



Product manual

IRB 6700

Trace back information:

Workspace R17-1 version a7

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Product manual

**IRB 6700 - 235/2.65
IRB 6700 - 205/2.80
IRB 6700 - 175/3.05
IRB 6700 - 150/3.20
IRB 6700 - 200/2.60
IRB 6700 - 155/2.85
IRB 6700 - 300/2.70
IRB 6700 - 245/3.00**

IRC5

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Revision: J

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Original instructions.

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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.
-

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.
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.

Continues on next page

Overview of this manual

Continued

Chapter	Contents
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 6700</i>	3HAC044268-001
<i>Product manual - IRB 6700Inv</i>	3HAC058254-001
<i>Product specification - IRB 6700</i>	3HAC044265-001
<i>Directions for use - Fork lift accessory for IRB 6700</i>	3HAC048484-002
<i>Circuit diagram - IRB 6700</i>	3HAC043446-005
<i>Product manual - DressPack/SpotPack IRB 6700</i>	3HAC044270-001
<i>Operating manual - General safety information</i> ⁱ	3HAC031045-001
<i>Product manual - IRC5</i> IRC5 with main computer DSQC1000.	3HAC047136-001
<i>Product manual - IRC5</i> IRC5 with main computer DSQC 639.	3HAC021313-001
<i>Operating manual - IRC5 with FlexPendant</i>	3HAC050941-001
<i>Operating manual - Calibration Pendulum</i>	3HAC16578-1
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001
<i>Technical reference manual - System parameters</i>	3HAC050948-001

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

Revisions

Revision	Description
-	First edition.
A	The following updates are done in this revision: <ul style="list-style-type: none">• The variants IRB 6700-200/2.60 and IRB 6700-155/2.85 are added.• Some illustrations showing IRB 6640 are replaced with IRB 6700.• The information is updated in <i>Lifting with fork lift accessory</i>. ABB recommends that the fork lift accessories are removed before powering up the robot.
B	The following updates are done in this revision: <ul style="list-style-type: none">• The protection type <i>Foundry Plus</i> is added throughout the manual.

Continues on next page

Revision	Description
C	<p>The following updates are done in this revision:</p> <ul style="list-style-type: none"> • The variants IRB 6700-300/2.70 and -245/3.00 are added throughout the manual. • The maximum allowed deviation in levelness of the base plate and foundation is changed, see Securing the base plate on page 78. • Added information about which axes are affected by non-integer gear ratio, see Updating revolution counters on page 770. • Removed faulty listed washer from consumables table, section Replacing the upper arm on page 292. • Added tightening torque for R1.SMB and 7th axis connector, see Refitting the cable harness on page 252. • Measurements added for transport support used on variants IRB 6700-300/2.70 and -245/3.00.
D	<p>The following updates are done in this revision:</p> <ul style="list-style-type: none"> • Number of attachment screws was wrong in Orienting and securing the robot on page 89. Corrected to 8 pcs. • Added an alternative tightening torque for robot attachment bolts, see Orienting and securing the robot on page 89. • Added information about guide pins, both when securing the robot to the base plate and when securing it to a track motion carriage, see Orienting and securing the robot on page 89. • Updated base plate drawings and added information regarding guide pins, see Securing the base plate on page 78. • Thread lines were missing. Now added in figure. • Figure updated so locating hole is shown at "12 o'clock".
E	<p>The following updates are done in this revision:</p> <ul style="list-style-type: none"> • Information regarding how to read the procedures in this product manual are updated, see How to read the product manual on page 15. • New standard calibration method is introduced (Axis Calibration). See Calibration on page 763. • Information added regarding compatibility between new design of turning disk and the axis-6 synchronization mark plate, see Replacing the synchronization mark plate on page 361. • Flattened cylindrical guide pin is removed for the base plate, replaced with a cylindrical. See Securing the base plate on page 78. • O-ring type changed in Replacing the axis-1 gearbox (IRB 6700 - 300/2.70, -245/3.00) on page 606. • Sections "Inspecting oil level" and "Changing oil in gear box" are updated with information for 300/2.70 and 245/3.00.

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Overview of this manual

Continued

Revision	Description
F	<p>The following updates are done in this revision:</p> <ul style="list-style-type: none">• Corrected the article number for the rotation tool to 3HAB7887-1.• Removed the tool measuring ring for radial seal from special tools list, since it is not used for the robot.• Removed the article number for the leak-down tester, since it is not a purchable equipment.• Removed the article number for the threaded bar used for pressing the rear balancing device bearing in place, since it is not a purchable equipment.• Corrected the article number for the fork lift from 3HAC047054-002 to 3HAC047054-003.• Edited information regarding deciding calibration routine in each repair section.• Added a warning that calibration pin must be inserted in the calibration bushing until it snaps, see Description of Axis Calibration on page 774.• Added warning regarding risk of pinching, in Description of Axis Calibration on page 774.• Added information about inspection of calibration tool prior to usage, see Examining the calibration tool on page 776.• Added information about the calibration procedure, see Overview of the calibration procedure on the FlexPendant on page 779, Restarting an interrupted calibration procedure on page 781.• Added information about Axis Calibration when SafeMove is installed, see Axis Calibration with SafeMove option on page 782.
G	<p>The following updates are done in this revision:</p> <ul style="list-style-type: none">• Removal tools for removing the motors are updated. New article numbers for the tools.
H	<p>Published in release R16.2. The following updates are made in this revision:</p> <ul style="list-style-type: none">• Drawing of base plate is not available for purchase, faulty information removed in Securing the base plate on page 78.• Type B motors are introduced throughout the manual.• The figure of the turning disc is updated, the throughout holes are removed and a table note is added, see Tool flange, standard on page 102.• Illustration regarding centering diameters on tool flange updated.
J	<p>Published in release R17.1. The following updates are made in this revision:</p> <ul style="list-style-type: none">• Illustration for "Tool flange, standard" is updated.• Bending radius for static floor cables added.• Instructions for how to install the fork lift accessory set are removed from the manual. The instructions are found in the user documentation, enclosed with the fork lift accessory.• Grease trade name changed (was Optimol PD0 - is Tribol GR 100-0 PD)• Article number for axis-4 motor o-ring is corrected.• Spare part numbers for movable mechanical stop set axis 1 is changed, and one new number is added.• Motors updated, M12 instead of M14 holes on IRB6700 for removal tool.• Quality recommendations on foundation removed from manual.

Product documentation, IRC5

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.

All documents listed can be ordered from ABB on a DVD. The documents listed are valid for IRC5 robot systems.

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 exploded views (or references to separate spare parts lists).
- Circuit diagrams (or references to circuit diagrams).

Technical reference manuals

The technical reference manuals describe reference information for robotics products.

- *Technical reference manual - Lubrication in gearboxes*: Description of types and volumes of lubrication for the manipulator gearboxes.
- *Technical reference manual - RAPID overview*: An overview of the RAPID programming language.
- *Technical reference manual - RAPID Instructions, Functions and Data types*: Description and syntax for all RAPID instructions, functions, and data types.
- *Technical reference manual - RAPID kernel*: A formal description of the RAPID programming language.
- *Technical reference manual - System parameters*: Description of system parameters and configuration workflows.

Continues on next page

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, DVD with PC software).
- How to install included or required hardware.
- How to use the application.
- Examples of how to use the application.

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 trouble shooters.

The group of manuals includes (among others):

- *Operating manual - Emergency safety information*
- *Operating manual - General safety information*
- *Operating manual - Getting started, IRC5 and RobotStudio*
- *Operating manual - IRC5 Integrator's guide*
- *Operating manual - IRC5 with FlexPendant*
- *Operating manual - RobotStudio*
- *Operating manual - Trouble shooting IRC5*

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 17](#).

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.

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1 Safety

1.1 Introduction to safety information

Overview

The safety information in this manual is divided into the following categories:

- General safety aspects, important to attend to before performing any service work on the robot. These are applicable for all service work and are found in [General safety information on page 18](#).
- Safety signals and symbols shown in the manual and on the robot, warning for different types of dangers, are found in [Safety signals and symbols on page 39](#).
- Specific safety information, pointed out in the procedures. How to avoid and eliminate the danger is either described directly in the procedure, or in specific instructions in the section [Safety related instructions on page 47](#).

1 Safety

1.2.1 Introduction to general safety information

1.2 General safety information

1.2.1 Introduction to general safety information

Definitions

This section details general safety information for personnel performing installation, repair and maintenance work.

Sections

The general safety information is divided into the following sections.

Section	Examples of content
<i>Safety in the manipulator system on page 19</i>	This section describes the following: <ul style="list-style-type: none">• safety, service• limitation of liability• related information
<i>Protective stop and emergency stop on page 21</i>	This section describes protective stop and emergency stop.
<i>Safety risks on page 22</i>	This section lists dangers relevant when working with the product. The dangers are split into different categories. <ul style="list-style-type: none">• safety risks during installation or service• risks associated with live electrical parts
<i>Safety actions on page 31</i>	This section describes actions which may be taken to remedy or avoid dangers. <ul style="list-style-type: none">• fire extinguishing• safe use of the teach pendant or jogging device

1.2.2 Safety in the manipulator system

Validity and responsibility

The information does not cover how to design, install and operate a complete system, nor does it cover all peripheral equipment that can influence the safety of the entire system. To protect personnel, the complete system must be designed and installed in accordance with the safety requirements set forth in the standards and regulations of the country where the robot is installed.

The users of ABB industrial robots are responsible for ensuring that the applicable safety laws and regulations in the country concerned are observed and that the safety devices necessary to protect people working with the robot system are designed and installed correctly. Personnel working with robot must be familiar with the operation and handling of the industrial robot as described in the applicable documents, for example:

- *Operating manual - IRC5 with FlexPendant*
- *Operating manual - General safety information*¹
- *Product manual*

¹ This manual contains all safety instructions from the product manuals for the robots and the controllers.

The robot system shall be designed and constructed in such a way as to allow safe access to all areas where intervention is necessary during operation, adjustment, and maintenance.

Where it is necessary to perform tasks within the safeguarded space there shall be safe and adequate access to the task locations.

Users shall not be exposed to hazards, including slipping, tripping, and falling hazards.

Connection of external safety devices

Apart from the built-in safety functions, the robot is also supplied with an interface for the connection of external safety devices. An external safety function can interact with other machines and peripheral equipment via this interface. This means that control signals can act on safety signals received from the peripheral equipment as well as from the robot.

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.

Related information

Type of information	Detailed in document	Section
Installation of safety devices	<i>Product manual for the robot</i>	Installation and commissioning
Changing operating modes	<i>Operating manual - IRC5 with FlexPendant</i> <i>Operator's Manual - IRC5P</i>	Operating modes

Continues on next page

1 Safety

1.2.2 Safety in the manipulator system

Continued

Type of information	Detailed in document	Section
Restricting the working space	<i>Product manual for the robot</i>	Installation and commissioning

1.2.3 Protective stop and emergency stop

Overview

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

1 Safety

1.2.4.1 Safety risks during installation and service work on robots

1.2.4 Safety risks

1.2.4.1 Safety risks during installation and service work on robots

Overview

This section includes information on general safety risks to be considered when performing installation and service work on the robot.

These safety instructions have to be read and followed by any person who deals with the installation and maintenance of the robot. Only persons who know the robot and are trained in the operation and handling of the robot are allowed to maintain the robot. Persons who are under the influence of alcohol, drugs or any other intoxicating substances are not allowed to maintain, repair, or use the robot.

General risks during installation and service

- The instructions in the product manual in the chapters *Installation and commissioning*, and *Repair* must always be followed.
- Emergency stop buttons must be positioned in easily accessible places so that the robot can be stopped quickly.
- Those in charge of operations must make sure that safety instructions are available for the installation in question.
- Those who install or service/maintain the robot must have the appropriate training for the equipment in question and in any safety matters associated with it.

Spare parts and special equipment

ABB does not supply spare parts and special equipment which have not been tested and approved by ABB. The installation and/or use of such products could negatively affect the structural properties of the robot and as a result of that affect the active or passive safety operation. ABB is not liable for damages caused by the use of non-original spare parts and special equipment. ABB is not liable for damages or injuries caused by unauthorized modifications to the robot system.

Personal protective equipment

Always use suitable personal protective equipment, based on the risk assessment for the robot installation.

Nation/region specific regulations

To prevent injuries and damages during the installation of the robot, the regulations applicable in the country concerned and the instructions of ABB Robotics must be complied with.

Non-voltage related risks

- Make sure that no one else can turn on the power to the controller and robot while you are working with the system. A good method is to always lock the main switch on the controller cabinet with a safety lock.

Continues on next page

1.2.4.1 Safety risks during installation and service work on robots

Continued

- Safety zones, which must be crossed before admittance, must be set up in front of the robot's working space. Light beams or sensitive mats are suitable devices.
- Turntables or the like should be used to keep the operator out of the robot's working space.
- If the robot is installed at a height, hanging, or other than standing directly on the floor, there may be additional risks than those for a robot standing directly on the floor.
- The axes are affected by the force of gravity when the brakes are released. In addition to the risk of being hit by moving robot parts, there is a risk of being crushed by the parallel arm (if there is one).
- Energy stored in the robot for the purpose of counterbalancing certain axes may be released if the robot, or parts thereof, are dismantled.
- When dismantling/assembling mechanical units, watch out for falling objects.
- Be aware of stored heat energy in the controller.
- Never use the robot as a ladder, which means, do not climb on the robot motors or other parts during service work. There is a serious risk of slipping because of the high temperature of the motors and oil spills that can occur on the robot.
- Never use the robot as a ladder, which means, do not climb on the manipulator motors or other parts during service work. There is a risk of the robot being damaged.

To be observed by the supplier of the complete system

When integrating the robot with external devices and machines:

- The supplier of the complete system must ensure that all circuits used in the safety function are interlocked in accordance with the applicable standards for that function.
- The supplier of the complete system must ensure that all circuits used in the emergency stop function are interlocked in a safe manner, in accordance with the applicable standards for the emergency stop function.

Complete robot

Safety risk	Description
Hot components!	 CAUTION Motors and gearboxes are HOT after running the robot! Touching motors and gearboxes may result in burns! With a higher environment temperature, more surfaces on the manipulator will get HOT and may also result in burns.

Continues on next page

1 Safety

1.2.4.1 Safety risks during installation and service work on robots

Continued

Safety risk	Description
Removed parts may result in collapse of the robot!	 WARNING Take any necessary measures to ensure that the robot does not collapse as parts are removed. For example, secure the lower arm according to the repair instruction if removing the axis-2 motor.
Removed cables to the measurement system	 WARNING If the internal cables for the measurement system have been disconnected during repair or maintenance, then the revolution counters must be updated.

Cabling

Safety risk	Description
Cable packages are sensitive to mechanical damage!	 CAUTION The cable packages are sensitive to mechanical damage. Handle the cable packages and the connectors with care in order to avoid damage.

Gearboxes and motors

Safety risk	Description
Gears may be damaged if excessive force is used!	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used!

Balancing device

Safety risk	Description
Dangerous balancing device!	 WARNING <i>Do not</i> , under any circumstances, deal with the balancing device in any other way than that described in the product documentation! For example, attempting to open the balancing device is potentially lethal!

1.2.4.2 CAUTION - Hot parts may cause burns!

1.2.4.2 CAUTION - Hot parts may cause burns!**Description**

During normal operation, many robot parts become hot, especially the drive motors and gearboxes. Sometimes areas around these parts also become hot. Touching these may cause burns of various severity.

Because of a higher environment temperature, more surfaces on the robot get hot and may result in burns.

Elimination

The following instructions describe how to avoid the dangers specified above:

	Action	Information
1	Always use your hand, at some distance, to feel if heat is radiating from the potentially hot component before actually touching it.	
2	Wait until the potentially hot component has cooled if it is to be removed or handled in any other way.	

1 Safety

1.2.4.3 Safety risks related to tools/work pieces

1.2.4.3 Safety risks related to tools/work pieces

Safe handling

It must be possible to safely turn off tools, such as milling cutters, etc. Make sure that guards remain closed until the cutters stop rotating.

It should be possible to release parts by manual operation (valves).

Safe design

Grippers/end effectors must be designed so that they retain work pieces in the event of a power failure or a disturbance to the controller.

Unauthorized modifications of the originally delivered robot are prohibited. Without the consent of ABB it is forbidden to attach additional parts through welding, riveting, or drilling of new holes into the castings. The strength could be affected.



CAUTION

Ensure that a gripper is prevented from dropping a work piece, if such is used.

1.2.4.4 Safety risks related to pneumatic/hydraulic systems

General

Special safety regulations apply to pneumatic and hydraulic systems.



Note

All components that remain pressurized after separating the machine from the power supply must be provided with clearly visible drain facilities and a warning sign that indicates the need for pressure relief before adjustments or performing any maintenance on the robot system.

Residual energy

- Residual energy can be present in these systems. After shutdown, particular care must be taken.
- The pressure must be released in the complete pneumatic or hydraulic systems before starting to repair them.
- Work on hydraulic equipment may only be performed by persons with special knowledge and experience of hydraulics.
- All pipes, hoses, and connections have to be inspected regularly for leaks and damage. Damage must be repaired immediately.
- Splashed oil may cause injury or fire.

Safe design

- Gravity may cause any parts or objects held by these systems 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.

1 Safety

1.2.4.5 Safety risks during operational disturbances

General

- The industrial robot is a flexible tool that can be used in many different industrial applications.
- All work must be carried out professionally and in accordance with the applicable safety regulations.
- Care must be taken at all times.

Qualified personnel

Corrective maintenance must only be carried out by qualified personnel who are familiar with the entire installation as well as the special risks associated with its different parts.

Extraordinary risks

If the working process is interrupted, extra care must be taken due to risks other than those associated with regular operation. Such an interruption may have to be rectified manually.

1.2.4.6 Risks associated with live electric parts

Voltage related risks, general

Work on the electrical equipment of the robot must be performed by a qualified electrician in accordance with electrical regulations.

- Although troubleshooting may, on occasion, need to be carried out while the power supply is turned on, the robot must be turned off (by setting the main switch to OFF) when repairing faults, disconnecting electric leads and disconnecting or connecting units.
- The main supply to the robot must be connected in such a way that it can be turned off from outside the working space of the robot.
- Make sure that no one else can turn on the power to the controller and robot while you are working with the system. A good method is to always lock the main switch on the controller cabinet with a safety lock.

The necessary protection for the electrical equipment and robot system during construction, commissioning, and maintenance is guaranteed if the valid regulations are followed.

All work must be performed:

- by qualified personnel
- on machine/robot system in deadlock
- in an isolated state, disconnected from power supply, and protected against reconnection.

Voltage related risks, IRC5 controller

A danger of high voltage is associated with, for example, the following parts:

- Be aware of stored electrical energy (DC link, Ultracapacitor bank unit) in the controller.
- Units such as I/O modules, can be supplied with power from an external source.
- The main supply/main switch
- The transformers
- The power unit
- The control power supply (230 VAC)
- The rectifier unit (262/400-480 VAC and 400/700 VDC. Note: capacitors!)
- The drive unit (400/700 VDC)
- The drive system power supply (230 VAC)
- The service outlets (115/230 VAC)
- The customer power supply (230 VAC)
- The power supply unit for additional tools, or special power supply units for the machining process.
- The external voltage connected to the controller remains live even when the robot is disconnected from the mains.
- Additional connections.

Continues on next page

1 Safety

1.2.4.6 Risks associated with live electric parts

Continued

Voltage related risks, robot

A danger of high voltage is associated with the robot in:

- The power supply for the motors (up to 800 VDC).
 - The user connections for tools or other parts of the installation (max. 230 VAC).
-

Voltage related risks, tools, material handling devices, etc.

Tools, material handling devices, etc., may be live even if the robot system is in the OFF position. Power supply cables which are in motion during the working process may be damaged.

1.2.5 Safety actions

1.2.5.1 Safety fence dimensions

General

Install a safety cell around the robot to ensure safe robot installation and operation.

Dimensioning

The fence or enclosure must be dimensioned to withstand the force created if the load being handled by the robot is dropped or released at maximum speed.

Determine the maximum speed from the maximum velocities of the robot axes and from the position at which the robot is working in the work cell (see the section *Robot motion* in the *Product specification*).

Also consider the maximum possible impact caused by a breaking or malfunctioning rotating tool or other device fitted to the robot.

1 Safety

1.2.5.2 Fire extinguishing



Note

Use a CARBON DIOXIDE (CO₂) extinguisher in the event of a fire in the robot or controller!

1.2.5.3 Emergency release of the robot arm

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 detailed in the section:

- [Manually releasing the brakes on page 93.](#)

The robot arm 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 arms does not increase the pressure on the trapped person, further increasing any injury!



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 arm.

1 Safety

1.2.5.4 Brake testing

1.2.5.4 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 robot axis to a position where the combined weight of the robot arm 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 robot does not change position as the motors are switched off, then the brake function is adequate.

1.2.5.5 Risk of disabling function "Reduced speed 250 mm/s"



Note

Do not change *Transm gear ratio* or other kinematic system parameters from the FlexPendant or a PC. This will affect the safety function "Reduced speed 250 mm/s".

1 Safety

1.2.5.6 Safe use of the jogging device

1.2.5.6 Safe use of the jogging device

Three-position enabling device

The three-position enabling device is a manually operated, constant pressure push-button which, when continuously activated in one position only, allows potentially hazardous functions but does not initiate them. In any other position, hazardous functions are stopped safely.

The three-position enabling device is of a specific type where you must press the push-button only half-way to activate it. In the fully in and fully out positions, operating the robot is impossible.



Note

The three-position enabling device is a push-button located on the jogging device which, when pressed halfway in, switches the system to MOTORS ON. When the enabling device is released or pushed all the way in, the manipulator switches to the MOTORS OFF state.

To ensure safe use of the jogging device, the following must be implemented:

- The enabling device must never be rendered inoperational in any way.
- During programming and testing, the enabling device must be released as soon as there is no need for the robot to move.
- Anyone entering the working space of the robot must always bring the jogging device with him/her. This is to prevent anyone else from taking control of the robot without his/her knowledge.

Hold-to-run function

The hold-to-run function allows movement when a button connected to the function is actuated manually and immediately stops any movement when released. The hold-to-run function can only be used in manual mode.

How to operate the hold-to-run function for IRC5 is described in *Operating manual - IRC5 with FlexPendant*.

1.2.5.7 Work inside the working range of the robot



WARNING

If work must be carried out within the work area of the robot, then the following points must be observed:

- The operating mode selector on the controller must be in the manual mode position to render the three-position enabling device operational and to block operation from a computer link or remote control panel.
- The maximum speed of the robot is limited to 250 mm/s when the operating mode selector is in the position *Manual mode with reduced speed*. This should be the normal position when entering the working space.
The position *Manual mode with full speed (100%)* may only be used by trained personnel who are aware of the risks that this entails. *Manual mode with full speed (100%)* is not available in USA or Canada.
- Pay attention to the rotating axes of the robot. Keep away from axes to not get entangled with hair or clothing. Also, be aware of any danger that may be caused by rotating tools or other devices mounted on the robot or inside the cell.
- Test the motor brake on each axis, according to the section [Brake testing on page 34](#).
- To prevent anyone else from taking control of the robot, always put a safety lock on the cell door and bring the three-position enabling device with you when entering the working space.



WARNING

NEVER, under any circumstances, stay beneath any of the robot's axes! There is always a risk that the robot will move unexpectedly when robot axes are moved using the three-position enabling device or during other work inside the working range of the robot.

1 Safety

1.2.5.8 Signal lamp (optional)

1.2.5.8 Signal lamp (optional)

Description

A signal lamp with a yellow fixed light can be mounted on the robot, as a safety device.

Function

The lamp is active in MOTORS ON mode.

Further information

Further information about the MOTORS ON/MOTORS OFF mode may be found in the product manual for the controller.

1.3 Safety signals and symbols

1.3.1 Safety signals in the manual

Introduction to safety signals

This section specifies all dangers that can arise when doing the work described in the user manuals. Each danger consists of:

- A caption specifying the danger level (DANGER, WARNING, or CAUTION) and the type of danger.
- A brief description of what will happen if the operator/service personnel do not eliminate the danger.
- Instruction about how to eliminate danger to simplify doing the work.

Danger levels

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

Symbol	Designation	Significance
 xx0200000022	DANGER	Warns that an accident <i>will</i> occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe 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, and so on.
 xx0100000002	WARNING	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.
 xx0200000024	ELECTRICAL SHOCK	Warns for electrical hazards which could result in severe personal injury or death.
 xx0100000003	CAUTION	Warns that an accident <i>may</i> 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.
 xx0200000023	ELECTROSTATIC DISCHARGE (ESD)	Warns for electrostatic hazards which could result in severe damage to the product.

Continues on next page

1 Safety

1.3.1 Safety signals in the manual

Continued

Symbol	Designation	Significance
 xx010000004	NOTE	Describes important facts and conditions.
 xx010000098	TIP	Describes where to find additional information or how to do an operation in an easier way.

1.3.2 Safety symbols on product labels

Introduction to labels

This section describes safety symbols used on labels (stickers) on the product.

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 safety and health symbols on the labels on the product must be observed. Additional safety information given by the system builder or integrator must also be observed.

Types of labels

Both the robot and the controller are marked with several safety and information labels, containing important information about the product. The information is useful for all personnel handling the robot system, for example during installation, service, or operation.

The safety labels are language independent, they only use graphics. See [Symbols on safety labels on page 41](#).

The information labels can contain information in text (English, German, and French).

Symbols on safety labels

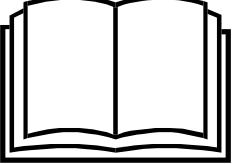
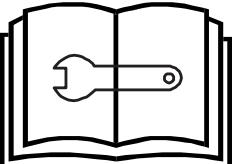
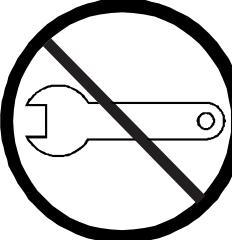
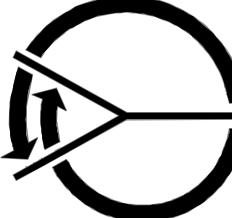
Symbol	Description
	Warning! Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc. xx0900000812
	Caution! 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. xx0900000811
	Prohibition Used in combinations with other symbols. xx0900000839

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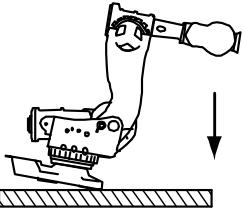
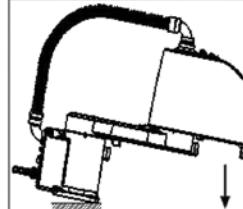
1 Safety

1.3.2 Safety symbols on product labels

Continued

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

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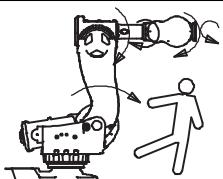
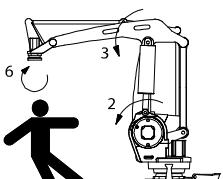
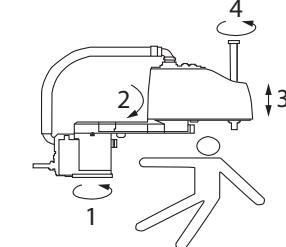
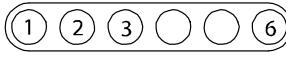
Symbol	Description
 xx0900000810	Tip risk when loosening bolts The robot can tip over if the bolts are not securely fastened.
  3HAC 057068-001	
  xx0900000817	Crush Risk of crush injuries.
 xx0900000818	Heat Risk of heat that can cause burns.

Continues on next page

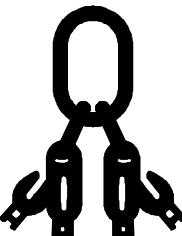
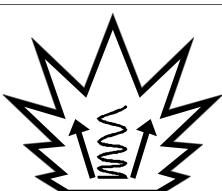
1 Safety

1.3.2 Safety symbols on product labels

Continued

Symbol	Description
 xx0900000819	Moving robot The robot can move unexpectedly.
 xx1000001141	
 xx1500002616	
 xx0900000820	Brake release buttons
 xx1000001140	
 xx0900000821	Lifting bolt

Continues on next page

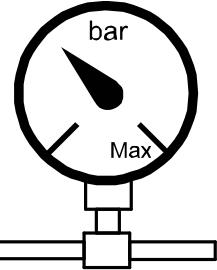
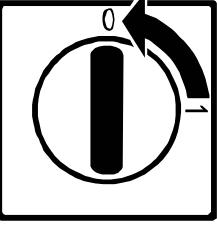
Symbol	Description
 xx1000001242	Chain sling with shortener
 xx0900000822	Lifting of robot
 xx0900000823	Oil Can be used in combination with prohibition if oil is not allowed.
 xx0900000824	Mechanical stop
 xx1000001144	No mechanical stop
 xx0900000825	Stored energy Warns that this part contains stored energy. Used in combination with <i>Do not disassemble</i> symbol.

Continues on next page

1 Safety

1.3.2 Safety symbols on product labels

Continued

Symbol	Description
 xx0900000826	Pressure Warns that this part is pressurized. Usually contains additional text with the pressure level.
 xx0900000827	Shut off with handle Use the power switch on the controller.
 xx1400002648	Do not step Warns that stepping on these parts can cause damage to the parts.

1.4.1 DANGER - Moving robots are potentially lethal!

1.4 Safety related instructions

1.4.1 DANGER - Moving robots are potentially lethal!

Description

Any moving robot is a potentially lethal machine.

When running, the robot may perform unexpected and sometimes irrational movements. Moreover, all movements are performed with great force and may seriously injure any personnel and/or damage any piece of equipment located within the working range of the robot.

Elimination

	Action	Note
1	Before attempting to run the robot, make sure all emergency stop equipment is correctly installed and connected.	Emergency stop equipment such as gates, tread mats, light curtains, etc.
2	Usually the hold-to-run function is active only in manual full speed mode. To increase safety it is also possible to activate hold-to-run for manual reduced speed with a system parameter. The hold-to-run function is used in manual mode, not in automatic mode.	How to use the hold-to-run function is described in section <i>How to use the hold-to-run function</i> in the <i>Operating manual - IRC5 with FlexPendant</i> .
3	Make sure no personnel are present within the working range of the robot before pressing the start button.	

1 Safety

1.4.2 DANGER - First test run may cause injury or damage!

Description

Since performing a service activity often requires disassembly of the robot, there are several safety risks to take into consideration before the first test run.

Elimination

Follow the procedure below when performing the first test run after a service activity, such as repair, installation, or maintenance.



DANGER

Running the robot without fulfilling the following aspects, may cause severe damage to the robot.

	Action
1	Remove all service tools and foreign objects from the robot and its working area.
2	Verify that the robot is secured to its position, see installation section in the product manual for the robot.
3	Verify that any safety equipment installed to secure the robot arm position or restrict the robot arm motion during service activity is removed.
4	Verify that the fixture and work piece are well secured, if applicable.
5	Install all safety equipment properly.
6	Make sure all personnel are standing at a safe distance from the robot, that is out of its reach behind safety fences, and so on.
7	Pay special attention to the function of the part that previously was serviced.

Collision risks



CAUTION

When programming the movements of the robot, always identify potential collision risks before the first test run.

1.4.3 WARNING - The brake release buttons may be jammed after service work

1.4.3 WARNING - The brake release buttons may be jammed after service work**Description**

The brake release unit has push-buttons for the brake release of each axis motor. When service work is performed inside the SMB recess that includes removal and refitting of the brake release unit, the brake release buttons may be jammed after refitting.

**DANGER**

If the power is turned on while a brake release button is jammed in depressed position, the affected motor brake is released! This may cause serious personal injuries and damage to the robot.

Elimination

To eliminate the danger after service work has been performed inside the SMB recess, follow the procedure below.

	Action
1	Make sure the power is turned off.
2	Remove the push-button guard, if necessary.
3	Verify that the push-buttons of the brake release unit are working by pressing them down, one by one. Make sure none of the buttons are jammed in the tube.
4	If a button gets jammed in the depressed position, the alignment of the brake release unit must be adjusted so that the buttons can move freely in their tubes!

1 Safety

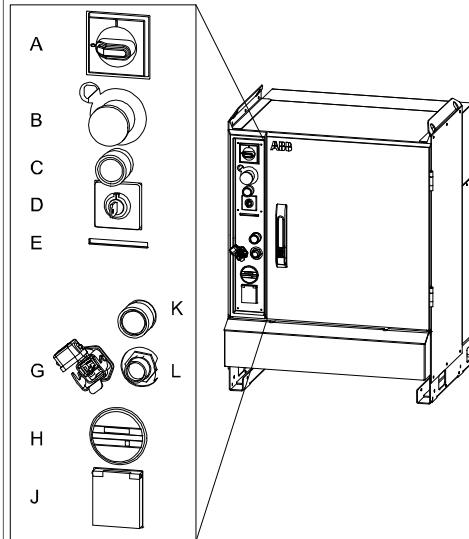
1.4.4 DANGER - Make sure that the main power has been switched off!

1.4.4 DANGER - Make sure that the main power has been switched off!

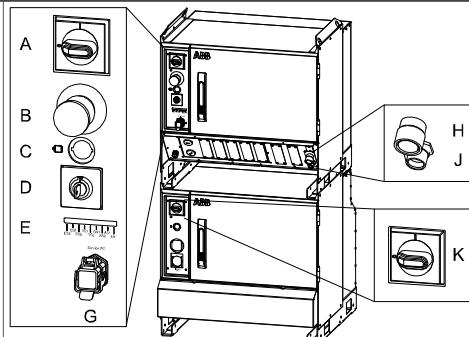
Description

Working with high voltage is potentially lethal. Persons subjected to high voltage may suffer cardiac arrest, burn injuries, or other severe injuries. To avoid these dangers, do not proceed working before eliminating the danger as detailed below.

Elimination, IRC5 Single Cabinet Controller

	Action	Note/illustration
1	Switch off the main switch on the controller cabinet.	 xx0600002782 A: Main switch

Elimination, IRC5 Dual Cabinet Controller

	Action	Note/illustration
1	Switch off the main switch on the Drive Module.	 xx0600002783 K: Main switch, Drive Module
2	Switch off the main switch on the Control Module.	A: Main switch, Control Module

1.4.5 WARNING - The unit is sensitive to ESD!

1.4.5 WARNING - 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.

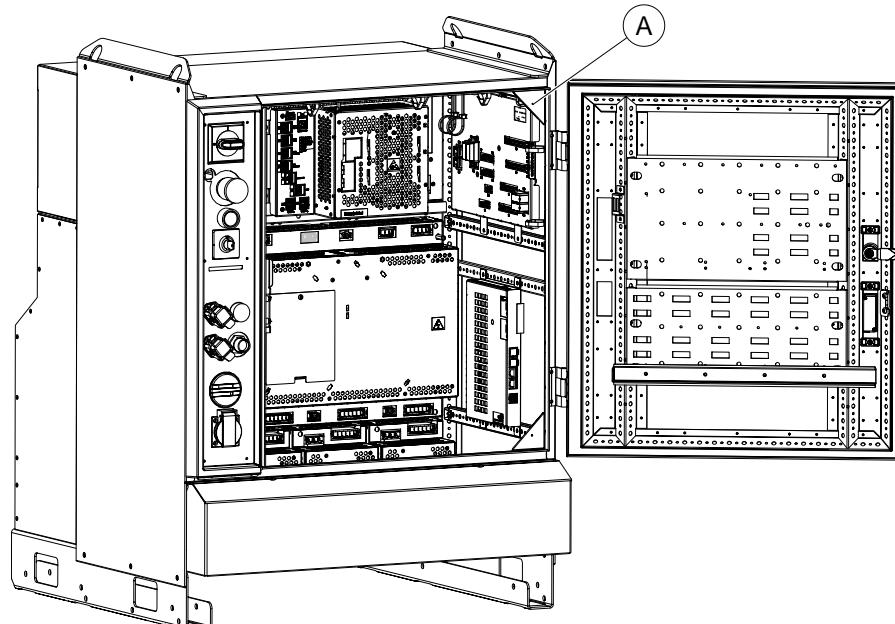
Elimination

	Action	Note
1	Use a wrist strap.	Wrist straps must be tested frequently to ensure that they are not damaged and are operating correctly.
2	Use an ESD protective floor mat.	The mat must be grounded through a current-limiting resistor.
3	Use a dissipative table mat.	The mat should provide a controlled discharge of static voltages and must be grounded.

Location of wrist strap button

The location of the wrist strap button is shown in the following illustration.

IRC5



A	Wrist strap button
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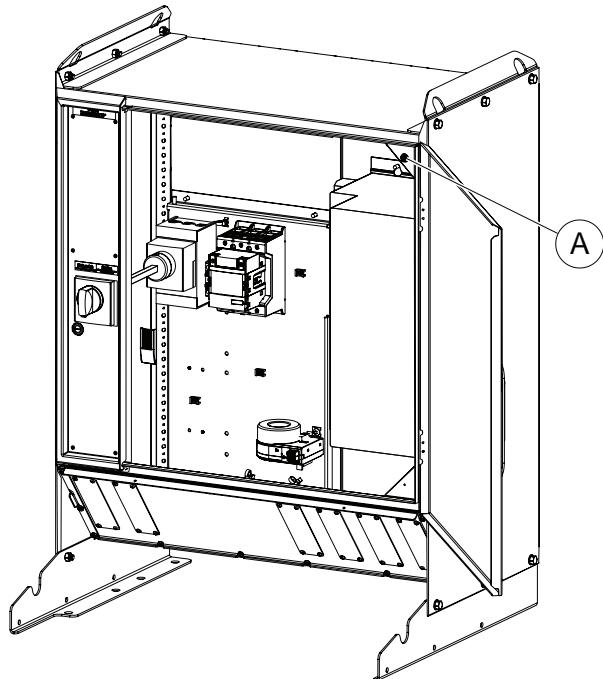
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1 Safety

1.4.5 **WARNING** - The unit is sensitive to ESD!

Continued

Spot welding cabinet



xx1600000253

1.4.6 WARNING - Safety risks during handling of batteries

Description

Under normal conditions of use, the electrode materials and liquid electrolyte in the batteries are not exposed to the outside, provided the battery integrity is maintained and seals remain intact.

There is a risk of exposure only in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery container. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.



Note

Appropriate disposal regulations must be observed.

Elimination

	Action	Note
1	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 Pre-installation procedure on page 58 .
2	Use safety glasses when handling the batteries.	
3	In the event of leakage, wear gloves and chemical apron.	
4	In the event of fire, use self-contained breathing apparatus.	

1 Safety

1.4.7 WARNING - Safety risks during work with gearbox lubricants (oil or grease)

Description

When handling gearbox lubricants, there is a risk of both personal injury and product damage occurring. The following safety information must be regarded before performing any work with lubricants in the gearboxes.



Note

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



Note

When aggressive media is handled, an appropriate skin protection must be provided. Gloves and goggles are recommended.



Note

Appropriate disposal regulations must be observed.



Note

Take special care when handling hot lubricants.

Warnings and elimination

Warning	Description	Elimination/Action
 xx0100000002 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.
 xx0100000002 Allergic reaction	When working with gearbox lubricant there is a risk of an allergic reaction.	Make sure that protective gear like goggles and gloves are always worn.
 xx0100000002 Possible pressure build-up in gearbox	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.

Continues on next page

1.4.7 WARNING - Safety risks during work with gearbox lubricants (oil or grease)

Continued

Warning	Description	Elimination/Action
 xx0100000002 Do not overfill	<p>Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may:</p> <ul style="list-style-type: none"> • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely. 	<p>Make sure not to overfill the gearbox when filling it with oil or grease!</p> <p>After filling, verify that the level is correct.</p>
 xx0100000002 Do not mix types of oil	<p>Mixing types of oil may cause severe damage to the gearbox.</p>	<p>When filling gearbox oil, do not mix different types of oil unless specified in the instructions. Always use the type of oil specified by the manufacturer!</p>
 xx0100000098 Heat up the oil	<p>Warm oil drains quicker than cold oil.</p>	<p>When changing gearbox oil, first run the robot for a time to heat up the oil.</p>
 xx0100000004 Specified amount depends on drained volume	<p>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.</p>	<p>After filling, verify that the level is correct.</p>
 xx0100000003 Contaminated oil in gear boxes	<p>When draining the oil make sure that as much oil as possible is drained from the gearbox. The reason for this is to drain as much oil sludge and metal chips as possible from the gearbox. The magnetic oil plugs will take care of any remaining metal chips.</p>	

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2 Installation and commissioning

2.1 Introduction

General

This chapter contains assembly instructions and information for installing the IRB 6700 at the working site.

More detailed technical data can be found in the *Product specification* for the IRB 6700, such as:

- Load diagram
- Permitted extra loads (equipment), if any
- Location of extra loads (equipment), if any.

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 17](#) before performing any installation work.



Note

If the IRB 6700 is connected to power, always make sure that the robot is connected to *protective earth* before starting any installation work!

For more information see:

- *Product manual - IRC5*

2 Installation and commissioning

2.2.1 Pre-installation procedure

2.2 Unpacking

2.2.1 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.  Note 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 is suitable to handle the weight of the robot as specified in: Weight, robot on page 59
6	If the robot is not installed directly, it must be stored as described in: Storage conditions, robot on page 60
7	Make sure that the expected operating environment of the robot conforms to the specifications as described in: Operating conditions, robot on page 60
8	Before taking the robot to its installation site, make sure that the site conforms to: <ul style="list-style-type: none">• Loads on foundation, robot on page 59• Protection classes, robot on page 61• Requirements, foundation on page 60
9	Before moving the robot, please observe the stability of the robot: Risk of tipping/stability on page 68
10	When these prerequisites are met, the robot can be taken to its installation site as described in section: On-site installation on page 77
11	Install required equipment, if any. <ul style="list-style-type: none">• Installing the signal lamp (option) on page 109

Continues on next page

Weight, robot

The table shows the weight of the robot.

The weight does not include the weight of the DressPack.

Robot model	Weight
IRB 6700	1300 kg

**Note**

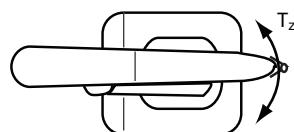
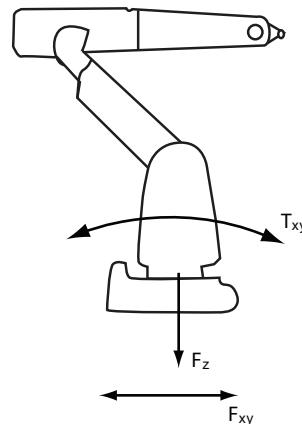
The weight does not include tools and other equipment fitted on the robot!

The weight does not include the weight of the DressPack.

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!

Continues on next page

2 Installation and commissioning

2.2.1 Pre-installation procedure

Continued

Floor mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	$\pm 7.4 \text{ kN}^{\text{i}} / \pm 8.7 \text{ kN}^{\text{ii}}$	$\pm 19.8 \text{ kN}^{\text{i}} / \pm 21.8 \text{ kN}^{\text{ii}}$
Force z	$14.6 \pm 4.5 \text{ kN}^{\text{i}} / 18.0 \pm 5.4 \text{ kN}^{\text{ii}}$	$14.6 \pm 15.7 \text{ kN}^{\text{i}} / 18.0 \pm 17.4 \text{ kN}^{\text{ii}}$
Torque xy	$\pm 21.0 \text{ kNm}^{\text{i}} / \pm 24.9 \text{ kNm}^{\text{ii}}$	$\pm 37.1 \text{ kNm}^{\text{i}} / \pm 45.3 \text{ kNm}^{\text{ii}}$
Torque z	$\pm 5.0 \text{ kNm}^{\text{i}} / \pm 6.5 \text{ kNm}^{\text{ii}}$	$\pm 11.4 \text{ kNm}^{\text{i}} / \pm 15.5 \text{ kNm}^{\text{ii}}$

ⁱ Valid for IRB 6700-235, -205, -175, -150, -200, -155.

ⁱⁱ Valid for IRB 6700-300, -245.

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	0.3 mm	Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB. The value for levelness aims at the circumstance of the anchoring points in the robot base. 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	0°	
Minimum resonance frequency	22 Hz	

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25°C (-13°F)
Maximum ambient temperature	+55°C (+131°F)
Maximum ambient temperature (less than 24 hrs)	+70°C (+158°F)
Maximum ambient humidity	Maximum 95% at constant temperature.

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	+5°C ⁱ (41°F)
Maximum ambient temperature	+50°C (122°F)
Maximum ambient humidity	Maximum 95% at constant temperature.

ⁱ At low environmental temperature (below 10°C) a warm-up phase is recommended to be run with the robot. Otherwise there is a risk that the robot stops or runs with lower performance due to temperature dependent oil and grease viscosity.

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	IP67
Manipulator, protection type Foundry Plus	IP67

2 Installation and commissioning

2.2.2 Working range

2.2.2 Working range

Working range

Axis	Type of motion	Working range	Note
Axis 1	Rotation motion	$\pm 170^\circ$ or $\pm 220^\circ$ (option)	
Axis 2	Arm motion	$-65^\circ/+85^\circ$ i	
Axis 3	Arm motion	$-180^\circ/+70^\circ$	
Axis 4	Wrist motion	$\pm 300^\circ$	Default value.
Axis 5	Bend motion	$\pm 130^\circ$ ii	
Axis 6	Turn motion	$\pm 360^\circ$ iii	Default value.
		± 93.7 revolutions	Maximum value. The default working range for axis 6 can be extended by changing parameter values in the software.

i Working range for variants IRB 6700 - 300/2.70 and - 245/3.00:

$+85^\circ$ to -65° when axis 3 is within $+70^\circ$ to -45°

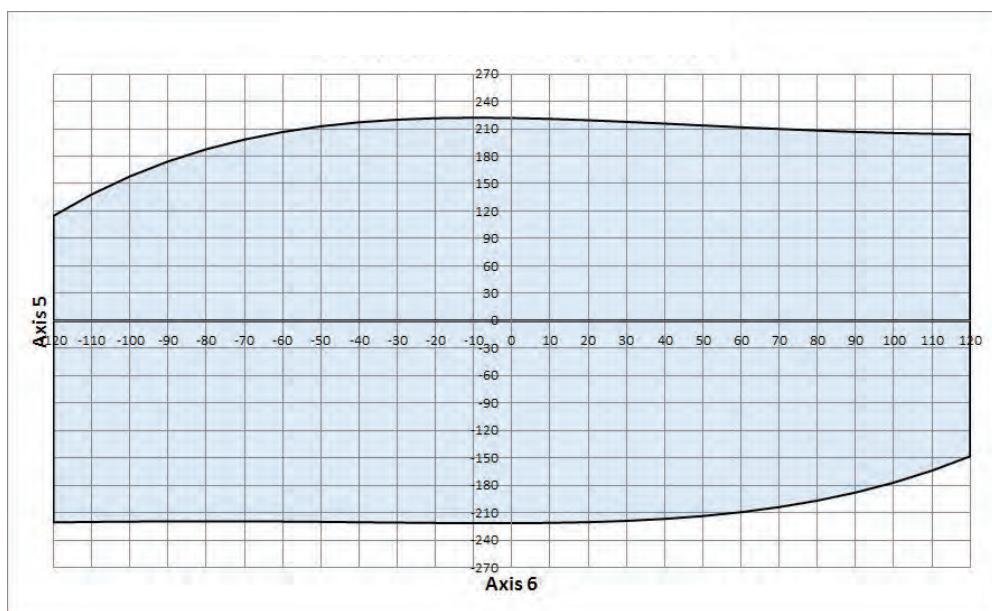
$+85^\circ$ to -58° when axis 3 is within $+70^\circ$ to -180°

ii Working range $+120^\circ$ to -120° for robots with LeanID, option 780-4.

iii Working range $+220^\circ$ to -220° for robots with LeanID, option 780-4.

Working range axis 5 and axis 6 for LeanID, option 780-4

Allowed working area for axis 6 related to axis 5 position is shown in the figure below.

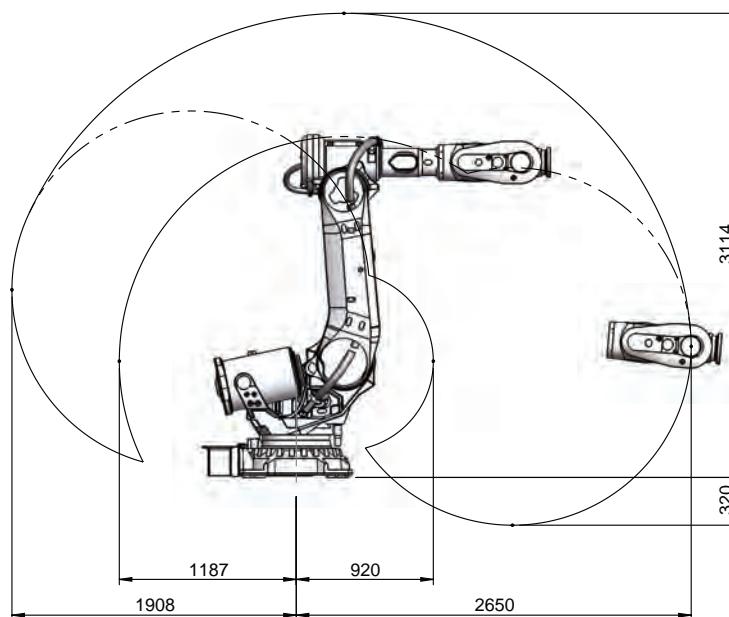


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Illustration, working range IRB 6700 - 235/2.65

This illustration shows the unrestricted working range of the robot.

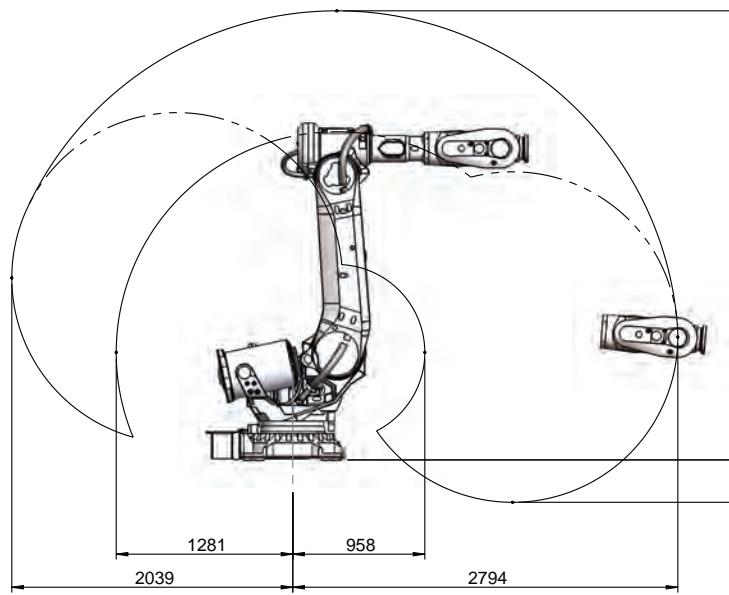


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Robot type	Handling capacity	Reach
IRB 6700	235 kg	2.65 m

Illustration, working range IRB 6700 - 205/2.80

This illustration shows the unrestricted working range of the robot.



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Robot type	Handling capacity	Reach
IRB 6700	205 kg	2.80 m

Continues on next page

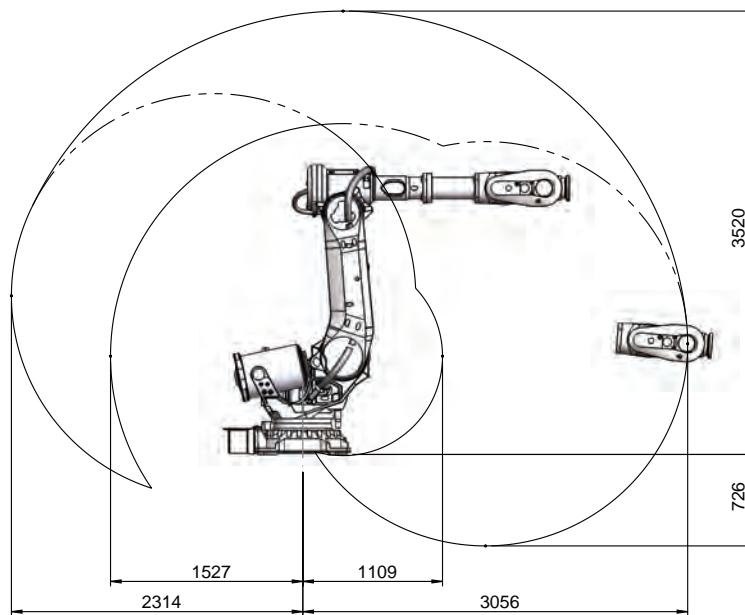
2 Installation and commissioning

2.2.2 Working range

Continued

Illustration, working range IRB 6700 - 175/3.05

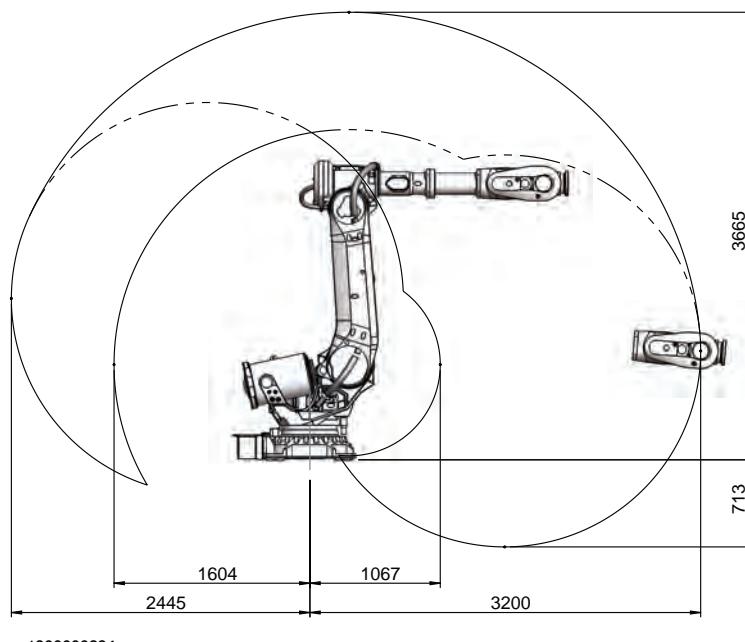
This illustration shows the unrestricted working range of the robot.



Robot type	Handling capacity	Reach
IRB 6700	175 kg	3.05 m

Illustration, working range IRB 6700 - 150/3.20

This illustration shows the unrestricted working range of the robot.

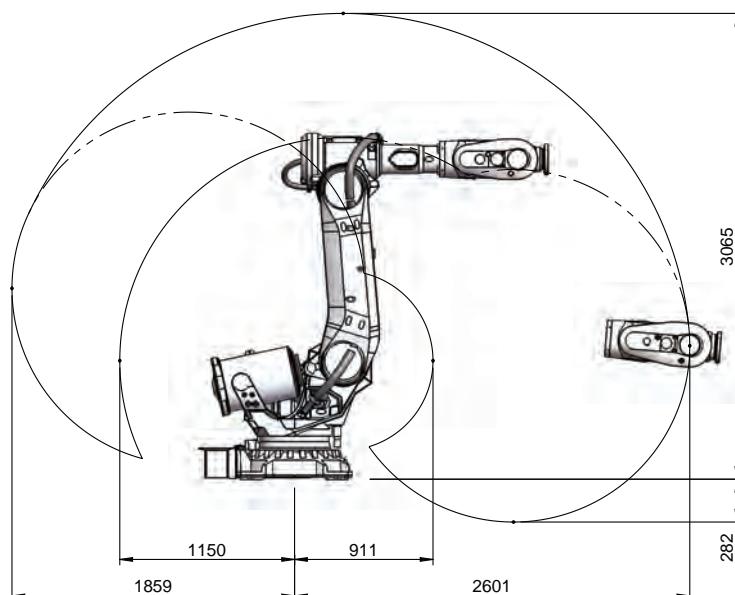


Robot type	Handling capacity	Reach
IRB 6700	150 kg	3.20 m

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Illustration, working range IRB 6700 - 200/2.60

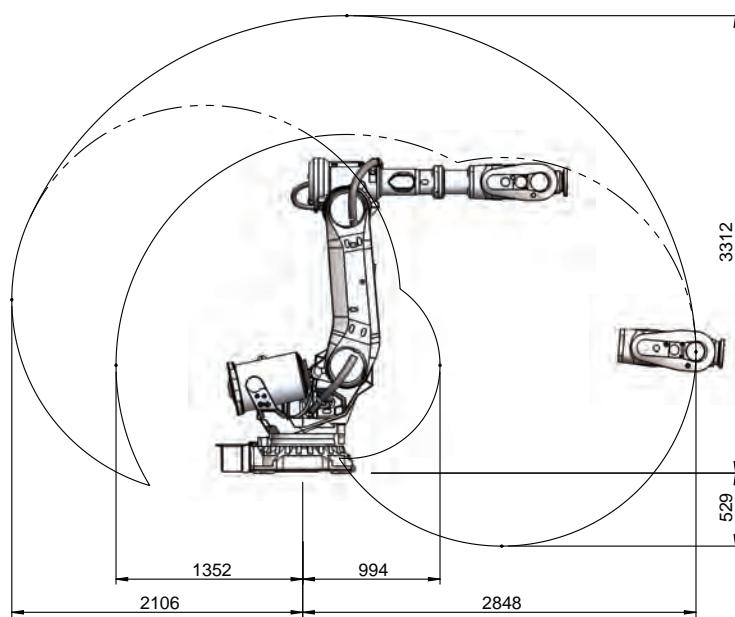
This illustration shows the unrestricted working range of the robot.



Robot type	Handling capacity	Reach
IRB 6700	200 kg	2.60 m

Illustration, working range IRB 6700 - 155/2.85

This illustration shows the unrestricted working range of the robot.



Robot type	Handling capacity	Reach
IRB 6700	155 kg	2.85 m

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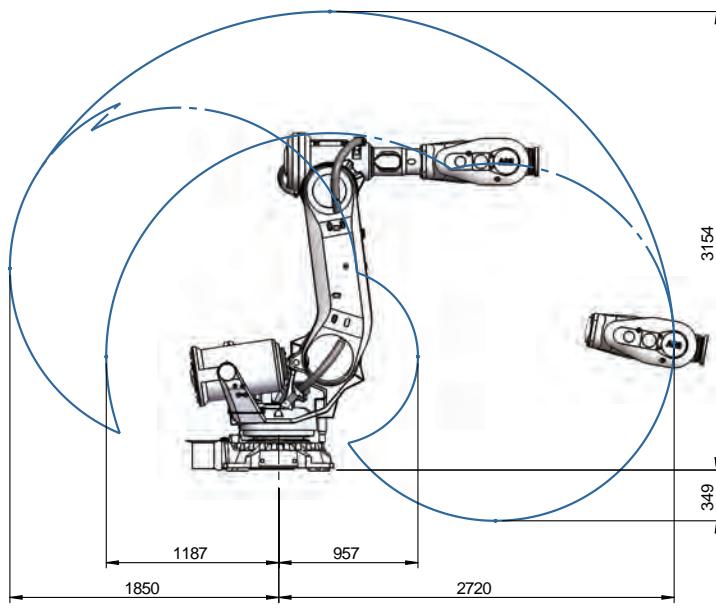
2 Installation and commissioning

2.2.2 Working range

Continued

Illustration, working range IRB 6700 - 300/2.70

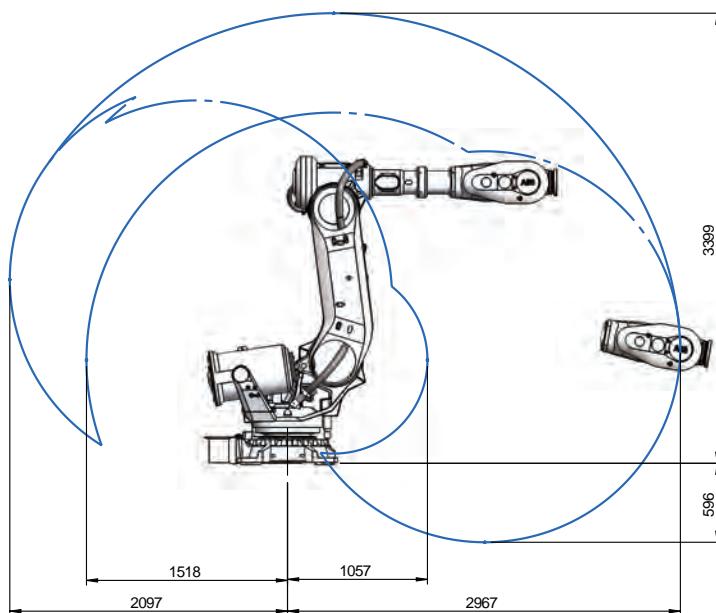
This illustration shows the unrestricted working range of the robot.



Robot type	Handling capacity	Reach
IRB 6700	300 kg	2.70 m

Illustration, working range IRB 6700 - 245/3.00

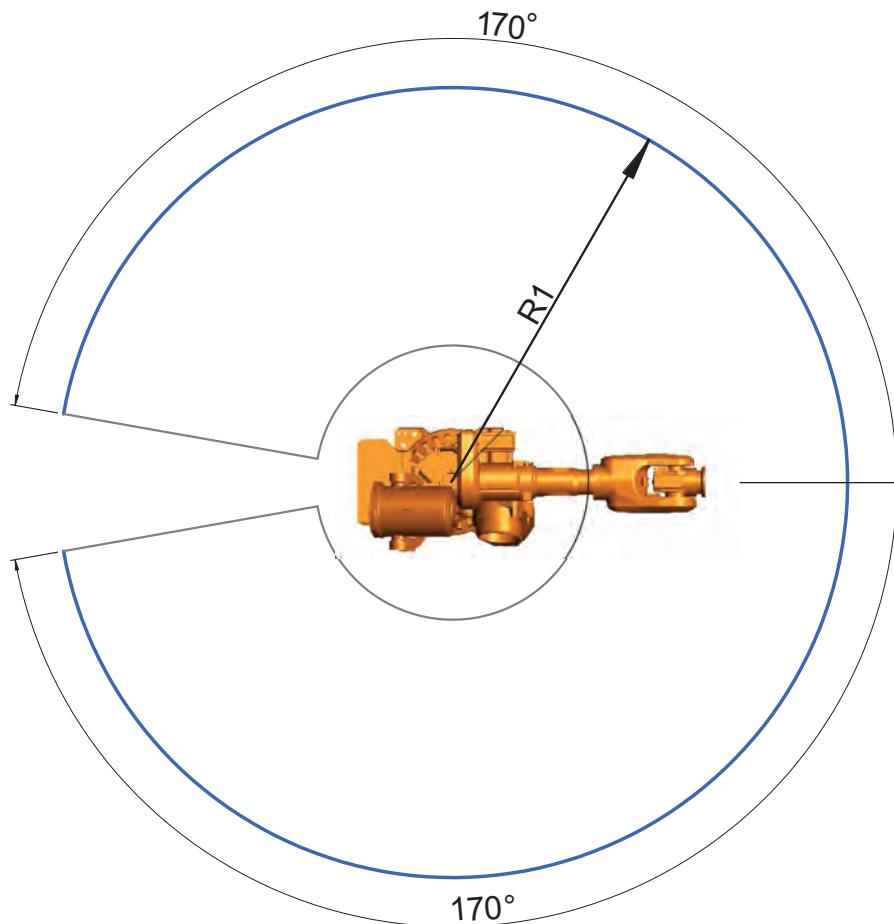
This illustration shows the unrestricted working range of the robot.



Robot type	Handling capacity	Reach
IRB 6700	245 kg	3.00 m

Continues on next page

Turning radius axis 1



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Robot variant	R1 (mm)
IRB 6700 - 235/2.65	2650
IRB 6700 - 205/2.80	2794
IRB 6700 - 175/3.05	3056
IRB 6700 - 150/3.20	3200
IRB 6700 - 200/2.60	2601
IRB 6700 - 155/2.85	2848
IRB 6700 - 300/2.70	2720
IRB 6700 - 245/3.00	2967

2 Installation and commissioning

2.2.3 Risk of tipping/stability

2.2.3 Risk of tipping/stability

Risk of tipping

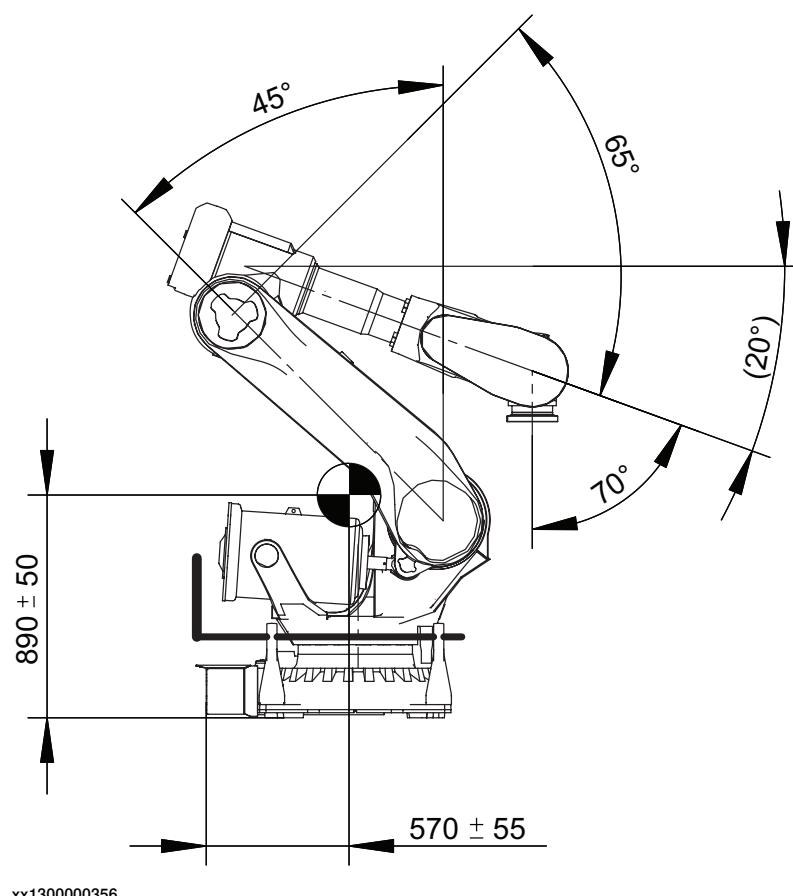
If the robot is not fastened to the foundation while moving the arm, the robot is not stable in the whole working area. Moving the arm will displace the center of gravity, which may cause the robot to tip over.

The shipping position is the most stable position.

Do not change the robot position before securing it to the foundation!

Shipping and transportation position

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

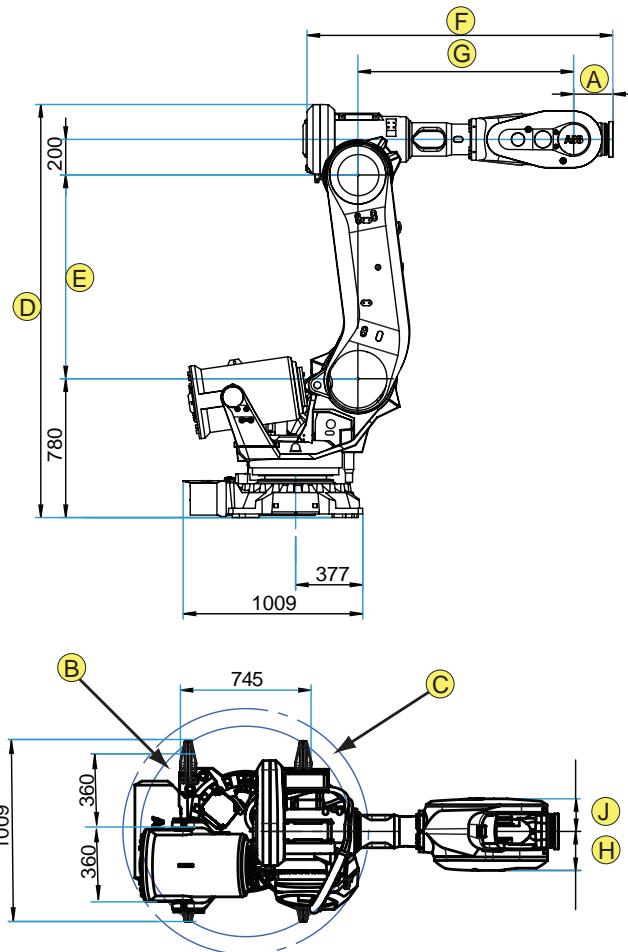


WARNING

The robot is likely to be mechanically unstable if not secured to the foundation.

2.2.4 Main dimensions

Illustration



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Dimensions for different robot variants

Pos	Description
B	Radius ax1, front = 532 mm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60 and -155/2.85) Radius ax1, front = 600 mm (IRB 6700-300/2.70 and -245/3.00)
C	Radius ax1, back = 633 mm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60 and -155/2.85) Radius ax1, back = 700 mm (IRB 6700-300/2.70 and -245/3.00)

Robot variant	A	A LeanID	D	E	F	F LeanID	G	H	J
IRB 6700 - 235/2.65	200	350	2300	1135	1670	1820	1,182.5	209	186
IRB 6700 - 205/2.80	200	350	2445	1280	1670	1820	1,182.5	186	209
IRB 6700 - 175/3.05	200	350	2300	1135	2080	2230	1,592.5	209	186
IRB 6700 - 150/3.20	200	350	2445	1280	2080	2230	1,592.5	209	186
IRB 6700 - 200/2.60	200	350	2276	1125	1623	1773	1,142.5	197.5	193

Continues on next page

2 Installation and commissioning

2.2.4 Main dimensions

Continued

Robot variant	A	A LeanID	D	E	F	F LeanID	G	H	J
IRB 6700 - 155/2.85	200	350	2276	1125	1873	2023	1,392.5	197.5	193
IRB 6700 - 300/2.70	220	380	2321	1145	1718.5	1878.5	1212.5	222.5	187
IRB 6700 - 245/3.00	220	380	2321	1145	1968.5	2128.5	1462.5	222.5	186

2.3 On-site transportation

2.3.1 Robot transportation precautions

General

This section describes ABB approved transportation precautions for ABB robots.



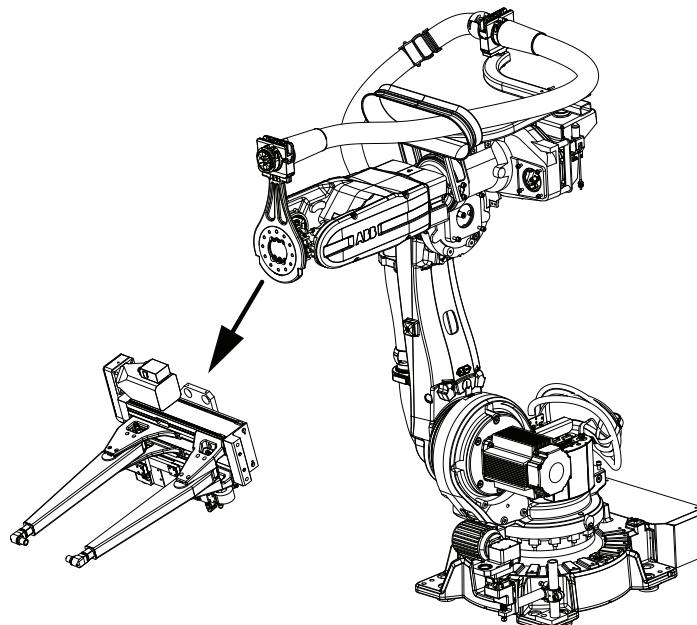
CAUTION

All transportation in or outside the plant, must be carried out according to the method described in this section.

Transportation in any other way can seriously damage the robot. If the robot is incorrectly transported and the instructions are not followed, the robot is not covered by the warranty and ABB will not accept any compensation claim.

Method 1 - recommended method

Transportation according to method 1 is strongly recommended by ABB.



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Always follow these instructions when transporting an ABB robot according to method 1:

- Always remove the tool before transportation of the robot.
- Always place the robot in the ABB recommended transport position, described in section [Risk of tipping/stability on page 68](#).
- Always read and follow the instructions in section [Pre-installation procedure on page 58](#)

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2 Installation and commissioning

2.3.1 Robot transportation precautions

Continued

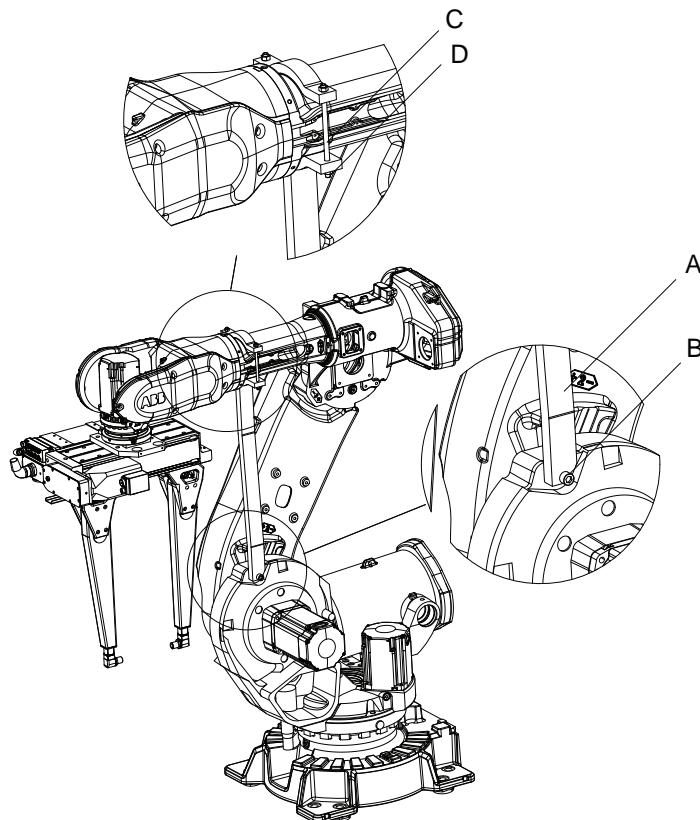
Method 2 - transportation with a tool mounted to the robot

Transportation according to method 2 is approved by ABB, only if use of method 1 is not possible.

Always follow these instructions when transporting an ABB robot according to method 2:

- Always read and follow the instructions in section [Securing the robot with a transport support on page 75](#)
- Always place the robot in the ABB recommended transport position for robot with tool, described in sub section [Transport position with a transport support on page 73](#).
- Always use the recommended transport support described in sub section [Recommended transport support on page 74](#).

IRB 6700



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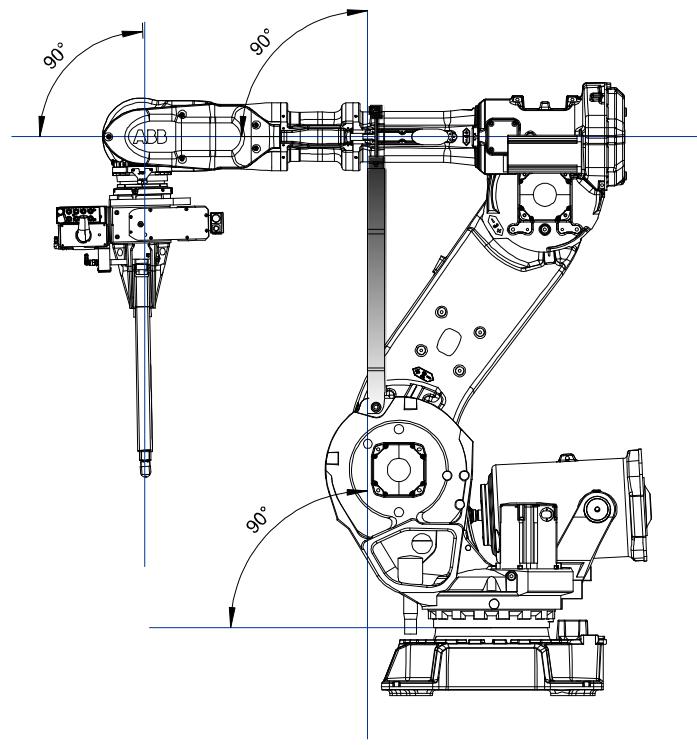
A	Transport Support
B	Hexagon socket head cap screw M16x140
C	Threaded bar M10x200
D	Nut M10

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Transport position with a transport support

All transportation of the robot with tool must follow these instructions.

IRB 6700



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2 Installation and commissioning

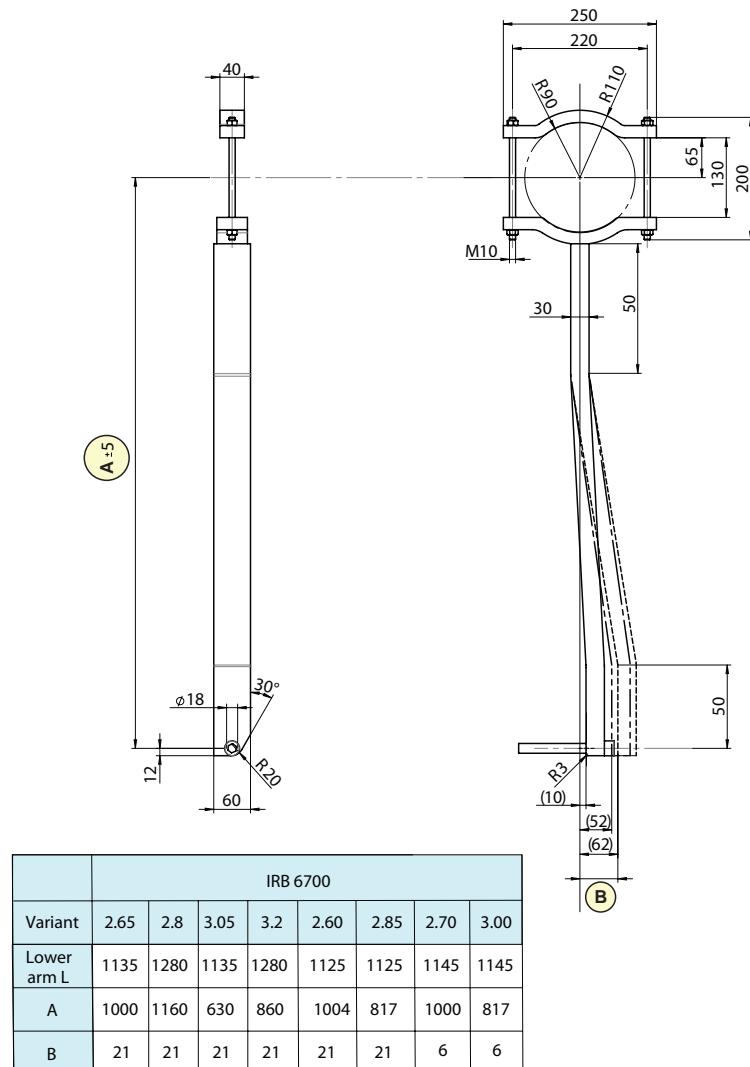
2.3.1 Robot transportation precautions

Continued

Recommended transport support

Always use the recommended transport support when transporting a robot with tool.

IRB 6700



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2.3.2 Securing the robot with a transport support

General

This section describes how to fit the transport support to the robot in order to secure the robot for transportation. The transport support is required if the robot must be transported with mounted tools.

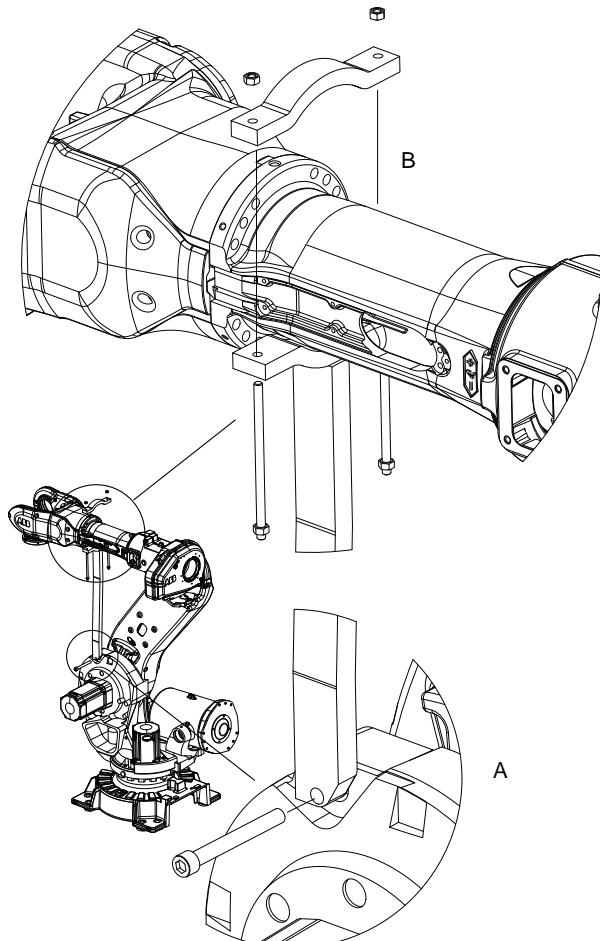


DANGER

Releasing the brakes is a hazardous action that may cause injury and damage property. It must be done with great care and only when absolutely necessary.

Fitting the transport support

Illustration for fitting the transport support



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Continues on next page

2 Installation and commissioning

2.3.2 Securing the robot with a transport support

Continued

Fitting the transport support

	Action	Note
1	Fit the transport support's lower end to the robot using the recommended screw joint, (A) in figure.	Do not tighten the screw. See attachment point for the specific robot in the section Transport position with a transport support on page 73 .
2	Jog the robot into a position as near above as possible to the recommended transport position for the specific robot, as specified in section Transport position with a transport support on page 73 .	 CAUTION Do not try to jog the robot to the exact position (max distance 1mm).
3	Use the brake release for axis 3 to reach the final resting position on the transport support, see the section Manually releasing the brakes on page 93 .	See attachment point for the specific robot in the section Transport position with a transport support on page 73
4	Tighten all the attachment screws, (A) and (B), in the figure with the brake release for axis 3 still activated starting with the lower attachment screw.	 CAUTION Do not attempt to tighten any attachment screws without first releasing the brakes. This can seriously damage the robot.
5	Use the brake release for axis 5 and 6 to reach the final resting position for the tool, see the section Manually releasing the brakes on page 93	

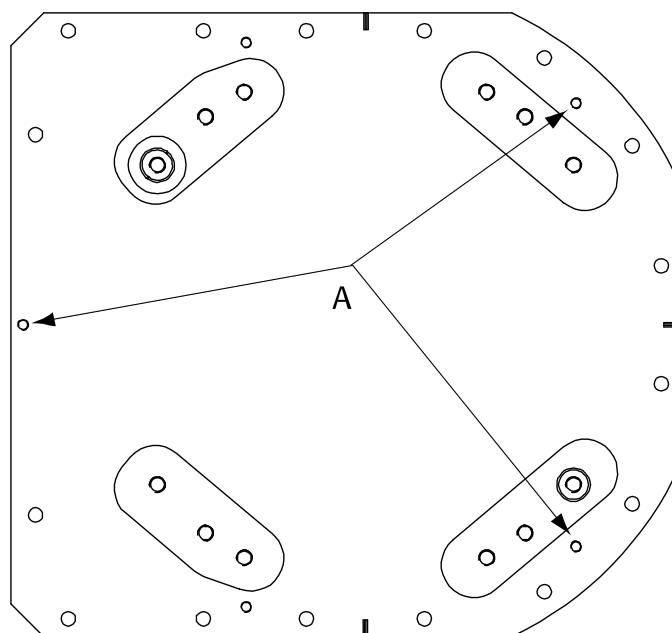
2.4 On-site installation

2.4.1 Lifting the base plate

Required equipment

Equipment	Article number	Note
Lifting eye, M16	3HAC14457-4	3 pcs
Lifting slings		Length: approx. 2 m

Hole configuration



xx0200000096

A	Attachment holes for lifting eyes (x3)
---	--

Lifting, base plate

	Action	Note
1	! CAUTION The base plate weighs 353 kg. All lifting accessories used must be sized accordingly.	
2	Fit lifting eyes in specified holes.	Shown in figure Hole configuration on page 77 .
3	! CAUTION Lift and move the base plate very slowly. If the base plate starts to swing it is a risk for injuries or damage.	

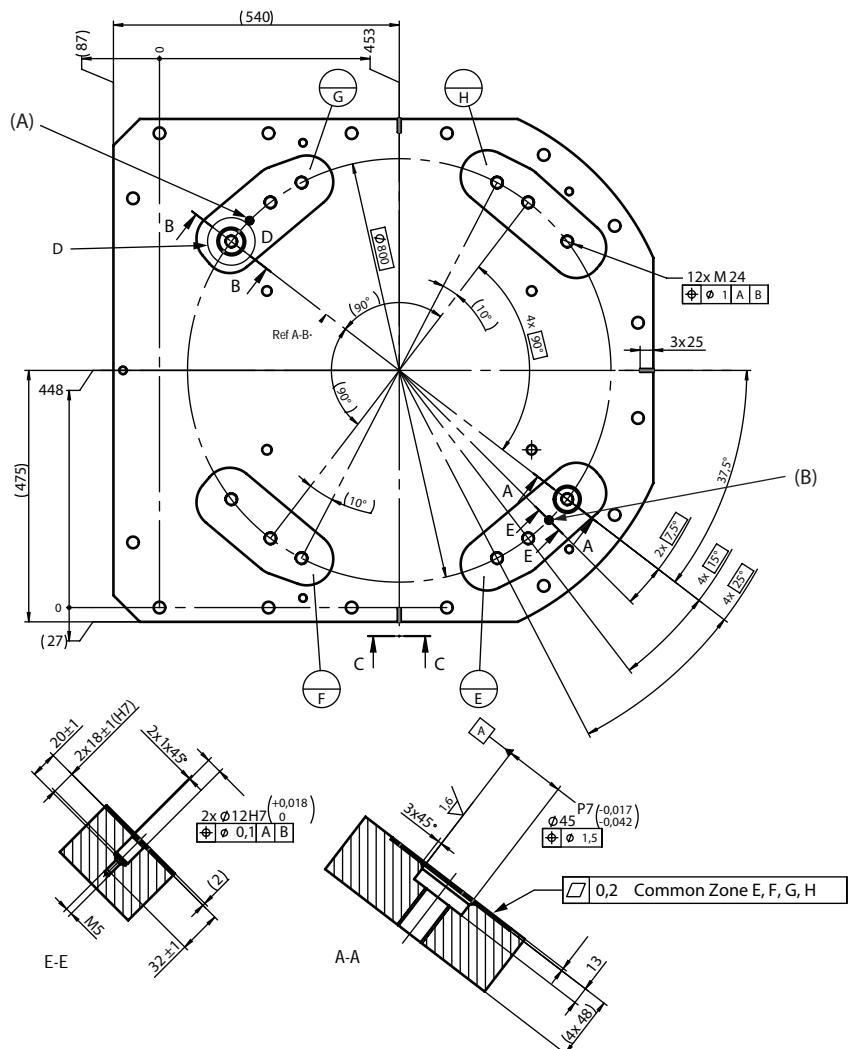
2 Installation and commissioning

2.4.2 Securing the base plate

2.4.2 Securing the base plate

Base plate drawing

The following figure shows the option base plate (dimensions in mm).



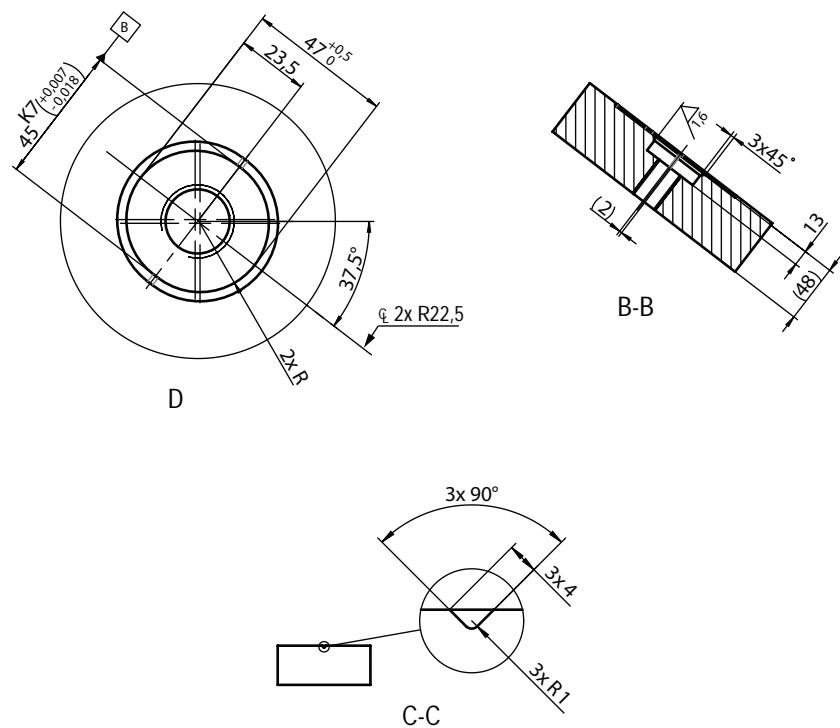
xx1500000246

Pos	Description
A, B	Hole for guide pin, cylindrical, see Guide pins on page 81
E, F, G, H	Common tolerance zone (accuracy all over the base plate from one contact surface to the other)

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2.4.2 Securing the base plate

Continued



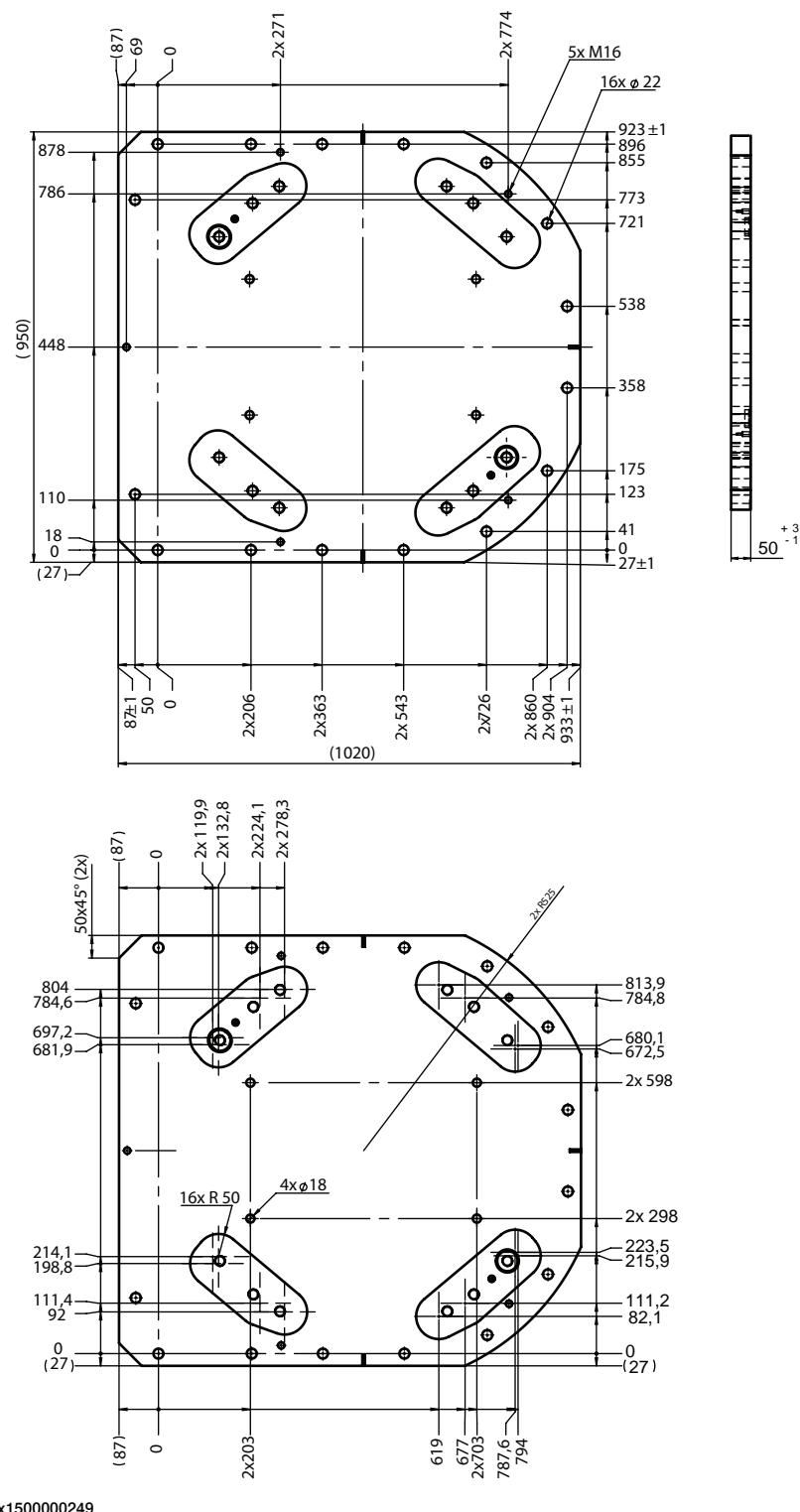
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2 Installation and commissioning

2.4.2 Securing the base plate

Continued

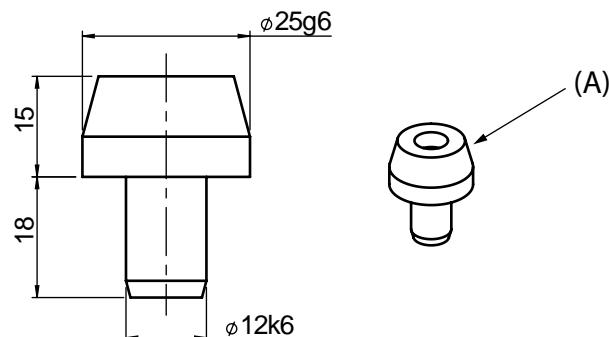


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A	Color: RAL 9005 Thickness: 80-100 µm Weight: 360 kg
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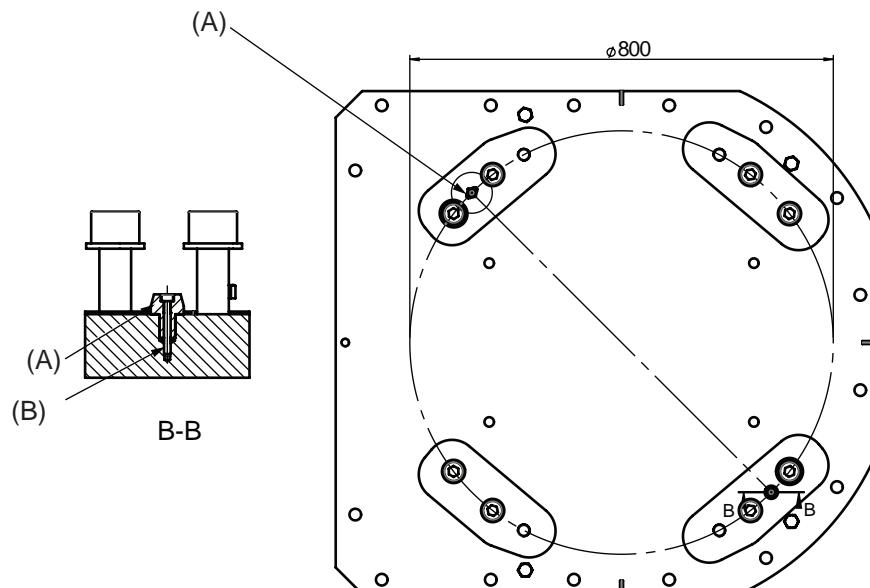
Guide pins



XX1500000248

Pos	Description
A	Cylindrical guide pin (x2)

Assembly of guide pins



Pos	Description
A	Cylindrical guide pin (x2)
B	M5 x 40. Tightening torque 6 Nm. (x2)



Note

All screws and pins are delivered in a plastic bag together with the base plate.

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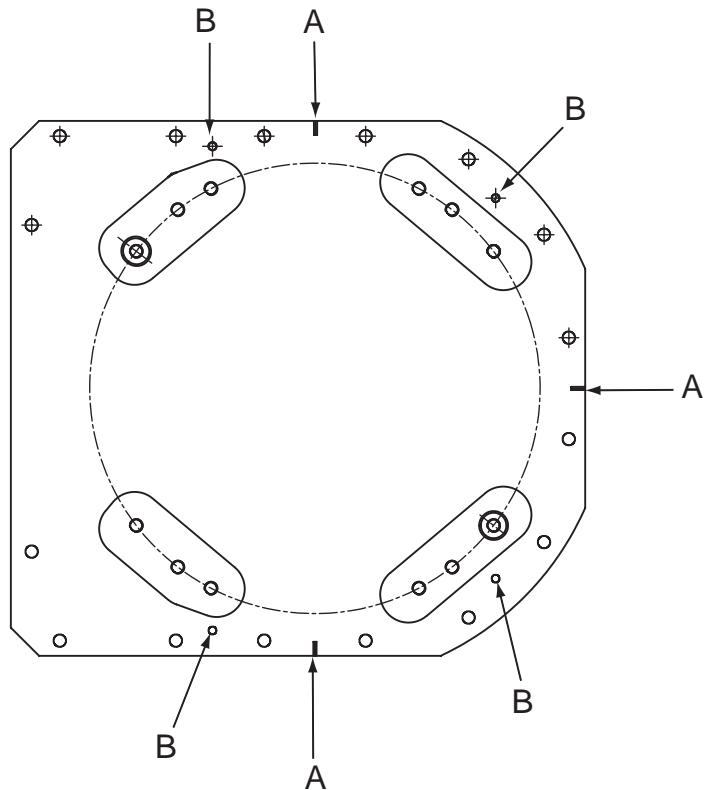
2 Installation and commissioning

2.4.2 Securing the base plate

Continued

Base plate, orienting grooves and leveling bolts

The illustration below shows the orienting grooves and attachment holes for leveling bolts in the base plate.



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A	Orienting grooves (3 pcs)
B	Levelling bolts, attachment holes (4 pcs)

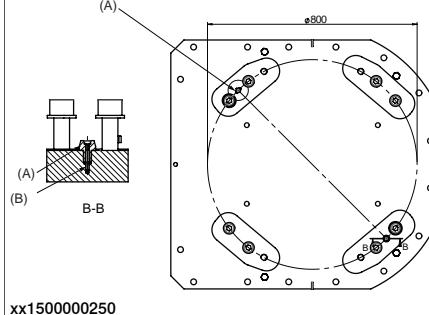
Required equipment

Equipment	Article number	Note
Base plate	3HAC051821-001	Includes <ul style="list-style-type: none">• guide pins• levelling screws, 9ADA120-79• attachment screws and washers for securing the robot to the base plate.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.		These procedures include references to the tools required.

Continues on next page

Base plate

This section details how to secure the base plate to the foundation.

	Action	Note
1	Make sure the foundation is levelled.	
2	 CAUTION The base plate weighs 353 kg! All lifting equipment used must be sized accordingly!	
3	Position base plate in relation to the robot work location using the grooves in the base plate.	Shown in figure Base plate, orienting grooves and leveling bolts on page 82 .
4	Lift the base plate to its mounting position.	Detailed in section Lifting the base plate on page 77 .
5	Use the base plate as a template and drill attachment holes as required by the selected bolt dimension.	Attachment holes: 16 pcs.
6	Fit the base plate and use the levelling bolts to level the base plate.	Shown in figure Base plate, orienting grooves and leveling bolts on page 82 .
7	If required, fit strips of sheet metal underneath the base plate to fill any gaps.	
8	Secure the base plate to the foundation with screws and sleeves.	
9	Recheck the four contact surfaces on the base plate to make sure the base plate is levelled and flat. If it is not, use pieces of sheet metal or similar to bring the base plate to a levelled position.	Maximum allowed deviation all over the base plate, from one contact surface to the other: 0.3 mm.
10	 Note All screws and pins are delivered in a plastic bag together with the base plate.	 A Cylindrical guide pin B M5 x 40. Tightening torque 6 Nm. (x2)

2 Installation and commissioning

2.4.3 Lifting the robot with fork lift

2.4.3 Lifting the robot with fork lift

Lifting methods

The robot may be lifted and transported using a fork lift, provided that available special aids are used. Also follow the recommendations given in [Robot transportation precautions on page 71](#).

This section specifies available special aids and references to valid user documentation for the lifting accessories.

Required tools and equipment

Equipment	Article number	Note
Fork lift accessory set	3HAC047054-003	Contains fork lift pockets and all required hardware for installation. User instructions are enclosed with the tool, see Directions for use - Fork lift accessory for IRB 6700.

Required documents

Document	Document number
Directions for use - Fork lift accessory for IRB 6700	3HAC048484-002

Lifting the robot

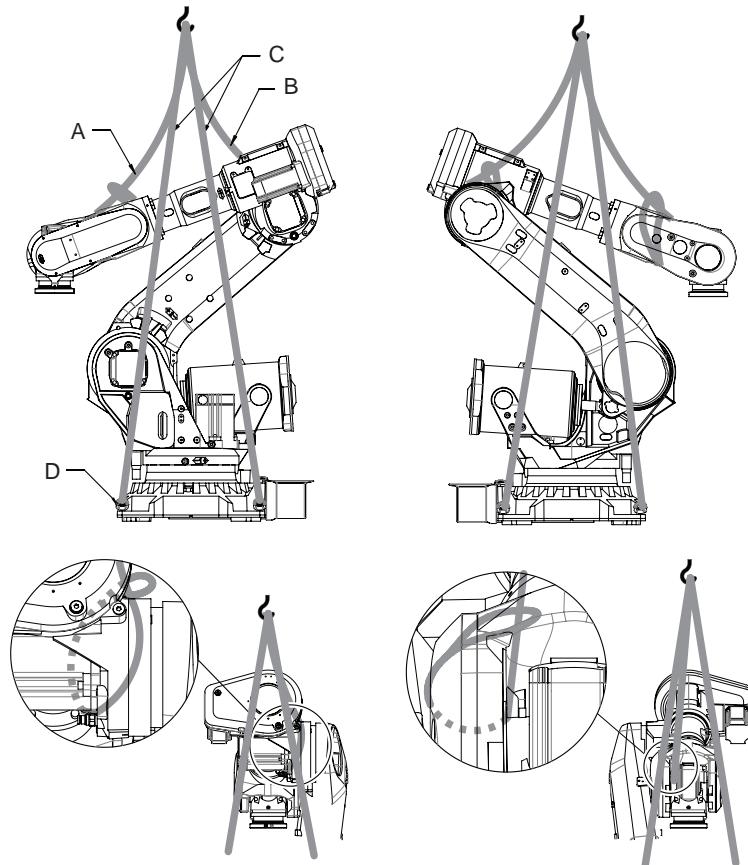
	Action	Note
1	Lift the robot according to the user instructions enclosed with the fork lift accessory.	

2.4.4 Lifting the robot with roundslings

Roundslings used for lifting and transporting

The robot can be lifted and transported using roundslings according to this section.

Attaching the roundslings



Variant	Length A (1 pc) Do not strain!	Length B (1 pc) Do not strain!
IRB 6700 - 235/2.65	Roundsling, 2 m	Roundsling, 2 m
IRB 6700 - 205/2.80	Roundsling, 2 m	Roundsling, 2 m
IRB 6700 - 175/3.05	Roundsling, 2.5 m	Roundsling, 2 m
IRB 6700 - 150/3.20	Roundsling, 2.5 m	Roundsling, 2 m
IRB 6700 - 200/2.60	Roundsling, 2 m	Roundsling, 2 m
IRB 6700 - 155/2.85	Roundsling, 2.5 m	Roundsling, 2 m
IRB 6700 - 300/2.70	Roundsling, 2 m	Roundsling, 2.5 m
IRB 6700 - 245/3.00	Roundsling, 2.5 m	Roundsling, 2.5 m

C	Roundsling, 2.5 m (4 pcs)
D	Lifting eye, M20 (4 pcs)

Continues on next page

2 Installation and commissioning

2.4.4 Lifting the robot with roundslings

Continued

Required equipment

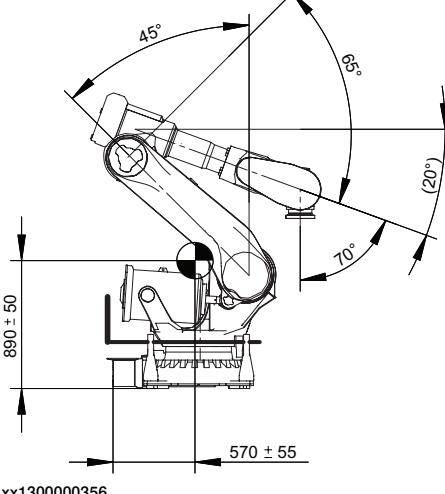
See quantity of roundslings in figure [Attaching the roundslings on page 85](#).

Equipment, etc.	Article number	Note
Overhead crane	-	
Lifting eye, M20	-	Working load limit: 2,000 kg.
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 2,000 kg.
Roundsling, 2.5 m	-	Length: 2.5 m. Lifting capacity: 2,000 kg.

Lifting the robot with roundslings

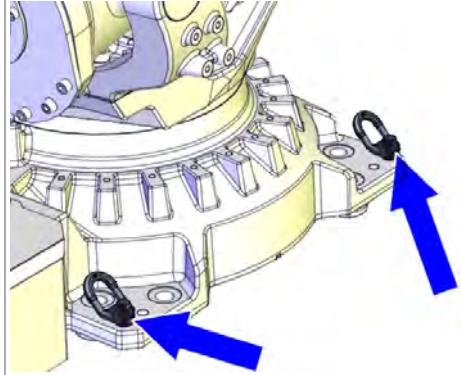
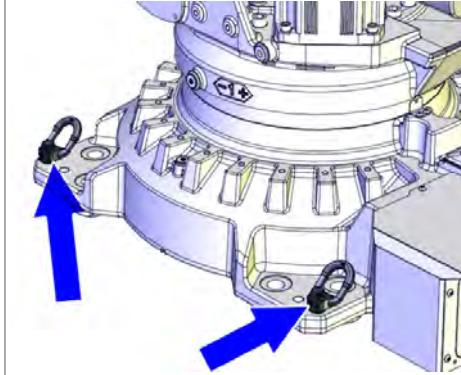
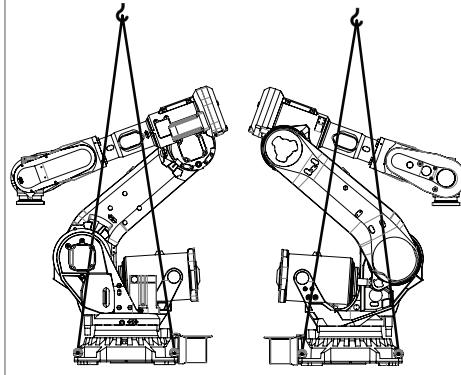
Use this procedure to lift the robot with roundslings.

Jogging the robot to lifting position

	Action	Note
1	<p>Jog the robot into position:</p> <ul style="list-style-type: none">• Axis 1: calibration position (0°)• Axis 2: -45°• Axis 3: $+65^\circ$• Axis 4: no significance• Axis 5: $+70^\circ$• Axis 6: no significance <p>WARNING</p> <p>The robot is likely to be mechanically unstable if not secured to the foundation.</p>	

Continues on next page

Lifting the robot with roundslings

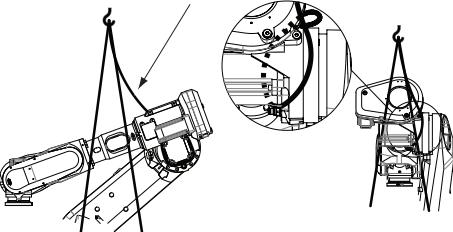
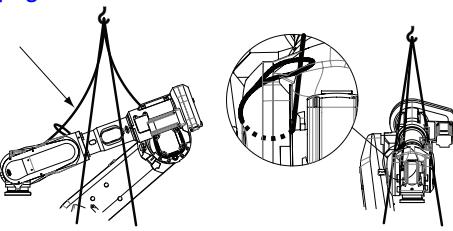
	Action	Note
1	Fit lifting eyes to the outer holes on each corner of the base.	 xx1200001301  xx1200001302
2	Run roundslings through the lifting eyes and fasten them in an overhead crane. CAUTION If the lifting eyes have sharp edges that might damage the roundslings, lifting shackles must be used to attach the roundslings to the lifting eyes.	Make sure the roundslings do not rub against any sharp edges. Roundsling, 2.5 m (4 pcs)  xx1300001572

Continues on next page

2 Installation and commissioning

2.4.4 Lifting the robot with roundslings

Continued

	Action	Note
3	<p>Attach a securing roundsling at the rear according to figure.</p> <p> Note</p> <p>The securing sling must not be strained at lifting. It only secures for tipping.</p>	<p>Length for the roundsling is given in the table Attaching the roundslings on page 85.</p>  <p>xx1300001573</p>
4	<p>Attach a securing roundsling at the front according to figure.</p> <p> Note</p> <p>The securing sling must not be strained at lifting. It only secures for tipping.</p>	<p>Length for the roundsling is given in the table Attaching the roundslings on page 85.</p>  <p>xx1300001574</p>
5	<p> CAUTION</p> <p>The IRB 6700 robot weighs 1300 kg. All lifting accessories used must be sized accordingly!</p>	
6	<p> WARNING</p> <p>Personnel must not, under any circumstances, be present under the suspended load!</p>	
7	<p>Raise the overhead crane to lift the robot.</p> <p> CAUTION</p> <p>Make sure that the roundsling running from the front, left corner is positioned on the correct side of the brake release unit plate when stretching the roundslings with the crane.</p>	

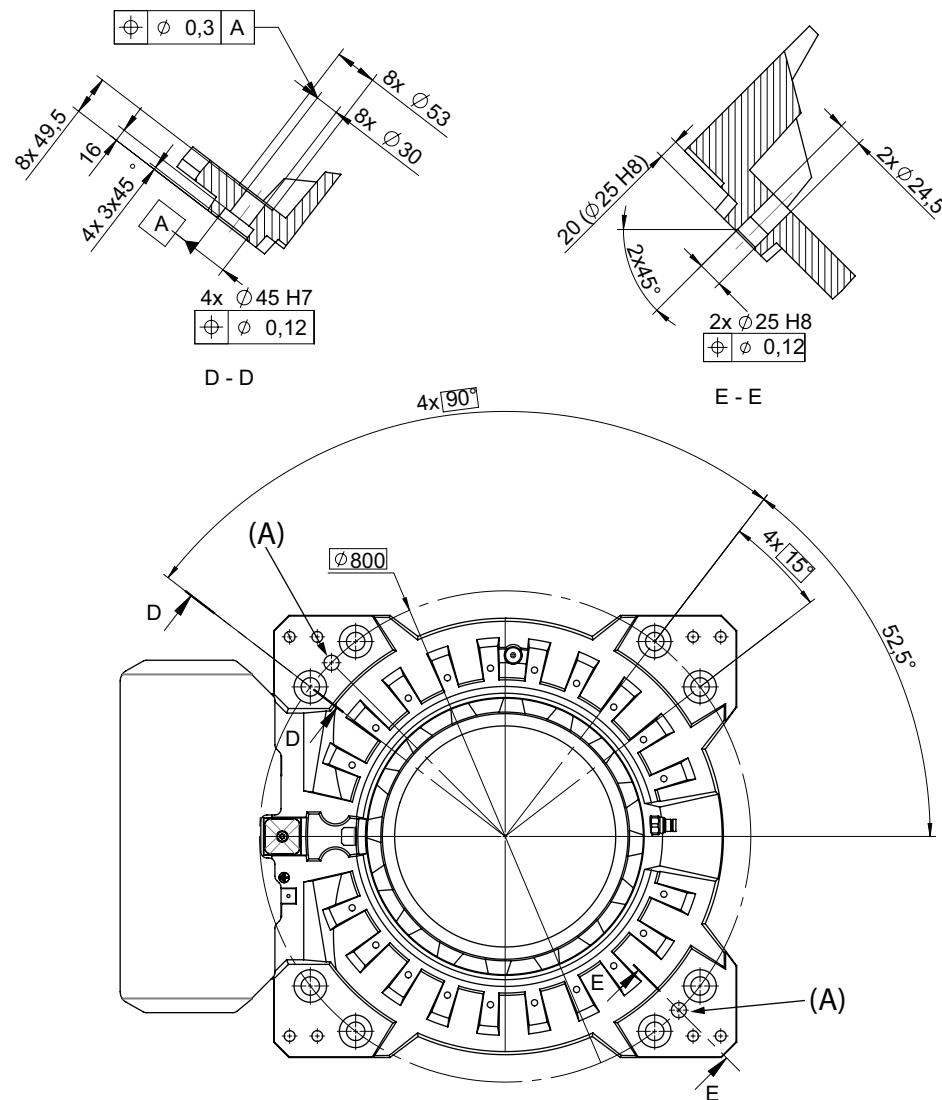
2.4.5 Orienting and securing the robot

General

This section details how to orient and secure the robot to the base plate in order to run the robot safely.

Hole configuration, base

The figure shows the hole configuration used when positioning and securing the robot.



xx1300000243

Pos	Description
A	Holes for guide pins (x2)

Continues on next page

2 Installation and commissioning

2.4.5 Orienting and securing the robot

Continued

Attachment screws

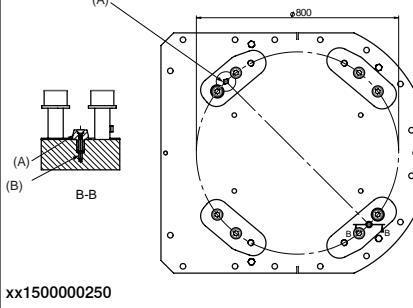
The table below specifies the type of securing screws and washers to be used for securing the robot to the base plate/foundation.

Suitable screws, lightly lubricated:	M24 x 100
Quantity:	8 pcs
Quality:	8.8
Screw tightening yield point utilization factor (v) (according to VDI2230):	90% (v=0.9)
Suitable washer:	4 mm flat washer
Tightening torque:	550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)

Securing the robot

Use this procedure to secure robot to base plate after fitting plate to the foundation.

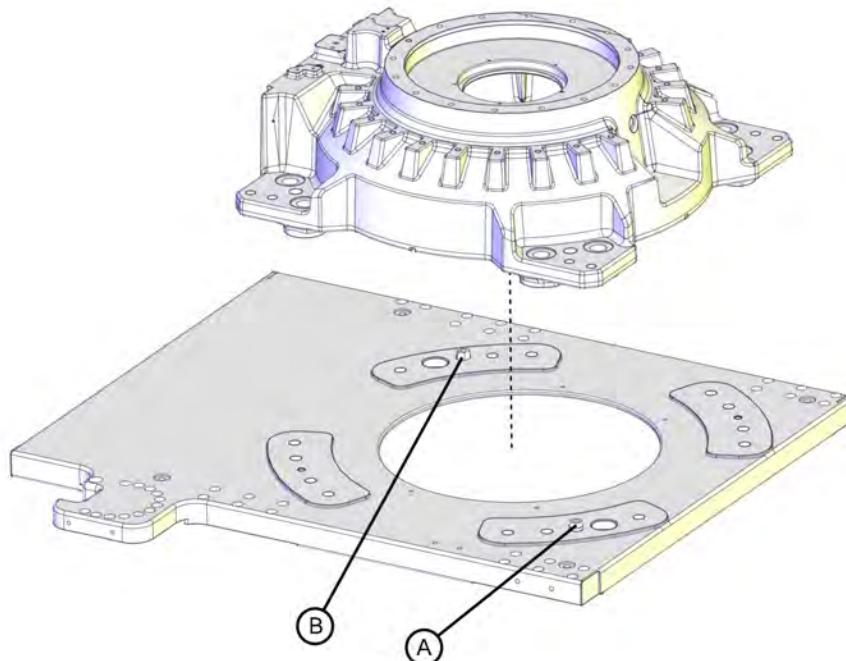
The same procedure is also used to secure the robot to a track motion carriage. See specific pictures for this in figure *Fitting manipulator to a track motion on page 91*.

Action	Note
1 Fit two guide pins to the guide pin holes in the base plate.  Note All screws and pins are delivered in a plastic bag together with the base plate.	 xx1500000250 A Cylindrical guide pin B M5 x 40. Tightening torque 6 Nm. (x2)
2 Lift the robot.	See <i>Lifting the robot with roundslings on page 85</i> .
3 Move robot close to its installation location.	
4 Guide the robot gently using two M24 screws while lowering it into its mounting position.	Make sure the robot base is correctly fitted onto the guide sleeves!
5 Fit the bolts and washers in the base attachment holes.	Specified in <i>Attachment screws on page 90</i> .  Note Lightly lubricate screws before assembly!
6 Tighten bolts in a crosswise pattern to ensure that the base is not distorted.	

Continues on next page

Fitting manipulator to a track motion

Fitting manipulator to a standard carriage



xx1500000319

Pos	Description
A	Cylindrical guide pin. Fitted to the right front of the base.
B	Flattened cylindrical guide pin. Note the position of the guide pin, must be aligned in the correct direction. Fitted to the left rear of the base.



Note

Cylindrical guide pin should be used in the right front of the base and the flattened cylindrical guide pin should be used in left rear of the base.

Continues on next page

2 Installation and commissioning

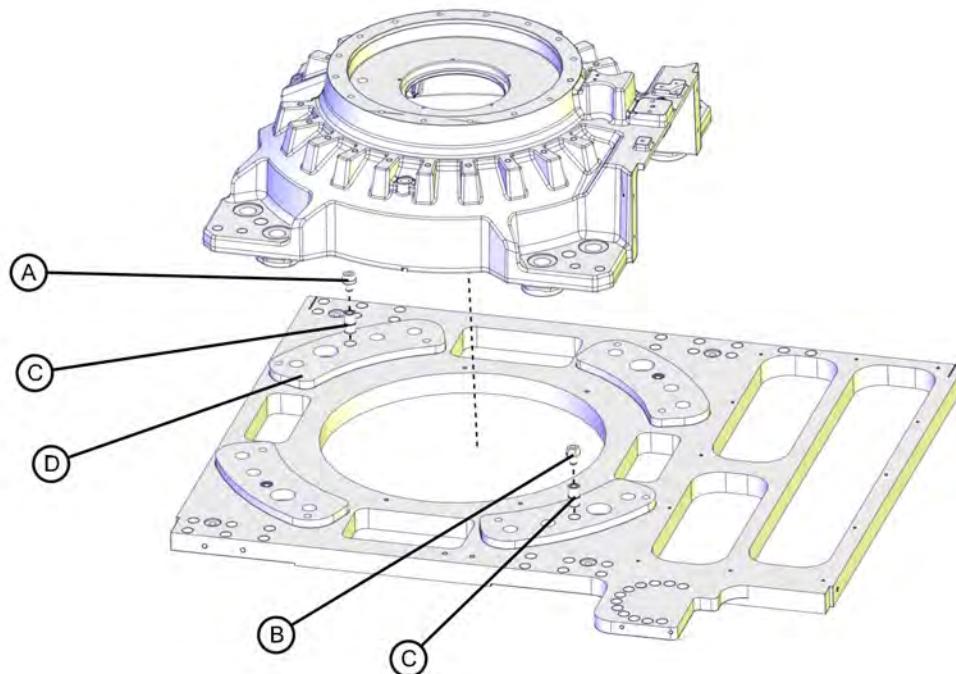
2.4.5 Orienting and securing the robot

Continued

Fitting manipulator to a carriage plate

The figure below shows the carriage plate that is used as a second added carriage for a double track or as a single carriage as mirrored, for track motions IRBT 6004/7004.

There are adapters fitted to the guide pin holes in each corner of the plate, to allow the robot to be installed in-line, turned 90° or 180°.



xx1500000320

Pos	Description
A	Cylindrical guide pin. Fitted to the right front of the base.
B	Flattened cylindrical guide pin. Note the position of the guide pin, must be aligned in the correct direction. Fitted to the left rear of the base.
C	Adapter for guide pin (fitted to the carriage at delivery)
D	Distance plate (fitted to the carriage at delivery)



Note

Cylindrical guide pin should be used in the right front of the base and the flattened cylindrical guide pin should be used in left rear of the base.

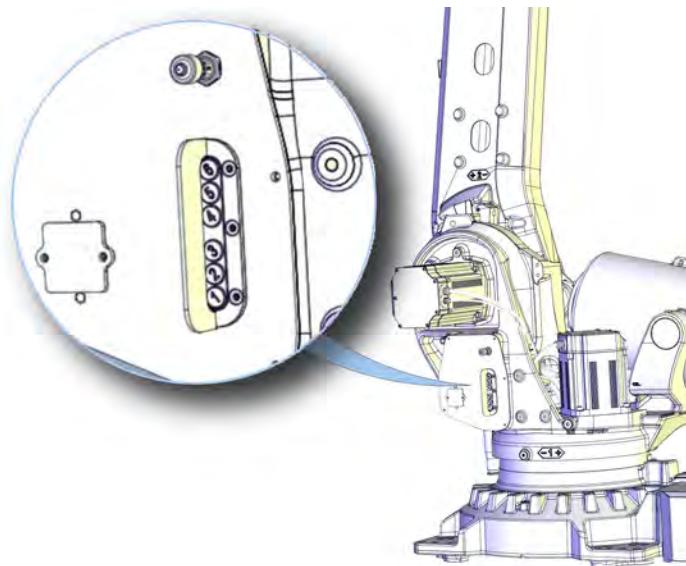
2.4.6 Manually releasing the brakes

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.



xx1200000964

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 buttons for controlling the axes brakes. The buttons are numbered according to the numbers of the axes.</p> <p>If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to the section Supplying power to connector R1.MP on page 94.</p>	<p>Buttons are shown in figure Location of brake release unit on page 93.</p>
2	<p> DANGER</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>	

Continues on next page

2 Installation and commissioning

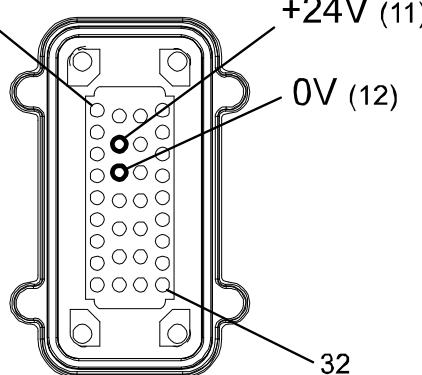
2.4.6 Manually releasing the brakes

Continued

Action	Note
3 Release the holding brake on a particular robot axis by pressing the corresponding button on the internal brake release unit. The brake will function again as soon as the button is released.	

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  DANGER Incorrect connections, such as supplying power to the wrong pin, may cause all brakes to be released simultaneously!	
2 Supply 0V on pin 12 and 24V on pin 11.	 xx0600002937

2.4.7 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 also be defined in the software as detailed in:

- *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 Installation and commissioning

2.4.8 Fitting equipment to the robot

General

Extra loads can be fitted on the upper arm housing, the lower arm, and on the frame. Definitions of distances and masses are shown in the following figures. The robot is supplied with holes for fitting extra equipment (see figure in [Holes for fitting extra equipment on page 99](#)). Maximum allowed arm load depends on center of gravity of arm load and robot payload.



Note

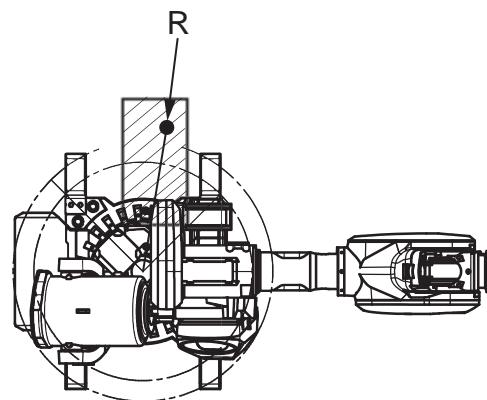
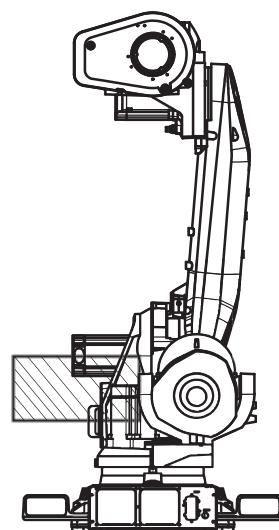
All equipment and cables used on the robot, must be designed and fitted not to damage the robot and/or its parts.

Frame (hip load)

Extra load can be fitted on the frame.

	Description
Permitted extra load on frame	$J_H = 100 \text{ kgm}^2$
Recommended position (see the following figure)	$J_H = J_{H0} + M_4 \times R^2$ where: <ul style="list-style-type: none">• J_{H0} is the moment of inertia of the equipment• R is the radius (m) from the center of axis 1• M_4 is the total mass (kg) of the equipment including bracket and harness ($\leq 250 \text{ kg}$)

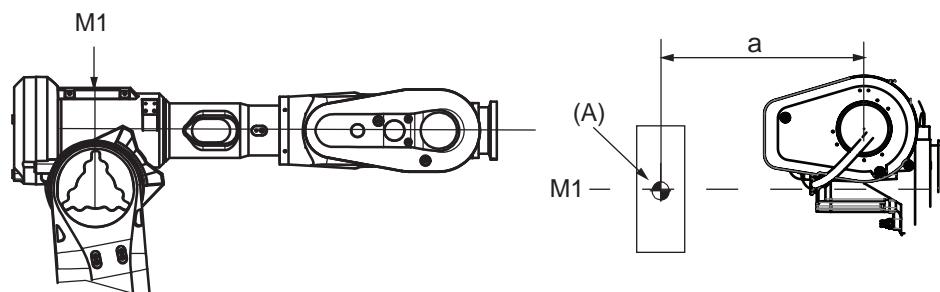
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xx1300000262

Upper arm

Allowed extra load on the upper arm housing, in addition to the maximum handling weight, is $M1 \leq 50$ kg with a distance $(a) \leq 500$ mm from the center of gravity in the axis-3 extension.



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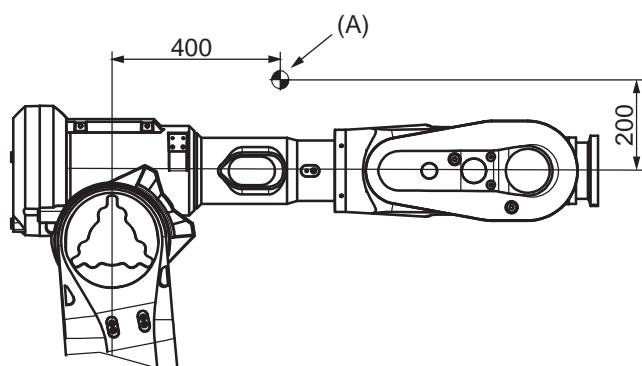
A	Mass center
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2 Installation and commissioning

2.4.8 Fitting equipment to the robot

Continued



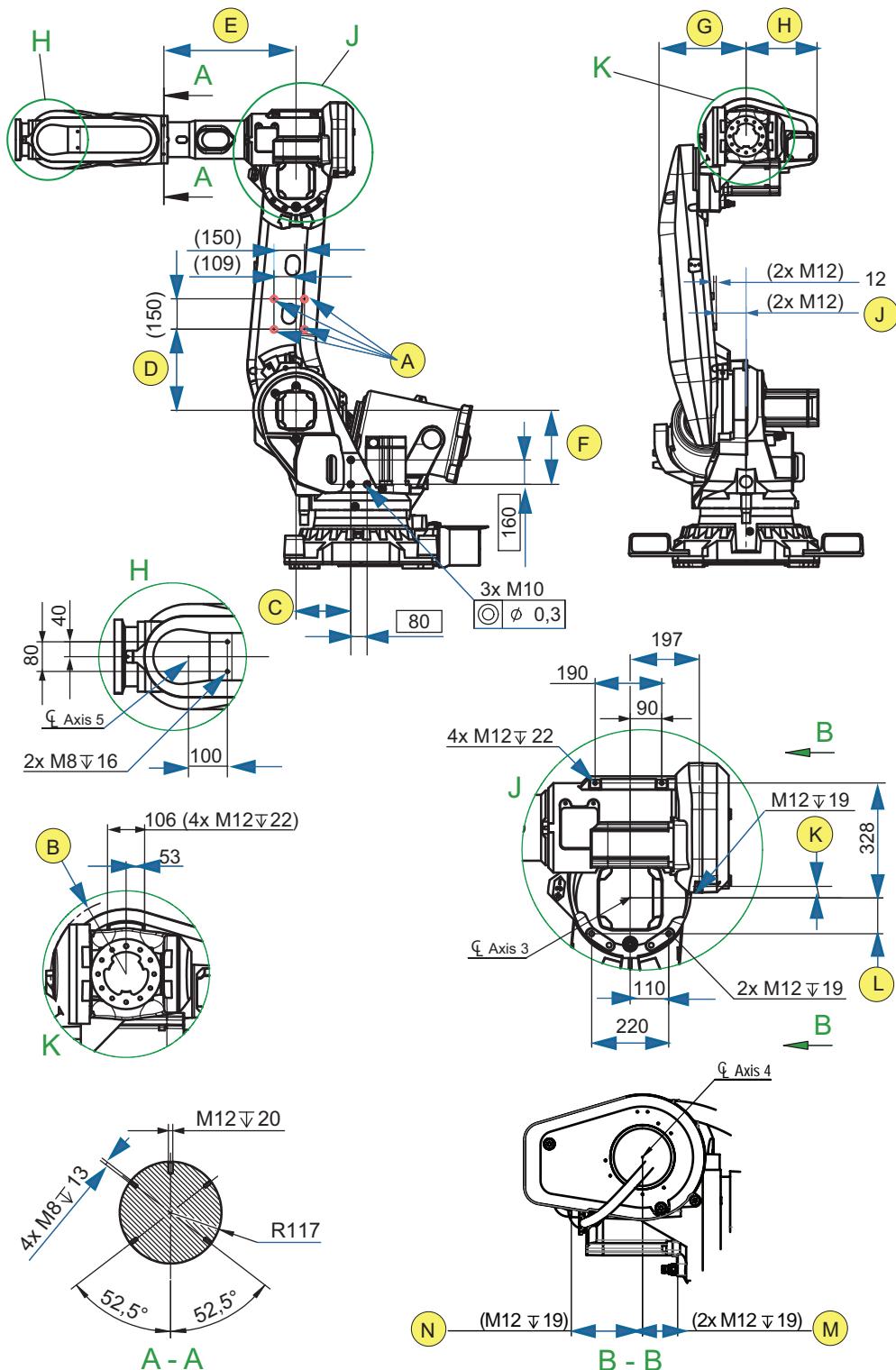
xx1300000866

A	Center of gravity 50 kg
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Holes for fitting extra equipment

Position of attachment holes - drawing 1



xx1300000263

A

Allowed position for attachment holes, M12 through. Be careful not to touch the cables when drilling.

Continues on next page

2 Installation and commissioning

2.4.8 Fitting equipment to the robot

Continued

Variant	B ⁱ	C	D	E	F	G	H	J	K	L	M	N
IRB 6700 - 235/2.65	R=216	270	400	652.5	365	437	349	147	33	102	104	210
IRB 6700 - 205/2.80	R=216	270	500	652.5	365	437	349	147	33	102	104	210
IRB 6700 - 175/3.05	R=216	270	400	652.5	365	437	349	147	33	102	104	210
IRB 6700 - 150/3.20	R=216	270	500	652.5	365	437	349	147	33	102	104	210
IRB 6700 - 200/2.60	R=204.5	270	400	650.5	365	437	315	143	43	102	95	210
IRB 6700 - 155/2.85	R=204.5	270	400	650.5	365	437	315	143	43	102	95	210
IRB 6700 - 300/2.70	R=230	310	450	652.5	376	467	405	152	12	117	98.5	215.5
IRB 6700 - 245/3.00	R=230	310	450	652.5	376	467	405	152	12	117	98.5	215.5

ⁱ Smallest circumscribed radius axis-4.

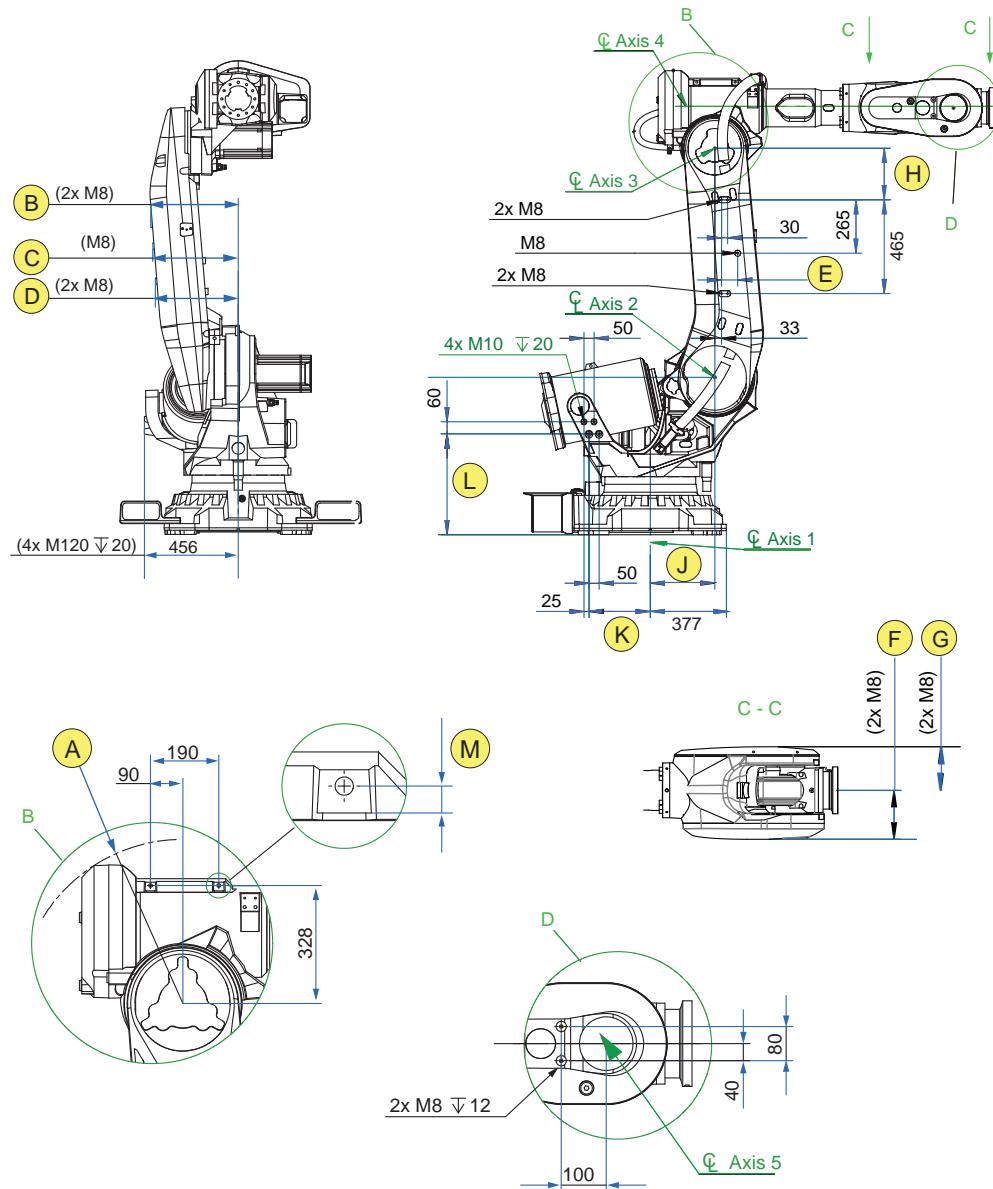
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2 Installation and commissioning

2.4.8 Fitting equipment to the robot

Continued

Position of attachment holes - drawing 2



xx1300000264

Variant	A ⁱ	B	C	D	E	F	G	H	J	K	L	M
IRB 6700 - 235/2.65	R=456	433	418	403	80	208.5	186	255	320	303.5	500	13.8
IRB 6700 - 205/2.80	R=456	438	423	408	80	208.5	186	255	320	303.5	500	13.8
IRB 6700 - 175/3.05	R=456	433	418	403	80	208.5	186	255	320	303.5	500	13.8
IRB 6700 - 150/3.20	R=456	438	423	408	80	208.5	186	255	320	303.5	500	13.8
IRB 6700 - 200/2.60	R=440	425	410	395	113	197	193	255	320	303.5	500	13.8
IRB 6700 - 155/2.85	R=440	425	410	395	113	197	193	255	320	303.5	500	13.8
IRB 6700 - 245/3.00	R=468	453	438	423	80	222.5	187	265	350	273.5	523.5	15
IRB 6700 - 300/2.70	R=468	453	438	423	80	222.5	187	265	350	273.5	523.5	15

ⁱ Smallest circumscribed radius axis-3.

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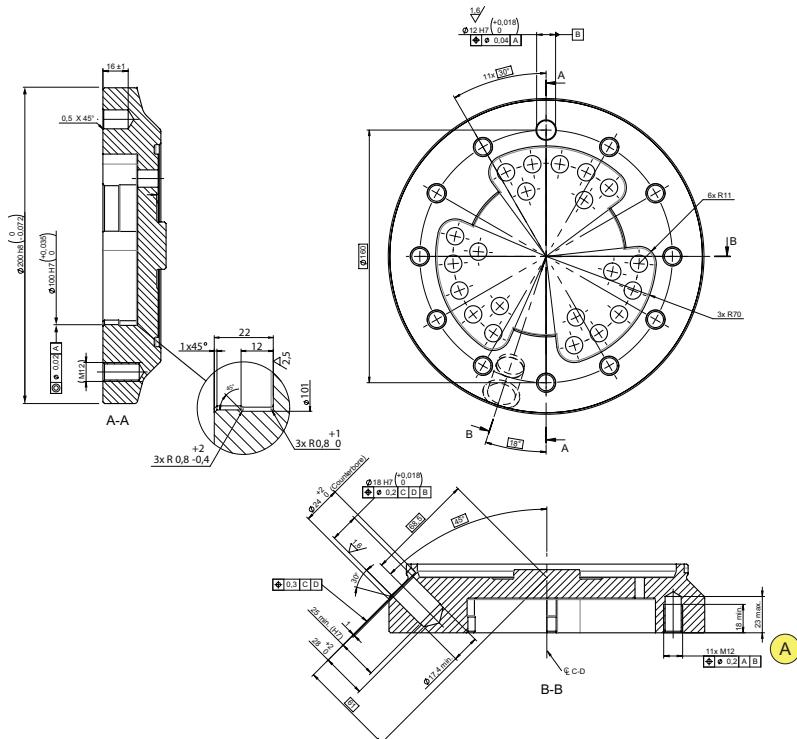
2 Installation and commissioning

2.4.8 Fitting equipment to the robot

Continued

Tool flange, standard

Below is the standard tool flange. The guide pin hole is, in calibration position, pointing upwards in Z-direction.



xx1300000280

A	Thread length: 18 mm.
---	-----------------------

The turning disc for robot variants IRB 6700 - 200/2.60 and IRB 6700 - 155/2.85 was redesigned when Axis Calibration was introduced for IRB 6700. Prior to Axis Calibration the holes on the disc were through. On the current turning disc the holes are not through.

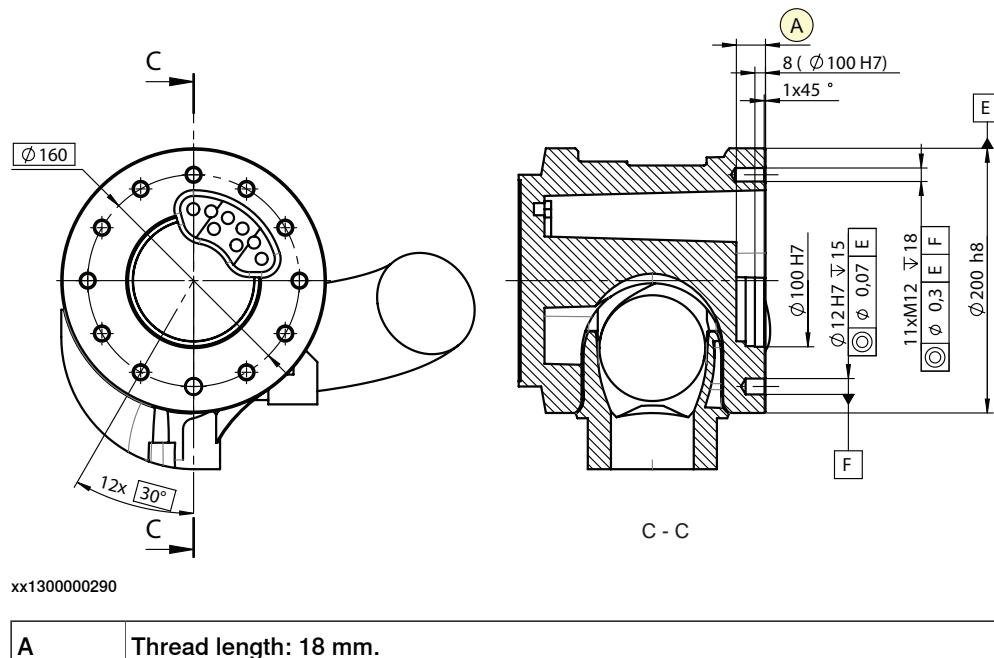
Fastener quality

Use suitable screws and tightening torque for your application, screws with quality class 12.9 are recommended.

Continues on next page

Tool flange, LeanID

Below is the tool flange for option 780-4, LeanID. The guide pin hole is, in calibration position, pointing upwards in Z-direction.



Fastener quality

Use suitable screws and tightening torque for your application, screws with quality class 12.9 are recommended.

2 Installation and commissioning

2.5.1 Axes with restricted working range

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.
- Axis 2, software.
- Axis 3, 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.

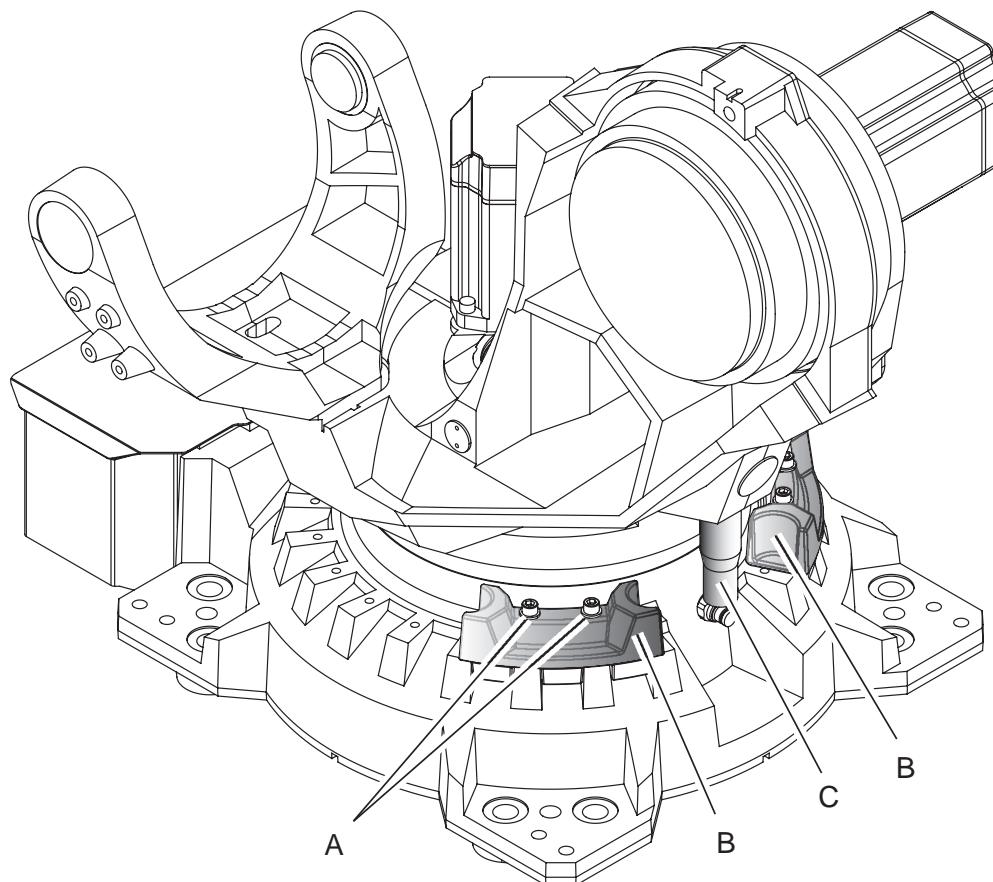
2.5.2 Mechanically restricting the working range of axis 1

General

The working range of axis 1 is limited by fixed mechanical stops and adjustment of the system parameter configuration. The working range can be reduced by adding additional mechanical stops giving 15° graduation, between ±5° and ±125° in both directions.

Mechanical stops, axis 1

The illustration shows the mounting position of the stop pin and one of the additional mechanical stops available for axis 1.



xx1300001971

A	Attachment screws M12x70 quality 12.9 Gleitmo 603 (2 pcs per additional mechanical stop)
B	Movable mechanical stop
C	Mechanical stop pin axis-1

Continues on next page

2 Installation and commissioning

2.5.2 Mechanically restricting the working range of axis 1

Continued

Required equipment

Equipment, etc.	Article number	Note
Movable mechanical stop set, axis 1 (15°).	3HAC055744-001	IRB6700 235/2.65, 205/2.80, 175/3.05, 150/3.20, 200/2.60, 155/2.85 Includes attachment screws and an assembly drawing.
Movable mechanical stop set, axis 1 (15°).	3HAC048533-003	IRB6700 300/2.70, 245/3.00 Includes attachment screws and an assembly drawing.
Standard toolkit	-	
<i>Technical reference manual - System parameters</i>	-	Article number is specified in section References on page 10 .

Installation, mechanical stops axis 1

Use this procedure to fit the additional mechanical stops to axis 1 of the robot. An assembly drawing is also enclosed with the product.

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply to the robot• hydraulic pressure supply to the robot• air pressure supply to the robot Before entering the robot working area.	
2	Fit the additional mechanical stop to the frame according to the figure Mechanical stops, axis 1 on page 105 .	Tightening torque: 60 Nm,
3	Adjust the software working range limitations (system parameter configuration) to correspond to the mechanical limitations.	The system parameters that must be changed (<i>Upper joint bound</i> and <i>Lower joint bound</i>) are described in <i>Technical reference manual - System parameters</i> .
4	 WARNING If the mechanical stop pin is deformed after a hard collision, it must be replaced! Deformed <i>movable stops</i> and/or <i>additional stops</i> as well as deformed <i>attachment screws</i> must also be replaced after a hard collision.	

2.6 Electrical connections

2.6.1 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 serial measurement board.
Customer cables (option)	Handles communication with equipment fitted on the robot by the customer, low voltage signals and high voltage power supply + protective ground. The customer cables also handle databus communication. See the product manual for the controller, see document number in References on page 10 .

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 resolver data from and power supply to the serial measurement board.	XS2	R1.SMB

Robot cable, power

Power cable length	Article number
7 m	3HAC026787-001
15 m	3HAC026787-002
22 m	3HAC026787-003
30 m	3HAC026787-004

Robot cable, signals

Signal cable length	Article number
7 m	3HAC2493-1
15 m	3HAC2530-1
22 m	3HAC2540-1
30 m	3HAC2566-1

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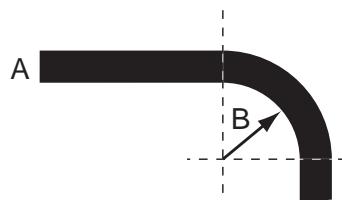
2 Installation and commissioning

2.6.1 Robot cabling and connection points

Continued

Bending radius for static floor cables

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

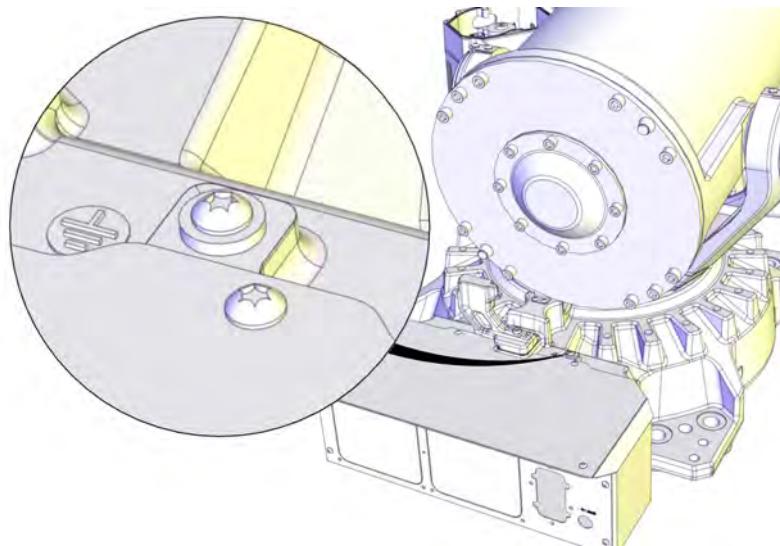


xx1600002016

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.



xx1500001600

2.7 Installation of options

2.7.1 Installing the signal lamp (option)

Signal lamp

See the assembly instruction delivered with the signal lamp.

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3 Maintenance

3.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 6700 .

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 17](#) before performing any service work!



Note

If the IRB 6700 is connected to power, always make sure that the IRB 6700 is connected to protective earth before starting any maintenance work!

For more information see:

- *Product manual - IRC5*

3 Maintenance

3.2.1 Specification of maintenance intervals

3.2 Maintenance schedule and expected component life

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 6700 :

- 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.

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. Values for these are specified in the section [Expected component life on page 115](#)

Activities and intervals, standard equipment

The table below specifies the required maintenance activities and intervals:

Maintenance activities	Regularly	Every 12 months	Every 36 months	Every 12,000 hours ⁱ	Every 20,000 hours ⁱ	Every 40,000 hours ⁱ	Reference
Cleaning activities							
Cleaning the robot	x						Cleaning the IRB 6700 on page 192
Inspection activities							
Inspecting the motor seal ⁱⁱ		x					Inspecting the motor seal on page 116
Inspecting the oil level in gearboxes							Inspect the oil level in the actual gearbox if there is a suspected leakage, after an oil change or a maintenance or repair activity where draining and filling oil is required.
Inspecting the balancing device		x					Inspecting the balancing device on page 136
Inspecting the robot harness		x ⁱⁱⁱ					Inspecting the cable harness on page 140
Inspecting the information labels		x					Inspecting the information labels on page 142
Inspecting the transportation lock screw	x						
Inspecting the dampers		x					Inspecting the axis-1 mechanical stop pin on page 146
Inspecting the mechanical stop		x					Inspecting the dampers on page 152
Replacement/changing activities							

Continues on next page

3 Maintenance

3.2.2 Maintenance schedule

Continued

Maintenance activities	Regularly	Every 12 months	Every 36 months	Every 12,000 hours ⁱ	Every 20,000 hours ⁱⁱ	Every 40,000 hours ⁱ	Reference
Changing the oil in axis-1 gearbox				x			Changing oil, axis-1 gearbox on page 158
Changing the oil in axis-2 gearbox				x			Changing oil, axis-2 gearbox on page 164
Changing the oil in axis-3 gearbox				x			Changing oil, axis-3 gearbox on page 169
Changing the oil in axis-4 gearbox				x			Changing oil, axis-4 gearbox on page 175
Changing the oil in axis-5 gearbox				x			Changing oil, axis-5 gearbox on page 179
Changing the oil in axis-6 gearbox				x			Changing oil, axis-6 gearbox on page 183
Replacing the SMB battery pack		x ^{iv}					Replacing the SMB battery pack on page 187
Lubrication activities							
Lubricating the balancing device bearings				x ^v			Lubricating the spherical roller bearing, balancing device on page 190
Overhaul							
Overhaul of complete robot						x	

ⁱ Operating hours counted by the DTC = Duty time counter.

ⁱⁱ Only valid for robots that are equipped with Type B motors.

Type B motors include evacuation on the motor flange to indicate failure of primary sealing between the gearbox and the motor. Robots with protection type Foundry Plus have a sight glass installed in the evacuation holes.

See [Type A vs type B motors on page 795](#).

ⁱⁱⁱ Replace when damage or cracks is detected or life limit is approaching that specified in section [Expected component life on page 115](#).

^{iv} The battery is to be replaced at given maintenance interval or at battery low alert.

^v Always lubricate the front eye bearing after refitting the shaft of the balancing device.

3.2.3 Expected component life

General

The expected life of a specific component of the robot can vary greatly depending on how hard it is run.

Expected component life - protection type Standard

Component	Expected life	Note
Cable harness Normal usage ⁱ	40,000 hours ⁱⁱ	Not including: • Possible SpotPack harnesses • Optional upper arm harnesses
Cable harness Extreme usage ⁱⁱⁱ	20,000 hours ⁱⁱ	Not including: • Possible SpotPack harnesses • Optional upper arm harnesses
Balancing device	40,000 hours ^{iv}	
Gearboxes ^v	40,000 hours	

ⁱ Examples of "normal usage" in regard to movement: most material handling applications.

ⁱⁱ Severe chemical or thermal environments, or similar environments, can result in shortened life expectancy.

ⁱⁱⁱ Examples of "extreme usage" in regard to movement: press tending, very severe palletizing applications, major use of axis 1 movement.

^{iv} The given life for the balancing device is based on a test cycle of 4,000,000 cycles that starts from the initial position and goes to maximum extension, and back. Deviations from this cycle will result in differences in expected life!

^v The SIS for an IRC5 system is described in the *Operating manual - Service Information System*.

3 Maintenance

3.3.1 Inspecting the motor seal

3.3 Inspection activities

3.3.1 Inspecting the motor seal

Purpose of evacuation holes

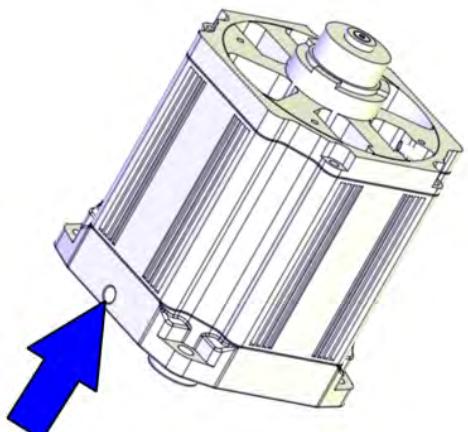
This section is only valid for robots that are equipped with Type B motors.

The motors include evacuation on the motor flange to indicate failure of primary sealing between the gearbox and the motor. Robots with protection type Foundry Plus have a sight glass installed in the evacuation holes. Robots with protection type Standard have a protection filter installed in the evacuation hole.

See [Type A vs type B motors on page 795](#).

Location of evacuation holes/sight glasses on motor

The evacuation hole/sight glass is located on each motor flange. The figure shows axis-1 motor as an example.



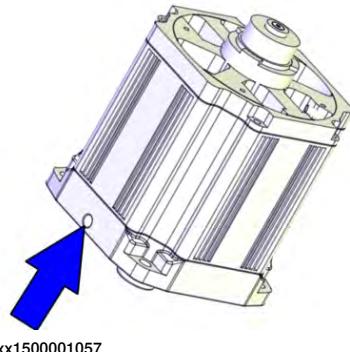
xx1500001057

Inspecting the evacuation hole/sight glass

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

Continues on next page

3.3.1 Inspecting the motor seal
Continued

Action	Note
<p>2</p> <p> WARNING</p> <p>Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</p>	
<p>3</p> <p>Do a leakage check of the sight glass/evacuation hole of each motor. If any oil is available on the sight glass or if any oil has been spilled out from the evacuation hole, replacement of the motor is recommended.</p>	 <p>xx1500001057</p> <p>Replacing of motors is described in the repair chapter Motors on page 492.</p>

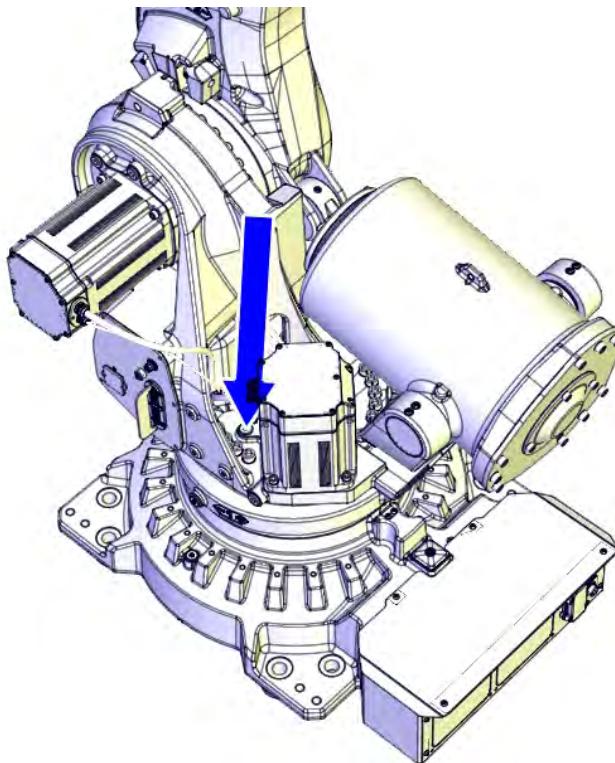
3 Maintenance

3.3.2 Inspecting the oil level in axis-1 gearbox

3.3.2 Inspecting the oil level in axis-1 gearbox

Location of oil plug

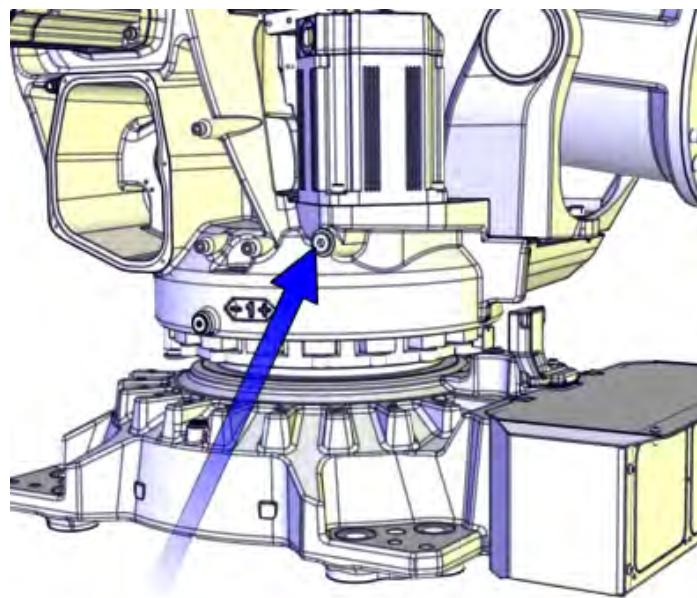
The oil plug through which the oil level is inspected is located as shown in the figure.



xx1200000950

IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20,
IRB 6700 - 200/2.60, IRB 6700 - 155/2.85

Continues on next page



xx1500001655

IRB 6700 - 300/2.70, IRB 6700 - 245/3.00

A	Oil plug Tightening torque: 24 Nm	
B	Venting hole	

Required tools

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Required consumables

Consumables	Article number	Note
Lubricating oil	-	Information about the oil is found in Technical reference manual - Lubrication in gearboxes .

Required documents

Document name	Document number
Technical reference manual - Lubrication in gearboxes	3HAC042927-001

Continues on next page

3 Maintenance

3.3.2 Inspecting the oil level in axis-1 gearbox

Continued

Inspecting the oil level in axis-1 gearbox

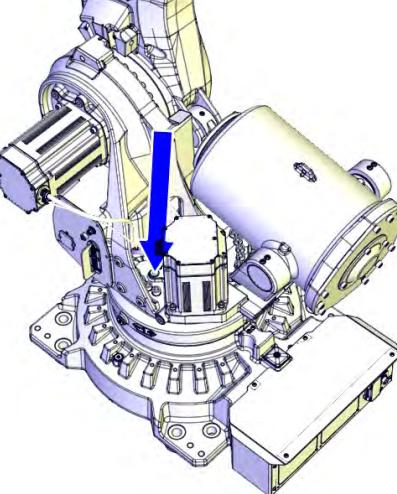
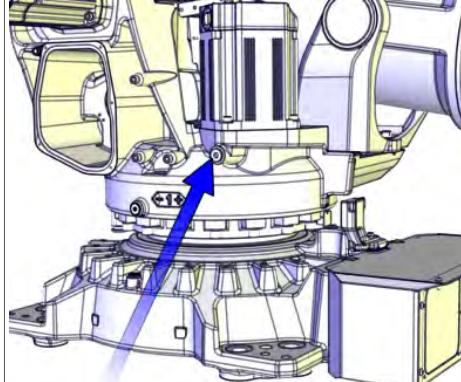
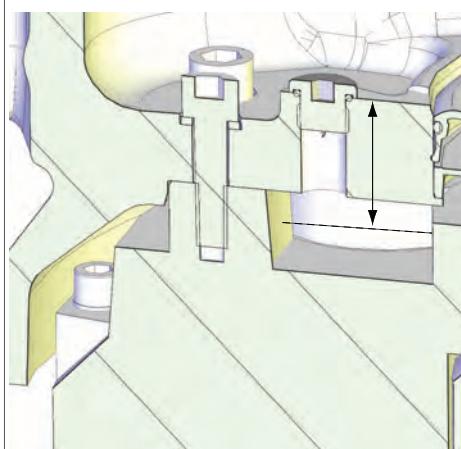
Use this procedure to inspect the oil level in the gearbox.

