ROBOTICS

Product manual

IRB 1300



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Product manual

IRB 1300-11/0.9
IRB 1300-10/1.15
IRB 1300-7/1.4
IRB 1300-12/1.4

OmniCore

Document ID: 3HAC070390-001

Revision: S

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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 IRB 1300
- maintenance of the IRB 1300
- mechanical and electrical repair of the IRB 1300

The robot described in this manual has the following protection types:

- *Standard*
- *IP67*
- *Foundry Plus*
- *Clean Room*

Usage

This manual shall be used during:

- installation and commissioning, from lifting the product to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- repair work
- decommissioning work

> **Note**
>
> It is the responsibility of the integrator to conduct a risk assessment of the final application.
>
> It is the responsibility of the integrator to provide safety and user guides for the robot system.

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

A maintenance/repair/installation craftsman working with an ABB robot shall:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.
- be trained to respond to emergencies or abnormal situations.

Product manual scope

The manual covers all variants and designs of the IRB 1300. Some variants and designs may have been removed from the business offer and are no longer available for purchase.

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Continued

References

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

Document name	Document ID
Product manual, spare parts - IRB 1300	*3HAC070392-001*
Product specification - IRB 1300	*3HAC070393-001*
Circuit diagram - IRB 1300	*3HAC068887-003*
Safety manual for robot - Manipulator and IRC5 or OmniCore controller [i]	*3HAC031045-001*
Product manual - OmniCore C30	*3HAC060860-001*
Product manual - OmniCore C90XT Type A	*3HAC089065-001*
Product manual - OmniCore E10	*3HAC079399-001*
Product manual - OmniCore V250XT Type B	*3HAC087112-001*
Product manual - OmniCore V400XT	*3HAC081697-001*
Operating manual - OmniCore	*3HAC065036-001*
Application manual - Controller software OmniCore	*3HAC066554-001*
Application manual - CalibWare Field	*3HAC030421-001*
Technical reference manual - Event logs for RobotWare 7	*3HAC066553-001*
Technical reference manual - Lubrication in gearboxes	*3HAC042927-001*
Technical reference manual - System parameters	*3HAC065041-001*

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

Revisions

Revision	Description
A	First edition.
B	Published in release 20D. The following updates are made in this revision: • Installation of signal lamp is added. • Information about mechanical restriction of axis-5 working range is updated and a figure showing related location is added. • A new O-ring on swing (3HAC061327-036) is added. • Updated cleaning method. • Added maximum arm load information and updated the load area figure.
C	Published in release 21A. The following updates are made in this revision: • Protection class IP67 (option 3350-670), protection type Clean Room (option 3351-4) and protection type Foundry Plus (option 3352-10) are added. • Figure of tool flange standard is updated. • Specification of connectors R1.C3 and R2.C3 is updated. • Connector types for CP/CS and Ethernet floor cable wiring are added. • A note about adding flange sealing Loctite 577 to the quick coupling on the base is added. • Minor changes.

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Revision	Description
D	Published in release 21B. The following updates are done in this revision: • Text regarding fastener quality is updated, see *Fastener quality on page 85*. • Text regarding diameter of air hoses is updated, see *Customer connections on page 101*. • Added maintenance activities of running the *Brake Check* and *Cyclic Brake Check* routines. See *Maintenance schedule on page 112*. • Removed maintenance activity of inspecting oil seepage and updated troubleshooting description about oil and grease stains on motors and gearboxes. • Updated tool flange dimension images. • Added a note to remind users that mechanical stop locations cannot be adjusted. See *Adjusting the working range on page 88*.
E	Published in release 21C. The following updates are done in this revision: • Updated the tool flange standard figure for IP40, IP67 and Clean Room robots. • Updated the information of foundation guide pins. • Supported controller OmniCore E10 is added. • Corrected the description of connection point on cabinet. • Updated the naming of timing belt tension adjustment tools, from acoustic tensiometer and tensiometer to sonic tension meter and dynamometer, respectively.
F	Published in release 21D. The following updates are done in this revision: • Updated the standard toolkit table.
G	Published in release 22A. The following updates are done in this revision: • Added variant IRB 1300-12/1.4. • Updated information of screws for fixing the housing to extender unit or tubular. • Updated the complete robot weight. • Added a note for inspecting the oil level of axis-2 gearbox. • Added information about length of thread engagement for attachment screws. • Added cautions in procedures of removing timing belts, motors and gearboxes. • Updated tightening torques for some screws. • Updated dimension figures to include dimension for bottom connector interface option. • Added troubleshooting for high motor temperature, see *Motor temperature too high on page 802*. • Updated information about Gleitmo treated screws, see *Screw joints on page 812*.
H	Published in release 22B. The following updates are done in this revision: • Added cleaning instructions for robots with protection type Clean Room. • Updated robot power cable information, see *Robot cables on page 96*. • Dimensions of tool flange with protection type Foundry Plus updated.

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Continued

Revision	Description
J	Published in release 22C. The following updates are done in this revision: • Updated repair procedures related to radial sealings on the swing bottom, swing top and housing. • Updated information label figure. • Updated the figure showing the cable routing direction in swing. • Updated the lifting capacity of the roundslings for lifting the robot. • Updated maintenance information for axis-2 gearbox oil level, both inspection interval and inspection procedure. • Updated the tool flange dimension figures. • Added disinfection instructions for Clean Room robots.
K	Published in release 22D. The following updates are done in this revision: • Supported IRB 1300-12/1.4 to work with controller OmniCore E10. • Updated the default stop category information for emergency stop function in IRB 1300-12/1.4. • Added information about Wrist Optimization in calibration chapter.
L	Published in release 23C. The following updates are done in this revision: • Updated article number of robot signal cable from 3HAC067446-00*X* to 3HAC084767-00*X*. • Added information about robots with solenoid valve (option 3303-3).
M	Published in release 24A. The following updates are done in this revision: • Updated maximum arm load information and updated the load area figure. • Added troubleshooting about robot vibration. • Updated information about timing belt inspection and refitting.
N	Published in release 24B. The following updates are done in this revision: • Added support for OmniCore V line controllers. • Added steps to measure the oil level of axis 1 gearbox.
P	Published in release 24C. The following updates are done in this revision: • Added support for OmniCore C90XT Type A controller and removed information for C90XT. • Changed locking liquid Loctite 243 to Loctite 2400. • Updated the spare part number of process hub with solenoid valve to 3HAC088301-001. • Updated the tool flange dimension for robots with protection type Foundry Plus.
Q	Published in release 24D. The following updates are done in this revision: • Added cable lengths 22m and 30m for power cable and signal cable used with OmniCore V line controllers.
R	Published in release 25A. The following updates are made in this revision: • Added information about expected component life working in L/H/P applications. • Updated cleaning instructions for Clean Room robots. • Added cable lengths 22m and 30m for CP/CS cable and Ethernet cable used with OmniCore V line controllers.

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Revision	Description
S	Published in release 25.2. The following updates are made in this revision: • Added the section *Safe supervision of working range limitations on page 89*. • Updated the section *Expected component life on page 115*. • Updated article numbers of O-ring on flexible spline side of axis 4 gearbox to 3HAC061327-115. • Added new spare part resolver cover 3HAC060261-001 to axis-1 motor for robots with bottom connector interface. • Updated article number of lubricating oil Kyodo Yushi TMO150 to 3HAC032140-009. • Updated the tightening torque of screws securing the swing support to 39 Nm±3%. • Added the section *Lubrication in gearboxes on page 816*. • Updated cleaning instructions with more details for Clean Room robots.

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Product documentation

Categories for user documentation from ABB Robotics

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



Tip

All documents can be found via myABB Business Portal, *www.abb.com/myABB*.

Product manuals

Manipulators, controllers, DressPack, 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.
- Troubleshooting.
- Decommissioning.
- Reference information (safety standards, unit conversions, screw joints, lists of tools).
- Spare parts list with corresponding figures (or references to separate spare parts lists).
- References to circuit diagrams.

Technical reference manuals

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

Application manuals

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

An application manual generally contains information about:

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

Continues on next page

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- 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 troubleshooters.

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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 Safety information

1.1.1 Limitation of liability

Limitation of liability

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

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

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

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

Spare parts and equipment

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

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1.1.2 Requirements on personnel

General

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

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

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

Personal protective equipment

Use personal protective equipment, as stated in the instructions.

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1.2 Safety signals and symbols

1.2.1 Safety signals in the manual

Introduction to safety signals

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

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

Hazard levels

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

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

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1.2.1 Safety signals in the manual

Continued

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

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1.2.2 Safety symbols on manipulator labels

Introduction to symbols

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

Symbols are used in combinations on the labels, describing each specific warning. The descriptions in this section are generic, the labels can contain additional information such as values.

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

Types of symbols

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

The safety labels are language independent, they only use graphics. See *Symbols on safety labels on page 21*.

The information labels can contain information in text.

Symbols on safety labels

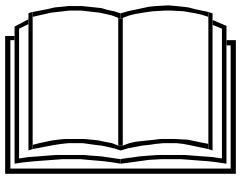
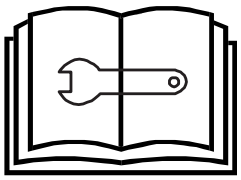
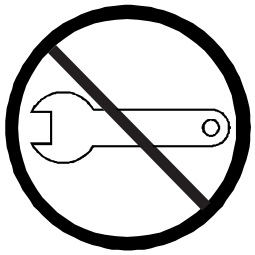
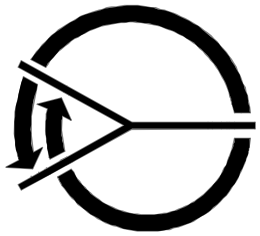
Symbol	Description
 xx0900000812	**Warning!** Warns that an accident *may* occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical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

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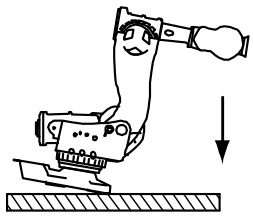
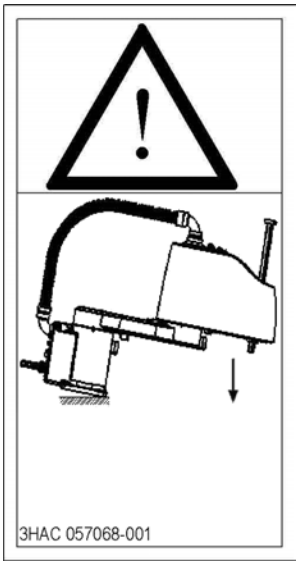
1.2.2 Safety symbols on manipulator labels

Continued

Symbol	Description
 xx0900000813	**See user documentation** Read user documentation for details. Which manual to read is defined by the symbol: • No text: *Product manual*.
 xx0900000816	**Before disassembly, 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.

Continues on next page

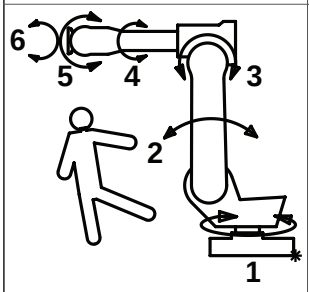
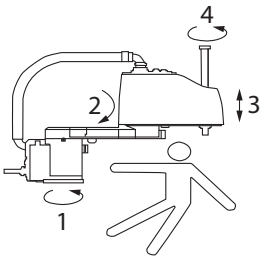
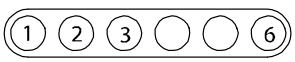
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Symbol	Description
 xx0900000810  xx1500002402	**Tip risk when loosening bolts** The robot can tip over if the bolts are not securely fastened.
  xx0900000817	**Crush** Risk of crush injuries.

Continues on next page

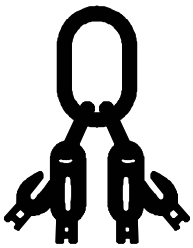
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1.2.2 Safety symbols on manipulator labels
Continued

Symbol	Description
 xx0900000818  xx1300001087	**Heat** Risk of heat that can cause burns. (Both signs are used)
 xx2400000736  xx1500002616	**Moving robot** The robot can move unexpectedly.
 xx0900000820  xx1000001140	**Brake release buttons**

Continues on next page

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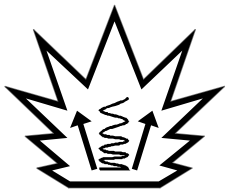
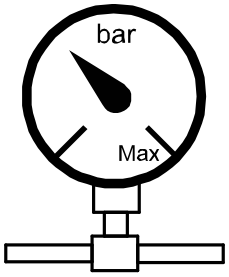
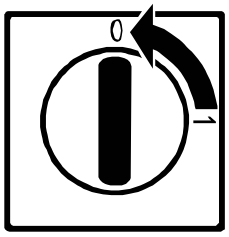
Symbol	Description
 xx0900000821	**Lifting bolt**
 xx1000001242	**Adjustable chain sling with shortener**
 xx0900000822	**Lifting of robot**
	Swivel eye bolt The exclamation mark indicates required usage of swivel eye bolts at the lifting points.
 xx0900000823	**Oil** Can be used in combination with prohibition if oil is not allowed.
 xx0900000824	**Mechanical stop**
 xx1000001144	**No mechanical stop**

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1.2.2 Safety symbols on manipulator labels

Continued

Symbol	Description
 xx0900000825	**Stored energy** Warns that this part contains stored energy. Used in combination with *Do not disassemble* symbol.
 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.

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1.3 Robot stopping functions

Protective stop and emergency stop

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

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C90XT Type A*
- *Product manual - OmniCore E10*
- *Product manual - OmniCore V250XT Type B*
- *Product manual - OmniCore V400XT*

Default stop category for the emergency stop function in IRB 1300-12/1.4

The stop category 1 is default for the emergency stop function in IRB 1300-12/1.4. The stop category can still be re-configured to stop category 0.

For more information, see section *Protective stop and emergency stop* in the product manual for the robot controller, listed in *References on page 10*.

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1.4 Safety during installation and commissioning

National or regional regulations

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

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

The integrator of the robot system is required to perform a risk assessment.

Layout

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

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

If the manipulator is delivered with mechanical stops, these can be used for reducing the working space. For OmniCore robots, safe supervision can be configured for the working space.

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

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

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

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

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

Hazards due to noise emission from the robot needs to be considered.

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

Allergenic material

See *Environmental information on page 806* for specification of allergenic materials in the product, if any.

Securing the robot to the foundation

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

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

Continues on next page

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Using lifting accessories and other external equipment

Ensure that all equipment used during installation, service and all handling of the robot are in correct condition for the intended use.

Electrical safety

Incoming mains must be installed to fulfil national regulations.

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

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

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

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

Note

Use a CARBON DIOXIDE (CO_2) extinguisher in the event of a fire in the robot.

Safety devices

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

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

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

Other hazards

A robot may perform unexpected limited movement.

WARNING

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

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

- Water
- Compressed air
- Hydraulics

End-effector hazards require particular attention for applications which involve close human collaboration with the robot.

Continues on next page

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Verify the safety functions

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

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1.5 Safety during operation

Automatic operation

Verify the application in the operating mode manual reduced speed, before changing mode to automatic and initiating automatic operation.

Unexpected movement of robot arm



WARNING

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

A robot may perform unexpected limited movement.



WARNING

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

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1.6 Safety during maintenance and repair

1.6.1 Safety during maintenance and repair

General

Corrective maintenance must only be carried out by personnel trained on the robot.

Maintenance or repair must be done with all electrical, pneumatic, and hydraulic power switched off, that is, no remaining hazards.

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

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

Make sure that there are no tools, loose screws, turnings, or other unexpected parts remaining after maintenance or repair work.

