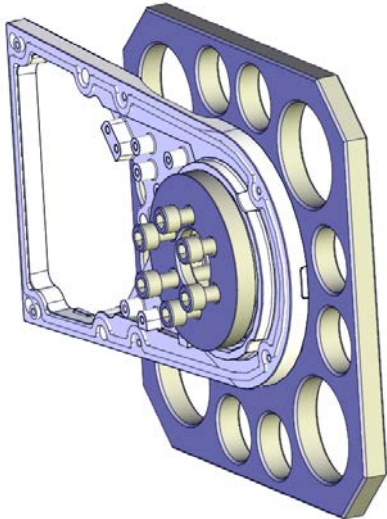

|   | Action   | Note  |
|---|--|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)<br/>                     For robots with protection type Foundry Plus (option 287-3)<br/>                     For robots with protection type Clean Room<br/>                     For robots with food grade lubrication<br/>                     Check the radial sealing.<br/>                     Replace if damaged, as described below.<br/>                     If undamaged and properly seated, skip to the next procedure table.</p> | <p>Radial sealing: 3HAB3701-42</p>  <p>xx1300002608</p> |
| 4 | <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>  |   |
| 5 | <p>Fit the radial sealing into the tubular cable housing.</p>  |   |
| 6 | <p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>   | <p>Axis-5 sealing assembly tool set: 3HAC049701-001</p>   |
| 7 | <p>Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.</p>  |  <p>xx1400000485</p>                                   |

Continues on next page

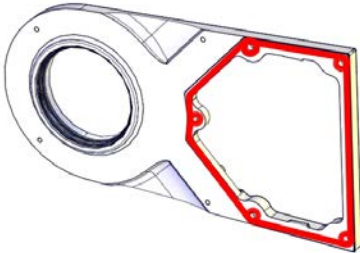

## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

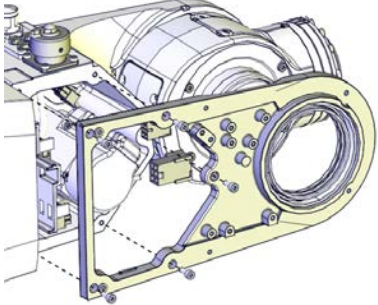

|    | Action   | Note   |
|----|--|--|
| 8  | Screw the screws, little by little, to press the sealing into place.   |  <p>xx1400000486</p> |
| 9  | Remove the assembly tool.  |  |
| 10 | Check that the sealing is undamaged and properly fitted.   |  |
| 11 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |  |
|    |  <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |

### Refitting the tubular cable housing

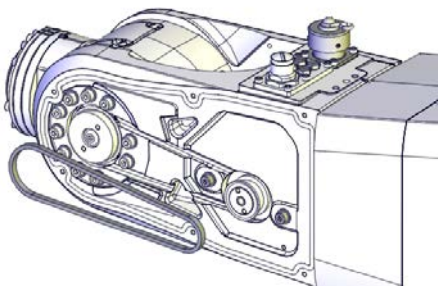

|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>  |   |
| 2 | <b>For robots with protection class IP67 (option 287-10)</b><br><b>For robots with protection type Foundry Plus (option 287-3)</b><br>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.<br>Apply flange sealing Sikaflex 521FC on the mounting surfaces of the tubular cable housing. |  <p>xx1300002610</p> |
|   |  <b>Note</b><br>For Clean Room robots, wipe clean the overflowing Sikaflex 521FC if there is any.  |   |

Continues on next page



|   | Action  | Note   |
|---|---|--|
| 3 | Refit the tubular cable housing with the screws.  | <p>Tightening torque: 1.5 Nm.<br/>                     Tubular cable housing:<br/>                     3HAC059695-001<br/>                     : 3HAC056143-001 (used with protection type Clean Room)<br/>                     Tubular cable housing, Clean Room<br/>                     Tubular cable housing, food grade lubrication</p>  <p>xx1300002392</p> |
| 4 | <p>Seal and paint the joints that have been opened.<br/>                     See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |  |

Securing the axis-5 motor and timing belt

|   | Action  | Note  |
|---|---|---|
| 1 | Clean the joints that have been opened.<br>See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |   |
| 2 | Refit the timing belt on the pulley.  |  <p>xx1300002351</p>  |
| 3 | Move the motor to a position where a good timing belt tension is reached (F = 26 N).  | <p> <b>Note</b></p> <p>Do not stretch the timing belt too much!</p> |

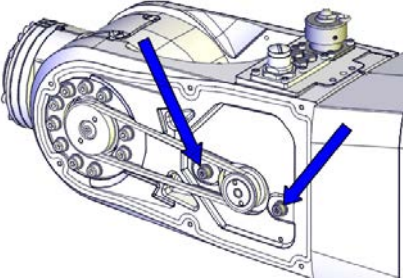

Continues on next page



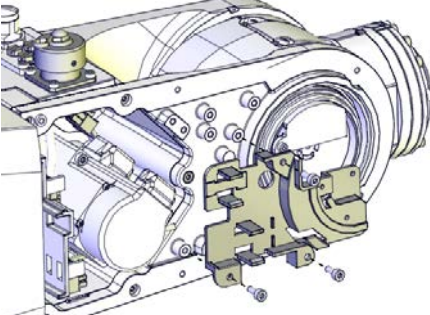
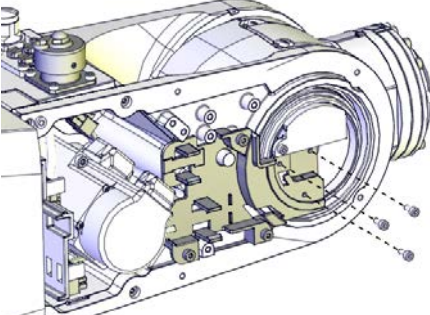
## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit


Continued

|   | Action  | Note   |
|---|---|--|
| 4 | Secure the motor with its attachment screws.  |  <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p> |
| 5 | Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a><br><br> <b>Note</b><br>After all repair work, wipe the robot free from particles with spirit on a lint free cloth. |  |


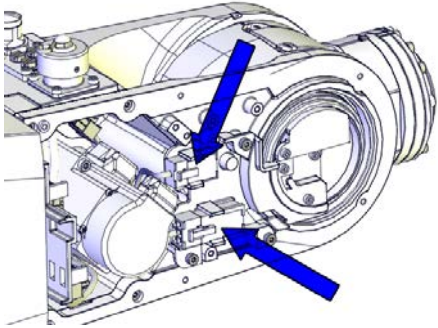
### Refitting the connector plate

|   | Action   | Note  |
|---|--|---|
| 1 | Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> |   |
| 2 | Refit the connector plate and secure with the M3 screws.   | Tightening torque: 0.3 Nm.<br><br> <p>xx1400001401</p> |
| 3 | Secure the three M2.5 screws.  | Tightening torque: 0.3 Nm.<br><br> <p>xx1400001402</p> |

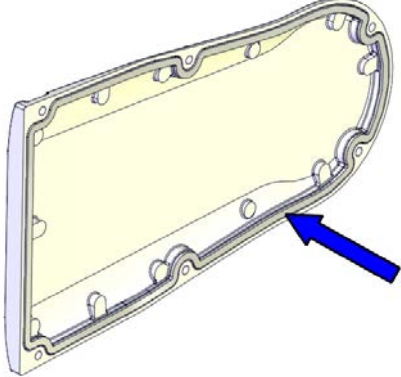
Continues on next page

|   | Action   | Note |
|---|--|------|
| 4 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p> |      |

Connecting the axis-5 motor FPC connectors

|   | Action   | Note  |
|---|--|---|
| 1 | <p>Connect the axis-5 FPC connectors and snap them to their holders.</p> <p> <b>CAUTION</b></p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a>.</p> |  <p>xx1300002390</p> |

Refitting the wrist covers

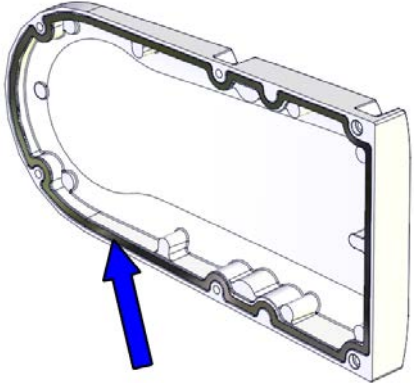
|   | Action   | Note  |
|---|--|---|
| 1 | <p>Clean the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p>  |   |
| 2 | <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p><b>For robots with protection type Clean Room</b></p> <p><b>For robots with food grade lubrication</b></p> <p>Check the tubular cover gasket. Replace if damaged.</p> | <p>Gasket for tubular cover: 3HAC058822-001</p>  <p>xx1400000034</p> |

Continues on next page

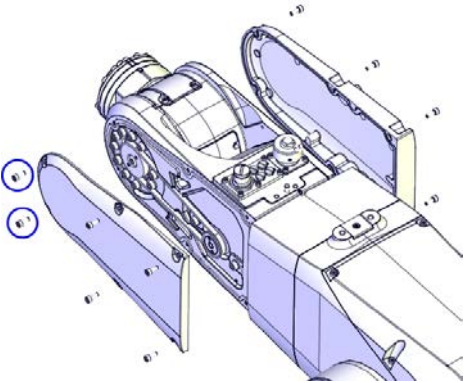
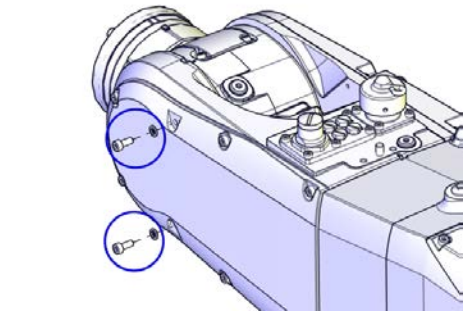


## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

*Continued*

|   | Action  | Note  |
|---|---|---|
| 3 | <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Check the tubular cable housing cover gasket.</p> <p>Replace if damaged.</p> | <p>Gasket for tubular cable housing cover: 3HAC056707-001</p>  <p>xx140000345</p> |

*Continues on next page*




|   | Action  | Note   |
|---|---|--|
| 4 | <p>Refit the both covers to the wrist.</p> <p><b>For robots with protection class IP67 (option 287-10)</b></p> <p><b>For robots with protection type Foundry Plus (option 287-3)</b></p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> <p><b>For robots with protection type Clean Room</b></p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p> | <p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 (option 287-10)</p> <p>For robots with protection type Foundry Plus (option 287-3)</p>  <p>xx1300002349</p> <p>For robots with protection type Clean Room</p>  <p>xx1600001153</p> <p> <b>Note</b></p> <p>Only use specified screws, never replace them with other screws.</p> |
| 5 | <p>Seal and paint the joints that have been opened. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a></p> <p> <b>Note</b></p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>  |  |

## 4 Repair

### 4.6.9 Replacing the axis-5 and axis-6 drive unit

*Continued*

#### Concluding procedure

|   | Action   | Note   |
|---|--|--|
| 1 |  <b>CAUTION</b><br>Always cut the paint with a knife and grind the paint edge when disassembling parts. See <a href="#">Cut the paint or surface on the robot before replacing parts on page 136</a> .<br> <b>Note</b><br>After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth. |  |
| 2 | Recalibrate the robot.   | Calibration information is included in section <a href="#">Calibration on page 729</a> . |
| 3 |  <b>DANGER</b><br>Make sure all safety requirements are met when performing the first test run.   |  |

## 5 Calibration

### 5.1 Introduction to calibration

#### 5.1.1 Introduction and calibration terminology

##### Calibration information

This chapter includes general information about the recommended calibration methods and also the detailed procedures for updating the revolution counters, checking the calibration position etc.

Detailed instructions of how to perform Axis Calibration are given on the FlexPendant during the calibration procedure. To prepare calibration with Axis Calibration method, see [Calibrating with Axis Calibration method on page 739](#).

##### Calibration terminology

| Term                      | Definition  |
|---------------------------|---|
| Calibration method        | A collective term for several methods that might be available for calibrating the ABB robot. Each method contains calibration routines.   |
| Synchronization position  | Known position of the complete robot where the angle of each axis can be checked against visual synchronization marks.  |
| Calibration position      | Known position of the complete robot that is used for calibration of the robot.   |
| Standard calibration      | A generic term for all calibration methods that aim to move the robot to calibration position.  |
| Fine calibration          | A calibration routine that generates a new zero position of the robot.  |
| Reference calibration     | <p>A calibration routine that in the first step generates a reference to current zero position of the robot. The same calibration routine can later on be used to recalibrate the robot back to the same position as when the reference was stored.</p> <p>This routine is more flexible compared to fine calibration and is used when tools and process equipment are installed.</p> <p>Requires that a reference is created before being used for recalibrating the robot.</p> <p>Requires that the robot is dressed with the same tools and process equipment during calibration as during creation of the reference values.</p> |
| Update revolution counter | A calibration routine to make a rough calibration of each manipulator axis.   |
| Synchronization mark      | Visual marks on the robot axes. When marks are aligned, the robot is in synchronization position.   |

## 5 Calibration


### 5.1.2 Calibration methods

### 5.1.2 Calibration methods

#### Overview

This section specifies the different types of calibration and the calibration methods that are supplied by ABB.

#### Types of calibration

| Type of calibration                      | Description  | Calibration method                                  |
|--|--|---|
| Standard calibration                     | <p>The calibrated robot is positioned at calibration position.</p> <p>Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot. For robots with RobotWare 5.04 or older, the calibration data is delivered in a file, <code>calib.cfg</code>, supplied with the robot at delivery. The file identifies the correct resolver/motor position corresponding to the robot home position.</p>   | Axis Calibration or manual calibration <sup>i</sup> |
| Absolute accuracy calibration (optional) | <p>Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for:</p> <ul style="list-style-type: none"> <li>Mechanical tolerances in the robot structure</li> <li>Deflection due to load</li> </ul> <p>Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot.</p> <p>Absolute accuracy calibration data is found on the SMB (serial measurement board) in the robot.</p> <p>For robots with RobotWare 5.05 or older, the absolute accuracy calibration data is delivered in a file, <code>absacc.cfg</code>, supplied with the robot at delivery. The file replaces the <code>calib.cfg</code> file and identifies motor positions as well as absolute accuracy compensation parameters.</p> <p>A robot calibrated with Absolute accuracy has a sticker next to the identification plate of the robot.</p> <p>To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">  </div> <p>xx0400001197</p> | CalibWare   |

*Continues on next page*



| Type of calibration | Description  | Calibration method |
|---------------------|--|--------------------|
| Optimization        | <p>Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing.</p> <p>Wrist optimization will update standard calibration data for axes 4 and 5.</p> | Wrist Optimization |

- i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

### Brief description of calibration methods

#### Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1200 and is the most accurate method for the standard calibration. It is the recommended method in order to achieve proper performance.

The following routines are available for the Axis Calibration method:

- Fine calibration
- Update revolution counters
- Reference calibration

The calibration equipment for Axis Calibration is delivered as a toolkit.

An introduction to the calibration method is given in this manual, see [Calibrating with Axis Calibration method on page 739](#).

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

#### Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing and is a complement to the standard calibration method.

The following routines are available for the Wrist Optimization method:

- Wrist Optimization

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

#### Manual calibration method

With the manual calibration method, the robot's axes are positioned in specific calibration positions using calibration tools. Under this condition, the position of the axis to be calibrated is pre-determined. The axes must be calibrated one at a time.

*Continues on next page*

## 5 Calibration

---

### 5.1.2 Calibration methods

*Continued*

#### CalibWare - Absolute Accuracy calibration

The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field*.

If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

---

#### References

Article numbers for the calibration tools are listed in the section [Special tools on page 812](#).

### 5.1.3 When to calibrate

---

#### When to calibrate

The system must be calibrated if any of the following situations occur.

#### The resolver values are changed

If resolver values are changed, the robot must be re-calibrated using the calibration methods supplied by ABB. Calibrate the robot carefully with standard calibration, according to information in this manual.

If the robot has *absolute accuracy* calibration, it is also recommended, but not always necessary to calibrate for new absolute accuracy.

The resolver values will change when parts affecting the calibration position are replaced on the robot, for example motors or parts of the transmission.

#### The revolution counter memory is lost

If the revolution counter memory is lost, the counters must be updated. See [Updating revolution counters on page 736](#). This will occur when:

- The battery is discharged
- A resolver error occurs
- The signal between a resolver and measurement board is interrupted
- A robot axis is moved with the control system disconnected

The revolution counters must also be updated after the robot and controller are connected at the first installation.

#### The robot is rebuilt

If the robot is rebuilt, for example, after a crash or when the reach ability of a robot is changed, it needs to be re-calibrated for new resolver values.

If the robot has *absolute accuracy* calibration, it needs to be calibrated for new absolute accuracy.

#### Robot is not floor mounted

The original calibration data delivered with the robot is generated when the robot is floor mounted. If the robot is not floor mounted, then the robot accuracy could be affected. The robot needs to be calibrated after it is mounted.

## 5 Calibration

### 5.2.1 Synchronization marks and synchronization position for axes

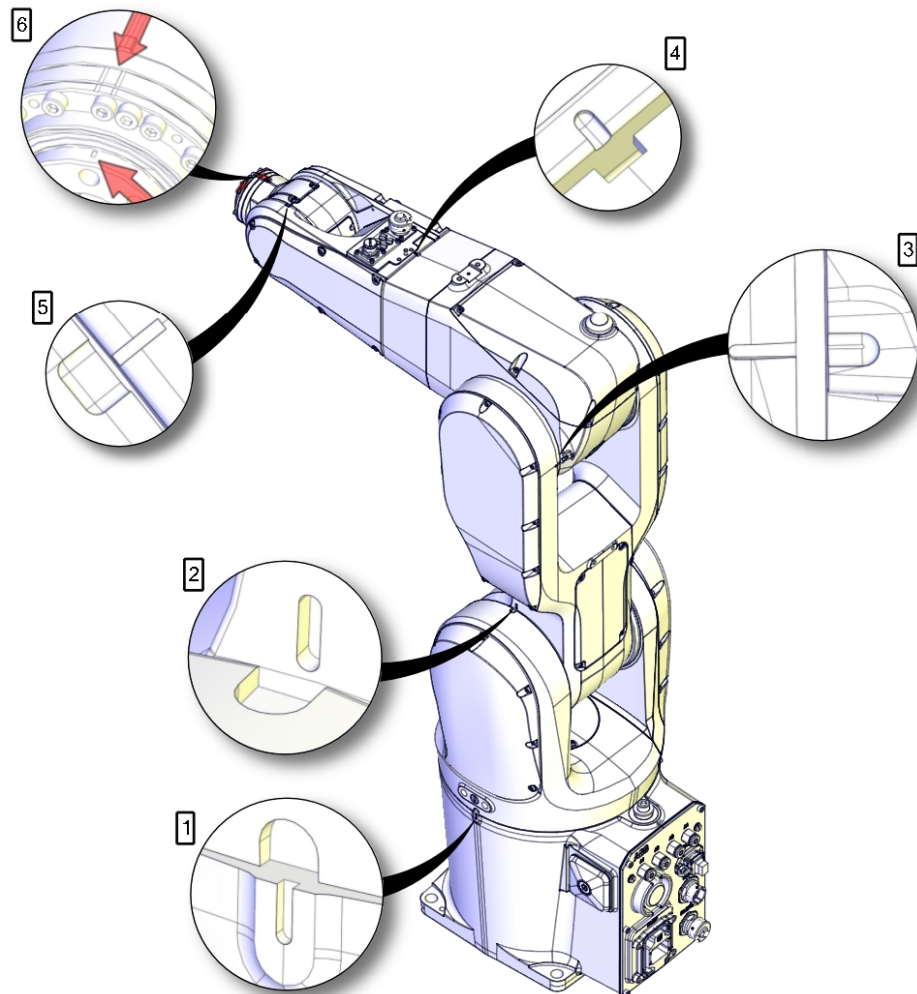
## 5.2 Synchronization marks and axis movement directions

### 5.2.1 Synchronization marks and synchronization position for axes

#### Introduction

This section shows the position of the synchronization marks and the synchronization position for each axis.

#### Synchronization marks, IRB 1200



xx140000402

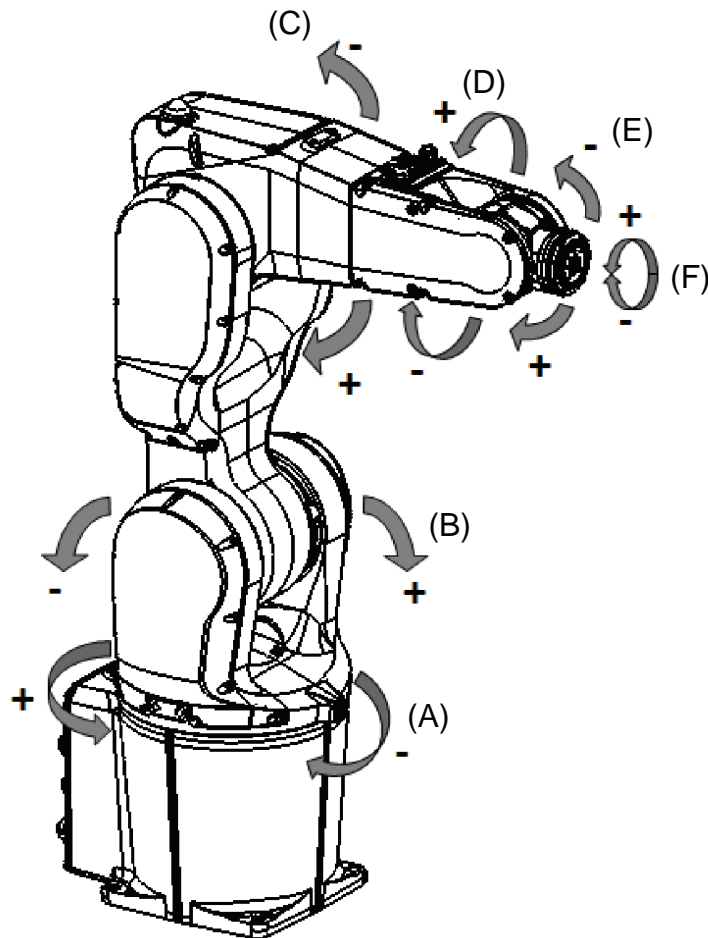
## 5.2.2 Calibration movement directions for all axes

### Overview

When calibrating, the axis must consistently be run towards the calibration position in the same direction in order to avoid position errors caused by backlash in gears and so on. Positive directions are shown in the graphic below.