Action	Note
<p>1</p> <p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply <p>to the robot, before entering the robot working area.</p>	
<p>2</p> <p> WARNING</p> <p>Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i></p>	
<p>3</p> <p>Make sure that the oil temperature is +25°C ± 10°C.</p>	

Continues on next page

3.3.2 Inspecting the oil level in axis-1 gearbox

Continued

Action	Note
4 Open the oil plug.	 <p>xx1200000950</p> <p>IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20, IRB 6700 - 200/2.60, IRB 6700 - 155/2.85</p>  <p>xx1500001655</p> <p>IRB 6700 - 300/2.70, IRB 6700 - 245/3.00</p>
5 IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20, IRB 6700 - 200/2.60, IRB 6700 - 155/2.85 Check the oil level. Required oil level is: 58 mm ± 5 mm below the sealing surface of the oil plug.	 <p>xx1300000692</p>

Continues on next page

3 Maintenance

3.3.2 Inspecting the oil level in axis-1 gearbox

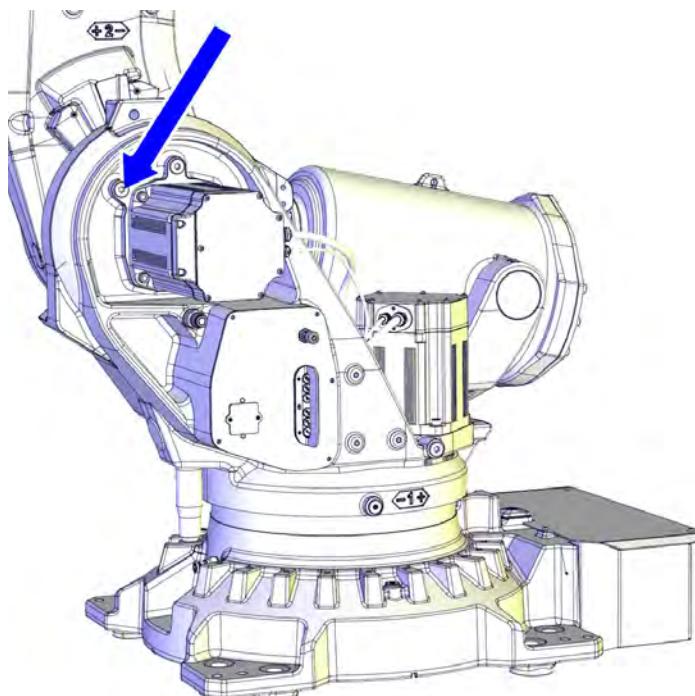
Continued

Action	Note
6 IRB 6700 - 300/2.70, IRB 6700 - 245/3.00 Check the oil level. Required oil level is: 0 - 10 mm below the oil plug hole.	
7 Add or drain oil, if required.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> . Further information about how to drain or fill with oil is found in section Changing oil, axis-1 gearbox on page 158 .
8 Refit the oil plug.	Tightening torque: 24 Nm.
9  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3.3.3 Inspecting the oil level in axis-2 gearbox

Location of oil plug

The gearbox has a level plug that is located as shown in the figure.



xx1200000952

Tightening torque: 24 Nm

Required tools

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Required consumables

Consumables	Article number	Note
Lubricating oil	-	Information about the oil is found in Technical reference manual - Lubrication in gearboxes .

Required documents

Document name	Document number
Technical reference manual - Lubrication in gearboxes	3HAC042927-001

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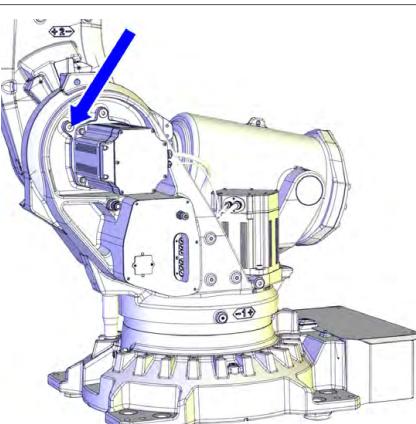
3 Maintenance

3.3.3 Inspecting the oil level in axis-2 gearbox

Continued

Inspecting the oil level in axis-2 gearbox

Use this procedure to inspect the oil level in the gearbox.

Action	Note
1  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54 .	
3 Make sure that the oil temperature is +25°C ± 10°C.	
4 Open the oil plug.	 xx1200000952
5 Check the oil level. Required oil level is: 0-15 mm below the oil plug hole.	
6 Add or drain oil, if required.	Type of oil and total amount is detailed in Technical reference manual - Lubrication in gearboxes . Further information about how to drain or fill with oil is found in section Changing oil, axis-2 gearbox on page 164 .
7 Refit the oil plug.	Tightening torque: 24 Nm.

Continues on next page

3.3.3 Inspecting the oil level in axis-2 gearbox

Continued

	Action	Note
8	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section <i>DANGER - First test run may cause injury or damage!</i> on page 48.	

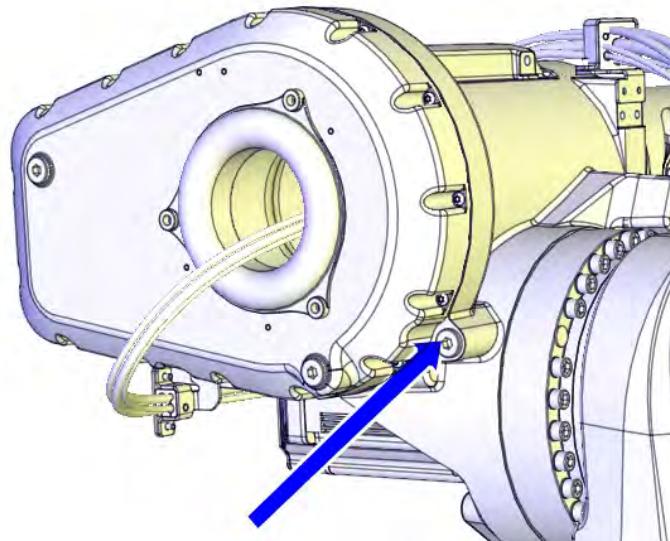
3 Maintenance

3.3.4 Inspecting the oil level in axis-3 gearbox

3.3.4 Inspecting the oil level in axis-3 gearbox

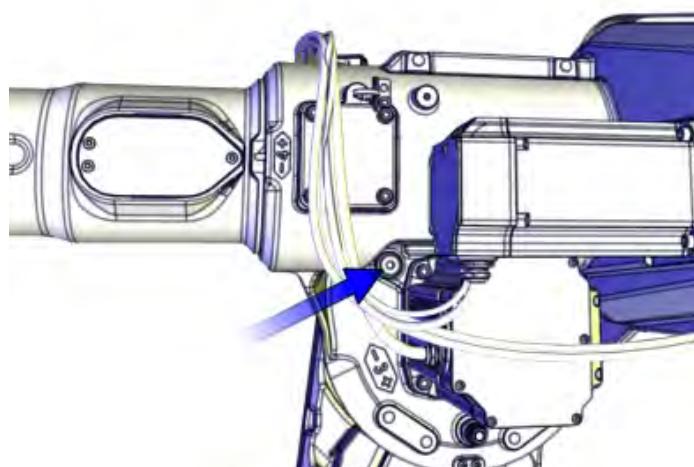
Location of oil plug

The gearbox has a level plug that is located as shown in the figure.



xx1200000955

IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20,
IRB 6700 - 200/2.60, IRB 6700 - 155/2.85



xx1500001645

IRB 6700 - 300/2.70, IRB 6700 - 245/3.00

Tightening torque: 24 Nm

Required tools

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Continues on next page

Required consumables

Consumables	Article number	Note
Lubricating oil	-	Information about the oil is found in <i>Technical reference manual - Lubrication in gearboxes</i> .

Required documents

Document name	Document number
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001

Inspecting the oil level in axis-3 gearbox

Use this procedure to inspect the oil level in the gearbox.

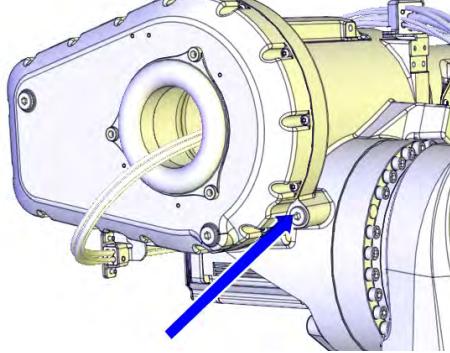
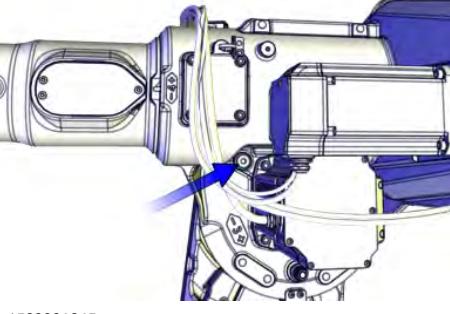
	Action	Note
1	Run the robot to calibration position.	
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	Make sure that the oil temperature is +25°C ± 10°C.	
4	 WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i>	

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3 Maintenance

3.3.4 Inspecting the oil level in axis-3 gearbox

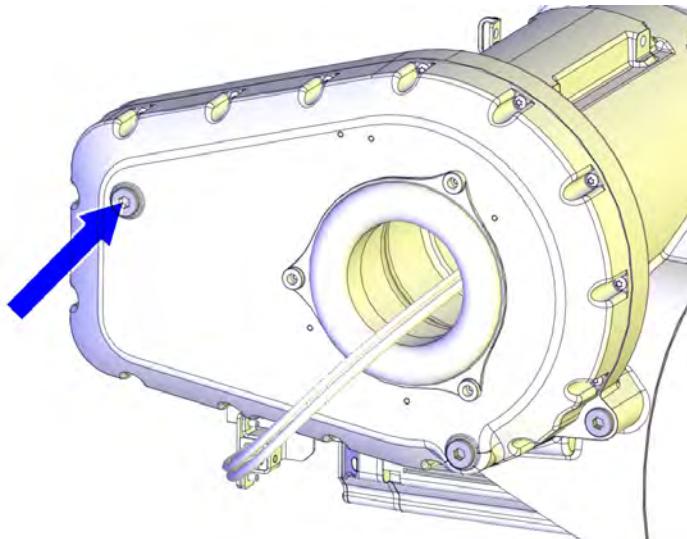
Continued

Action	Note
5 Open the oil plug.	 xx1200000955 IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20, IRB 6700 - 200/2.60, IRB 6700 - 155/2.85  xx1500001645 IRB 6700 - 300/2.70, IRB 6700 - 245/3.00
6 Check the oil level. Required oil level is: 0 - 20 mm below the oil plug hole.	
7 Add or drain oil, if required.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> . Further information about how to drain or fill with oil is found in section Changing oil, axis-3 gearbox on page 169 .
8 Refit the oil plug.	Tightening torque: 24 Nm.
9  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3.3.5 Inspecting the oil level in axis-4 gearbox

Location of oil plug

The gearbox has a level plug that is located as shown in the figure.



xx1200000957

Tightening torque: 24 Nm

Required tools

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Required consumables

Consumables	Article number	Note
Lubricating oil	-	Information about the oil is found in Technical reference manual - Lubrication in gearboxes .

Required documents

Document name	Document number
Technical reference manual - Lubrication in gearboxes	3HAC042927-001

Inspecting the oil level in axis-4 gearbox

Use this procedure to inspect the oil level in the gearbox.

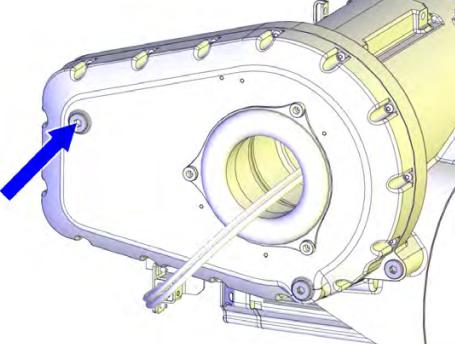
	Action	Note
1	Run the robot to calibration position.	

Continues on next page

3 Maintenance

3.3.5 Inspecting the oil level in axis-4 gearbox

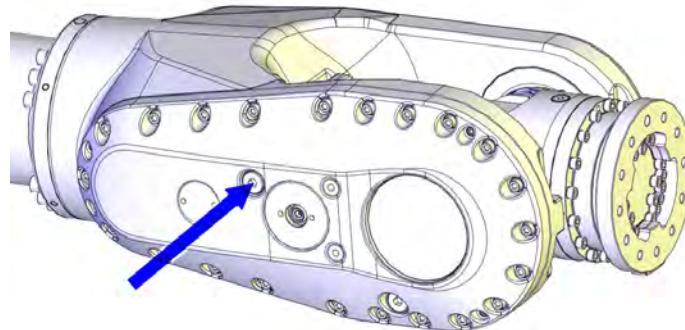
Continued

Action	Note
2  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54 .	
5 Open the oil plug.	 xx1200000957
6 Check the oil level. Required oil level is: 0 - 10 mm below the oil plug hole.	
7 Add or drain oil, if required.	Type of oil and total amount is detailed in Technical reference manual - Lubrication in gearboxes . Further information about how to drain or fill with oil is found in section Changing oil, axis-4 gearbox on page 175 .
8 Refit the oil plug.	Tightening torque: 24 Nm.
9  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3.3.6 Inspecting the oil level in axis-5 gearbox

Location of oil plug

The gearbox has a level plug that is located as shown in the figure.



xx1200000959

Tightening torque: 24 Nm

Required tools

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Required consumables

Consumables	Article number	Note
Lubricating oil	-	Information about the oil is found in <i>Technical reference manual - Lubrication in gearboxes</i> .

Required documents

Document name	Document number
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001

Inspecting the oil level in axis-5 gearbox

Use this procedure to inspect the oil level in the gearbox.

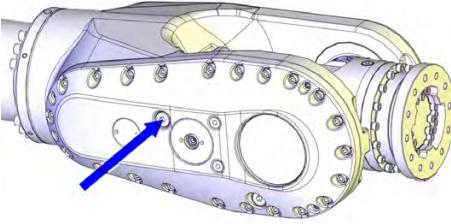
	Action	Note
1	Run the robot to calibration position.	

Continues on next page

3 Maintenance

3.3.6 Inspecting the oil level in axis-5 gearbox

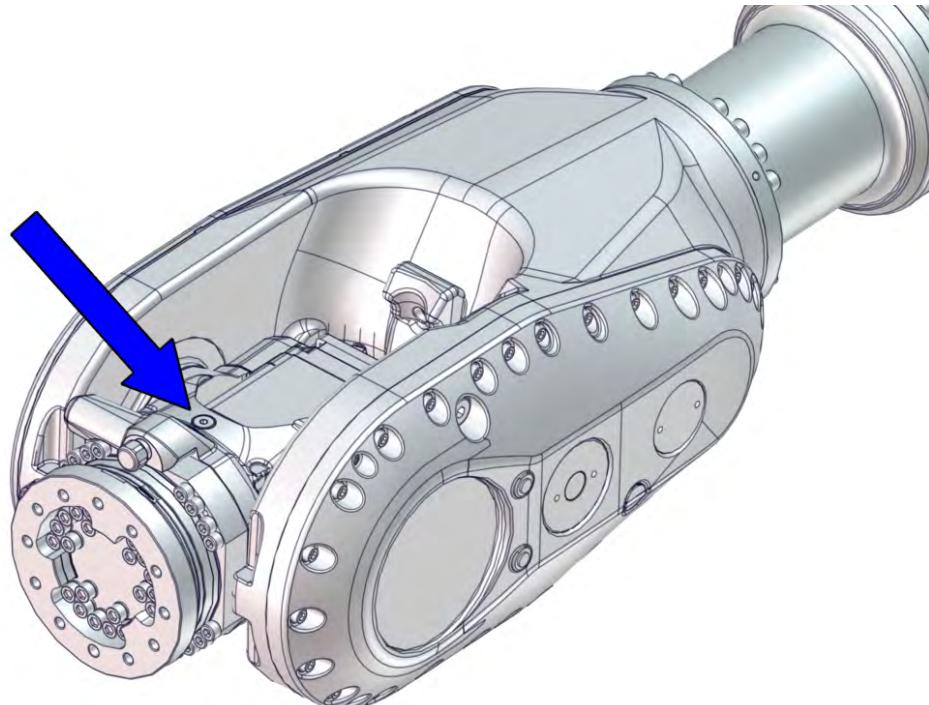
Continued

Action	Note
2  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54 .	
5 Open the oil plug.	 xx1200000959
6 Check the oil level. Required oil level is: 0 - 10 mm below the oil plug hole.	
7 Add or drain oil, if required.	Type of oil and total amount is detailed in Technical reference manual - Lubrication in gearboxes . Further information about how to drain or fill with oil is found in section Changing oil, axis-5 gearbox on page 179 .
8 Refit the oil plug.	Tightening torque: 24 Nm.
9  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3.3.7 Inspecting the oil level in axis-6 gearbox

Location of oil plug

The oil plug through which the oil level is inspected is located as shown in the figure.



xx1600002049

Tightening torque: 24 Nm

Required tools

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Required consumables

Consumable	Article number	Note
Lubricating oil	-	Information about the oil is found in Technical reference manual - Lubrication in gearboxes .

Required documents

Document name	Document number
Technical reference manual - Lubrication in gearboxes	3HAC042927-001

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3 Maintenance

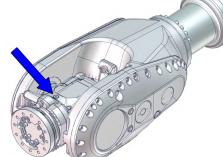
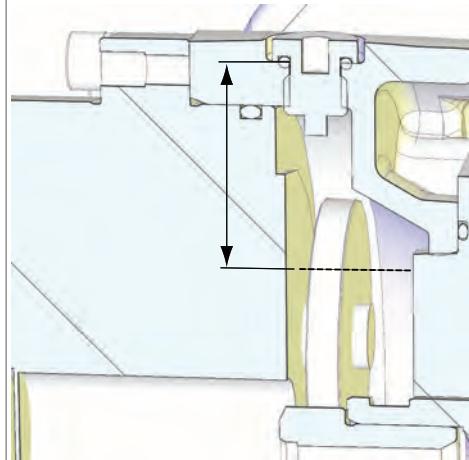
3.3.7 Inspecting the oil level in axis-6 gearbox

Continued

Inspecting the oil level in axis-6 gearbox

Use this procedure to inspect the oil level in the gearbox.

The procedure includes two alternative positions for axis 5, where one of the positions makes it possible to use the filling plug as a level plug.

Action	Note
1 Run the robot to calibration position.	
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3 Make sure that the oil temperature is +25°C ± 10°C.	
4  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i>	
5 Open the oil plug.	 xx1600002049
6 Method 1 Check the oil level. <ul style="list-style-type: none">• IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20, IRB 6700 - 200/2.60, IRB 6700 - 155/2.85 Required oil level is: 50 mm ± 5 mm below the sealing surface of the oil plug.• IRB 6700 - 300/2.70, IRB 6700 - 245/3.00 Required oil level is: 45 mm ± 5 mm below the sealing surface of the oil plug.	 xx1300000693

Continues on next page

3.3.7 Inspecting the oil level in axis-6 gearbox

Continued

	Action	Note
7	Method 2 Rotate axis 5 +77°. Required oil level is: 0 - 10 mm below the oil plug hole.	
8	Add or drain oil, if required.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> . Further information about how to drain or fill with oil is found in section Changing oil, axis-6 gearbox on page 183 .
9	Refit the oil plug.	Tightening torque: 24 Nm.
10	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3 Maintenance

3.3.8 Inspecting the balancing device

3.3.8 Inspecting the balancing device

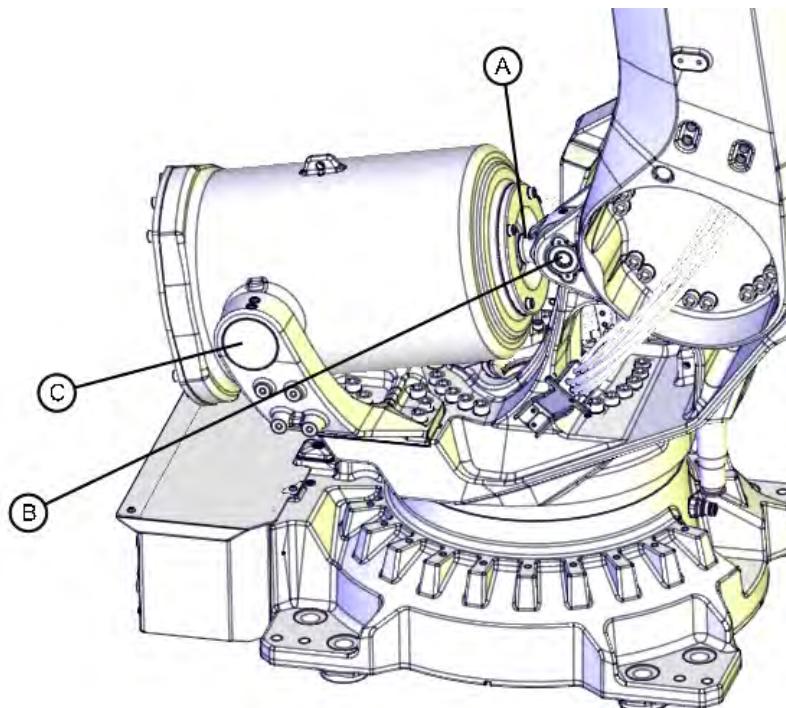
General

Several points are to be checked on the balancing device during the inspection. This section describes how to perform the inspection regarding:

- dissonance
- damage
- leakage
- contamination / lack of free space.

Inspection points, balancing device

The balancing device is located at the top rear of the frame as shown in the figure. The figure also shows the inspection points, further described in the instructions.



xx1300000413

A	Piston rod (inside balancing device)
B	Link ear
C	Rear attachments of the balancing device (rear bearing)

Required tools

Visual inspection, no tools are required.

Continues on next page

Required material

Equipment	Article number	Note
Maintenance kit, link ear	3HAC045815-001	The maintenance kit contains: <ul style="list-style-type: none"> • End cover • Radial sealing with dust lip, 50x68x8 (2 pcs) • O-ring 85 • Spherical roller bearing • Washer
Maintenance kit, rear attachment	3HAC045822-001	Includes: <ul style="list-style-type: none"> • bearings and seals • VK cover.

Check for dissonance

The check points are shown in the figure [Inspection points, balancing device on page 136](#).

	Check points	Action
1	Check for dissonance from the bearing at the link ear and the bearings at the rear attachments.	If dissonance is detected, perform maintenance according to maintenance kits and instructions in section Replacing spherical roller bearing, link ear on page 435 and on page ? .
2	Check for dissonance from the balancing device (a tapping sound, caused by the springs inside the cylinder).	If dissonance is detected, replace the balancing device or consult ABB Robotics. How to replace the device is detailed in section Replacing the balancing device on page 452 . This section also specifies the spare part number!
3	Check for dissonance from the piston rod (squeaking may indicate worn plain bearings, internal contamination or insufficient lubrication).	If dissonance is detected, perform maintenance according to given instructions in Maintenance kit, complete.

Check for damage

Check for damages, such as scratches, general wear, uneven surfaces or incorrect positions.

The check points are shown in the figure [Inspection points, balancing device on page 136](#).

	Check points	Action
1	Check for damage on the part of the piston rod that is visible at the front of the balancing device.	If damage is detected, perform maintenance according to given instructions in Maintenance kit, complete.

Continues on next page

3 Maintenance

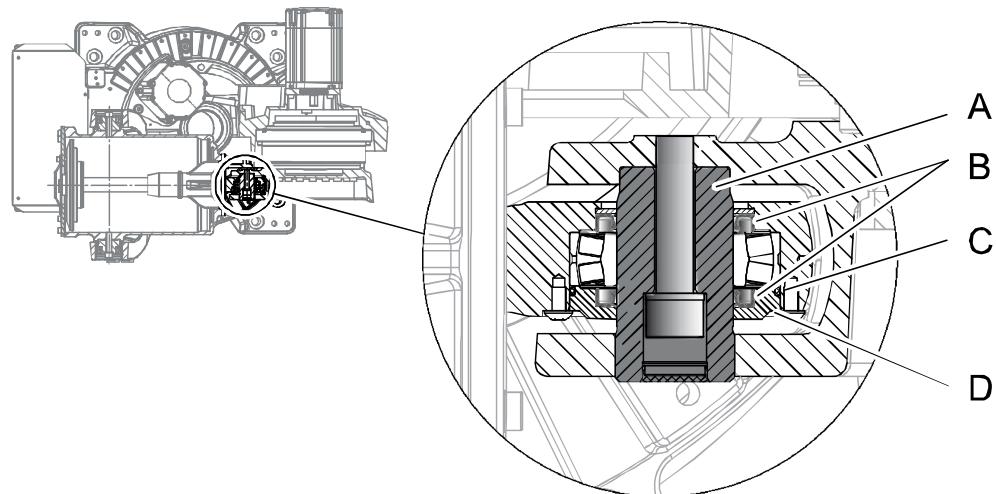
3.3.8 Inspecting the balancing device

Continued

Check for leakage

The front ear of the balancing device is lubricated with grease.

Leaks at o-rings, radial sealings etc. are not acceptable and must be attended to immediately to avoid damage to the bearing.



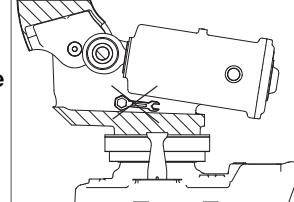
xx1000000207

A	Shaft
B	Radial sealing with dust lip, 50x68x8 (2 pcs)
C	O-ring, 85x3
D	End cover

	Action	Note
1	Clean the area at the front ear from contamination.	
2	Run the robot for some minutes, in order to move the balancing device piston.	
3	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply to the robot• hydraulic pressure supply to the robot• air pressure supply to the robot Before entering the robot working area.	
4	Check the area around the o-ring and radial sealings at the front ear, for leakage.	
5	Replace o-ring and radial sealings if leaks are detected.	<p>The o-ring and radial sealings are included in the Maintenance kit, bearings and seals already assembled with sealing spacers and sealing rings. Article number for the kit is specified in Required material on page 137.</p> <p>Replacement of the complete bearing is also described in section Replacing the balancing device on page 452.</p>

Continues on next page

Check for contamination / lack of free space

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply to the robot• hydraulic pressure supply to the robot• air pressure supply to the robot Before entering the robot working area.	
2	Check that there are no obstacles inside the frame, that could prevent the balancing device from moving freely. Keep the areas around the balancing device clean and free from objects, such as service tools.	 xx1300000423

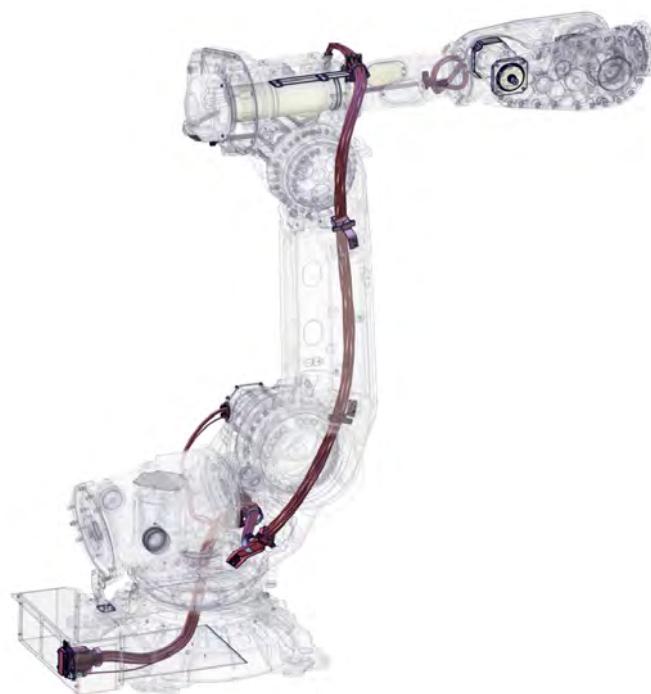
3 Maintenance

3.3.9 Inspecting the cable harness

3.3.9 Inspecting the cable harness

Location of cable harness

The cable harness is located as shown in the figure.



xx1300001096

Required tools

Visual inspection, no tools are needed.

Inspecting the cable harness

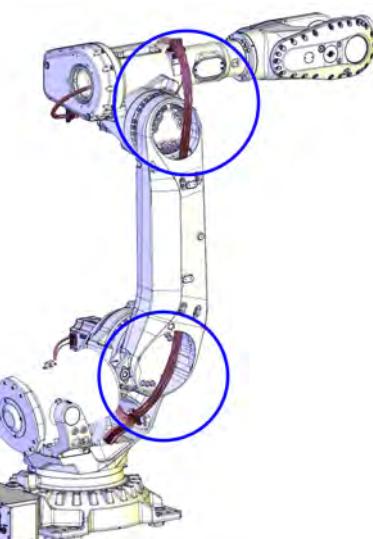
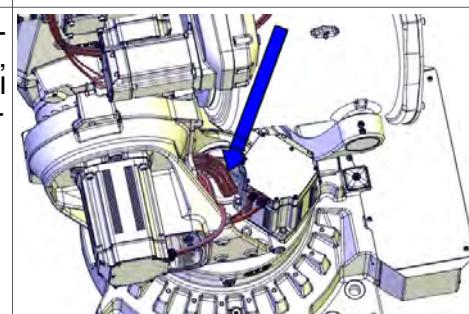
Use this procedure to inspect cable harness of axes 1-6.

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

Continues on next page

3.3.9 Inspecting the cable harness

Continued

Action	Note
2 Make an overall inspection of the cable harness in order to detect wear and damage. Pay special attention to the areas of axis-2 and axis-3 movement, shown in the figure. Make sure the cabling is not damaged between the cable brackets in these areas.	 xx1300001095
3 Check that all visible cable brackets, velcro straps and attachments are properly secured, by following the cable harness from the base to the wrist.	
4 Check the motor cables visually for any damage.	
5 Check the connectors at the base visually for any damage.	
6 Check the cabling going through the protection tube, to detect possible cable chafing, by using your hands inside the tube to feel the cables. Ensure that the cables are undamaged. Remove any objects that may cause possible cable chafing. Replace damaged cabling, if any.	 xx1300001094
7 Replace the cable harness if wear, cracks or damage is detected.	See Removing the cable harness on page 226 .

3 Maintenance

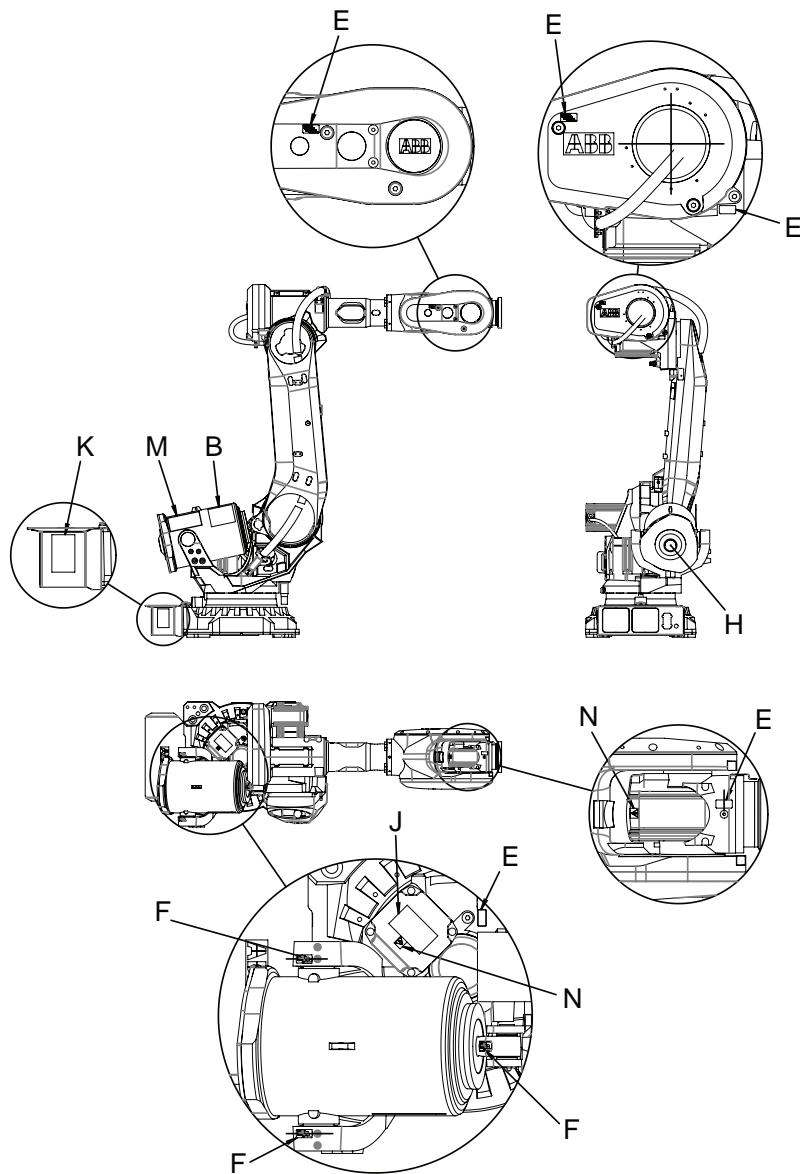
3.3.10 Inspecting the information labels

3.3.10 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 product labels on page 41](#).

Illustration 1

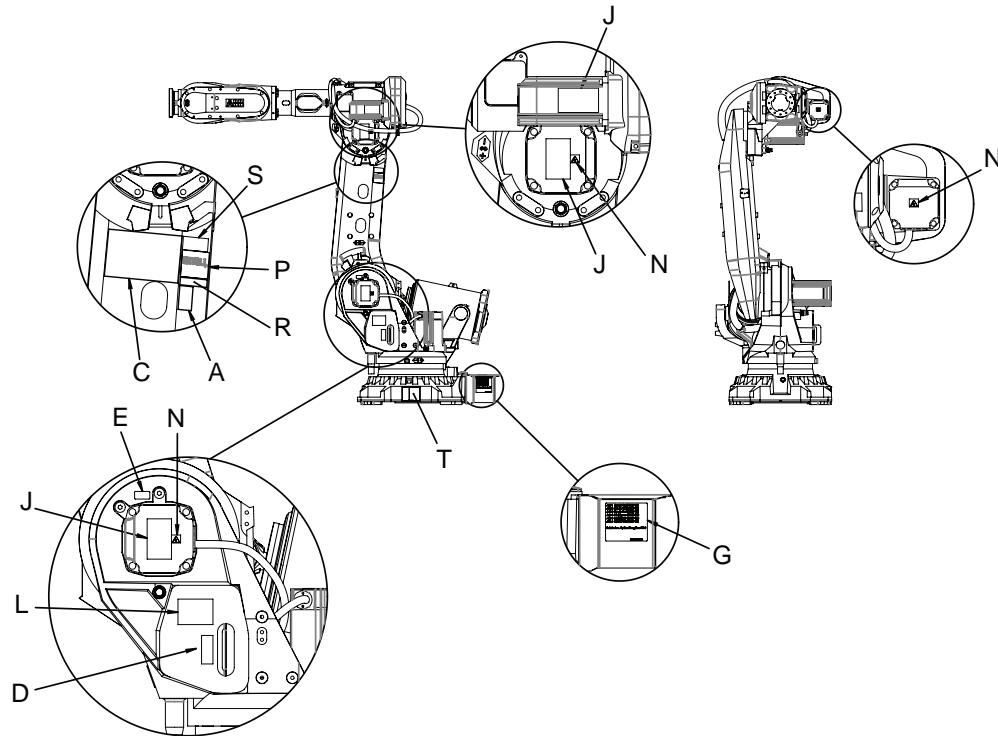


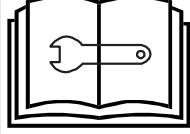
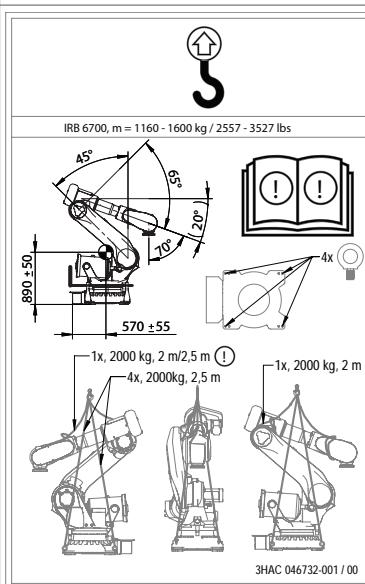
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3.3.10 Inspecting the information labels

Continued

Illustration 2



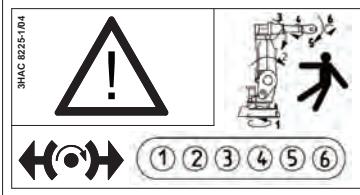
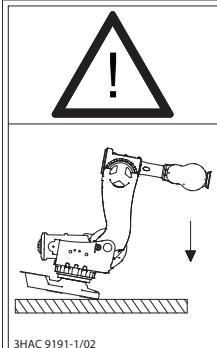
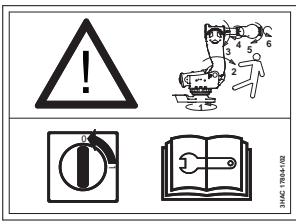
	Description	Illustration
A	Calibration label	
B	Instruction label Before dismantling see product manual	 xx0900000816
C	Instruction label Lifting of robot	 xx1300001084

Continues on next page

3 Maintenance

3.3.10 Inspecting the information labels

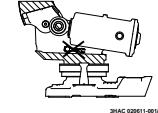
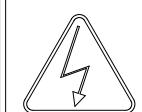
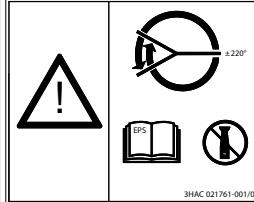
Continued

D	Instruction label Brake release Moving robot Brake release buttons	 xx1300001083
E	Oil specification label	
F	Grease specification label	
G	Complete oil specification	
H	Warning label Do not dismantle Stored energy	 xx1300001086
J	Warning label Heat	 xx1300001087
K	Warning label Tip risk when loosening bolts	 xx1300001088
L	Warning label Moving robot Shut off with handle Before dismantling see product manual	 xx1300001089

Continues on next page

3.3.10 Inspecting the information labels

Continued

M	Warning label Keep areas around the balancing device free from objects	  xx1300001090
N	Warning label Flash	 xx1300001091
P	Rating label	
R	Absolute accuracy label	
S	UL label	
T	Label Extended rotation No mechanical stop See user documentation	 xx1300001092

Required tools and equipment

Visual inspection, no tools are required.

Inspecting, labels

Action	Note
1  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
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 Spare parts on page 811 .

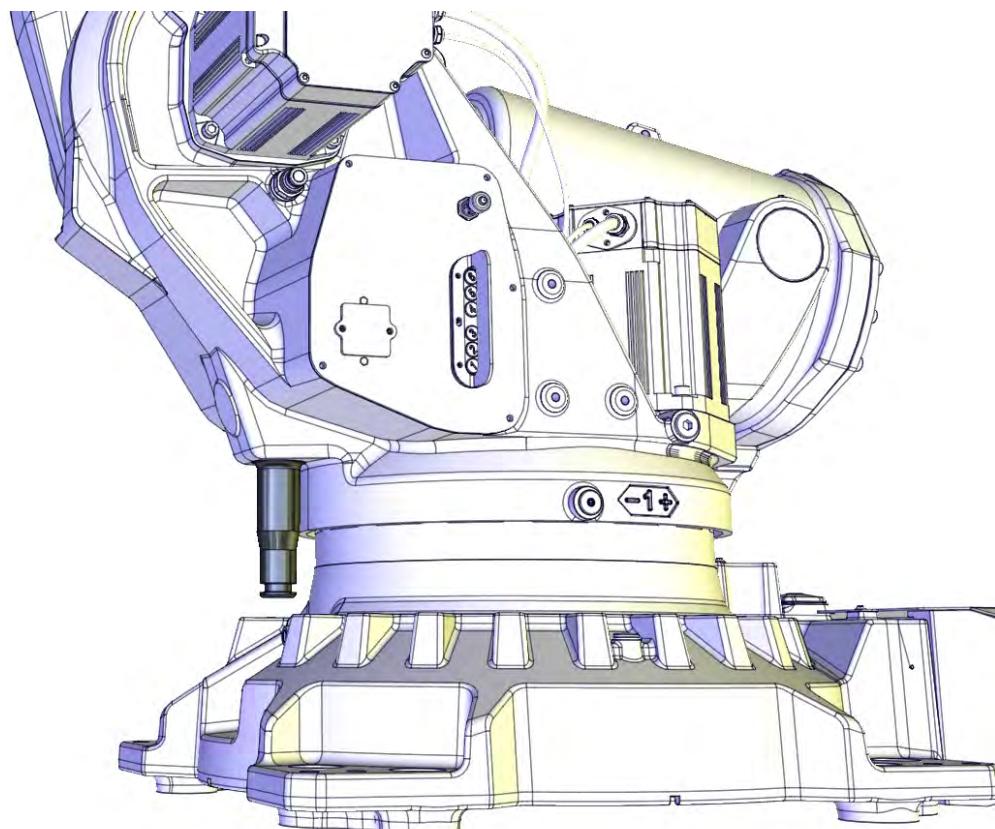
3 Maintenance

3.3.11 Inspecting the axis-1 mechanical stop pin

3.3.11 Inspecting the axis-1 mechanical stop pin

Location of mechanical stop pin

The axis-1 mechanical stop is located as shown in the figure.



xx1200001073

Required equipment

Visual inspection, no tools are required.

Inspecting, mechanical stop pin

Use this procedure to inspect the axis-1 mechanical stop pin.

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

Continues on next page

3.3.11 Inspecting the axis-1 mechanical stop pin

Continued

Action	Note
<p>2 Inspect the axis-1 mechanical stop pin. If the mechanical stop pin is bent or damaged, it must be replaced.</p> <p> Note</p> <p>The expected life of gearboxes can be reduced after collision with the mechanical stop.</p>	

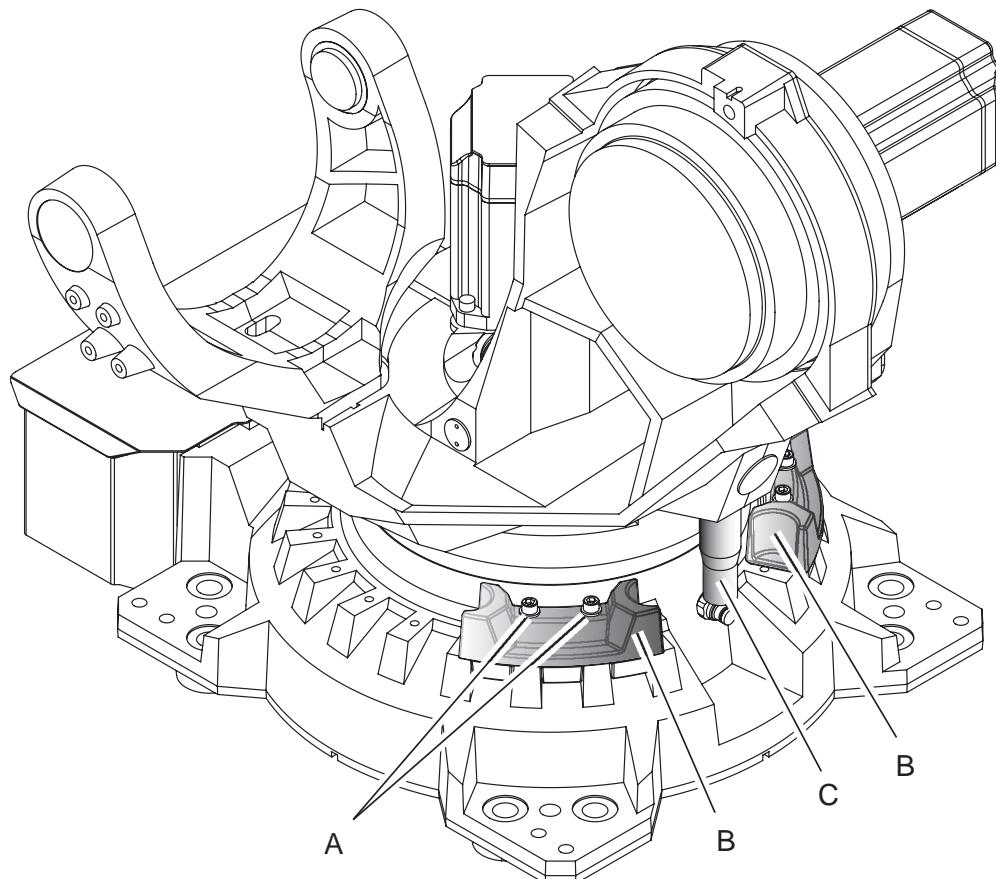
3 Maintenance

3.3.12 Inspecting the additional mechanical stops

3.3.12 Inspecting the additional mechanical stops

Location of mechanical stops

The figure shows the location of additional mechanical stops.



xx1300001971

A	Attachment screws M12x70 quality 12.9 Gleitmo 603 (2 pcs per additional mechanical stop)
B	Movable mechanical stop
C	Mechanical stop pin axis-1

Required equipment

Equipment etc.	Article number	Note
Movable mechanical stop axis 1	3HAC055744-001	IRB6700 235/2.65, 205/2.80, 175/3.05, 150/3.20, 200/2.60, 155/2.85 Limits the robot working range by 15°. Includes attachment screws and an assembly drawing. <ul style="list-style-type: none">• Mechanical stop• Attachment screws M12x70 quality 12.9 Gleitmo 603 and washers• Document for mechanical stop

Continues on next page

3.3.12 Inspecting the additional mechanical stops

Continued

Equipment etc.	Article number	Note
Movable mechanical stop axis 1	3HAC048533-003	IRB6700 300/2.70, 245/3.00 Limits the robot working range by 15°. Includes attachment screws and an assembly drawing. <ul style="list-style-type: none">• Mechanical stop• Attachment screws M12x70 quality 12.9 Gleitmo 603 and washers• Document for mechanical stop
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Inspecting, mechanical stops

Use this procedure to inspect the additional mechanical stops.

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2	Make sure no additional stops are damaged.	Shown in figure Location of mechanical stops on page 148 .
3	Make sure the stops are properly attached. Correct tightening torque, additional mechanical stops: <ul style="list-style-type: none">• Axis 1 = 115 Nm	
4	If any damage is detected, the mechanical stops must be replaced! Correct attachment screws: <ul style="list-style-type: none">• M12x70 quality 12.9 Gleitmo 603 (2 pcs per additional mechanical stop)	Article number is specified in Required equipment on page 148 .

3 Maintenance

3.3.13 Inspecting the fork lift accessory

3.3.13 Inspecting the fork lift accessory

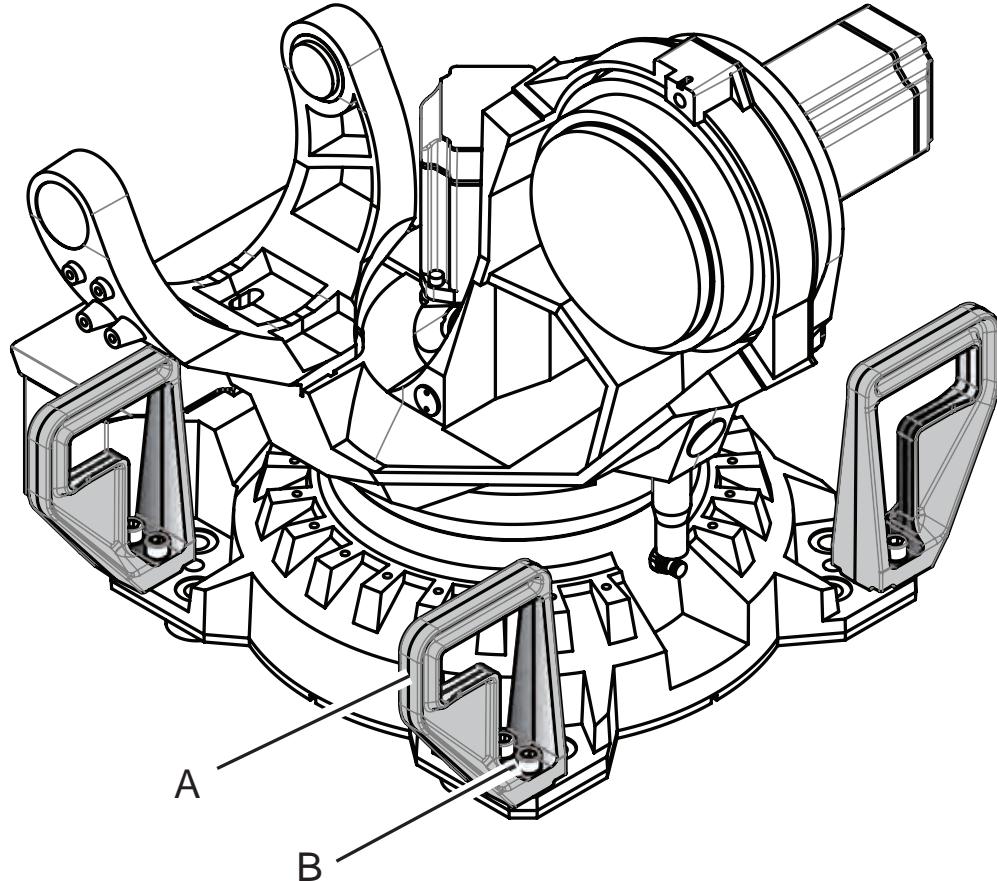
Introduction

The installation and use of the Fork lift accessories is described in:

- *Directions for use - Fork lift accessory for IRB 6700*

Location of fork lift accessory

The fork lift accessory is fitted to the robot as shown in the figure.



xx1300001602

A	Fork lift pocket (4 pcs)
B	Hex socket head cap screw M20x60 quality steel 8.8-A3F (2 pcs per fork lift device)

Required equipment

Equipment	Article number	Note
Fork lift accessory set	3HAC047054-003	
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Continues on next page

Inspecting, fork lift device set

Use this procedure to inspect the fork lift device set.

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	Check the fork lift device set for damage.	
3	Check attachment screws for deformation and other type of damage.	
4	Make sure fork lift device set is properly attached. Correct tightening torque, fork lift devices: <ul style="list-style-type: none"> • 280 Nm 	
5	If any damage is detected, the fork lift device and attachment screws must be replaced. Correct attachment screws: <ul style="list-style-type: none"> • M20x60 quality steel 8.8-A3F (2 pcs per additional mechanical stop) 	Article number is specified in Required equipment on page 148 .

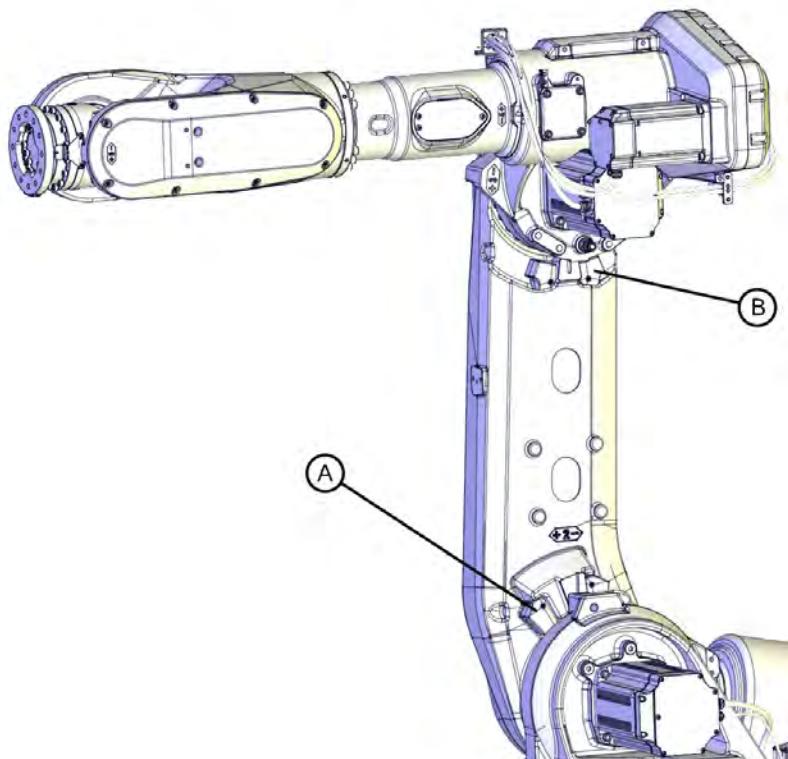
3 Maintenance

3.3.14 Inspecting the dampers

3.3.14 Inspecting the dampers

Location of dampers

The figure below shows the location of all the dampers to be inspected.



xx1300000414

A	Axis-2 damper, 2 pcs
B	Axis-3 damper, 2 pcs

Required equipment

Visual inspection, no tools are required.

Inspecting, dampers

The procedure below details how to inspect the dampers.

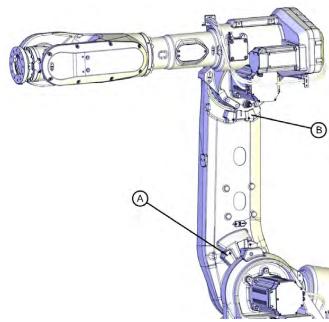


Note

A damaged damper must be replaced.

Continues on next page

3.3.14 Inspecting the dampers
Continued

Action	Note				
<p>1  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply to the robot • hydraulic pressure supply to the robot • air pressure supply to the robot Before entering the robot working area.</p>					
<p>2 Check all dampers for damage, cracks or existing impressions larger than 1 mm.</p>	 xx1300000414				
<p>3 Check attachment screws for deformation.</p>	<table border="1"> <tr> <td>A</td> <td>Axis-2 damper, 2 pcs</td> </tr> <tr> <td>B</td> <td>Axis-3 damper, 2 pcs</td> </tr> </table>	A	Axis-2 damper, 2 pcs	B	Axis-3 damper, 2 pcs
A	Axis-2 damper, 2 pcs				
B	Axis-3 damper, 2 pcs				
<p>4 If any damage is detected, the damper must be replaced with a new one. Attachment screws: M6x60. Locking liquid: Loctite 243.</p>	Spare part number is found in <i>Product manual, spare parts - IRB 6700</i> .				

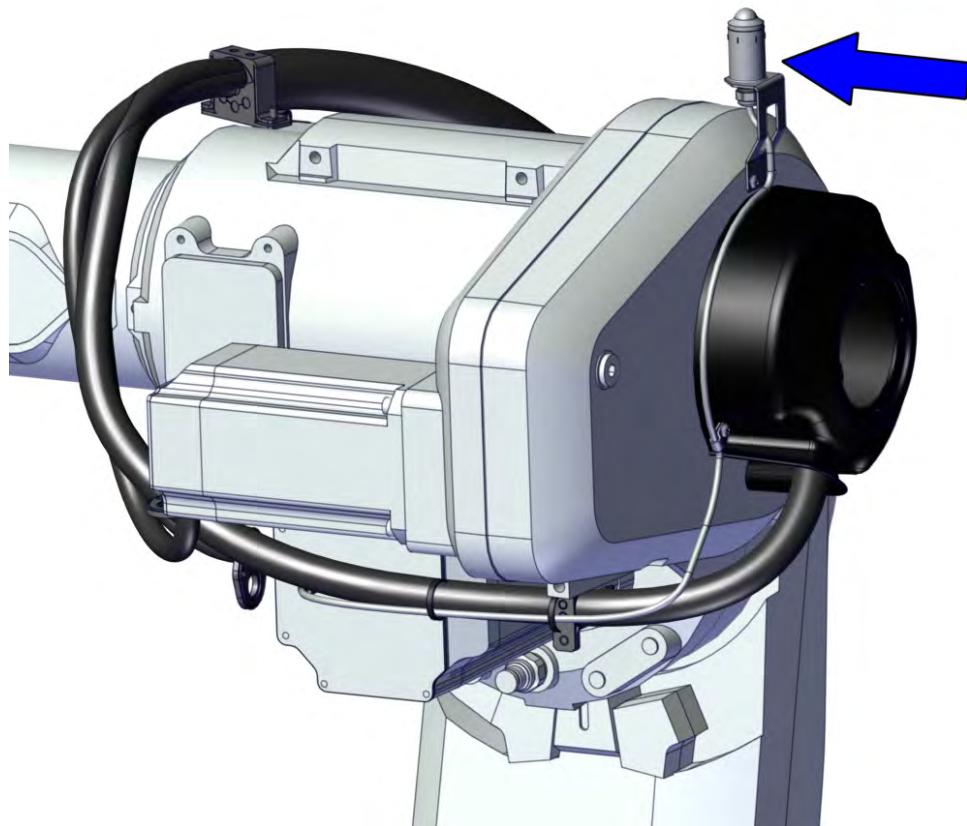
3 Maintenance

3.3.15 Inspecting the signal lamp (option)

3.3.15 Inspecting the signal lamp (option)

Location of signal lamp

The signal lamp is located as shown in this figure.



xx1600002089

Required tools and equipment

Equipment	Article number	Note
Signal lamp kit	See Spare parts on page 811 .	To be replaced if damage is detected.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

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

3.3.15 Inspecting the signal lamp (option)

Continued

Action	Note
<p>2</p>  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
<p>3</p> If the lamp is not lit, trace the fault by: <ul style="list-style-type: none"> • inspecting whether the signal lamp is broken. If so, replace it. • inspecting cable connections. • measuring the voltage in the connectors of motor axis 3 (=24V). • inspecting the cabling. Replace the cabling if a fault is detected. 	Article number is specified in Required tools and equipment on page 154 .

3 Maintenance

3.4.1 Type of lubrication in gearboxes

3.4 Replacement/changing activities

3.4.1 Type of lubrication in gearboxes

Introduction

This section describes where to find information about the *type of lubrication*, *article number* and the *amount of lubrication* in the specific gearbox. It also describes the equipment needed when working with lubrication.

Type and amount of oil in gearboxes

Information about the *type of lubrication*, *article number* as well as the *amount* in the specific gearbox can be found in *Technical reference manual - Lubrication in gearboxes* on the Documentation DVD (released twice a year). The revision of the manual published on the Documentation DVD, will contain the latest updates when the Documentation DVD is released.

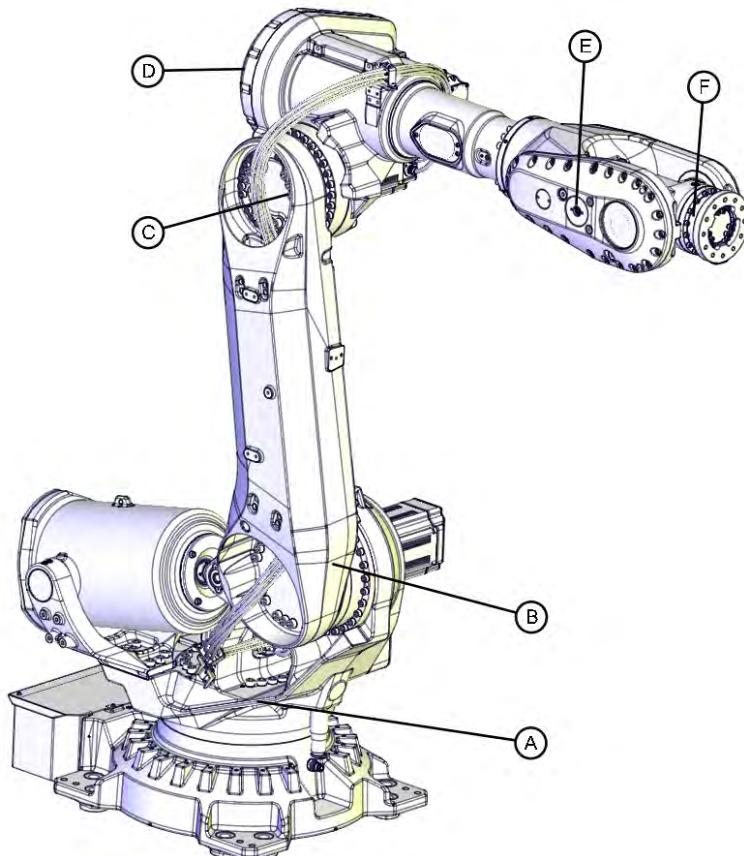
Before starting any inspection, maintenance, or changing activities of lubrication, **always** contact the local ABB Service organization for more information.

For ABB personnel: Always check ABB Library for the latest revision of the manual *Technical reference manual - Lubrication in gearboxes*, in order to always get the latest information of updates about lubrication in gearboxes. A new revision will be published on ABB Library immediately after any updates. Therefore the manual published on the documentation DVD may not contain the latest updates about lubrication.

Continues on next page

Location of gearboxes

The figure shows the location of the gearboxes.



xx1400000189

A	Gearbox, axis 1
B	Gearbox, axis 2
C	Gearbox, axis 3
D	Gearbox, axis 4
E	Gearbox, axis 5
F	Gearbox, axis 6

Equipment

Equipment	Note
Oil dispenser	Includes pump with outlet pipe. Use the suggested dispenser or a similar one: <ul style="list-style-type: none">• Orion OriCan article number 22590 (pneumatic)
Nipple for quick connect fitting, with o-ring	

3 Maintenance

3.4.2 Changing oil, axis-1 gearbox

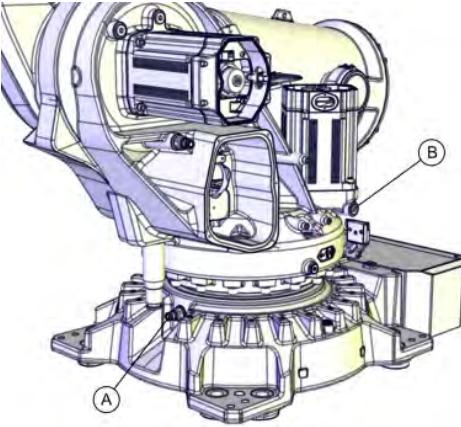
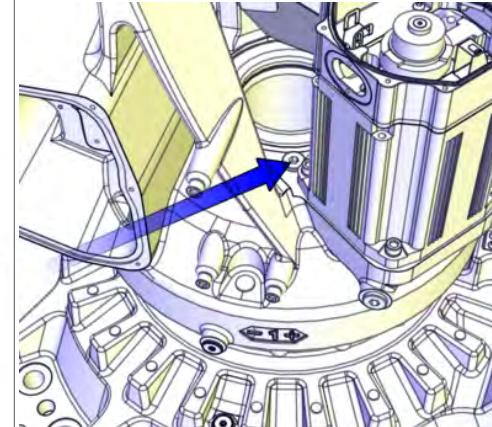
3.4.2 Changing oil, axis-1 gearbox

Usage of oil dispenser

The oil change procedure in this section describes usage of an oil dispenser.

Location of oil plugs

The oil plugs of the gearbox are located as shown in the figure.

	
A Oil hole with nipple (Used for both draining and filling with an oil dispenser). B Level plug (300/2.70, 245/3.00)	Oil plug. Used for both ventilation and level measurement on manipulator types: <ul style="list-style-type: none">• 150/3.20, 155/2.85, 175/3.05, 200/2.60, 205/2.80 and 235/2.65 Used for ventilation on manipulator types: <ul style="list-style-type: none">• 300/2.70 and 245/3.00
Tightening torque: 24 Nm.	Tightening torque: 24 Nm.

Required material

Material	Note
Lubricating oil	Information about the oil is found in <i>Technical reference manual - Lubrication in gearboxes</i> . See Type and amount of oil in gearboxes on page 156 .

Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

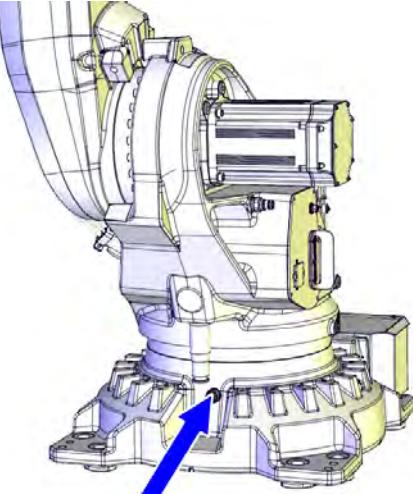
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Required documents

Document name	Document number	Note
Technical reference manual - Lubrication in gearboxes	3HAC042927-001	

Draining the axis-1 gearbox

Use this procedure to drain the gearbox.

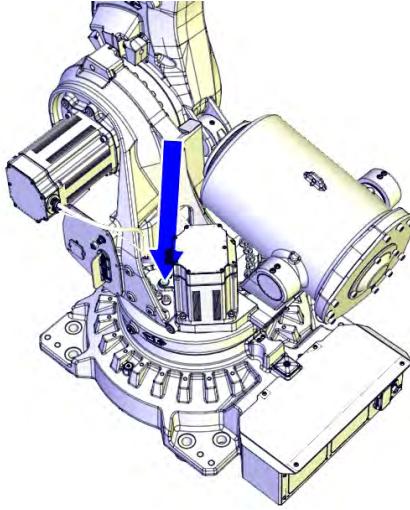
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	 WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.	
3	 CAUTION The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
4	Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 xx1200000948

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3 Maintenance

3.4.2 Changing oil, axis-1 gearbox

Continued

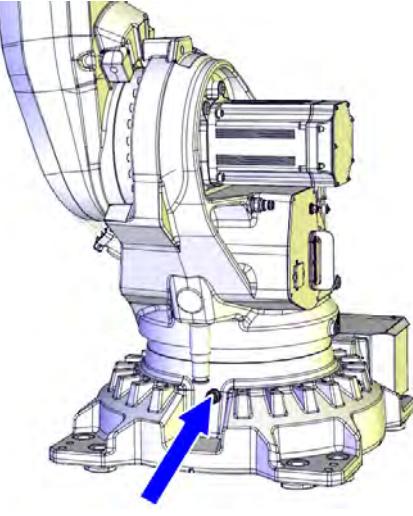
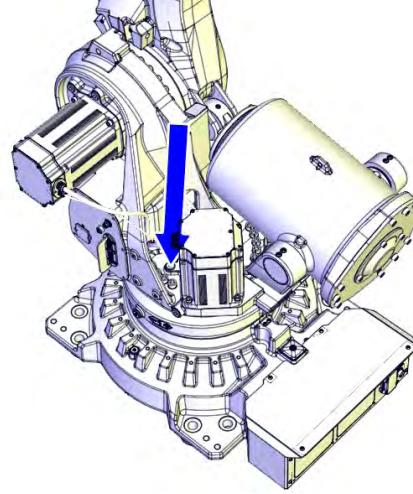
Action	Note
5 Remove the plug from the vent hole.  WARNING Open the vent hole while using the dispenser, to avoid damaging vital parts in the gear.	 xx1200000950
6 Suck out the oil with the oil dispenser.  Note There will be some oil left in the gear after draining.	
7  WARNING Used oil is hazardous material and must be disposed of in a safe way. See section Decommissioning on page 789 for more information.	
8 Remove the oil dispenser and refit the protective cap on the nipple.	
9 Refit the vent hole plug.	Tightening torque: 24 Nm.

Filling oil into the axis-1 gearbox

Use this procedure to refill the gearbox with oil.

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

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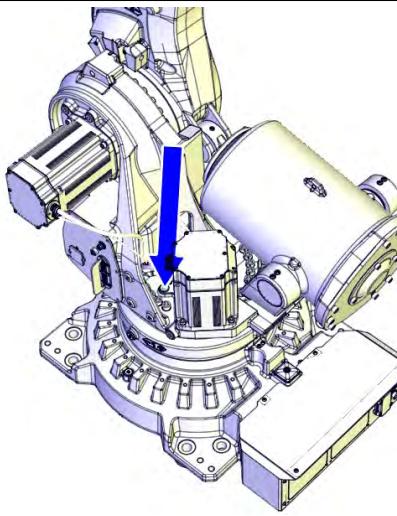
Action	Note
2  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.	
3 Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 xx1200000948
4 Remove the plug from the vent hole.  Note The vent hole is opened to let out air during the filling process.	 xx1200000950
5 Refill the gearbox with oil with the oil dispenser.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in Technical reference manual - Lubrication in gearboxes .

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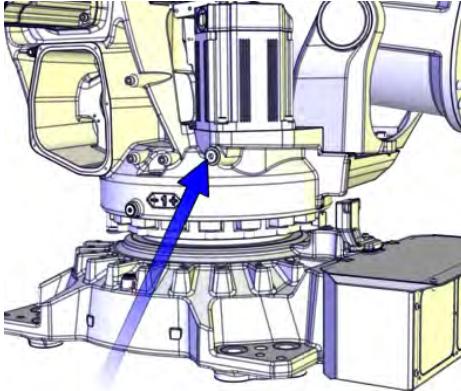
3 Maintenance

3.4.2 Changing oil, axis-1 gearbox

Continued

Action	Note
6 Inspect the oil level.	 xx1200000950 <p><i>Figure 3.1: Valid for robot types 150/3.20, 155/2.85, 175/3.05, 200/2.60, 205/2.80 and 235/2.65</i></p> <p>Required oil level: $58 \text{ mm} \pm 5 \text{ mm}$ below the sealing surface of the oil plug.</p>  xx1300000692

Continues on next page

Action	Note
	 xx1500001655 <p><i>Figure 3.2: Valid for robot types 300/2.70 and 245/3.00</i></p> <p>Required oil level: 0 - 10 mm below the oil plug hole.</p>
7 Remove the oil dispenser and refit the protective cap to the nipple.	
8 Refit the vent hole plug.	Tightening torque: 24 Nm
9  Note	<p>After all repair and maintenance work involving oil, always wipe the robot clean from all surplus oil. The robot color can otherwise be discolored.</p>
10  DANGER	<p>Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48.</p>

3 Maintenance

3.4.3 Changing oil, axis-2 gearbox

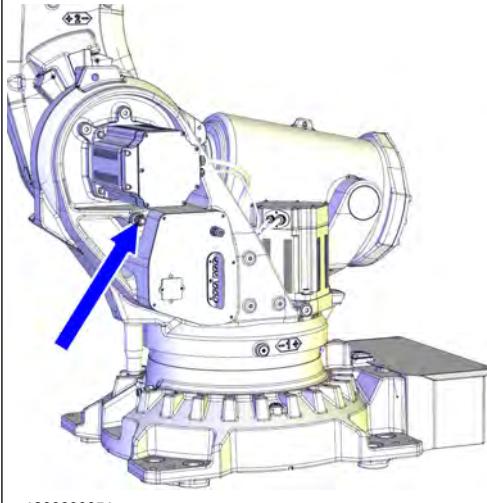
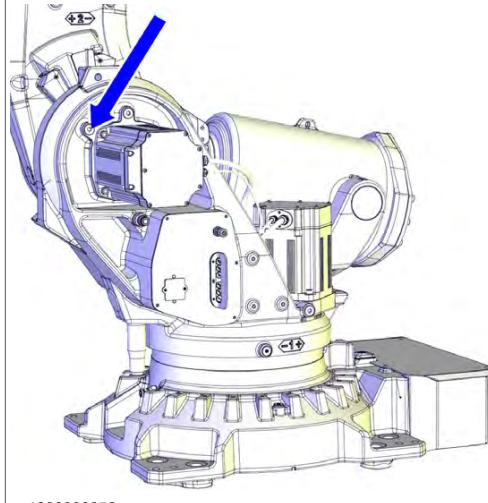
3.4.3 Changing oil, axis-2 gearbox

Usage of oil dispenser

The oil change procedure in this section describes usage of an oil dispenser.

Location of oil plugs

The oil plugs of the gearbox are located as shown in the figure.

 xx1200000951	 xx1200000952
Oil hole with nipple Used for both draining and filling with an oil dispenser. Tightening torque: N/A.	Vent hole plug/level plug Tightening torque: 24 Nm.

Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Required consumable

Material	Note
Lubricating oil	Information about the oil is found in Technical reference manual - Lubrication in gearboxes . See Type and amount of oil in gearboxes on page 156 .

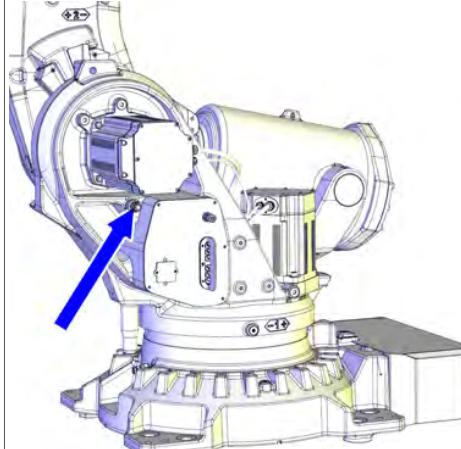
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Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

Draining the axis-2 gearbox

Use this procedure to drain the gearbox.

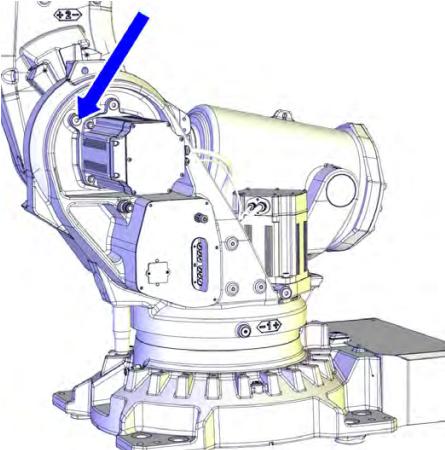
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	 WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i>	
3	 CAUTION The gearbox can contain an excess pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
4	Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 xx1200000951

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3 Maintenance

3.4.3 Changing oil, axis-2 gearbox

Continued

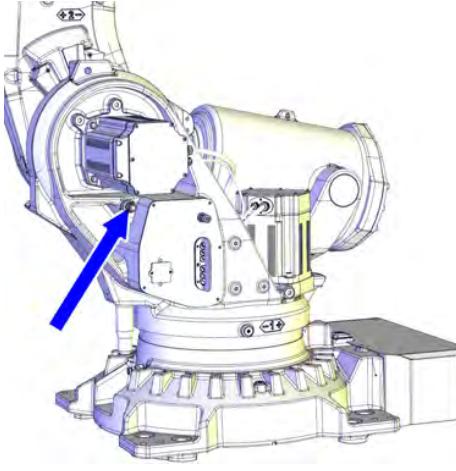
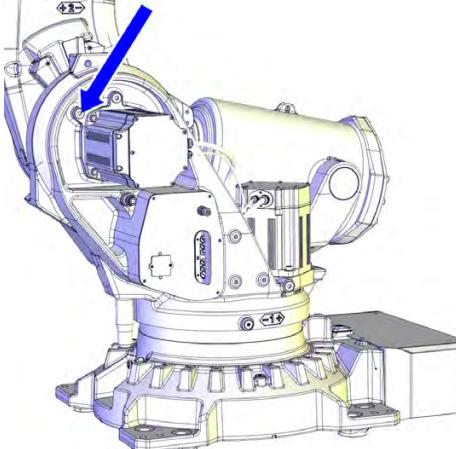
Action	Note
5 Remove the plug from the vent hole.  WARNING Open the vent hole while using the dispenser, to avoid damaging vital parts in the gear.	 xx1200000952
6 Suck out the oil with the oil dispenser.  Note There will be some oil left in the gear after draining.	
7  WARNING Used oil is hazardous material and must be disposed of in a safe way. See section Decommissioning on page 789 for more information.	
8 Refill oil or: 1 Remove the oil dispenser and refit the protective cap on the nipple. 2 Refit the vent hole plug.	Vent hole plug, tightening torque: 24 Nm.

Filling oil into the axis-2 gearbox

Use this procedure to refill the gearbox with oil.

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

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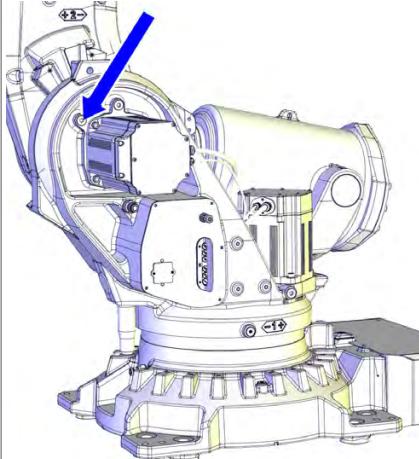
	Action	Note
2	 WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i>	
3	Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 xx1200000951
4	Remove the plug from the vent hole.  Note The vent hole is opened to let air out during the filling process.	 xx1200000952
5	Refill the gearbox with oil.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes.</i>

Continues on next page

3 Maintenance

3.4.3 Changing oil, axis-2 gearbox

Continued

Action	Note
6 Inspect the oil level at the vent hole (level plug).	 xx1200000952 Required oil level is: 0-15 mm below the oil plug hole. More information is found in Inspecting the oil level in axis-2 gearbox on page 124 .
7 Remove the oil dispenser and refit the protective cap to the nipple.	
8 Refit the level plug.	Tightening torque: 24 Nm
9  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

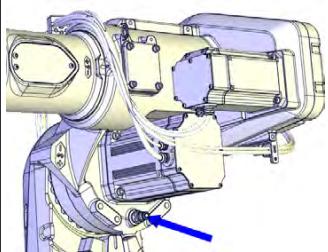
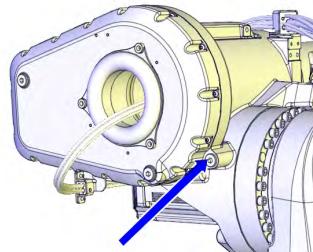
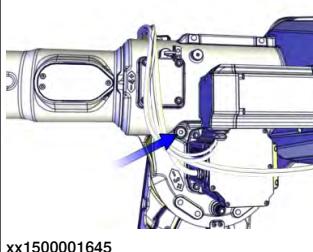
3.4.4 Changing oil, axis-3 gearbox

Usage of oil dispenser

The oil change procedure in this section describes usage of an oil dispenser.

Location of oil plugs

The oil plugs of the gearbox are located as shown in the figure.

		
Oil hole with nipple Used for both draining and filling with an oil dispenser.	Level/vent plug Valid for robot types 150/3.20, 155/2.85, 175/3.05, 200/2.60, 205/2.80 and 235/2.65	Level/vent plug Valid for robot types 300/2.70 and 245/3.00
Tightening torque: 24 Nm.	Tightening torque: 24 Nm.	Tightening torque: 24 Nm.

Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumable

Material	Note
Lubricating oil	Information about the oil is found in Technical reference manual - Lubrication in gearboxes . See Type and amount of oil in gearboxes on page 156 .

Required documents

Document name	Document number	Note
Technical reference manual - Lubrication in gearboxes	3HAC042927-001	

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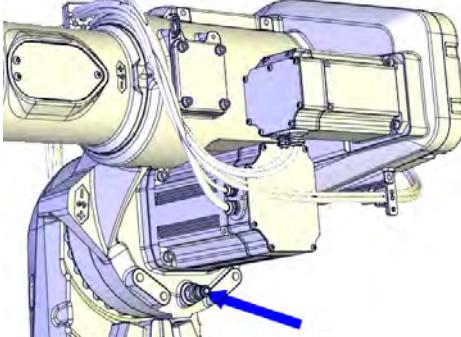
3 Maintenance

3.4.4 Changing oil, axis-3 gearbox

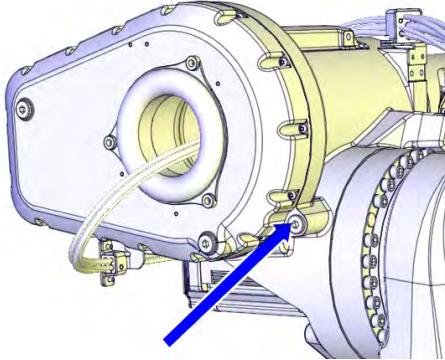
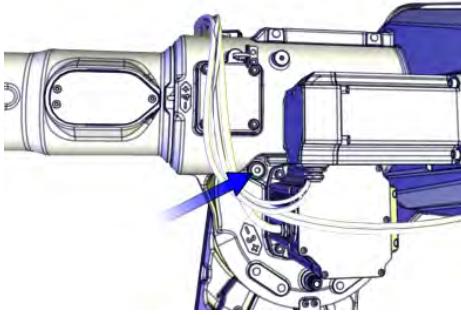
Continued

Draining the axis-3 gearbox

Use this procedure to drain the gearbox.

	Action	Note
1	Run the robot to calibration position.	
2	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply <p>to the robot, before entering the robot working area.</p>	
3	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i></p>	
4	<p> CAUTION</p> <p>The gearbox can contain an <i>excess pressure</i> that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.</p>	
5	Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 xx1200000954

Continues on next page

Action	Note
6 Remove the plug from the vent hole.  WARNING Open the vent hole while using the dispenser, to avoid damaging vital parts in the gear.	 xx1200000955 <i>Figure 3.3: Valid for robot types 150/3.20, 155/2.85, 175/3.05, 200/2.60, 205/2.80 and 235/2.65</i>
	 xx1500001645 <i>Figure 3.4: Valid for robot types 300/2.70 and 245/3.00</i>
7 Suck out the oil with the oil dispenser.  Note There will be some oil left in the gear after draining.	
8  WARNING Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 789 for more information.	
9 Remove the oil dispenser and refit the protective cap on the nipple.	
10 Refit the vent hole plug.	Tightening torque: 24 Nm.

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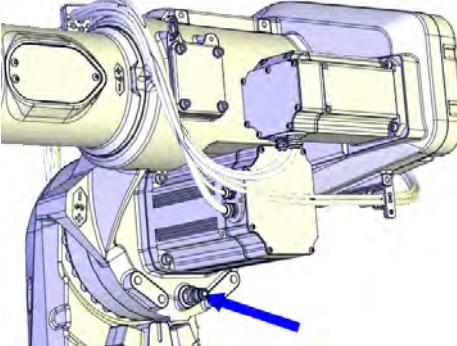
3 Maintenance

3.4.4 Changing oil, axis-3 gearbox

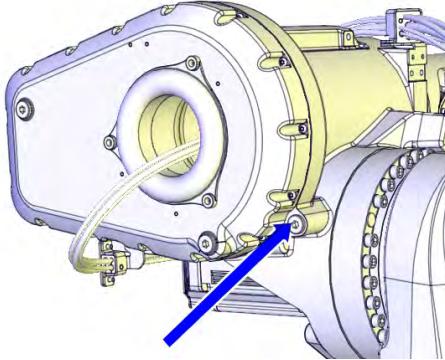
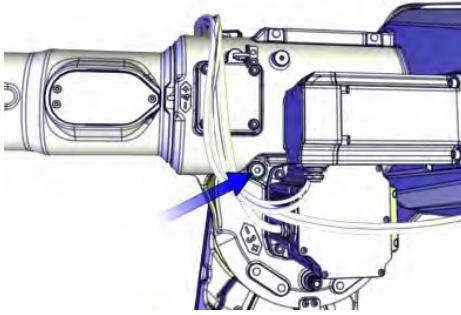
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Filling oil into the axis-3 gearbox

Use this procedure to refill the gearbox with oil.

	Action	Note
1	Run the robot to calibration position.	
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3	 WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i>	
4	Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 xx1200000954

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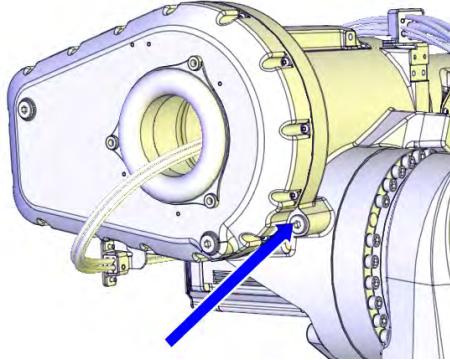
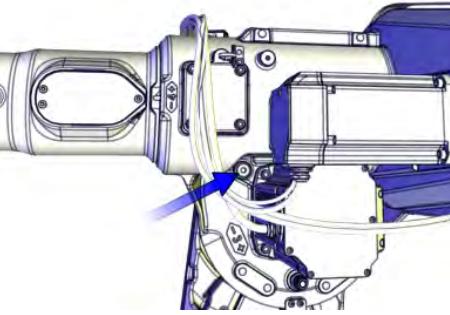
Action	Note
5 Remove the plug from the vent hole.  Note The vent hole is opened to let air out during the filling process.	 xx120000955 <p><i>Figure 3.5: Valid for robot types 150/3.20, 155/2.85, 175/3.05, 200/2.60, 205/2.80 and 235/2.65</i></p>  xx1500001645 <p><i>Figure 3.6: Valid for robot types 300/2.70 and 245/3.00</i></p>
6 Refill the gearbox with oil.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> .

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3 Maintenance

3.4.4 Changing oil, axis-3 gearbox

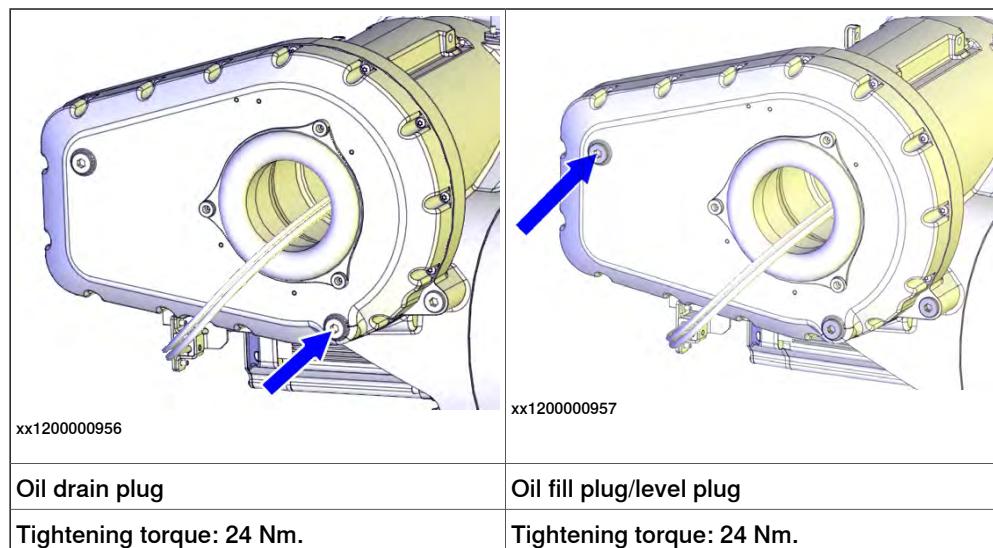
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Action	Note
7 Inspect the oil level at the vent hole (level plug).	 xx1200000955 <p><i>Figure 3.7: Valid for robot types 150/3.20, 155/2.85, 175/3.05, 200/2.60, 205/2.80 and 235/2.65</i></p>
	 xx1500001645 <p><i>Figure 3.8: Valid for robot types 300/2.70 and 245/3.00</i></p> <p>Required oil level is: 0 - 20 mm below the oil plug hole.</p> <p>More information is found in Inspecting the oil level in axis-3 gearbox on page 127.</p>
8 Remove the oil dispenser and refit the protective cap on the nipple.	
9 Refit the level plug.	Tightening torque: 24 Nm
10  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3.4.5 Changing oil, axis-4 gearbox

Location of oil plugs

The oil plugs of the gearbox are located as shown in the figure.



Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumable

Material	Note
Lubricating oil	Information about the oil is found in Technical reference manual - Lubrication in gearboxes . See Type and amount of oil in gearboxes on page 156 .

Required documents

Document name	Document number	Note
Technical reference manual - Lubrication in gearboxes	3HAC042927-001	

Draining the axis-4 gearbox

Use this procedure to drain the gearbox.

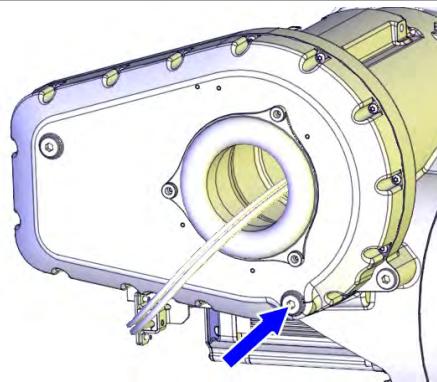
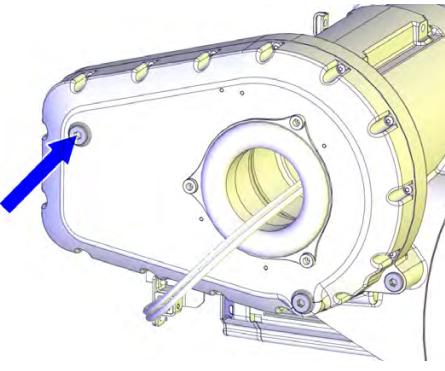
	Action	Note
1	Run the robot to calibration position.	

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3 Maintenance

3.4.5 Changing oil, axis-4 gearbox

Continued

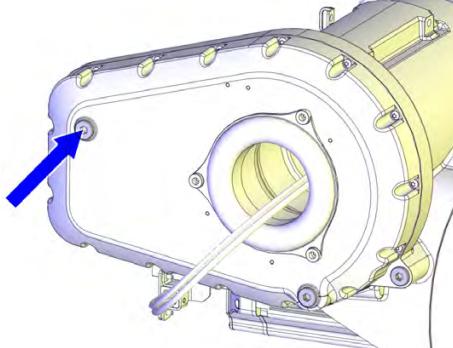
Action	Note
<p>2  DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
<p>3  WARNING</p> <p>Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i></p>	
<p>4  CAUTION</p> <p>The gearbox can contain an <i>excess pressure</i> that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.</p>	
5 Place the oil collecting vessel underneath the oil drain plug.	
6 Remove the oil plug from the drain hole and let the oil run into the vessel.	 xx1200000956
<p>7 Remove the oil plug from the fill/level hole.</p> <p> Note</p> <p>The level hole is opened to speed up the drainage.</p>	 xx1200000957

Continues on next page

Action	Note
8  WARNING Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 789 for more information.	
9 Refill oil or refit the oil plugs.	Tightening torque: 24 Nm.

Filling oil into the axis-4 gearbox

Use this procedure to refill the gearbox with oil.

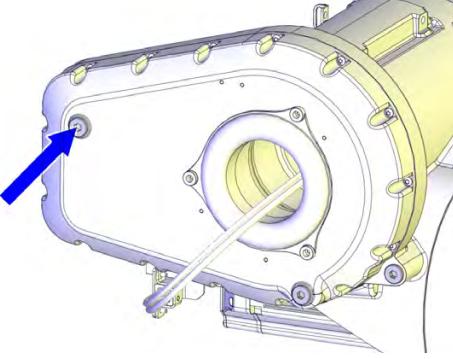
Action	Note
1 Run the robot to calibration position.	
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54 .	
4 Open the fill/level plug.	 xx1200000957
5 Refill the gearbox with oil.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in Technical reference manual - Lubrication in gearboxes .

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3 Maintenance

3.4.5 Changing oil, axis-4 gearbox

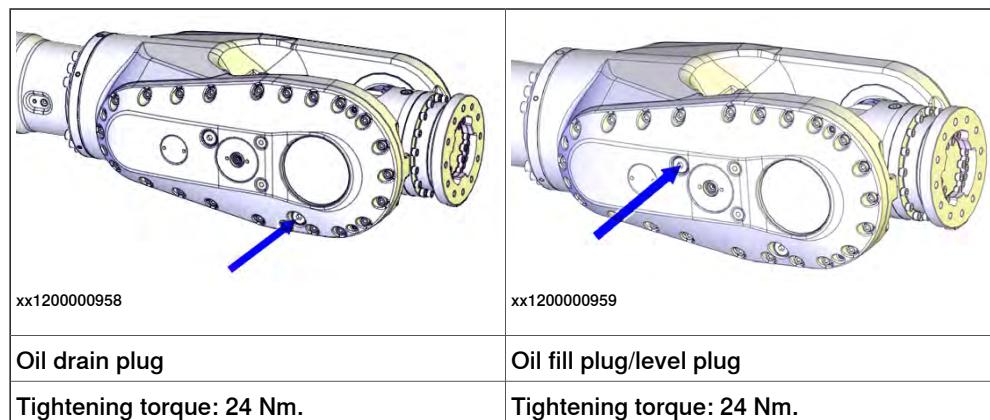
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Action	Note
6 Inspect the oil level.	<p>The level is measured at the fill hole.  xx1200000957 Required oil level is: 0 - 10 mm below the oil plug hole. See Inspecting the oil level in axis-4 gearbox on page 129.</p>
7 Refit the oil plug.	Tightening torque: 24 Nm
8  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3.4.6 Changing oil, axis-5 gearbox

Location of oil plugs

The oil plugs of the gearbox are located as shown in the figure.



Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumable

Material	Note
Lubricating oil	Information about the oil is found in <i>Technical reference manual - Lubrication in gearboxes</i> . See Type and amount of oil in gearboxes on page 156 .

Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

Draining the axis-5 gearbox

Use this procedure to drain the gearbox.

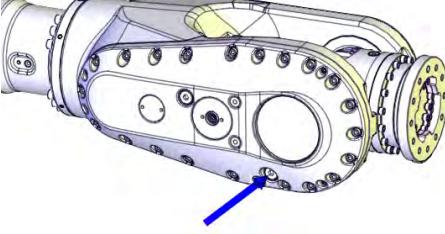
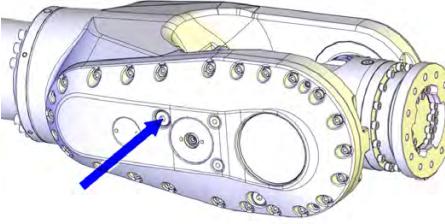
Action	Note
1 Run the robot to calibration position.	

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3 Maintenance

3.4.6 Changing oil, axis-5 gearbox

Continued

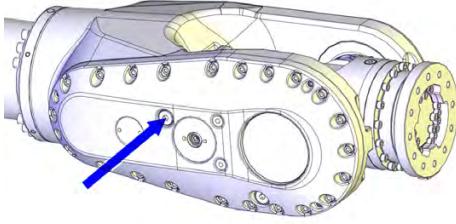
Action	Note
<p>2  DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
<p>3  WARNING</p> <p>Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i></p>	
<p>4  CAUTION</p> <p>The gearbox can contain an <i>excess pressure</i> that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.</p>	
<p>5 Remove the oil plug from the drain hole and let the oil run into the vessel.</p>	 xx1200000958
<p>6 Place the oil collecting vessel underneath the oil drain plug.</p>	
<p>7 Remove the oil plug from the fill/level hole.</p> <p> Note</p> <p>The fill hole is opened to speed up the drainage.</p>	 xx1200000959

Continues on next page

Action	Note
8  WARNING Used oil is hazardous material and must be disposed of in a safe way. See section Decommissioning on page 789 for more information.	
9 Refill oil or refit the oil plug.	Tightening torque: 24 Nm.

Filling oil into the axis-5 gearbox

Use this procedure to refill the gearbox with oil.

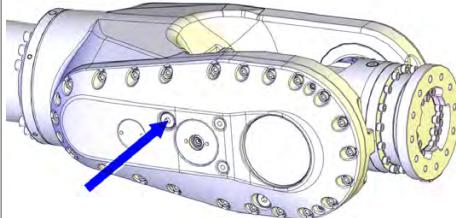
Action	Note
1 Run the robot to calibration position.	
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54 .	
4 Open the fill/level plug.	 xx1200000959
5 Refill the gearbox with oil.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in Technical reference manual - Lubrication in gearboxes .

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3 Maintenance

3.4.6 Changing oil, axis-5 gearbox

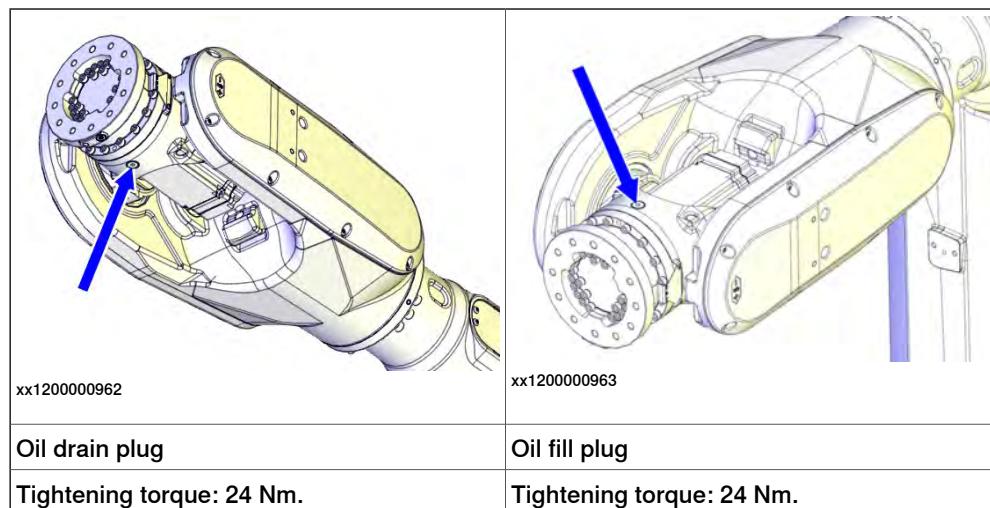
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Action	Note
6 Inspect the oil level at the oil fill/level hole (level plug).	 xx1200000959 Required oil level is: 0 - 10 mm below the oil plug hole. More information is found in Inspecting the oil level in axis-5 gearbox on page 131 .
7 Refit the oil plug.	Tightening torque: 24 Nm
8  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3.4.7 Changing oil, axis-6 gearbox

Location of oil plugs

The oil plugs of the gearbox are located as shown in the figure.



Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumable

Material	Note
Lubricating oil	Information about the oil is found in <i>Technical reference manual - Lubrication in gearboxes</i> . See Type and amount of oil in gearboxes on page 156 .

Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

Draining the axis-6 gearbox

Use this procedure to drain the gearbox.

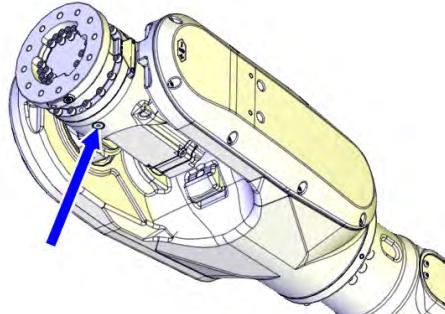
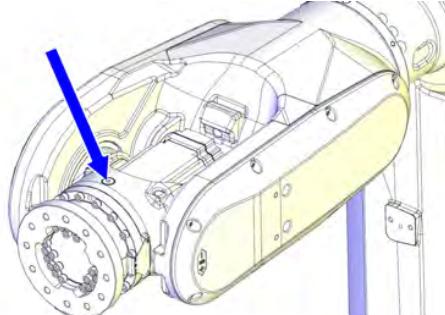
	Action	Note
1	Jog the robot to calibration position.	

Continues on next page

3 Maintenance

3.4.7 Changing oil, axis-6 gearbox

Continued

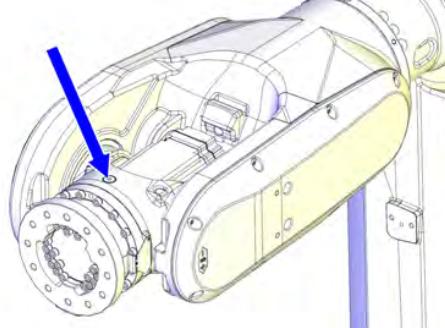
Action	Note
<p>2  DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
<p>3  WARNING</p> <p>Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section <i>WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54.</i></p>	
<p>4  CAUTION</p> <p>The gearbox can contain an <i>excess pressure</i> that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.</p>	
<p>5 Place the oil collecting vessel underneath the oil drain plug.</p>	
<p>6 Remove the oil plug from the drain hole and let the oil run into the vessel.</p>	 <p>xx1200000962</p>
<p>7 Remove the oil plug from the fill hole.</p> <p> Note</p> <p>The fill hole is opened to speed up the drainage.</p>	 <p>xx1200000963</p>

Continues on next page

Action	Note
8  WARNING Used oil is hazardous material and must be disposed of in a safe way. See section Decommissioning on page 789 for more information.	
9 Refill oil or refit the oil plugs.	Tightening torque: 24 Nm.

Filling oil into the axis-6 gearbox

Use this procedure to refill the gearbox with oil.

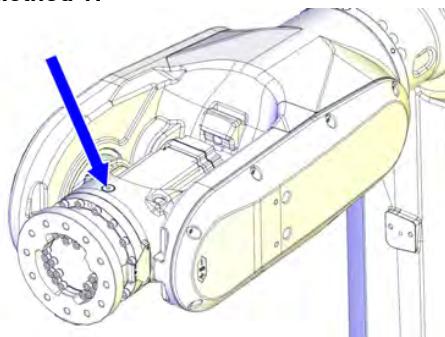
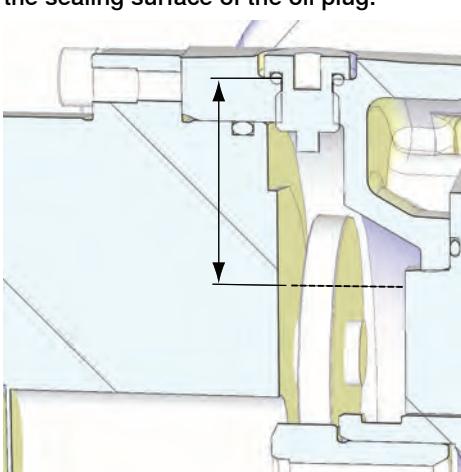
Action	Note
1 Jog axis 5 to horizontal position.	
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54 .	
4 Open the fill plug.	 xx1200000963
5 Refill the gearbox with oil.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in Technical reference manual - Lubrication in gearboxes .

Continues on next page

3 Maintenance

3.4.7 Changing oil, axis-6 gearbox

Continued

Action	Note
6 Check the oil level.  Note The level is measured at the fill hole.	Method 1:  xx1200000963 Robot types 150/3.20, 155/2.85, 175/3.05, 200/2.60, 205/2.80 and 235/2.65: Required oil level is: 50 mm ± 5 mm below the sealing surface of the oil plug. Robot types 300/2.70 and 245/3.00: Required oil level is: 45 mm ± 5 mm below the sealing surface of the oil plug.  xx1300000693 More information is found in Inspecting the oil level in axis-6 gearbox on page 134 . Method 2: Rotate axis 5 +77°. Required oil level is: 0 - 10 mm below the oil plug hole.
7 Refit the oil plug.	Tightening torque: 24 Nm
8  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

3.4.8 Replacing the SMB battery



Note

The battery low alert (38213 Battery charge low) is displayed when the battery needs to be replaced. The recommendation to avoid an un-synchronized robot is to keep the power to the controller turned on until the battery is to be replaced.

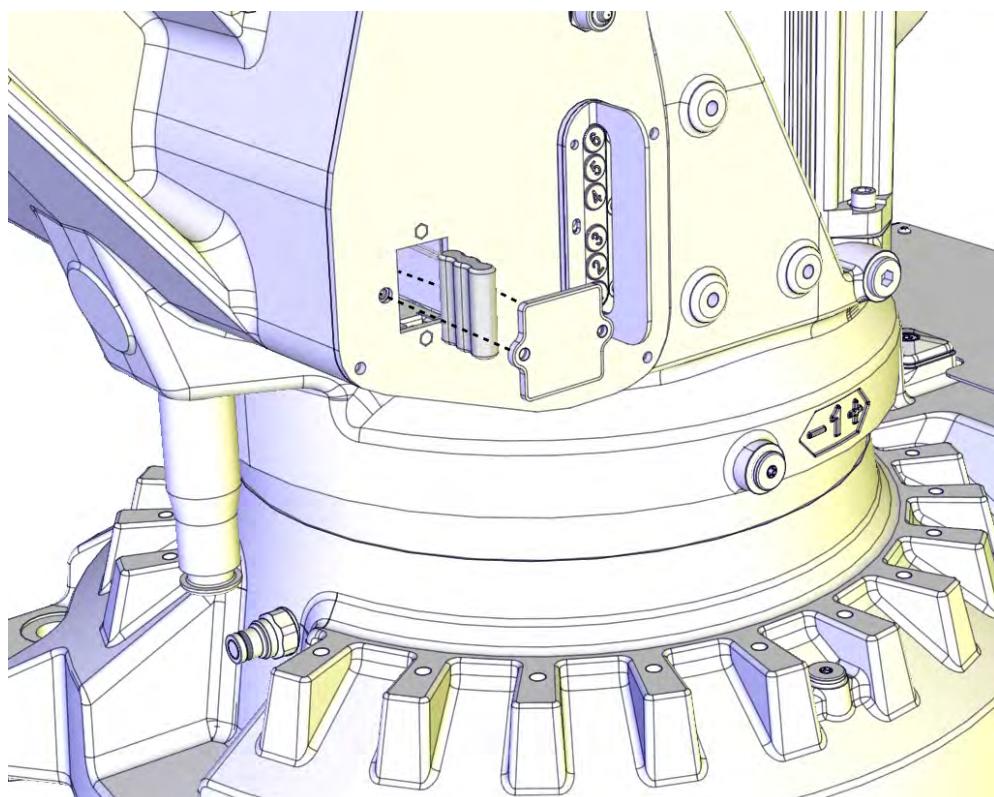


WARNING

See instructions for batteries, [WARNING - Safety risks during handling of batteries on page 53](#).

Location of SMB battery

The SMB battery (SMB = serial measurement board) is located on the frame as shown in the figure below.



xx1200001069

Required tools

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Continues on next page

3 Maintenance

3.4.8 Replacing the SMB battery

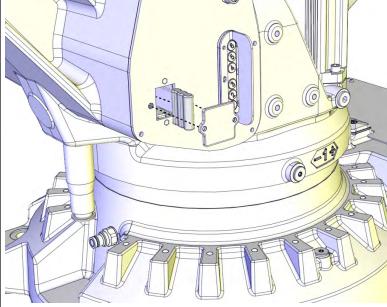
Continued

Required spare parts

Spare part	Article number	Note
Battery unit	For spare part number, see: • Spare parts on page 811	Battery includes protection circuits. Only replace with the specified spare part or an ABB-approved equivalent.

Removing the battery

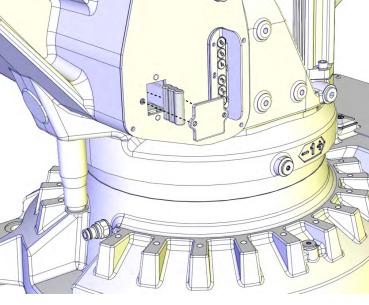
Use this procedure to remove the SMB battery.

	Action	Note
1	Move the robot to its calibration position.	This is done in order to facilitate updating of the revolution counter.
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	
4	Remove the SMB battery cover by unscrewing the attachment screws.	
5	Pull out the battery and disconnect the battery cable.	
6	Remove the SMB battery. Battery includes protection circuits. Only replace with a specified spare part or with an ABB-approved equivalent.	

Continues on next page

Refitting the battery

Use this procedure to refit the SMB battery.

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	
3	Connect the battery cable and install the battery pack into the SMB/battery recess.	
4	Secure the SMB battery cover with its attachment screws.	 xx1200001069
5	Update the revolution counters.	See Updating revolution counters on page 770 .
6	 DANGER Make sure all safety requirements are met when performing the first test run. These are further described in the section DANGER - First test run may cause injury or damage! on page 48 .	

3 Maintenance

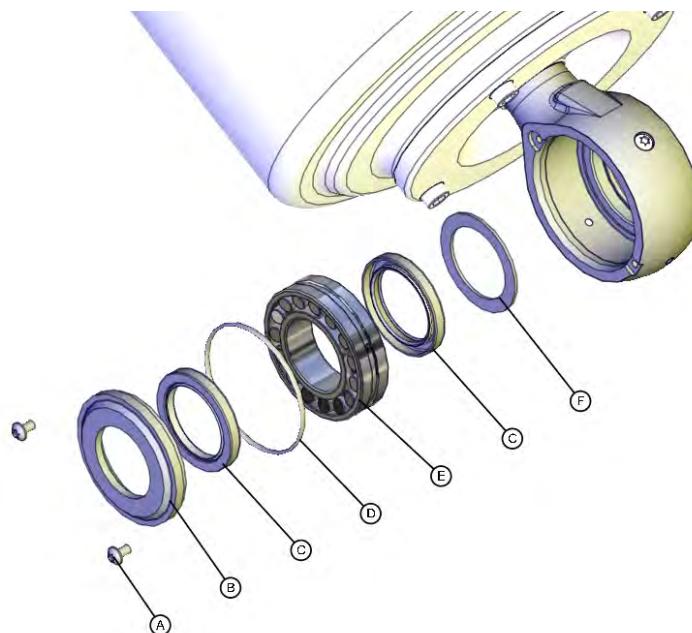
3.5.1 Lubricating the spherical roller bearing, balancing device

3.5 Lubrication activities

3.5.1 Lubricating the spherical roller bearing, balancing device

Location of spherical roller bearing

The spherical roller bearing is located in the link ear of the balancing device.



xx1300000773

A	Attachment screws M6x10 quality 8.8-A2F (2 pcs)
B	End cover
C	Radial sealing with dust lip, 50x68x8 (2 pcs)
D	O-ring 85
E	Spherical roller bearing
F	Washer

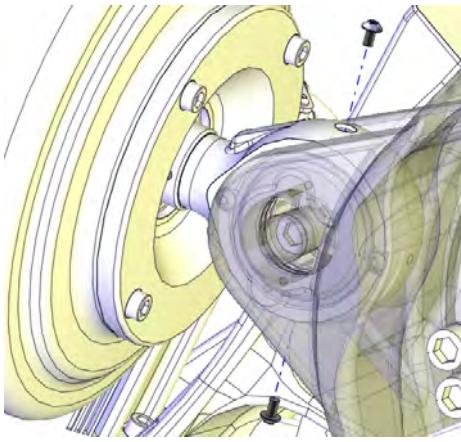
Consumables

Equipment, etc.	Article number	Note
Grease	3HAA1001-294	Tribol GR 100-0 PD, 50 ml Used for lubrication of the spherical roller bearing.

Continues on next page

Lubricating the spherical roller bearing

Use this procedure to lubricate the spherical roller bearing.

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	Unscrew both screws in link ear and fill the bearing with grease from the upper hole until the grease appears in the lower hole.	Grease: 3HAA1001-294  xx1300000783
3	Refit the two screws and wipe clean from residual grease.	

3 Maintenance

3.6.1 Cleaning the IRB 6700

3.6 Cleaning activities

3.6.1 Cleaning the IRB 6700



WARNING

Turn off all electrical power supplies to the manipulator before entering its work space.

General

To secure high uptime it is important that the IRB 6700 is cleaned regularly. The frequency of cleaning depends on the environment in which the manipulator works. Different cleaning methods are allowed depending on the type of protection of the IRB 6700 .



Note

Always verify the protection type of the robot before cleaning.

Oil spills

Oil spills from gearboxes

Use the following procedure if any oil spills are detected that can be suspected to originate from a gearbox.

- 1 Inspect that the oil level in the suspected gearbox is according to the recommendations, see [Inspection activities on page 116](#).
- 2 Write down the oil level.
- 3 Inspect the oil level again after, for example, 6 months.
- 4 If the oil level is decreased then replace the gearbox.

Oil spills discolors painted surfaces

Oil spills on painted surfaces of the robot can result in discoloration.



Note

After all repair and maintenance work involving oil, always wipe the robot clean from all surplus oil.

Dos and don'ts!

This section specifies some special considerations when cleaning the robot.

Always!

- 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!

Continues on next page

Never!

- Never point the water jet at connectors, joints, sealings, or gaskets!
- Never use compressed air to clean the robot!
- Never use solvents that are not approved by ABB to clean the robot!
- Never spray from a distance closer than 0.4 meters!
- Never remove any covers or other protective devices before cleaning the robot!

Cleaning methods

These following table defines what cleaning methods are allowed for ABB manipulators depending on the protection type.

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water or steam
Standard	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 ⁱ . It is highly recommended that the water and steam contains rust preventive, without cleaning detergents.

ⁱ Perform according to section [Cleaning with water and steam on page 193](#).

Cleaning with water and steam**Instructions for rinsing with water**

ABB robots with protection types *Standard*, *Foundry Plus*, *Wash*, or *Foundry Prime* can be cleaned by rinsing with water (water cleaner).¹

The following list defines the prerequisites:

- Maximum water pressure at the nozzle: 700 kN/m² (7 bar)¹
- Fan jet nozzle should be used, min. 45° spread
- Minimum distance from nozzle to encapsulation: 0.4 meters
- Maximum flow: 20 liters/min¹

¹ 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.²

¹ See [Cleaning methods on page 193](#) for exceptions.

² See [Cleaning methods on page 193](#) for exceptions.

Continues on next page

3 Maintenance

3.6.1 Cleaning the IRB 6700

Continued

The following list defines the prerequisites:

- Maximum water pressure at the nozzle: 2500 kN/m² (25 bar)
- Fan jet nozzle should be used, min. 45° spread
- Minimum distance from nozzle to encapsulation: 0.4 meters
- 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.

4 Repair

4.1 Introduction

Structure of this chapter

This chapter describes all repair activities recommended for the IRB 6700 and any external unit.

It is made up of separate procedures, each describing a specific repair activity. Each procedure contains all 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. Otherwise damage to the mechanics and electronics may occur.

Required equipment

The details of the equipment required to perform a specific repair activity are listed in the respective procedures.

The details of equipment are also available in different lists in the chapter [Reference information on page 797](#).

Safety information

There are general safety information and specific safety information. The specific safety information describes the danger and safety risks while performing specific steps in a procedure. Make sure to read through the chapter [Safety on page 17](#) before commencing any service work.



Note

If the IRB 6700 is connected to power, always make sure that the IRB 6700 is connected to earth before starting any repair work.

For more information see:

- *Product manual - IRC5*

4 Repair

4.2.1 Performing a leak-down test

4.2 General procedures

4.2.1 Performing a leak-down test

When to perform a leak-down test

After refitting any motor and gearbox, the integrity of all seals enclosing the gearbox oil must be tested. This is done in a leak-down test.

Required equipment

Equipment, etc.	Article number	Note
Leak-down tester	-	
Leak detection spray	-	

Performing a leak-down test

Action	Note
1 Finish the refitting procedure of the motor or gear in question.	
2 Remove the topmost oil plug on the gear and replace it with the <i>leak-down tester</i> . Regulators, which are included in the leak-down test, may be required.	
3 Use caution, apply compressed air and raise the pressure with the knob until the correct value is shown on the manometer.  CAUTION The pressure must under no circumstance be higher than 0.25 bar (20-25 kPa). Also during the time when the pressure is raised.	Correct value: 0.2-0.25 bar (20-25 kPa)
4 Disconnect the compressed air supply.	
5 Wait for approximately 8-10 minutes and make sure that no pressure loss occurs.	If the compressed air is significantly colder or warmer than the gearbox to be tested, a slight pressure increase or decrease may occur. This is quite normal.
6 If any pressure drop occurred, then localize the leak as described in step 7. If no pressure drop occurred, then remove the leak-down tester and refit the oil plug. The test is complete.	
7 Spray any suspected leak areas with the leak detection spray. Bubbles indicate a leak.	
8 When the leak has been localized, take the necessary measures to correct the leak.	

4.2.2 Mounting instructions for bearings

General

This section describes how to mount and grease different types of bearings on the robot.

Equipment

Equipment, etc.	Article number	Note
Grease	3HAB3537-1	Used to grease the bearings, if not specified otherwise.

Assembly of all bearings

Follow the following instructions while mounting a bearing on the robot.

Action	Note
1 To avoid contamination, let a new bearing remain in its wrapping until it is time for fitting.	
2 Ensure that the parts included in the bearing fitting are free from burrs, grinding waste, and other contamination. Cast components must be free of foundry sand.	
3 Bearing rings, inner rings, and roller elements must not be subjected to direct impact. The roller elements must not be exposed to any stresses during the assembly work.	

Assembly of tapered bearings

Follow the preceding instructions for the assembly of the bearings when mounting a tapered bearing on the robot.

In addition to those instructions, the following procedure must be carried out to enable the roller elements to adjust to the correct position against the race flange.

Action	Note
1 Tension the bearing gradually until the recommended pre-tension is achieved.  Note The roller elements must be rotated a specified number of turns before pre-tensioning is carried out and also rotated during the pre-tensioning sequence.	
2 Make sure the bearing is properly aligned as this will directly affect the durability of the bearing.	

Greasing of bearings

The bearings must be greased after assembly according to the following instructions:

- The bearings must not be completely filled with grease. However, if space is available beside the bearing fitting, the bearing may be totally filled with grease when mounted, as excessive grease will be pressed out from the bearing when the robot is started.

Continues on next page

4 Repair

4.2.2 Mounting instructions for bearings

Continued

- During operation, the bearing should be filled to 70-80% of the available volume.
- Ensure that grease is handled and stored properly to avoid contamination.

Grease the different types of bearings as following description:

- *Grooved ball bearings* must be filled with grease from both sides.
- *Tapered roller bearings* and axial needle bearings must be greased in the split condition.

4.2.3 Mounting instructions for seals

General

This section describes how to mount different types of seals onto the robot.

Equipment

Equipment, etc.	Article number	Note
Grease	3HAB3537-1	Used to lubricate the seals.

Rotating seals

The procedure below describes how to fit rotating seals.



CAUTION

Please observe the following before commencing any assembly of seals:

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

	Action	Note
1	Check the seal to ensure that: <ul style="list-style-type: none"> • The seal is of the correct type (provided with cutting edge). • There is no damage to the sealing edge (feel with a fingernail). 	
2	Inspect the sealing surface before mounting. If scratches or damage are found, the seal must be replaced since it may result in future leakage.	
3	Lubricate the seal with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the seal.) Fill 2/3 of the space between the dust tongue and sealing lip with grease. The rubber coated external diameter must also be greased, unless otherwise specified.	Article number is specified in Equipment on page 199 .
4	Mount the seal correctly with a mounting tool. Never hammer directly on the seal as this may result in leakage.	

Continues on next page

4 Repair

4.2.3 Mounting instructions for seals

Continued

Flange seals and static seals

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

Action	
1	Check the flange surfaces. They must be even and free from pores. It is easy to check flatness using a gauge on the fastened joint (without sealing compound). 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.

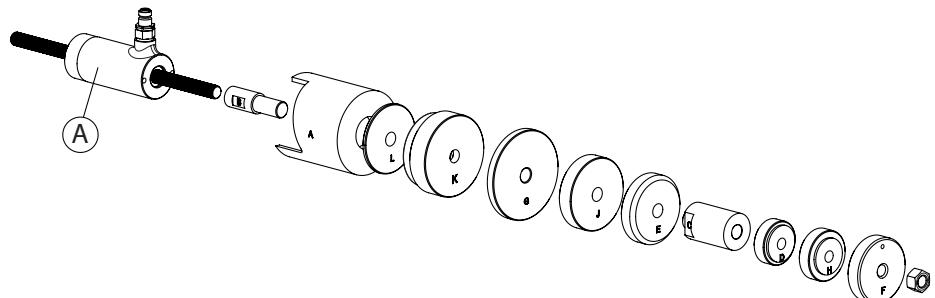
Action	Note
1 Ensure that the correct o-ring size is used.	
2 Check the o-ring for surface defects, burrs, shape accuracy, and so on.	Defective o-rings may not be used.
3 Check the o-ring grooves. The grooves must be geometrically correct and should be free of pores and contamination.	Defective o-rings may not be used.
4 Lubricate the o-ring with grease.	
5 Tighten the screws evenly while assembling.	

4.2.4 Dismantle and mounting tool, 3HAC028920-001

Dismantle and mounting tool

The dismantle and mounting tool is used to replace shafts and replace bearings and sealings in several of the following instructions. Only some of the tool parts are needed in each procedure. The procedure specifies which tool to be used.

The complete tool set (3HAC028920-001), as follows.



xx1700000383

Part A can be ordered separately, 3HAC028920-002.

4 Repair

4.3.1 Attaching lifting accessories to complete arm system (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

4.3 Lifting associated procedures

4.3.1 Attaching lifting accessories to complete arm system (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Validity of this section - IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85



Note

Some sections have similar titles. Make sure to use the correct section, to find information about a certain IRB 6700 variant.

This section describes how to attach lifting accessories to variants IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85

How to attach lifting accessories to variants IRB 6700 -300/2.70, -245/3.00 see section [4.3.2 Attaching lifting accessories to complete arm system](#).

Definition of the complete arm system

The complete arm system consists of the following parts of the robot:

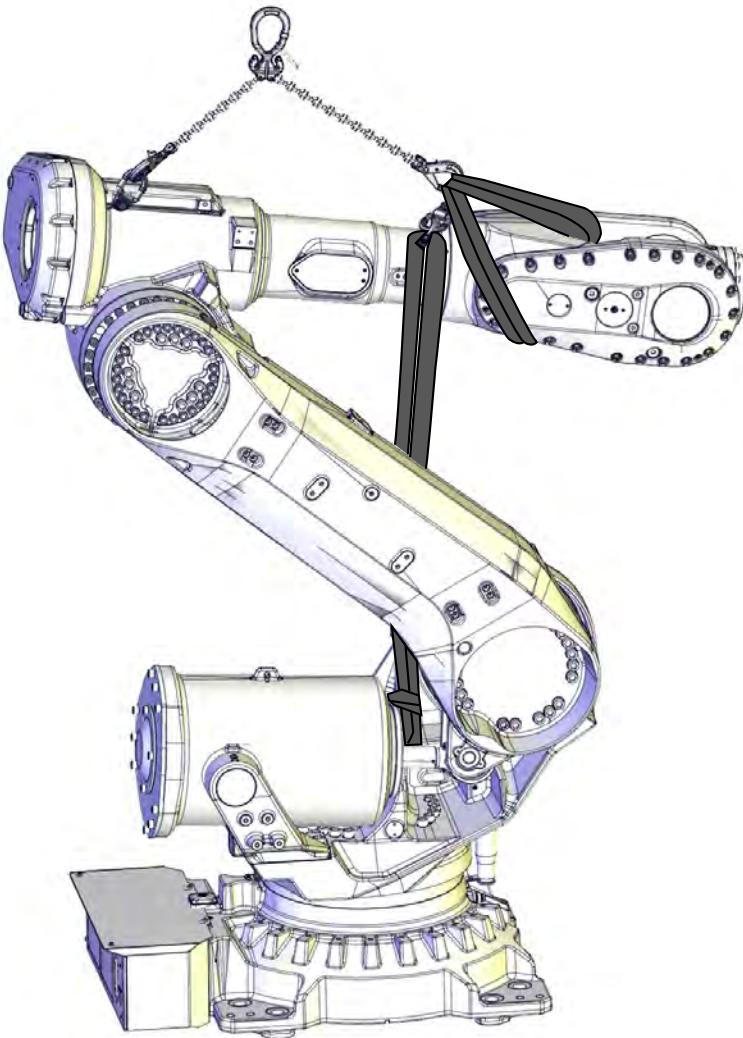
- upper arm
- wrist
- lower arm
- frame.

Continues on next page

4.3.1 Attaching lifting accessories to complete arm system (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Attachment points of lifting accessory



Required tools

Equipment, etc.	Article number	Note
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC16131-1	M12
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting shackle	-	SA-10-8-NA1
Roundsling, 1.5 m	-	Length: 1.5 m. Lifting capacity: 2,000 kg.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

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4 Repair

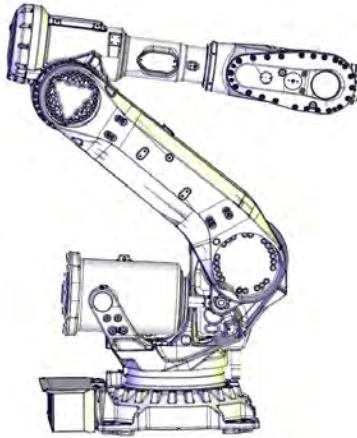
4.3.1 Attaching lifting accessories to complete arm system (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Attaching the lifting accessories

Robot position

Use this procedure to jog the robot into position - variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

	Action	Note
1	<p>Jog the robot into position:</p> <ul style="list-style-type: none">• Axis 1: no significance as long as the robot is secured to the foundation.• Axis 2: -45°• Axis 3: +50° to 55° (approximately)• Axis 4, 5 and 6: calibration position (0°)	 xx1200001132
2	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply <p>to the robot, before entering the robot working area.</p>	

Attaching lifting accessories to the arm system

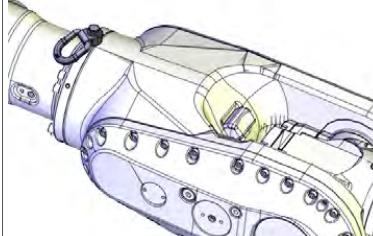
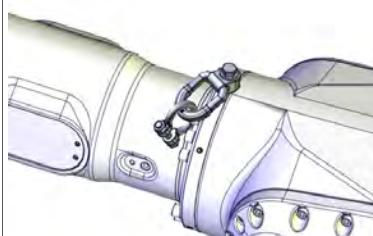
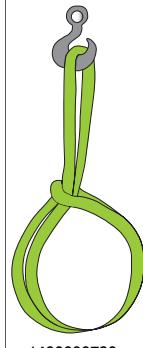
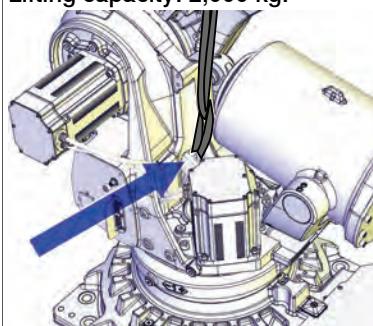
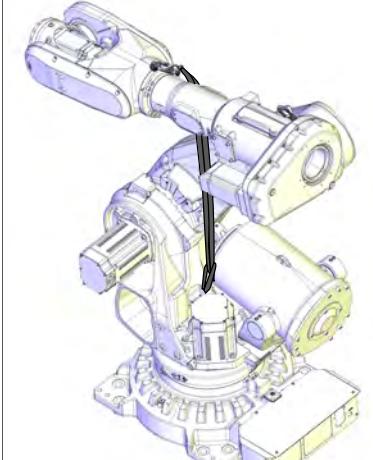
Use this procedure to attach the lifting accessories on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>The complete arm system weigh (according to variants) 1100 kg.</p> <p>All lifting accessories used must be sized accordingly!</p>	

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4.3.1 Attaching lifting accessories to complete arm system (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

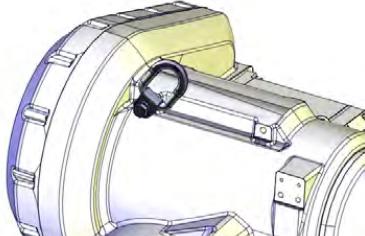
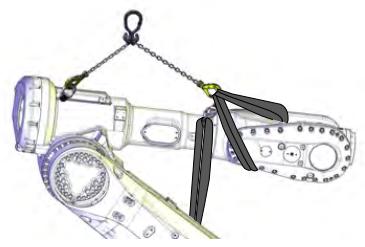
Action	Note
3 Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1  xx1200001133
4 Fit a lifting shackle in the wrist lifting eye.	Lifting shackle: SA-10-8-NA1  xx1200001234
5 Run a roundsling through the hole in the frame. Attach the roundsling choked. See figure! 	Roundsling, 1.5 m: Length: 1.5 m. Lifting capacity: 2,000 kg.  xx1200001209
6 Attach the roundsling to the shackle on the wrist and jog axis-3 slowly to stretch the roundsling.  Note Make sure the roundsling is stretched, so it can carry the weight of the frame.	 xx1200001235

Continues on next page

4 Repair

4.3.1 Attaching lifting accessories to complete arm system (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
7	<p>Fit a lifting eye in the arm house, with a fender washer underneath.</p>  xx1400002196 Fender washer	<p>Lifting eye: 3HAC16131-1 Fender washer. Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.</p>  xx1200001134
8	<p>Attach the Lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and to a roundsling run through the wrist.</p>	<p>Lifting accessory (chain): 3HAC15556-1 Roundsling, 1 m: Length: 1 m. Lifting capacity: 1,000 kg.</p>  xx1200001236

4.3.2 Attaching lifting accessories to complete arm system (IRB 6700 -300/2.70, -245/3.00)

4.3.2 Attaching lifting accessories to complete arm system (IRB 6700 -300/2.70, -245/3.00)**Validity of this section - IRB 6700 -300/2.70, -245/3.00****Note**

Some sections have similar titles. Make sure to use the correct section, to find information about a certain IRB 6700 variant.

This section describes how to attach lifting accessories to variants IRB 6700 -300/2.70, -245/3.00

How to attach lifting accessories to variants IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85 see section *4.3.1 Attaching lifting accessories to complete arm system*.

Definition of the complete arm system

The complete arm system consists of the following parts of the robot:

- upper arm
- wrist
- lower arm
- frame, including the balancing device.

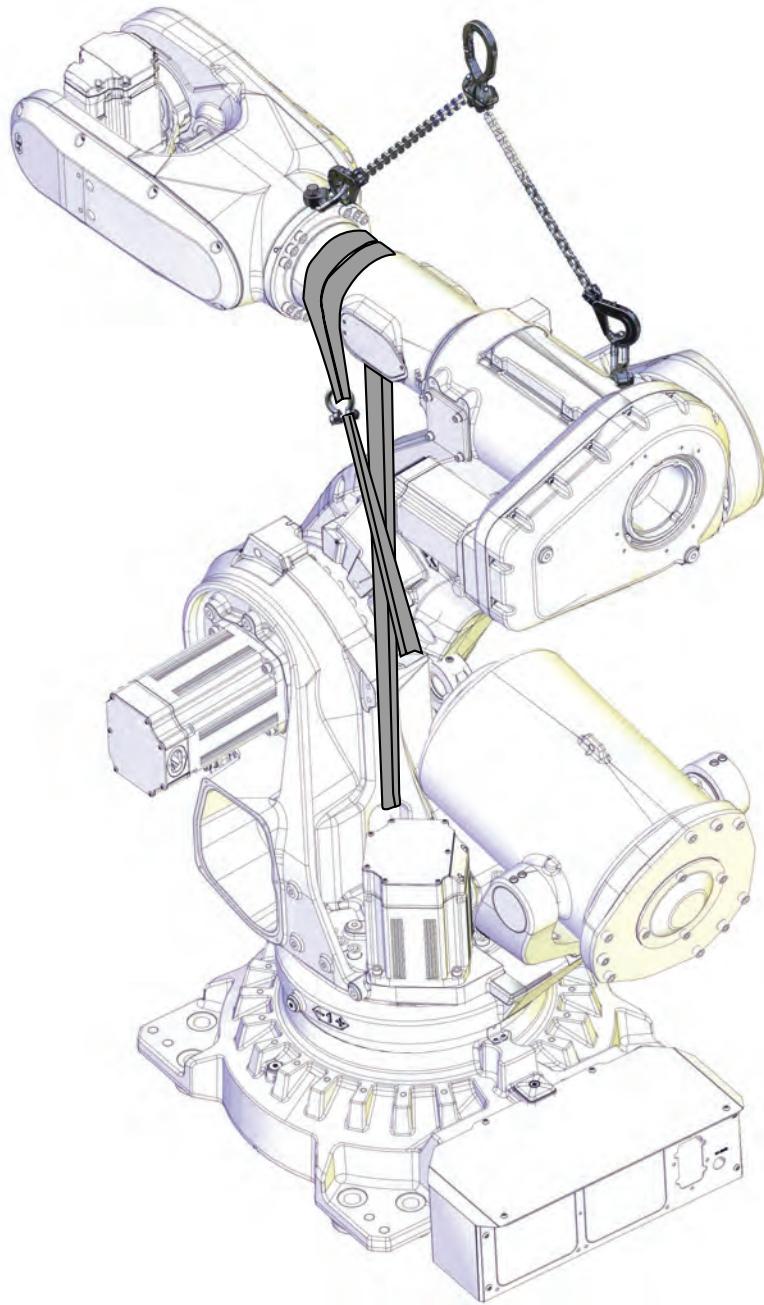
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4 Repair

4.3.2 Attaching lifting accessories to complete arm system (IRB 6700 -300/2.70, -245/3.00)

Continued

Attachment points of lifting accessory



xx1400002080

Required tools

Equipment, etc.	Article number	Note
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC16131-1	M12
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting shackle	-	SA-10-8-NA1

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4.3.2 Attaching lifting accessories to complete arm system (IRB 6700 -300/2.70, -245/3.00)

Continued

Equipment, etc.	Article number	Note
Roundsling, 1.5 m	-	Length: 1.5 m. Lifting capacity: 2,000 kg.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Attaching the lifting accessories**Robot position**

	Action	Note
1	<p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance (as long as the robot is secured to the foundation) • Axis 2: -45° • Axis 3: +65° • Axis 4: 0° • Axis 5: +90° • Axis 6: calibration position (0°) 	
2	 DANGER <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	

Attaching the lifting accessories to the arm system

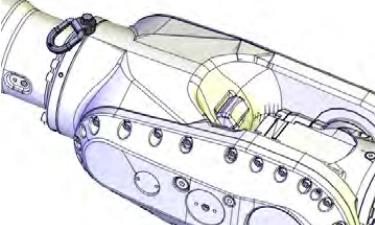
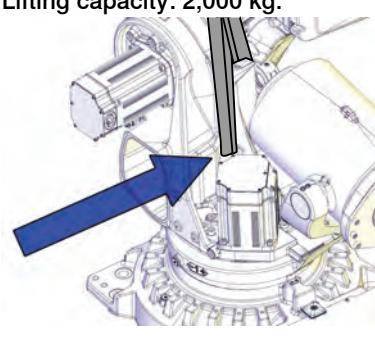
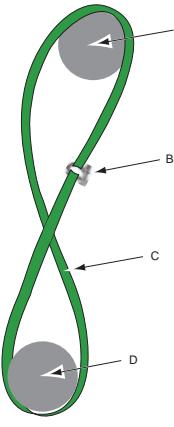
	Action	Note
1	 DANGER <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 CAUTION <p>The complete arm system weighs 1300 Kg. All lifting accessories used must be sized accordingly!</p>	

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4 Repair

4.3.2 Attaching lifting accessories to complete arm system (IRB 6700 -300/2.70, -245/3.00)

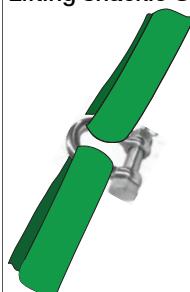
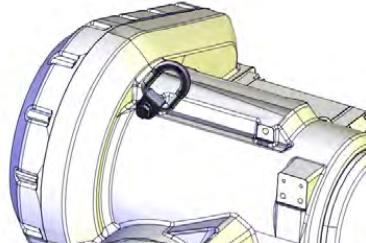
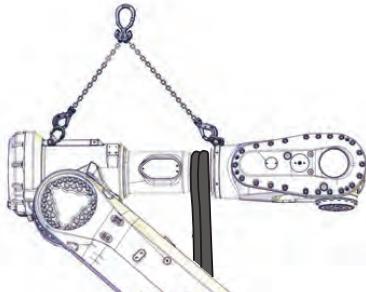
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Action	Note
3 Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1  xx1200001133
4 Run a roundsling through the hole in the frame.	Roundsling, 2.5 m: Length: 2.5 m. Lifting capacity: 2,000 kg.  xx1400002107
5 Continue to run the roundsling up and over the upper arm.  Tip When attaching the roundsling, make sure to cross it over, creating a figure 8 of the roundsling. This will prevent the roundsling from gliding.	 xx1400000728 A Upper arm B Shackle C Roundsling D Hole in frame

Continues on next page

4.3.2 Attaching lifting accessories to complete arm system (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
6	Connect the roundsling with a shackle.	Lifting shackle SA-10-8-NA1  xx1400000729
7	Use caution and jog axis-3 slowly to stretch the roundsling.  Note Make sure the roundsling is stretched, so it can carry the weight of the frame.	
8	Fit a lifting eye to the arm house, with a fender washer underneath.  xx1400002196	Lifting eye: 3HAC16131-1 Fender washer. Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.  xx1200001134
9	Attach the Lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and to the lifting eye in the wrist.	Lifting accessory (chain): 3HAC15556-1  xx1400002108

4 Repair

4.3.3 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

4.3.3 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Validity of this section - IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85



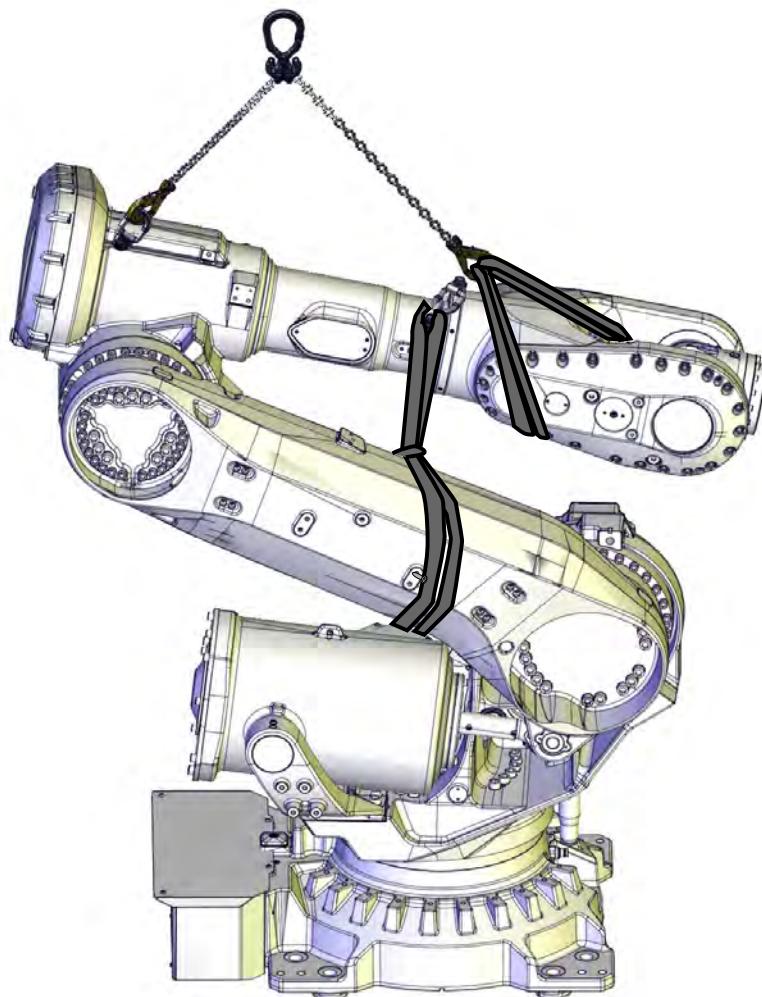
Note

Some sections have similar titles. Make sure to use the correct section, to find information about a certain IRB 6700 variant.

This section describes how to attach lifting accessories to variants IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85

How to attach lifting accessories to variants IRB 6700 -300/2.70, -245/3.00 see section **4.3.4 Attaching lifting accessories to an unseparated lower and upper arm.**

Attachment points of lifting accessory



xx1200001254

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4.3.3 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Required tools

Equipment, etc.	Article number	Note
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC16131-1	M12
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting shackle	-	SA-10-8-NA1
Roundsling, 1.5 m	-	Length: 1.5 m. Lifting capacity: 2,000 kg.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

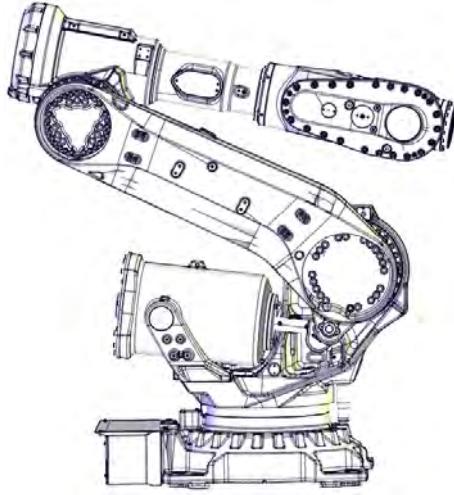
Attaching lifting accessories to the lower and upper arm

Robot position



Note

This procedure describes the position of variants IRB 6700 -235/2.65, -205/2.80, -174/3.05, -150/3.20, 200/2.60, -155/2.85. Make sure to jog the robot to the correct position depending on variant.

	Action	Note
1	Note When jogging the axis-2 into position check that the balancing device ear and the ear on the lower arm is not colliding!	
2	Jog the robot into position: <ul style="list-style-type: none"> • Axis-1: no significance as long as the robot is secured to the foundation • Axis-2: -45° • Axis-3: +65° (approximately) • Axis-4: 0° • Axis-5: 0° • Axis-6: 0°. 	 xx1200001250

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4 Repair

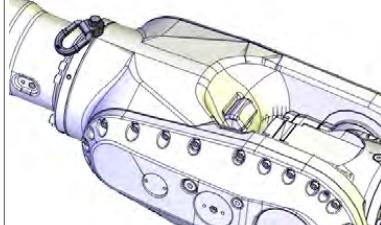
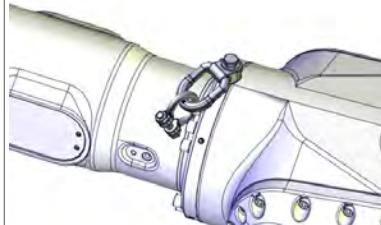
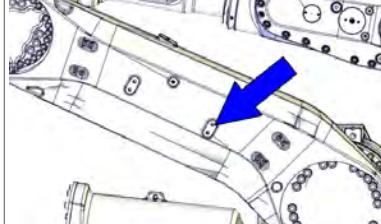
4.3.3 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

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

Attaching lifting accessories to the lower and upper arm

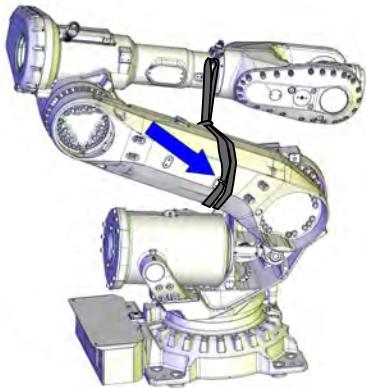
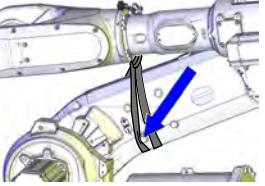
Use this procedure to attach the lifting accessories.

Action	Note
<p>1</p> <p> CAUTION</p> <p>The lower and upper arms together weigh (according to variants) 510 kg. All lifting accessories used must be sized accordingly!</p>	
<p>2</p> <p>Fit a lifting eye to the wrist.</p>	<p>Lifting eye: 3HAC16131-1</p>  <p>xx1200001133</p>
<p>3</p> <p>Fit a lifting shackle in the wrist lifting eye.</p>	<p>Lifting shackle: SA-10-8-NA1</p>  <p>xx1200001234</p>
<p>4</p> <p>In order to secure the roundsling from gliding when lifting:</p> <ul style="list-style-type: none"> • <i>With no DressPack cable package installed:</i> Insert a M12x50 securing screw, not more than 10-15 mm, into the screw hole shown in the figure. • <i>With DressPack cable package installed:</i> Use the ball joint housing in the same way. 	 <p>xx1200001251</p>

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4.3.3 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

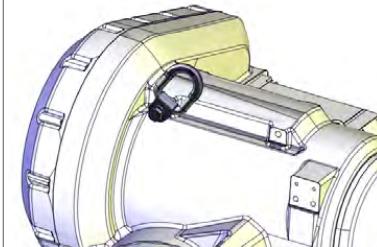
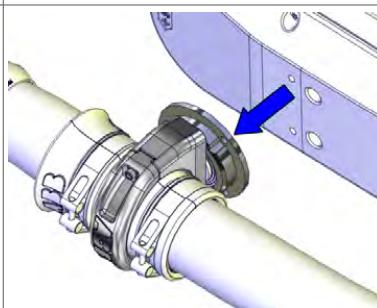
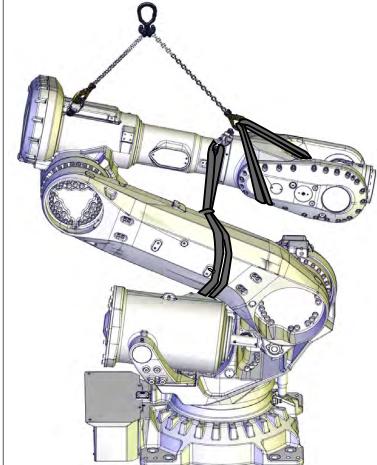
Action	Note
5 Run a roundsling around the lower arm, place it accordingly: <ul style="list-style-type: none"> • <i>With no DressPack cable package installed:</i> Place the roundsling beneath the securing screw. • <i>With DressPack cable package installed:</i> Place the roundsling beneath the ball joint housing on the outside of the lower arm. 	Roundsling, 1.5 m: Length: 1.5 m. Lifting capacity: 2,000 kg.  xx1200001252
6 Adjust the roundsling on the other side of the lower arm, so that the roundsling runs on the left side of the most lower of the four bosses. This will prevent the roundsling from gliding.	
7 Attach the roundsling to the shackle on the wrist.	 xx1200001253
8 Stretch the roundsling between the wrist and the lower arm by slowly jogging the axis-3. Note Make sure the roundsling is stretched, in order to carry the weight of the lower arm.	
9  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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4 Repair

4.3.3 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
10	<p>Fit a lifting eye in the arm house, with a fender washer underneath.</p>  <p>xx1400002196</p>	<p>Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.</p>  <p>xx1200001134</p>
11	<p>If the robot is equipped with DressPack, unscrew the attachment screws of the bracket that holds the ball joint housings on the wrist. The DressPack can stay fitted in the ball joint housing.</p>	 <p>xx1400000355</p>
12	<p>Move the DressPack cable package over to the other side of where the lifting accessory will be attached to the shackle on the arm house.</p>	
13	<p>Attach the Lifting accessory (chain) to an overhead crane (or similar), then to the lifting eye in the arm house and to a roundsling run through the wrist.</p>	<p>Lifting accessory (chain): 3HAC15556-1 Roundsling, 1 m: Length: 1 m. Lifting capacity: 1,000 kg.</p>  <p>xx1200001254</p>
14	<p>Raise the overhead crane to stretch the chains and roundslings. Verify that the roundsling between the wrist and the lower arm is stretched.</p>	

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4.3.3 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)*Continued*

	Action	Note
15	To release the brake, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor: <ul style="list-style-type: none">• + = pin 2• - = pin 5	

4 Repair

4.3.4 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700 -300/2.70, -245/3.00)

4.3.4 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700 -300/2.70, -245/3.00)

Validity of this section - IRB 6700 -300/2.70, -245/3.00



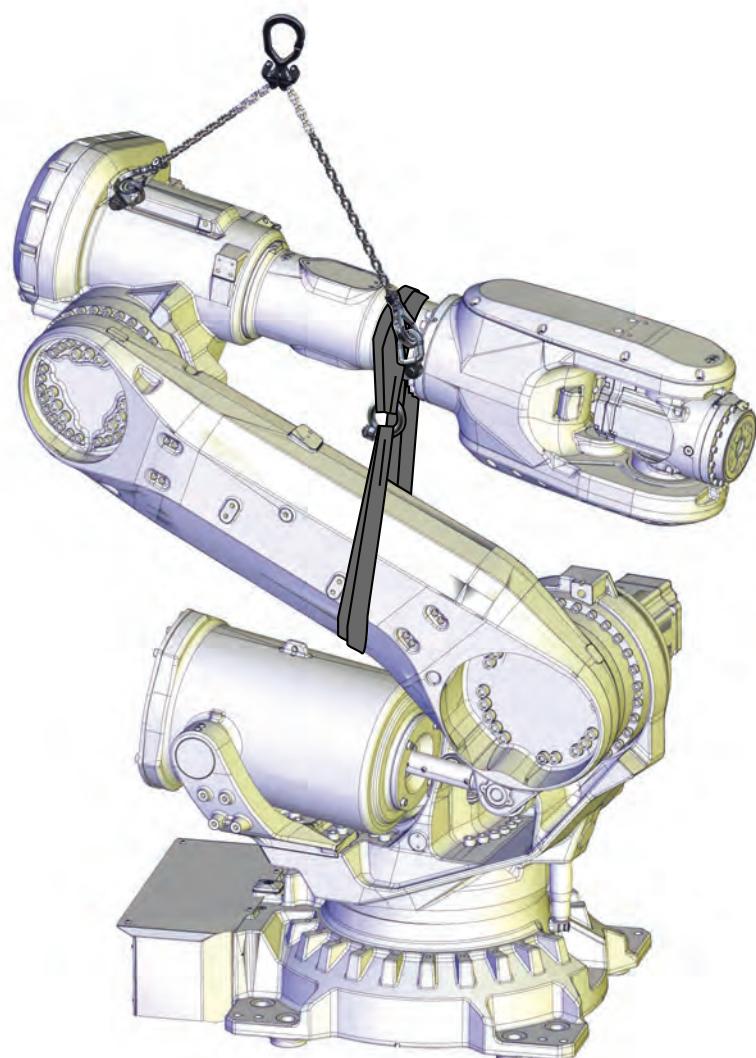
Note

Some sections have similar titles. Make sure to use the correct section, to find information about a certain IRB 6700 variant.

This section describes how to attach lifting accessories to variants IRB 6700 -300/2.70, -245/3.00

How to attach lifting accessories to variants IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85 see section **4.3.3 Attaching lifting accessories to an unseparated lower and upper arm**.

Attachment points of lifting accessory



xx1400002104

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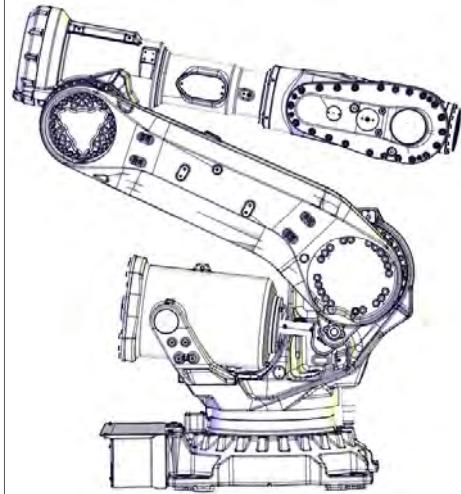
4.3.4 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700 -300/2.70, -245/3.00)

Continued

Required tools

Equipment, etc.	Article number	Note
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC16131-1	M12
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting shackle	-	SA-10-8-NA1
Roundsling, 1.5 m	-	Length: 1.5 m. Lifting capacity: 2,000 kg.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Attaching lifting accessories to the lower and upper arm**Robot position**

	Action	Note
1	 Note When jogging the axis-2 into position check that the balancing device ear and the ear on the lower arm is not colliding!	
2	Jog the robot into position: <ul style="list-style-type: none"> • Axis-1: no significance as long as the robot is secured to the foundation. Otherwise jog to 0° position. • Axis-2: -60° • Axis-3: +70° (approximately) • Axis-4: +90° • Axis-5: 0° • Axis-6: 0°. 	 xx1200001250

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4 Repair

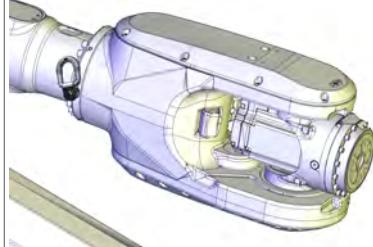
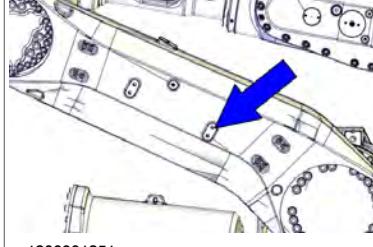
4.3.4 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700 -300/2.70, -245/3.00)

Continued

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

Attaching lifting accessories to the lower and upper arm

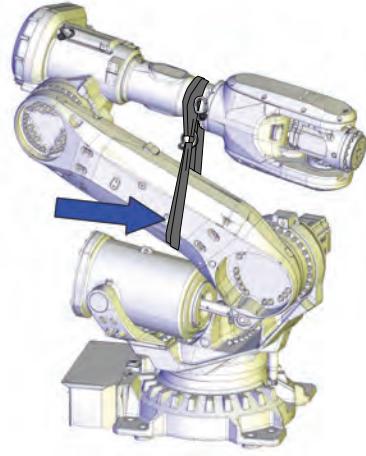
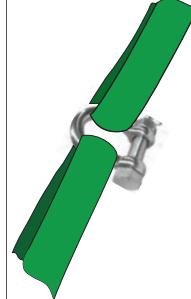
Use this procedure to attach the lifting accessories.

Action	Note
<p>1  CAUTION</p> <p>The lower and upper arms together weigh (according to variants) 650 kg.</p> <p>All lifting accessories used must be sized accordingly!</p>	
2 Fit a lifting eye to the wrist.	<p>Lifting eye: 3HAC16131-1</p>  <p>xx1400002106</p>
3 In order to secure the roundsling from gliding when lifting: <ul style="list-style-type: none"> • <i>With no DressPack cable package installed:</i> Insert a M12x50 securing screw, not more than 10-15 mm, into the screw hole shown in the figure. • <i>With DressPack cable package installed:</i> Use the ball joint housing in the same way. 	 <p>xx1200001251</p>

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4.3.4 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700 -300/2.70, -245/3.00)

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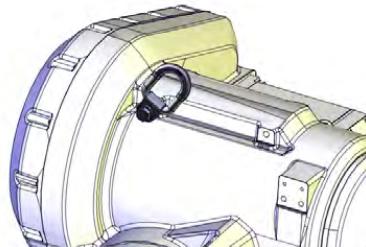
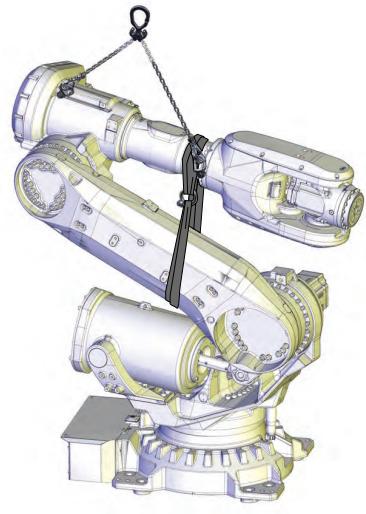
	Action	Note
4	<p>Run a roundsling around the lower arm, place it accordingly:</p> <ul style="list-style-type: none"> <i>With no DressPack cable package installed:</i> Place the roundsling beneath the securing screw. <i>With DressPack cable package installed:</i> Place the roundsling beneath the ball joint housing on the outside of the lower arm. 	<p>Roundsling, 2.5 m: Length: 2.5 m. Lifting capacity: 2,000 kg.</p>  <p>xx1400002105</p>
5	Run the roundsling up and over the upper arm.	
6	Connect both ends of the roundsling with a shackle.	 <p>xx1400000729</p>
7	<p>Stretch the roundsling between the upper and the lower arm by slowly jogging the axis-3.</p> <p> Note</p> <p>Make sure the roundsling is stretched, in order to carry the weight of the lower arm.</p>	
8	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	

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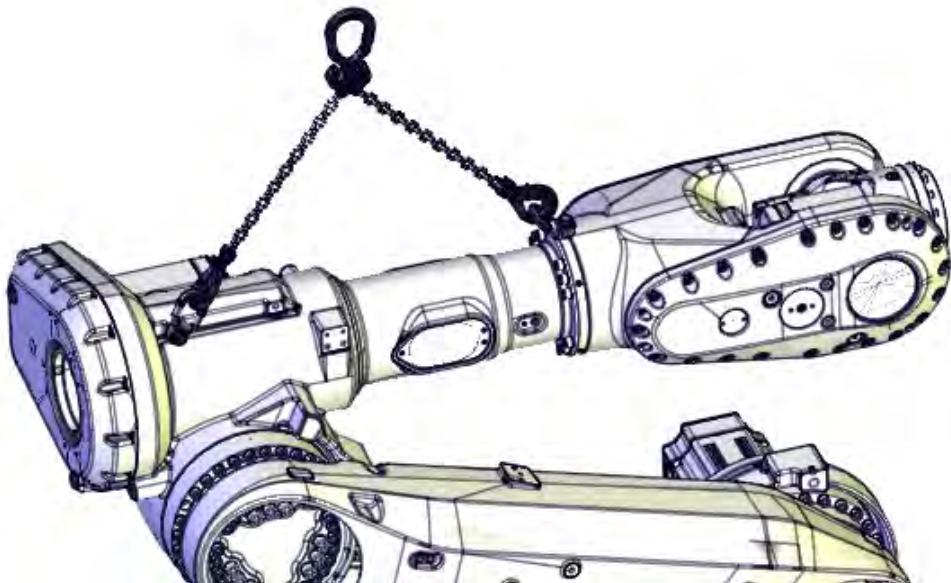
4 Repair

4.3.4 Attaching lifting accessories to an unseparated lower and upper arm (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
<p>9 Fit a lifting eye in the arm house, with a fender washer underneath.</p>  <p>xx1400002196</p>	<p>Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.</p>  <p>xx1200001134</p>
<p>10 Attach the Lifting accessory (chain) to an overhead crane (or similar), then to the lifting eye in the arm house and to the lifting eye in the wrist.</p>	<p>Lifting accessory (chain): 3HAC15556-1</p>  <p>xx1400002104</p>
<p>11 Raise the overhead crane to stretch the chains and roundslings. Verify that the roundsling between the wrist and the lower arm is stretched.</p>	
<p>12 To release the brake, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	

4.3.5 Attaching lifting accessories to the upper arm

4.3.5 Attaching lifting accessories to the upper arm**Attachment points of lifting accessory**

xx1200001308

Required equipment

Equipment, etc.	Article number	Note
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC16131-1	M12
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

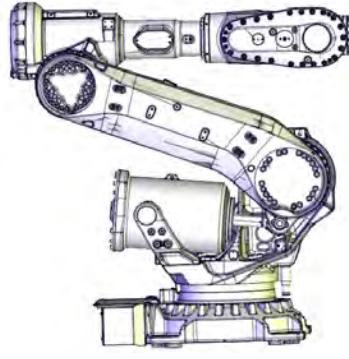
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4 Repair

4.3.5 Attaching lifting accessories to the upper arm

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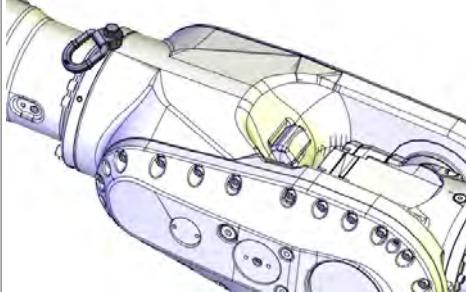
Robot position

	Action	Note
1	Jog the robot to the position: <ul style="list-style-type: none">• Axis-1: no significance• Axis-2: -65°• Axis-3: +65°• Axis-4: 0°• Axis-5: no significance• Axis-6: no significance	 xx1200001255

Attaching lifting accessories

Attaching the lifting accessories to the upper arm

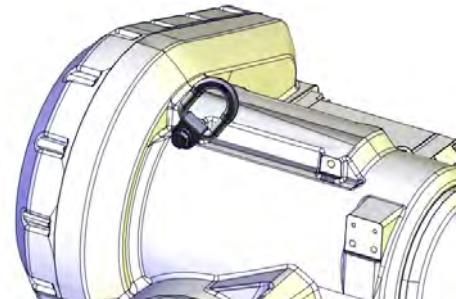
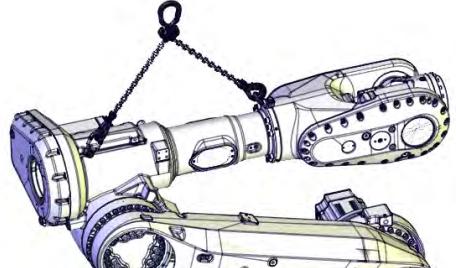
Use this procedure to attach the lifting accessories to the upper arm.