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

Hot surfaces

Surfaces can be hot after running the robot, and touching these may result in burns. Allow the surfaces to cool down before maintenance or repair.

Allergic reaction

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

Gearbox lubricants (oil or grease)

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



Note

Take special care when handling hot lubricants.

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

Continues on next page

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Warning	Description	Elimination/Action
 **Allergic reaction**	When working with lubricants there is a risk of an allergic reaction.	Make sure that protective gear like goggles and gloves are always worn.
 **Possible pressure build-up in gearbox**	When opening the oil or grease plug, there may be pressure present in the gearbox, causing hot lubricant to spray from the opening.	Open the plug carefully and keep away from the opening. Do not overfill the gearbox when filling. Put oil absorbent cloth, bags or paper at appropriate locations to catch any oil residues. Use appropriate protective gear such as heat-resistant gloves, goggles/protective visor, or a body suit if necessary.
 **Do not overfill**	Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	Make sure not to overfill the gearbox when filling it with oil or grease. After filling, verify that the level is correct.
 **Specified amount depends on drained volume**	The specified amount of oil or grease is based on the total volume of the gearbox. When changing the lubricant, the amount refilled may differ from the specified amount, depending on how much has previously been drained from the gearbox.	After filling, verify that the level is correct.

Hazards related to batteries

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

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

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

Operating temperatures are listed in *Operating conditions, robot on page 43*.

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

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1.6.1 Safety during maintenance and repair
Continued

Unexpected movement of robot arm

WARNING

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

A robot may perform unexpected limited movement.

WARNING

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

Related information

See also the safety information related to installation and operation.

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1.6.2 Emergency release of the robot axes

Description

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

How to release the brakes is described in the section:

- *Manually releasing the brakes on page 68*.

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

Increased injury

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

DANGER

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

Make sure no personnel is near or beneath the robot.

Prerequsites for access to brake release buttons

Make sure that the brake release buttons on the manipulator are within reach and quickly accessible in case of emergency situations, even when the manipulator is installed on a height, on a wall, or suspended.

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1.6.3 Brake testing

When to test

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

How to test

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

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

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

Note

It is recommended to run the service routine *BrakeCheck* as part of the regular maintenance, see the operating manual for the robot controller.

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

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1.7 Safety during troubleshooting

General

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

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



DANGER

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



CAUTION

Risk of hot surfaces that can cause burns.

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



WARNING

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

A robot may perform unexpected limited movement.



WARNING

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

Related information

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

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1.8 Safety during decommissioning

General

See section *Decommissioning on page 805*.

If the robot is decommissioned for storage, take extra precaution to reset safety devices to delivery status.

Unexpected movement of robot arm

WARNING

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

A robot may perform unexpected limited movement.

WARNING

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

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2 Manipulator description

2.1 About IRB 1300

Introduction

The IRB 1300 is one of ABB Robotics latest generation of 6-axis industrial robot, with a payload of 7 kg, 10 kg, 11 kg and 12 kg designed specifically for manufacturing industries that use flexible robot-based automation, e.g. 3C industry. The robot has an open structure that is especially adapted for flexible use, and can communicate extensively with external systems.

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2.2 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Nominal weight
IRB 1300	IRB 1300-11/0.9: 75 kg IRB 1300-10/1.15: 77 kg IRB 1300-7/1.4: 79 kg IRB 1300-12/1.4: 79 kg

Note

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

Mounting positions

The table shows valid mounting positions and the installation (mounting) angle for the manipulator.

Mounting position	Installation angle
Floor mounted	Any angle
Wall mounted	Any angle
Suspended	Any angle

Note

The actual mounting angle must always be configured in the system parameters, otherwise the performance and lifetime is affected. See *Setting the system parameters for an inverted or a tilted robot on page 74*.

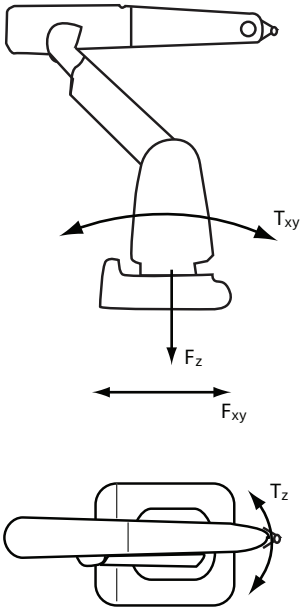
Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

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



xx1100000521

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

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

Note

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

WARNING

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

Floor mounted

Force	Endurance load (in operation)	Maximum load (emergency stop)
Force xy	±821 N	±2186 N
Force z	428 N±1000 N	1547 N±1000 N
Torque xy	±814 Nm	±2392 Nm
Torque z	±236 Nm	±583 Nm

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Wall mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±1478 N	±2860 N
Force z	±288 N	±963 N
Torque xy	±1068 Nm	±2741 Nm
Torque z	±352 Nm	±863 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±821 N	±2186 N
Force z	428 N±1000 N	1547 N±1000 N
Torque xy	±814 Nm	±2392 Nm
Torque z	±236 Nm	±583 Nm

Requirements, foundation

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

Requirement	Value	Note
Flatness of foundation surface	0.1/500 mm	Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB. 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
Minimum resonance frequency	22 Hz **Note** It may affect the manipulator lifetime to have a lower resonance frequency than recommended.	The value is recommended for optimal performance. Due to foundation stiffness, consider robot mass including equipment.[i] For information about compensating for foundation flexibility, see the description of *Motion Process Mode* in the manual that describes the controller software option, see *References on page 10*.
Minimum foundation material yield strength	150 MPa	

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

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

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Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25°C (-13°F) [i]
Maximum ambient temperature	+55°C (+131°F) [ii]
Maximum ambient temperature (less than 24 hrs)	+70°C (+158°F)
Maximum ambient humidity	95% at constant temperature (gaseous only) [iii]

i For robots installed with solenoid valves (option 3303-3), the minimum allowed ambient temperature is -10°C (14°F).

ii For robots installed with solenoid valves (option 3303-3), the maximum allowed ambient temperature is +50°C (+122°F).

iii For robots installed with solenoid valves (option 3303-3), the maximum allowed ambient humidity is 20% to 80% at constant temperature and no dew condensation allowed.

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	+45°C (113°F)
Maximum ambient humidity	95% at constant temperature [ii]

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.

ii For robots installed with solenoid valves (option 3303-3), the maximum allowed ambient humidity is 20% to 80% at constant temperature and no dew condensation allowed.

Protection classes, robot

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

Protection type	Protection class [i]
Manipulator, protection type Standard	IP40 IP67 (option 3350-670)
Manipulator, protection type Foundry Plus 2	IP67
Manipulator, protection type Clean Room	ISO 4, IP54
Manipulator with solenoid valve (option)	IP40 IP67 (option 3350-670)

i According to IEC 60529.

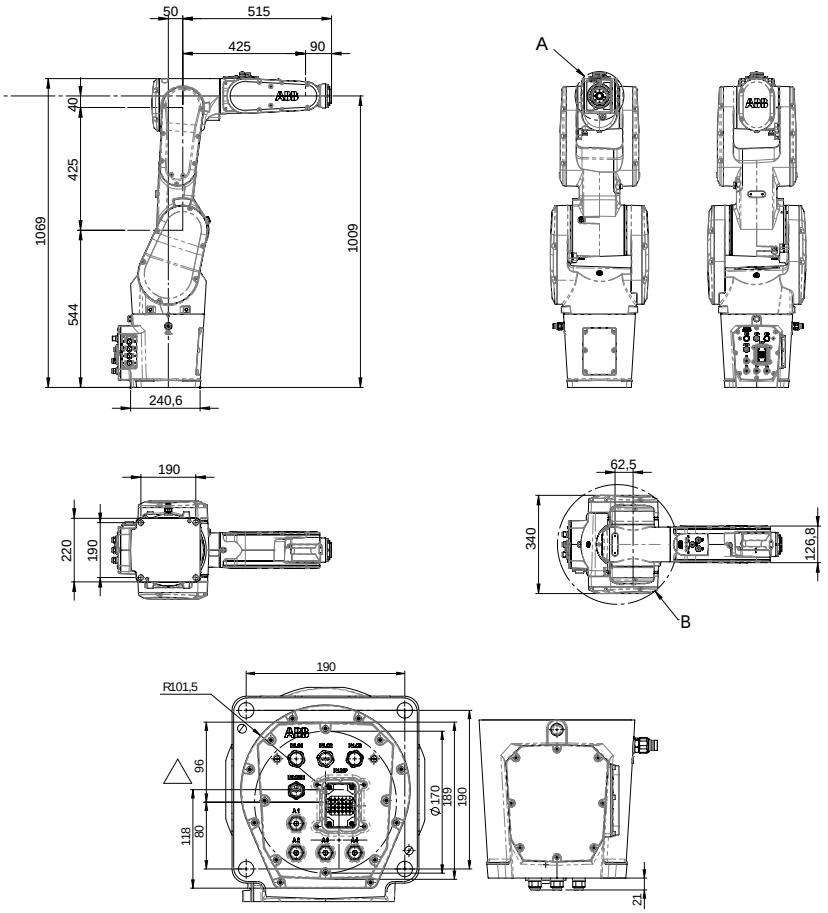
Environmental information

The product complies with IEC 63000. *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*.

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2.3 Dimensions

Main dimensions of IRB 1300-11/0.9



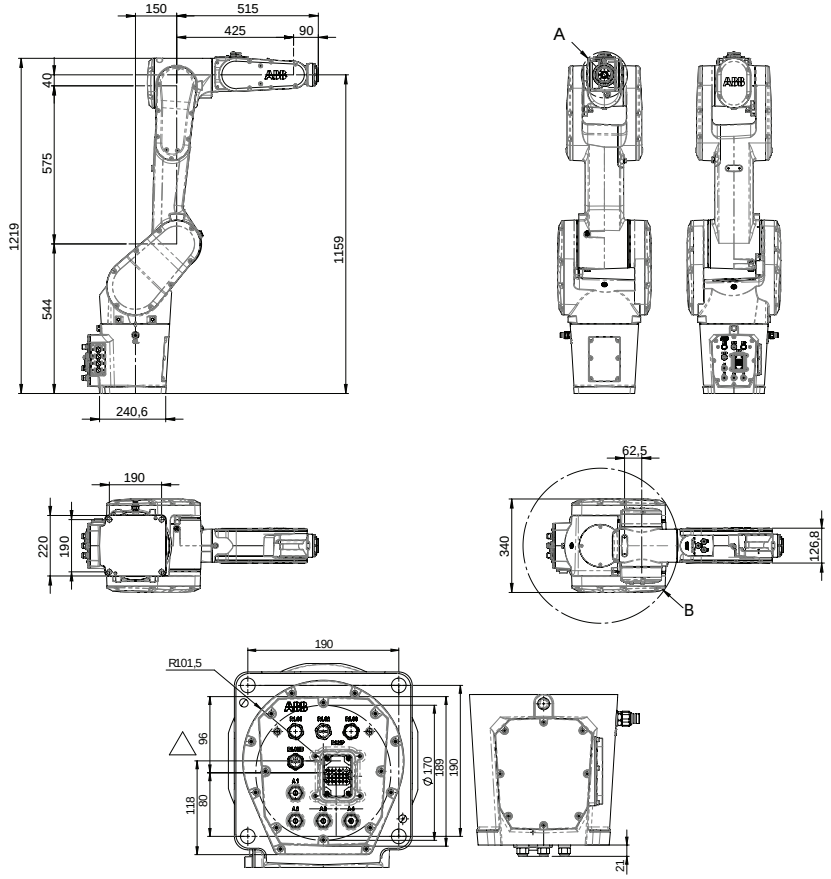
xx1900001331

Pos	Description
A	Turning radius: R84
B	Turning radius: R207

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Main dimensions of IRB 1300-10/1.15



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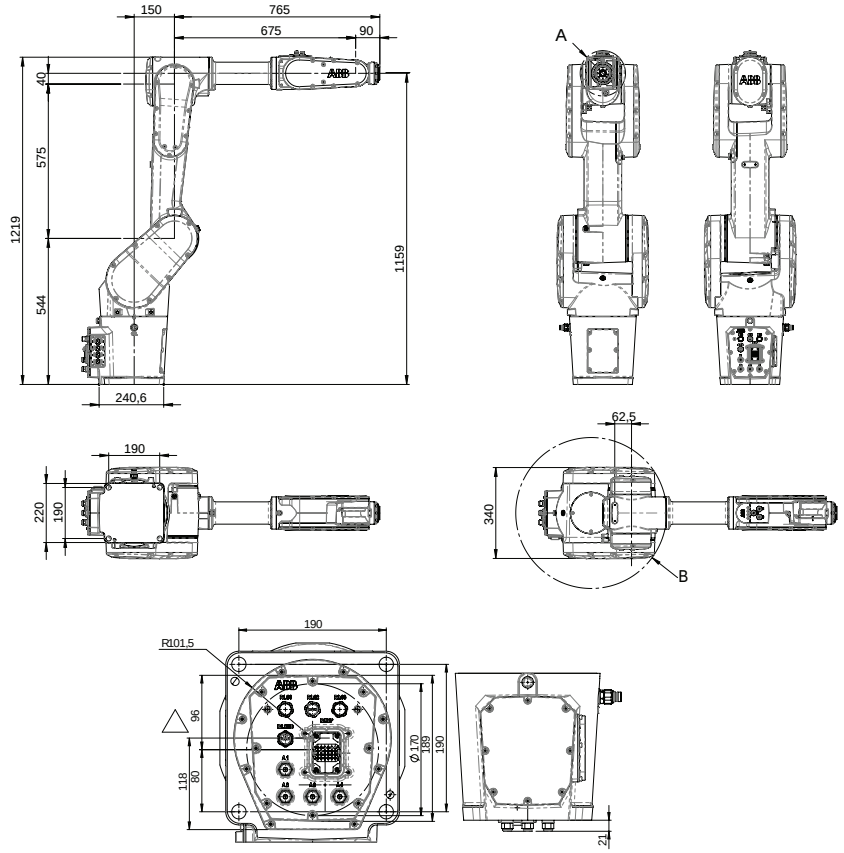
Pos	Description
A	Turning radius: R84
B	Turning radius: R282

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2.3 Dimensions
Continued

Main dimensions of IRB 1300-7/1.4 and IRB 1300-12/1.4



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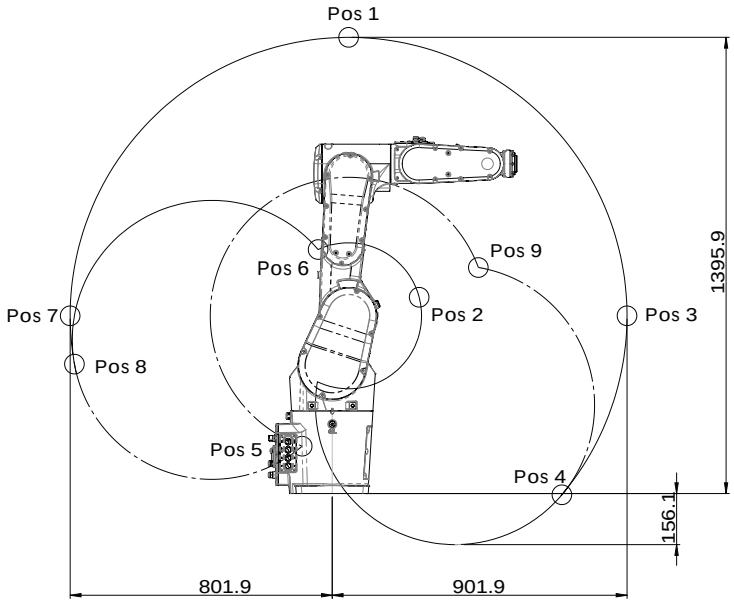
Pos	Description
A	Turning radius: R84
B	Turning radius: R282

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2.4 Working range

Illustration, working range IRB 1300-11/0.9

This illustration shows the unrestricted working range of the robot.