Calibration service routines will handle the calibration movements automatically and these might be different from the positive directions shown below.

### Manual movement directions



xx130000365

| Position | Description | Position | Description |
|----------|-------------|----------|-------------|
| A        | Axis 1      | B        | Axis 2      |
| C        | Axis 3      | D        | Axis 4      |
| E        | Axis 5      | F        | Axis 6      |

## 5 Calibration

### 5.3 Updating revolution counters

### 5.3 Updating revolution counters

#### Introduction

This section describes how to do a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

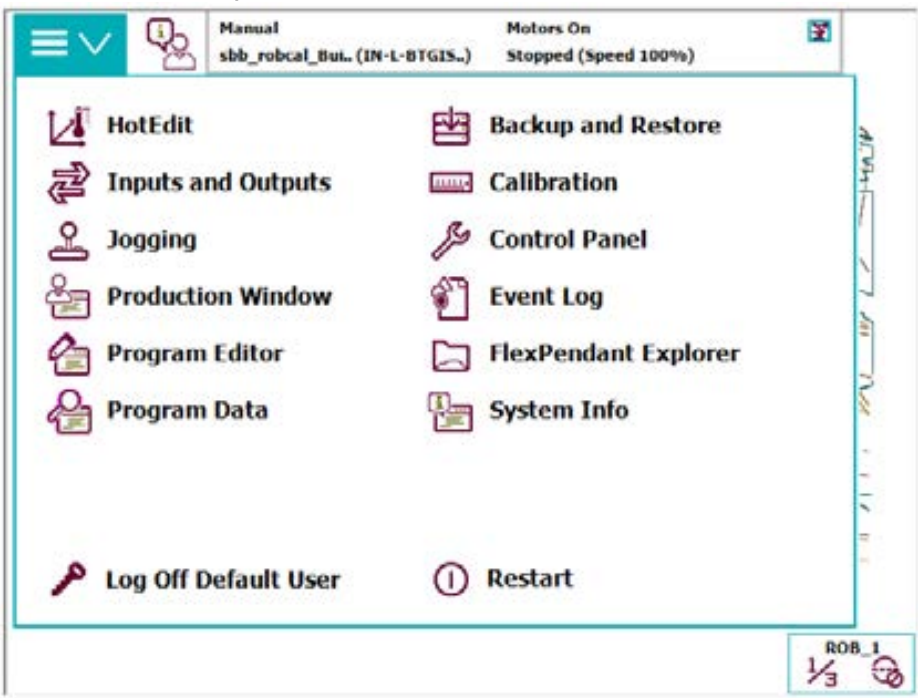
#### Step 1 - Manually running the manipulator to the synchronization position

Use this procedure to manually run the manipulator to the synchronization position.

|   | Action   | Note  |
|---|--|---|
| 1 | Select axis-by-axis motion mode.                             |   |
| 2 | Jog the manipulator to align the synchronization marks.      | See <a href="#">Synchronization marks and synchronization position for axes on page 734</a> . |
| 3 | When all axes are positioned, update the revolution counter. | <a href="#">Step 2 - Updating the revolution counter with the FlexPendant on page 736</a> .   |

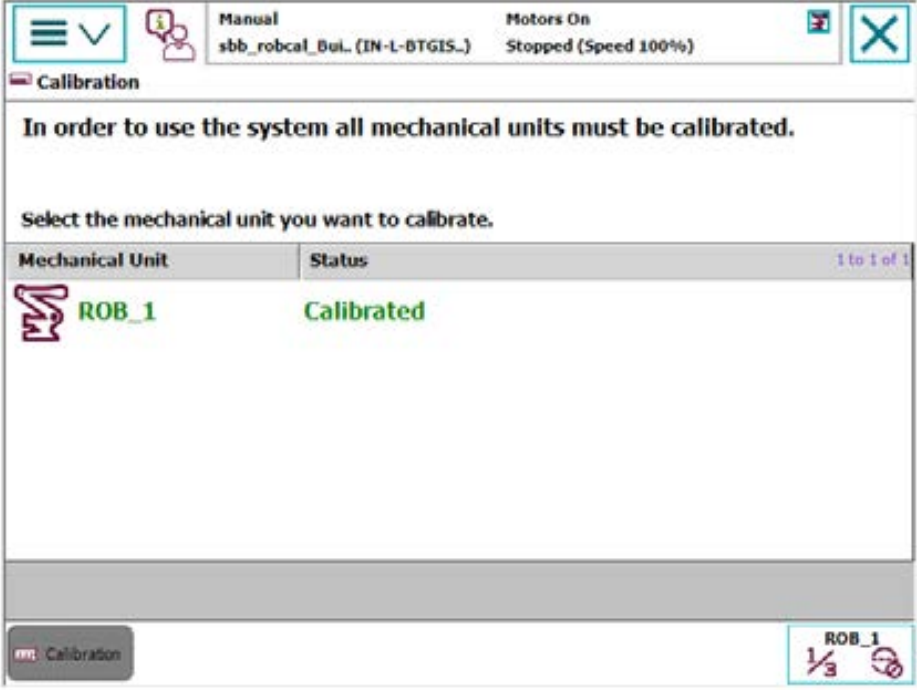
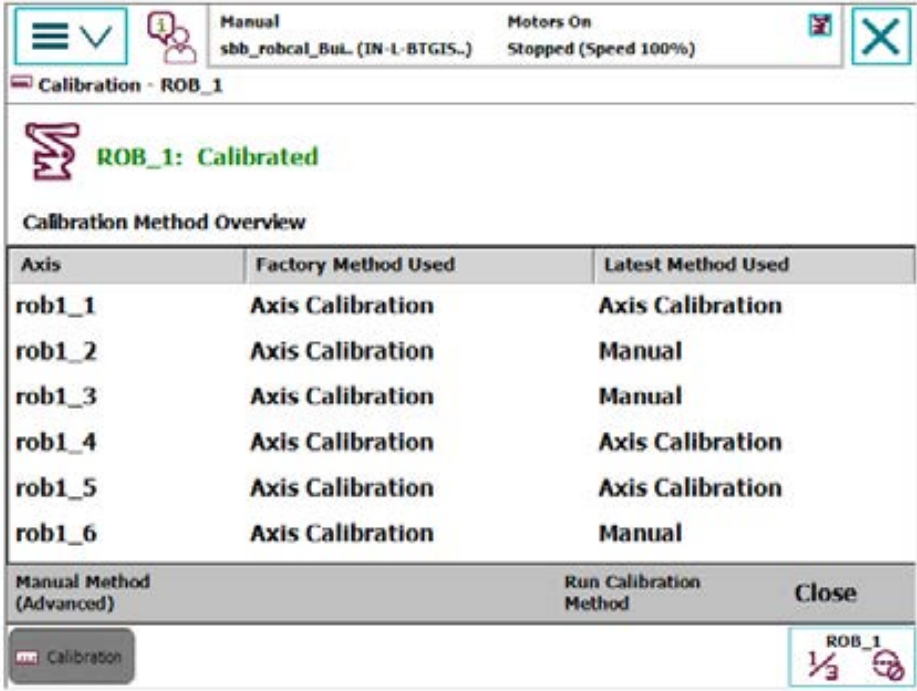
#### Step 2 - Updating the revolution counter with the FlexPendant

Use this procedure to update the revolution counter with the FlexPendant (IRC5).

|   | Action  |
|---|---|
| 1 | <p>On the <b>ABB</b> menu, tap <b>Calibration</b>.</p>  <p>The screenshot shows the ABB FlexPendant menu interface. At the top, it displays 'Manual sbb_robcal_but. (IN-L-BTGIS...)' and 'Motors On Stopped (Speed 100%)'. The main menu contains several options: HotEdit, Inputs and Outputs, Jogging, Production Window, Program Editor, Program Data, Backup and Restore, Calibration (highlighted with a red box), Control Panel, Event Log, FlexPendant Explorer, System Info, Log Off Default User, and Restart. A 'ROB_1' status indicator is visible in the bottom right corner.</p> |

xx150000942

Continues on next page

| Action          |  |                    |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
|-----------------|--|--------------------|---------------------|--------------------|------------|------------------|------------------|--------|------------------|--------|--------|------------------|--------|--------|------------------|------------------|--------|------------------|------------------|--------|------------------|--------|
| 2               | <p>All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.</p>  <p>The screenshot shows a mobile application interface for calibration. At the top, there's a status bar with 'Manual' mode, 'Motors On', and 'Stopped (Speed 100%)'. Below that, a 'Calibration' header is followed by a message: 'In order to use the system all mechanical units must be calibrated. Select the mechanical unit you want to calibrate.' A table lists the mechanical units:</p> <table border="1"> <thead> <tr> <th>Mechanical Unit</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>ROB_1</td> <td>Calibrated</td> </tr> </tbody> </table> <p>At the bottom, there's a 'Calibration' button and a progress indicator for ROB_1 (1/3).</p> <p>xx150000943</p>   | Mechanical Unit    | Status              | ROB_1              | Calibrated |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| Mechanical Unit | Status   |                    |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| ROB_1           | Calibrated   |                    |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| 3               | <p>This step is valid for RobotWare 6.04 and later. Calibration method used at factory for each axis is shown, as well as calibration method used during last field calibration. Tap <b>Manual Method (Advanced)</b>.</p>  <p>The screenshot shows the 'Calibration Method Overview' for ROB_1. It features a table with the following data:</p> <table border="1"> <thead> <tr> <th>Axis</th> <th>Factory Method Used</th> <th>Latest Method Used</th> </tr> </thead> <tbody> <tr> <td>rob1_1</td> <td>Axis Calibration</td> <td>Axis Calibration</td> </tr> <tr> <td>rob1_2</td> <td>Axis Calibration</td> <td>Manual</td> </tr> <tr> <td>rob1_3</td> <td>Axis Calibration</td> <td>Manual</td> </tr> <tr> <td>rob1_4</td> <td>Axis Calibration</td> <td>Axis Calibration</td> </tr> <tr> <td>rob1_5</td> <td>Axis Calibration</td> <td>Axis Calibration</td> </tr> <tr> <td>rob1_6</td> <td>Axis Calibration</td> <td>Manual</td> </tr> </tbody> </table> <p>Below the table, there are buttons for 'Manual Method (Advanced)', 'Run Calibration Method', and 'Close'. At the bottom, there's a 'Calibration' button and a progress indicator for ROB_1 (1/3).</p> <p>xx150000944</p> | Axis               | Factory Method Used | Latest Method Used | rob1_1     | Axis Calibration | Axis Calibration | rob1_2 | Axis Calibration | Manual | rob1_3 | Axis Calibration | Manual | rob1_4 | Axis Calibration | Axis Calibration | rob1_5 | Axis Calibration | Axis Calibration | rob1_6 | Axis Calibration | Manual |
| Axis            | Factory Method Used  | Latest Method Used |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| rob1_1          | Axis Calibration   | Axis Calibration   |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| rob1_2          | Axis Calibration   | Manual             |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| rob1_3          | Axis Calibration   | Manual             |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| rob1_4          | Axis Calibration   | Axis Calibration   |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| rob1_5          | Axis Calibration   | Axis Calibration   |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |
| rob1_6          | Axis Calibration   | Manual             |                     |                    |            |                  |                  |        |                  |        |        |                  |        |        |                  |                  |        |                  |                  |        |                  |        |

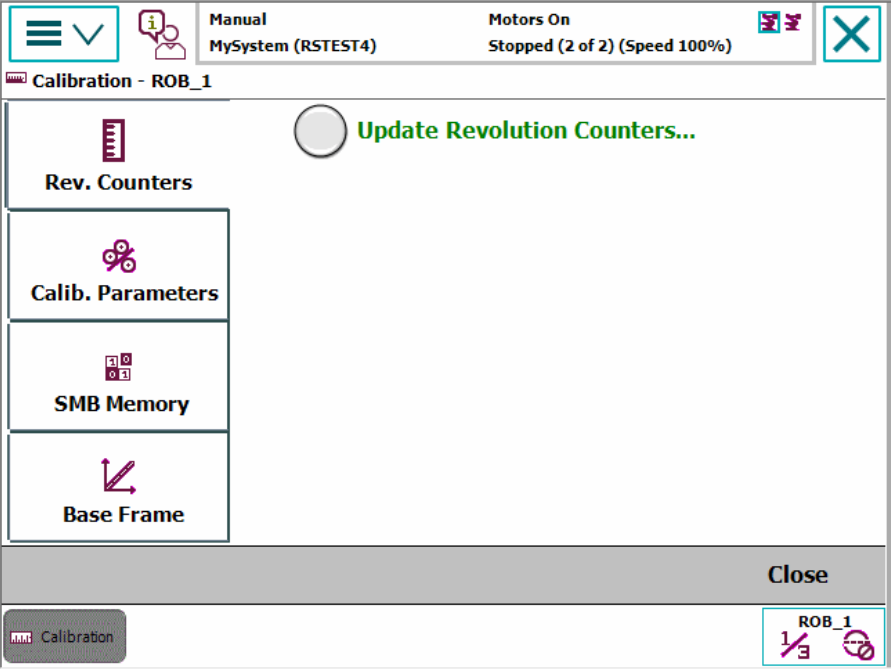

Continues on next page



## 5 Calibration

### 5.3 Updating revolution counters

Continued

| Action |  |
|--------|--|
| 4      | <p>A screen is displayed, tap <b>Rev. Counters</b>.</p>  <p>en040000771</p>   |
| 5      | <p>Tap <b>Update Revolution Counters...</b></p> <p>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none"><li>• Tap <b>Yes</b> to update the revolution counters.</li><li>• Tap <b>No</b> to cancel updating the revolution counters.</li></ul> <p>Tapping <b>Yes</b> displays the axis selection window.</p>   |
| 6      | <p>Select the axis to have its revolution counter updated by:</p> <ul style="list-style-type: none"><li>• Ticking in the box to the left</li><li>• Tapping <b>Select all</b> to update all axes.</li></ul> <p>Then tap <b>Update</b>.</p>  |
| 7      | <p>A dialog box is displayed, warning that the updating operation cannot be undone:</p> <ul style="list-style-type: none"><li>• Tap <b>Update</b> to proceed with updating the revolution counters.</li><li>• Tap <b>Cancel</b> to cancel updating the revolution counters.</li></ul> <p>Tapping <b>Update</b> updates the selected revolution counters and removes the tick from the list of axes.</p>        |
| 8      | <p> <b>CAUTION</b></p> <p>If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury!</p> <p>Check the synchronization position very carefully after each update. See <a href="#">Checking the synchronization position on page 786</a>.</p> |

## 5.4 Calibrating with Axis Calibration method

### 5.4.1 Description of Axis Calibration

#### Instructions for Axis Calibration procedure given on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

This manual contains a brief description of the method, additional information to the information given on the FlexPendant, article number for the tools and images of where to fit the calibration tools on the robot.

#### Overview of the Axis Calibration procedure

The Axis Calibration procedure applies to all axes, and is performed on one axis at the time. The robot axes are both manually and automatically moved into position, as instructed on the FlexPendant.

Bushings are installed on each robot axis at delivery, for installation of the calibration tools. For axis 6 calibration there is one bushing on the wrist and one mounting hole on the tool flange.

The Axis Calibration procedure described roughly:

- 1 A removable calibration tool is inserted by the operator into a calibration bushing on the axis chosen for calibration, according to instructions on the FlexPendant.

**WARNING**

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration bushings may cause severe damage to the robot and/or personnel.

**WARNING**

The calibration tool must be fully inserted into the calibration bushing, until the steel spring ring snaps into place.

- 2 During the calibration procedure, RobotWare moves the robot axis chosen for calibration so that the calibration tools get into contact. RobotWare records values of the axis position and repeats the coming-in-contact procedure several times to get an exact value of the axis position.

**WARNING**

Risk of pinching! The contact force for large robots can be up to 150 kg. Keep a safe distance to the robot.

*Continues on next page*

## 5 Calibration

---

### 5.4.1 Description of Axis Calibration

*Continued*

- 3 The axis position is stored in RobotWare with an active choice from the operator.

---

#### Routines in the calibration procedure

The following routines are available in the Axis Calibration procedure, given at the beginning of the procedure on the FlexPendant.

##### Fine calibration routine

Choose this routine to calibrate the robot when there are no tools, process cabling or equipment fitted to the robot.

##### Reference calibration routine

Choose this routine to create reference values and to calibrate the robot when the robot is dressed with tools, process cabling or other equipment.

Also choose this routine if the robot is wall mounted or suspended.



#### Note

When calibrating the robot with the reference calibration routine, the robot must be dressed with the same tools, process cabling and any other equipment as when the reference values were created.

If calibrating the robot with reference calibration there must be reference values created before repair is made to the robot, if values are not already available. Creating new values requires possibility to move the robot. The reference values contain positions of all axes, torque of axes and technical data about the tool installed. A benefit with reference calibration is that the current state of the robot is stored and not the state when the robot left the ABB factory. The reference value will be named according to tool name, date etc.

Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.

When reference calibration is performed, the robot is restored to the status given by the reference values.

##### Update revolution counters

Choose this routine to make a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

##### Validation

In the mentioned routines, it is also possible to validate the calibration data.

---

#### System containing SafeMove/EPS

##### SafeMove/EPS

SafeMove will lose its synchronization to the controller if a new calibration is done. New calibration values have to be downloaded to SafeMove, and a new SafeMove/EPS calibration has to be done. Make sure that the user rights admit to change the safety settings and to synchronize SafeMove/EPS.

*Continues on next page*

**Position of robot axes**

The robot axes should be positioned close to 0 degrees before commencing the calibration program. The axis chosen for calibration is then automatically run by the calibration program to its exact calibration position during the calibration procedure.

It is possible to position some of the other axes in positions different from 0 degrees. Information about which axes are allowed to be jogged is given on the FlexPendant. These axes are marked with **Unrestricted** in the FlexPendant window. Also the following table shows the dependencies between the axes.

**Requirements for axis positioning during calibration**

| Required position of axis | Axis to calibrate |        |        |        |        |        |
|---------------------------|-------------------|--------|--------|--------|--------|--------|
|                           | Axis 1            | Axis 2 | Axis 3 | Axis 4 | Axis 5 | Axis 6 |
| Axis 1                    | -                 | *      | *      | *      | *      | *      |
| Axis 2                    | 0                 | -      | 0      | *      | *      | *      |
| Axis 3                    | 0                 | 0      | -      | *      | *      | *      |
| Axis 4                    | *                 | *      | *      | -      | *      | *      |
| Axis 5                    | *                 | *      | *      | *      | -      | X      |
| Axis 6                    | *                 | *      | *      | *      | *      | -      |

|   |  |
|---|--|
| - | Axis to be calibrated  |
| * | Unrestricted. Axis is allowed to be jogged to other position than 0 degrees. |
| 0 | Axis must be put in position 0 degrees.                                      |
| X | Special requirement  |

**How to calibrate a suspended or wall mounted robot**

The IRB 1200 is fine calibrated floor standing in factory, prior to shipping.

To calibrate a suspended or wall mounted robot, reference calibration must be used. Reference values for a suspended or a wall mounted robot must be created with the robot mounted at its working position, not standing on a floor.

To calibrate a suspended or wall mounted robot with the fine calibration routine, the robot must first be taken down and mounted standing on the floor.

## 5 Calibration

### 5.4.2 Calibration tools for Axis Calibration

#### 5.4.2 Calibration tools for Axis Calibration

##### Calibration tool set

The calibration tools used for Axis Calibration are designed to meet requirements for calibration performance, durability and safety in case of accidental damage.

The calibration tool will eventually break from fatigue after longer period of use and then needs to be replaced. There is no risk for bad calibrations as long as the calibration tool is in one piece.



#### WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration bushings may cause severe damage to the robot and/or personnel.

| Equipment, etc.                        | Article number | Note  |
|--|----------------|---|
| Calibration tool box, Axis Calibration | 3HAC074119-001 | Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot. <sup>i</sup><br>The tool box also includes a unique calibration pin for IRB 1200 to be fitted to the tool flange during calibration of axis 6. |

- <sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

##### Examining the calibration tool

##### Check prior to usage

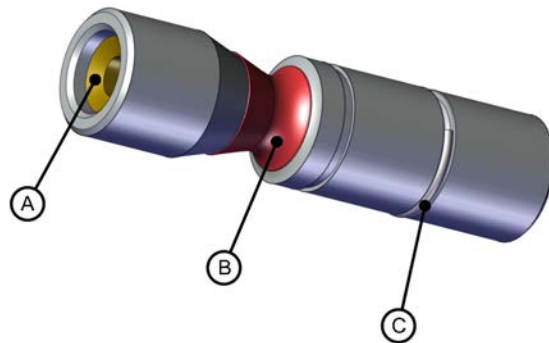
Before using the calibration tool, make sure that the tube insert, the plastic protection and the steel spring ring are present.