	Action	Note
1	 CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2	Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1  xx1200001133

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4.3.5 Attaching lifting accessories to the upper arm

Continued

Action	Note
3 Fit a lifting eye in the arm house, with a fender washer underneath.  xx1400002196	Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.  xx1200001134
4 Attach the upper arm lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and in the wrist.	Lifting accessory (chain): 3HAC15556-1  xx1200001308
5 Raise the lifting accessories to take the weight of the upper arm.	
6 In case of necessary adjustments, use the shortening loops on the lifting accessory (chain) to find the level position. See figure!	 xx1400002197
7 Release the brakes in order to find the most level lifting position of the upper arm as possible, before lifting. To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP3: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	24 VDC power supply

4 Repair

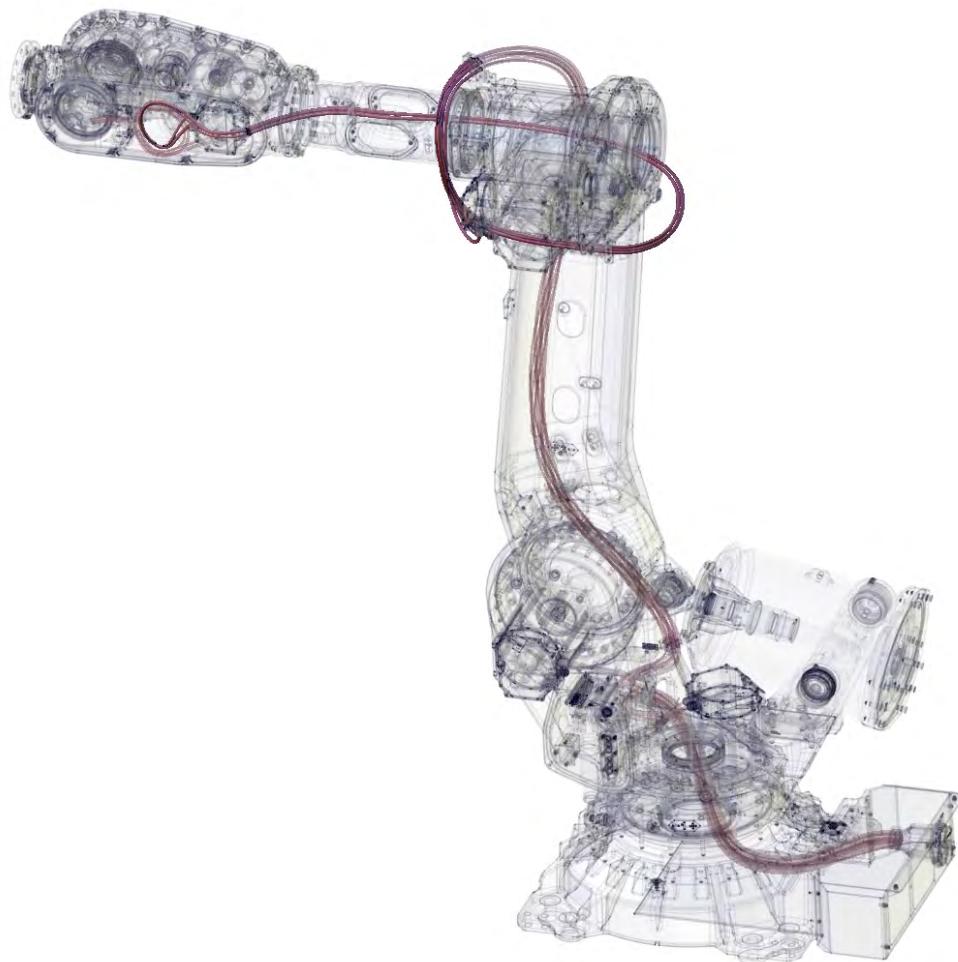
4.4.1 Removing the cable harness

4.4 Complete robot

4.4.1 Removing the cable harness

Location of the cable harness

The cable harness is located as shown in the figure.



xx1300000555

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	<p>If the robot is to be calibrated with reference calibration: 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. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the cable harness - upper arm and wrist

These procedures describe how to remove the cable harness in the upper arm and wrist.

Preparations on the robot

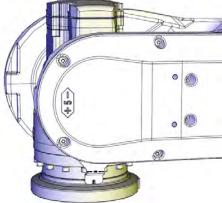
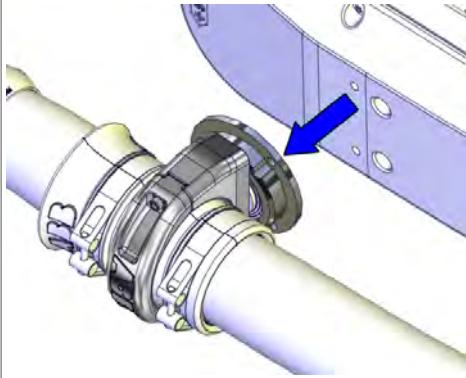
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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4 Repair

4.4.1 Removing the cable harness

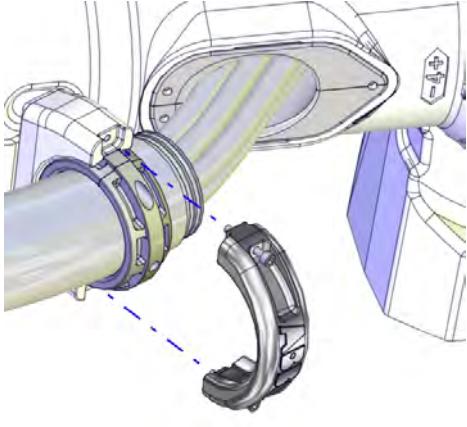
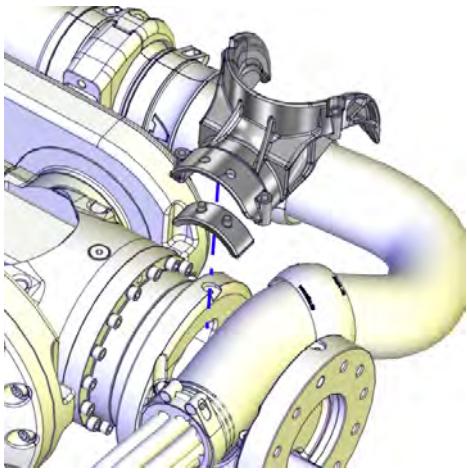
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Action	Note
<p>2 Jog the robot to the specified position:</p> <ul style="list-style-type: none">• Axis 1: 0°• Axis 2: -60°• Axis 3: +60°• Axis 4: 0°• Axis 5: +90°• Axis 6: No significance. <p> Note</p> <p>The specified position is a recommended position. Axis-5 must be oriented as close as possible to +90° to be able to open the axis-6 motor cover and to remove the axis-6 motor cables, and in order to avoid the spiral of the cable harness in the carrier, being unwound or placed in the wrong position. Depending on what tool is used, the other axes may need to be jogged to another position.</p>	 xx1200001081
<p>3  DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply <p>to the robot, before entering the robot working area.</p>	
<p>4 If DressPack is installed:</p> <ul style="list-style-type: none">• Remove the bracket with the complete ball joint housing still fitted, as shown in the figure. <p>This is done to be able to reach the two hidden screws that secure the wrist cover.</p>	 xx1400000355

Continues on next page

4.4.1 Removing the cable harness

Continued

	Action	Note
5	If used, open the ball joint housing on the arm tube and remove the DressPack cable package.	 xx1400000206
6	 Note If only the manipulator harness shall be removed, the DressPack cable package can stay fitted on the process turning disk.	 xx1400000208

Retrieving access to the wrist cabling

Use this procedure to remove the wrist cover to retrieve access to the axis-5 and axis-6 motor cables.

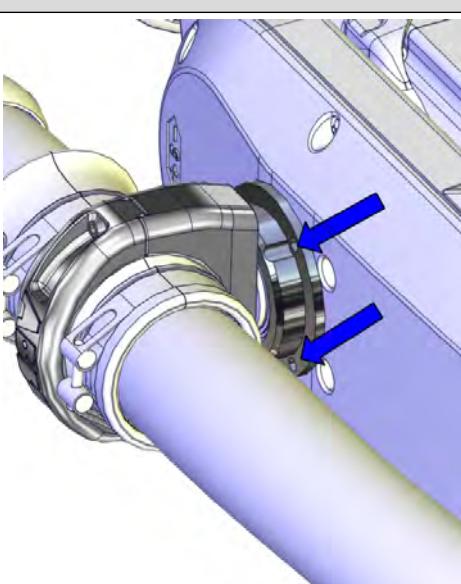
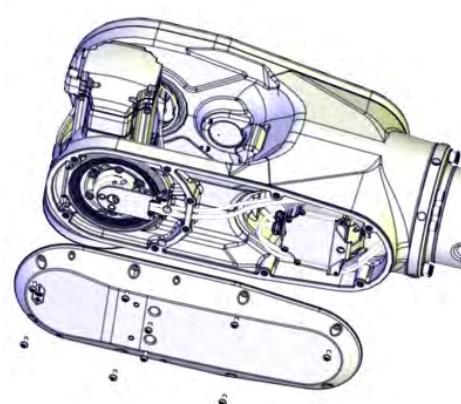
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

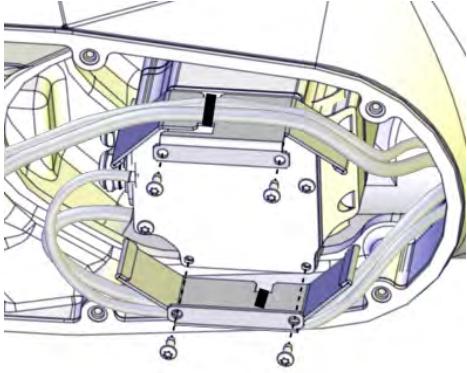
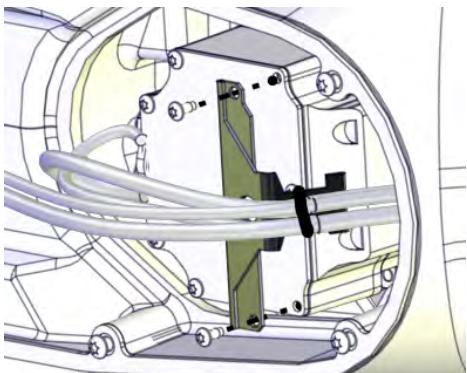
4.4.1 Removing the cable harness

Continued

Action	Note
2 If DressPack is not already removed, the complete ball joint housing (including the bracket) must be removed at this point, in order to reach the two hidden screws that secures the wrist cover.	 xx1400000355
3 Remove the wrist cover.	 xx1300002247

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4.4.1 Removing the cable harness Continued

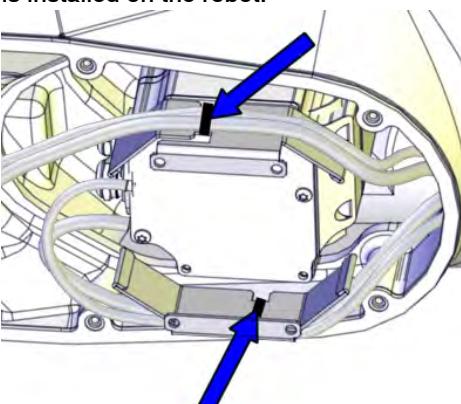
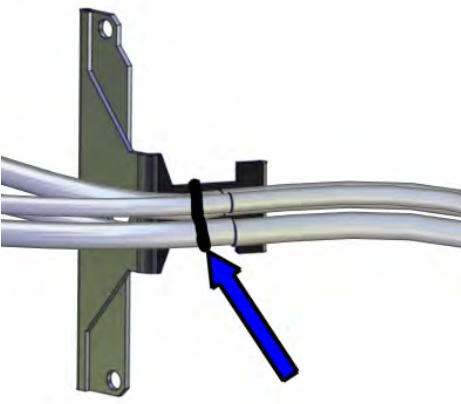
Action	Note
<p>4 Remove the heat protection plate/plates from the motor with the cabling still attached to the plate.</p> <p>Remove the heat protection plates from the motor with the cabling still attached to the plate.</p>	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001030</p>  <p>xx1300000490</p>

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4 Repair

4.4.1 Removing the cable harness

Continued

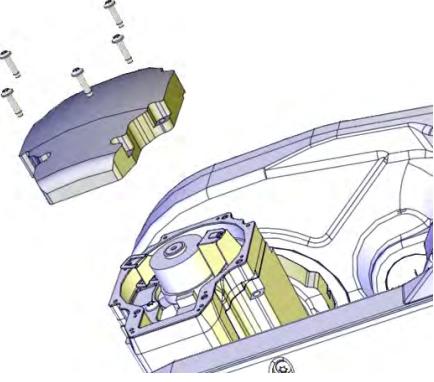
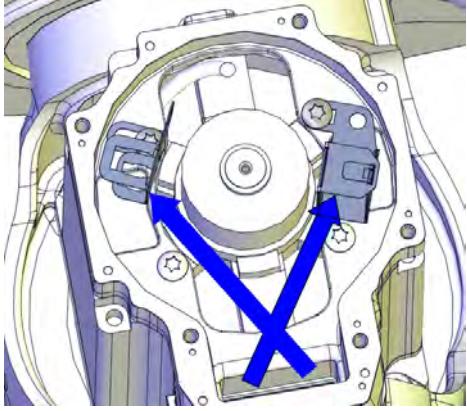
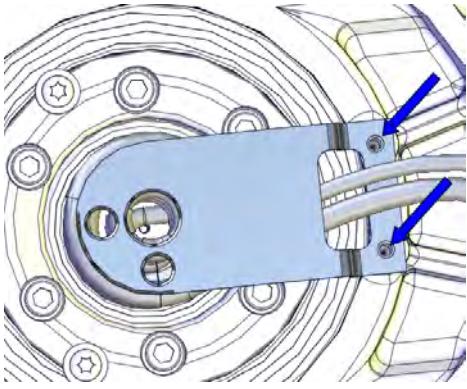
Action	Note
5 Cut the cable ties that hold the cable harness to the plate.  Note Keep the heat protection plate until refitting.  Tip If removing the plate only for replacing the motor, the cabling does not need to be loosened from the plate.	Choose figure depending on which plate is installed on the robot.  xx1500001029  xx1300000489

Disconnecting the axis-6 motor cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.4.1 Removing the cable harness
Continued

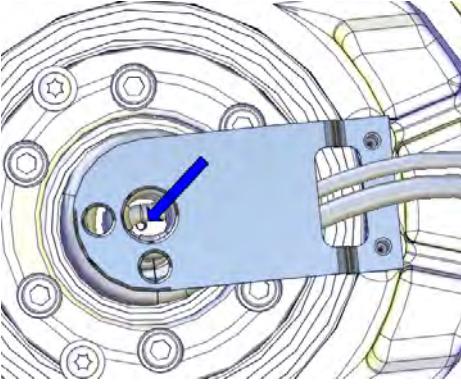
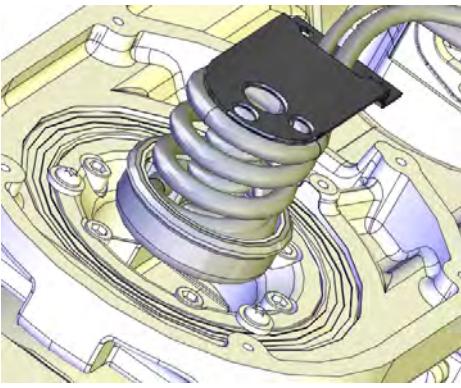
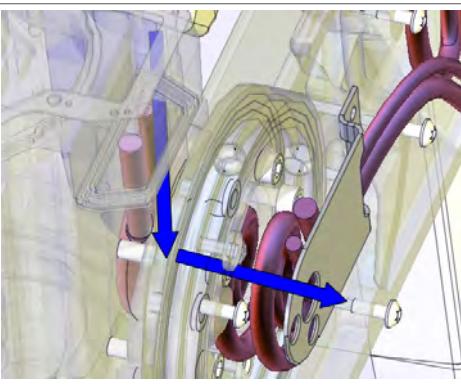
Action	Note
2 Unscrew the attachment screws and remove the motor cover.	 xx1200001080
3 Disconnect the motor cables.	 xx1300000488
4 Unscrew the attachment screws that hold the cable bracket.	 xx1300000484

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4 Repair

4.4.1 Removing the cable harness

Continued

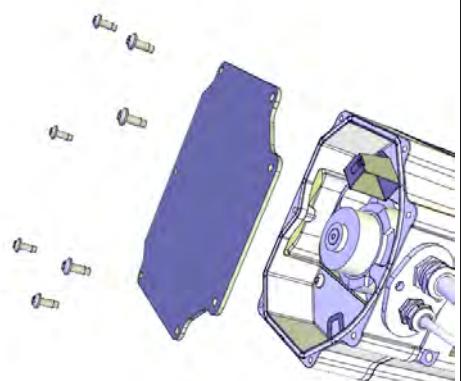
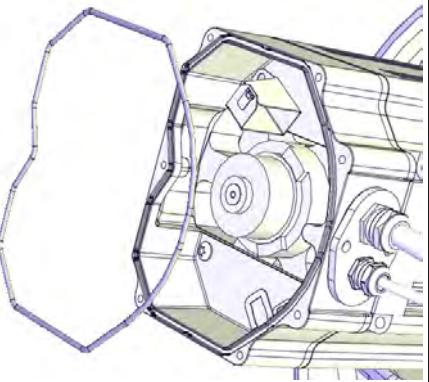
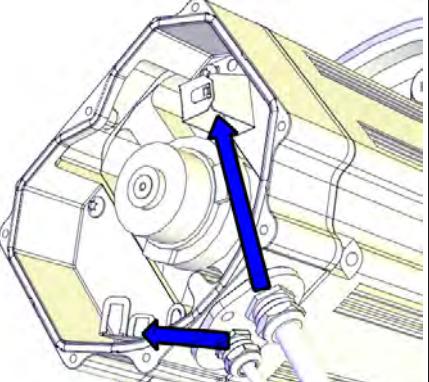
Action	Note
5 Unscrew the M4 screw that holds the carrier.  Note The screw is located at the bottom of the carrier.	 xx1300000485
6 Pull out the carrier from its position.	 xx1300001113
7 Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.	 xx1300000666

Disconnecting the axis-5 motor cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.4.1 Removing the cable harness
Continued

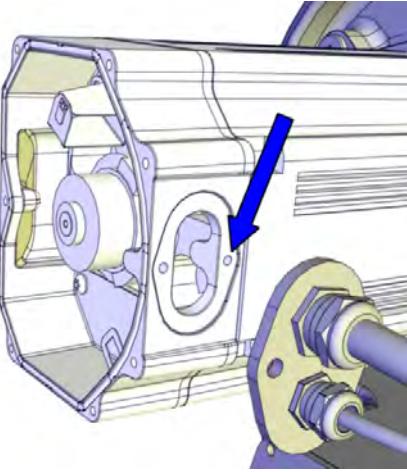
Action	Note
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066

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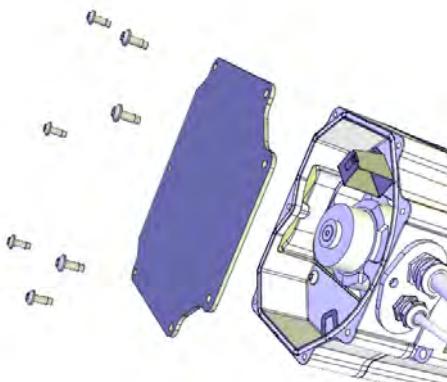
4 Repair

4.4.1 Removing the cable harness

Continued

Action	Note
<p>5 Remove the cable gland cover by performing the following steps:</p> <ol style="list-style-type: none"> 1 Open the inner screw a little (the one the arrow is pointing at). No need to remove this screw from the motor. 2 Remove the outer screw. 3 Slide the cable gland cover away from the inner screw. Make sure the gasket is not damaged. <p> Tip</p> <p>Make a note in which direction the cable exit hole is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1300000656
6 Use caution and pull out the motor cables.	

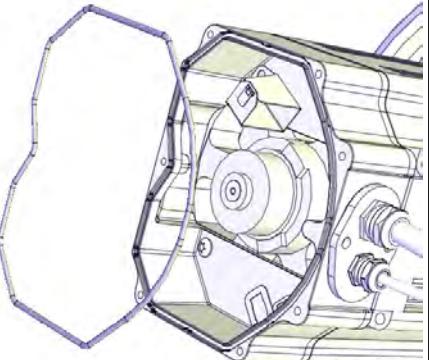
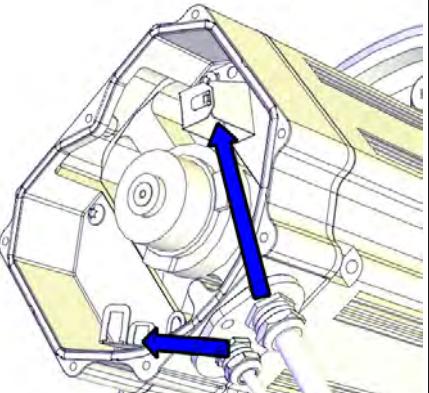
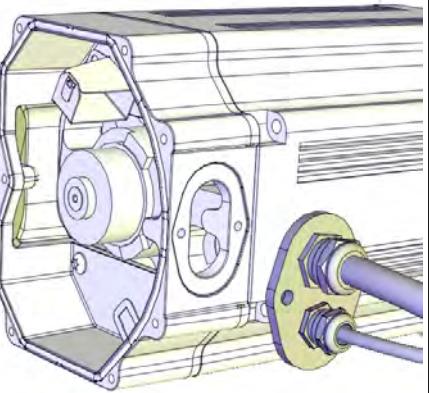
Disconnecting the axis-3 and axis-4 motor cables

Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135

Continues on next page

4.4.1 Removing the cable harness

Continued

Action	Note
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066
5 Remove the cable gland cover. Make sure the gasket is not damaged.  Tip Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.	 xx1200001067
6 Use caution and pull out the motor cables.	

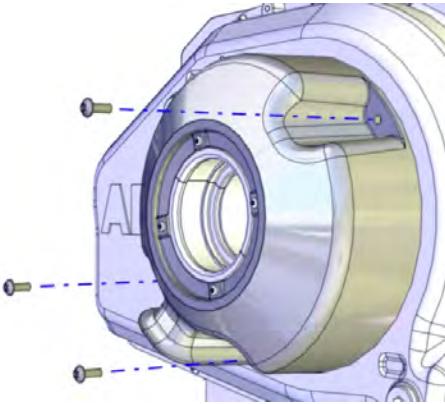
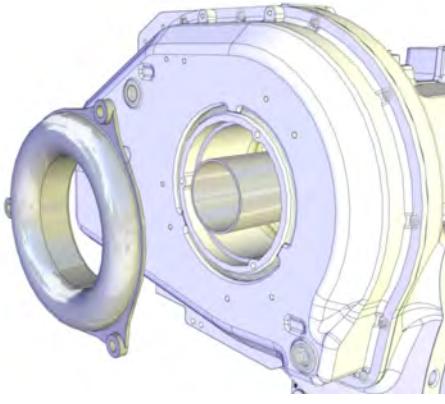
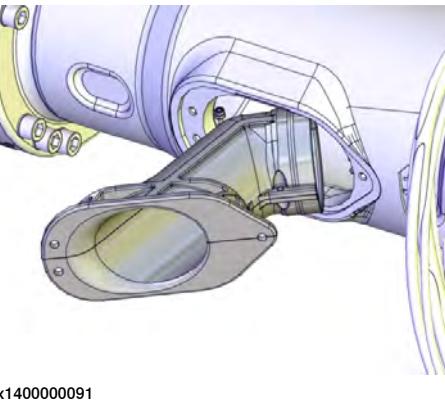
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4 Repair

4.4.1 Removing the cable harness

Continued

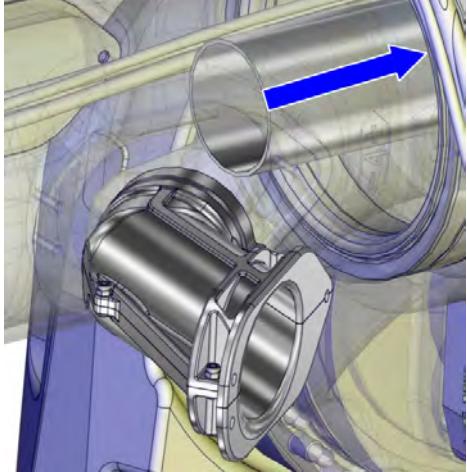
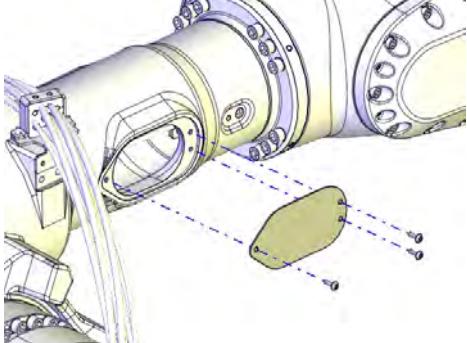
Removing the cable harness - wrist and upper arm

Action	Note
1 Remove the cover.  Note Foundry Plus: Use caution not to damage the gasket, to loose the washers on the cover sealing or to loose the inserts fitted on the cover.	 xx1200000045
2 Remove the cable guide, slide it out a little and let it rest on the cables.	 xx1300000657
3 If used, remove the insert.  Note This is not needed on variants IRB 6700 - 300/2.70, -245/3.00	 xx1400000091

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4.4.1 Removing the cable harness

Continued

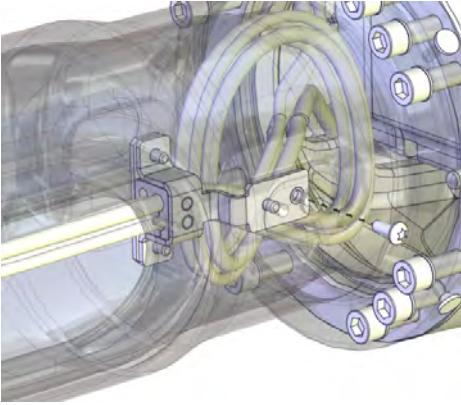
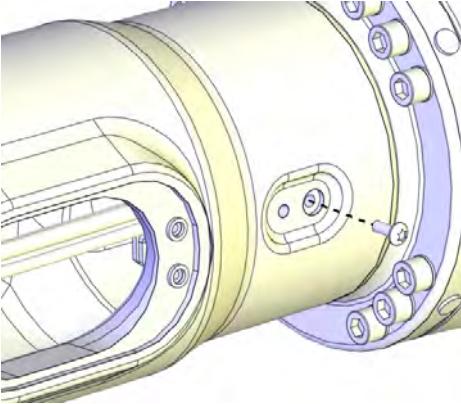
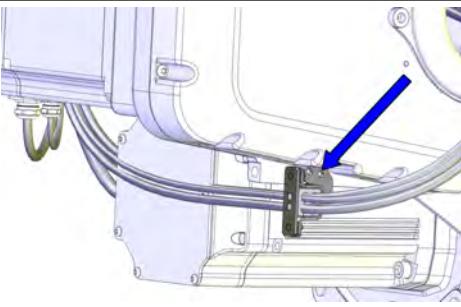
Action	Note
4 If used, push the DressPack tube a little backwards.  Note This is not needed on variants IRB 6700 - 300/2.70, -245/3.00	 xx1400000720
5  Tip Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the procedure and to avoid damaging the parts during the procedure. This will also make it easier to run the cable harness through the inside of the upper arm.	 xx1300000668
6 Remove the side cover on the arm tube.	 xx1300000557

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4 Repair

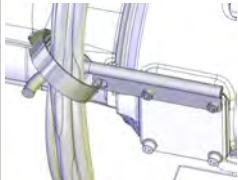
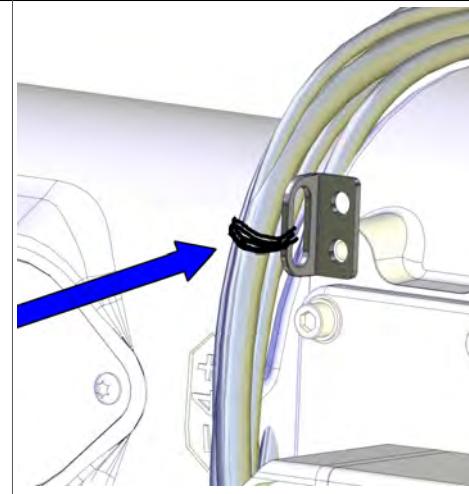
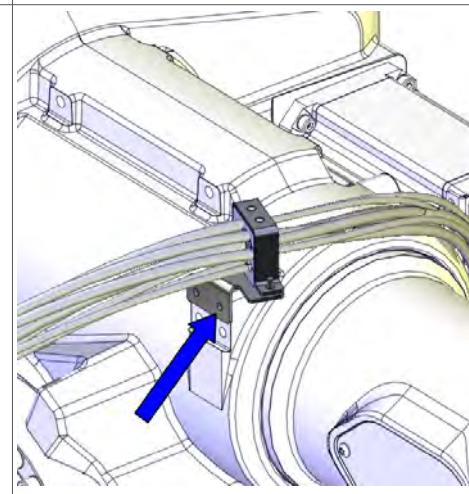
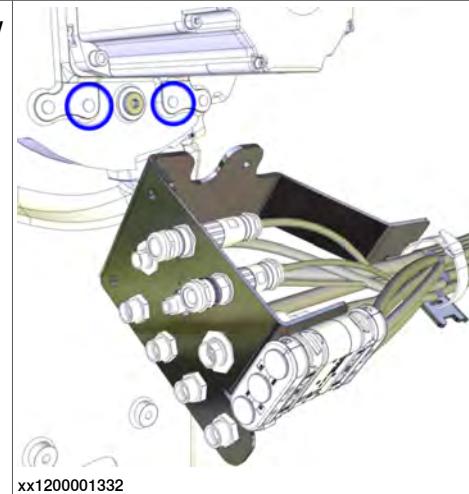
4.4.1 Removing the cable harness

Continued

Action	Note
7 Unscrew the attachment screw that secures the axis-4 metal clamp inside the arm tube.  Note The screw is reached from outside the upper arm!	 xx1700000340  xx1700000339
8 Remove the armhouse metal clamp.	 xx1300000543

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4.4.1 Removing the cable harness Continued

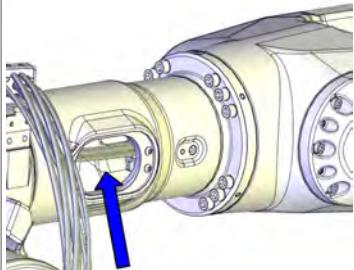
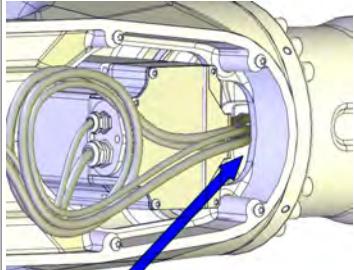
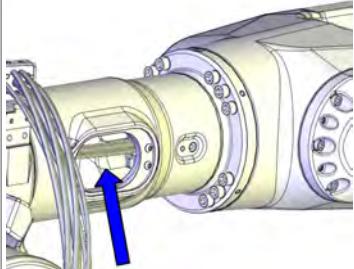
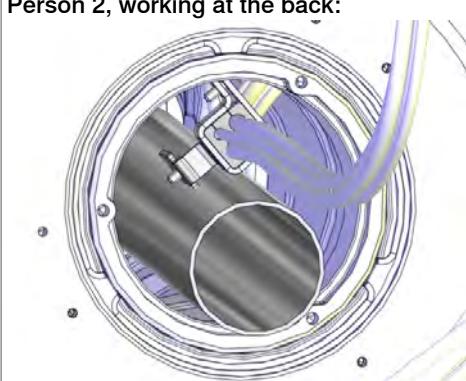
Action	Note
<p>9 Open the velcro strap at the cable fixing bracket.</p> <p>Note If DressPack is fitted, the cable fixing bracket is replaced by the cable guide.</p>  <p>xx1300001973</p> <p>Cable guide.</p>	 <p>xx1300000544</p> <p>Cable fixing bracket.</p>
<p>10 Remove the metal clamp on top of the armhouse.</p>	 <p>xx1300000541</p>
<p>11 If used (and if not already done), unscrew the screws that hold the connection plate and let it hang free with the rest of the DressPack cable package.</p>	 <p>xx1200001332</p>

Continues on next page

4 Repair

4.4.1 Removing the cable harness

Continued

	Action	Note
12	 Tip <p>This step is best performed by two persons working together.</p> <p>Use caution and remove the cable harness out of the wrist like this:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole and take a hold of the cable harness. • Person 2: Take a hold on the cable harness inside the wrist. • Together: Move the cable harness past the axis-5 motor and into the arm tube. 	<p>Person 1, working at the side hole:</p>  xx1300000745 <p>Person 2, working at the wrist:</p>  xx1300000746
13	 Tip <p>This step is best performed by two persons working together.</p> <p>Use caution and remove the cable harness out of the arm tube like this:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole and take a hold of the cable harness. • Person 2: Take a hold on the cable harness at the back of the robot. • Together: Move the cable harness out of the arm tube. <p>Remove the cable harness from the upper arm.</p> <p> Note</p> <p>To be able to remove the cable harness with the DressPack tube fitted, the tube needs to be pulled out a little, then be placed on the lower left side in the arm tube and the bracket of the cable harness then needs to be placed on the upper right hand side.</p> <p>(This is not needed on variants IRB 6700 - 300/2.70, -245/3.00)</p>	<p>Person 1, working at side hole:</p>  xx1300000745 <p>Person 2, working at the back:</p>  xx1400002561

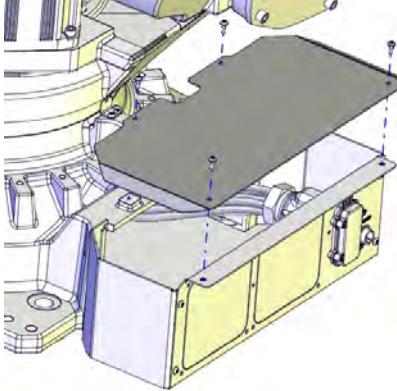
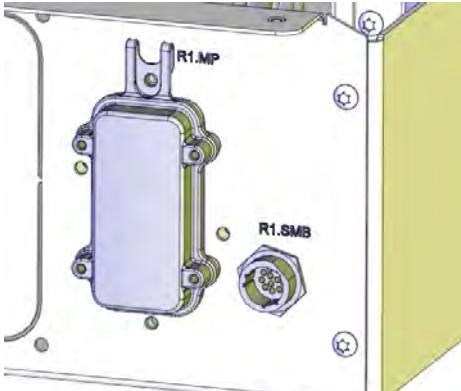
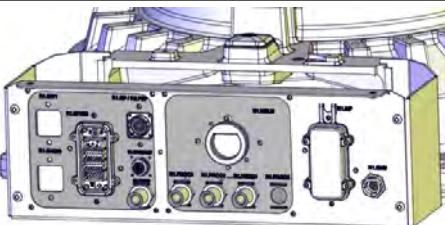
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4.4.1 Removing the cable harness Continued

Removing the cable harness - base, frame and lower arm

These procedures describes how to remove the cable harness from base, frame and lower arm.

Preparations before removing the cable harness in the base

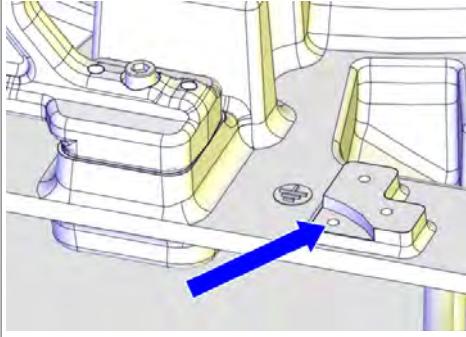
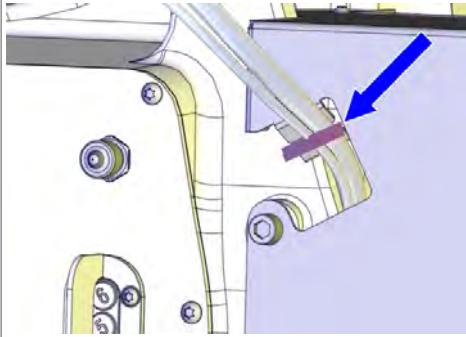
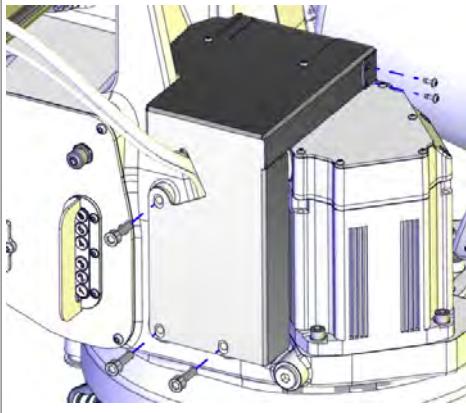
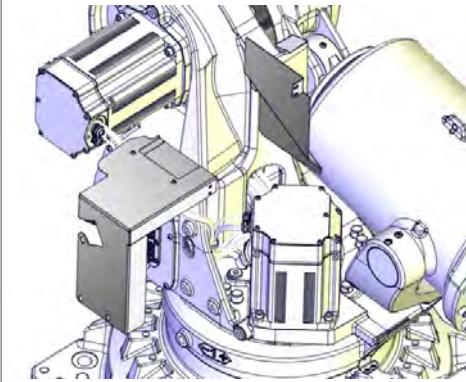
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the base cover.	 xx1300000561
3	Remove connectors in the base: <ul style="list-style-type: none"> • R1.MP • R1.SMB 	 xx1300000591
4	If used, disconnect the DressPack hoses in the base.	 xx1400000366

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4 Repair

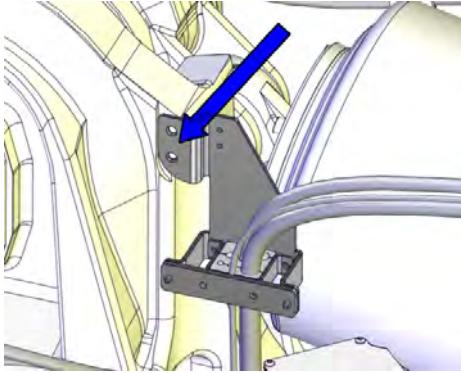
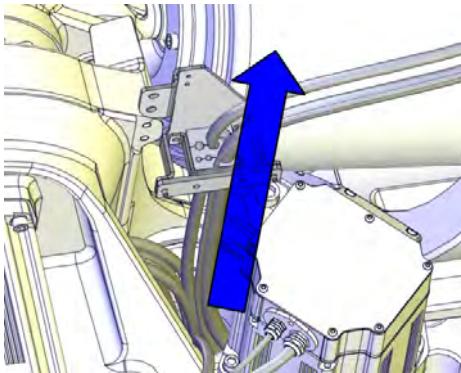
4.4.1 Removing the cable harness

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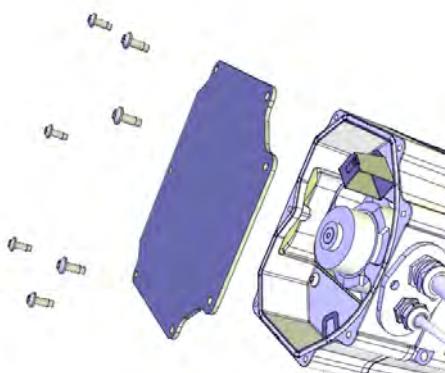
Action	Note
5 Disconnect the earth cable.	Screw dimension : M6x16 Washer dimension : 6.4x17x3  xx1400000354
6 Foundry Plus. Cut the cable tie that hold the axis-1 and axis-2 motor cables on the protection plates.	 xx1400000722
7 Foundry Plus. Disassemble the protection plates by removing five of the attachment screws (three M10x30 and two of the M5x12 screws).	 xx1400000723
8 Foundry Plus. Remove the two protection plates.	 xx1400000724

Continues on next page

4.4.1 Removing the cable harness Continued

Action	Note
9 If used, remove the attachment screws that secure the bracket. This is done to facilitate removal of the DressPack hoses.	 xx1400000078
10 If used, use caution and pull out the DressPack hoses through the protection tube in the base. Note There is no need to pull out the DressPack cables at this point!	 xx1400000088

Disconnecting the axis-1 and axis-2 motor cables

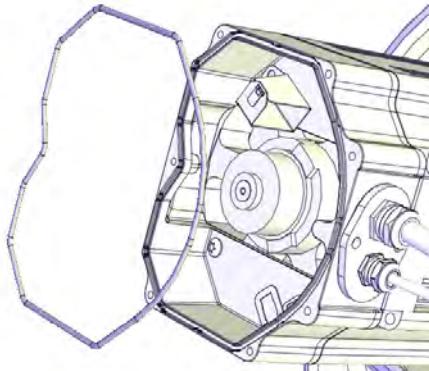
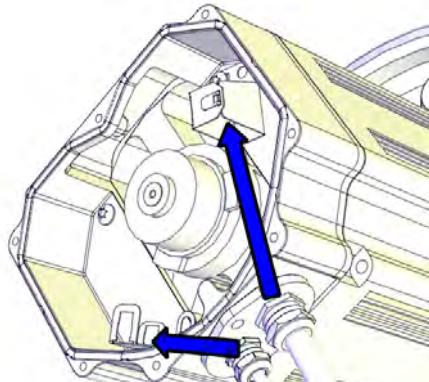
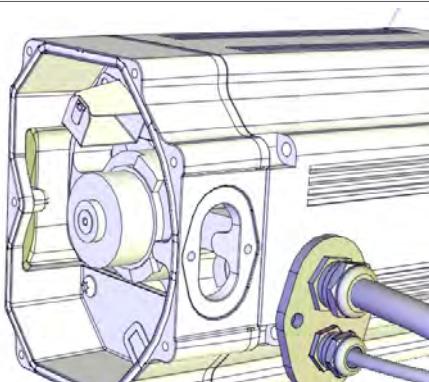
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135

Continues on next page

4 Repair

4.4.1 Removing the cable harness

Continued

Action	Note
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066
5 Remove the cable gland cover. Make sure the gasket is not damaged.  Tip Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.	 xx1200001067
6 Use caution and pull out the motor cables.	

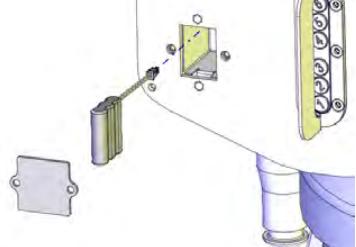
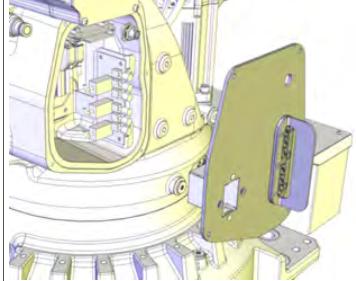
Preparations before disconnecting the SMB unit

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4.4.1 Removing the cable harness

Continued

Action	Note
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	
3 Open the small cover on the SMB cover, disconnect the battery cable and remove the battery.	 xx1300000829
4 Remove the SMB cover.	 xx1300000669

Disconnecting the brake release unit

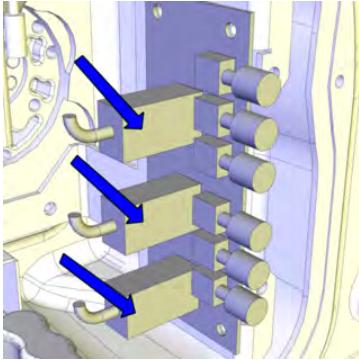
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	

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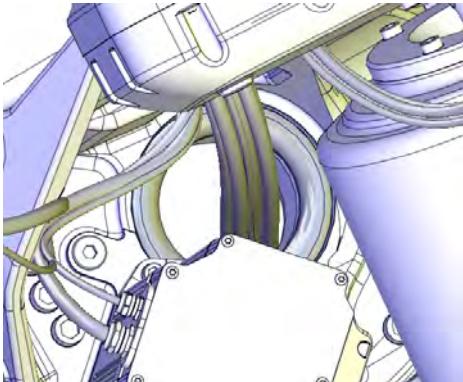
4 Repair

4.4.1 Removing the cable harness

Continued

Action	Note
3 Remove the connectors X8, X9 and X10 from the brake release board.	 xx1300000670

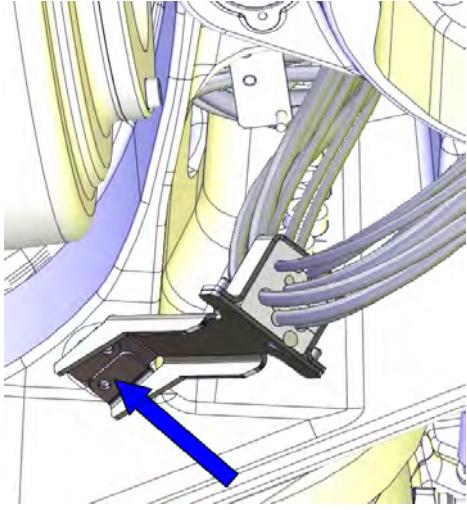
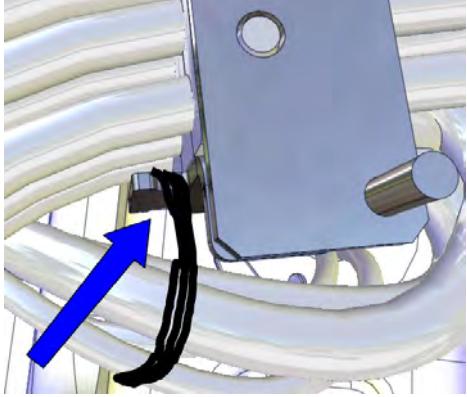
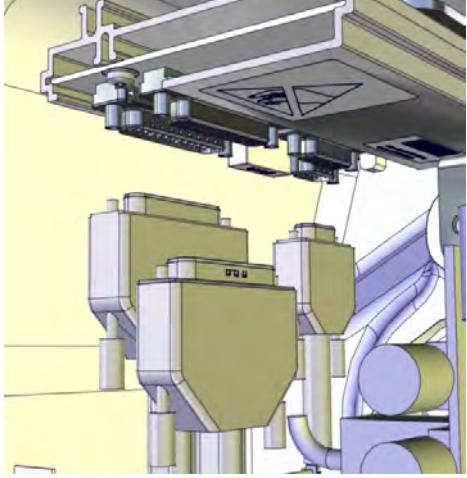
Removing the cable harness in the base

Action	Note
1 If used, use caution and pull out the DressPack cables through the protection tube and place it safely over the balancing device.	
2 Use caution and pull out the robot cable harness through the protection tube.	 xx1300000732
3 Place the cable harness over the balancing device.	

Continues on next page

4.4.1 Removing the cable harness Continued

Removing the cable harness in the frame

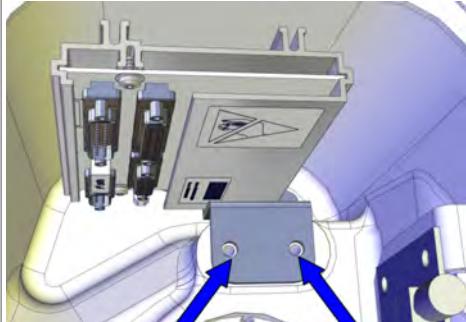
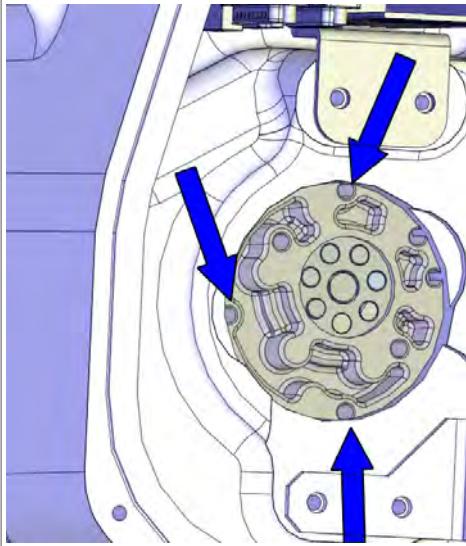
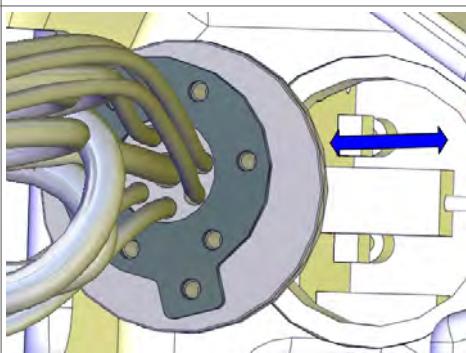
	Action	Note
1	Unscrew the attachment screws that hold the metal clamp frame.	 xx130000542
2	Cut the cable tie inside the hole in the frame.	 xx1200001237
3	Disconnect connectors on the SMB unit.	 xx1300001114

Continues on next page

4 Repair

4.4.1 Removing the cable harness

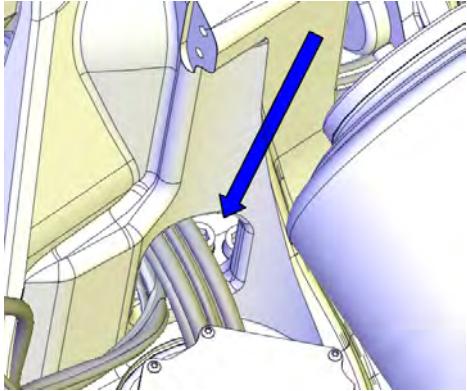
Continued

Action	Note
4 Unscrew the screws and washers that holds the bracket with the SMB unit, and remove the SMB unit.	 xx1300000730
5 Put the SMB unit in an ESD bag until it shall be refitted.	
6 Unscrew the three attachment screws that hold the SMB/BU cover from inside the SMB recess.	 xx1300000655
7 Use caution and pull out the cable harness from the SMB recess.	 xx1300000560

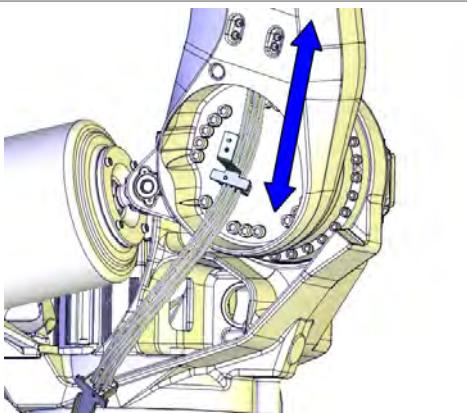
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4.4.1 Removing the cable harness

Continued

Action	Note
8 Use caution and pull out the cable harness through the hole in the frame.	 xx1300000593

Removing the cable harness in the lower arm

Action	Note
1 Loosen the axis-2 lower arm metal clamp and the axis-3 lower arm metal clamp located on the inside of the lower arm by removing the attachment screws.  Note The screws are reached from the outside of the lower arm.	 xx1300000540
2 Use caution and pull the cable harness out of the lower arm.	 xx1300000733

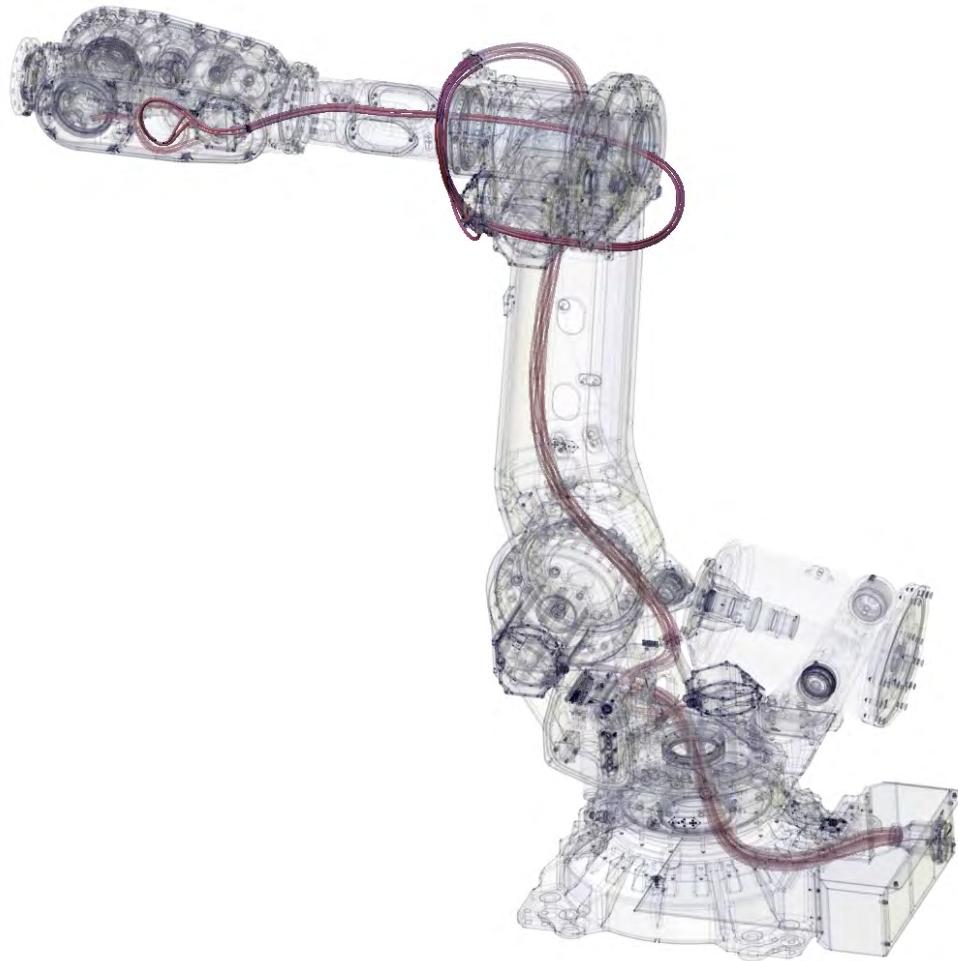
4 Repair

4.4.2 Refitting the cable harness

4.4.2 Refitting the cable harness

Location of the cable harness

The cable harness is located as shown in the figure.



xx1300000555

Spare part

Spare part	Spare part number	Note
Cable harness	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Continues on next page

Consumables

Consumable	Article number	Note
Grease	3HAB3537-1	Used to lubricate o-rings.
O-ring	21522012-429	D=84.5x3 Used on the SMB/BU cover.
O-ring The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile) 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)	D=169.5x3 Used on axis-1 motor cover. D=169.5x3 Used on axis-2 motor cover. D=169.5x3 Used on axis-3 motor cover D=119x3 Used on axis-4 motor cover. D=119x3 Used on axis-5 motor cover.
Gasket	3HAC033489-001/ 3HAC044252-001	Used on axis-6 motor cover.
Cable ties	-	
Elastic glue and sealant	3HAC042559-001	Sikaflex 521FC

Refitting the cable harness - base, frame and lower arm

These procedures describes how to refit the cable harness in base, frame and lower arm.

Preparations before refitting the cable harness in the base, frame and lower arm

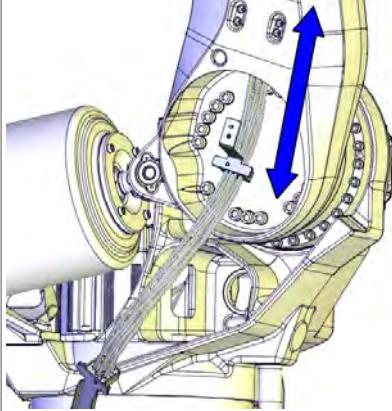
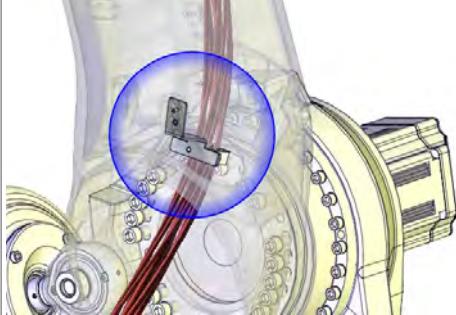
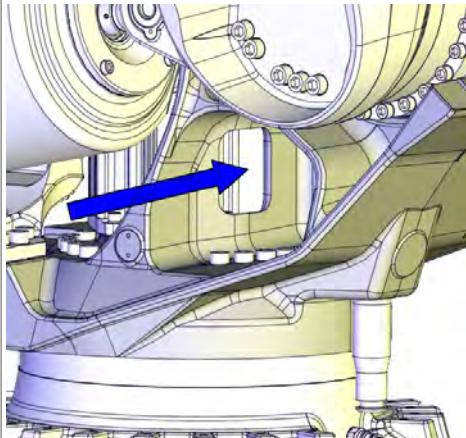
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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4 Repair

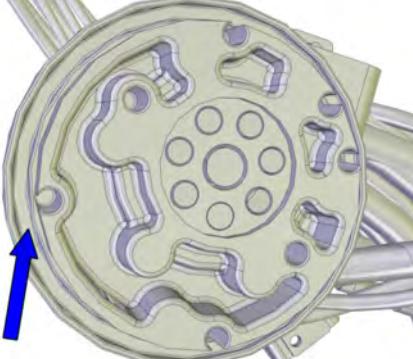
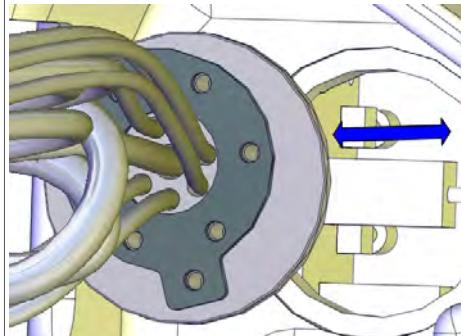
4.4.2 Refitting the cable harness

Continued

Action	Note
2 Tie the axis-5 and axis-6 connectors and carrier into a bundle with tape. This is done to facilitate the procedure and to avoid damaging the parts during the procedure. This will also make it easier to run the cable harness through the inside of the robot.	 xx1300000668
3 Run the cable harness through the lower arm.	 xx1300000733
4 Secure the axis-2 lower arm cable bracket. i Note Do not secure the axis-3 lower arm cable bracket at this point. i Note Screws are reached from the outside of the lower arm.	 xx1300000734
5 Run the cable harness into the hole in the frame in this order: <ul style="list-style-type: none"> • R1.MP • R1.SMB • R2.MP2 • R2.MP1 	 xx1300000735

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Refitting the cable harness in the frame

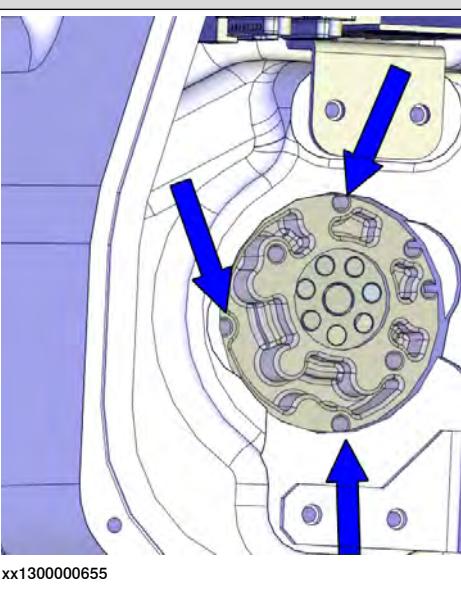
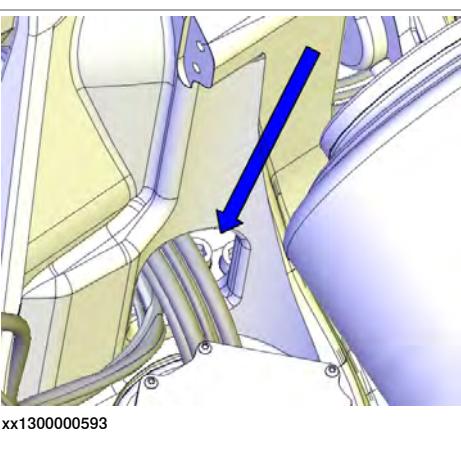
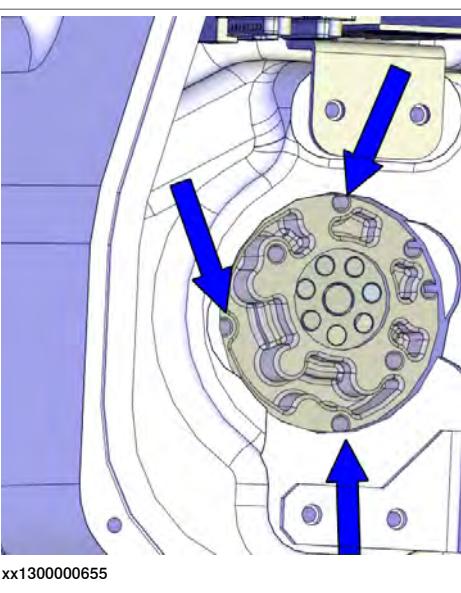
	Action	Note
1	Check the o-ring located on the SMB/BU cover. Replace if damaged.	 xx1300000737 The figure shows the position of the o-ring.
2	Wipe clean the contact surfaces of the cover as well as the hole it shall fit in.	
3	Fit the o-ring.	
4	Apply Sikaflex on the o-ring before assembly.	
5	Run the SMB/BU cables into the SMB recess.	 xx1300000560

Continues on next page

4 Repair

4.4.2 Refitting the cable harness

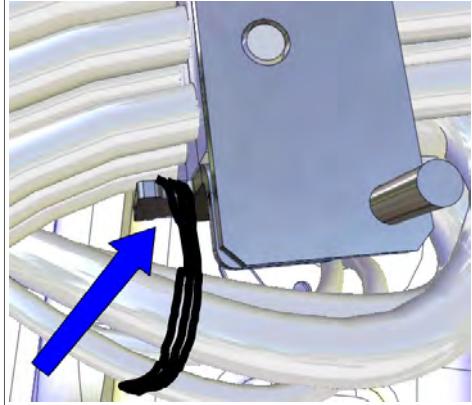
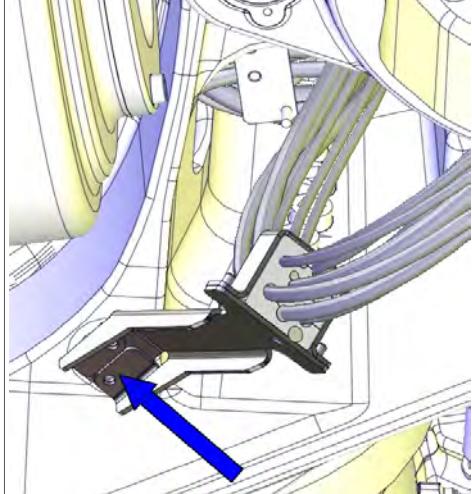
Continued

Action	Note
6 Fit the SMB/BU cover in its hole with three attachment screws from inside the SMB recess without damaging the o-ring.	<p>Note</p> <p>Do not tighten the screws fully! It must still be possible to adjust the position of the cable harness by rotating the SMB/BU cover in its hole a little.</p> 
7 Adjust the cables running through the hole in the frame by carefully moving the SMB/BU cover on its screws, while at the same time checking the position of the cable harness through the hole.	<p>Note</p> <p>The cables must be placed so that they don't rub against any part of the robot.</p> 
8 Secure the SMB/BU cover with its attachment screws from inside the SMB/BU recess.	

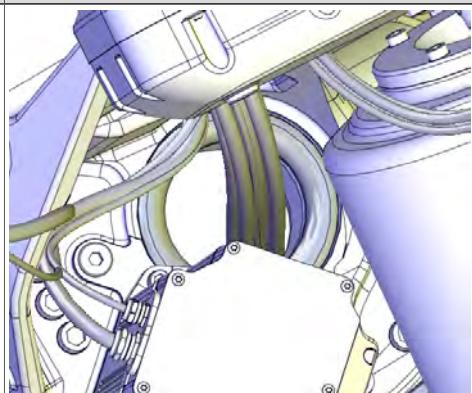
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4.4.2 Refitting the cable harness

Continued

Action	Note
9 Secure the cable harness to the bracket inside the frame hole, with a cable tie.	 xx1200001237
10 Refit the frame metal clamp.	 xx1300000542

Refitting the cable harness in the base

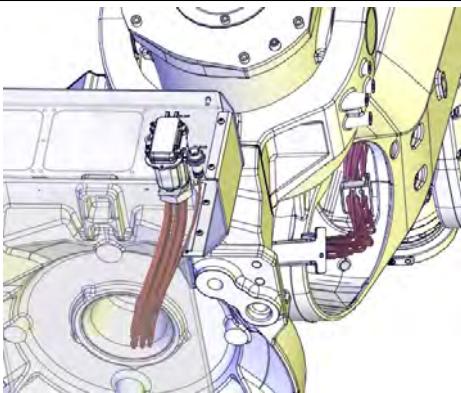
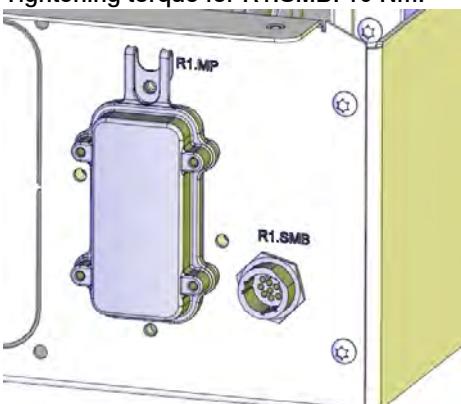
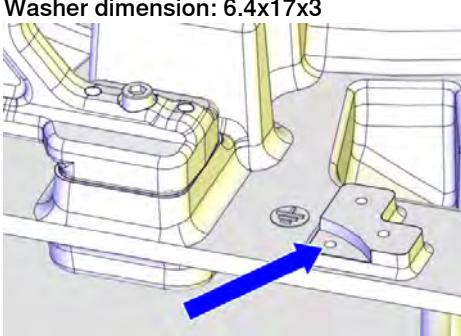
Action	Note
1 Run the cables through the protection tube in this order: <ul style="list-style-type: none">• R1.MP• R1.SMB If necessary, lubricate the cables with grease in order to make them run more smoothly.	 xx1300000732

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4 Repair

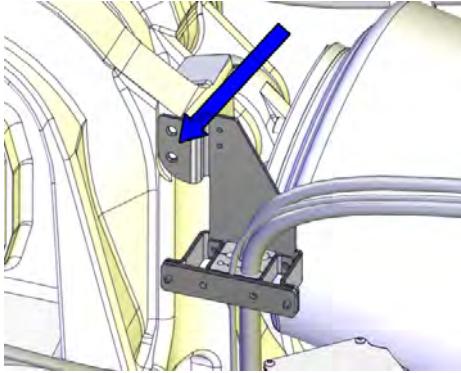
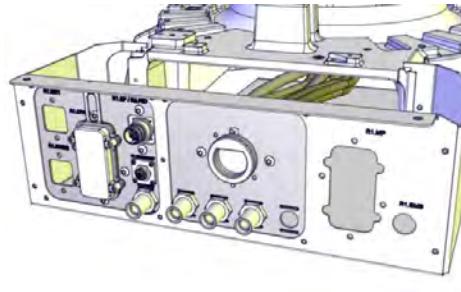
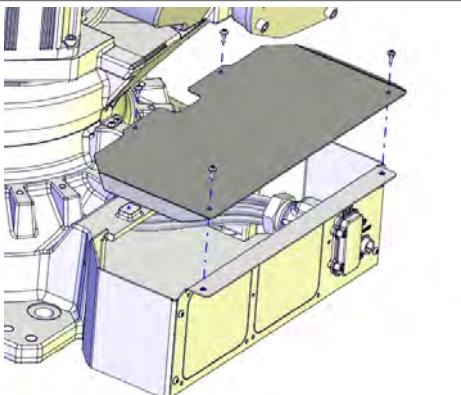
4.4.2 Refitting the cable harness

Continued

Action	Note
2 <ul style="list-style-type: none"> Make sure that the cables are not twisted. Each cable must be in line with its position on the base plate. Make sure that the R1.SMB cable will run on the correct side of the R1.MP1, see the figure. 	 xx1300000736
3 Make sure that the markings on the cables are facing the base cover, when connected.	
4 Connect R1.MP and R1.SMB.	Tightening torque for R1.SMB: 10 Nm.  xx1300000591
5 Connect the earth cable.	Screw dimension: M6x16 Washer dimension: 6.4x17x3  xx1400000354
6 If used, run the DressPack cables through the protection tube in the base.	
7 If used, run the DressPack hoses through the protection tube in the base. Make sure that the hoses are running correctly and are not twisted!	

Continues on next page

4.4.2 Refitting the cable harness Continued

Action	Note
8 If used, fit the bracket that hold the DressPack to the frame.	 xx1400000078
9 If used, connect the DressPack cable package on the base plate.	 xx1200000052
10 Refit the base cover.	 xx1300000561

Refitting and reconnecting the SMB and BU units

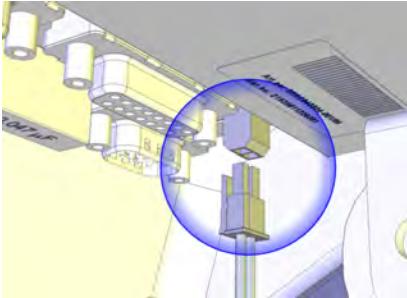
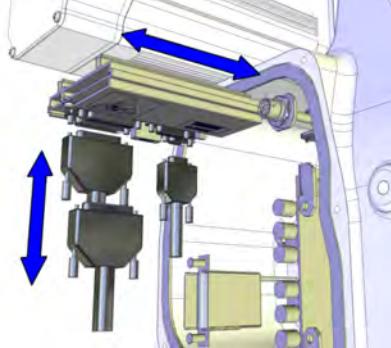
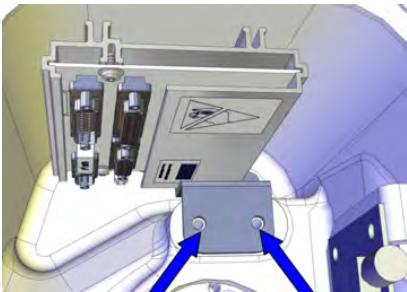
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

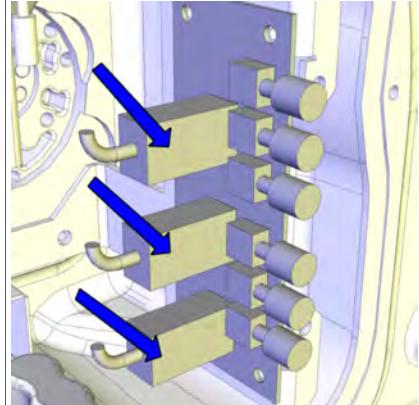
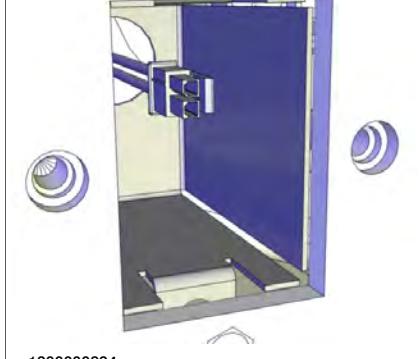
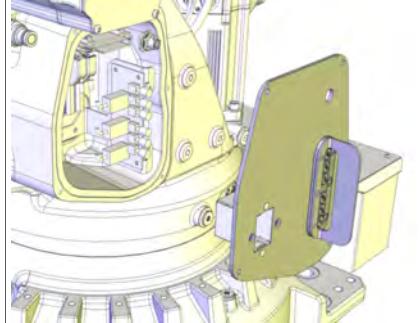
4.4.2 Refitting the cable harness

Continued

Action	Note
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	
3 Connect the battery cable to the SMB unit.	 xx1300000729
4 Connect all connectors to the SMB board: R1.SMB1-3, R1.SMB4-6 and R2.SMB	 xx1300000728
5 Push in the SMB unit carefully into position and fit the bracket that secures the SMB unit.	 xx1300000730

Continues on next page

4.4.2 Refitting the cable harness
Continued

Action	Note
6 If disconnected, reconnect the connectors X8, X9 and X10 to the brake release board.	 xx1300000670
7 Pull out the battery cable through the recess for the battery.	 xx1300000834
8 Secure the SMB cover with its attachment screws. If cabling is used for 7th axis (option), refit the connector R2.FB7 to the SMB cover and tighten with 6 Nm.	 xx1300000669

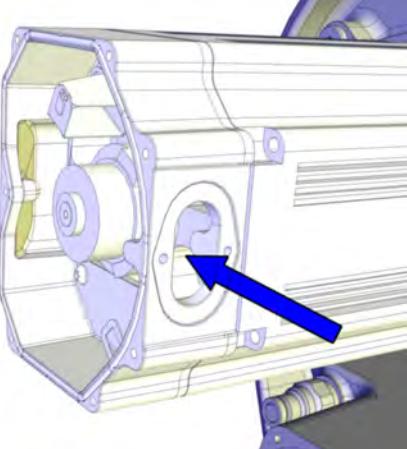
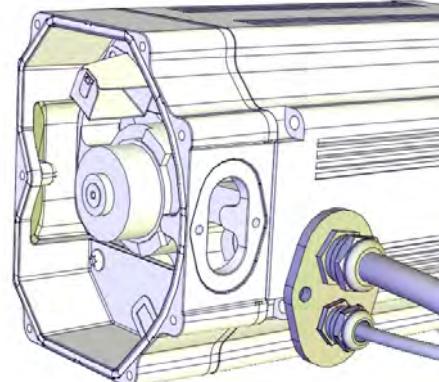
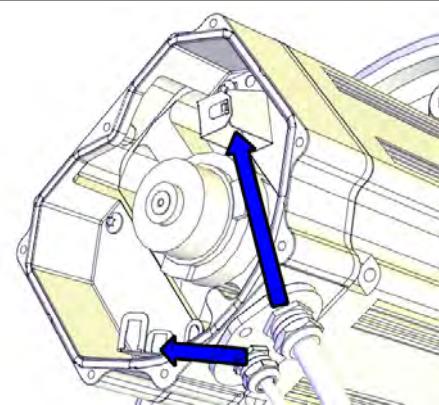
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4 Repair

4.4.2 Refitting the cable harness

Continued

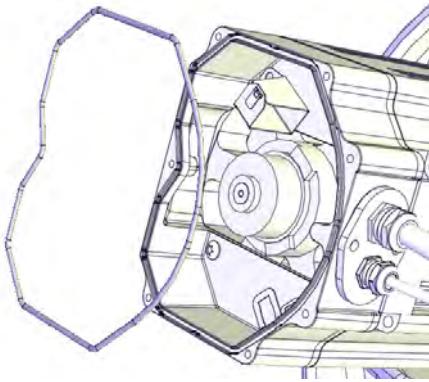
Reconnecting the axis-1 and axis-2 motor cables

	Action	Note
1	Push the motor cables in through the cable gland opening.	 xx1300000738
2	Refit the cable gland cover.  Note Replace the gasket if damaged.	 xx1200001067
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066

Continues on next page

4.4.2 Refitting the cable harness

Continued

Action	Note
4 Inspect the o-ring. Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)
	 xx1200001070
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring. Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

Continues on next page

4 Repair

4.4.2 Refitting the cable harness

Continued

Action	Note
<p>8 Refit the motor cover with its attachment screws.</p> <p>Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001135
9 Make sure that the covers are tightly sealed.	

Refitting the cable harness - lower arm

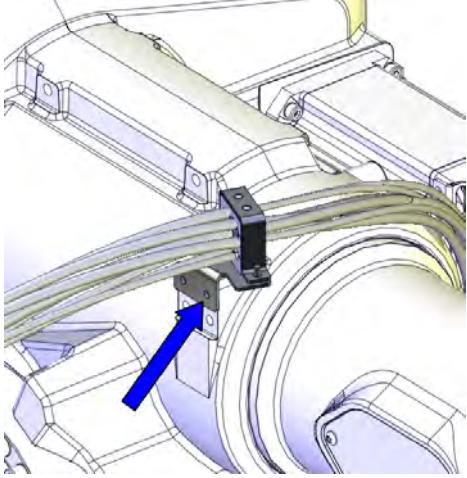
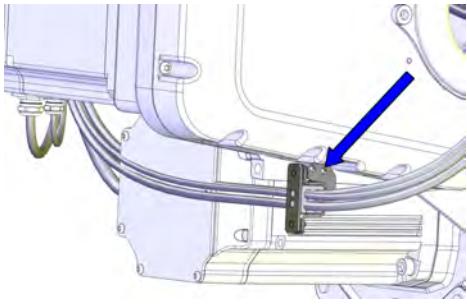
Action	Note
1 Before fitting the remaining axis-3 lower arm cable bracket inside the lower arm, make sure that it will stay twisted between the metal clamps, after fitting, as shown in the figure.	 xx1300000595
<p>2 Refit the axis-3 lower arm metal clamp located on the inside of the lower arm.</p> <p>Note The screws are reached from the outside of the lower arm.</p>	 xx1300000558

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Refitting the cable harness - upper arm and wrist

These procedures describes how to refit the cable harness in upper arm and wrist.

Refitting the cable harness - upper arm

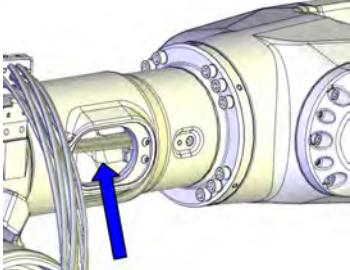
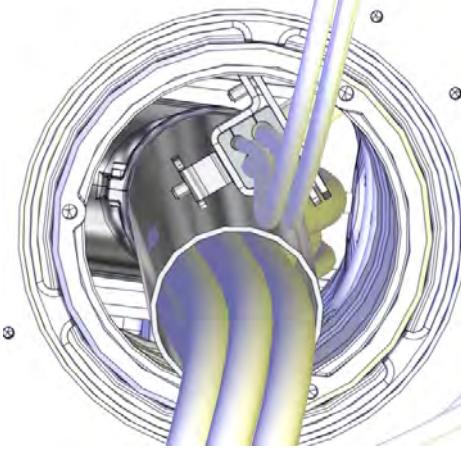
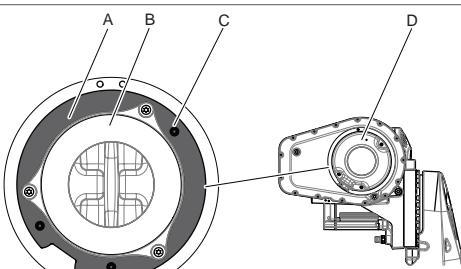
	Action	Note
1	Refit the metal clamp on top of the arm house.	 xx1300000541
2	Refit the arm house metal clamp.	 xx1300000543
3	Arrange the cables between the cable clamps in the upper arm.	
4	 Tip Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the procedure and to avoid damaging the parts during the procedure. This will also make it easier to run the cable harness through the inside of the upper arm.	 xx1300000668

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4 Repair

4.4.2 Refitting the cable harness

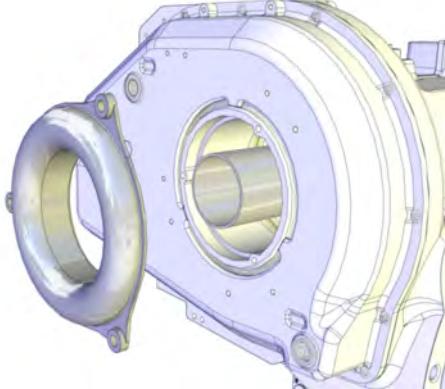
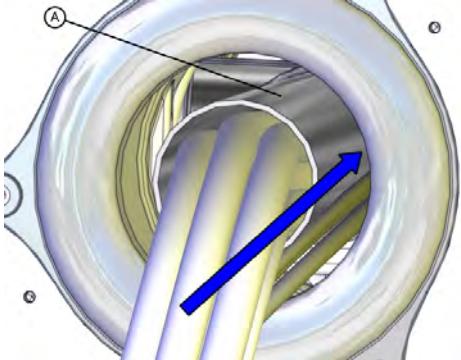
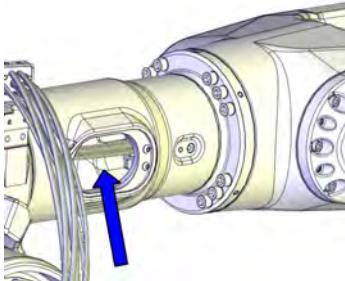
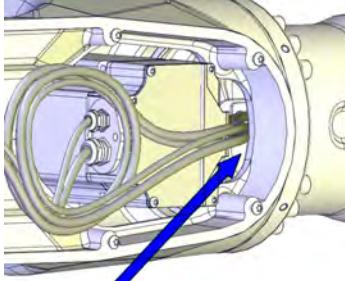
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Action	Note
<p>5</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole of the arm tube and take a hold of the cable harness. • Person 2: Take a hold on the cable harness at the back of the robot. • Together: Use caution and move the cable harness into the arm tube. <p> Note</p> <p>If DressPack is fitted it is needed to pull out the DressPack tube a little and then place it on the lower left side in the arm tube and then place the bracket of the cable harness on the upper right hand side, to be able to remove the cable harness. See figure!</p> <p>(This is not needed on variants IRB 6700 - 300/2.70, -245/3.00)</p>	<p>Person 1, working at the side hole:</p>  <p>xx1300000745</p> <p>Person 2, working at the back:</p>  <p>xx1400000356</p>
<p>6</p> <p>Foundry Plus:</p> <p>Make sure that the gasket between the robot and cover is correctly fitted. Replace if damaged!</p> <p>The gasket is covered with adhesive on the side facing the upper arm cover. The three washers are pressed into the holes in the gasket. Make sure all three washers are fitted.</p>	 <p>xx1400000382</p> <p>A Gasket B Cable guide C Washer D Cover</p>

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4.4.2 Refitting the cable harness

Continued

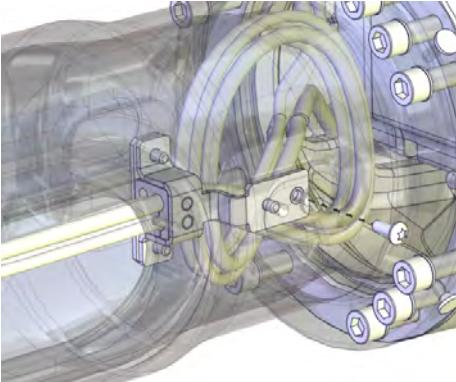
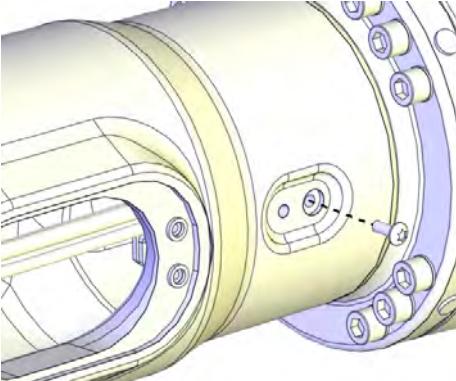
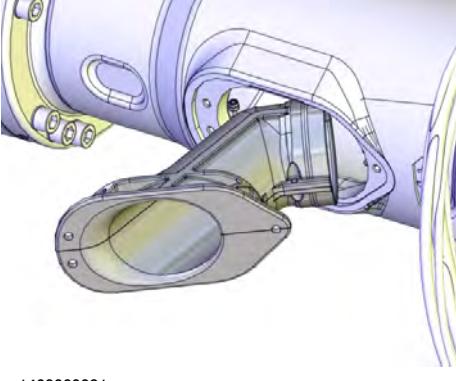
Action	Note
7 Fit the cable guide.	 xx1300000657
8 Run the cable harness through the cable guide and then into the upper arm tube.  Note The cable harness is best placed at the upper right hand side of the DressPack tube, if used, through the arm tube. Do not run the cable harness into the DressPack tube!	 xx1400000357 A Tube for DressPack
9 Use caution and push the cable harness into the upper arm tube.	
10  Tip This step is best performed by two persons working together. Use caution and push the cable harness into the wrist like this: <ul style="list-style-type: none"> • Person 1: Put one hand inside the side cover hole and take a hold of the cable harness. • Person 2: Take a hold of the cable harness from inside the wrist. • Together: Move the cable harness past the axis-5 motor and into the wrist. 	Person 1, working at the side hole:  xx1300000745 Person 2, working at the wrist:  xx1300000746

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4 Repair

4.4.2 Refitting the cable harness

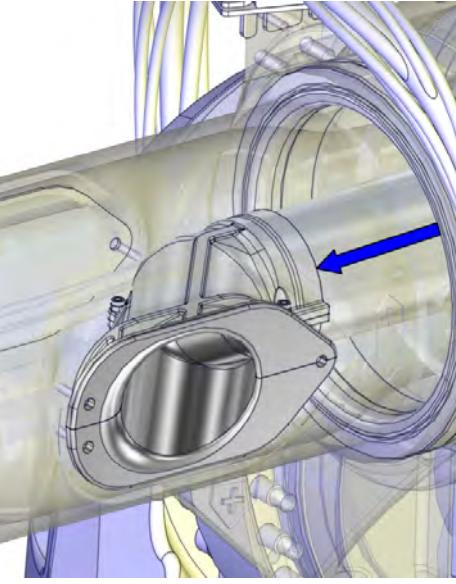
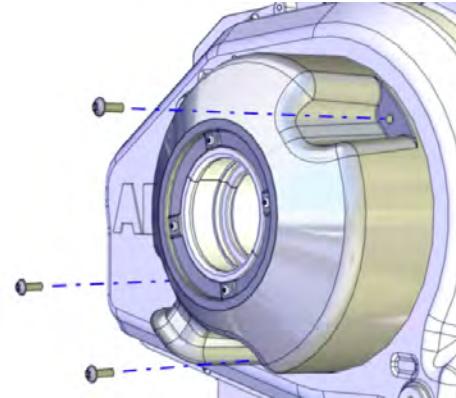
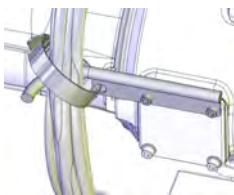
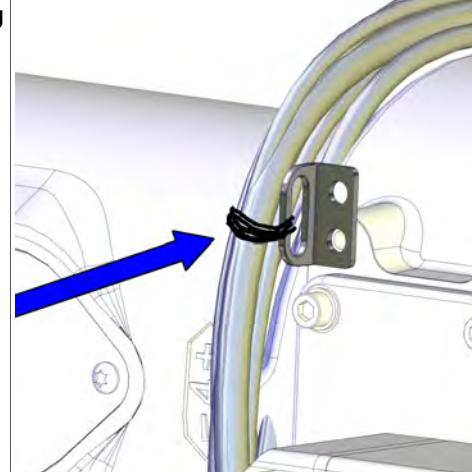
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Action	Note
11 Refit the metal clamp axis-4 inside the arm tube.  Note The screws are reached from outside the upper arm!	 xx1700000340
12 Refit the side cover.  Note Foundry Plus: <ul style="list-style-type: none"> • Make sure the gasket is fitted correctly on the side cover • Use attachment screws made of stainless steel to fit the side cover. 	 xx1300000557
13 If used, refit the insert that guides the DressPack cable package through the hole in the upper arm.  Note This is not needed on variants IRB 6700 - 300/2.70, -245/3.00	 xx1400000091

Continues on next page

4.4.2 Refitting the cable harness

Continued

	Action	Note
14	<p>If used, refit the tube containing the DressPack into the insert.</p> <p>Note</p> <p>This is not needed on variants IRB 6700 - 300/2.70, -245/3.00</p>	 xx1400000092
15	<p>If used (<i>DressPack or Foundry Plus</i>), refit the cover with the tube guiding ring fitted.</p> <p>Note</p> <p><i>Foundry Plus:</i></p> <ul style="list-style-type: none"> • Make sure the gasket is fitted correctly • Use attachment screws made of stainless steel to fit the cover. 	 xx1200000045
16	<p>Secure the cable harness to the cable fixing bracket with the velcro strap.</p> <p>Note</p> <p>If DressPack is fitted, the cable fixing bracket is replaced by the cable guide.</p>  xx1300001973	 xx1300000544

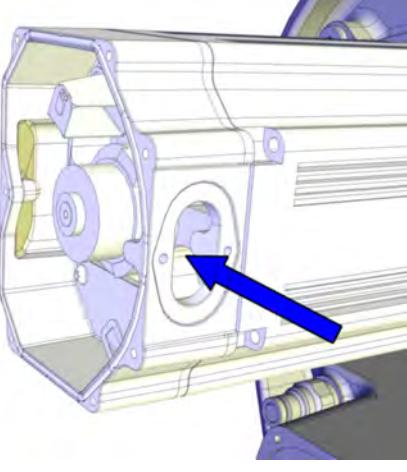
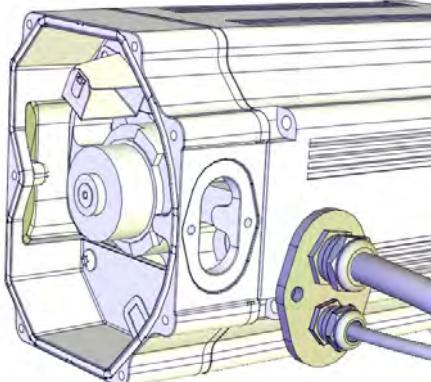
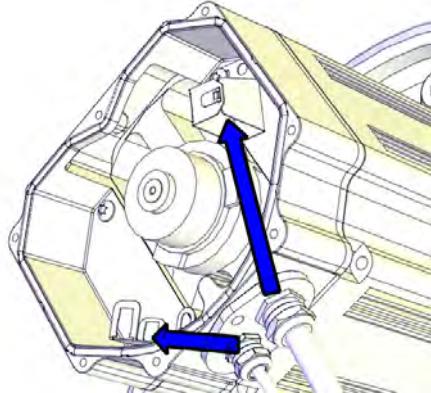
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4 Repair

4.4.2 Refitting the cable harness

Continued

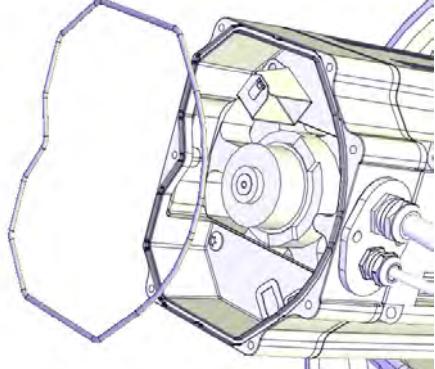
Connecting the axis-3 and axis-4 motor cables

Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738
2 Refit the cable gland cover.  Note Replace the gasket if damaged.	 xx1200001067
3 Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066

Continues on next page

4.4.2 Refitting the cable harness

Continued

Action	Note
4 Inspect the o-ring. Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)
	
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring. Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

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4 Repair

4.4.2 Refitting the cable harness

Continued

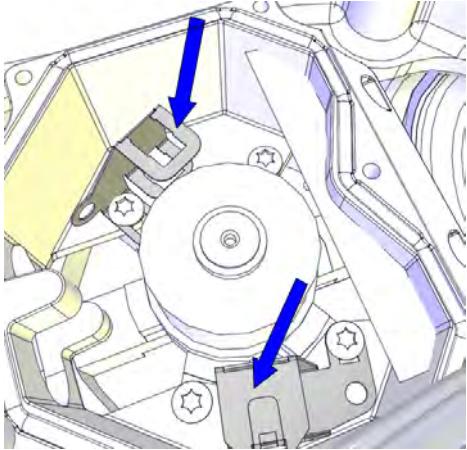
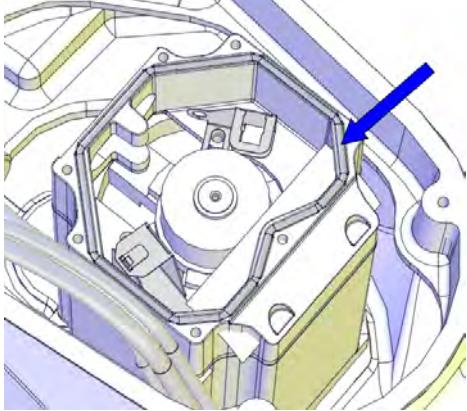
Action	Note
<p>8 Refit the motor cover with its attachment screws.</p> <p>Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001135
<p>9 Make sure that the covers are tightly sealed.</p>	

Connecting the axis-5 motor cables

Action	Note
<p>1 Push the motor cables in through the cable gland opening.</p>	 xx1300000738
<p>2 Refit the cable gland cover by performing the following steps:</p> <ul style="list-style-type: none"> Slide the cable gland cover onto the inner screw. Refit and tighten the outer screw. Tighten the inner screw. Make sure that the gasket is not damaged. <p>Note Replace the gasket if damaged.</p>	 xx1200001016

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4.4.2 Refitting the cable harness
Continued

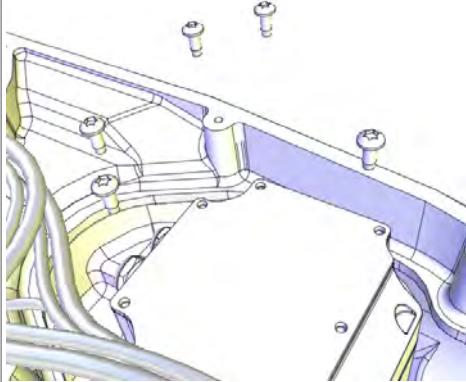
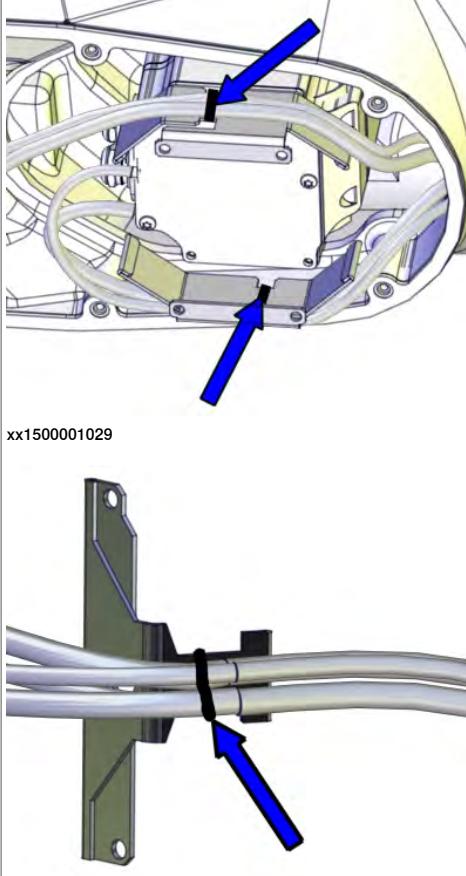
Action	Note
3 Connect the connectors. Connect in accordance with the markings on the connectors.	 xx1200001015
4 Make sure the o-ring on the motor is undamaged. Replace if damaged.	O-ring, axis 5: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile).  xx1200001021
5  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

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4 Repair

4.4.2 Refitting the cable harness

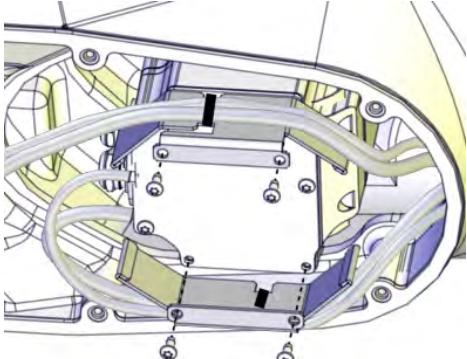
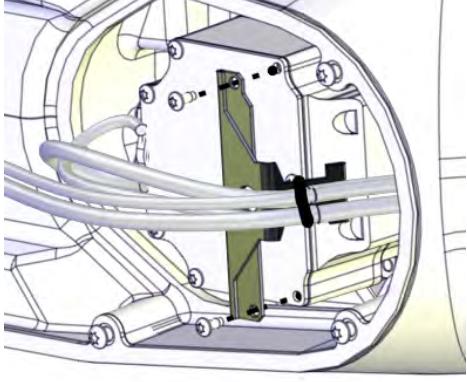
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	Action	Note
6	<p>Refit the motor cover with its attachment screws.</p> <p>Note</p> <p>Do not refit the screws that will hold the heat protection plate at this point.</p> <p>Note</p> <p>Do not reuse the self-threading attachment screws, it will damage the threads. Replace with standard attachment screws.</p> <p>Note</p> <p>Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001013
7	<p>Secure the cable harness with cable straps to the heat protection plate.</p> <p>Note</p> <p>If replacing a type A motor with a type B motor, the heat protection plate must be replaced with plates suited for the type B motor. See Type A vs type B motors on page 795.</p>	<p>There are two versions of the heat protection plates.</p> <p>Choose figure depending on which plate is installed on the robot.</p>  xx1500001029 xx1300000489

Continues on next page

4.4.2 Refitting the cable harness

Continued

Action	Note
8 Fit the heat protection plate with the screws.	<p>Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001030</p>  <p>xx1300000490</p>
9 Make sure that the cover is tightly sealed.	

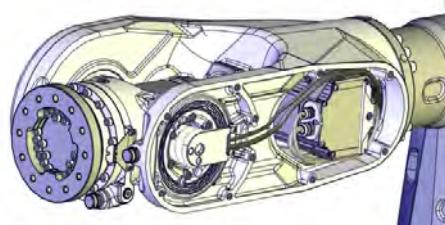
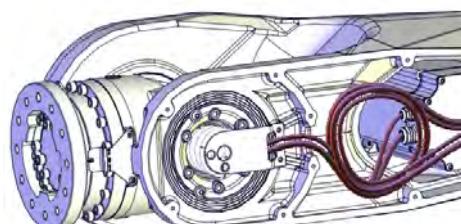
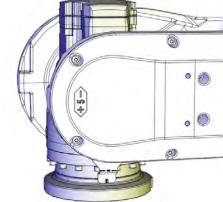
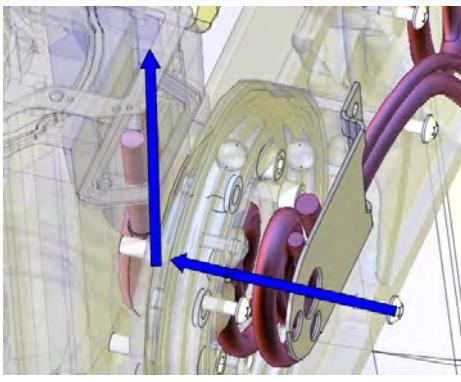
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4 Repair

4.4.2 Refitting the cable harness

Continued

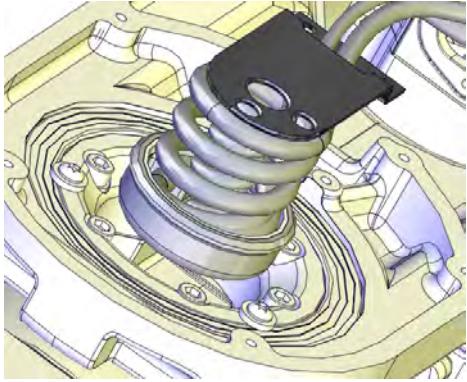
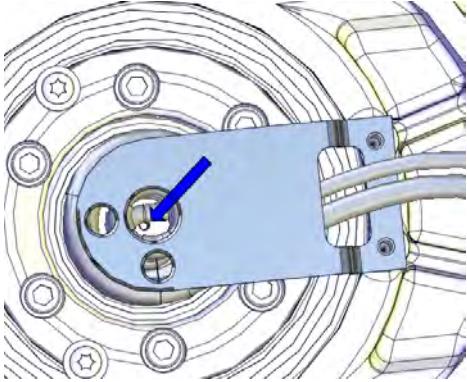
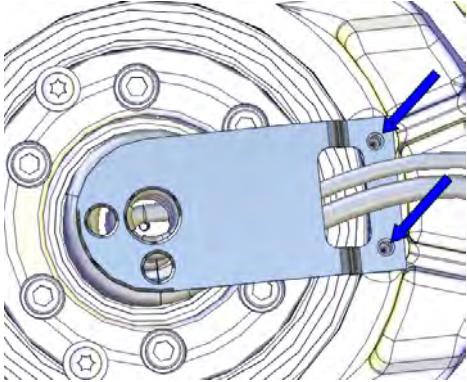
Connecting the axis-6 motor cables

Action	Note
1 Make sure that the cable harness is placed in a way that it will not be damaged when the cover is fitted.	 xx1600002061  xx1300000596 Cable layout in the wrist with Type A motors.
2  Note Axis 5 must be in position +90° (or as close as possible) for a correct installation of the cable harness in the wrist. If not, connect the 24 VDC power supply, release the brakes and move axis 5 manually to +90°.	 xx1200001081
3 Push the cable harness into the wrist recess and up into the axis-6 motor.	 xx1300000667

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4.4.2 Refitting the cable harness

Continued

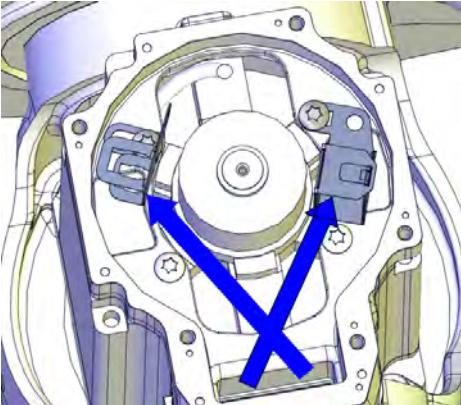
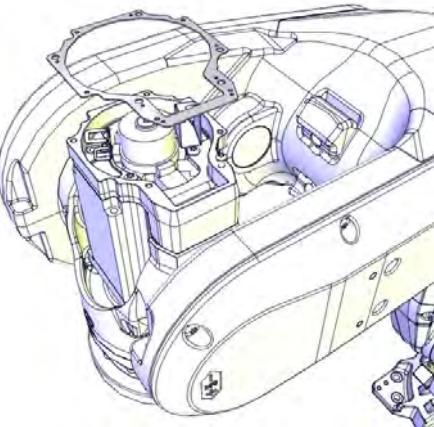
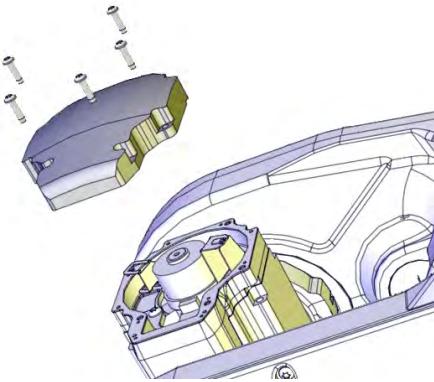
Action	Note
4 Push the carrier carefully into position.	
5 Secure the carrier with the M4 screw. Note The screw is located at the bottom of the carrier. Tip The attachment screw securing the carrier may be difficult to fit. Make sure the carrier is level and completely pressed against the bottom.	
6 Secure the cable bracket with its attachment screws.	

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4 Repair

4.4.2 Refitting the cable harness

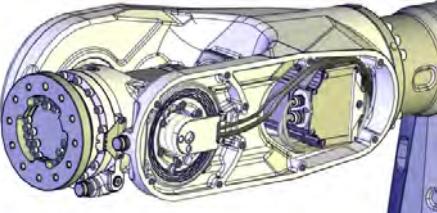
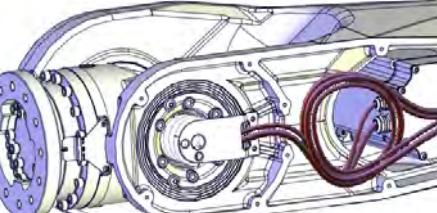
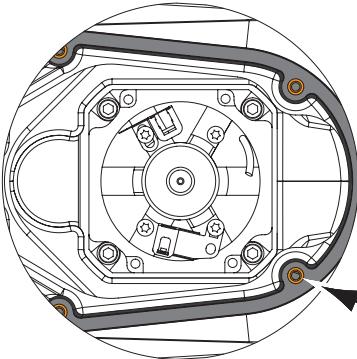
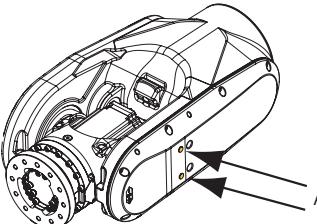
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Action	Note
7 Reconnect the connectors to the axis-6 motor.  Note Place the resolver cable under the motor cable.	 xx1300000488
8 Make sure the gasket is undamaged. Replace if damaged.	Gasket, 3HAC033489-001/ 3HAC044252-001  xx1200001095
9  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
10 Refit the motor cover.	 xx1200001080

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4.4.2 Refitting the cable harness Continued

Concluding procedure

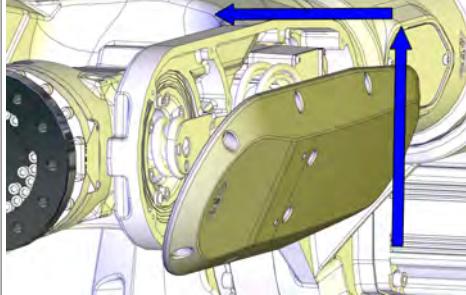
Action	Note
1 Make sure that the cable harness is placed in a way that it will not be damaged when the wrist cover is fitted.	 xx1600002061
	 xx1300000596
	Cable layout in the wrist with Type A motors.
2 Inspect the gasket. Replace if damaged.	
3 Foundry Plus: <ul style="list-style-type: none"> • Make sure that the gasket is undamaged on the cover. Replace if damaged! • Put washers in the holes of the gasket. • Use attachment screws made of stainless steel to fit the wrist cover. 	 B  A xx1400000383 <p>A Protection plugs (2 on wrist cover and 2 on cover axis-5 gearbox) B Washers (10 pcs) in gasket holes</p>

Continues on next page

4 Repair

4.4.2 Refitting the cable harness

Continued

Action	Note
4 Refit the wrist cover. In order not to damage the cable harness when the wrist cover is refitted, use this method: <ol style="list-style-type: none"> 1 Hold the cover in an angle. See figure! 2 Catch any part of the cable harness hanging down. 3 Lift the cover, still held in an angle. 4 Move the upper part of the cover into position. 5 Secure the cover with its attachment screws. 	Tightening torque: 10 Nm.  xx1300000772
5 Foundry Plus: Refit protection plugs.	See figure above!
6 If used, refit the DressPack cable package on the wrist.	
7 Recalibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
8  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

4.4.3 Replacing the SMB

About the figures

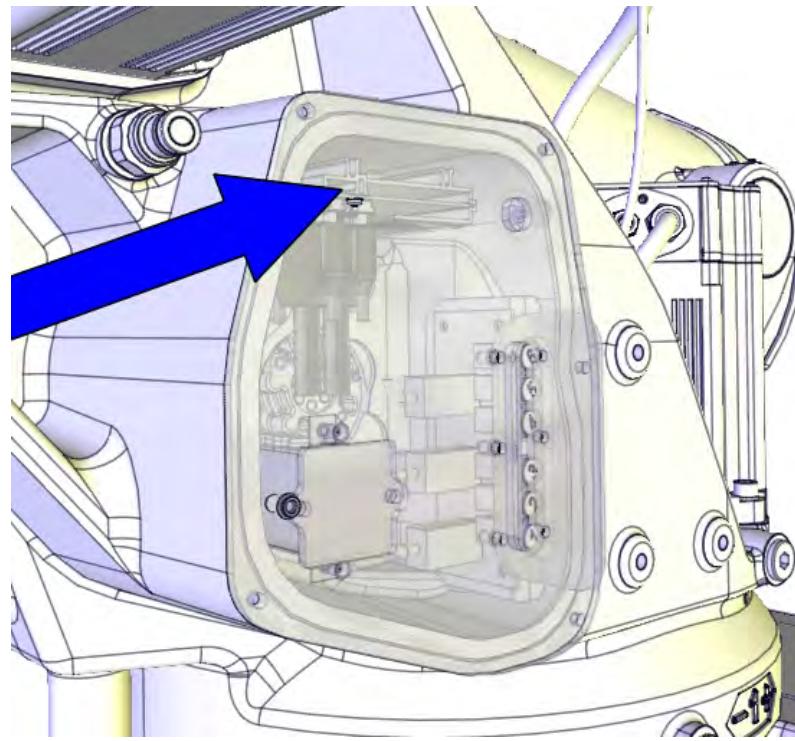


Note

When visual differences between variants, is of no importance, only one is shown in the figures.

Location of SMB unit

The SMB (serial measurement board) unit is located inside the SMB/BU recess, as shown in the figure.



xx1300000740

Spare part

Equipment, etc.	Article number	Note
SMB unit (DSQC633C)	See <i>Product manual, spare parts - IRB 6700</i> .	
Battery pack	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

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4 Repair

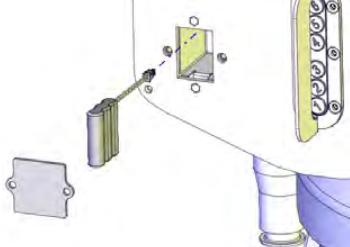
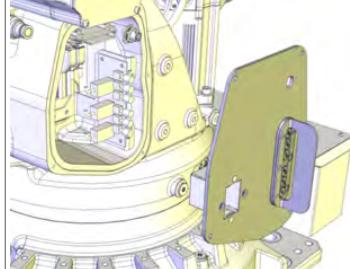
4.4.3 Replacing the SMB

Continued

Removing the SMB unit

Use these procedures to disconnect and remove the SMB unit.

Preparations before disconnecting the SMB unit

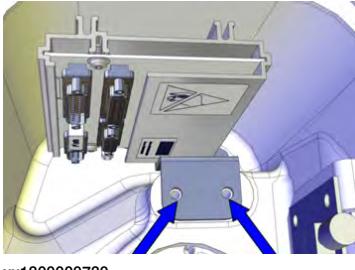
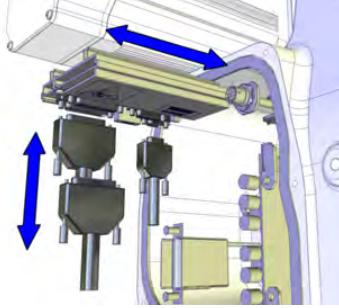
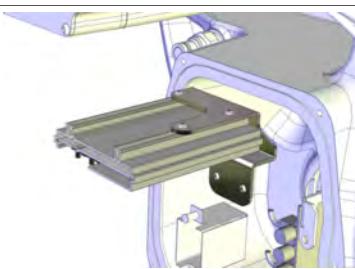
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	
3 Open the small cover on the SMB cover, disconnect the battery cable and remove the battery.	 xx1300000829
4 Remove the SMB cover.	 xx1300000669

Disconnecting and removing the SMB unit

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	

Continues on next page

4.4.3 Replacing the SMB Continued

Action	Note
3 Remove the screws and washers that secure the SMB unit bracket.	 xx1300000730
4 Pull out the SMB unit a little and disconnect the connectors from the SMB board: R1.SMB1-3, R1.SMB4-6 and R2.SMB	 xx1300000728
5 Pull out the SMB unit and put it in an ESD bag.	 xx1300000731

Refitting the SMB unit

Refitting the SMB unit

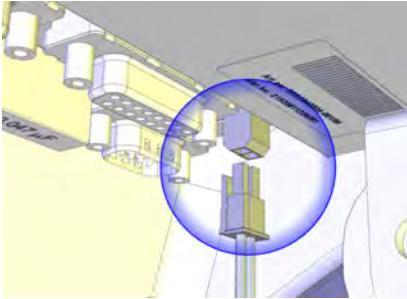
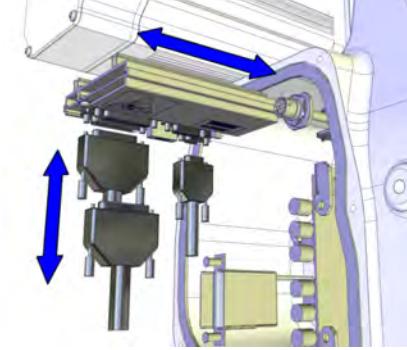
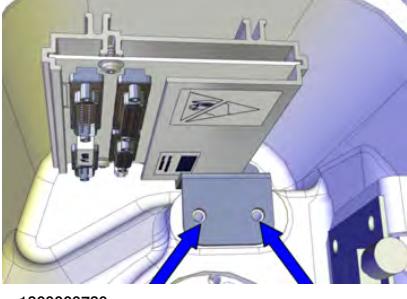
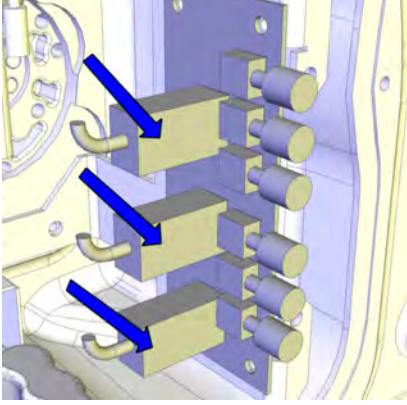
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	

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4 Repair

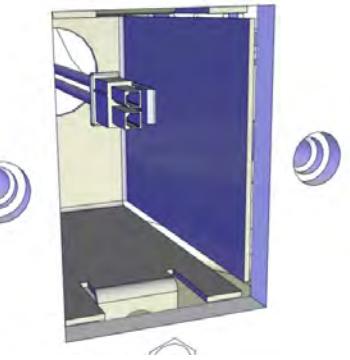
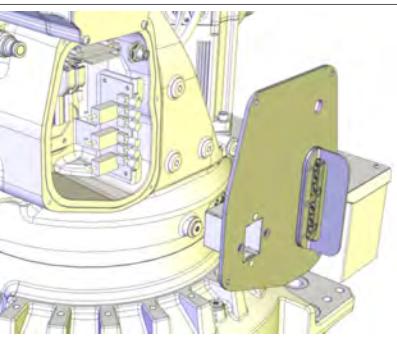
4.4.3 Replacing the SMB

Continued

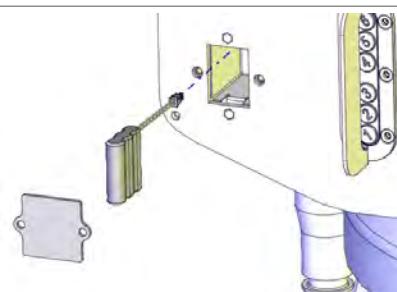
Action	Note
3 Connect the battery cable to the SMB unit.	 xx1300000729
4 Connect all connectors to the SMB board: R1.SMB1-3, R1.SMB4-6 and R2.SMB	 xx1300000728
5 Push in the SMB unit carefully into position and fit the bracket that secures the SMB unit.	 xx1300000730
6 If disconnected, reconnect the connectors X8, X9 and X10 to the brake release board.	 xx1300000670

Continues on next page

4.4.3 Replacing the SMB Continued

Action	Note
7 Pull out the battery cable through the recess for the battery.	 xx1300000834
8 Secure the SMB cover with its attachment screws. If cabling is used for 7th axis (option), refit the connector R2.FB7 to the SMB cover and tighten with 6 Nm.	 xx1300000669

Refitting the SMB battery

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>WARNING - The unit is sensitive to ESD! on page 51</i>	
2 Get a hold of the battery cable in the recess for the battery and reconnect.	
3 Place the battery in the recess.	 xx1300000829
4 Refit the battery cover.	

Continues on next page

4 Repair

4.4.3 Replacing the SMB

Continued

Concluding procedures

	Action	Note
1	Update the revolution counters.	See Updating revolution counters on page 770 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

4.4.4 Replacing the brake release unit

About the figures

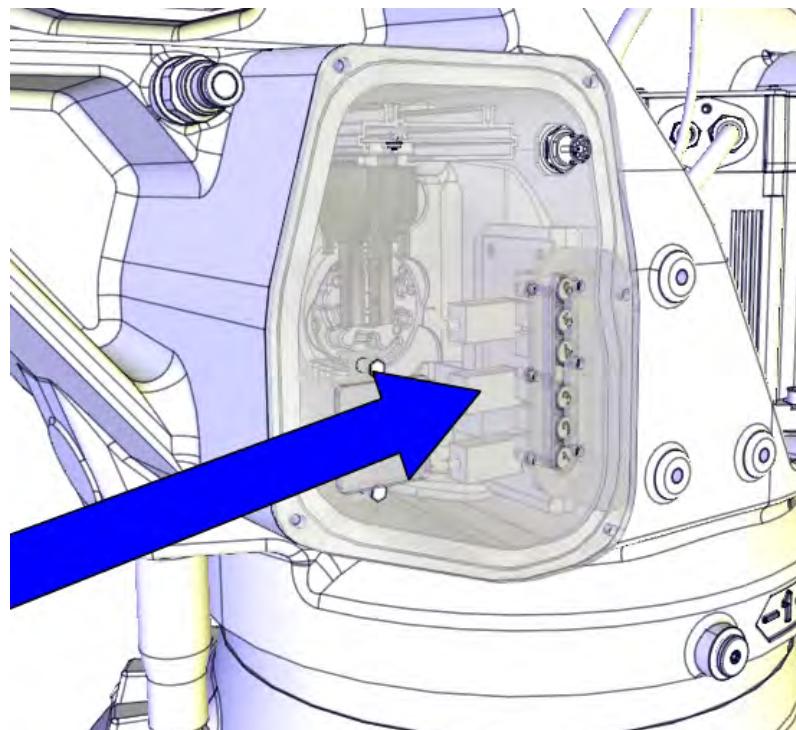


Note

When visual differences between variants, is of no importance, only one is shown in the figures.

Location of BU unit

The brake release unit (BU) is located inside SMB/BU recess, as shown in the figure.



xx1300000741

Spare part

Equipment, etc.	Article number	Note
Brake release unit	See <i>Product manual, spare parts - IRB 6700</i> .	
Battery pack	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

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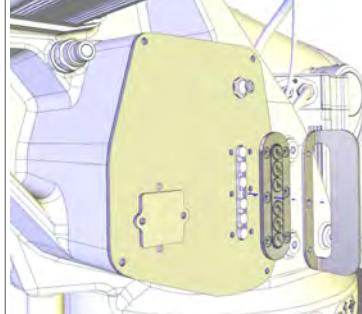
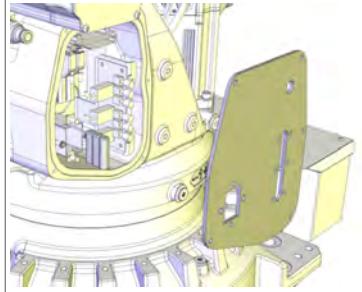
4 Repair

4.4.4 Replacing the brake release unit

Continued

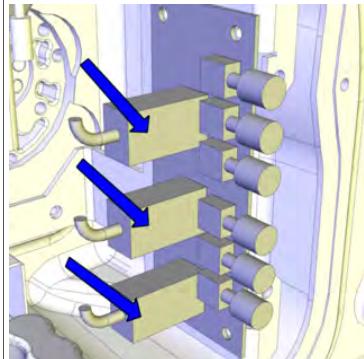
Removing the brake release unit

Preparations before removing the brake release unit

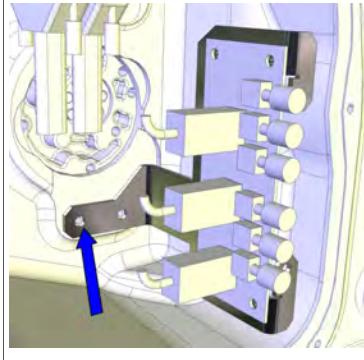
Action	Note
1  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	
3 Remove the push button guard from the SMB cover. The push button guard must be removed to ensure a correct refitting of the brake release unit.	 xx1300000743
4 Remove the SMB cover.	 xx1300000742
5 The battery can stay connected, to avoid the need of synchronizing the robot.  CAUTION If the battery stays connected, put (or hold) the SMB cover in a safe position. The battery cable connectors can otherwise be damaged.	

Continues on next page

Disconnecting the brake release unit

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	
3	Remove the connectors X8, X9 and X10 from the brake release board.	 xx1300000670

Removing the brake release unit

	Action	Note
1	Unscrew the attachment screws that secure the brake release unit bracket.	
2	Remove the bracket with the brake release unit fitted.	 xx1300000744

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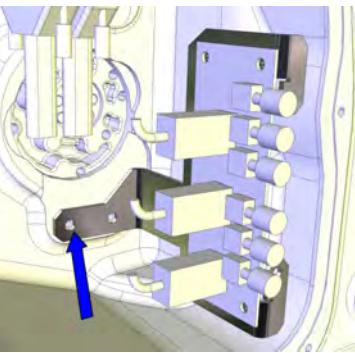
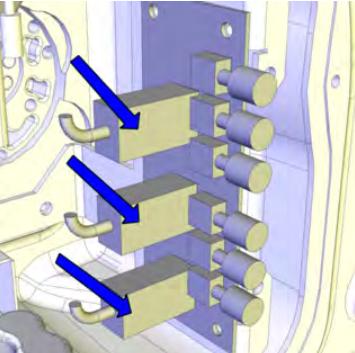
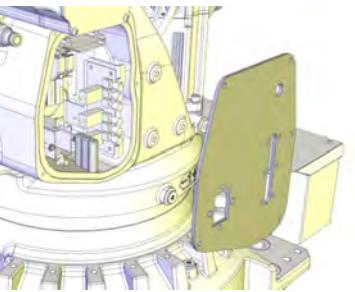
4 Repair

4.4.4 Replacing the brake release unit

Continued

Refitting the brake release unit

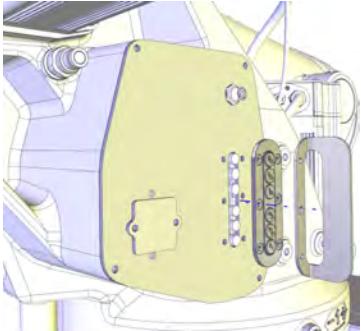
Use this procedure to refit the brake release unit.

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	
2 Refit the bracket with the brake release unit fitted. Make sure the unit is placed as straight as possible on the bracket! The push buttons can otherwise get jammed when the SMB cover is refitted.	 xx1300000744
3 Reconnect the connectors X8, X9 and X10 to the brake release unit.	 xx1300000670
4 Refit the SMB cover with its attachment screws.  Note Do not refit the push button guard at this point!	 xx1300000742
5  WARNING Before continuing any service work, please observe the safety information in section WARNING - The brake release buttons may be jammed after service work on page 49!	

Continues on next page

4.4.4 Replacing the brake release unit

Continued

Action	Note
6 Refit the push button guard to the SMB cover.	 xx1300000743
7 Reconnect the battery, if it has been disconnected. Update the revolution counters if the battery has been disconnected.	See Updating revolution counters on page 770 .
8  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

4 Repair

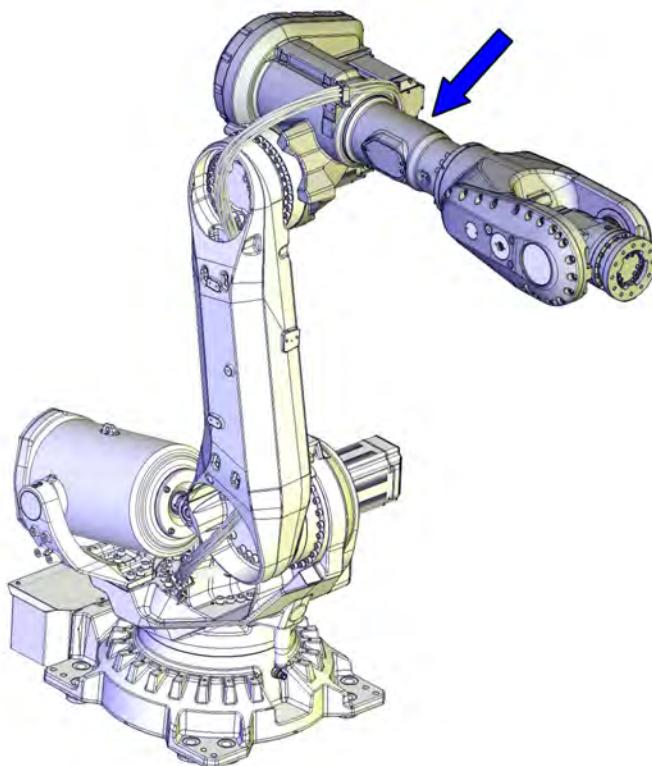
4.5.1 Replacing the upper arm

4.5 Upper and lower arms

4.5.1 Replacing the upper arm

Location of the upper arm

The upper arm is located as shown in the figure. These sections describe how to replace the complete upper arm, which includes the wrist unit.



xx1300000483

Spare part

Spare part	Spare part number	Note
Upper arm	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC16131-1	M12
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.

Continues on next page

4.5.1 Replacing the upper arm
Continued

Equipment, etc.	Article number	Note
Pallet		Used for putting down removed parts from robot.
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs!
Guide pin, M12x200	3HAC13056-4	Always use guide pins in pairs!
Guide pin, M16x150	3HAC13120-2	Always use guide pins in pairs!
Guide pin, M16x200	3HAC13120-3	Always use guide pins in pairs!
24 VDC power supply	-	Used to release the motor brakes.
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Parts needed to be replaced after removal.

Equipment, etc.	Art. no.	Note
Grease	3HAB3537-1	Used to lubricate o-rings.
O-ring	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on axis-3 motor cover.
	3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)	D=119x3 Used on axis-4 motor cover.
	3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)	D=119x3 Used on axis-5 motor cover.
Gasket	3HAC033489-001/ 3HAC044252-001	Used on axis-6 motor cover.
Rust preventive	-	Mercasol, used to Foundry Plus

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	

Continues on next page

4 Repair

4.5.1 Replacing the upper arm

Continued

Action	Note
<p>If the robot is to be calibrated with reference calibration: 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775. Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum.</p>
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the upper arm

Use these procedures to remove the upper arm.



Note

There is an alternative method to remove the upper arm if only the axis-3 gearbox shall be replaced. This alternative method describes how to remove the upper arm with the robot cable harness still partly fitted. See [Replacing the axis-3 gearbox on page 715](#).

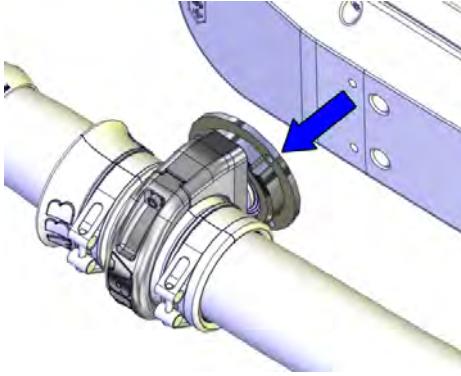
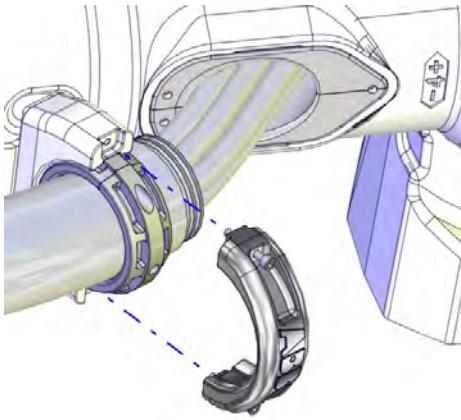
Preparations before removing the upper arm

Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 Jog the robot to a position where it is best to remove tools and other equipment fitted to wrist and upper arm.	
3  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

Continues on next page

4.5.1 Replacing the upper arm

Continued

Action	Note
4 If DressPack is installed: <ul style="list-style-type: none"> Remove the bracket with the complete ball joint housing still fitted, as shown in the figure. <p>This is done to be able to reach the two hidden screws that secure the wrist cover.</p>	 xx1400000355
5 If used, open the ball joint housing on the arm tube and remove the DressPack cable package.	 xx1400000206
6 Remove tools and other equipment fitted to wrist and upper arm.	
7 Prepare an area where to put the upper arm, after removed. On pallets, as a suggestion.	

Position of the robot in the continued process

Action	Note
1 Jog the robot into position: <ul style="list-style-type: none"> Axis 1: No significance (as long as the robot is secured to the foundation) Axis 2: -60° Axis 3: +60° Axis 4: +90° Axis 5: +90° Axis 6: No significance 	

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4 Repair

4.5.1 Replacing the upper arm

Continued

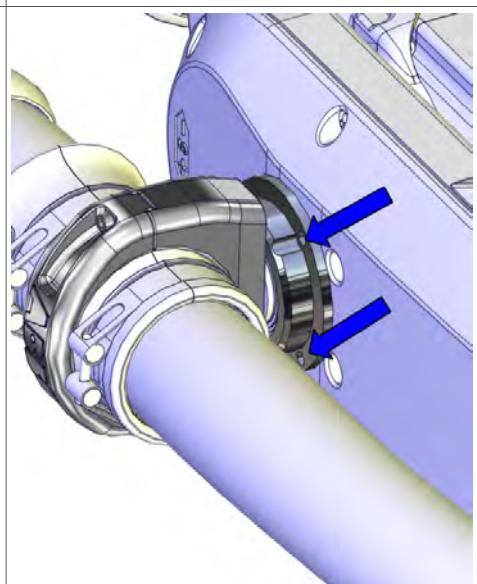
	Action	Note
2	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply <p>to the robot, before entering the robot working area.</p>	

Removing the DressPack cable package

Remove the DressPack cable package, if used. How to remove the DressPack cable package is described in more detail in the product manual "IRB 6700 DressPack". For article number see [References on page 10](#).

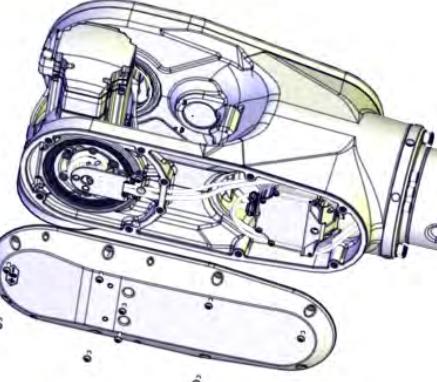
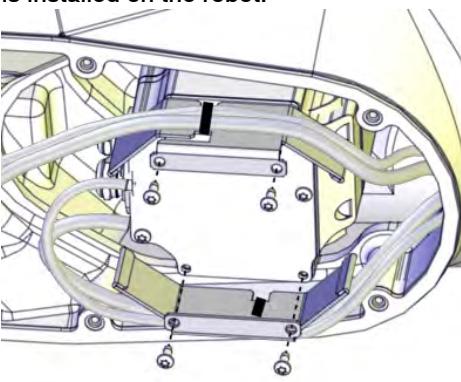
Retrieving access to the wrist cabling

Use this procedure to remove the wrist cover to retrieve access to the axis-5 and axis-6 motor cables.

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	If DressPack is not already removed, the complete ball joint housing (including the bracket) must be removed at this point, in order to reach the two hidden screws that secures the wrist cover.	 xx1400000355

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4.5.1 Replacing the upper arm
Continued

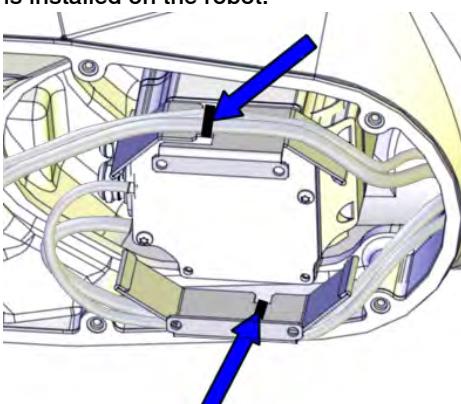
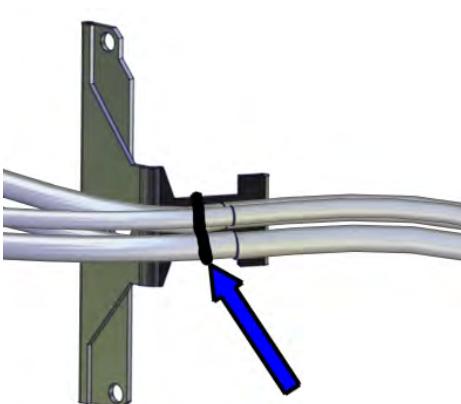
Action	Note
3 Remove the wrist cover.	 xx1300002247
4 Remove the heat protection plate/plates from the motor with the cabling still attached to the plate. Remove the heat protection plates from the motor with the cabling still attached to the plate.	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  xx150001030

Continues on next page

4 Repair

4.5.1 Replacing the upper arm

Continued

Action	Note
<p>5 Cut the cable ties that hold the cable harness to the plate.</p> <p>Note Keep the heat protection plate until refitting.</p> <p>Tip If removing the plate only for replacing the motor, the cabling does not need to be loosened from the plate.</p>	<p>Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001029</p>  <p>xx1300000489</p>

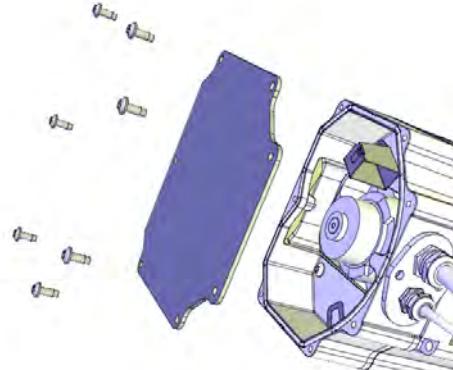
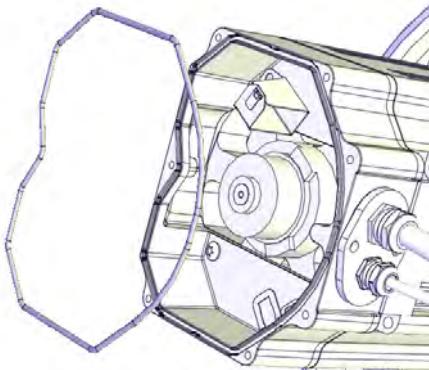
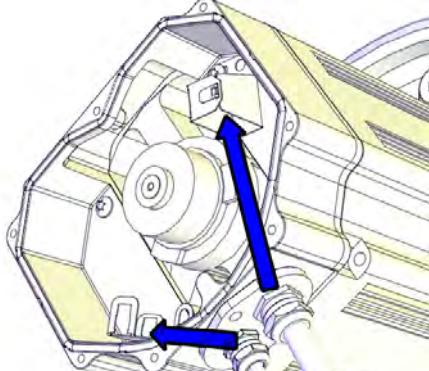
Disconnecting the axis-5 motor cables

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

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4.5.1 Replacing the upper arm

Continued

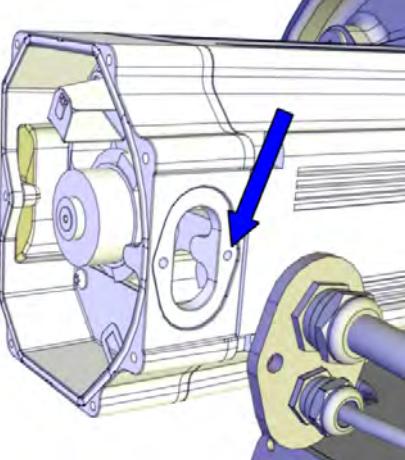
Action	Note
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066

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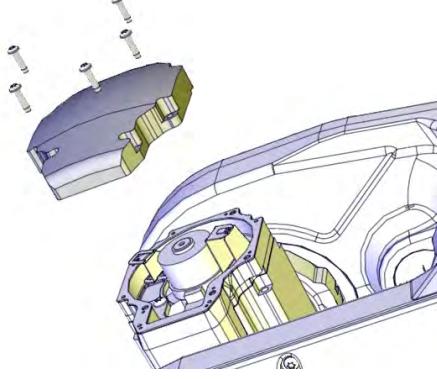
4 Repair

4.5.1 Replacing the upper arm

Continued

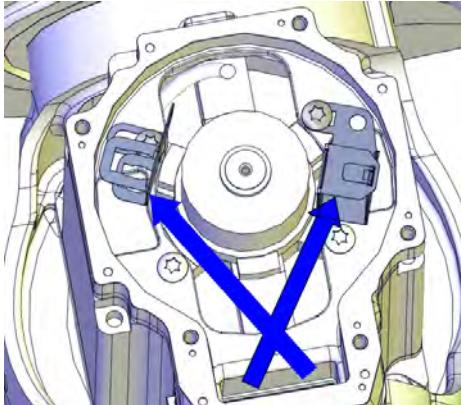
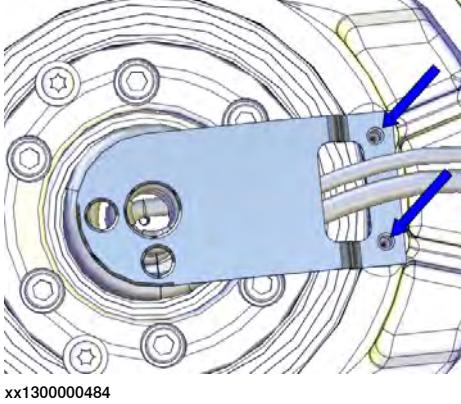
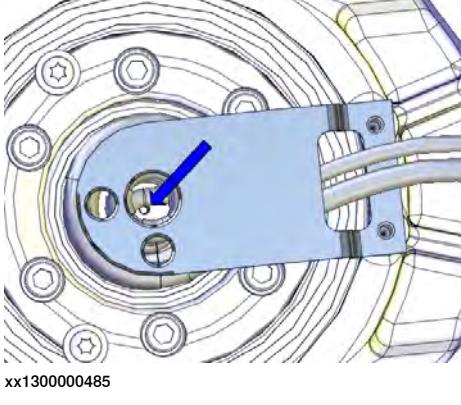
Action	Note
<p>5 Remove the cable gland cover by performing the following steps:</p> <ol style="list-style-type: none"> 1 Open the inner screw a little (the one the arrow is pointing at). No need to remove this screw from the motor. 2 Remove the outer screw. 3 Slide the cable gland cover away from the inner screw. Make sure the gasket is not damaged. <p> Tip</p> <p>Make a note in which direction the cable exit hole is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1300000656
6 Use caution and pull out the motor cables.	

Disconnecting the axis-6 motor cables

Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2 Unscrew the attachment screws and remove the motor cover.	 xx1200001080

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4.5.1 Replacing the upper arm
Continued

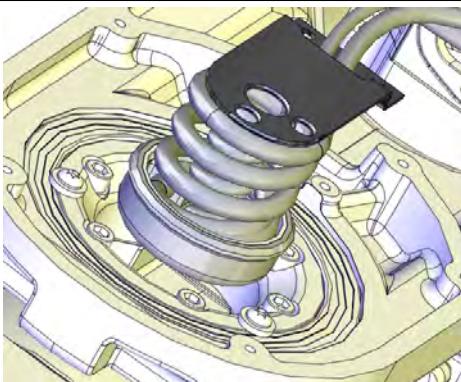
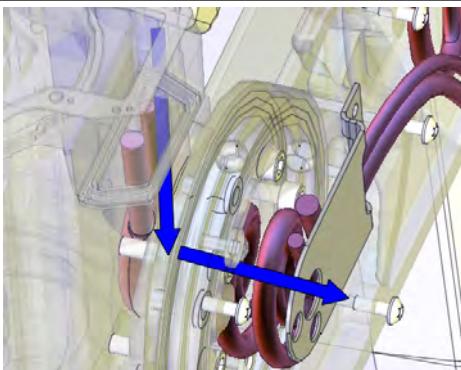
Action	Note
3 Disconnect the motor cables.	 xx1300000488
4 Unscrew the attachment screws that hold the cable bracket.	 xx1300000484
5 Unscrew the M4 screw that holds the carrier.  Note The screw is located at the bottom of the carrier.	 xx1300000485

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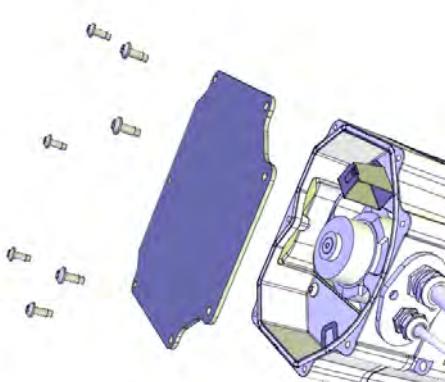
4 Repair

4.5.1 Replacing the upper arm

Continued

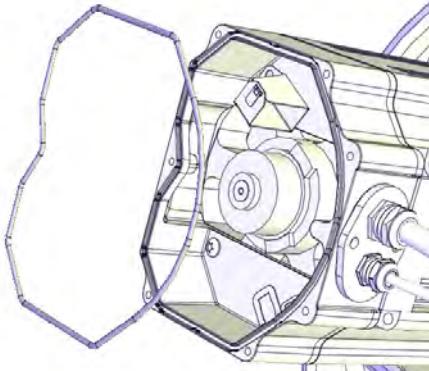
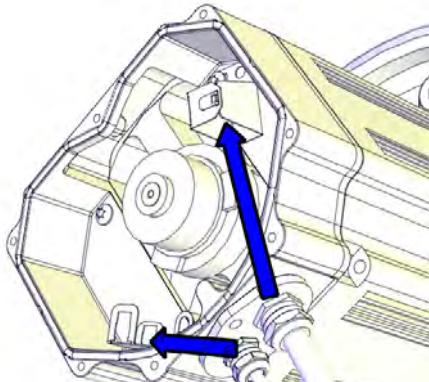
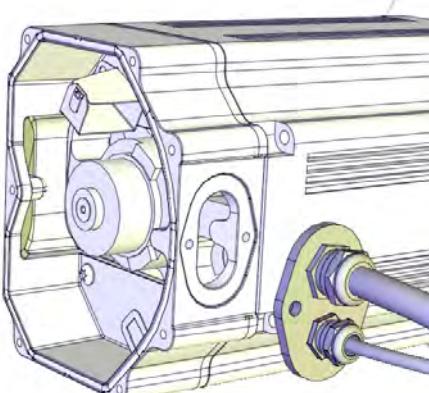
Action	Note
6 Pull out the carrier from its position.	 xx1300001113
7 Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.	 xx1300000666

Disconnecting the axis-3 and axis-4 motor cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135

Continues on next page

4.5.1 Replacing the upper arm Continued

Action	Note
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066
5 Remove the cable gland cover. Make sure the gasket is not damaged.  Tip Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.	 xx1200001067
6 Use caution and pull out the motor cables.	

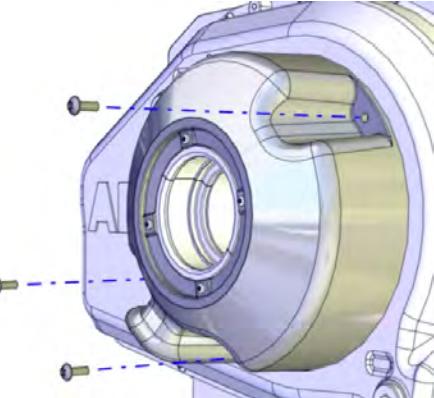
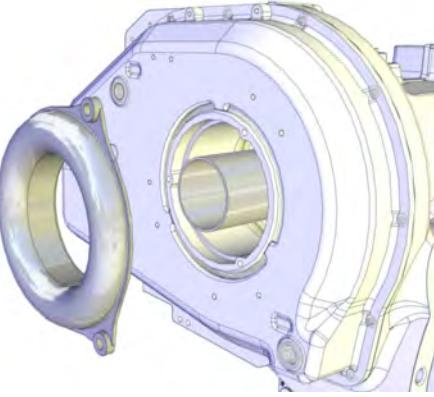
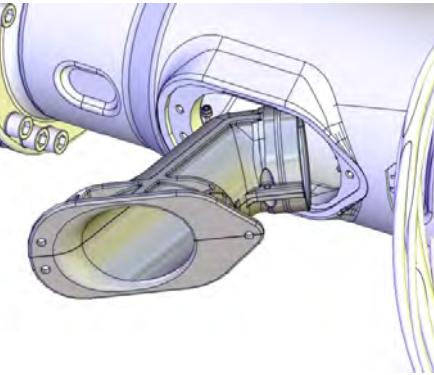
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4 Repair

4.5.1 Replacing the upper arm

Continued

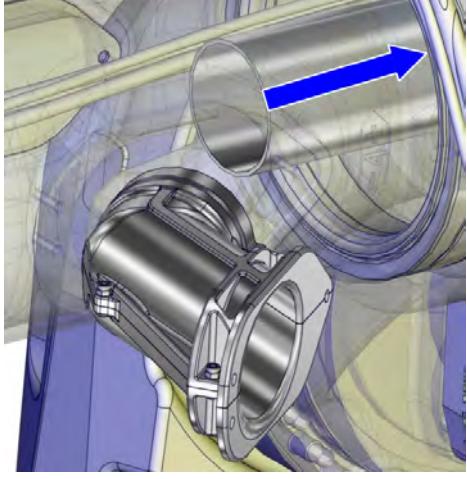
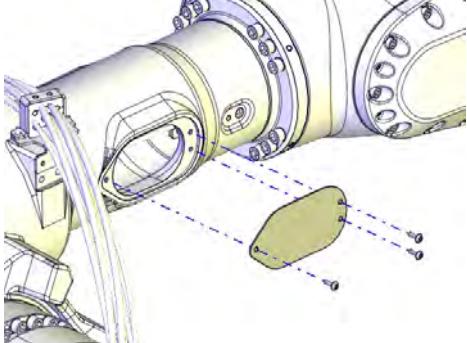
Removing the cable harness - wrist and upper arm

Action	Note
1 Remove the cover.  Note Foundry Plus: Use caution not to damage the gasket, to loose the washers on the cover sealing or to loose the inserts fitted on the cover.	 xx1200000045
2 Remove the cable guide, slide it out a little and let it rest on the cables.	 xx1300000657
3 If used, remove the insert.  Note This is not needed on variants IRB 6700 - 300/2.70, -245/3.00	 xx1400000091

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4.5.1 Replacing the upper arm

Continued

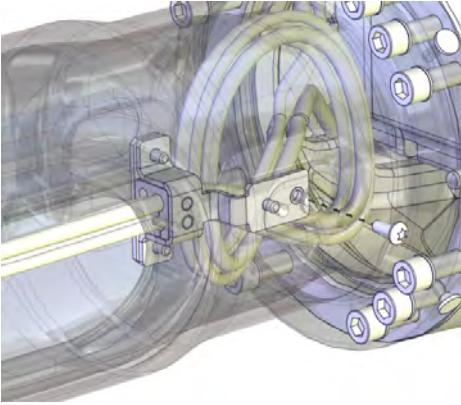
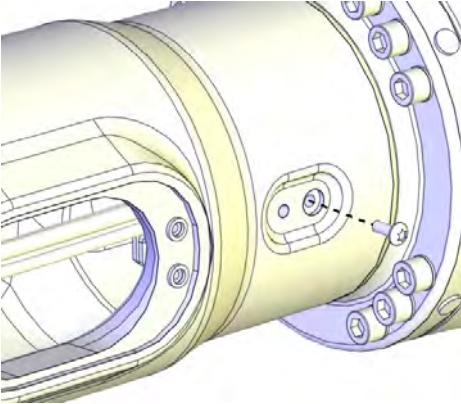
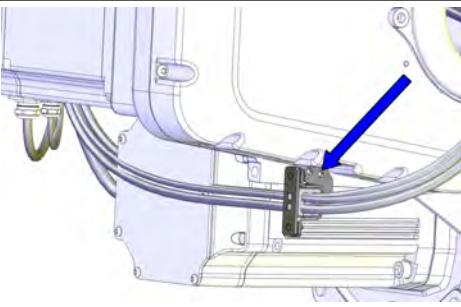
Action	Note
4 If used, push the DressPack tube a little backwards.  Note This is not needed on variants IRB 6700 - 300/2.70, -245/3.00	 xx1400000720
5  Tip Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the procedure and to avoid damaging the parts during the procedure. This will also make it easier to run the cable harness through the inside of the upper arm.	 xx1300000668
6 Remove the side cover on the arm tube.	 xx1300000557

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4 Repair

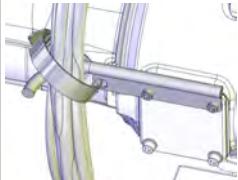
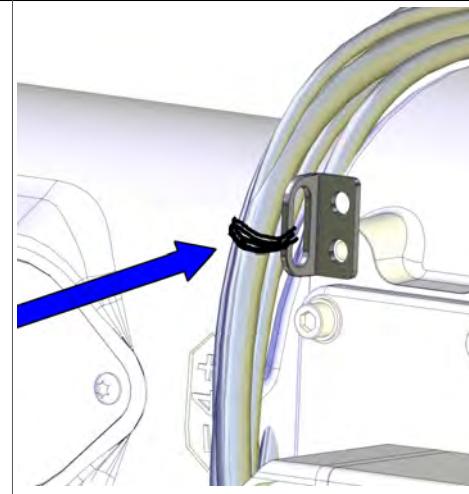
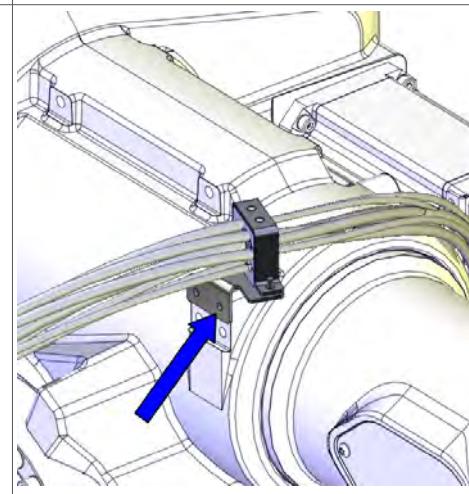
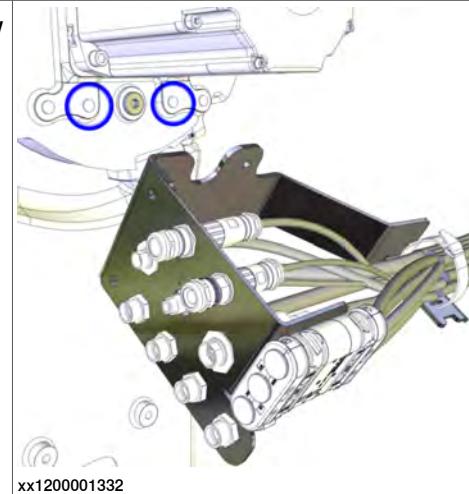
4.5.1 Replacing the upper arm

Continued

Action	Note
7 Unscrew the attachment screw that secures the axis-4 metal clamp inside the arm tube.  Note The screw is reached from outside the upper arm!	 xx1700000340  xx1700000339
8 Remove the armhouse metal clamp.	 xx1300000543

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4.5.1 Replacing the upper arm
Continued

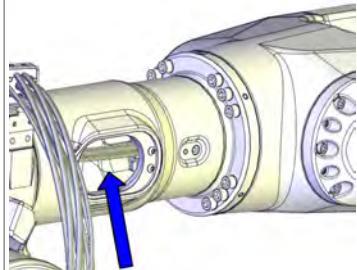
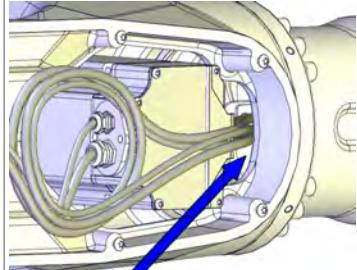
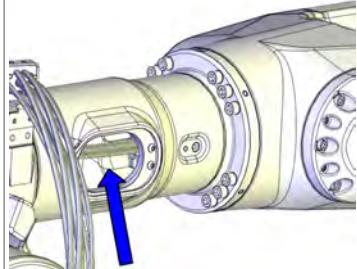
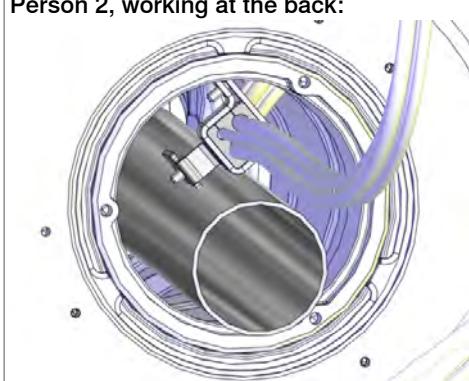
Action	Note
<p>9 Open the velcro strap at the cable fixing bracket.</p> <p>Note If DressPack is fitted, the cable fixing bracket is replaced by the cable guide.</p>  <p>xx1300001973</p> <p>Cable guide.</p>	 <p>xx1300000544</p> <p>Cable fixing bracket.</p>
<p>10 Remove the metal clamp on top of the armhouse.</p>	 <p>xx1300000541</p>
<p>11 If used (and if not already done), unscrew the screws that hold the connection plate and let it hang free with the rest of the DressPack cable package.</p>	 <p>xx1200001332</p>

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4 Repair

4.5.1 Replacing the upper arm

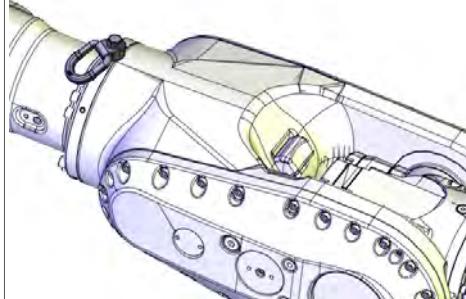
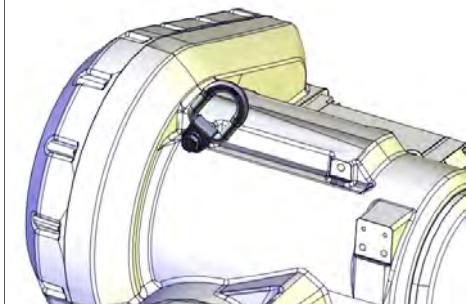
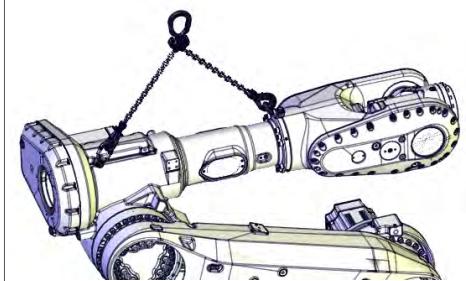
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	Action	Note
12	 Tip <p>This step is best performed by two persons working together.</p> <p>Use caution and remove the cable harness out of the wrist like this:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole and take a hold of the cable harness. • Person 2: Take a hold on the cable harness inside the wrist. • Together: Move the cable harness past the axis-5 motor and into the arm tube. 	<p>Person 1, working at the side hole:</p>  xx1300000745 <p>Person 2, working at the wrist:</p>  xx1300000746
13	 Tip <p>This step is best performed by two persons working together.</p> <p>Use caution and remove the cable harness out of the arm tube like this:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole and take a hold of the cable harness. • Person 2: Take a hold on the cable harness at the back of the robot. • Together: Move the cable harness out of the arm tube. <p>Remove the cable harness from the upper arm.</p> <p> Note</p> <p>To be able to remove the cable harness with the DressPack tube fitted, the tube needs to be pulled out a little, then be placed on the lower left side in the arm tube and the bracket of the cable harness then needs to be placed on the upper right hand side.</p> <p>(This is not needed on variants IRB 6700 - 300/2.70, -245/3.00)</p>	<p>Person 1, working at side hole:</p>  xx1300000745 <p>Person 2, working at the back:</p>  xx1400002561

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Attaching the lifting accessories

Use this procedure to attach the lifting accessories to the upper arm.

	Action	Note
1	 CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2	Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1  xx1200001133
3	Fit a lifting eye in the arm house, with a fender washer underneath.	Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.  xx1200001134
4	Attach the upper arm lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and in the wrist.	Lifting accessory (chain): 3HAC15556-1  xx1200001308

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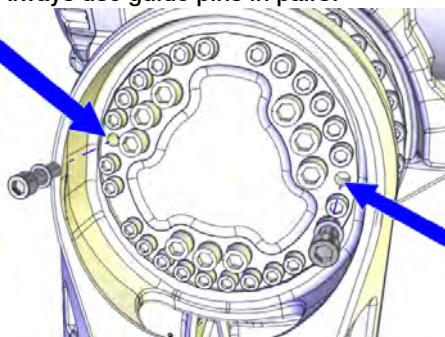
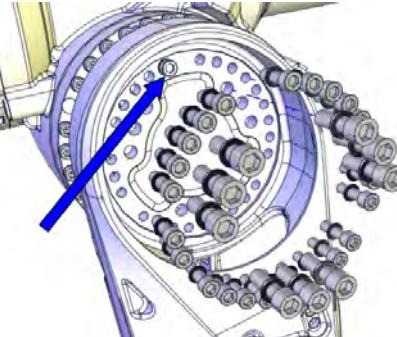
4 Repair

4.5.1 Replacing the upper arm

Continued

Action	Note
5 Raise the lifting accessories to take the weight of the upper arm.	
6 In case of necessary adjustments, use the shortening loops on the lifting accessory (chain) to find the level position. See figure!	 xx1400002197
7 Release the brakes in order to find the most level lifting position of the upper arm as possible, before lifting. To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP3: <ul style="list-style-type: none">• + = pin 2• - = pin 5	24 VDC power supply

Preparations before removing the upper arm - IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20

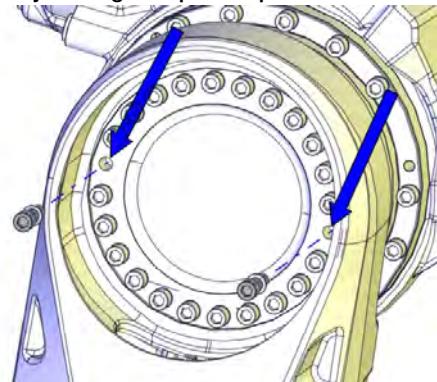
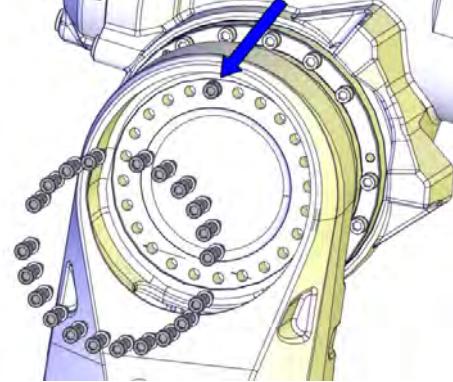
Action	Note
1 Remove two attachment screws (M12) in opposite holes and replace them with guide pins. Note Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure!	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!
Tip Lubricate the guide pins with some grease to make the upper arm slide better.	 xx1300000659
2 Leave one of the remaining attachment screws fitted, remove the other screws.	 xx1300000747

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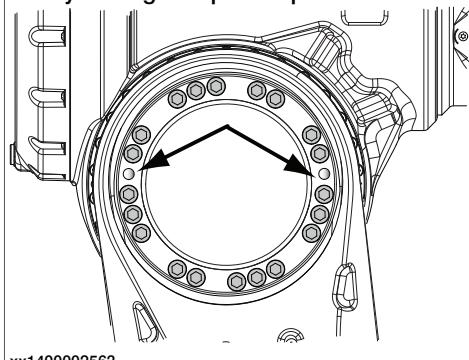
4.5.1 Replacing the upper arm

Continued

Preparations before removing the upper arm - *IRB 6700-200/2.60, -155/2.85*

	Action	Note
1	<p>Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p>Note</p> <p>Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure!</p> <p>Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!</p>  <p>xx1300002245</p>
2	Leave one of the remaining attachment screws fitted, remove the other screws.	 <p>xx1300002246</p>

Preparations before removing the upper arm - *IRB 6700-300/2.70, -245/3.00*

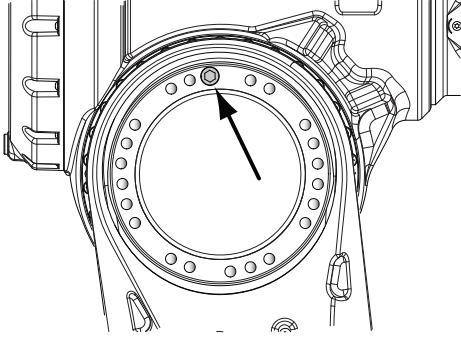
	Action	Note
1	<p>Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p>Note</p> <p>Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure!</p> <p>Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!</p>  <p>xx1400002563</p>

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4 Repair

4.5.1 Replacing the upper arm

Continued

Action	Note
2 Leave one of the remaining attachment screws fitted, remove the other screws.	

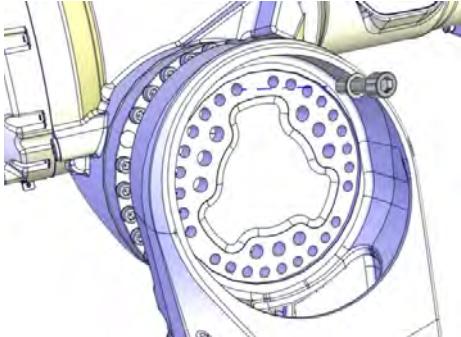
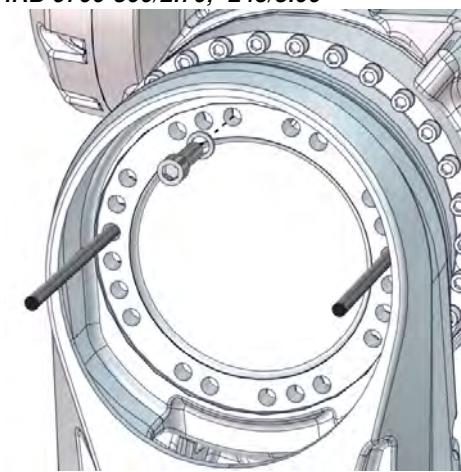
Removing the upper arm

Action	Note
1  Note Make sure the lift is done completely leveled! In case of necessary adjustments, use the shortening loops on the lifting accessory (chain), and make sure to place the chain the right way through the loops.	

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4.5.1 Replacing the upper arm

Continued

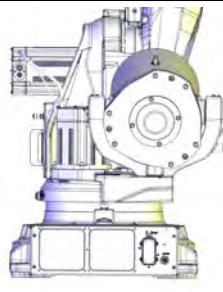
Action	Note
2 Remove the remaining attachment screw and let the upper arm slide out from the lower arm with support from the guide pins.	<p><i>IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85</i></p>  <p>xx1300001610</p> <p><i>IRB 6700-300/2.70, -245/3.00</i></p>  <p>xx1700000059</p>
3 Lift the upper arm and place it on the prepared area.	<p>! CAUTION</p> <p><i>Only valid when the upper arm is removed due to replacement of the axis-3 gearbox:</i></p> <p>If the cable harness is still fitted or partly fitted, use caution when lifting the upper arm over to the other side of the robot, in order not to cause any damage to the cable harness.</p>

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4 Repair

4.5.1 Replacing the upper arm

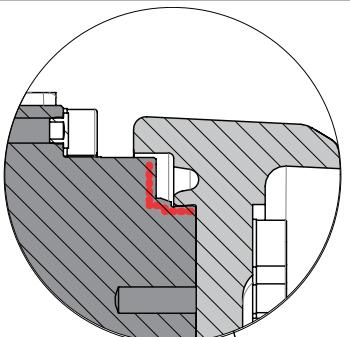
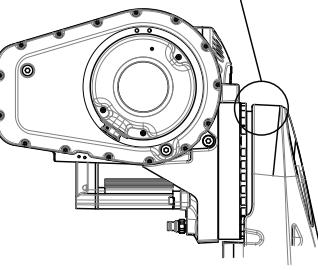
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Action	Note
<p>4 <i>This step is only valid when the upper arm is removed due to replacement of the axis-3 gearbox:</i></p> <p>Place pieces of wood (or similar) under arm house and wrist. Lower the upper arm, and let the upper arm rest as shown in the figure.</p> <p>This is done in order to keep the axis-3 gearbox in a vertical position and to get the best position to replace the axis-3 gearbox, if applicable.</p> <p> CAUTION</p> <p>Make sure that no part of the cable harness or DressPack cable package will be damaged in the process!</p>	  <p>xx1300000553</p>

Refitting the upper arm

Use these procedures to refit the upper arm.