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Positions at wrist center and angle of axes 2 and 3

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	475	1009	0°	0°
pos1	50	1,395.9	0°	-84.6°
pos2	265.9	600.7	0°	65°
pos3	901.9	544	90°	-84.6°
pos4	702.6	-3.6	130°	-84.6°
pos5	-64.7	170.3	-100°	-210°
pos6	-43.3	746.7	-100°	65°
pos7	-801.9	544	-90°	-84.6°
pos8	-788.9	396.1	-100°	-84.6°
pos9	410	696.3	130°	-210°

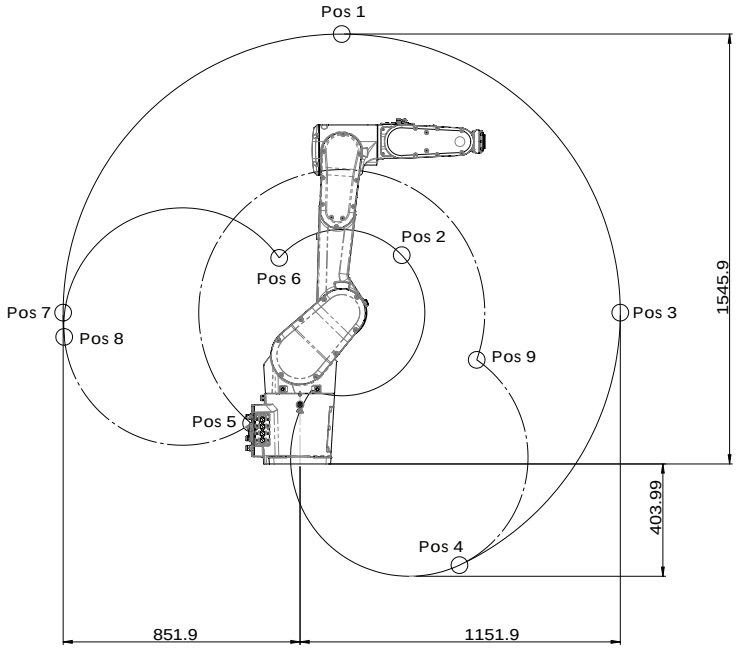
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2.4 Working range
Continued

Illustration, working range IRB 1300-10/1.15

This illustration shows the unrestricted working range of the robot.



xx1900001335

Positions at wrist center and angle of axes 2 and 3

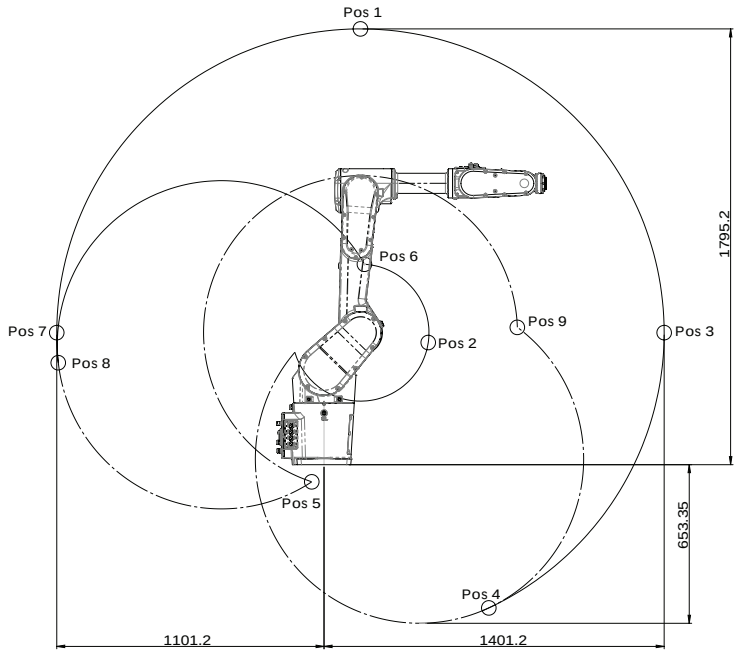
Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	575	1159	0°	0°
pos1	150	1,545.9	0°	-84.6°
pos2	365.9	750.7	0°	65°
pos3	1,151.9	544	90°	-84.6°
pos4	573.4	-364	155°	-84.6°
pos5	-146.3	168.7	-95°	-210°
pos6	-74.8	741	-95°	65°
pos7	-851.9	544	-90°	-84.6°
pos8	-848.1	456.9	-95°	-84.6°
pos9	604	394	155°	-210°

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Illustration, working range IRB 1300-7/1.4

This illustration shows the unrestricted working range of the robot.



xx1900001336

Positions at wrist center and angle of axes 2 and 3

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	825	1159	0°	0°
pos1	150	1,795.2	0°	-86.6°
pos2	429.2	503.2	0°	69°
pos3	1,401.2	544	90°	-86.6°
pos4	678.8	-590	155°	-86.6°
pos5	-2.9	-36.1	-95°	-210°
pos6	166.3	825.7	-95°	69°
pos7	-1,101.2	544	-90°	-86.6°
pos8	-1,096.4	435	-95°	-86.6°
pos9	747.4	598.7	155°	-210°

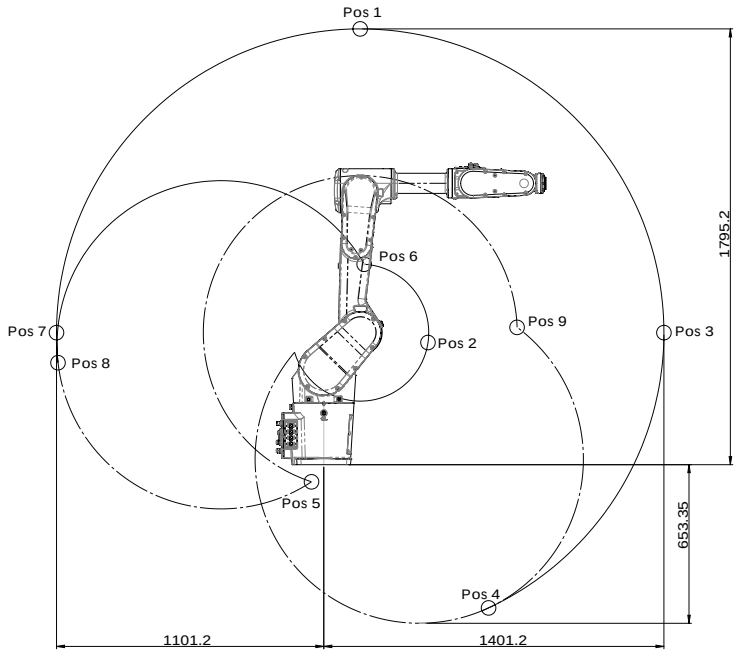
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2.4 Working range
Continued

Illustration, working range IRB 1300-12/1.4

This illustration shows the unrestricted working range of the robot.



xx1900001336

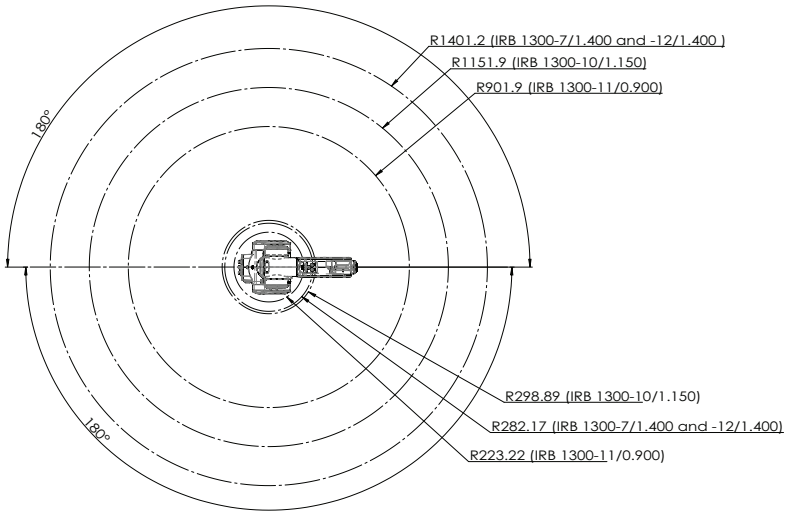
Positions at wrist center and angle of axes 2 and 3

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	825	1159	0°	0°
pos1	150	1,795.2	0°	-86.6°
pos2	429.2	503.2	0°	69°
pos3	1,401.2	544	90°	-86.6°
pos4	678.8	-590	155°	-86.6°
pos5	-2.9	-36.1	-95°	-210°
pos6	166.3	825.7	-95°	69°
pos7	-1,101.2	544	-90°	-86.6°
pos8	-1,096.4	435	-95°	-86.6°
pos9	747.4	598.7	155°	-210°

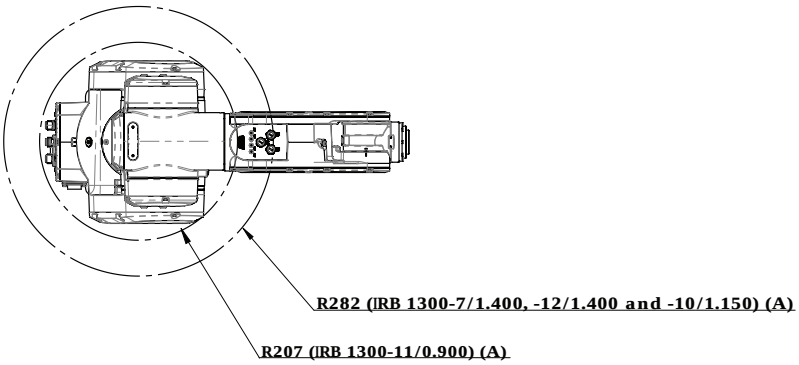
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Top view of working range



xx1900001341



xx1900001342

Working range

Axis	Working range	Note
Axis 1	±180°	Wall mounted robot has a work area for axis 1 that depends on payload and the positions of other axes. Simulation in RobotStudio is recommended.
Axis 2	**IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4** -95°/+155° **IRB 1300-11/0.9** -100°/+130°	
Axis 3	**IRB 1300-7/1.4 and IRB 1300-12/1.4** -210°/+69° **IRB 1300-10/1.15 and IRB 1300-11/0.9** -210°/+65°	
Axis 4	±230°	

Continues on next page

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2.4 Working range
Continued

Axis	Working range	Note
Axis 5	±130°	
Axis 6	±400°	Default value.
	±242	Maximum revolution value. The default working range for axis 6 can be extended by changing parameter values in the software.

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2.5 The unit is sensitive to ESD

Description

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

Safe handling

Use one of the following alternatives:

- Use a wrist strap.

  Wrist straps must be tested frequently to ensure that they are not damaged and are operating correctly.
- Use an ESD protective floor mat.

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

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

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3 Installation and commissioning

3.1 Introduction to installation and commissioning

General

This chapter contains assembly instructions and information for installing the IRB 1300 at the working site.

See also the product manual for the robot controller.

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

The technical data is detailed in section *Technical data on page 40*.

Safety information

Before any installation work is commenced, all safety information must be 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

Always connect the IRB 1300 and the robot to protective earth and residual current device (RCD) before connecting to power and starting any installation work.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C90XT Type A*
- *Product manual - OmniCore E10*
- *Product manual - OmniCore V250XT Type B*
- *Product manual - OmniCore V400XT*

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3.2 Unpacking

3.2.1 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 prerequisites for installation

	Action
1	If the robot is to be work in Clean Room environments, make sure that sufficient space is reserved for moving the robot in and out of the Clean Room working spaces.
2	Make a visual inspection of the packaging and make sure that nothing is damaged.
3	Remove the packaging.
4	Check for any visible transport damage. **Note** Stop unpacking and contact ABB if transport damages are found.
5	Clean the unit with a lint-free cloth, if necessary. Wipe away the protective transportation grease applied to the tool flange.
6	Make sure that the lifting accessory used (if required) is suitable to handle the weight of the robot as specified in: *Weight, robot on page 40*
7	If the robot is not installed directly, it must be stored as described in: *Storage conditions, robot on page 43*
8	Make sure that the expected operating environment of the robot conforms to the specifications as described in: *Operating conditions, robot on page 43*
9	Before taking the robot to its installation site, make sure that the site conforms to: • *Loads on foundation, robot on page 40* • *Protection classes, robot on page 43* • *Requirements, foundation on page 42*
10	Before moving the robot, please observe the stability of the robot: *Risk of tipping/stability on page 57*
11	When these prerequisites are met, the robot can be taken to its installation site as described in section: *On-site installation on page 62*
12	Install required equipment, if any.

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3.2.2 Risk of tipping/stability

Risk of tipping

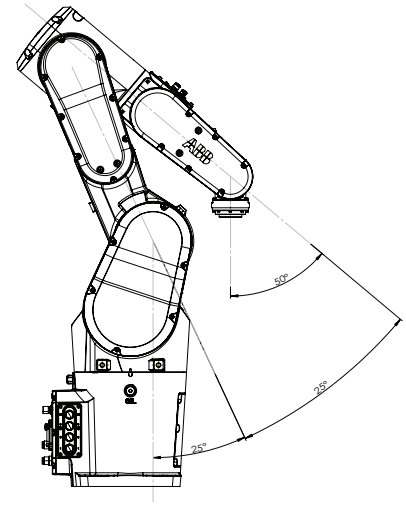
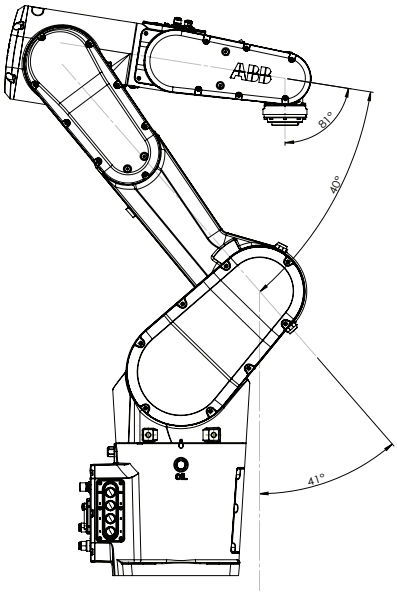
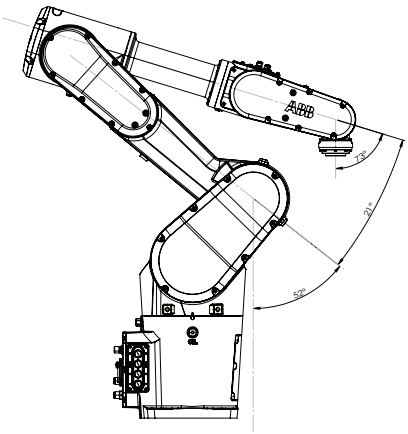
If the robot is not fastened to the foundation while moving the arm, the robot is not stable in the whole working area. Moving the arm will displace the center of gravity, which may cause the robot to tip over.

The transportation position is the most stable position.

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

Transportation position

This figure shows the robot in its transportation position.

IRB 1300-11/0.9	IRB 1300-10/1.15	IRB 1300-7/1.4 and IRB 1300-12/1.4
 xx1900001576	 xx1900001577	 xx1900001578

Axis number	Angle of axis		
	-11/0.9	-10/1.15	-7/1.4 and -12/1.4
1	0°	0°	0°
2	-25°	-41°	-52°
3	65°	50°	69°
4	0°	0°	0°
5	50°	81°	73°
6	0°	0°	0°

Note

The robot might be positioned in a different position at delivery, due to actual configurations and options (for example DressPack).