#### WARNING

If any part is missing or damaged, the tool must be replaced immediately.

*Continues on next page*



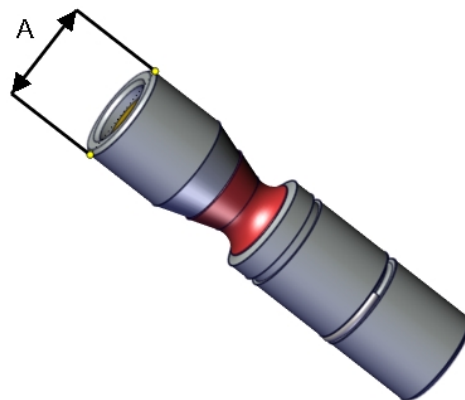
xx1500001914

|   |                    |
|---|--------------------|
| A | Tube insert        |
| B | Plastic protection |
| C | Steel spring ring  |

#### Periodic check of the calibration tool

If including the calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within  $\varnothing 12g4$  mm,  $\varnothing 8g4$  mm or  $\varnothing 6g5$  mm (depending on calibration tool size).
- Straightness within 0.005 mm.



xx1500000951

|   |                |
|---|----------------|
| A | Outer diameter |
|---|----------------|

#### Periodic check of the calibration tool for the tool flange (3HAC058238-001)

If including the tool flange calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within  $\varnothing 5g5$  mm.
- Straightness within 0.005 mm.

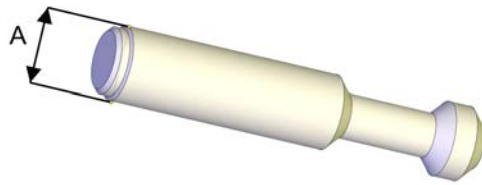
*Continues on next page*

## 5 Calibration

---

### 5.4.2 Calibration tools for Axis Calibration

*Continued*



xx1600001142

|   |                |
|---|----------------|
| A | Outer diameter |
|---|----------------|



### 5.4.3 Installation locations for the calibration tools

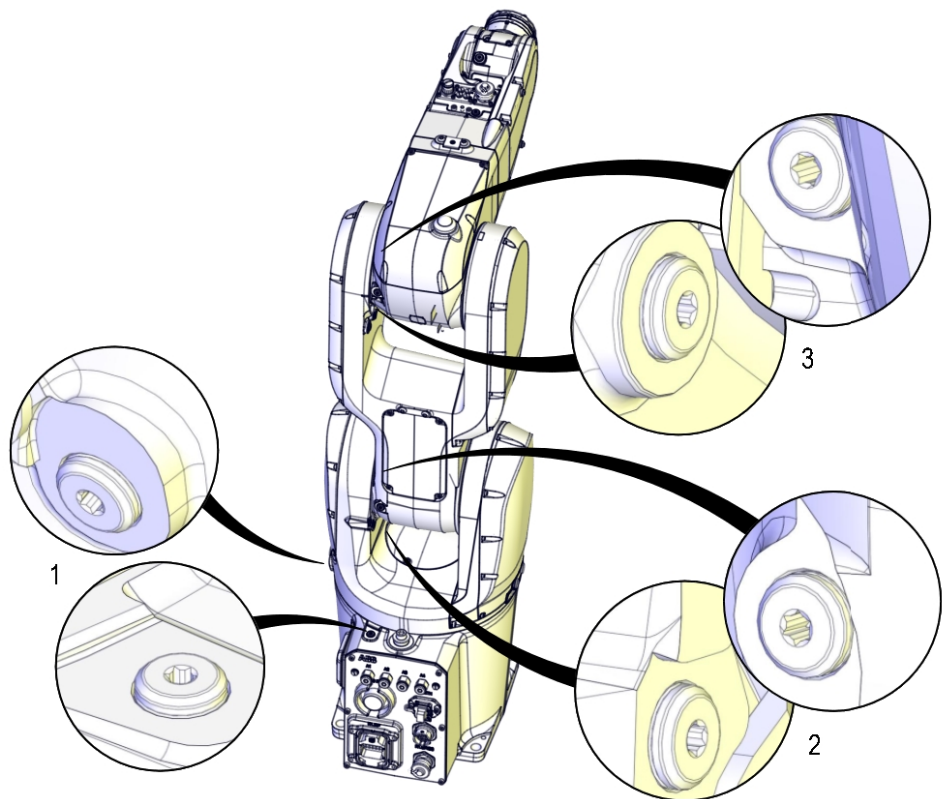
#### Location of fixed calibration items

This section shows how the robot is equipped with items for installation of calibration tools for Axis Calibration (fixed calibration pins and/or bushings). Installed calibration tools are not shown.

A fixed calibration pin and a bushing for the movable calibration tool are located on each axis as follows.

If there is not enough space on an axis to install a fixed calibration pin, the axis is equipped with two bushings instead, for installation of two calibration tools when calibration is carried out. This is shown in the figure.

For axis 6 there is only one bushing, the second calibration tool is installed at the mounting flange of the turning disk.



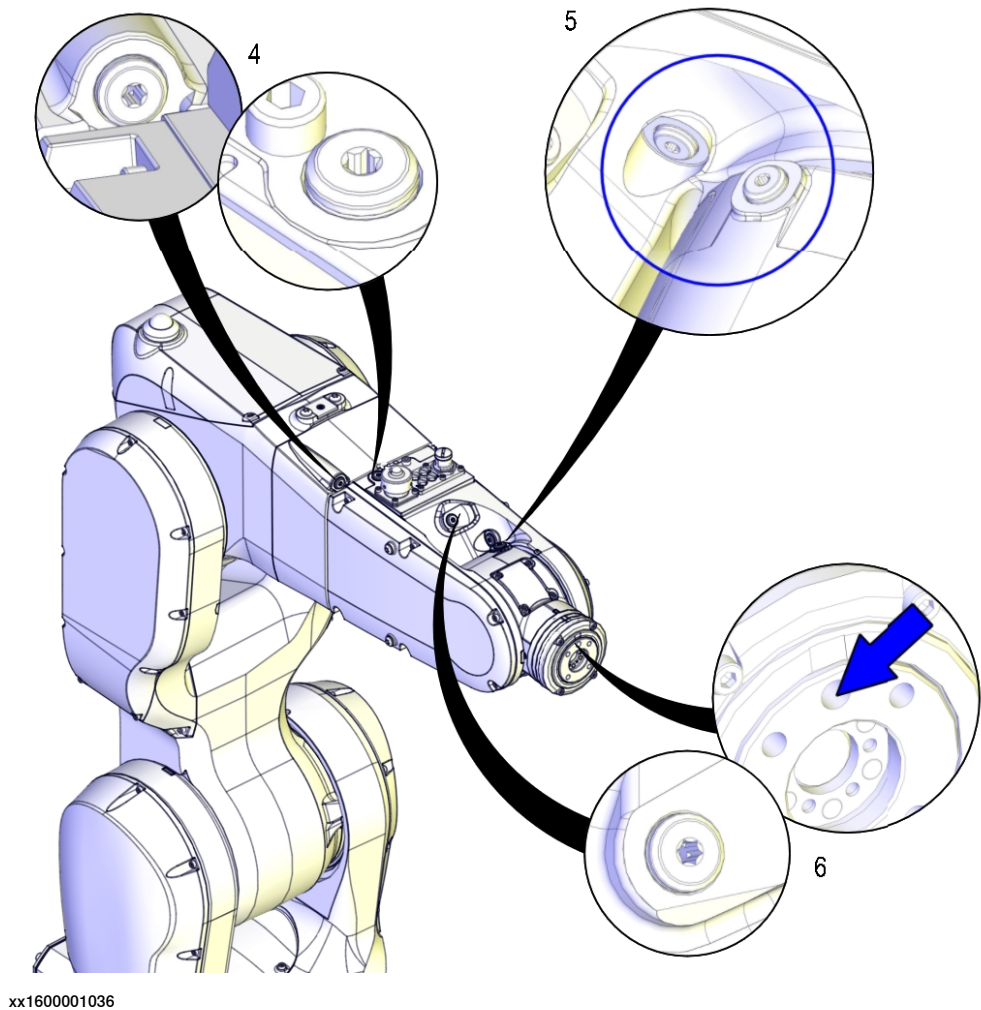
xx1600001035

*Continues on next page*

## 5 Calibration

### 5.4.3 Installation locations for the calibration tools

Continued



#### Spare parts

When calibration is not being performed, a protective plug should always be installed in the bushing. Replace damaged parts with new, if needed.

| Spare part  | Article number | Note                           |
|---|----------------|--------------------------------|
| Protective plug for bushing                         | 3HAC059556-001 | Replace if damaged or missing. |
| Protective plug for bushing, Clean Room             | 3HAC059557-001 | Replace if damaged or missing. |
| Protective plug for bushing, food grade lubrication |                |                                |

### 5.4.4 Axis Calibration - Running the calibration procedure

#### Required tools

The calibration tools used for Axis Calibration are designed to meet requirements for calibration performance, durability and safety in case of accidental damage.



#### WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration holes may cause severe damage to the robot and/or personnel.

| Equipment, etc.                        | Article number | Note  |
|--|----------------|---|
| Calibration tool box, Axis Calibration | 3HAC074119-001 | Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot. <sup>i</sup><br>The tool box also includes a unique calibration pin for IRB 1200 to be fitted to the tool flange during calibration of axis 6. |

<sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

#### Required consumables

| Consumable  | Article number | Note |
|-------------|----------------|------|
| Clean cloth | -              |      |

#### Spare parts

| Spare part  | Article number | Note                           |
|---|----------------|--------------------------------|
| Protective plug for bushing                         | 3HAC059556-001 | Replace if damaged or missing. |
| Protective plug for bushing, Clean Room             | 3HAC059557-001 | Replace if damaged or missing. |
| Protective plug for bushing, food grade lubrication |                |                                |

#### Overview of the calibration procedure on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Use the following list to learn about the calibration procedure before running the RobotWare program on the FlexPendant. It gives you a brief overview of the calibration procedure sequence.

*Continues on next page*

## 5 Calibration

### 5.4.4 Axis Calibration - Running the calibration procedure

*Continued*



After the calibration method has been called for on the FlexPendant, the following sequence will be run.

- 1 Choose calibration routine. The routines are described in [Routines in the calibration procedure on page 740](#).
- 2 Choose which axis/axes to calibrate.
- 3 The robot moves to synchronization position.
- 4 Validate the synchronization marks.
- 5 The robot moves to preparation position.
- 6 Remove the protection plug from the bushings, and install the calibration tool.
- 7 The robot performs a measurement sequence by rotating the axis back and forth.
- 8 Remove the calibration tool and reinstall the protection plugs in the bushings.
- 9 The robot moves to verify that the calibration tool is removed.
- 10 Choose whether to save the calibration data or not.

Calibration of the robot is not finished until the calibration data is saved, as last step of the calibration procedure.

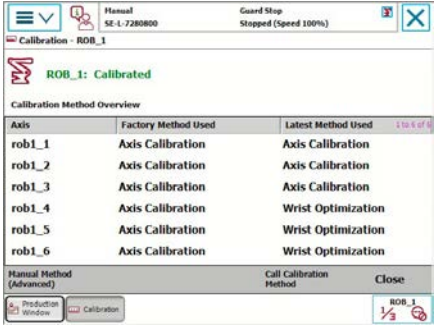
#### Preparation prior to calibration

The calibration procedure is described in the FlexPendant while conducting it.

|   | Action   | Note               |
|---|--|--------------------|
| 1 |  <b>DANGER</b><br>While conducting the calibration, the robot needs to be connected to power.<br>Make sure that the robot's working area is empty, as the robot can make unpredictable movements. |                    |
| 2 | Wipe the calibration tool clean.<br> <b>Note</b><br>The calibration method is exact. Dust, dirt or color flakes will affect the calibration value.  | Use a clean cloth. |

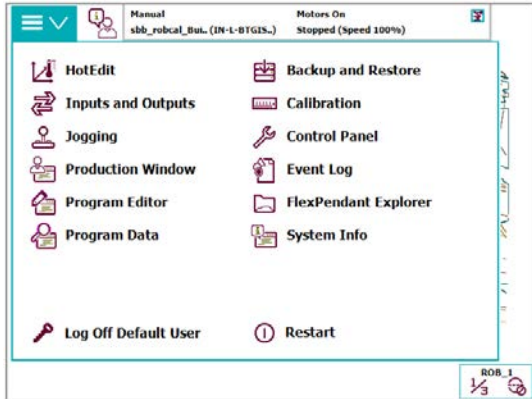
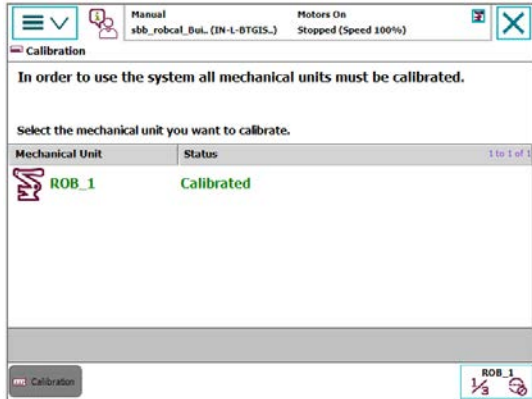
*Continues on next page*

5.4.4 Axis Calibration - Running the calibration procedure  
Continued

|   | Action  | Note   |
|---|---|--|
| 3 | <p>Check if the standard calibration data for axes 4 or 5 are updated with wrist optimization. This is shown in the Calibration Method Overview window on the FlexPendant.</p>  <p>xx200000509</p> | <p>If the data is optimized, the calibration routine <b>Wrist Optimization</b> must be re-run after standard calibration.</p> <p>See <a href="#">Calibrating with Wrist Optimization method on page 756</a>.</p> |

Starting the calibration procedure

Use this procedure to start the Axis Calibration routine on the FlexPendant.

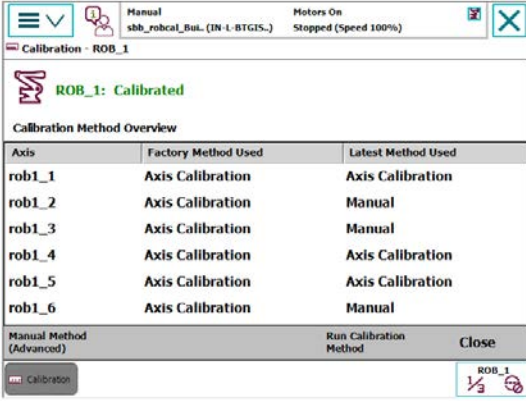
|   | Action  | Note |
|---|---|------|
| 1 | <p>On the <b>ABB</b> menu, tap <b>Calibration</b>.</p>  <p>xx150000942</p>  |      |
| 2 | <p>All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.</p>  <p>xx150000943</p> |      |

Continues on next page

## 5 Calibration

### 5.4.4 Axis Calibration - Running the calibration procedure

Continued

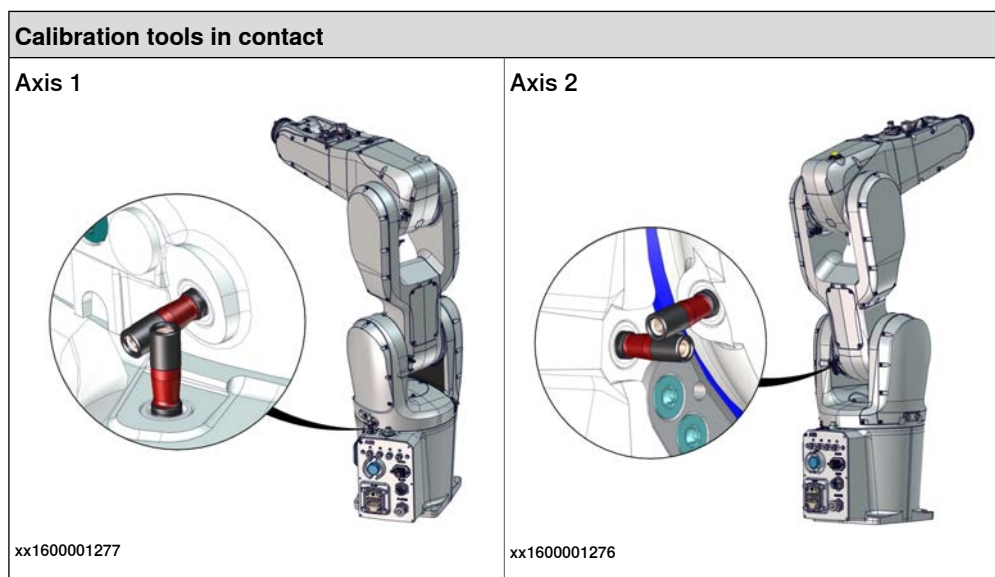
|   | Action  | Note  |
|---|---|---|
| 3 | <p>Calibration method used at factory for each axis is shown, as well as calibration method used for the robot during last field calibration.</p> <p>Tap <b>Run Calibration Method</b>. The software will automatically call for the procedure for the valid calibration method.</p>  <p>xx150000944</p> | <p>The FlexPendant will give all information needed to proceed with Axis Calibration.</p>   |
| 4 | <p>Follow the instructions given on the FlexPendant.</p>  | <p>A brief overview of the sequence that will be run on the FlexPendant is given in <a href="#">Overview of the calibration procedure on the FlexPendant on page 747</a>.</p> |

### Fitting of calibration tools

The figures show the calibration tools in contact with each other on each axis.

The position of the complete robot shown for each axis is only an example.

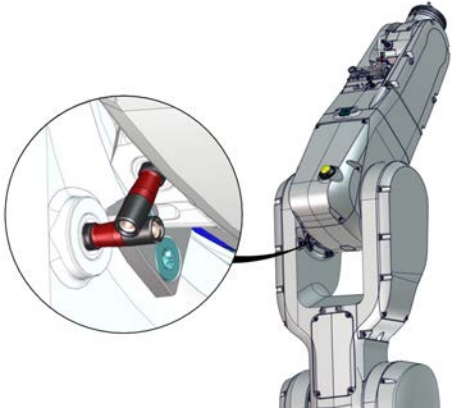
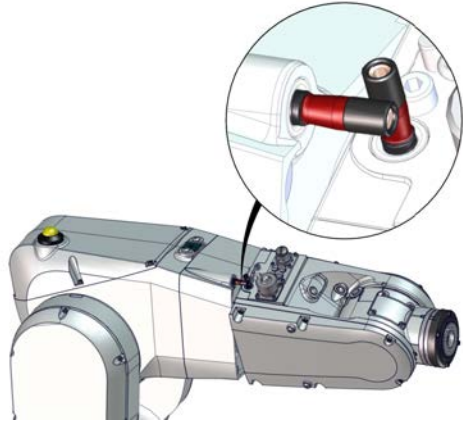
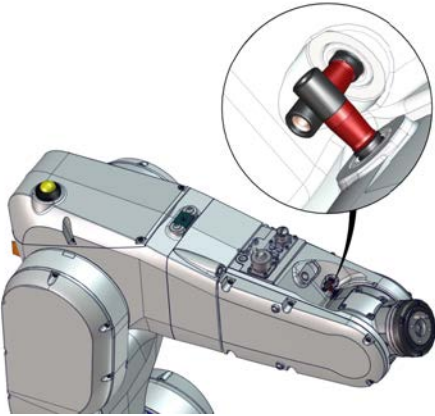
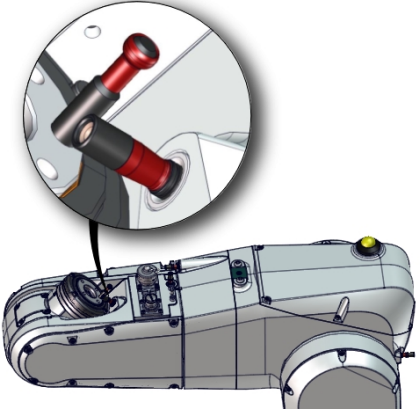
In order for the axis to be able to be moved to calibration position, or in order for getting proper access to the calibration bushing, other axes might need to be jogged to positions different from 0 degrees. Information about which axes are allowed to be jogged will be given on the FlexPendant. These axes are marked with **Unrestricted** in the FlexPendant window.



Continues on next page



5.4.4 Axis Calibration - Running the calibration procedure  
Continued

| Calibration tools in contact   |  |
|--|--|
| <p>Axis 3</p>  <p>xx1600001275</p>  | <p>Axis 4</p>  <p>xx1600001274</p>   |
| <p>Axis 5</p>  <p>xx1600001273</p> | <p>Axis 6</p> <p>Make sure to orient the tool flange calibration tool correctly.</p>  <p>xx1600001272</p> |

**Restarting an interrupted calibration procedure**

If the Axis Calibration procedure is interrupted before the calibration is finished, the RobotWare program needs to be started again. Use this procedure to take required action.

| Situation  | Action  |
|--|---|
| The three-position enabling device on the FlexPendant has been released during robot movement. | Press and hold the three-position enabling device and press <b>Play</b> . |

*Continues on next page*



## 5 Calibration

### 5.4.4 Axis Calibration - Running the calibration procedure

*Continued*

| Situation  | Action  |
|--|---|
| The RobotWare program is terminated with <b>PP to Main</b> . | <p>Remove the calibration tool, if it is installed, and restart the calibration procedure from the beginning. See <a href="#">Starting the calibration procedure on page 749</a>.</p> <p>If the calibration tool is in contact the robot axis needs to be jogged in order to release the calibration tool. Jogging the axis in wrong direction will cause the calibration tool to break. Directions of axis movement is shown in <a href="#">Calibration movement directions for all axes on page 735</a></p> |

#### Axis Calibration with SafeMove option

To be able to run Axis Calibration, SafeMove needs to be unsynchronized. The Axis Calibration routine recognizes if the robot is equipped with SafeMove and will force SafeMove to unsynchronize automatically.