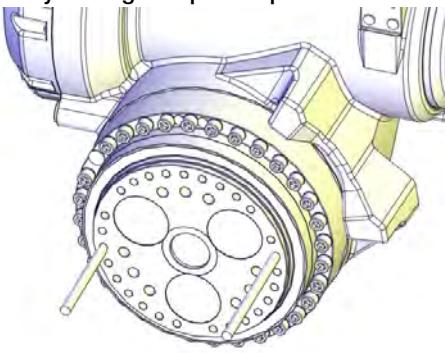
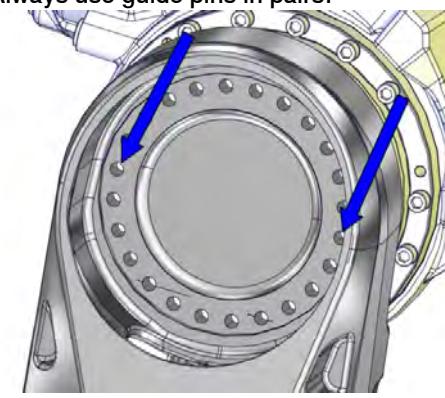
Preparations before refitting the upper arm

Action	Note
1 Wipe clean all contact surfaces.	
2 <i>Foundry Plus:</i> Apply Mercasol on the surface shown in the figure.	  <p>xx1400000375</p>

Continues on next page

4.5.1 Replacing the upper arm

Continued

	Action	Note
3	<p><i>IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20.</i></p> <p>Fit two guide pins in opposite M12 holes in the axis-3 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!</p>  <p>xx1700000058</p>
4	<p><i>IRB 6700 - 200/2.60, - 155/2.85.</i></p> <p>Fit two guide pins in opposite M12 holes in the axis-3 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!</p>  <p>xx1400000361</p>
5	<p><i>IRB 6700 - 300/2.70, - 245/3.00.</i></p> <p>Fit two guide pins in opposite M16 holes in the axis-3 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!</p>  <p>xx1700000056</p>

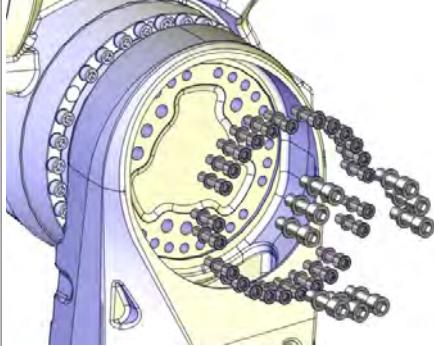
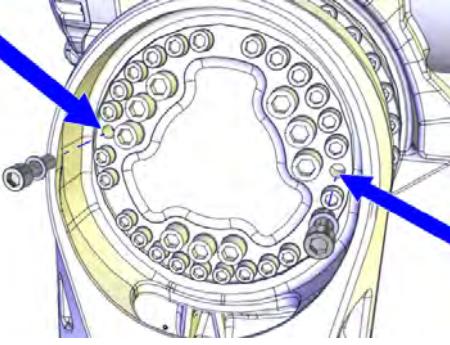
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4 Repair

4.5.1 Replacing the upper arm

Continued

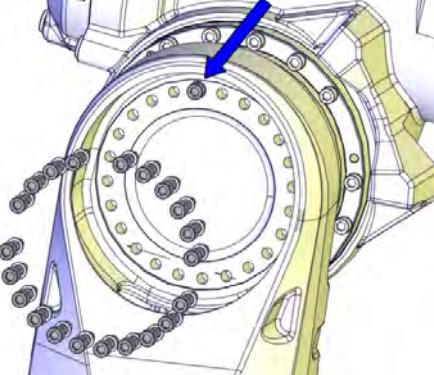
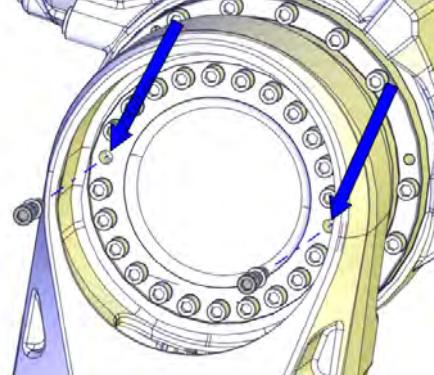
Securing the upper arm - *IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20*

Action	Note
<p>1 ! CAUTION</p> <p>The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00)</p> <p>All lifting accessories used must be sized accordingly.</p>	
2 Attach the lifting accessories, if not already fitted.	See <i>Attaching lifting accessories to the upper arm on page 223</i> .
3 Lift the upper arm and put it on the guide pins.	
4 In order to release the brakes, connect the 24 VDC power supply. Connect to R2.MP3-connector: • + = pin 2 • - = pin 5	24 VDC power supply
5 Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6 Insert all nine M16 screws and 25 of the 27 M12 screws.	 xx1400000359
7 Remove the guide pins and fit the two remaining M12 screws.	 xx1300000659
8 Secure the upper arm by tightening the attachment screws.	Tightening torque depends on screw dimension and variant. M16, tightening torque: 300 Nm M12, tightening torque: 120 Nm

Continues on next page

4.5.1 Replacing the upper arm
Continued

Securing the upper arm - *IRB 6700 -200/2.60, -155/2.85*

	Action	Note
1	<p>! CAUTION</p> <p>The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.</p>	
2	Attach the lifting accessories, if not already fitted.	See <i>Attaching lifting accessories to the upper arm on page 223</i> .
3	Lift the upper arm and put it on the guide pins.	
4	<p>In order to release the brakes, connect the 24 VDC power supply.</p> <p>Connect to R2.MP3-connector:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	24 VDC power supply
5	Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6	Insert 22 of the 24 M12 screws and washers.	 xx1300002246
7	Remove the guide pins and fit the two remaining screws and washers.	 xx1300002245

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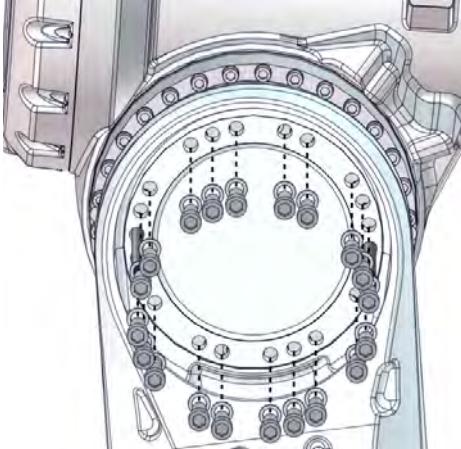
4 Repair

4.5.1 Replacing the upper arm

Continued

Action	Note
8 Secure the upper arm by tightening the attachment screws.	M12, tightening torque: 120 Nm

Securing the upper arm - IRB 6700 -300/2.70, -245/3.00

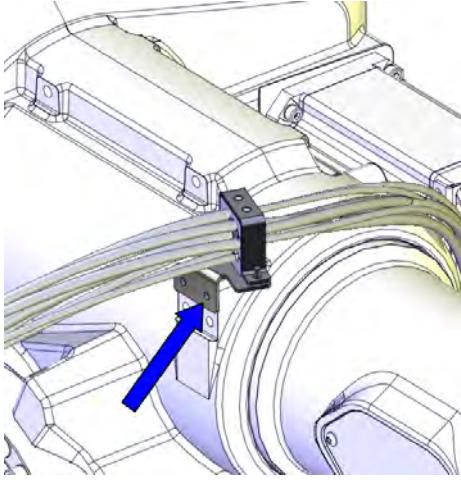
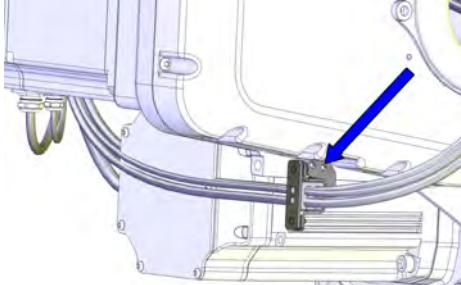
Action	Note
1  CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2 Attach the lifting accessories, if not already fitted.	See Attaching lifting accessories to the upper arm on page 223 .
3 Lift the upper arm and bring it towards the lower arm.	
4 In order to release the brakes, connect the 24 VDC power supply. Connect to R2.MP3-connector: • + = pin 2 • - = pin 5	24 VDC power supply
5 Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6 Insert and tighten 20 of the 22 M16 screws.	
7 Remove the guide pins and fit the two remaining screws.	
8 Secure the upper arm by tightening the attachment screws.	M16, tightening torque: 300 Nm

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4.5.1 Replacing the upper arm

Continued

Refitting the cable harness - upper arm

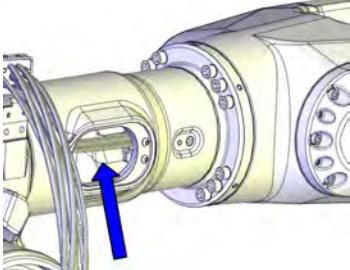
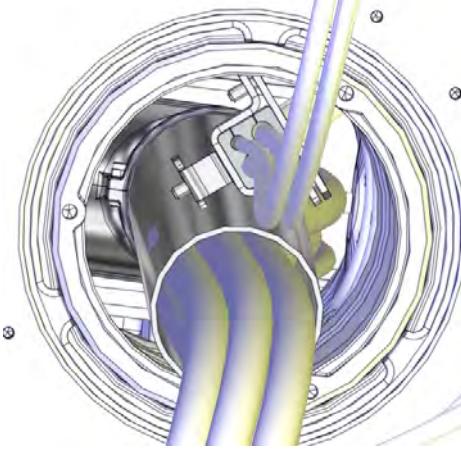
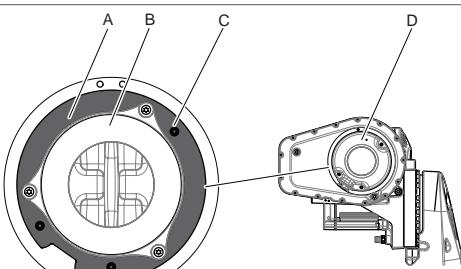
	Action	Note
1	Refit the metal clamp on top of the arm house.	 xx1300000541
2	Refit the arm house metal clamp.	 xx1300000543
3	Arrange the cables between the cable clamps in the upper arm.	
4	 Tip Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the procedure and to avoid damaging the parts during the procedure. This will also make it easier to run the cable harness through the inside of the upper arm.	 xx1300000668

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4 Repair

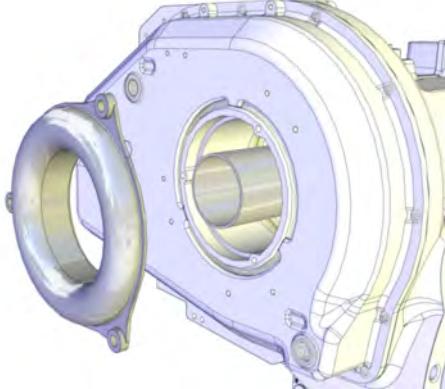
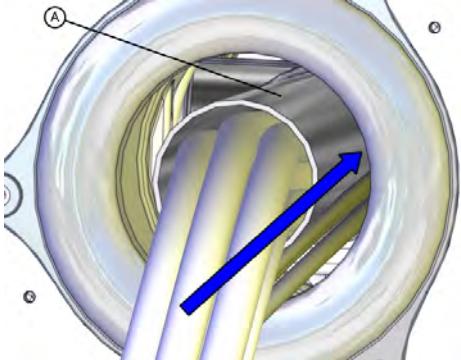
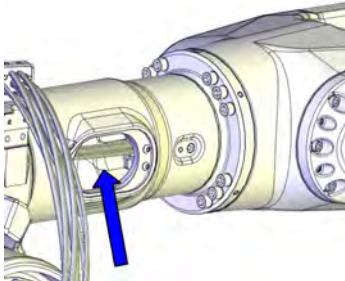
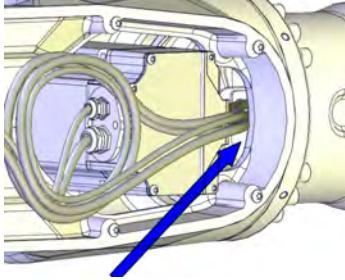
4.5.1 Replacing the upper arm

Continued

Action	Note
<p>5</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole of the arm tube and take a hold of the cable harness. • Person 2: Take a hold on the cable harness at the back of the robot. • Together: Use caution and move the cable harness into the arm tube. <p> Note</p> <p>If DressPack is fitted it is needed to pull out the DressPack tube a little and then place it on the lower left side in the arm tube and then place the bracket of the cable harness on the upper right hand side, to be able to remove the cable harness. See figure! (This is not needed on variants IRB 6700 - 300/2.70, -245/3.00)</p>	<p>Person 1, working at the side hole:</p>  <p>xx1300000745</p> <p>Person 2, working at the back:</p>  <p>xx1400000356</p>
<p>6</p> <p>Foundry Plus:</p> <p>Make sure that the gasket between the robot and cover is correctly fitted. Replace if damaged!</p> <p>The gasket is covered with adhesive on the side facing the upper arm cover. The three washers are pressed into the holes in the gasket. Make sure all three washers are fitted.</p>	 <p>xx1400000382</p> <p>A Gasket B Cable guide C Washer D Cover</p>

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4.5.1 Replacing the upper arm Continued

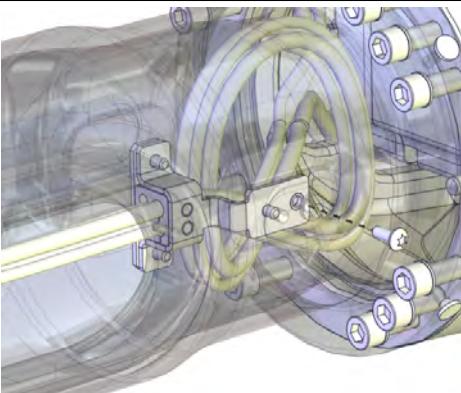
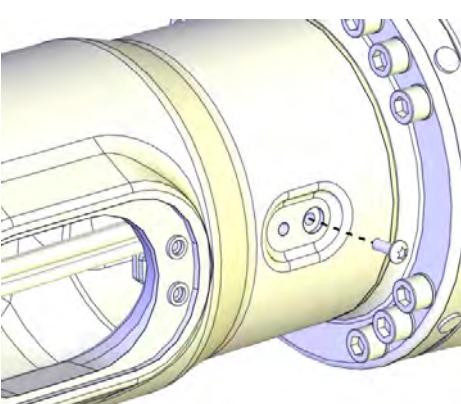
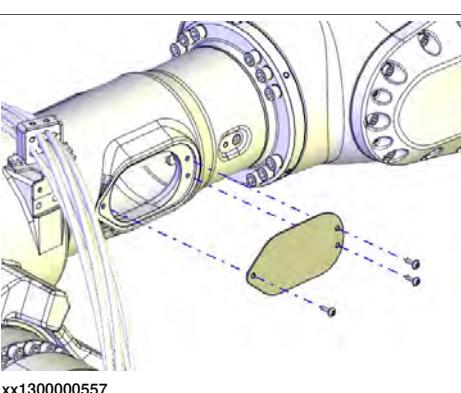
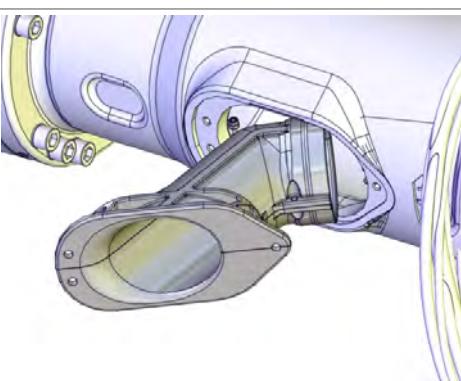
	Action	Note
7	Fit the cable guide.	 xx1300000657
8	Run the cable harness through the cable guide and then into the upper arm tube. Note The cable harness is best placed at the upper right hand side of the DressPack tube, if used, through the arm tube. Do not run the cable harness into the DressPack tube!	 xx1400000357 A Tube for DressPack
9	Use caution and push the cable harness into the upper arm tube.	
10	Tip This step is best performed by two persons working together. Use caution and push the cable harness into the wrist like this: <ul style="list-style-type: none"> • Person 1: Put one hand inside the side cover hole and take a hold of the cable harness. • Person 2: Take a hold of the cable harness from inside the wrist. • Together: Move the cable harness past the axis-5 motor and into the wrist. 	Person 1, working at the side hole:  xx1300000745 Person 2, working at the wrist:  xx1300000746

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4 Repair

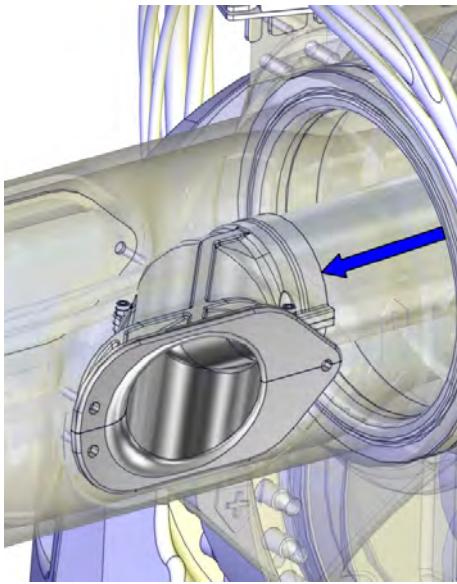
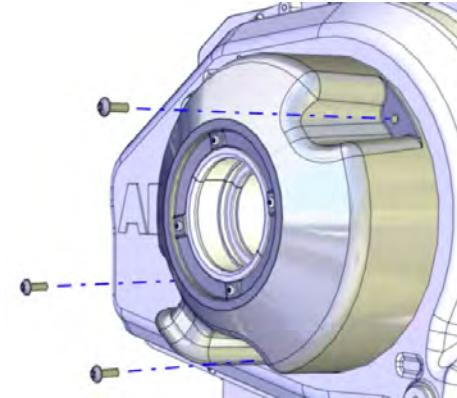
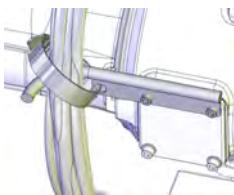
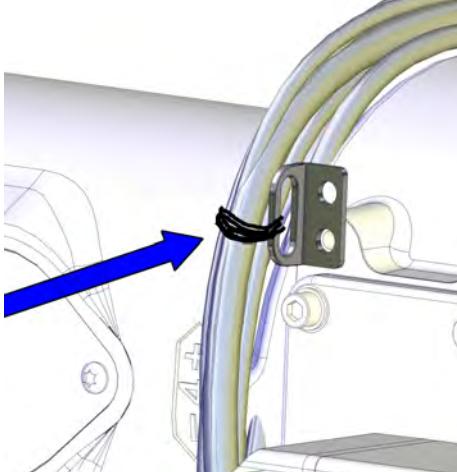
4.5.1 Replacing the upper arm

Continued

Action	Note	
11 Refit the metal clamp axis-4 inside the arm tube.	<p>Note</p> <p>The screws are reached from outside the upper arm!</p>	 xx1700000340  xx1700000339
12 Refit the side cover.	<p>Note</p> <p>Foundry Plus:</p> <ul style="list-style-type: none"> • Make sure the gasket is fitted correctly on the side cover • Use attachment screws made of stainless steel to fit the side cover. 	 xx1300000557
13 If used, refit the insert that guides the DressPack cable package through the hole in the upper arm.	<p>Note</p> <p>This is not needed on variants IRB 6700 - 300/2.70, -245/3.00</p>	 xx1400000091

Continues on next page

4.5.1 Replacing the upper arm Continued

	Action	Note
14	<p>If used, refit the tube containing the DressPack into the insert.</p> <p>Note</p> <p>This is not needed on variants IRB 6700 - 300/2.70, -245/3.00</p>	 <p>xx1400000092</p>
15	<p>If used (<i>DressPack or Foundry Plus</i>), refit the cover with the tube guiding ring fitted.</p> <p>Note</p> <p>Foundry Plus:</p> <ul style="list-style-type: none"> • Make sure the gasket is fitted correctly • Use attachment screws made of stainless steel to fit the cover. 	 <p>xx1200000045</p>
16	<p>Secure the cable harness to the cable fixing bracket with the velcro strap.</p> <p>Note</p> <p>If DressPack is fitted, the cable fixing bracket is replaced by the cable guide.</p>  <p>xx1300001973</p>	 <p>xx1300000544</p>

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4 Repair

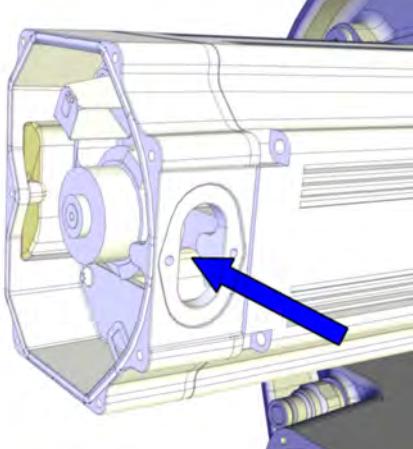
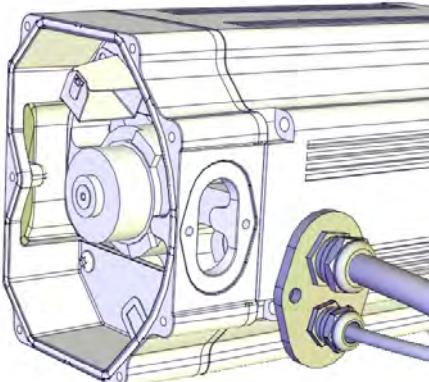
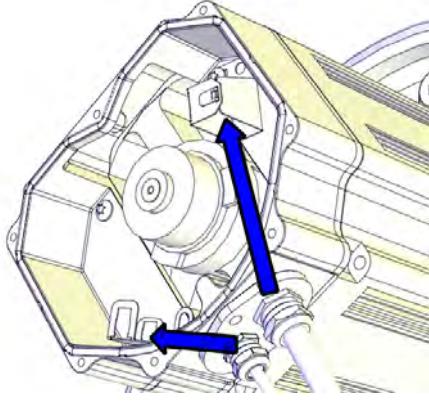
4.5.1 Replacing the upper arm

Continued

Refitting the DressPack cable package

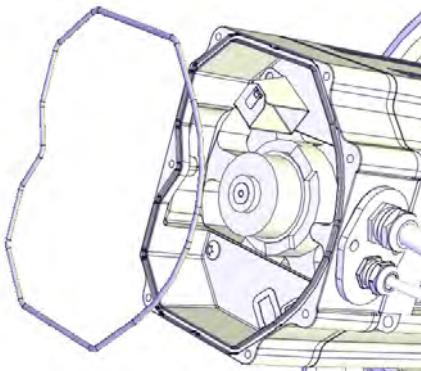
If used, refit the DressPack cable package. How to refit the DressPack cable package is described in more detail in the product manual "IRB 6700 DressPack". For article number see [References on page 10](#).

Connecting the axis-3 and axis-4 motor cables

	Action	Note
1	Push the motor cables in through the cable gland opening.	 xx1300000738
2	Refit the cable gland cover.	 xx1200001067
3	Connect the motor cables.	 xx1200001066

Continues on next page

4.5.1 Replacing the upper arm Continued

	Action	Note
4	<p>Inspect the o-ring.</p> <p> Note</p> <p>Replace if damaged.</p>	<p>O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)</p>  <p>xx1200001070</p>
5	Wipe clean o-ring and o-ring groove.	
6	<p>Refit the o-ring.</p> <p> Tip</p> <p>Lubricate the o-ring with some grease for a better fitting in the groove.</p>	
7	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

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4 Repair

4.5.1 Replacing the upper arm

Continued

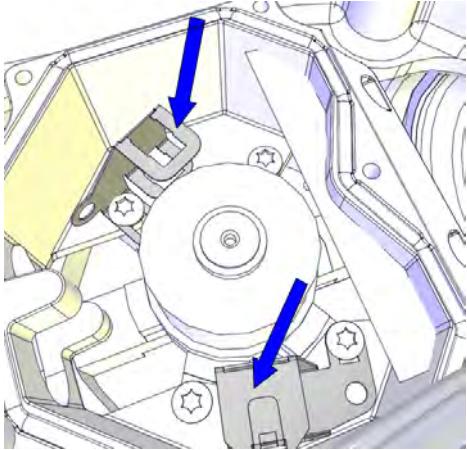
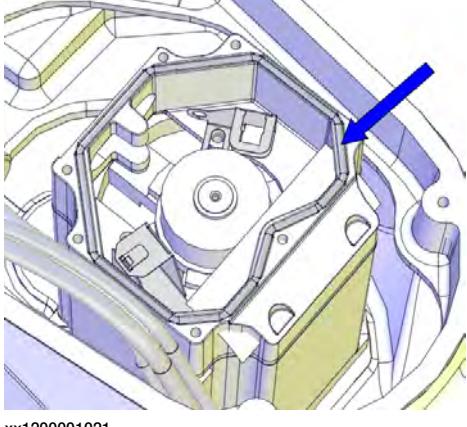
Action	Note
<p>8 Refit the motor cover with its attachment screws.</p> <p>Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001135
<p>9 Make sure that the covers are tightly sealed.</p>	

Connecting the axis-5 motor cables

Action	Note
<p>1 Push the motor cables in through the cable gland opening.</p>	 xx1300000738
<p>2 Refit the cable gland cover by performing the following steps:</p> <ul style="list-style-type: none"> • Slide the cable gland cover onto the inner screw. • Refit and tighten the outer screw. • Tighten the inner screw. Make sure that the gasket is not damaged. <p>Note Replace the gasket if damaged.</p>	 xx1200001016

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4.5.1 Replacing the upper arm
Continued

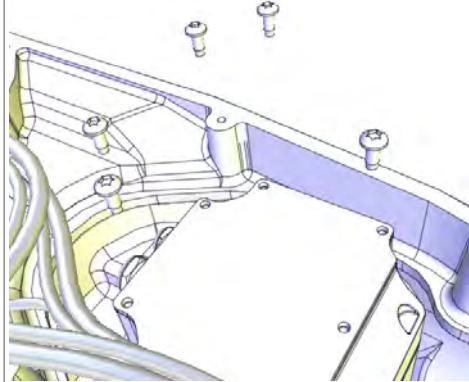
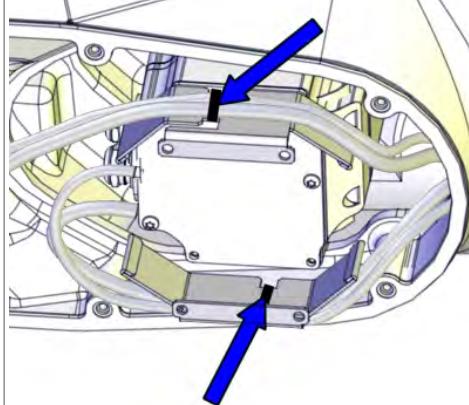
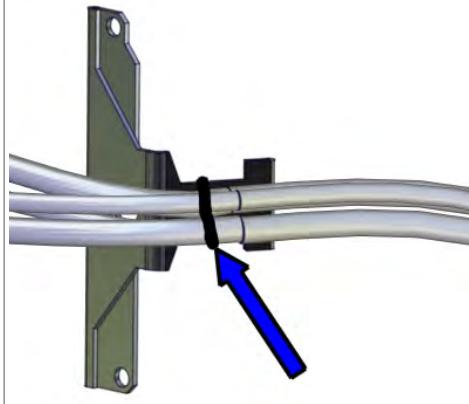
Action	Note
3 Connect the connectors. Connect in accordance with the markings on the connectors.	 xx1200001015
4 Make sure the o-ring on the motor is undamaged. Replace if damaged.	O-ring, axis 5: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile).  xx1200001021
5  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

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4 Repair

4.5.1 Replacing the upper arm

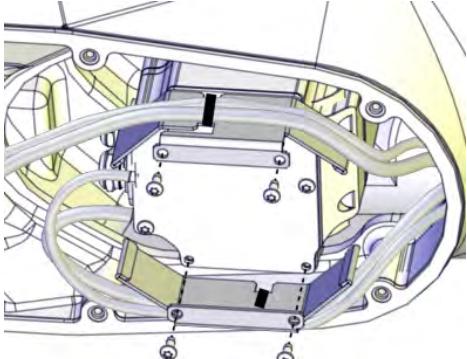
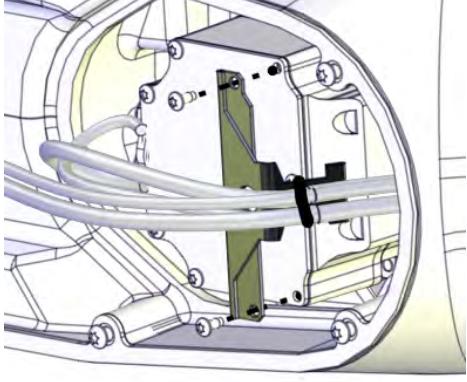
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	Action	Note
6	<p>Refit the motor cover with its attachment screws.</p> <p>Note</p> <p>Do not refit the screws that will hold the heat protection plate at this point.</p> <p>Note</p> <p>Do not reuse the self-threading attachment screws, it will damage the threads. Replace with standard attachment screws.</p> <p>Note</p> <p>Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001013
7	<p>Secure the cable harness with cable straps to the heat protection plate.</p> <p>Note</p> <p>If replacing a type A motor with a type B motor, the heat protection plate must be replaced with plates suited for the type B motor. See Type A vs type B motors on page 795.</p>	<p>There are two versions of the heat protection plates.</p> <p>Choose figure depending on which plate is installed on the robot.</p>  xx1500001029  xx1300000489

Continues on next page

4.5.1 Replacing the upper arm

Continued

Action	Note
8 Fit the heat protection plate with the screws.	<p>Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001030</p>  <p>xx1300000490</p>
9 Make sure that the cover is tightly sealed.	

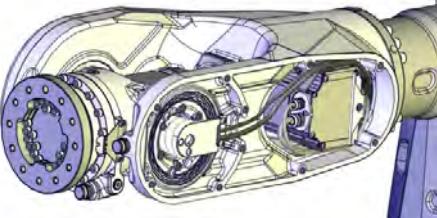
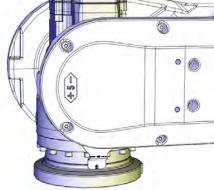
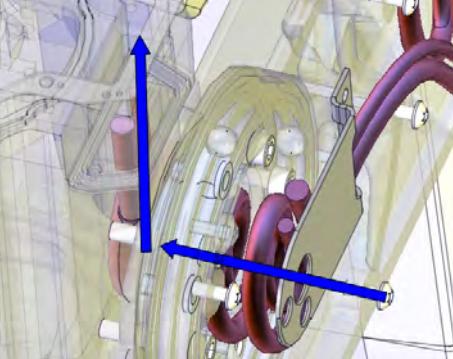
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4 Repair

4.5.1 Replacing the upper arm

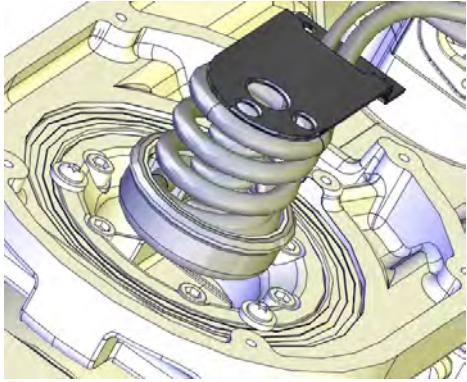
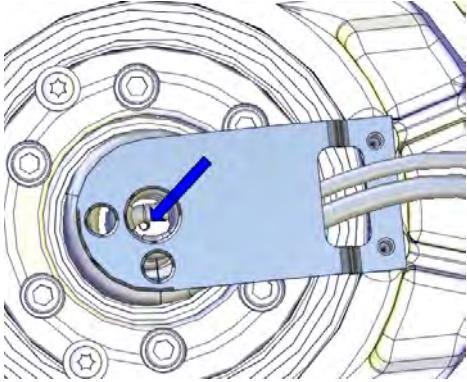
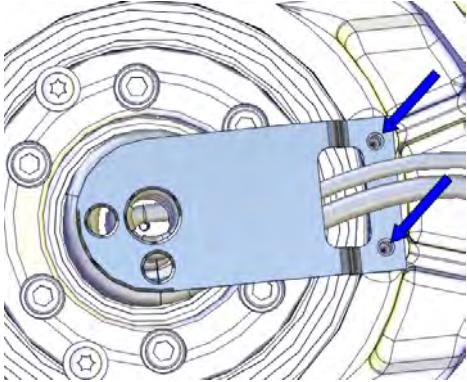
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Connecting the axis-6 motor cables

Action	Note
1	<p>Make sure that the cable harness is placed in a way that it will not be damaged when the cover is fitted.</p>  xx1600002061
2	<p> Note</p> <p>Axis 5 must be in position +90° (or as close as possible) for a correct installation of the cable harness in the wrist. If not, connect the 24 VDC power supply, release the brakes and move axis 5 manually to +90°.</p>  xx1200001081
3	<p>Push the cable harness into the wrist recess and up into the axis-6 motor.</p>  xx1300000667

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4.5.1 Replacing the upper arm Continued

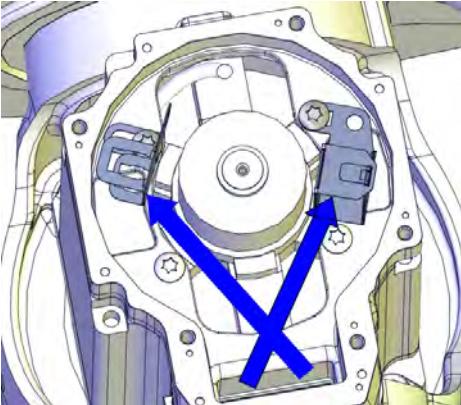
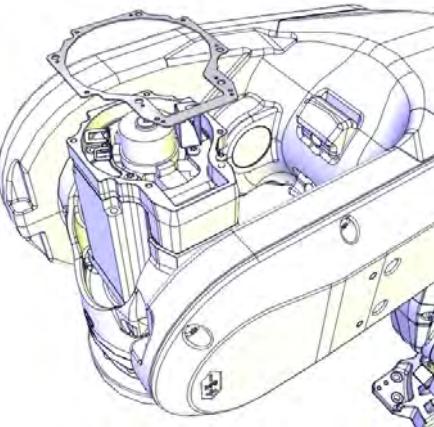
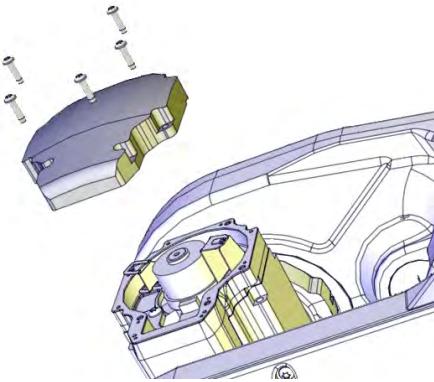
Action	Note
4 Push the carrier carefully into position.	 xx1300001113
5 Secure the carrier with the M4 screw. Note The screw is located at the bottom of the carrier. Tip The attachment screw securing the carrier may be difficult to fit. Make sure the carrier is level and completely pressed against the bottom.	 xx1300000485
6 Secure the cable bracket with its attachment screws.	 xx1300000484

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4 Repair

4.5.1 Replacing the upper arm

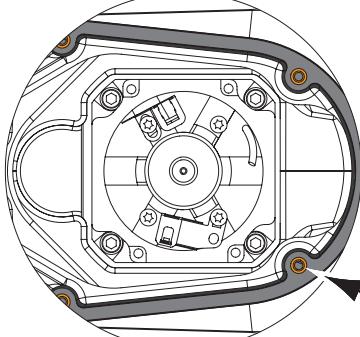
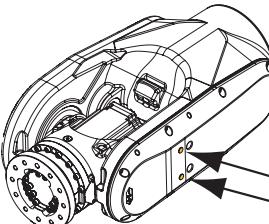
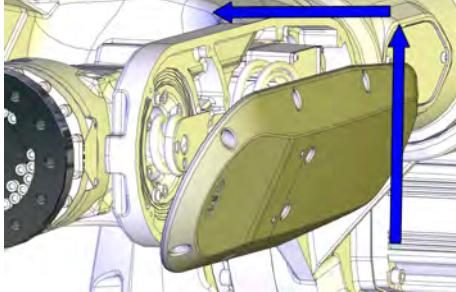
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Action	Note
7 Reconnect the connectors to the axis-6 motor.  Note Place the resolver cable under the motor cable.	 xx1300000488
8 Make sure the gasket is undamaged. Replace if damaged.	Gasket, 3HAC033489-001/ 3HAC044252-001  xx1200001095
9  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
10 Refit the motor cover.	 xx1200001080

Continues on next page

4.5.1 Replacing the upper arm Continued

Refitting the wrist cover

	Action	Note
1	<p>Foundry Plus:</p> <ul style="list-style-type: none"> • Make sure that the gasket is undamaged on the cover. Replace if damaged! • Put washers (10 pcs) in the holes of the gasket. • Use attachment screws made of stainless steel to fit the wrist cover. 	  <p>xx1400000383</p> <p>A Protection plugs (2 on wrist cover and 2 on cover axis-5 gearbox) B Washers (10 pcs) in gasket holes</p>
2	<p>Refit the wrist cover. In order not to damage the cable harness when the wrist cover is refitted, use this method:</p> <ol style="list-style-type: none"> 1 Hold the cover in an angle. See figure! 2 Catch any part of the cable harness hanging down. 3 Lift the cover, still held in an angle. 4 Move the upper part of the cover into position. 5 Secure the cover with its attachment screws. 	<p>Tightening torque: 10 Nm.</p>  <p>xx1300000772</p>
3	Remove the lifting accessories.	

Concluding procedure

	Action	Note
1	Recalibrate the robot.	<p>Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i>, enclosed with the calibration tools.</p> <p>Axis Calibration is described in Calibrating with Axis Calibration method on page 774.</p> <p>General calibration information is included in section Calibration on page 763.</p>

Continues on next page

4 Repair

4.5.1 Replacing the upper arm

Continued

	Action	Note
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further described in <i>DANGER - First test run may cause injury or damage! on page 48.</i>	

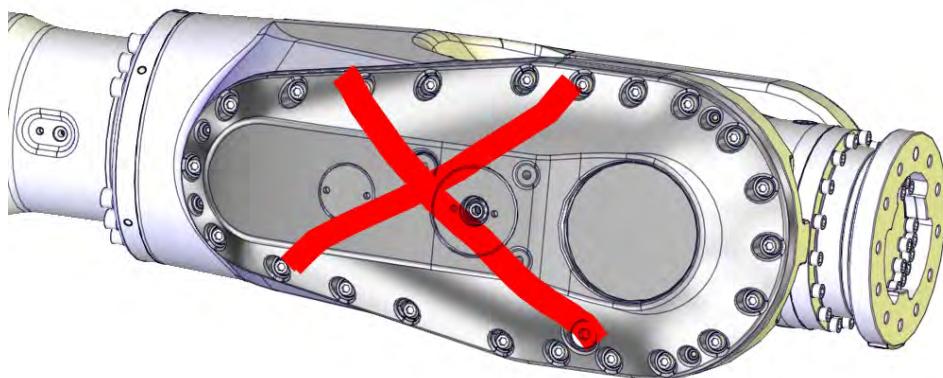
4.5.2 Replacing the wrist

Strictly forbidden to open the cover on the axis-5 gearbox



Note

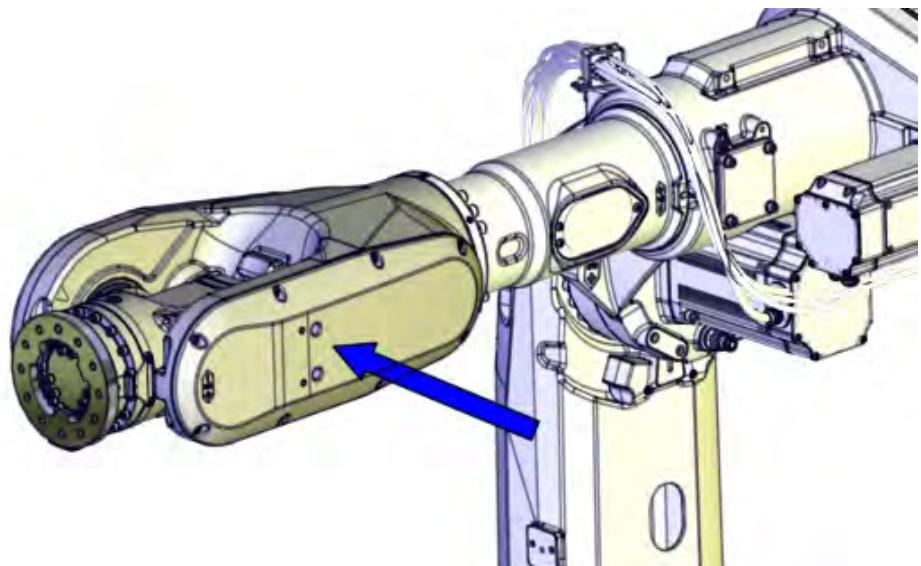
Do not, under any circumstances, open the cover on the axis-5 gearbox! It is strictly forbidden to do any repair work on the axis-5 gearbox.



xx1300002248

Location of the wrist

The wrist is located as shown in the figure.



xx1300000597

Continues on next page

4 Repair

4.5.2 Replacing the wrist

Continued

Spare part

Spare part	Spare part number	Note
Wrist	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Pallet		Used for putting down removed parts from robot.
Cardboard		Used for protection.
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs!
24 VDC power supply	-	Used to release the motor brakes.
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Art. no.	Note
Cable tie	-	
Grease	3HAB3537-1	Used to lubricate o-rings.
O-ring	3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)	D=119x3 Used on axis-5 motor cover.
Gasket	3HAC033489-001/ 3HAC044252-001	Used on axis-6 motor cover.
Mercasol	-	Foundry Plus

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">• Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.• Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	

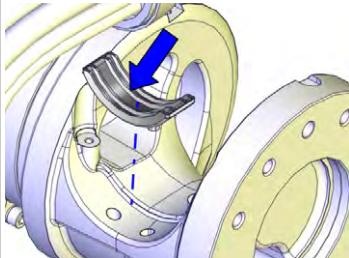
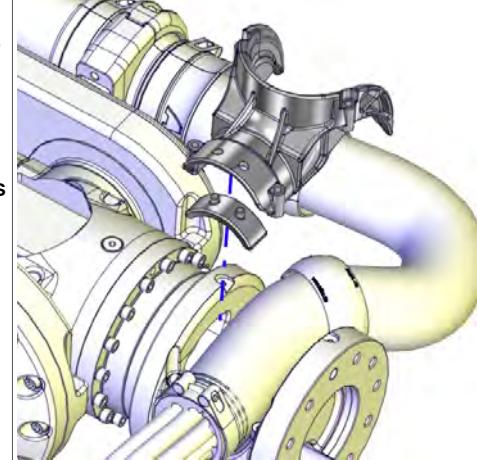
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Action	Note
<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the wrist

These procedures describes how to remove the wrist.

Preparations before removing the wrist

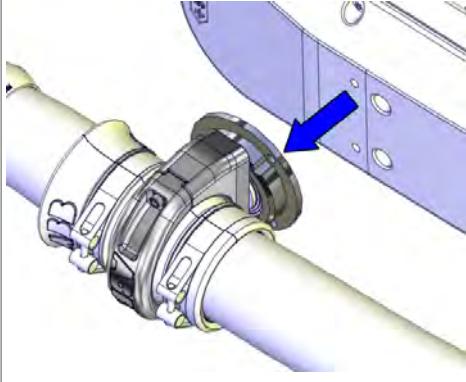
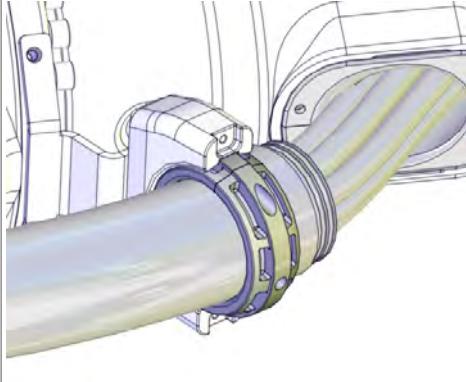
Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 Remove tools and other equipment fitted to the wrist.	
<p>3 If used, open the DressPack axis-6 cable support and remove the DressPack cable package from the process turning disk.</p> <p>Note Use caution not to lose the two clamp jaws on either side of the DressPack cable package.</p>  <p>xx1400000223 Clamp jaw</p>  <p>xx1400000208</p>	

Continues on next page

4 Repair

4.5.2 Replacing the wrist

Continued

Action	Note
4 If used, remove the complete ball joint housing (including the bracket), from the wrist cover. This is done to be able to reach the two hidden screws that secure the wrist cover. Leave the DressPack fitted in the ball joint housing.	 xx1400000355 How to remove the DressPack is described in more detail in the product manual "IRB 6700 DressPack". For article number see References on page 10 .
5 If used, open the ball joint housing on the arm tube, use caution and lift down the DressPack cable package on the floor.	 xx1400000352
6 If used, remove the bracket with the part of the ball joint housing still fitted.	
7 Jog the robot into position: <ul style="list-style-type: none">• Axis 1: no significance (as long as the robot is secured to the foundation)• Axis 2: -60°• Axis 3: +60°• Axis 4: +90°• Axis 5: +90°• Axis 6: no significance	
8  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

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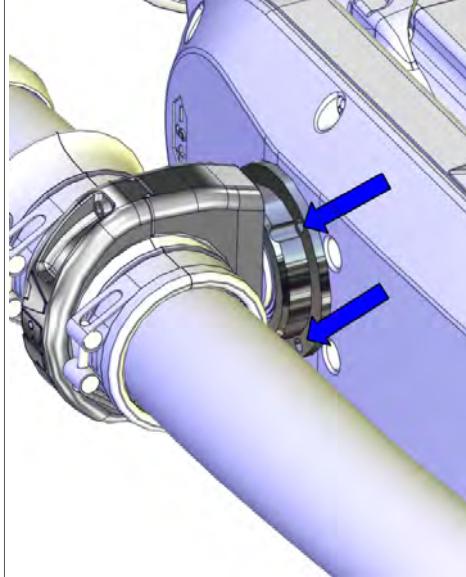
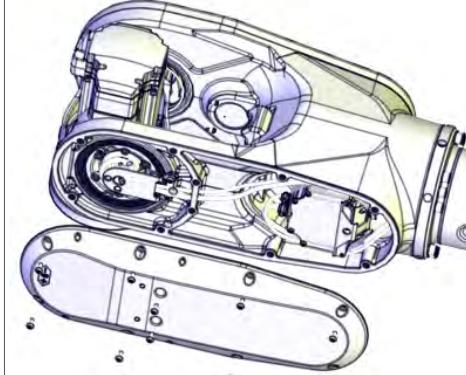
4.5.2 Replacing the wrist

Continued

Action	Note
9 Prepare a pallet with cardboard in front of the robot or where it is possible, to be used for putting down the wrist unit on.	

Retrieving access to the wrist cabling

Use this procedure to remove the wrist cover to retrieve access to the axis-5 and axis-6 motor cables.

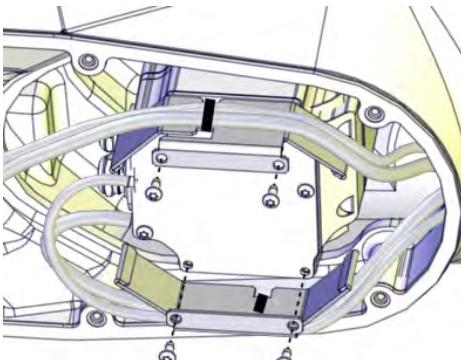
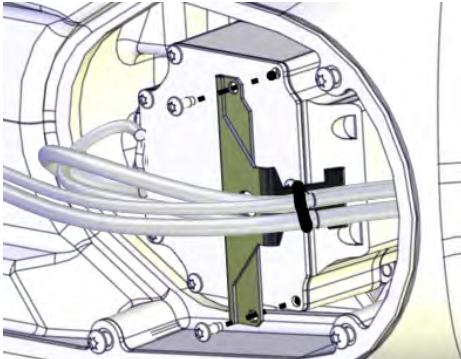
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 If DressPack is not already removed, the complete ball joint housing (including the bracket) must be removed at this point, in order to reach the two hidden screws that secures the wrist cover.	 xx1400000355
3 Remove the wrist cover.	 xx1300002247

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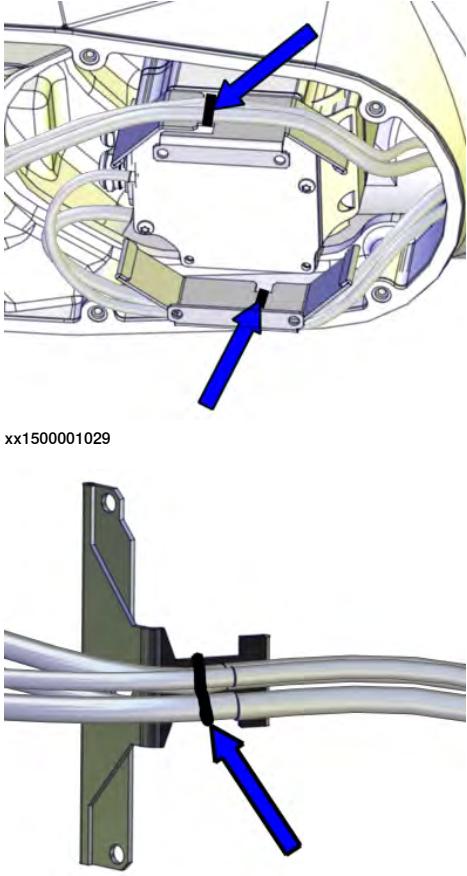
4 Repair

4.5.2 Replacing the wrist

Continued

Action	Note
4 Remove the heat protection plate/plates from the motor with the cabling still attached to the plate. Remove the heat protection plates from the motor with the cabling still attached to the plate.	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001030</p>  <p>xx1300000490</p>

Continues on next page

Action	Note
<p>5 Cut the cable ties that hold the cable harness to the plate.</p> <p>Note</p> <p>Keep the heat protection plate until refitting.</p> <p>Tip</p> <p>If removing the plate only for replacing the motor, the cabling does not need to be loosened from the plate.</p>	<p>Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001029</p> <p>xx1300000489</p>

Disconnecting the axis-6 motor cables

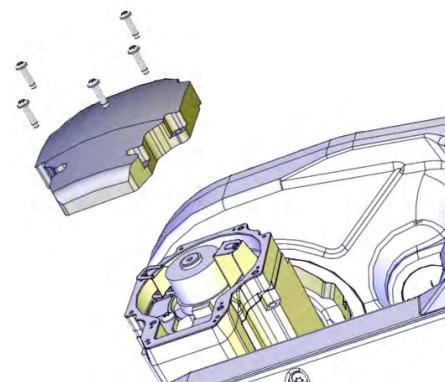
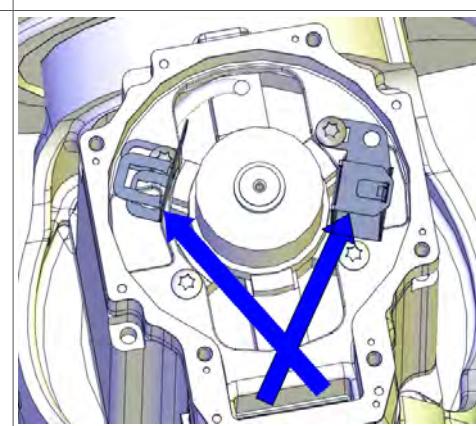
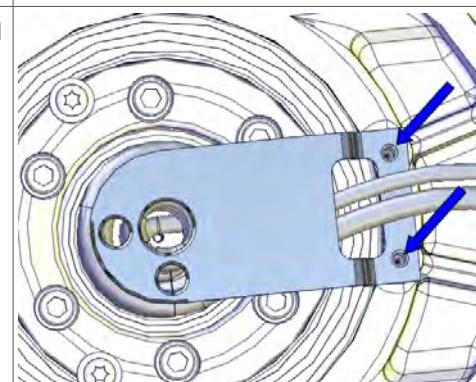
Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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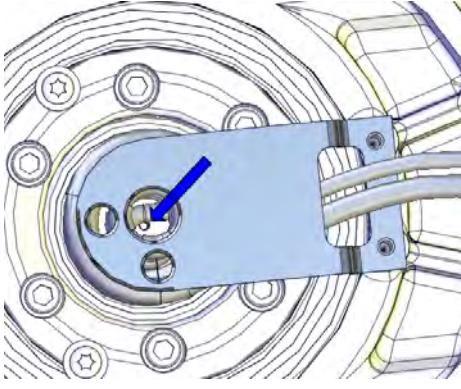
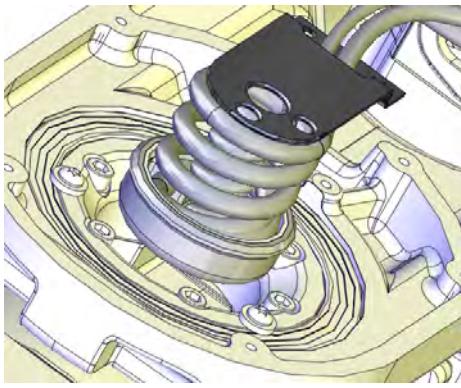
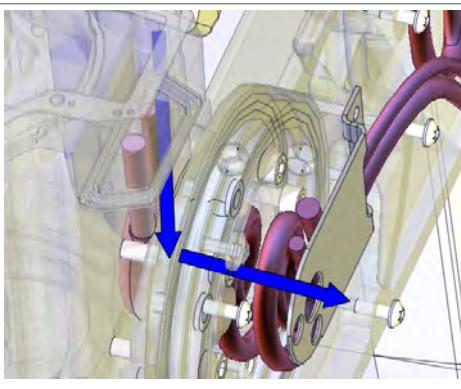
4 Repair

4.5.2 Replacing the wrist

Continued

Action	Note
2 Unscrew the attachment screws and remove the motor cover.	 xx1200001080
3 Disconnect the motor cables.	 xx1300000488
4 Unscrew the attachment screws that hold the cable bracket.	 xx1300000484

Continues on next page

	Action	Note
5	Unscrew the M4 screw that holds the carrier.  Note The screw is located at the bottom of the carrier.	 xx1300000485
6	Pull out the carrier from its position.	 xx1300001113
7	Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.	 xx1300000666

Disconnecting the axis-5 motor cables

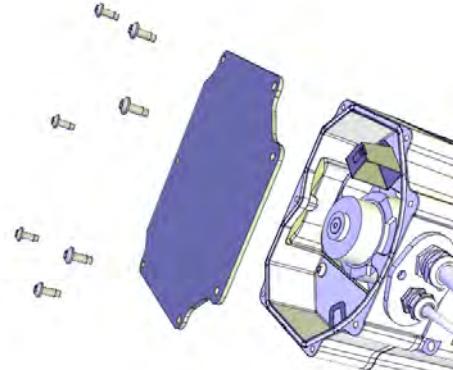
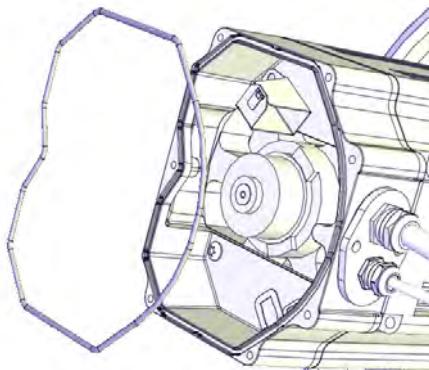
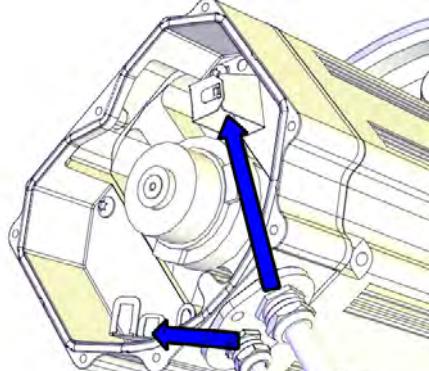
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

4.5.2 Replacing the wrist

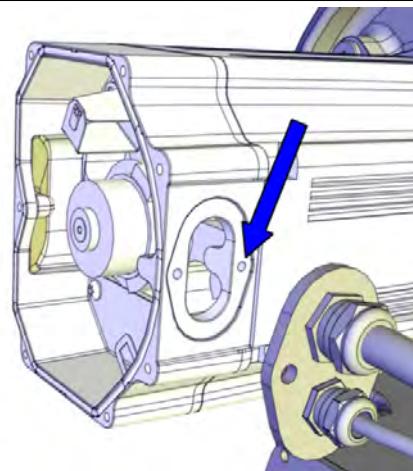
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Action	Note
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066

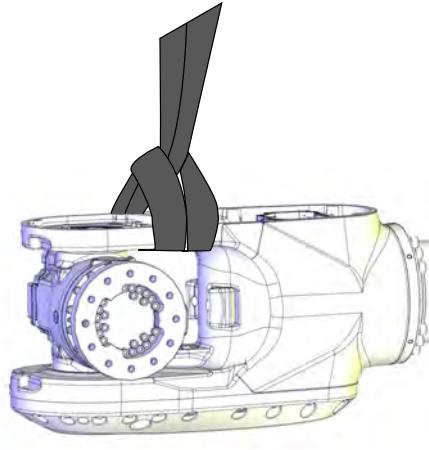
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4.5.2 Replacing the wrist

Continued

Action	Note
<p>5 Remove the cable gland cover by performing the following steps:</p> <ol style="list-style-type: none"> 1 Open the inner screw a little (the one the arrow is pointing at). No need to remove this screw from the motor. 2 Remove the outer screw. 3 Slide the cable gland cover away from the inner screw. Make sure the gasket is not damaged. <p> Tip</p> <p>Make a note in which direction the cable exit hole is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1300000656
6 Use caution and pull out the motor cables.	

Attaching the lifting accessories to the wrist

Action	Note
<p>1  CAUTION</p> <p>The weight of the complete wrist is 125 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 140 kg (IRB 6700 -300/2.70, -245/3.00)</p> <p>All lifting accessories used must be sized accordingly.</p>	
<p>2 Attach a roundsling to the wrist as shown in the figure.</p> <p> CAUTION</p> <p>It is very important that the roundsling is placed as shown in the figure, to keep the wrist balanced when it is removed. Placed at a different position, there is a risk of sudden change in the balance, which can cause damage or injury.</p> <p>Do not attach the roundsling around the axis-5 gearbox!</p>	Roundsling, 1 m: Length: 1 m. Lifting capacity: 1,000 kg.  xx1300000673
<p>3  Note</p> <p>Make sure the roundsling is stretched, so it can carry the weight of the wrist.</p>	

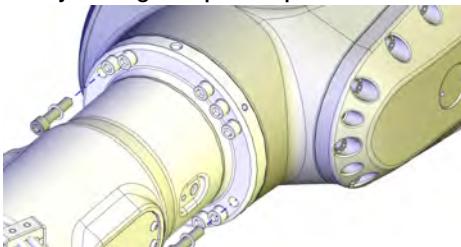
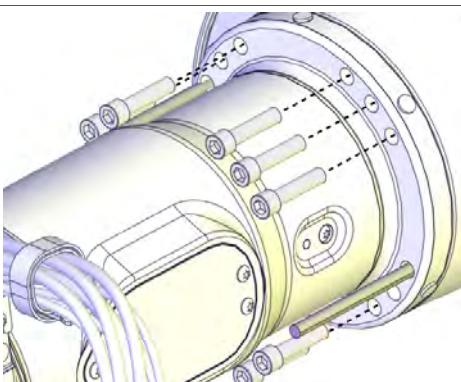
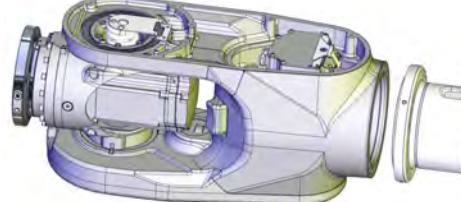
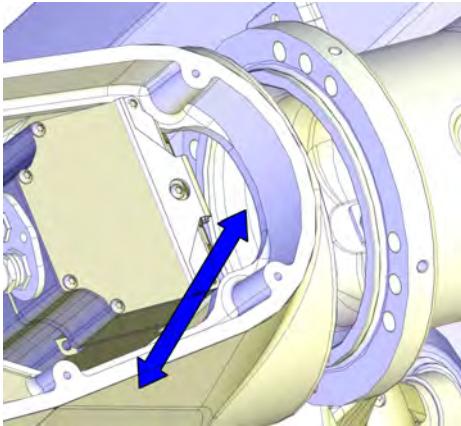
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4 Repair

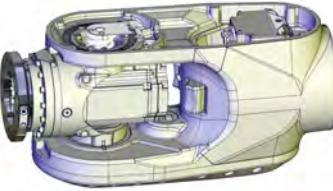
4.5.2 Replacing the wrist

Continued

Removing the wrist

Action	Note
<p>1 Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the wrist slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!</p>  <p>xx1300000748</p>
2 Remove the remaining attachment screws.	 <p>xx1300000749</p>
<p>3 Pull out the wrist a bit, onto the guide pins. This is done to be able to remove the cable harness from the wrist in a safe way.</p> <p> CAUTION</p> <p>Make sure that the cabling does not get damaged.</p>	 <p>xx1300000750</p>
4 Use caution and pull out the cabling from the wrist unit.	 <p>xx1300000769</p>

Continues on next page

Action	Note
5 Slide the wrist off the guide pins and put it on a pallet or similar.	  xx1300000770

Refitting the wrist

These procedures describes how to refit the wrist.

Preparations before refitting the wrist

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Wipe clean all contact surfaces.	
3 Fit two guide pins in opposite holes in the wrist.  Tip Lubricate the guide pins with some grease to make the wrist slide better.	Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!
4 If axis-5 is not already in position +90°, connect the 24 VDC power supply, release the brakes and move the axis manually into that position. Connect to R2.MP5-connector: • + = pin 2 • - = pin 5	24 VDC power supply

Attaching the lifting accessories to the wrist

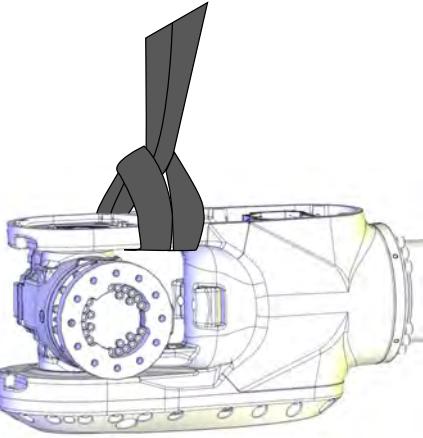
Action	Note
1  CAUTION The weight of the complete wrist is 125 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 140 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	

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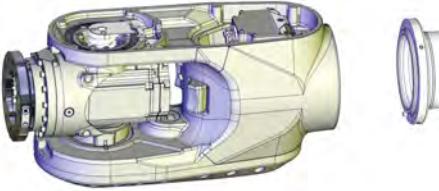
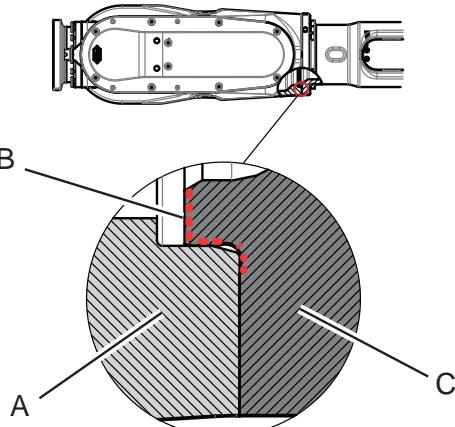
4 Repair

4.5.2 Replacing the wrist

Continued

Action	Note
<p>2 Attach a roundsling to the wrist as shown in the figure.</p> <p>CAUTION</p> <p>It is very important that the roundsling is placed as shown in the figure, to keep the wrist balanced when it is removed. Placed at a different position, there is a risk of sudden change in the balance, which can cause damage or injury.</p> <p>Do not attach the roundsling around the axis-5 gearbox!</p>	<p>Roundsling, 1 m: Length: 1 m. Lifting capacity: 1,000 kg.</p>  <p>xx1300000673</p>
<p>3 Note</p> <p>Make sure the roundsling is stretched, so it can carry the weight of the wrist.</p>	

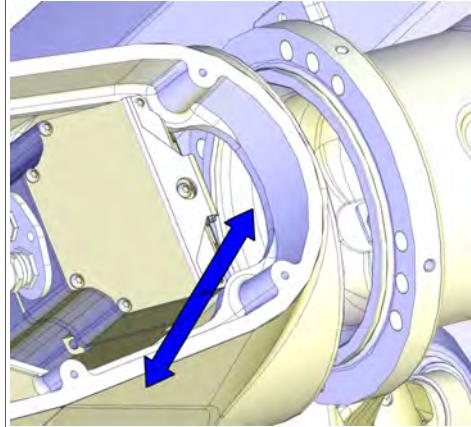
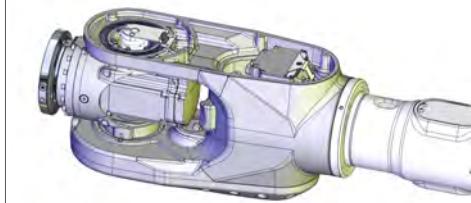
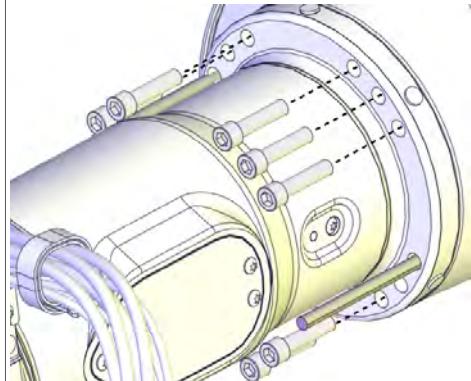
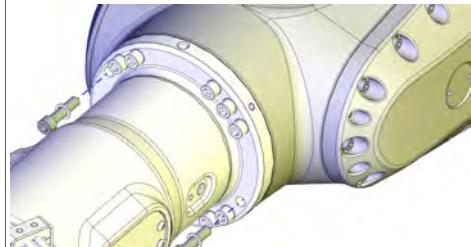
Refitting the wrist

Action	Note
<p>1 Lift the wrist and insert the guide pins into the holes of the arm tube.</p> <p>Tip</p> <p>Leave a small opening between wrist and arm tube. This will make it easier to run the cable harness back into the wrist.</p>	 <p>xx1300000770</p>
<p>2 Foundry Plus: Apply Mercasol on the surfaces shown in the figure.</p>	 <p>xx1400000371</p>

Continues on next page

4.5.2 Replacing the wrist

Continued

	Action	Note
3	<p>Run the cabling into the wrist unit. Be careful not to damage any part of the cable harness.</p>	 xx1300000769
4	Slide the wrist into fitting position.	 xx1300000771
5	Fit 10 of the 12 attachment screws.	 xx1300000749
6	Remove the guide pins and replace them with the remaining attachment screws.	 xx1300000748
7	Tighten the attachment screws.	M12x50, tightening torque: 120 Nm.

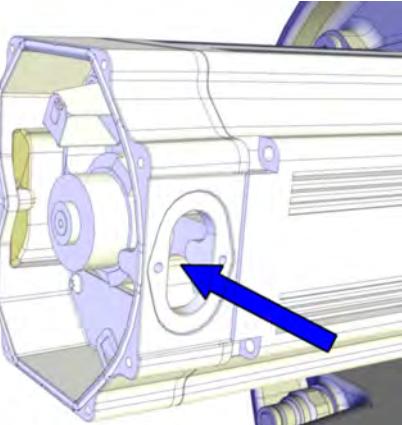
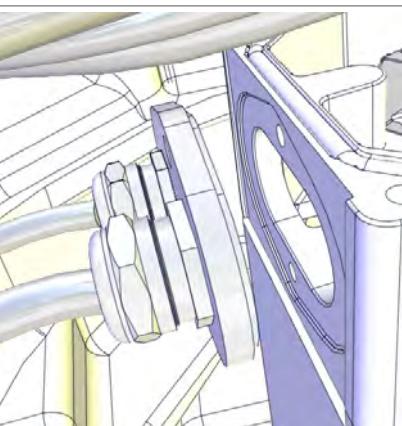
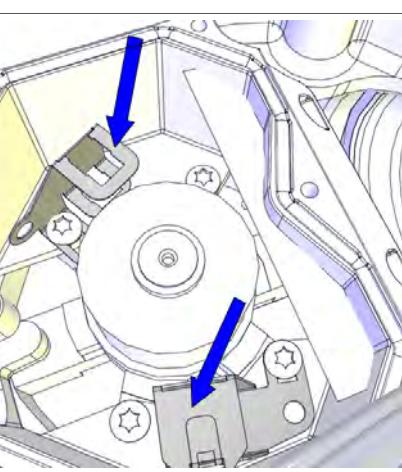
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4 Repair

4.5.2 Replacing the wrist

Continued

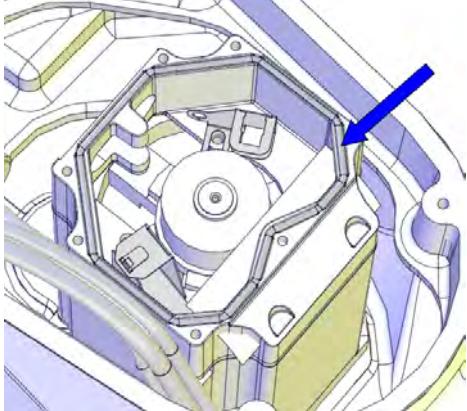
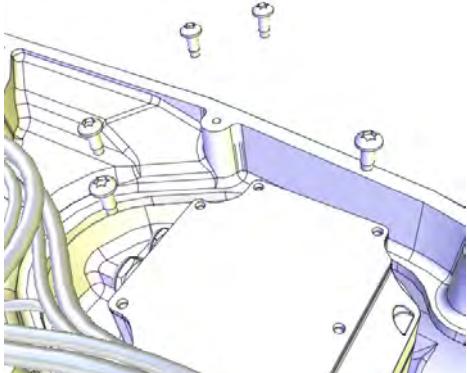
Connecting the axis-5 motor cables

Action	Note
1	Push the motor cables in through the cable gland opening.
	 xx1300000738
2	Refit the cable gland cover by performing the following steps: <ul style="list-style-type: none">Slide the cable gland cover onto the inner screw.Refit and tighten the outer screw.Tighten the inner screw. Make sure that the gasket is not damaged.
	 xx1200001016
3	Connect the connectors. Connect in accordance with the markings on the connectors.
	 xx1200001015

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4.5.2 Replacing the wrist

Continued

Action	Note
4 Make sure the o-ring on the motor is undamaged. Replace if damaged.	O-ring, axis 5: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile).  xx1200001021
5  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
6 Refit the motor cover with its attachment screws.  Note Do not refit the screws that will hold the heat protection plate at this point.  Note Do not reuse the self-threading attachment screws, it will damage the threads. Replace with standard attachment screws.  Note Make sure the o-ring is undamaged and properly fitted.	 xx1200001013

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4 Repair

4.5.2 Replacing the wrist

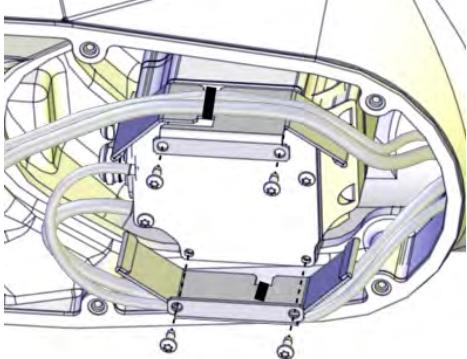
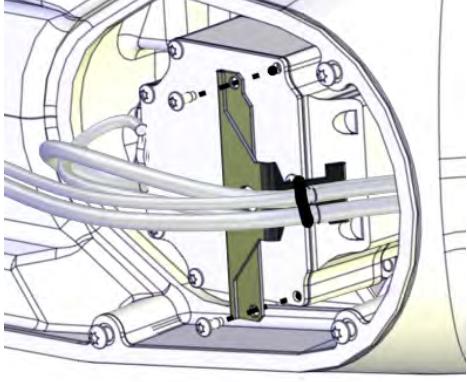
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Action	Note
7 Secure the cable harness with cable straps to the heat protection plate.	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p> <p>xx1500001029</p> <p>xx1300000489</p>

Continues on next page

4.5.2 Replacing the wrist

Continued

Action	Note
8 Fit the heat protection plate with the screws.	<p>Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001030</p>  <p>xx1300000490</p>
9 Make sure that the cover is tightly sealed.	

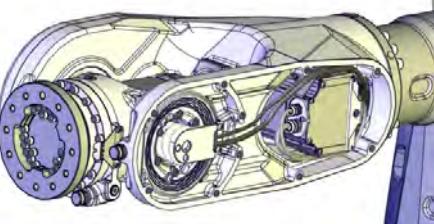
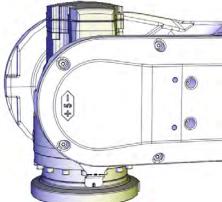
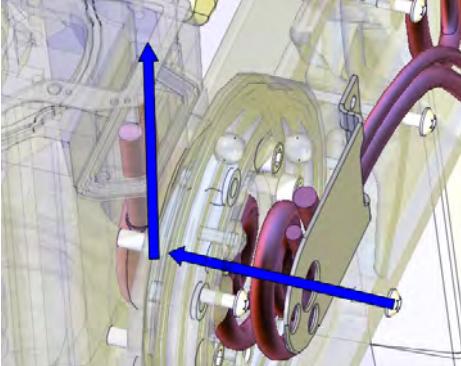
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4 Repair

4.5.2 Replacing the wrist

Continued

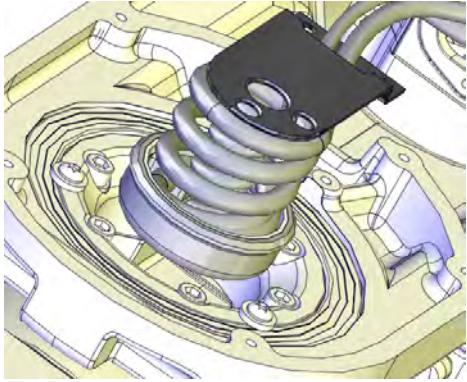
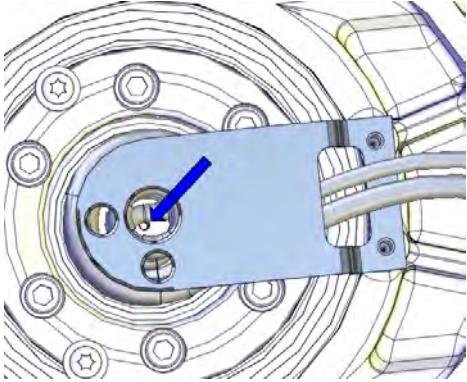
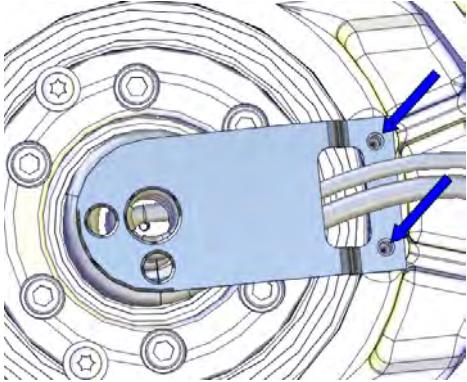
Connecting the axis-6 motor cables

Action	Note
1	<p>Make sure that the cable harness is placed in a way that it will not be damaged when the cover is fitted.</p>  xx1600002061
2	<p> Note</p> <p>Axis 5 must be in position +90° (or as close as possible) for a correct installation of the cable harness in the wrist. If not, connect the 24 VDC power supply, release the brakes and move axis 5 manually to +90°.</p>  xx1200001081
3	<p>Push the cable harness into the wrist recess and up into the axis-6 motor.</p>  xx1300000667

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4.5.2 Replacing the wrist

Continued

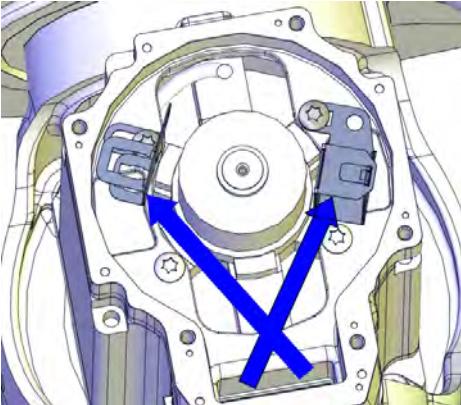
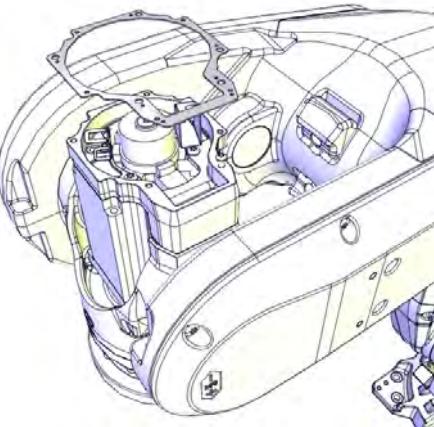
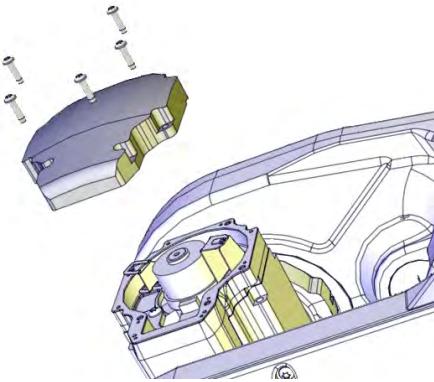
Action	Note
4 Push the carrier carefully into position.	 xx1300001113
5 Secure the carrier with the M4 screw. Note The screw is located at the bottom of the carrier. Tip The attachment screw securing the carrier may be difficult to fit. Make sure the carrier is level and completely pressed against the bottom.	 xx1300000485
6 Secure the cable bracket with its attachment screws.	 xx1300000484

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4 Repair

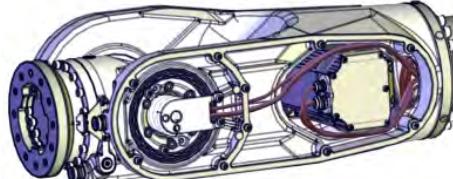
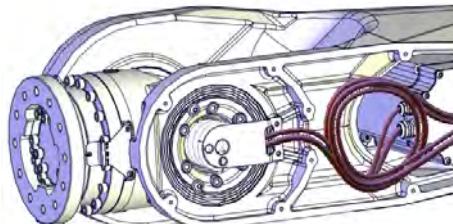
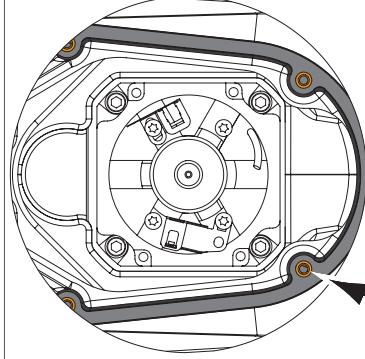
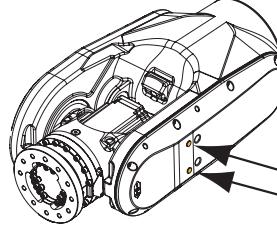
4.5.2 Replacing the wrist

Continued

Action	Note
7 Reconnect the connectors to the axis-6 motor.  Note Place the resolver cable under the motor cable.	 xx1300000488
8 Make sure the gasket is undamaged. Replace if damaged.	Gasket, 3HAC033489-001/ 3HAC044252-001  xx1200001095
9  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
10 Refit the motor cover.	 xx1200001080

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Concluding procedure

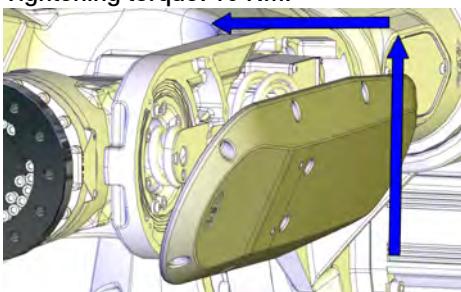
	Action	Note
1	Make sure that the cable harness is placed in a way so it will not be damaged when the wrist cover is fitted.	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001672</p>  <p>xx1300000596</p> <p>Cable layout in the wrist with Type A motors.</p>
2	Inspect the gasket. Replace if damaged.	
3	<p>Foundry Plus:</p> <ul style="list-style-type: none"> • Make sure that the gasket is undamaged on the cover. Replace if damaged. • Put washers in the holes of the gasket. • Use attachment screws made of stainless steel to fit the wrist cover. 	  <p>xx1400000383</p> <p>A Protection plugs (2 on wrist cover and 2 on cover axis-5 gearbox) B Washers (10 pcs) in gasket holes</p>

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4 Repair

4.5.2 Replacing the wrist

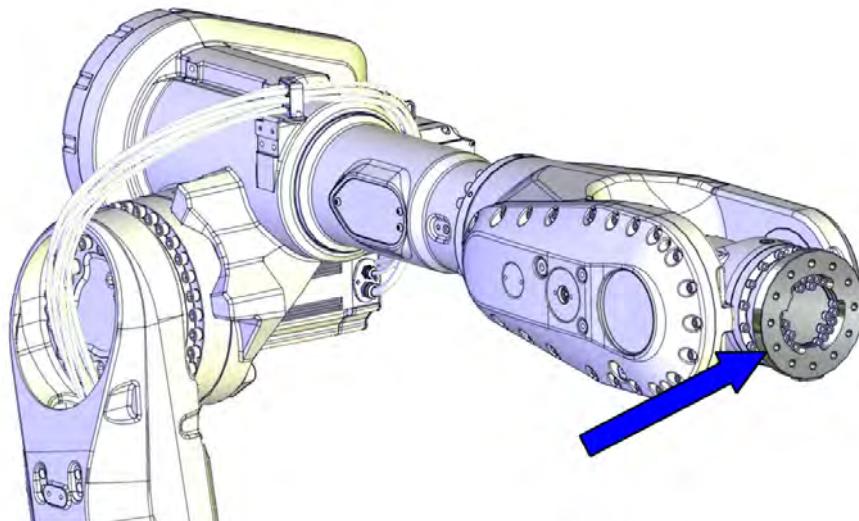
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Action	Note
4 Refit the wrist cover. Use this method not to damage the cable harness: <ol style="list-style-type: none"> 1 Hold the cover tilted. See figure! 2 Catch any part of the cable harness hanging down. 3 Lift the cover, still held tilted. 4 Move the upper part of the cover into position. 5 Secure the cover with its attachment screws. 	Tightening torque: 10 Nm.  xx1300000772
5 <i>Foundry Plus:</i> Refit protection plugs.	
6 If used, refit the DressPack cable package on the wrist.	
7 Re-calibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
8  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

4.5.3 Replacing the turning disc

Location of the turning disc

The turning disc is located in the front of the wrist housing as shown in the figure.



xx1300000491

Spare part

Spare part	Spare part number	Note
Turning disc	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Article number	Note
Rust preventive	-	Mercasol, used on Foundry Plus

Removing the turning disc

Use these procedures to remove the turning disc.

Preparations before removing the turning disc

	Action	Note
1	Run the robot to a position most comfortable for the removal of the turning disc.	

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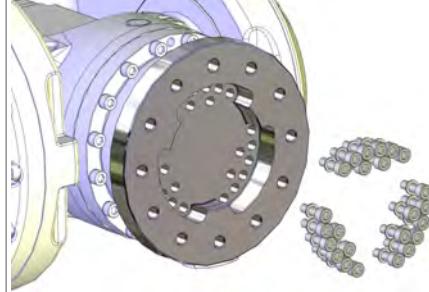
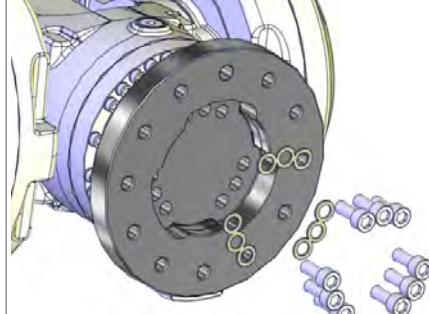
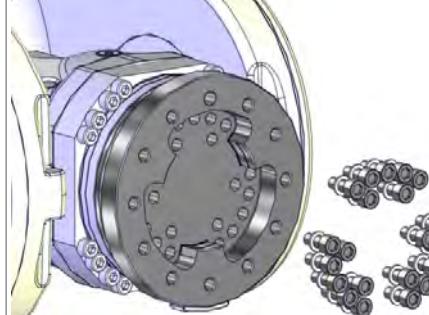
4 Repair

4.5.3 Replacing the turning disc

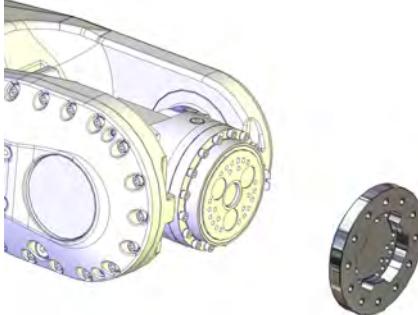
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Action	Note
<p>2</p>  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3 Remove any equipment fitted to the turning disc.	

Removing the turning disc

Action	Note
<p>1 <i>IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20.</i> Remove the 24 M8 screws and washers, that secure the turning disc.</p>	 xx130000492
<p>2 <i>IRB 6700 - 200/2.60, - 155/2.85.</i> Remove the nine M10 screws and three washers, that secure the turning disc.</p>	 xx1300002302
<p>3 <i>IRB 6700 - 300/2.70, - 245/3.00.</i> Remove the 21 M10 screws and washers, that secure the turning disc.</p>	 xx1400002195

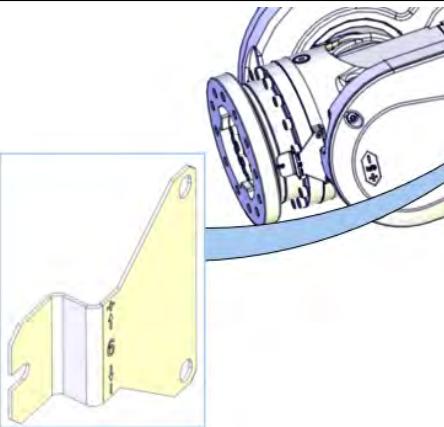
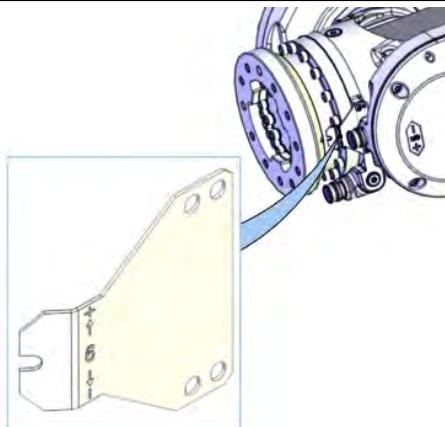
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Action	Note
4 Remove the turning disc.	 xx1300000493

Replacing the synchronization mark plate

The design of the turning disc spare part might require replacement of the axis-6 synchronization mark plate if the existing plate is not compatible with the new turning disc.

If ordering a new turning disc, the synchronization mark plate required is enclosed with the spare part. Check if the robot is already equipped with a compatible plate or if it needs to be replaced. The difference is shown in the figures.

Incompatible axis-6 synchronization mark plate on robot	Compatible axis-6 synchronization mark plate on robot
 xx1500000873 <p>Incompatible synchronization mark plate is installed. Replace the plate.</p>	 xx1500000874 <p>Compatible synchronization mark plate is installed. No action required.</p>

Continues on next page

4 Repair

4.5.3 Replacing the turning disc

Continued

Fitting the axis-6 synchronization mark plate

There are different attachment holes on the plate used for different robot variants.

See table below.

IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20, IRB 6700 - 200/2.60, IRB 6700 - 155/2.85	IRB 6700 - 300/2.70, IRB 6700 - 245/3.00
xx1500000877	xx1500000878
Use the holes closest to the synchronization mark.	Use the holes at the back end of the synchronization plate.

Refitting the turning disc

Use this procedure to refit the turning disc.

Screw joint for refitting turning disc

Variant	Screw dimension	Number of screws	Number of washers	Tightening torque
IRB 6700 - 235/2.65	M8x25	24 pcs	24 pcs	35 Nm
IRB 6700 - 205/2.80	M8x25	24 pcs	24 pcs	35 Nm
IRB 6700 - 175/3.05	M8x25	24 pcs	24 pcs	35 Nm
IRB 6700 - 150/3.20	M8x25	24 pcs	24 pcs	35 Nm
IRB 6700 - 200/2.60	M10x25	9 pcs	3 pcs	70 Nm
IRB 6700 - 155/2.85	M10x25	9 pcs	3 pcs	70 Nm
IRB 6700 - 300/2.70	M10x25	21 pcs	21 pcs	70 Nm
IRB 6700 - 245/3.00	M10x25	21 pcs	21 pcs	70 Nm

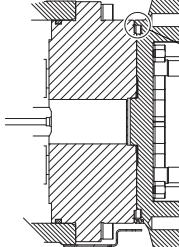
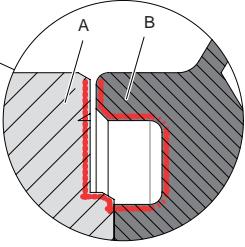
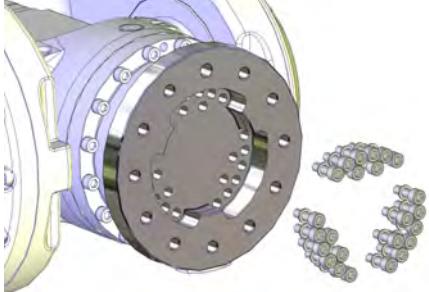
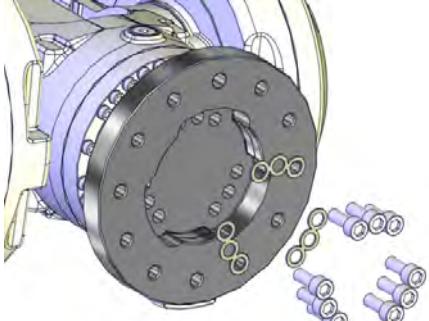
Refitting the turning disc

Action	Note
1 If new turning disc spare part is installed: verify that the correct synchronization mark plate for axis-6 is installed on the wrist.	See Replacing the synchronization mark plate on page 361 .
2 Wipe clean the contact surfaces.	

Continues on next page

4.5.3 Replacing the turning disc

Continued

Action	Note
3 Foundry Plus: Apply Mercasol on the surfaces on turning disc and axis-6 gearbox as shown in the figure.	  xx1400000385
4 IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20. Secure the turning disc with its attachment screws and washers.	Tightening torque: 35 Nm. Attachment screws: M8x25, Steel 12.9 Gleitmo 603 (24 pcs) Washers: Steel 8.4x13x1.5 (24 pcs)  xx1300000492
5 IRB 6700 -200/2.60, -155/2.85. Secure the turning disc with its attachment screws and washers.	Tightening torque: 70 Nm Attachment screws: M10x25, Steel 12.9 Gleitmo 603, (9 pcs) Washers: (3 pcs)  xx1300002302

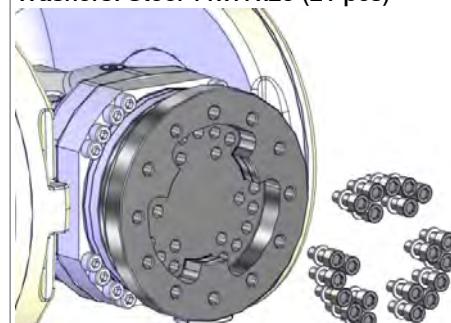
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4 Repair

4.5.3 Replacing the turning disc

Continued

Action	Note
6 <i>IRB 6700 -300/2.70, -245/3.00.</i> Secure the turning disc with its attachment screws and washers.	Tightening torque: 70 Nm Attachment screws: M10x25, Steel 12.9 Gleitmo 603, (21 pcs) Washers: Steel 11x17x25 (21 pcs)



xx1400002195

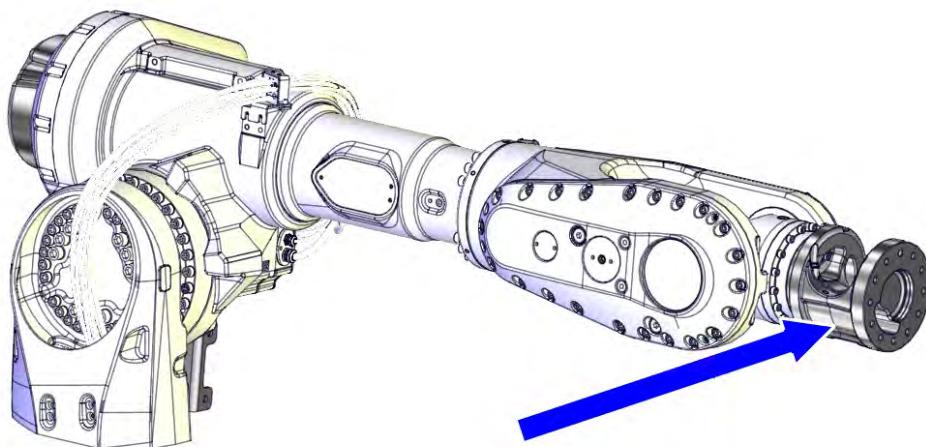
Concluding procedure

Action	Note
1  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in <i>DANGER - First test run may cause injury or damage! on page 48.</i>	

4.5.4 Replacing the process turning disc

Location of the process turning disc

The process turning disc is located in the front of the wrist housing as shown in the figure.



xx1400001391

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Article number	Note
Rust preventive	-	Mercasol, used on Foundry Plus

Removing the process turning disc

Use these procedures to remove the process turning disc.

Preparations before removing the process turning disc

	Action	Note
1	Run the robot to a position most comfortable for the removal of the process turning disc.	

Continues on next page

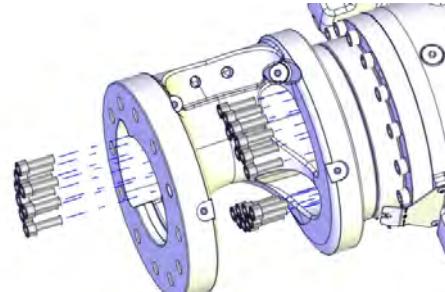
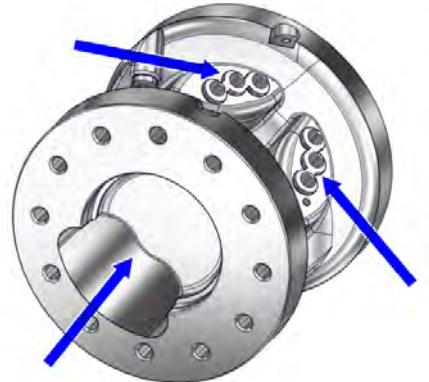
4 Repair

4.5.4 Replacing the process turning disc

Continued

	Action	Note
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3	Remove any equipment fitted to the process turning disc.	

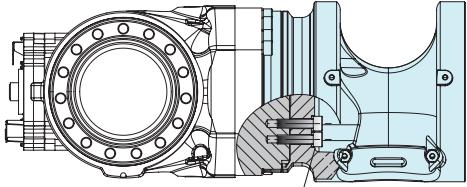
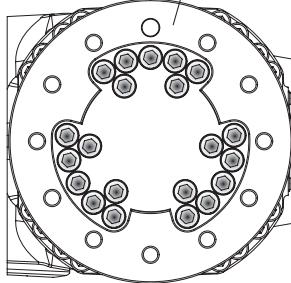
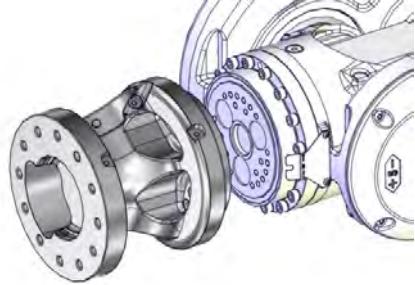
Removing the process turning disc

	Action	Note
1	<i>IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20.</i> Remove the 24 M8 screws and washers, that secure the process turning disc.	 xx1400001392
2	<i>IRB 6700 - 200/2.60, - 155/2.85.</i> Remove the nine M10 screws and three washers, that secure the process turning disc.	 xx1400001394

Continues on next page

4.5.4 Replacing the process turning disc

Continued

Action	Note
3 <i>IRB 6700 -300/2.70, -245/3.00.</i> Remove the 21 M10 screws and washers, that secure the process turning disc.	  xx1400001395
4 Remove the process turning disc.	 xx1400001393

Replacing the synchronization mark plate

The images below shows a wrist with standard turning disc, but is also valid for the process turning disc.

The design of the turning disc spare part might require replacement of the axis-6 synchronization mark plate if the existing plate is not compatible with the new turning disc.

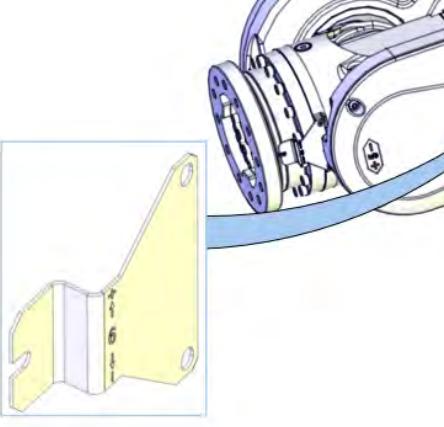
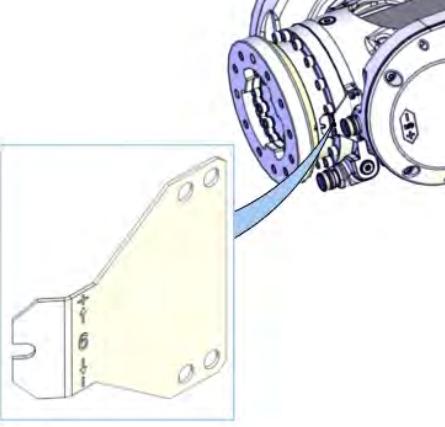
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4 Repair

4.5.4 Replacing the process turning disc

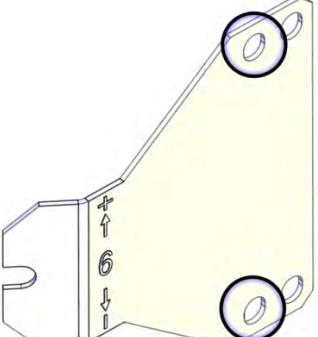
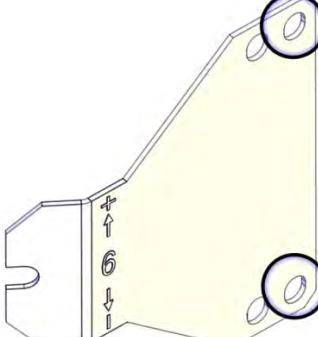
Continued

If ordering a new turning disc, the synchronization mark plate required is enclosed with the spare part. Check if the robot is already equipped with a compatible plate or if it needs to be replaced. The difference is shown in the figures.

Incompatible axis-6 synchronization mark plate on robot	Compatible axis-6 synchronization mark plate on robot
 <p>xx1500000873</p> <p>Incompatible synchronization mark plate is installed. Replace the plate.</p>	 <p>xx1500000874</p> <p>Compatible synchronization mark plate is installed. No action required.</p>

Fitting the axis-6 synchronization mark plate

There are different attachment holes on the plate used for different robot variants. See table below.

IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20, IRB 6700 - 200/2.60, IRB 6700 - 155/2.85	IRB 6700 - 300/2.70, IRB 6700 - 245/3.00
 <p>xx1500000877</p> <p>Use the holes closest to the synchronization mark.</p>	 <p>xx1500000878</p> <p>Use the holes at the back end of the synchronization plate.</p>

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4.5.4 Replacing the process turning disc

Continued

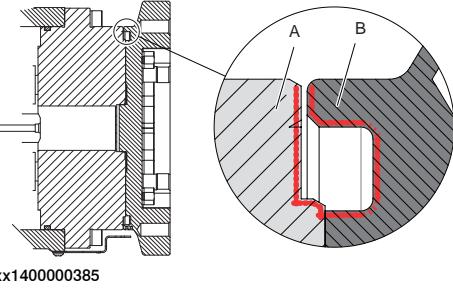
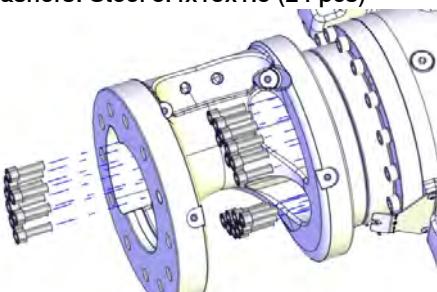
Refitting the process turning disc

Use this procedure to refit the process turning disc.

Screw joint for refitting process turning disc

Variant	Screw dimension	Number of screws	Number of washers	Tightening torque
IRB 6700 - 235/2.65	M8x25	24 pcs	24 pcs	35 Nm
IRB 6700 - 205/2.80	M8x25	24 pcs	24 pcs	35 Nm
IRB 6700 - 175/3.05	M8x25	24 pcs	24 pcs	35 Nm
IRB 6700 - 150/3.20	M8x25	24 pcs	24 pcs	35 Nm
IRB 6700 - 200/2.60	M10x25	9 pcs	3 pcs	70 Nm
IRB 6700 - 155/2.85	M10x25	9 pcs	3 pcs	70 Nm
IRB 6700 - 300/2.70	M10x25	21 pcs	21 pcs	70 Nm
IRB 6700 - 245/3.00	M10x25	21 pcs	21 pcs	70 Nm

Refitting the process turning disc

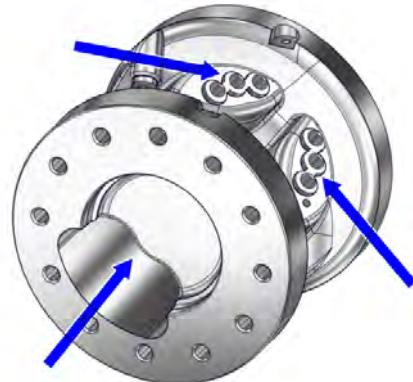
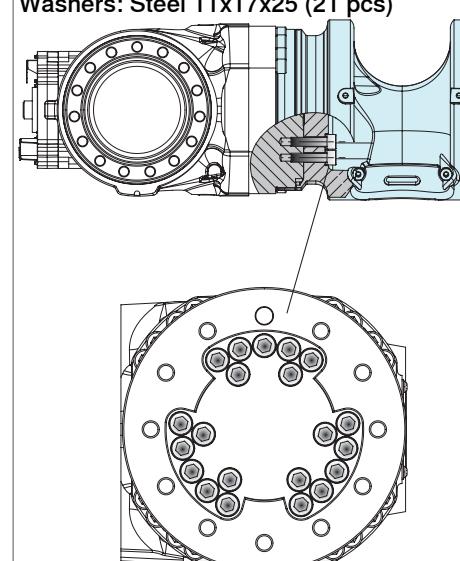
	Action	Note
1	If new turning disc spare part is installed: verify that the correct synchronization mark plate for axis-6 is installed on the wrist.	See Replacing the synchronization mark plate on page 367 .
2	Wipe clean the contacts surfaces.	
3	Foundry Plus: Apply Mercasol on the surfaces on the process turning disc and axis-6 gearbox as shown in the figure.	 The figure shows standard turning disc. Surfaces to apply Mercasol on are the same with process turning disc.
4	IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20. Secure the process turning disc with its attachment screws and washers.	Tightening torque: 35 Nm. Attachment screws: M8x25, Steel 12.9 Gleitmo 603 (24 pcs) Washers: Steel 8.4x13x1.5 (24 pcs) 

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4 Repair

4.5.4 Replacing the process turning disc

Continued

Action	Note
5 <i>IRB 6700 -200/2.60, -155/2.85.</i> Secure the process turning disc with its attachment screws and washers.	Tightening torque: 70 Nm Attachment screws: M10x25, Steel 12.9 Gleitmo 603, (9 pcs) Washers: (3 pcs)
	 xx1400001394
6 <i>IRB 6700 -300/2.70, -245/3.00.</i> Secure the process turning disc with its attachment screws and washers.	Tightening torque: 70 Nm Attachment screws: M10x25, Steel 12.9 Gleitmo 603, (21 pcs) Washers: Steel 11x17x25 (21 pcs)
	 xx1400001395

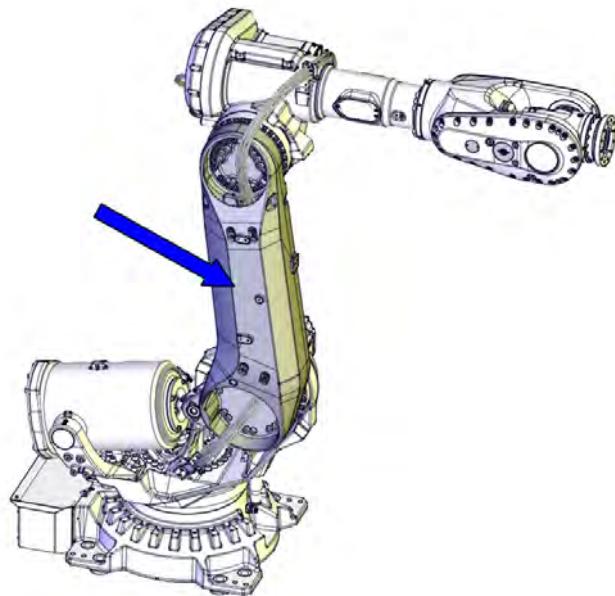
Concluding procedure

Action	Note
1  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in <i>DANGER - First test run may cause injury or damage! on page 48.</i>	

4.5.5 Replacing the lower arm

Location of the lower arm

The lower arm is located as shown in the figure.



xx1300000786

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Unload the balancing device.
- 2 Remove the shaft in the balancing device front link ear
- 3 Remove the cabling from the upper and lower arm.
- 4 Remove the upper arm.
- 5 Replace the lower arm.

Spare part

Spare part	Spare part number	Note
Lower arm	See <i>Product manual, spare parts - IRB 6700</i> .	
VK cover	3HAA2166-12	Located at the front link ear of the balancing device.

Continues on next page

4 Repair

4.5.5 Replacing the lower arm

Continued

Required tools and equipment

Equipment	Article number	Note
Distance tool	3HAC030662-001	Only used to keep the balancing device in a locked position, after the balancing device springs has been unloaded with the help of the robot itself.  DANGER Never use this tool to unload or restore a balancing device!
Lifting shackle	-	SA-10-8-NA1
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Dismantle and mounting tool	3HAC028920-001	Used for removing and fitting shaft and bearings.
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC16131-1	M12
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs!
Guide pin, M12x200	3HAC13056-4	Always use guide pins in pairs!
Pallet		Used for putting down removed parts from robot.
Guide pin, M16x150	3HAC13120-2	Always use guide pins in pairs!
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Anvil	3HAC047273-001	Included in the tool kit Dismantle and mounting tool (3HAC028920-001).
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment	Article number	Note
Grease	3HAA1001-294	Tribol GR 100-0 PD, 50 ml For lubrication of the front bearing of the balancing device.
Grease	3HAB3537-1	Used to lubricate o-rings.

Continues on next page

Equipment	Article number	Note
O-ring	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on axis-3 motor cover.
	3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)	D=119x3 Used on axis-4 motor cover.
	3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)	D=119x3 Used on axis-5 motor cover.
Gasket	3HAC033489-001/ 3HAC044252-001	Used on axis-6 motor cover.

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the lower arm

Use these procedures to remove the lower arm.

Preparations before removing the lower arm

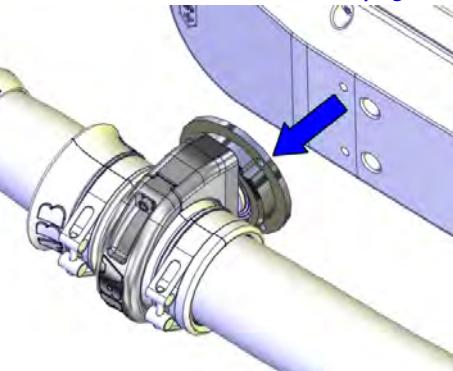
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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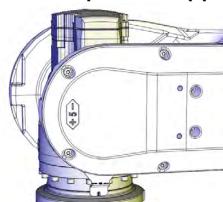
4 Repair

4.5.5 Replacing the lower arm

Continued

Action	Note
<p>2  DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
3 Remove all equipment fitted to upper and lower arms.	
<p>4 If used, remove the complete ball joint housing (including the bracket), from the wrist cover. Leave the DressPack fitted in the ball joint housing. This is done to be able to reach the two hidden screws that secure the wrist cover.</p>	<p>How to remove the DressPack cable package is described in more detail in the product manual "IRB 6700 DressPack". For article number see References on page 10.</p>  <p>xx1400000355</p>

Position of the robot in the continued process

Action	Note
<p>1 Jog the robot to:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: 0° • Axis 3: 0° • Axis 4: 0° • Axis 5: +90° • Axis 6: 0° 	
<p>2 Connect the 24 VDC power supply, release the brakes and move the axis 5 manually into +90°. Connect to R2.MP5-connector:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	<p>24 VDC power supply</p>  <p>xx1200001081</p>

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

Unloading or locking the balancing device springs

Use this procedure to unload the balancing device with the help of the robot, and lock the balancing device springs in a compressed position, using the Distance tool (3HAC030662-001).

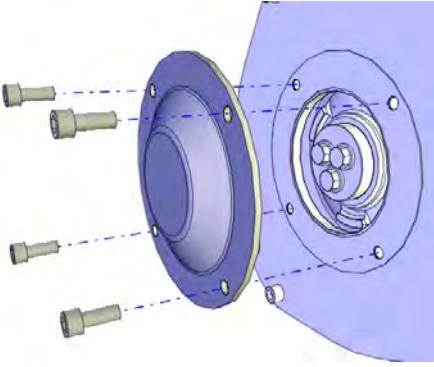
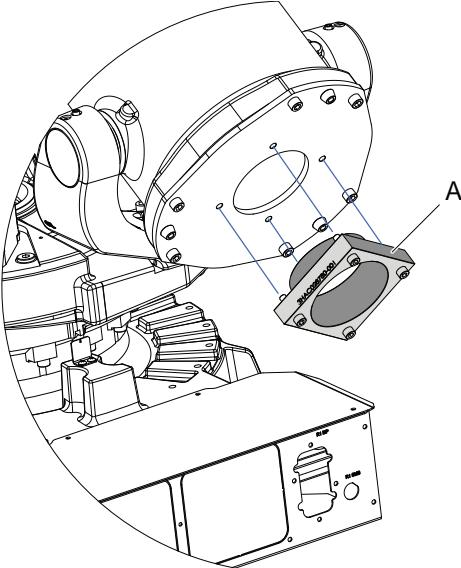
Action	Note
<p>1</p> <p> DANGER</p> <p>Do not use the Distance tool (3HAC030662-001) to unload or restore the pressure of the balancing device springs! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position!</p> <p>To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the Hydraulic press tool, balancing device (3HAC020902-001).</p>	
<p>2</p> <p>Jog axis-2 to:</p> <ul style="list-style-type: none"> • -20° or +20° 	This is done in order to compress the balancing device springs inside the balancing device before fitting the Distance tool.
<p>3</p> <p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	

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4 Repair

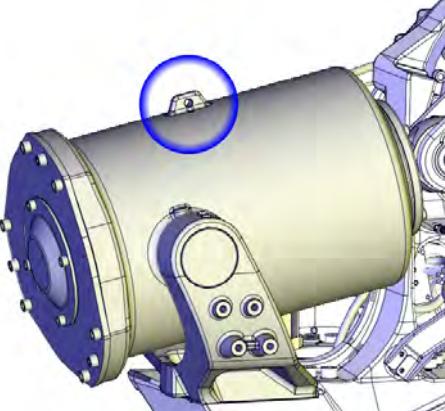
4.5.5 Replacing the lower arm

Continued

Action	Note
4 Remove the cover plate on the back of the balancing device.	 DANGER DO NOT remove any other screws than the rear cover attachment screws! See figure!  xx1300000554
5 Fit the Distance tool on the back of the balancing device using the four screws.	 DANGER Use caution when tightening the screws. The threads in the cover can be damaged if more tightening torque than 45 Nm is used, risking that the Distance tool is not properly fitted.  xx0800000480 A Distance tool: 3HAC030662-001
6 Jog axis-2 to the calibration position. The balancing device is now unloaded.	This is done to compress the balancing device springs, making it possible to remove the front shaft of the balancing device.
7 Let the Distance tool stay fitted during the continued procedure.	
8	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.

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Preparations before removing the shaft in the link ear

	Action	Note
1	Jog axis-2 to the calibration position (if not already in this position).	
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	Remove any equipment, if fitted, on or close to the balancing device.	
4	 CAUTION The weight of the balancing device (excluding cradle) is 140 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 185 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
5	Fit a lifting shackle to the balancing device.	Lifting shackle: SA-10-8-NA1  xx1300000661
6	Fit the lifting accessory (chain) to the shackle and raise to unload the weight.	Lifting accessory (chain): 3HAC15556-1

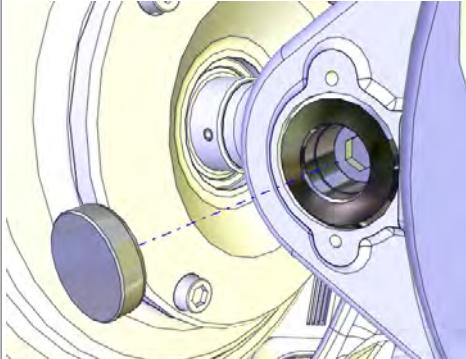
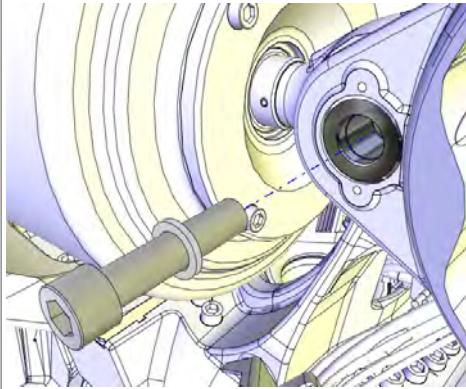
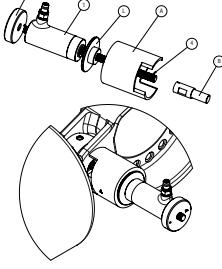
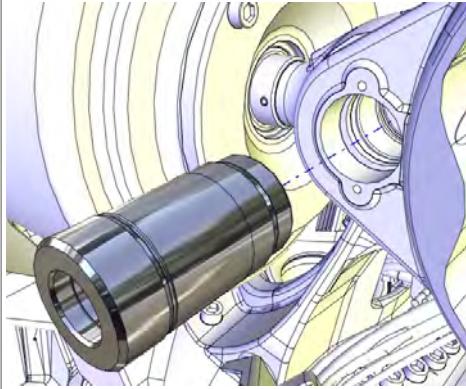
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4 Repair

4.5.5 Replacing the lower arm

Continued

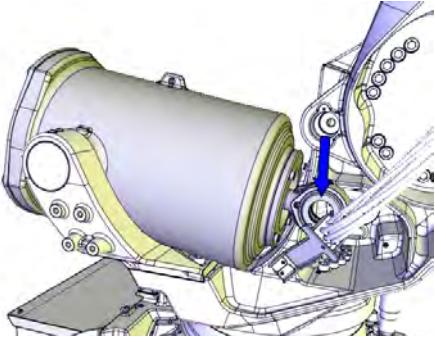
Removing the shaft in the front (link ear)

Action	Note
1 Remove the small VK cover.  Note It is almost impossible to remove the VK cover without damage. New VK covers are needed.	 xx1200001278
2 Unscrew the attachment screw and washer.	 xx1200001279
3 Use the dismantle and mounting tool and pull the shaft out.  xx1700000378 The numbers in the figure refers to the marked tool pieces respectively.	Dismantle and mounting tool: 3HAC028920-001  xx1200001280

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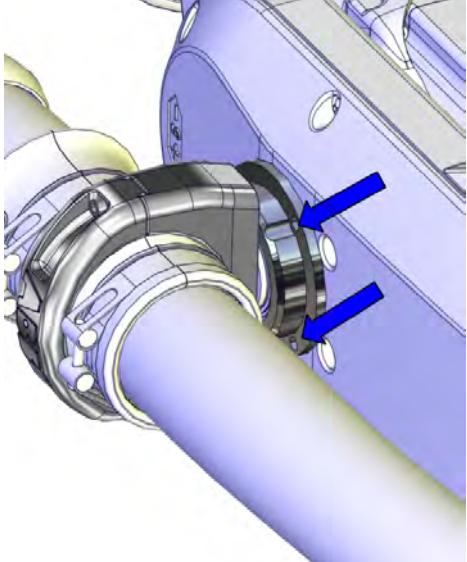
4.5.5 Replacing the lower arm

Continued

Action	Note
4 Put down the balancing device and let it rest on the frame.	 xx1200001281

Retrieving access to the wrist cabling

Use this procedure to remove the wrist cover to retrieve access to the axis-5 and axis-6 motor cables.

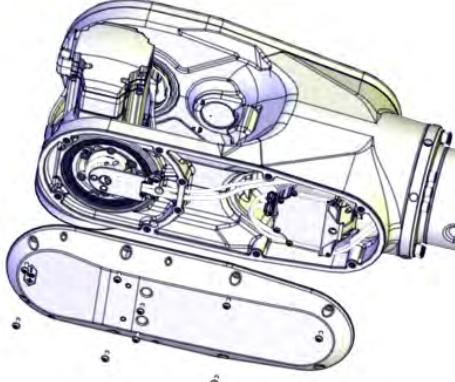
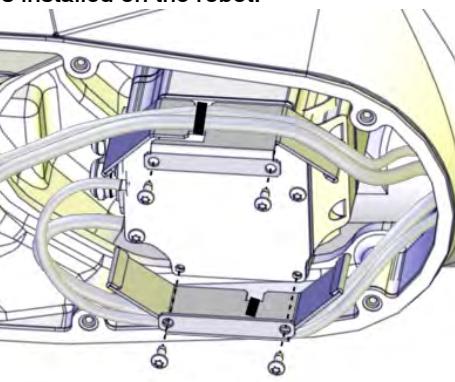
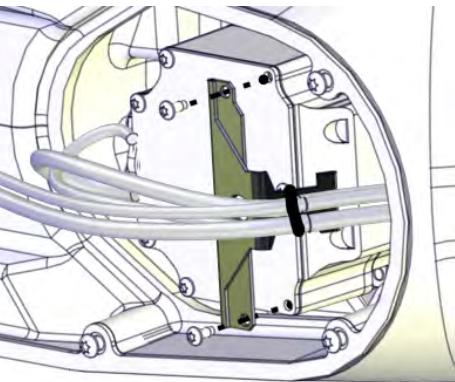
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 If DressPack is not already removed, the complete ball joint housing (including the bracket) must be removed at this point, in order to reach the two hidden screws that secures the wrist cover.	 xx1400000355

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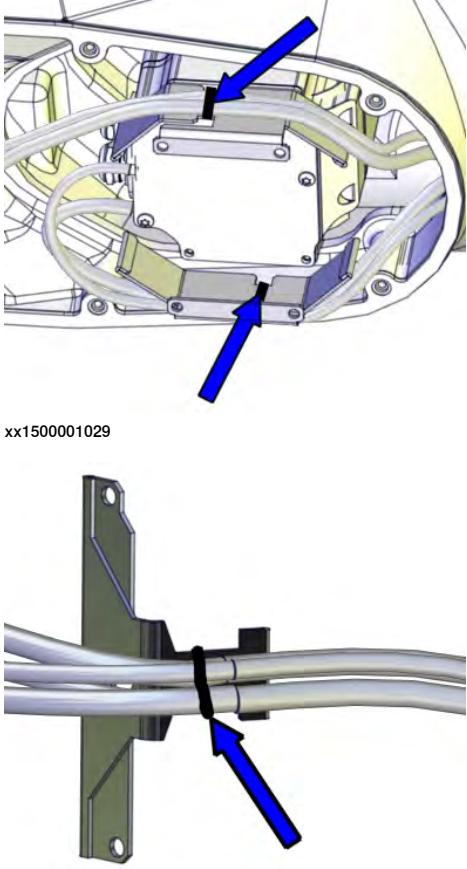
4 Repair

4.5.5 Replacing the lower arm

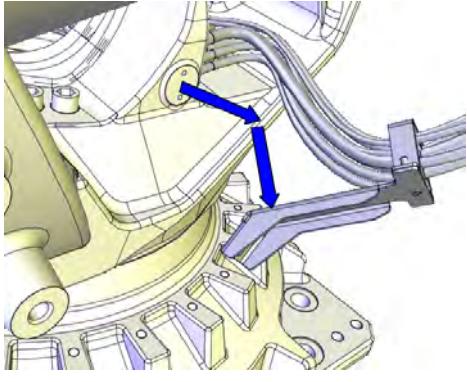
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Action	Note
3 Remove the wrist cover.	 xx1300002247
4 Remove the heat protection plate/plates from the motor with the cabling still attached to the plate. Remove the heat protection plates from the motor with the cabling still attached to the plate.	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  xx1500001030  xx130000490

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Action	Note
<p>5 Cut the cable ties that hold the cable harness to the plate.</p> <p>Note Keep the heat protection plate until refitting.</p> <p>Tip If removing the plate only for replacing the motor, the cabling does not need to be loosened from the plate.</p>	<p>Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001029</p> <p>xx1300000489</p>

Removing cable brackets

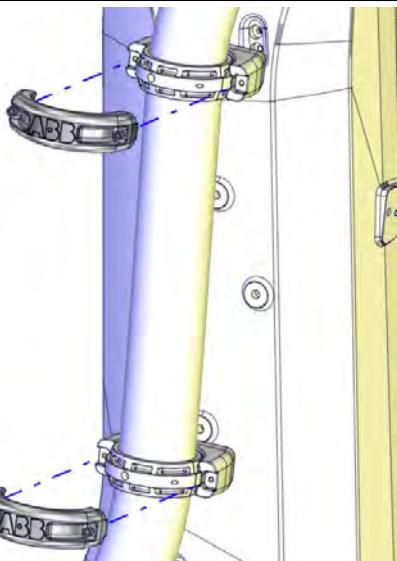
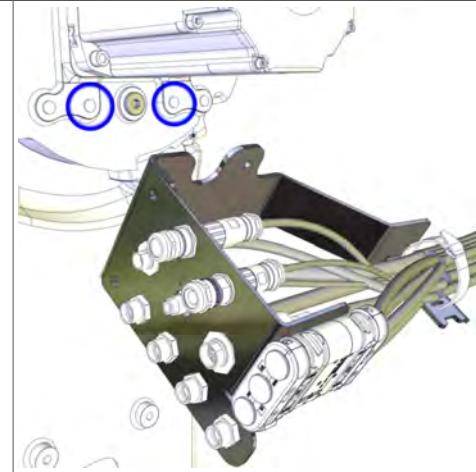
Action	Note
<p>1 Unscrew the screws that hold the bracket and let it hang free.</p>	 <p>xx1200001184</p>

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4 Repair

4.5.5 Replacing the lower arm

Continued

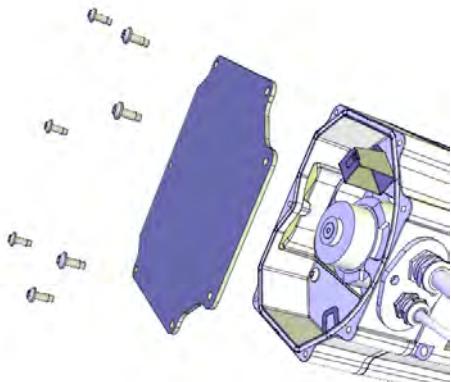
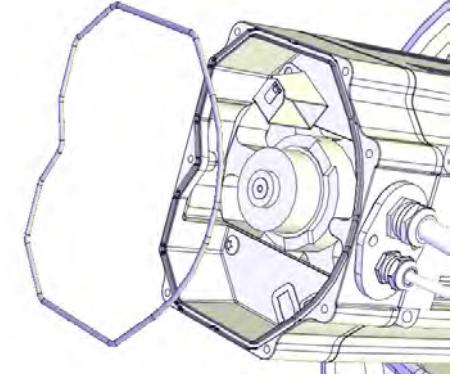
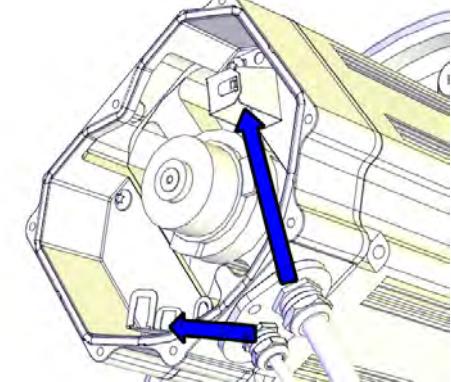
Action	Note
2 If used, open the ball joint housings on the lower arm and remove the DressPack.	 xx1400000195
3 If used, unscrew the screws that hold the connection plate and let the DressPack hang free.	 xx1200001332

Disconnecting the axis-3 and axis-4 motor cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.5.5 Replacing the lower arm
Continued

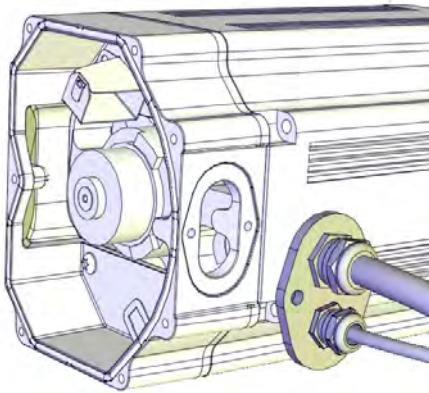
	Action	Note
2	Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3	Make sure the o-ring is present.	 xx1200001070
4	Disconnect the motor cables.	 xx1200001066

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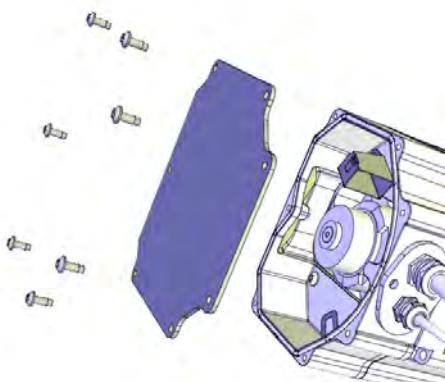
4 Repair

4.5.5 Replacing the lower arm

Continued

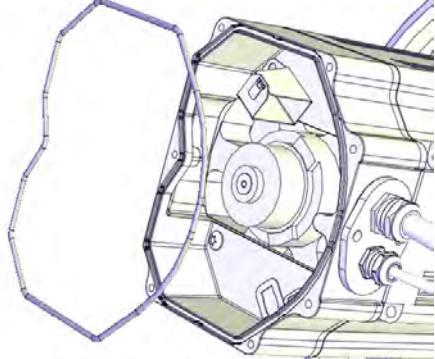
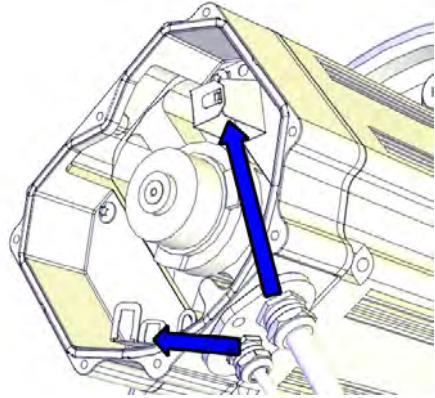
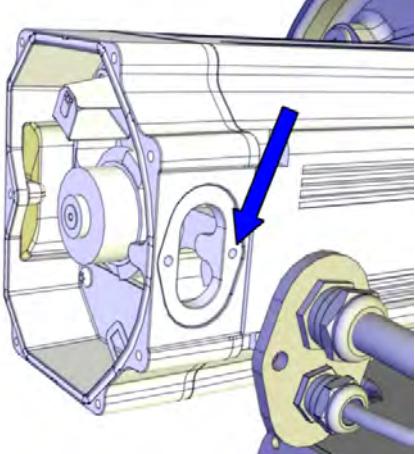
Action	Note
<p>5 Remove the cable gland cover. Make sure the gasket is not damaged.</p> <p> Tip</p> <p>Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1200001067
6 Use caution and pull out the motor cables.	

Disconnecting the axis-5 motor cables

Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135

Continues on next page

4.5.5 Replacing the lower arm Continued

Action	Note
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066
5 Remove the cable gland cover by performing the following steps: 1 Open the inner screw a little (the one the arrow is pointing at). No need to remove this screw from the motor. 2 Remove the outer screw. 3 Slide the cable gland cover away from the inner screw. Make sure the gasket is not damaged.  Tip Make a note in which direction the cable exit hole is facing, if the motor will be removed too. The motor shall be refitted in the same position.	 xx1300000656
6 Use caution and pull out the motor cables.	

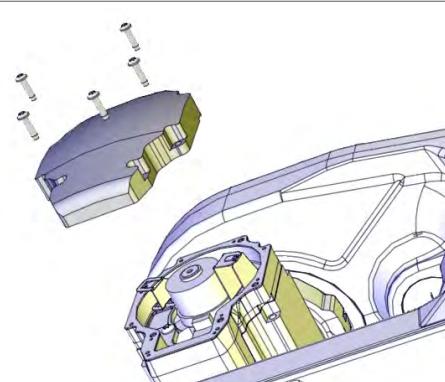
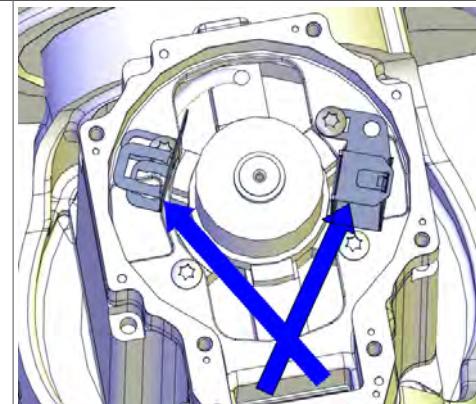
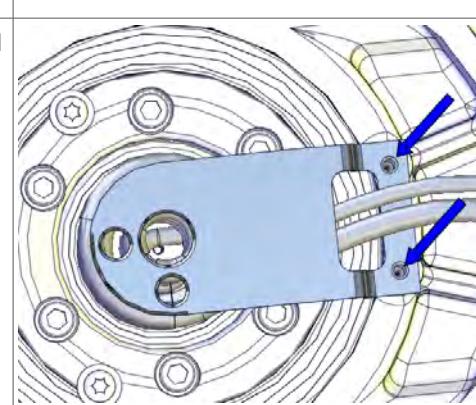
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4 Repair

4.5.5 Replacing the lower arm

Continued

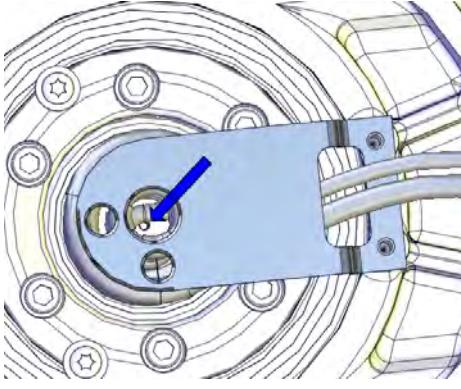
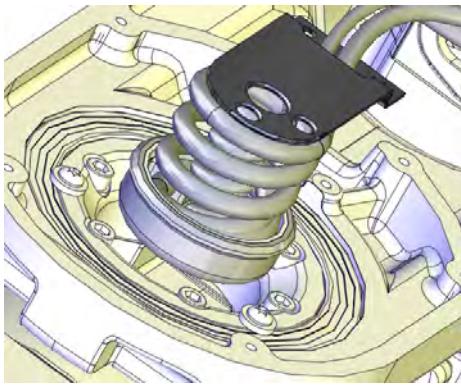
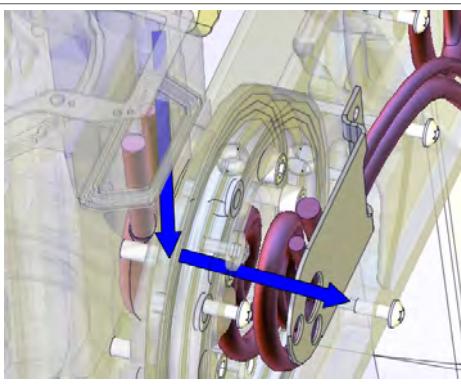
Disconnecting the axis-6 motor cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Unscrew the attachment screws and remove the motor cover.	 xx1200001080
3 Disconnect the motor cables.	 xx1300000488
4 Unscrew the attachment screws that hold the cable bracket.	 xx1300000484

Continues on next page

4.5.5 Replacing the lower arm

Continued

Action	Note
5 Unscrew the M4 screw that holds the carrier.	 Note The screw is located at the bottom of the carrier.  xx1300000485
6 Pull out the carrier from its position.	 xx1300001113
7 Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.	 xx1300000666

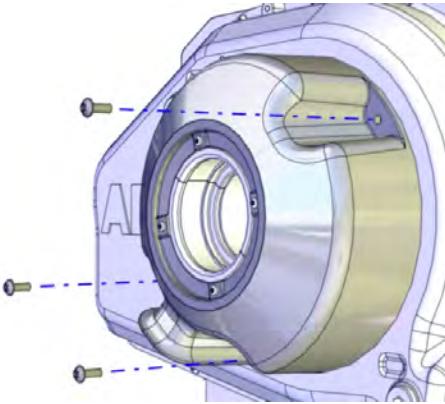
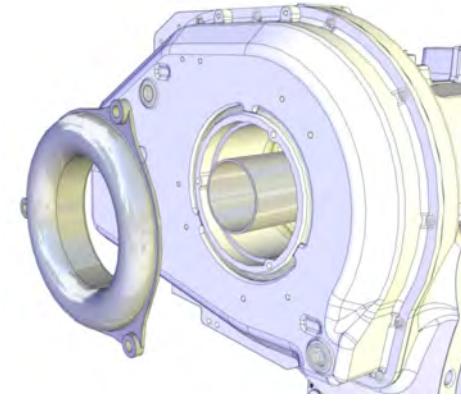
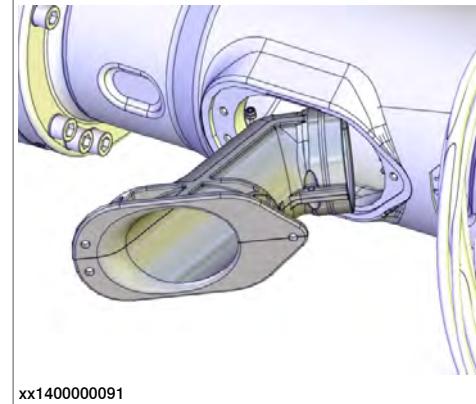
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4 Repair

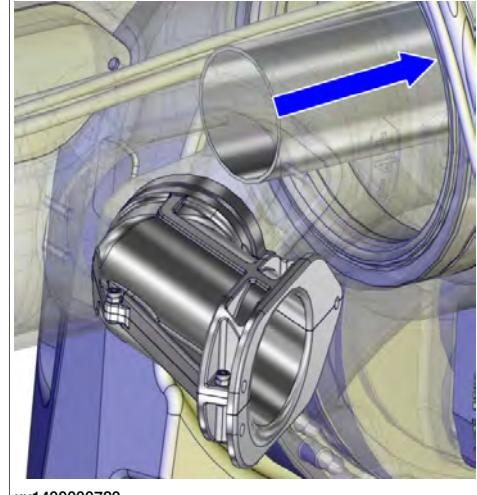
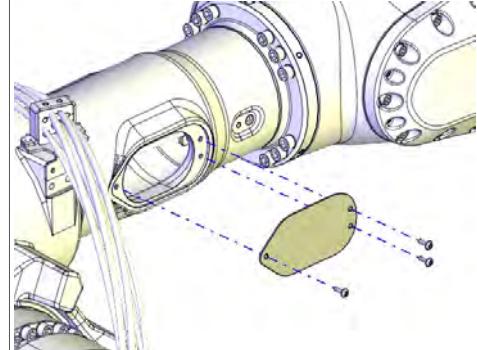
4.5.5 Replacing the lower arm

Continued

Removing the cable harness - wrist and upper arm

Action	Note
1 Remove the cover.  Note Foundry Plus: Use caution not to damage the gasket, to loose the washers on the cover sealing or to loose the inserts fitted on the cover.	 xx1200000045
2 Remove the cable guide, slide it out a little and let it rest on the cables.	 xx1300000657
3 If used, remove the insert.  Note This is not needed on variants IRB 6700 - 300/2.70, -245/3.00	 xx1400000091

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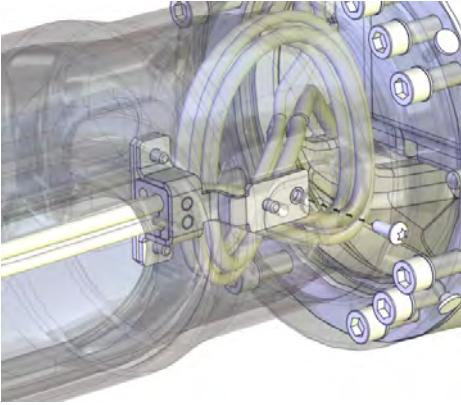
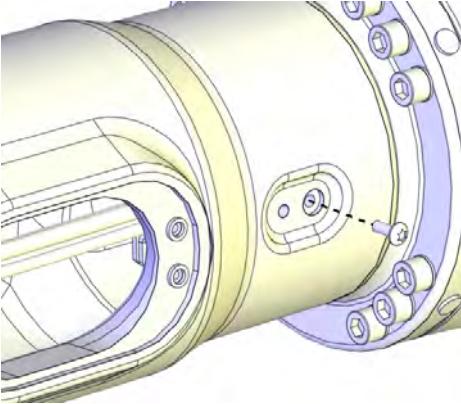
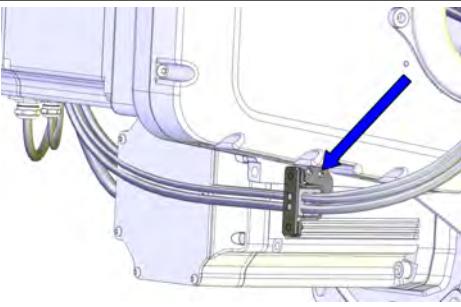
	Action	Note
4	<p>If used, push the DressPack tube a little backwards.</p> <p>Note This is not needed on variants IRB 6700 - 300/2.70, -245/3.00</p>	 xx1400000720
5	<p>Tip</p> <p>Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the procedure and to avoid damaging the parts during the procedure.</p> <p>This will also make it easier to run the cable harness through the inside of the upper arm.</p>	 xx1300000668
6	Remove the side cover on the arm tube.	 xx1300000557

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4 Repair

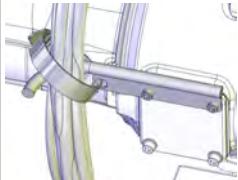
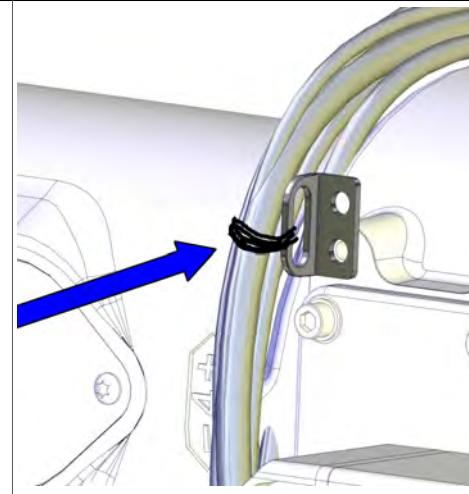
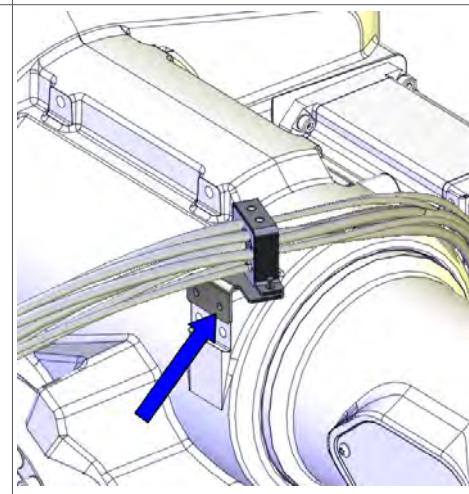
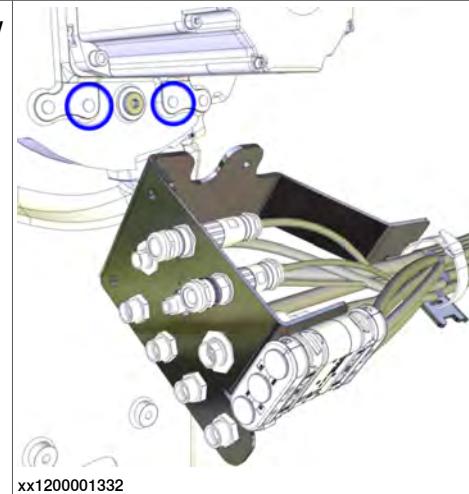
4.5.5 Replacing the lower arm

Continued

Action	Note
7 Unscrew the attachment screw that secures the axis-4 metal clamp inside the arm tube.  Note The screw is reached from outside the upper arm!	 xx1700000340  xx1700000339
8 Remove the armhouse metal clamp.	 xx1300000543

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4.5.5 Replacing the lower arm Continued

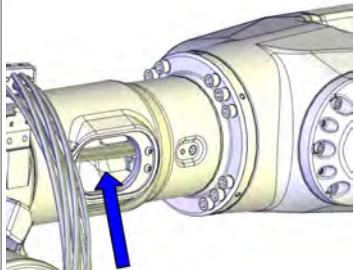
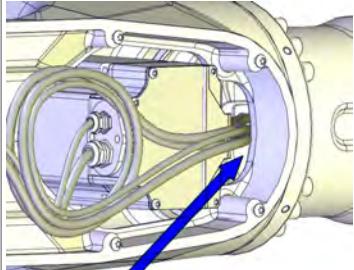
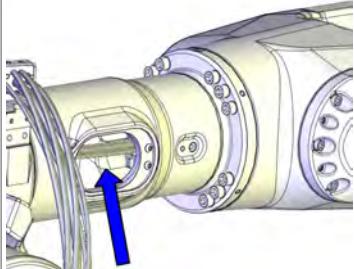
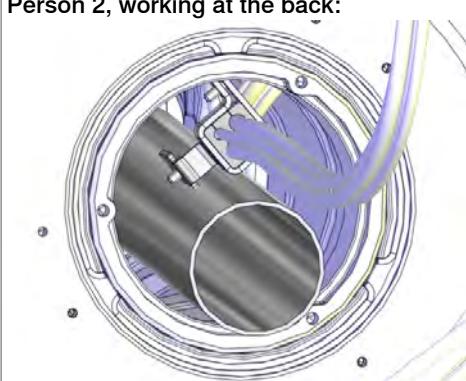
Action	Note
<p>9 Open the velcro strap at the cable fixing bracket.</p> <p>Note</p> <p>If DressPack is fitted, the cable fixing bracket is replaced by the cable guide.</p>  <p>xx1300001973</p> <p>Cable guide.</p>	 <p>xx1300000544</p> <p>Cable fixing bracket.</p>
<p>10 Remove the metal clamp on top of the armhouse.</p>	 <p>xx1300000541</p>
<p>11 If used (and if not already done), unscrew the screws that hold the connection plate and let it hang free with the rest of the DressPack cable package.</p>	 <p>xx1200001332</p>

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4 Repair

4.5.5 Replacing the lower arm

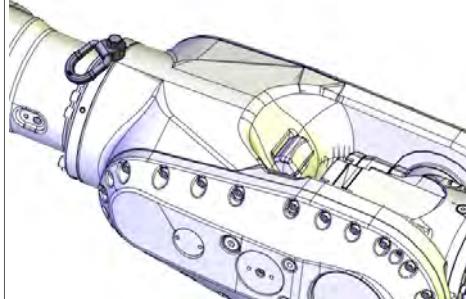
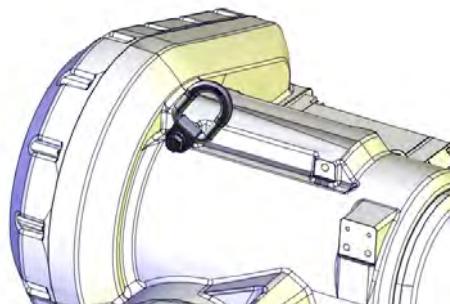
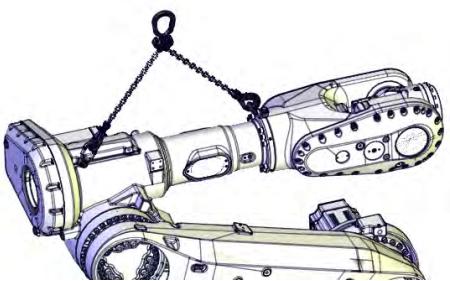
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	Action	Note
12	 Tip <p>This step is best performed by two persons working together.</p> <p>Use caution and remove the cable harness out of the wrist like this:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole and take a hold of the cable harness. • Person 2: Take a hold on the cable harness inside the wrist. • Together: Move the cable harness past the axis-5 motor and into the arm tube. 	<p>Person 1, working at the side hole:</p>  xx1300000745 <p>Person 2, working at the wrist:</p>  xx1300000746
13	 Tip <p>This step is best performed by two persons working together.</p> <p>Use caution and remove the cable harness out of the arm tube like this:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole and take a hold of the cable harness. • Person 2: Take a hold on the cable harness at the back of the robot. • Together: Move the cable harness out of the arm tube. <p>Remove the cable harness from the upper arm.</p> <p> Note</p> <p>To be able to remove the cable harness with the DressPack tube fitted, the tube needs to be pulled out a little, then be placed on the lower left side in the arm tube and the bracket of the cable harness then needs to be placed on the upper right hand side.</p> <p>(This is not needed on variants IRB 6700 - 300/2.70, -245/3.00)</p>	<p>Person 1, working at side hole:</p>  xx1300000745 <p>Person 2, working at the back:</p>  xx1400002561

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Attaching the lifting accessories to the upper arm

Use this procedure to attach the lifting accessories to the upper arm.

	Action	Note
1	 CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2	Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1  xx1200001133
3	Fit a lifting eye in the arm house, with a fender washer underneath.	Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.  xx1200001134
4	Attach the upper arm lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and in the wrist.	Lifting accessory (chain): 3HAC15556-1  xx1200001308

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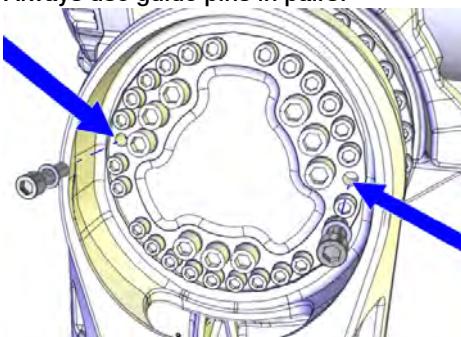
4 Repair

4.5.5 Replacing the lower arm

Continued

Action	Note
5 Raise the lifting accessories to take the weight of the upper arm.	
6 In case of necessary adjustments, use the shortening loops on the lifting accessory (chain) to find the level position. See figure!	 xx1400002197
7 Release the brakes in order to find the most level lifting position of the upper arm as possible, before lifting. To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP3: <ul style="list-style-type: none">• + = pin 2• - = pin 5	24 VDC power supply

Preparations before removing the upper arm - IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20

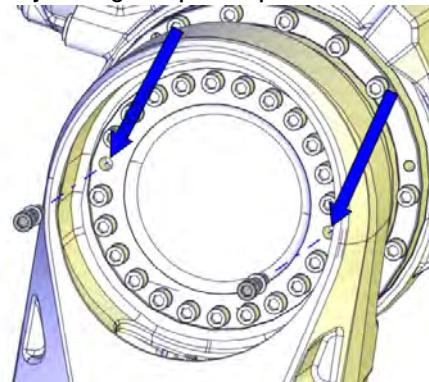
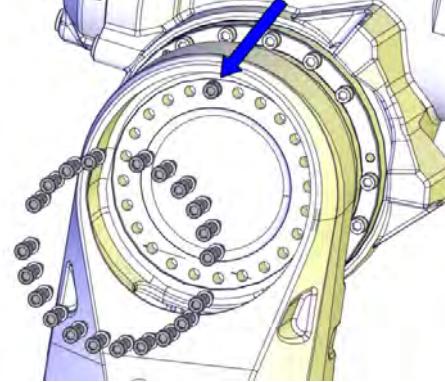
Action	Note
1 Remove two attachment screws (M12) in opposite holes and replace them with guide pins. Note Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure!	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!
2 Leave one of the remaining attachment screws fitted, remove the other screws.	 xx1300000659

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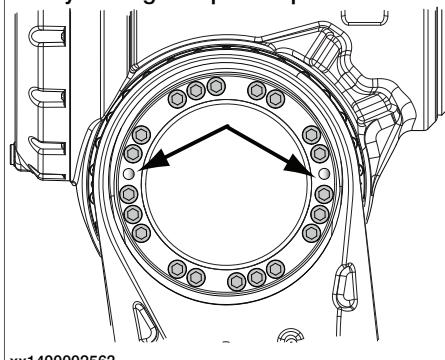
4.5.5 Replacing the lower arm

Continued

Preparations before removing the upper arm - IRB 6700-200/2.60, -155/2.85

	Action	Note
1	<p>Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p>Note</p> <p>Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure!</p> <p>Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!</p>  <p>xx1300002245</p>
2	Leave one of the remaining attachment screws fitted, remove the other screws.	 <p>xx1300002246</p>

Preparations before removing the upper arm - IRB 6700-300/2.70, -245/3.00

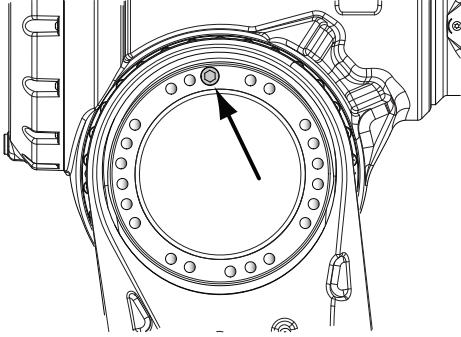
	Action	Note
1	<p>Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p>Note</p> <p>Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure!</p> <p>Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!</p>  <p>xx1400002563</p>

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4 Repair

4.5.5 Replacing the lower arm

Continued

Action	Note
2 Leave one of the remaining attachment screws fitted, remove the other screws.	

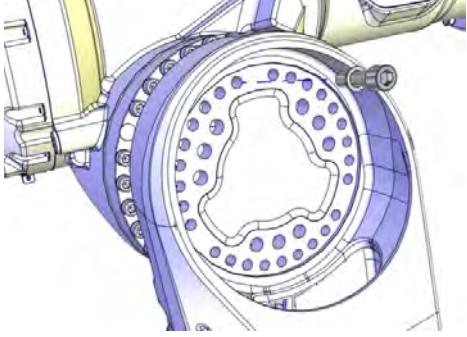
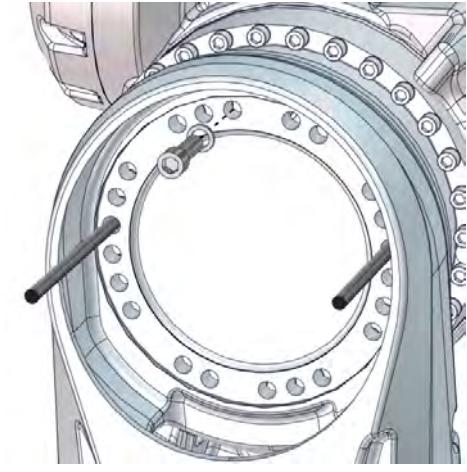
Removing the upper arm

Action	Note
1  Note Make sure the lift is done completely leveled! In case of necessary adjustments, use the shortening loops on the lifting accessory (chain), and make sure to place the chain the right way through the loops.	

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4.5.5 Replacing the lower arm

Continued

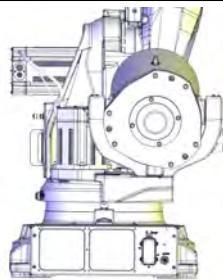
Action	Note
2 Remove the remaining attachment screw and let the upper arm slide out from the lower arm with support from the guide pins.	 <p>IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85</p> <p>xx1300001610</p>  <p>IRB 6700-300/2.70, -245/3.00</p> <p>xx1700000059</p>
3 Lift the upper arm and place it on the prepared area.	<p>! CAUTION</p> <p><i>Only valid when the upper arm is removed due to replacement of the axis-3 gearbox:</i></p> <p>If the cable harness is still fitted or partly fitted, use caution when lifting the upper arm over to the other side of the robot, in order not to cause any damage to the cable harness.</p>

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4 Repair

4.5.5 Replacing the lower arm

Continued

Action	Note
<p>4 <i>This step is only valid when the upper arm is removed due to replacement of the axis-3 gearbox:</i></p> <p>Place pieces of wood (or similar) under arm house and wrist. Lower the upper arm, and let the upper arm rest as shown in the figure.</p> <p>This is done in order to keep the axis-3 gearbox in a vertical position and to get the best position to replace the axis-3 gearbox, if applicable.</p> <p> CAUTION</p> <p>Make sure that no part of the cable harness or DressPack cable package will be damaged in the process!</p>	  <p>xx1300000553</p>

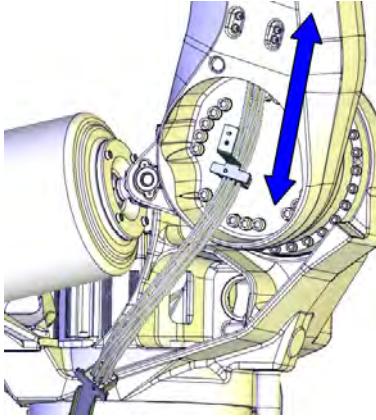
Preparations before removing the lower arm

Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2 Open the ball joint housings on the lower arm and remove the DressPack.</p>	
<p>3 Loosen the axis-2 lower arm metal clamp and the axis-3 lower arm metal clamp located on the inside of the lower arm by removing the attachment screws.</p> <p> Note</p> <p>The screws are reached from outside the lower arm!</p>	 <p>xx1300000540</p>

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4.5.5 Replacing the lower arm

Continued

Action	Note
4 Remove the cable harness from inside the lower arm.	 xx1300000733
5  CAUTION The lower arm weighs 145 kg (IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85) 160 kg (IRB 6700 - 300/2.70, - 245/3.00) All lifting accessories used must be sized accordingly!	
6 Apply the lifting accessory to the lower arm.	

Removing the lower arm - IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85

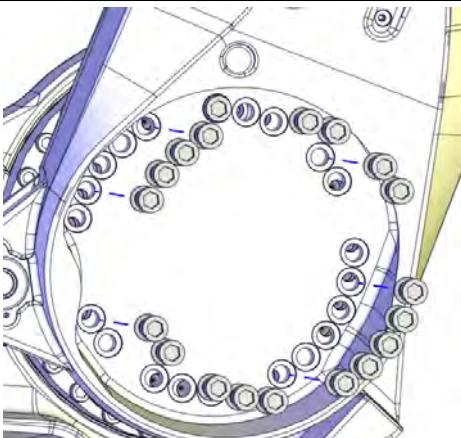
Action	Note
1 Raise the lifting accessory to unload the lower arm.	
2 Remove two attachment screws in opposite holes and replace them with guide pins.  Tip Lubricate the guide pins with some grease to make the lower arm slide better.	Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!  xx1300000788

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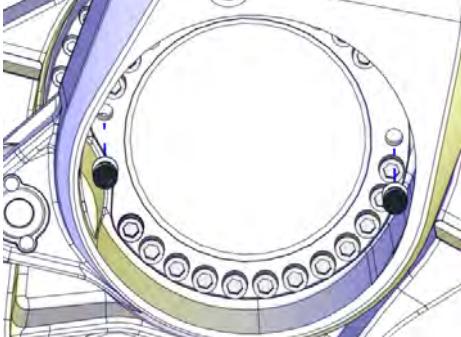
4 Repair

4.5.5 Replacing the lower arm

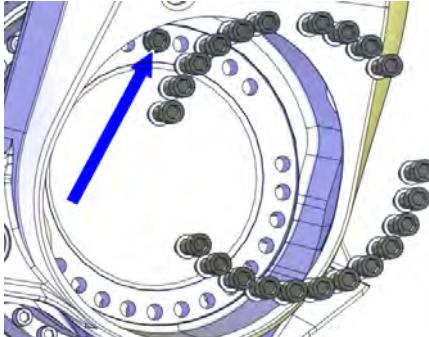
Continued

Action	Note
3 Remove all but one of the remaining attachment screws and washers that secure the lower arm to the axis 2 gearbox.	 xx1300000789
4 Make sure the lifting accessory is holding the weight of the arm system.	
5 Remove the remaining screw and slide the lower arm out on the guide pins and remove the lower arm. Put it somewhere safe.	

Removing the lower arm - IRB 6700 -300/2.70, -245/3.00

Action	Note
1 Raise the lifting accessory to unload the lower arm.	
2 Remove two attachment screws in opposite holes and replace them with guide pins.  Tip Lubricate the guide pins with some grease to make the lower arm slide better.	Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!  xx1400002181

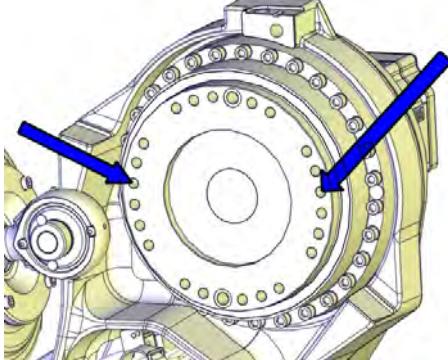
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Action	Note
3 Remove all but one of the remaining attachment screws that secure the lower arm to the axis-2 gearbox.	 xx1400002182
4 Make sure the lifting accessory is holding the weight of the arm system.	
5 Remove the remaining screw and slide the lower arm out on the guide pins and remove the lower arm.	

Refitting the lower arm

Use these procedures to refit the lower arm.

Preparations before refitting the lower arm

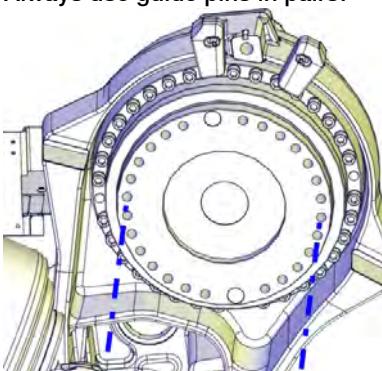
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 <i>Valid for robot variant IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85.</i> Fit two guide pins in opposite holes in the axis-2 gearbox.  Tip Lubricate the guide pins with some grease to make the lower arm slide better.	Guide pin, M16x150: 3HAC13120-2 Always use guide pins in pairs!  xx170000055

Continues on next page

4 Repair

4.5.5 Replacing the lower arm

Continued

Action	Note
<p>3 <i>Valid for variants IRB 6700 - 300/2.70, - 245/3.00.</i> Fit two guide pins in opposite holes in the axis-2 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the lower arm slide better.</p>	<p>Guide pin, M16x150: 3HAC13120-2 Always use guide pins in pairs!</p> 
<p>4  CAUTION The lower arm weighs . 145 kg (IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85) 160 kg (IRB 6700 - 300/2.70, - 245/3.00) All lifting accessories used must be sized accordingly.</p>	
5 Attach the lifting accessory to the lower arm.	
6 Wipe clean all contact surfaces.	