Continues on next page

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3.2.2 Risk of tipping/stability
Continued

Transportation bracket

At delivery, the robot is locked in the correct position with a transportation bracket for securing the position during shipping and transport. The bracket must be removed before conducting any service work.

How to use the transportation bracket is described further in *Transportation bracket on page 60*.

WARNING

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

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3.2.3 Extra O-rings

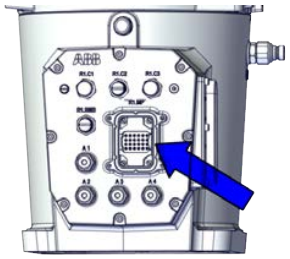
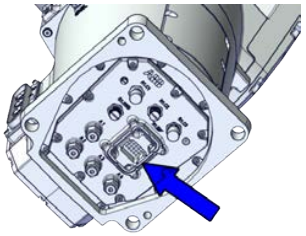
Installation of extra O-rings

For robots with protection class IP67 (option 3350-670)

For robots with protection type Clean Room (option 3351-4)

For robots with protection type Foundry Plus (option 3352-10)

An extra O-ring is delivered together with the robot and must be fitted to the robot during installation.

Equipment	Article number	Note
O-ring	3HAB3772-19	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used to seal between the main power cable and connector. Robots with manipulator cables routed from the rear of the base:  xx2000002338 Robots with manipulator cables routed from below (3309-1):  xx2000002339

Further information

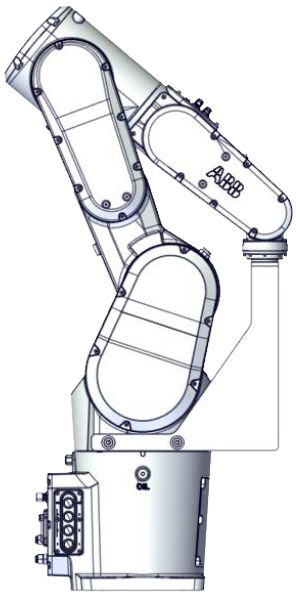
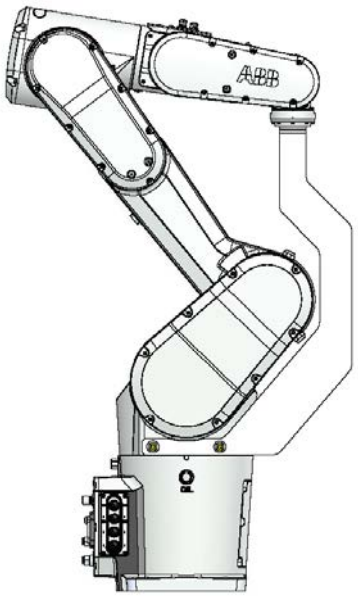
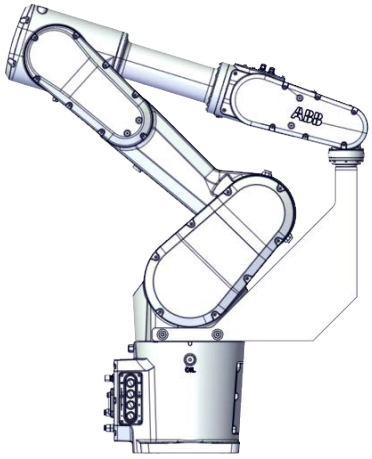
For installation information, see *On-site installation on page 62* and *Electrical connections on page 96*.

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3.2.4 Transportation bracket

Location of the transportation bracket

At delivery, the robot is locked in the correct position with a transportation bracket for securing the position during shipping and transport. The bracket must be removed before conducting any service work and must be refitted before shipping and transportation.

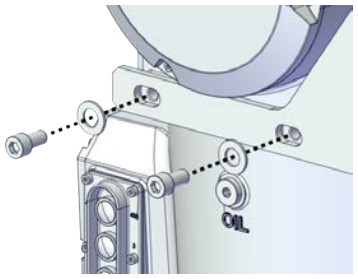
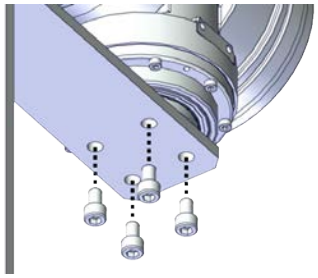
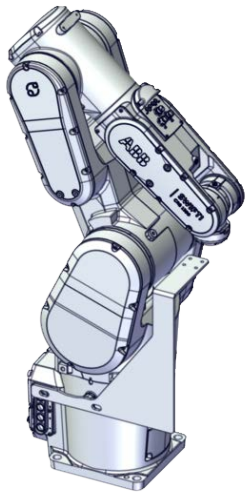
IRB 1300-11/0.9	IRB 1300-10/1.15	IRB 1300-7/1.4
 xx1900001526	 xx1900001527	 xx1900001528

Removing the transportation bracket

	Action	Note
1	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Continues on next page

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	Action	Note
2	Remove the screws and washers.	 xx1900001529  xx1900001530
3	Remove the bracket.	The transportation bracket of IRB 1300-11/0.9 is used as an example.  xx2200000980

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3.3 On-site installation

3.3.1 Lifting the robot

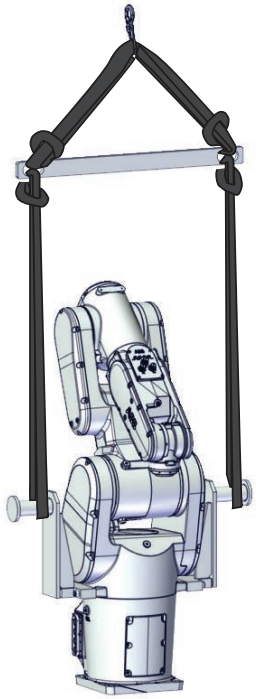
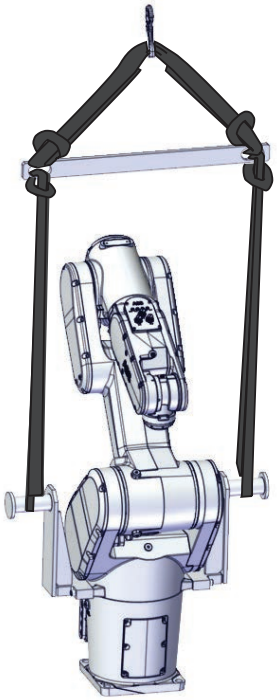
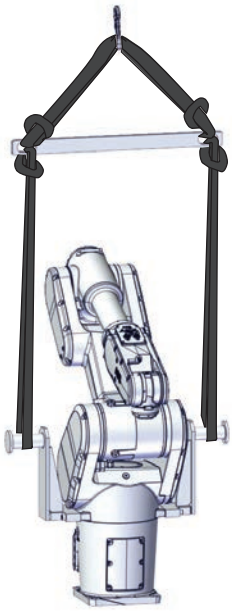
3.3.1.1 Lifting the robot with roundslings

Illustration - attaching the roundslings

Note

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

For details, see *Transportation bracket on page 60*.

IRB 1300-11/0.9	IRB 1300-10/1.15	IRB 1300-7/1.4 and IRB 1300-12/1.4
 xx1900001579	 xx1900001580	 xx1900001581

DANGER

Attempting to lift a robot in any other position than the recommended lifting position may result in the robot tipping over, causing severe damage or injury.

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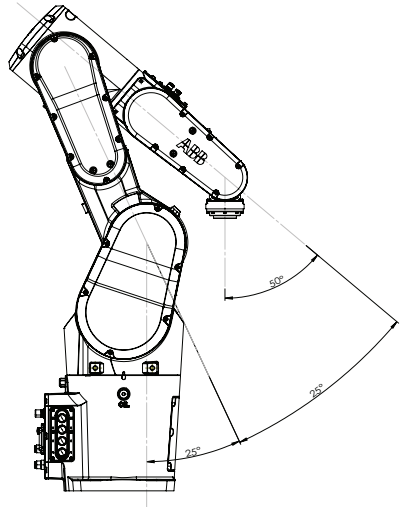
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Required tools and equipment

Equipment	Article number	Note
Overhead crane	-	
Roundsling, 0.8 m	-	Length: 0.8 m Lifting capacity: >70 kg
Roundsling, 1.7 m	-	Length: 1.7 m Lifting capacity: >70 kg
Lifting accessory, robot	3HAC077885-001	Includes lifting accessories, lifting beam and screws.

Lifting the robot with roundslings

Use this procedure to lift the robot with roundslings .

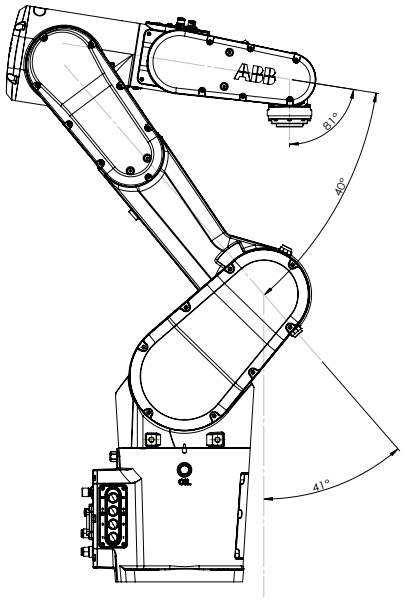
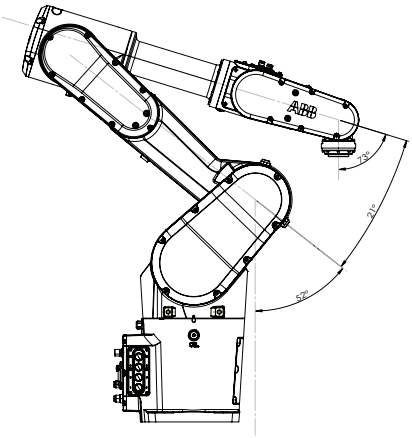
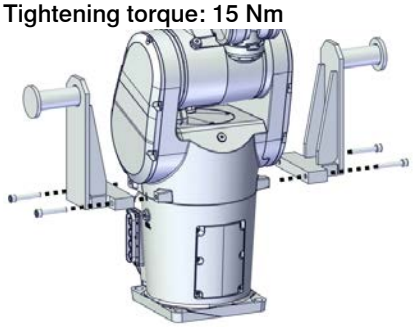
	Action	Note
1	**Valid for IRB 1300-11/0.9** Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -25° • Axis 3: 65° • Axis 4: 0° • Axis 5: 50° • Axis 6: 0° **WARNING** The robot is mechanically unstable if not secured to the foundation.	 xx1900001576

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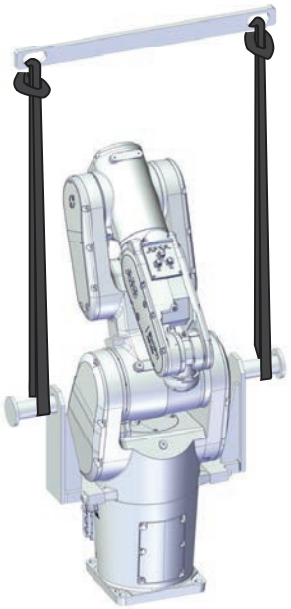
3.3.1.1 Lifting the robot with roundslings

Continued

	Action	Note
2	**Valid for IRB 1300-10/1.15** Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -41° • Axis 3: 50° • Axis 4: 0° • Axis 5: 81° • Axis 6: 0° **WARNING** The robot is mechanically unstable if not secured to the foundation.	 xx1900001577
3	**Valid for IRB 1300-7/1.4 and IRB 1300-12/1.4** Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -52° • Axis 3: 69° • Axis 4: 0° • Axis 5: 73° • Axis 6: 0° **WARNING** The robot is mechanically unstable if not secured to the foundation.	 xx1900001578
4	Fit the lifting tools to the robot. Use the enclosed screws.	Lifting accessory, robot: 3HAC077885-001 Tightening torque: 15 Nm  xx1900001594

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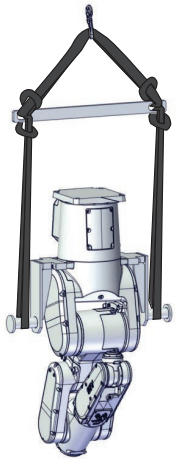
	Action	Note
5	Fit the roundslings to the lifting tools and attach them to the lifting beam.	Make sure the roundsling has free space and does not wear against any part of the robot. Roundsling, 1.7 m  xx2200000985
6	Fit the roundslings to the lifting beam and to the overhead crane.	Roundsling, 0.8 m  xx2200000981

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3.3.1.1 Lifting the robot with roundslings

Continued

	Action	Note
7	**CAUTION** The weight of the IRB 1300 robot is IRB 1300-11/0.9: 75 kg IRB 1300-10/1.15: 77 kg IRB 1300-7/1.4: 79 kg IRB 1300-12/1.4: 79 kg All lifting accessories used must be sized accordingly.	
8	**WARNING** Personnel must not, under any circumstances, be present under the suspended load.	
9	Raise the overhead crane to lift the robot.	
10	If the manipulator should be mounted on a wall, or in an suspended position the manipulator can now be tilted slowly by hand.	 xx1900001596

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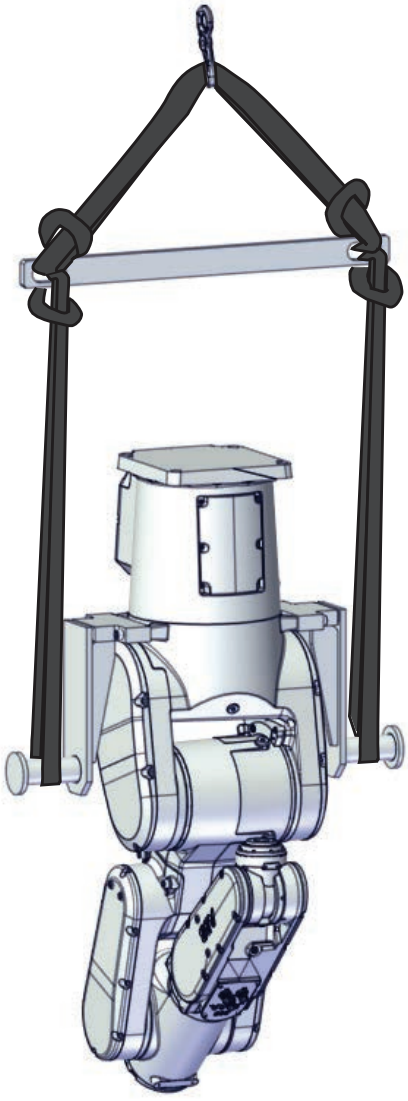
3.3.1.2 Lifting and rotating a suspended mounted manipulator

Introduction

How to lift and turn the robot to a suspended position using the turning accessory is described in the lifting instruction delivered with the lifting accessory. Article numbers for the accessory and the instruction is specified in *Special tools on page 818*. Any additional equipment required is specified in the instruction for the lifting accessory. Contact ABB for more information.