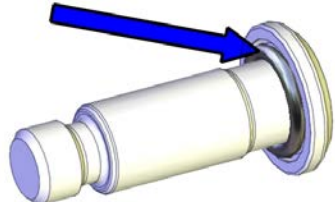
However, SafeMove may generate other warning messages anytime during the Axis Calibration routine. When a warning message is displayed, tap **Acknowledge** to confirm the unsynchronized state and continue Axis Calibration procedure.



#### CAUTION

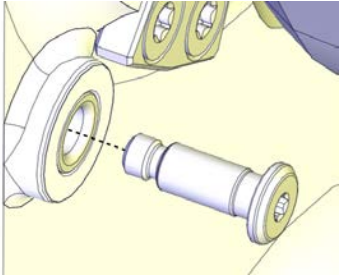
SafeMove must be synchronized after the calibration is completed.

#### After calibration

|   | Action  | Note  |
|---|---|---|
| 1 | <p>Check the o-ring on the plug.<br/>Replace the plug with new spare part, if missing or damaged.</p> |  <p>xx1600001143</p> <p>Protective plug for bushing:<br/>3HAC059556-001.<br/>: 3HAC059557-001.</p> <p>Protective plug for bushing, Clean Room</p> <p>Protective plug for bushing, food grade lubrication</p> |

*Continues on next page*

### 5.4.4 Axis Calibration - Running the calibration procedure Continued

|   | Action   | Note  |
|---|--|---|
| 2 | <p>Reinstall the protective plugs in both bushings on each axis, directly after the axis is calibrated.<br/>Replace the plug with new spare part, if missing or damaged.</p> |  <p>xx1600001144</p> |
| 3 | <p>If the standard calibration data for axes 4, 5 or 6 should be updated with wrist optimization, run the calibration routine <b>Wrist Optimization</b>.</p>                 | <p>See <a href="#">Calibrating with Wrist Optimization method on page 756</a>.</p>                      |

## 5 Calibration

---

### 5.4.5 Reference calibration

#### 5.4.5 Reference calibration

---

##### Brief introduction to Reference Calibration

Reference calibration is a faster method compared to Fine calibration, as it refers to a previously made calibration.

- 1 Create a backup of the current robot system.
- 2 Check that the active calibration offset values corresponds to the values on the silver label (on the lower arm or the base).
- 3 Jog the manipulator so that all axes are in zero position (ex use `MoveAbsJ` instruction). Check that all axis scales are aligned with calibration marks.
- 4 If the scales differ from calibration marks it might depend on wrong turns of the revolution counters. Make a marker line on the corresponding axis to be able to validate the result of the calibration. If more than one motor revolutions are wrong, the calibration will fail.
- 5 Use a verification position. This is especially recommended if all axes were not aligned with the synchronization marks (step 3). Reuse an existing position that is suitable and accurate so it can be used to validate the repair. Use a position where a deviation in axis calibration gives a big deviation in positioning. Note! Check the position after each repair in one axis.
- 6 Use Reference calibration to save reference values for all axes that is to be replaced. Make sure that the values are saved in RobotStudio or FTP program. The files are located in "Active system folder name/HOME/RefCalibFiles".
- 7 Perform the repair.
- 8 Make sure that the tooling and process equipment are the same as when creating the reference. Use Reference calibration to update the system with new calibration offset value for the repaired axis.
- 9 Check the position against the verification position (step 5).
- 10 Proceed with the repair of the next axis, if necessary, and repeat (step 8-9) for every axis.
- 11 (For system containing SafeMove or EPS) Download new calibration values to SafeMove. Use Visual SafeMove in RobotStudio.
- 12 (For system containing SafeMove or EPS) Synchronize SafeMove to activate SafeMove.
- 13 Perform test run.
- 14 Update the label for resolver values with new calibration values.

##### Manual tuning of calibration offset

Manual tuning of calibration offset is normally not needed, but can be useful in some situations. The requirement to do manual tuning is that there is a known accurate position, that worked accurately before the repair (step 5, see [Brief introduction to Reference Calibration on page 754](#)).

Example "Adjust axis 4":

- 1 Create a backup.

*Continues on next page*

- 2 Run the manipulator to the verification position. (The manipulator position is now deviating from the verification position.)
- 3 Read and note current axis 4 value in degrees (example: 96.3 degrees).
- 4 Manually jog, only axis 4, so that the manipulator is correctly positioned to the verification position.
- 5 Read and note current axis 4 value in degrees (example: 94.2 degrees).
- 6 Move the manipulator to its calibration position.
- 7 Calculate the angle difference (ie  $96.3 - 94.2 = 2.1$  degrees).
- 8 Manually jog axis 4 the calculated angle difference (-2.1). NOTE! The direction +/- shall be the same direction as the direction used when axis 4 was manually jogged to coincide with the verification process. In the example -2.1 degrees.
- 9 Make a new manual fine calibration of axis 4 with axis in -2.1 degrees position.
- 10 Check again against the verification position.
- 11 Repeat the manual tuning if needed.
- 12 Create a new reference if the intention is to use the reference in the future.

## 5 Calibration

### 5.5 Calibrating with Wrist Optimization method

### 5.5 Calibrating with Wrist Optimization method

#### When to run Wrist Optimization

Wrist Optimization routine is run to improve TCP reorientation performance.

Calibrating the robot with standard calibration method overwrites the optimized positions of axes 4, 5. Re-run the Wrist Optimization routine after standard calibration to re-achieve the optimized positions of the wrist axes.

#### Overview of the calibration procedure on the FlexPendant

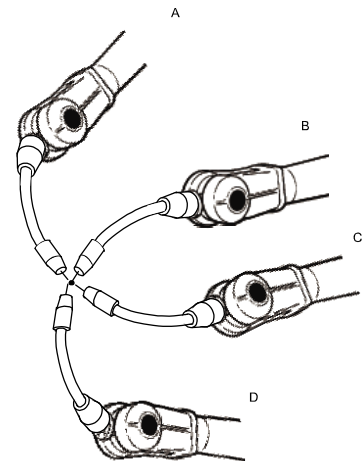
The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Use the following list to learn about the calibration procedure before running the RobotWare program on the FlexPendant. It gives you a brief overview of the calibration procedure sequence.

After the calibration method has been called for on the FlexPendant, the following sequence will be run.

- 1 Choose calibration routine Wrist Optimization.
- 2 Modify targets for 4-point tool frame definition, in Wrist Optimization routine.

- a Jog the robot to an appropriate position, A, for the first approach point.  
Use small increments to accurately position the tool tip as close to the reference point as possible.
- b Tap **Modify Position** to define the point.
- c Repeat for each approach point to be defined, positions B, C, and D.  
Jog away from the fixed world point to achieve the best result. Just changing the tool orientation will not give as good a result.



en0400000906

- 3 Improved calibration data to the wrist axes is identified and presented.
- 4 Optimized positions for the wrist axes are presented.
- 5 The robot moves to the optimized positions for the wrist axes and automatically overwrites previous calibration data.



#### WARNING

Robot moves automatically when pressing **Calibrate**.

- 6 Wrist optimization is finished.
- 7 Redefine / verify TCP for all tools.

## 5.6 Calibrating with manual calibration method

### 5.6.1 Manual calibration method - calibration position

#### Calibration position

The position of the axis to be calibrated is illustrated in each calibration section respectively.

The table below specifies the exact axis positions in degrees.

| Axis | IRB 1200-5/0.9 | IRB 1200-7/0.7 |
|------|----------------|----------------|
| 1    | +84.474066°    | +84.474066°    |
| 2    | +131.862755°   | +136.862755°   |
| 3    | +72.250000°    | +72.250000°    |
| 4    | 0°             | 0°             |
| 5    | -90°           | -90°           |
| 6    | 0°             | 0°             |

## 5 Calibration

### 5.6.2 Manual calibration method - content of calibration toolkit 3HAC051256-001

### 5.6.2 Manual calibration method - content of calibration toolkit 3HAC051256-001

#### Content of calibration toolkit 3HAC051256-001

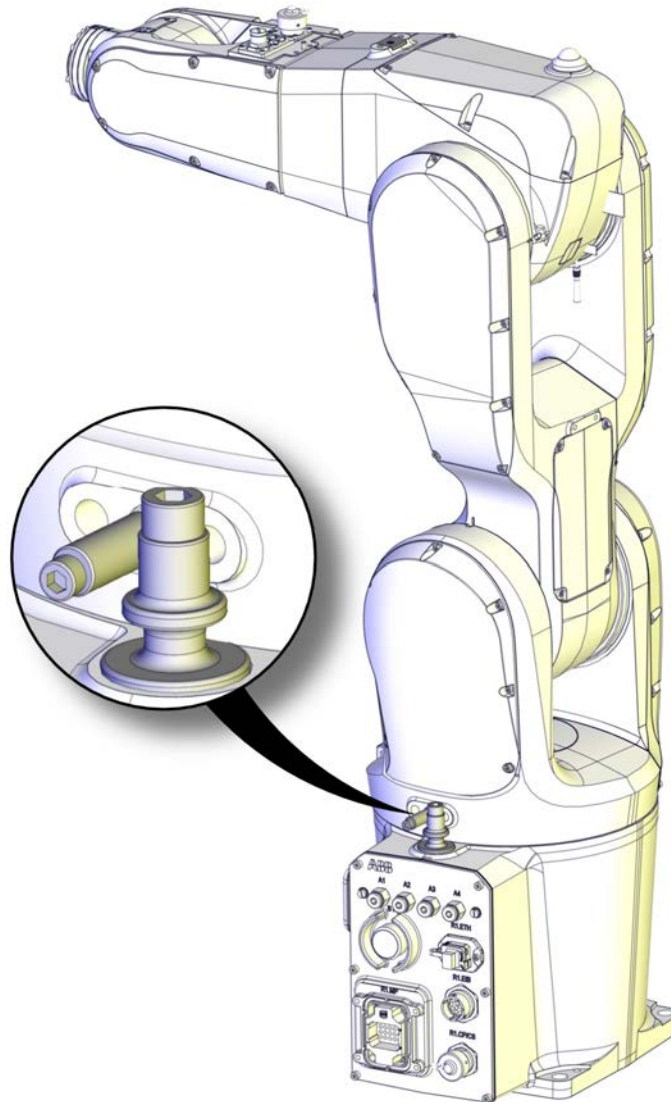
| Content in calibration toolkit 3HAC051256-001 | Art. no.       | Note   |
|---|----------------|--|
| Calibration pin, axis 1                       | 3HAC051209-001 |  |
| Calibration stop pin, axis 1                  | 3HAC051211-001 |  |
| Calibration tool, axis 4                      | 3HAC051212-001 |  |
| Calibration tool, axes 5 and 6                | 3HAC051213-001 |  |
| Conical screw M3                              | 3HAC055410-001 | Used together with the calibration tool, axis 4.   |
| Guide pin                                     | 3HAC034513-001 | Used together with the calibration tool, axis 5/6. |
| Calibration block with pin                    | 3HAC051254-001 | Fitted on tubular.                                 |
| Hex socket head screw                         | 9ADA183-19     | M5x40  |
| Hex socket head screw                         | 9ADA183-41     | M8x45  |
| Hex socket head screw                         | 9ADA183-15     | M5x20  |
| Hex socket head screw                         | 9ADA183-5      | M4x16  |
| Hex socket head screw                         | 9ADA183-14     | M5x16  |



### 5.6.3 Manual calibration method - calibrating axis 1

#### Calibration position of axis 1

The figure shows axis 1 in calibration position, with calibration tools fitted.



xx1400001209

#### Required equipment

| Equipment                               | Art. no.       | Note   |
|---|----------------|--|
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |

*Continues on next page*

## 5 Calibration

### 5.6.3 Manual calibration method - calibrating axis 1

*Continued*

| Equipment       | Art. no.       | Note   |
|-----------------|----------------|--|
| Protection plug | 3HAC051199-001 | Protection plug for the calibration hole in the swing (the hole is used during calibration of axis 1 with the manual calibration method).<br>Replace if damaged. |

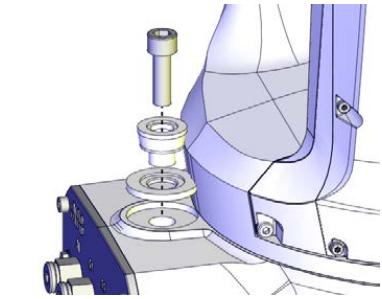
- i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.  
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.  
If no data is found related to standard calibration, manual calibration is used as default.

#### Required consumables


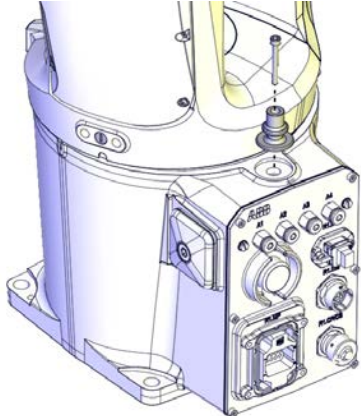

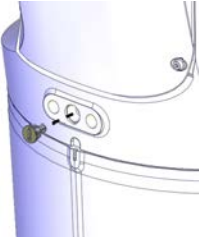
| Equipment      | Art. no. | Note        |
|----------------|----------|-------------|
| Cleaning agent | -        | Isopropanol |

#### Calibrating axis 1

##### Moving the robot to calibration position

|   | Action                                 | Note   |
|---|--|--|
| 1 | Jog all axes to zero position.         |  |
| 2 | Remove the axis-1 mechanical stop pin. | <br>xx1400000392 |

*Continues on next page*


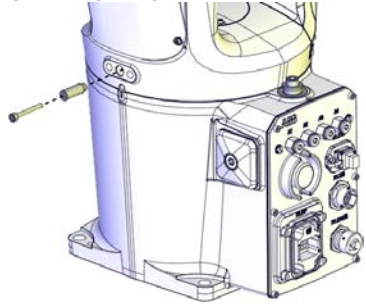

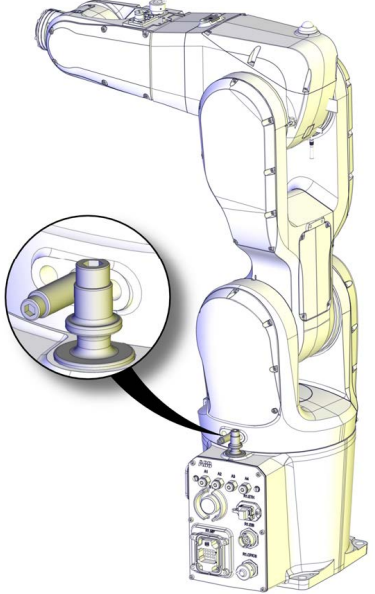
|   | Action  | Note  |
|---|---|---|
| 3 | <p>The axis-1 calibration stop pin should now be fitted to the mechanical stop pin attachment hole, but it does not fit if the axis 1 stands in its zero position.</p> <p>Jog axis 1 to find a suitable position where the axis-1 calibration stop pin can be fitted to the attachment hole in the base.</p> <p>Fit the axis-1 calibration stop pin to the base and secure it with the screw.</p> | <p>Screw: M8x45.<br/>Tightening torque: 10 Nm.</p> <p> <b>Note</b></p> <p>The position of the robot shown in the figure, is only a suggestion. The suitable position in which the axis-1 calibration pin is possible to fit may differ.</p>  <p>xx1400001100</p> |
| 4 | <p>Jog axis 1 to zero position.</p>   |   |
| 5 | <p> <b>DANGER</b></p> <p>Turn off all:</p> <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> <p>to the robot, before entering the robot working area.</p>  |   |
| 6 | <p>Remove the protection plug from the swing.</p>   |  <p>xx1400001134</p>   |

Continues on next page

## 5 Calibration


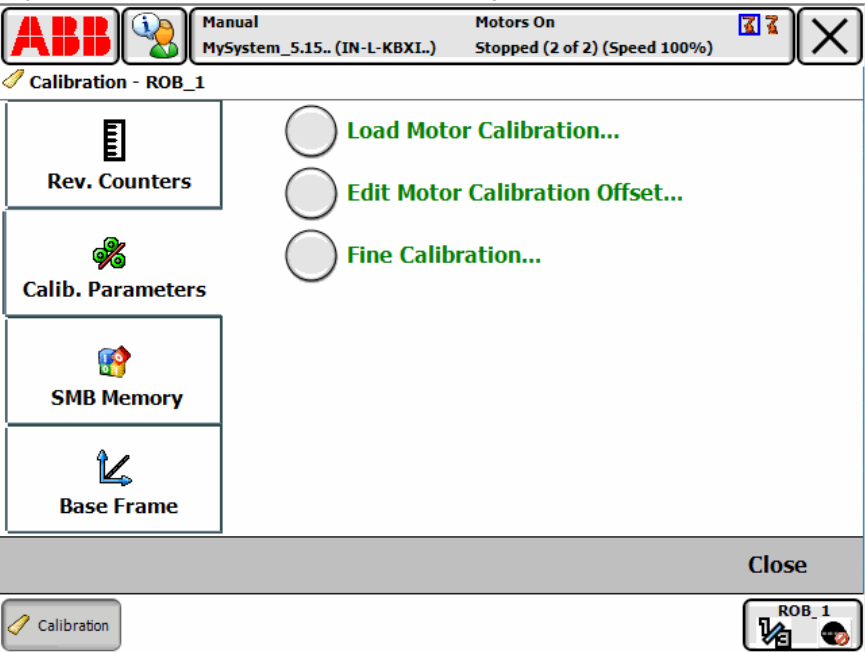
### 5.6.3 Manual calibration method - calibrating axis 1

Continued

|    | Action   | Note  |
|----|--|---|
| 7  | <p>Fit the axis-1 calibration pin to the swing and secure it with the screw.</p> <p> <b>CAUTION</b></p> <p>Hold the calibration pin firmly with your hands while securing it with the screw, in order to keep a straight line when fitting the screw. The calibration pin must not be tilted.</p> | <p>Screw: M5x40.<br/>Tightening Torque: 5 Nm.</p>  <p>xx1400001099</p>   |
| 8  | <p>Turn on the electric power to the robot.</p>  |   |
| 9  | <p> <b>DANGER</b></p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!<br/>Make sure no personnel is near or beneath the robot arm!</p>   |   |
| 10 | <p>Release the brakes and manually rotate axis 1 until the two axis-1 calibration pins touches each other gently. There should be no pressing force between the pins.</p> <p>When doing this, pay attention to robot pose in order to avoid arm collision.</p> <p>When the axis is in position, release the brake release button to activate the brakes again.</p>                 | <p>How to release the brakes is detailed in <a href="#">Manually releasing the brakes on page 66</a>.</p>  <p>xx1400001209</p> |

Continues on next page

## Performing the fine calibration procedure

|   | Action   | Note |
|---|--|------|
| 1 |  <b>WARNING</b><br>Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.   |      |
| 2 | Choose fine calibration from Calib menu<br>On the <b>ABB</b> menu, tap <b>Calibration</b> .<br>All mechanical units connected to the system are shown along with their calibration status.   |      |
| 3 | Tap to select the mechanical unit and then tap <b>Calib. Parameters</b> .<br>   |      |
| 4 | <b>Tap Fine Calibration....</b><br>A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated.<br>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none"> <li>• Tap <b>Yes</b> to proceed.</li> <li>• Tap <b>No</b> to cancel.</li> </ul> |      |
| 5 | Select the check-box for the current axis/axes to be calibrated.   |      |

Continues on next page

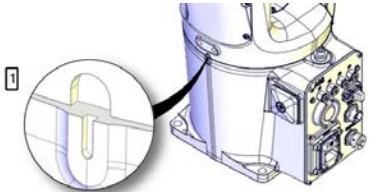
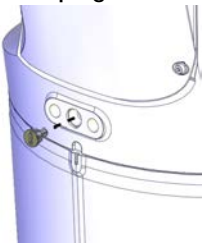
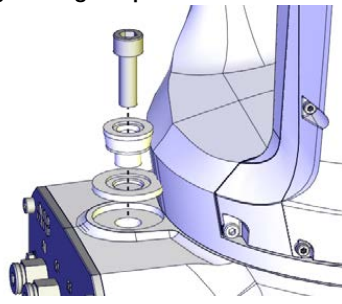
## 5 Calibration

### 5.6.3 Manual calibration method - calibrating axis 1

*Continued*

|   | Action  | Note |
|---|---|------|
| 6 | <p><b>Tap Calibrate.</b></p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> <li>• Tap <b>Calibrate</b> to proceed.</li> <li>• Tap <b>Cancel</b> to cancel.</li> </ul> <p>Tapping <b>Calibrate</b> results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p> |      |

#### Checking and finalizing the calibration

|   | Action   | Note   |
|---|--|--|
| 1 | Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.   |  |
| 2 | Jog axis 1 to zero degree using the FlexPendant.   |  |
| 3 | <p>Check that the synchronization marks on axis 1 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> <li>• If yes, the calibration is verified OK.</li> <li>• If no, redo the fine calibration procedure.</li> </ul> |  <p>xx1400001092</p>   |
| 4 | Remove the axis-1 calibration pin from the swing and refit the protection plug.  | <p>Protection plug: 3HAC051199-001</p>  <p>xx1400001134</p> |
| 5 | Rotate axis 1 to a suitable position to get access and remove the calibration stop pin from the base.  |  |
| 6 | Remove the axis-1 calibration stop pin from the base and refit the axis-1 mechanical stop.   | <p>Tightening torque: 12 Nm</p>  <p>xx1400000392</p>        |

*Continues on next page*

---

#### After calibration

|   | Action  | Note |
|---|---|------|
| 1 | Write down the new system parameters on a new label and stick on top of the calibration label on the robot. |      |



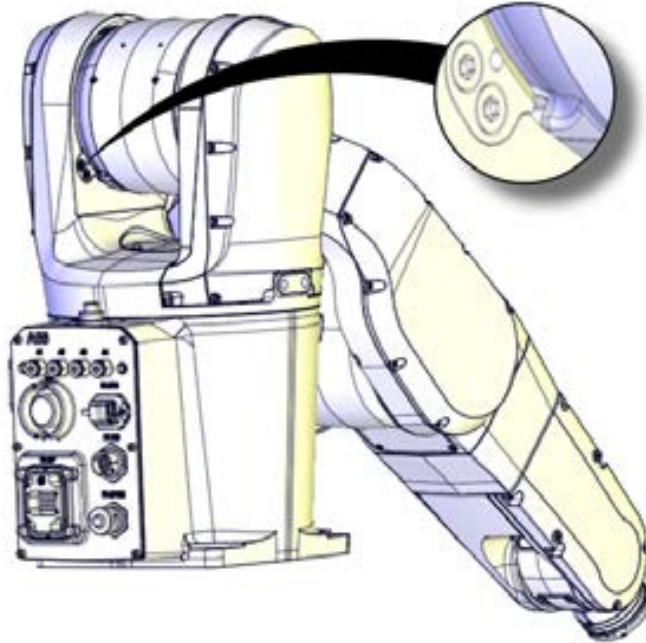
## 5 Calibration

### 5.6.4 Manual calibration method - calibrating axis 2

#### 5.6.4 Manual calibration method - calibrating axis 2

##### Calibration position of axis 2

The figure shows axis 2 in calibration position.