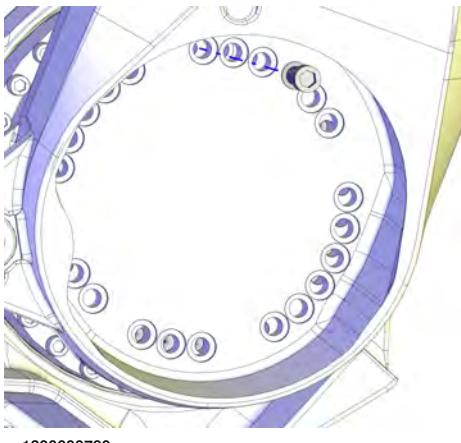
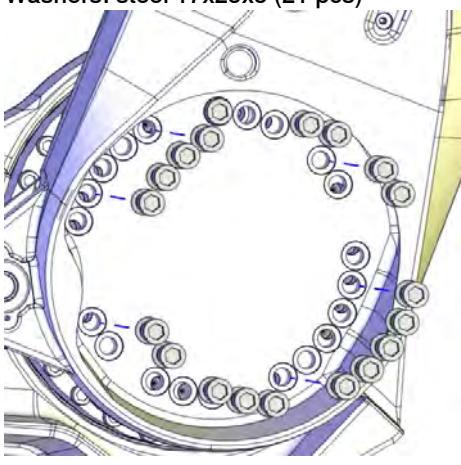
Securing the lower arm to the axis-2 gearbox - *IRB 6700 -235/2.65, -205/2.80, -175/3.05. -150/3.20, -200/2.60, -155/2.85*

Action	Note
<p>1  CAUTION The lower arm weighs . 145 kg (IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85) 160 kg (IRB 6700 - 300/2.70, - 245/3.00) All lifting accessories used must be sized accordingly!</p>	
2 Lift the lower arm onto the guide pins and slide it into position.	

Continues on next page

4.5.5 Replacing the lower arm

Continued

Action	Note
<p>3 In case the hole pattern of the lower arm and gearbox does not match:</p> <ul style="list-style-type: none"> • Remove the motor cover. • Apply the rotation tool on the motor shaft. • Connect the 24 VDC power supply. • Release the brakes. • Rotate pinion and gear with the rotational tool until the holes matches. <p>Connect 24 VDC the power supply to connector R2.MP2:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	 xx1300000819
4 Fit one attachment screw in one of the upper holes using it for security and lower the lifting accessory a little.	 xx1300000790
5 Secure the lower arm with its attachment screws and washers.	Tightening torque M16: 300 Nm Attachment screws: M16x50 quality steel 12.9 Gleitmo (21 pcs) Washers: steel 17x25x3 (21 pcs)  xx1300000789

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4 Repair

4.5.5 Replacing the lower arm

Continued

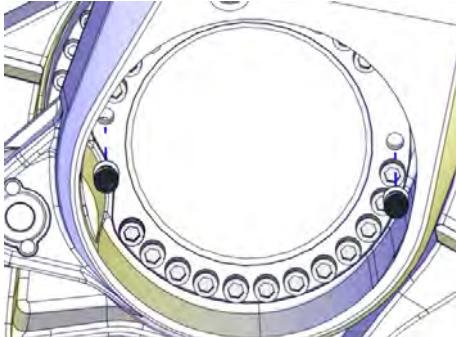
Action	Note
6 Disconnect the 24 VDC power supply (if used).	
7 Remove the guide pins and replace them with the remaining attachment screws.	 xx1300000788
8 Secure the remaining attachment screws.	The tightening torque depends on variant. Tightening torque M16: 300 Nm
9 Remove the lifting accessory from the lower arm.	

Securing the lower arm to the axis-2 gearbox - *IRB 6700 -300/2.70, -245/3.00*

Action	Note
1 Lift the lower arm onto the guide pins and slide it into position.	
2 In case the hole pattern of the lower arm and gearbox does not match: <ul style="list-style-type: none"> • Remove the motor cover. • Apply the rotation tool on the motor shaft. • Connect the 24 VDC power supply. • Release the brakes. • Rotate pinion and gear with the rotational tool until the holes matches. Connect 24 VDC the power supply to connector R2.MP2: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	Rotation tool 24 VDC power supply  xx1300000819
3 Fit one attachment screw in one of the upper holes using it for security and lower the lifting accessory a little.	

Continues on next page

4.5.5 Replacing the lower arm
Continued

	Action	Note
4	Secure the lower arm by fitting and tightening the accessible screws.	Tightening torque M16: 300 Nm Attachment screws: M16x50 quality steel 12.9 Gleitmo (21 pcs) Washers: steel 17x25x3 (21 pcs)  xx1400002190
5	Disconnect the 24 VDC power supply (if used).	
6	Remove the guide pins and replace them with the remaining attachment screws.	 xx1400002181
7	Secure the remaining attachment screws.	Tightening torque M16: 300 Nm
8	Remove the lifting accessory from the lower arm.	

Preparations before refitting the upper arm

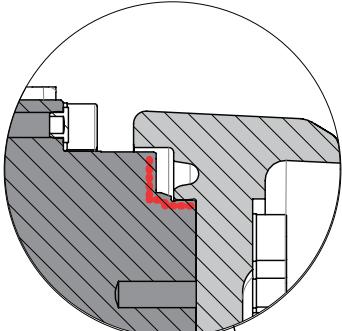
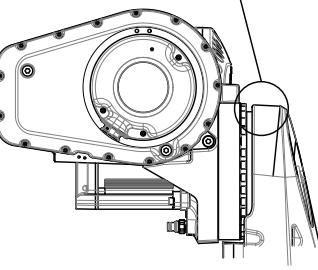
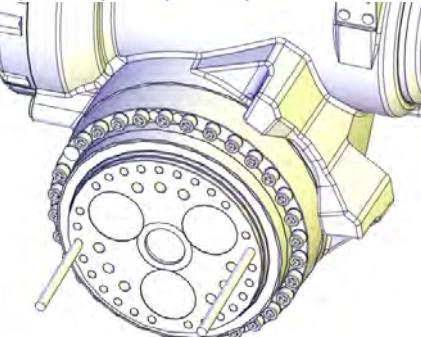
	Action	Note
1	Wipe clean all contact surfaces.	

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4 Repair

4.5.5 Replacing the lower arm

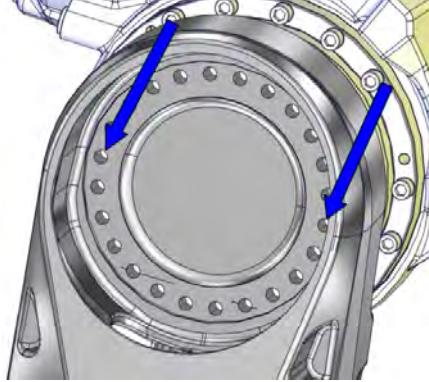
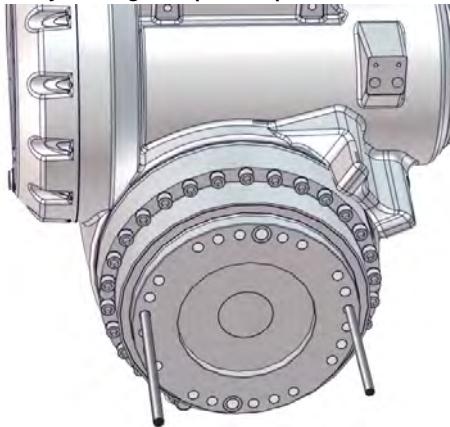
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Action	Note
2 Foundry Plus: Apply Mercasol on the surface shown in the figure.	  xx1400000375
3 IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20. Fit two guide pins in opposite M12 holes in the axis-3 gearbox.  Tip Lubricate the guide pins with some grease to make the upper arm slide better.	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!  xx1700000058

Continues on next page

4.5.5 Replacing the lower arm

Continued

	Action	Note
4	<p><i>IRB 6700 - 200/2.60, - 155/2.85.</i> Fit two guide pins in opposite M12 holes in the axis-3 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!</p>  <p>xx1400000361</p>
5	<p><i>IRB 6700 - 300/2.70, - 245/3.00.</i> Fit two guide pins in opposite M16 holes in the axis-3 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!</p>  <p>xx1700000056</p>

Securing the upper arm - *IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20*

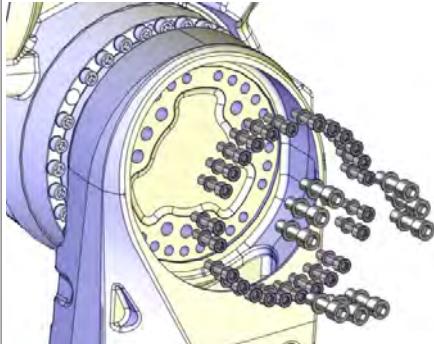
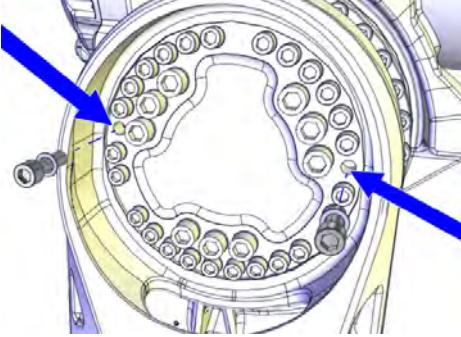
	Action	Note
1	<p> CAUTION</p> <p>The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.</p>	
2	Attach the lifting accessories, if not already fitted.	See Attaching lifting accessories to the upper arm on page 223 .

Continues on next page

4 Repair

4.5.5 Replacing the lower arm

Continued

Action	Note
3 Lift the upper arm and put it on the guide pins.	
4 In order to release the brakes, connect the 24 VDC power supply. Connect to R2.MP3-connector: <ul style="list-style-type: none">• + = pin 2• - = pin 5	24 VDC power supply
5 Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6 Insert all nine M16 screws and 25 of the 27 M12 screws.	 xx1400000359
7 Remove the guide pins and fit the two remaining M12 screws.	 xx1300000659
8 Secure the upper arm by tightening the attachment screws.	Tightening torque depends on screw dimension and variant. M16, tightening torque: 300 Nm M12, tightening torque: 120 Nm

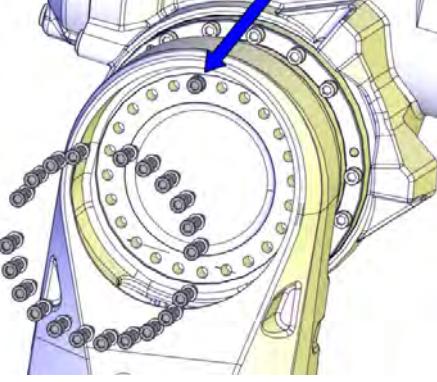
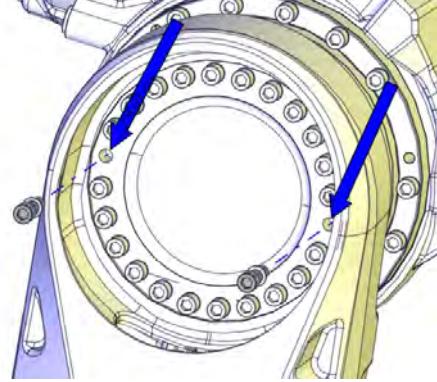
Securing the upper arm - *IRB 6700 -200/2.60, -155/2.85*

Action	Note
1  CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	

Continues on next page

4.5.5 Replacing the lower arm

Continued

	Action	Note
2	Attach the lifting accessories, if not already fitted.	See Attaching lifting accessories to the upper arm on page 223 .
3	Lift the upper arm and put it on the guide pins.	
4	In order to release the brakes, connect the 24 VDC power supply Connect to R2.MP3-connector: • + = pin 2 • - = pin 5	24 VDC power supply
5	Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6	Insert 22 of the 24 M12 screws and washers.	 xx1300002246
7	Remove the guide pins and fit the two remaining screws and washers.	 xx1300002245
8	Secure the upper arm by tightening the attachment screws.	M12, tightening torque: 120 Nm

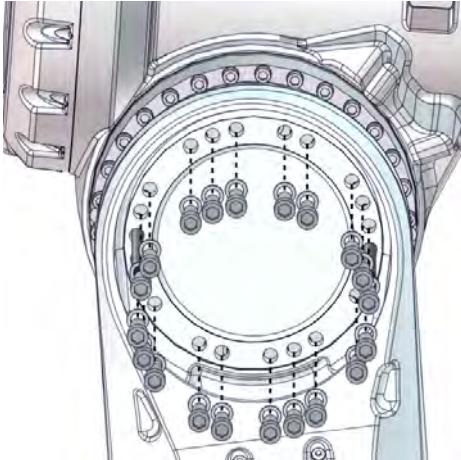
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4 Repair

4.5.5 Replacing the lower arm

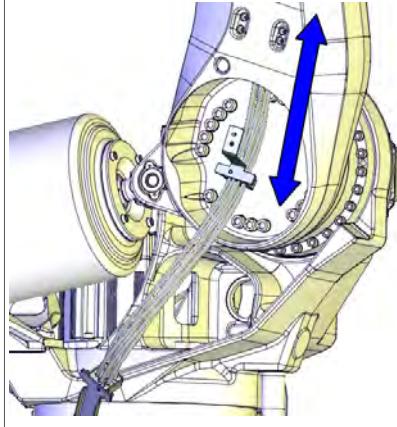
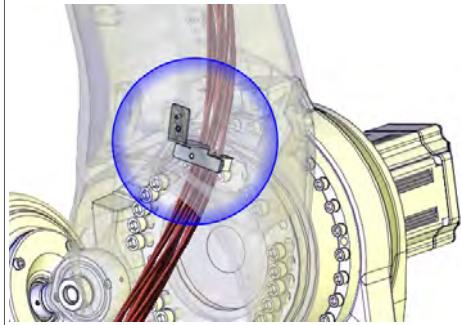
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Securing the upper arm - IRB 6700 -300/2.70, -245/3.00

Action	Note
1  CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2 Attach the lifting accessories, if not already fitted.	See Attaching lifting accessories to the upper arm on page 223 .
3 Lift the upper arm and bring it towards the lower arm.	
4 In order to release the brakes, connect the 24 VDC power supply. Connect to R2.MP3-connector: • + = pin 2 • - = pin 5	24 VDC power supply
5 Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6 Insert and tighten 20 of the 22 M16 screws.	 xx1700000057
7 Remove the guide pins and fit the two remaining screws.	
8 Secure the upper arm by tightening the attachment screws.	M16, tightening torque: 300 Nm

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Refitting the cable harness - lower arm

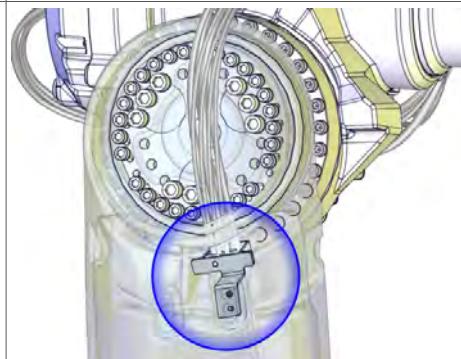
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	Tie the axis-5 and axis-6 motor cables into bundles (if not already done), to avoid damaging them during the continued procedure. This will also make it easier to run the cables through the inside of the robot.	 xx1300000668
3	Run the upper end of the cable harness up through the lower arm.	 xx1300000733
4	Refit the axis-2 lower arm metal clamp located on the inside of the lower arm.  Note The screws are reached from the outside of the lower arm.	 xx1300000734

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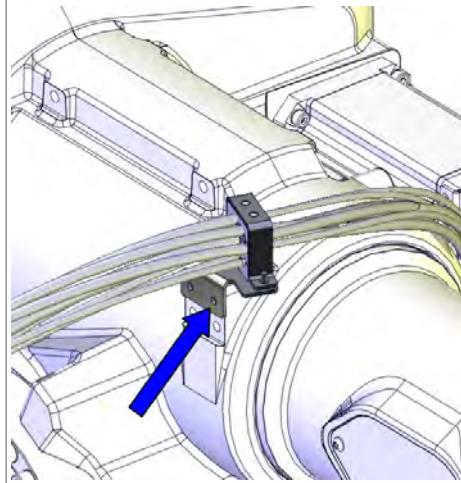
4 Repair

4.5.5 Replacing the lower arm

Continued

Action	Note
5 Before fitting the remaining axis-3 lower arm cable bracket inside the lower arm, check that it will stay twisted a little between the metal clamps, after fitting, as shown in the figure. Do not change the position of the brackets!	 xx1300000595
6 Refit the axis-3 lower arm metal clamp located on the inside of the lower arm.  Note The screws are reached from the outside of the lower arm.	 xx1300000558

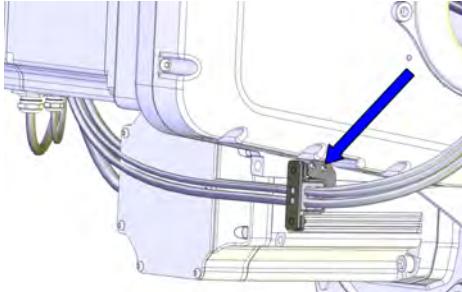
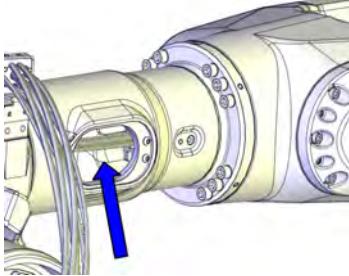
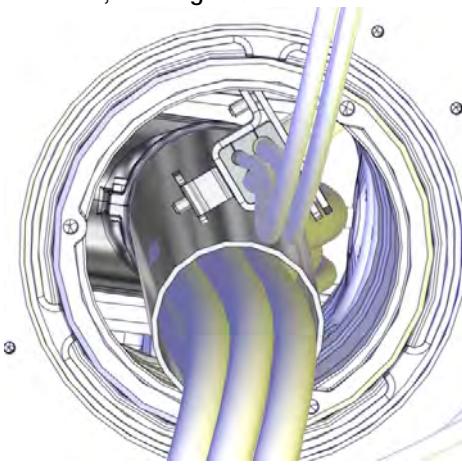
Refitting the cable harness - upper arm

Action	Note
1 Refit the metal clamp on top of the arm house.	 xx1300000541

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4.5.5 Replacing the lower arm

Continued

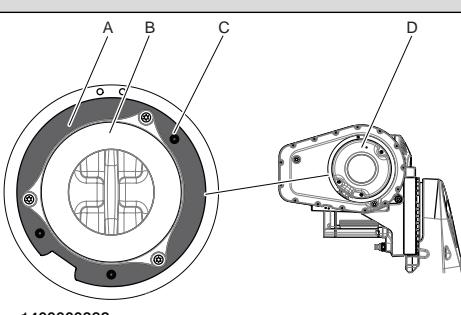
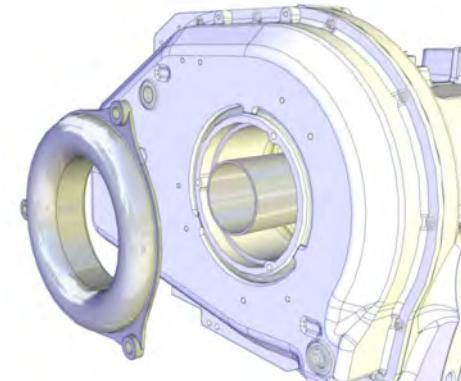
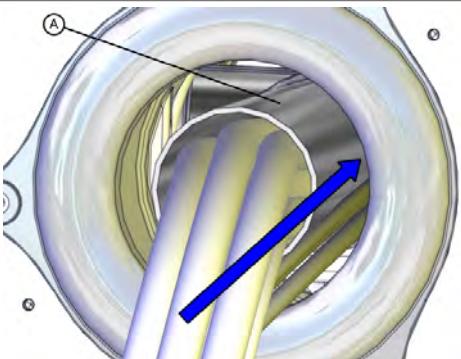
	Action	Note
2	Refit the arm house metal clamp.	 xx1300000543
3	Tie the axis-5 and axis-6 motor cables into bundles (if not already done), to avoid damaging them during the continued procedure. This will also make it easier to run the cables through the inside of the robot.	 xx1300000668
4	<p> Tip</p> <p>The next step is best performed by two persons working together:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole of the arm tube and take a hold of the cable harness. • Person 2: Take a hold on the cable harness at the back of the robot. • Together: Use caution and move the cable harness into the arm tube. <p>If DressPack is fitted it is needed to pull out the DressPack tube a little and then place it on the lower left side in the arm tube and then place the bracket of the cable harness on the upper right hand side, to be able to remove the cable harness. See figure!</p>	<p>Person 1, working at the side hole:</p>  xx1300000745 <p>Person 2, working at the back:</p>  xx1400000356

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4 Repair

4.5.5 Replacing the lower arm

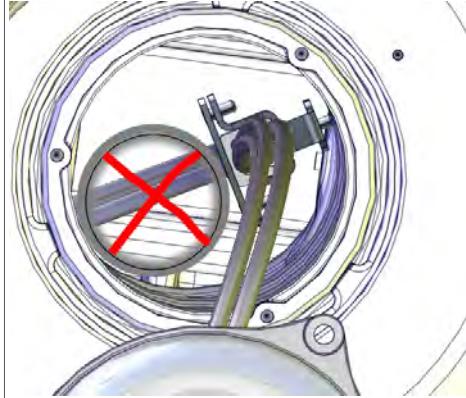
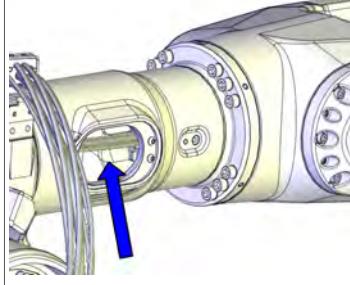
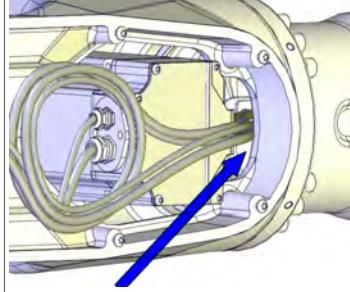
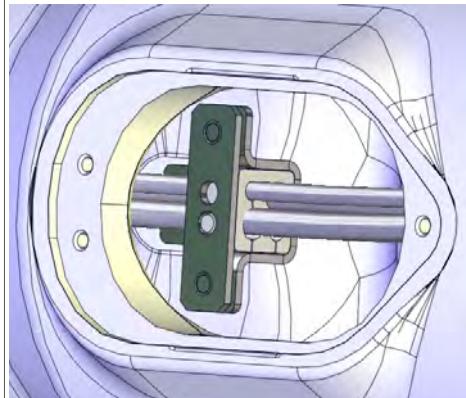
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Action	Note
5 Foundry Plus: Make sure that the gasket between the robot and cover is correctly fitted. Replace if damaged!	 xx1400000382 A Gasket B Cable guide C Washer D Cover
6 Fit the cable guide.	 xx1300000657
7 Run the cabling through the cable guide and then into the arm upper arm tube.	 xx1400000357

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4.5.5 Replacing the lower arm

Continued

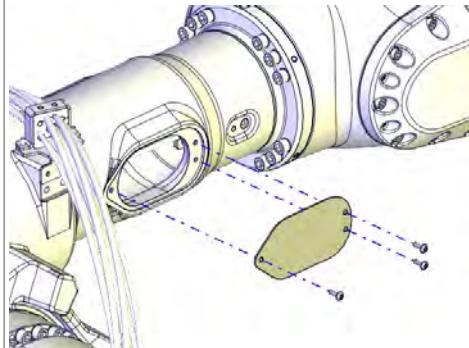
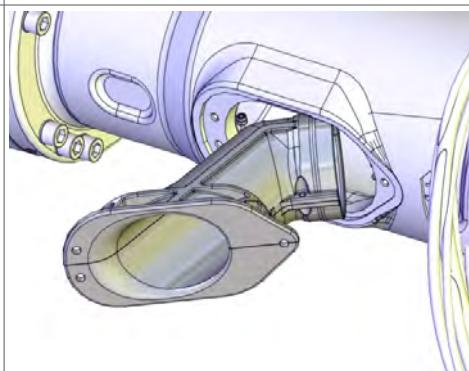
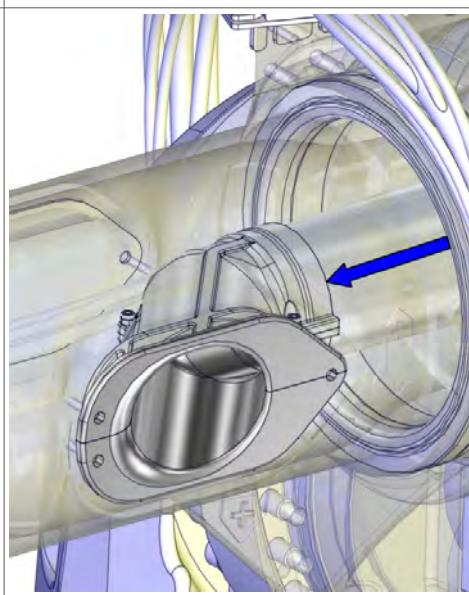
Action	Note
8 Use caution and push the cable harness into the upper arm tube.  Note Do not run the cable harness into the DressPack tube, if one is fitted!	 xx1300000820
9  Tip This step is best performed by two persons working together. Use caution and push the cable harness into the wrist like this: <ul style="list-style-type: none">• Person 1: Put one hand inside the side cover hole and take a hold of the cable harness.• Person 2: Take a hold of the cable harness from inside the wrist.• Together: Use caution and move the cable harness past the axis-5 motor and into the wrist.	Person 1, working at the side hole:  xx1300000745 Person 2, working at the wrist:  xx1300000746
10 Refit the metal clamp axis-4 inside the arm tube.  Note The screws are reached from outside the upper arm!	 xx1300000592

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4 Repair

4.5.5 Replacing the lower arm

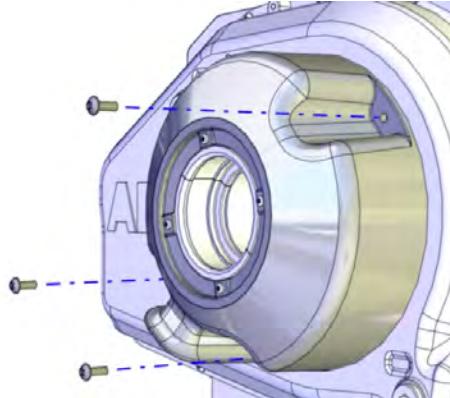
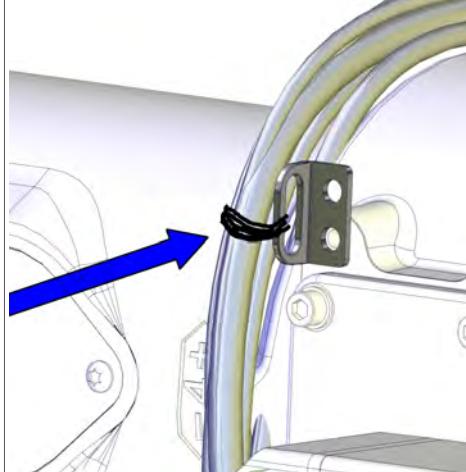
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	Action	Note
11	<p>Refit the side cover.</p> <p>Note</p> <p>Foundry Plus:</p> <ul style="list-style-type: none">• Make sure the gasket is fitted correctly on the side cover• Use attachment screws made of stainless steel to fit the side cover.	 xx1300000557
12	<p>If used, refit the insert that guides the DressPack cable package through the hole in the upper arm.</p>	 xx1400000091
13	<p>If used, refit the tube containing the DressPack into the insert.</p>	 xx1400000092

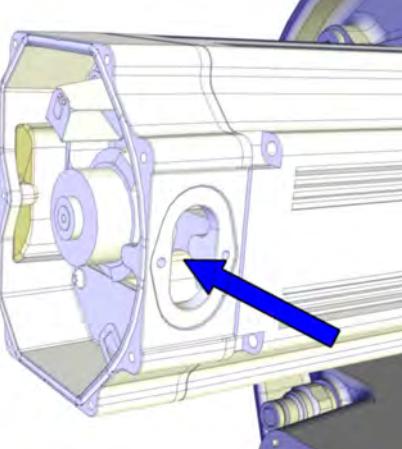
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4.5.5 Replacing the lower arm

Continued

Action	Note
14 If used (<i>DressPack</i> or <i>Foundry Plus</i>), refit the cover with the tube guiding ring fitted.  Note Foundry Plus: <ul style="list-style-type: none"> • Make sure the gasket is fitted correctly • Use attachment screws made of stainless steel to fit the cover. 	 xx1200000045
15 Secure the cable harness to the cable fixing bracket with the velcro strap. If DressPack is fitted, the cable fixing bracket is replaced by the cable guide.	 xx1300000544

Connecting the axis-3 and axis-4 motor cables

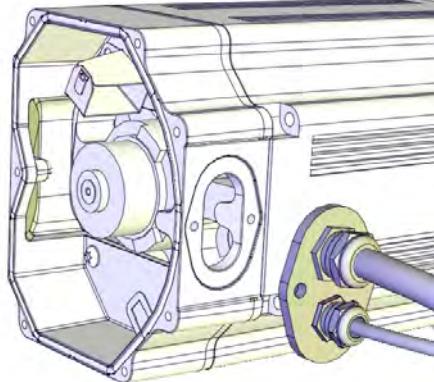
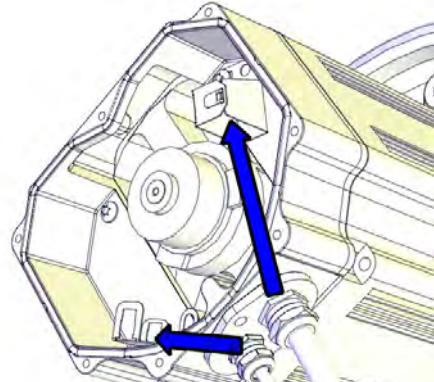
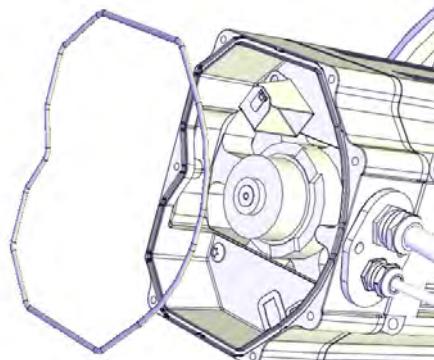
Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738

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4 Repair

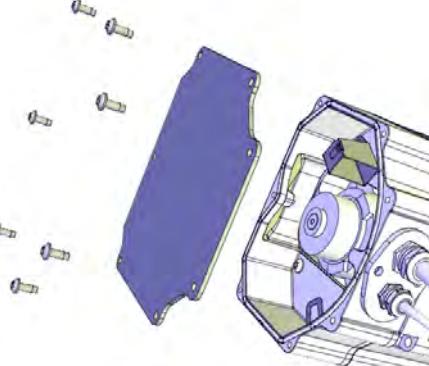
4.5.5 Replacing the lower arm

Continued

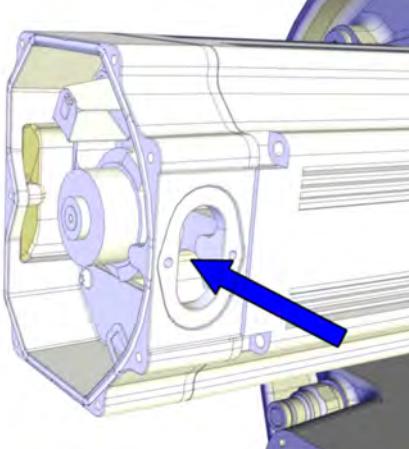
Action	Note
2 Refit the cable gland cover.  Note Replace the gasket if damaged.	 xx1200001067
3 Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066
4 Inspect the o-ring.  Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)  xx1200001070

Continues on next page

4.5.5 Replacing the lower arm Continued

	Action	Note
5	Wipe clean o-ring and o-ring groove.	
6	Refit the o-ring.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7	 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
8	Refit the motor cover with its attachment screws.  Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.  Note Make sure the o-ring is undamaged and properly fitted.	 xx1200001135
9	Make sure that the covers are tightly sealed.	

Connecting the axis-5 motor cables

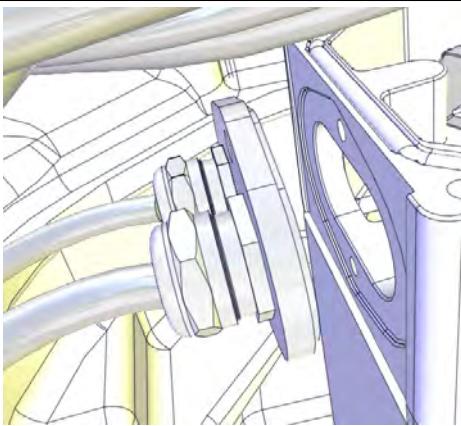
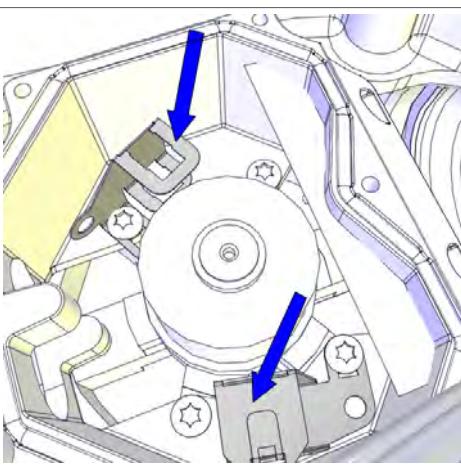
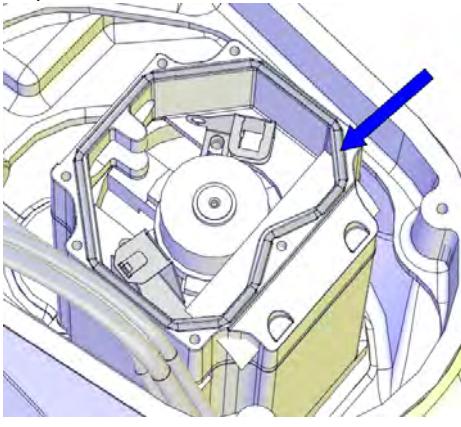
	Action	Note
1	Push the motor cables in through the cable gland opening.	 xx1300000738

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4 Repair

4.5.5 Replacing the lower arm

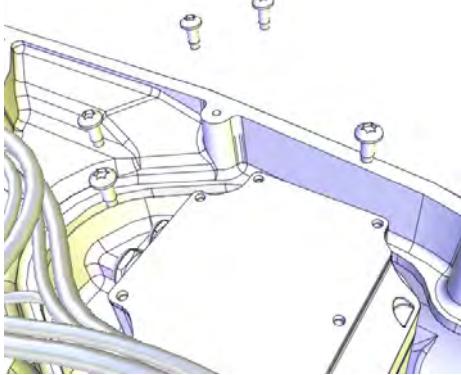
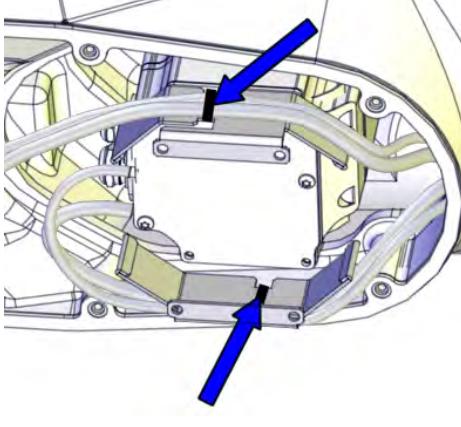
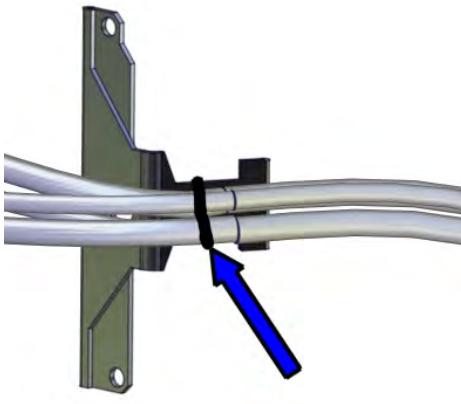
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Action	Note
<p>2 Refit the cable gland cover by performing the following steps:</p> <ul style="list-style-type: none"> • Slide the cable gland cover onto the inner screw. • Refit and tighten the outer screw. • Tighten the inner screw. Make sure that the gasket is not damaged. <p>Note Replace the gasket if damaged.</p>	 xx1200001016
<p>3 Connect the connectors. Connect in accordance with the markings on the connectors.</p>	 xx1200001015
<p>4 Make sure the o-ring on the motor is undamaged. Replace if damaged.</p>	<p>O-ring, axis 5: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile).</p>  xx1200001021
<p>5</p> <p>CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

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4.5.5 Replacing the lower arm

Continued

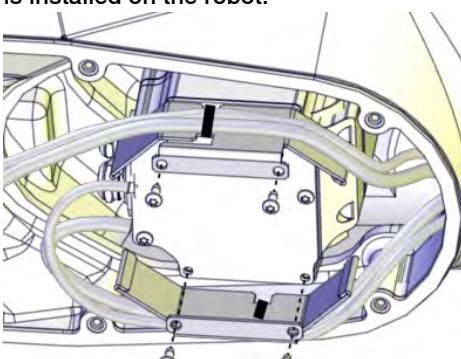
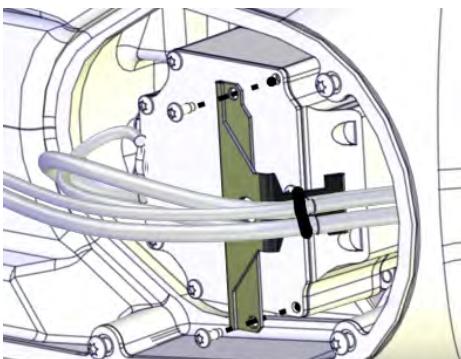
	Action	Note
6	<p>Refit the motor cover with its attachment screws.</p> <p>Note Do not refit the screws that will hold the heat protection plate at this point.</p> <p>Note Do not reuse the self-threading attachment screws, it will damage the threads. Replace with standard attachment screws.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001013
7	<p>Secure the cable harness with cable straps to the heat protection plate.</p> <p>Note If replacing a type A motor with a type B motor, the heat protection plate must be replaced with plates suited for the type B motor. See Type A vs type B motors on page 795.</p>	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  xx1500001029  xx1300000489

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4 Repair

4.5.5 Replacing the lower arm

Continued

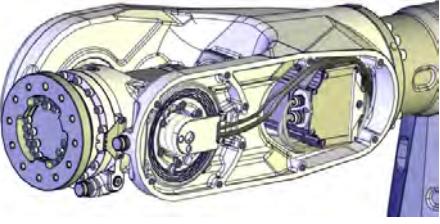
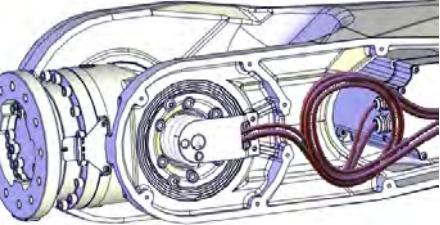
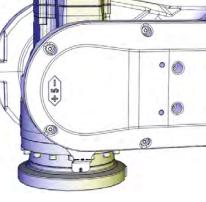
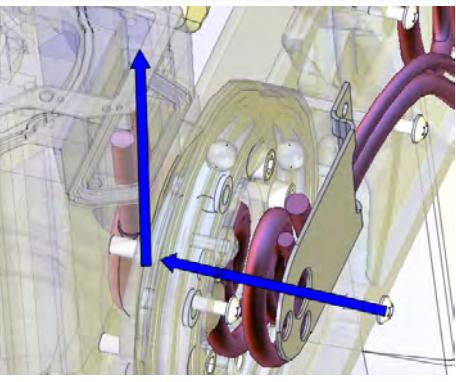
Action	Note
8 Fit the heat protection plate with the screws.	Choose figure depending on which plate is installed on the robot.  xx1500001030  xx1300000490
9 Make sure that the cover is tightly sealed.	

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4.5.5 Replacing the lower arm

Continued

Connecting the axis-6 motor cables

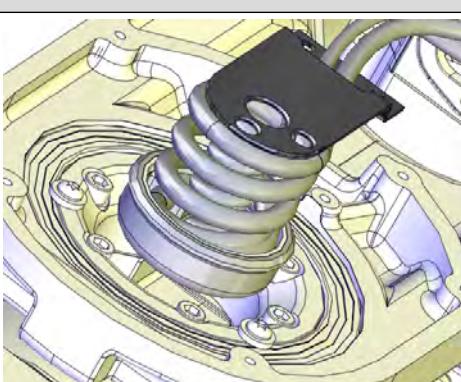
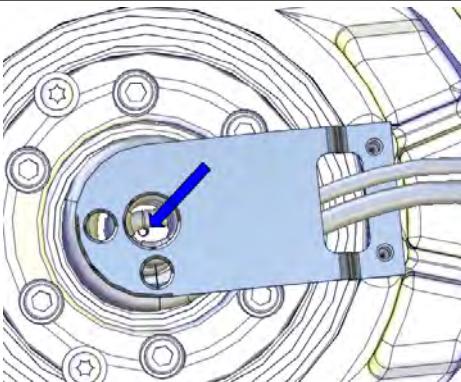
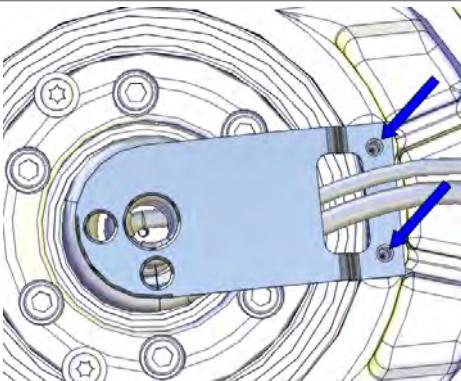
	Action	Note
1	<p>Make sure that the cable harness is placed in a way that it will not be damaged when the cover is fitted.</p>	 xx1600002061  xx1300000596 <p>Cable layout in the wrist with Type A motors.</p>
2	<p> Note</p> <p>Axis 5 must be in position +90° (or as close as possible) for a correct installation of the cable harness in the wrist. If not, connect the 24 VDC power supply, release the brakes and move axis 5 manually to +90°.</p>	 xx1200001081
3	<p>Push the cable harness into the wrist recess and up into the axis-6 motor.</p>	 xx1300000667

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4 Repair

4.5.5 Replacing the lower arm

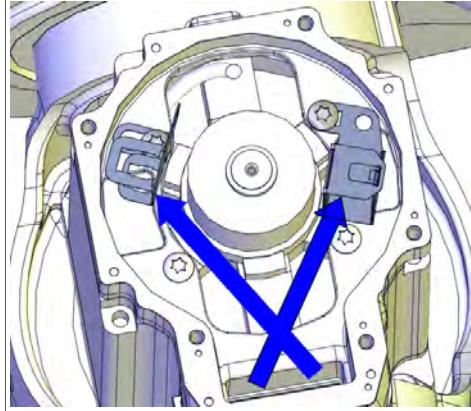
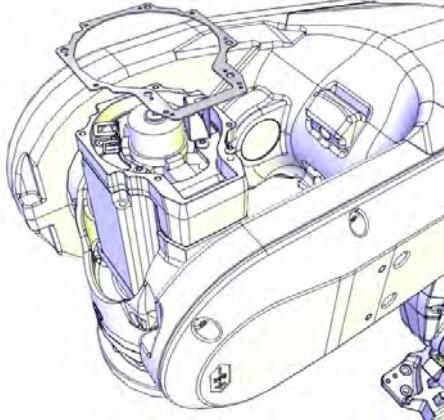
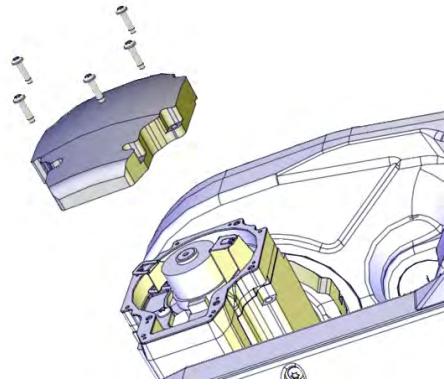
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Action	Note
4 Push the carrier carefully into position.	 xx1300001113
5 Secure the carrier with the M4 screw.  Note The screw is located at the bottom of the carrier.  Tip The attachment screw securing the carrier may be difficult to fit. Make sure the carrier is level and completely pressed against the bottom.	 xx1300000485
6 Secure the cable bracket with its attachment screws.	 xx1300000484

Continues on next page

4.5.5 Replacing the lower arm

Continued

	Action	Note
7	<p>Reconnect the connectors to the axis-6 motor.</p> <p>Note</p> <p>Place the resolver cable under the motor cable.</p>	 xx1300000488
8	<p>Make sure the gasket is undamaged. Replace if damaged.</p>	<p>Gasket, 3HAC033489-001/ 3HAC044252-001</p>  xx1200001095
9	<p>CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	
10	<p>Refit the motor cover.</p>	 xx1200001080

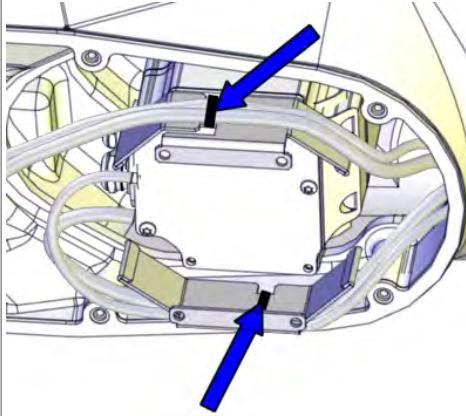
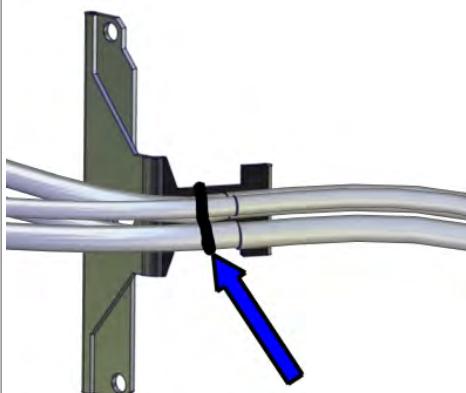
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4 Repair

4.5.5 Replacing the lower arm

Continued

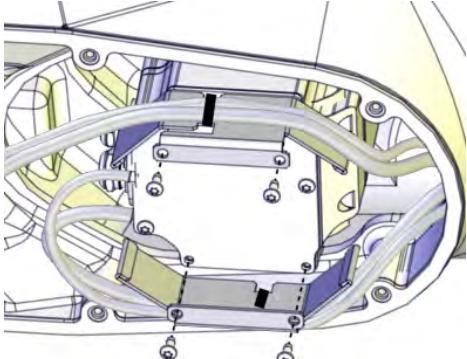
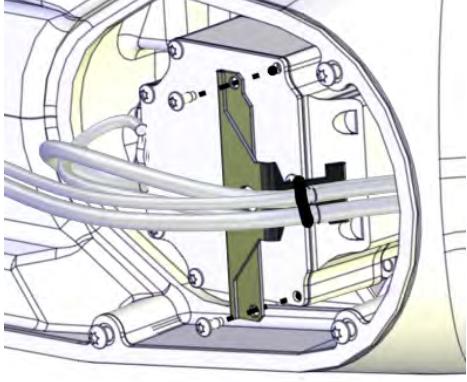
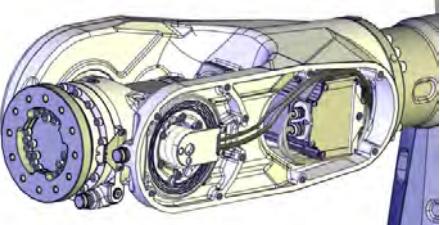
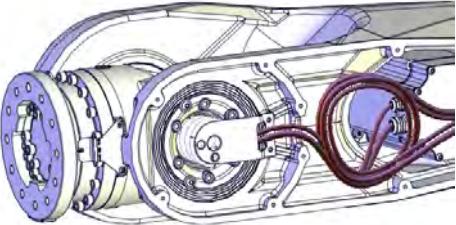
Concluded refitting of the cable harness

Action	Note
1 Secure the cable harness with cable straps to the heat protection plate.	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001029</p>  <p>xx1300000489</p>

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4.5.5 Replacing the lower arm

Continued

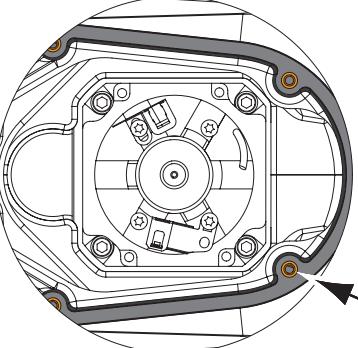
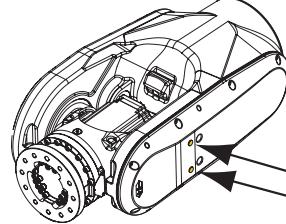
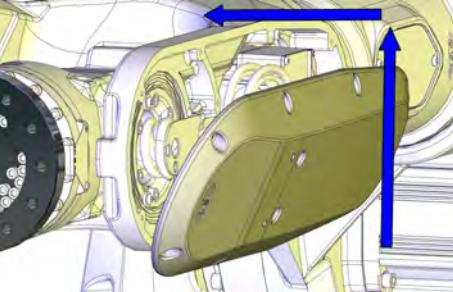
Action	Note
2 Fit the heat protection plate with the screws.	<p>Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001030</p>  <p>xx1300000490</p>
3 Make sure that the cable harness is placed so it will not be damaged when the wrist cover is fitted.	 <p>xx1600002061</p>  <p>xx1300000596</p> <p>Cable layout in the wrist with Type A motors.</p>

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4 Repair

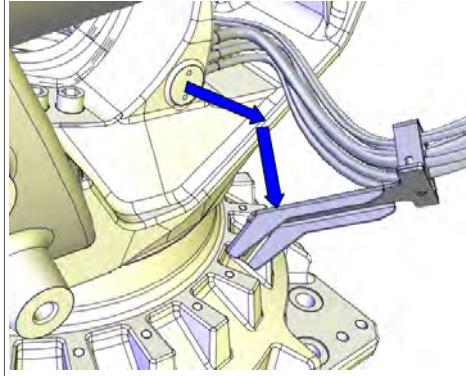
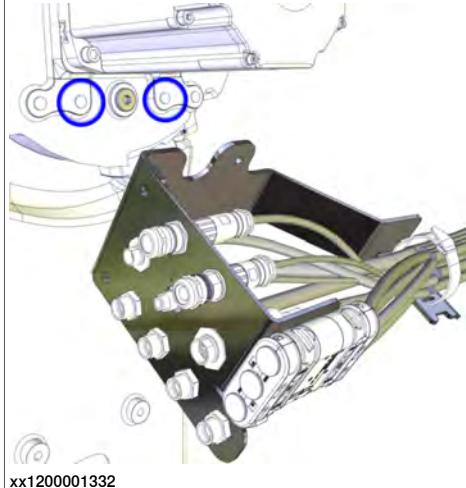
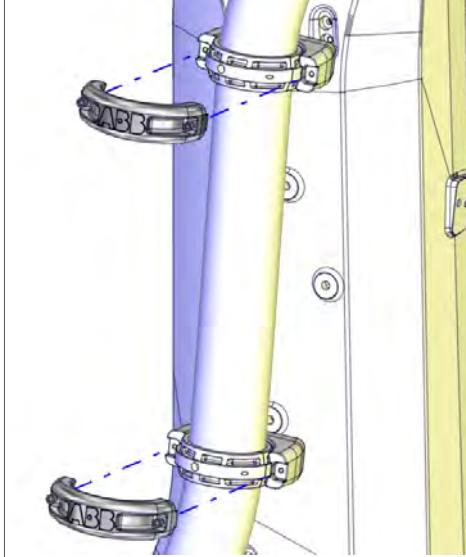
4.5.5 Replacing the lower arm

Continued

Action	Note
4 Foundry Plus: <ul style="list-style-type: none"> Make sure that the gasket is undamaged on the cover. Replace if damaged. Put washers (10 pcs) in the holes of the gasket. Use attachment screws made of stainless steel to fit the wrist cover. 	  xx1400000383 <p>A Protection plugs (2 on wrist cover and 2 on cover axis-5 gearbox) B Washers (10 pcs) in gasket holes</p>
5 Use caution in order not to damage the cable harness when the wrist cover is refitted, by following this method: <ol style="list-style-type: none"> Hold the cover tilted. See figure! Put the cable harness on the cover. Lift the cover, still tilted. Move the upper part of the cover into position. Secure the cover with its attachment screws. 	Tightening torque: 10 Nm.  xx1300000772
6 If the robot is equipped with DressPack cable package: <ul style="list-style-type: none"> Refit the distance to the wrist cover. Refit the ball joint housing to the distance. Refit the bracket with the ball joint housing to the upper arm tube. Refit the process turning disk. 	How to refit the DressPack cable package is described in the product manual "IRB 6700 DressPack". For article number see References on page 10 .

Continues on next page

4.5.5 Replacing the lower arm
Continued

	Action	Note
7	Refit the bracket to the frame.	 xx1200001184
8	Refit the connection plate.	 xx1200001332
9	If used, refit the DressPack in the ball joint housings on the lower arm.	 xx1400000195

Refitting the front shaft of the balancing device

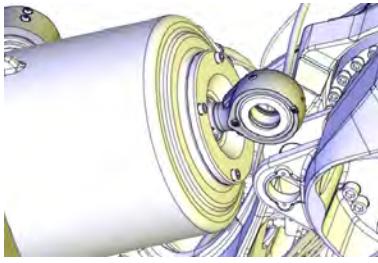
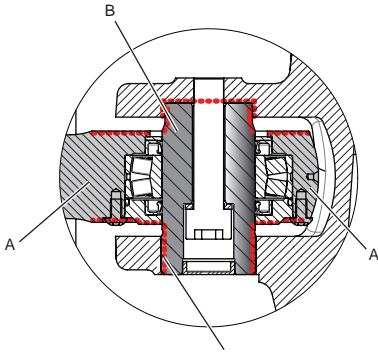
	Action	Note
1	Turn on the power to the robot.	

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4 Repair

4.5.5 Replacing the lower arm

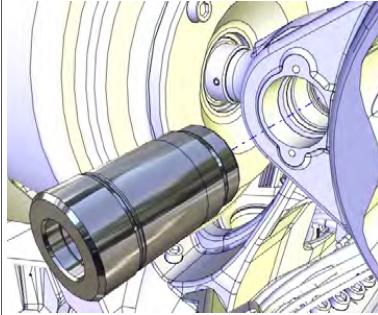
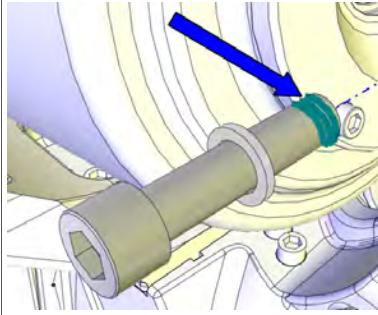
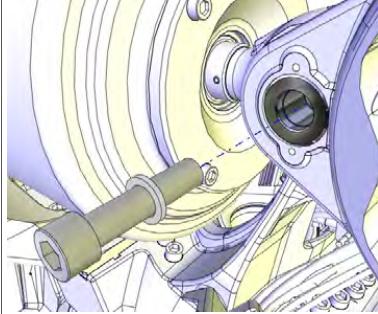
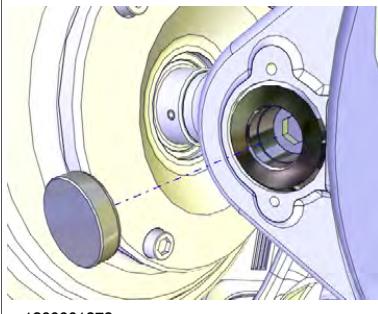
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	Action	Note
2	Use caution and jog the robot to the calibration position (if not already done).	
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	Apply the lifting accessory to the balancing device (if not already done).	Lifting shackle: SA-10-8-NA1 Lifting accessory (chain): 3HAC15556-1
5	Remove all residue of Loctite in the screw hole of the shaft.	
6	Wipe all contact surfaces inside the recess clean from residual grease or other contamination.	
7	Align the balancing device link ear with the hole in the lower arm.  Note Verify that the link ear is correctly turned.	 xx1300000784
8	Foundry Plus: Apply Mercasol on the surfaces on the shaft and front ear.	 xx1400000368 A Front link ear B Shaft C Mercasol (red dotted lines)

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4.5.5 Replacing the lower arm

Continued

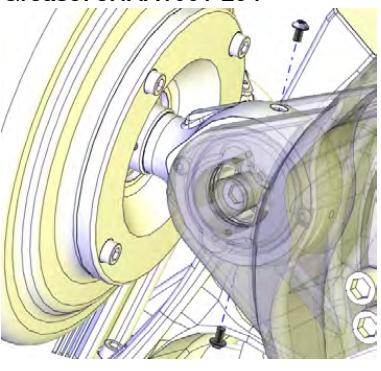
	Action	Note
9	Lubricate the shaft and place it to the front ear.	 Note Foundry Plus: Do not lubricate surfaces where Mercasol is applied!  xx1200001280
10	Press the shaft in with the hydraulic press tool.	Hydraulic pump 80 MPa: 3HAC13086-1 Hydraulic cylinder: 3HAC11731-1 Dismantle and mounting tool: 3HAC028920-001
11	Apply locking liquid (Loctite 2701) on the threads of the screw, first entering the threads in the frame.	 xx1300000782
12	Secure the shaft with screw and washer.	Tightening torque: 180 Nm  xx1200001279
13	Fit the VK-cover.	 xx1200001278

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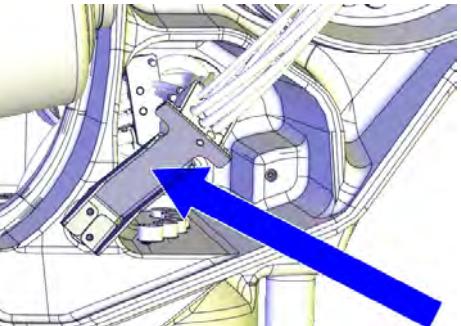
4 Repair

4.5.5 Replacing the lower arm

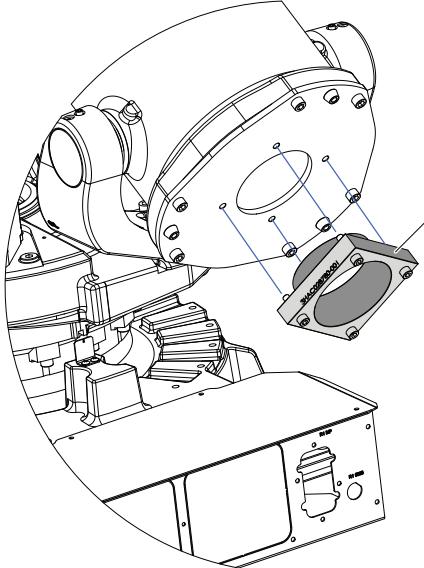
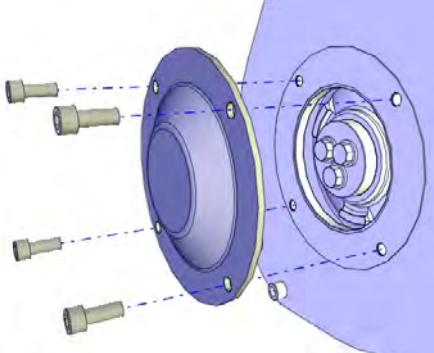
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Action	Note
14 Unscrew both screws in link ear and fill the bearing with grease from the upper hole until the grease appears in the lower hole.	Grease: 3HAA1001-294  xx1300000783
15 Refit the two screws and wipe clean from residual grease.	

Concluded refitting of the front shaft

Action	Note
1 Remove the lifting accessory from the balancing device.	
2 Refit the cable bracket (if not already refitted).	 xx1200001283
3  DANGER Do not use the Distance tool: 3HAC030662-001 to unload or restore the pressure of the balancing device spring unit! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position! To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the hydraulic press tool Dismantle and mounting tool 3HAC028920-001.	
4 Jog axis-2 to: • -20° or +20°.	This is done in order to compress the spring unit inside the balancing device before refitting or removal of the distance tool.

Continues on next page

	Action	Note
5	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
6	Remove the distance tool.	 xx0800000480 A Distance tool: 3HAC030662-001
7	Refit the cover plate.	 xx1300000554

Concluding procedure

	Action	Note
1	Remove the lifting accessory.	

Continues on next page

4 Repair

4.5.5 Replacing the lower arm

Continued

Action	Note
2 Re-calibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
3  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

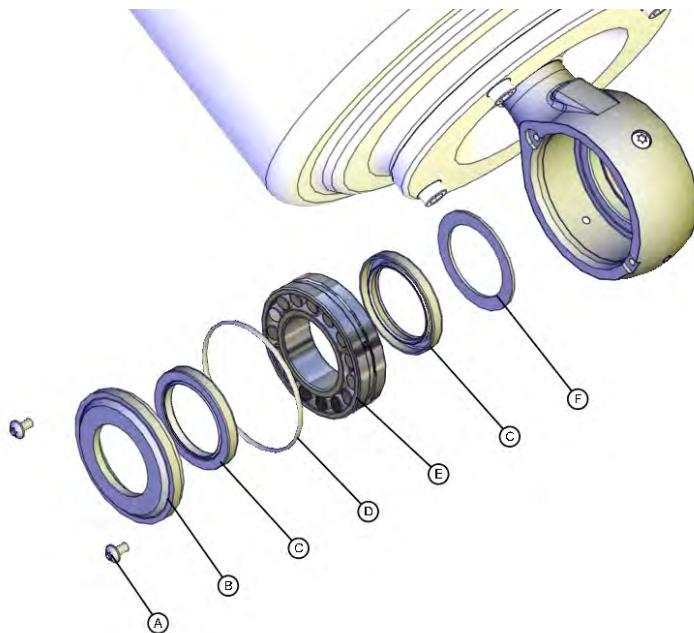
4.6.1 Replacing spherical roller bearing, link ear

4.6 Frame and base

4.6.1 Replacing spherical roller bearing, link ear

Location of spherical roller bearing

The spherical roller bearing is located in the link ear of the balancing device.



xx1300000773

A	Attachment screws M6x10 quality 8.8-A2F (2 pcs)
B	End cover
C	Radial sealing with dust lip, 50x68x8 (2 pcs)
D	O-ring 85
E	Spherical roller bearing
F	Washer

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Unload the balancing device.
- 2 Replace the spherical roller bearing.
- 3 Restore the balancing device.

Continues on next page

4 Repair

4.6.1 Replacing spherical roller bearing, link ear

Continued

Spare part

Equipment	Article number	Note
Spherical roller bearing kit	3HAC045815-001	The maintenance kit contains: <ul style="list-style-type: none">• End cover• Radial sealing with dust lip, 50x68x8 (2 pcs)• O-ring 85• Spherical roller bearing• Washer

Required tools and equipment

Equipment, etc.	Article number	Note
Distance tool	3HAC030662-001	Only used to keep the balancing device in a locked position, after the balancing device springs has been unloaded with the help of the robot itself.  DANGER Never use this tool to unload or restore a balancing device!
Hydraulic press tool, balancing device	3HAC020902-001	Used to unload or restore a balancing device.
Press tool	3HAC028920-003	
Press tool J	3HAC034037-001	
Hydraulic cylinder	3HAC11731-1	To be used with the press tool.
Hydraulic pump 80 MPa	3HAC13086-1	To be used with the hydraulic cylinder.
Lock screw, M16x120	-	Used to secure lower arm.
Lifting shackle	-	SA-10-8-NA1
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Dismantle and mounting tool	3HAC028920-001	Used for removing and fitting shaft and bearings.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

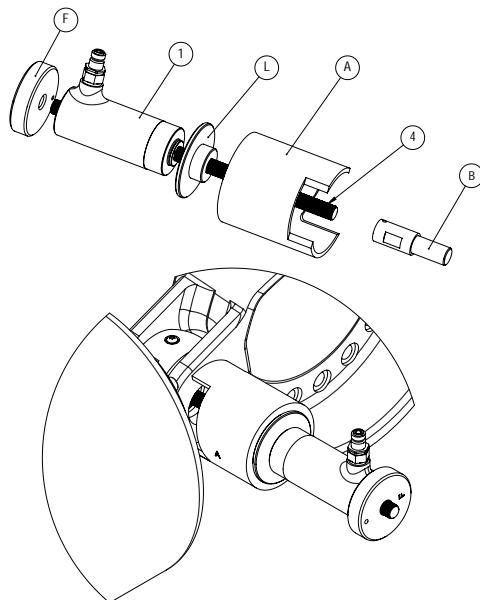
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4.6.1 Replacing spherical roller bearing, link ear

Continued

Dismantle and mounting tool

The following parts of the tool are needed for this replacement.



xx1700000378

The numbers in the figure refers to the marked tool pieces respectively.

Consumables

Equipment	Article number	Note
VK cover	3HAA2166-12	
Grease	3HAA1001-294	Tribol GR 100-0 PD, 50 ml Used for lubrication of the spherical roller bearing.
Locking liquid	3HAB7116-1	Loctite 243

Removing the spherical roller bearing

Use these procedures to remove the spherical roller bearing in the link ear.

Unloading or locking the balancing device springs

Compression of the balancing device springs to an unloaded position, can be done in two different methods using two different tools - Distance tool or Hydraulic press tool, balancing device. The situations when to use which tool are very different.

The method described in this procedure, describes how to use the Distance tool (3HAC030662-001). The Distance tool can not be used to unload or restore the pressure of the balancing device spring unit! The Distance tool is only used to keep the balancing device springs in a locked position, after they have been

Continues on next page

4 Repair

4.6.1 Replacing spherical roller bearing, link ear

Continued

unloaded with the help of the robot itself (as described in this procedure) and with the balancing device still being fitted on the robot.



Note

To unload or restore a balancing device which cannot be done with the help of the robot itself, the Hydraulic press tool, balancing device (3HAC020902-001) must be used. See [Unloading the balancing device on page 481](#)

Illustration	Article number Article number	Note
 xx1400000726	3HAC030662-001 Distance tool	<p>Only used to keep the balancing device in a locked position, after the balancing device springs has been unloaded with the help of the robot itself.</p> <p> DANGER</p> <p>Never use this tool to unload or restore a balancing device!</p>
 xx1300000672	3HAC020902-001 Hydraulic press tool, balancing device	<p>This tool is used to unload or restore a balancing device which cannot be done with the help of the robot itself. This press tool shall also be used if the tool shall be fitted on or be removed from a balancing device, not fitted on the robot.</p> <p>Use this tool:</p> <ul style="list-style-type: none">• if the balancing device shall be unloaded or restored after it has been removed from the robot• on a balancing device not fitted on the robot, such as a spare part.



DANGER

Never remove or fit the Distance tool on a balancing device which can not be unloaded by the robot. There is a severe risk of personal injury.

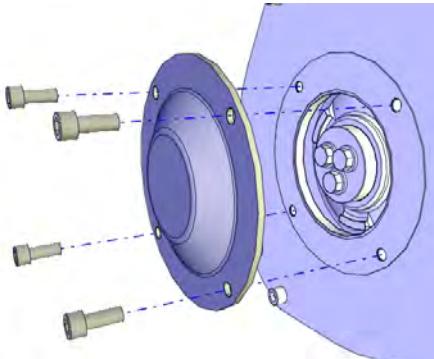
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4.6.1 Replacing spherical roller bearing, link ear

Continued

Locking the balancing device springs with the Distance tool

Use this procedure to unload the balancing device springs with the help of the robot, and to lock the springs in a compressed position, using the Distance tool (3HAC030662-001).

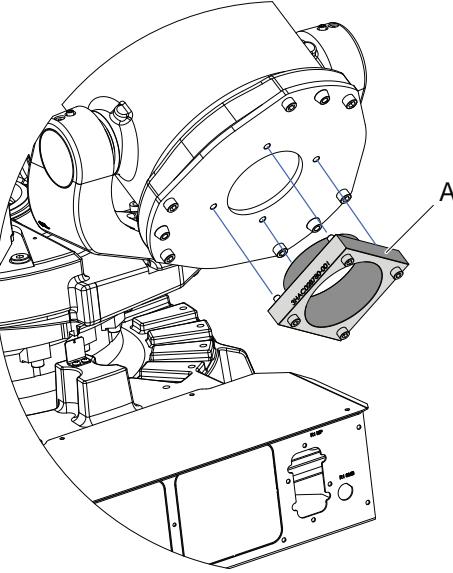
Action	Note
1  DANGER <p>Do not use the Distance tool (3HAC030662-001) to unload or restore the pressure of the balancing device springs! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position!</p> <p>To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the Hydraulic press tool, balancing device (3HAC020902-001).</p>	
2 Jog axis-2 to: <ul style="list-style-type: none"> • -20° or +20° 	This is done in order to compress the balancing device springs inside the balancing device before fitting the Distance tool.
3  DANGER <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
4 Remove the cover plate on the back of the balancing device.  DANGER <p>DO NOT remove any other screws than the rear cover attachment screws! See figure!</p>	 xx1300000554

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4 Repair

4.6.1 Replacing spherical roller bearing, link ear

Continued

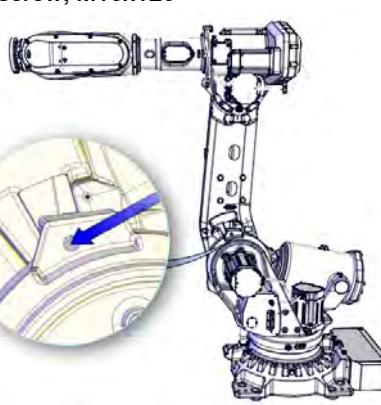
Action	Note
5 Fit the Distance tool on the back of the balancing device using the four screws.	Tightening torque: 45 Nm Attachment screws: M10 quality 12.9 (4 pcs)
 DANGER Use caution when tightening the screws. The threads in the cover can be damaged if more tightening torque than 45 Nm is used, risking that the Distance tool is not properly fitted.	 xx0800000480 A Distance tool: 3HAC030662-001
6 Jog axis-2 to the calibration position. The balancing device is now unloaded.	This is done to compress the balancing device springs, making it possible to remove the front shaft of the balancing device.
7 Let the Distance tool stay fitted during the continued procedure.	
 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

Preparations before removing the spherical roller bearing

Action	Note
1 Jog axis-2 to the calibration position (if not already in this position).	

Continues on next page

4.6.1 Replacing spherical roller bearing, link ear
Continued

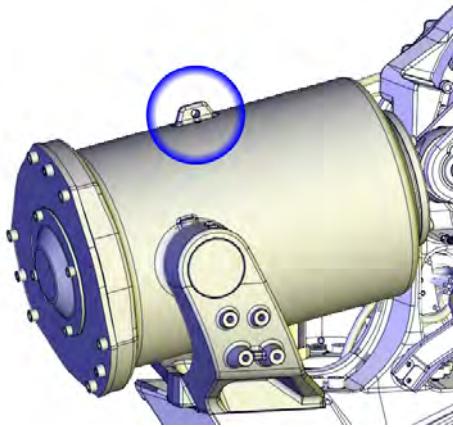
Action	Note
2 Fit a lock screw through the hole for the lock screw in the frame and into the lower arm (or using a lifting accessory or similar). The lock screw is used to secure the weight of the lower arm, in order to avoid accidents or damage.	Lock screw, M16x120  xx1200001116
3  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
4 Remove any equipment, if fitted, on or close to the balancing device.	
5  CAUTION The weight of the balancing device (excluding cradle) is 140 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 185 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	

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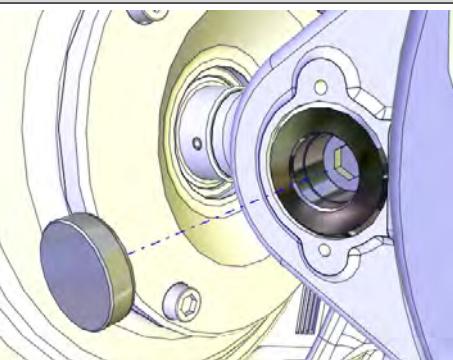
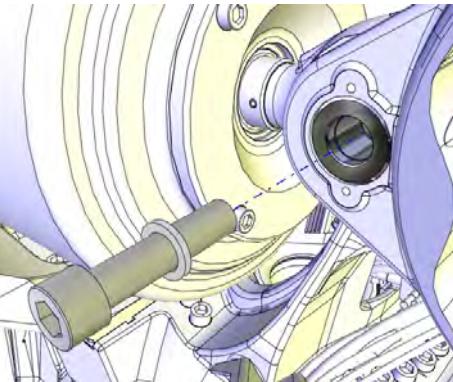
4 Repair

4.6.1 Replacing spherical roller bearing, link ear

Continued

Action	Note
6 Fit a lifting shackle to the balancing device.	Lifting shackle: SA-10-8-NA1  xx1300000661
7 Fit the lifting accessory to the shackle and raise to unload the weight.	Lifting accessory (chain): 3HAC15556-1

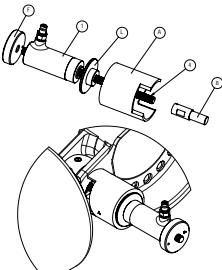
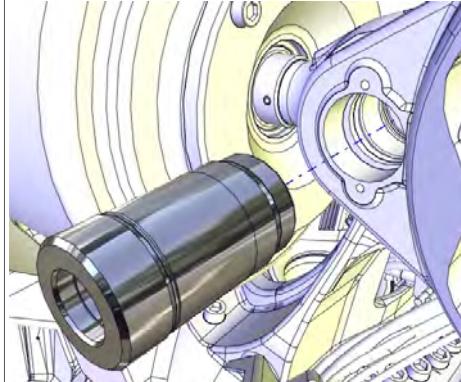
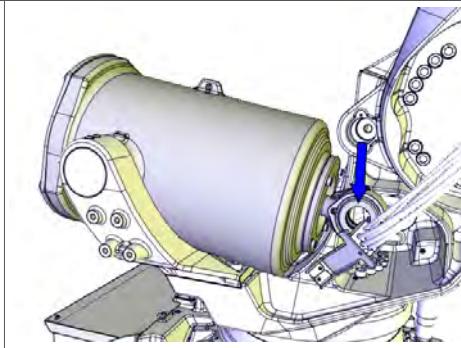
Removing the shaft in the front (link ear)

Action	Note
1 Remove the small VK cover.  Note It is almost impossible to remove the VK cover without damage. New VK covers are needed.	 xx1200001278
2 Unscrew the attachment screw and washer.	 xx1200001279 <ul style="list-style-type: none">• M16x70 quality steel 8.8-A3F

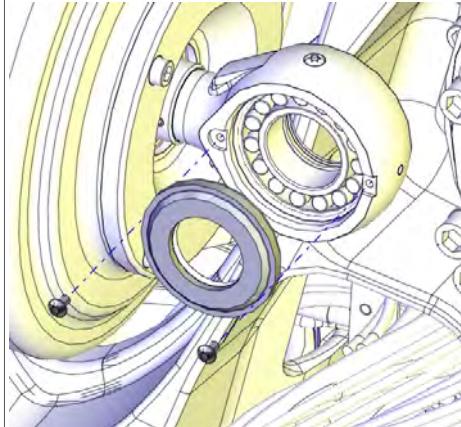
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4.6.1 Replacing spherical roller bearing, link ear

Continued

Action	Note
<p>3 Use the dismantle and mounting tool and pull the shaft out.</p>  xx1700000378 <p>The numbers in the figure refers to the marked tool pieces respectively.</p>	Dismantle and mounting tool: 3HAC028920-001  xx1200001280
<p>4 Put down the balancing device and let it rest on the frame.</p>	 xx1200001281

Removing the spherical roller bearing, link ear

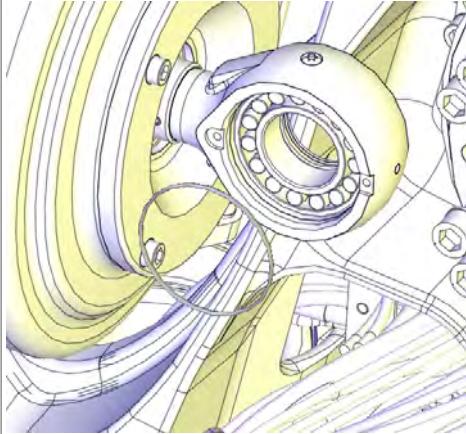
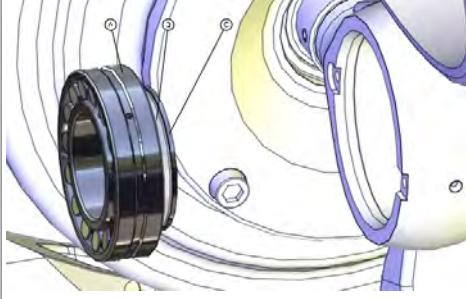
Action	Note
<p>1 Check that the link ear is in a position where it is possible to apply the dismantle and mounting tool. If not, adjust with the lifting accessory.</p>	
<p>2 Unscrew the attachment screws securing the end cover, remove end cover and radial sealing with a screwdriver.</p>	 xx1300000774

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4 Repair

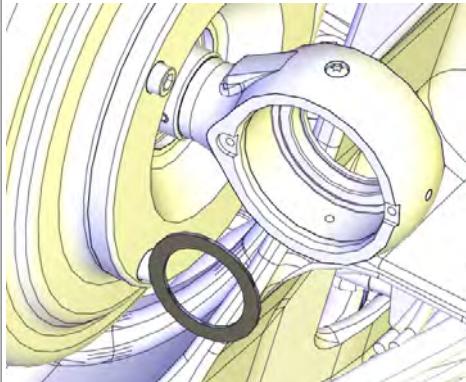
4.6.1 Replacing spherical roller bearing, link ear

Continued

Action	Note
3 Remove the o-ring.	 xx1300000775
4 Apply the dismantle and mounting tool and pull out the spherical roller bearing together with the radial sealing and washer. Tool figure missing xx1700000412	Dismantle and mounting tool: 3HAC028920-001  xx1300000840 A Spherical roller bearing B Radial sealing C Washer

Refitting the spherical roller bearing

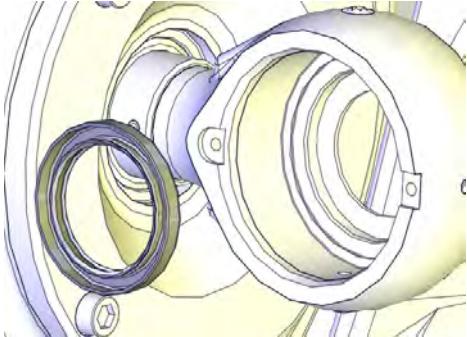
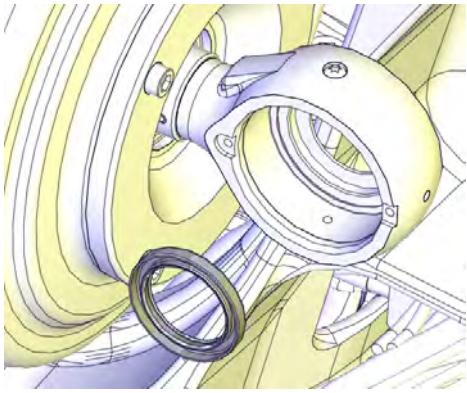
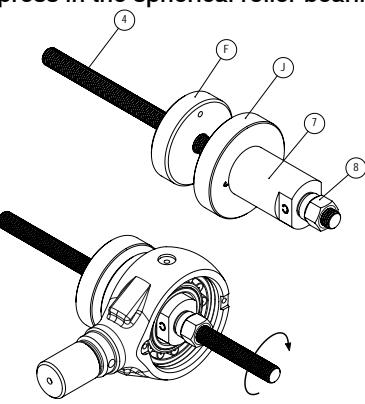
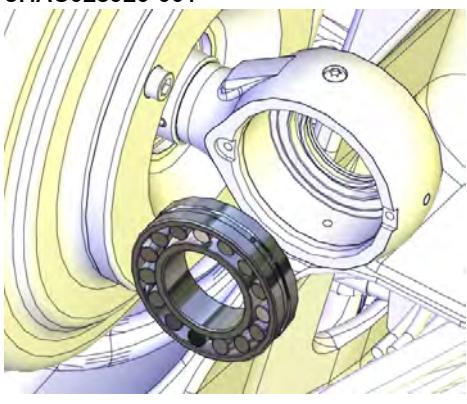
Refitting the spherical roller bearing, link ear

Action	Note
1 Wipe clean all contact surfaces from residual grease.	
2 Refit the washer.	 xx1300000778

Continues on next page

4.6.1 Replacing spherical roller bearing, link ear

Continued

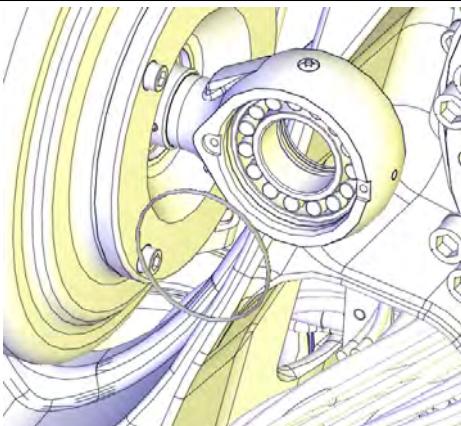
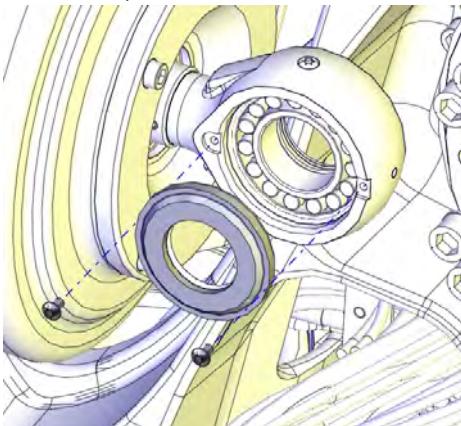
Action	Note
3 Put the radial sealing on the Press tool J.  Note Make sure that the sealing is turned the according to figure.	Press tool J included in tool set Dismantle and mounting tool  xx1300000839
4 Use a plastic mallet or similar on the Press tool J and refit the radial sealing.	 xx1300000777
5 Apply some grease on the surface for the bearing.	
6 Apply the dismantle and mounting tool and press in the spherical roller bearing.  xx1700000379	Dismantle and mounting tool: 3HAC028920-001  xx1300000776

Continues on next page

4 Repair

4.6.1 Replacing spherical roller bearing, link ear

Continued

Action	Note
7 Refit the o-ring.	 xx1300000775
8 Apply Locking liquid on the screws and secure the end cover with the radial sealing ring.	Loctite 243, 3HAB7116-1  xx1300000774

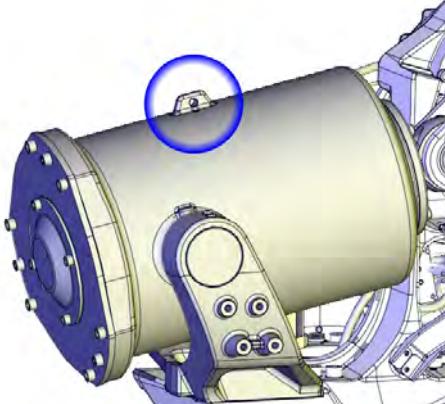
Attaching lifting accessory to the balancing device

Action	Note
1  CAUTION The weight of the balancing device (excluding cradle) is 140 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 185 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	

Continues on next page

4.6.1 Replacing spherical roller bearing, link ear

Continued

Action	Note
2 Fit a lifting shackle to the balancing device.	Lifting shackle: SA-10-8-NA1  xx1300000661
3 Fit the lifting accessory to the shackle and raise to unload the weight.	Lifting accessory (chain): 3HAC15556-1

Unloading a new spare part, balancing device

Action	Note
1  DANGER Do not use the Distance tool: 3HAC030662-001 to unload or restore the pressure of the balancing device spring unit! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position! To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the Hydraulic press tool, balancing device (3HAC020902-001).	
2 Before a new spare part balancing device is fitted, the springs must be unloaded using the Hydraulic press tool, balancing device 3HAC020902-001.	How to unload a new balancing device (a spare part, not yet fitted to the robot) is described in Unloading the balancing device on page 481 .

Refitting the front shaft of the balancing device

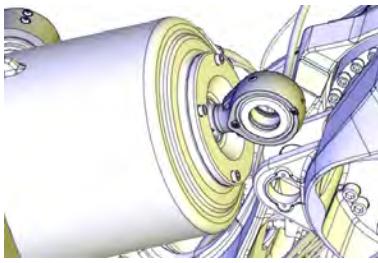
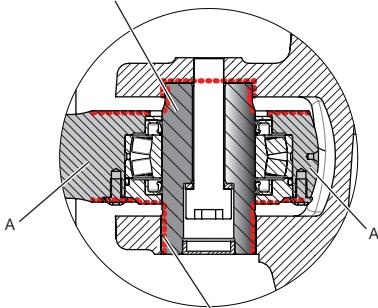
Action	Note
1 Turn on the power to the robot.	
2 Use caution and jog the robot to the calibration position (if not already done).	

Continues on next page

4 Repair

4.6.1 Replacing spherical roller bearing, link ear

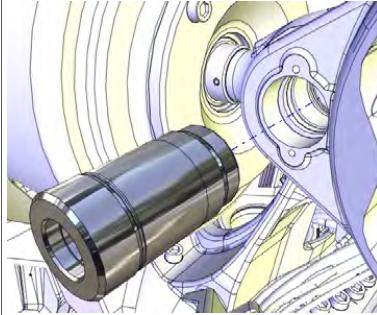
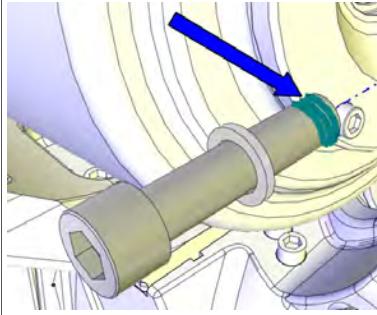
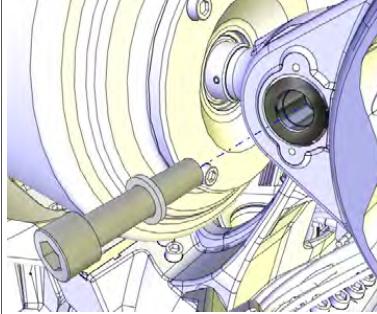
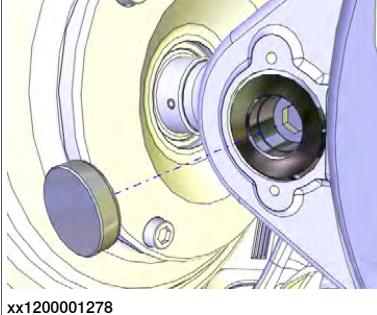
Continued

	Action	Note
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	Apply the lifting accessory to the balancing device (if not already done).	Lifting shackle: SA-10-8-NA1 Lifting accessory (chain): 3HAC15556-1
5	Remove all residue of Loctite in the screw hole of the shaft.	
6	Wipe all contact surfaces inside the recess clean from residual grease or other contamination.	
7	Align the balancing device link ear with the hole in the lower arm.  Note Verify that the link ear is correctly turned.	 xx1300000784
8	Foundry Plus: Apply Mercasol on the surfaces on the shaft and front ear.	 xx1400000368 A Front link ear B Shaft C Mercasol (red dotted lines)

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4.6.1 Replacing spherical roller bearing, link ear

Continued

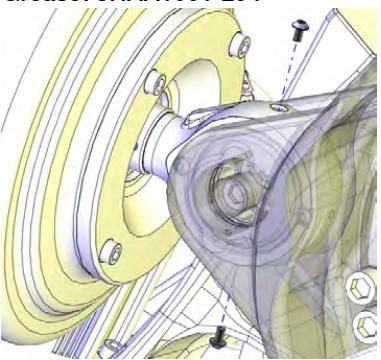
	Action	Note
9	Lubricate the shaft and place it to the front ear.	 Note Foundry Plus: Do not lubricate surfaces where Mercasol is applied!  xx1200001280
10	Press the shaft in with the hydraulic press tool.	Hydraulic pump 80 MPa: 3HAC13086-1 Hydraulic cylinder: 3HAC11731-1 Dismantle and mounting tool: 3HAC028920-001
11	Apply locking liquid (Loctite 2701) on the threads of the screw, first entering the threads in the frame.	 xx1300000782
12	Secure the shaft with screw and washer.	Tightening torque: 180 Nm  xx1200001279
13	Fit the VK-cover.	 xx1200001278

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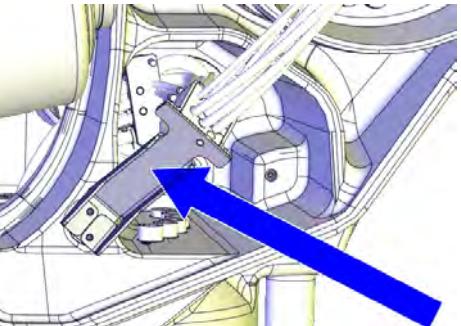
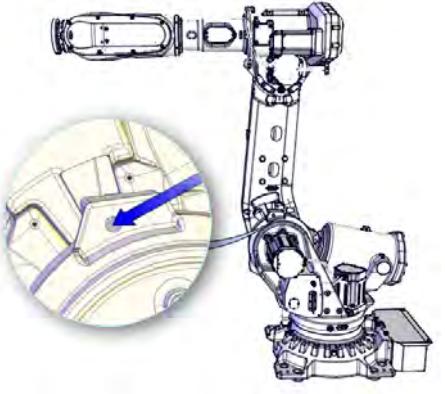
4 Repair

4.6.1 Replacing spherical roller bearing, link ear

Continued

Action	Note
14 Unscrew both screws in link ear and fill the bearing with grease from the upper hole until the grease appears in the lower hole.	Grease: 3HAA1001-294  xx1300000783
15 Refit the two screws and wipe clean from residual grease.	

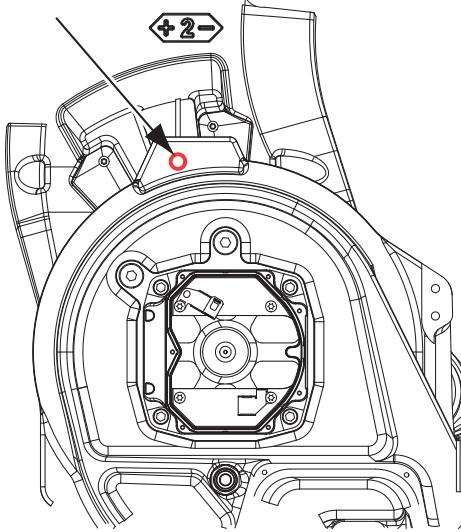
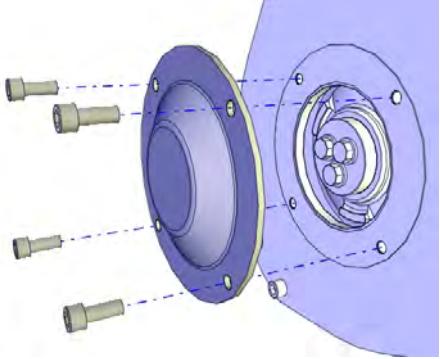
Concluded refitting of the front shaft

Action	Note
1 Remove the lifting accessory from the balancing device.	
2 Refit the cable bracket (if not already refitted).	 xx1200001283
3 Remove the locking screw (M16x120).	 xx1200001116

Continues on next page

4.6.1 Replacing spherical roller bearing, link ear

Continued

Action	Note
4 Foundry Plus: Apply Mercasol in the hole for the locking screw.	 xx1400000372
5 Jog axis-2 to: • -20° or +20°.	
6  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
7 Remove the Distance tool.	
8 Apply Loctite 754 and refit the cover plate on the back of the balancing device.	 xx1300000554

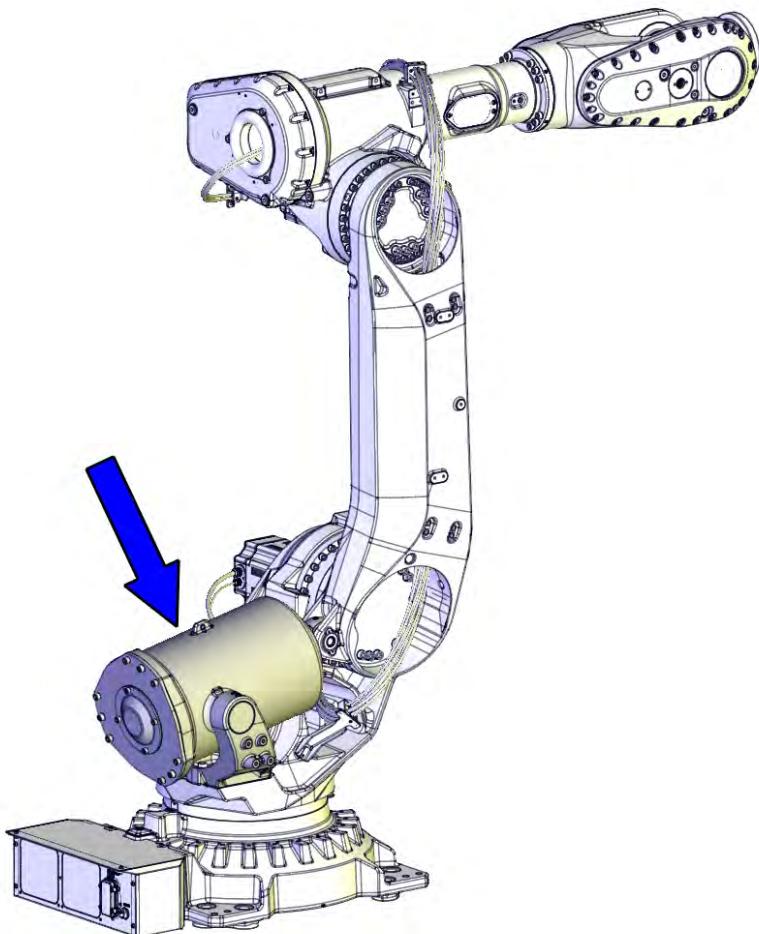
4 Repair

4.6.2 Replacing the balancing device

4.6.2 Replacing the balancing device

Location of the balancing device

The balancing device is located as shown in the figure.



xx1300000660

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Unload the balancing device.
- 2 Replace the balancing device.

Spare part

Equipment, etc.	Spare part number	Note
Balancing device	See <i>Product manual, spare parts - IRB 6700</i> .	

Continues on next page

Required tools and equipment

Equipment, etc.	Article number	Note
Distance tool	3HAC030662-001	Only used to keep the balancing device in a locked position, after the balancing device springs has been unloaded with the help of the robot itself.  DANGER Never use this tool to unload or restore a balancing device!
Lock screw, M16x120	-	Used to secure lower arm.
Threaded bar, M16x340	-	
Anvil	3HAC047273-001	Included in the tool kit Dismantle and mounting tool (3HAC028920-001).
Hydraulic press tool, balancing device	3HAC020902-001	Used to unload or restore a balancing device.
Dismantle and mounting tool	3HAC028920-001	Used for removing and fitting shaft and bearings.
Hydraulic pump 80 MPa	3HAC13086-1	To be used with the hydraulic cylinder.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Lifting shackle	-	SA-10-8-NA1
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Article number	Note
Grease	3HAA1001-294	Tribol GR 100-0 PD Used for lubrication of the bearings at the cradle.
Grease	3HAA1001-294	Tribol GR 100-0 PD, 50 ml Used for lubrication of the spherical roller bearing.
VK-Cover (2 pcs)	3HAA2166-28	VK 90x12
VK-Cover (2 pcs)	3HAA2166-12	VK 28x7
Locking liquid	3HAB7116-1	Loctite 243

Removing the balancing device

Use these procedures to remove the balancing device.

Unloading or locking the balancing device springs

Compression of the balancing device springs to an unloaded position, can be done in two different methods using two different tools - Distance tool or Hydraulic press tool, balancing device. The situations when to use which tool are very different.

Continues on next page

4 Repair

4.6.2 Replacing the balancing device

Continued

The method described in this procedure, describes how to use the Distance tool (3HAC030662-001). The Distance tool can not be used to unload or restore the pressure of the balancing device spring unit! The Distance tool is only used to keep the balancing device springs in a locked position, after they have been unloaded with the help of the robot itself (as described in this procedure) and with the balancing device still being fitted on the robot.



Note

To unload or restore a balancing device which cannot be done with the help of the robot itself, the Hydraulic press tool, balancing device (3HAC020902-001) must be used. See [Unloading the balancing device on page 481](#)

Illustration	Art. no.	Note
 xx1400000726	3HAC030662-001 Distance tool	<p>Only used to keep the balancing device in a locked position, after the balancing device springs has been unloaded with the help of the robot itself.</p> <p> DANGER</p> <p>Never use this tool to unload or restore a balancing device!</p>
 xx1300000672	3HAC020902-001 Hydraulic press tool, balancing device	<p>This tool is used to unload or restore a balancing device which cannot be done with the help of the robot itself. This press tool shall also be used if the tool shall be fitted on or be removed from a balancing device, not fitted on the robot.</p> <p>Use this tool:</p> <ul style="list-style-type: none">• if the balancing device shall be unloaded or restored after it has been removed from the robot• on a balancing device not fitted on the robot, such as a spare part.



DANGER

Never remove or fit the Distance tool on a balancing device which can not be unloaded by the robot. There is a severe risk of personal injury.

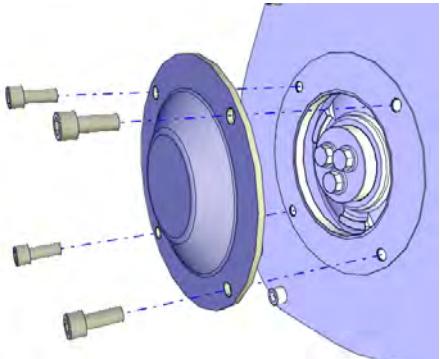
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4.6.2 Replacing the balancing device

Continued

Unloading or locking the balancing device springs

Use this procedure to unload the balancing device with the help of the robot, and lock the balancing device springs in a compressed position, using the Distance tool (3HAC030662-001).

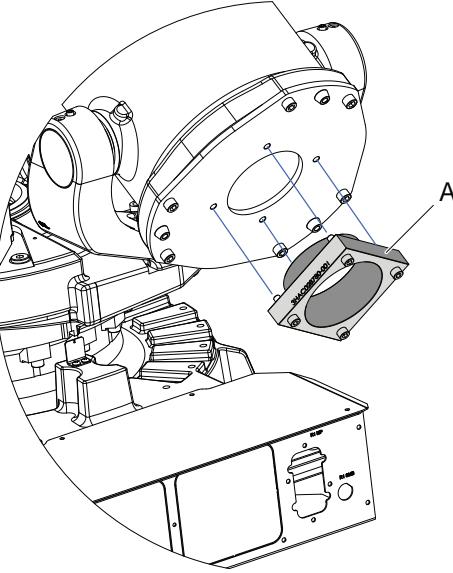
	Action	Note
1	 DANGER <p>Do not use the Distance tool (3HAC030662-001) to unload or restore the pressure of the balancing device springs! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position!</p> <p>To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the Hydraulic press tool, balancing device (3HAC020902-001).</p>	
2	Jog axis-2 to: <ul style="list-style-type: none"> • -20° or +20° 	This is done in order to compress the balancing device springs inside the balancing device before fitting the Distance tool.
3	 DANGER <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
4	Remove the cover plate on the back of the balancing device.  DANGER <p>DO NOT remove any other screws than the rear cover attachment screws! See figure!</p>	 xx1300000554

Continues on next page

4 Repair

4.6.2 Replacing the balancing device

Continued

Action	Note
5 Fit the Distance tool on the back of the balancing device using the four screws.	Tightening torque: 45 Nm Attachment screws: M10 quality 12.9 (4 pcs)
 DANGER Use caution when tightening the screws. The threads in the cover can be damaged if more tightening torque than 45 Nm is used, risking that the Distance tool is not properly fitted.	 xx0800000480 A Distance tool: 3HAC030662-001
6 Jog axis-2 to the calibration position. The balancing device is now unloaded.	This is done to compress the balancing device springs, making it possible to remove the front shaft of the balancing device.
7 Let the Distance tool stay fitted during the continued procedure.	
 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

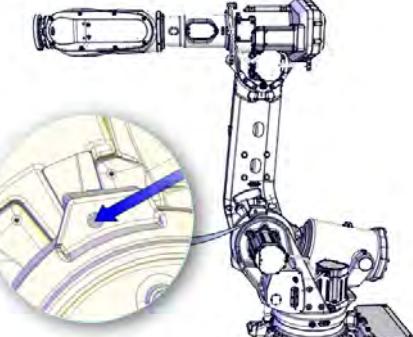
Preparations before removing the balancing device

Action	Note
1 Jog axis-2 to the calibration position (if not already in this position).	

Continues on next page

4.6.2 Replacing the balancing device

Continued

Action	Note
2 Fit a locking screw M16x120 through the hole for the lock screw in the frame and into the lower arm (or using a lifting accessory or similar). The lock screw is used to secure the weight of the lower arm, in order to avoid accidents or damage.	 xx1200001116
3  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
4 Remove any equipment, if fitted, on or close to the balancing device.	

Attaching lifting accessory to the balancing device

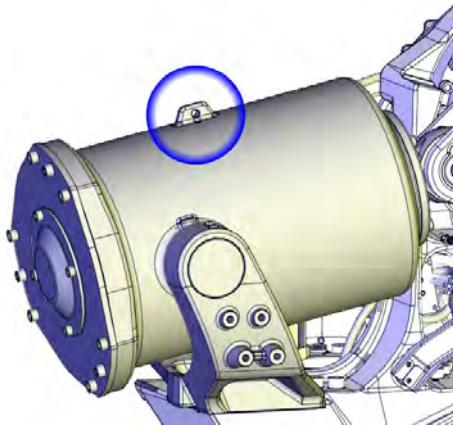
Action	Note
1  CAUTION The weight of the balancing device (excluding cradle) is 140 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 185 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	

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4 Repair

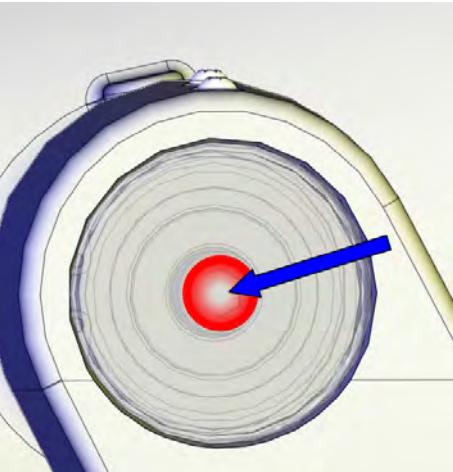
4.6.2 Replacing the balancing device

Continued

Action	Note
2 Fit a lifting shackle to the balancing device.	Lifting shackle: SA-10-8-NA1  xx1300000661
3 Fit the lifting accessory to the shackle and raise to unload the weight.	Lifting accessory (chain): 3HAC15556-1

Removing the rear shafts

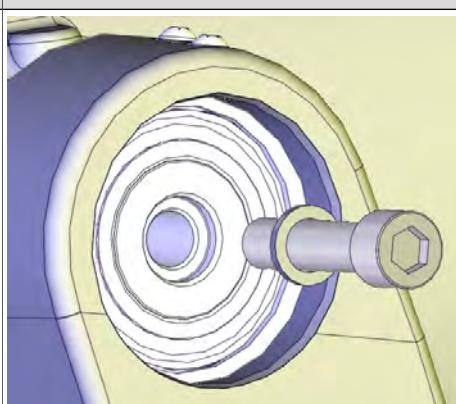
Perform this procedure on both sides.

Action	Note
1 Remove both VK covers by driving a screwdriver (or similar) through the VK cover, as close as possible to the center of the VK cover. If not making a hole in the center of the VK cover, there is a risk of damaging the bearing inside.  Note It is almost impossible to remove the VK cover without damage. New VK covers are needed.	 xx1300000662
2 Wipe off all residual grease inside the recess.	

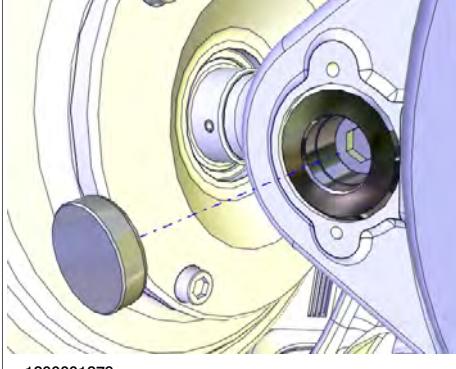
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4.6.2 Replacing the balancing device

Continued

	Action	Note
3	Unscrew the attachment screws on each shaft.	 xx1300000663
4	Remove retaining ring, bore on one side.	 xx1300000664
5	Use the removal tool and pull the shaft out a few millimeters, just long enough for the balancing device to go free.	

Removing the shaft in the front (link ear)

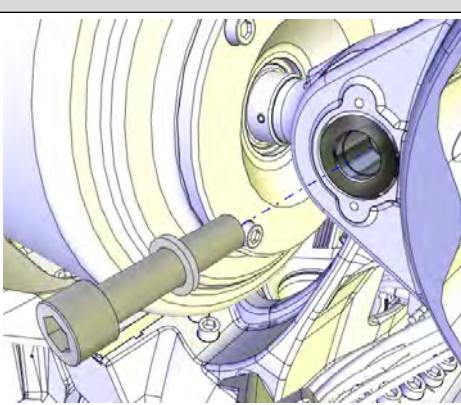
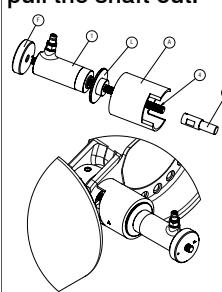
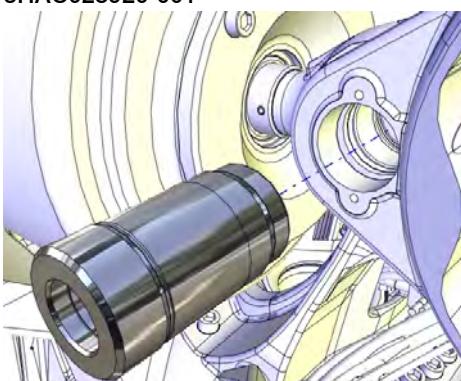
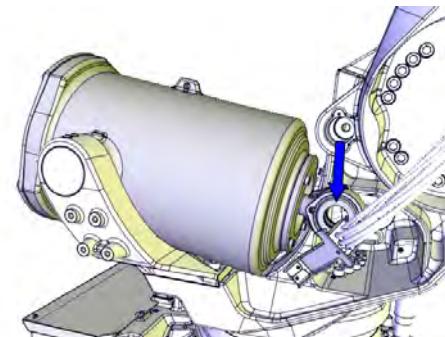
	Action	Note
1	Remove the small VK cover.	 xx1200001278

Continues on next page

4 Repair

4.6.2 Replacing the balancing device

Continued

Action	Note
2 Unscrew the attachment screw and washer.	 xx1200001279 <ul style="list-style-type: none"> • M16x70 quality steel 8.8-A3F
3 Use the dismantle and mounting tool and pull the shaft out.  xx1700000378 <p>The numbers in the figure refers to the marked tool pieces respectively.</p>	Dismantle and mounting tool: 3HAC028920-001  xx1200001280
4 Put down the balancing device and let it rest on the frame.	 xx1200001281

Concluding procedure

Action	Note
1 Remove the balancing device.	

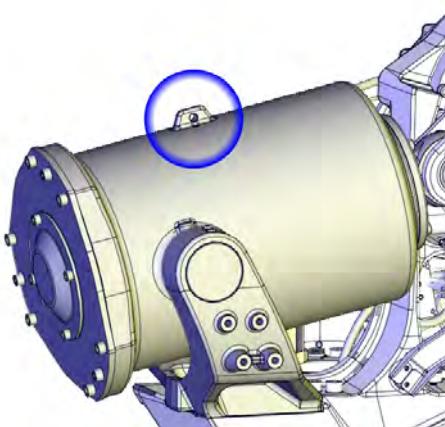
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Action	Note
<p>2 If the same balancing device shall be refitted, the Distance tool 3HAC030662-001 must stay fitted during the time the balancing device is removed from the robot!</p> <p> DANGER</p> <p>The distance tool shall, under no circumstance, be fitted on or be removed from a balancing device that not is fitted to the robot! Fitting and removing this tool can only be done in a safe way with axis-2 in -20° or +20° position and with the balancing device fitted to the robot.</p>	

Refitting the balancing device

Use this procedure to refit the balancing device.

Attaching lifting accessory to the balancing device

Action	Note
<p>1  CAUTION</p> <p>The weight of the balancing device (excluding cradle) is</p> <p>140 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)</p> <p>185 kg (IRB 6700 -300/2.70, -245/3.00)</p> <p>All lifting accessories used must be sized accordingly.</p>	
2 Fit a lifting shackle to the balancing device.	Lifting shackle: SA-10-8-NA1
	 <p>xx1300000661</p>
3 Fit the lifting accessory to the shackle and raise to unload the weight.	Lifting accessory (chain): 3HAC15556-1

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4 Repair

4.6.2 Replacing the balancing device

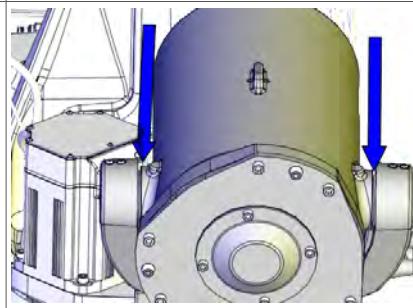
Continued

Unloading a new spare part, balancing device

Action	Note
1  DANGER Do not use the Distance tool: 3HAC030662-001 to unload or restore the pressure of the balancing device spring unit! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position! To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the Hydraulic press tool, balancing device (3HAC020902-001).	
2 Before a new spare part balancing device is fitted, the springs must be unloaded using the Hydraulic press tool, balancing device 3HAC020902-001.	How to unload a new balancing device (a spare part, not yet fitted to the robot) is described in Unloading the balancing device on page 481 .

Refitting the rear shafts

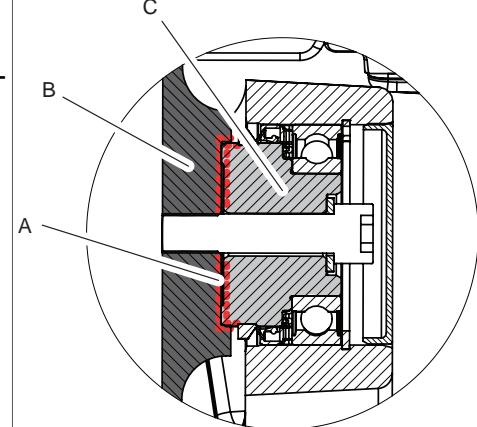
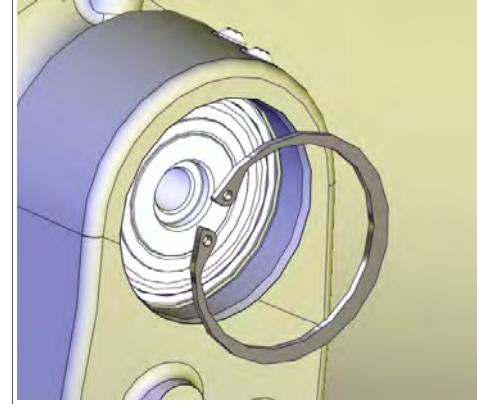
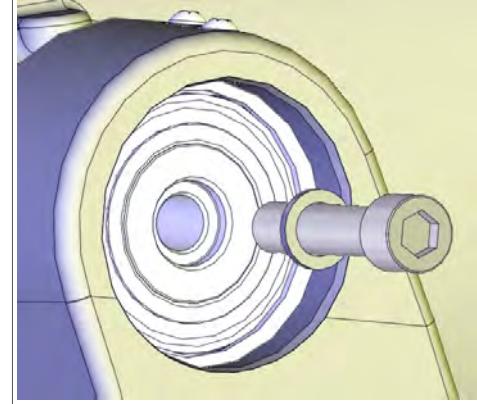
Perform this procedure on both sides.

Action	Note
1  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2 Lift the balancing device into position in the cradle.	
3 Apply a big screwdriver between the cradle and the balancing device, as shown in the figure when the shafts are refitted.	 xx1300000838
4 Apply the refitting tool and press the shafts into position one at a time.	

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4.6.2 Replacing the balancing device

Continued

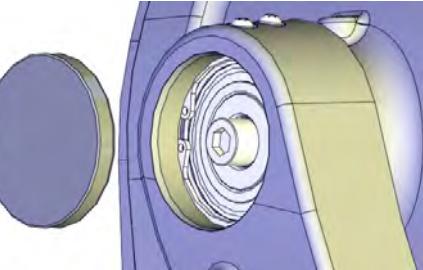
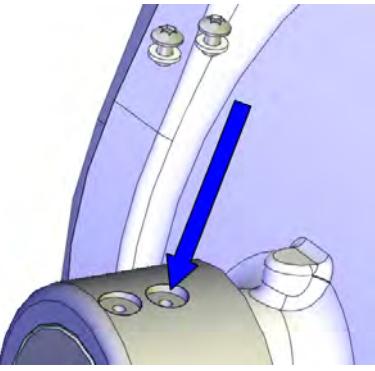
Action	Note
5 Foundry Plus: Apply Mercasol on matching surfaces on the axis and balancing device. See the figure!	 <p>xx1400000367</p> <p>A Mercasol (red dotted lines) B Balancing device C Shaft</p>
6 Fit the retaining ring.	 <p>xx1300000664</p>
7 Apply Loctite 243 on the screws and secure the shafts on both sides.	<p>Tightening torque: 180 Nm</p>  <p>xx1300000663</p>

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4 Repair

4.6.2 Replacing the balancing device

Continued

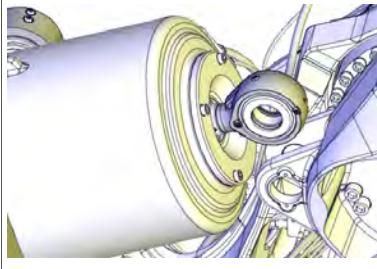
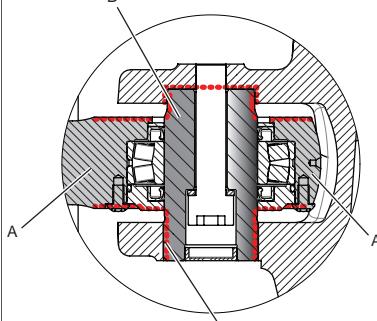
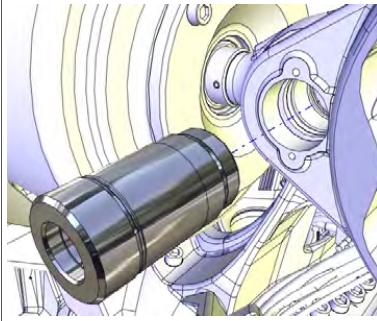
Action	Note
8 Refit new VK covers.	
9 Unscrew both screws in the cradle and fill the bearing with grease from the inner hole (see figure) until grease appears in the outer hole.	Grease: 3HAA1001-294 
10 Refit the screws.	
11 Wipe clean from residual grease.	
12  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48.	

Refitting the front shaft of the balancing device

Action	Note
1 Turn on the power to the robot.	
2 Use caution and jog the robot to the calibration position (if not already done).	
3  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

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4.6.2 Replacing the balancing device Continued

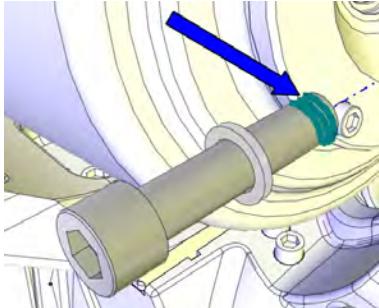
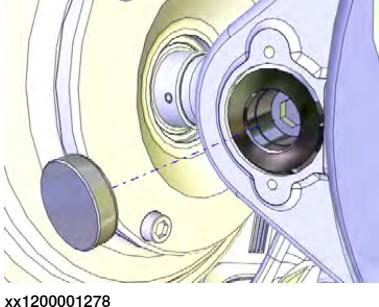
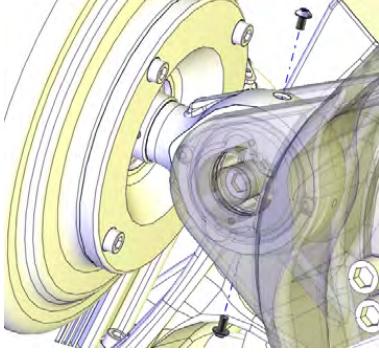
	Action	Note
4	Apply the lifting accessory to the balancing device (if not already done).	Lifting shackle: SA-10-8-NA1 Lifting accessory (chain): 3HAC15556-1
5	Remove all residue of Loctite in the screw hole of the shaft.	
6	Wipe all contact surfaces inside the recess clean from residual grease or other contamination.	
7	Align the balancing device link ear with the hole in the lower arm.  Note Verify that the link ear is correctly turned.	
8	Foundry Plus: Apply Mercasol on the surfaces on the shaft and front ear.	 A Front link ear B Shaft C Mercasol (red dotted lines)
9	Lubricate the shaft and place it to the front ear.  Note Foundry Plus: Do not lubricate surfaces where Mercasol is applied!	
10	Press the shaft in with the hydraulic press tool.	Hydraulic pump 80 MPa: 3HAC13086-1 Hydraulic cylinder: 3HAC11731-1 Dismantle and mounting tool: 3HAC028920-001

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4 Repair

4.6.2 Replacing the balancing device

Continued

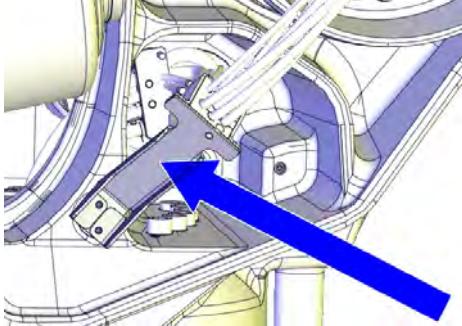
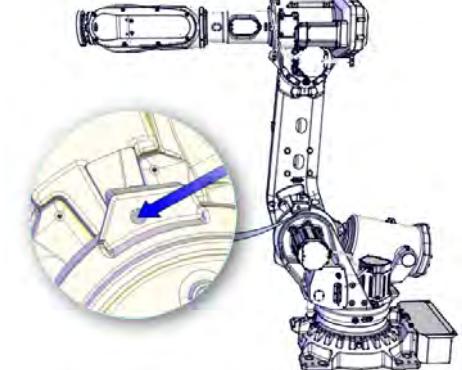
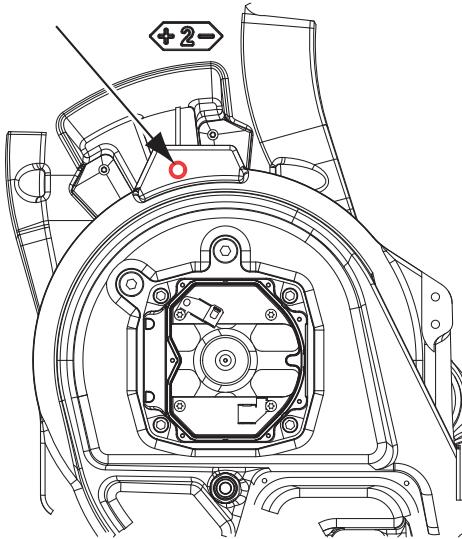
	Action	Note
11	Apply locking liquid (Loctite 2701) on the threads of the screw, first entering the threads in the frame.	 xx1300000782
12	Secure the shaft with screw and washer.	Tightening torque: 180 Nm  xx1200001279
13	Fit the VK-cover.	 xx1200001278
14	Unscrew both screws in link ear and fill the bearing with grease from the upper hole until the grease appears in the lower hole.	Grease: 3HAA1001-294  xx1300000783
15	Refit the two screws and wipe clean from residual grease.	

Continues on next page

4.6.2 Replacing the balancing device

Continued

Concluded refitting of the front shaft

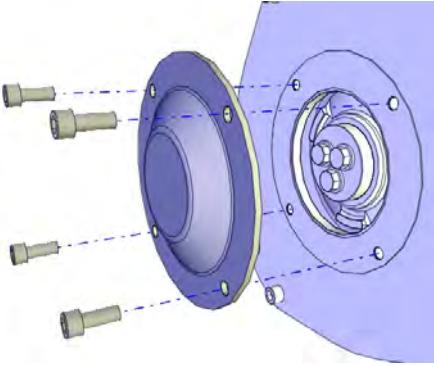
	Action	Note
1	Remove the lifting accessory from the balancing device.	
2	Refit the cable bracket (if not already refitted).	 xx1200001283
3	Remove the locking screw (M16x120).	 xx1200001116
4	Foundry Plus: Apply Mercasol in the hole for the locking screw.	 xx1400000372
5	Jog axis-2 to: • -20° or +20°.	

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4 Repair

4.6.2 Replacing the balancing device

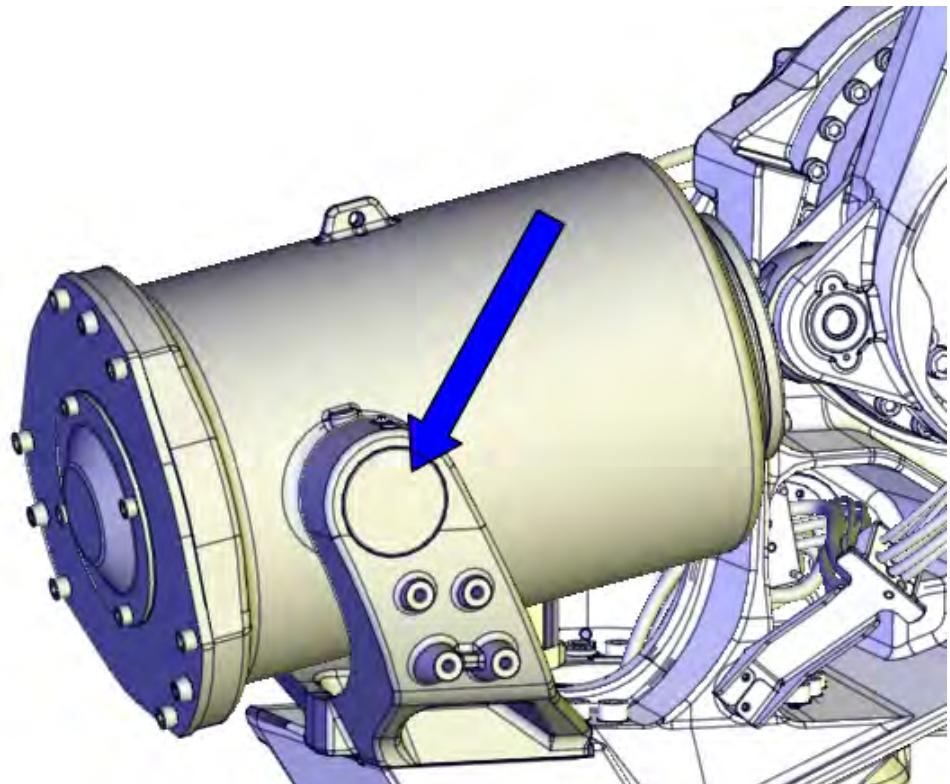
Continued

	Action	Note
6	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
7	Remove the Distance tool.	
8	Apply Loctite 754 and refit the cover plate on the back of the balancing device.	 xx1300000554

4.6.3 Replacing the rear bearings on the balancing device

4.6.3 Replacing the rear bearings on the balancing device**Location of rear bearings, balancing device**

The rear bearings of the balancing device are located in the cradle, one on each side.



xx1300000785

Spare parts

Equipment	Article number	Note
Maintenance kit, cradle	See <i>Product manual, spare parts - IRB 6700</i> .	<p>The maintenance kit contains all necessary parts to replace the bearings, including VK covers.</p> <ul style="list-style-type: none">• 3HAA2166-28 VK cover (2 pcs). Can be ordered separately.

Continues on next page

4 Repair

4.6.3 Replacing the rear bearings on the balancing device

Continued

Required tools and equipment

Equipment	Article number	Note
Distance tool	3HAC030662-001	Only used to keep the balancing device in a locked position, after the balancing device springs has been unloaded with the help of the robot itself.  DANGER Never use this tool to unload or restore a balancing device!
Lock screw, M16x120	-	Used to secure lower arm.
Lifting shackle	-	SA-10-8-NA1
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Threaded bar, M16x340	-	
Press tool G	3HAC027146-001	
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment	Article number	Note
VK cover, 90x12(2 pcs)	3HAA2166-28	Included in the maintenance kit
Grease	3HAA1001-294	Tribol GR 100-0 PD Used for lubrication of the bearings at the cradle.
Locking liquid	3HAB7116-1	Loctite 243

Required documents

Document	Document number
Directions for use - Fork lift accessory for IRB 6700	3HAC048484-002

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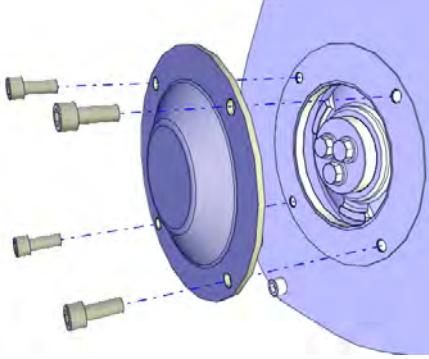
4.6.3 Replacing the rear bearings on the balancing device

*Continued***Removing the bearing, cradle**

Use these procedures to remove the bearing in the cradle.

Unloading or locking the balancing device springs

Use this procedure to unload the balancing device with the help of the robot, and lock the balancing device springs in a compressed position, using the Distance tool (3HAC030662-001).

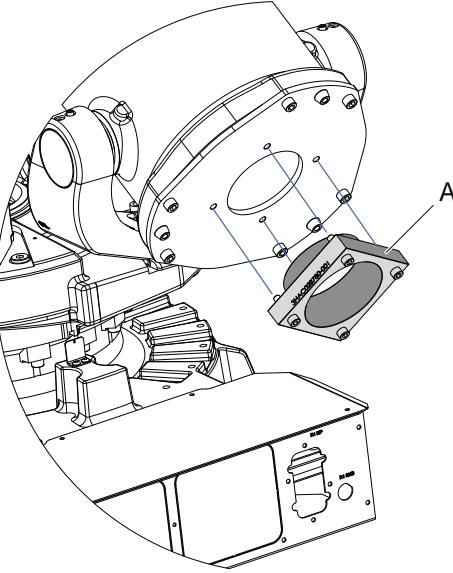
	Action	Note
1	 DANGER <p>Do not use the Distance tool (3HAC030662-001) to unload or restore the pressure of the balancing device springs! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position!</p> <p>To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the Hydraulic press tool, balancing device (3HAC020902-001).</p>	
2	Jog axis-2 to: • -20° or +20°	This is done in order to compress the balancing device springs inside the balancing device before fitting the Distance tool.
3	 DANGER <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
4	<p>Remove the cover plate on the back of the balancing device.</p>  DANGER <p>DO NOT remove any other screws than the rear cover attachment screws! See figure!</p>	 <p>xx1300000554</p>

Continues on next page

4 Repair

4.6.3 Replacing the rear bearings on the balancing device

Continued

Action	Note
5 Fit the Distance tool on the back of the balancing device using the four screws.	Tightening torque: 45 Nm Attachment screws: M10 quality 12.9 (4 pcs)
 DANGER Use caution when tightening the screws. The threads in the cover can be damaged if more tightening torque than 45 Nm is used, risking that the Distance tool is not properly fitted.	 xx0800000480 A Distance tool: 3HAC030662-001
6 Jog axis-2 to the calibration position. The balancing device is now unloaded.	This is done to compress the balancing device springs, making it possible to remove the front shaft of the balancing device.
7 Let the Distance tool stay fitted during the continued procedure.	
 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

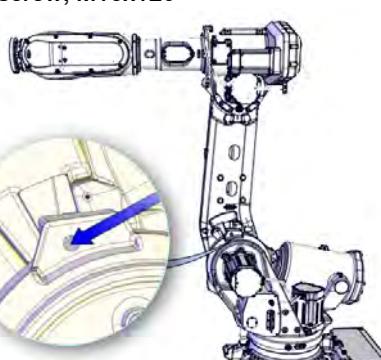
Preparations before removing the rear bearings

Action	Note
1 Jog axis-2 to the calibration position (if not already in this position).	

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4.6.3 Replacing the rear bearings on the balancing device

Continued

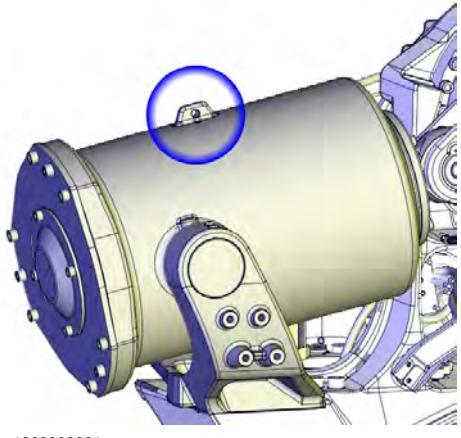
Action	Note
2 Fit a locking screw through the hole for the lock screw in the frame and into the lower arm (or using a lifting accessory or similar). The lock screw is used to secure the weight of the lower arm, in order to avoid accidents or damage.	Lock screw, M16x120  xx1200001116
3  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4 Remove any equipment, if fitted, on or close to the balancing device.	
5  CAUTION The weight of the balancing device (excluding cradle) is 140 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 185 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	

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4 Repair

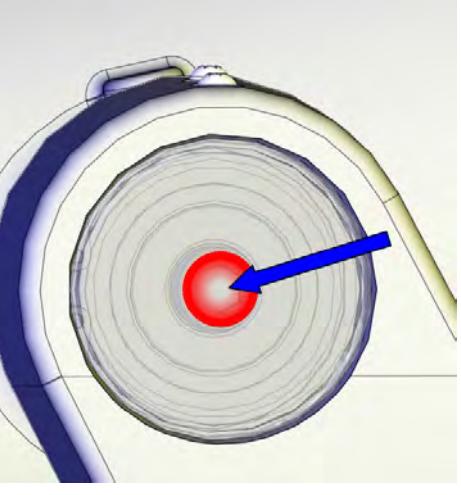
4.6.3 Replacing the rear bearings on the balancing device

Continued

Action	Note
6 Fit a lifting shackle to the balancing device.	Lifting shackle: SA-10-8-NA1  xx1300000661
7 Fit the lifting accessory to the shackle and raise to unload the weight.	Lifting accessory (chain): 3HAC15556-1

Removing the shaft end, cradle

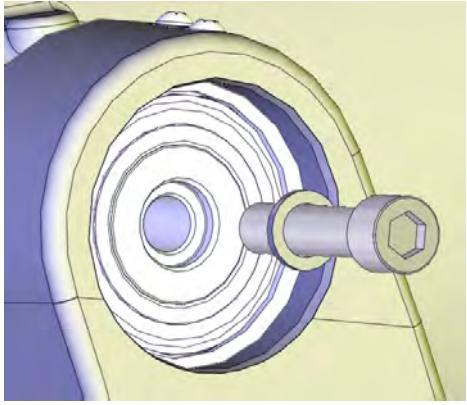
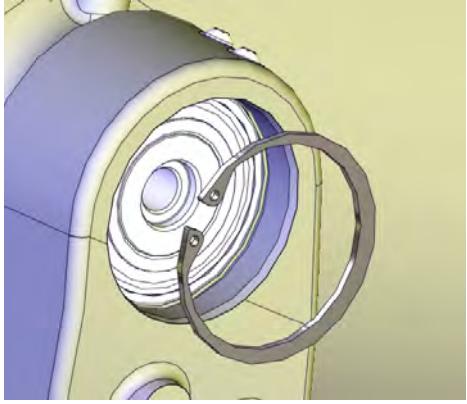
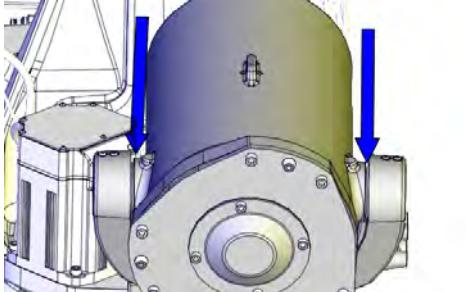
The procedure of removing the shaft end in the cradle is the same on both sides.

Action	Note
1 Remove the VK cover by driving a screw-driver (or similar) through the VK cover, as close as possible to the center of the VK cover. If not making a hole in the center of the VK cover, there is a risk of damaging the bearing inside.  Note It is almost impossible to remove the VK cover without damage. New VK covers are needed.	 xx1300000662
2 Wipe off all residual grease inside the recess.	

Continues on next page

4.6.3 Replacing the rear bearings on the balancing device

Continued

	Action	Note
3	Unscrew the attachment screw securing the shaft.	 xx1300000663
4	Remove the retaining ring bore.	 xx1300000664
5	Before pulling out the shaft end, put a big screw driver between the cradle and balancing device and use it as a distance tool.	 xx1300000838
6	<p><i>IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85.</i></p> <p>Apply the press tool and pull out the shaft end with bearing, sealing and distance.</p>	
7	<p><i>IRB 6700 -300/2.70, -245/3.00.</i></p> <p>Apply the press tool and pull out the shaft end with the groove ball bearing.</p>	

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4 Repair

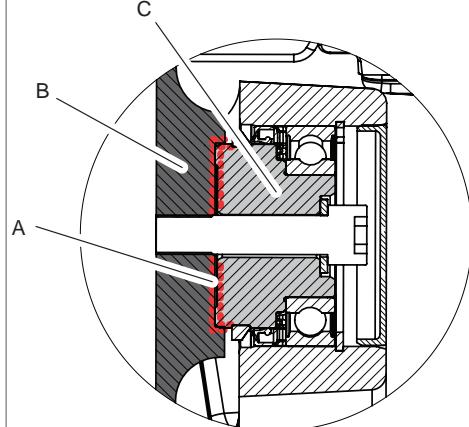
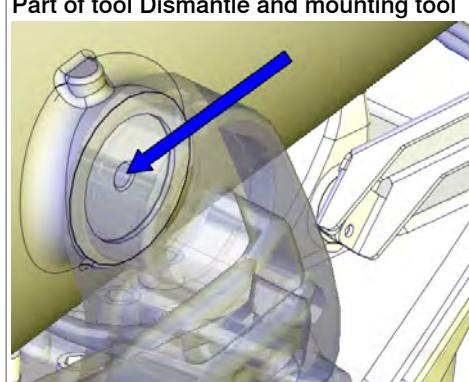
4.6.3 Replacing the rear bearings on the balancing device

Continued

Refitting the bearing, cradle

Use these procedures to refit the bearing in the cradle.

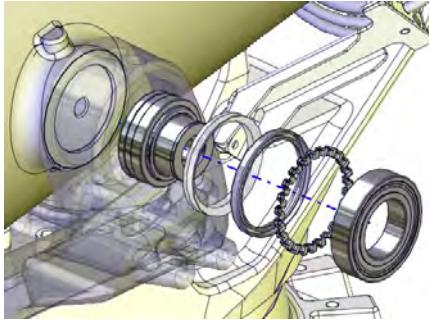
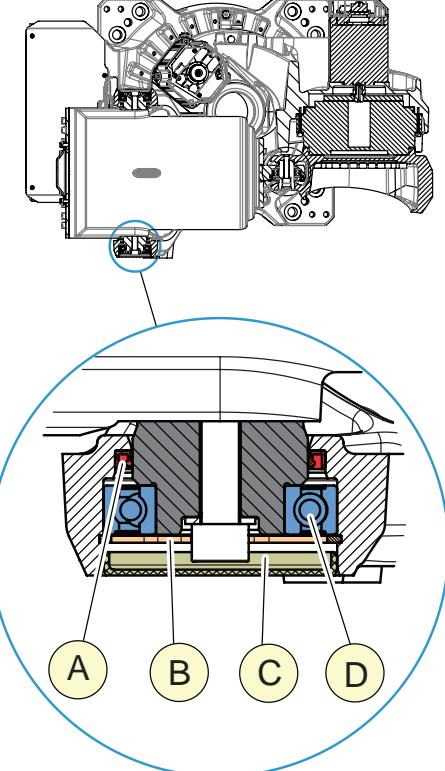
Refitting the shaft end and rear bearings

Action	Note
1 Wipe clean all contact surfaces from residual grease and other contamination inside the recess.	
2 Foundry Plus: Apply Mercasol on matching surfaces on the axis and balancing device. See the figure!	 <p>xx1400000367</p> <p>A Mercasol (red dotted lines) B Balancing device C Shaft</p>
3 Apply some grease in the hole for the bearing in the cradle.  Note Do not apply grease on surfaces with Mercasol.	
4 Apply a threaded bar into the hole in the balancing device.	 <p>xx1300000831</p>

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4.6.3 Replacing the rear bearings on the balancing device

Continued

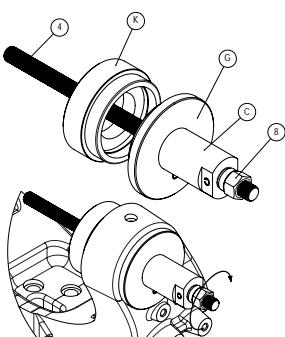
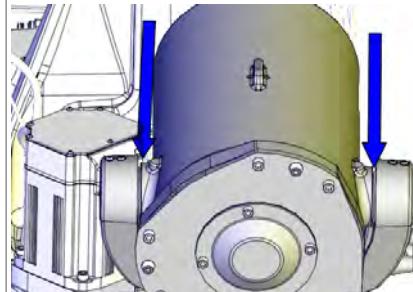
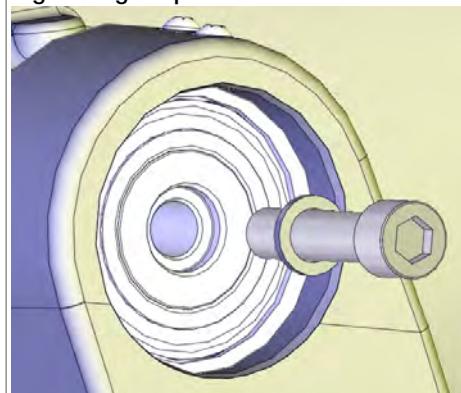
Action	Note
5 IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85. Use caution and put sealing ring, radial sealing, spacer and groove ball bearing onto the shaft end manually.	 xx1300000830
6 IRB 6700 -300/2.70, -245/3.00 Use caution and put radial sealing and groove ball bearing onto the shaft end manually.	 xx1400001996
A Radial sealing with dustlip(2 pcs) B Retaining ring bore (2 pcs) C VK-cover (2 pcs) D Groove ball bearing (2 pcs)	
7 Put the shaft end with the fitted parts, on the threaded bar.	
8 Manually press the shaft end into the cradle a little.	

Continues on next page

4 Repair

4.6.3 Replacing the rear bearings on the balancing device

Continued

Action	Note
9 Apply the press tool, hydraulic pump and nut on the threaded bar. Do not press yet!	Hydraulic pump 80 MPa, 3HAC13086-1 To be used with the hydraulic cylinder.. Hydraulic cylinder, 3HAC11731-1
 xx1700000406	
10 Put a big screw driver between the cradle and balancing device and use it as a distance tool.	 xx1300000838
11 Use caution and press the shaft end in position.	
12 Remove the press tool and the threaded bar.	
13 Apply locking liquid on the attachment screw.	Loctite 243, 3HAB7116-1
14 While using the screw driver between the cradle and balancing device as a distance tool, tighten the attachment screw completely.	
15 Secure the balancing device.	Tightening torque: 280 Nm.  xx1300000663

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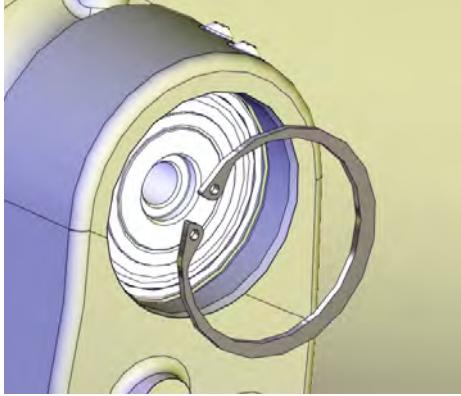
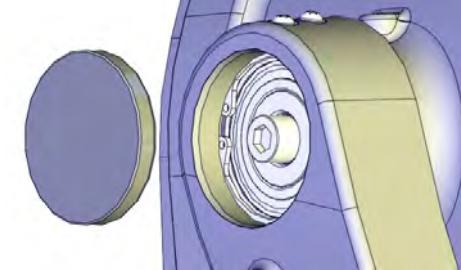
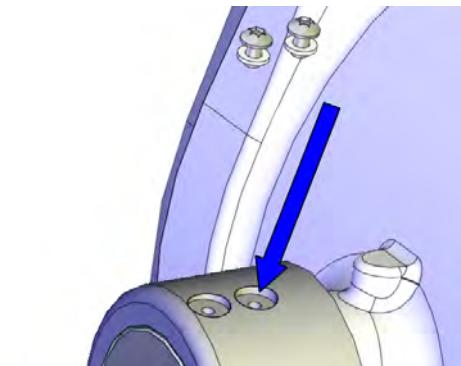
4.6.3 Replacing the rear bearings on the balancing device

Continued

Remove the lifting accessories

	Action	Note
1	Remove the lifting accessories.	

Concluding procedure

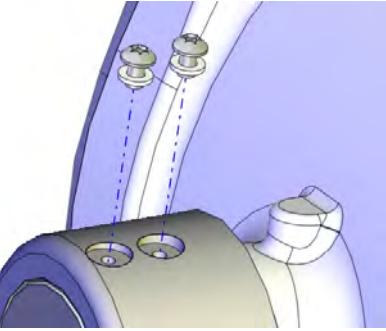
	Action	Note
1	Refit the retaining ring bore.	 xx1300000664
2	Refit the VK-cover.	 xx1300000837
3	Unscrew both screws and refill grease from the inner hole (See figure).	Grease: 3HAA1001-294  xx1300000832

Continues on next page

4 Repair

4.6.3 Replacing the rear bearings on the balancing device

Continued

Action	Note
4 Refit the screws.	 xx1300000833
5 Wipe clean from residual grease.	
6  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48.	

4.6.4 Unloading the balancing device

Prerequisite

This section describes how to unload the balancing device using the Hydraulic press tool, balancing device: 3HAC020902-001.



DANGER

If the balancing device is fitted on the robot during the procedure, remember to:

- jog axis-2 to calibration position
- lock axis-2 with a M16 lock screw. How to secure the lower arm is described in the current repair activity, for example removal of the balancing device.



DANGER

There is a high tensioned spring inside the balancing device, incorrect handling may cause injuries and damage property.

Continues on next page

4 Repair

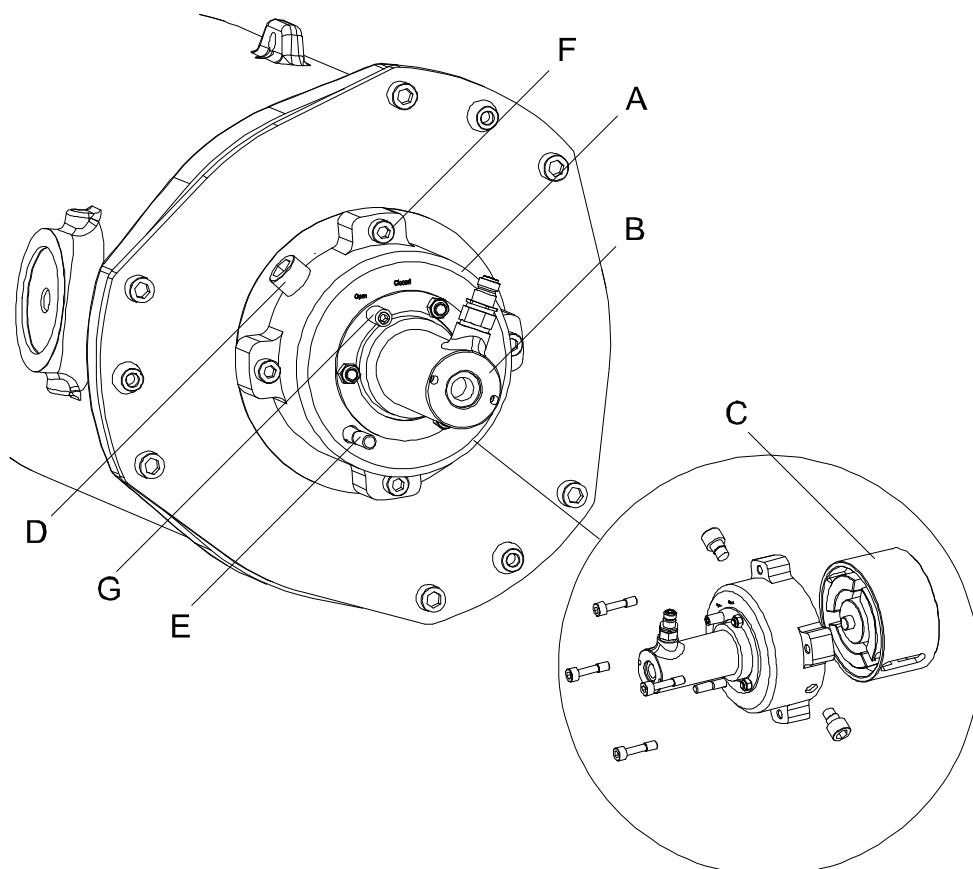
4.6.4 Unloading the balancing device

Continued

Press tool and hydraulic cylinder

The figure below shows the hydraulic cylinder mounted on the press tool.

The press tool includes two press devices that are used to different models of the balancing device.



xx0200000174

A	Press block
B	Hydraulic cylinder
C	Press device
D	Bolt, press device
E	Moving pin with marking
F	Bolt (4 pcs)
G	Pin, attached to the fix plate

Required equipment

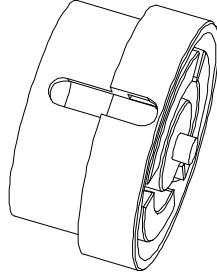
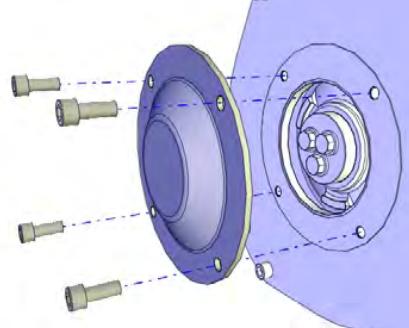
Equipment, etc.	Article number	Note
Hydraulic press tool, balancing device	3HAC020902-001	Used to unload or restore a balancing device.
Hydraulic cylinder	3HAC11731-1	To be used with the press tool.
Hydraulic pump 80 MPa	3HAC13086-1	To be used with the hydraulic cylinder.

Continues on next page

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Unloading the balancing device

The procedure below details how to use the press tool in order to unload the balancing device. How to remove the press tool, is detailed in section [Restoring the balancing device on page 485](#).

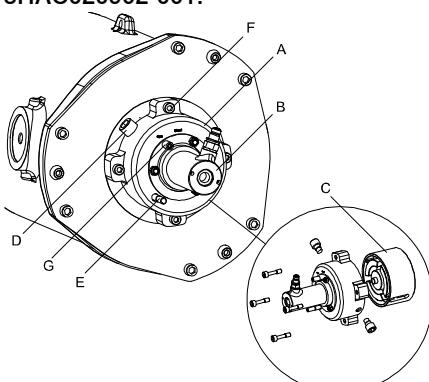
	Action	Note
1	Fit the moving pin to the correct press device.	 Press device: 3HAC12800-1 xx0300000599 The moving pin is shown in the figure Press tool and hydraulic cylinder on page 482 .
2	Fit the correct press device and moving pin to the press tool. Secure with the bolt, press device.  Note Make sure the bolt is secured properly!	The bolt is shown in the figure Press tool and hydraulic cylinder on page 482 .
3	Remove the rear cover of the balancing device, by unscrewing the attachment screws.  DANGER DO NOT! remove any other screws than the rear cover attachment screws.	 xx1300000554

Continues on next page

4 Repair

4.6.4 Unloading the balancing device

Continued

Action	Note
4 Fit the press tool to the rear of the balancing device with enclosed bolts. Tighten them with 45 Nm!	Hydraulic press tool, balancing device: 3HAC020902-001.  xx0200000174
5 Fit the hydraulic cylinder to the press tool.	
6 Connect the hydraulic pump to the cylinder.	
7 Increase the pressure and press until the marking on the moving pin indicates the correct position (in level with the pressure block).	
8 Turn the fix plate to position "Closed" in order to lock the tool in loaded condition.	
9 Unload the hydraulic cylinder.	
10 The hydraulic cylinder may now be removed from the tool, when necessary.	
	<p>CAUTION</p> <p>Do not remove the press tool!</p>

4.6.5 Restoring the balancing device

Overview

This section details how to restore the balancing device and how to remove the press tool from the device.



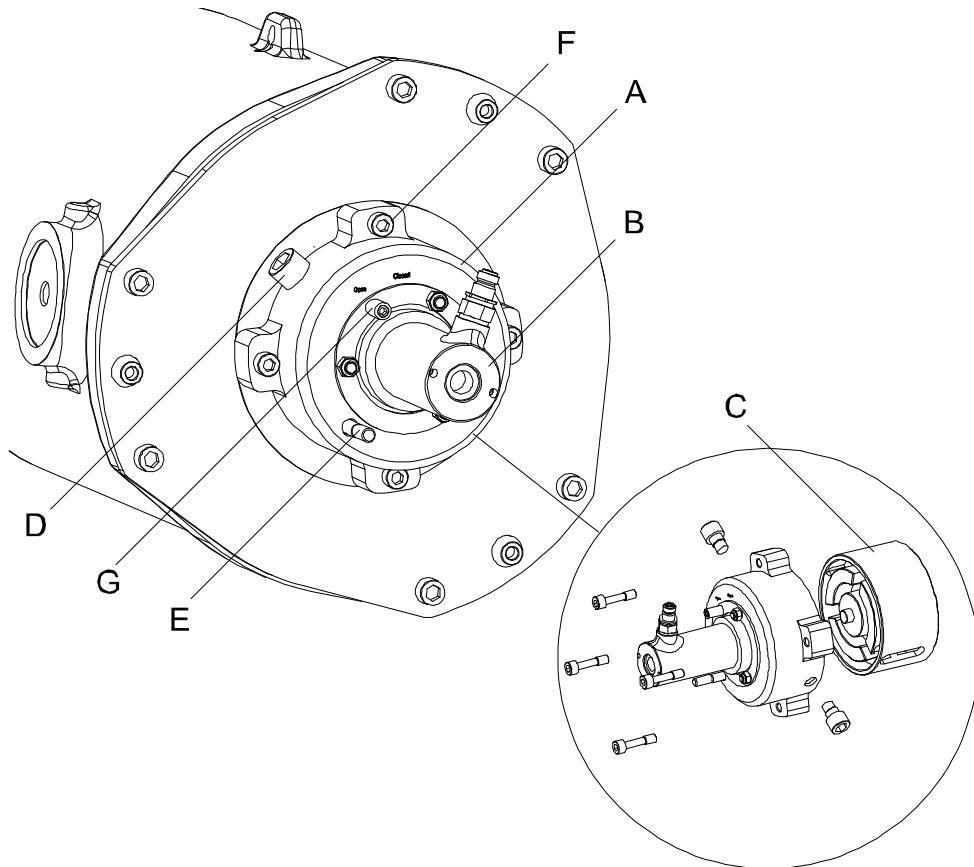
DANGER

There is a high tensioned spring inside the balancing device, incorrect handling may cause injuries and damage property.

Press tool and hydraulic cylinder

The figure below shows the hydraulic cylinder mounted on the press tool.

The press tool includes two press devices that are used to different models of the balancing device.



xx0200000174

A	Press block
B	Hydraulic cylinder
C	Press device
D	Bolt, press device
E	Moving pin with marking

Continues on next page

4 Repair

4.6.5 Restoring the balancing device

Continued

F	Bolt (4 pcs)
G	Pin, attached to the fix plate

Required equipment

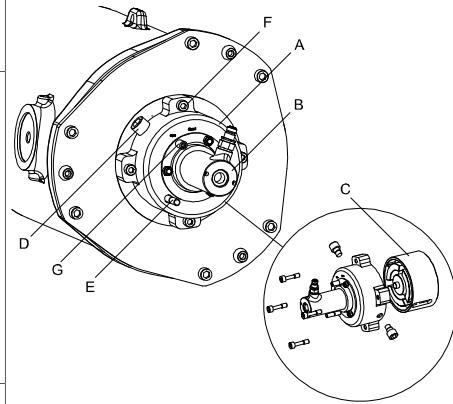
Equipment, etc.	Article number	Note
Hydraulic cylinder	3HAC11731-1	To be used with the press tool.
Hydraulic pump 80 MPa	3HAC13086-1	To be used with the hydraulic cylinder.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Art. no.	Note
Locking liquid	-	Loctite 577 Used to secure the attachment screws of the rear cover at the end of the balancing device.
Elastic glue and sealant	3HAC042559-001	Sikaflex 521FC

Restoring the balancing device

The procedure below details how to restore the balancing device, that is removing the press tool.

	Action	Note
1	Refit the <i>hydraulic cylinder</i> to the press tool, in case it has been removed.	
2	Press with the cylinder and the hydraulic pump until the <i>fix plate</i> is movable again. Turn the pin on the fix plate to position "Open".  CAUTION Do not apply more pressure than necessary, it could damage bearings and sealings at the shaft.	 xx0200000174
3	Unload the hydraulic cylinder and make sure the <i>moving pin</i> indicates that the tool has returned to its starting position.	
4	Remove the hydraulic cylinder.	
5	Remove the press tool by unscrewing the <i>bolts</i> .	

A	Press block
B	Hydraulic cylinder
C	Press device
D	Bolt, press device
E	Moving pin with marking
F	Bolt (4 pcs)
G	Pin, attached to the fix plate

Continues on next page

4.6.5 Restoring the balancing device

Continued

Action	Note
6 Refit the rear cover to the balancing device with its attachment screws, using locking liquid. Apply Sikaflex on the cover.	
7  DANGER The rear cover of the balancing device is a safety device for the piston rod during operation! Make sure the cover is properly secured before commissioning of the robot!	

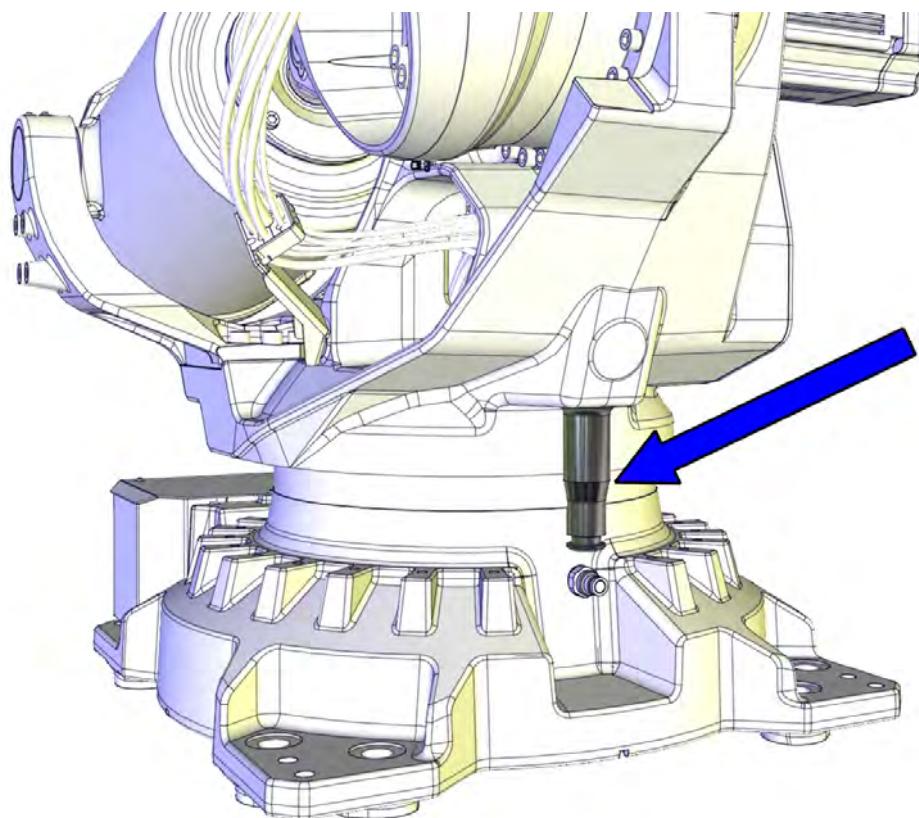
4 Repair

4.6.6 Replacing the stop pin

4.6.6 Replacing the stop pin

Location of the stop pin

The stop pin is located as shown in the figure.



xx1300000475

Spare part

Equipment	Article number	Note
Stop pin	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

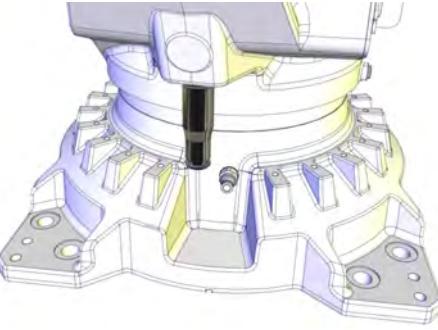
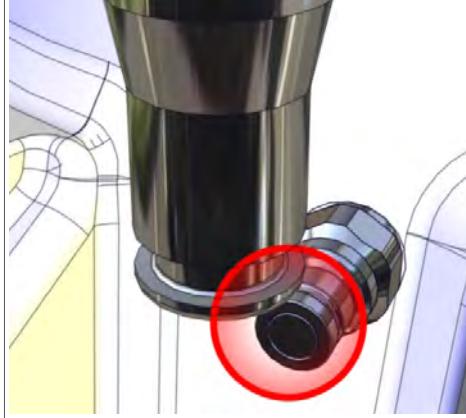
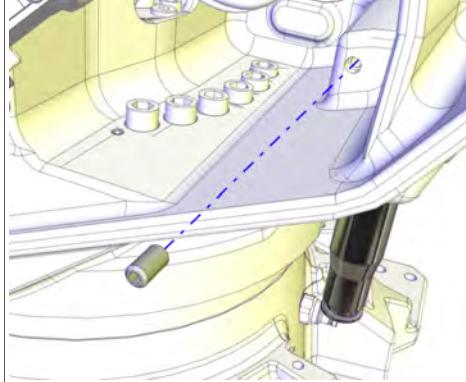
Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Required consumables

Consumable	Article number	Note
Locking liquid	3HAB7116-1	Loctite 243
Foundry plus: Rust preventive		Mercasol

Continues on next page

Removing the stop pin

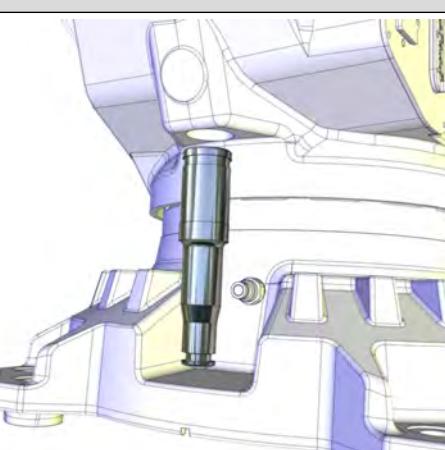
	Action	Note
1	IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20, IRB 6700 - 200/2.60, IRB 6700 - 155/2.85 Jog the robot to this position: • axis 1 = -5°	 xx1300000479
2	IRB 6700 - 235/2.65, IRB 6700 - 205/2.80, IRB 6700 - 175/3.05, IRB 6700 - 150/3.20, IRB 6700 - 200/2.60, IRB 6700 - 155/2.85  Note If the axis-1 is not in this position the stop pin will not be able to go free from the axis-1 oil plug draining, when removed.	 xx1300000478
3	 DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	Hold the mechanical stop pin in a firm grip, use caution and remove it by unscrewing the set screw, cup point.  CAUTION The mechanical stop weighs 5 kg and may unexpectedly fall down when the set screw is removed.	 xx1300000476

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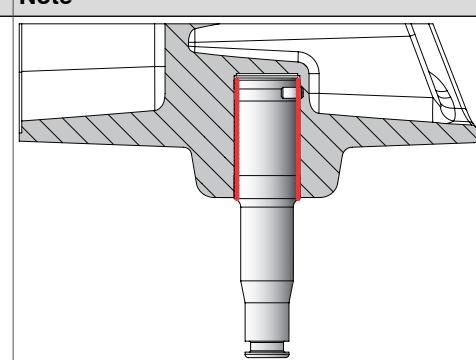
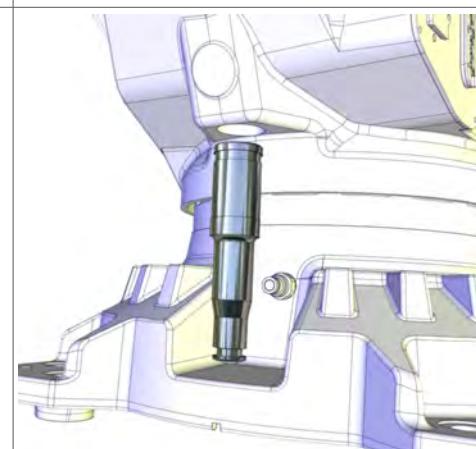
4 Repair

4.6.6 Replacing the stop pin

Continued

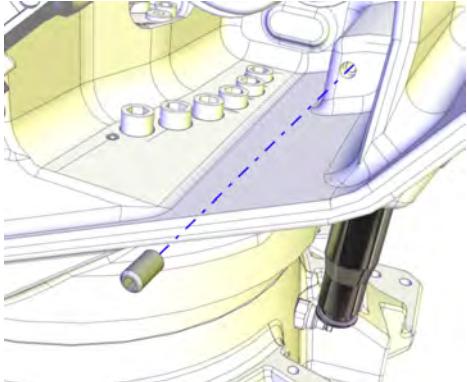
Action	Note
5 Remove the stop pin.	 xx1300000477

Refitting the stop pin

Action	Note
1 Foundry Plus: Apply Mercasol on the surfaces shown in the figure, on stop pin and in the hole as shown in the figure.	 xx1400000378
2 Fit the stop pin.	 xx1300000477

Continues on next page

4.6.6 Replacing the stop pin
Continued

	Action	Note
3	Apply locking liquid on the set screw, and secure the stop pin.	Loctite 243 Set screw M10x20  xx1300000476

4 Repair

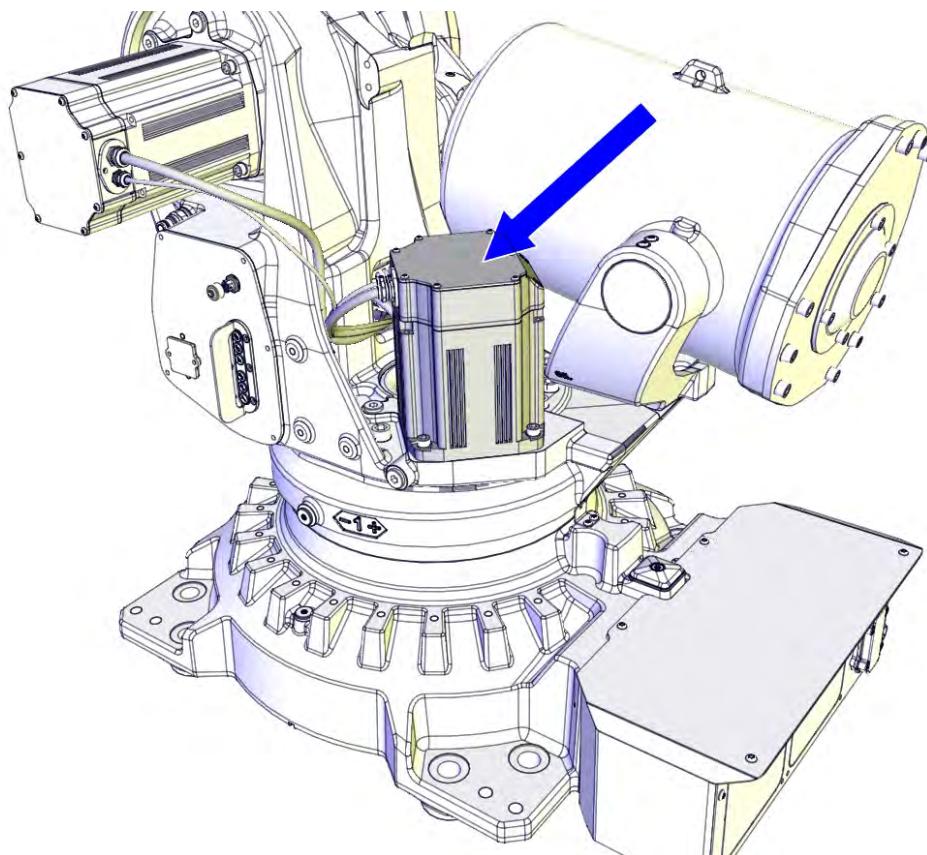
4.7.1 Replacing the axis-1 motor

4.7 Motors

4.7.1 Replacing the axis-1 motor

Location of the axis-1 motor

The motor is located as shown in the figure.



xx1200001064

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Attach the lifting tools
- 2 Remove the motor
- 3 Refit the motor
- 4 Remove the lifting tools.