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

Illustration



xx1900001596

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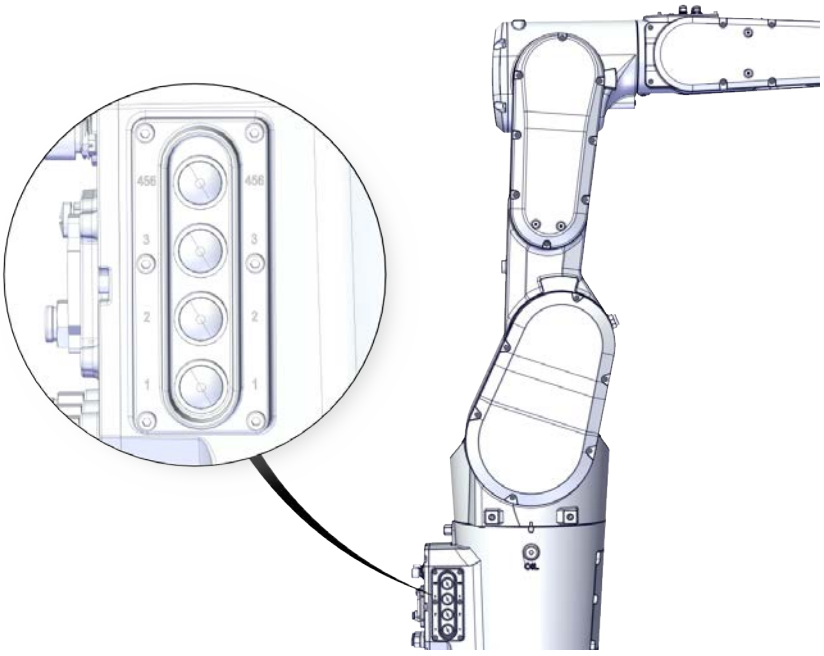
3.3.2 Manually releasing the brakes

Introduction to manually releasing the brakes

This section describes how to release the holding brakes for the axes motors.

Location of the brake release unit

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



xx1900001653

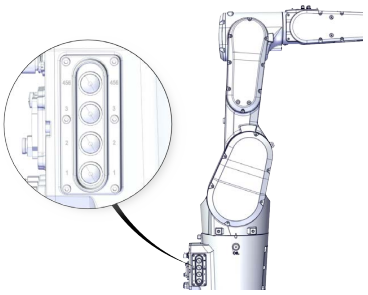
Releasing the brakes

This procedure describes how to release the holding brakes when the robot is equipped with a brake release unit.

	Action	Note
1	**Note** 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 69*.	
2	**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.	

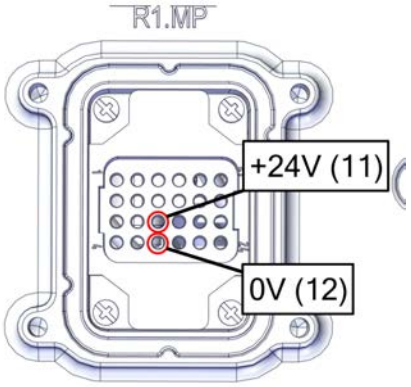
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	Action	Note
3	The brake is enabled when the button is released.	 xx1900001653

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 and instantly!	
2	Supply • 0V on pin 12. • 24V on pin 11. **Note** Do not interchange the 24V and 0V pins. If they are mixed up, damage can be caused to internal electrical components.	 xx1900001654
3	Use the brake releasing button as described in *Releasing the brakes on page 68*.	

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3.3.3 Orienting and securing the robot

General

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

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	M16x50
Quantity	4 pcs
Quality	8.8
Suitable washer	17 x 30 x 3, steel hardness class 200HV
Guide pins	2 pcs, D10x30, ISO 2338 - 10m6x30 - A1
Tightening torque	150 Nm±10 Nm
Length of thread engagement	Minimum 19 mm for ground with material yield strength 150 MPa
Level surface requirements	0.1/500 mm [i]

[i] See *Requirements, foundation on page 42*.

Installation of extra O-rings

For robots with protection class IP67 (option 3350-670)

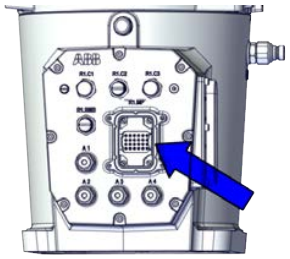
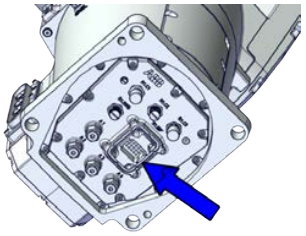
For robots with protection type Clean Room (option 3351-4)

For robots with protection type Foundry Plus (option 3352-10)

Continues on next page

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An extra O-ring is delivered together with the robot and must be fitted to the robot during installation.

Equipment	Article number	Note
O-ring	3HAB3772-19	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used to seal between the main power cable and connector. Robots with manipulator cables routed from the rear of the base:  xx2000002338 Robots with manipulator cables routed from below (3309-1):  xx2000002339

Securing a floor mounted robot

Use this procedure to orient and secure the robot floor mounted.

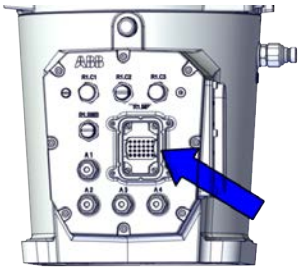
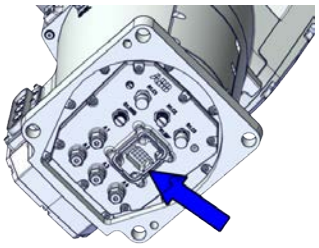
	Action	Note
1	Make sure the installation site for the robot conforms to the specifications in section *Technical data on page 40*.	
2	Prepare the installation site with attachment holes The foundation surface must be clean and unpainted.	The hole configuration of the base is shown in the figure in *Hole configuration, base on page 73*.
3	**CAUTION** The weight of the IRB 1300 robot is IRB 1300-11/0.9: 75 kg IRB 1300-10/1.15: 77 kg IRB 1300-7/1.4: 79 kg IRB 1300-12/1.4: 79 kg All lifting accessories used must be sized accordingly.	

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3.3.3 Orienting and securing the robot

Continued

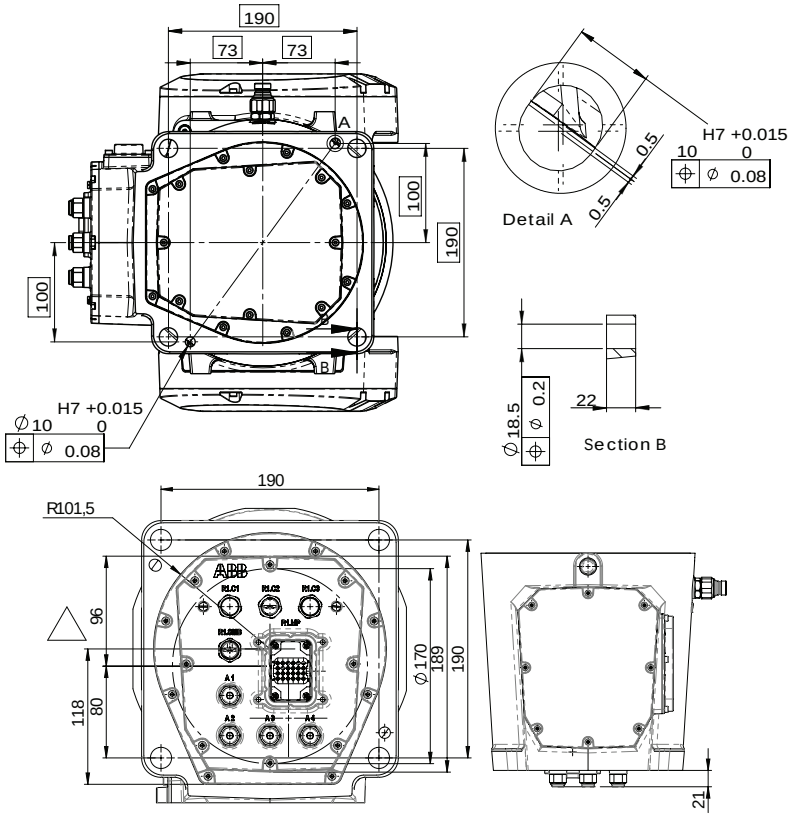
	Action	Note
4	**CAUTION** When the robot is put down after being lifted or transported, there is a risk of it tipping, if not properly secured.	
5	Lift the robot.	See *Lifting the robot on page 62*.
6	Guide the robot gently, using the attachment screws while lowering it into its mounting position.	Make sure the robot base is correctly fitted onto the pins.
7	Fit the securing screws and washers in the attachment holes of the base.	Screws: M16x50, 4 pcs, quality 8.8 Washers: 17 x 30 x 3, steel hardness class 200HV
8	Tighten the bolts in a crosswise pattern to ensure that the base is not distorted.	Tightening torque: 150 Nm±10 Nm
9	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Fit the O-ring 3HAB3772-19 to the main power connector on the robot base.	Robots with manipulator cables routed from the rear of the base:  xx2000002338 Robots with manipulator cables routed from below (3309-1):  xx2000002339

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Hole configuration, base

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



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3.3.4 Setting the system parameters for an inverted or a tilted robot

General

The robot is configured for mounting parallel to the floor, without tilting, on delivery. If the robot is mounted in any other angle than 0°, then the system parameters that describe the mounting angle (how the robot is oriented relative to the gravity) must be re-defined.

Note

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

Note

The mounting positions are described in *Mounting positions on page 40*, and the requirements on the foundation are described in *Requirements, foundation on page 42*.

System parameters

Note

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

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

Gravity Beta

When the robot is mounted other than floor-standing (rotated around the y-axis), the robot base frame and the system parameter *Gravity Beta* must be redefined.

If the robot is mounted upside down (inverted), then *Gravity Beta* should be π (+3.141593).

If the robot is mounted on a wall, then *Gravity Beta* should be ±π/2 (±1.570796).

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

Gravity Alpha

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

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

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Note

The system parameter *Gravity Alpha* is not supported for all robot types.

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

Note

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

Gamma Rotation

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

Mounting angles and values

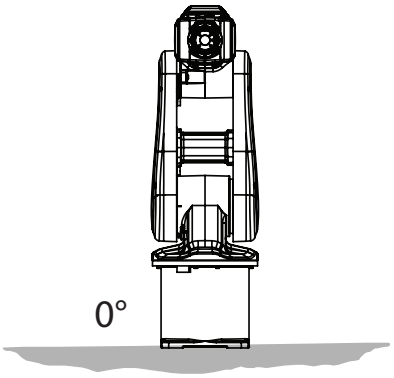
The parameter *Gravity Beta* (or *Gravity Alpha*) specifies the mounting angle of the robot in radians. It is calculated in the following way.

`Gravity Beta = A° x 3.141593/180 = B radians`, where `A` is the mounting angle in degrees and `B` is the mounting angle in radians.

Example of position	Mounting angle (A°)	Gravity Beta
Floor mounted	0°	0.000000 (Default)
Wall mounted	90°	1.570796
Inverted mounting	180°	3.141593

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

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

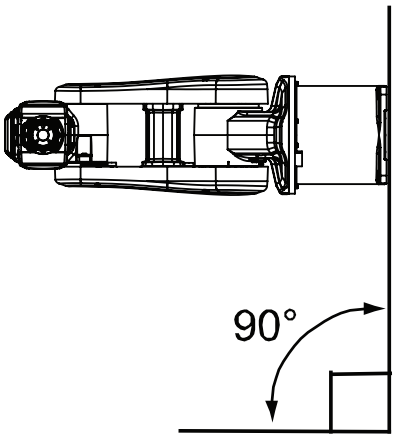


xx2100000297

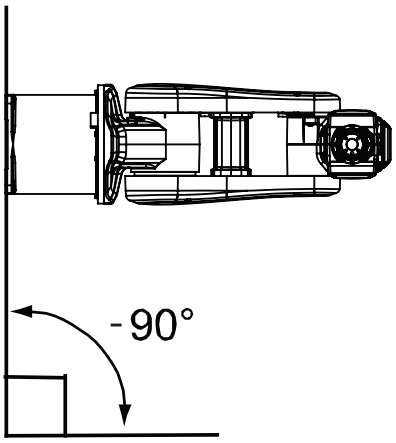
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3.3.4 Setting the system parameters for an inverted or a tilted robot
Continued



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Mounting angle	Gravity Alpha
0° (Floor mounted)	0
90° (Wall)	1.570796
-90° (Wall)	-1.570796

Note

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

Limitations in working area

If mounting the robot on a wall, the working range of axis 1 is limited. These limitations are specified in the table *Working range on page 51*.

Defining the system parameters in RobotWare

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

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

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

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3.3.5 Loads fitted to the robot, stopping time and braking distances

Define loads carefully

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.

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

Stopping time and braking distances

The performance of the motor brake depends on if there are any loads attached to the robot.

See the product specification for the robot, listed in *References on page 10*.

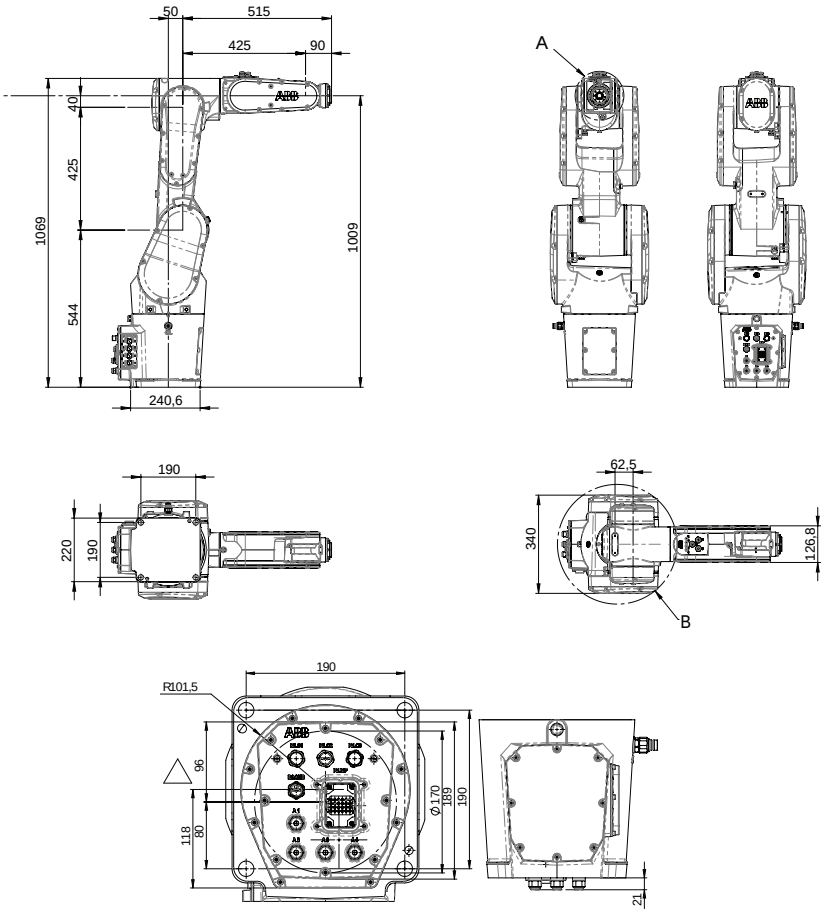
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3.3.6 Fitting equipment on the robot (robot dimensions)

Robot dimensions

The figure shows the dimension of the robot.