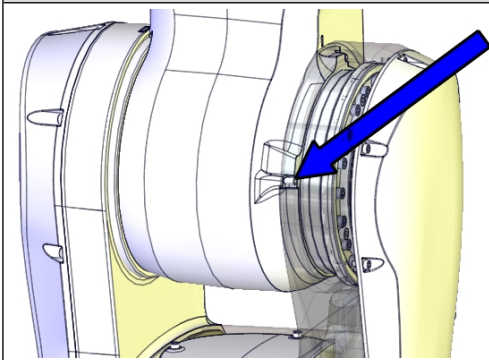
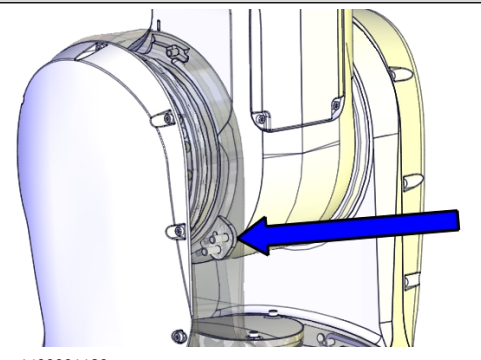
xx1400001201

##### Required equipment

Calibration of axis 2 is done by moving the lower arm so that the calibration pin and calibration stop touches each other gently.

These parts are already fitted to the robot, no extra installation of calibration equipment is required.


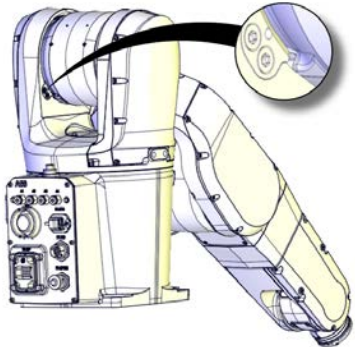
See figures below for reference, and follow the step-by-step procedure that follows.

| Calibration pin  | Calibration stop  |
|--|---|
| <br>xx1400001135                                  | <br>xx1400001136                      |
| The press fit mechanical stop pin fitted to the lower arm is used for calibration of axis 2.<br>No additional equipment is required. | The axis-2 mechanical stop fitted to the swing is used for calibration of axis 2.<br>No additional equipment is required. |


*Continues on next page*

## Calibrating axis 2

## Moving the robot to calibration position

|   | Action  | Note   |
|---|---|--|
| 1 | Jog all axes to zero position.  |  |
| 2 |  <b>DANGER</b><br>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!<br>Make sure no personnel is near or beneath the robot arm!  |  |
| 3 | Release the brakes and manually rotate axis 2 until the axis-2 calibration pin and calibration stop touches each other gently. There should be no pressing force between the pins.<br>When doing this, pay attention to robot pose in order to avoid arm collision.<br>When the axis is in position, release the brake release button to activate the brakes again. | How to release the brakes is detailed in <a href="#">Manually releasing the brakes on page 66</a> .<br>The calibration pin and calibration stop are illustrated in <a href="#">Required equipment on page 766</a> . <br>xx1400001201 |

## Performing the fine calibration procedure

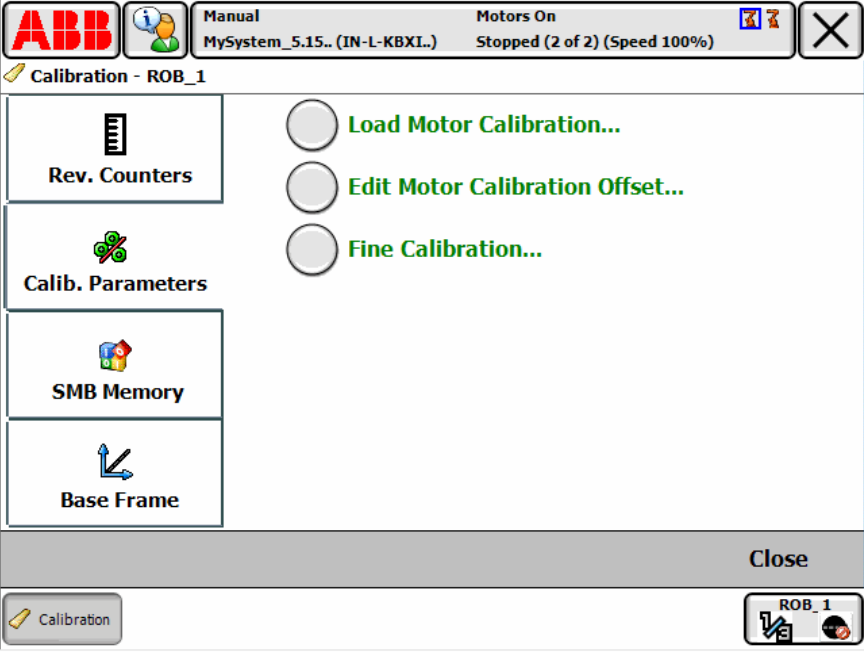
|   | Action   | Note |
|---|--|------|
| 1 |  <b>WARNING</b><br>Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement. |      |
| 2 | Choose fine calibration from Calib menu<br>On the <b>ABB</b> menu, tap <b>Calibration</b> .<br>All mechanical units connected to the system are shown along with their calibration status.   |      |

Continues on next page

## 5 Calibration

### 5.6.4 Manual calibration method - calibrating axis 2

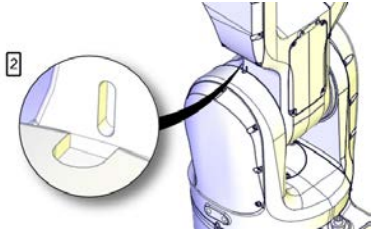
Continued

|   | Action  | Note |
|---|---|------|
| 3 | <p>Tap to select the mechanical unit and then tap <b>Calib. Parameters</b>.</p>  <p>en0400001127</p>  |      |
| 4 | <p>Tap <b>Fine Calibration....</b></p> <p>A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated.</p> <p>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none"> <li>• Tap <b>Yes</b> to proceed.</li> <li>• Tap <b>No</b> to cancel.</li> </ul>                                   |      |
| 5 | <p>Select the check-box for the current axis/axes to be calibrated.</p>   |      |
| 6 | <p>Tap <b>Calibrate</b>.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> <li>• Tap <b>Calibrate</b> to proceed.</li> <li>• Tap <b>Cancel</b> to cancel.</li> </ul> <p>Tapping <b>Calibrate</b> results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p> |      |

#### Checking and finalizing the calibration

|   | Action  | Note |
|---|---|------|
| 1 | <p>Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.</p> |      |

Continues on next page

|   | Action   | Note  |
|---|--|---|
| 2 | Jog axis 2 to zero degree using the FlexPendant.   |   |
| 3 | <p>Check that the synchronization marks on axis 2 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> <li>• If yes, the calibration is verified OK.</li> <li>• If no, redo the fine calibration procedure.</li> </ul> |  <p>xx1400001093</p> |

#### After calibration

|   | Action  | Note |
|---|---|------|
| 1 | Write down the new system parameters on a new label and stick on top of the calibration label on the robot. |      |

## 5 Calibration

---

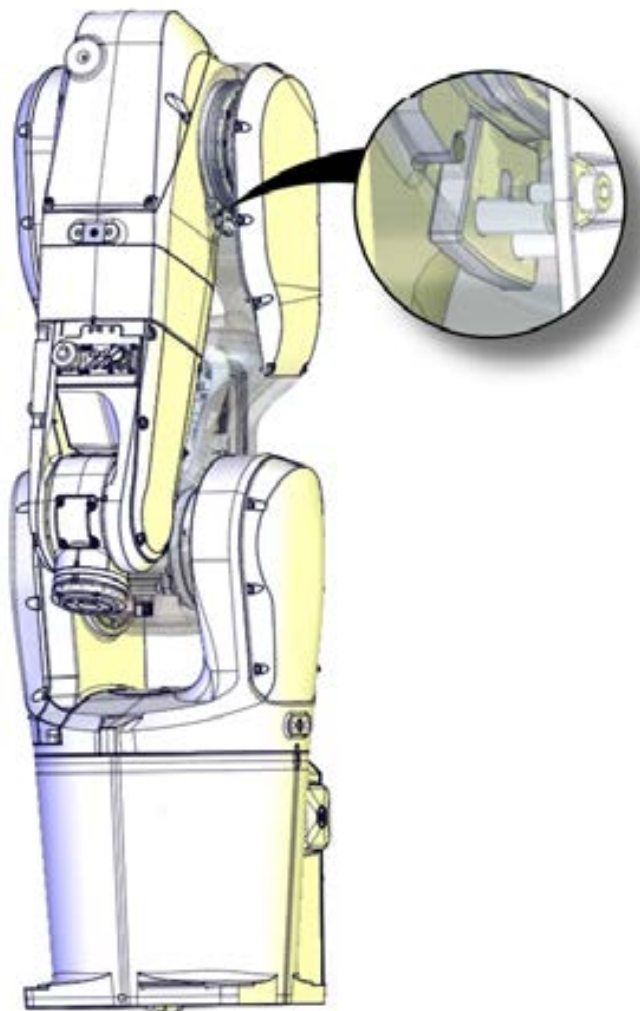
### 5.6.5 Manual calibration method - calibrating axis 3

### 5.6.5 Manual calibration method - calibrating axis 3

---

#### Calibration position of axis 3

The figure shows axis 3 in calibration position.



xx1400001204

---

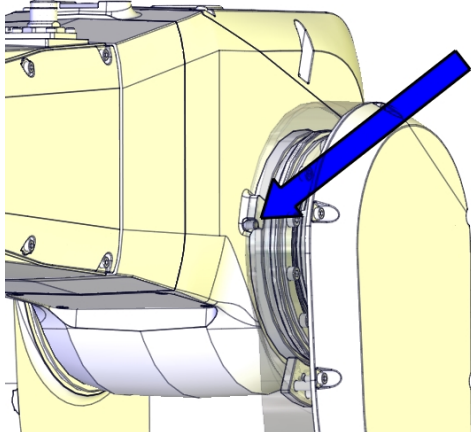
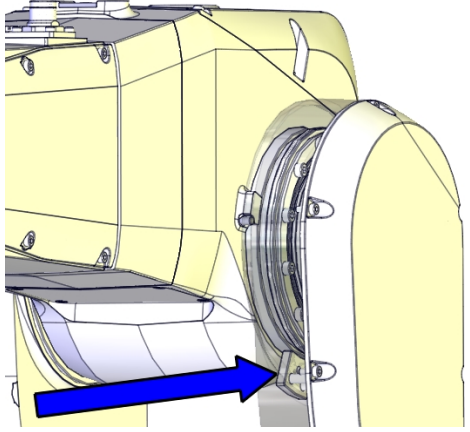
#### Required equipment

Calibration of axis 3 is done by moving the upper arm so that the calibration pin and calibration stop touches each other gently.

These parts are already fitted to the robot, no extra installation of calibration equipment is required.


*Continues on next page*

See figures below for reference, and follow the step-by-step procedure that follows the figures.

| Calibration pin  | Calibration stop  |
|--|---|
|  <p>xx1400001202</p>                                    |  <p>xx1400001203</p>                            |
| <p>The press fit mechanical stop pin fitted to the upper arm is used for calibration of axis 3. No additional equipment is required.</p> | <p>The axis-3 mechanical stop fitted to the lower arm is used for calibration of axis 3. No additional equipment is required.</p> |

**Calibrating axis 3**

Moving the robot to calibration position

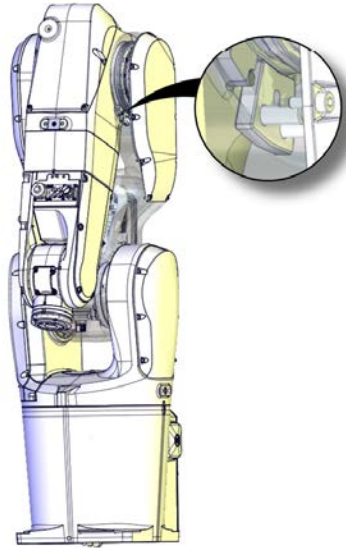
|   | Action   | Note |
|---|--|------|
| 1 | Jog all axes to zero position.   |      |
| 2 |  <p><b>DANGER</b></p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!<br/>Make sure no personnel is near or beneath the robot arm!</p> |      |

Continues on next page


## 5 Calibration

### 5.6.5 Manual calibration method - calibrating axis 3

Continued

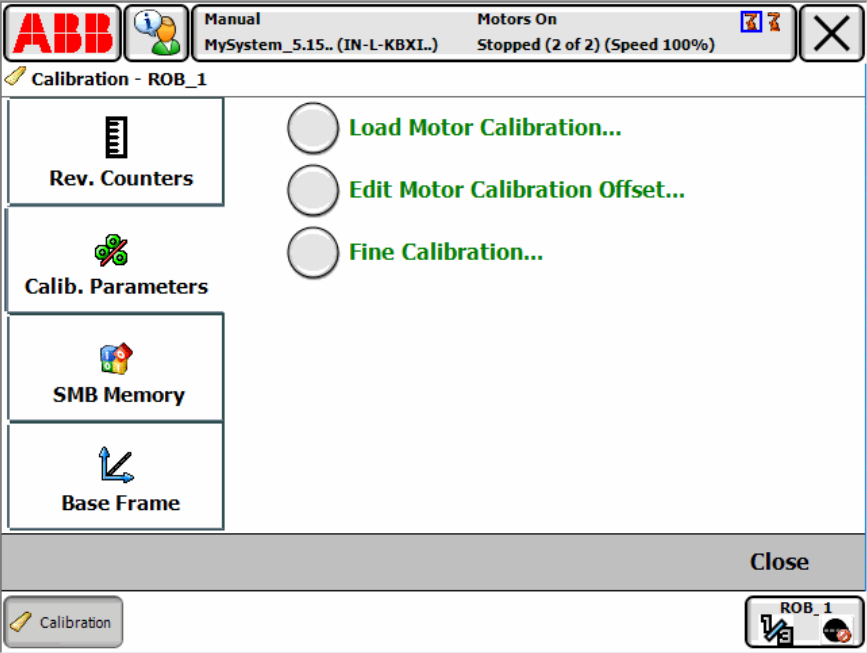
|   | Action   | Note  |
|---|--|---|
| 3 | <p>Release the brakes and manually rotate axis 3 until the axis-3 calibration calibration pin and calibration stop touches each other gently. There should be no pressing force between the pins.</p> <p>When doing this, pay attention to robot pose in order to avoid arm collision.</p> <p>When the axis is in position, release the brake release button to activate the brakes again.</p> | <p>How to release the brakes is detailed in <a href="#">Manually releasing the brakes on page 66</a>.</p> <p>The calibration pin and calibration stop are illustrated in <a href="#">Required equipment on page 770</a>.</p>  <p>xx1400001204</p> |

#### Performing the fine calibration procedure

|   | Action  | Note |
|---|---|------|
| 1 |  <p><b>WARNING</b></p> <p>Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.</p> |      |
| 2 | <p>Choose fine calibration from Calib menu</p> <p>On the <b>ABB</b> menu, tap <b>Calibration</b>.</p> <p>All mechanical units connected to the system are shown along with their calibration status.</p>  |      |

Continues on next page



|   | Action  | Note |
|---|---|------|
| 3 | <p>Tap to select the mechanical unit and then tap <b>Calib. Parameters</b>.</p>  <p>en0400001127</p>  |      |
| 4 | <p>Tap <b>Fine Calibration....</b></p> <p>A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated.</p> <p>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none"> <li>• Tap <b>Yes</b> to proceed.</li> <li>• Tap <b>No</b> to cancel.</li> </ul>                                   |      |
| 5 | <p>Select the check-box for the current axis/axes to be calibrated.</p>   |      |
| 6 | <p>Tap <b>Calibrate</b>.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> <li>• Tap <b>Calibrate</b> to proceed.</li> <li>• Tap <b>Cancel</b> to cancel.</li> </ul> <p>Tapping <b>Calibrate</b> results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p> |      |

#### Checking and finalizing the calibration

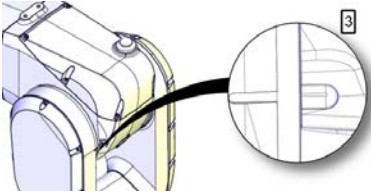
|   | Action  | Note |
|---|---|------|
| 1 | <p>Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.</p> |      |

Continues on next page

## 5 Calibration

### 5.6.5 Manual calibration method - calibrating axis 3

*Continued*

|   | Action  | Note  |
|---|---|---|
| 2 | Jog axis 3 to zero degree using the FlexPendant.  |   |
| 3 | <p>Check that the synchronization marks on axis 3 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"><li>• If yes, the calibration is verified OK.</li><li>• If no, redo the fine calibration procedure.</li></ul> |  <p>xx1400001094</p> |

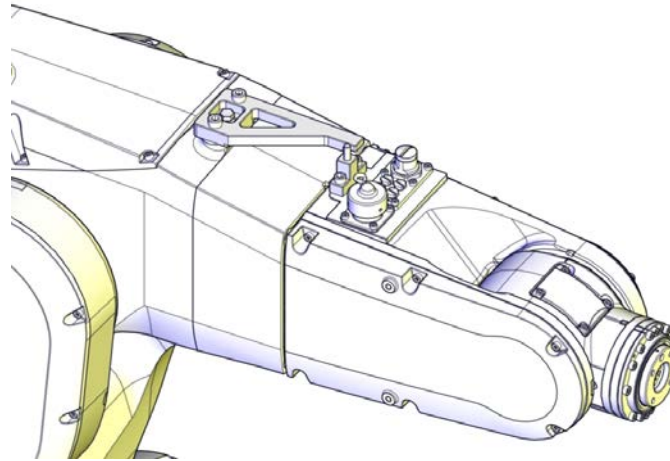
#### After calibration

|   | Action  | Note |
|---|---|------|
| 1 | Write down the new system parameters on a new label and stick on top of the calibration label on the robot. |      |

### 5.6.6 Manual calibration method - calibrating axis 4

#### Calibration position of axis 4

The figure shows axis 4 in calibration position, with calibration tools fitted.



xx1400001207

#### Required equipment

| Equipment                               | Art. no.       | Note   |
|---|----------------|--|
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |

<sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory. Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant. If no data is found related to standard calibration, manual calibration is used as default.