Spare parts

Spare part	Spare part number	Note
Axis-1 motor	See <i>Product manual, spare parts - IRB 6700</i> .	

Continues on next page

4.7.1 Replacing the axis-1 motor

Continued

Required tools and equipment

Equipment, etc.	Article number	Note
Lifting accessory, motor	3HAC14459-1	
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Removal tool M12	3HAC057339-003	Used to push out the motor, if necessary. Always use removal tools in pairs.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs!
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Article number	Note
Grease	3HAB3537-1	Used to lubricate o-rings, Shell Gadus S2V220 AC.
O-ring ⁱ	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on motor cover.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	

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4 Repair

4.7.1 Replacing the axis-1 motor

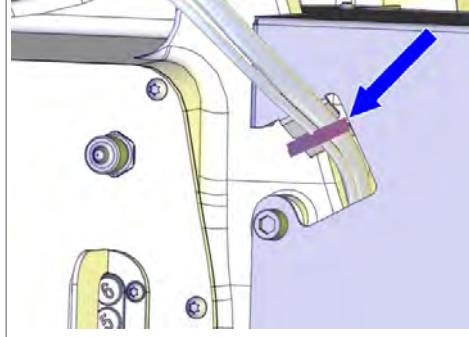
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Action	Note
<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775. Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum.</p>
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the axis-1 motor

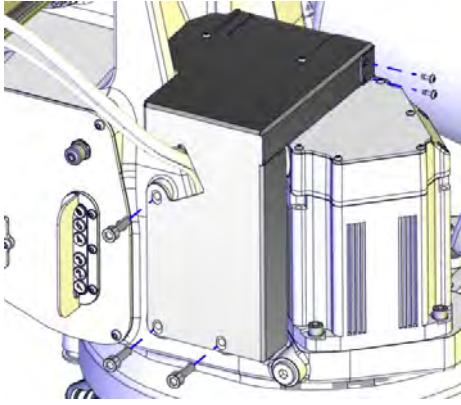
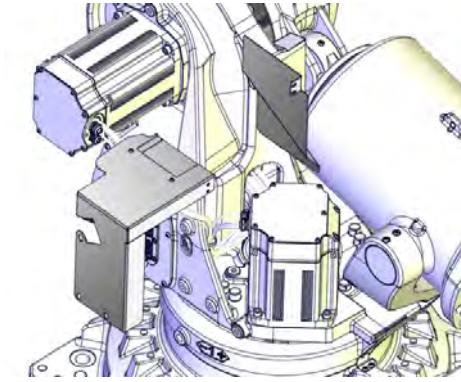
These procedures describe how to remove the motor.

Preparations before removing the axis-1 motor

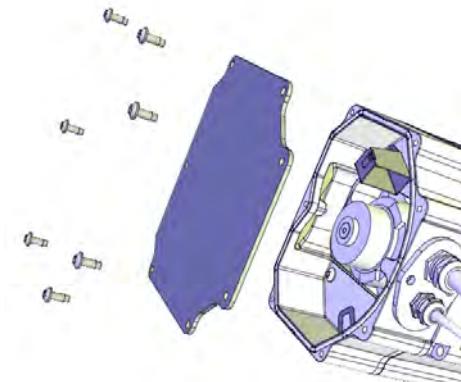
Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 Jog the robot to the synchronization position.	
3  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
4 Foundry Plus: Cut the cable strap that hold the axis-1 and axis-2 motor cables on the protection plates.	

Continues on next page

4.7.1 Replacing the axis-1 motor Continued

Action	Note
5 Foundry Plus: Disassemble the protection plates by removing five of the attachment screws (three M10x30 and two of the M5x12 screws).	 xx1400000723
6 Foundry Plus: Remove the two protection plates.	 xx1400000724

Disconnecting the motor cables

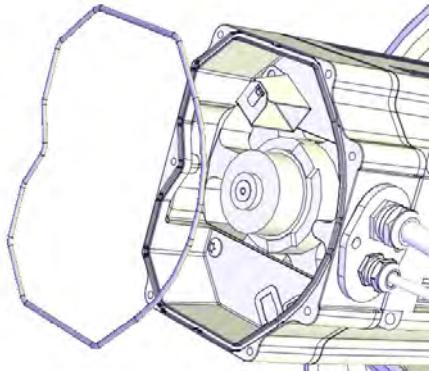
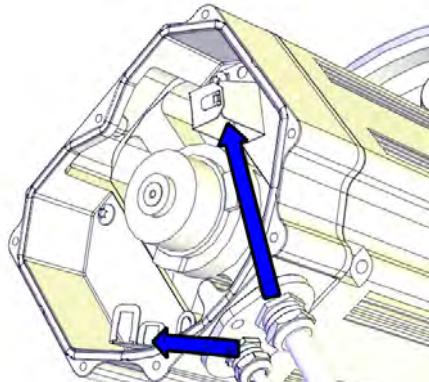
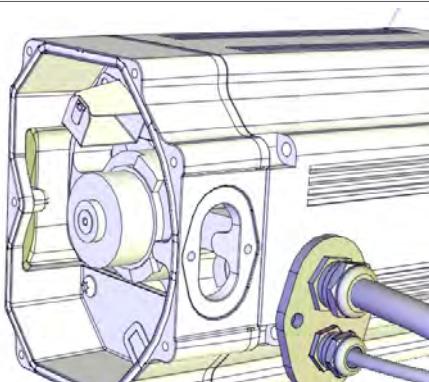
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135

Continues on next page

4 Repair

4.7.1 Replacing the axis-1 motor

Continued

Action	Note
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066
5 Remove the cable gland cover. Make sure the gasket is not damaged.  Tip Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.	 xx1200001067
6 Use caution and pull out the motor cables.	

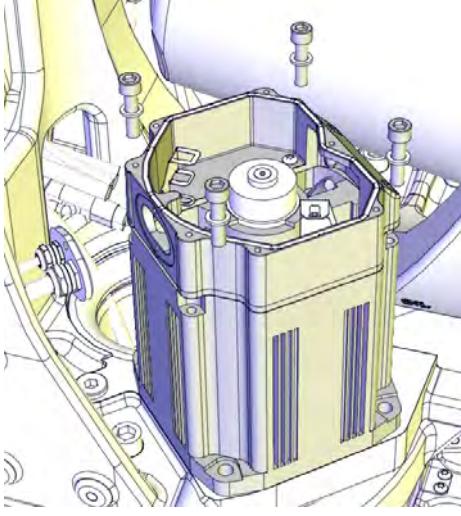
Removing the axis-1 motor

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4.7.1 Replacing the axis-1 motor

Continued

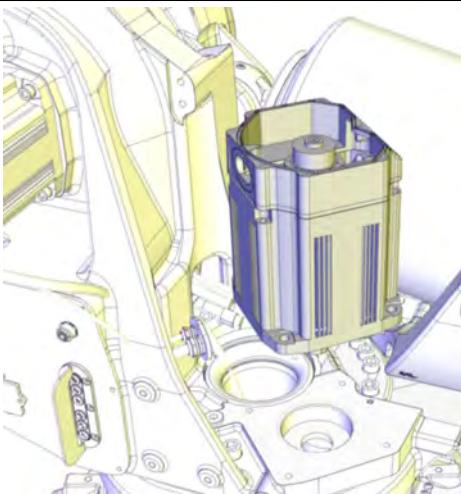
	Action	Note
2	Attach the lifting accessories.	Lifting accessory (chain): 3HAC15556-1 Lifting accessory, motor: 3HAC14459-1.
3	To release the brakes, connect the 24 VDC power supply. Connect to R2.MP1-connector: <ul style="list-style-type: none">• + = pin 2• - = pin 5	24 VDC power supply
4	 CAUTION The weight of the motor is 25 kg All lifting accessories used must be sized accordingly.	
5	Unscrew the attachment screws and washers. Use a bits extender in order to reach the screws.	Bits extender: 3HAC12342-1  xx1200001071
6	Fit guide pins in opposite holes.	Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!
7	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
8	If needed, use removal tools to help remove the motor.	Removal tool M12: 3HAC057339-003

Continues on next page

4 Repair

4.7.1 Replacing the axis-1 motor

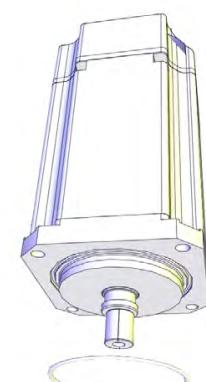
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Action	Note
9 Use caution and lift the motor straight up to get the pinion parted from the gear.	 xx1200001072
10 Disconnect the 24 VDC power supply.	

Refitting the axis-1 motor

These procedures describes how to refit the motor.

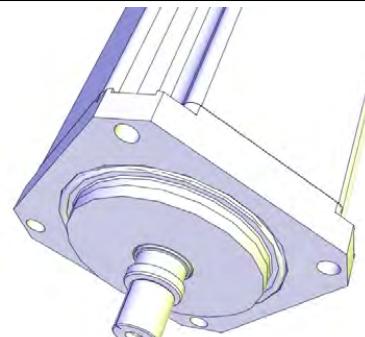
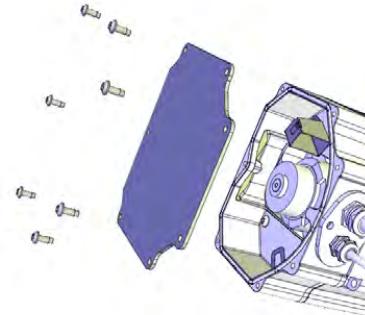
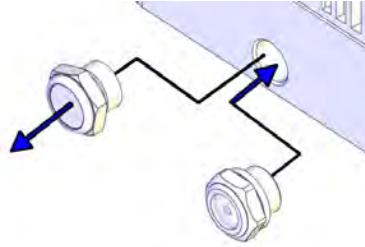
Preparations prior to refitting motor

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	
3 Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	
4 Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019

Continues on next page

4.7.1 Replacing the axis-1 motor

Continued

	Action	Note
5	<p>Make sure the o-ring is seated in the groove.</p> <p> Tip</p> <p>Lubricate the o-ring with some grease for a better fitting in the groove.</p>	 xx1200001020
6	If the motor is a new spare part, remove the cover.	 xx1200001135
7	<p>Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.</p>	<p>Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.</p>  xx1600000576

Securing the axis-1 motor

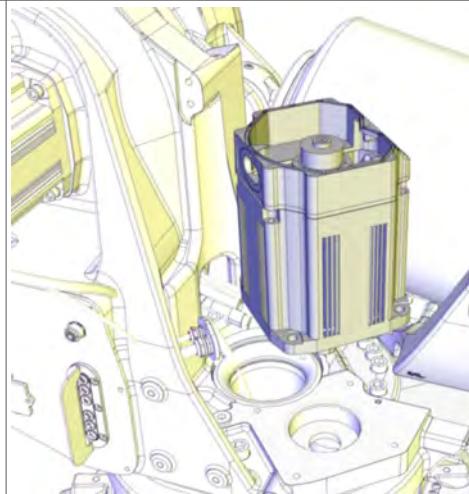
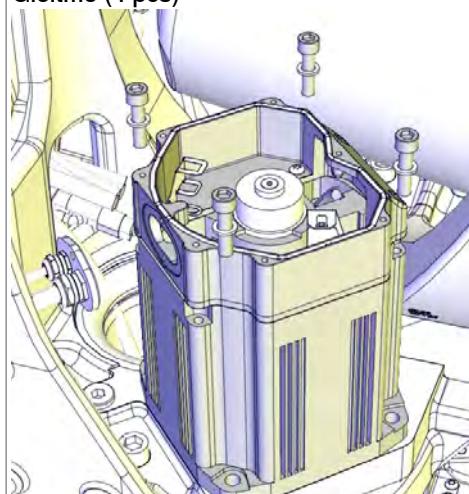
	Action	Note
1	Fit guide pins in opposite holes.	Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!
2	<p> CAUTION</p> <p>The motor weighs 25 kg. All lifting accessories used must be sized accordingly.</p>	
3	Apply the lifting accessory.	Lifting accessory, motor: 3HAC14459-1.

Continues on next page

4 Repair

4.7.1 Replacing the axis-1 motor

Continued

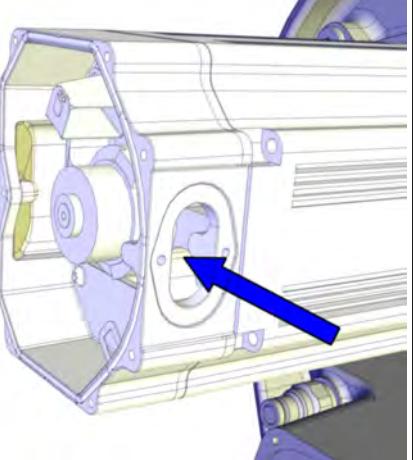
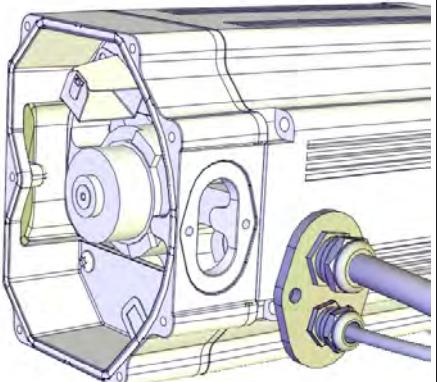
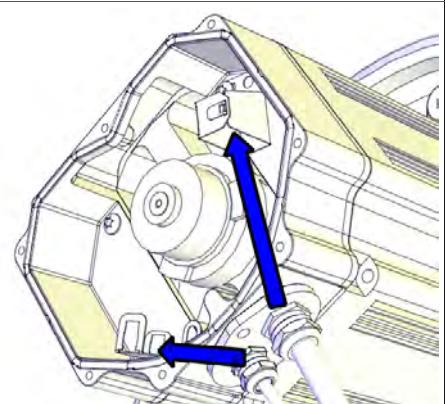
	Action	Note
4	Fit the rotation tool.	Rotation tool: 3HAB7887-1
5	In order to release the brakes, connect the 24 VDC power supply. To release the brakes, connect the 24 VDC power supply as described in the list. Connect to R2.MP1-connector: <ul style="list-style-type: none">• + = pin 2• - = pin 5	
6	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
7	Lower the motor into position. <ul style="list-style-type: none">• Make sure that the motor pinion is properly mated to the gear in the gearbox.• Make sure that the motor pinion does not get damaged.• Make sure that the direction of the cable exit is facing the correct way.	 xx1200001072
8	Secure the motor with its attachment screws and washers. Use a bits extender to reach the screws.	Bits extender: 3HAC12342-1 Tightening torque: 50 Nm. Screw dimension : M10x40 quality 12.9 Gleitmo (4 pcs)  xx1200001071

Continues on next page

4.7.1 Replacing the axis-1 motor Continued

	Action	Note
9	Perform a leak-down test (if not already done).	See Performing a leak-down test on page 196 .
10	Disconnect the 24 VDC power supply.	

Connecting the motor cables

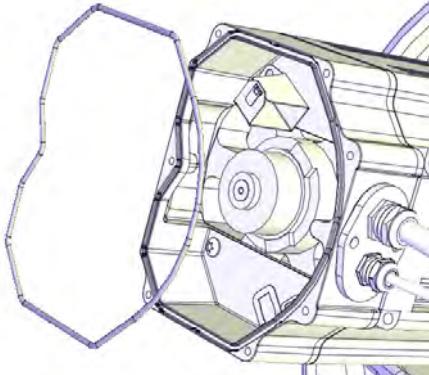
	Action	Note
1	Push the motor cables in through the cable gland opening.	 xx1300000738
2	Refit the cable gland cover.  Note Replace the gasket if damaged.	 xx1200001067
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066

Continues on next page

4 Repair

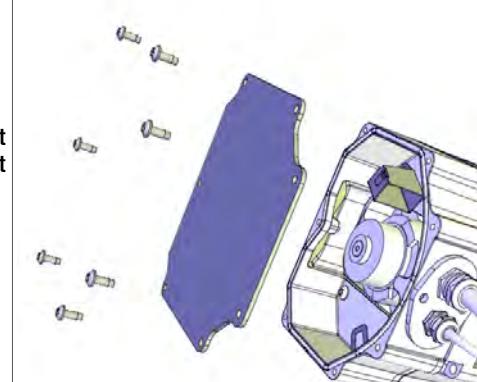
4.7.1 Replacing the axis-1 motor

Continued

Action	Note
4 Inspect the o-ring.  Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)
	 xx1200001070
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

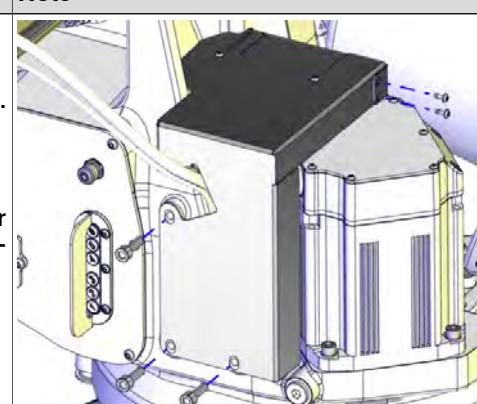
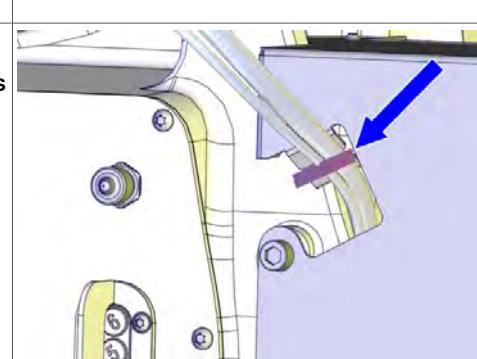
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4.7.1 Replacing the axis-1 motor Continued

	Action	Note
8	<p>Refit the motor cover with its attachment screws.</p> <p>Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	
9	Make sure that the covers are tightly sealed.	

Concluding procedure

Use this procedure for the concluding refitting.

	Action	Note
1	<p>Foundry Plus: Refit the protection plates with three M10x30 and two M5x12 attachment screws.</p> <p>Note Make sure that the axis-1 and axis-2 motor cables are run through the hole in the protection plates correctly.</p>	
2	<p>Foundry Plus: Secure the axis-1 and axis-2 motor cables with a cable tie.</p>	

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4 Repair

4.7.1 Replacing the axis-1 motor

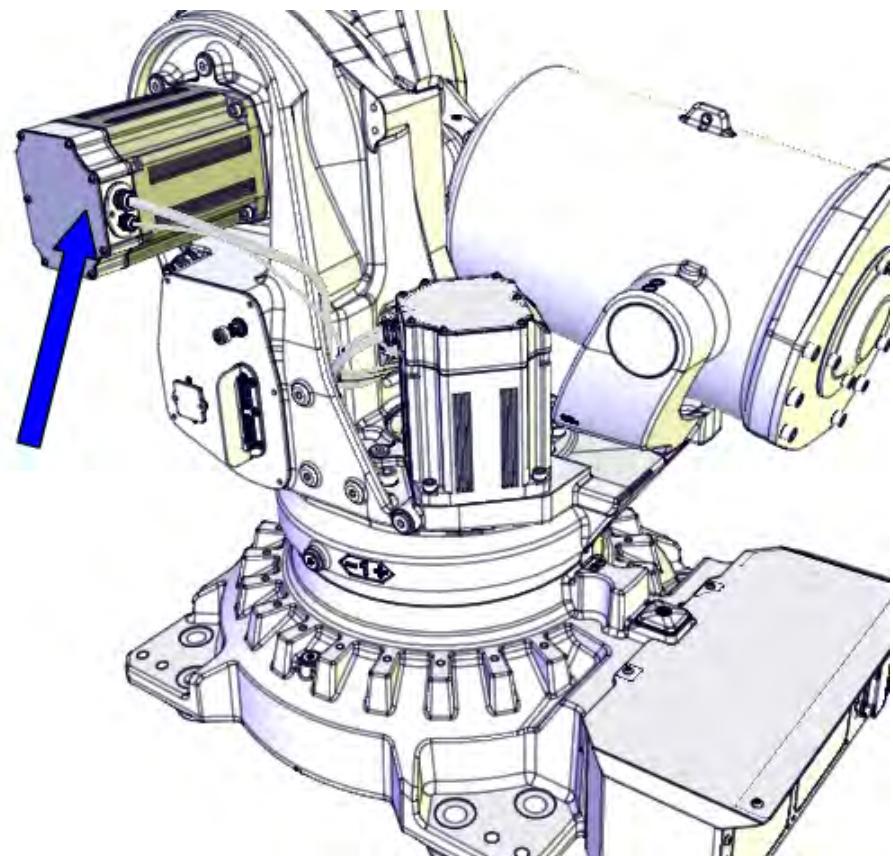
Continued

Action	Note
3 Re-calibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
4  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

4.7.2 Replacing the axis-2 motor

Location of the motor

The motor is located as shown in the figure.



xx1200001112

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Attach the lifting tools
- 2 Remove the motor
- 3 Refit the motor
- 4 Remove the lifting tools.

Spare parts

Spare part	Spare part number	Note
Axis-2 motor	See <i>Product manual, spare parts - IRB 6700</i> .	

Continues on next page

4 Repair

4.7.2 Replacing the axis-2 motor

Continued

Required tools and equipment

Equipment, etc.	Article number	Note
Lifting accessory, motor	3HAC15534-1	Lifting instruction 3HAC15640-2 enclosed.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Removal tool M12	3HAC057339-003	Used to push out the motor, if necessary. Always use removal tools in pairs.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs!
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Lock screw, M16x120	-	Used to secure lower arm.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Article number	Note
Grease	3HAB3537-1	Shell Gadus S2V220 AC Used to lubricate o-rings.
Rust preventive	3HAC034903-001	Mercasol. Recommended drying time is 24h.
O-ring ⁱ	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on motor cover.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

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	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor

These procedures describes how to remove the motor.

Preparations before removing the axis-2 motor

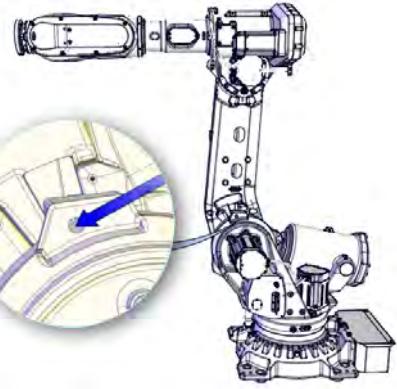
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Drain the oil from the gearbox.	See Draining the axis-2 gearbox on page 165 .
3	Jog the robot to the calibration position.	
4	 DANGER Secure the weight of the lower arm with a lock screw, before releasing the brakes on the axis-2 motor as well as before removing the axis-2 motor or the axis-2 gearbox.	

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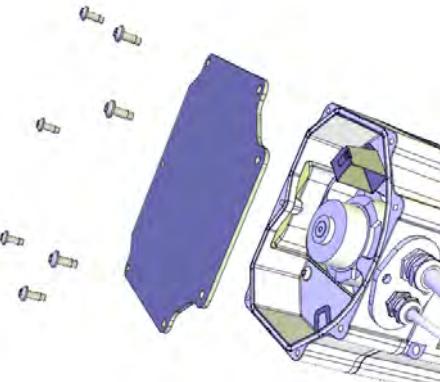
4 Repair

4.7.2 Replacing the axis-2 motor

Continued

Action	Note
<p>5 Insert the lock screw into the frame. If needed, adjust the position of axis-2 to make it possible to insert the lock screw. The lock screw is used to secure the weight of the lower arm, in order to avoid accidents or damage.</p> <p> Note</p> <p>Tighten the lock screw manually, no tools needed.</p>	<p>Lock screw, M16x120</p>  <p>xx1200001116</p>
<p>6  DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
7 Remove any equipment hindering access to the motor.	

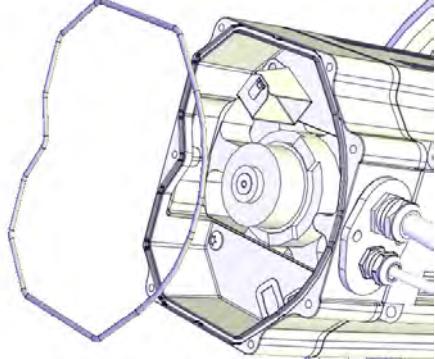
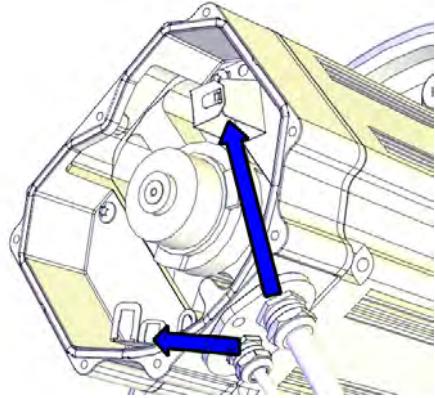
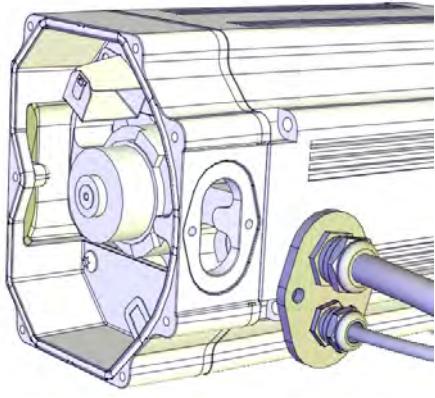
Disconnecting the motor cables

Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2 Unscrew the attachment screws and washers and remove the motor cover.	 <p>xx1200001135</p>

Continues on next page

4.7.2 Replacing the axis-2 motor

Continued

Action	Note
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066
5 Remove the cable gland cover. Make sure the gasket is not damaged.  Tip Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.	 xx1200001067
6 Use caution and pull out the motor cables.	

Removing the axis-2 motor

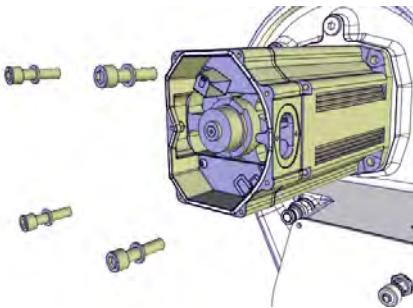
Action	Note
1 Before removing the motor, make sure that the axis-2 gearbox is completely drained.	

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4 Repair

4.7.2 Replacing the axis-2 motor

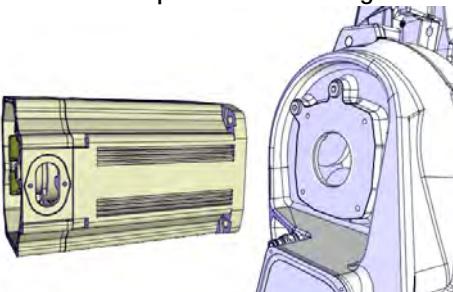
Continued

	Action	Note
2	 DANGER When releasing the holding brakes of the motor, the lower arm will be movable and may fall down. Secure the lower arm before continuing.	
3	To release the brake, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
4	Remove the attachment screws securing the motor. Use a bits extender in order to reach the screws.	Bits extender: 3HAC12342-1  xx1200001117
5	Fit guide pins in opposite holes.  Tip Lubricate the guide pins with some grease to make the motor slide better.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
6	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
7	If required, press the motor out of its position by using the removal tool in opposite holes of the motor.	Removal tool M12: 3HAC057339-003 Always use removal tools in pairs.
8	Disconnect the 24 VDC power supply.	
9	 CAUTION The motor weighs 28 kg. All lifting accessories used must be sized accordingly.	
10	Carefully lift the motor out on the guide pins, in order to get the pinion away from the gear and let it rest on the guide pins.	

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4.7.2 Replacing the axis-2 motor

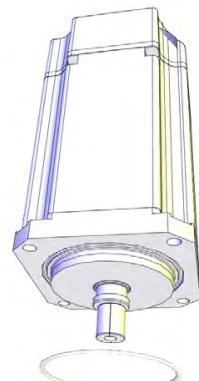
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Action	Note
11 Fasten the lifting accessory. Attach the lifting chain to the accessory and an overhead crane.	Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1
12 Remove the motor by sliding it out on the guide pins and lift it off.	Make sure the pinion is not damaged.  xx1200001118

Refitting the motor

These procedures describes how to refit the motor.

Preparations prior to refitting motor

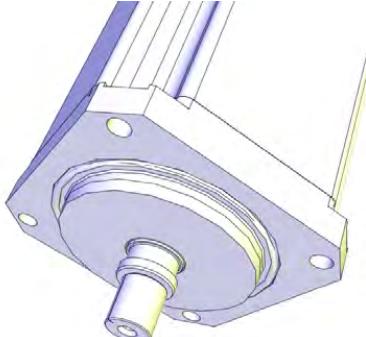
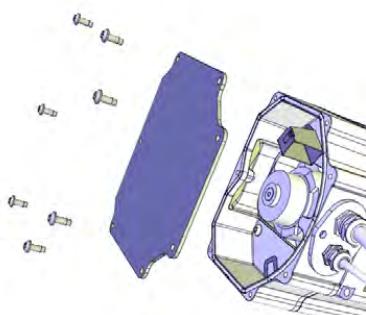
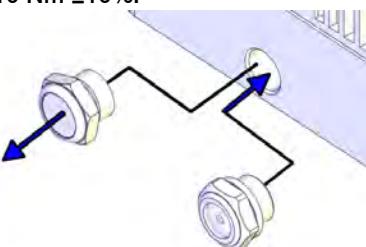
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	
3 Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	
4 Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019

Continues on next page

4 Repair

4.7.2 Replacing the axis-2 motor

Continued

Action	Note
<p>5 Make sure the o-ring is seated in the groove.</p> <p> Tip</p> <p>Lubricate the o-ring with some grease for a better fitting in the groove.</p>	 xx1200001020
<p>6 If the motor is a new spare part, remove the cover.</p>	 xx1200001135
<p>7 Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.</p>	<p>Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.</p>  xx1600000576

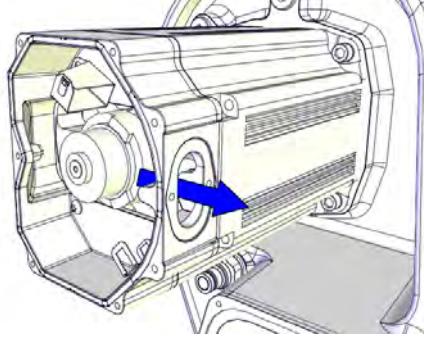
Securing the axis-2 motor

Action	Note
1 Fit guide pins in opposite holes.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
2  CAUTION The motor weighs 28 kg. All lifting accessories used must be sized accordingly.	
3 Apply the lifting accessory.	Lifting accessory, motor: 3HAC15534-1

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4.7.2 Replacing the axis-2 motor

Continued

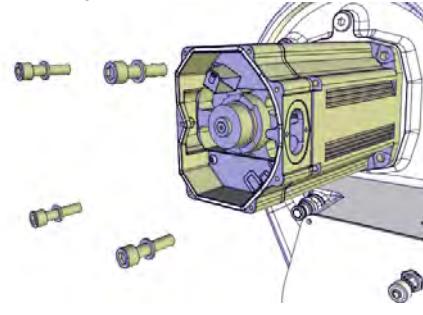
	Action	Note
4	 Note Make sure the cable exit hole is turned the correct way.	 xx1200001120
5	Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.	
6	Remove the lifting accessory and allow the motor to rest on the guide pins.	
7	Apply the rotation tool and use it to rotate the pinion when mating it into the gear.	Rotation tool: 3HAB7887-1
8	To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
9	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
10	Use caution and fit the motor in its final position while at the same time rotating the motor pinion slightly using the rotation tool. <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear of the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	
11	Fit two of the attachment screws.	Screw dimension: M10x40 quality 12.9 Gleitmo (4 pcs)
12	Remove the guide pins and replace with the remaining attachment screws.	

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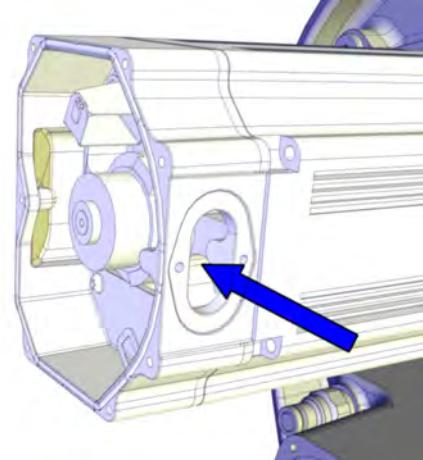
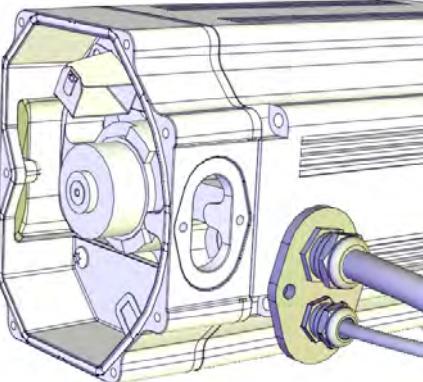
4 Repair

4.7.2 Replacing the axis-2 motor

Continued

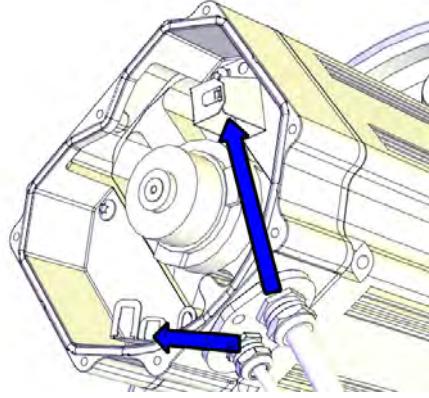
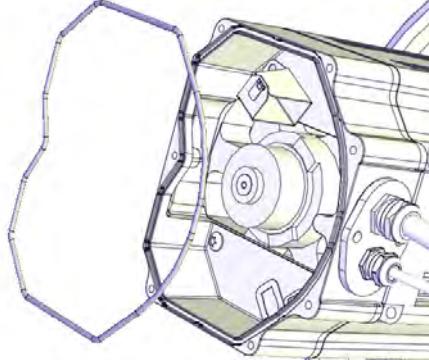
Action	Note
13 Secure the motor with its attachment screws and washers. Use a bits extender in order to reach the screws.	Bits extender: 3HAC12342-1 Tightening torque: 50 Nm. Screw dimension: M10x40 quality 12.9 Gleitmo (4 pcs)  xx1200001117
14 Perform a leak-down test.	See Performing a leak-down test on page 196 .

Connecting the motor cables

Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738
2 Refit the cable gland cover.  Note Replace the gasket if damaged.	 xx1200001067

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4.7.2 Replacing the axis-2 motor Continued

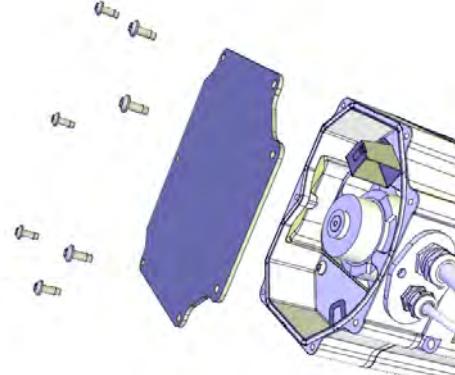
	Action	Note
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066
4	Inspect the o-ring.  Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)
5	Wipe clean o-ring and o-ring groove.	 xx1200001070
6	Refit the o-ring.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7	 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

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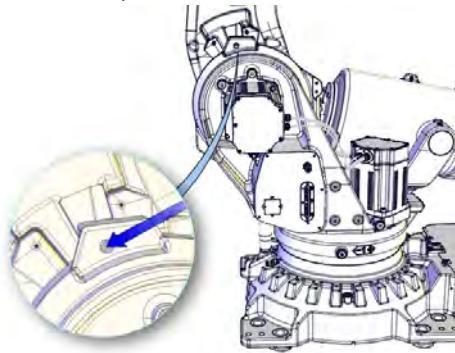
4 Repair

4.7.2 Replacing the axis-2 motor

Continued

Action	Note
8 Refit the motor cover with its attachment screws.  Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.  Note Make sure the o-ring is undamaged and properly fitted.	 xx1200001135
9 Make sure that the covers are tightly sealed.	

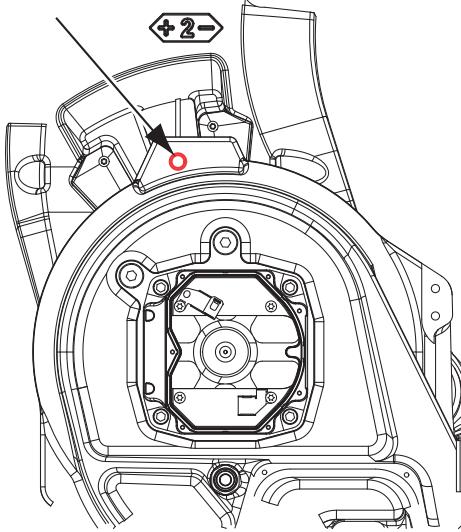
Concluding procedure

Action	Note
1 Use caution and jog axis-2 a little to facilitate the removal of the lock screw.	
2 Remove the lock screw securing the lower arm.	Lock screw, M16x120  xx1200001115

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4.7.2 Replacing the axis-2 motor

Continued

Action	Note
3 <i>Foundry Plus:</i> Apply Mercasol in the hole for the lock screw.	
4 Refill the gearbox with oil.	See Filling oil into the axis-2 gearbox on page 166 .
5 Re-calibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
6  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in the section DANGER - First test run may cause injury or damage! on page 48 .	

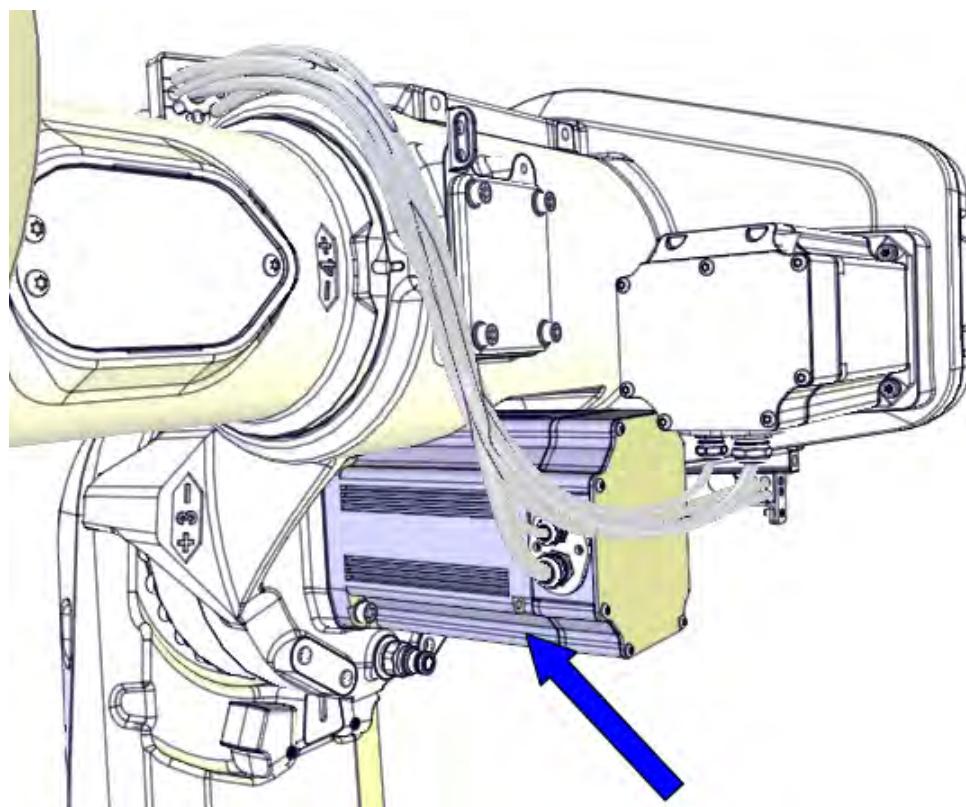
4 Repair

4.7.3 Replacing the axis-3 motor

4.7.3 Replacing the axis-3 motor

Location of the axis-3 motor

The axis-3 motor is located as shown in the figure.



Spare part

Spare part	Spare part number	Note
Axis-3 motor	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Lifting accessory, motor	3HAC15534-1	Lifting instruction 3HAC15640-2 enclosed.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Removal tool M12	3HAC057339-003	Used to push out the motor, if necessary. Always use removal tools in pairs.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs!
Bits extender	3HAC12342-1	300 mm, bits 1/2"

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4.7.3 Replacing the axis-3 motor

Continued

Equipment, etc.	Article number	Note
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Article number	Note
Grease	3HAB3537-1	Shell Gadus S2V220 AC Used to lubricate o-rings.
O-ring ⁱ	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on motor cover.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .

Continues on next page

4 Repair

4.7.3 Replacing the axis-3 motor

Continued

Action	Note
If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor

These procedures describes how to remove the motor.

Preparations before removing the axis-3 motor

Use this procedure to do the necessary preparations before removing the motor.

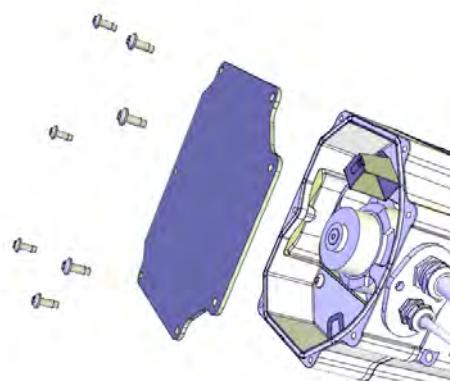
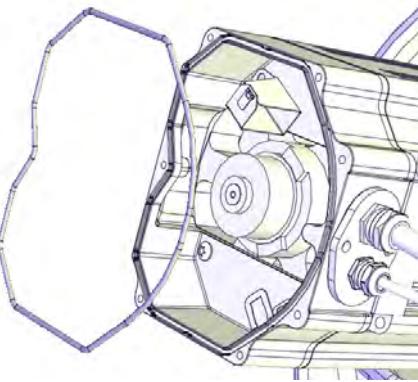
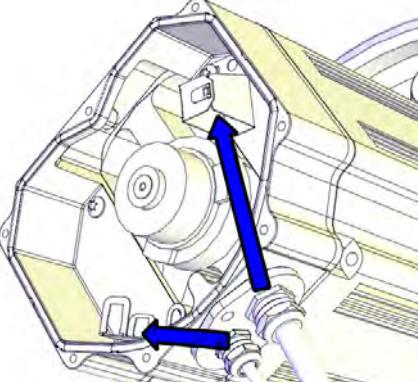
Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 Drain the axis-3 gearbox.	See Draining the axis-3 gearbox on page 170 .
3 Unload the upper arm using one of these methods: <ul style="list-style-type: none">• Use caution and jog axis-3 to maximum + position. Release the brakes and let the upper arm rest against the axis-3 damper.• Use a fork lift to rest the upper arm onto.• Use lifting slings and an overhead crane to rest the upper arm onto.	
4  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
5 Remove any equipment hindering access to the motor.	

Disconnecting the motor cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4.7.3 Replacing the axis-3 motor
Continued

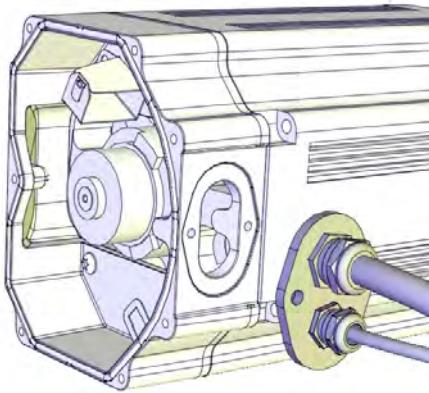
Action	Note
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066

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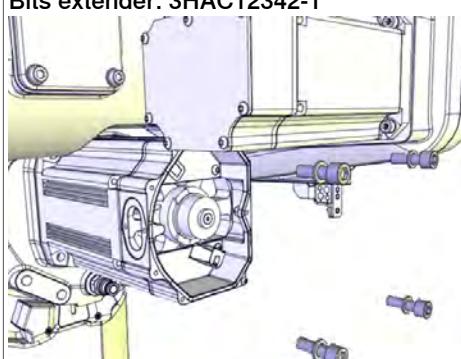
4 Repair

4.7.3 Replacing the axis-3 motor

Continued

Action	Note
<p>5 Remove the cable gland cover. Make sure the gasket is not damaged.</p> <p> Tip</p> <p>Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1200001067
6 Use caution and pull out the motor cables.	

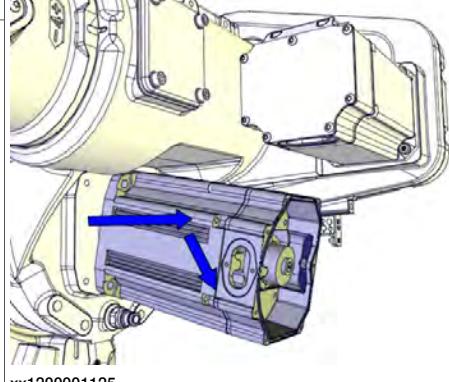
Removing the axis-3 motor

Action	Note
1 Before removing the motor, make sure that the axis-3 gearbox is completely drained.	
<p>2  DANGER</p> <p>When releasing the holding brakes of the motor, the upper arm will be movable and may fall down! Before continuing the weight of the upper arm must be secured!</p>	
<p>3 To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP3:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
<p>4 Unscrew the attachment screws that hold the motor. Use a bits extender to reach the screws.</p>	 Bits extender: 3HAC12342-1 xx1200001126

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4.7.3 Replacing the axis-3 motor

Continued

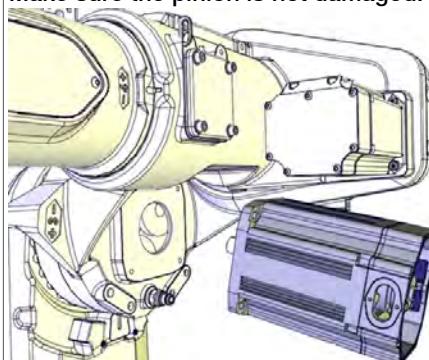
Action	Note
5 Fit guide pins in opposite holes. Tip Lubricate the guide pins with some grease to make the motor slide better.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
6 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
7 If required, press the motor out of position by using the removal tool in the remaining holes for the motor.	Removal tool M12: 3HAC057339-003 Always use removal tools in pairs.
8 Use caution and lift the motor out on the guide pins, in order to get the pinion away from the gear, and let the motor rest on the guide pins.	
9 CAUTION The motor weighs 26 kg. All lifting accessories used must be sized accordingly.	
10 Fasten the lifting accessory to the motor. Attach the lifting chain to the accessory and an overhead crane.	Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1
11 When the motor is hanging in the lifting accessory, and the pinion no longer is mated to the gear, let the outer end of the motor hang lower so that it will hang in an angle. This position makes it easier to remove the axis-3 motor with the axis-4 motor still fitted. CAUTION The pinion must have been parted from the gear before the motor is angled. If not there is a risk of damaging the pinion and gear.	 xx1200001125
12 Disconnect the 24 VDC power supply.	

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4 Repair

4.7.3 Replacing the axis-3 motor

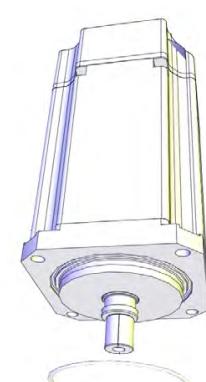
Continued

Action	Note
13 Remove the motor by lifting it straight out.	Make sure the pinion is not damaged.  xx1200001131

Refitting the motor

These procedures describes how to refit the motor.

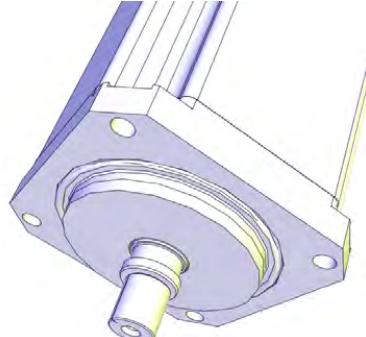
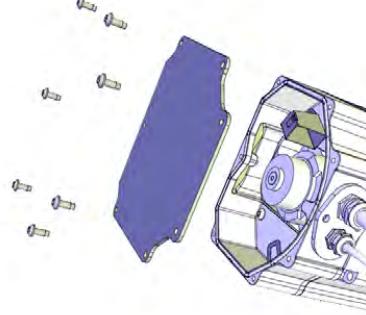
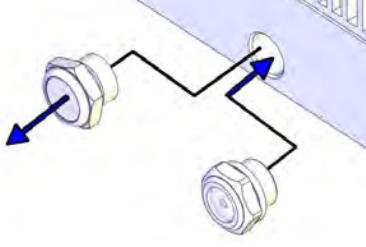
Preparations prior to refitting motor

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	
3 Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	
4 Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019

Continues on next page

4.7.3 Replacing the axis-3 motor

Continued

	Action	Note
5	<p>Make sure the o-ring is seated in the groove.</p> <p> Tip</p> <p>Lubricate the o-ring with some grease for a better fitting in the groove.</p>	 xx1200001020
6	If the motor is a new spare part, remove the cover.	 xx1200001135
7	<p>Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.</p>	<p>Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.</p>  xx1600000576

Securing the axis-3 motor

Use this procedure to secure the motor.

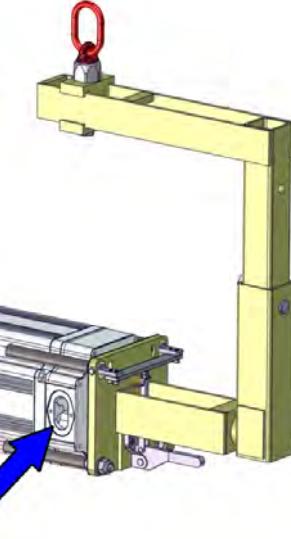
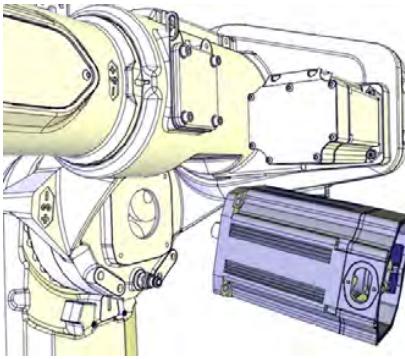
	Action	Note
1	Fit guide pins in opposite holes.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
2	<p> CAUTION</p> <p>The motor weighs 26 kg. All lifting accessories used must be sized accordingly.</p>	

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4 Repair

4.7.3 Replacing the axis-3 motor

Continued

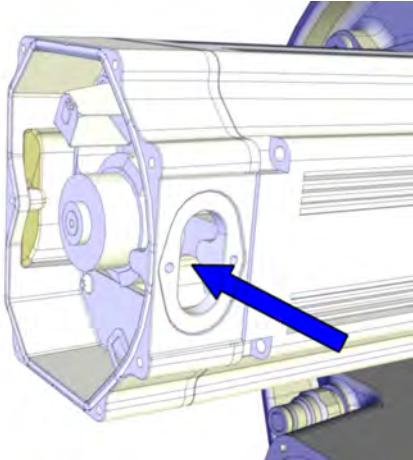
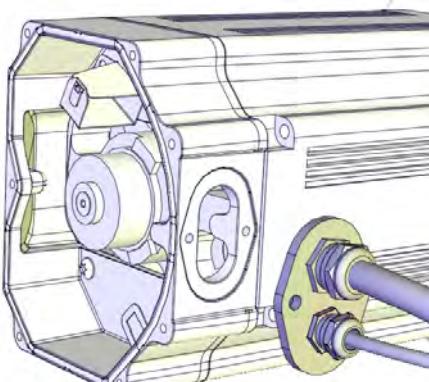
	Action	Note
3	<p>Apply the lifting accessories to the motor.</p> <p> Note</p> <p>Make sure the cable exit hole is turned according to figure.</p>	<p>Lifting accessory, motor: 3HAC15534-1</p>  <p>xx1700000273</p>
4	<p>Lift the motor on to the guide pins and let it hang with the outer end a little lower when resting on the guide pins. Do not push the motor pinion into the gear yet!</p> <p>This is done in order to fit the motor with the axis-4 motor still fitted.</p>	 <p>xx1200001131</p>
5	Remove the lifting accessory and allow the motor to rest on the guide pins.	
6	Apply the rotation tool and use it to rotate the pinion when mating it into the gear.	Rotation tool: 3HAB7887-1
7	<p>To release the brakes, connect the 24 VDC power supply.</p> <p>Connect to connector R2.MP3:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
8	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	

Continues on next page

4.7.3 Replacing the axis-3 motor Continued

Action	Note
9 Use caution and push the motor in position while at the same time the motor pinion is slightly rotated. Pay attention to following points: <ul style="list-style-type: none">• Mate the motor pinion properly to the gear of the gearbox.• Do not damage the motor pinion!	
10 Fit two of the attachment screws. Screw dimension: M10x30 quality 12.9 Gleitmo (2 pcs)	
11 Remove the guide pins.	
12 Fit the remaining attachment screws. Screw dimension: M10x30 quality 12.9 Gleitmo (2 pcs)	
13 Tighten the screws. Tightening torque: 50 Nm	
14 Remove the rotation tool.	
15 Perform a leak-down test. See Performing a leak-down test on page 196 .	
16 Disconnect the 24 VDC power supply.	

Connecting the motor cables

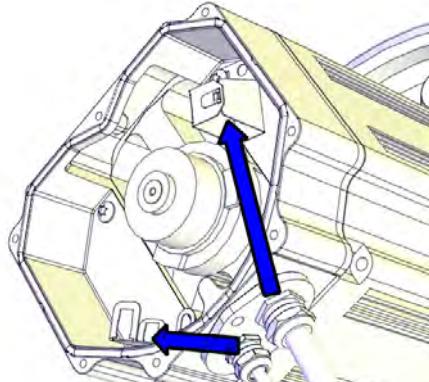
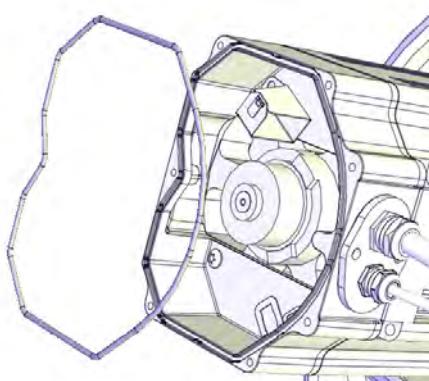
Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738
2 Refit the cable gland cover. Note Replace the gasket if damaged.	 xx1200001067

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4 Repair

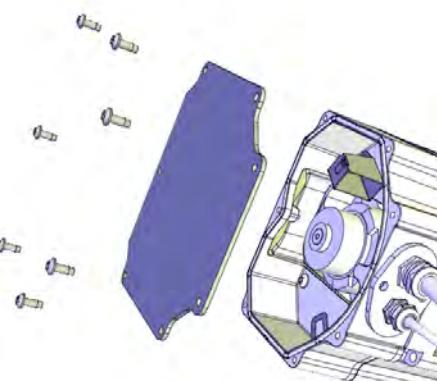
4.7.3 Replacing the axis-3 motor

Continued

Action	Note
3 Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066
4 Inspect the o-ring.  Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)  xx1200001070
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

Continues on next page

4.7.3 Replacing the axis-3 motor Continued

Action	Note
<p>8 Refit the motor cover with its attachment screws.</p> <p>Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001135
9 Make sure that the covers are tightly sealed.	

Concluding procedure

Use this procedure for the concluding refitting.

Action	Note
1 Remove the equipment used to unload the upper arm.	
2 Refill the gearbox with oil.	See Filling oil into the axis-3 gearbox on page 172 .
3 Re-calibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
4  DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

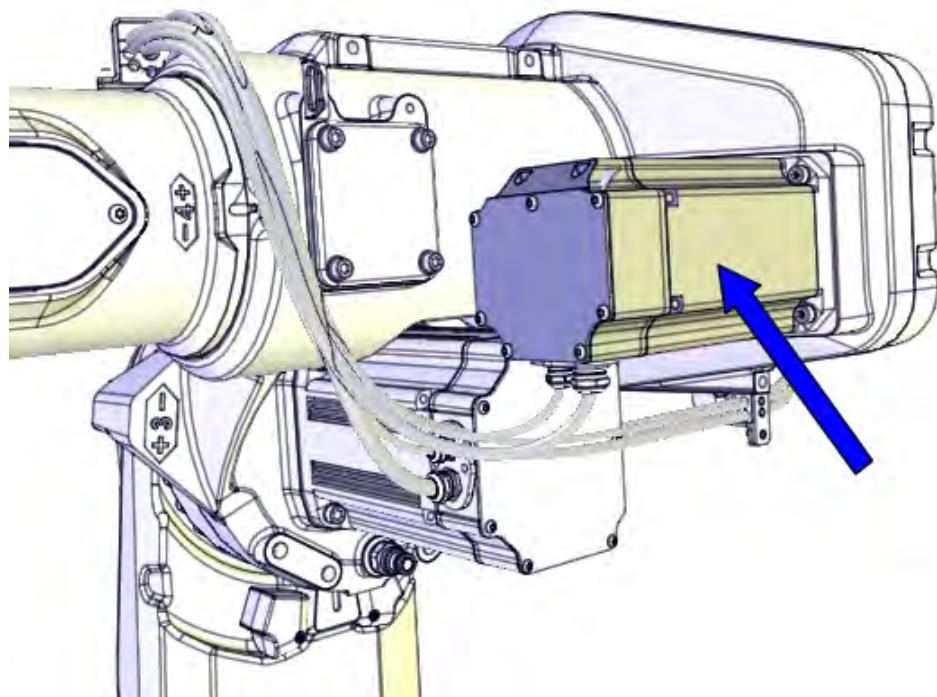
4 Repair

4.7.4 Replacing the axis-4 motor

4.7.4 Replacing the axis-4 motor

Location of the axis-4 motor

The axis-4 motor is located as shown in the figure.



xx1200001114

Spare parts

Spare part	Spare part number	Note
Axis-4 motor	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Removal tool M12	3HAC057339-003	Used to push out the motor, if necessary. Always use removal tools in pairs.
Guide pin, M8x150	3HAC15520-2	Always use guide pins in pairs!
Long AllenKeySocketIN19L 6-140	-	Length: 140 mm.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Leak-down tester	-	

Continues on next page

Equipment, etc.	Article number	Note
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Article number	Note
Grease	3HAB3537-1	Shell Gadus S2V220 AC Used to lubricate o-rings.
O-ring ⁱ	3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)	D=119x3 Used on motor cover.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Continues on next page

4 Repair

4.7.4 Replacing the axis-4 motor

Continued

Removing the motor

These procedures describes how to remove the motor.

Preparations before removing the axis-4 motor

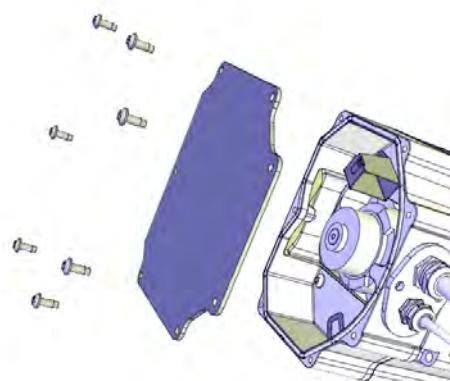
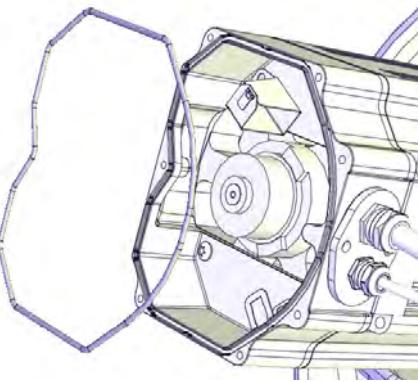
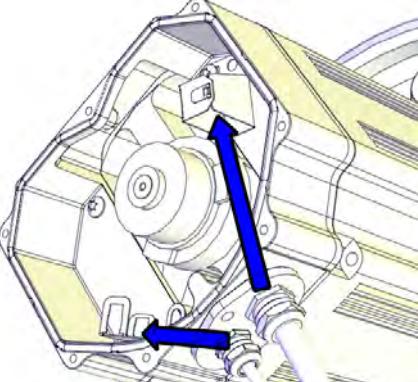
Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 Jog the robot into position: <ul style="list-style-type: none">• axis 1 = no significance.• axis 2 = -65°• axis 3 = upper arm pointing straight up (if possible). <p>With the robot in this position, there is no need to drain oil from the axis-4 gearbox when the motor is replaced.</p>	
3 If there is no space to position the upper arm pointed straight up, drain the axis-4 gearbox.	
4  DANGER <p>Turn off all:<ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supplyto the robot, before entering the robot working area.</p>	

Disconnecting the motor cables

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

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4.7.4 Replacing the axis-4 motor
Continued

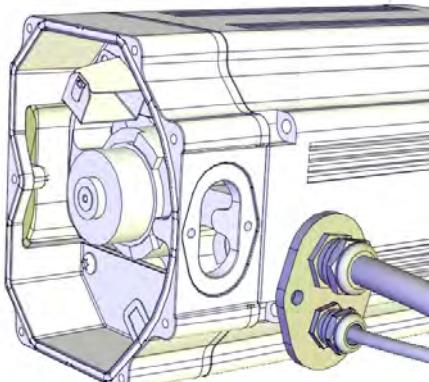
Action	Note
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066

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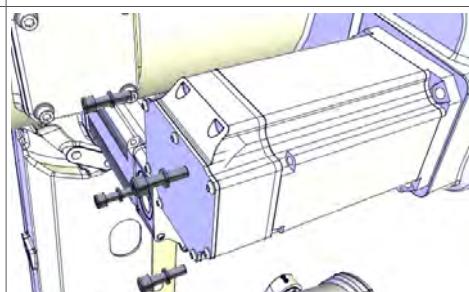
4 Repair

4.7.4 Replacing the axis-4 motor

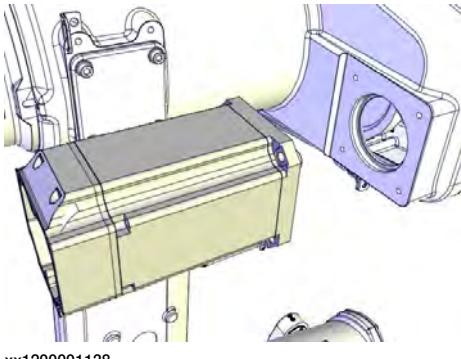
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Action	Note
<p>5 Remove the cable gland cover. Make sure the gasket is not damaged.</p> <p> Tip</p> <p>Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1200001067
6 Use caution and pull out the motor cables.	

Removing the axis-4 motor

Action	Note
<p>1  CAUTION</p> <p>Use caution when releasing the brakes! Axis-4 can move unexpectedly!</p>	
<p>2 To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP4:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
<p>3 Unscrew the attachment screws that secure the motor.</p>	 xx1200001137
<p>4 Apply two guide pins in opposite holes.</p>	Guide pin, M8x150: 3HAC15520-2 Always use guide pins in pairs!
<p>5  CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	
<p>6 Press the motor out of position by fitting the removal tool in the remaining attachment holes for the motor.</p>	Removal tool M12: 3HAC057339-003 Always use removal tools in pairs.

Continues on next page

Action	Note
7  CAUTION The motor weighs 13 kg. All lifting accessories used must be sized accordingly.	
8 Disconnect the 24 VDC power supply.	
9 Remove the motor by carefully lifting it straight out/straight up (if the upper arm points upwards). Make sure the pinion is not damaged.	

Refitting the motor

These procedures describes how to refit the motor.

Preparations prior to refitting motor

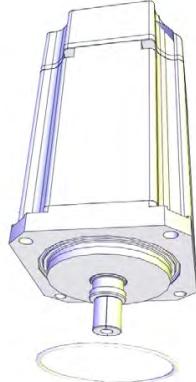
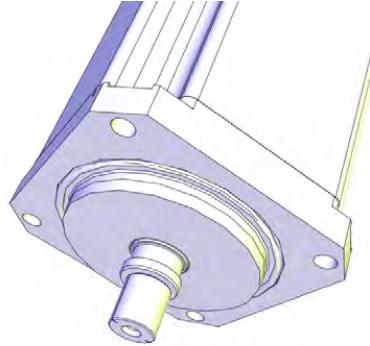
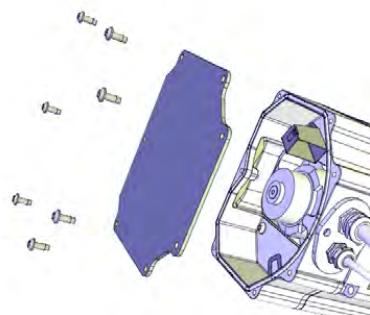
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	
3 Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	

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4 Repair

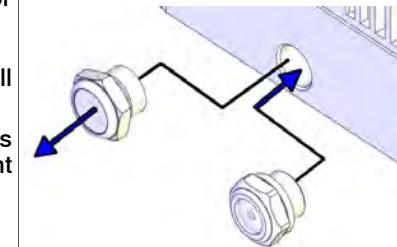
4.7.4 Replacing the axis-4 motor

Continued

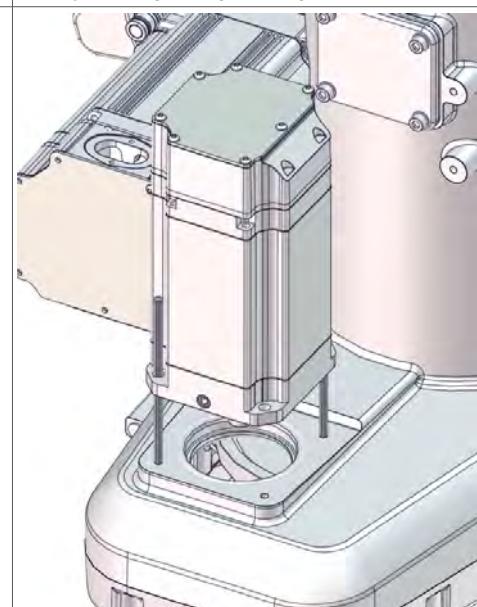
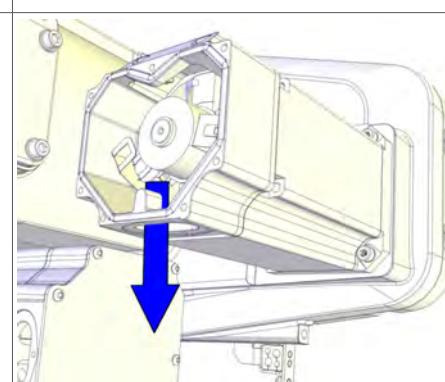
	Action	Note
4	Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019
5	Make sure the o-ring is seated in the groove.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	 xx1200001020
6	If the motor is a new spare part, remove the cover.	 xx1200001135

Continues on next page

4.7.4 Replacing the axis-4 motor Continued

	Action	Note
7	<p>Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.</p>	<p>Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.</p>  <p>xx1600000576</p>

Securing the axis-4 motor

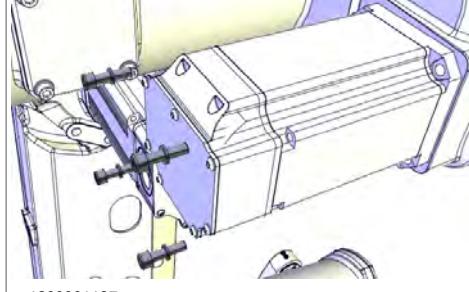
	Action	Note
1	Apply two guide pins in opposite holes.	Guide pin, M8x150: 3HAC15520-2 Always use guide pins in pairs!
2	Put the motor onto the guide pins.	
3	<p> Note Make sure the cable gland opening is turned the correct way.</p>	

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4 Repair

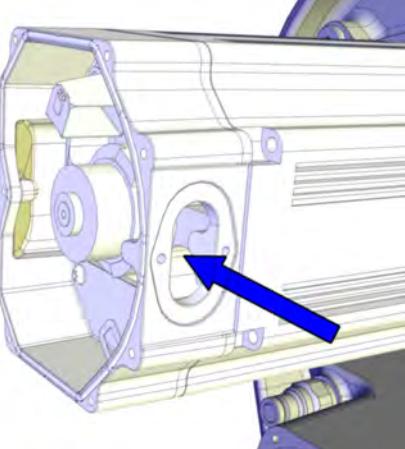
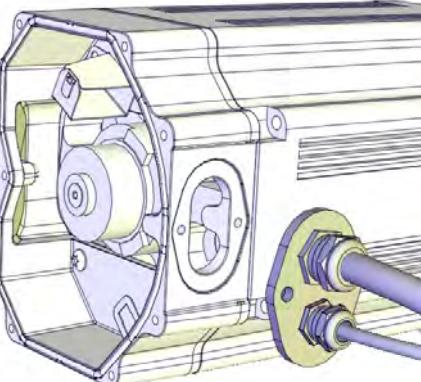
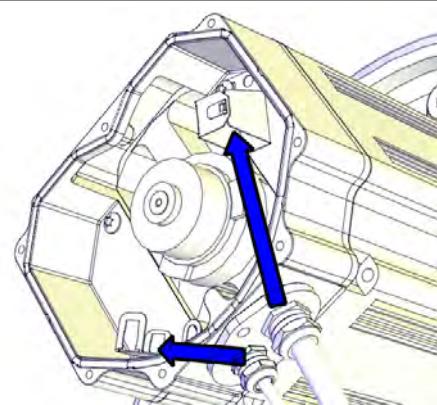
4.7.4 Replacing the axis-4 motor

Continued

	Action	Note
4	 CAUTION The motor weighs 13 kg. All lifting accessories used must be sized accordingly.	
5	Apply the <i>rotation tool</i> and use it to rotate the pinion when mating it into the gear. This requires two persons co-operating, if the motor is installed from above (if the upper arm is pointing upwards).	Rotation tool: 3HAB7887-1
6	To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP2: • + = pin 2 • - = pin 5	
7	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
8	Push the motor carefully in position while at the same time rotating the motor pinion slightly. <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear of the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable gland is facing the correct way. 	
9	Remove the guide pins.	
10	Secure the motor with its attachment screws and washers.	Tightening torque: 35 Nm. Screw dimension: M8x30 quality 12.9 Gleitmo (4 pcs)  xx1200001137
11	Perform a leak-down test.	See Performing a leak-down test on page 196 .
12	Disconnect the 24 VDC power supply.	

Continues on next page

Connecting the motor cables

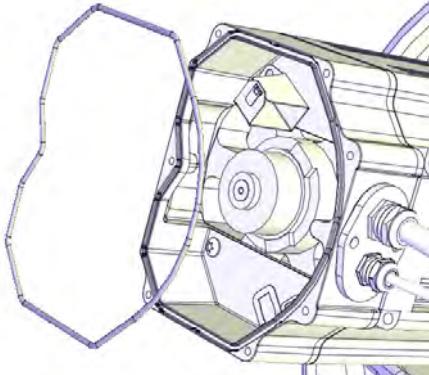
	Action	Note
1	Push the motor cables in through the cable gland opening.	 xx1300000738
2	Refit the cable gland cover. Note Replace the gasket if damaged.	 xx1200001067
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066

Continues on next page

4 Repair

4.7.4 Replacing the axis-4 motor

Continued

Action	Note
4 Inspect the o-ring.  Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)
	 xx1200001070
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

Continues on next page

4.7.4 Replacing the axis-4 motor Continued

	Action	Note
8	<p>Refit the motor cover with its attachment screws.</p> <p>Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	<p>xx1200001135</p>
9	Make sure that the covers are tightly sealed.	

Concluding procedure

	Action	Note
1	Refill the gearbox with oil, if gearbox has been drained.	See Filling oil into the axis-4 gearbox on page 177 .
2	Re-calibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
3	 DANGER <p>Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48.</p>	

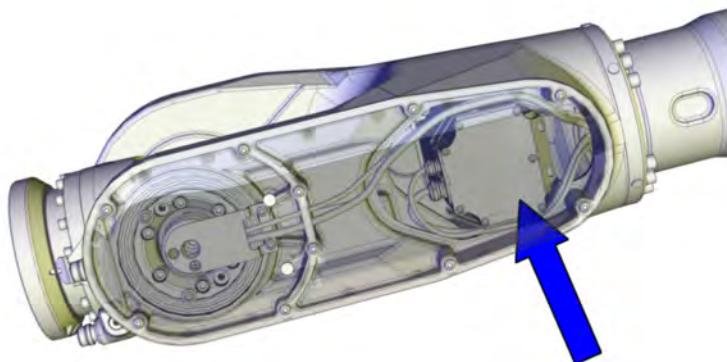
4 Repair

4.7.5 Replacing the axis-5 motor

4.7.5 Replacing the axis-5 motor

Location of the axis-5 motor

The axis-5 motor is located inside the wrist, as shown in the figure.



xx1500001899

Spare part

Spare part	Spare part number	Note
Axis-5 motor	See <i>Product manual, spare parts - IRB 6700</i> .	
Heat protection plate (2 pcs required)	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools

Equipment, etc.	Article number	Note
Removal tool M12	3HAC057339-003	Used to push out the motor, if necessary. Always use removal tools in pairs.
Long AllenKeySocketIN19L 6-140	-	Length: 140 mm.
Guide pin, M8x100	3HAC15520-1	Always use guide pins in pairs!
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Continues on next page

Consumables

Equipment, etc.	Article number	Note
Grease	3HAB3537-1	Shell Gadus S2V220 AC Used to lubricate o-rings.
O-ring ⁱ	3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)	D=119x3 Used on motor cover.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the axis-5 motor

Use these procedures to remove the motor.

Preparations before removing the axis-5 motor

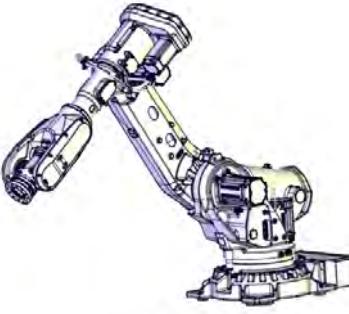
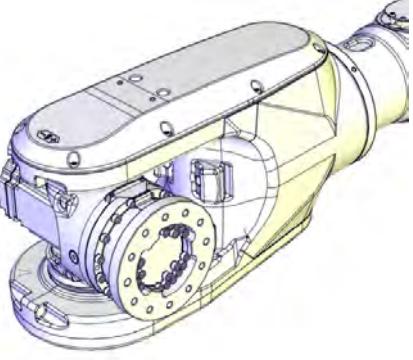
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

Continues on next page

4 Repair

4.7.5 Replacing the axis-5 motor

Continued

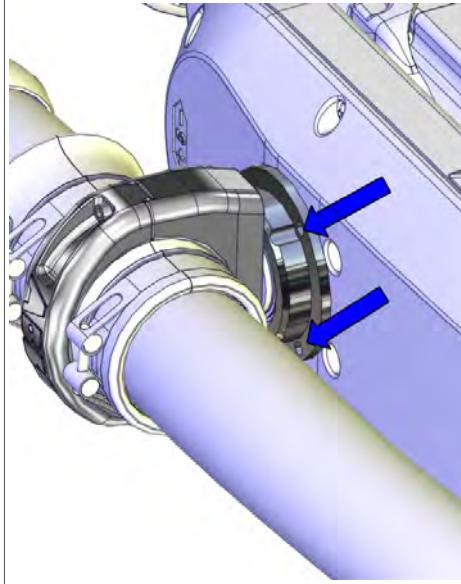
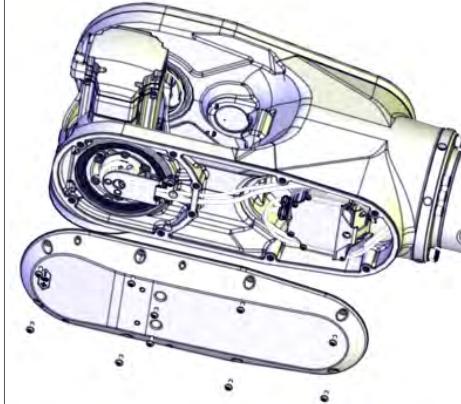
Action	Note
2 Jog the robot to this position: <ul style="list-style-type: none"> • Axis 2: +25° • Axis 3: +35° 	 xx1200001005
3 Jog axis 4 to this position: <ul style="list-style-type: none"> • Axis 4: +90° 	With the robot in this position, there is no need to drain oil from the axis-5 gearbox when the motor is replaced.  xx1400000719
4  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
5 If DressPack is used: Remove the complete ball joint housing, with DressPack still fitted, from the bracket on the wrist cover. This is done in order to reach the two hidden attachment screws that hold the cover.	
6 Remove the bracket from the wrist cover.	

Continues on next page

4.7.5 Replacing the axis-5 motor Continued

Retrieving access to the wrist cabling

Use this procedure to remove the wrist cover to retrieve access to the axis-5 and axis-6 motor cables.

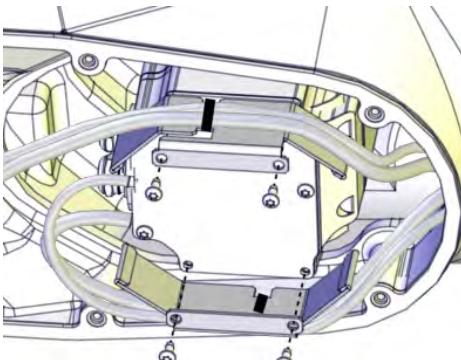
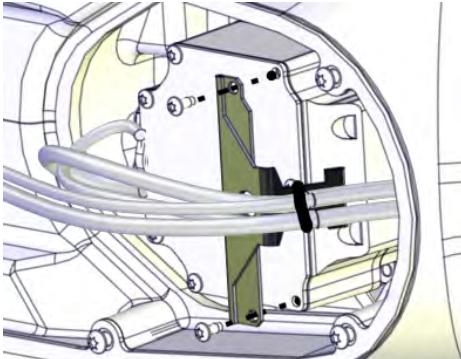
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 If DressPack is not already removed, the complete ball joint housing (including the bracket) must be removed at this point, in order to reach the two hidden screws that secures the wrist cover.	 xx1400000355
3 Remove the wrist cover.	 xx1300002247

Continues on next page

4 Repair

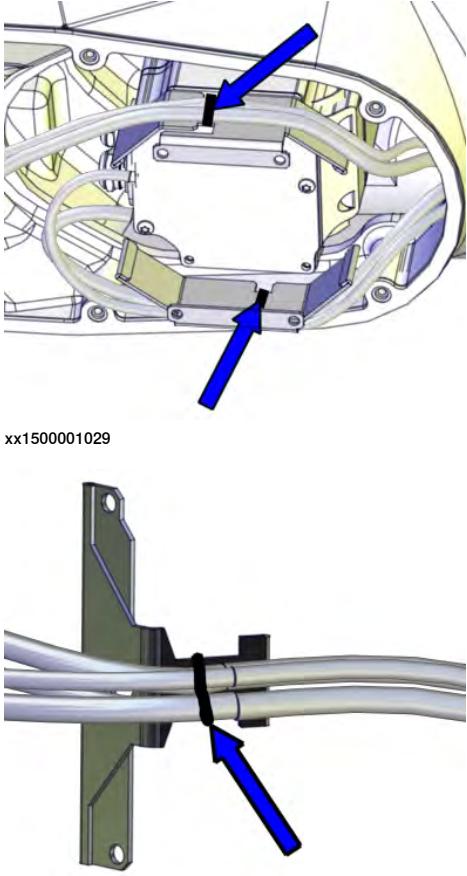
4.7.5 Replacing the axis-5 motor

Continued

Action	Note
4 Remove the heat protection plate/plates from the motor with the cabling still attached to the plate. Remove the heat protection plates from the motor with the cabling still attached to the plate.	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001030</p>  <p>xx1300000490</p>

Continues on next page

4.7.5 Replacing the axis-5 motor Continued

Action	Note
<p>5 Cut the cable ties that hold the cable harness to the plate.</p> <p>Note Keep the heat protection plate until refitting.</p> <p>Tip If removing the plate only for replacing the motor, the cabling does not need to be loosened from the plate.</p>	<p>Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001029</p> <p>xx1300000489</p>

Disconnecting the motor cables

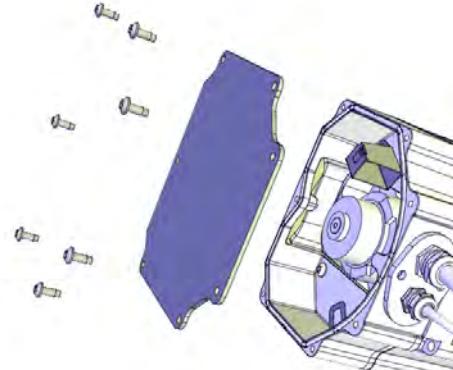
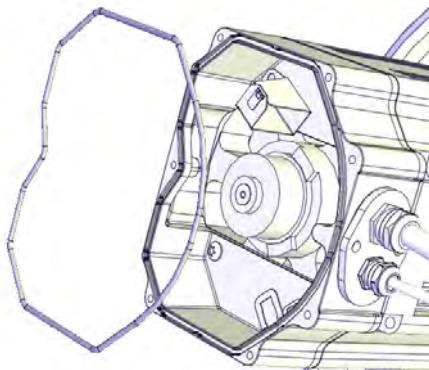
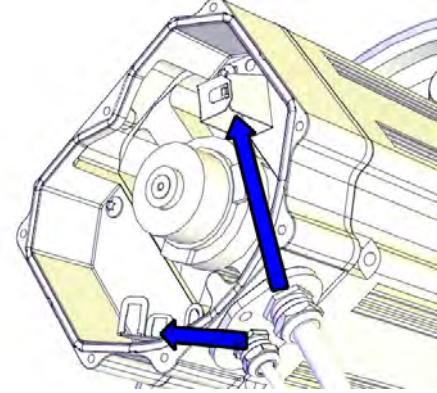
Action	Note
<p>1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4 Repair

4.7.5 Replacing the axis-5 motor

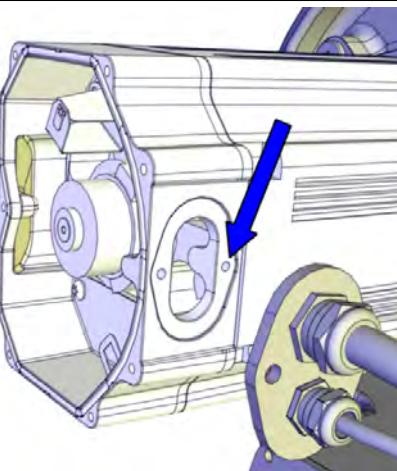
Continued

Action	Note
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066

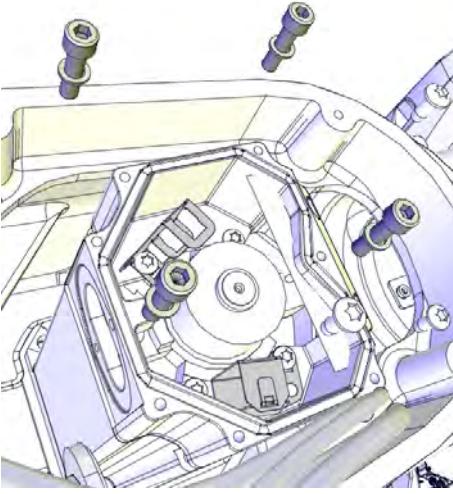
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4.7.5 Replacing the axis-5 motor

Continued

Action	Note
<p>5 Remove the cable gland cover by performing the following steps:</p> <ol style="list-style-type: none"> 1 Open the inner screw a little (the one the arrow is pointing at). No need to remove this screw from the motor. 2 Remove the outer screw. 3 Slide the cable gland cover away from the inner screw. Make sure the gasket is not damaged. <p> Tip</p> <p>Make a note in which direction the cable exit hole is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1300000656
6 Use caution and pull out the motor cables.	

Removing the axis-5 motor

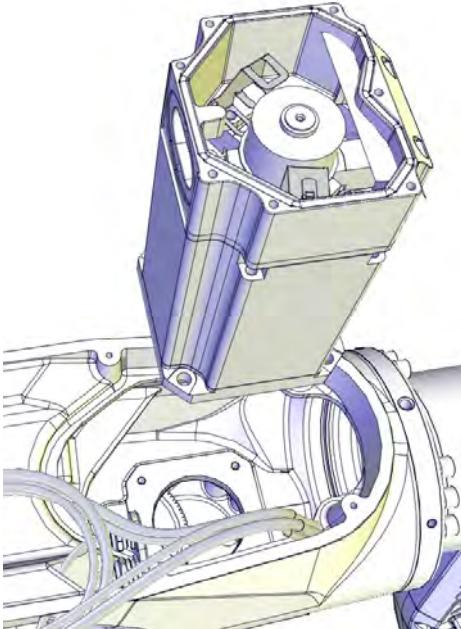
Action	Note
1 Unscrew the attachment screws that secure the motor, using a bits extender.	Bits extender: 3HAC12342-1  xx1200001017
2  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
3 If needed, fit removal tools in opposite holes.	Removal tool M12: 3HAC057339-003 Always use removal tools in pairs.

Continues on next page

4 Repair

4.7.5 Replacing the axis-5 motor

Continued

Action	Note
4  CAUTION The motor weighs 12 kg. All lifting accessories used must be sized accordingly.	
5 Use caution and lift the motor out. Be careful not to damage the pinion.	 xx1200001018

Refitting the axis-5 motor

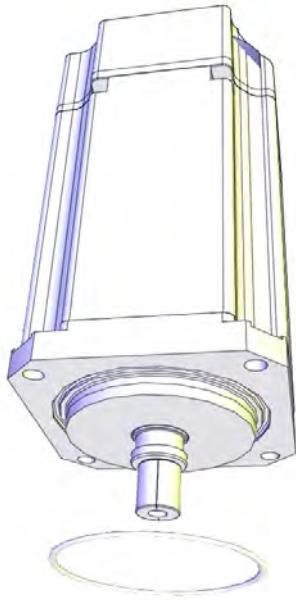
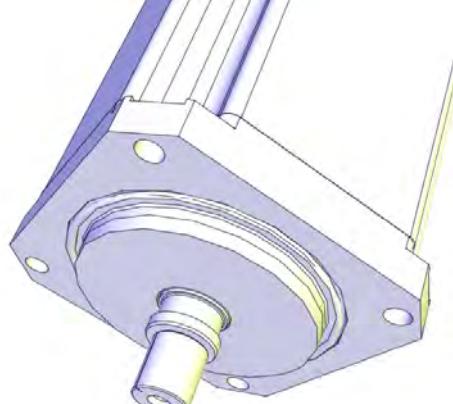
The procedures describe how to refit the motor.

Preparations before refitting the axis-5 motor

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

Continues on next page

4.7.5 Replacing the axis-5 motor Continued

	Action	Note
2	Wipe clean the contact surfaces from any contamination. Also wipe clean the o-ring groove.	 xx1200001019
3	Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107
4	Lubricate the o-ring with some grease.	
5	Make sure the o-ring is seated in the groove.	 xx1200001020
6	Apply two guide pins in opposite holes.	Guide pin, M8x100: 3HAC15520-1

Securing the axis-5 motor

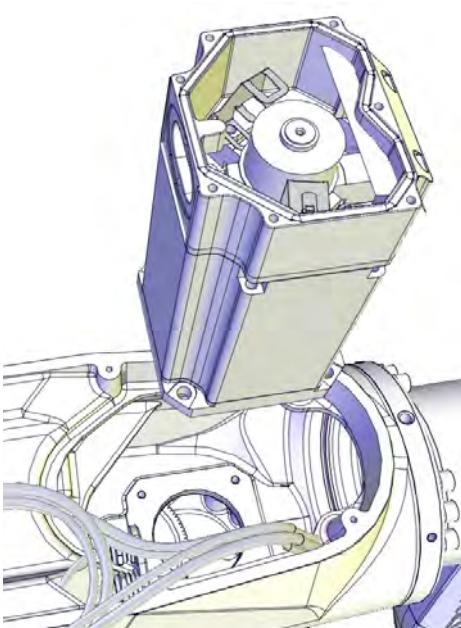
	Action	Note
1	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	

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4 Repair

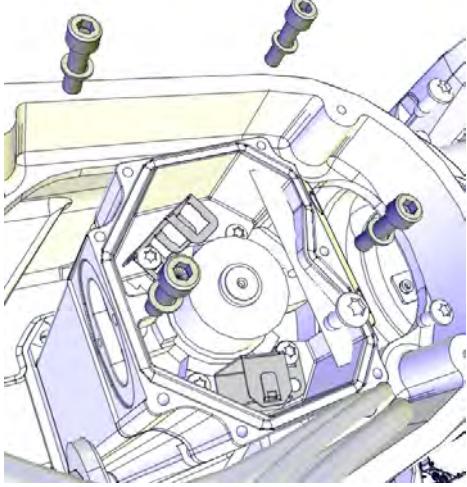
4.7.5 Replacing the axis-5 motor

Continued

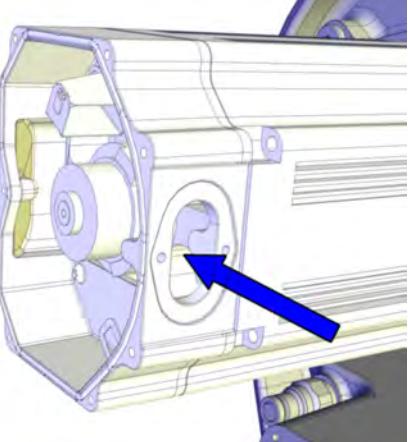
	Action	Note
2	Apply the rotation tool and use it to rotate the pinion when mating it into the gear.	Rotation tool: 3HAB7887-1
3	To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP5: <ul style="list-style-type: none">• + = pin 2• - = pin 5	24 VDC power supply
4	<p>! CAUTION</p> <p>The motor weighs 12 kg. All lifting accessories used must be sized accordingly.</p>	
5	<p>Use caution and lower the motor into position on the guide pins, while at the same time rotating the motor pinion slightly. Make sure that:</p> <ul style="list-style-type: none">• the motor pinion is properly mated to the gear of the gearbox.• the motor pinion does not get damaged.• the direction of the cable exit is facing the same way as before removal.	<p>Rotation tool, 3HAB7887-1</p>  <p>xx1200001018</p>
6	Remove the guide pins.	

Continues on next page

4.7.5 Replacing the axis-5 motor Continued

	Action	Note
7	Secure the motor with its attachment screws and washers.	Tightening torque: 24 Nm. Screw dimension: M8x30 quality 12.9 Gleitmo(4 pcs)
		 xx1200001017
8	Perform a leak-down test.	See Performing a leak-down test on page 196 .
9	Disconnect the 24 VDC power supply.	

Connecting the motor cables

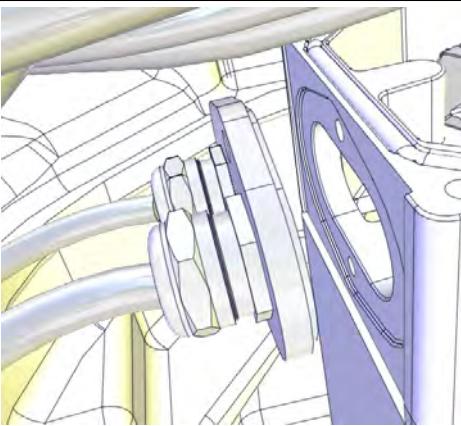
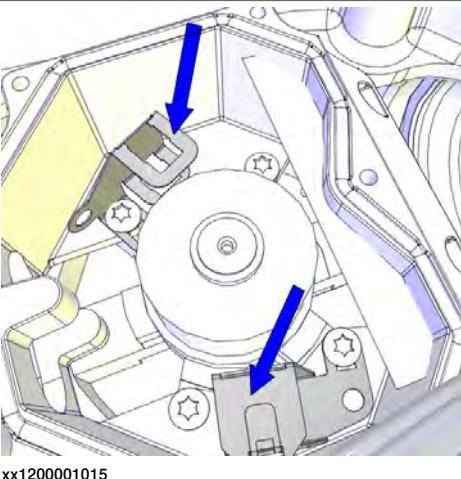
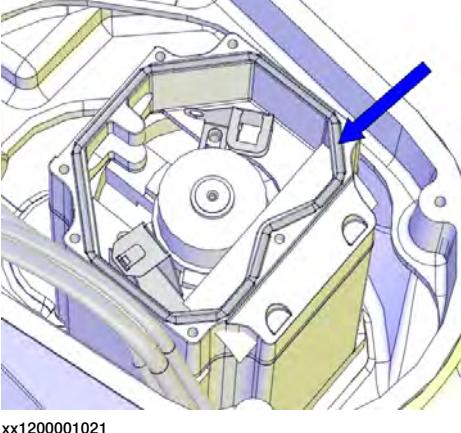
	Action	Note
1	Push the motor cables in through the cable gland opening.	 xx1300000738

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4 Repair

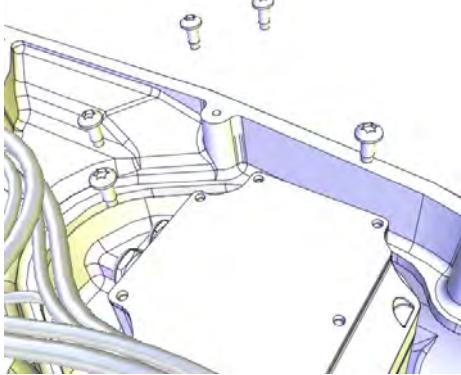
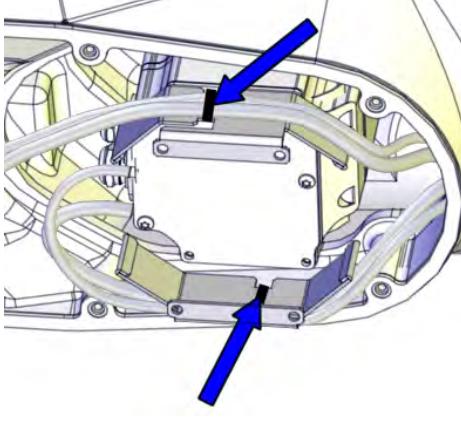
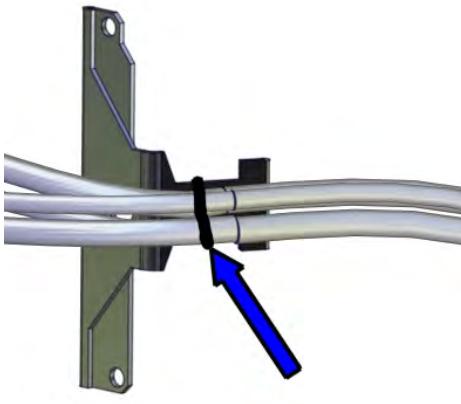
4.7.5 Replacing the axis-5 motor

Continued

Action	Note
<p>2 Refit the cable gland cover by performing the following steps:</p> <ul style="list-style-type: none"> • Slide the cable gland cover onto the inner screw. • Refit and tighten the outer screw. • Tighten the inner screw. Make sure that the gasket is not damaged. 	 Note
	<p>Replace the gasket if damaged.</p>
	
<p>3 Connect the connectors.</p> <p>Connect in accordance with the markings on the connectors.</p>	
	<p>xx1200001015</p>
<p>4 Make sure the o-ring on the motor is undamaged.</p> <p>Replace if damaged.</p>	<p>O-ring, axis 5: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile).</p> 
	<p>xx1200001021</p>
<p>5</p>	 CAUTION <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>

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4.7.5 Replacing the axis-5 motor Continued

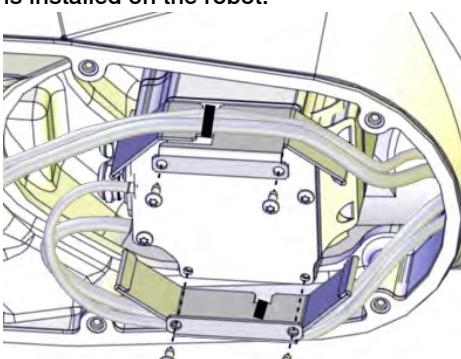
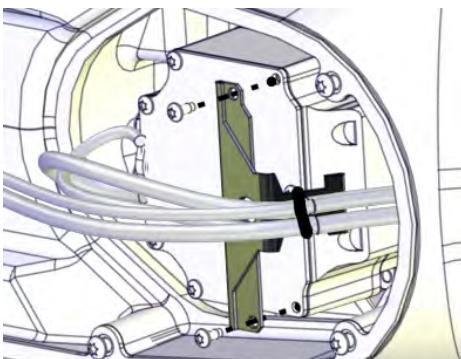
	Action	Note
6	<p>Refit the motor cover with its attachment screws.</p> <p>Note Do not refit the screws that will hold the heat protection plate at this point.</p> <p>Note Do not reuse the self-threading attachment screws, it will damage the threads. Replace with standard attachment screws.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	
7	<p>Secure the cable harness with cable straps to the heat protection plate.</p> <p>Note If replacing a type A motor with a type B motor, the heat protection plate must be replaced with plates suited for the type B motor. See Type A vs type B motors on page 795.</p>	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  

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4 Repair

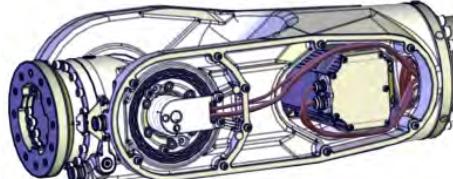
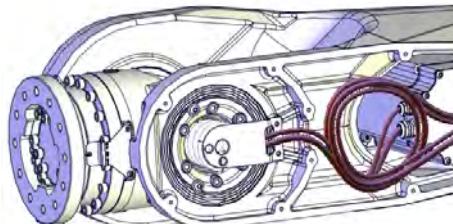
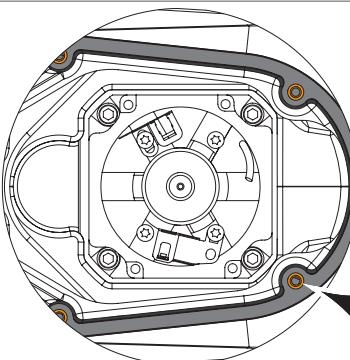
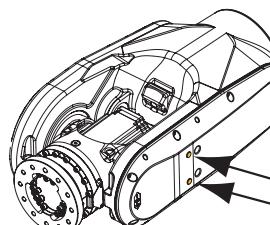
4.7.5 Replacing the axis-5 motor

Continued

Action	Note
8 Fit the heat protection plate with the screws.	Choose figure depending on which plate is installed on the robot.  xx1500001030  xx1300000490
9 Make sure that the cover is tightly sealed.	

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Concluding procedure

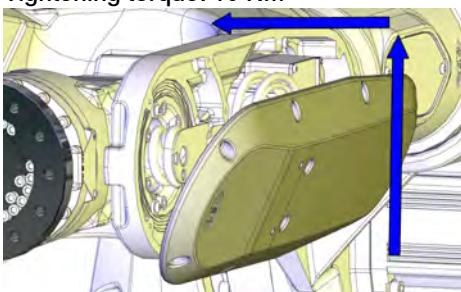
	Action	Note
1	Make sure that the cable harness is placed in a way that it will not be damaged when the wrist cover is fitted.	<p>There are two versions of the heat protection plates. Choose figure depending on which plate is installed on the robot.</p>  <p>xx1500001672</p>  <p>xx1300000596</p> <p>Cable layout in the wrist with Type A motors.</p>
2	Inspect the gasket. Replace if damaged.	
3	<p>Foundry Plus:</p> <ul style="list-style-type: none"> • Make sure that the gasket is undamaged on the cover. Replace if damaged. • Put washers in the holes of the gasket. • Use attachment screws made of stainless steel to fit the wrist cover. 	  <p>xx1400000383</p> <p>A Protection plugs (2 on wrist cover and 2 on cover axis-5 gearbox) B Washers (10 pcs) in gasket holes</p>

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4 Repair

4.7.5 Replacing the axis-5 motor

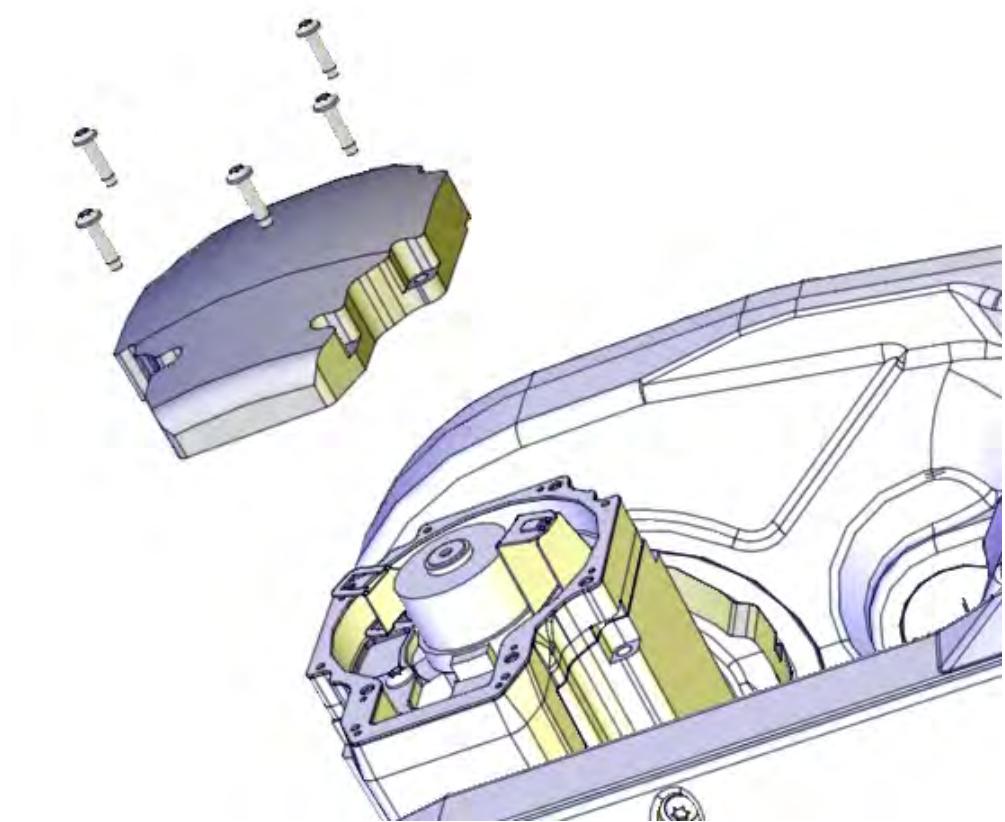
Continued

Action	Note
4 Carefully refit the wrist cover. Use the following method not to damage the cables: 1 Hold the cover slightly tilted below the wrist. 2 Put the cable harness inside the cover. 3 Lift the cover, still tilted. 4 Move the upper part of the cover into position. 5 Secure the cover with its attachment screws.	Tightening torque: 10 Nm  xx1300000772
5 Foundry Plus: Refit protection plugs.	
6 If used, refit the DressPack cable package on the wrist.	
7 Recalibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
8  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4.7.6 Replacing the axis-6 motor

Location of axis-6 motor

The axis-6 motor is located as shown in the figure.



xx1200001080

Spare part

Spare part	Spare part number	Note
Axis-6 motor	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Removal tool M12	3HAC057339-003	Used to push out the motor, if necessary. Always use removal tools in pairs.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.

Continues on next page

4 Repair

4.7.6 Replacing the axis-6 motor

Continued

Equipment, etc.	Article number	Note
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc.	Article number	Note
Grease	3HAB3537-1	Shell Gadus S2V220 AC Used to lubricate o-rings.
Gasket ⁱ	3HAC033489-001/ 3HAC044252-001	Used on motor cover.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.

ⁱ Information about which of the two types of gasket to choose is found in *Product manual, spare parts - IRB 6700*.

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.

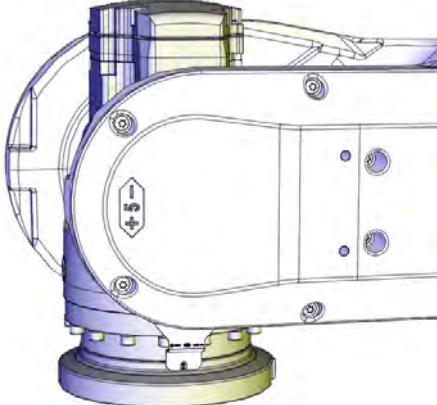
	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none">• Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.• Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Continues on next page

Removing the axis-6 motor

Use these procedures to remove the motor.

Preparations before removing the axis-6 motor

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog the robot to a position where axis 5 can be positioned with the motor pointing straight up at an acceptable working position. With axis 5 in this position it is possible to replace the motor without draining the oil from the axis-6 gearbox.	 xx1200001081
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

Disconnecting the axis-6 motor cables

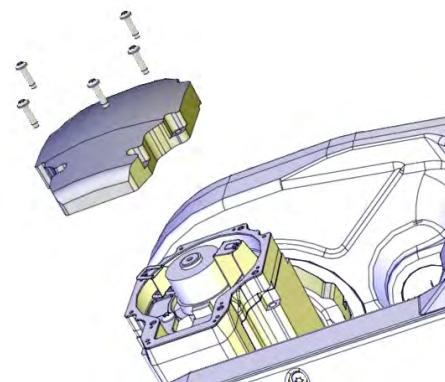
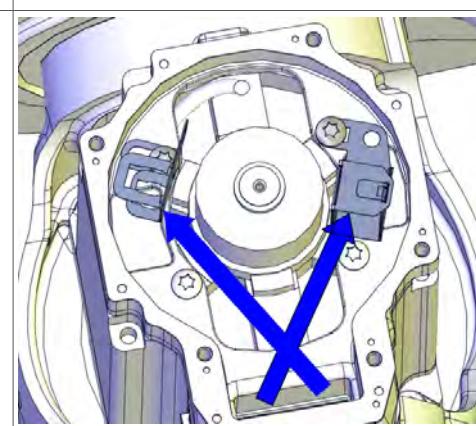
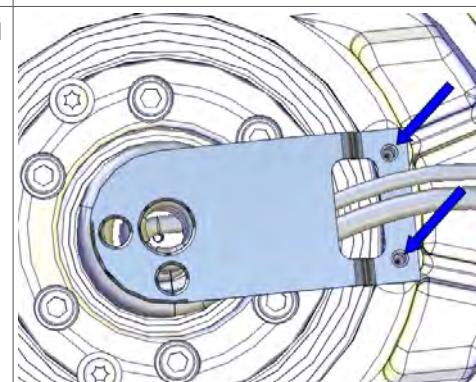
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

4.7.6 Replacing the axis-6 motor

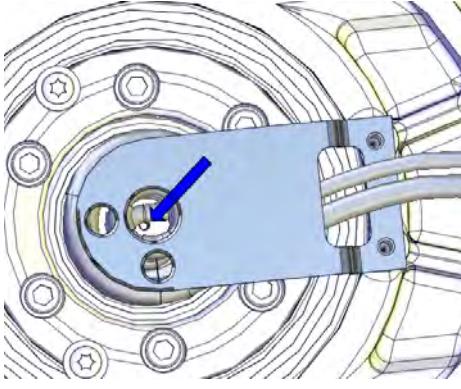
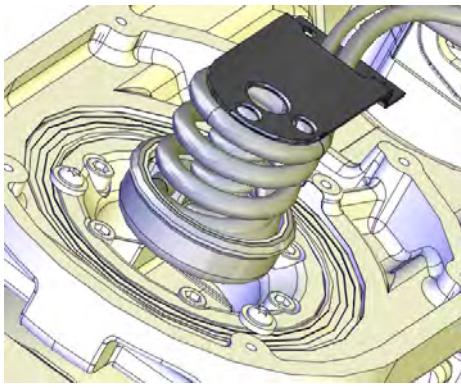
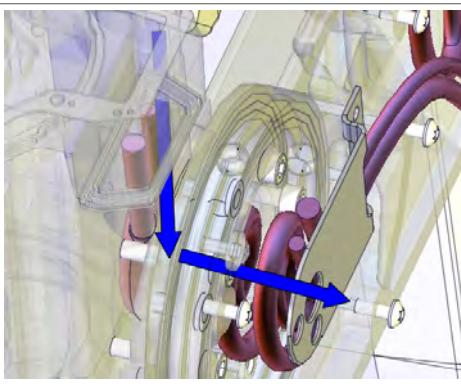
Continued

Action	Note
2 Unscrew the attachment screws and remove the motor cover.	 xx1200001080
3 Disconnect the motor cables.	 xx1300000488
4 Unscrew the attachment screws that hold the cable bracket.	 xx1300000484

Continues on next page

4.7.6 Replacing the axis-6 motor

Continued

	Action	Note
5	Unscrew the M4 screw that holds the carrier.  Note The screw is located at the bottom of the carrier.	 xx1300000485
6	Pull out the carrier from its position.	 xx1300001113
7	Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.	 xx1300000666

Removing the axis-6 motor

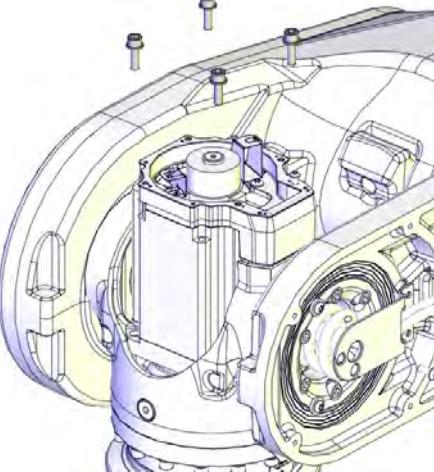
	Action	Note
1	To release the brakes, connect the 24 VDC power supply. Connect to R2.MP6-connector: <ul style="list-style-type: none">• + = pin 2• - = pin 5	24 VDC power supply

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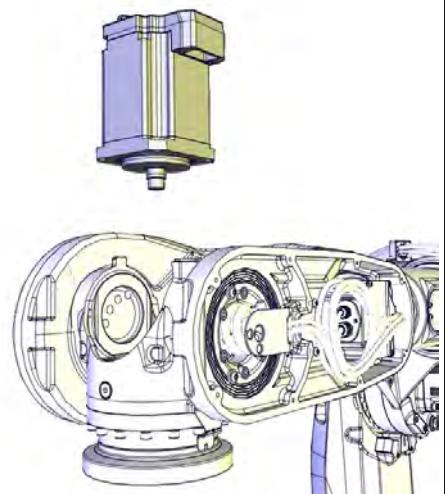
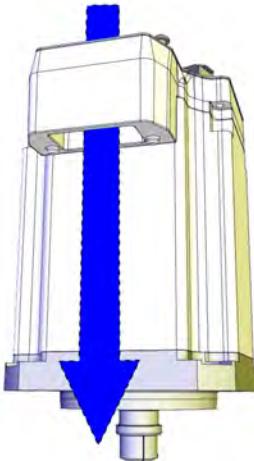
4 Repair

4.7.6 Replacing the axis-6 motor

Continued

Action	Note
2 Unscrew the motor attachment screws.	 xx1200001090
3  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
4 If required, press the motor out of position by fitting the removal tool, motor to the attachment holes of the motor.	Removal tool M12: 3HAC057339-003 Always use removal tools in pairs.
5  CAUTION The motor weighs 9 kg. All lifting accessories used must be sized accordingly.	

Continues on next page

Action	Note
6 Remove the motor by lifting it straight up from the gear while at the same time picking out the motor cables from the motor. Make sure the motor pinion is not damaged!	 xx1200001091
7 Disconnect the 24 VDC power supply.	 xx1200001096

Refitting the axis-6 motor

Use this procedure to refit the motor.

Preparations prior to refitting motor

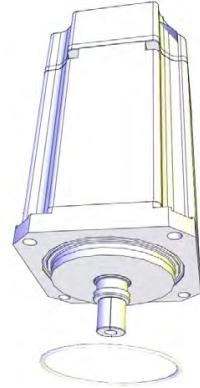
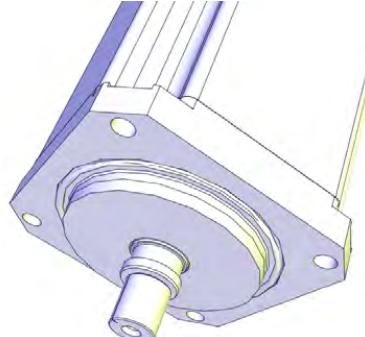
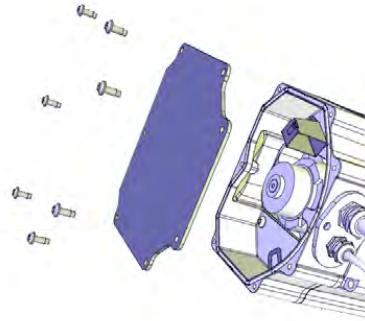
Action	Note
 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	

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4 Repair

4.7.6 Replacing the axis-6 motor

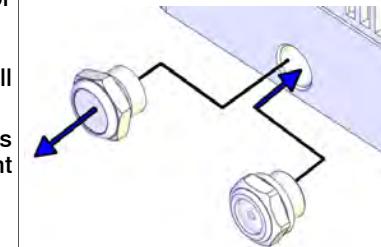
Continued

Action	Note
3 Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	
4 Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019
5 Make sure the o-ring is seated in the groove.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	 xx1200001020
6 If the motor is a new spare part, remove the cover.	 xx1200001135

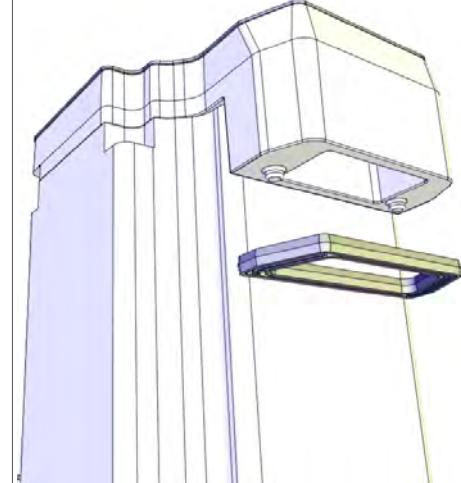
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4.7.6 Replacing the axis-6 motor

Continued

	Action	Note
7	<p>Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.</p>	<p>Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.</p>  <p>xx1600000576</p>

Securing the axis-6 motor

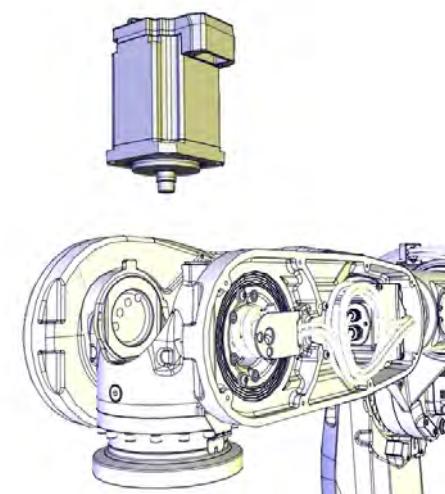
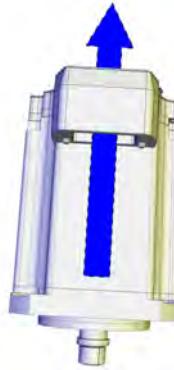
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP6: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
3	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
4	Check the gasket. Replace if damaged.	 <p>xx1200001094</p>

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4 Repair

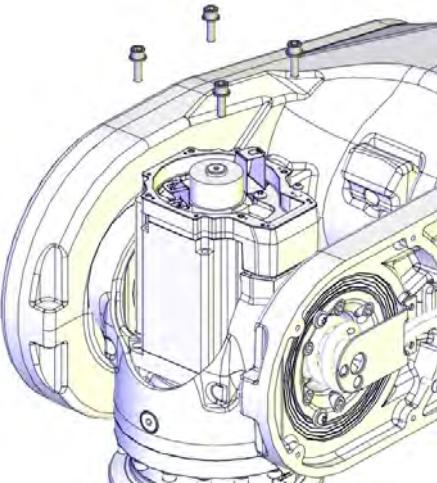
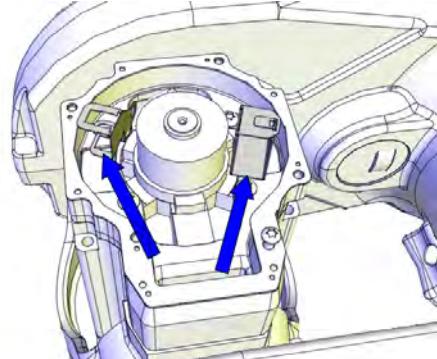
4.7.6 Replacing the axis-6 motor

Continued

	Action	Note
5	 CAUTION The motor weighs 9 kg. All lifting accessories used must be sized accordingly.	
6	Fit the motor while, at the same, time pushing the motor cables in through the cable gland. Make sure the motor pinion is properly mated with the gear of the axis-6 gearbox. Make sure the motor pinion is not damaged!	 xx1200001091  xx1200001097

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4.7.6 Replacing the axis-6 motor Continued

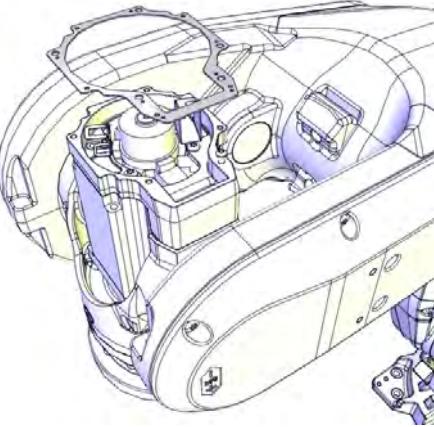
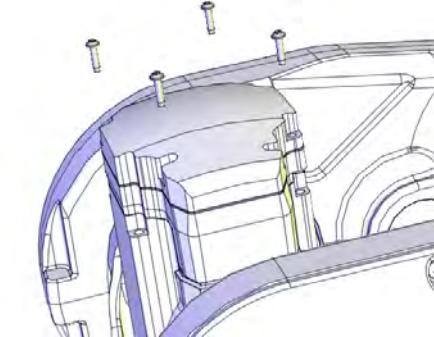
	Action	Note
7	Check that the gasket is fitted correctly. Secure the motor with its attachment screws.	Tightening torque: 24 Nm Screw dimension: M8x25 Steel 8.8-A2F (4 pcs)
		 xx1200001090
8	Perform a leak-down test.	See Performing a leak-down test on page 196 .
9	Disconnect the 24 V DC power supply.	
10	Reconnect the connectors.	 xx1200001084

Continues on next page

4 Repair

4.7.6 Replacing the axis-6 motor

Continued

	Action	Note
11	Check the gasket. Replace if damaged.	<p>Gasket: 3HAC033489-001/ 3HAC044252-001 Information about which of the two types of gasket to choose is found in <i>Product manual, spare parts - IRB 6700</i>.</p>  <p>xx1200001095</p>
12	Refit the motor cover.	 <p>xx1200001082</p>
13	Re-calibrate the robot.	<p>Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i>, enclosed with the calibration tools.</p> <p>Axis Calibration is described in Calibrating with Axis Calibration method on page 774.</p> <p>General calibration information is included in section Calibration on page 763.</p>
14	 DANGER <p>Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48.</p>	

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

4.8 Gearboxes

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Validity of this section - variants IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85



Note

This section describes how to replace the gearbox on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

How to replace the gearbox on variants *IRB 6700 -300/2.70, -245/3.00* see section **4.8.2 Replacing the axis-1 gearbox (not all variants)**.

About the figures



Note

When visual differences between variants, is of no importance, only one is shown in the figures.

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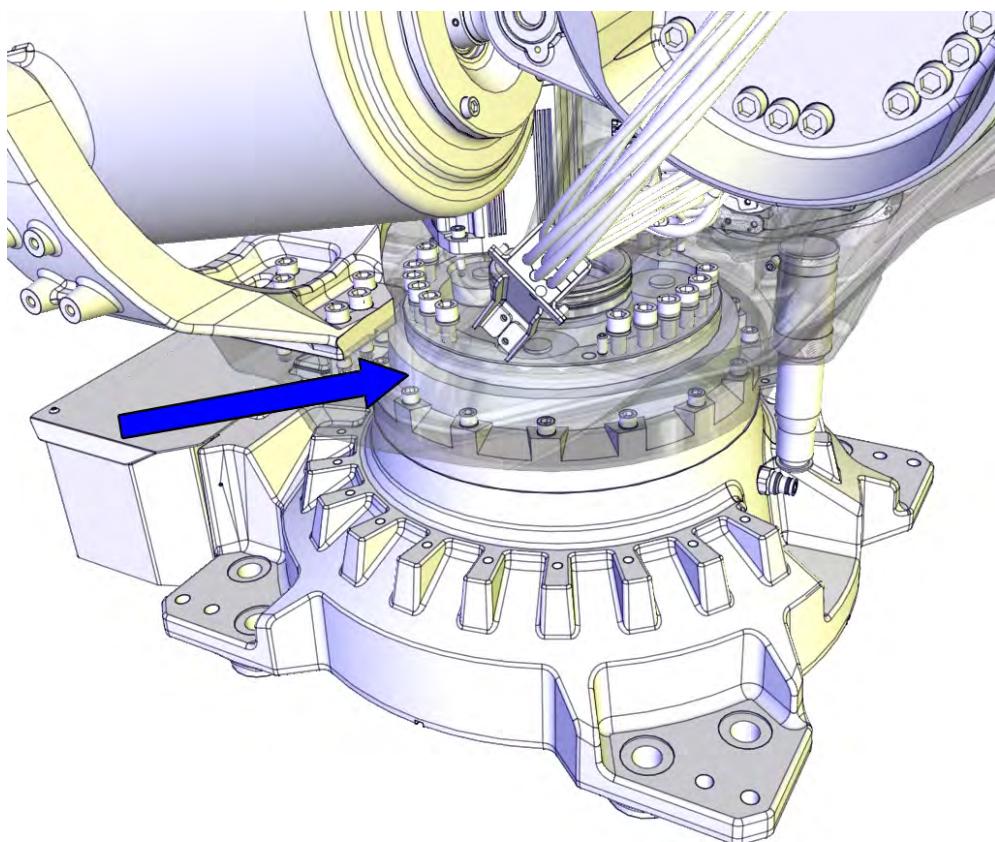
4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Location of the axis-1 gearbox

The axis-1 gearbox is located as shown in the figure.



xx1200001183

Spare parts

Spare parts	Article number	Note
Axis-1 gearbox	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Removal tool M14	3HAC057339-004	Used to push out the motor, if necessary. Always use removal tools in pairs.
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Lifting eye	3HAC16131-1	M12

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Equipment, etc.	Article number	Note
Lifting eye	3HAC16131-1	M12
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting shackle	-	SA-10-8-NA1
Roundsling, 1.5 m	-	Length: 1.5 m. Lifting capacity: 2,000 kg.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Lifting eye	3HAC14457-4	M16
Lifting accessory, motor	3HAC14459-1	
Removal tool M14	3HAC057339-004	Used to push out the motor, if necessary. Always use removal tools in pairs.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Aligning tool	3HAC046645-003	Used for aligning the gearbox against the frame, so that the play in the motor does not need to be adjusted.
24 VDC power supply	-	Used to release the motor brakes.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs!
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs!
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs!
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs!
Guide pin, M16x150	3HAC13120-2	Always use guide pins in pairs!
Guide pin, M16x200	3HAC13120-3	Always use guide pins in pairs!
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc	Article number	Note
Locking liquid (Loctite 243)	-	
Flange sealant (Loctite 574)	-	
Grease	3HAB3537-1	Used to lubricate o-rings.
O-ring	3HAB3772-93	D=380.59x3.53 Used on gearbox

Continues on next page

4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Equipment, etc	Article number	Note
O-ring ⁱ	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on motor cover.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.
Sealing ring	-	
Cable straps	-	

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

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">• Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.• Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the axis-1 gearbox

These procedures describe how to remove the gearbox.

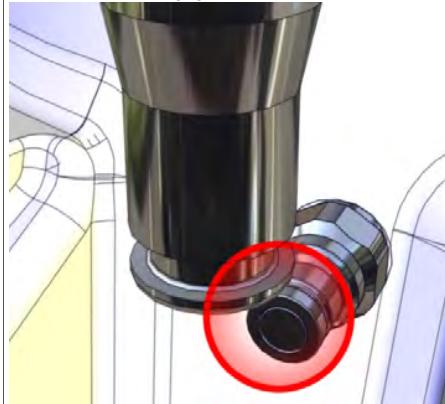
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4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Follow the order of the procedures according to the order they are presented.

Preparations before removing the axis-1 gearbox

Use this procedure to do the necessary preparations, before removing the axis-1 gearbox on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

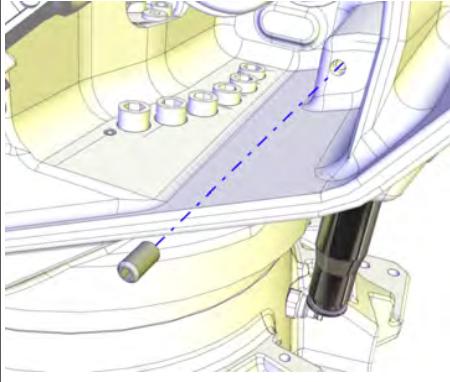
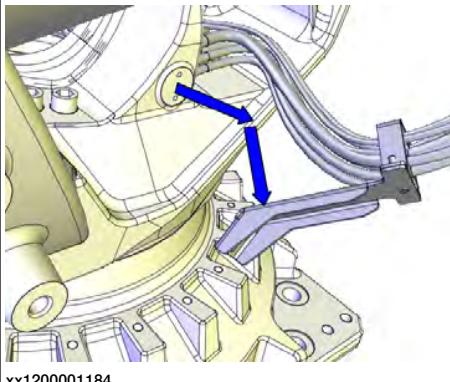
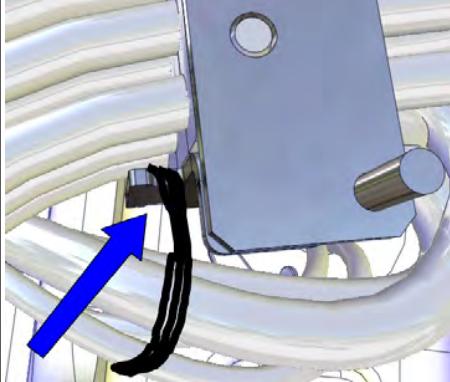
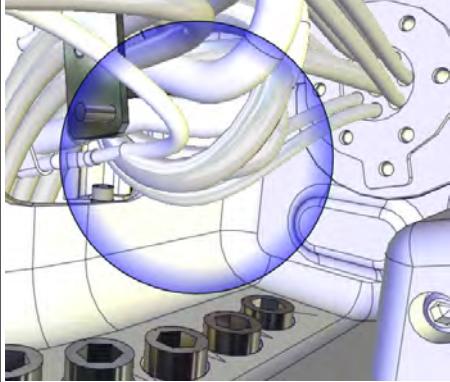
Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 Remove tools and other equipment fitted on the turning disk. DressPack can stay fitted for the time being.	This is done to achieve the best stability of the complete arm system when it is resting by itself, after it has been removed.
3 Begin draining the axis-1 gearbox.	See Draining the axis-1 gearbox on page 159 .
4 Jog the robot into position: • axis 1 = -5°	The position of axis-1 is needed. Otherwise it will not be possible to remove the mechanical stop pin. 
5  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

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4 Repair

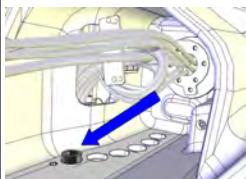
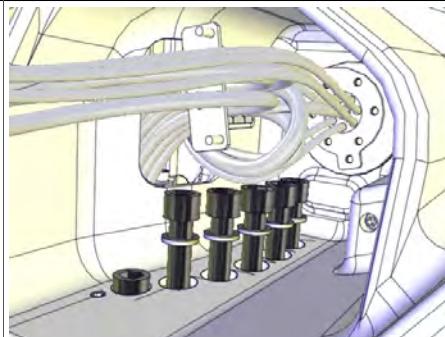
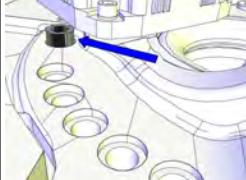
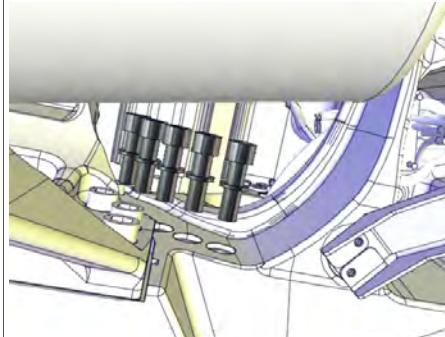
4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
<p>6 Hold the mechanical stop pin in a firm grip, use caution and remove it by unscrewing the set screw.</p> <p>! CAUTION</p> <p>The mechanical stop pin weighs 5 kg and may unexpectedly fall down when the set screw is removed.</p>	 xx1300000476
<p>7 Unscrew the attachment screws that secure the cable bracket.</p>	 xx1200001184
<p>8 Cut the cable tie inside the frame recess.</p>	 xx1200001237
<p>9 Lift up the part of the cable harness shown in the figure, and let it rest against the bracket.</p> <p>This is done in order to be able to reach all attachment screws inside the recess.</p>	 xx1200001240

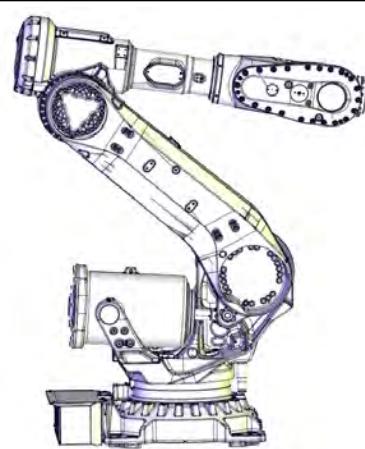
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4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Action	Note
<p>10 Unscrew five of the six attachment screws inside the frame hole that secure the frame to the gearbox.</p> <p>Note Leave the outermost screw fitted as a safety precaution!</p>  <p>xx1200001185</p>	 <p>xx1200001189</p>
<p>11 Unscrew five of the six attachment screws under the balancing device.</p> <p>Note Leave the screw closest to the axis-1 motor fitted.</p>  <p>xx1200001239</p>	 <p>xx1200001238</p>

Robot position

Use this procedure to jog the robot into position - variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

Action	Note
<p>1 Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance as long as the robot is secured to the foundation. • Axis 2: -45° • Axis 3: +50° to 55° (approximately) • Axis 4, 5 and 6: calibration position (0°) 	 <p>xx1200001132</p>

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4 Repair

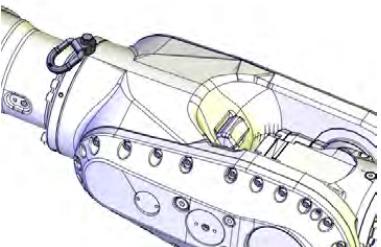
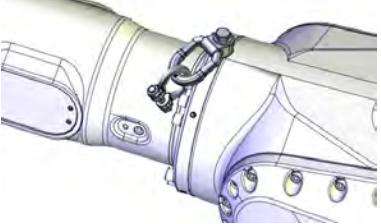
4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

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

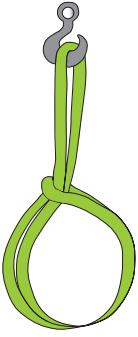
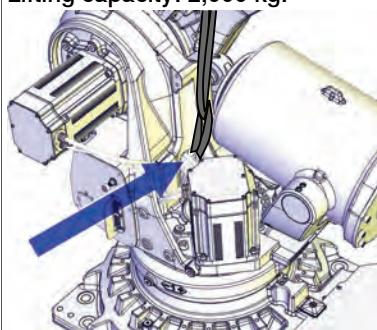
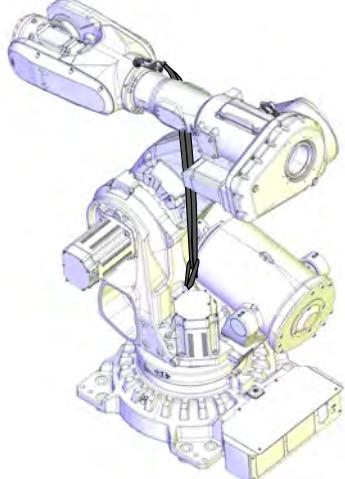
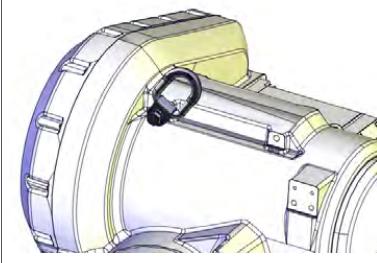
Attaching the lifting accessories

Use this procedure to attach the lifting accessories on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

Action	Note
<p>1</p> <p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2</p> <p> CAUTION</p> <p>The complete arm system weigh (according to variants) 1100 kg. All lifting accessories used must be sized accordingly!</p>	
<p>3</p> <p>Fit a lifting eye to the wrist.</p>	<p>Lifting eye: 3HAC16131-1</p>  <p>xx1200001133</p>
<p>4</p> <p>Fit a lifting shackle in the wrist lifting eye.</p>	<p>Lifting shackle: SA-10-8-NA1</p>  <p>xx1200001234</p>

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4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

	Action	Note
5	<p>Run a roundsling through the hole in the frame. Attach the roundsling choked. See figure!</p>  <p>xx1400000730</p>	<p>Roundsling, 1.5 m: Length: 1.5 m. Lifting capacity: 2,000 kg.</p>  <p>xx1200001209</p>
6	<p>Attach the roundsling to the shackle on the wrist and jog axis-3 slowly to stretch the roundsling.</p> <p>Note</p> <p>Make sure the roundsling is stretched, so it can carry the weight of the frame.</p>	 <p>xx1200001235</p>
7	<p>Fit a lifting eye in the arm house, with a fender washer underneath.</p>  <p>xx1400002196</p> <p>Fender washer</p>	<p>Lifting eye: 3HAC16131-1 Fender washer. Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.</p>  <p>xx1200001134</p>

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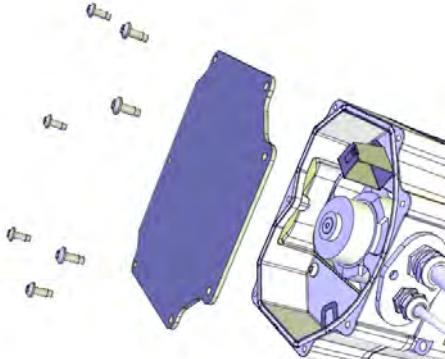
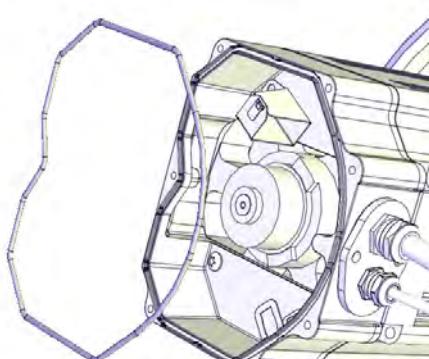
4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

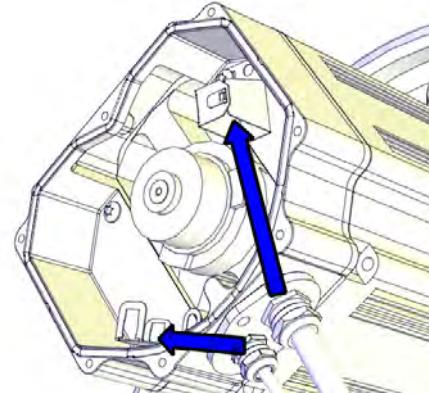
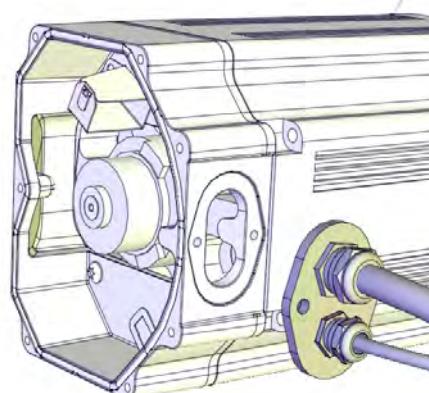
Action	Note
8 Attach the Lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and to a roundsling run through the wrist.	Lifting accessory (chain): 3HAC15556-1 Roundsling, 1 m: Length: 1 m. Lifting capacity: 1,000 kg.  xx1200001236

Disconnecting the axis-1 motor cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3 Make sure the o-ring is present.	 xx1200001070

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Action	Note
4 Disconnect the motor cables.	 xx1200001066
5 Remove the cable gland cover. Make sure the gasket is not damaged.  Tip Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.	 xx1200001067
6 Use caution and pull out the motor cables.	

Removing the axis-1 motor

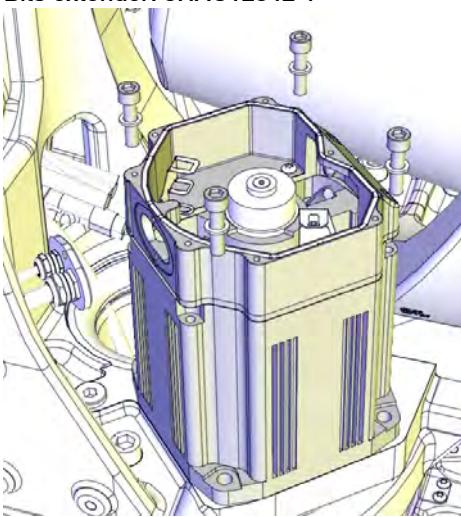
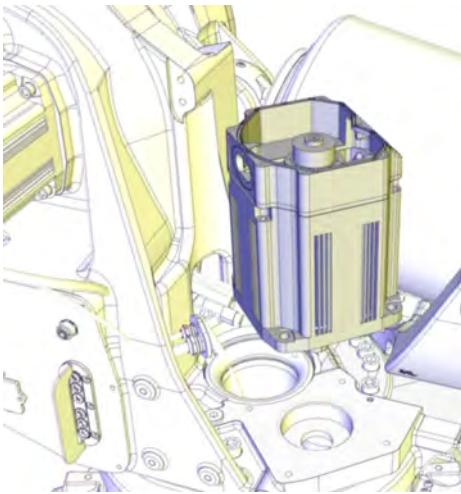
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Attach the lifting accessories.	Lifting accessory (chain): 3HAC15556-1 Lifting accessory, motor: 3HAC14459-1.
3 To release the brakes, connect the 24 VDC power supply. Connect to R2.MP1-connector: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	24 VDC power supply
4  CAUTION The weight of the motor is 25 kg All lifting accessories used must be sized accordingly.	

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4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

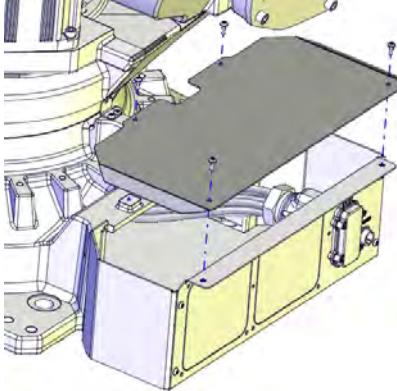
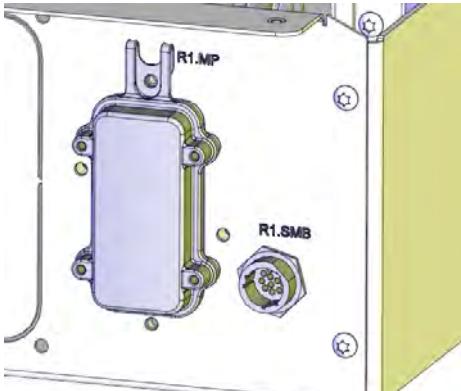
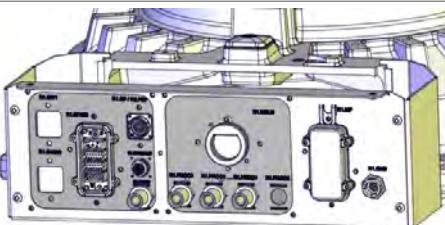
Continued

Action	Note
5 Unscrew the attachment screws and washers. Use a bits extender in order to reach the screws.	Bits extender: 3HAC12342-1  xx1200001071
6 Fit guide pins in opposite holes.	Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!
7  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
8 If needed, use removal tools to help remove the motor.	Removal tool M12: 3HAC057339-003
9 Use caution and lift the motor straight up to get the pinion parted from the gear.	 xx1200001072
10 Disconnect the 24 VDC power supply.	

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4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Preparations before removing the cable harness in the base

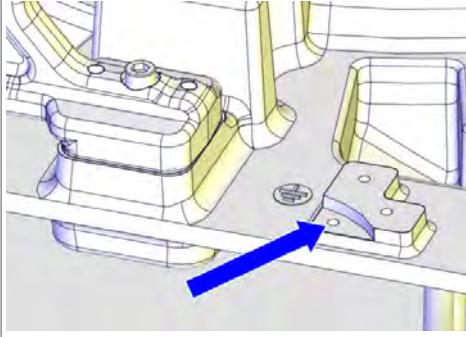
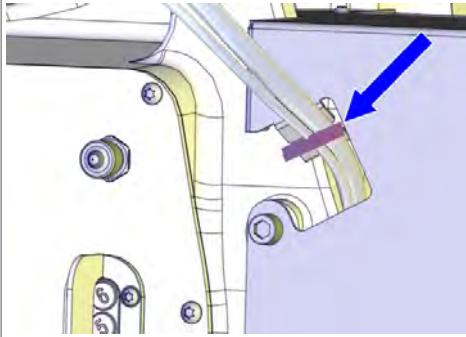
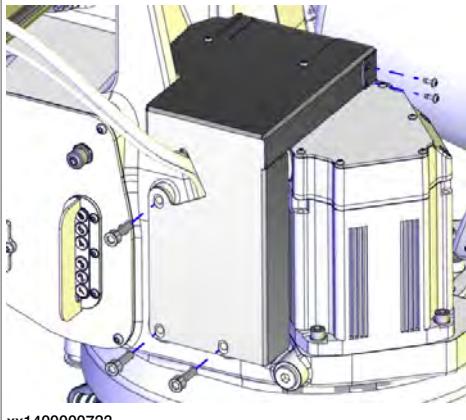
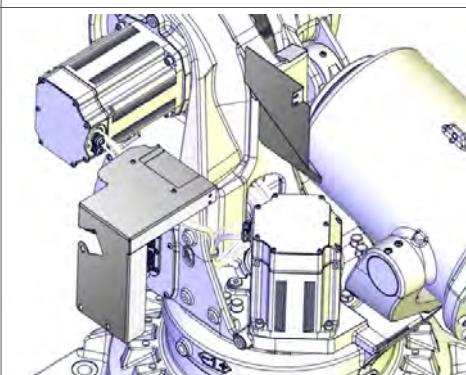
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the base cover.	 xx1300000561
3	Remove connectors in the base: <ul style="list-style-type: none"> • R1.MP • R1.SMB 	 xx1300000591
4	If used, disconnect the DressPack hoses in the base.	 xx1400000366

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4 Repair

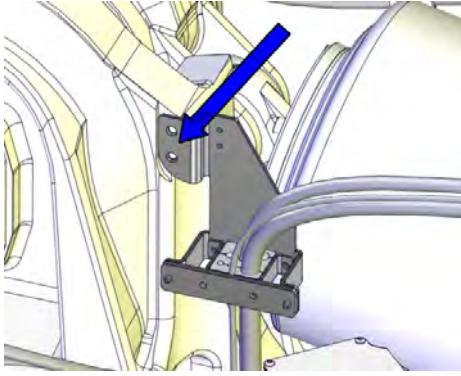
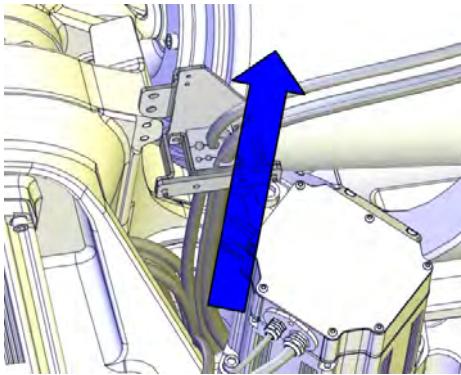
4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

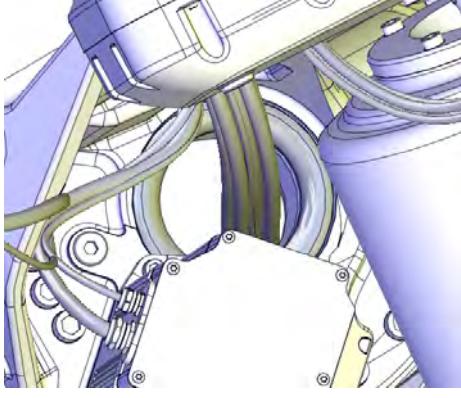
Action	Note
5 Disconnect the earth cable.	Screw dimension : M6x16 Washer dimension : 6.4x17x3  xx1400000354
6 Foundry Plus. Cut the cable tie that hold the axis-1 and axis-2 motor cables on the protection plates.	 xx1400000722
7 Foundry Plus. Disassemble the protection plates by removing five of the attachment screws (three M10x30 and two of the M5x12 screws).	 xx1400000723
8 Foundry Plus. Remove the two protection plates.	 xx1400000724

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Action	Note
9 If used, remove the attachment screws that secure the bracket. This is done to facilitate removal of the DressPack hoses.	 xx1400000078
10 If used, use caution and pull out the DressPack hoses through the protection tube in the base. Note There is no need to pull out the DressPack cables at this point!	 xx1400000088

Removing the cable harness in the base

Action	Note
1 If used, use caution and pull out the DressPack cables through the protection tube and place it safely over the balancing device.	
2 Use caution and pull out the robot cable harness through the protection tube.	 xx130000732
3 Place the cable harness over the balancing device.	

Continues on next page

4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Lifting away the complete arm system

Use this procedure to lift away the complete arm system on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

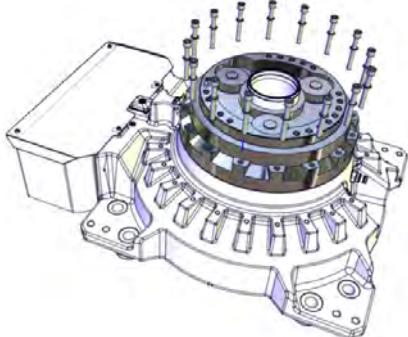
Action	Note
1 Raise the overhead crane to stretch the chains and roundslings. Make sure that the roundsling between the wrist and the frame is stretched.	
2 Remove two attachment screws in opposite holes and replace them with guide pins.  Tip Lubricate the guide pins with some grease to make the frame slide better.	Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!
3 Remove the remaining attachment screws, that hold the frame to the axis-1 gearbox.	
4  CAUTION The complete arm system weighs: 1100 kg. All lifting accessories used must be sized accordingly!	
5 Use caution and lift the complete arm system.	
6 Move the complete arm system and put it down somewhere safe.	
7  DANGER When the complete arm system is removed and resting by itself on the floor, make sure it is resting completely stable before removing the lifting accessories. Do not change the position of the axes from the position described earlier.	

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4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Removing the gearbox

Use this procedure to remove the gearbox on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

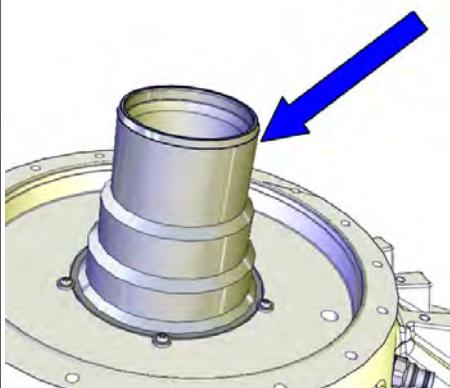
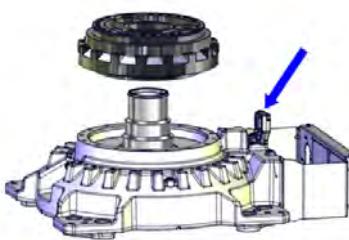
Action	Note
1 Remove the attachment screws and washers that secure the gearbox to the base.	 xx1200001186
2 Fit two guide pins in opposite holes.  Tip Lubricate the guide pins with some grease to make the gearbox slide better.	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!
3 Fit two lifting eyes manually in opposite holes in the gearbox.  CAUTION Leave a couple of millimeters of space between the lug and the surface of the gearbox. This is done in order not to damage the surface of the gearbox which is a sealing surface.	Lifting eye: 3HAC14457-4
4  CAUTION The gearbox weighs: 92 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 140 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
5 Attach the lifting accessory (chain) to the gearbox.	Lifting accessory (chain): 3HAC15556-1

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4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
6 Protect the sealing areas on top of the protection tube.	 xx1200001187
7 Lift away the gearbox.  WARNING When the gearbox is lifted, make sure not to damage the calibration bracket in the process.	 xx1400001983

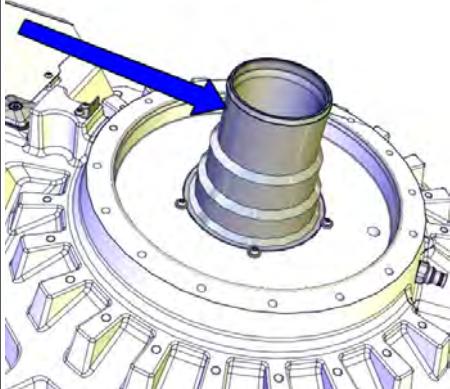
Refitting the axis-1 gearbox

These procedures describe how to refit the axis-1 gearbox.

Follow the order of the procedures according to the order they are presented.

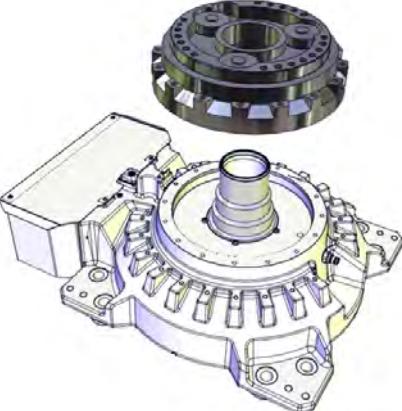
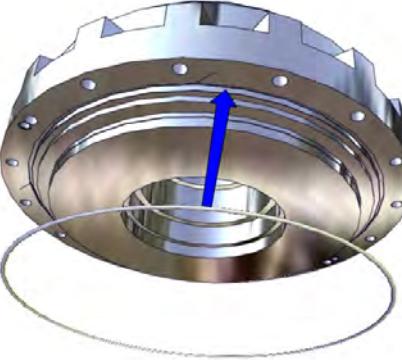
Preparations before refitting the axis-1 gearbox

Use this procedure to do the necessary preparations, before refitting the gearbox on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

Action	Note
1 Check the protection tube and sealing tube for damages. Especially check the surface for the sealing ring. See figure! Replace if damaged.	 xx1300000779

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

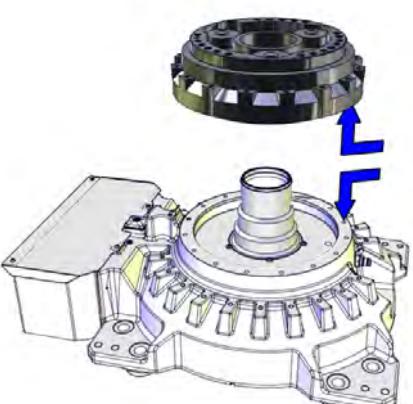
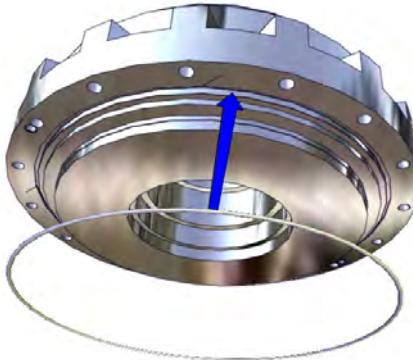
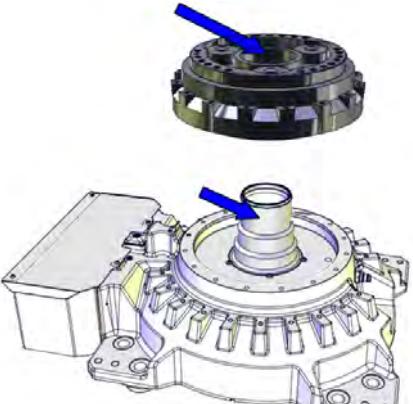
	Action	Note
2	Fit two lifting eyes manually in opposite holes in the gearbox.	Lifting eye: 3HAC14457-4
	 CAUTION	
	Leave a couple of millimeters of space between the lug and the surface of the gearbox. This is done in order not to damage the surface of the gearbox which is a sealing surface.	
3	Attach the lifting accessory (chain).	Lifting accessory (chain): 3HAC15556-1
4	 CAUTION	
	The gearbox weighs: 92 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 140 kg (IRB 6700 -300/2.70, -245/3.00)	
	All lifting accessories used must be sized accordingly.	
5	Lift the gearbox up.	 xx1200001188
6	Remove the old o-ring. It shall be replaced by a new one.	 xx1200001244

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4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
7 Wipe clean the contact surfaces from any contamination. Also wipe clean the o-ring groove.  xx1200001245	 xx1200001231
8 Wipe clean and put some grease on a new o-ring.  Note Do not reuse the old o-ring!	
9 Fit the o-ring in the groove of the gearbox.	 xx1200001244
10 Wipe clean the surfaces of the sealing tube and hole in axis-1 gearbox.	 xx1200001232
11 Put grease on the protection tube.	

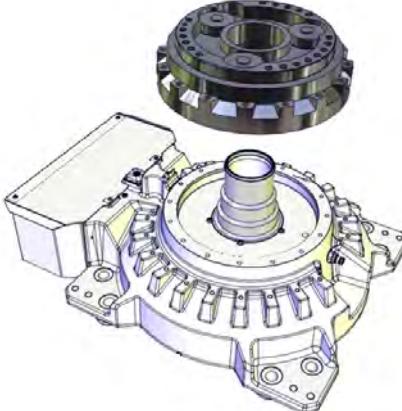
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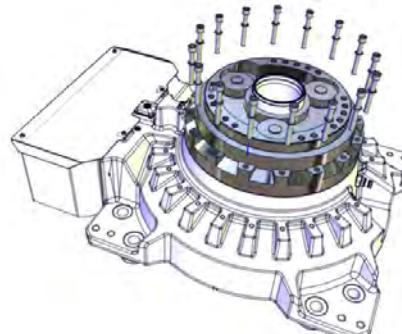
4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Action	Note
<p>12 Fit guide pins in opposite holes in the base.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the gearbox slide better.</p>	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!

Refitting the gearbox to the base

Use this procedure to refit the gearbox to the base on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

Action	Note
<p>1 Attach the <i>guide reduction gear</i> on top of the sealing tube.</p> <p>It will be used to protect the sealing tube from getting damaged when the gearbox is being fitted.</p>	
<p>2 Use caution and lower the gearbox very carefully down over the guide pins and over the sealing tube.</p> <p> Note</p> <p>Make sure that the o-ring is still fitted correctly when the gearbox is being fitted.</p>	 <p>xx1200001188</p>
3 Remove the guide pins.	
4 Remove the lifting accessory and the lifting eyes.	
5 Fit the attachment screws.	Attachment screws: M12x90 (16 pcs)
6 Tighten the screws.	Tightening torque: 120 Nm.



xx1200001186

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4 Repair

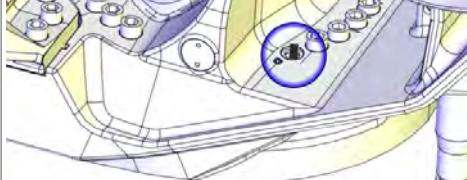
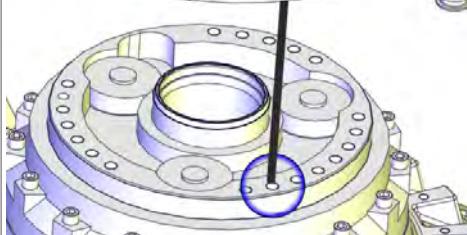
4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
7 Remove the guide reduction gear.	