Main dimensions of IRB 1300-11/0.9



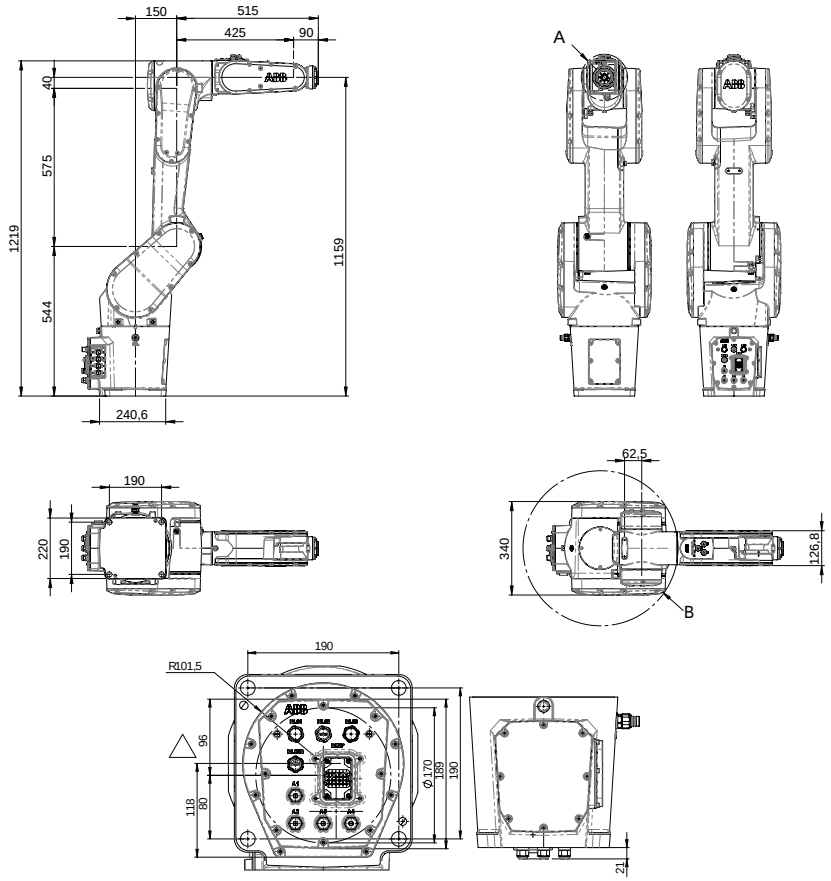
xx1900001331

Pos	Description
A	Turning radius: R84
B	Turning radius: R207

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Main dimensions of IRB 1300-10/1.15



xx1900001332

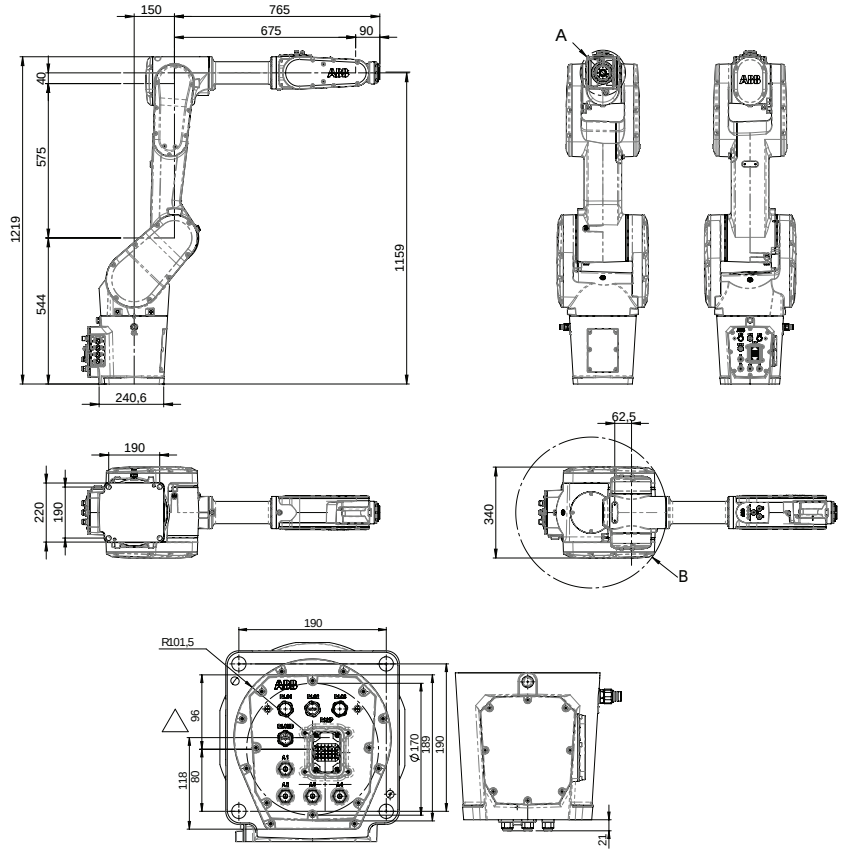
Pos	Description
A	Turning radius: R84
B	Turning radius: R282

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3.3.6 Fitting equipment on the robot (robot dimensions)
Continued

Main dimensions of IRB 1300-7/1.4 and IRB 1300-12/1.4



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Pos	Description
A	Turning radius: R84
B	Turning radius: R282

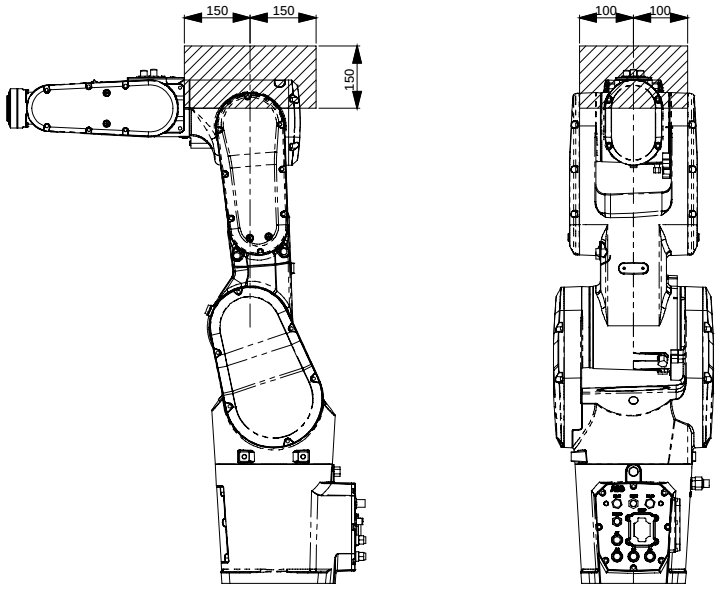
Attachment holes and dimensions

Extra loads can be mounted on robot. Definitions of dimensions and masses are shown in the following figures. The robot is supplied with holes for fitting extra equipment.

Maximum allowed arm load depends on center of gravity of arm load and robot payload.

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Variant	Max. armload (kg)
IRB 1300-11/0.9	1
IRB 1300-10/1.15	0.5
IRB 1300-7/1.4	0.5
IRB 1300-12/1.4	0.5

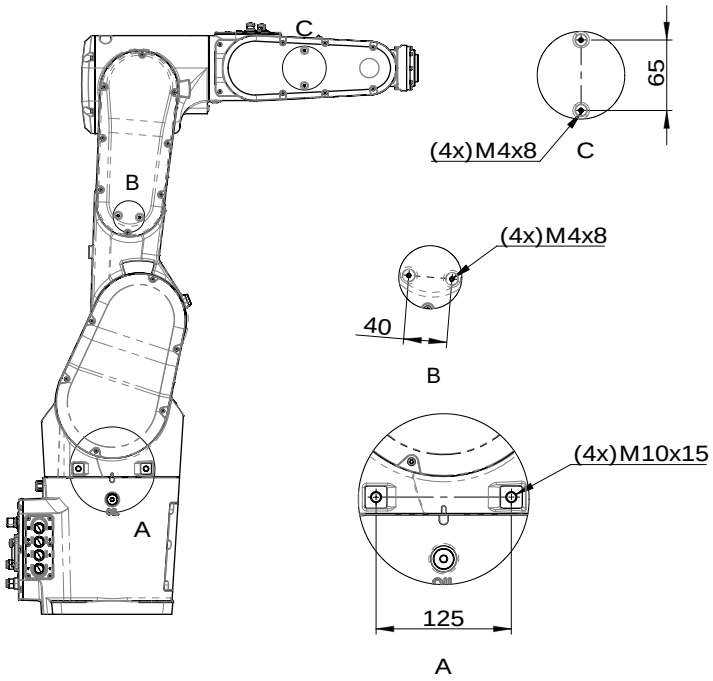
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3.3.6 Fitting equipment on the robot (robot dimensions)
Continued

Holes for fitting extra equipment

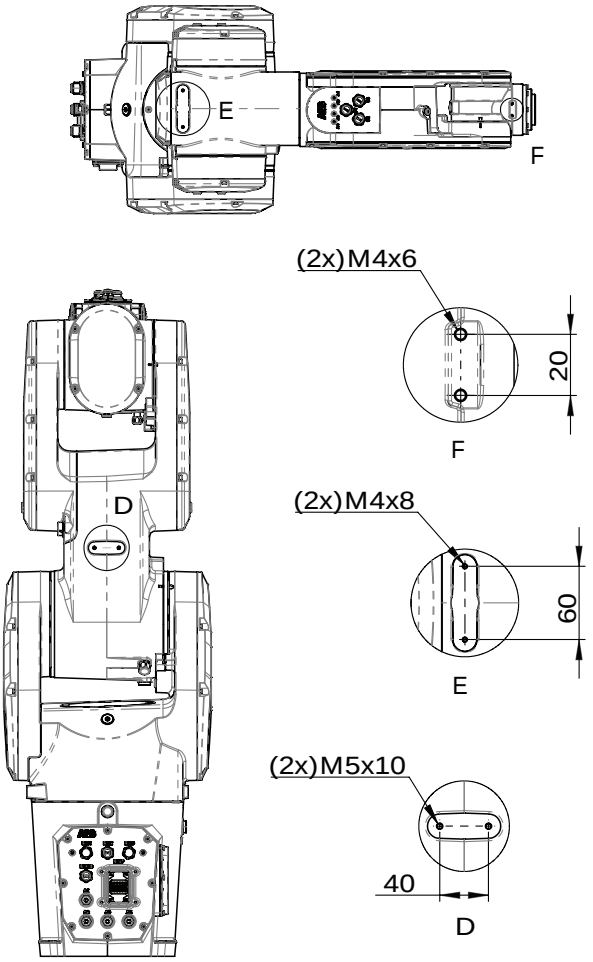
The robot is supplied with holes for fitting extra equipment, as shown in the following figures.



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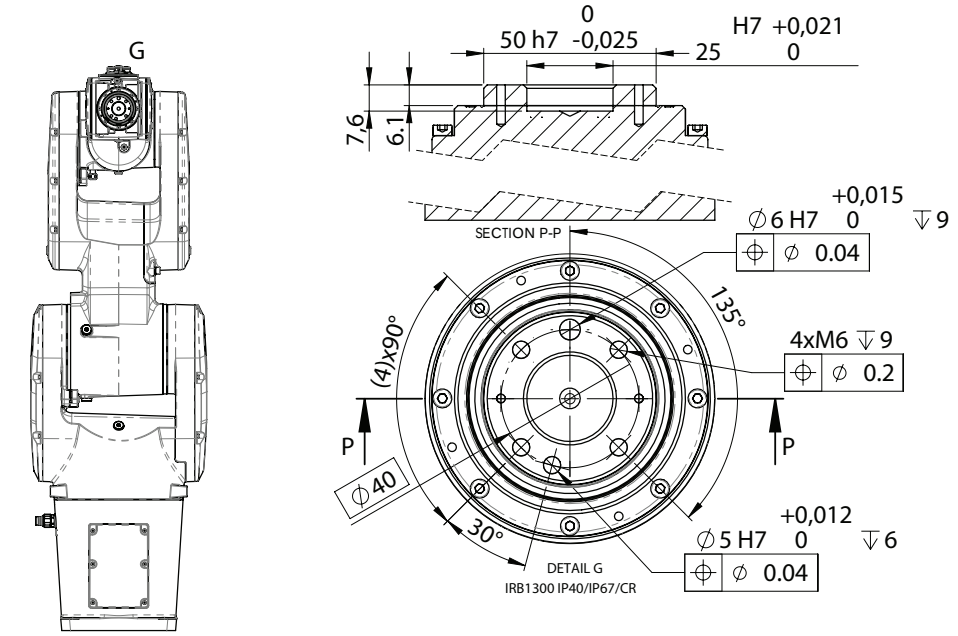
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3.3.6 Fitting equipment on the robot (robot dimensions)

Continued

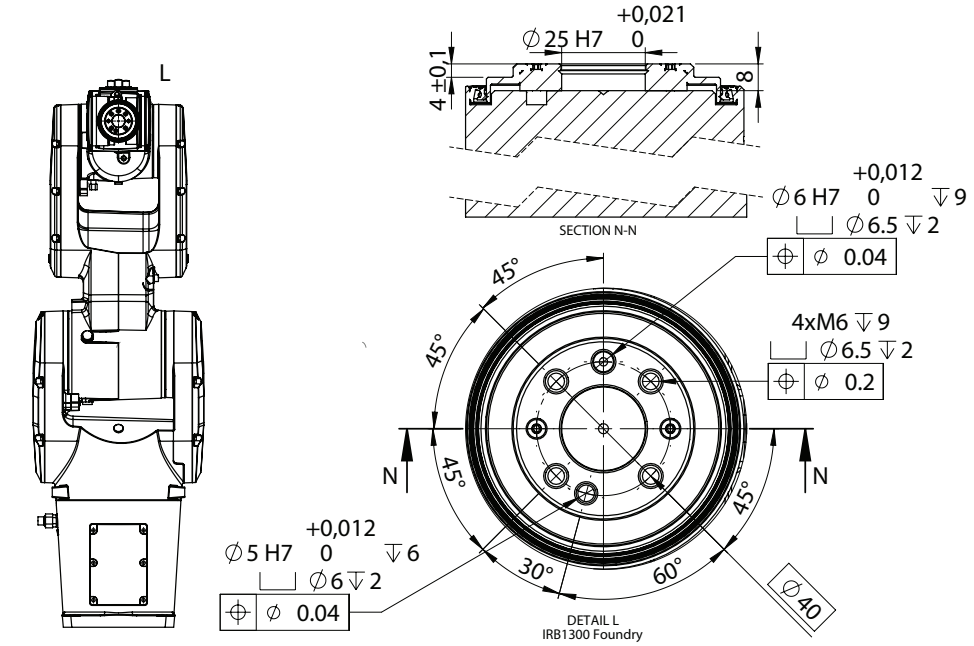
Tool flange standard

For robots with protection classes IP40 and IP67, and with protection type Clean Room



xx1900001340

For robots with protection type Foundry Plus



xx2100000705

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Fastener quality

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

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3.3.7 Installation of signal lamp (option)

Description

A signal lamp with a yellow fixed light can be mounted in the cell or any other visible location, and driven by I/O signal or MON_LAMP signal from the controller.

Function

The lamp is active in MOTORS ON mode.

Installation of signal lamp from I/O signal

	Action
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.
2	**For robots with OmniCore C line** **For robots with OmniCore V line** Connect the lamp cable connector to the local I/O connector on the controller. **Note** The local I/O connectors provides 16 digital output signals for use.
3	**For robots with OmniCore E line** Connect the lamp cable connector to the I/O connector on the controller. **Note** The I/O connector provides 8 digital output signals for use.
4	Configure the lamp by adding a *System Output* type signal with status set to *Motors On State*.
5	The lamp is now ready for use and is lit in MOTORS ON mode.