#### Required consumables

| Equipment      | Art. no. | Note        |
|----------------|----------|-------------|
| Cleaning agent | -        | Isopropanol |

#### Calibrating axis 4

##### Moving the robot to calibration position


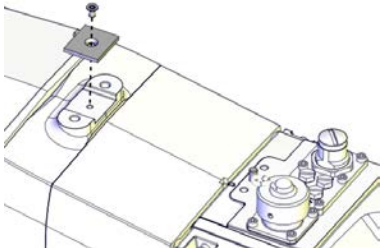
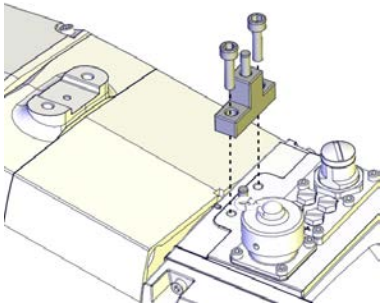

|   | Action  | Note |
|---|---|------|
| 1 | Jog all axes to zero position.<br>Rotate axis 4 some degrees toward positive direction to avoid interference between the calibration tools when fitting them. |      |

*Continues on next page*

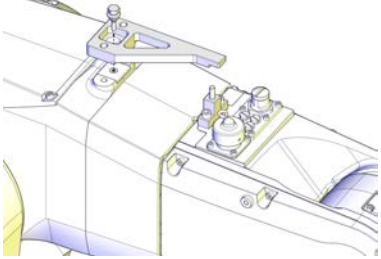
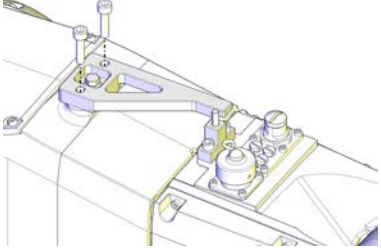

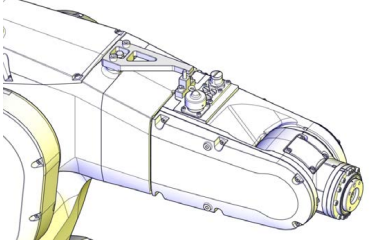
## 5 Calibration

### 5.6.6 Manual calibration method - calibrating axis 4

Continued

|   | Action   | Note  |
|---|--|---|
| 2 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"><li>• electric power supply</li><li>• hydraulic pressure supply</li><li>• air pressure supply</li></ul> to the robot, before entering the robot working area. |   |
| 3 | Remove the protection cover from the housing.  | <br>xx1400001205                     |
| 4 | Clean the location surfaces on the housing and the calibration tool surfaces to make sure there is no paint or burrs on these surfaces.  |   |
| 5 | Fit the calibration block to the tubular.  | Screws: M4x16.<br><br>xx1400001208 |
| 6 | Locate the calibration tool by the location surface on the housing.<br> <b>Tip</b><br>Press down slightly on the calibration tool to make sure the tool attaches the location surface tightly.                                |   |

Continues on next page

|    | Action   | Note  |
|----|--|---|
| 7  | Fit the conical screw to the calibration tool.   | <p>Conical screw M3 (3HAC055410-001, 1 pcs)<br/>Tightening torque: 1 Nm</p>  <p>xx1500001608</p>                                 |
| 8  | Fit the M5 screws.   | <p>Screws: M5x20.<br/>Tightening torque: 2.5 Nm</p>  <p>xx1400001117</p>  |
| 9  | Turn on the electric power to the robot.   |   |
| 10 |  <p><b>DANGER</b></p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!<br/>Make sure no personnel is near or beneath the robot arm!</p>   |   |
| 11 | <p>Release the brakes and manually rotate axis 4 until the axis-4 calibration tool and the calibration block touches each other gently. There should be no pressing force between the pins.</p> <p>When doing this, pay attention to robot pose in order to avoid arm collision.</p> <p>When the axis is in position, release the brake release button to activate the brakes again.</p> | <p>How to release the brakes is detailed in <a href="#">Manually releasing the brakes on page 66</a>.</p>  <p>xx1400001207</p> |


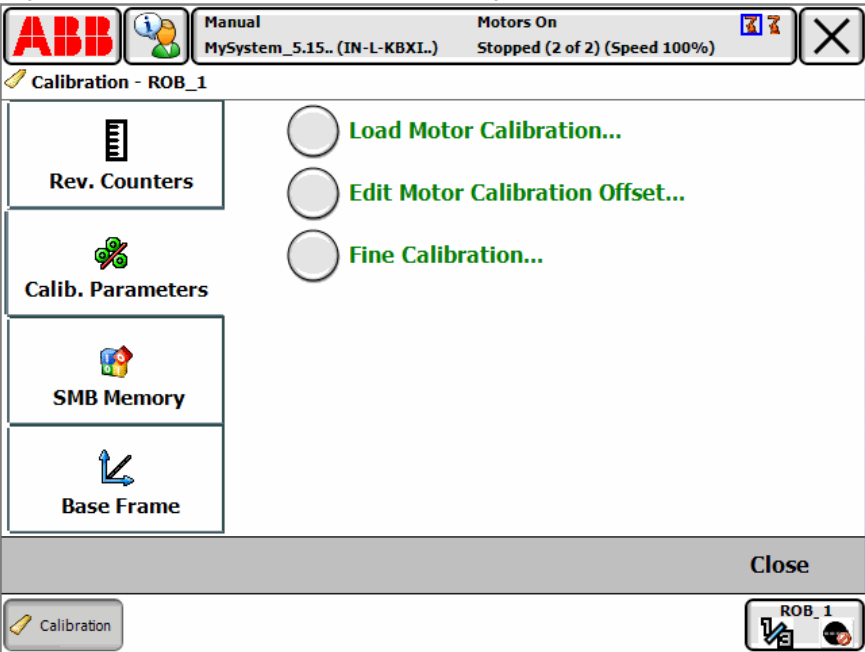
Continues on next page

## 5 Calibration

### 5.6.6 Manual calibration method - calibrating axis 4

Continued

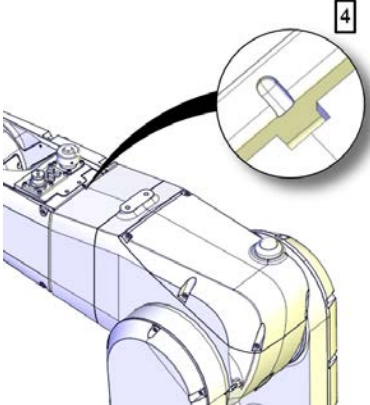
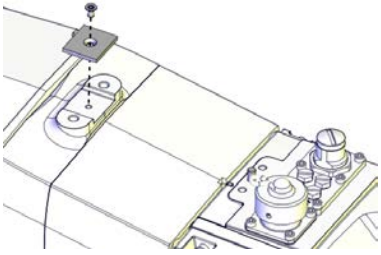
Performing the fine calibration procedure

|   | Action   | Note |
|---|--|------|
| 1 |  <b>WARNING</b><br>Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.   |      |
| 2 | Choose fine calibration from Calib menu<br>On the <b>ABB</b> menu, tap <b>Calibration</b> .<br>All mechanical units connected to the system are shown along with their calibration status.   |      |
| 3 | Tap to select the mechanical unit and then tap <b>Calib. Parameters</b> .<br>   |      |
| 4 | <b>Tap Fine Calibration....</b><br>A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated.<br>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none"> <li>• Tap <b>Yes</b> to proceed.</li> <li>• Tap <b>No</b> to cancel.</li> </ul> |      |
| 5 | Select the check-box for the current axis/axes to be calibrated.   |      |

Continues on next page

|   | Action  | Note |
|---|---|------|
| 6 | <p><b>Tap Calibrate.</b></p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> <li>• Tap <b>Calibrate</b> to proceed.</li> <li>• Tap <b>Cancel</b> to cancel.</li> </ul> <p>Tapping <b>Calibrate</b> results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p> |      |

Checking and finalizing the calibration

|   | Action  | Note  |
|---|---|---|
| 1 | Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.  |   |
| 2 | Remove the calibration tool of axes 4, 5, and 6 from the tubular.   |   |
| 3 | Remove the axis-4 calibration tool from the housing.  |   |
| 4 | Jog axis 4 to zero degree using the FlexPendant.  |   |
| 5 | <p>Check that the synchronization marks on axis 4 are aligned with eachother.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> <li>• If yes, the calibration is verified OK.</li> <li>• If no, redo the fine calibration procedure.</li> </ul> |  <p>xx1400001095</p> |
| 6 | Refit the protection cover to the housing.  |  <p>xx1400001205</p> |

Continues on next page



## 5 Calibration

---

### 5.6.6 Manual calibration method - calibrating axis 4

*Continued*

---

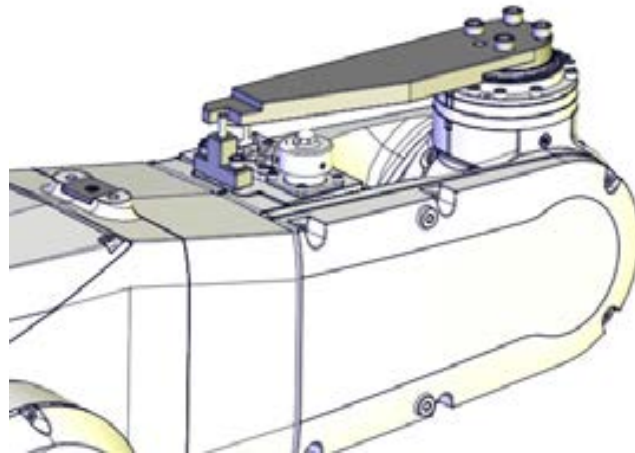
#### After calibration

|   | Action  | Note |
|---|---|------|
| 1 | Write down the new system parameters on a new label and stick on top of the calibration label on the robot. |      |

### 5.6.7 Manual calibration method - calibrating axis 5 and axis 6

#### Calibration position of axes 5 and 6

The figure shows axes 5 and 6 in calibration position, with calibration tools fitted.



xx1400001206

#### Required equipment

| Equipment                               | Art. no.       | Note   |
|---|----------------|--|
| Calibration toolkit, manual calibration | 3HAC051256-001 | Includes calibration tools, pins and attachment screws for manual calibration method. <sup>i</sup> |


<sup>i</sup> The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory. Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant. If no data is found related to standard calibration, manual calibration is used as default.

#### Required consumables

| Equipment      | Art. no. | Note        |
|----------------|----------|-------------|
| Cleaning agent | -        | Isopropanol |

#### Calibrating axis 5 and axis 6

##### Moving the robot to calibration position

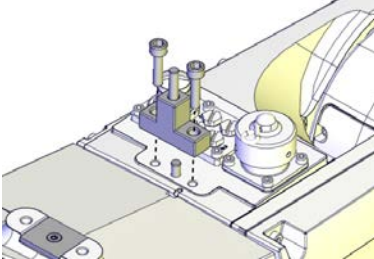
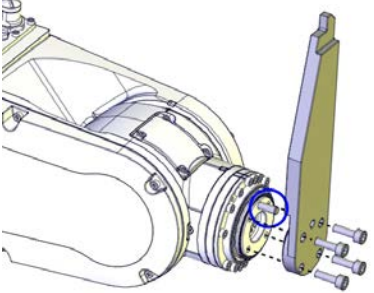

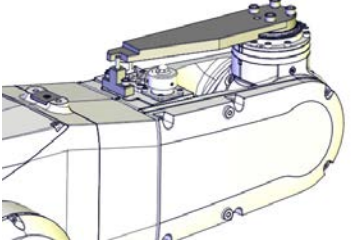
|   | Action   | Note |
|---|--|------|
| 1 | Jog all axes to zero position.   |      |
| 2 |  <b>DANGER</b><br>Turn off all: <ul style="list-style-type: none"> <li>• electric power supply</li> <li>• hydraulic pressure supply</li> <li>• air pressure supply</li> </ul> to the robot, before entering the robot working area. |      |

*Continues on next page*

## 5 Calibration


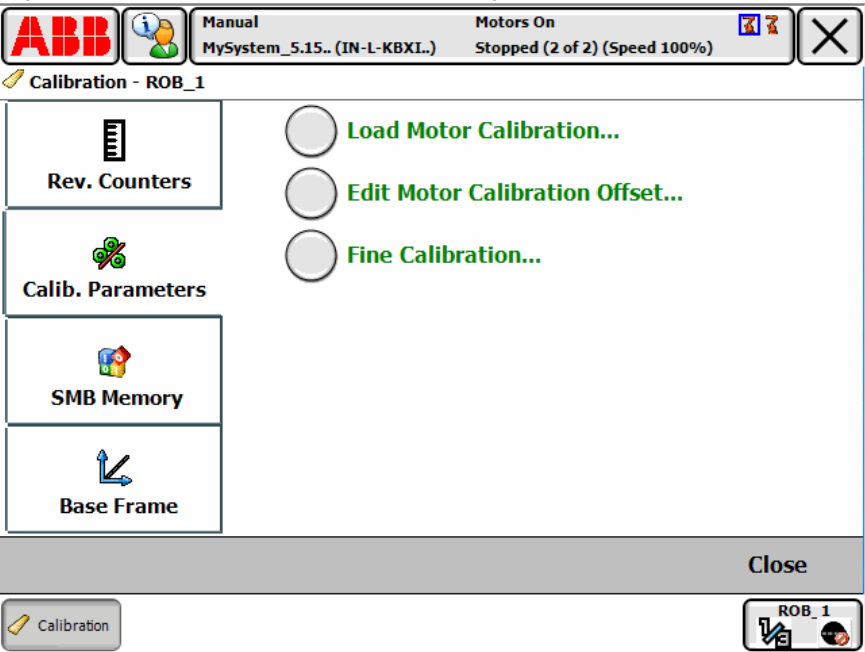
### 5.6.7 Manual calibration method - calibrating axis 5 and axis 6

Continued

|   | Action  | Note   |
|---|---|--|
| 3 | Fit the calibration block to the tubular.   | Screws: M4x16.<br><br>xx1400001114  |
| 4 | Fit the guide pin to the disk and then fit the calibration tool of axes 5 and 6.  | Screws: M5x16.<br><br>xx1400001115  |
| 5 |  <b>DANGER</b><br>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!<br>Make sure no personnel is near or beneath the robot arm!  |  |
| 6 | Release the brakes and manually rotate axes 5 and 6 until the axis-5/6 calibration tool and the calibration block touches each other gently. There should be no pressing force between the pins.<br>When doing this, pay attention to robot pose in order to avoid arm collision.<br>When the axis is in position, release the brake release button to activate the brakes again. | How to release the brakes is detailed in <a href="#">Manually releasing the brakes on page 66</a> .<br><br>xx1400001206 |

Continues on next page

## Performing the fine calibration procedure

|   | Action   | Note |
|---|--|------|
| 1 |  <b>WARNING</b><br>Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.   |      |
| 2 | Choose fine calibration from Calib menu<br>On the <b>ABB</b> menu, tap <b>Calibration</b> .<br>All mechanical units connected to the system are shown along with their calibration status.   |      |
| 3 | Tap to select the mechanical unit and then tap <b>Calib. Parameters</b> .<br>   |      |
| 4 | <b>Tap Fine Calibration....</b><br>A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated.<br>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none"> <li>• Tap <b>Yes</b> to proceed.</li> <li>• Tap <b>No</b> to cancel.</li> </ul> |      |
| 5 | Select the check-box for the current axis/axes to be calibrated.   |      |

Continues on next page

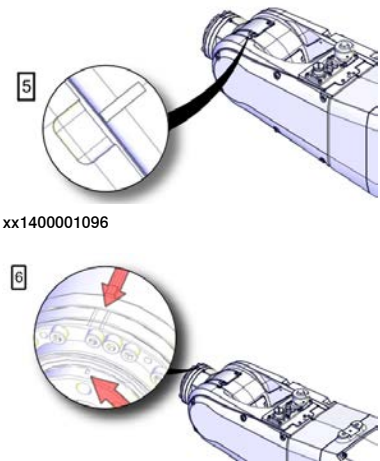
## 5 Calibration

### 5.6.7 Manual calibration method - calibrating axis 5 and axis 6

*Continued*

|   | Action  | Note |
|---|---|------|
| 6 | <p><b>Tap Calibrate.</b></p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> <li>• Tap <b>Calibrate</b> to proceed.</li> <li>• Tap <b>Cancel</b> to cancel.</li> </ul> <p>Tapping <b>Calibrate</b> results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p> |      |

#### Checking and finalizing the calibration

|   | Action  | Note   |
|---|---|--|
| 1 | Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.  |  |
| 2 | Jog axis 5 and 6 to zero degree using the FlexPendant.  |  |
| 3 | <p>Check that the synchronization marks on axis 5 and axis 6 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> <li>• If yes, the calibration is verified OK.</li> <li>• If no, redo the fine calibration procedure.</li> </ul> |  <p>xx1400001096</p> <p>xx1400001097</p> |
| 4 | Remove the calibration block from the tubular.  |  |
| 5 | Remove the calibration tool of axes 5 and 6 from the disk.  |  |

#### After calibration

|   | Action  | Note |
|---|---|------|
| 1 | Write down the new system parameters on a new label and stick on top of the calibration label on the robot. |      |

---

## 5.7 Verifying the calibration

---

### Introduction

Always verify the results after calibrating *any* robot axis to verify that all calibration positions are correct.

---

### Verifying the calibration

Use this procedure to verify the calibration result.

|   | Action  | Note  |
|---|---|---|
| 1 | Run the calibration home position program twice.<br>Do not change the position of the robot axes after running the program!         | See <a href="#">Checking the synchronization position on page 786</a> .   |
| 2 | Adjust the <i>synchronization marks</i> when the calibration is done, if necessary.   | This is detailed in section <a href="#">Synchronization marks and synchronization position for axes on page 734</a> . |
| 3 | Write down the values on a new label and stick it on top of the calibration label.<br>The label is located on one side of the base. |   |

## 5 Calibration

### 5.8 Checking the synchronization position

### 5.8 Checking the synchronization position

#### Introduction

Check the synchronization position of the robot before beginning any programming of the robot system. This may be done:

- Using a `MoveAbsJ` instruction with argument zero on all axes.
- Using the **Jogging** window on the FlexPendant.

#### Using a `MoveAbsJ` instruction

Use this procedure to create a program that runs all the robot axes to their synchronization position.

|   | Action   | Note   |
|---|--|--|
| 1 | On ABB menu tap <b>Program editor</b> .  |  |
| 2 | Create a new program.  |  |
| 3 | Use <b>MoveAbsJ</b> in the <b>Motion&amp;Proc</b> menu.  |  |
| 4 | Create the following program:<br><pre>MoveAbsJ [[0,0,0,0,0,0],           [9E9,9E9,9E9,9E9,9E9,9E9]] \NoEOffs, v1000, fine, tool0</pre> |  |
| 5 | Run the program in manual mode.  |  |
| 6 | Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.                     | See <a href="#">Synchronization marks and synchronization position for axes on page 734</a> and <a href="#">Updating revolution counters on page 736</a> . |

#### Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

|   | Action  | Note   |
|---|---|--|
| 1 | On the <b>ABB</b> menu, tap <b>Jogging</b> .  |  |
| 2 | Tap <b>Motion mode</b> to select group of axes to jog.  |  |
| 3 | Tap to select the axis to jog, axis 1, 2, or 3.   |  |
| 4 | Manually run the robots axes to a position where the axis position value read on the FlexPendant, is equal to zero. |  |
| 5 | Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.  | See <a href="#">Synchronization marks and synchronization position for axes on page 734</a> and <a href="#">Updating revolution counters on page 736</a> . |



## 6 Decommissioning

### 6.1 Introduction

---

#### Introduction

This section contains information to consider when taking a product, robot or controller, out of operation.

It deals with how to handle potentially dangerous components and potentially hazardous materials.

---

#### General

All used grease/oils and dead batteries **must** be disposed of in accordance with the current legislation of the country in which the robot and the control unit are installed.

If the robot or the control unit is partially or completely disposed of, the various parts **must** be grouped together according to their nature (which is all iron together and all plastic together), and disposed of accordingly. These parts **must** also be disposed of in accordance with the current legislation of the country in which the robot and control unit are installed.

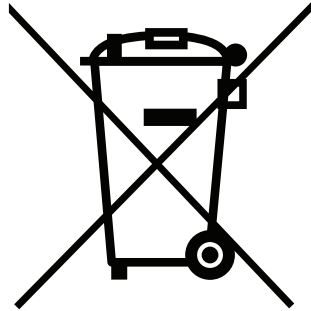
## 6 Decommissioning

### 6.2 Environmental information

#### 6.2 Environmental information

##### Symbol

The following symbol indicates that the product must not be disposed of as common garbage. Handle each product according to local regulations for the respective content (see table below).



xx180000058

##### Hazardous material

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly according to local regulations to prevent health or environmental hazards.

| Material               | Example application              |
|------------------------|----------------------------------|
| Aluminium              | Base, lower arm, upper arm       |
| Batteries, Lithium     | Encoder interface board          |
| Cast iron/nodular iron | Gears                            |
| Copper                 | Cables, motors                   |
| Neodymium              | Motors                           |
| Oil, grease            | Gears                            |
| Stainless steel        | Mechanical stop                  |
| Steel                  | Gears, screws, washers, brackets |

##### Oil and grease

Where possible, arrange for oil and grease to be recycled. Dispose of via an authorized person/contractor in accordance with local regulations. Do not dispose of oil and grease near lakes, ponds, ditches, down drains, or onto soil. Incineration must be carried out under controlled conditions in accordance with local regulations.

Also note that:

- Spills can form a film on water surfaces causing damage to organisms. Oxygen transfer could also be impaired.
- Spillage can penetrate the soil causing ground water contamination.

### 6.3 Scrapping of robot

#### Important when scrapping the robot



#### **DANGER**

When a robot is disassembled while being scrapped, it is very important to remember the following before disassembling starts, in order to prevent injuries:

- Always remove all batteries. If a battery is exposed to heat, for example from a blow torch, it will explode.
- Always remove all oil/grease in gearboxes. If exposed to heat, for example from a blow torch, the oil/grease will catch fire.
- When motors are removed from the robot, the robot will collapse if it is not properly supported before the motor is removed.

**This page is intentionally left blank**

## 7 Robot description

### 7.1 Type A of IRB 1200

---

#### Type A - Axis Calibration

The difference between IRB 1200 and IRB 1200 Type A is that the Type A is calibrated with Axis Calibration. On each axis there are bushings for installation of calibration tools.

As a result of this, the castings differ between IRB 1200 and IRB 1200 Type A.

**Note**

IRB 1200 Type B is designed based on IRB 1200 Type A so that Type B has the bushings for installation of calibration tools too.

The difference between IRB 1200 Type A and IRB 1200 Type B is that Type B also supports SafeMove 2. See [Type B of IRB 1200 on page 792](#).

---

#### How to know which type the robot is?

The type label on the base of the robot tells if the robot is calibrated with Axis Calibration.

Those robots are named IRB 1200 Type A.

**Note**

If no type label attached on the robot, use the bushings on each axis to identify a robot calibrated with Axis Calibration.

Those robots which are not equipped for Axis Calibration are simply named IRB 1200 (no type specified).