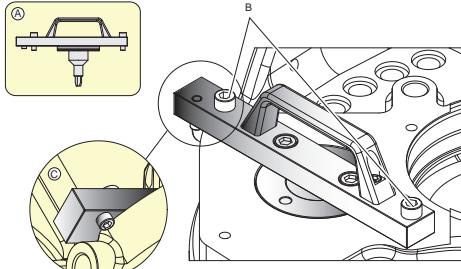
Preparations before refitting the arm system

Use this procedure to refit the arm system on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

Action	Note
<p>1 Remove old residues of flange sealant and other contamination from the contact surfaces on the gearbox.</p> <p>2 Wipe clean the contact surfaces from any remaining contamination.</p> <p>3 Wipe clean the o-ring groove in the gearbox.</p> <p>4 Apply flange sealant (Loctite 574) on the contact surface of the gearbox.</p> <p>5 Apply guide pins in opposite holes in the gearbox.</p> <p>Note Make sure that the guide pins are fitted in the correct holes in the gearbox! See figures!</p> <p>Tip Lubricate the guide pins with some grease to make the frame slide better.</p>	<p>Guide pin, M16x150 (one): 3HAC13120-2 Guide pin, M16x200 (two): 3HAC13120-3 Always use guide pins in pairs!</p> <p>Position of guide pin one:</p>  <p>xx1300000822</p> <p>Position of guide pin two:</p>  <p>xx1300000823</p>

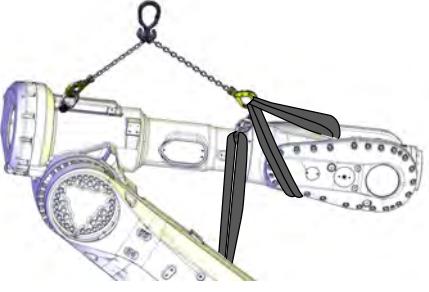
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4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Action	Note						
6 Put some grease on the o-ring of the aligning tool.	Aligning tool: 3HAC046645-003						
7 Put some grease on the part of the aligning tool that will mate with the hole in the gearbox. Also put some grease in the matching hole in the gearbox.							
8 Fit the aligning tool. See figure how to fit the tool correctly.	 xx1300001118 <table border="1"> <tr> <td>A</td> <td>Aligning tool</td> </tr> <tr> <td>B</td> <td>Attachment screws (2 pcs)</td> </tr> <tr> <td>C</td> <td>Correct fitting of the aligning tool.</td> </tr> </table> <p>Tightening torque: 50 Nm.</p>	A	Aligning tool	B	Attachment screws (2 pcs)	C	Correct fitting of the aligning tool.
A	Aligning tool						
B	Attachment screws (2 pcs)						
C	Correct fitting of the aligning tool.						

Refitting the armsystem

Use this procedure to refit the arm system on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

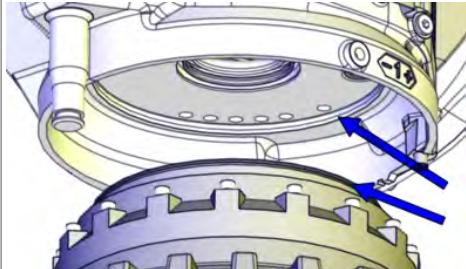
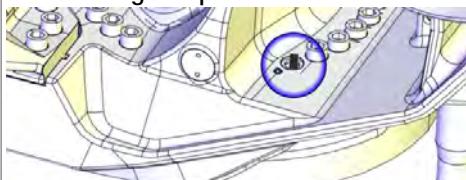
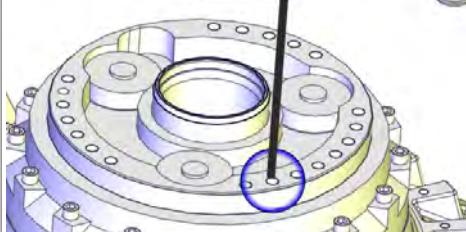
Action	Note
1  CAUTION The arm system weighs 1100 kg. All lifting accessories used must be sized accordingly!	
2 Make sure that all lifting accessories still is fitted correctly on the arm system.	
3 Attach the upper arm lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and to a roundsling run through the wrist.	For a more detailed description see Attaching the lifting accessories on page 578 . Lifting accessory (chain): 3HAC15556-1 Roundsling, 1 m: Length: 1 m. Lifting capacity: 1,000 kg.  xx1200001236

Continues on next page

4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
4 Lift the arm system up, in order to reach the contact surfaces underneath the frame.	
5 Remove old residues of flange sealant and remove all contamination from all contact surfaces.	
6 Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove!	
7 Fit the o-ring in the groove of the gearbox.	
8 Apply grease on gearbox O-ring, and on the corresponding surface on the frame.	 xx1500001955
9 Before putting the complete arm system on to the guide pins, make sure that the hole pattern will match and that the guide pins will enter the correct holes in the frame.	<p>Position of guide pin one:</p>  xx1300000822 <p>Position of guide pin two:</p>  xx1300000823

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Action	Note
10 Use caution and put the complete arm system on the guide pins and lower it down very slowly.  Note While lowering the complete arm system, check that the cylindrical pin is fitted correctly!	
11 When the arm system is almost in position, fit the attachment screws now accessible. Do not use any tools! Fit screws manually.	This is done to be sure that all screws will enter the gears correctly. Attachment screws: M16x110 (16 pcs)
12 Use caution and lower the complete arm system down into position on top of the gearbox.	
13 Secure the complete arm system to the axis-1 gearbox with its <i>attachment screws</i> .	Tightening torque: 300 Nm.
14 Remove the two guide pins and replace with attachment screws. Tighten the remaining attachment screws.	Tightening torque: 300 Nm.
15 Perform a leak-down test.	See Performing a leak-down test on page 196 .
16 Remove the aligning tool, after the leak-down test is completed successfully.	

Preparations prior to refitting motor

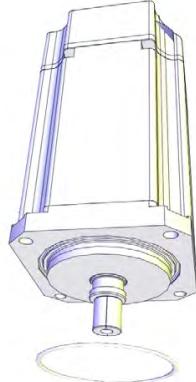
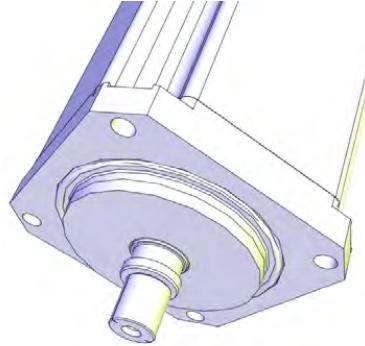
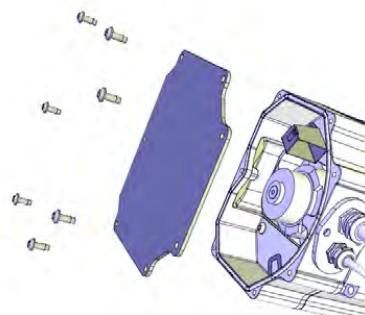
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	
3 Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	

Continues on next page

4 Repair

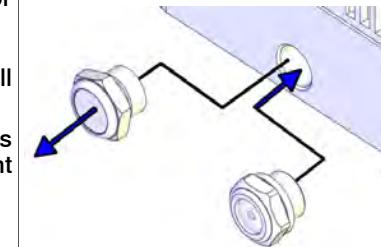
4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
4	Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019
5	Make sure the o-ring is seated in the groove.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	 xx1200001020
6	If the motor is a new spare part, remove the cover.	 xx1200001135

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

	Action	Note
7	<p>Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.</p>	<p>Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.</p>  <p>xx1600000576</p>

Securing the axis-1 motor

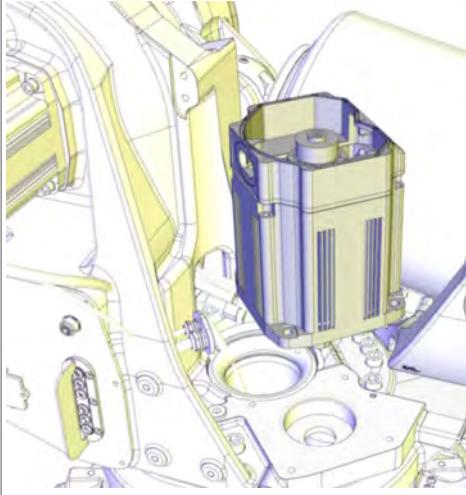
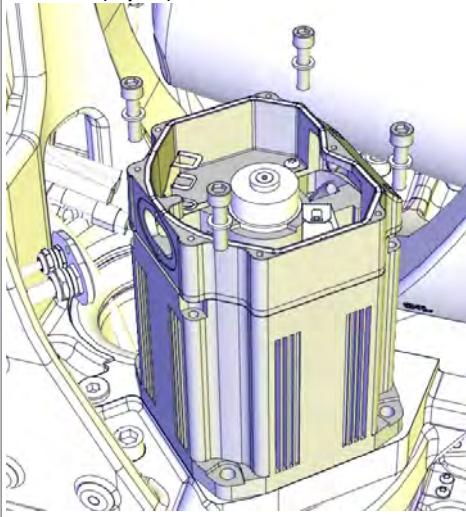
	Action	Note
1	Fit guide pins in opposite holes.	Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!
2	<p>! CAUTION The motor weighs 25 kg. All lifting accessories used must be sized accordingly.</p>	
3	Apply the lifting accessory.	Lifting accessory, motor: 3HAC14459-1.
4	Fit the rotation tool.	Rotation tool: 3HAB7887-1
5	In order to release the brakes, connect the 24 VDC power supply. To release the brakes, connect the 24 VDC power supply as described in the list. Connect to R2.MP1-connector: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
6	<p>! CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	

Continues on next page

4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

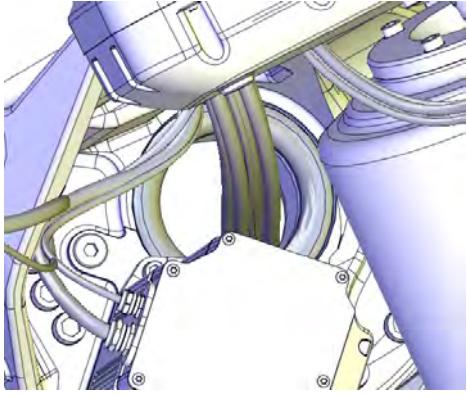
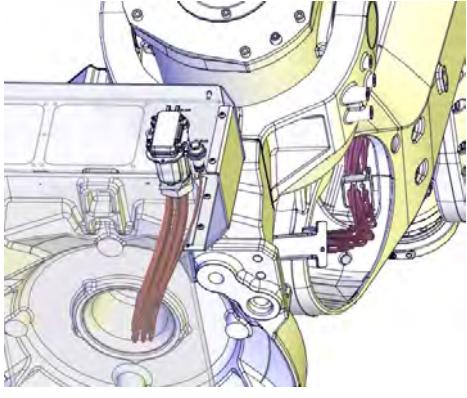
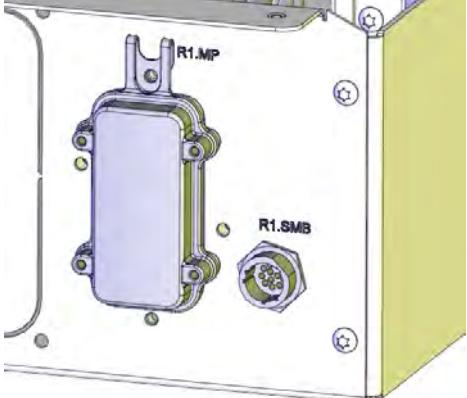
Continued

Action	Note
7 Lower the motor into position. <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear in the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	 xx1200001072
8 Secure the motor with its attachment screws and washers. Use a bits extender to reach the screws.	Bits extender: 3HAC12342-1 Tightening torque: 50 Nm. Screw dimension : M10x40 quality 12.9 Gleitmo (4 pcs)  xx1200001071
9 Perform a leak-down test (if not already done).	See Performing a leak-down test on page 196 .
10 Disconnect the 24 VDC power supply.	

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Refitting the cable harness in the base

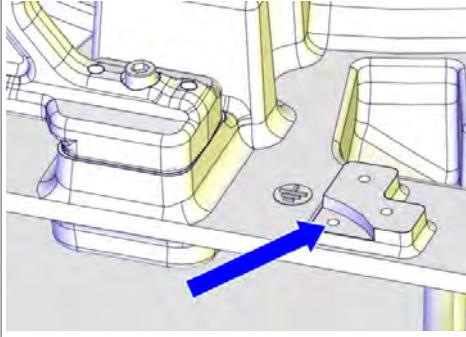
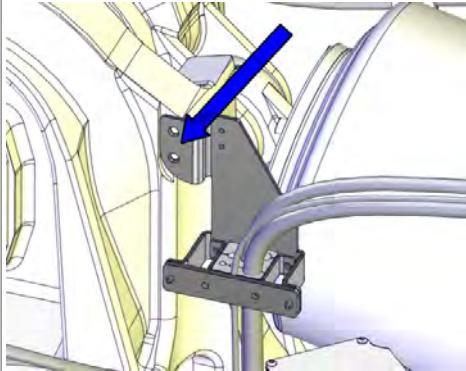
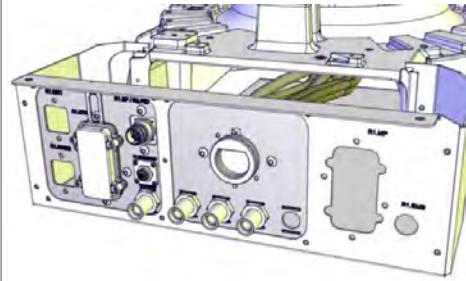
	Action	Note
1	<p>Run the cables through the protection tube in this order:</p> <ul style="list-style-type: none"> • R1.MP • R1.SMB <p>If necessary, lubricate the cables with grease in order to make them run more smoothly.</p>	 xx1300000732
2	<ul style="list-style-type: none"> • Make sure that the cables are not twisted. Each cable must be in line with its position on the base plate. • Make sure that the R1.SMB cable will run on the correct side of the R1.MP1, see the figure. 	 xx1300000736
3	Make sure that the markings on the cables are facing the base cover, when connected.	
4	Connect R1.MP and R1.SMB.	<p>Tightening torque for R1.SMB: 10 Nm.</p>  xx1300000591

Continues on next page

4 Repair

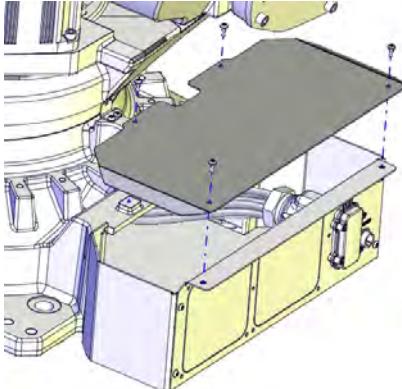
4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

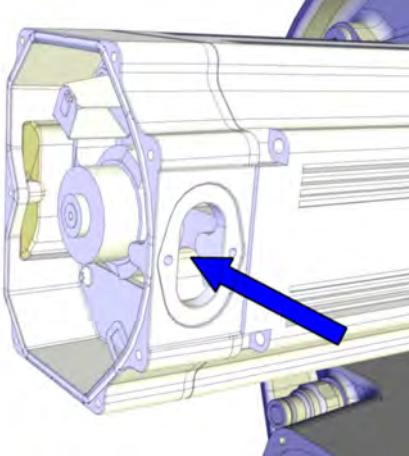
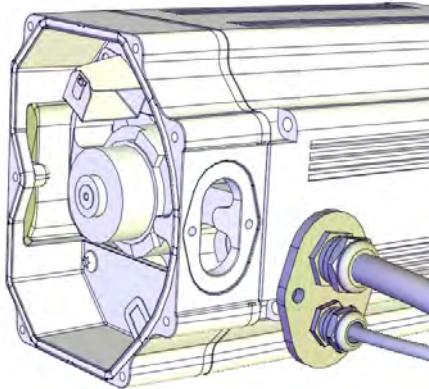
Action	Note
5 Connect the earth cable.	Screw dimension: M6x16 Washer dimension: 6.4x17x3  xx1400000354
6 If used, run the DressPack cables through the protection tube in the base.	
7 If used, run the DressPack hoses through the protection tube in the base. Make sure that the hoses are running correctly and are not twisted!	
8 If used, fit the bracket that hold the DressPack to the frame.	 xx1400000078
9 If used, connect the DressPack cable package on the base plate.	 xx1200000052

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

Action	Note
10 Refit the base cover.	 xx1300000561

Connecting the axis-1 motor cables

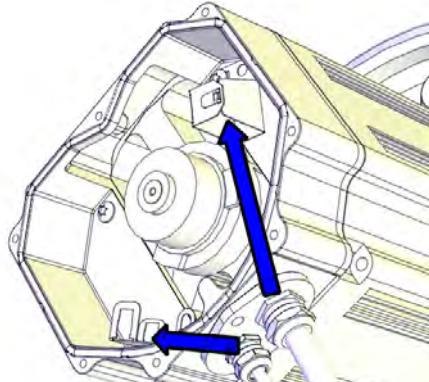
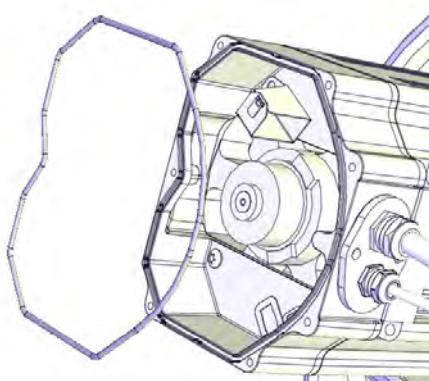
Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738
2 Refit the cable gland cover.  Note Replace the gasket if damaged.	 xx1200001067

Continues on next page

4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
3 Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066
4 Inspect the o-ring.  Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)  xx1200001070
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7  CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)
Continued

	Action	Note
8	<p>Refit the motor cover with its attachment screws.</p> <p>Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001135
9	Make sure that the covers are tightly sealed.	

Concluding procedure

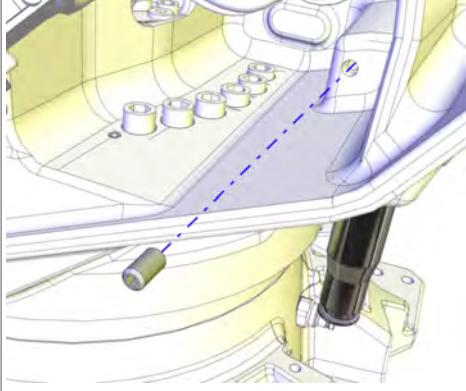
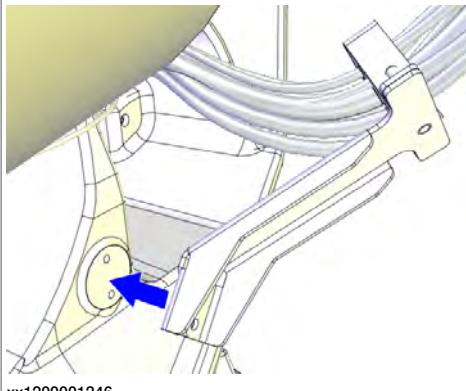
	Action	Note
1	Turn on the power to the robot and jog to: <ul style="list-style-type: none"> • axis 1 = -5° • axis 2 = +10° 	
2	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
3	Refill oil in the gearbox.	See Filling oil into the axis-1 gearbox on page 160 .
4	<p>Foundry Plus: Apply Mercasol on the surfaces shown in the figure, on stop pin and in the hole as shown in the figure.</p>	 xx1400000378

Continues on next page

4 Repair

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
5 Refit the mechanical stop pin and secure it with the attachment screw. Locking liquid (Loctite 243) on screw.	Tightening torque: 24 Nm  xx1300000476
6 Secure the cable harness inside the frame hole with a cable strap.	 xx1200001237
7 Refit the cable bracket on the frame.	 xx1200001246
8 Recalibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .

Continues on next page

4.8.1 Replacing the axis-1 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60,
-155/2.85)
Continued

	Action	Note
9	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48.	

4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Validity of this section - variant *IRB 6700 -300/2.70, -245/3.00*



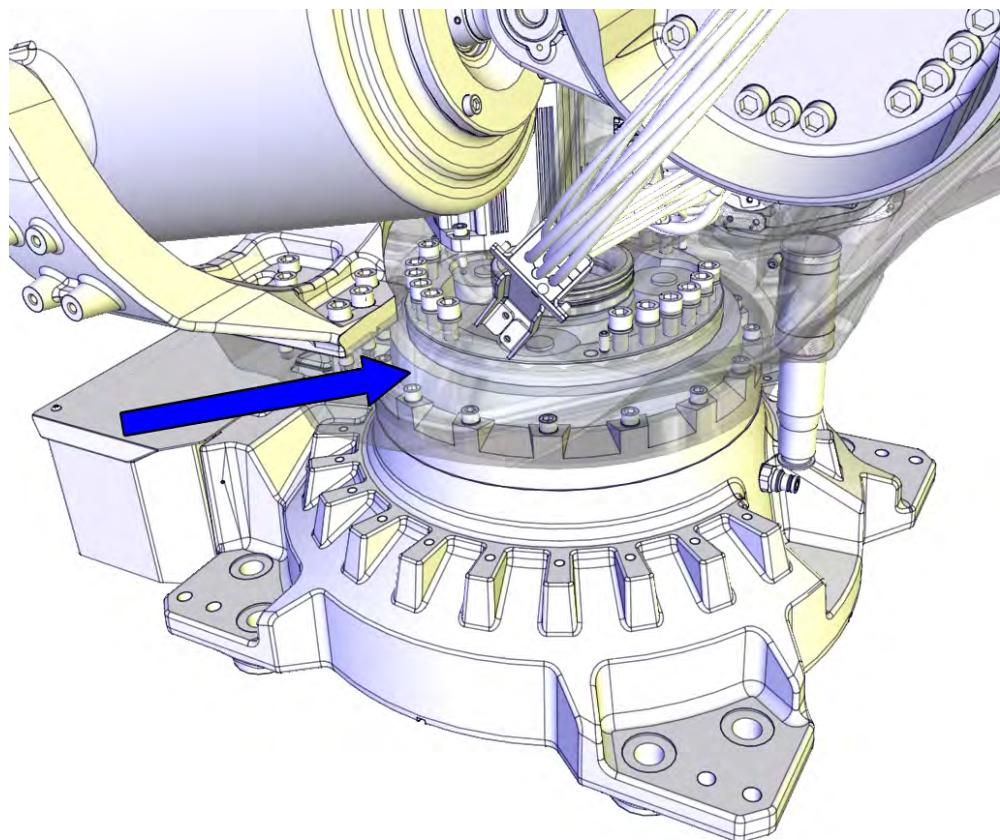
Note

This section describes how to replace the gearbox on variants *IRB 6700-300/2.70, -245/3.00*.

How to replace the gearbox on variants *IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85* see [Replacing the axis-1 gearbox \(IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85\) on page 571](#).

Location of the axis-1 gearbox

The axis-1 gearbox is located as shown in the figure.



xx1200001183

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Remove the cabling from the base.
- 2 Remove the complete arm system (including frame and balancing device) as a package.

Continues on next page

3 Replace the axis-1 gearbox.

Spare parts

Spare parts	Article number	Note
Axis-1 gearbox	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Removal tool M14	3HAC057339-004	Used to push out the motor, if necessary. Always use removal tools in pairs.
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC16131-1	M12
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting shackle	-	SA-10-8-NA1
Roundsling, 1.5 m	-	Length: 1.5 m. Lifting capacity: 2,000 kg.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Lifting eye	3HAC14457-4	M16
Lifting eye	3HAC14457-4	M16
Lifting accessory, motor	3HAC14459-1	
Removal tool M14	3HAC057339-004	Used to push out the motor, if necessary. Always use removal tools in pairs.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Aligning tool	3HAC046645-003	Used for aligning the gearbox against the frame, so that the play in the motor does not need to be adjusted.
24 VDC power supply	-	Used to release the motor brakes.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs!
Guide pin, M16x120	3HAC062397-001	Always use guide pins in pairs!
Guide pin, M16x120	3HAC062397-001	Always use guide pins in pairs!
Guide pin, M20x180	3HAC048814-002	Always use guide pins in pairs.

Continues on next page

4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Equipment, etc.	Article number	Note
Support legs	3HAC15535-1	
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc	Article number	Note
Locking liquid (Loctite 243)	-	
Flange sealant	12340011-116	Loctite 574
Grease	3HAB3537-1	Used to lubricate o-rings.
Locking liquid	3HAB7116-1	Loctite 243
O-ring	3HAB3772-160	414.3x5.7. Located between the gearbox and the frame.
O-ring	3HAB3772-97	Located at the oil inlet underneath of gearbox.
O-ring ⁱ	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on motor cover.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.
Sealing ring	3HAC047474-001	Located in the frame, on top of the protection tube.
O-ring	3HAB3772-57	Located on the sealing ring.
Radial sealing with dust lip	3HAB3701-51	Located in the frame, underneath the sealing ring.
Cable straps	-	

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

Required documents

Document name	Document number	Note
Technical reference manual - Lubrication in gearboxes	3HAC042927-001	

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 Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the axis-1 gearbox

These procedures describe how to remove the gearbox.

Preparations before removing the axis-1 gearbox

Use this procedure to do the necessary preparations, before removing the gearbox.

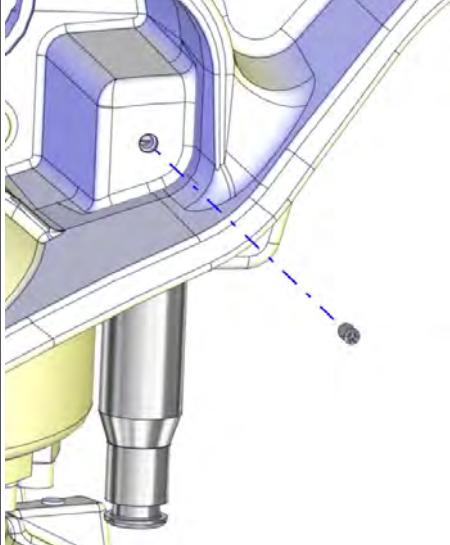
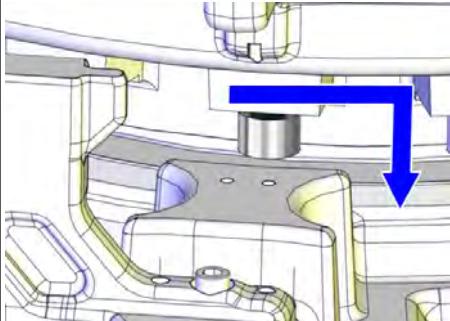
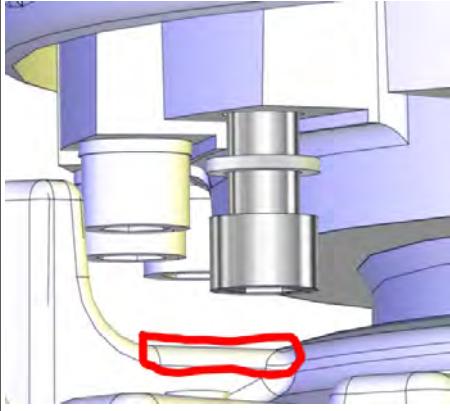
Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 Move the robot to synchronization position.	The axis-1 must be in 0 position to make it possible to remove the mechanical stop pin.
3  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

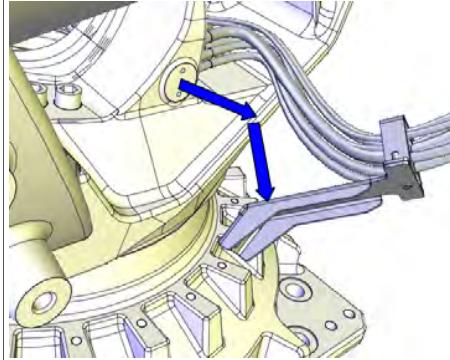
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Action	Note
4 Remove tools and other equipment fitted on the turning disc. DressPack can stay fitted for the time being.	This is done to achieve the best stability of the complete arm system, when it is resting by itself, after it has been removed.
5 Begin draining the axis-1 gearbox.	See <i>Draining the axis-1 gearbox on page 159</i> .
6 Hold the mechanical stop pin in a firm grip, and remove it by unscrewing the attachment screw.  CAUTION The mechanical stop weighs 5 kg.	 xx1400002179
7 Move axis 1 to a position where it is possible to remove the most backward attachment screw, placed behind the axis-1 synchronization plate.  Tip Either turn on the power temporarily, jog the robot and then turn off power supply again. Or release the brakes manually on the axis-1 motor by connecting the 24 VDC power supply to the R2.MP1-connector: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	 xx1400002167
8 Unscrew the screw but only so far that it will be possible to remove manually later.  Note It must still be possible to change position of axis-1 without the attachment screw colliding with something.	 xx1400002168

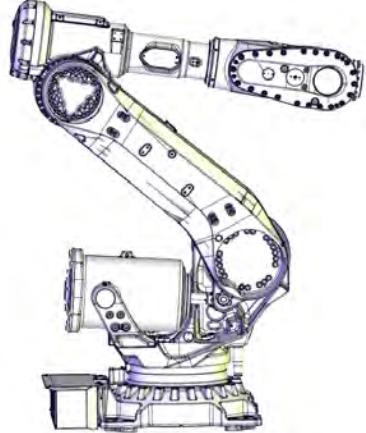
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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
9 Unscrew the attachment screws that secure the cable bracket.	 xx1200001184

Robot position

Action	Note
1 Jog the robot into position: <ul style="list-style-type: none"> Axis 1: no significance (as long as the robot is secured to the foundation) Axis 2: -45° Axis 3: +65° Axis 4: 0° Axis 5: +80° Axis 6: no significance 	 xx1200001132
2  DANGER Turn off all: <ul style="list-style-type: none"> electric power supply hydraulic pressure supply air pressure supply to the robot, before entering the robot working area.	

Attaching the lifting accessories to the arm system

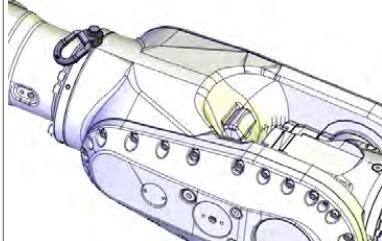
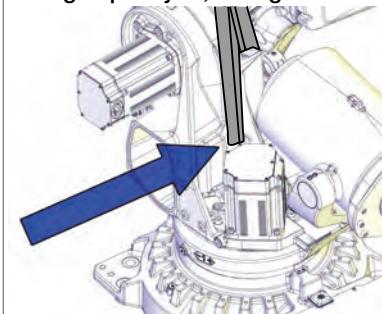
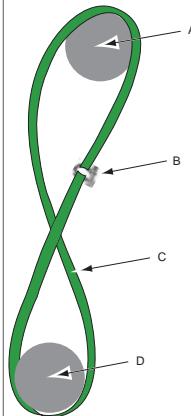
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

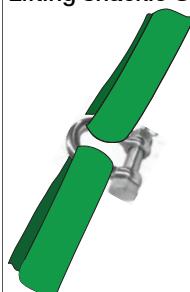
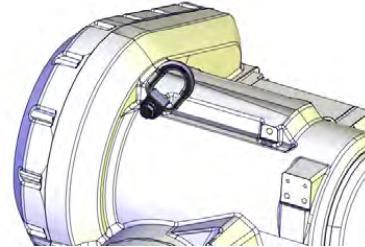
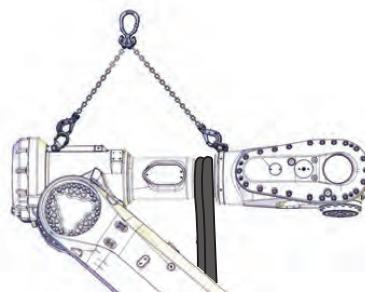
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	Action	Note
2	 CAUTION The complete arm system weighs 1300 Kg. All lifting accessories used must be sized accordingly!	
3	Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1  xx1200001133
4	Run a roundsling through the hole in the frame.	Roundsling, 2.5 m: Length: 2.5 m. Lifting capacity: 2,000 kg.  xx1400002107
5	Continue to run the roundsling up and over the upper arm.  Tip When attaching the roundsling, make sure to cross it over, creating a figure 8 of the roundsling. This will prevent the roundsling from gliding.	 xx1400000728 A Upper arm B Shackle C Roundsling D Hole in frame

Continues on next page

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
6	Connect the roundsling with a shackle.	Lifting shackle SA-10-8-NA1  xx1400000729
7	Use caution and jog axis-3 slowly to stretch the roundsling.  Note Make sure the roundsling is stretched, so it can carry the weight of the frame.	
8	Fit a lifting eye to the arm house, with a fender washer underneath.  xx1400002196	Lifting eye: 3HAC16131-1 Fender washer. Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.  xx1200001134
9	Attach the Lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and to the lifting eye in the wrist.	Lifting accessory (chain): 3HAC15556-1  xx1400002108

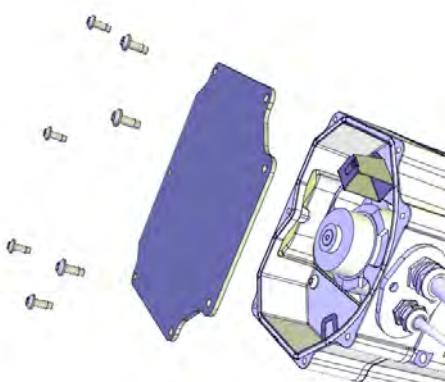
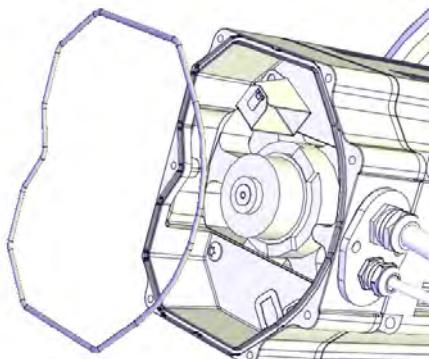
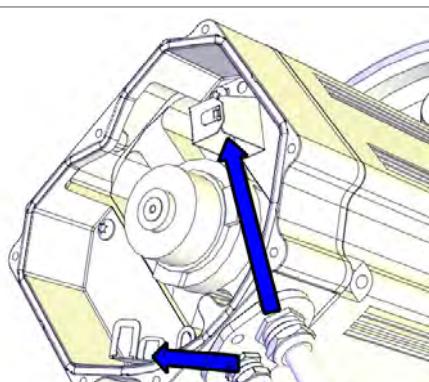
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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

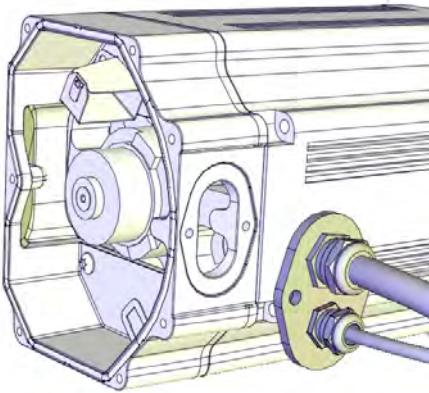
Disconnecting the axis-1 motor cables

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3	Make sure the o-ring is present.	 xx1200001070
4	Disconnect the motor cables.	 xx1200001066

Continues on next page

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
<p>5 Remove the cable gland cover. Make sure the gasket is not damaged.</p> <p> Tip</p> <p>Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1200001067
6 Use caution and pull out the motor cables.	

Removing the axis-1 motor

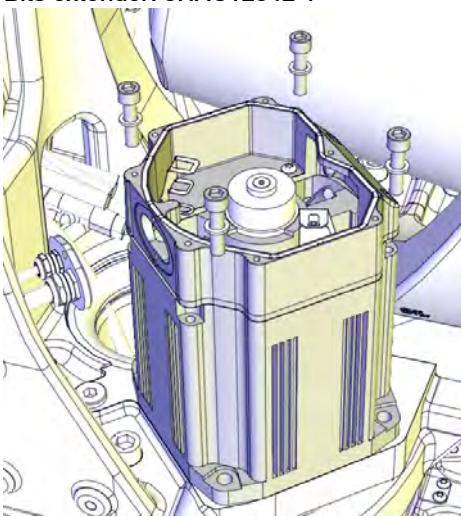
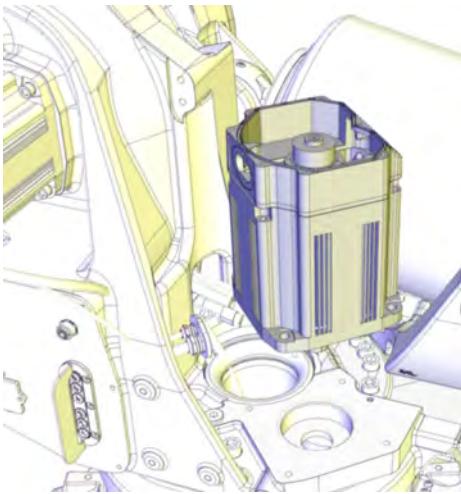
Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2 Attach the lifting accessories.	Lifting accessory (chain): 3HAC15556-1 Lifting accessory, motor: 3HAC14459-1.
<p>3 To release the brakes, connect the 24 VDC power supply</p> <p>Connect to R2.MP1-connector:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	24 VDC power supply
<p>4  CAUTION</p> <p>The weight of the motor is 25 kg All lifting accessories used must be sized accordingly.</p>	

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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

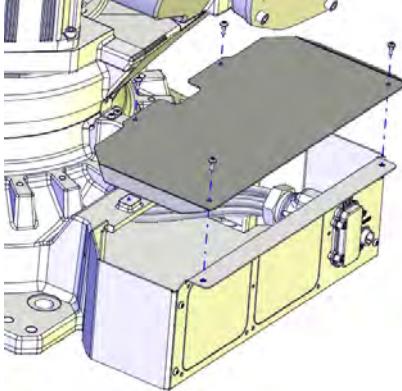
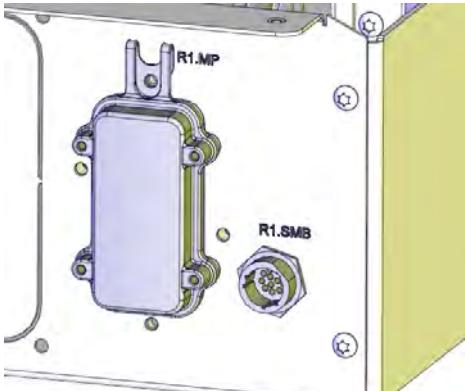
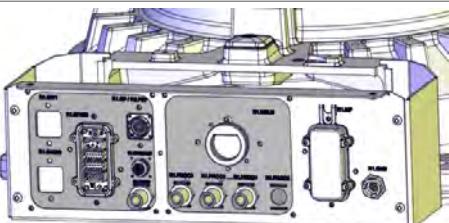
Action	Note
5 Unscrew the attachment screws and washers. Use a bits extender in order to reach the screws.	Bits extender: 3HAC12342-1  xx1200001071
6 Fit guide pins in opposite holes.	Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!
7  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
8 If needed, use removal tools to help remove the motor.	Removal tool M12: 3HAC057339-003
9 Use caution and lift the motor straight up to get the pinion parted from the gear.	 xx1200001072
10 Disconnect the 24 VDC power supply.	

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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Preparations before removing the cable harness in the base

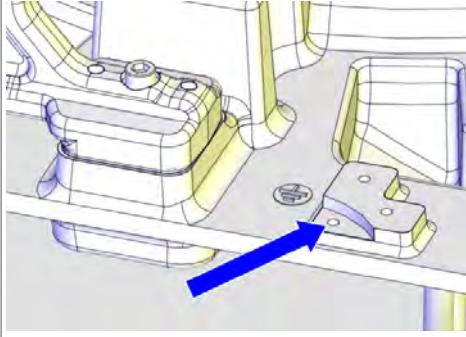
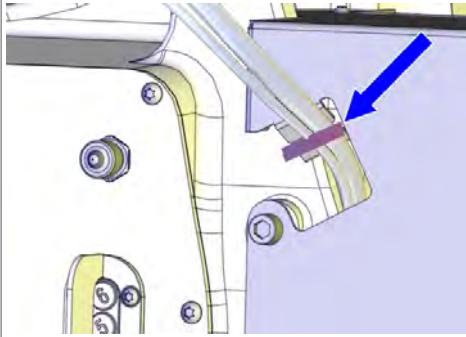
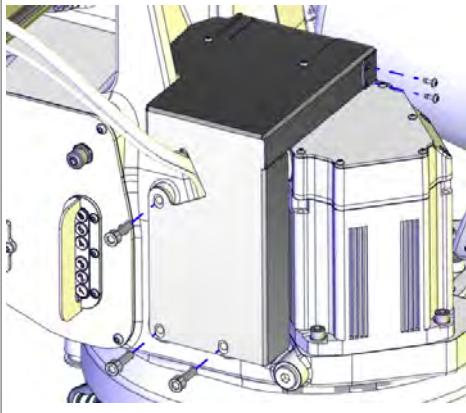
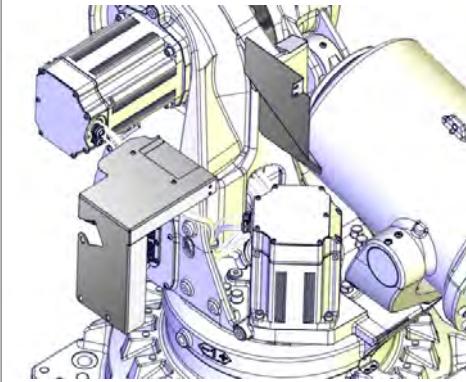
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the base cover.	 xx1300000561
3	Remove connectors in the base: <ul style="list-style-type: none"> • R1.MP • R1.SMB 	 xx1300000591
4	If used, disconnect the DressPack hoses in the base.	 xx1400000366

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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

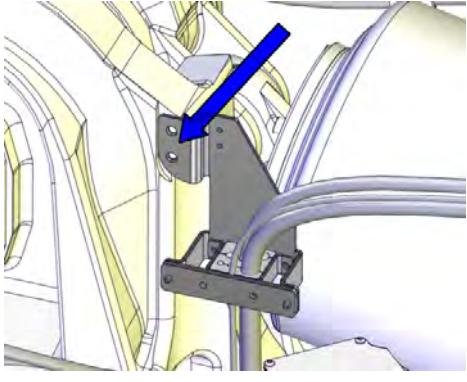
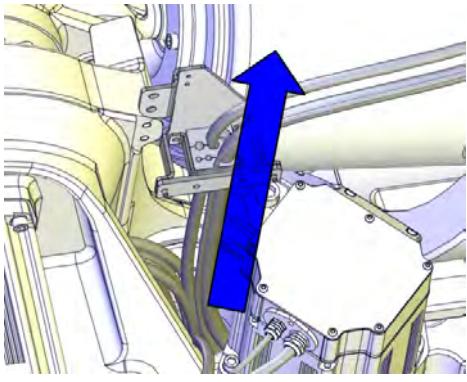
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Action	Note
5 Disconnect the earth cable.	Screw dimension : M6x16 Washer dimension : 6.4x17x3  xx1400000354
6 Foundry Plus. Cut the cable tie that hold the axis-1 and axis-2 motor cables on the protection plates.	 xx1400000722
7 Foundry Plus. Disassemble the protection plates by removing five of the attachment screws (three M10x30 and two of the M5x12 screws).	 xx1400000723
8 Foundry Plus. Remove the two protection plates.	 xx1400000724

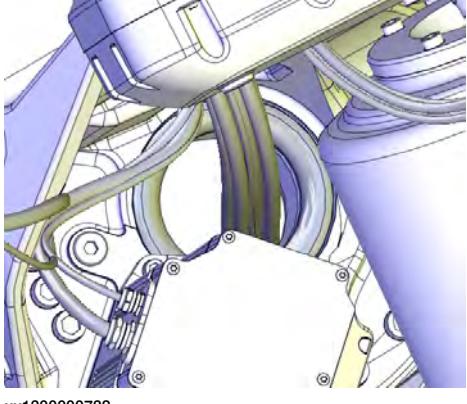
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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
9	If used, remove the attachment screws that secure the bracket. This is done to facilitate removal of the DressPack hoses.	 xx1400000078
10	If used, use caution and pull out the DressPack hoses through the protection tube in the base. Note There is no need to pull out the DressPack cables at this point!	 xx1400000088

Removing the cable harness in the base

	Action	Note
1	If used, use caution and pull out the DressPack cables through the protection tube and place it safely over the balancing device.	
2	Use caution and pull out the robot cable harness through the protection tube.	 xx1300000732
3	Place the cable harness over the balancing device.	

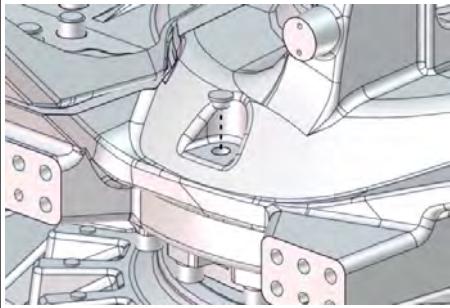
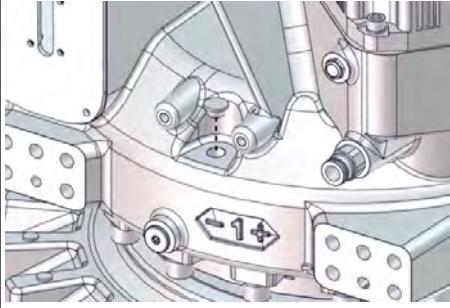
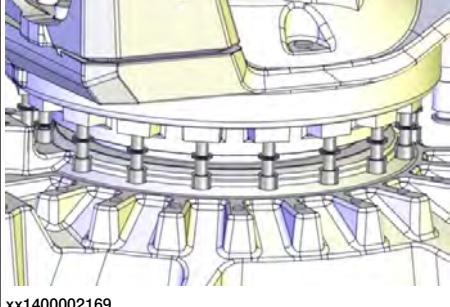
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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Lifting away the complete arm system

Action	Note
1 Check that the axis-1 gearbox is drained and then remove the draining equipment.	
2 Raise the overhead crane to stretch the chains and roundslings. Make sure that the roundsling between the upper arm and the frame is stretched.	
3 Remove the two protection plugs on the left and right hand side of the frame and install guide pins in the holes.  Tip Lubricate the guide pins with some grease to make the frame slide better.	 xx1700000320  xx1700000321 Guide pin, M16x120: 3HAC062397-001 Always use guide pins in pairs!
4 Unscrew all attachment screws as far as it is possible at this point.	 xx1400002169  Note It will not be possible to remove the screws completely at this point.
5  CAUTION The complete arm system weighs: 1300 Kg. All lifting accessories used must be sized accordingly!	

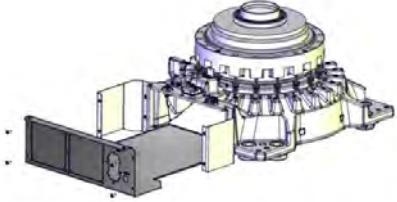
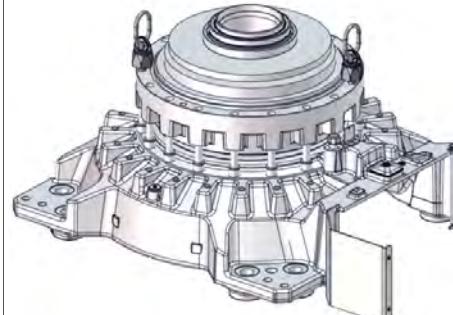
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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
<p>6 Lift away the complete arm system.</p> <p>! CAUTION</p> <p>When the arm system has left the guide pins it can move. Use caution in order to avoid injury or damage!</p> <p>i Note</p> <p>There will be some oil spill!</p>	
7 Put down the arm system on the floor.	
<p>8 ! DANGER</p> <p>When the complete arm system is removed and resting by itself on the floor, make sure it is resting completely stable before removing the lifting accessories. Do not change the position of the axes from the position described earlier.</p>	

Removing the gearbox

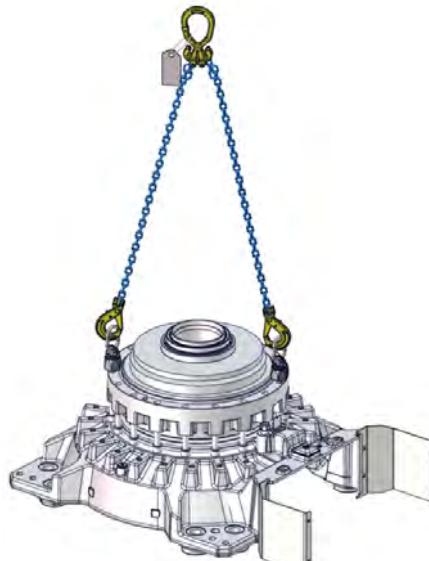
Action	Note
1 Remove the back plate.	 xx1400002171
<p>2 Fit two lifting eyes in opposite holes in the gearbox.</p> <p>! CAUTION</p> <p>Leave a couple of millimeters of space between the lug and the surface of the gearbox. This is done in order not to damage the surface of the gearbox which is a sealing surface.</p>	<p>Lifting eye: 3HAC14457-4</p>  xx1700000323

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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

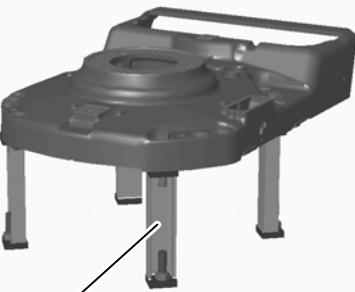
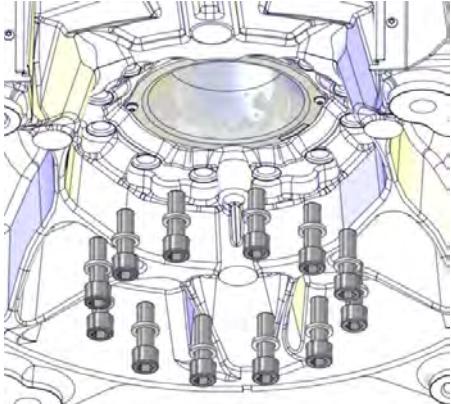
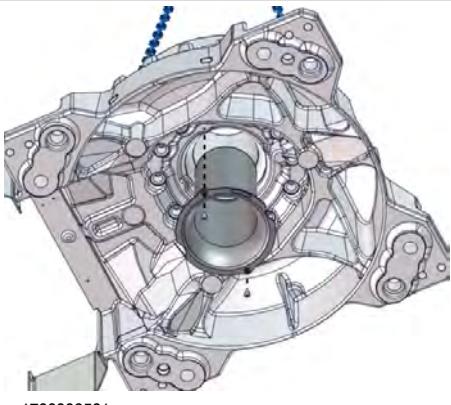
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Action	Note
3  CAUTION The gearbox and base together weighs: 240 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 305 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
4 Attach the lifting accessory.	Lifting accessory (chain): 3HAC15556-1  xx1700000324
5 Unscrew the attachment screws that hold the base to the foundation and lift base and gearbox up high enough to be able to fit the four support legs.	 xx1400002180

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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

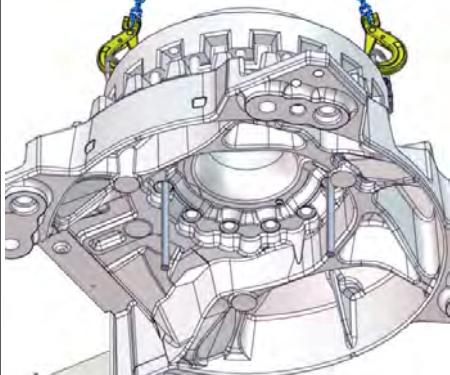
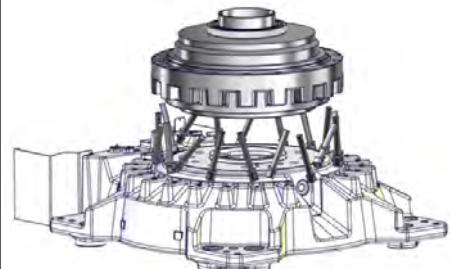
	Action	Note
6	Secure the support legs to the foundation using the same holes as to secure the base.	 A xx1000000364
7	Lower the base and gearbox to the support legs and secure.	
8	With base and gearbox safely resting on the support legs, unscrew the attachment screws that secure the gearbox to the base, from underneath the base.	 xx1400002172
9	Remove the protection tube from the base by removing the two attachment screws and pulling the tube downwards.	 xx1700000561

Continues on next page

4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
10 Fit two guide pins in opposite holes.  Tip Lubricate the guide pins with some grease to make the gearbox slide better.	Guide pin, M20x180: 3HAC048814-002 Always use guide pins in pairs.  xx1700000337
11  CAUTION The gearbox weighs: 92 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 140 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
12 Lift away the gearbox.	 xx1700000566
13 Make sure that the o-ring between base and gearbox is not lost.	

Refitting the axis-1 gearbox

These procedures describe how to refit the axis-1 gearbox.

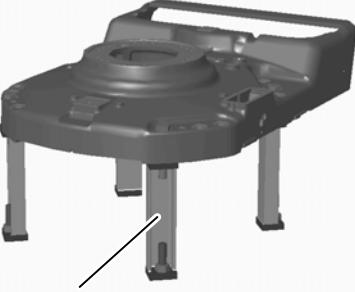
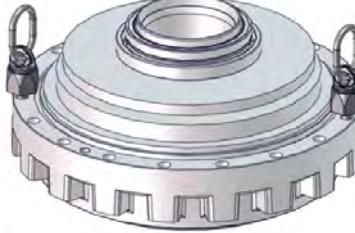
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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Follow the order of the procedures according to the order they are presented.

Preparations before refitting the axis-1 gearbox

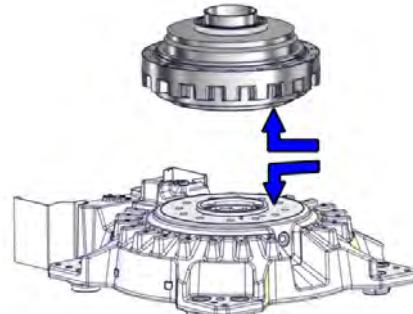
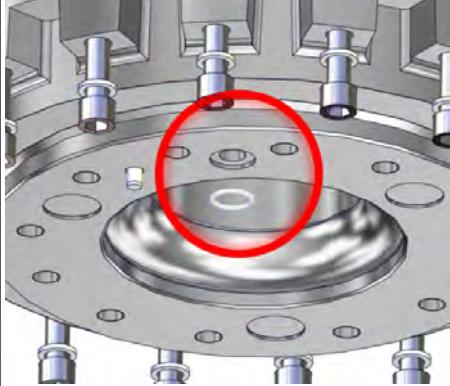
Action	Note
1 If not already done, fit and secure the four support legs to the foundation. Then lift up and secure the base on top of the legs.	 xx1000000364 A Support legs: 3HAC15535-1.
2 Fit two lifting eyes in opposite holes in the gearbox. ! CAUTION Leave a couple of millimeters of space between the lug and the surface of the gearbox. This is done in order not to damage the surface of the gearbox which is a sealing surface.	Lifting eye: 3HAC14457-4  xx1700000325
3 ! CAUTION The gearbox weighs: 92 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 140 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	

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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

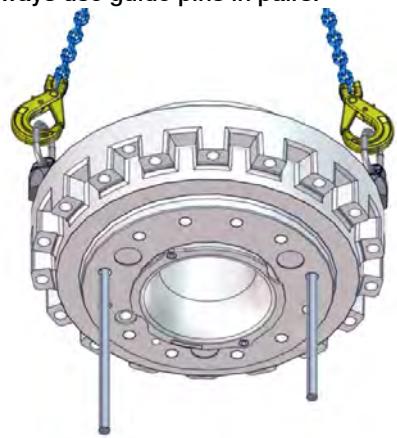
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Action	Note
4 Attach the lifting accessory and lift the gearbox.	Lifting accessory (chain): 3HAC15556-1  xx1700000326
5 Wipe the contact surfaces between gearbox and base clean from any contamination.	 xx1700000567
6 Wipe clean the o-ring groove for the small o-ring beneath the gearbox.	 xx1400002175
7 Replace the small o-ring between base and gearbox with a new. Clean the new o-ring, put some grease on it and place it in the groove.	O-ring: 3HAB3772-97.

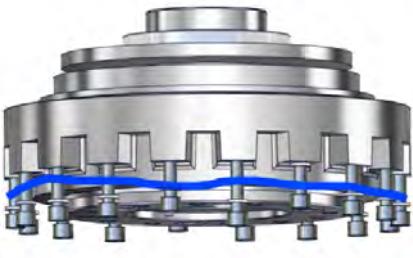
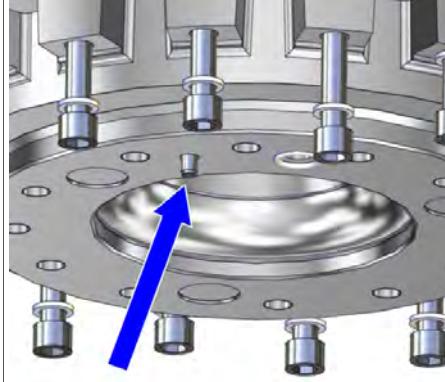
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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
<p>8 Fit guide pins in opposite holes in the gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the gearbox slide better.</p>	<p>Guide pin, M20x180: 3HAC048814-002 Always use guide pins in pairs.</p>  <p>xx1700000327</p>

Refitting the gearbox to the base

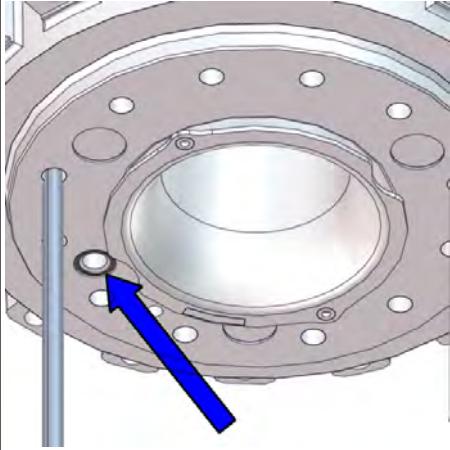
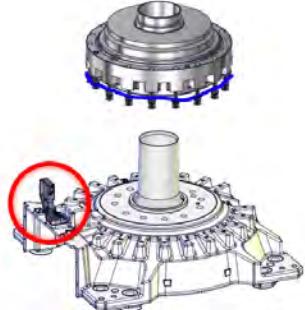
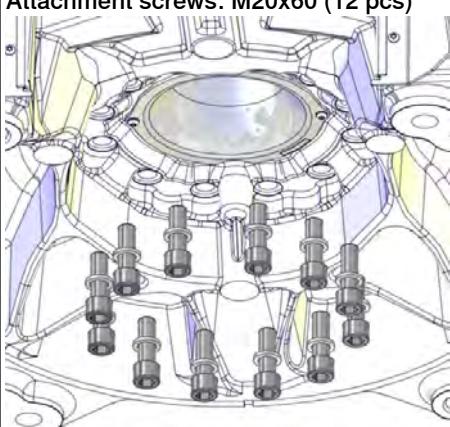
Action	Note
<p>1 Before the gearbox is being fitted, place the attachment screws that will secure the gearbox to the frame, temporarily in their holes and lock screws with the old o-ring. This is done to prevent the screws from falling out.</p> <p> Note</p> <p>Do not use the new o-ring!</p>	<p>If the attachment screws are not fitted like this at this point, it will be almost impossible to fit the screws later when the gearbox is resting on the base.</p>  <p>xx1400002176</p>
<p>2 Make sure that the locating pin in the base will match its hole in the gearbox.</p>	 <p>xx1400002177</p>

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4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

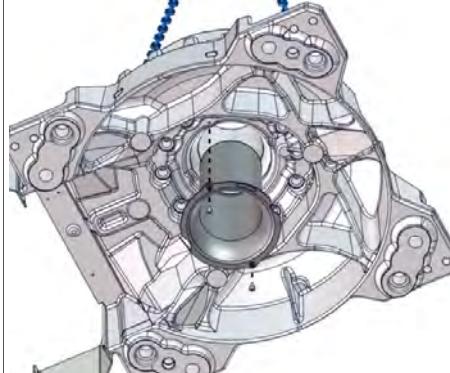
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Action	Note
<p>3 With all screws in position, lower the gearbox carefully down against the base with guidance from the guide pins.</p> <p>Note Make sure that the small o-ring underneath the gearbox, stays fitted correctly when the gearbox is being fitted.</p> <p>Note Be careful not to collide with the calibration bracket at the base.</p>  <p>xx1700000328 O-ring: 3HAB3772-97.</p>  <p>xx1400002178</p>	
<p>4 Remove the big o-ring that holds the attachment screws in the temporary position and let them drop down on the base.</p> <p>Note Make sure that none of the screws are missing or in the wrong position. If so, redo the procedure!</p>	
<p>5 Lower the lifting accessory so that the chain is no longer stretched.</p>	
<p>6 Fit the attachment screws that secure the gearbox to the base, from underneath.</p>	<p>Attachment screws: M20x60 (12 pcs)</p>  <p>xx1400002172</p>

Continues on next page

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
7	Remove the guide pins and fit the two remaining screws.	
8	<p>Secure the attachment screws.</p> <p> Tip</p> <p>This procedure is best performed by two persons working together:</p> <ul style="list-style-type: none"> one underneath the robot base making sure that the bit is being fitted into the screw head holes, all the way until they reach the bottom one using the torque wrench, tightening the screws from beside the base. 	Tightening torque: 500 Nm.
9	<p>Check the protection tube for damages. Especially inspect the surface for the sealing ring.</p> <p>Replace if damaged.</p>	 xx1700000568
10	Wipe the surfaces of the protection tube and the hole in axis-1 gearbox clean from any contamination.	
11	Put some grease on the protection tube.	
12	Refit the protection tube to the base. Secure with the two attachment screws.	 xx1700000561

Continues on next page

4 Repair

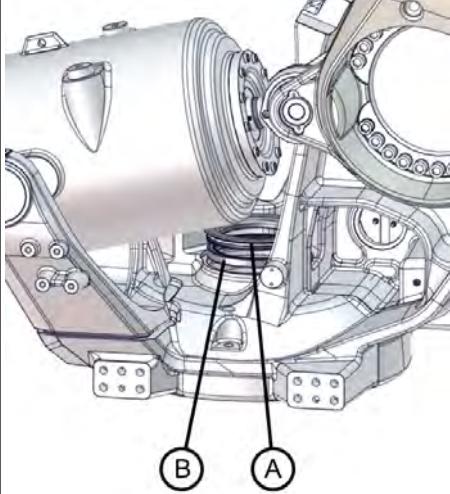
4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Refitting the base to the foundation

Action	Note
1  CAUTION The gearbox and base together weighs: 240 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 305 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2 Stretch the lifting accessories to take the weight of base and gearbox.	
3 Unscrew the screws that secure the base to the support legs and lift up base and gearbox.	
4 Remove the support legs.	
5 Lower the base and gearbox down to the foundation.	
6 Secure the base to the foundation.	M24 x 100 (8 pcs) 550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)

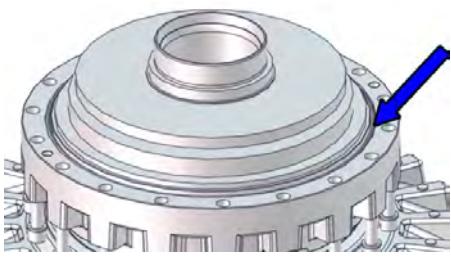
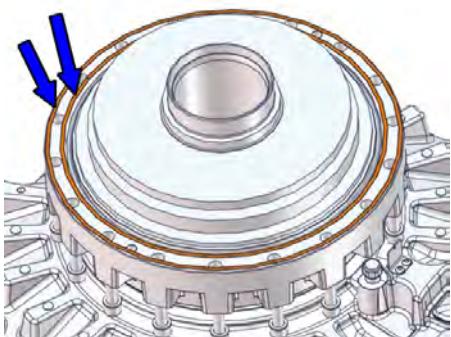
Preparations before refitting the arm system

Action	Note
1 Remove the sealing ring and the radial sealing from the frame.	 xx1700000569 A Sealing ring B Radial sealing with dust lip
2 Remove old residues of flange sealant and other contamination from the contact surfaces on the gearbox.	
3 Wipe clean the contact surfaces from any remaining contamination.	

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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

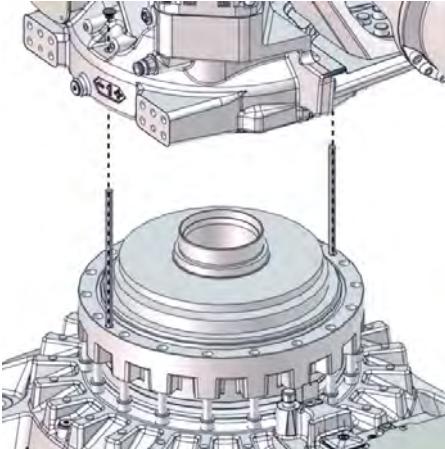
	Action	Note
4	Wipe clean the o-ring groove in the gearbox and apply some grease to the groove.	Grease, Shell Gadus S2V220 AC: 3HAB3537-1.
5	Wipe a new o-ring clean, apply some grease to it and replace the old one between base and frame with a new. Install the new o-ring in the groove.  Note A new o-ring also needs to be cleaned!	O-ring: 3HAB3772-160. Grease, Shell Gadus S2V220 AC: 3HAB3537-1.  xx1700000336
6	Apply flange sealant in two strings according to the figure.	Flange sealant, Loctite 574: 12340011-116.  xx1700000415
7	Apply some grease on: <ul style="list-style-type: none">• the outside of the bearing• the guiding part of the bearing• the edge of the protection tube• the edge around the gearbox.	

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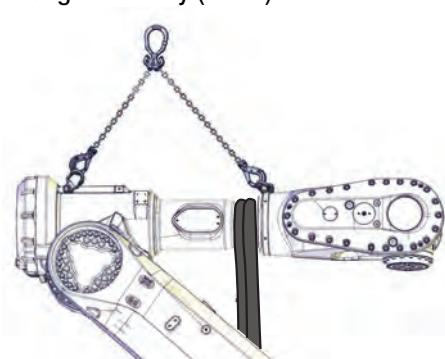
4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
<p>8 Apply guide pins in the guide pin holes in the gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the frame slide better.</p>	<p>Guide pin, M16x120: 3HAC062397-001 (2 pcs). Always use guide pins in pairs!</p>  <p>xx1700000329</p>

Refitting the armsystem

Action	Note
<p>1  CAUTION</p> <p>The arm system weighs 1300 Kg. All lifting accessories used must be sized accordingly!</p>	
<p>2 Make sure that all lifting accessories still is fitted correctly on the arm system.</p>	<p>See Attachment points of lifting accessory on page 208.</p>
<p>3 Attach the upper arm lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and to the lifting eye in the wrist.</p>	<p>Lifting accessory (chain): 3HAC15556-1</p>  <p>xx1400002108</p>
<p>4 Lift the arm system up, in order to reach the contact surfaces underneath the frame.</p>	
<p>5 Wipe clean the contact surfaces from any remaining contamination.</p>	

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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

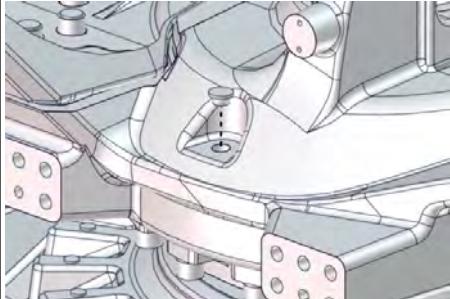
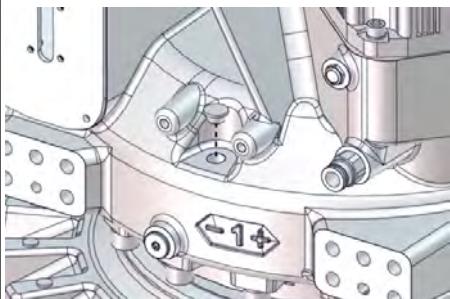
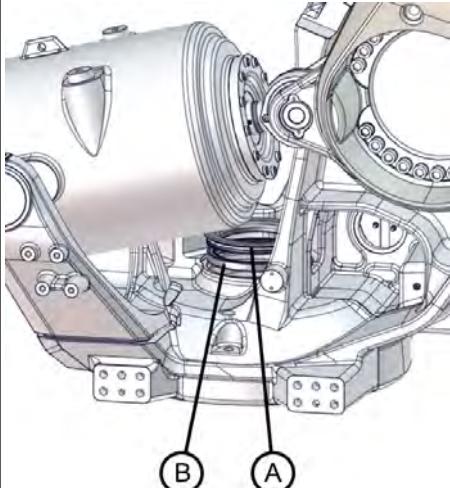
	Action	Note
6	Before putting the complete arm system on to the guide pins, make sure that the hole pattern will match and that the guide pins will enter the correct holes in the frame.	
7	Lift the complete arm system and lower it slowly down over the guide pins, until it is possible to insert the attachment screws manually.  CAUTION Do not lower the arm system completely at this stage! The attachment screws must be fitted in two steps. If not, the complete arm system will risk resting on the attachment screws in the wrong position!	
8	Fit the attachment screws manually as far as possible. Then lower the complete arm system slowly in steps until all attachment screws no longer can reach the base when the arm system is completely lowered all the way down.	Attachment screws: M16x110
9	Make sure that the complete arm system is completely lowered all the way.	
10	 Note The attachment screw at the axis-1 synchronization plate can not be reached to be secured at this stage. Make sure it is still in its place and will not be damaged in the continued procedure.	
11	 Note In order to be able to reach the attachment screws, a holder for bits is needed.	Bit holder: 3HAC029090-001. Tightening torque: 300 Nm
12	Manually rotate axis-1 to a position where the remaining attachment screw can be secured.	

Continues on next page

4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
13 Remove the guide pins and refit the plastic protection plugs.	 xx1700000320
	 xx1700000321
14 Refit the radial sealing. Replace if damaged.	
15 Refit the sealing ring. Make sure the o-ring is placed in its groove on the sealing ring. Replace if damaged.	 xx1700000569
16 Refit the base plate.	

Securing the axis-1 motor

Action	Note
1 Fit guide pins in opposite holes.	Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!

Continues on next page

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

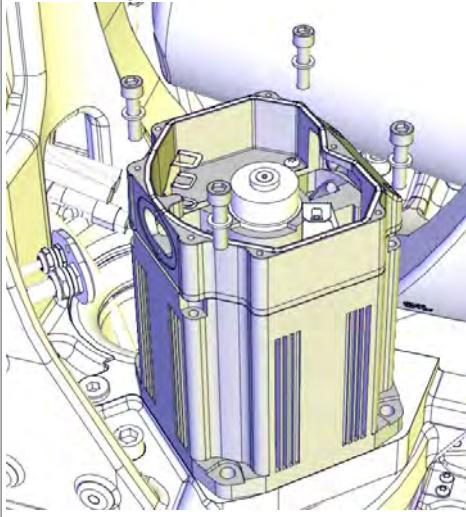
Continued

	Action	Note
2	 CAUTION The motor weighs 25 kg. All lifting accessories used must be sized accordingly.	
3	Apply the lifting accessory.	Lifting accessory, motor: 3HAC14459-1.
4	Fit the rotation tool.	Rotation tool: 3HAB7887-1
5	In order to release the brakes, connect the 24 VDC power supply.	
	To release the brakes, connect the 24 VDC power supply as described in the list.	
	Connect to R2.MP1-connector:	
	• + = pin 2	
	• - = pin 5	
6	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
7	Lower the motor into position.	
	• Make sure that the motor pinion is properly mated to the gear in the gearbox.	
	• Make sure that the motor pinion does not get damaged.	
	• Make sure that the direction of the cable exit is facing the correct way.	

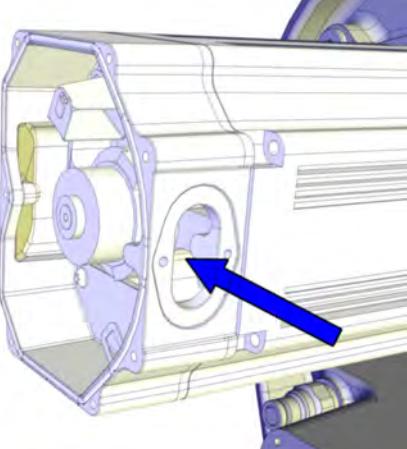
4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
8 Secure the motor with its attachment screws and washers. Use a bits extender to reach the screws.	Bits extender: 3HAC12342-1 Tightening torque: 50 Nm. Screw dimension : M10x40 quality 12.9 Gleitmo (4 pcs)  xx1200001071
9 Perform a leak-down test (if not already done).	See Performing a leak-down test on page 196 .
10 Disconnect the 24 VDC power supply.	

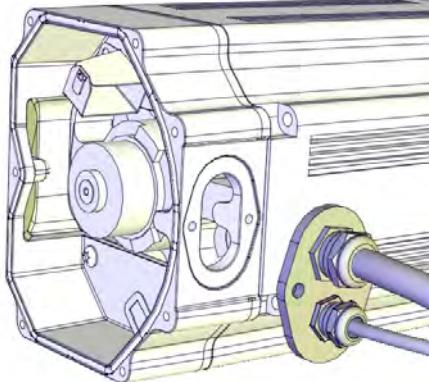
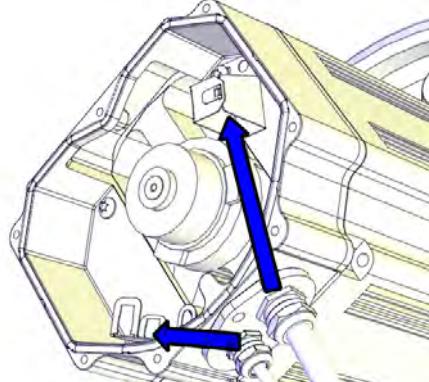
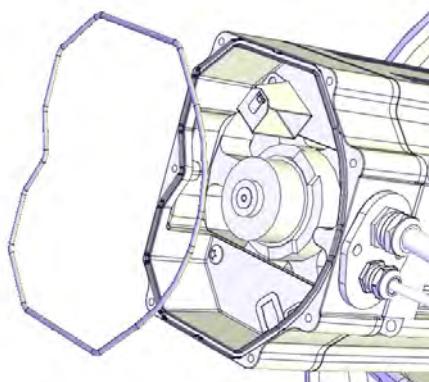
Connecting the axis-1 motor cables

Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738

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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

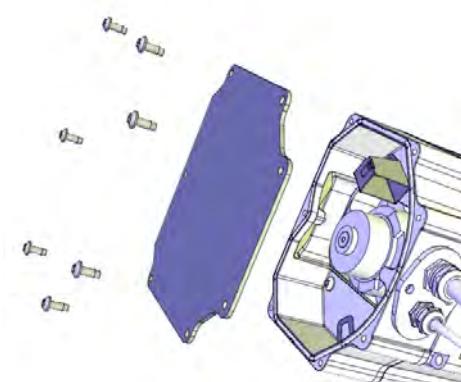
	Action	Note
2	<p>Refit the cable gland cover.</p> <p>Note</p> <p>Replace the gasket if damaged.</p>	 xx1200001067
3	<p>Connect the motor cables.</p> <p>Connect in accordance with the markings on the connectors.</p>	 xx1200001066
4	<p>Inspect the o-ring.</p> <p>Note</p> <p>Replace if damaged.</p>	<p>O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)</p>  xx1200001070

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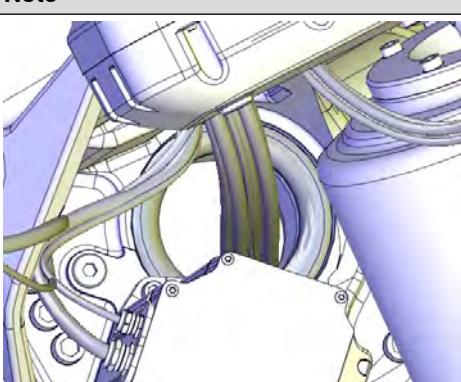
4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring. 💡 Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7 ! CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
8 Refit the motor cover with its attachment screws. 💡 Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged. 💡 Note Make sure the o-ring is undamaged and properly fitted.	 xx1200001135
9 Make sure that the covers are tightly sealed.	

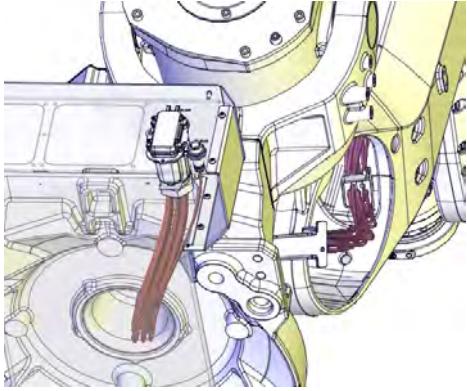
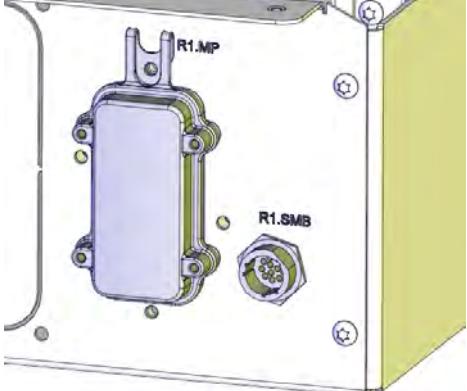
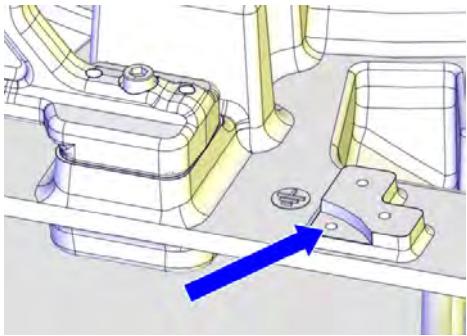
Refitting the cable harness in the base

Action	Note
1 Run the cables through the protection tube in this order: <ul style="list-style-type: none">• R1.MP• R1.SMB If necessary, lubricate the cables with grease in order to make them run more smoothly.	 xx1300000732

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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

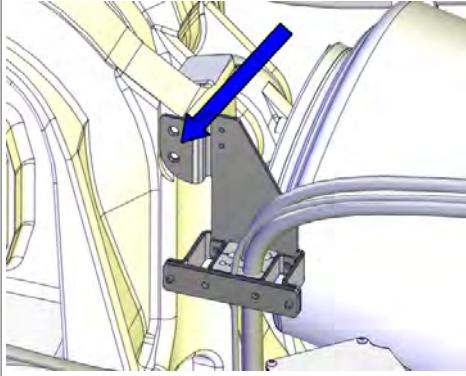
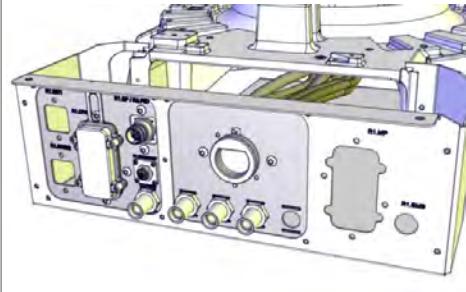
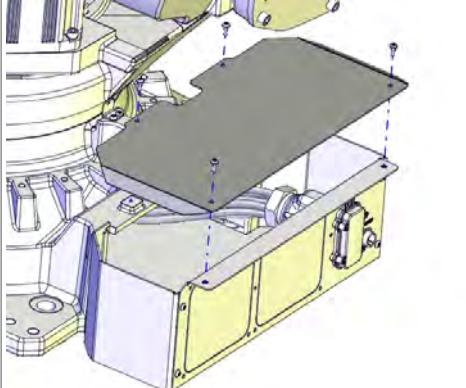
Action	Note
2 • Make sure that the cables are not twisted. Each cable must be in line with its position on the base plate. • Make sure that the R1.SMB cable will run on the correct side of the R1.MP1, see the figure.	 xx1300000736
3 Make sure that the markings on the cables are facing the base cover, when connected.	
4 Connect R1.MP and R1.SMB.	Tightening torque for R1.SMB: 10 Nm.  xx1300000591
5 Connect the earth cable.	Screw dimension: M6x16 Washer dimension: 6.4x17x3  xx1400000354
6 If used, run the DressPack cables through the protection tube in the base.	
7 If used, run the DressPack hoses through the protection tube in the base. Make sure that the hoses are running correctly and are not twisted!	

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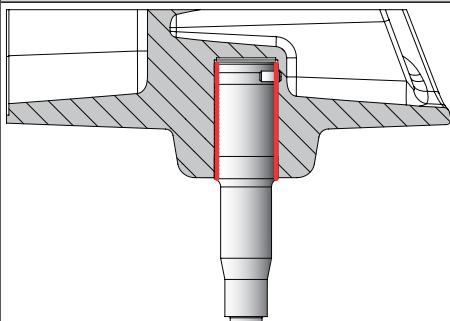
4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
8 If used, fit the bracket that hold the DressPack to the frame.	 xx1400000078
9 If used, connect the DressPack cable package on the base plate.	 xx1200000052
10 Refit the base cover.	 xx1300000561

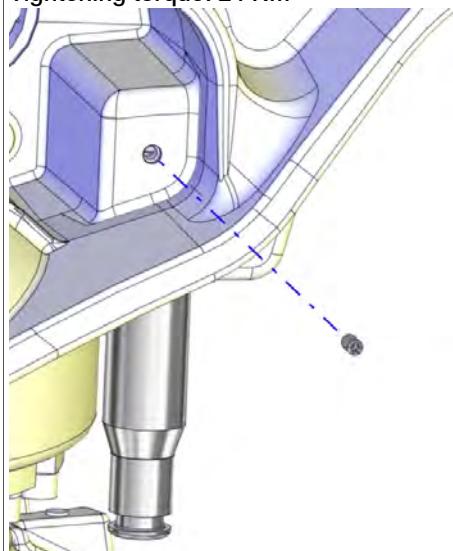
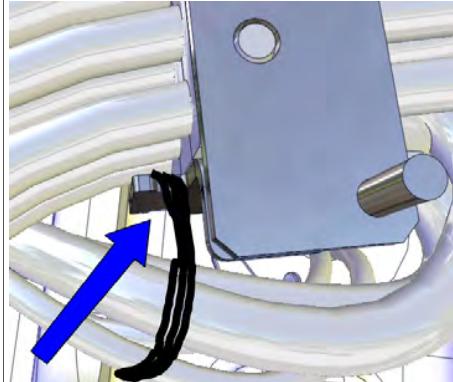
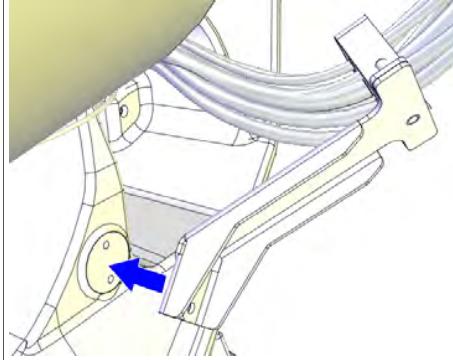
Refitting the mechanical stop and remaining cable brackets

Action	Note
1 <i>Foundry Plus:</i> Apply Mercasol on the surfaces shown in the figure, on stop pin and in the hole as shown in the figure.	 xx1400000378

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4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
2	Refit the mechanical stop pin and secure it with the attachment screw. Locking liquid (Loctite 243) on screw.	 xx1400002179
3	Secure the cable harness inside the frame hole with a cable strap.	 xx1200001237
4	Refit the cable bracket on the frame.	 xx1200001246

Concluding procedure

	Action	Note
1	Refill oil in the gearbox.	See Changing oil, axis-1 gearbox on page 158 .

Continues on next page

4 Repair

4.8.2 Replacing the axis-1 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
2	Recalibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
3	 DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)**Validity of this section - variants IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85****Note**

This section describes how to replace the gearbox on variants *IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

How to replace the gearbox on variants *IRB 6700-300/2.70, -245/3.00* see section **4.8.4 Replacing axis-2 gearbox (not all variants)**.

About the figures**Note**

When visual differences between variants, is of no importance, only one is shown in the figures.

Space required beside

This section describes how to replace the gearbox without needing to remove the cable harness and DressPack cable package (if installed) from the robot.

The described procedure requires free space on the floor, in front of the frame (with axis-1 in calibration position). There should be enough space to place two pallets as shown in the figures in the procedures below.

**DANGER**

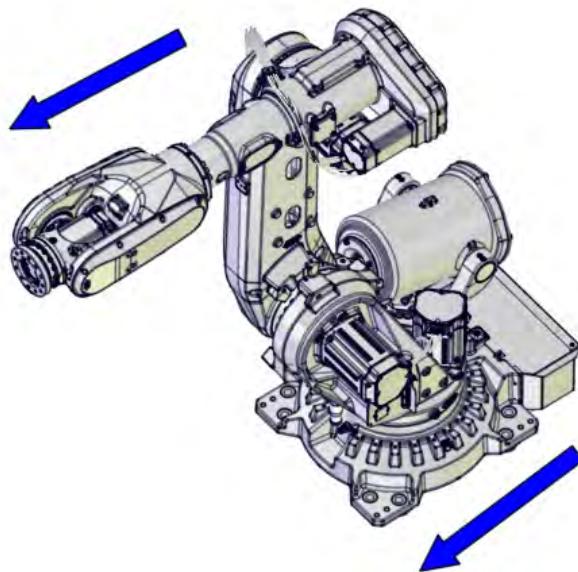
The base shall be fitted to the foundation when performing this procedure! Valid in both examples described below!

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4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

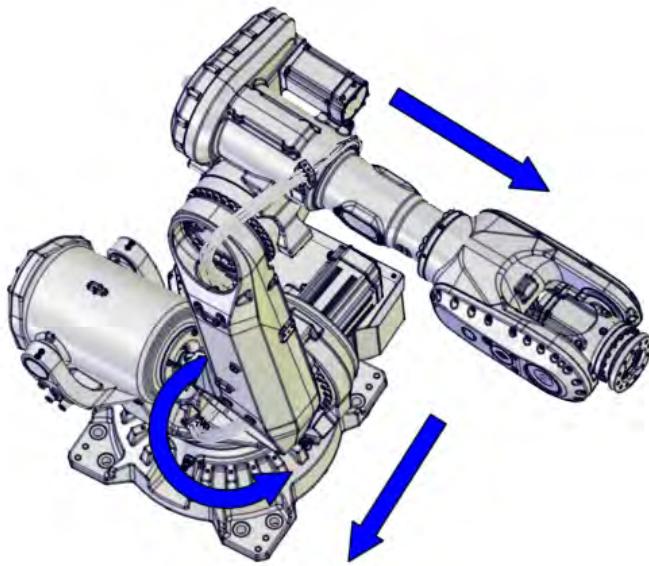
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xx1300002303

Example 1: Position with space for pallets in front of the robot. Axis-1 in calibration position.

If needed, run axis-1 into a position that gives the required space. The figure shows an example.



xx1300002304

Example 2: Axis-1 jogged to a position where it is possible to find the required space in another position of axis-1 than calibration position.

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

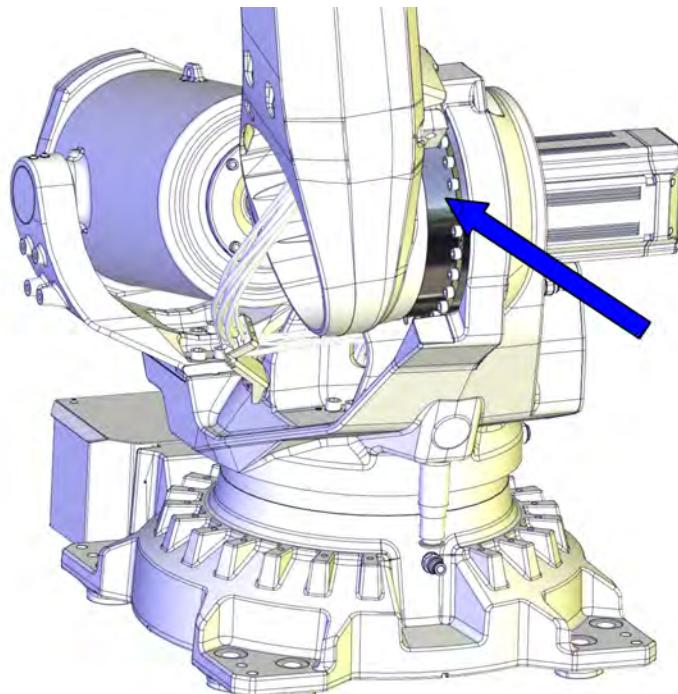


Note

Using this method to replace the gearbox with cable harness and DressPack fitted, is only a recommendation. If it is not possible to put the arm system close enough to the robot and keep the cable harness partly fitted, it may be necessary to remove the cable harness and DressPack in base and frame first.

Location of the axis-2 gearbox

The axis-2 gearbox is located as shown in the figure.



xx1200001276

Spare parts

Spare parts	Article number	Note
IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20- 200/2.60, - 155/2.85, Axis-2 gearbox	See Product manual, spare parts - IRB 6700.	

Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Lifting eye	3HAC16131-1	M12

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Equipment, etc.	Article number	Note
Lifting eye	3HAC14457-4	M16
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting shackle	-	SA-10-8-NA1
Roundsling, 1.5 m	-	Length: 1.5 m. Lifting capacity: 2,000 kg.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Removal tool M14	3HAC057339-004	Used to push out the motor, if necessary. Always use removal tools in pairs.
Pallet		Used for putting down removed parts from robot.
Guide pin, M16x150	3HAC13120-2	Always use guide pins in pairs!
Guide pin, M16x200	3HAC13120-3	Always use guide pins in pairs!
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs!
Guide pin, M12x200	3HAC13056-4	Always use guide pins in pairs!
Aligning tool	3HAC046645-003	Used for aligning the gearbox against the frame, so that the play in the motor does not need to be adjusted.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs!
Lifting accessory, gearbox	Article number depends on robot variant. ⁱ	
Hydraulic cylinder	3HAC11731-1	To be used with the press tool.
Hydraulic pump 80 MPa	3HAC13086-1	To be used with the hydraulic cylinder.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

ⁱ Robot variants IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20: 3HAC046112-001.
Robot variants IRB 6700 - 200/2.60, - 155/2.85: 3HAC046128-001.

Consumables

Equipment, etc	Article number	Note
Grease	3HAB3537-1	Used to lubricate o-rings.

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Equipment, etc	Article number	Note
O-ring	3HAB3772-107	D=102x3 Used on motor flange.
O-ring ⁱ	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on motor cover.
O-ring	3HAB3772-144 or 3HAB3772-48	D=309.3x3.1 D=319.3x5.7 Used on gearbox, depending on model.
VK cover	3HAA2166-28	VK 28x7
Locking liquid (Loctite 2701)	-	

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

Required documents

Document name	Document number	Note
Technical reference manual - Lubrication in gearboxes	3HAC042927-001	

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the axis-2 gearbox

Use these procedures to remove the gearbox.

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Follow the order of the procedures according to the order they are presented.



CAUTION

When performing these procedures, the cable harness will still be fitted or partly fitted to the robot. Use extreme caution not to cause any damage to the cable harness!

Preparations before replacing the axis-2 gearbox

Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3 Begin draining the gearbox.	See Draining the axis-2 gearbox on page 165 .

Unloading or locking the balancing device springs

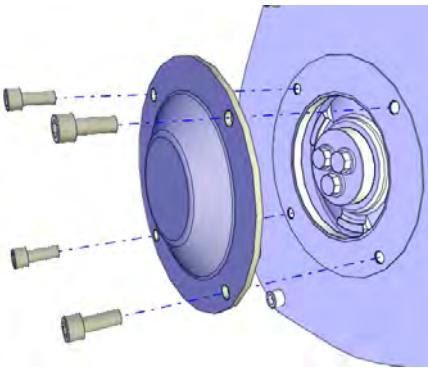
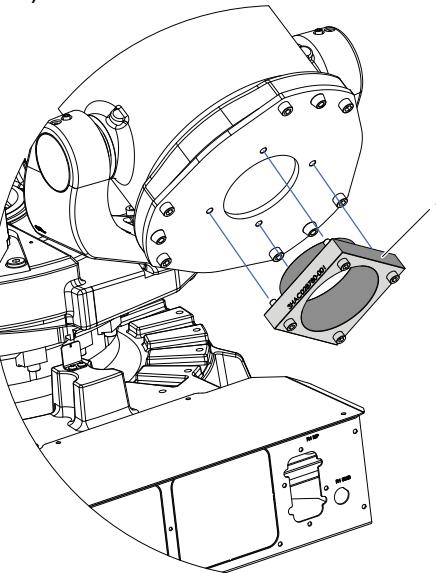
Use this procedure to unload the balancing device with the help of the robot, and lock the balancing device springs in a compressed position, using the Distance tool (3HAC030662-001).

Action	Note
1 DANGER Do not use the Distance tool (3HAC030662-001) to unload or restore the pressure of the balancing device springs! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position! To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the Hydraulic press tool, balancing device (3HAC020902-001).	
2 Jog axis-2 to: <ul style="list-style-type: none">• -20° or +20°	This is done in order to compress the balancing device springs inside the balancing device before fitting the Distance tool.

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	Remove the cover plate on the back of the balancing device.  DANGER DO NOT remove any other screws than the rear cover attachment screws! See figure!	 xx1300000554
5	Fit the Distance tool on the back of the balancing device using the four screws.  DANGER Use caution when tightening the screws. The threads in the cover can be damaged if more tightening torque than 45 Nm is used, risking that the Distance tool is not properly fitted.	Tightening torque: 45 Nm Attachment screws: M10 quality 12.9 (4 pcs)  xx0800000480 A Distance tool: 3HAC030662-001
6	Jog axis-2 to the calibration position. The balancing device is now unloaded.	This is done to compress the balancing device springs, making it possible to remove the front shaft of the balancing device.
7	Let the Distance tool stay fitted during the continued procedure.	

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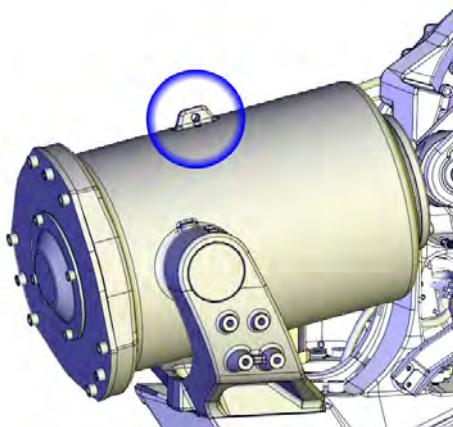
4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
<p>8  DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	

Attaching lifting accessory to the balancing device

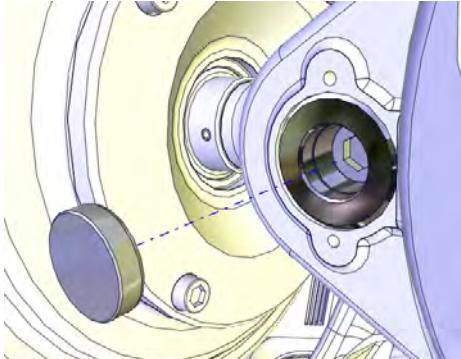
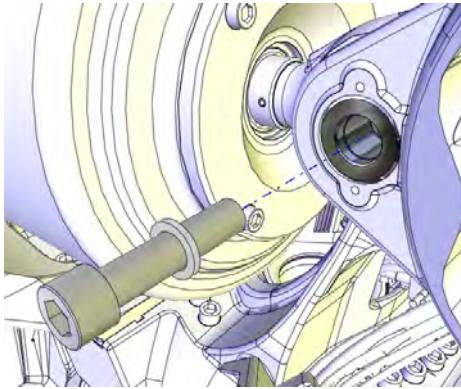
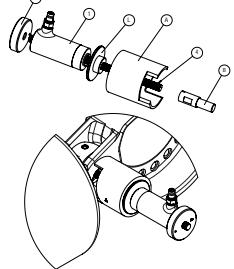
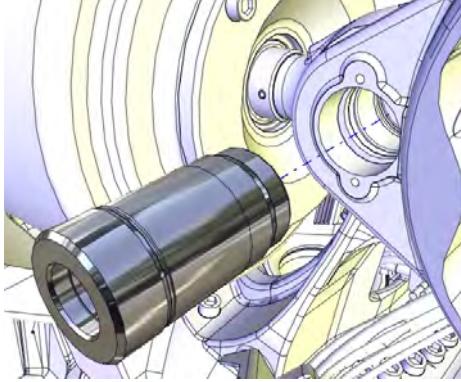
Action	Note
<p>1  CAUTION</p> <p>The weight of the balancing device (excluding cradle) is</p> <p>140 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)</p> <p>185 kg (IRB 6700 -300/2.70, -245/3.00)</p> <p>All lifting accessories used must be sized accordingly.</p>	
2 Fit a lifting shackle to the balancing device.	Lifting shackle: SA-10-8-NA1
	 xx1300000661
3 Fit the lifting accessory to the shackle and raise to unload the weight.	Lifting accessory (chain): 3HAC15556-1

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Removing the shaft in the front (link ear)

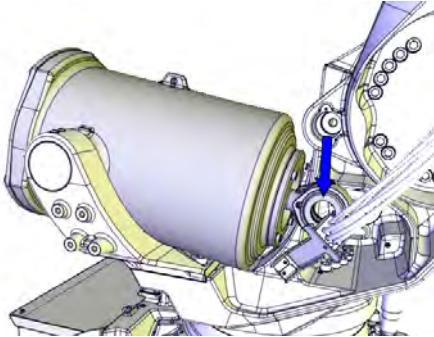
	Action	Note
1	Remove the small VK cover.  Note It is almost impossible to remove the VK cover without damage. New VK covers are needed.	 xx1200001278
2	Unscrew the attachment screw and washer.	 xx1200001279 <ul style="list-style-type: none">• M16x70 quality steel 8.8-A3F
3	Use the dismantle and mounting tool and pull the shaft out.  xx1700000378 The numbers in the figure refers to the marked tool pieces respectively.	Dismantle and mounting tool: 3HAC028920-001  xx1200001280

Continues on next page

4 Repair

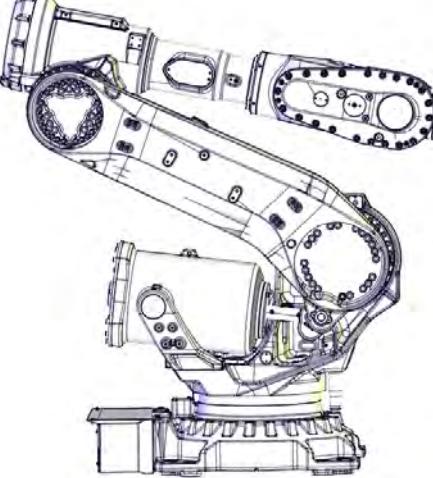
4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
4 Put down the balancing device and let it rest on the frame.	 xx1200001281

Robot position

Note	
This procedure describes the position of variants IRB 6700 -235/2.65, -205/2.80, -174/3.05, -150/3.20, 200/2.60, -155/2.85. Make sure to jog the robot to the correct position depending on variant.	

Action	Note
1  Note	When jogging the axis-2 into position check that the balancing device ear and the ear on the lower arm is not colliding!
2 Jog the robot into position: <ul style="list-style-type: none">• Axis-1: no significance as long as the robot is secured to the foundation• Axis-2: -45°• Axis-3: +65° (approximately)• Axis-4: 0°• Axis-5: 0°• Axis-6: 0°.	 xx1200001250

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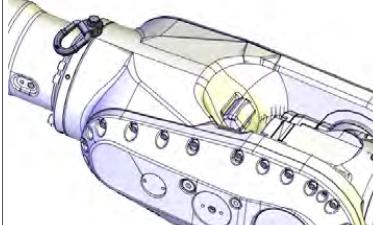
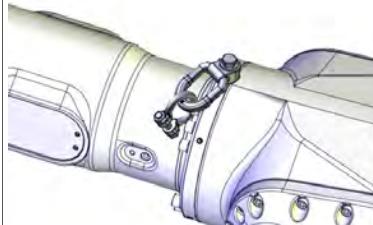
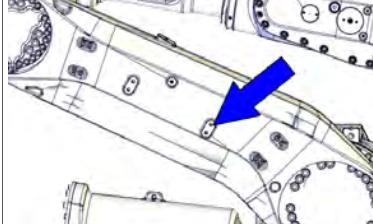
4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

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

Attaching lifting accessories to the lower and upper arm

Use this procedure to attach the lifting accessories.

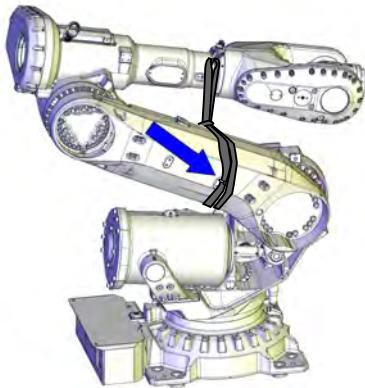
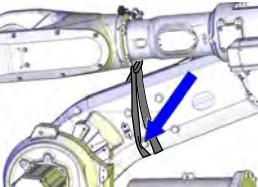
Action	Note
<p>1  CAUTION The lower and upper arms together weigh (according to variants) 510 kg. All lifting accessories used must be sized accordingly!</p>	
2 Fit a lifting eye to the wrist.	<p>Lifting eye: 3HAC16131-1</p>  <p>xx1200001133</p>
3 Fit a lifting shackle in the wrist lifting eye.	<p>Lifting shackle: SA-10-8-NA1</p>  <p>xx1200001234</p>
4 In order to secure the roundsling from gliding when lifting: <ul style="list-style-type: none"> • <i>With no DressPack cable package installed:</i> Insert a M12x50 securing screw, not more than 10-15 mm, into the screw hole shown in the figure. • <i>With DressPack cable package installed:</i> Use the ball joint housing in the same way. 	 <p>xx1200001251</p>

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

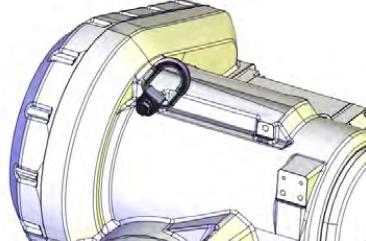
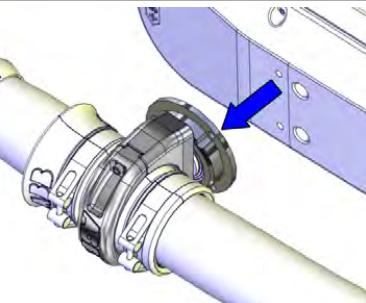
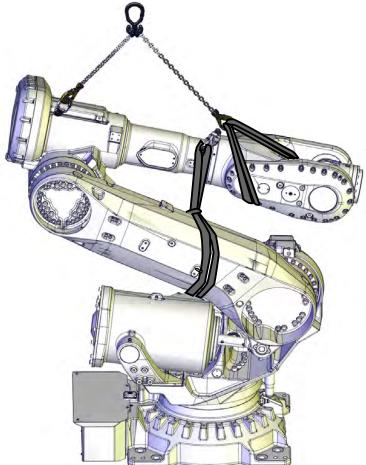
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	Action	Note
5	<p>Run a roundsling around the lower arm, place it accordingly:</p> <ul style="list-style-type: none"> • <i>With no DressPack cable package installed:</i> Place the roundsling beneath the securing screw. • <i>With DressPack cable package installed:</i> Place the roundsling beneath the ball joint housing on the outside of the lower arm. 	<p>Roundsling, 1.5 m; Length: 1.5 m. Lifting capacity: 2,000 kg.</p>  <p>xx1200001252</p>
6	Adjust the roundsling on the other side of the lower arm, so that the roundsling runs on the left side of the most lower of the four bosses. This will prevent the roundsling from gliding.	
7	Attach the roundsling to the shackle on the wrist.	 <p>xx1200001253</p>
8	<p>Stretch the roundsling between the wrist and the lower arm by slowly jogging the axis-3.</p> <p> Note</p> <p>Make sure the roundsling is stretched, in order to carry the weight of the lower arm.</p>	
9	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
10	<p>Fit a lifting eye in the arm house, with a fender washer underneath.</p>  <p>xx1400002196</p>	<p>Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.</p>  <p>xx1200001134</p>
11	<p>If the robot is equipped with DressPack, unscrew the attachment screws of the bracket that holds the ball joint housings on the wrist. The DressPack can stay fitted in the ball joint housing.</p>	 <p>xx1400000355</p>
12	<p>Move the DressPack cable package over to the other side of where the lifting accessory will be attached to the shackle on the arm house.</p>	
13	<p>Attach the Lifting accessory (chain) to an overhead crane (or similar), then to the lifting eye in the arm house and to a roundsling run through the wrist.</p>	<p>Lifting accessory (chain): 3HAC15556-1 Roundsling, 1 m: Length: 1 m. Lifting capacity: 1,000 kg.</p>  <p>xx1200001254</p>
14	<p>Raise the overhead crane to stretch the chains and roundslings. Verify that the roundsling between the wrist and the lower arm is stretched.</p>	

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4 Repair

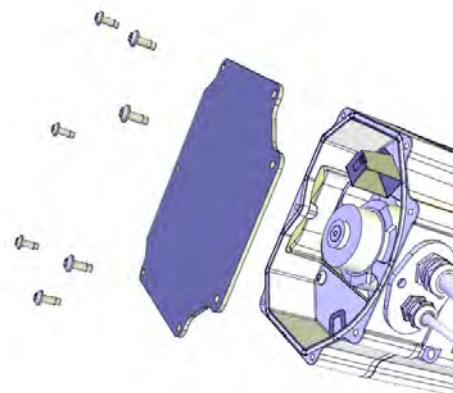
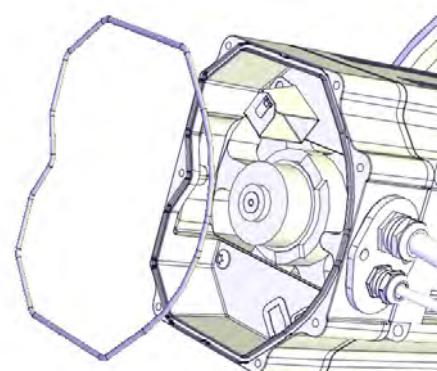
4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
15	To release the brake, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor: <ul style="list-style-type: none">• + = pin 2• - = pin 5	

Disconnecting the axis-2 motor cables

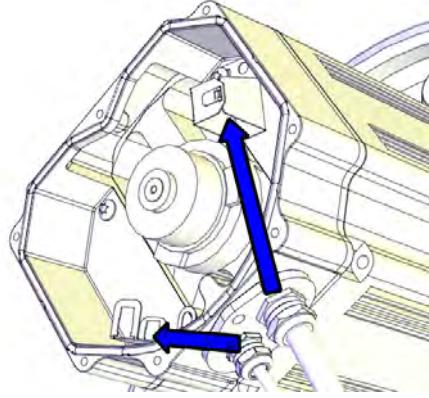
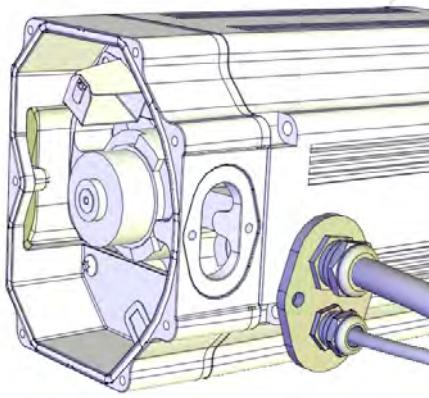
Use this procedure to disconnect the motor cables.

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3	Make sure the o-ring is present.	 xx1200001070

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4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
4	Disconnect the motor cables.	 xx1200001066
5	Remove the cable gland cover. Make sure the gasket is not damaged.  Tip Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.	 xx1200001067
6	Use caution and pull out the motor cables.	

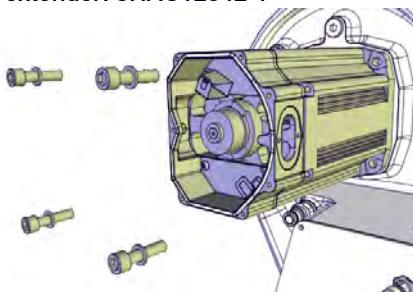
Removing the axis-2 motor

	Action	Note
1	Before removing the motor, make sure that the axis-2 gearbox is completely drained.	
2	 DANGER When releasing the holding brakes of the motor, the lower arm will be movable and may fall down. Secure the lower arm before continuing.	
3	To release the brake, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) Continued

Action	Note
4 Remove the attachment screws securing the motor. Use a bits extender in order to reach the screws.	Bits extender: 3HAC12342-1  xx1200001117
5 Fit guide pins in opposite holes.  Tip Lubricate the guide pins with some grease to make the motor slide better.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
6  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
7 If required, press the motor out of its position by using the removal tool in opposite holes of the motor.	Removal tool M12: 3HAC057339-003 Always use removal tools in pairs.
8 Disconnect the 24 VDC power supply.	
9  CAUTION The motor weighs 28 kg. All lifting accessories used must be sized accordingly.	
10 Carefully lift the motor out on the guide pins, in order to get the pinion away from the gear and let it rest on the guide pins.	
11 Fasten the lifting accessory. Attach the lifting chain to the accessory and an overhead crane.	Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1
12 Remove the motor by sliding it out on the guide pins and lift it off.	Make sure the pinion is not damaged.  xx1200001118

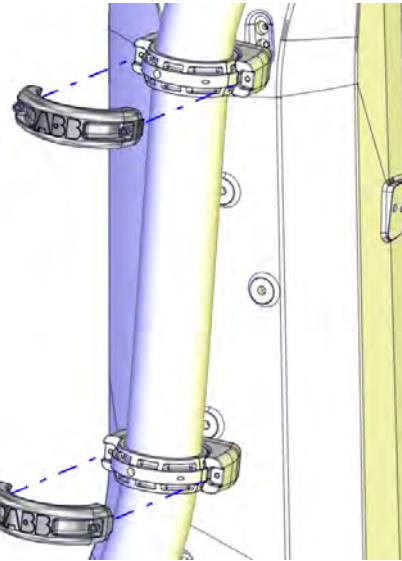
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4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Loosening the cable brackets

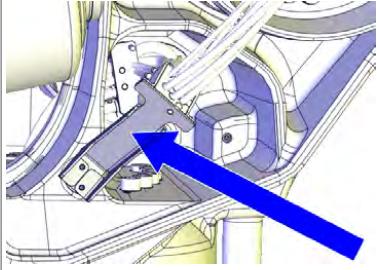
Use this procedure to lift the lower and upper arm unseparated.

	Action	Note
1	If robot is equipped with DressPack: • Open the two ball joint housings from the lower arm and lift away the cabling from the ball joint housings.	How to remove the DressPack cable package is described in more detail in the product manual "IRB 6700 DressPack". For article number see References on page 10 .  xx1400000195
2	Unscrew the attachment screws that secure the <i>axis-2 lower arm metal clamp</i> and the <i>axis-3 lower arm metal clamp</i> located on the inside of the lower arm by removing the attachment screws.  Note The screws are reached from outside the lower arm!	 xx1300000540

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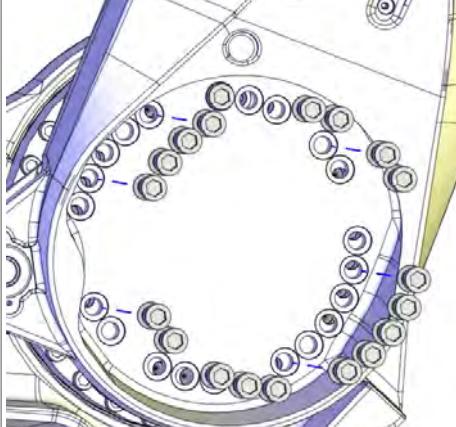
4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) Continued

Action	Note
3 Unscrew the attachment screws of the cable bracket on the frame and let it hang loose.	 xx1200001283

Removing and lifting away the lower and upper arms unseparated (Step 1): *IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*

Use this procedure for the first step of removing and lifting away the lower and upper arm unseparated, from variants *IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85*.

Action	Note
1 Remove two attachment screws in opposite holes and replace them with guide pins.  Tip Lubricate the guide pins with some grease to make the lower arm slide better.	Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!  xx1300000788
2 Remove all but one of the remaining attachment screws that secure the lower arm to the axis-2 gearbox.	 xx1300000789

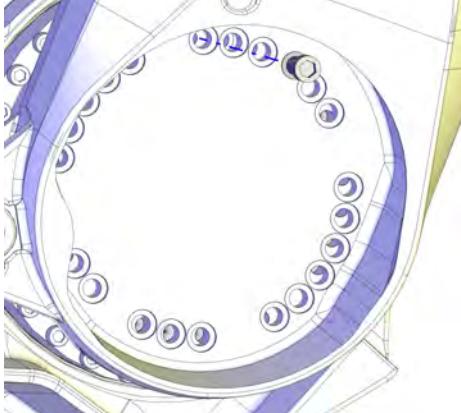
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4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Removing and lifting away the lower and upper arms unseparated (Step 2) - All variants

Use this procedure for the second step to remove and lift the lower and upper arm unseparated, all variants.

	Action	Note
1	<p>Put two pallets on the floor, in front of the position of the mechanical stop.</p> <p> Note</p> <p>Using the method to replace the gearbox with cable harness and DressPack fitted, is only a recommendation. If it is not possible to put the arm system close enough to the robot and keep the cable harness partly fitted, it may be necessary to remove the cable harness and DressPack in base and frame first.</p>	
2	<p> CAUTION</p> <p>The lower and upper arms together weigh 510 kg.</p> <p>All lifting accessories used must be sized accordingly!</p>	
3	<p>Use caution and remove the remaining screw and slowly lift away the lower and upper arm together.</p> <p>Let the cabling run in the lower arm. Make sure not to stretch any cabling!</p> <p> CAUTION</p> <p>Use extreme caution when lifting the upper arm. The cable harness is still partly connected.</p>	 xx1300000790
4	<p>Use a piece of wood or similar as a support under the arm house when the arm system is put down on the pallets.</p> <p>This is done in order not to damage any parts of the cable harness and DressPack.</p>	
5	<p>Use caution and lift the arm system and lay it down safely on the pallets.</p>	

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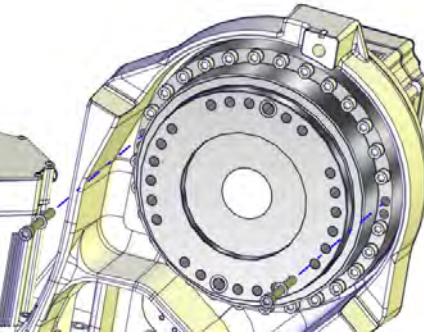
4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Removing the axis-2 gearbox

Use the procedure to remove gearbox.

Action	Note
1 Remove two attachment screws in opposite holes and replace them with guide pins.  Tip Lubricate the guide pins with some grease to make the gearbox slide better.	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!  xx1300002249
2 Leave one of the upper attachment screws and remove the rest. The remaining screw is used to prevent the gearbox from falling down.	
3  CAUTION The gearbox weighs according to the list below 83 kg. All lifting accessories used must be sized accordingly!	
4 Remove the remaining screw left in the gearbox.	
5 Use two fully threaded attachment screws (M12) as removal tools to press the gearbox out of position.	
6 Attach the lifting accessory to the gearbox.	Lifting accessory, gearbox: Article number depends on robot variant. i
7 Use caution and let the gearbox slide out on the guide pins.	
8 Remove the gearbox.	

- i Robot variants IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20: 3HAC046112-001.
Robot variants IRB 6700 - 200/2.60, - 155/2.85: 3HAC046128-001.

Refitting the axis-2 gearbox

Use these procedures to refit the gearbox.

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Follow the order of the procedures according to the order they are presented.

**CAUTION**

When performing these procedures, the cable harness will still be fitted or partly fitted to the robot. Use extreme caution not to cause any damage to the cable harness!

Refitting the axis-2 gearbox

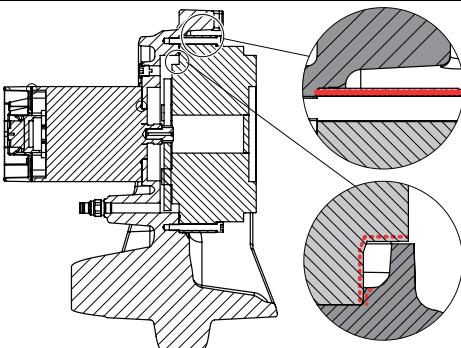
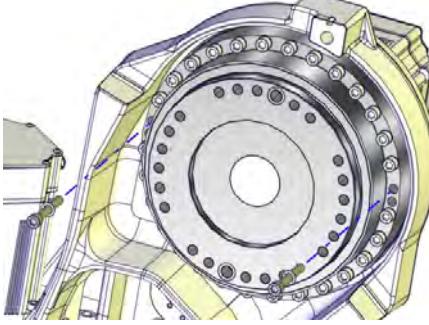
Use this procedure to refit the gearbox.

	Action	Note
1	CAUTION The gearbox weighs according to the list below 83 kg. All lifting accessories used must be sized accordingly!	
2	Apply the lifting accessory to the gearbox.	Lifting accessory, gearbox: Article number depends on robot variant. ⁱ
3	Use caution and lift the gearbox so that it rests on its side.	
4	Note This must also be done on a new spare part!	
5	Note Also wipe clean the o-ring groove.	
6	Check the condition of the o-ring. Replace if damaged!	
7	Lubricate the o-ring with some grease, for a better fitting in the groove.	
8	Fit the o-ring in the groove.	Measure the groove to see dimension of the o-ring: <ul style="list-style-type: none"> • 3HAB3772-144 D=309.3x3.1 • 3HAB3772-48 D=319.3x5.7

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) Continued

Action	Note
9 Foundry Plus: Apply Mercasol on the surfaces shown in the figure.	 xx1400000374
10 Fit two guide pins in opposite holes (M12).  Tip Lubricate the guide pins with some grease to make the gearbox slide better.	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!  xx1300002249
11 Lift the gearbox and let it rest on the guide pins.	
12 Slide the gearbox into position.	
13 Variant: IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85 Fit the attachment screws and washers now accessible.	M12x90 12.9 Gleitmo (30 pcs)
14 Remove the lifting accessory.	
15 Remove the guide pins and fit the remaining attachment screws and washers.	
16 Secure the gearbox with its attachment screws.	Tightening torque: 120 Nm.

i Robot variants IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20: 3HAC046112-001.
Robot variants IRB 6700 - 200/2.60, - 155/2.85: 3HAC046128-001.

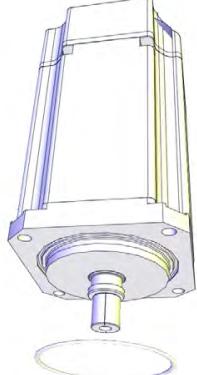
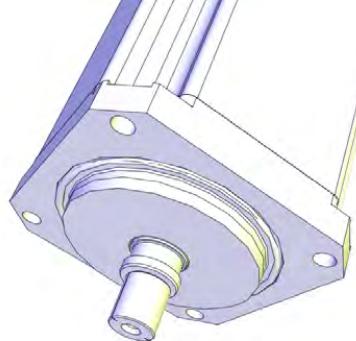
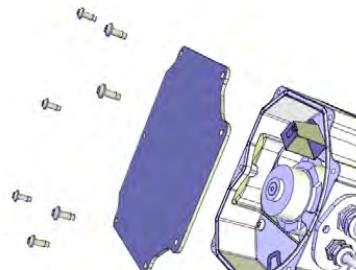
Preparations prior to refitting motor

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

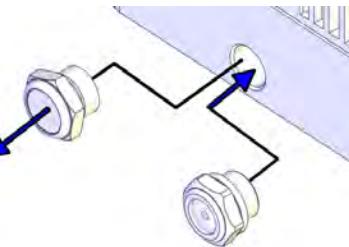
Continued

	Action	Note
2	Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	
3	Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	
4	Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019
5	Make sure the o-ring is seated in the groove.  Tip Lubricate the o-ring with some grease for a better fitting in the groove.	 xx1200001020
6	If the motor is a new spare part, remove the cover.	 xx1200001135

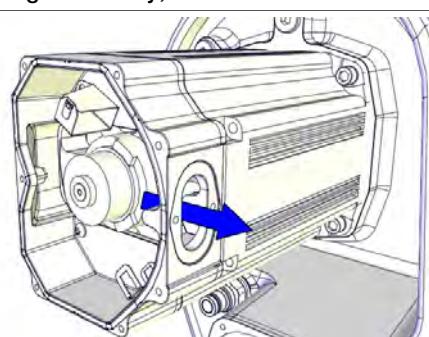
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4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) Continued

	Action	Note
7	<p>Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.</p>	<p>Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.</p>  <p>xx1600000576</p>

Securing the axis-2 motor

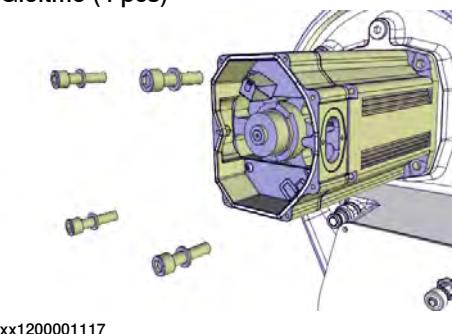
	Action	Note
1	Fit guide pins in opposite holes.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
2	<p>! CAUTION The motor weighs 28 kg. All lifting accessories used must be sized accordingly.</p>	
3	Apply the lifting accessory.	Lifting accessory, motor: 3HAC15534-1
4	<p>i Note Make sure the cable exit hole is turned the correct way.</p>	 <p>xx1200001120</p>
5	Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.	
6	Remove the lifting accessory and allow the motor to rest on the guide pins.	
7	Apply the rotation tool and use it to rotate the pinion when mating it into the gear.	Rotation tool: 3HAB7887-1
8	To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
9	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
10	Use caution and fit the motor in its final position while at the same time rotating the motor pinion slightly using the rotation tool. <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear of the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	
11	Fit two of the attachment screws.	Screw dimension: M10x40 quality 12.9 Gleitmo (4 pcs)
12	Remove the guide pins and replace with the remaining attachment screws.	
13	Secure the motor with its attachment screws and washers. Use a bits extender in order to reach the screws.	Bits extender: 3HAC12342-1 Tightening torque: 50 Nm. Screw dimension: M10x40 quality 12.9 Gleitmo (4 pcs)
14	Perform a leak-down test.	See Performing a leak-down test on page 196 .



Lifting back and refitting the lower and upper arm

Use this procedure to lift back and refit the lower and upper arm unseparated.

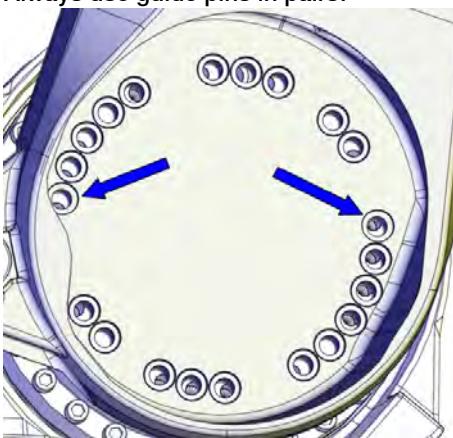
	Action	Note
1	Connect the 24 VDC power supply to the axis-2 motor to release the brakes of the motor.	
2	Fit the rotation tool, if not already fitted.	Rotation tool: 3HAB7887-1

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

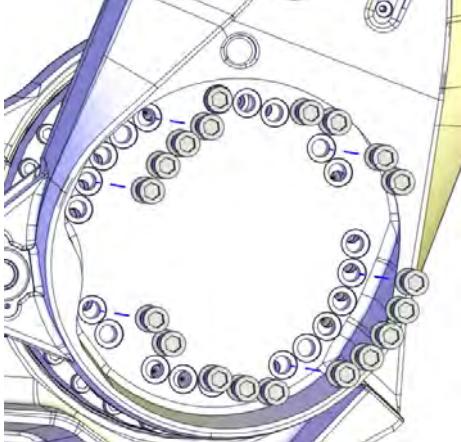
Continued

Action	Note
<p>3 <i>Variant: IRB 6700 - 235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85</i> Fit two guide pins in opposite holes in the axis-2 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the lower arm slide better.</p>	<p>Guide pin, M16x150: 3HAC13120-2 Always use guide pins in pairs!</p>  <p>xx1400000360</p>
<p>4  CAUTION</p> <p>The lower and upper arms together weigh 510 kg. All lifting accessories used must be sized accordingly!</p>	
5 Attach the lifting accessories, if not already fitted.	
<p>6 Use caution and slowly lift the lower and upper arm together. Make sure:</p> <ul style="list-style-type: none"> • not to stretch any of the cables • that the arm package is level when lifted. 	
7 Before putting the arms on the guide pins, make sure that the hole pattern is matched and in the correct position for all screws.	
8 If the hole pattern is not matching, use the rotation tool and adjust.	 <p>Rotation tool: 3HAB7887-1</p> <p>xx1300000819</p>
9 Slide the lower arm on to the guide pins.	

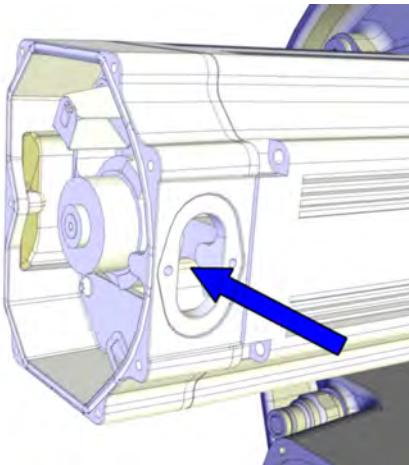
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4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
10 Use caution and move the arms into position at the axis-2 gearbox on the guide pins.	
11 <i>Variant: IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85</i> Fit all now accessible attachment screws and washers.	 xx1300000789
12 Remove the two guide pins and replace with the remaining attachment screws and washers.	
13 Secure the lower arm to the axis-2 gearbox with its attachment screws.	The tightening torque according to dimension: <i>Variant: IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85</i> Tightening torque M16: 300 Nm
14 Disconnect the 24 VDC power supply.	
15 Remove the lifting accessories.	

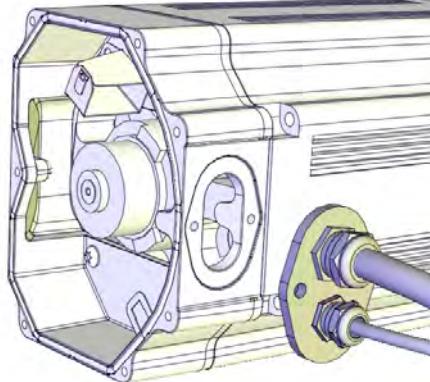
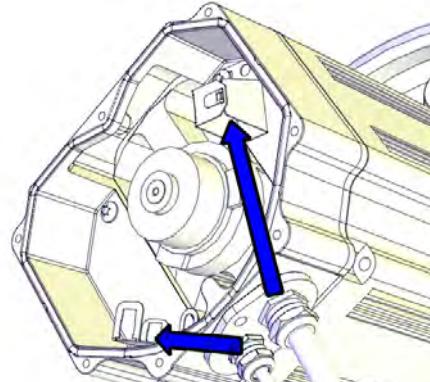
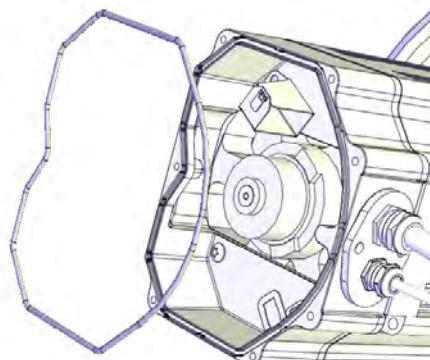
Connecting the axis-2 motor cables

Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738

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4 Repair

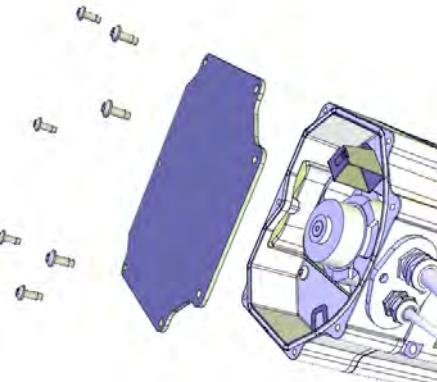
4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) Continued

Action	Note
2 Refit the cable gland cover.  Note Replace the gasket if damaged.	 xx1200001067
3 Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066
4 Inspect the o-ring.  Note Replace if damaged.	O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile) O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)  xx1200001070

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring. 💡 Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7 ! CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
8 Refit the motor cover with its attachment screws. 💡 Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged. 💡 Note Make sure the o-ring is undamaged and properly fitted.	 xx1200001135
9 Make sure that the covers are tightly sealed.	

Refitting the cabling

Use this procedure to refit the cabling.

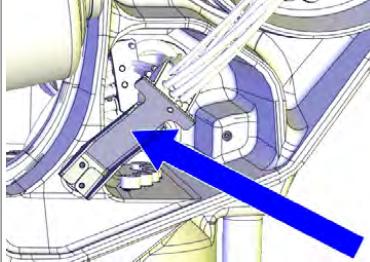
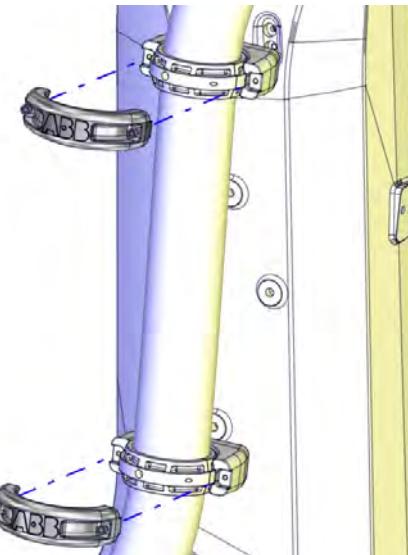
Action	Note
1 Use caution and push the cable harness into the lower arm.	

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

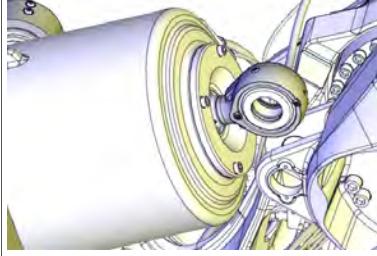
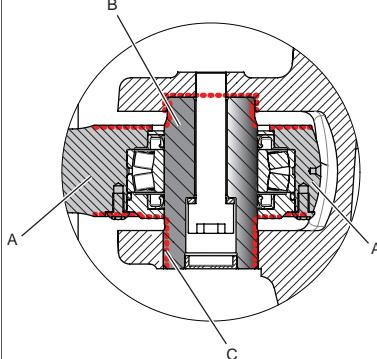
Action	Note
2 Refit the axis-2 lower arm metal clamp and the axis-3 lower arm metal clamp located on the inside of the lower arm.	 Note The screws are reached from the outside of the lower arm!  xx1200001282
3 Refit the cable bracket on the frame.	 xx1200001283
4 If robot is equipped with DressPack. <ul style="list-style-type: none"> Place the cabling in the two ball joint housings on the lower arm and close the housings. 	How to refit the DressPack is described in the product manual "IRB 6700 DressPack". For article number see References on page 10 .  xx1400000195

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Refitting the front shaft of the balancing device

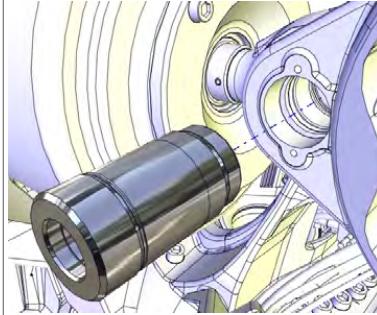
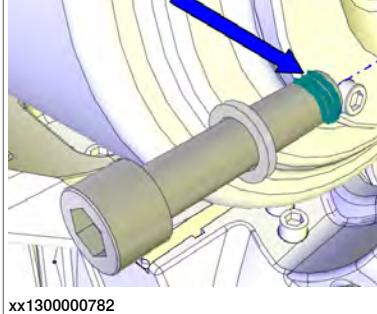
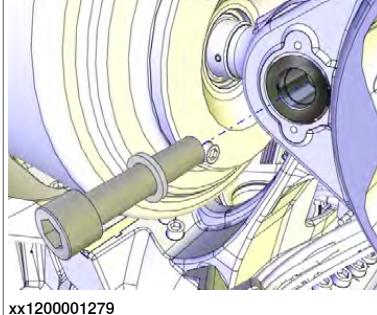
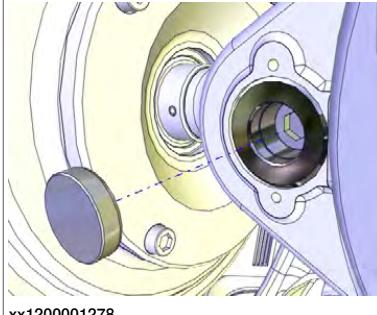
	Action	Note
1	Turn on the power to the robot.	
2	Use caution and jog the robot to the calibration position (if not already done).	
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	Apply the lifting accessory to the balancing device (if not already done).	Lifting shackle: SA-10-8-NA1 Lifting accessory (chain): 3HAC15556-1
5	Remove all residue of Loctite in the screw hole of the shaft.	
6	Wipe all contact surfaces inside the recess clean from residual grease or other contamination.	
7	 Note Align the balancing device link ear with the hole in the lower arm. Verify that the link ear is correctly turned.	 xx1300000784
8	Foundry Plus: Apply Mercasol on the surfaces on the shaft and front ear.	 xx1400000368 A Front link ear B Shaft C Mercasol (red dotted lines)

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

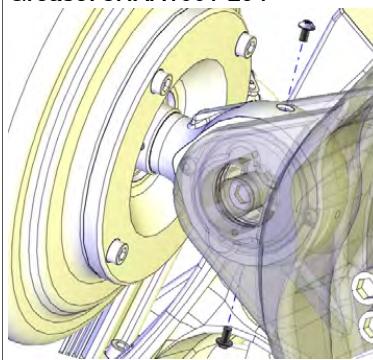
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	Action	Note
9	<p>Lubricate the shaft and place it to the front ear.</p> <p> Note</p> <p>Foundry Plus: Do not lubricate surfaces where Mercasol is applied!</p>	 xx1200001280
10	Press the shaft in with the hydraulic press tool.	Hydraulic pump 80 MPa: 3HAC13086-1 Hydraulic cylinder: 3HAC11731-1 Dismantle and mounting tool: 3HAC028920-001
11	Apply locking liquid (Loctite 2701) on the threads of the screw, first entering the threads in the frame.	 xx1300000782
12	Secure the shaft with screw and washer.	Tightening torque: 180 Nm  xx1200001279
13	Fit the VK-cover.	 xx1200001278

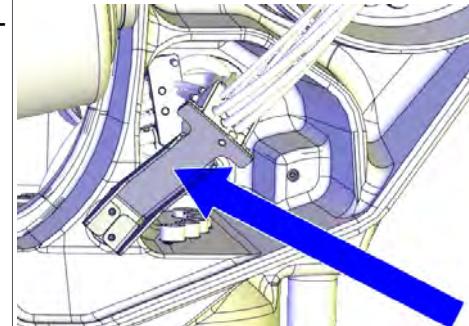
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4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

	Action	Note
14	Unscrew both screws in link ear and fill the bearing with grease from the upper hole until the grease appears in the lower hole.	 xx1300000783
15	Refit the two screws and wipe clean from residual grease.	

Concluded refitting of the front shaft

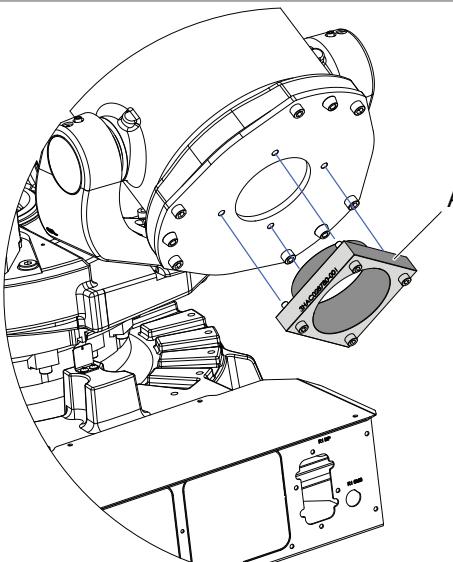
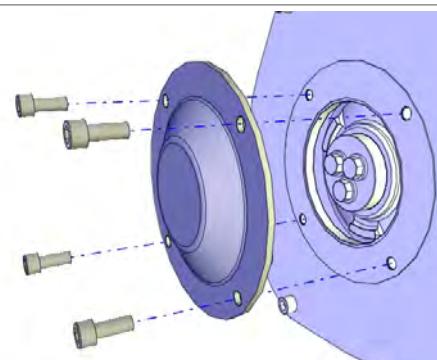
	Action	Note
1	Remove the lifting accessory from the balancing device.	
2	Refit the cable bracket (if not already refitted).	 xx1200001283
3	 DANGER <p>Do not use the Distance tool: 3HAC030662-001 to unload or restore the pressure of the balancing device spring unit! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position!</p> <p>To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the hydraulic press tool Dismantle and mounting tool 3HAC028920-001.</p>	
4	Jog axis-2 to: • -20° or +20°.	This is done in order to compress the spring unit inside the balancing device before refitting or removal of the distance tool.

Continues on next page

4 Repair

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
5  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
6 Remove the distance tool.	 xx0800000480 A Distance tool: 3HAC030662-001
7 Refit the cover plate.	 xx1300000554

Concluding procedure

Action	Note
1 If the robot is equipped with DressPack, refit the brackets of the ball joint housings on the wrist.	
2 Refill oil to the axis-2 gearbox.	See Filling oil into the axis-2 gearbox on page 166 .

Continues on next page

4.8.3 Replacing axis-2 gearbox (IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85)

Continued

Action	Note
3 Recalibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
4  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Validity of this section - variants IRB 6700 -300/2.70, -245/3.00



Note

This section describes how to replace the gearbox on variants IRB 6700-300/2.70, -245/3.00.

How to replace the gearbox on variants IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85 see section *4.8.3 Replacing axis-2 gearbox (not all variants)*.

Space required beside

This section describes how to replace the gearbox without needing to remove the cable harness and DressPack cable package (if installed) from the robot.

The described procedure requires free space on the floor, in front of the lower arm, so that the upper and lower arm can be laid down with the cabling still attached to the robot. There should be enough space to place two pallets on the floor. If needed, run axis-1 into a position that gives the required space.



DANGER

The base shall be fitted to the foundation when performing this procedure! Valid in both examples described below!



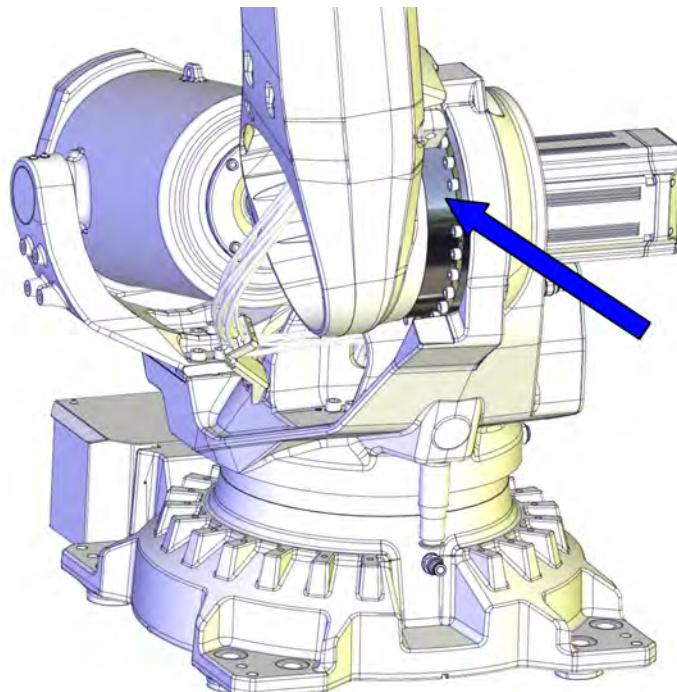
Note

Using this method to replace the gearbox with cable harness and DressPack fitted, is only a recommendation. If it is not possible to put the arm system close enough to the robot and keep the cable harness partly fitted, it is necessary to remove the cable harness and DressPack in base and frame first.

Continues on next page

Location of the axis-2 gearbox

The axis-2 gearbox is located as shown in the figure.



xx1200001276

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Remove the upper and lower arm together, as a package.
- 2 Replace the axis-2 gearbox.

Spare parts

Spare parts	Article number	Note
Axis-2 gearbox	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section <i>Type of lubrication in gearboxes on page 156</i> .
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC14457-4	M16

Continues on next page

4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Equipment, etc.	Article number	Note
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting shackle	-	SA-10-8-NA1
Roundsling, 1.5 m	-	Length: 1.5 m. Lifting capacity: 2,000 kg.
Roundsling, 1 m	-	Length: 1 m. Lifting capacity: 1,000 kg.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Removal tool M14	3HAC057339-004	Used to push out the motor, if necessary. Always use removal tools in pairs.
Pallet		Used for putting down removed parts from robot.
Guide pin, M16x150	3HAC13120-2	Always use guide pins in pairs!
Guide pin, M16x200	3HAC13120-3	Always use guide pins in pairs!
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs!
Guide pin, M12x200	3HAC13056-4	Always use guide pins in pairs!
Aligning tool	3HAC046645-003	Used for aligning the gearbox against the frame, so that the play in the motor does not need to be adjusted.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs!
Lifting accessory, gearbox	Article number depends on robot variant. ⁱ	
Hydraulic cylinder	3HAC11731-1	To be used with the press tool.
Hydraulic pump 80 MPa	3HAC13086-1	To be used with the hydraulic cylinder.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

ⁱ Robot variants IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20: 3HAC046112-001.
Robot variants IRB 6700 - 200/2.60, - 155/2.85: 3HAC046128-001.

Consumables

Equipment, etc	Article number	Note
Grease	3HAB3537-1	Used to lubricate o-rings.

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Equipment, etc	Article number	Note
O-ring	3HAB3772-107	D=102x3 Used on motor flange.
O-ring ⁱ	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on motor cover.
O-ring	3HAB3772-144	D=309.3x3.1 Used on gearbox.
VK cover	3HAA2166-28	VK 28x7
Locking liquid (Loctite 2701)	-	

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

Required documents

Document name	Document number	Note
Technical reference manual - Lubrication in gearboxes	3HAC042927-001	

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	<p>If the robot is to be calibrated with reference calibration:</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 Reference calibration routine on page 775.</p> <p>Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the axis-2 gearbox

Use these procedures to remove the gearbox.

Continues on next page

4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Follow the order of the separate procedures according to the order they are presented.



CAUTION

When performing these procedures, the cable harness will still be fitted or partly fitted to the robot. Use extreme caution not to cause any damage to the cable harness!

Preparations before replacing the axis-2 gearbox

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3	Begin draining the gearbox.	See Draining the axis-2 gearbox on page 165 .

Unloading or locking the balancing device springs

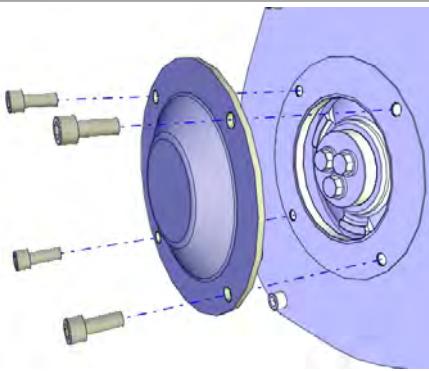
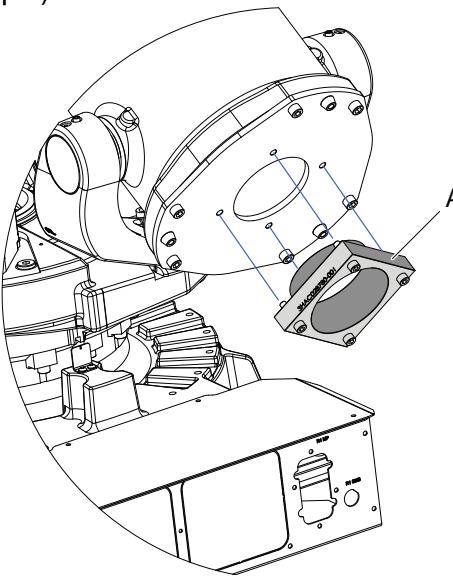
Use this procedure to unload the balancing device with the help of the robot, and lock the balancing device springs in a compressed position, using the Distance tool (3HAC030662-001).

	Action	Note
1	 DANGER Do not use the Distance tool (3HAC030662-001) to unload or restore the pressure of the balancing device springs! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position! To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the Hydraulic press tool, balancing device (3HAC020902-001).	
2	Jog axis-2 to: <ul style="list-style-type: none">• -20° or +20°	This is done in order to compress the balancing device springs inside the balancing device before fitting the Distance tool.

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
<p>3</p>  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
<p>4</p> Remove the cover plate on the back of the balancing device.  DANGER DO NOT remove any other screws than the rear cover attachment screws! See figure!	 xx1300000554
<p>5</p> Fit the Distance tool on the back of the balancing device using the four screws.  DANGER Use caution when tightening the screws. The threads in the cover can be damaged if more tightening torque than 45 Nm is used, risking that the Distance tool is not properly fitted.	Tightening torque: 45 Nm Attachment screws: M10 quality 12.9 (4 pcs)  xx0800000480 A Distance tool: 3HAC030662-001
<p>6</p> Jog axis-2 to the calibration position. The balancing device is now unloaded.	This is done to compress the balancing device springs, making it possible to remove the front shaft of the balancing device.
<p>7</p> Let the Distance tool stay fitted during the continued procedure.	

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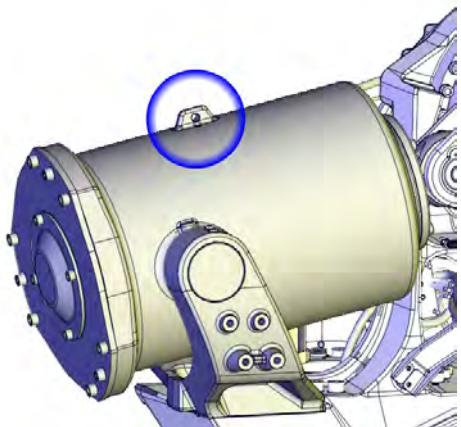
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

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

Attaching lifting accessory to the balancing device

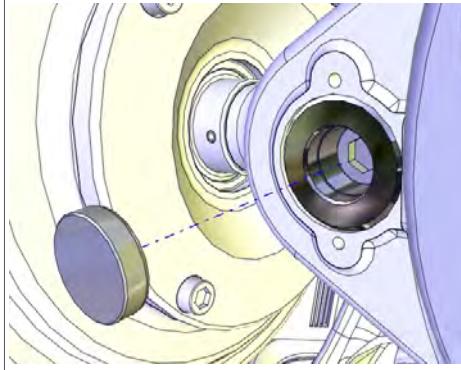
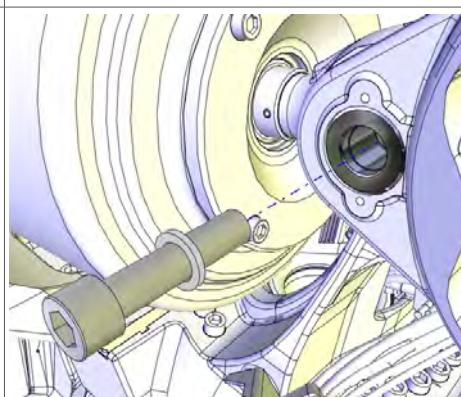
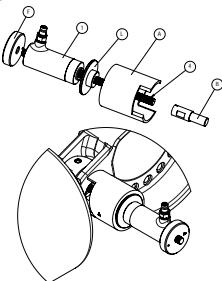
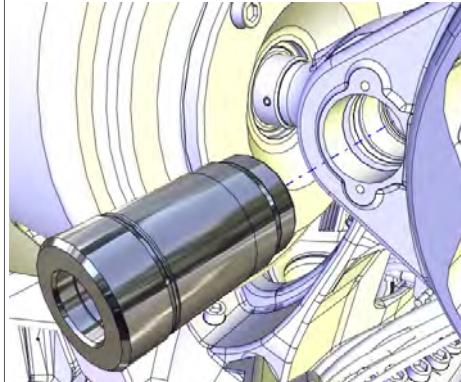
Action	Note
1  CAUTION The weight of the balancing device (excluding cradle) is 140 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 185 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2 Fit a lifting shackle to the balancing device.	Lifting shackle: SA-10-8-NA1
	 xx1300000661
3 Fit the lifting accessory to the shackle and raise to unload the weight.	Lifting accessory (chain): 3HAC15556-1

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Removing the shaft in the front (link ear)

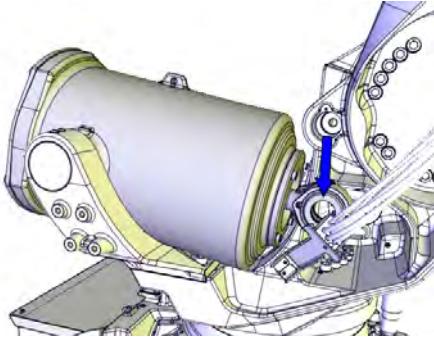
	Action	Note
1	<p>Remove the small VK cover.</p> <p>Note It is almost impossible to remove the VK cover without damage. New VK covers are needed.</p>	 xx1200001278
2	Unscrew the attachment screw and washer.	 xx1200001279 <ul style="list-style-type: none"> • M16x70 quality steel 8.8-A3F
3	<p>Use the dismantle and mounting tool and pull the shaft out.</p>  xx1700000378 <p>The numbers in the figure refers to the marked tool pieces respectively.</p>	<p>Dismantle and mounting tool: 3HAC028920-001</p>  xx1200001280

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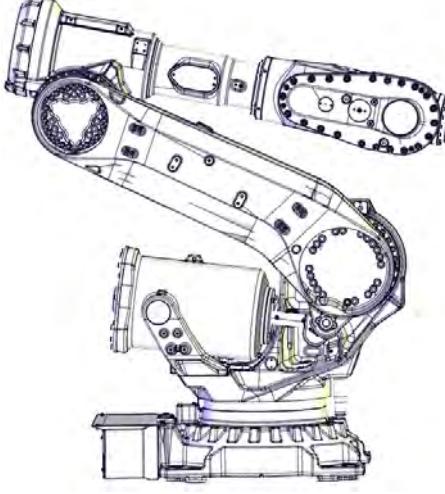
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
4 Put down the balancing device and let it rest on the frame.	 xx1200001281

Robot position

Action	Note
1  Note When jogging the axis-2 into position check that the balancing device ear and the ear on the lower arm is not colliding!	
2 Jog the robot into position: <ul style="list-style-type: none">• Axis-1: no significance as long as the robot is secured to the foundation. Otherwise jog to 0° position.• Axis-2: -60°• Axis-3: +70° (approximately)• Axis-4: +90°• Axis-5: 0°• Axis-6: 0°.	 xx1200001250
3  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

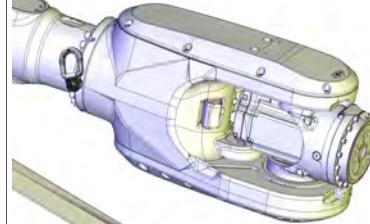
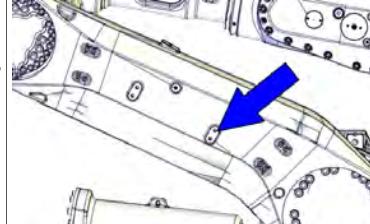
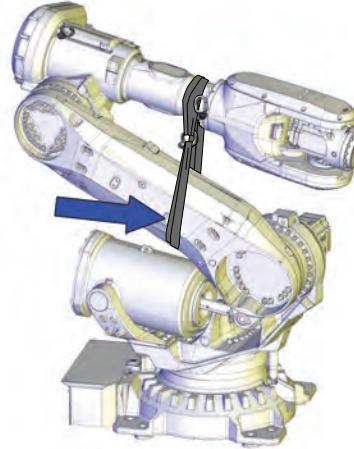
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4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Attaching lifting accessories to the lower and upper arm

Use this procedure to attach the lifting accessories.

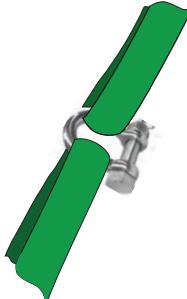
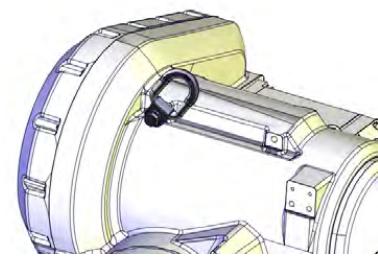
	Action	Note
1	 CAUTION The lower and upper arms together weigh (according to variants) 650 kg. All lifting accessories used must be sized accordingly!	
2	Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1  xx1400002106
3	In order to secure the roundsling from gliding when lifting: <ul style="list-style-type: none"> <i>With no DressPack cable package installed:</i> Insert a M12x50 securing screw, not more than 10-15 mm, into the screw hole shown in the figure. <i>With DressPack cable package installed:</i> Use the ball joint housing in the same way. 	 xx1200001251
4	Run a roundsling around the lower arm, place it accordingly: <ul style="list-style-type: none"> <i>With no DressPack cable package installed:</i> Place the roundsling beneath the securing screw. <i>With DressPack cable package installed:</i> Place the roundsling beneath the ball joint housing on the outside of the lower arm. 	Roundsling, 2.5 m: Length: 2.5 m. Lifting capacity: 2,000 kg.  xx1400002105
5	Run the roundsling up and over the upper arm.	

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4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

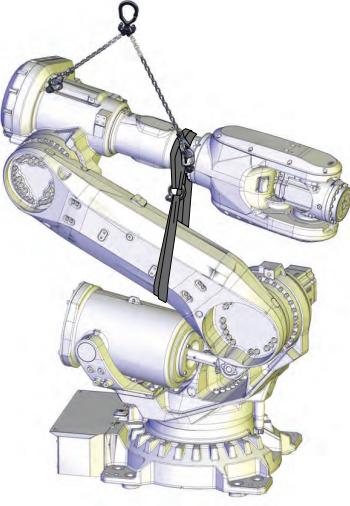
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Action	Note
6 Connect both ends of the roundsling with a shackle.	 xx1400000729
7 Stretch the roundsling between the upper and the lower arm by slowly jogging the axis-3.  Note Make sure the roundsling is stretched, in order to carry the weight of the lower arm.	
8  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
9 Fit a lifting eye in the arm house, with a fender washer underneath.  xx1400002196	Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.  xx1200001134

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4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
10 Attach the Lifting accessory (chain) to an overhead crane (or similar), then to the lifting eye in the arm house and to the lifting eye in the wrist.	Lifting accessory (chain): 3HAC15556-1  xx1400002104
11 Raise the overhead crane to stretch the chains and roundslings. Verify that the roundsling between the wrist and the lower arm is stretched.	
12 To release the brake, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor: <ul style="list-style-type: none">• + = pin 2• - = pin 5	

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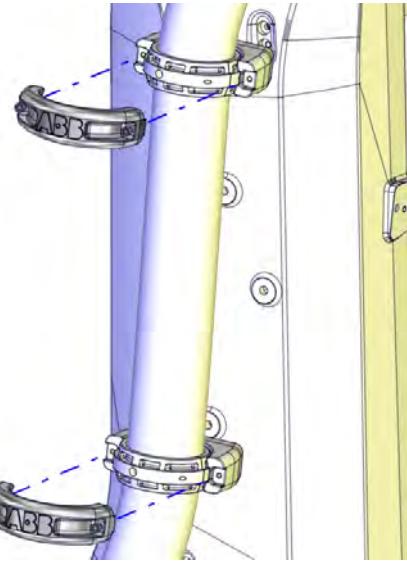
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Loosening the cable brackets

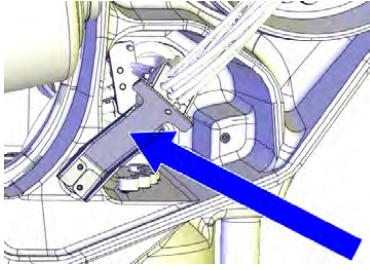
Use this procedure to loosen required cable brackets.

Action	Note
1 If robot is equipped with DressPack: <ul style="list-style-type: none">• Open the two ball joint housings from the lower arm and lift away the cabling from the ball joint housings.	How to remove the DressPack cable package is described in more detail in the product manual "IRB 6700 DressPack". For article number see References on page 10 .  xx1400000195
2 Unscrew the attachment screws that secure the <i>axis-2 lower arm metal clamp</i> and the <i>axis-3 lower arm metal clamp</i> located on the inside of the lower arm by removing the attachment screws.  Note The screws are reached from outside the lower arm!	 xx1300000540

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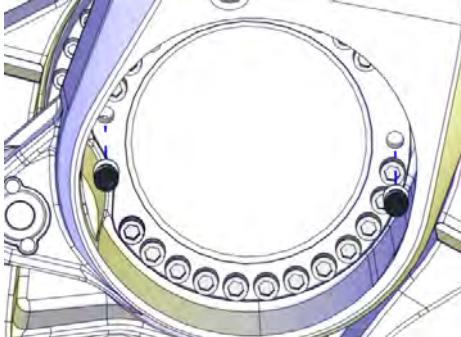
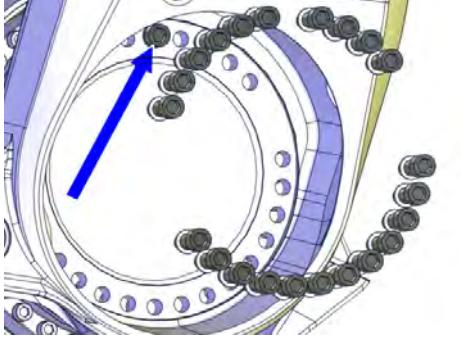
4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
3 Unscrew the attachment screws of the cable bracket on the frame and let it hang loose.	 xx1200001283

Fitting guide pins to the lower arm

Use this procedure to prepare the removal of the lower arm.

Action	Note
1 Remove two attachment screws in opposite holes and replace them with guide pins.  Tip Lubricate the guide pins with some grease to make the lower arm slide better.	Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!  xx1400002181
2 Remove all but one of the remaining attachment screws that secure the lower arm to the axis-2 gearbox.	 xx1400002182

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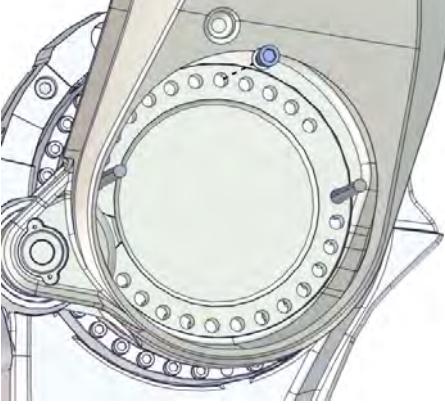
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Removing and lifting away the lower and upper arms un-separated

Use this procedure to remove and lift away the lower and upper arm unseparated.

Action	Note
1 Put two pallets on the floor, in front of the position of the mechanical stop.  Note Using the method to replace the gearbox with cable harness and DressPack fitted, is only a recommendation. If it is not possible to put the arm system close enough to the robot and keep the cable harness partly fitted, it is necessary to remove the cable harness and DressPack in base and frame first.	
2  CAUTION The lower and upper arms together weigh 650 kg. All lifting accessories used must be sized accordingly!	
3 Remove the remaining screw and slowly lift away the lower and upper arm together. Let the cabling run in the lower arm. Make sure not to stretch any cabling!  CAUTION Use extreme caution when lifting the lower and upper arm. The cable harness is still partly connected.	 xx1700000442
4 Use a piece of wood or similar as a support under the arm house when the arm system is put down on the pallets. This is done in order not to damage any parts of the cable harness and DressPack.	
5 Use caution and lift the arm system and lay it down safely on the pallets.	

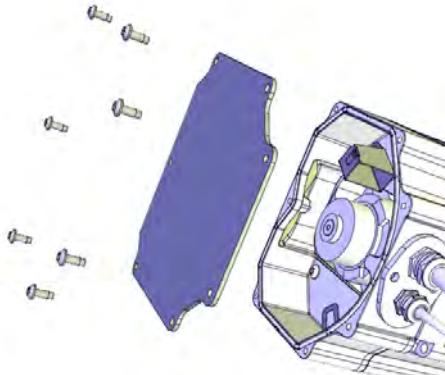
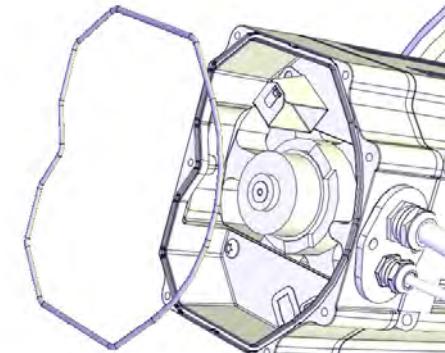
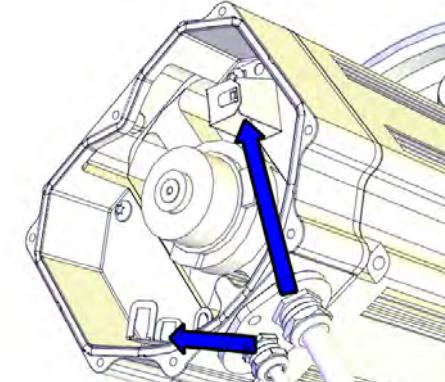
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4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Disconnecting the axis-2 motor cables

Use this procedure to disconnect the motor cables.

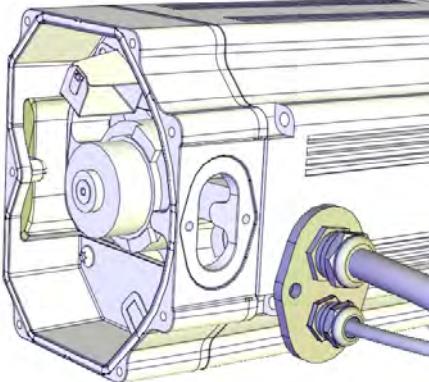
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3	Make sure the o-ring is present.	 xx1200001070
4	Disconnect the motor cables.	 xx1200001066

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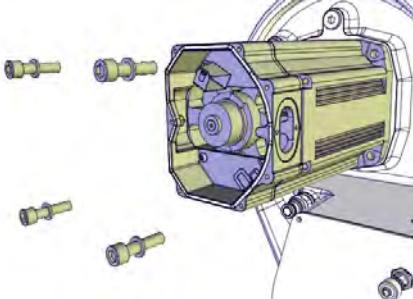
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
<p>5 Remove the cable gland cover. Make sure the gasket is not damaged.</p> <p> Tip</p> <p>Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 xx1200001067
6 Use caution and pull out the motor cables.	