Installation of signal lamp from MON_LAMP signal

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

Continues on next page

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	Action
2	**For robots with OmniCore C line** **For robots with OmniCore V line** Connect the lamp cable connector to the X15 connector on the controller. **Note** The X15 connector provides MON_LAMP output signals for use. For more details, see chapter *Descriptions for connectors* in OmniCore product manuals.
3	**For robots with OmniCore E line** Connect the lamp cable connector to the MON connector on the controller. **Note** The MON connector provides MON_LAMP output signals for use. For more details, see chapter *Descriptions for connectors* in OmniCore product manuals.
4	The lamp is now ready for use and is lit 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.

Further information about how to set up I/O system may be found in *Technical reference manual - System parameters*.

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3.4 Restricting the working range

3.4.1 Adjusting the working range

Reasons for adjusting the manipulator working range

The working range of each manipulator axis is configured in the software. If there is a risk that the manipulator may collide with other objects at installation site, its working space should be limited. The manipulator must always be able to move freely within its entire working space.

OmniCore robots with RobotWare 7.19 or later can use safe supervision of the working range limitations instead of mechanical stops. This requires the option *SafeMove Standard+*. See *Safe supervision of working range limitations on page 89*.

Working range configurations

The parameter values for the axes working range can be altered within the allowed working range and according to available options for the robot, either to limit or to extend a default working range. Allowed working ranges and available options for each manipulator axis are specified in *Working range on page 51*.

Mechanical stops on the manipulator

Mechanical stops are and can be installed on the manipulator as limiting devices to ensure that the manipulator axis does not exceed the working range values set in the software parameters.

Note

The mechanical stops are only installed as safety precaution to physically stop the robot from exceeding the working range set. A collision with a mechanical stop always requires actions for repair and troubleshooting.

Axis	Fixed mechanical stop[i]	Movable mechanical stop[ii]
Axis 1	yes	no
Axis 2	yes	no
Axis 3	yes	no
Axis 4	yes	no
Axis 5	yes	no
Axis 6	no	no

i Part of the casting or fixed on the casting and can not /should not be removed.

ii Can be installed in one or more than one position, to ensure a reduced working range, or be removed to allow extended working range.

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3.4.2 Safe supervision of working range limitations

About safe supervision of working range limitations

OmniCore robots with RobotWare 7.19 or later can use safe supervision of the working range limitations instead of mechanical stops. This requires the option *SafeMove Standard+*. The safe supervision can be set on axes 1-3. For robots with either of the MultiMove or additional axis options, all axes can be supervised.

The supervision is configured in Visual SafeMove. More details about Visual SafeMove are available in *Application manual - Functional safety and SafeMove*.

Note

If the robot has SafeMove Premium, then there are more configuration possibilities for the safe ranges and the safe axis positions, see *Application manual - Functional safety and SafeMove*.

Configure the safe axis range

With the option SafeMove Standard+, only one safe range can be configured.

DANGER

When setting range limits, brake distances must be taken into consideration, so that the SafeMove functions are configured with enough margin. If an axis hits the range limit, the robot starts to brake and needs the brake distance to stop. This occurs outside the allowed range.

Note that if the robot starts accelerating strongly just before reaching a configured range limit, there will occur a speed overshoot before decelerating. This may result in a somewhat increased speed and extended braking distance compared to a smoother speed situation.

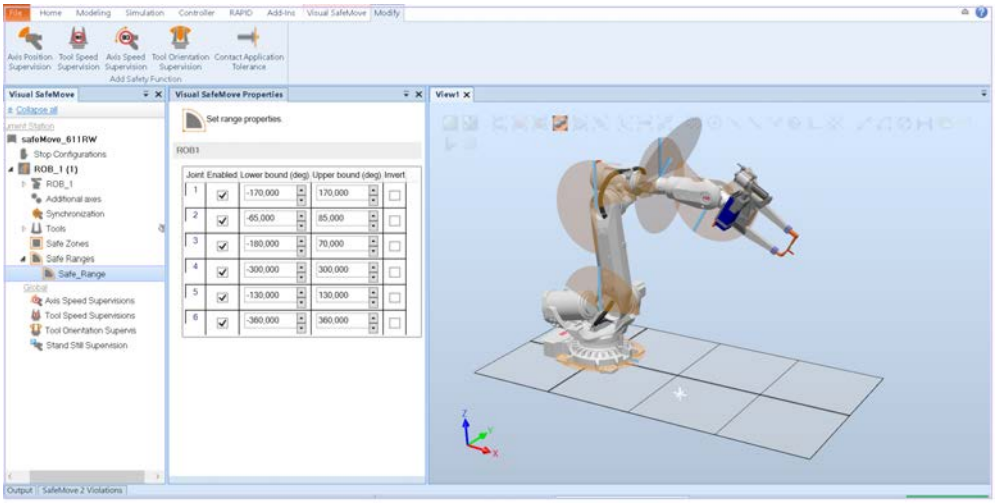
	Action	Note/illustration
1	In the **Visual SafeMove** ribbon, click on **Safe Range**.	A range of default size is shown for each axis in the graphics window.
2	Specify **Upper bound** and **Lower bound** for each axis.	Brake distances must be taken into consideration.
3	If an axis should be excluded from the safe range, clear the checkbox **Enabled** for that axis.	
4	To supervise the inverted range for an axis (below **Lower bound** and above **Upper bound**) select the checkbox **Inverted** for that axis.	

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3.4.2 Safe supervision of working range limitations

Continued



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Tip

To change the name of a range, right-click on the range in the **Visual SafeMove** browser, select **Rename** and type the desired name.

Configure the safe axis position

	Action	Note/illustration
1	To configure the safe axis position, right-click the safe range and select **Axis Position Supervision**. **Note** If the robot has either of the MultiMove or additional axis options, then more configuration options are available.	
2	For SafeMove Standard+, the supervision function is permanently active.	
3	In the **Violation action** part, configure the stop category. Select if violation of the function should stop the robot with stop category 0, stop category 1, or not stop the robot.	For SCARA robot axes without brakes, stop category 1 shall be used.[i]

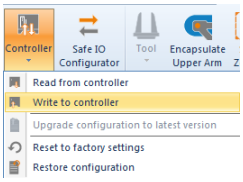
i See the product specification for the respective manipulator.

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Concluding procedure

The concluding procedure requires that the logged in user has the grant **Safety Services**.

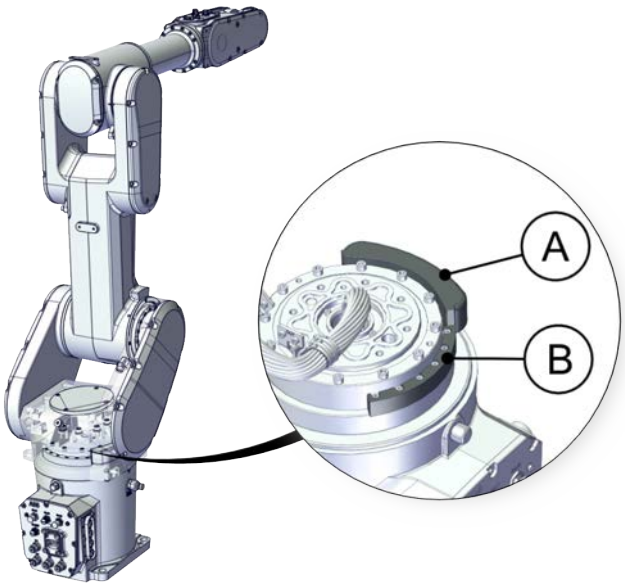
	Action	Note/illustration
1	In the **Visual SafeMove** ribbon, click on **Controller** and then select **Write to controller**.	 xx1500000801
2	A report of the safety configuration is shown. The report can be printed by clicking on **Print** (it is recommended to print the report since it should be used when validating the configuration). Click OK to close the report.	
3	Answer **Yes** when asked if you want to restart the controller.	After the restart, the downloaded configuration is active. Before running in auto mode, the configuration should be validated and locked.
4	Deactivate any supervision functions that are signal activated.	
5	Move the robot beyond the working range limit, for example with a move instruction.	The robot will stop when it reaches the limit.
6	Validate the checksum to verify that the right configuration is used. Lock the configuration.	

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3.4.3 Mechanically restricting the working range

Location of mechanical stops

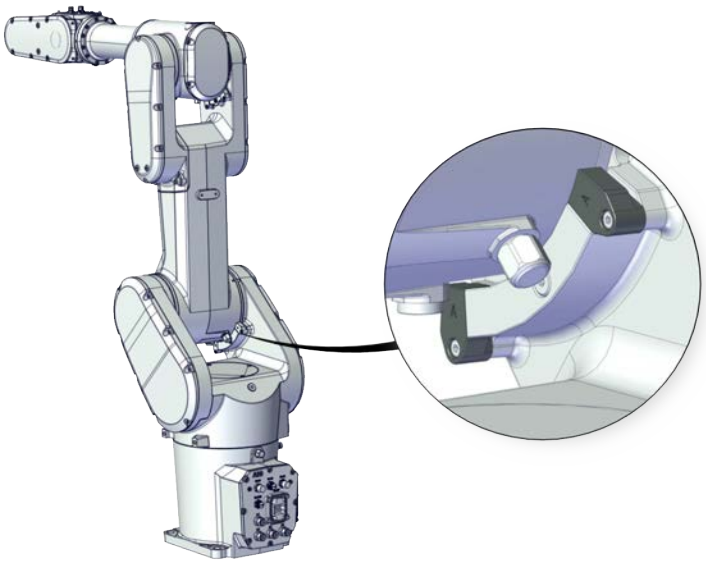
Axis 1



xx2000000406

A	Mechanical stop, axis 1, slider
B	Mechanical stop, axis 1, fixed block

Axis 2

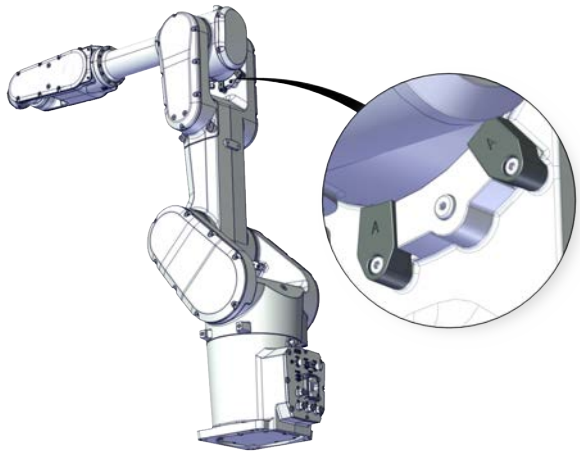
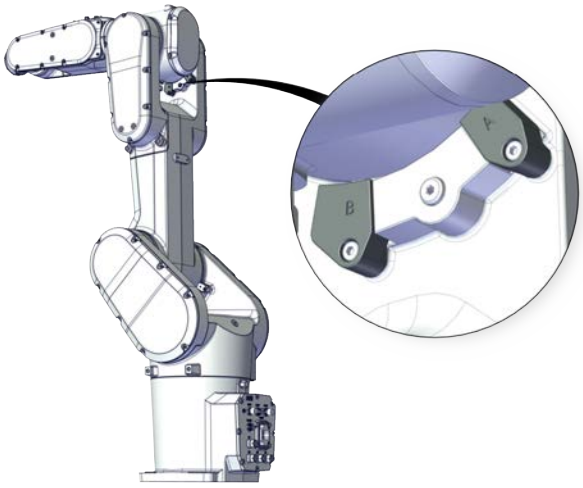


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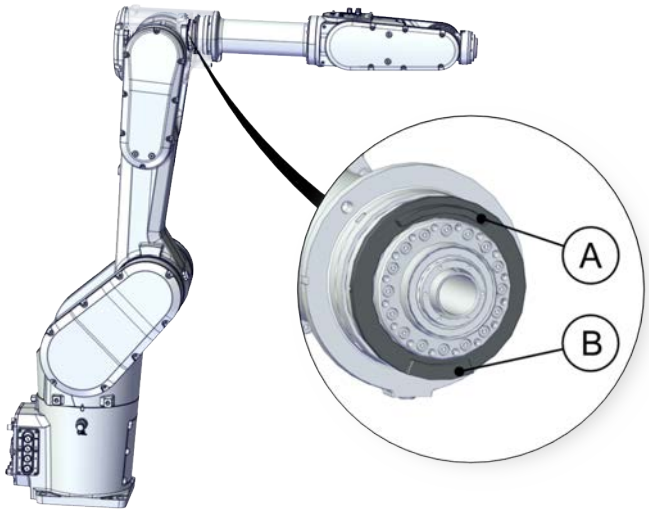
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Axis 3

IRB 1300-11/0.9, IRB 1300-7/1.4 and IRB 1300-12/1.4	IRB 1300-10/1.15
 xx2000000408	 xx2000000471

Axis 4



xx2000000409

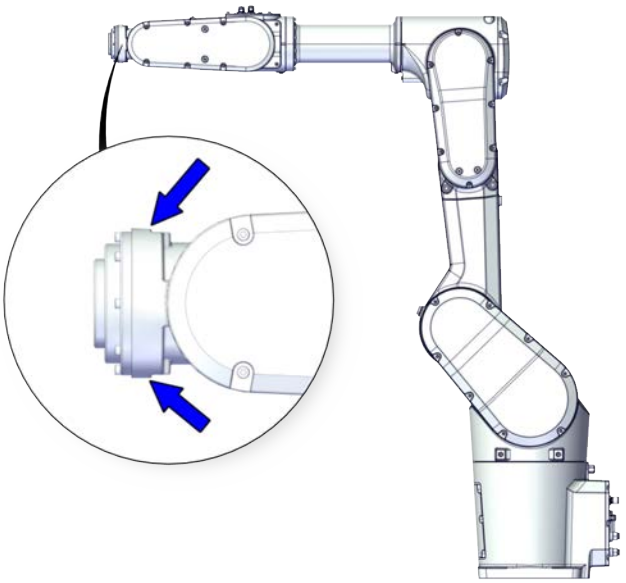
A	Mechanical stop, axis 4, flange
B	Mechanical stop, axis 4, slider

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3.4.3 Mechanically restricting the working range
Continued

Axis 5



xx2000002181

Installation of mechanical stops

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

- *Replacing the axis-1 mechanical stops on page 317*
- *Replacing the axis-2 mechanical stops on page 319*
- *Replacing the axis-3 mechanical stops on page 529*
- *Replacing the axis-4 mechanical stops on page 532*

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3.5 Making robot ready for operation

3.5.1 Additional installation procedure, Clean Room

General

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

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

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

Clean Room class 4

According to **IPA test result**, the robot IRB 1300 is suitable for use in Clean Room environment.

Classification of airborne molecular contamination

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

Preparations before commissioning a Clean Room robot

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

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

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3.6 Electrical connections

3.6.1 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.

DANGER

Turn off the main power before connecting any cables.

CAUTION

Verify that the serial number is according to the number(s) in the *Declaration of Incorporation* (DoI).

Main cable categories

The following table specifies cabling categories between the robot and the controller. Some of the cabling belong to optional applications.

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. Specified in the table *Robot cables on page 96*.
Customer cables	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. The customer cables also include the air hose. See the product manual for the controller, see document number in *References on page 10*.
Air hoses	The hose for compressed air is integrated with the manipulator cable harness.