## 7 Robot description

---

### 7.2 Type B of IRB 1200

### 7.2 Type B of IRB 1200

---

#### Type B - SafeMove 2

The difference between IRB 1200 Type B and other IRB 1200 versions is that the Type B supports SafeMove 2.

As a result of this, the following parts differ from other versions:

- Base
- Drive unit, axis 2, axis 3, axis 5 and axis 6
- Motor with pulley, axis 4 and axis 5
- Manipulator cable harness
- Battery pack
- SMB unit (replacing EIB unit)

IRB 1200 Type B is designed based on IRB 1200 Type A so that Type B has the bushings for installation of calibration tools too.

---

#### How to know which type the robot is?

The type label on the base of the robot tells if the robot supports SafeMove 2.

Those robots are named IRB 1200 Type B.

7.3 Description of spare part versions



7.3.1 Spare part versions for the base on IP40/IP67 robots

Spare part versions for the base on IP40/IP67 robots



Note

IRB 1200 has different base versions that are not compatible with each other. Always use the following list as a reference to check the base installed on robot and order the correct spare parts.

| Base installed on robot (spare part number) | Article number in WebConfig | What to order  | How to see which version is installed on robot  |
|---|-----------------------------|--|---|
| 3HAC049628-001                              | 3HAC044533-001              | Order: <ul style="list-style-type: none"> <li>base 3HAC059553-001</li> <li>swing 3HAC059554-001</li> <li>IP40: sealing ring 3HAC068107-001</li> <li>IP67: sealing ring + gasket + V-ring 3HAC059791-001</li> </ul> | Look on the outside of the base. Base 3HAC049628-001 has no hole on the side of the base.  <p>xx160000124</p> |
| 3HAC057999-001                              | 3HAC056657-001              | Order: <ul style="list-style-type: none"> <li>base 3HAC059553-001</li> </ul>   | Base 3HAC057999-001 has a hole on the side of the base.  <p>xx160000051</p>                                  |

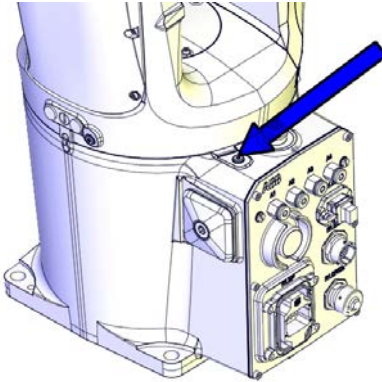
Continues on next page



## 7 Robot description

### 7.3.1 Spare part versions for the base on IP40/IP67 robots

Continued

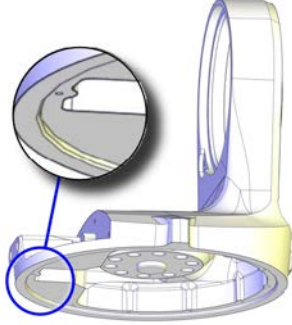
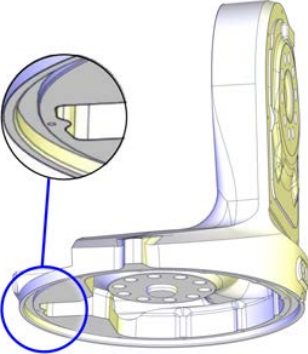
| Base installed on robot (spare part number) | Article number in WebConfig | What to order  | How to see which version is installed on robot  |
|---|-----------------------------|--|---|
| 3HAC059553-001                              | 3HAC058386-001              | Order: <ul style="list-style-type: none"><li>• base 3HAC059553-001</li></ul> | <p>Base 3HAC059553-001 has a bushing for fitting calibration tool for Axis Calibration.</p>  <p>xx1600001037</p> |

## 7.3.2 Spare part versions for the swing on IP40/IP67 robots

## Spare part versions for the swing on IP40/IP67 robots

**Note**

IRB 1200 has different swing versions that are not compatible with each other. Always use the following list as a reference to check the swing installed on robot and order the correct spare parts.

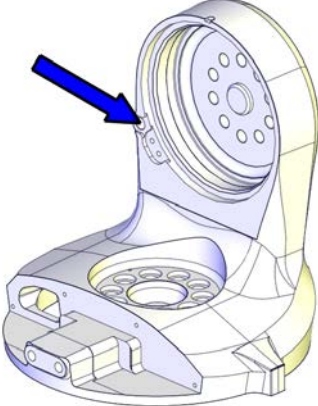
| Swing installed on robot (spare part number) | Article number in WebConfig | What to order  | How to see which version is installed on robot   |
|--|-----------------------------|--|--|
| 3HAC049632-001                               | 3HAC044534-001              | Order: <ul style="list-style-type: none"> <li>• swing 3HAC059554-001</li> <li>• IP67: sealing ring + gasket + V-ring 3HAC059791-001</li> </ul> | Look underneath the swing, the surface is flat.<br><br><small>xx1600000052</small> |
| 3HAC058000-001                               | 3HAC056656-001              | Order: <ul style="list-style-type: none"> <li>• swing 3HAC059554-001</li> </ul>  | Look underneath the swing, there is a groove.<br><br><small>xx1600000053</small>  |

Continues on next page

## 7 Robot description

### 7.3.2 Spare part versions for the swing on IP40/IP67 robots

Continued

| Swing installed on robot (spare part number) | Article number in WebConfig | What to order   | How to see which version is installed on robot  |
|--|-----------------------------|---|---|
| 3HAC059554-001                               | 3HAC058387-001              | Order: <ul style="list-style-type: none"><li>• swing 3HAC059554-001</li></ul> | The swing has a bushing for fitting calibration tool for Axis Calibration.<br><br>xx1600001038 |

## 7.3.3 Spare part versions for the axis-1 sealing ring on IP40/IP67 robots

## Spare part versions for the axis-1 sealing ring on IP40/IP67 robots



## Note

IRB 1200 has different axis-1 sealing ring versions that are not compatible with each other. Always use the following list as a reference to check the sealing ring installed on robot and order the correct spare parts.

| Sealing ring installed on robot (spare part number) | Article number in WebConfig | What to order   | How to see which version is installed on robot  |
|---|-----------------------------|---|---|
| 3HAC044676-001                                      | 3HAC044676-001              | Order: <ul style="list-style-type: none"> <li>sealing ring 3HAC044676-001</li> </ul>  | The sealing ring is flat. <br>xx1600000125                             |
| 3HAC056658-001                                      | 3HAC056658-001              | Order: <ul style="list-style-type: none"> <li>IP40: sealing ring 3HAC068107-001</li> <li>IP67: sealing ring + gasket + V-ring 3HAC059791-001</li> </ul> | The sealing ring has one folded wall on both sides. <br>xx1600000126 |
| 3HAC058568-001                                      | 3HAC058568-001              | Order: <ul style="list-style-type: none"> <li>sealing ring 3HAC068107-001</li> </ul>  | The sealing ring is flat and the edge is thinner. <br>xx1600001039   |
| 3HAC068107-001                                      | 3HAC068107-001              | Order: <ul style="list-style-type: none"> <li>sealing ring 3HAC068107-001</li> </ul>  | The sealing ring has a gap in the inner side. <br>xx1900001603       |

Continues on next page


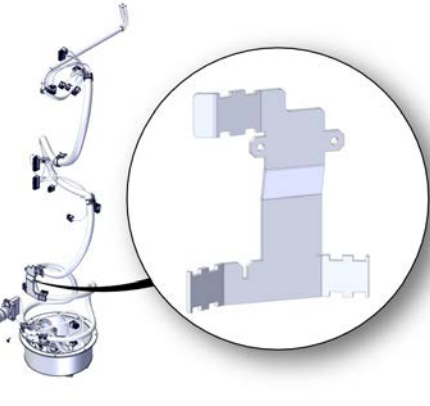
## 7 Robot description

### 7.3.3 Spare part versions for the axis-1 sealing ring on IP40/IP67 robots

*Continued*

#### Compatibility between cable harness and axis-1 sealing ring on IP40/IP67 robots

The manipulator cable harness is designed with different cable brackets that are compatible with different spare part versions of the axis-1 sealing ring. Always use the following list as a reference to check the cable harness installed on robot and order the correct spare parts.

| How to see which kind of cable harness is installed on robot  | What to order  |
|---|--|
|  <p>xx1900001602</p>   | <p>Order:</p> <ul style="list-style-type: none"> <li>• corresponding cable harness. See "Manipulator cable harness" in <i>Product manual, spare parts - IRB 1200</i> for spare part numbers.</li> <li>• sealing ring 3HAC068107-001</li> </ul> |
|  <p>xx1900001601</p> | <p>Order:</p> <ul style="list-style-type: none"> <li>• corresponding cable harness. See "Manipulator cable harness" in <i>Product manual, spare parts - IRB 1200</i> for spare part numbers.</li> </ul>  |

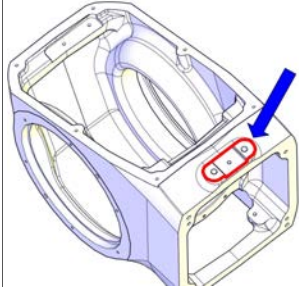
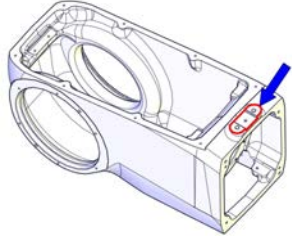
## 7.3.4 Spare part versions for the housing on Type A robots

## Spare part versions for the housing on Type A robots



## Note

IRB 1200 and IRB 1200 Type A have different housing versions that are not compatible with each other. Always use the following list as a reference to check the housing installed on robot and to order the correct spare parts.

| Robot variant  | Housing installed on robot (spare part number) | Article number in WebConfig | What to order   | How to see which version is installed on robot   |
|----------------|--|-----------------------------|---|--|
| IRB 1200-7/0.7 | 3HAC059680-001                                 | 3HAC044544-001              | Order: <ul style="list-style-type: none"> <li>housing (IRB 1200-7/0.7): 3HAC059680-001</li> </ul> | <p>The plane (encircled in the figure) on housing 3HAC059680-001 has no painting, while that on housing 3HAC059721-001 is painted.</p>  <p>xx1600001127</p>  |
|                | 3HAC059721-001                                 | 3HAC058389-001              | Order: <ul style="list-style-type: none"> <li>housing (IRB 1200-7/0.7): 3HAC059721-001</li> </ul> |  |
| IRB 1200-5/0.9 | 3HAC059681-001                                 | 3HAC04456-001               | Order: <ul style="list-style-type: none"> <li>housing (IRB 1200-5/0.9): 3HAC059681-001</li> </ul> | <p>The plane (encircled in the figure) on housing 3HAC059681-001 has no painting, while that on housing 3HAC059722-001 is painted.</p>  <p>xx1600001129</p> |
|                | 3HAC059722-001                                 | 3HAC058393-001              | Order: <ul style="list-style-type: none"> <li>housing (IRB 1200-5/0.9): 3HAC059722-001</li> </ul> |  |

## 7 Robot description

### 7.3.5 Spare part versions for the tubular on Type A robots

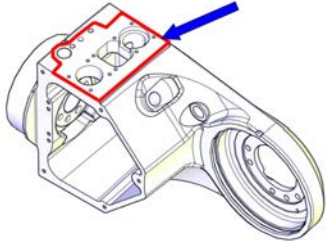
### 7.3.5 Spare part versions for the tubular on Type A robots

#### Spare part versions for the tubular on Type A robots



#### Note

IRB 1200 and IRB 1200 Type A have different tubular versions that are not compatible with each other. Always use the following list as a reference to check the tubular installed on robot and to order the correct spare parts.

| Tubular installed on robot (spare part number) | Article number in WebConfig | What to order  | How to see which version is installed on robot  |
|--|-----------------------------|--|---|
| 3HAC059693-001                                 | 3HAC044548-001              | Order: <ul style="list-style-type: none"><li>tubular with sleeve: 3HAC059693-001</li></ul> | The plane (encircled in the figure) on tubular 3HAC059693-001 has no painting, while that on tubular 3HAC059723-001 is painted.<br><br>xx1600001128 |
| 3HAC059723-001                                 | 3HAC058390-001              | Order: <ul style="list-style-type: none"><li>tubular with sleeve: 3HAC059723-001</li></ul> |   |



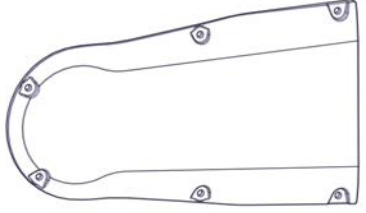
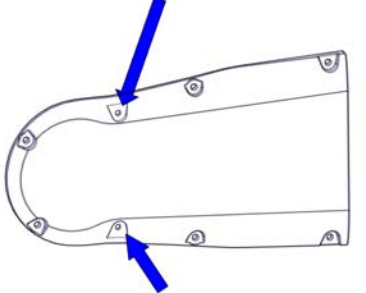
## 7.3.6 Spare part versions for the tubular cover on Clean Room robots

## Spare part versions for the tubular cover on Clean Room robots



## Note

IRB 1200 with protection type Clean Room has different tubular cover versions that are not compatible with each other. Always use the following list as a reference to check the tubular cover installed on robot and to order the correct spare parts.

| Tubular cover installed on Clean Room robots (spare part number) | Article number in WebConfig | What to order  | How to see which version is installed on robot   |
|--|-----------------------------|--|--|
| 3HAC056144-001   | 3HAC044550-001              | Order: <ul style="list-style-type: none"> <li>tubular cover, clean room: 3HAC056144-001</li> </ul> | <p>Tubular cover 3HAC056144-001 has six screw holes.</p>  <p>xx1600001117</p>    |
| 3HAC059708-001   | 3HAC058929-001              | Order: <ul style="list-style-type: none"> <li>tubular cover, clean room: 3HAC059708-001</li> </ul> | <p>Tubular cover 3HAC059708-001 has eight screw holes.</p>  <p>xx1600001118</p> |

**This page is intentionally left blank**

# 8 Reference information

## 8.1 Introduction

---

### General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

## 8 Reference information

### 8.2 Applicable standards

### 8.2 Applicable standards



#### Note

The listed standards are valid at the time of the release of this document. Phased out or replaced standards are removed from the list when needed.

#### General

The product is designed in accordance with ISO 10218-1:2011, Robots for industrial environments - Safety requirements -Part 1 Robots, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviations from ISO 10218-1:2011, these are listed in the declaration of incorporation which is part of the product delivery.

#### Normative standards as referred to from ISO 10218-1

| Standard         | Description  |
|------------------|--|
| ISO 9283:1998    | Manipulating industrial robots - Performance criteria and related test methods   |
| ISO 10218-2      | Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration               |
| ISO 12100        | Safety of machinery - General principles for design - Risk assessment and risk reduction                                     |
| ISO 13849-1:2006 | Safety of machinery - Safety related parts of control systems - Part 1: General principles for design                        |
| ISO 13850        | Safety of machinery - Emergency stop - Principles for design   |
| IEC 60204-1:2005 | Safety of machinery - Electrical equipment of machines - Part 1: General requirements  |
| IEC 62061:2005   | Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems |

#### Region specific standards and regulations

| Standard                           | Description  |
|------------------------------------|--|
| ANSI/RIA R15.06                    | Safety requirements for industrial robots and robot systems  |
| ANSI/UL 1740<br>(option 429-1)     | Safety standard for robots and robotic equipment   |
| CAN/CSA Z 434-14<br>(option 429-1) | Industrial robots and robot Systems - General safety requirements  |
| ANSI/ESD S20.20:2007               | Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) |

#### Other standards used in design

| Standard      | Description   |
|---------------|---|
| ISO 9787:2013 | Robots and robotic devices -- Coordinate systems and motion nomenclatures |

*Continues on next page*

| Standard                        | Description   |
|---------------------------------|---|
| IEC 61000-6-2                   | Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments |
| IEC 61000-6-4<br>(option 129-1) | Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments |
| ISO 13732-1:2008                | Ergonomics of the thermal environment - Part 1  |
| IEC 60974-1:2012 <sup>i</sup>   | Arc welding equipment - Part 1: Welding power sources   |
| IEC 60974-10:2014 <sup>f</sup>  | Arc welding equipment - Part 10: EMC requirements   |
| ISO 14644-1:2015 <sup>ii</sup>  | Classification of air cleanliness   |
| IEC 60529:1989 + A2:2013        | Degrees of protection provided by enclosures (IP code)  |
| IEC 61340-5-1:2010              | Protection of electronic devices from electrostatic phenomena - General requirements                              |

<sup>i</sup> Only valid for arc welding robots. Replaces IEC 61000-6-4 for arc welding robots.

<sup>ii</sup> Only robots with protection Clean Room.

## 8 Reference information

---

### 8.3 Unit conversion

### 8.3 Unit conversion

---

#### Converter table

Use the following table to convert units used in this manual.

| Quantity | Units |              |          |
|----------|-------|--------------|----------|
| Length   | 1 m   | 3.28 ft.     | 39.37 in |
| Weight   | 1 kg  | 2.21 lb.     |          |
| Weight   | 1 g   | 0.035 ounces |          |
| Pressure | 1 bar | 100 kPa      | 14.5 psi |
| Force    | 1 N   | 0.225 lbf    |          |
| Moment   | 1 Nm  | 0.738 lbf-ft |          |
| Volume   | 1 L   | 0.264 US gal |          |

## 8.4 Screw joints

### General

This section describes how to tighten the various types of screw joints on ABB robots.

The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.

### UNBRAKO screws

UNBRAKO is a special type of screw recommended by ABB for certain screw joints. It features special surface treatment (Gleitmo as described below) and is extremely resistant to fatigue.

Whenever used, this is specified in the instructions, and in such cases, *no other type of replacement screw* is allowed. Using other types of screws will void any warranty and may potentially cause serious damage or injury.

### Gleitmo treated screws

Gleitmo is a special surface treatment to reduce the friction when tightening the screw joint. Screws treated with Gleitmo may be reused 3-4 times before the coating disappears. After this the screw must be discarded and replaced with a new one.

When handling screws treated with Gleitmo, protective gloves of **nitrile rubber** type should be used.

### Screws lubricated in other ways

Screws lubricated with Molycote 1000 should *only* be used when specified in the repair, maintenance or installation procedure descriptions.

In such cases, proceed as follows:

- 1 Apply lubricant to the screw thread.
- 2 Apply lubricant between the plain washer and screw head.
- 3 Tighten to the torque as described in the procedures.

| Lubricant                                    | Article number |
|--|----------------|
| Molycote 1000 (molybdenum disulphide grease) | 3HAC042472-001 |

### Tightening torque

Before tightening any screw, note the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard torques** are specified in the following tables. Any **special torques** are specified in the repair, maintenance or installation procedure descriptions. **Any special torque specified overrides the standard torque!**
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- Always *tighten the joint by hand*, and never use pneumatic tools.

*Continues on next page*

## 8 Reference information

### 8.4 Screw joints

*Continued*

- Use the *correct tightening technique*, that is *do not* jerk. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is **10%**!

#### Oil-lubricated screws with slotted or cross-recess head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws with slotted or cross-recess head screws*.



#### Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

#### Oil-lubricated screws with allen head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws with allen head screws*.



#### Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

| Dimension | Tightening torque (Nm)<br>Class 8.8, oil-lubricated | Tightening torque (Nm)<br>Class 10.9, oil-lubricated | Tightening torque (Nm)<br>Class 12.9, oil-lubricated |
|-----------|---|--|--|
| M5        | 6   | -  | -  |
| M6        | 10  | -  | -  |
| M8        | 24  | 34   | 40   |
| M10       | 47  | 67   | 80   |
| M12       | 82  | 115  | 140  |
| M16       | 200   | 290  | 340  |
| M20       | 400   | 560  | 670  |
| M24       | 680   | 960  | 1150   |

#### Lubricated screws (Molycote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for *screws lubricated with Molycote 1000, Gleitmo 603 or equivalent with allen head screws*.



#### Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

| Dimension | Tightening torque (Nm)<br>Class 10.9, lubricated <sup>i</sup> | Tightening torque (Nm)<br>Class 12.9, lubricated <sup>i</sup> |
|-----------|---|---|
| M8        | 28  | 35  |
| M10       | 55  | 70  |

*Continues on next page*



| Dimension | Tightening torque (Nm)<br>Class 10.9, lubricated <sup>i</sup> | Tightening torque (Nm)<br>Class 12.9, lubricated <sup>i</sup> |
|-----------|---|---|
| M12       | 96  | 120   |
| M16       | 235   | 280   |
| M20       | 460   | 550   |
| M24       | 790   | 950   |

<sup>i</sup> Lubricated with Molycote 1000, Gleitmo 603 or equivalent

## 8 Reference information

---

### 8.5 Weight specifications

### 8.5 Weight specifications

---

#### Definition


In installation, repair, and maintenance procedures, weights of the components handled are sometimes specified. All components exceeding 22 kg (50 lbs) are highlighted in this way.

To avoid injury, ABB recommends the use of a lifting accessory when handling components with a weight exceeding 22 kg. A wide range of lifting accessories and devices are available for each manipulator model.