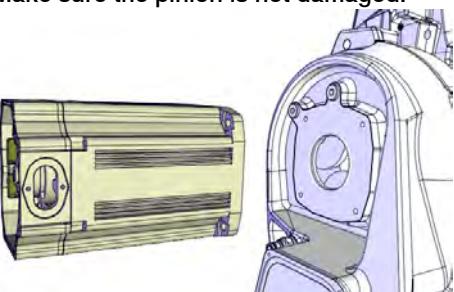
Removing the axis-2 motor

Action	Note
1 Before removing the motor, make sure that the axis-2 gearbox is completely drained.	
<p>2  DANGER</p> <p>When releasing the holding brakes of the motor, the lower arm will be movable and may fall down. Secure the lower arm before continuing.</p>	
<p>3 To release the brake, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
<p>4 Remove the attachment screws securing the motor. Use a bits extender in order to reach the screws.</p>	Bits extender: 3HAC12342-1  xx1200001117
<p>5 Fit guide pins in opposite holes.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the motor slide better.</p>	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
6	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
7	If required, press the motor out of its position by using the removal tool in opposite holes of the motor.	Removal tool M12: 3HAC057339-003 Always use removal tools in pairs.
8	Disconnect the 24 VDC power supply.	
9	 CAUTION The motor weighs 28 kg. All lifting accessories used must be sized accordingly.	
10	Carefully lift the motor out on the guide pins, in order to get the pinion away from the gear and let it rest on the guide pins.	
11	Fasten the lifting accessory. Attach the lifting chain to the accessory and an overhead crane.	Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1
12	Remove the motor by sliding it out on the guide pins and lift it off.	Make sure the pinion is not damaged.  xx1200001118

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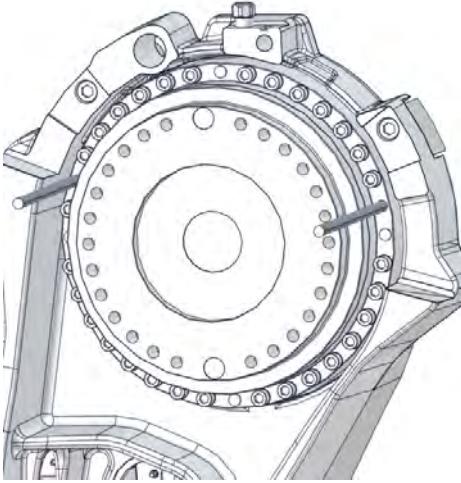
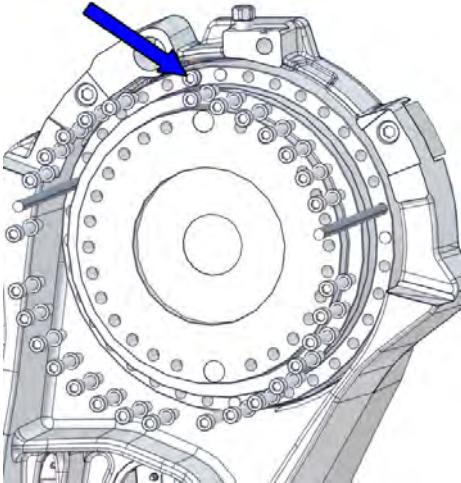
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Removing the axis-2 gearbox

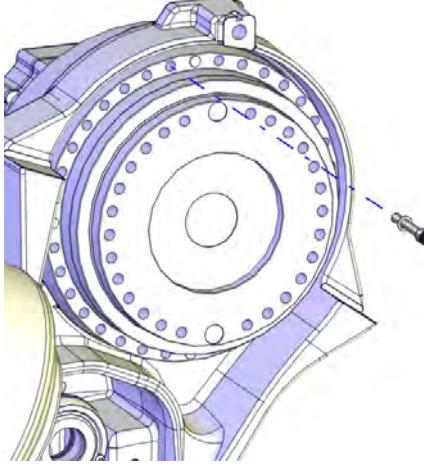
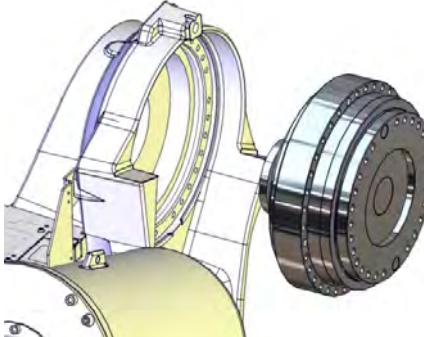
Use the procedure to remove gearbox.

Action	Note
<p>1 Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the gearbox slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!</p>  <p>xx1700000443</p>
<p>2 Leave one of the upper attachment screws and remove the rest. The remaining screw is used to prevent the gearbox from falling down.</p>	 <p>xx1700000444</p>
<p>3  CAUTION</p> <p>The gearbox weighs 110 kg. All lifting accessories used must be sized accordingly!</p>	

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
4 Remove the remaining screw left in the gearbox.	 xx1400002185
5 Use two fully threaded attachment screws (M12) as removal tools to press the gearbox out of position.	
6 Attach the lifting accessory to the gearbox.	Lifting accessory, gearbox: Article number depends on robot variant. ⁱ
7 Let the gearbox slide out on the guide pins.	
8 Remove the gearbox.	 xx1400002186

ⁱ Robot variants IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20: 3HAC046112-001.
 Robot variants IRB 6700 - 200/2.60, - 155/2.85: 3HAC046128-001.

Refitting the axis-2 gearbox

Use these procedures to refit the gearbox.

Follow the order of the separate procedures according to the order they are presented.

**CAUTION**

When performing these procedures, the cable harness will still be fitted or partly fitted to the robot. Use the utmost caution not to cause any damage to the cable harness!

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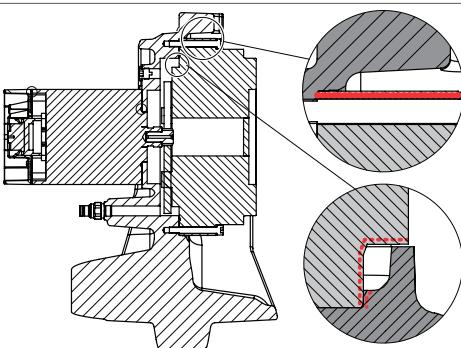
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Refitting the gearbox

Use this procedure to refit the gearbox.

Action	Note
1  CAUTION The gearbox weighs according to variant 110 kg. All lifting accessories used must be sized accordingly!	
2 Apply the lifting accessory to the gearbox.	Lifting accessory, gearbox: Article number depends on robot variant. i
3 Use caution and lift the gearbox so that it rests on its side.	
4 Remove the o-ring and wipe it clean.  Note This must also be done on a new spare part!	
5 Wipe clean the contact surfaces from any contamination.  Note Also wipe clean the o-ring groove.	
6 Check the condition of the o-ring. Replace if damaged!	
7 Lubricate the o-ring with some grease, for a better fitting in the groove.	
8 Fit the o-ring in the groove.	
9 Foundry Plus: Apply Mercasol on the surfaces shown in the figure.	 xx1400000374

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4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

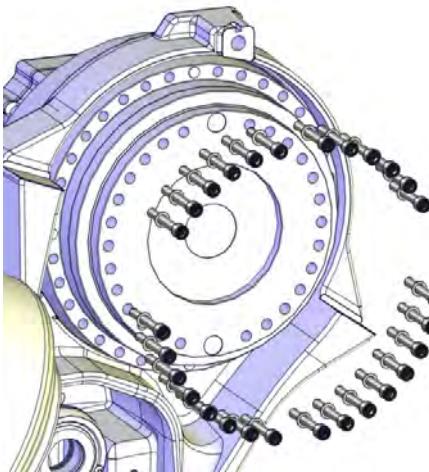
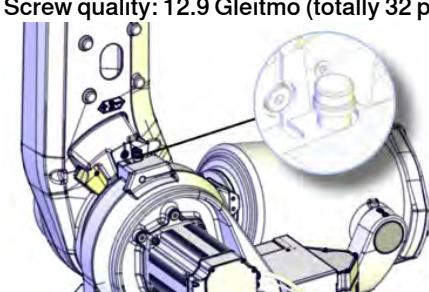
Action	Note
<p>10 Fit two guide pins in opposite holes (M12).</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the gearbox slide better.</p>	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!
11 Lift the gearbox and let it rest on the guide pins.	
12 Slide the gearbox into position.	

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4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

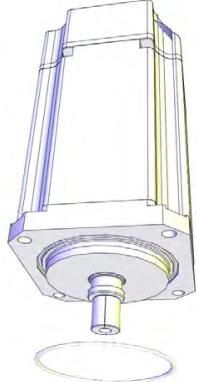
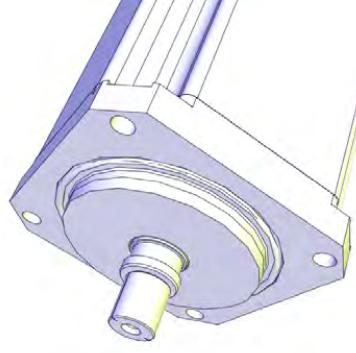
Continued

Action	Note
13 Fit the attachment screws now accessible.	 xx1400002188 <p>Screw dimension: There are two versions of the robot frame. Depending on which frame the robot is equipped with, the depth of the screw holes in the frame, used for the axis-2 gearbox, differ. The frame that is configured for Axis Calibration, has a calibration pin and bushing as shown in the figure. For this frame, screws with dimension M12x90 should be used. For a frame without the calibration pin and bushing, screws with dimension M12x80 should be used..</p> <p>Screw quality: 12.9 Gleitmo (totally 32 pcs)</p>  xx1500002118
14 Remove the lifting accessory.	
15 Remove the guide pins and fit the remaining attachment screws.	
16 Secure the gearbox with its attachment screws.	Tightening torque: 120 Nm.

- i Robot variants IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20: 3HAC046112-001.
- Robot variants IRB 6700 - 200/2.60, - 155/2.85: 3HAC046128-001.

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Preparations prior to refitting motor

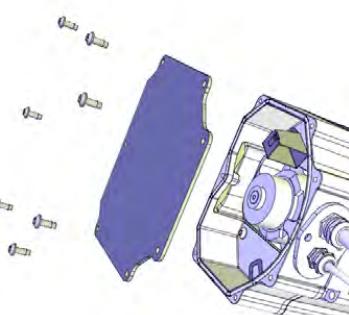
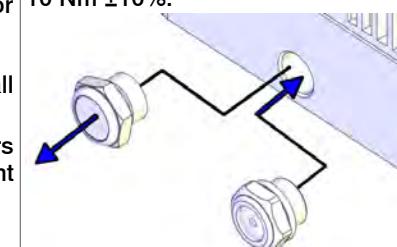
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	
3	Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	
4	Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019
5	 Tip Lubricate the o-ring with some grease for a better fitting in the groove.	 xx1200001020

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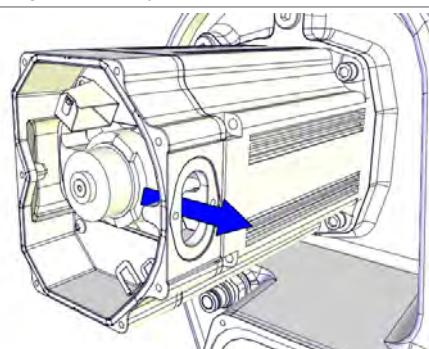
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
6 If the motor is a new spare part, remove the cover.	 xx1200001135
7 Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.	Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.  xx1600000576

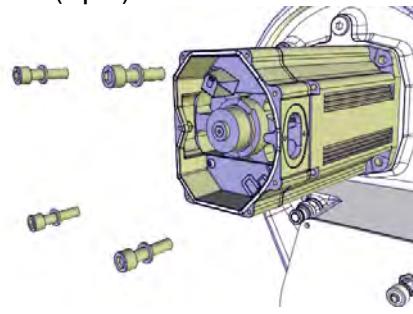
Securing the axis-2 motor

Action	Note
1 Fit guide pins in opposite holes.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
2  CAUTION The motor weighs 28 kg. All lifting accessories used must be sized accordingly.	
3 Apply the lifting accessory.	Lifting accessory, motor: 3HAC15534-1
4  Note Make sure the cable exit hole is turned the correct way.	 xx1200001120

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
5 Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.	
6 Remove the lifting accessory and allow the motor to rest on the guide pins.	
7 Apply the rotation tool and use it to rotate the pinion when mating it into the gear.	Rotation tool: 3HAB7887-1
8 To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP2, axis-2 motor: <ul style="list-style-type: none">• + = pin 2• - = pin 5	
9  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
10 Use caution and fit the motor in its final position while at the same time rotating the motor pinion slightly using the rotation tool. <ul style="list-style-type: none">• Make sure that the motor pinion is properly mated to the gear of the gearbox.• Make sure that the motor pinion does not get damaged.• Make sure that the direction of the cable exit is facing the correct way.	
11 Fit two of the attachment screws.	Screw dimension: M10x40 quality 12.9 Gleitmo (4 pcs)
12 Remove the guide pins and replace with the remaining attachment screws.	
13 Secure the motor with its attachment screws and washers. Use a bits extender in order to reach the screws.	Bits extender: 3HAC12342-1 Tightening torque: 50 Nm. Screw dimension: M10x40 quality 12.9 Gleitmo (4 pcs)  xx1200001117
14 Perform a leak-down test.	See Performing a leak-down test on page 196 .

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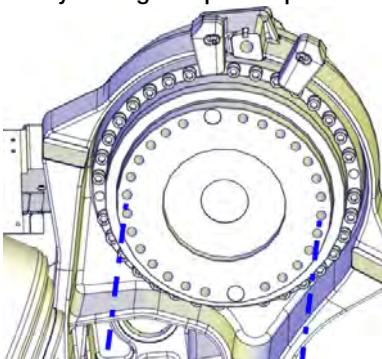
4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Lifting back and refitting the lower and upper arm

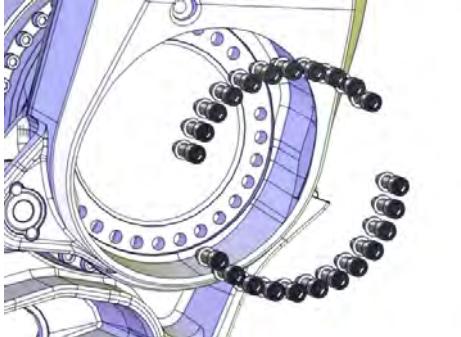
Use this procedure to lift back and refit the lower and upper arm unseparated.

Action	Note
1 Connect the 24 VDC power supply to the axis-2 motor to release the brakes of the motor.	
2 Fit the rotation tool, if not already fitted.	Rotation tool: 3HAB7887-1
3 Fit two guide pins in opposite holes in the axis-2 gearbox.  Tip Lubricate the guide pins with some grease to make the lower arm slide better.	Guide pin, M16x150: 3HAC13120-2 Always use guide pins in pairs!  xx1400002189
4  CAUTION The lower and upper arms together weigh 650 kg. All lifting accessories used must be sized accordingly!	
5 Apply the lifting accessories, if not already fitted.	
6 Use caution and slowly lift the lower and upper arm together. Make sure: <ul style="list-style-type: none">• not to stretch any of the cables• that the arm package is level when lifted.	
7 Before putting the upper and lower arm on the guide pins, make sure that the hole pattern is matched and in the correct position for all screws.	

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
8 If the hole pattern is not matching, use the rotation tool and adjust.	 Rotation tool: 3HAB7887-1 xx1300000819
9 Slide the lower arm on to the guide pins.	
10 Use caution and move the arms into position at the axis-2 gearbox on the guide pins. Rotate the axis-2 gearbox until the hole pattern is matching the holes in the lower arm.	
11 Fit one attachment screw in one of the upper holes using it for security and lower the lifting accessory a little.	
12 Fit all now accessible attachment screws.	 xx1400002190
13 Remove the two guide pins and fit the remaining attachment screws.	
14 Secure the lower arm to the axis-2 gearbox with its attachment screws.	Tightening torque M16: 300 Nm.
15 Disconnect the 24 VDC power supply.	
16 Remove the lifting accessories.	

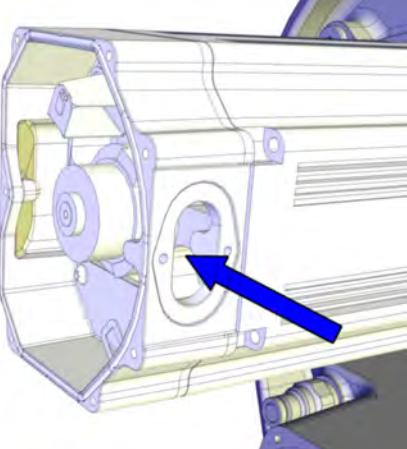
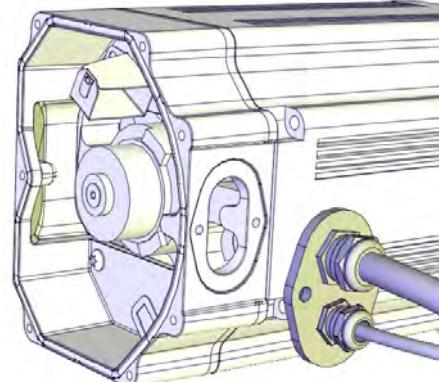
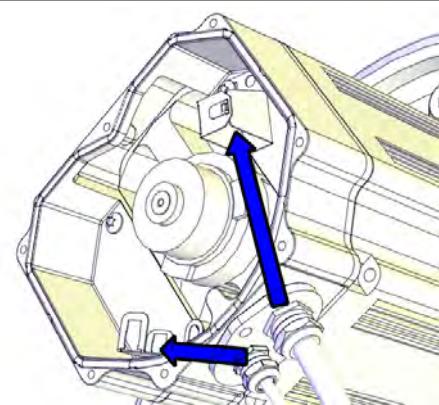
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4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

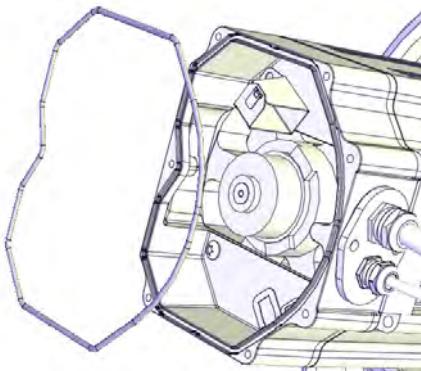
Connecting the axis-2 motor cables

Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738
2 Refit the cable gland cover.  Note Replace the gasket if damaged.	 xx1200001067
3 Connect the motor cables. Connect in accordance with the markings on the connectors.	 xx1200001066

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
4	<p>Inspect the o-ring.</p> <p> Note</p> <p>Replace if damaged.</p>	<p>O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)</p>  xx1200001070
5	Wipe clean o-ring and o-ring groove.	
6	<p>Refit the o-ring.</p> <p> Tip</p> <p>Lubricate the o-ring with some grease for a better fitting in the groove.</p>	
7	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

Continues on next page

4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
<p>8 Refit the motor cover with its attachment screws.</p> <p>Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged.</p> <p>Note Make sure the o-ring is undamaged and properly fitted.</p>	 xx1200001135
9 Make sure that the covers are tightly sealed.	

Refitting the cabling

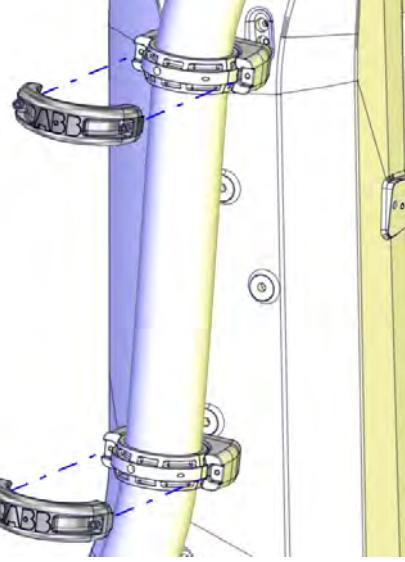
Use this procedure to refit the cabling.

Action	Note
1 Use caution and push the cable harness into the lower arm.	
<p>2 Refit the <i>axis-2 lower arm metal clamp</i> and the <i>axis-3 lower arm metal clamp</i> located on the inside of the lower arm.</p> <p>Note The screws are reached from the outside of the lower arm!</p>	 xx1200001282
3 Refit the cable bracket on the frame.	 xx1200001283

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

Action	Note
4 If robot is equipped with DressPack. <ul style="list-style-type: none"> Place the cabling in the two ball joint housings on the lower arm and close the ball joint housings. 	How to refit the DressPack is described in the product manual "IRB 6700 DressPack". For article number see References on page 10 . 

Refitting the front shaft of the balancing device

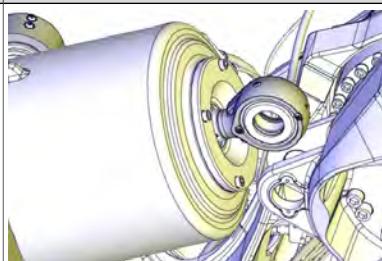
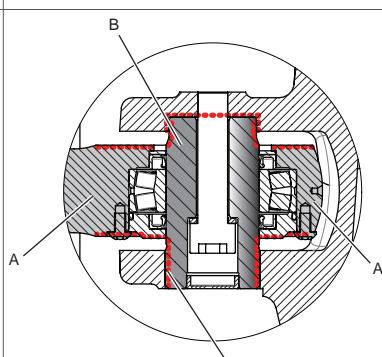
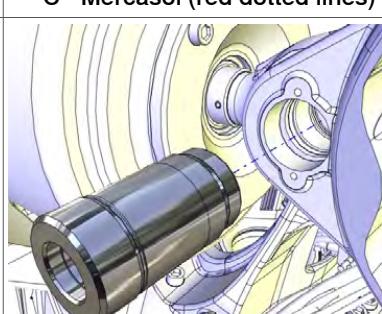
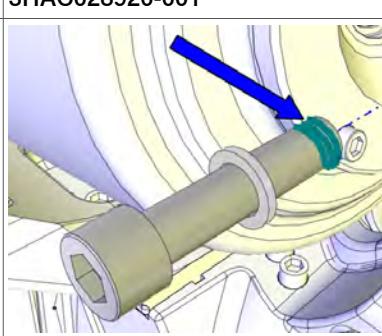
Action	Note
1 Turn on the power to the robot.	
2 Use caution and jog the robot to the calibration position (if not already done).	
3  DANGER Turn off all: <ul style="list-style-type: none"> electric power supply hydraulic pressure supply air pressure supply to the robot, before entering the robot working area.	
4 Apply the lifting accessory to the balancing device (if not already done).	Lifting shackle: SA-10-8-NA1 Lifting accessory (chain): 3HAC15556-1
5 Remove all residue of Loctite in the screw hole of the shaft.	
6 Wipe all contact surfaces inside the recess clean from residual grease or other contamination.	

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4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

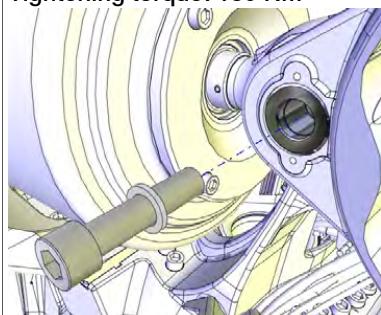
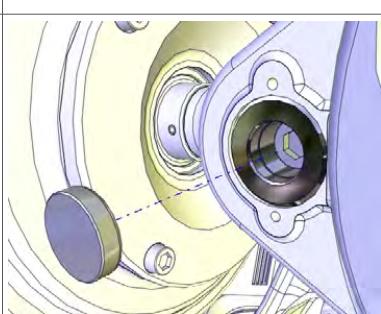
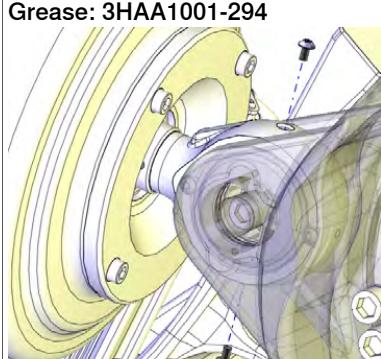
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Action	Note
<p>7 Align the balancing device link ear with the hole in the lower arm.</p> <p>Note</p> <p>Verify that the link ear is correctly turned.</p>	 xx1300000784
<p>8 Foundry Plus: Apply Mercasol on the surfaces on the shaft and front ear.</p>	 xx1400000368 <p>A Front link ear B Shaft C Mercasol (red dotted lines)</p>
<p>9 Lubricate the shaft and place it to the front ear.</p> <p>Note</p> <p>Foundry Plus: Do not lubricate surfaces where Mercasol is applied!</p>	 xx1200001280
<p>10 Press the shaft in with the hydraulic press tool.</p>	<p>Hydraulic pump 80 MPa: 3HAC13086-1 Hydraulic cylinder: 3HAC11731-1 Dismantle and mounting tool: 3HAC028920-001</p>
<p>11 Apply locking liquid (Loctite 2701) on the threads of the screw, first entering the threads in the frame.</p>	 xx1300000782

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4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
12	Secure the shaft with screw and washer.	Tightening torque: 180 Nm  xx1200001279
13	Fit the VK-cover.	 xx1200001278
14	Unscrew both screws in link ear and fill the bearing with grease from the upper hole until the grease appears in the lower hole.	Grease: 3HAA1001-294  xx1300000783
15	Refit the two screws and wipe clean from residual grease.	

Concluded refitting of the front shaft

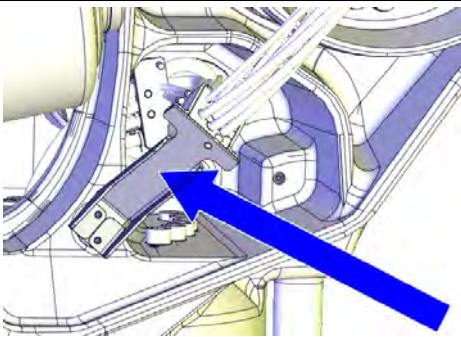
	Action	Note
1	Remove the lifting accessory from the balancing device.	

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4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

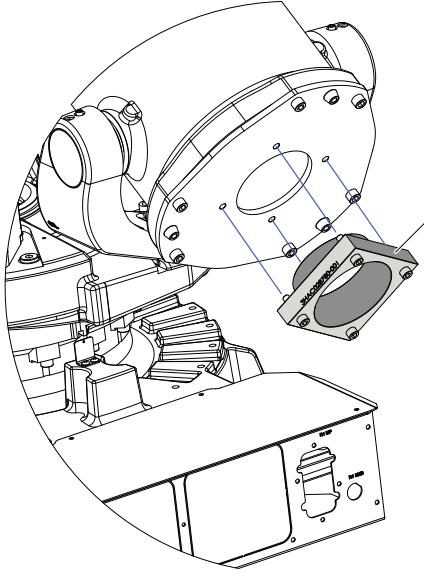
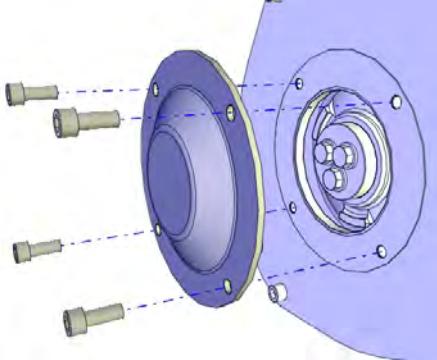
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Action	Note
2 Refit the cable bracket (if not already refitted).	 xx1200001283
3  DANGER Do not use the Distance tool: 3HAC030662-001 to unload or restore the pressure of the balancing device spring unit! This tool is only used to lock the spring unit in a compressed position, after axis-2 has been jogged to -20° or +20°. Fitting and removal of the tool shall only be done with axis-2 in this position! To unload or restore a new balancing device or if the spring unit of the balancing device cannot be compressed by jogging the robot, only use the hydraulic press tool Dismantle and mounting tool 3HAC028920-001.	
4 Jog axis-2 to: • -20° or +20°.	This is done in order to compress the spring unit inside the balancing device before refitting or removal of the distance tool.
5  DANGER Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

Continues on next page

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
6	Remove the distance tool.	 <p>xx0800000480</p> <p>A Distance tool: 3HAC030662-001</p>
7	Refit the cover plate.	 <p>xx1300000554</p>

Concluding procedure

	Action	Note
1	If the robot is equipped with DressPack, refit the brackets of the ball joint housings on the wrist.	
2	Refill oil to the axis-2 gearbox.	See Filling oil into the axis-2 gearbox on page 166 .
3	Recalibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .

Continues on next page

4 Repair

4.8.4 Replacing the axis-2 gearbox (IRB 6700 -300/2.70, -245/3.00)

Continued

	Action	Note
4	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48.	

4.8.5 Replacing the axis-3 gearbox

Space required beside

This section describes how to replace the gearbox without needing to remove the cable harness and DressPack cable package (if installed) from the robot.

The described procedure requires free space on the floor, at the right-hand side of the balancing device (seen from behind). There should be enough space to place two pallets in a row.

If needed, run axis 1 into a position that gives the required space at the right-hand side of the balancing device.

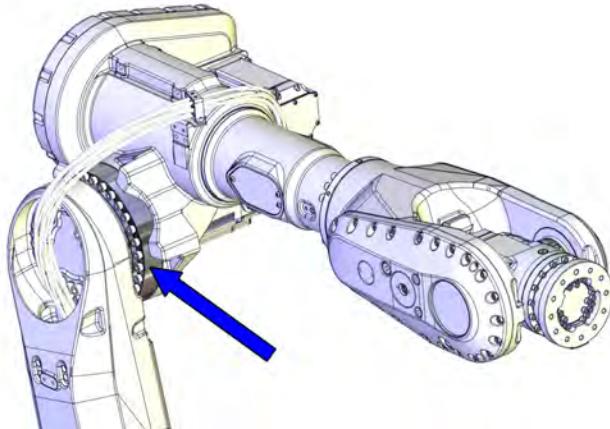


DANGER

Do not unscrew the attachment screws that secure the robot to the foundation!
If unscrewed, the robot will be unstable.

Location of the axis-3 gearbox

The axis-3 gearbox is located as shown in the figure.



xx1300000515

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4 Repair

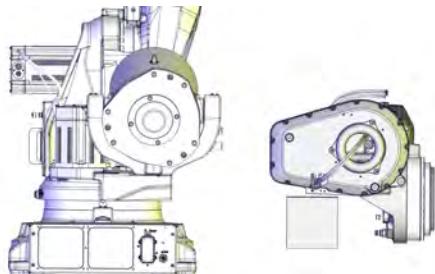
4.8.5 Replacing the axis-3 gearbox

Continued

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Remove the upper arm from the robot and position it as shown in the figure, for easy removal of the axis-3 gearbox.



xx1300000553

When removing the upper arm, the cable harness can be kept fitted or partly fitted to the robot. Use caution not to cause any damage to the cable harness.

- 2 Replace the axis-3 gearbox.

Spare parts

Spare parts	Spare part number	Note
Axis-3 gearbox	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 156 .
Lifting eye	3HAC16131-1	M12
Lifting eye	3HAC14457-4	M16
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Pallet		Used for putting down removed parts from robot.
Lifting accessory, gearbox	3HAC046128-001	
Removal tool M14	3HAC057339-004	Used to push out the motor, if necessary. Always use removal tools in pairs.

Continues on next page

Equipment, etc.	Article number	Note
Screws M8x75, fully threaded	-	Used to push out the gearbox, if necessary.
Pallet		Used for putting down removed parts from robot.
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs!
Guide pin, M16x200	3HAC13120-3	Always use guide pins in pairs!
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Consumables

Equipment, etc	Article number	Note
Grease	3HAB3537-1	Used to lubricate o-rings.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.
O-ring ⁱ	3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)	D=169.5x3 Used on motor cover.
O-ring	3HAB3772-145	D=266.29x3.53 Used on gearbox.

ⁱ The cross-section profile is either circular or hexagon. If only ordering the o-ring, order the same profile that is currently installed in the connection box.

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	

Continues on next page

4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
<p>If the robot is to be calibrated with reference calibration:</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 Reference calibration routine on page 775.</p> <p>Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum.</p>
<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the axis-3 gearbox

Use these procedures to remove the axis-3 gearbox.

Follow the order of the separate procedure according to the order they are presented.

Preparations before removing the axis-3 gearbox

Action	Note
1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2 Jog the robot to: <ul style="list-style-type: none">• Axis 1 = No significance (as long as the robot is secured to the foundation).• Axis 2 = -60°• Axis 3 = +60°• Axis 4 = 0°• Axis 5 = 0°• Axis 6 = 0°	If needed, run the axis-1 into a position that gives the required space (space to place two pallets in a row) at the right-hand side of the balancing device, as seen from behind.
3  DANGER <p>Turn off all:<ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supplyto the robot, before entering the robot working area.</p>	

Continues on next page

4.8.5 Replacing the axis-3 gearbox

Continued

	Action	Note
4	<p>Unscrew the uppermost attachment screw that holds the bracket of the DressPack cable package (if one is fitted), and let it "fall down". See figure!</p> <p>Note</p> <p>It is not needed to disconnect the lower end connectors of the DressPack (as the figure shows). Connectors are only hidden to get a better view of which screw to be removed.</p>	<p>xx1200001331</p> <p>A Attachment screw to be removed B Attachment screw not to be removed</p>
5	<p>Unscrew the two attachment screws that holds the bracket of the DressPack cable package (if one is fitted), and let it hang down together with the rest of the DressPack cable package.</p>	<p>xx1200001332</p>
6	<p>Begin draining the gearbox.</p>	<p>See Draining the axis-3 gearbox on page 170.</p>
7	<p>Put two pallets on the floor, at the right-hand side of the robot.</p> <p>Note</p> <p>This position is only a recommendation. If it is not possible to put the upper arm close enough to the robot and keep the cable harness partly fitted, it may be necessary to remove the cable harness and DressPack in the upper arm and wrist first.</p>	

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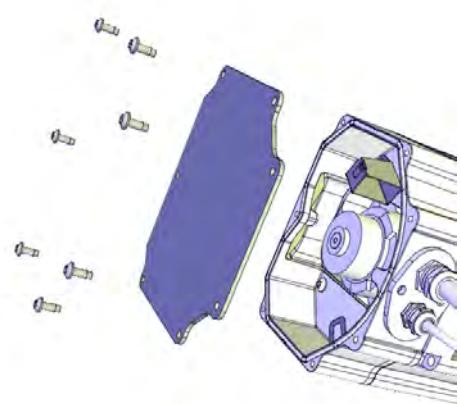
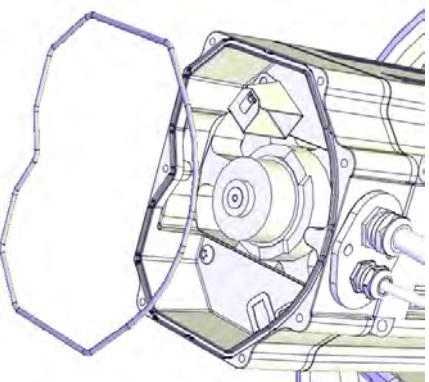
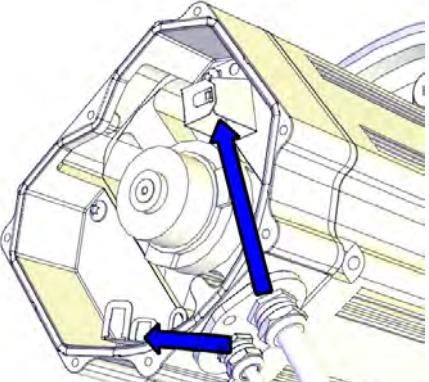
4 Repair

4.8.5 Replacing the axis-3 gearbox

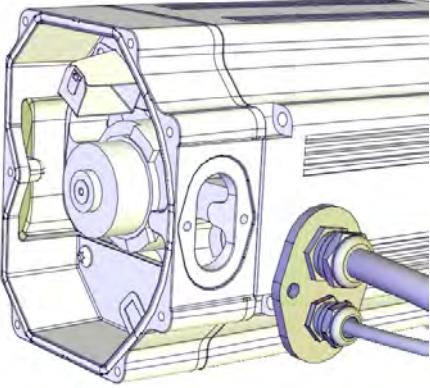
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Disconnecting the axis-3 and axis-4 motor cables

Use this procedure to disconnect the motor cables on the axis-3 and axis-4 motors.

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Unscrew the attachment screws and washers and remove the motor cover.	 xx1200001135
3 Make sure the o-ring is present.	 xx1200001070
4 Disconnect the motor cables.	 xx1200001066

Continues on next page

Action	Note
<p>5 Remove the cable gland cover. Make sure the gasket is not damaged.</p> <p> Tip</p> <p>Make a note in which direction the <i>cable exit hole</i> is facing, if the motor will be removed too. The motor shall be refitted in the same position.</p>	 <p>xx1200001067</p>
6 Use caution and pull out the motor cables.	

Keeping cabling installed in upper arm - loosening the cable brackets

This procedure is valid if wanting to keep the cabling installed in the upper arm, when removing the upper arm from the robot. If this is not possible due to lack of space where to put the upper arm, the cable harness must be removed from the upper arm, see [Removing the cable harness - upper arm and wrist on page 227](#).

Use this procedure to loosen required cable brackets of the robot cable harness, in order to get the longest possible length of the cable harness between the lower and upper arm.

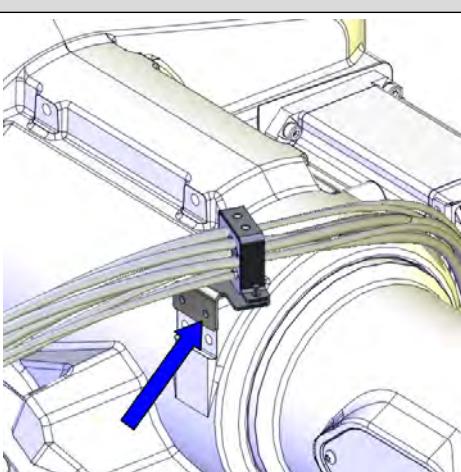
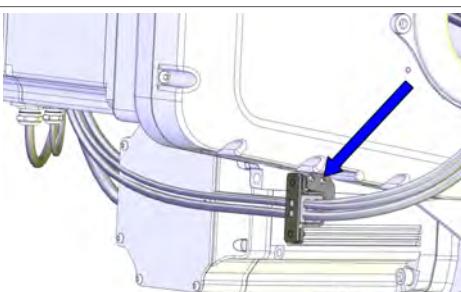
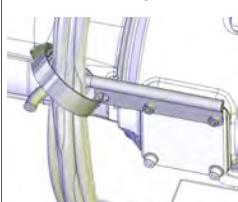
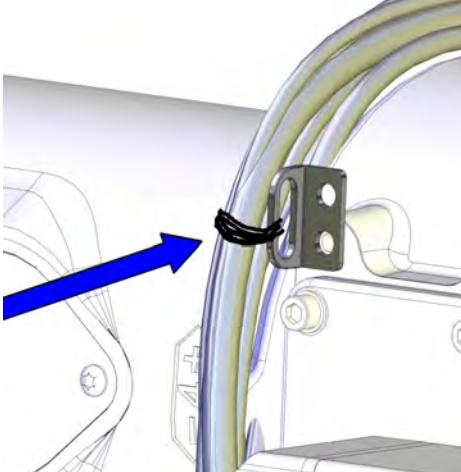
Action	Note
<p>1 Unscrew the attachment screws that hold the axis-3 lower arm metal clamp (the one closest to the axis-3 gearbox) located on the inside of the lower arm.</p> <p> Note</p> <p>The screw is reached from the outside of the lower arm!</p>	 <p>xx1300000558</p>

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4 Repair

4.8.5 Replacing the axis-3 gearbox

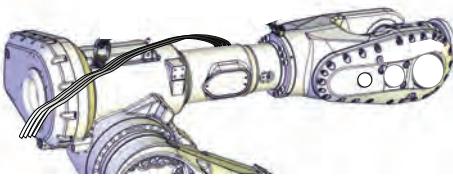
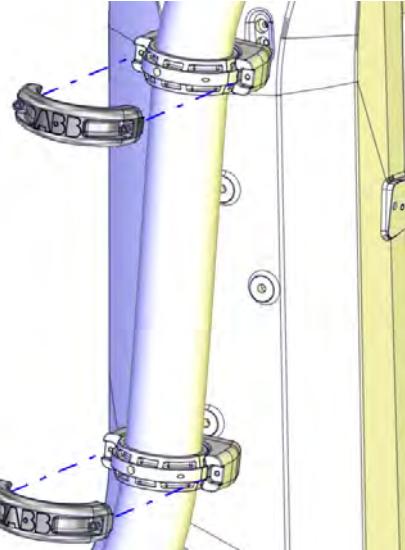
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Action	Note
2 Unscrew the attachment screws that hold the cable bracket on top of the arm house.	 xx1300000541
3 Unscrew the attachment screws that hold the cable bracket under the armhouse.	 xx1300000543
4 Open the velcro strap on the cable fixing bracket. Note If DressPack is fitted, the cable fixing bracket is replaced by the cable guide.  xx1300001973 Cable guide.	 xx1300000544 Cable fixing bracket.

Continues on next page

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
5 In order not to damage the cable harness later, it shall be moved over to the other side of the armhouse and be placed on the right side (as seen from behind) of the back lifting eye. See figure!	 xx1300000534
6 If the robot is equipped with DressPack: • Open the two ball joint housings on the lower arm and lift away the cable harness from the ball joint housings.	How to remove the DressPack is described in more detail in the product manual "IRB 6700 DressPack". For article number see References on page 10 .  xx1400000195
7 If the robot is equipped with DressPack: Lift the DressPack cable package at the arm house up and put the cable bracket on the cable guide where the velcro strap normally is fitted. Secure the temporary position with a velcro strap or similar, to ensure it will not fall down or damage anything.	

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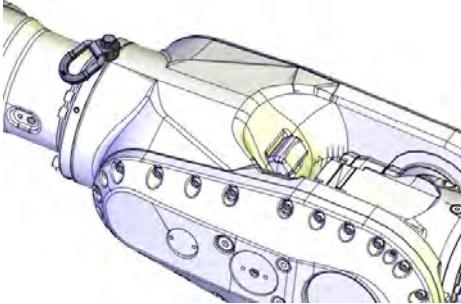
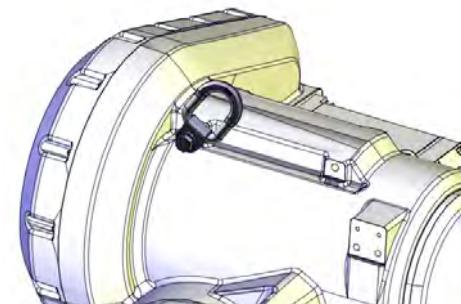
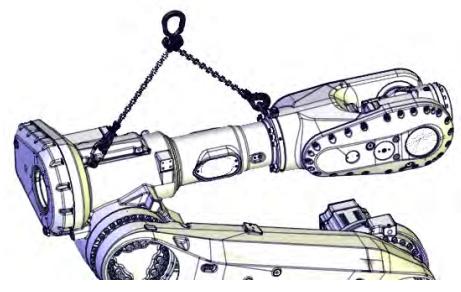
4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Attaching the lifting accessories to the upper arm

Use this procedure to attach the lifting accessories to the upper arm.

Action	Note
1  CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2 Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1  xx1200001133
3 Fit a lifting eye in the arm house, with a fender washer underneath.  xx1400002196	Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.  xx1200001134
4 Attach the upper arm lifting accessory (chain) to an overhead crane (or similar) and then to the lifting eye in the arm house and in the wrist.	Lifting accessory (chain): 3HAC15556-1  xx1200001308

Continues on next page

Action	Note
5 Raise the lifting accessories to take the weight of the upper arm.	
6 In case of necessary adjustments, use the shortening loops on the lifting accessory (chain) to find the level position. See figure!	 xx1400002197
7 Release the brakes in order to find the most level lifting position of the upper arm as possible, before lifting. To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP3: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	24 VDC power supply

Removing the axis-3 motor

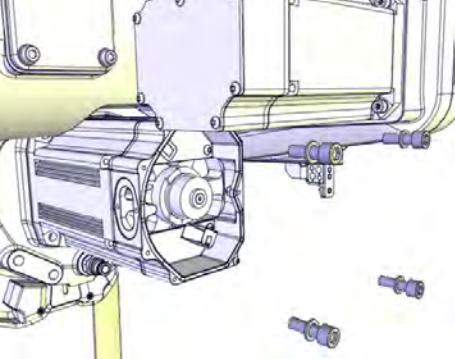
Action	Note
1 Before removing the motor, make sure that the axis-3 gearbox is completely drained.	
2  DANGER When releasing the holding brakes of the motor, the upper arm will be movable and may fall down! Before continuing the weight of the upper arm must be secured!	
3 To release the brakes, connect the 24 VDC power supply. Connect to connector R2.MP3: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	

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4 Repair

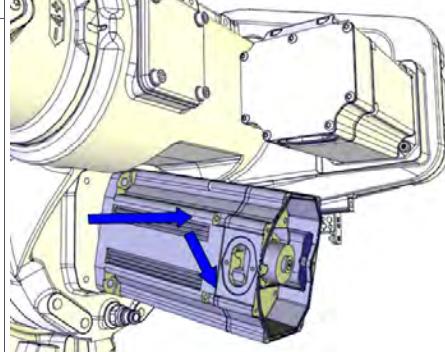
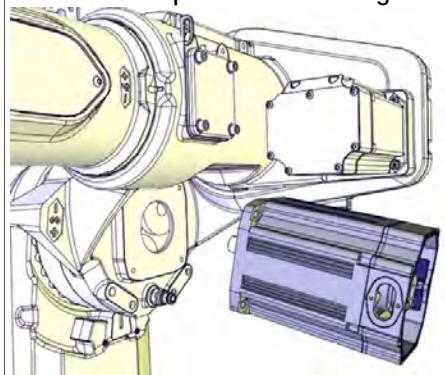
4.8.5 Replacing the axis-3 gearbox

Continued

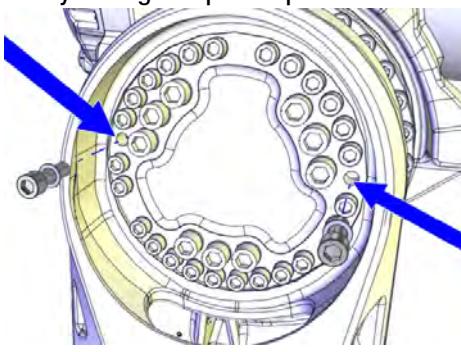
Action	Note
4 Unscrew the attachment screws that hold the motor. Use a bits extender to reach the screws.	Bits extender: 3HAC12342-1  xx1200001126
5 Fit guide pins in opposite holes.  Tip Lubricate the guide pins with some grease to make the motor slide better.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
6  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
7 If required, press the motor out of position by using the removal tool in the remaining holes for the motor.	Removal tool M12: 3HAC057339-003 Always use removal tools in pairs.
8 Use caution and lift the motor out on the guide pins, in order to get the pinion away from the gear, and let the motor rest on the guide pins.	
9  CAUTION The motor weighs 26 kg. All lifting accessories used must be sized accordingly.	

Continues on next page

4.8.5 Replacing the axis-3 gearbox Continued

	Action	Note
10	Fasten the lifting accessory to the motor. Attach the lifting chain to the accessory and an overhead crane.	Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1  xx1200001125
11	When the motor is hanging in the lifting accessory, and the pinion no longer is mated to the gear, let the outer end of the motor hang lower so that it will hang in an angle. This position makes it easier to remove the axis-3 motor with the axis-4 motor still fitted.  CAUTION The pinion must have been parted from the gear before the motor is angled. If not there is a risk of damaging the pinion and gear.	 xx1200001131
12	Disconnect the 24 VDC power supply.	
13	Remove the motor by lifting it straight out.	Make sure the pinion is not damaged.  xx1200001131

Preparations before removing the upper arm - IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20

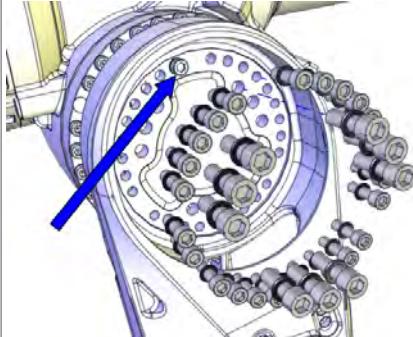
	Action	Note
1	Remove two attachment screws (M12) in opposite holes and replace them with guide pins.  Note Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure!  Tip Lubricate the guide pins with some grease to make the upper arm slide better.	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!  xx1300000659

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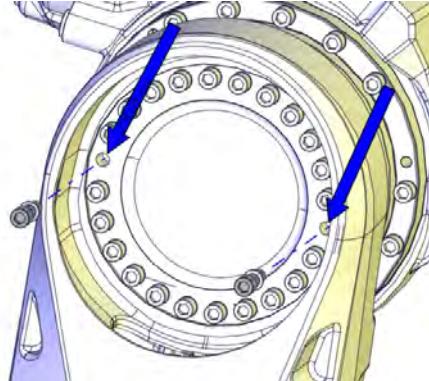
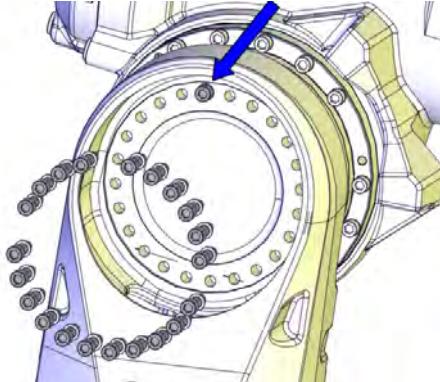
4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

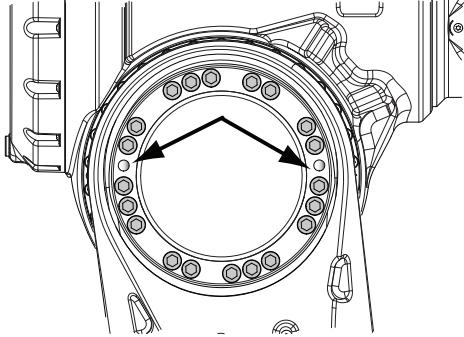
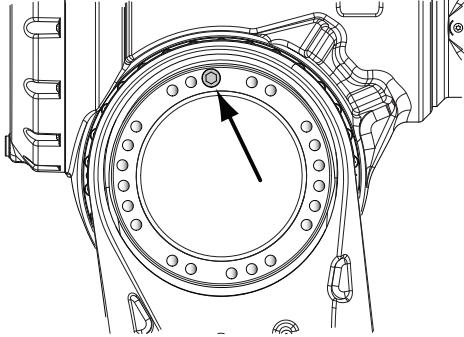
Action	Note
2 Remove all but one of the remaining attachment screws.	 xx1300000747

Preparations before removing the upper arm - IRB 6700-200/2.60, -155/2.85

Action	Note
1 Remove two attachment screws (M12) in opposite holes and replace them with guide pins. Note Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure! Tip Lubricate the guide pins with some grease to make the upper arm slide better.	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!  xx1300002245
2 Remove all but one of the remaining attachment screws.	 xx1300002246

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Preparations before removing the upper arm - IRB 6700-300/2.70, -245/3.00

	Action	Note
1	<p>Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p>Note</p> <p>Make sure that it is the screws that hold the lower arm to the axis-3 gearbox that are removed! See figure!</p> <p>Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!</p>  <p>xx1400002563</p>
2	Leave one of the remaining attachment screws fitted, remove the other screws.	 <p>xx1400002564</p>

Removing the upper arm

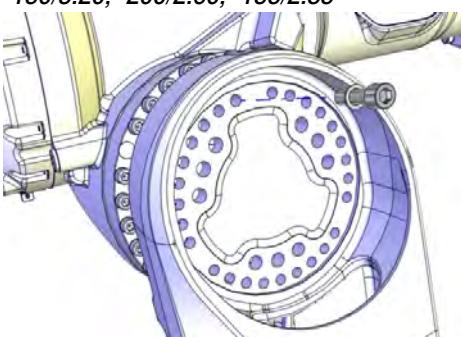
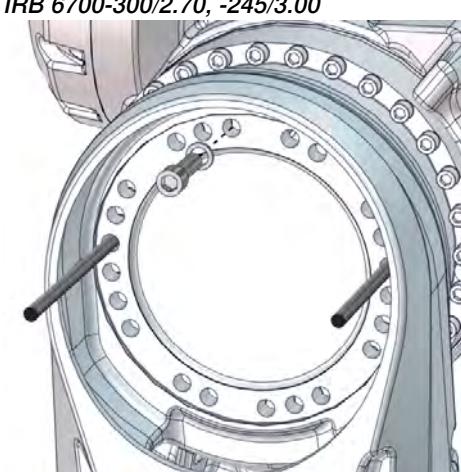
	Action	Note
1	<p>Note</p> <p>Make sure the lift is done completely leveled! In case of necessary adjustments, use the shortening loops on the lifting accessory (chain), and make sure to place the chain the right way through the loops.</p>	 <p>xx1400002197</p>

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4 Repair

4.8.5 Replacing the axis-3 gearbox

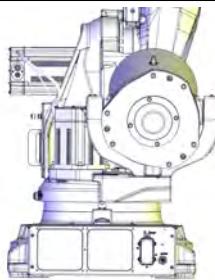
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Action	Note
2 Remove the remaining attachment screw and let the upper arm slide out from the lower arm with support from the guide pins.	<p><i>IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85</i></p>  <p><i>IRB 6700-300/2.70, -245/3.00</i></p> 
3 Lift the upper arm and place it on the prepared area.	<p>CAUTION</p> <p><i>Only valid when the upper arm is removed due to replacement of the axis-3 gearbox:</i></p> <p>If the cable harness is still fitted or partly fitted, use caution when lifting the upper arm over to the other side of the robot, in order not to cause any damage to the cable harness.</p>

Continues on next page

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
<p>4 <i>This step is only valid when the upper arm is removed due to replacement of the axis-3 gearbox:</i></p> <p>Place pieces of wood (or similar) under arm house and wrist. Lower the upper arm, and let the upper arm rest as shown in the figure.</p> <p>This is done in order to keep the axis-3 gearbox in a vertical position and to get the best position to replace the axis-3 gearbox, if applicable.</p> <p> CAUTION</p> <p>Make sure that no part of the cable harness or DressPack cable package will be damaged in the process!</p>	  <p>xx1300000553</p>

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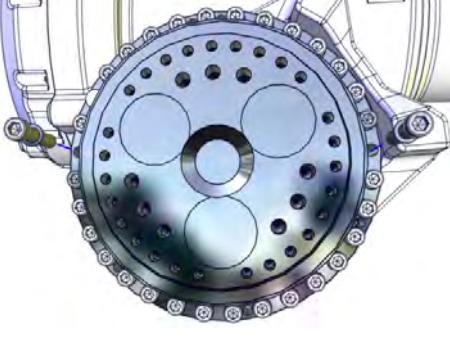
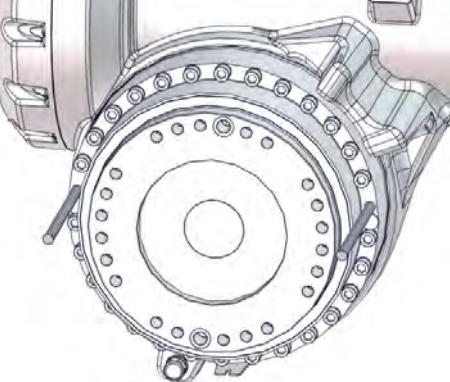
4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Removing the axis-3 gearbox

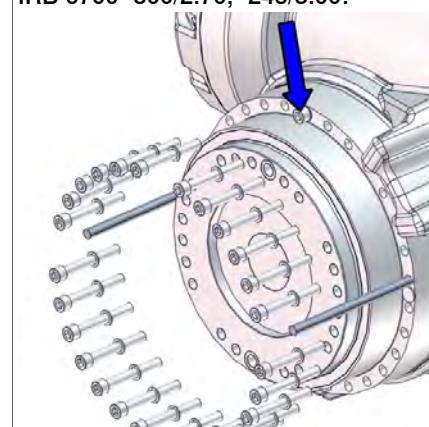
Use this procedure to remove the gearbox.

Action	Note
<p>1 Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the gearbox slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs! IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85: The figure show one of the variants but the principle is the same on all variants. The number of M12 screws differ.</p>  <p>xx1300001969</p> <p>IRB 6700 -300/2.70, -245/3.00:</p>  <p>xx1700000370</p>

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4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
2 Remove all but one of the remaining attachment screws.	<p>IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85: The figure shows one of the variants but the principle is the same on all variants. The number of M12 screws differ.</p>  <p>xx1300001970</p> <p>IRB 6700 -300/2.70, -245/3.00:</p>  <p>xx1700000371</p>
3 Fit three fully threaded screws and use them as removal tools.	ScrewsM8x75, fully threaded: Used to push out the gearbox, if necessary.
4 Remove the remaining attachment screw.	
5 Loosen the gearbox from its fitting position with the help of the removal tools, but only pull it out on the guide pins a little.	

**DANGER**

If pulled out to far on the guide pins before the lifting accessory is applied, there is a risk the gearbox may start to glide on the guide pins with a risk of falling down!

Continues on next page

4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
6  CAUTION The axis-3 gearbox weighs . <ul style="list-style-type: none">• 56 kg (<i>IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85</i>)• 85 kg (<i>IRB 6700 - 300/2.70, - 245/3.00</i>) All lifting accessories used must be sized accordingly!	
7 Apply the lifting accessory to the gearbox.	Lifting accessory, gearbox: 3HAC046128-001
8  Note There will be some oil spill when the gearbox is removed! Put some oil absorbant cloth or paper below the gearbox.	
9 With the gearbox attached to the lifting accessory, remove the gearbox by letting it slide out on the guide pins.	
10 Remove the gearbox.	

Refitting the axis-3 gearbox

Use these procedures to refit the axis-3 gearbox.

Follow the order of the separate procedures according to the order they are presented.

Refitting the axis-3 gearbox

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  CAUTION The axis-3 gearbox weighs . <ul style="list-style-type: none">• 56 kg (<i>IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20, - 200/2.60, - 155/2.85</i>)• 85 kg (<i>IRB 6700 - 300/2.70, - 245/3.00</i>) All lifting accessories used must be sized accordingly!	
3 Apply the lifting accessory to the gearbox.	Lifting accessory, gearbox: 3HAC046128-001

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4.8.5 Replacing the axis-3 gearbox

Continued

	Action	Note
4	Lift the gearbox so that it rests on the side.	
5	Remove the o-ring and wipe it clean.  Note This shall also be done on a new spare part!	
6	Check the condition of the o-ring. Replace if damaged!	
7	Wipe clean the contact surfaces. Also wipe clean the o-ring groove!	
8	Lubricate the o-ring with some grease.	
9	Fit the o-ring in the groove.	
10	Fit two guide pins in opposite holes.  Tip Lubricate the guide pins with some grease to make the gearbox slide better.	Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs!
11	Lift the gearbox to the upper arm and let it rest on the guide pins.	

Securing the axis-3 gearbox - IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20

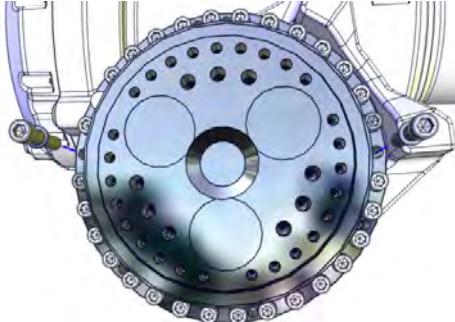
	Action	Note
1	Secure the gearbox with 29 of the 31 attachment screws.	Tightening torque: 120 Nm M12x70.  xx1300001970

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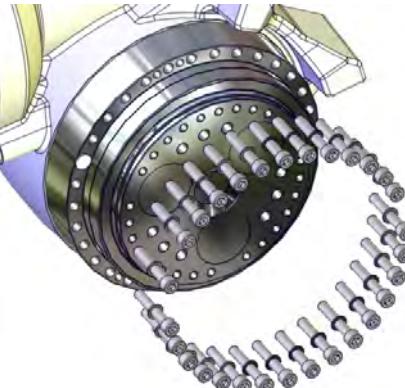
4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
2 Remove the guide pins and replace with the remaining attachment screws.	 xx1300001969
3 Secure the remaning attachment screws.	Tightening torque: 120 Nm. M12x70.
4 Remove the lifting accessory.	
5 Perform a leak-down test.	See Performing a leak-down test on page 196 .

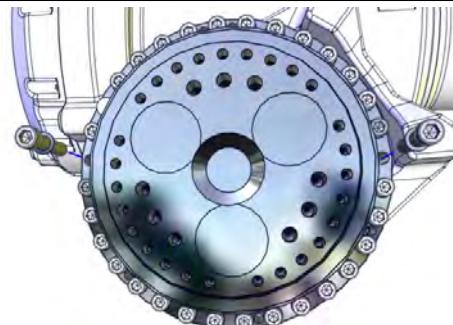
Securing the axis-3 gearbox - IRB 6700 -200/2.60, -155/2.85

Action	Note
1 Secure the gearbox with 13 of the 15 attach- ment screws.	Tightening torque: 120 Nm M12x70.  xx1300001970 The figure show one of the variants but the principle is the same on all variants. The number of M12 screws differ.

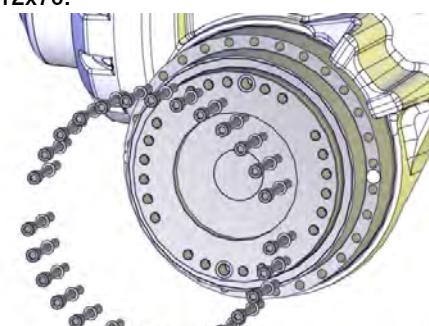
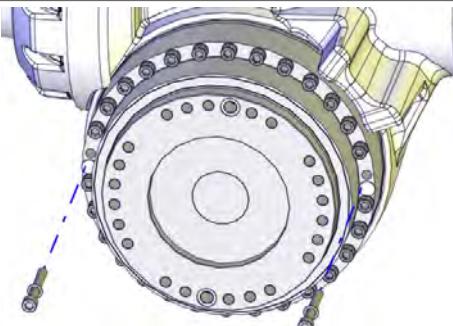
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4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
2 Remove the guide pins and replace with the remaining attachment screws.	 xx1300001969 <p>The figure show one of the variants but the principle is the same on all variants. The number of M12 screws differ.</p>
3 Secure the remaning attachment screws.	Tightening torque: 120 Nm. M12x70.
4 Remove the lifting accessory.	
5 Perform a leak-down test.	See Performing a leak-down test on page 196 .

Securing the axis-3 gearbox - IRB 6700-300/2.70, -245/3.00

Action	Note
1 Secure the gearbox with 28 of the 30 attach- ment screws.	Tightening torque: 120 Nm M12x70.  xx1400002193
2 Remove the guide pins and replace with the remaining attachment screws.	 xx1400002194

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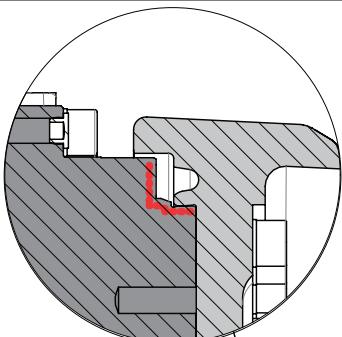
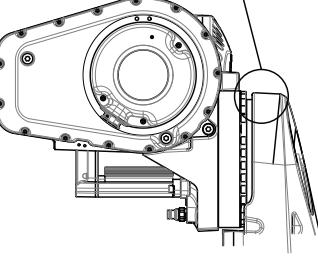
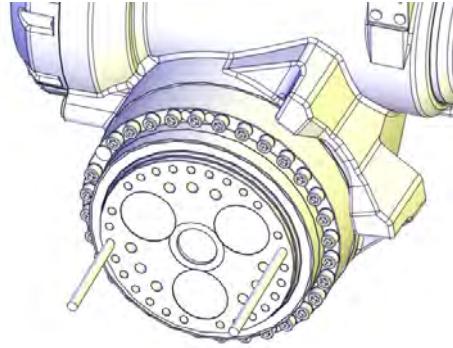
4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
3 Secure the remaning attachment screws.	Tightening torque: 120 Nm. M12x70.
4 Remove the lifting accessory.	
5 Perform a leak-down test.	See Performing a leak-down test on page 196 .

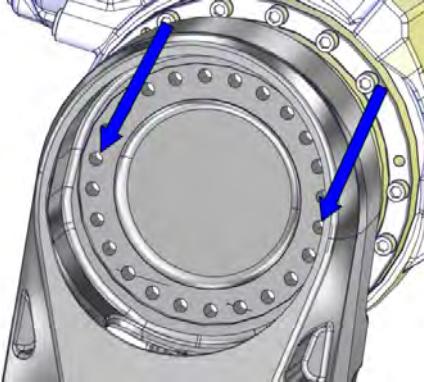
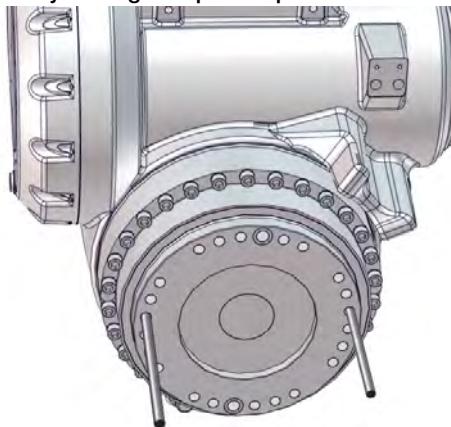
Preparations before refitting the upper arm

Action	Note
1 Wipe clean all contact surfaces.	
2 <i>Foundry Plus:</i> Apply Mercasol on the surface shown in the figure.	  xx1400000375
3 <i>IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20.</i> Fit two guide pins in opposite M12 holes in the axis-3 gearbox.  Tip Lubricate the guide pins with some grease to make the upper arm slide better.	Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!  xx1700000058

Continues on next page

4.8.5 Replacing the axis-3 gearbox

Continued

	Action	Note
4	<p><i>IRB 6700 - 200/2.60, - 155/2.85.</i> Fit two guide pins in opposite M12 holes in the axis-3 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Guide pin, M12x200: 3HAC13056-4 Always use guide pins in pairs!</p>  <p>xx1400000361</p>
5	<p><i>IRB 6700 - 300/2.70, - 245/3.00.</i> Fit two guide pins in opposite M16 holes in the axis-3 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M16x150: 3HAC13120-2 Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs!</p>  <p>xx1700000056</p>

Securing the upper arm - *IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20*

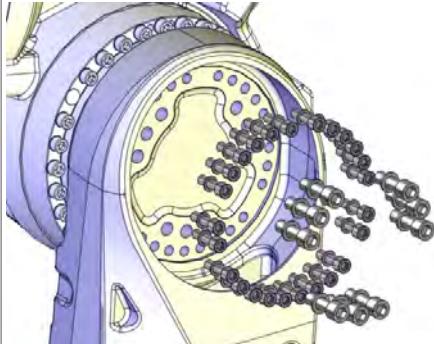
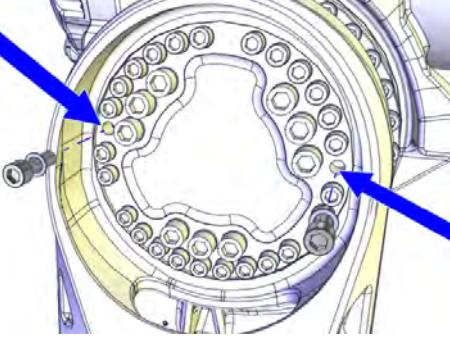
	Action	Note
1	<p> CAUTION</p> <p>The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.</p>	
2	Attach the lifting accessories, if not already fitted.	See Attaching lifting accessories to the upper arm on page 223 .

Continues on next page

4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
3 Lift the upper arm and put it on the guide pins.	
4 In order to release the brakes, connect the 24 VDC power supply. Connect to R2.MP3-connector: <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	24 VDC power supply
5 Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6 Insert all nine M16 screws and 25 of the 27 M12 screws.	 xx1400000359
7 Remove the guide pins and fit the two remaining M12 screws.	 xx1300000659
8 Secure the upper arm by tightening the attachment screws.	Tightening torque depends on screw dimension and variant. M16, tightening torque: 300 Nm M12, tightening torque: 120 Nm

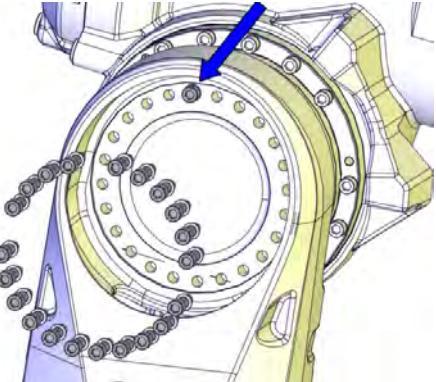
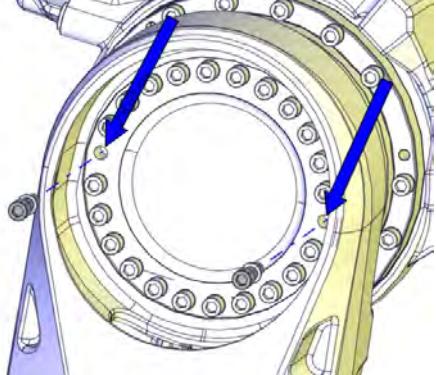
Securing the upper arm - *IRB 6700 -200/2.60, -155/2.85*

Action	Note
1  CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	

Continues on next page

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
2 Attach the lifting accessories, if not already fitted.	See Attaching lifting accessories to the upper arm on page 223 .
3 Lift the upper arm and put it on the guide pins.	
4 In order to release the brakes, connect the 24 VDC power supply Connect to R2.MP3-connector: <ul style="list-style-type: none">• + = pin 2• - = pin 5	24 VDC power supply
5 Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6 Insert 22 of the 24 M12 screws and washers.	 xx1300002246
7 Remove the guide pins and fit the two remaining screws and washers.	 xx1300002245
8 Secure the upper arm by tightening the attachment screws.	M12, tightening torque: 120 Nm

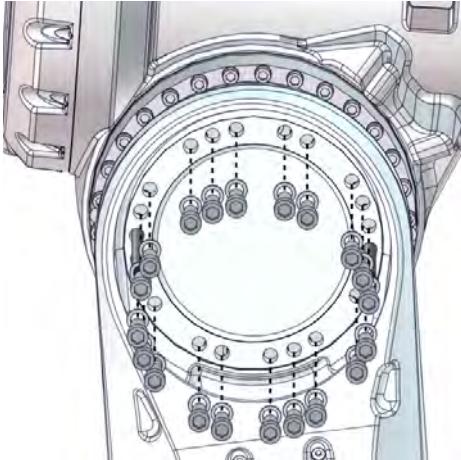
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4 Repair

4.8.5 Replacing the axis-3 gearbox

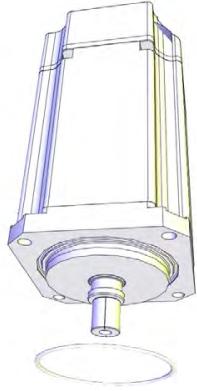
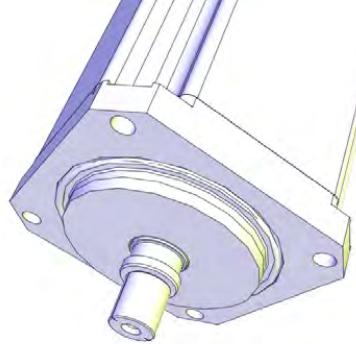
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Securing the upper arm - IRB 6700 -300/2.70, -245/3.00

Action	Note
1  CAUTION The weight of the complete upper arm (including the wrist) is 360 kg (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85) 465 kg (IRB 6700 -300/2.70, -245/3.00) All lifting accessories used must be sized accordingly.	
2 Attach the lifting accessories, if not already fitted.	See Attaching lifting accessories to the upper arm on page 223 .
3 Lift the upper arm and bring it towards the lower arm.	
4 In order to release the brakes, connect the 24 VDC power supply. Connect to R2.MP3-connector: <ul style="list-style-type: none">• + = pin 2• - = pin 5	24 VDC power supply
5 Use the rotation tool and rotate the axis-3 motor to find the correct position for the guide pins in the lower arm.	Rotation tool
6 Insert and tighten 20 of the 22 M16 screws.	 xx1700000057
7 Remove the guide pins and fit the two remaining screws.	
8 Secure the upper arm by tightening the attachment screws.	M16, tightening torque: 300 Nm

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Preparations prior to refitting motor

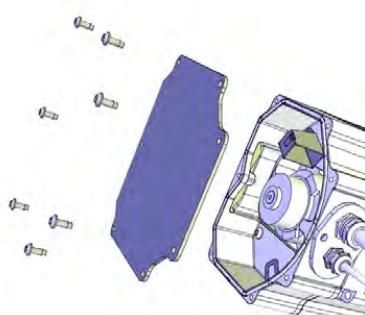
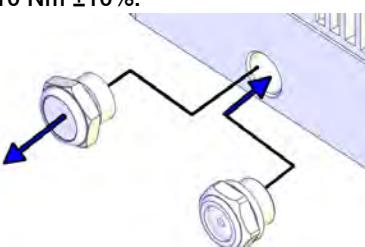
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove old paint residues and other contamination from the contact surfaces on both the motor and the mating parts.	
3	Wipe clean the contact surfaces from any remaining contamination. Also wipe clean the o-ring groove.	
4	Check the o-ring. Replace if damaged.	O-ring, 3HAB3772-107  xx1200001019
5	 Tip Lubricate the o-ring with some grease for a better fitting in the groove.	 xx1200001020

Continues on next page

4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
6 If the motor is a new spare part, remove the cover.	 xx1200001135
7 Foundry Plus: Valid for axis-2, axis-3, axis-4 and axis-6 motors. If the motor is a new spare part, the protection filter located in the evacuation hole on the motor flange must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass. On the axis-6 motor there are two protection filters that must be replaced with transparent plugs/sight glasses.	Tightening torque, transparent plug: 25 Nm $\pm 10\%$. Tightening torque, protection filter: 10 Nm $\pm 10\%$.  xx1600000576

Securing the axis-3 motor

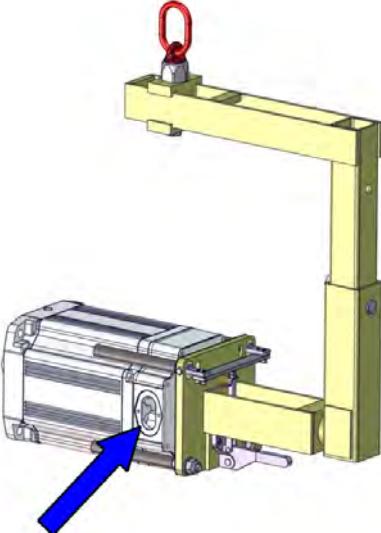
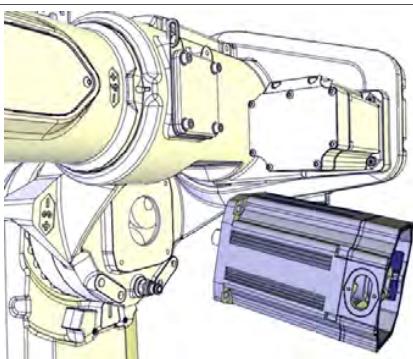
Use this procedure to secure the motor.

Action	Note
1 Fit guide pins in opposite holes.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs!
2  CAUTION The motor weighs 26 kg. All lifting accessories used must be sized accordingly.	

Continues on next page

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
<p>3 Apply the lifting accessories to the motor.</p> <p>Note Make sure the cable exit hole is turned according to figure.</p>	 <p>Lifting accessory, motor: 3HAC15534-1 xx1700000273</p>
<p>4 Lift the motor on to the guide pins and let it hang with the outer end a little lower when resting on the guide pins. Do not push the motor pinion into the gear yet!</p> <p>This is done in order to fit the motor with the axis-4 motor still fitted.</p>	 <p>xx1200001131</p>
5 Remove the lifting accessory and allow the motor to rest on the guide pins.	
6 Apply the rotation tool and use it to rotate the pinion when mating it into the gear.	Rotation tool: 3HAB7887-1
<p>7 To release the brakes, connect the 24 VDC power supply.</p> <p>Connect to connector R2.MP3:</p> <ul style="list-style-type: none"> • + = pin 2 • - = pin 5 	
<p>8</p> <p>! CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	

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4 Repair

4.8.5 Replacing the axis-3 gearbox

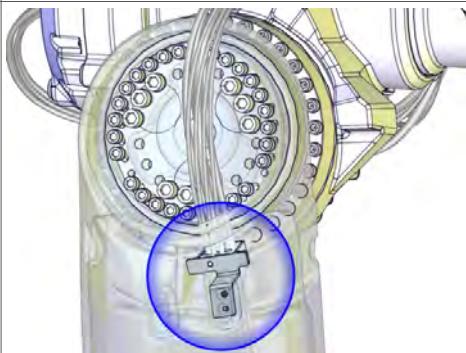
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Action	Note
9 Use caution and push the motor in position while at the same time the motor pinion is slightly rotated. Pay attention to following points: <ul style="list-style-type: none">• Mate the motor pinion properly to the gear of the gearbox.• Do not damage the motor pinion!	
10 Fit two of the attachment screws.	Screw dimension: M10x30 quality 12.9 Gleitmo (2 pcs)
11 Remove the guide pins.	
12 Fit the remaining attachment screws.	Screw dimension: M10x30 quality 12.9 Gleitmo (2 pcs)
13 Tighten the screws.	Tightening torque: 50 Nm
14 Remove the rotation tool.	
15 Perform a leak-down test.	See Performing a leak-down test on page 196 .
16 Disconnect the 24 VDC power supply.	

Refitting cable brackets

This procedure is valid if the cabling has been kept installed in the upper arm, when removing the upper arm from the robot. If the cable harness in the upper arm instead has been removed completely, see [Refitting the cable harness - upper arm and wrist on page 265](#).

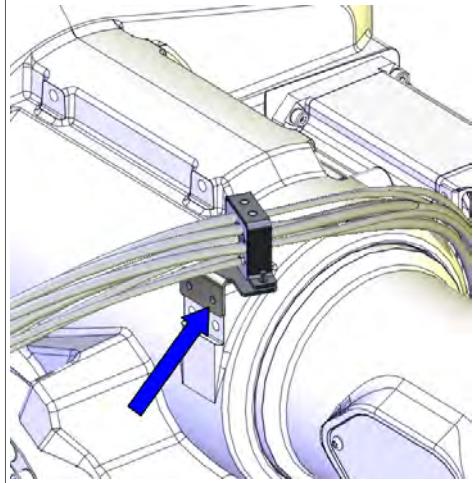
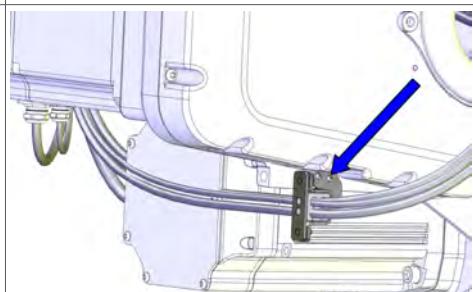
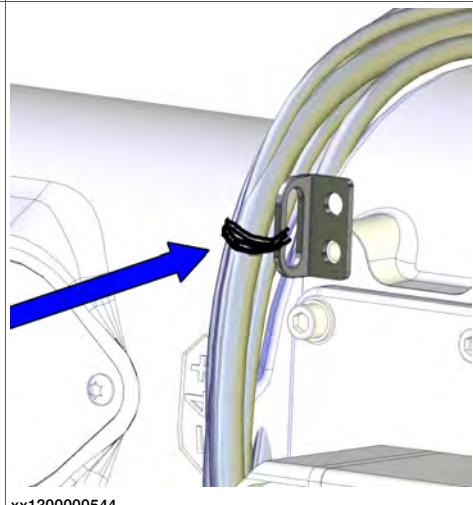
Use this procedure to refit the cable brackets.

Action	Note
1 Remove the lifting accessories.	
2 Move the cable harness and DressPack back to the correct side of the robot.	
3 Refit the axis-3 lower arm metal clamp (the one closest to the axis-3 gearbox) located on the inside of the lower arm.  Note The screw is reached from the outside of the lower arm!	 xx1300000558

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4.8.5 Replacing the axis-3 gearbox

Continued

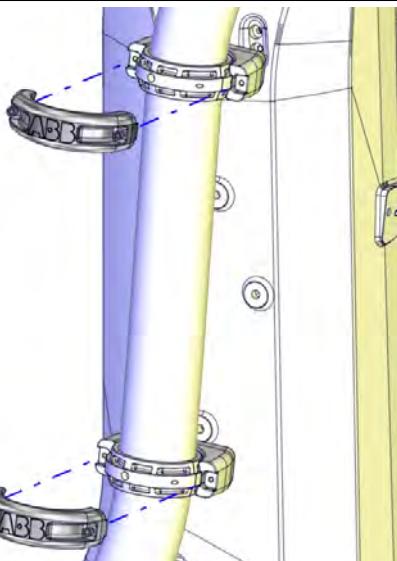
	Action	Note
4	Fasten the cable bracket on top of the arm house.	 xx1300000541
5	Fasten the cable bracket under the arm-house.	 xx1300000543
6	Secure the cable harness with the velcro strap on the cable fixing bracket. If equipped with DressPack, instead secure both DressPack and cable harness with velcro straps on the cable guide.	 xx1300000544

Continues on next page

4 Repair

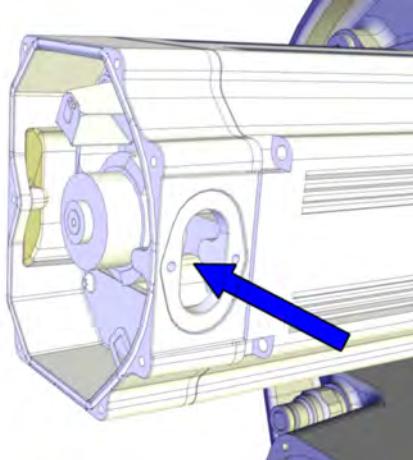
4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
7 Refit the DressPack cable package into the ball joint housings on the lower arm and close them.	 xx1400000195

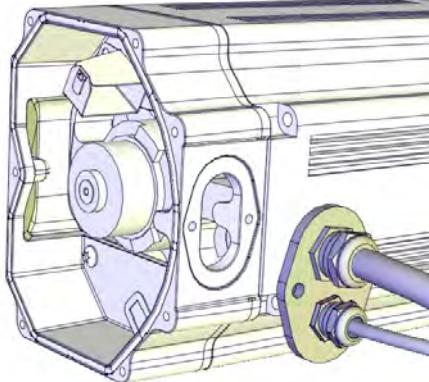
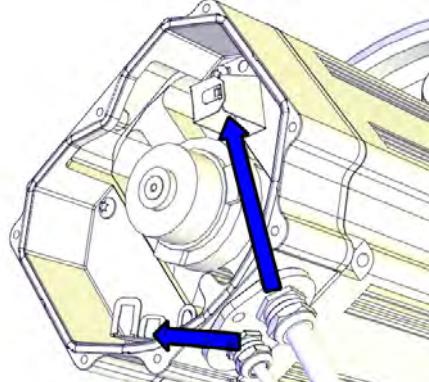
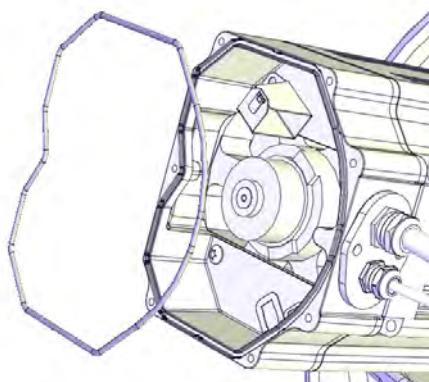
Connecting the axis-3 and axis-4 motor cables

Use this procedure to connect the motor cables.

Action	Note
1 Push the motor cables in through the cable gland opening.	 xx1300000738

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4.8.5 Replacing the axis-3 gearbox Continued

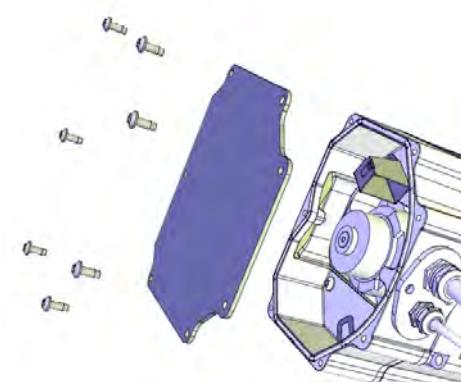
	Action	Note
2	<p>Refit the cable gland cover.</p> <p>Note</p> <p>Replace the gasket if damaged.</p>	 <p>xx1200001067</p>
3	<p>Connect the motor cables.</p> <p>Connect in accordance with the markings on the connectors.</p>	 <p>xx1200001066</p>
4	<p>Inspect the o-ring.</p> <p>Note</p> <p>Replace if damaged.</p>	<p>O-ring, axis-1: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-2: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-3: 3HAB3772-111 (circular profile) / 3HAC054692-002 (hexagon profile)</p> <p>O-ring, axis-4: 3HAB3772-110 (circular profile) / 3HAC054692-001 (hexagon profile)</p>  <p>xx1200001070</p>

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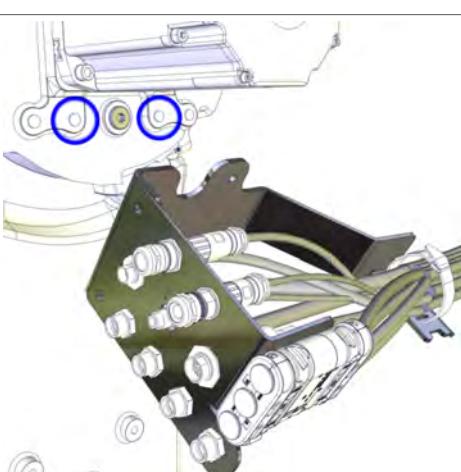
4 Repair

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
5 Wipe clean o-ring and o-ring groove.	
6 Refit the o-ring. 💡 Tip Lubricate the o-ring with some grease for a better fitting in the groove.	
7 ! CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
8 Refit the motor cover with its attachment screws. 💡 Note Do not reuse the self-threading attachment screws. Replace with standard attachment screws or the threads will be damaged. 💡 Note Make sure the o-ring is undamaged and properly fitted.	 xx1200001135
9 Make sure that the covers are tightly sealed.	

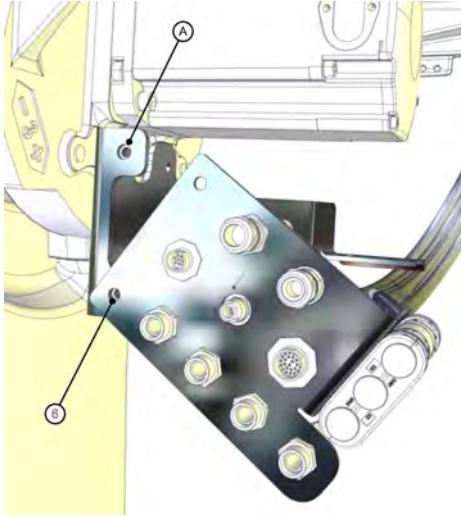
Refitting DressPack cable packages

Action	Note
1 Remove the lifting accessory.	
2 Fit the bracket of the DressPack cable package (if one is fitted) under the arm-house with its screws.	 xx1200001332

Continues on next page

4.8.5 Replacing the axis-3 gearbox

Continued

Action	Note
<p>3 Secure the bracket of the DressPack cable package (if one is fitted) with its attachment screws.</p> <p>Note</p> <p>It is not needed to disconnect the lower end of the DressPack as the figure shows. Connectors are only hidden here to get a better view of which screw to refit.</p>	 <p>A Removed screw. B Screw unscrewed but not removed.</p>

Concluding procedures

Action	Note
1 Refill oil in the gearbox.	See Filling oil into the axis-3 gearbox on page 172 .
2 Recalibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
3  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

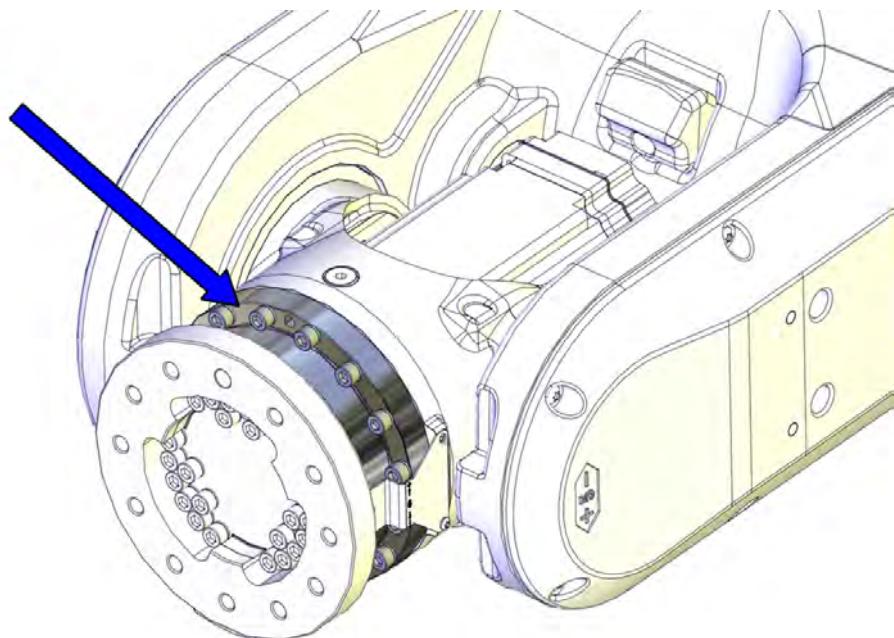
4 Repair

4.8.6 Replacing the axis-6 gearbox

4.8.6 Replacing the axis-6 gearbox

Location of the axis-6 gearbox

The axis-6 gearbox is located as shown in the figure.



xx1300000824

Spare parts

Spare parts	Spare part number	Note
Axis-6 gearbox	See <i>Product manual, spare parts - IRB 6700</i> .	

Required tools and equipment

Equipment, etc.	Article number	Note
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
24 VDC power supply	-	Used to release the motor brakes.
Leak-down tester	-	
Calibration Pendulum toolkit	3HAC15716-1	Required if Calibration Pendulum is the valid calibration method for the robot.
Calibration tool box, Axis Calibration	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .

Continues on next page

Consumables

Equipment, etc	Article number	Note
Grease	3HAB3537-1	Used to lubricate o-rings.
O-ring	3HAB3772-107	D=102x3 Used on motor flange.
Gasket	3HAC033489-001/ 3HAC044252-001	Used on motor cover.
O-ring	3HAB3772-58	D=151.99x3.53 Used on gearbox.

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"> • Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. • Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	
	If the robot is to be calibrated with reference calibration: 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. 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. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 775 . Read more about reference calibration for Pendulum Calibration in Operating manual - Calibration Pendulum .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the axis-6 gearbox

Use these procedures to remove the axis-6 gearbox.

Preparations before removing the axis-6 gearbox

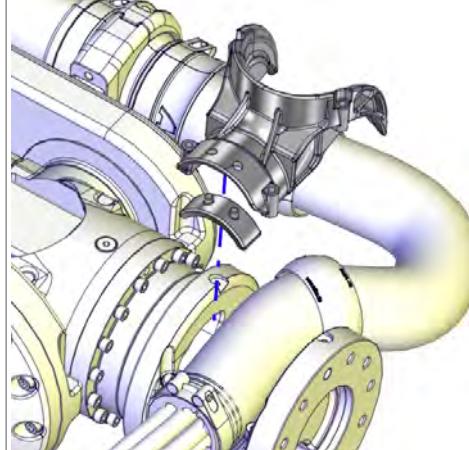
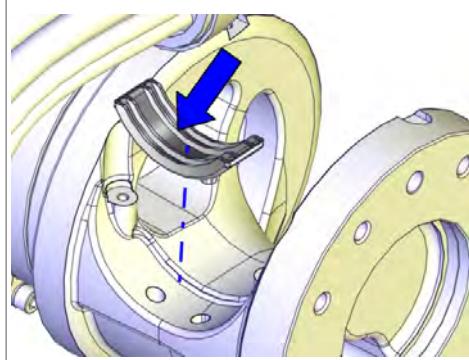
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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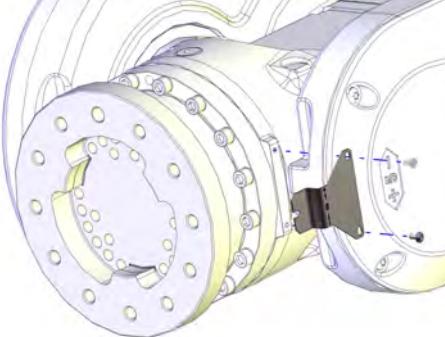
4 Repair

4.8.6 Replacing the axis-6 gearbox

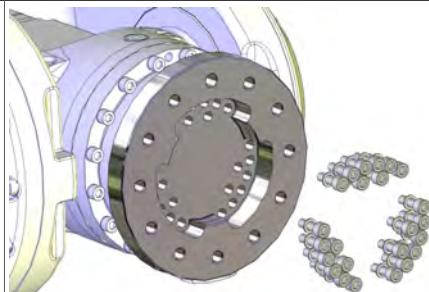
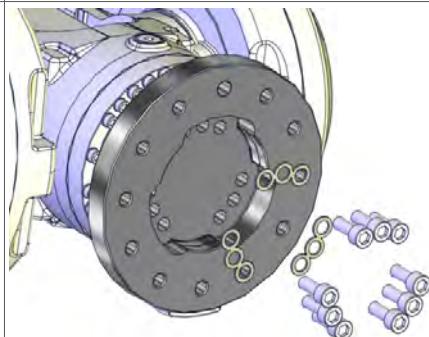
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Action	Note
2 Jog the robot to: <ul style="list-style-type: none"> • Axis 1 = No significance (as long as the robot is secured to the foundation). • Axis 2 = +25° • Axis 3 = +20° • Axis 4 = 0° • Axis 5 = -37° • Axis 6 = -10° 	
3  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4 Remove all equipment fitted on the turning disc.	
5 Drain the gearbox. See Draining the axis-6 gearbox on page 183 .	
6 If installed, remove the DressPack axis-6 support.	 xx1400000208  xx1400000223

Continues on next page

	Action	Note
7	Turn the power on temporarily. Jog axis 5 to -55°.	
8	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
9	Remove the synchronization plate axis-6.	 xx1300000825

Removing the turning disc

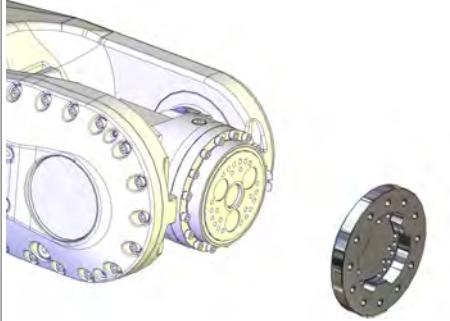
	Action	Note
1	<i>IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20.</i> Remove the 24 M8 screws and washers, that secure the turning disc.	 xx130000492
2	<i>IRB 6700 - 200/2.60, - 155/2.85.</i> Remove the nine M10 screws and three washers, that secure the turning disc.	 xx1300002302

Continues on next page

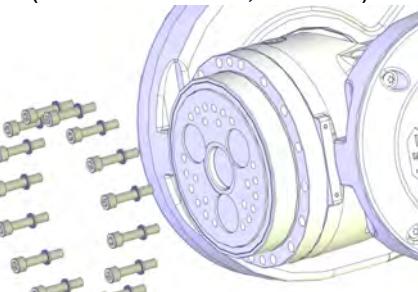
4 Repair

4.8.6 Replacing the axis-6 gearbox

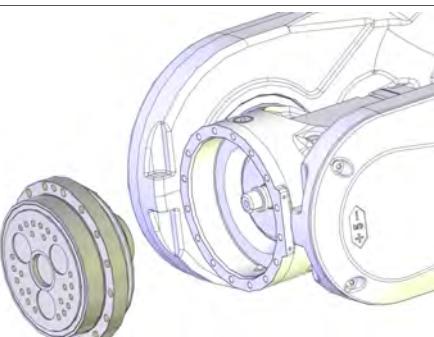
Continued

Action	Note
3 <i>IRB 6700 - 300/2.70, - 245/3.00.</i> Remove the 21 M10 screws and washers, that secure the turning disc.	 xx1400002195
4 Remove the turning disc.	 xx1300000493

Removing the axis-6 gearbox

Action	Note
1 Unscrew the attachment screws that secure the axis-6 gearbox.	<ul style="list-style-type: none"> • M8x40 quality 12.9 Gleitmo, 16 pcs (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20) • M6x30 quality 12.9 Gleitmo, 24 pcs (IRB 6700 -200/2.60, -155/2.85) • M8x50 quality 12.9 Gleitmo, 16 pcs (IRB 6700 -300/2.70, -245/3.00)  xx1300000826
2  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	

Continues on next page

Action	Note
3 If required fit two attachment screws and press out the gearbox.	
4 Use caution and remove the gearbox.	 xx1300000827

Refitting the axis-6 gearbox

Use these procedures to refit the gearbox.

Preparations before refitting the axis-6 gearbox

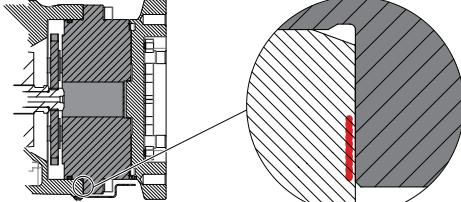
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the o-ring and wipe it clean.  Note The o-ring needs to be cleaned also on a new spare part!	 xx1300000828
3 Check the o-ring. Replace if damaged!	
4 Wipe clean the contact surfaces from any contamination. Also wipe clean the o-ring groove.	
5 Put some grease on the o-ring.	
6 Fit the o-ring in the groove of the gearbox.	

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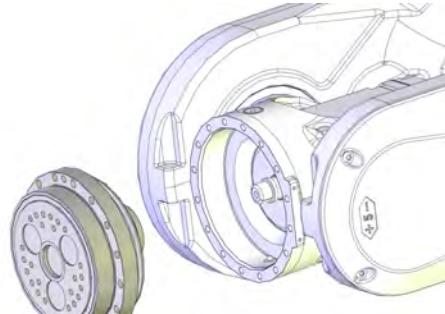
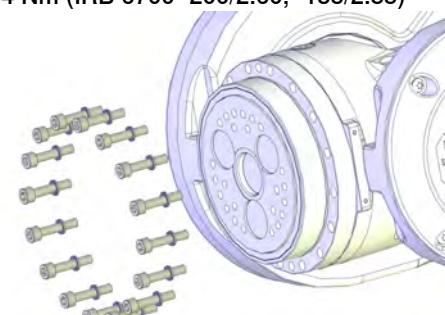
4 Repair

4.8.6 Replacing the axis-6 gearbox

Continued

Action	Note
7 Foundry Plus: Apply Loctite 574 on the surface shown in the figure.	 xx1400000717

Refitting the axis-6 gearbox

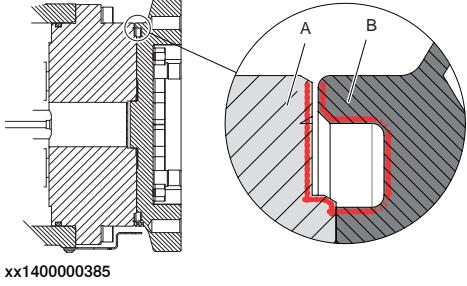
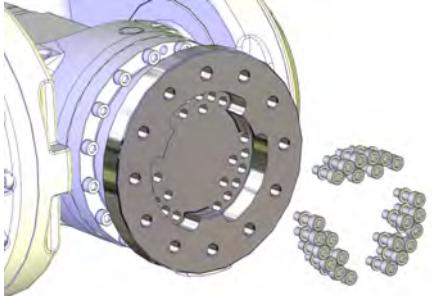
Action	Note
1  CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
2  CAUTION Be careful not to damage motor pinion or gears!	 xx1300000827
3 Secure the gearbox with its attachment screws.	<ul style="list-style-type: none"> M8x40 quality 12.9 Gleitmo, 16 pcs (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20) M6x30 quality 12.9 Gleitmo, 24 pcs (IRB 6700 -200/2.60, -155/2.85) M8x50 quality 12.9 Gleitmo, 16 pcs (IRB 6700 -300/2.70, -245/3.00) Tightening torque: 35 Nm (IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20, -300/2.70, -245/3.00) 14 Nm (IRB 6700 -200/2.60, -155/2.85)  xx1300000826

Continues on next page

4.8.6 Replacing the axis-6 gearbox Continued

	Action	Note
4	Perform a leak-down test.	See Performing a leak-down test on page 196 .
5	Jog axis-5 to horizontal position.	
6	Refill oil in the gearbox.	See Filling oil into the axis-6 gearbox on page 185 .

Refitting the turning disc

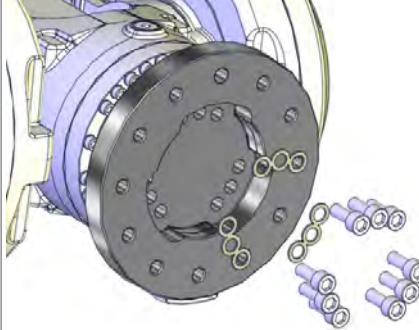
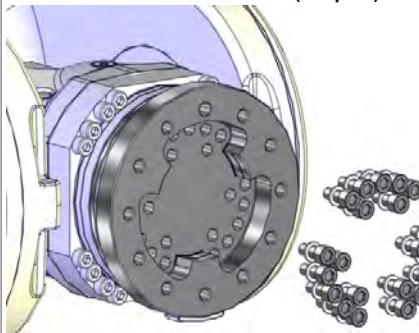
	Action	Note
1	If new turning disc spare part is installed: verify that the correct synchronization mark plate for axis-6 is installed on the wrist.	See Replacing the synchronization mark plate on page 361 .
2	Wipe clean the contact surfaces.	
3	Foundry Plus: Apply Mercasol on the surfaces on turning disc and axis-6 gearbox as shown in the figure.	 <p>xx1400000385</p>
4	IRB 6700 -235/2.65, -205/2.80, -175/3.05, -150/3.20. Secure the turning disc with its attachment screws and washers.	Tightening torque: 35 Nm. Attachment screws: M8x25, Steel 12.9 Gleitmo 603 (24 pcs) Washers: Steel 8.4x13x1.5 (24 pcs)  <p>xx1300000492</p>

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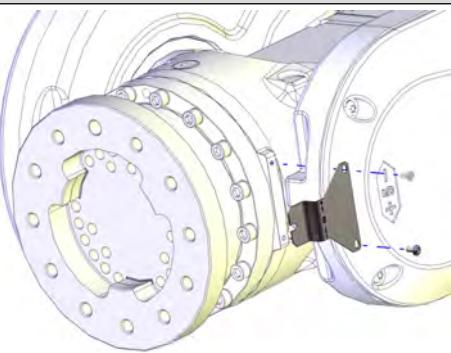
4 Repair

4.8.6 Replacing the axis-6 gearbox

Continued

Action	Note
5 <i>IRB 6700 -200/2.60, -155/2.85.</i> Secure the turning disc with its attachment screws and washers.	Tightening torque: 70 Nm Attachment screws: M10x25, Steel 12.9 Gleitmo 603, (9 pcs) Washers: (3 pcs)  xx1300002302
6 <i>IRB 6700 -300/2.70, -245/3.00.</i> Secure the turning disc with its attachment screws and washers.	Tightening torque: 70 Nm Attachment screws: M10x25, Steel 12.9 Gleitmo 603, (21 pcs) Washers: Steel 11x17x25 (21 pcs)  xx1400002195

Concluding procedure

Action	Note
1 Refit the synchronization plate axis-6.	 xx1300000825

Continues on next page

	Action	Note
2	Recalibrate the robot.	Pendulum Calibration is described in <i>Operating manual - Calibration Pendulum</i> , enclosed with the calibration tools. Axis Calibration is described in Calibrating with Axis Calibration method on page 774 . General calibration information is included in section Calibration on page 763 .
3	 DANGER Make sure all safety requirements are met when performing the first test run. These are further described in DANGER - First test run may cause injury or damage! on page 48 .	

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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 774](#).

Detailed instructions of how to perform Pendulum Calibration are given in the documentation enclosed with the calibration tools.

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	A calibration routine that generates a new zero position of the robot. This routine is more flexible compared to fine calibration and is used when tools and process equipment are installed. Requires that a reference is created before being used for recalibrating the robot.
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.</p> <p>For robots with RobotWare 5.04 or older, the calibration data is delivered in a file, calib.cfg, supplied with the robot at delivery. The file identifies the correct resolver/motor position corresponding to the robot home position.</p>	Axis Calibration or Calibration Pendulum ⁱ
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">Mechanical tolerances in the robot structureDeflection due to load <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, absacc.cfg, supplied with the robot at delivery. The file replaces the calib.cfg 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!</p>  <p>ABSOLUTE ACCURACY</p> <p>xx0400001197</p>	CalibWare

- ⁱ The robot is calibrated by either Calibration Pendulum 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, Calibration Pendulum is used as default.

Continues on next page

Brief description of calibration methods

Calibration Pendulum method

Calibration Pendulum is a standard calibration method for calibration of all ABB robots (except IRB 6400R, IRB 640, IRB 1400H, and IRB 4400S).

Two different routines are available for the Calibration Pendulum method:

- Calibration Pendulum II
- Reference calibration

The calibration equipment for Calibration Pendulum is delivered as a complete toolkit, including the *Operating manual - Calibration Pendulum*, which describes the method and the different routines further.

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 6700 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 774](#).

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.

CalibWare - Absolute Accuracy calibration

To achieve a good positioning in the Cartesian coordinate system, Absolute Accuracy calibration is used as a TCP calibration. The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field 5.0*.

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 motor and transmission replacements that do not include taking apart the robot structure, standard calibration is sufficient. Standard calibration also supports wrist exchange.

References

Article numbers for the calibration tools are listed in the section [Special tools on page 806](#).

The calibration equipment for Calibration Pendulum is delivered as a complete toolkit, including the *Operating manual - Calibration Pendulum*, which describes the method and the different routines further.

5 Calibration

5.1.3 When to calibrate

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 recalibrated 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 770](#). 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 recalibrated for new resolver values.

If the robot has *absolute accuracy* calibration, it needs to be calibrated for new absolute accuracy.

5.2 Synchronization marks and axis movement directions

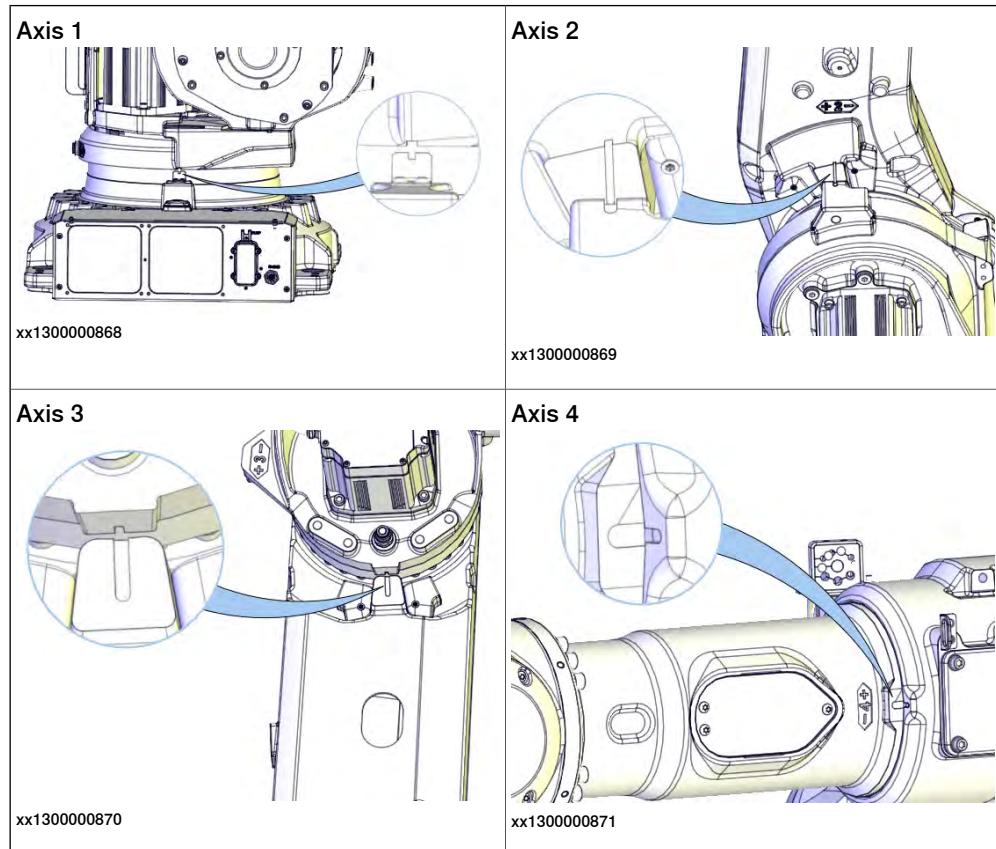
5.2 Synchronization marks and axis movement directions

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 6700

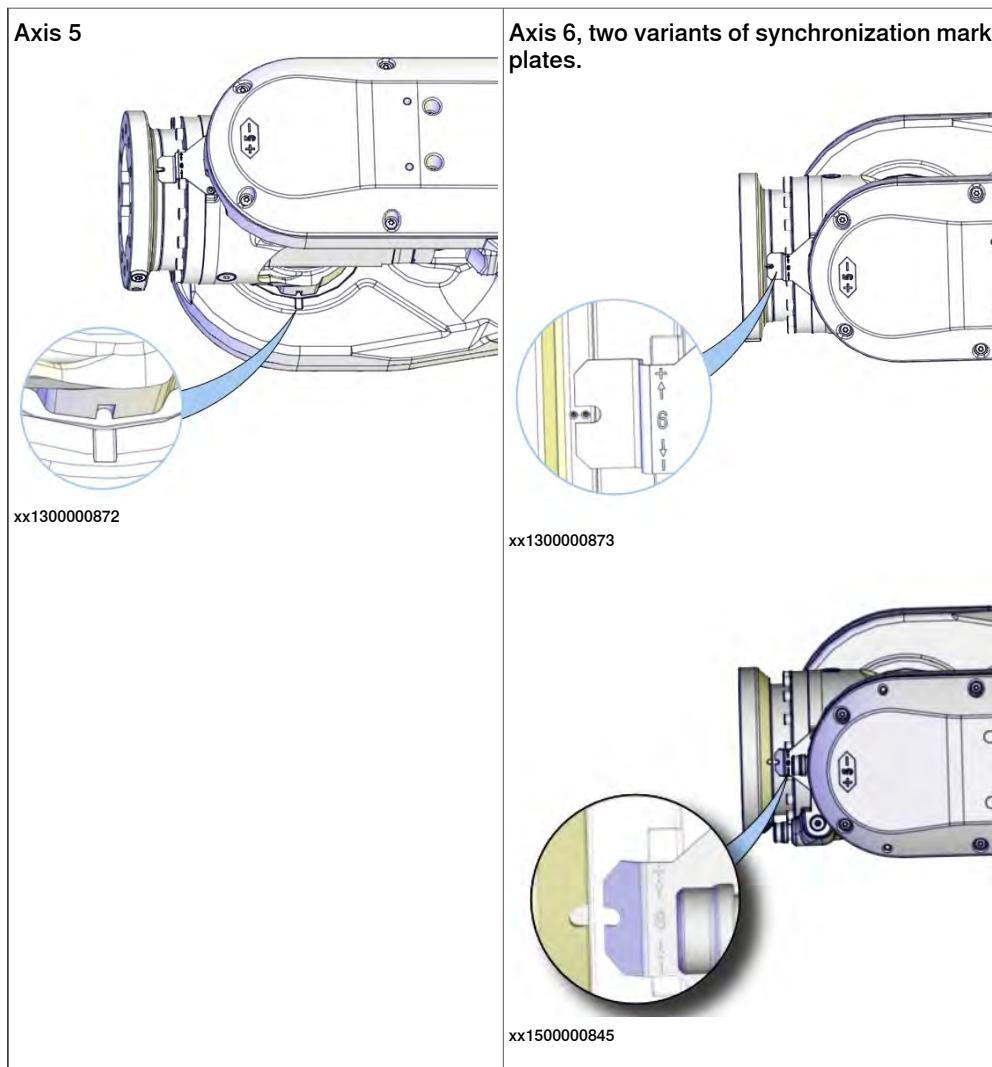


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5 Calibration

5.2.1 Synchronization marks and synchronization position for axes

Continued



5.2.2 Calibration movement directions for all axes

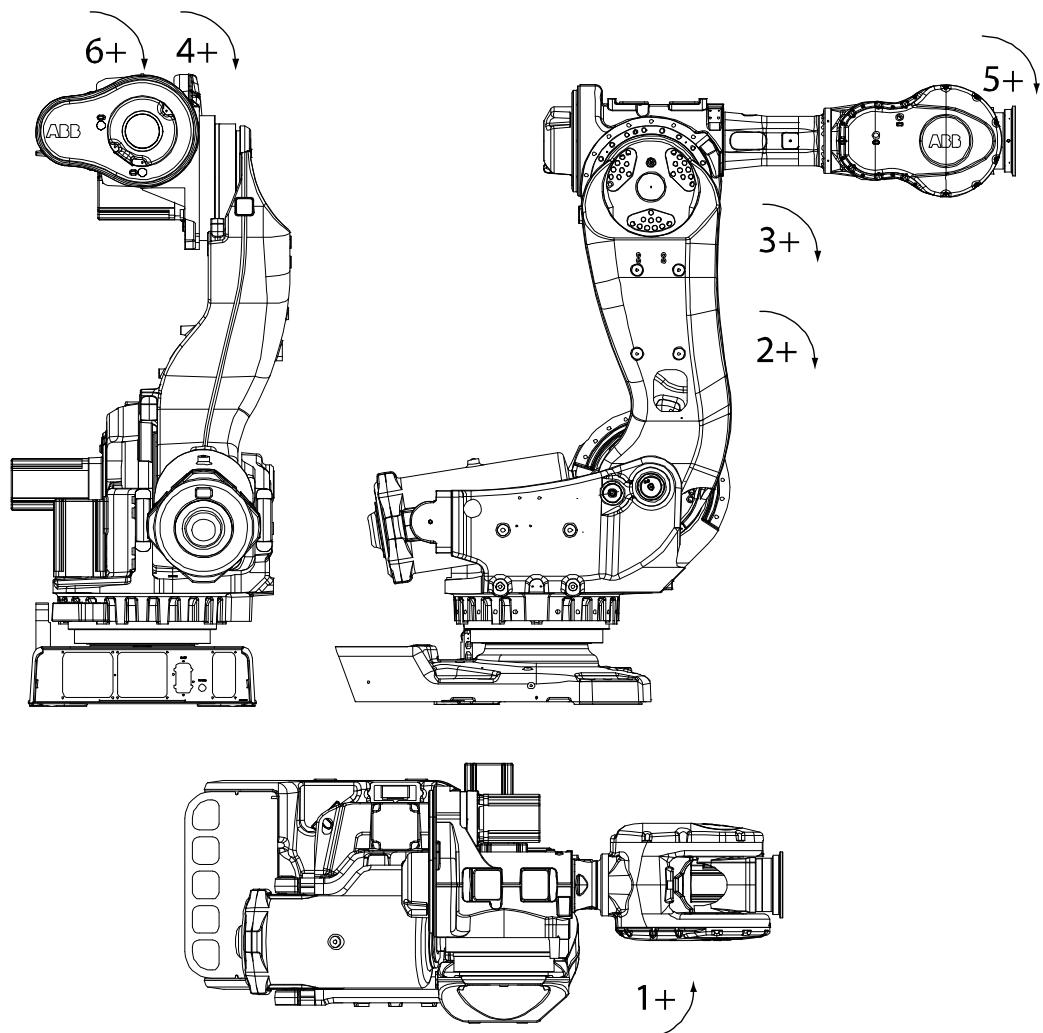
5.2.2 Calibration movement directions for all axes**Overview**

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, 6 axes

Note! The graphic shows an IRB 7600. The positive direction is the same for all 6-axis robots, except the positive direction of axis 3 for IRB 6400R, which is in the opposite direction!



xx0200000089

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 Synchronization marks and synchronization position for axes on page 767 .
3 When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 771 .

Correct calibration position of axis 4 and 6

When jogging the manipulator to synchronization position, it is extremely important to make sure that axes 4 and 6 of the following mentioned manipulators are positioned correctly. The axes can be calibrated at the wrong turn, resulting in an incorrect manipulator calibration.

Make sure the axes are positioned according to the correct calibration values, not only according to the synchronization marks. The correct values are found on a label, located either on the lower arm, underneath the flange plate on the base or on the frame.

At delivery the manipulator is in the correct position, do NOT rotate axis 4 or 6 at power up before the revolution counters are updated.

If one of the following mentioned axes are rotated one or more turns from its calibration position before updating the revolution counter, the correct calibration position will be lost due to non-integer gear ratio. This affects the following manipulators:

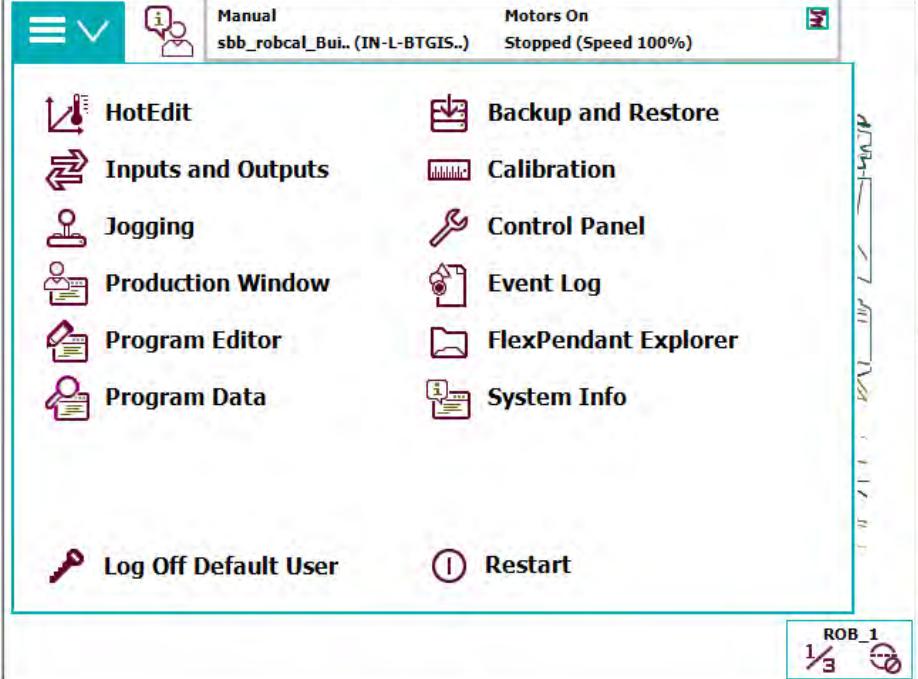
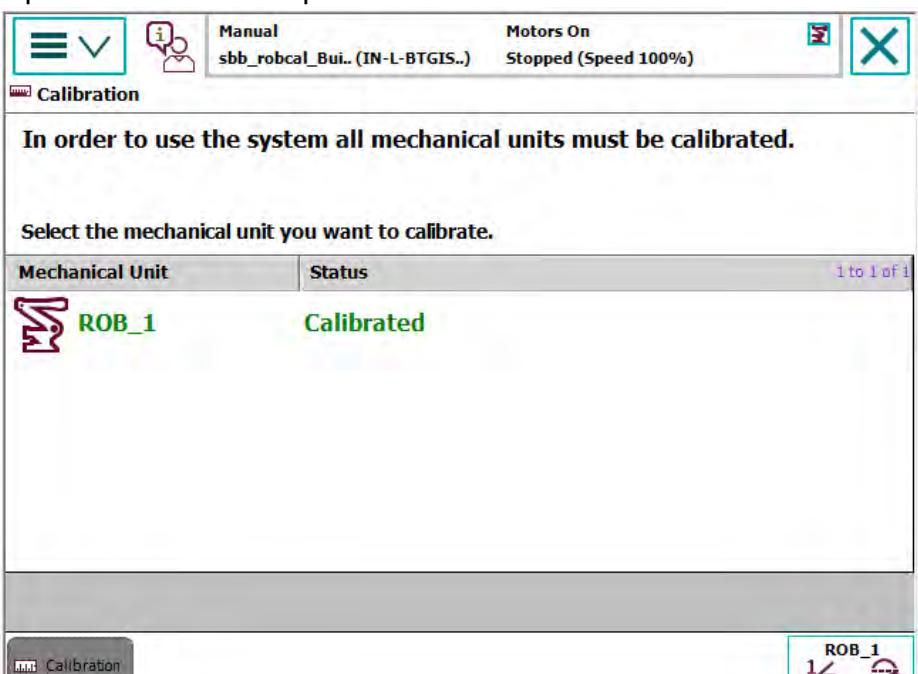
Manipulator variant	Axis 4	Axis 6
IRB 6700-235/2.65, -205/2.80, -175/3.05, -150/3.20, -200/2.60, -155/2.85	Yes	No
IRB 6700-300/2.70, -245/3.00	No	No

If the synchronization marks seem to be wrong (even if the motor calibration data is correct), try to rotate the axis one turn, update the revolution counter and check the synchronization marks again (try both directions, if needed).

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Step 2 - Updating the revolution counter with the FlexPendant

Use this procedure to update the revolution counter with the FlexPendant (IRC5).

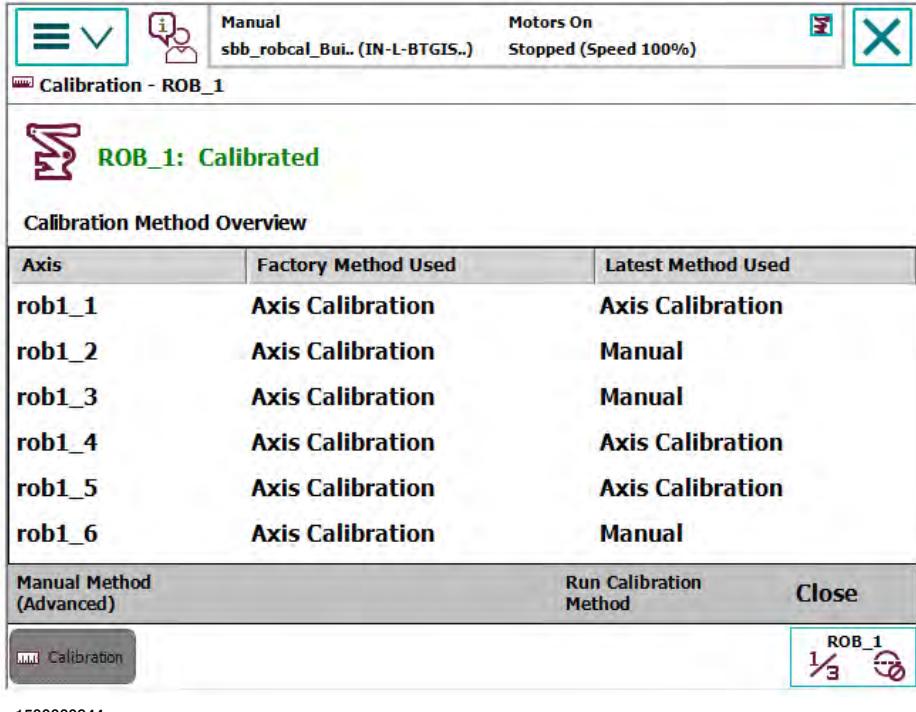
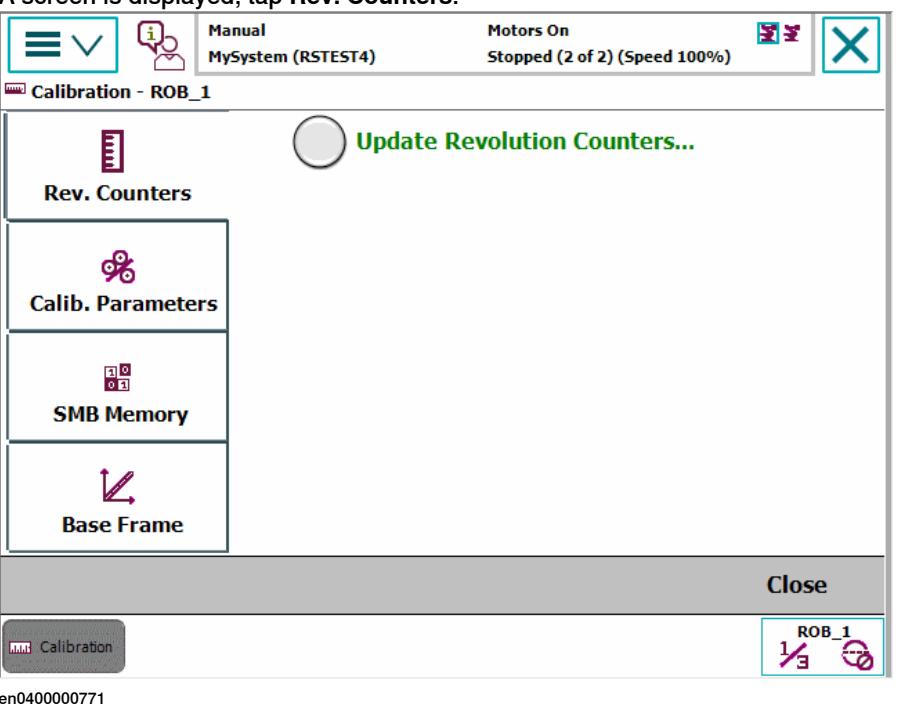
Action
<p>1 On the ABB menu, tap Calibration.</p>  <p>The screenshot shows the ABB menu interface. At the top, it says 'Manual sbb_robcal_Bui.. (IN-L-BTGIS..)' and 'Motors On Stopped (Speed 100%)'. Below this is a list of icons and text labels: 'HotEdit', 'Backup and Restore'; 'Inputs and Outputs', 'Calibration'; 'Jogging', 'Control Panel'; 'Production Window', 'Event Log'; 'Program Editor', 'FlexPendant Explorer'; 'Program Data', 'System Info'. At the bottom are two buttons: 'Log Off Default User' and 'Restart'. A status bar at the bottom left shows 'xx1500000942' and a footer shows 'ROB_1 1/3'.</p>
<p>2 All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.</p>  <p>The screenshot shows the 'Calibration' screen. At the top, it says 'Manual sbb_robcal_Bui.. (IN-L-BTGIS..)' and 'Motors On Stopped (Speed 100%)'. Below this is a message: 'In order to use the system all mechanical units must be calibrated.' Then it says 'Select the mechanical unit you want to calibrate.' A table follows with one row: 'Mechanical Unit' (with an icon) and 'Status' (labeled 'Calibrated'). At the bottom are buttons for 'Calibration' and 'xx1500000943'.</p>

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5 Calibration

5.3 Updating revolution counters

Continued

	Action																					
3	<p>This step is valid for RobotWare 6.02 and later.</p> <p>Calibration method used at factory for each axis is shown, as well as calibration method used during last field calibration.</p> <p>Tap Manual Method (Advanced).</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>	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																				
4	<p>A screen is displayed, tap Rev. Counters.</p>  <p>Rev. Counters</p> <p>Calib. Parameters</p> <p>SMB Memory</p> <p>Base Frame</p> <p>Update Revolution Counters...</p>																					

Continues on next page

	Action
5	<p>Tap Update Revolution Counters.... A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none"> • Tap Yes to update the revolution counters. • Tap No to cancel updating the revolution counters. <p>Tapping Yes 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"> • Ticking in the box to the left • Tapping Select all to update all axes. <p>Then tap Update.</p>
7	<p>A dialog box is displayed, warning that the updating operation cannot be undone:</p> <ul style="list-style-type: none"> • Tap Update to proceed with updating the revolution counters. • Tap Cancel to cancel updating the revolution counters. <p>Tapping Update updates the selected revolution counters and removes the tick from the list of axes.</p>
8	<p> CAUTION</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 Checking the synchronization position on page 787.</p>

5 Calibration

5.4.1 Description of Axis Calibration

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.

A fixed calibration pin/bushing is installed on each robot axis at delivery.

The Axis Calibration procedure described roughly:

- 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.

- 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.

- The axis position is stored in RobotWare with an active choice from the operator.

Continues on next page

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.

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. The reference value is unique for the current setup of the robot and 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.

Position of robot axes

The axis chosen for calibration is automatically run by the calibration program to its calibration position during the calibration procedure.

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.

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.



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	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.

Examining the calibration tool

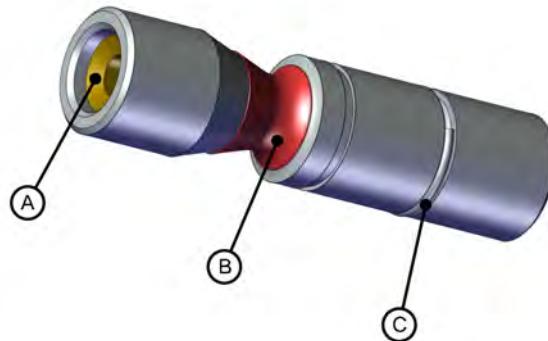
Check prior to usage

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.



xx1500001914

A	Tube insert
B	Plastic protection
C	Steel spring ring

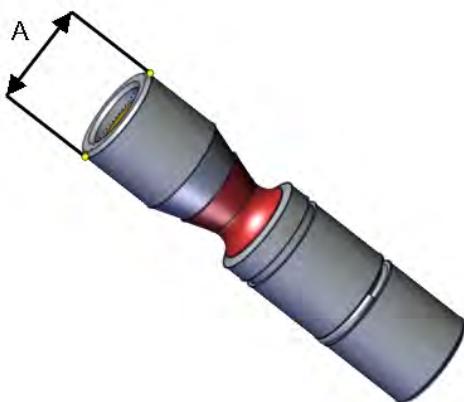
Periodic check of the calibration tool

If including the calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within Ø12g4 mm, Ø8g4 mm or Ø6g5 mm (depending on calibration tool size).

Continues on next page

- Straightness within 0.005 mm.



xx1500000951

A	Outer diameter
---	----------------

Identifying the calibrating tools

It is possible to make the calibration tool identifiable with, for example, an RFID chip. The procedure of how to install an RFID chip is described below.



Note

The tool identifier is NOT delivered from ABB, it is a customized solution.

	Action	Note
1	<p>It is possible to use any RFID solution, with the correct dimensions. ABB has verified function on some suppliers fulfilling the requirements of NFC compatible devices (13.56 Mhz) according to ISO 14443 or ISO 15693.</p> <p> Note</p> <p>The maximum dimensions on the RFID chip must not exceed Ø7.9 mm x 8.0 mm, Ø5.9 mm x 8.0 mm or Ø3.9 mm x 8.0 mm (depending on calibration tool size).</p>	
2	<p>There is a cavity on one end of the calibration tool in which the RFID chip can be installed.</p> <p>Install the RFID chip according to supplier instructions.</p> <p>Install the chip in flush with the tool end.</p>	

5 Calibration

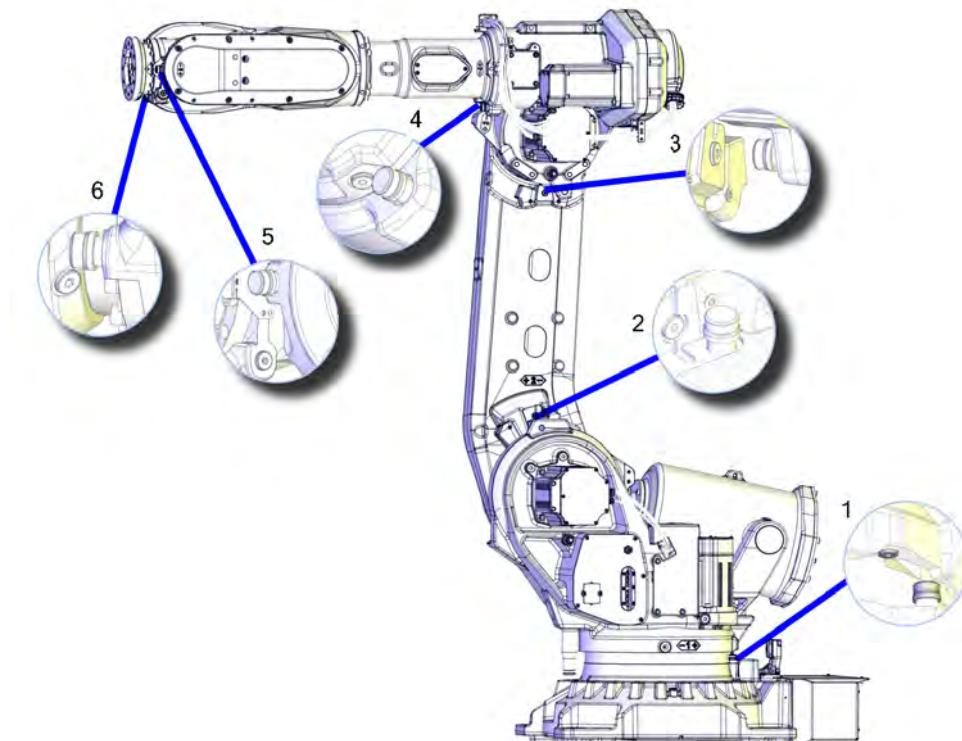
5.4.3 Installation locations for the calibration tools

5.4.3 Installation locations for the calibration tools

Location of fixed calibration items

The figure shows how the robot is equipped with items for installation of calibration tools for Axis Calibration (fixed calibration pins and/or bushings). The figure does not show installed calibration tools.

A fixed calibration pin and a bushing for the movable calibration tool are located on each axis as follows.



xx1500000890

Spare parts

When calibration is not being performed, a protective cover and an o-ring should always be installed on the fixed calibration pin as well as a protective plug, included a sealing, in the bushing. Replace damaged parts with new, if needed.

Spare part	Article number	Note
Protection cover and plug set	3HAC056806-001	Contains replacement calibration pin covers and protective plugs for the bushing.

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	3HAC055412-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.

Required consumables

Consumable	Article number	Note
Clean cloth	-	

Spare parts

Spare part	Article number	Note
Protection cover and plug set	3HAC056806-001	Contains replacement calibration pin covers and protective plugs for the bushing.

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. The routines are described in [Routines in the calibration procedure on page 775](#).
- 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 protective cover from the fixed pin and the protection plug from the bushing, if any, and install the calibration tool.

Continues on next page

5 Calibration

5.4.4 Axis Calibration - Running the calibration procedure

Continued

- 7 The robot performs a measurement sequence by rotating the axis back and forth.
- 8 Remove the calibration tool and reinstall the protective cover on the fixed pin and the protection plug in the bushing, if any.
- 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.

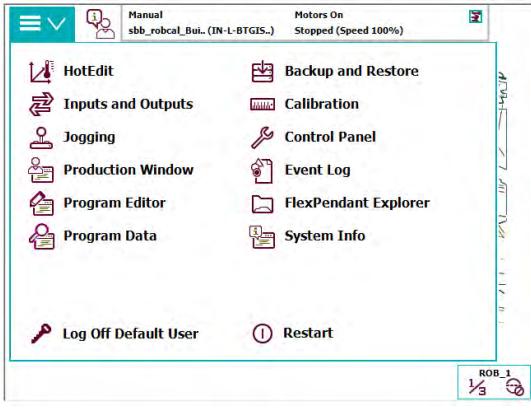
Preparation prior to calibration

The calibration procedure is described in the FlexPendant while conducting it.

Action	Note
1  DANGER While conducting the calibration, the robot needs to be connected to power. Make sure that the robots working area is empty, as the robot can make unpredictable movements.	
2 Wipe the calibration tool clean.  Note The calibration method is exact. Dust, dirt or color flakes will affect the calibration value.	Use a clean cloth.

Starting the calibration procedure

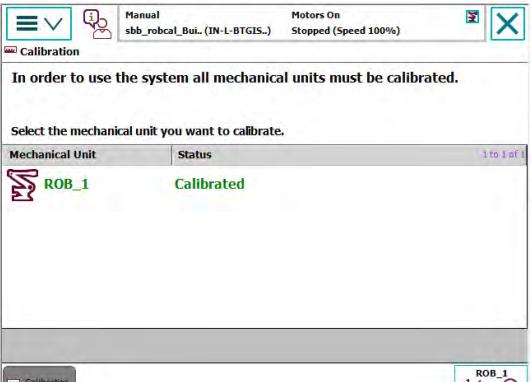
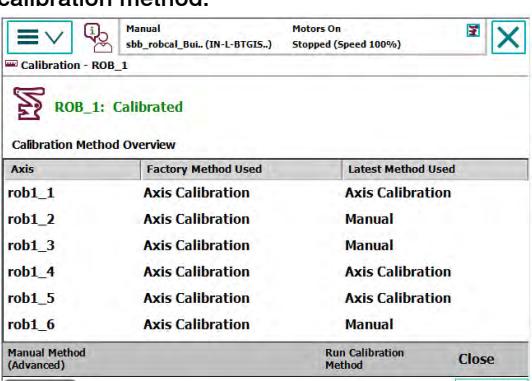
Use this procedure to call for the Axis Calibration method on the FlexPendant.

Action	Note
1 On the ABB menu, tap Calibration. 	

Continues on next page

5.4.4 Axis Calibration - Running the calibration procedure

Continued

Action	Note
<p>2 All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.</p> 	
<p>3 Calibration method used at factory for each axis is shown, as well as calibration method used for the robot during last field calibration. Tap Run Calibration Method. The software will automatically call for the procedure for the valid calibration method.</p> 	<p>The FlexPendant will give all information needed to proceed with Axis Calibration.</p>
<p>4 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 Overview of the calibration procedure on the FlexPendant on page 779.</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 Play.

Continues on next page

5 Calibration

5.4.4 Axis Calibration - Running the calibration procedure

Continued

Situation	Action
The RobotWare program is terminated with PP to Main.	<p>Remove the calibration tool, if it is installed, and restart the calibration procedure from the beginning. See Starting the calibration procedure on page 780.</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 Calibration movement directions for all axes on page 769</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.

Safety controller not synchronized - SafeMove message

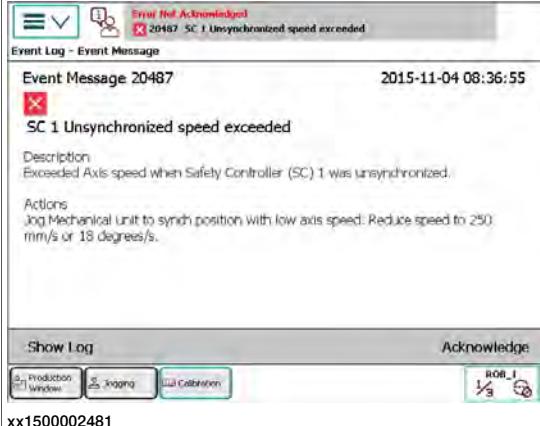
	Action	Note
1	<p>SafeMove generates the message "Safety controller not synchronized".</p> 	
2	Confirm unsynchronized state by pressing Acknowledge to continue Axis Calibration procedure.	
3	Restart Axis Calibration procedure by pressing Play .	

Continues on next page

5.4.4 Axis Calibration - Running the calibration procedure

Continued

Unsynchronized speed exceeded - SafeMove message while saving robot data

Action	Note
<p>1 SafeMove generates the message "Unsynchronized speed exceeded" while saving robot data.</p>  <p>The screenshot shows the 'Event Log - Event Message' window. It displays a single message: 'Event Message 20487 SC 1 Unsynchronized speed exceeded'. The message details: 'Description: Exceeded Axis speed when Safety Controller (SC) 1 was unsynchronized.' and 'Actions: Jog Mechanical Unit to synch position with low axis speed. Reduce speed to 250 mm/s or 18 degrees/s.' Below the message are buttons for 'Show Log' and 'Acknowledge'. The 'Acknowledge' button is highlighted in green. The status bar at the bottom shows the message ID 'xx1500002481'.</p>	
2 Press Acknowledge to continue Axis Calibration procedure.	
3 Restart Axis Calibration procedure by pressing Play.	

Unsynchronized time limit expired - SafeMove message anytime during Axis Calibration routine

Action	Note
<p>1 SafeMove generates the message "Unsynchronized time limit expired" (anytime).</p>  <p>The screenshot shows the 'Event Log - Event Message' window. It displays a single message: 'Event Message 20488 SC 1 Unsynchronized time limit expired'. The message details: 'Description: Available time to move the Robot when unsynchronized has expired for Safety Controller (SC) 1.' and 'Actions: 1. Do a Confirm stop by pressing the Motors ON push button or activate System Input. 2. Synchronize SC 1.' Below the message are buttons for 'Next', 'Previous', and 'OK'. The 'OK' button is highlighted in green. The status bar at the bottom shows the message ID 'xx1500002482'.</p>	
2 Press OK to continue Axis Calibration procedure.	
3 Restart Axis Calibration procedure by pressing Play.	

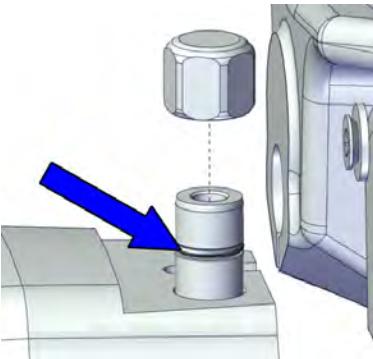
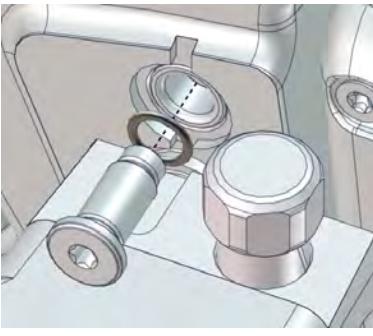
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5 Calibration

5.4.4 Axis Calibration - Running the calibration procedure

Continued

After calibration

	Action	Note
1	Check the o-ring on the fixed calibration pin. Replace if damaged or missing.	 xx1600002102 Protection cover and plug set: 3HAC056806-001.
2	Reinstall the protective cover on the fixed calibration pin on each axis, directly after the axis has been calibrated. Replace the cover with new spare part, if missing or damaged.	 xx1500000952 Protection cover and plug set: 3HAC056806-001.
3	Reinstall the protective plug and sealing in the bushing on each axis, directly after the axis has been calibrated. Ensure that the sealing is not damaged. Replace the plug and the sealing with new spare part, if missing or damaged.	

5.5 Calibrating with Calibration Pendulum method

Where to find information for Calibration Pendulum

Detailed instructions of how to perform Pendulum Calibration are given in the documentation enclosed with the calibration tools.

5 Calibration

5.6 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. Do not change the position of the robot axes after running the program!	See Checking the synchronization position on page 787 .
2 Adjust the <i>synchronization marks</i> when the calibration is done, if necessary.	This is detailed in section Synchronization marks and synchronization position for axes on page 767 .
3 Write down the values on a new label and stick it on top of the calibration label. The label is located on the lower arm.	
4 Remove any calibration equipment from the robot.	

5.7 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 Program editor .	
2	Create a new program.	
3	Use MoveAbsJ in the Motion&Proc menu.	
4	Create the following program: <pre>MoveAbsJ [[0,0,0,0,0,0], [9E9,9E9,9E9,9E9,9E9,9E9]] \NoEOoffs, 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 Synchronization marks and synchronization position for axes on page 767 and Updating revolution counters on page 770 .

Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

	Action	Note
1	On the ABB menu, tap Jogging .	
2	Tap Motion mode 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 Synchronization marks and synchronization position for axes on page 767 and Updating revolution counters on page 770 .

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6 Decommissioning

6.1 Environmental information

Hazardous material

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly to prevent health or environmental hazards.

Material	Example application
Batteries, NiCad or Lithium	Serial measurement board
Copper	Cables, motors
Cast iron/nodular iron	Base, lower arm, upper arm
Steel	Gears, screws, base frame, and so on.
Neodymium	Brakes, motors
Plastic/rubber	Cables, connectors, drive belts, and so on.
Oil, grease	Gearboxes
Aluminium	Covers, synchronization 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 Decommissioning

6.2 Scrapping of robot

6.2 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 from the robot. 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.

6.3 Decommissioning of balancing device

General

There is much energy stored in the balancing device. Therefore a special procedure is required to disassemble it. The coil springs inside the balancing device exert a potentially lethal force unless disassembled properly.

The device must be disassembled by a decommissioning company.

Required equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 805 .
Protective clothing that also covers face and hands	-	Must protect against spatter of sparks and flames.
Cutting torch with a long shaft	-	For opening housing and cutting coils. The long shaft is a safety requirement.
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.		These procedures include references to the tools required.



DANGER

Do not, under any circumstances, deal with the balancing device in any other way than that detailed in the product documentation! For example, attempting to open the balancing device is potentially lethal!

Action on field, decommissioning

The procedure below details the actions to perform on field, when the balancing device is to be decommissioned.

	Action	Note
1	Remove the balancing device from the robot.	Detailed in section Replacing the balancing device on page 452 .
2	Send the device to a decommissioning company.	Make sure the decommissioning company is well informed about the stored energy built up by high tensioned compression springs and that the device contains some grease. The following procedure contains useful information about decommissioning.

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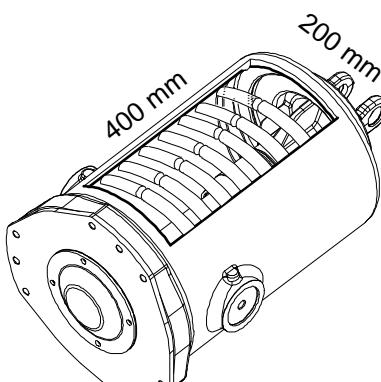
6 Decommissioning

6.3 Decommissioning of balancing device

Continued

Decommissioning at decommissioning company, balancing device

The instruction below details how to decommission the balancing device. Contact ABB Robotics for further consultation.

Action	Note
1  DANGER There is stored energy built up by high tensioned compression springs inside the balancing device! When a coil is cut the released tension creates a spatter of sparks and flames. The working area must be free of flammable materials. Position the balancing device so that the spatter will be directed away from personnel.	
2 Clamp the device at the working location. Place the device at ground level so that the hole and spring coils are cut from a safe distance and somewhat from above.	
3  DANGER The hole must be cut as specified in the figure. Pieces of the spring can be thrown out from the cylinder at high speed if the hole is cut larger than specified!	
4 Cut a hole in the housing as shown in the figure.	Use a cutting torch with a long shaft. The measurements shown below are maximum values!  xx0700000391
5 Cut the coils of the springs inside the housing as specified below: <ul style="list-style-type: none">• Outer spring: cut at least five coils!• Middle spring: cut at least four coils!• Inner spring: cut at least four coils!	Use a cutting torch with a long shaft.

Continues on next page

	Action	Note
6	Double-check the number of coils cut and make sure all the tension in the springs is removed. Double-check the number of coils cut and make sure all the tension in the springs is removed.	

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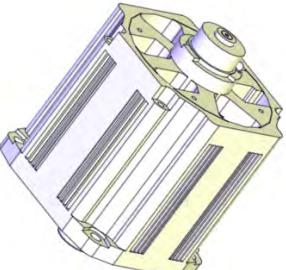
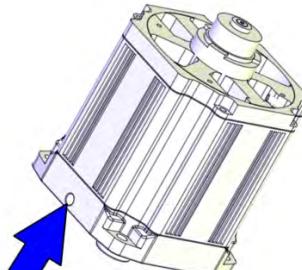
7 Robot description

7.1 Type A vs type B motors

Identifying the motor visually

Type B motors include evacuation on the motor flange to indicate failure of primary sealing between the gearbox and the motor. Robots with protection type Foundry Plus have a sight glass installed in the evacuation holes.

Use the images to identify which type of motor is installed on each robot axis.

Type A motor	Type B motor
 xx1500001058	 xx1500001057
No evacuation on type A motors.	The type B motor include evacuation on the motor flange.

Identifying the motor by article number

Use the table to identify which type of motor is installed on each robot axis by article number. The article numbers specified are found in WebConfig.

Contact ABB Service for further assistance regarding which motor type is installed on the robot, if needed.



Note

The article numbers in the table can not be used for ordering spare parts. The numbers are only used for identification of installed motors.

See *Product manual, spare parts - IRB 6700* for spare part numbers.

Robot axis	Article number Type A motor	Article number Type B motor	235 /2.65	205 /2.80	175 /3.05	150 /3.20	200 /2.60	155 /2.85	300 /2.70	245 /3.00
1	3HAC045060-001	3HAC055433-001	X	X	X	X	X	X		
	3HAC051321-001	3HAC055442-001							X	X
2	3HAC045061-001	3HAC055434-001	X	X	X	X	X	X		
	3HAC051323-001	3HAC055443-001							X	X
3	3HAC045063-001	3HAC055435-001	X	X	X	X	X	X		
	3HAC051323-001	3HAC055443-001							X	X

Continues on next page

7 Robot description

7.1 Type A vs type B motors

Continued

Robot axis	Article number Type A motor	Article number Type B motor	235 /2.65	205 /2.80	175 /3.05	150 /3.20	200 /2.60	155 /2.85	300 /2.70	245 /3.00
4	3HAC045064-001	3HAC055436-001	X	X	X	X	X	X		
	3HAC045762-001	3HAC055449-001							X	X
5	3HAC045064-001	3HAC055436-001	X	X	X	X	X	X	X	X
6	3HAC045066-001	3HAC055445-001	X	X	X	X			X	X
	3HAC045067-001	3HAC055438-001					X	X		

Interchangeable parts

Use the table to see if type A and type B motors are interchangeable on each robot axis.

Robot axis	Motor replacement from type A to type B	Requirements/notes for replacing type A motor with type B motor
1	Fully interchangeable.	
2	Fully interchangeable.	
3	Fully interchangeable.	
4	Fully interchangeable.	
5	Fully interchangeable.	Replacement to type B requires replacement of the heat protection plates that are fitted to the motor.
6	Interchangeable in a wrist that is manufactured in and after October 2015.	A type B motor does not fit a wrist that is manufactured before October 2015.

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.

Standards, EN ISO

The product is designed in accordance with the requirements of:

Standard	Description
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13849-1	Safety of machinery, safety related parts of control systems - Part 1: General principles for design
EN ISO 13850	Safety of machinery - Emergency stop - Principles for design
EN ISO 10218-1	Robots for industrial environments - Safety requirements -Part 1 Robot
EN ISO 9787	Robots and robotic devices -- Coordinate systems and motion nomenclatures
EN ISO 9283	Manipulating industrial robots, performance criteria, and related test methods
EN ISO 14644-1 ⁱ	Classification of air cleanliness
EN ISO 13732-1	Ergonomics of the thermal environment - Part 1
EN IEC 61000-6-4 (option 129-1)	EMC, Generic emission
EN IEC 61000-6-2	EMC, Generic immunity
EN IEC 60974-1 ⁱⁱ	Arc welding equipment - Part 1: Welding power sources
EN IEC 60974-10 ⁱⁱ	Arc welding equipment - Part 10: EMC requirements
EN IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1 General requirements
IEC 60529	Degrees of protection provided by enclosures (IP code)

ⁱ Only robots with protection Clean Room.

ⁱⁱ Only valid for arc welding robots. Replaces EN IEC 61000-6-4 for arc welding robots.

European standards

Standard	Description
EN 614-1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN 574	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design

Continues on next page

Other standards

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-14	Industrial robots and robot Systems - General safety requirements

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 the IRB 6700.

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 Screw dimensions of M8 or larger must be tightened with a torque wrench. Screw dimensions of M6 or smaller may be tightened without a torque wrench if this is done by trained and qualified personnel.

Lubricant	Article number
Molycote 1000 (molybdenum disulphide grease)	11712016-618

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.

Continues on next page

8 Reference information

8.4 Screw joints

Continued

- Always *tighten the joint by hand*, and never use pneumatic tools.
- 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*. Any 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*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Dimension	Tightening torque (Nm) Class 8.8, oil-lubricated	Tightening torque (Nm) Class 10.9, oil-lubricated	Tightening torque (Nm) 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 (Molykote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for *screws lubricated with Molykote 1000, Gleitmo 603 or equivalent with allen head screws*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Dimension	Tightening torque (Nm) Class 10.9, lubricated ⁱ	Tightening torque (Nm) Class 12.9, lubricated ⁱ
M8	28	35
M10	55	70
M12	96	120
M16	235	280
M20	460	550
M24	790	950

ⁱ Lubricated with Molykote 1000, Gleitmo 603 or equivalent

Continues on next page

Water and air connectors

The following table specifies the recommended standard tightening torque for *water and air connectors* when *one or both* connectors are made of *brass*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Dimension	Tightening torque Nm - Nominal	Tightening torque Nm - Min.	Tightening torque Nm - Max.
1/8	12	8	15
1/4	15	10	20
3/8	20	15	25
1/2	40	30	50
3/4	70	55	90

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
	 CAUTION The robot weighs 1300 kg. 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	Comment
1	Ring-open-end spanner 8-19 mm	
1	Socket head cap 2.5-17 mm	
1	Torx socket no: 20-60	
1	Box spanner set	
1	Torque wrench 10-100 Nm	
1	Torque wrench 75-400 Nm	
1	Ratchet head for torque wrench 1/2	
2	Hexagon-headed screw M10x100	
1	Hexagon-headed screw M16x90	
1	Hex bit socket head cap no. 14 socket 40 mm L=100 mm	
1	Hex bit socket head cap no. 14 socket 40 mm L=20 mm	To be shortened to 12 mm
1	Hex bit socket head cap no. 6 socket 40 mm L=145 mm	
1	Hex bit socket head cap no. 6 socket 40mm bit L=220 mm	
1	Plastic mallet	

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 805*](#), and of special tools, listed directly in the instructions and also gathered in this section.

Special tools

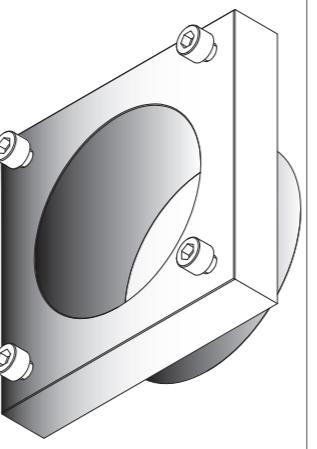
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Tools and equipment with spare part number: (These tools can be ordered from ABB)		Cable harness	SMB	Brake release unit	Lower arm	Upper arm	Wrist	Turning disk	Balancing device	Spherical roller bearing (link ear)	Rear bearing (balancing device)	Axis 1 motor	Axis 2 motor	Axis 3 motor	Axis 4 motor	Axis 5 motor	Axis 6 motor	Axis 1 gearbox	Axis 2 gearbox	Axis 3 gearbox	Axis 6 gearbox
Guide pins																					
3HAC15520-1	Guide pin, M8x100																				
3HAC15521-2	Guide pin, M10x150																	2		2	
3HAC15521-2	Guide pin, M10x150																				
3HAC13056-2	Guide pin, M12x150				x	x	2					2	2	2					x	x	
3HAC13056-4	Guide pin, M12x200				x	x												x	x	x	
3HAC13056-4	Guide pin, M12x250				x													x	x		
3HAC13120-2	Guide pin, M16x150				x													x	x		
3HAC13120-3	Guide pin, M16x200				x												x	x			
Lifting accessories																					
3HAC15556-1	Lifting accessory (chain)	 xx1200001241			x	x					x						x	x	x		
3HAC14459-1	Lifting accessory, motor									x							x				
3HAC15534-1	Lifting accessory, motor									x	x						x				
Article number depends on robot variant. ⁱ	Lifting accessory, gearbox																x				
3HAC046128-001	Lifting accessory, gearbox																	x			
3HAC16131-1	Lifting eye M12	 xx1200001242			2	2											2	2	2		
3HAC14457-4	Lifting eye M16	 xx1200001242															2	x			

Continues on next page

8 Reference information

8.7 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness	SMB	Brake release unit	Lower arm	Upper arm	Wrist	Turning disk	Balancing device	Spherical roller bearing (link ear)	Rear bearing (balancing device)	Axis 1 motor	Axis 2 motor	Axis 3 motor	Axis 4 motor	Axis 5 motor	Axis 6 motor	Axis 1 gearbox	Axis 2 gearbox	Axis 3 gearbox	Axis 6 gearbox
-	Lifting shackle SA-10-8-NA1	 xx1200001243			x					x	x	x				x						
-	Fender washer Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.				x	x										x	x	x				
-	Roundsling, 1.5 m Length: 1.5 m. Lifting capacity: 2,000 kg.				x											x	x					
-	Roundsling, 1 m Length: 1 m. Lifting capacity: 1,000 kg.				x		x			x	x	x	x	x		x	x					
Press, puller and unloading tools																						
3HAC12475-6	AdapterM20-M16				x				x ii							x						
3HAC047273-001	Anvil	 xx1300000675			x				x ii	x						x						
3HAC028920-001	Dismantle and mounting tool				x				x	x	x					x						
3HAC030662-001	Distance tool	 xx1400000726			x					x	x					x						
3HAC11731-1	Hydraulic cylinder								x	x	x					x						
3HAC13086-1	Hydraulic pump 80 MPa								x	x	x					x						
-	Threaded bar, M16x340				x				x		x					x						

Continues on next page

Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness	SMB	Brake release unit	Lower arm	Upper arm	Wrist	Turning disk	Balancing device	Spherical roller bearing (link ear)	Rear bearing (balancing device)	Axis 1 motor	Axis 2 motor	Axis 3 motor	Axis 4 motor	Axis 5 motor	Axis 6 motor	Axis 1 gearbox	Axis 2 gearbox	Axis 3 gearbox	Axis 6 gearbox
3HAC028920-003	Press tool	 xx1300000674							x ⁱⁱ													
Removal tools																						
-	ScrewsM8x75, fully threaded																					3
3HAC057339-003	Removal tool M12																x	x	x			
3HAC057339-004	Removal tool M14												x	x	x				x	x		
Other tools																						
-	24 VDC power supply					x	x	x			x	x	x	x	x	x	x	x	x	x	x	
3HAC046645-003	Aligning tool																		x			
-	Long AllenKeySocketIN19L 6-140														x	x	x					
3HAC12342-1	Bits extender										x	x	x	x					x	x		
3HAC15716-1	Calibration Pendulum toolkit ⁱⁱⁱ					x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	
3HAC055412-001	Calibration tool box, Axis Calibration ⁱⁱⁱ					x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	
-	Leak-down tester										x	x	x	x	x	x	x	x	x	x	x	
-	Lock screw, M16x120										x	x	x	x								
-	Oil collecting vessel												x	x					x	x	x	x
-	Oil dispenser												x	x					x	x	x	x
	Pallet					x	x	x											x	x		
3HAB7887-1	Rotation tool					x	x				x	x	x	x	x	x	x	x	x	x	x	

i Robot variants IRB 6700 - 235/2.65, - 205/2.80, - 175/3.05, - 150/3.20: 3HAC046112-001.

Robot variants IRB 6700 - 200/2.60, - 155/2.85: 3HAC046128-001.

ii Included in Dismantle and mounting tool (3HAC028920-001).

iii The robot is calibrated by either Calibration Pendulum 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.

Continues on next page

8 Reference information

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.

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 on the documentation DVD.

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10 Circuit diagrams

10.1 Circuit diagrams

Overview

The circuit diagrams are not included in this manual, but delivered as separate documents on the documentation DVD. 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 6400RF</i>	<i>3HAC8935-1</i>
<i>Circuit diagram - IRB 6600 type A</i>	<i>3HAC13347-1 3HAC025744-001</i>
<i>Circuit diagram - IRB 6600 type B</i>	<i>3HAC13347-1 3HAC025744-001</i>
<i>Circuit diagram - IRB 6620</i>	<i>3HAC025090-001</i>

Continues on next page

10 Circuit diagrams

10.1 Circuit diagrams

Continued

Product	Article numbers for circuit diagrams
<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> <i>3HAC025744-001</i>
<i>Circuit diagram - IRB 6660</i>	<i>3HAC025744-001</i> <i>3HAC029940-001</i>
<i>Circuit diagram - IRB 6700</i>	<i>3HAC043446-005</i>
<i>Circuit diagram - IRB 7600</i>	<i>3HAC13347-1</i> <i>3HAC025744-001</i>
<i>Circuit diagram - IRB 14000</i>	<i>3HAC050778-003</i>
<i>Circuit diagram - IRB 910SC</i>	<i>3HAC056159-002</i>

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