---

#### Example

Following is an example of a weight specification in a procedure:

|  | Action   | Note |
|--|--|------|
|  |  <b>CAUTION</b><br>The arm weighs 25 kg.<br>All lifting accessories used must be sized accordingly. |      |

## 8.6 Standard toolkit

### General

All service (repairs, maintenance, and installation) procedures contains lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the following table.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

### Contents, standard toolkit

| Qty | Tool   | Rem.                              |
|-----|--|-----------------------------------|
| 1   | Socket head cap 2-17 mm                              |                                   |
| 1   | Torque wrench 0.3-45 Nm                              |                                   |
| 1   | Torque wrench 55 Nm $\pm$ 5 Nm                       | For securing robot to foundation. |
| 1   | Ratchet head for torque wrench 1/2                   |                                   |
| 1   | Hex socket head cap no. 2.5 socket 1/2" bit L=110 mm |                                   |
| 1   | Small screwdriver                                    |                                   |
| 1   | T-handle with ball head                              |                                   |
| 1   | Small cutting plier                                  |                                   |
| 1   | Plastic mallet                                       |                                   |
| 1   | Needle-nose plier                                    |                                   |

## 8 Reference information

---

### 8.7 Special tools

### 8.7 Special tools

---

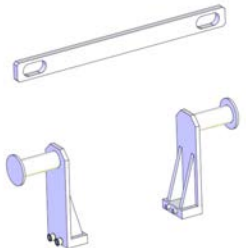
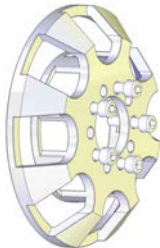
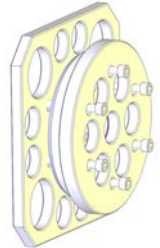
#### General

All service instructions contain lists of tools required to perform the specified activity. The required tools are a sum of standard tools, defined in the section [Standard toolkit on page 811](#), and of special tools, listed directly in the instructions and also gathered in this section.

---

#### Special tools

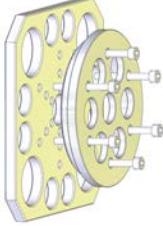
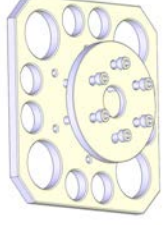
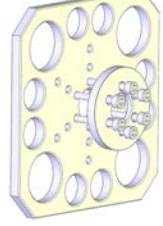
*Continues on next page*

| Tools and equipment with spare part number:<br>(These tools can be ordered from ABB) |  |  | Cable harness | EIB/SMB unit | Axis-4 FPC unit | Axis-5 FPC unit | Housing extender unit<br>(including sealings) | Base spare parts | Swing spare parts | Lower arm | Signal lamp | Axis-3 radial sealing and<br>sealing ring | Axis-1 mechanical stop | Axis-2 mechanical stop | Axis-3 mechanical stop | Axis-4 mechanical stop | Tubular spare parts | Axis-4 motor with pulley | Axis-5 motor with pulley | Axis-5 and axis-6 drive unit | Axis-4 gearbox, drive shaft<br>and pulley | Axis-4 timing belt | Axis-5 timing belt |  |
|--|--|--|---------------|--------------|-----------------|-----------------|---|------------------|-------------------|-----------|-------------|---|------------------------|------------------------|------------------------|------------------------|---------------------|--------------------------|--------------------------|------------------------------|---|--------------------|--------------------|--|
| <b>Guide pins</b>  |  |  |               |              |                 |                 |   |                  |                   |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| 3HAC049703-001   | Guide pin for axis-1 gear unit   |  | 3             |              |                 |                 |   | 3                | 3                 |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| 3HAC049704-001   | Guide pin for axis-2 gear unit   |  |               |              |                 |                 |   |                  | 3                 | 3         |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| 3HAC049705-001   | Guide pin for upper arm  |  |               |              |                 |                 |   |                  |                   | 3         |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| 3HAC049706-001   | Guide pin for tilt unit (axis 5)   |  |               |              |                 |                 |   |                  |                   |           |             |   |                        |                        |                        |                        | 3                   |                          |                          | 3                            |   |                    |                    |  |
| <b>Lifting accessories</b>   |  |  |               |              |                 |                 |   |                  |                   |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| 3HAC049711-001   | Lifting accessory, robot<br>Includes lifting accessories, lifting<br>beam and screws.              | <br>xx140000542  | 1             |              |                 |                 |   | 1                |                   |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| -  | Roundsling, 2 m<br>Length: 2 m. Lifting capacity: 100<br>kg.                                       |  | 1             |              |                 |                 |   | 1                | 1                 |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| <b>Press, puller and unloading tools</b>   |  |  |               |              |                 |                 |   |                  |                   |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| 3HAC049692-001   | Axis-1 sealing assembly tool set<br>Used to refit the axis-1 radial<br>sealing.                    | <br>xx140000535 |               |              |                 |                 |   | 1                |                   |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |
| 3HAC049694-001   | Axis-2 sealing assembly tool set<br>Used to refit the radial sealing, if<br>replacement is needed. | <br>xx140000541 |               |              |                 |                 |   |                  | 1                 |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |  |

Continues on next page

## 8 Reference information

### 8.7 Special tools

| Tools and equipment with spare part number:<br>(These tools can be ordered from ABB) |  |   | Cable harness | EIB/SMB unit | Axis-4 FPC unit | Axis-5 FPC unit | Housing extender unit<br>(including sealings) | Base spare parts | Swing spare parts | Lower arm | Signal lamp | Axis-3 radial sealing and<br>sealing ring | Axis-1 mechanical stop | Axis-2 mechanical stop | Axis-3 mechanical stop | Axis-4 mechanical stop | Tubular spare parts | Axis-4 motor with pulley | Axis-5 motor with pulley | Axis-5 and axis-6 drive unit | Axis-4 gearbox, drive shaft<br>and pulley | Axis-4 timing belt | Axis-5 timing belt |   |
|--|--|---|---------------|--------------|-----------------|-----------------|---|------------------|-------------------|-----------|-------------|---|------------------------|------------------------|------------------------|------------------------|---------------------|--------------------------|--------------------------|------------------------------|---|--------------------|--------------------|---|
| 3HAC049697-001   | Axis-3 sealing assembly tool set<br>Used to refit the axis-3 radial<br>sealing.                    | <br>xx1400000538   |               |              |                 |                 |   |                  |                   |           |             | 1   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |   |
| 3HAC049699-001   | Axis-4 sealing assembly tool set<br>Used to refit the radial sealing, if<br>replacement is needed. | <br>xx1400000539  |               |              | 1               |                 |   |                  |                   |           |             |   |                        |                        |                        | 1                      |                     |                          |                          |                              | 1   |                    |                    |   |
| 3HAC049701-001   | Axis-5 sealing assembly tool set<br>Used to refit the radial sealing, if<br>replacement is needed. | <br>xx1400000540 |               |              |                 | 1               |   |                  |                   |           |             |   |                        |                        |                        |                        | 1                   |                          |                          |                              | 1   |                    |                    |   |
| <b>Other tools</b>   |  |   |               |              |                 |                 |   |                  |                   |           |             |   |                        |                        |                        |                        |                     |                          |                          |                              |   |                    |                    |   |
| -  | 24 VDC power supply  |   | 1             | 1            | 1               | 1               | 1   | 1                | 1                 | 1         | 1           | 1   | 1                      | 1                      | 1                      | 1                      | 1                   | 1                        | 1                        | 1                            | 1   | 1                  | 1                  | 1 |
| 3HAC051256-001   | Calibration toolkit, manual<br>calibration   |   | 1             |              | 1               |                 | 1   | 1                | 1                 | 1         |             |   |                        |                        |                        |                        | 1                   | 1                        | 1                        | 1                            | 1   | 1                  | 1                  | 1 |
| 3HAC074119-001   | Calibration tool box, Axis<br>Calibration  |   | 1             |              | 1               |                 | 1   | 1                | 1                 | 1         |             |   |                        |                        |                        |                        | 1                   | 1                        | 1                        | 1                            | 1   | 1                  | 1                  | 1 |

Continues on next page

## 8.8 Lifting accessories and lifting instructions

---

### General

Many repair and maintenance activities require different pieces of lifting accessories, which are specified in each procedure.

The use of each piece of lifting accessories is *not* detailed in the activity procedure, but in the instruction delivered with each piece of lifting accessories.

This implies that the instructions delivered with the lifting accessories should be stored for later reference.

**This page is intentionally left blank**



## 9 Spare parts

### 9.1 Spare part lists and illustrations

---

#### Location

Spare parts and exploded views are not included in the manual but delivered as a separate document for registered users on myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).



#### Tip

All documents can be found via myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

**This page is intentionally left blank**

# 10 Circuit diagrams

## 10.1 Circuit diagrams

### Overview

The circuit diagrams are not included in this manual, but are available for registered users on myABB Business Portal, [www.abb.com/myABB](http://www.abb.com/myABB).

See the article numbers in the tables below.

### Controllers

| Product  | Article numbers for circuit diagrams |
|--|--------------------------------------|
| <i>Circuit diagram - IRC5</i>                          | <i>3HAC024480-011</i>                |
| <i>Circuit diagram - IRC5 Compact</i>                  | <i>3HAC049406-003</i>                |
| <i>Circuit diagram - IRC5 Panel Mounted Controller</i> | <i>3HAC026871-020</i>                |
| <i>Circuit diagram - Euromap</i>                       | <i>3HAC024120-004</i>                |
| <i>Circuit diagram - Spot welding cabinet</i>          | <i>3HAC057185-001</i>                |

### Robots

| Product  | Article numbers for circuit diagrams        |
|--|---|
| <i>Circuit diagram - IRB 120</i>               | <i>3HAC031408-003</i>                       |
| <i>Circuit diagram - IRB 140 type C</i>        | <i>3HAC6816-3</i>                           |
| <i>Circuit diagram - IRB 260</i>               | <i>3HAC025611-001</i>                       |
| <i>Circuit diagram - IRB 360</i>               | <i>3HAC028647-009</i>                       |
| <i>Circuit diagram - IRB 460</i>               | <i>3HAC036446-005</i>                       |
| <i>Circuit diagram - IRB 660</i>               | <i>3HAC025691-001</i>                       |
| <i>Circuit diagram - IRB 760</i>               | <i>3HAC025691-001</i>                       |
| <i>Circuit diagram - IRB 1200</i>              | <i>3HAC046307-003</i>                       |
| <i>Circuit diagram - IRB 1410</i>              | <i>3HAC2800-3</i>                           |
| <i>Circuit diagram - IRB 1600/1660</i>         | <i>3HAC021351-003</i>                       |
| <i>Circuit diagram - IRB 1520</i>              | <i>3HAC039498-007</i>                       |
| <i>Circuit diagram - IRB 2400</i>              | <i>3HAC6670-3</i>                           |
| <i>Circuit diagram - IRB 2600</i>              | <i>3HAC029570-007</i>                       |
| <i>Circuit diagram - IRB 4400/4450S</i>        | <i>3HAC9821-1</i>                           |
| <i>Circuit diagram - IRB 4600</i>              | <i>3HAC029038-003</i>                       |
| <i>Circuit diagram - IRB 6620</i>              | <i>3HAC025090-001</i>                       |
| <i>Circuit diagram - IRB 6620 / IRB 6620LX</i> | <i>3HAC025090-001</i>                       |
| <i>Circuit diagram - IRB 6640</i>              | <i>3HAC025744-001</i>                       |
| <i>Circuit diagram - IRB 6650S</i>             | <i>3HAC13347-1</i><br><i>3HAC025744-001</i> |

*Continues on next page*

## 10 Circuit diagrams

---

### 10.1 Circuit diagrams

*Continued*

| <b>Product</b>                               | <b>Article numbers for circuit diagrams</b> |
|--|---|
| <i>Circuit diagram - IRB 6660</i>            | <i>3HAC025744-001<br/>3HAC029940-001</i>    |
| <i>Circuit diagram - IRB 6700 / IRB 6790</i> | <i>3HAC043446-005</i>                       |
| <i>Circuit diagram - IRB 7600</i>            | <i>3HAC13347-1<br/>3HAC025744-001</i>       |
| <i>Circuit diagram - IRB 14000</i>           | <i>3HAC050778-003</i>                       |
| <i>Circuit diagram - IRB 910SC</i>           | <i>3HAC056159-002</i>                       |

# Index

## A

Absolute Accuracy, calibration, 732  
 allergenic material, 30  
 aluminum  
   disposal, 788  
 ambient humidity  
   operation, 52  
   storage, 52  
 ambient temperature  
   operation, 52  
   storage, 52  
 assembly instructions, 41  
 assessment of hazards and risks, 30  
 axis-5 and axis-6 drive unit  
   replacing, 708  
 axis-5 FPC unit  
   replacing, 246  
 axis-5 motor  
   replacing, 692  
 axis-5 timing belt  
   replacing, 702  
 axis-4 FPC unit  
   replacing, 215  
 axis-4 gear unit  
   replacing, 624  
 axis-4 motor  
   replacing, 666  
 axis-4 pulley  
   replacing, 624  
 axis-4 shaft  
   replacing, 624  
 axis-4 timing belt  
   replacing, 677  
 axis-3  
   radial sealing  
     replacing, 373  
   sealing ring  
     replacing, 373  
 axis-3 drive unit  
   replacing, 603  
 axis-3 gearbox  
   replacing, 603  
 axis-3 motor  
   replacing, 603  
 axis-2 drive unit  
   replacing, 582  
 Axis Calibration, 739  
   calibration tool  
     article number, 742, 747  
     examining, 742  
     installation position, 745  
   overview of method, 739  
   procedure on FlexPendant, 747, 756  
   protective cover and protection plug, 745, 747

## B

base  
   replacing, 441  
 batteries  
   disposal, 788  
 battery  
   replacing, 121  
 battery shutdown  
   service routine, 121

brakes  
   testing function, 38

## C

cabinet lock, 31  
 cable package main  
   replacing, 146  
 cabling, robot, 94  
 cabling between robot and controller, 94  
 calibrating  
   robot, 739  
   roughly, 736  
 calibrating robot, 739, 756  
 calibration  
   Absolute Accuracy type, 730  
   rough, 736  
   standard type, 730  
   verification, 785  
   when to calibrate, 733  
 calibration, Absolute Accuracy, 732  
 calibration manuals, 732  
 calibration marks, 734  
 calibration position  
   jogging to, 786  
   scales, 734  
 calibration scales, 734  
 CalibWare, 730  
 carbon dioxide extinguisher, 31  
 cast iron  
   disposal, 788  
 cleaning, 131  
 climbing on robot, 34  
 Cold environments, 101  
 connecting the robot and controller, cabling, 94  
 copper  
   disposal, 788

## D

damage to mechanical stop, 113  
 dimensions  
   robot, 79  
 direction of axes, 735  
 drive unit  
   axis-3, 603  
   axis-2, 582

## E

EIB/SMB battery  
   extension of lifetime, 121  
   replacing, 121  
 EIB unit  
   replacing, 259  
 environmental information, 788  
 equipment, robot, 79  
 equipment on robot, fitting, 80  
 ESD  
   damage elimination, 60  
   sensitive equipment, 60  
 extra equipment, 79

## F

fire extinguishing, 31  
 fitting  
   extra equipment, 80  
   fitting, equipment, 79  
 FlexPendant  
   jogging to calibration position, 786

- MoveAbsJ instruction, 786
- updating revolution counters, 736

- foundation requirements, 51

- FPC unit
  - axis-5, 246
  - axis-4, 215

## G

- gearbox
  - axis-3, 603
  - axis-2, 582
- gear unit
  - axis-4, 624
- Gravity Alpha, 74
- Gravity Beta, 73
- grease, 34
  - disposal, 788

## H

- hanging
  - installed hanging, 30
- hazard levels, 21
- hazardous material, 788
- height
  - installed at a height, 30
- hot surfaces, 34
- housing extender unit
  - replacing, 215
  - sealings, 215
- HRA, 30
- humidity
  - operation, 52
  - storage, 52

## I

- information labels location, 108
- inspecting
  - information labels, 108
  - mechanical stop, 113
  - robot cabling, 107
  - timing belts, 116
- installation
  - equipment, 79
- instructions for assembly, 41
- integrator responsibility, 30
- intervals for maintenance, 105

## L

- labels
  - robot, 23
- lamp unit
  - installing, 84
- lifting
  - accessory, 65
- lifting accessory, 810
- limitation of liability, 19
- Lithium
  - disposal, 788
- loads on foundation, 50
- lock and tag, 31
- lower arm
  - replacing, 274
- lubricants, 34

## M

- main power connector, o-ring, 95

- maintenance intervals, 105
- maintenance schedule, 105
- mechanical stop
  - axis-4, 410
  - axis-3, 407
  - axis-2, 404
  - axis-1, 578
- mechanical stop location, 113
- motor
  - axis-6, 708
  - axis-5, 692
  - axis-4, 666
  - axis-3, 603
- motor unit
  - axis-2, 582
- mounting, equipment, 79
- MoveAbsJ instruction, 786

## N

- national regulations, 30
- negative directions, axes, 735
- neodymium
  - disposal, 788
- nodular iron
  - disposal, 788

## O

- oil, 34
  - disposal, 788
- operating conditions, 52
- option
  - signal lamp, 84
- original spare parts, 19
- o-rings, enclosed with robot, 70, 95
- o-rings, extra at delivery, 42

## P

- pedestal
  - installed on pedestal, 30
- personnel
  - requirements, 20
- positive directions, axes, 735
- PPE, 20
- product standards, 804
- protection classes, 53
- protection sleeve, base
  - replacing, 441
- protection type, 53
- protective equipment, 20
- protective wear, 20
- pulley
  - axis-5, 692

## R

- radial sealing
  - axis-4, replacing, 215
  - axis-2, replacing, 516
  - axis-1, replacing, 441
- regional regulations, 30
- release brakes, 37
- replacements, report, 135
- replacing
  - axis-5 and axis-6 drive unit, 708
  - axis-5 FPC unit, 246
  - axis-5 motor with pulley, 692
  - axis-5 pulley, 692
  - axis-5 timing belt, 702

- axis-4 FPC unit, 215
  - axis-4 gear unit, 624
  - axis-4 motor, 666
  - axis-4 pulley, 624
  - axis-4 shaft, 624
  - axis-4 timing belt, 677
  - axis-3
    - radial sealing, 373
    - sealing ring, 373
  - axis-3 drive unit, 603
  - axis-3 gearbox, 603
  - axis-3 motor, 603
  - axis-2 drive unit, 582
  - axis-2 gearbox, 582
  - axis-2 motor unit, 582
  - base, 441
  - cable package main, 146
  - EIB unit, 259
  - housing extender unit, 215
  - lower arm, 274
  - mechanical stop
    - axis-4, 410
    - axis-3, 407
    - axis-2, 404
    - axis-1, 578
  - protection sleeve, base, 441
  - radial sealing, axis-4, 215
  - radial sealing, axis-2, 516
  - radial sealing, axis-1, 441
  - signal lamp, 337
  - SMB unit, 259
  - swing, 516
  - tubular, 340
  - UL-lamp, 337
  - report replacements, 135
  - requirements on foundation, 51
  - responsibility and validity, 19
  - revolution counters
    - storing on FlexPendant, 736
    - updating, 736
  - risk of burns, 34
  - risk of tipping, 59
  - robot
    - dimensions, 79
    - equipment, fitting, 79
    - labels, 23
    - protection class, 53
    - protection types, 53
    - symbols, 23
  - robot cabling
    - inspecting, 107
- S**
- safety
    - brake testing, 38
    - ESD, 60
    - fire extinguishing, 31
    - release robot axes, 37
    - signals, 21
    - signals in manual, 21
    - symbols, 21
    - symbols on robot, 23
  - safety devices, 31
  - safety equipment
    - signal lamp, 119
  - safety hazard
    - hydraulic system, 32
    - pneumatic system, 32
  - safety signals
    - in manual, 21
  - safety standards, 804
  - scales on robot, 734
  - schedule of maintenance, 105
  - screw joints, 807
  - securing, robot, 69
  - signal lamp
    - installing, 84
    - replacing, 337
  - signals
    - safety, 21
  - SMB unit
    - replacing, 259
  - speed
    - adjusting, 101
  - stability, 59
  - stainless steel
    - disposal, 788
  - standards, 804
    - ANSI, 804
    - CAN, 804
    - EN IEC, 804
    - EN ISO, 804
  - start of robot in cold environments, 101
  - steel
    - disposal, 788
  - storage conditions, 52
  - suspended mounting, 73
  - swing
    - replacing, 516
  - symbols
    - safety, 21
  - synchronization position, 736
  - sync marks, 734
  - system integrator requirements, 30
  - system parameter
    - Gravity Alpha, 74
    - Gravity Beta, 73
- T**
- temperatures
    - operation, 52
    - storage, 52
  - testing
    - brakes, 38
  - tilted mounting, 73
  - timing belts
    - inspecting, 116
  - torques on foundation, 50
  - Transportation bracket, 45, 59, 61
  - troubleshooting
    - safety, 39
  - tubular
    - replacing, 340
  - turning
    - accessory, 65
  - type A, 791
  - type B, 792
- U**
- UL lamp
    - replacing, 337
  - updating revolution counters, 736
  - users
    - requirements, 20

## V

validity and responsibility, 19  
velocity  
  adjusting, 101  
verifying calibration, 785

## W

wall mounting, 73

weight, 49

  robot, 64

Wrist Optimization

  overview of method, 756

## Z

zero position

  checking, 786







**ABB AB**

**Robotics & Discrete Automation**

S-721 68 VÄSTERÅS, Sweden

Telephone +46 (0) 21 344 400

**ABB AS**

**Robotics & Discrete Automation**

Nordlysvegen 7, N-4340 BRYNE, Norway

Box 265, N-4349 BRYNE, Norway

Telephone: +47 22 87 2000

**ABB Engineering (Shanghai) Ltd.**

Robotics & Discrete Automation

No. 4528 Kangxin Highway

PuDong District

SHANGHAI 201319, China

Telephone: +86 21 6105 6666

**ABB Inc.**

**Robotics & Discrete Automation**

1250 Brown Road

Auburn Hills, MI 48326

USA

Telephone: +1 248 391 9000

**[abb.com/robotics](http://abb.com/robotics)**