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 cables, power	Transfers drive power from the drive units in the control cabinet to the robot motors.	X1	R1.MP
Robot cable, signals	Transfers resolver data from and power supply to the serial measurement board.	X2	R1.SMB

Continues on next page

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Robot cable, power

Power cable length	Article number
Power cable, straight connector, 3 m	3HAC077245-001
Power cable, straight connector, 7 m	3HAC077245-002
Power cable, straight connector, 15 m	3HAC077245-003
Power cable, straight connector, 22 m [i]	3HAC077245-006
Power cable, straight connector, 30 m [i]	3HAC077245-007
Power cable, angled connector, 3 m	3HAC077247-001
Power cable, angled connector, 7 m	3HAC077247-002
Power cable, angled connector, 15 m	3HAC077247-003
Power cable, angled connector, 22 m [i]	3HAC077247-005
Power cable, angled connector, 30 m [i]	3HAC077247-006

i Cable lengths 22m and 30m work only with OmniCore V line controllers.

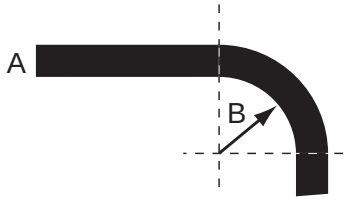
Robot cable, signals

Signal cable length	Article number
Signal cable, shielded: 3 m	3HAC084767-001
Signal cable, shielded: 7 m	3HAC084767-002
Signal cable, shielded: 15 m	3HAC084767-003
Signal cable, shielded: 22 m [i]	3HAC084767-005
Signal cable, shielded: 30 m [i]	3HAC084767-004

i Cable lengths 22m and 30m work only with OmniCore V line controllers.

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

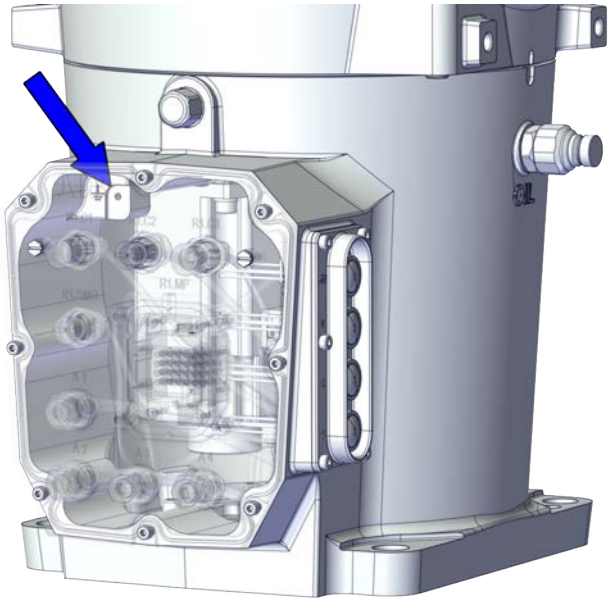
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3.6.1 Robot cabling and connection points
Continued

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.



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Installation of extra O-rings

For robots with protection class IP67 (option 3350-670)

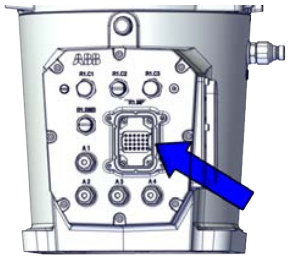
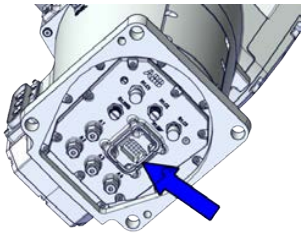
For robots with protection type Clean Room (option 3351-4)

For robots with protection type Foundry Plus (option 3352-10)

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An extra O-ring is delivered together with the robot and must be fitted to the robot during installation.

Equipment	Article number	Note
O-ring	3HAB3772-19	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used to seal between the main power cable and connector. Robots with manipulator cables routed from the rear of the base:  xx2000002338 Robots with manipulator cables routed from below (3309-1):  xx2000002339

Customer cables - CP/CS cable

CP/CS cable length	Article number [i]
3 m	3HAC067449-001
7 m	3HAC067449-002
15 m	3HAC067449-003
22 m [ii]	3HAC067449-005
30 m [ii]	3HAC067449-006

i It is recommended to always use the CP/CS cable provided by ABB. If users still require to do wiring by their own, make sure to use R1.C1 connector in M12 A-code 12p female type. It is the responsibility of the users to guarantee the safety of the system when self-prepared cables and connectors are used.

ii Cable lengths 22m and 30m work only with OmniCore V line controllers.

Customer cables - Ethernet floor cable

Ethernet floor cable length	Article number [i]
7 m	3HAC067447-002
15 m	3HAC067447-003
22 m [ii]	3HAC067447-005

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3.6.1 Robot cabling and connection points

Continued

Ethernet floor cable length	Article number[i]
30 m[ii]	3HAC067447-006

i It is recommended to always use the Ethernet floor cable provided by ABB. If users still require to do wiring by their own, make sure to use R1.C2 connector in M12 X-code male type. It is the responsibility of the users to guarantee the safety of the system when self-prepared cables and connectors are used.

ii Cable lengths 22m and 30m work only with OmniCore V line controllers.

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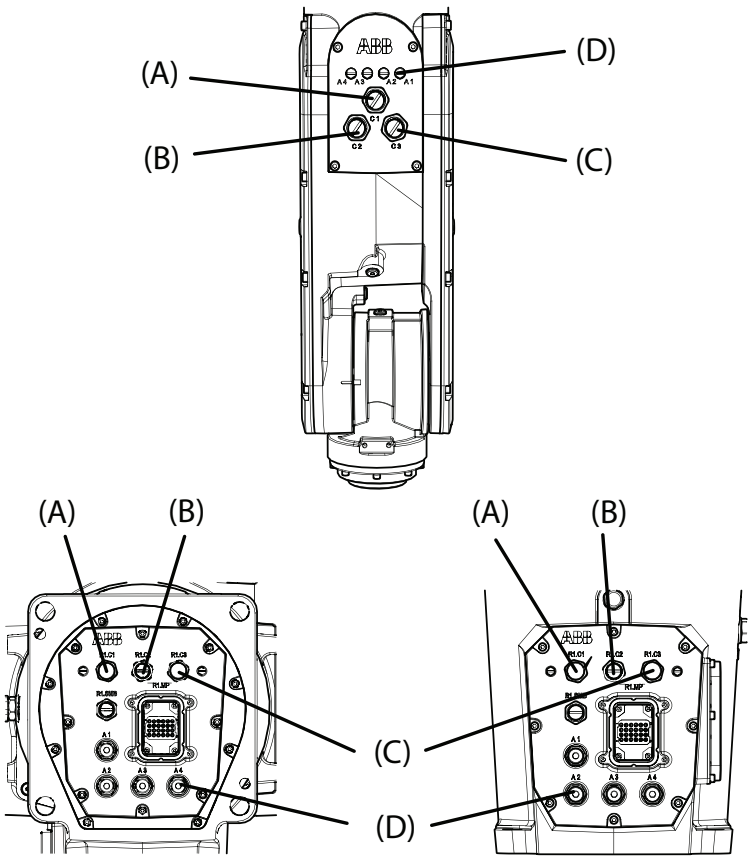
3.6.2 Customer connections

Introduction to customer connections (without solenoid valve)

The cables for customer connection are integrated in the robot and the connectors are placed on the tubular and at the base. There are two connectors R2.C1 and R2.C3 at the tubular. Corresponding connectors R1.C1 and R1.C3 are located at the base.

There is also connections for Ethernet, one connector R2.C2 at the tubular and the corresponding connector R1.C2 located at the base.

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



xx2000001007

Position	Connection	Description	Number	Value
A	(R1)R2.C1	Customer power/signal	12 wires	30 V, 1.5 A
B	(R1)R2.C2	Customer power/signal or Ethernet	8 wires	30 V, 1 A or 1 Gbits/s
C	(R1)R2.C3	Customer power/signal	4 wires	42 V DC or 25 V AC, 4 A[i]
D	Air	Max. 6 bar	4	Outer diameter of air hose: 6 mm

[i] Contact ABB for more information if to use the (R1)R2.C3 connection for an application with a higher voltage.

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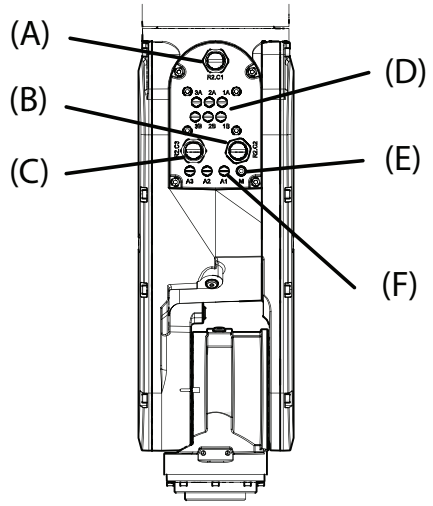
3.6.2 Customer connections
Continued

Introduction to customer connections (with solenoid valve)

IRB 1300 with option 3303-3 Solenoid Valves Ext. selected also provides customer connection and Ethernet connection. There are two connectors R2.C1 and R2.C3 at the tubular and corresponding connectors R1.C1 and R1.C3 are located at the base. Connector R2.C2 for Ethernet connection is located at the tubular and the corresponding connector R1.C2 is located at the base.

Hose for compressed air is also integrated into the manipulator. There are 3 inlets at the base (R1/8”) and 3 outlets (M5) on the tubular.

IRB 1300 with option 3303-3 Solenoid Valves Ext. selected is also integrated with 1 air inlet for valve at the base and 3 pairs of outlets from valve on the tubular. There is also a silencer on the tubular.



xx2300001443

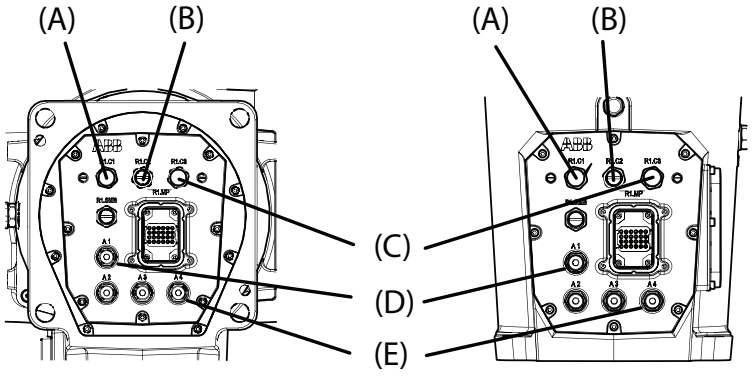
Position	Connection	Description	Number	Value
A	R2.C1	Customer power/signal	5 wires [1]	30 V, 1.5 A
B	R2.C2	Customer power/signal or Ethernet	8 wires	30 V, 1 A, or 1 Gbits/s
C	R2.C3	Customer power/signal	4 wires	42 V DC or 25 V AC, 4 A [i]
D	1A(B) / 2A(B) / 3A(B)	Air from solenoid valve	3 pairs	Max. 6 bar Outer diameter of air hose: 4 mm Air cleanness requirement: 5 µm or less, dry and clean - base
E	M	Silencer for solenoid valve	1	
F	A1 / A2 / A3	Air	3	Max. 6 bar Outer diameter of air hose: 6 mm

i Contact ABB for more information if to use the (R1)R2.C3 connection for an application with a higher voltage.

1 5 wires out of total 12 wires are available for customer power/signal. See details in *Circuit diagram - IRB 1300* for the 5 free wires.

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xx2300001369

Position	Connection	Description	Number	Value
A	R1.C1	Customer power/signal	12 wires	30 V, 1.5 A
B	R1.C2	Customer power/signal or Ethernet	8 wires	30 V, 1 A, or 1 Gbits/s
C	R1.C3	Customer power/signal	4 wires	42 V DC or 25 V AC, 4 A[i]
D	A1 / A2 / A3	Air	3	Max. 6 bar Outer diameter of air hose: 6 mm
E	A4	Air for solenoid valve	1	Max. 6 bar Outer diameter of air hose: 6 mm Air cleanness requirement: 5 µm or less, dry and clean

i Contact ABB for more information if to use the (R1)R2.C3 connection for an application with a higher voltage.

Special considerations when working with solenoid valve

- Always read the instructions in the manual and follow the indications to use the solenoid valve. If handled improperly, human injury and/or malfunction or damage of machinery and equipment may occur.
- Do not use compressed air that contains chemicals, synthetic oils that include organic solvents, salt, corrosive gases, etc., as it can cause damage or malfunction.
- Perform periodic maintenance on the valve to confirm the operating condition and check for any air leakage.
- The valve should be operated at least once every 30 days to prevent malfunction.
- Actuators may travel in an unexpected direction depending on the switching position of the valve. Every time before using the valve, check the actuator direction and implement measures to prevent any danger from occurring when operating.
- If the valve is operated with momentary energization, it should be energized for at least 0.1 seconds. However, depending on the piping conditions, the cylinder may malfunction even when the double solenoid valve is energized

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3.6.2 Customer connections
Continued

for 0.1 seconds or longer. In this case, energize the valve until the cylinder is exhausted completely.

Connector kits (optional)

Connector kits, base

R1.C1 and R1.C2 connectors on the base are parts of the CP/CS cable and Ethernet floor cable, respectively. For details about the robot cabling, see *Robot cabling and connection points on page 96*.

Customers need to do wiring when using the R1.C3 connector on the base. Make sure to use the R1.C3 connector in M12 A-code 4p female type.

Connector kits, tubular

The table describes the CP/CS and Ethernet (if any) connector kits for tubular.

Position	Description			Art. no.
Connector kits	CP/CS	R2.C1	M12 CPCS Male straight connector kits	3HAC066098-001
			M12 CPCS Male angled connector kits	3HAC066099-001
		R2.C3	M12 CPCS Male straight connector kits	3HAC068412-001
			M12 CPCS Male angled connector kits	3HAC068413-001
	Ethernet	R2.C2	M12 Ethernet CAT6a Male straight connector kits	3HAC067413-001
			M12 Ethernet CAT6a Male angled connector kits	3HAC067414-001

Protection covers

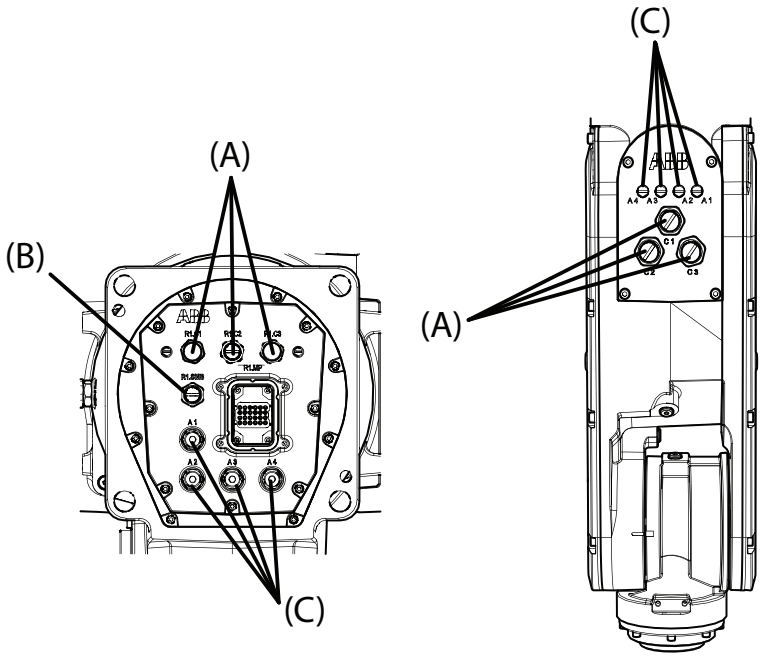
Protection covers for water and dust proofing

Protection covers are delivered together with the robot and must be well fitted to the connectors in any application requiring water and dust proofing.

Always remember to refit the protection covers after removing them.

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xx2000001008

A	CP/CS or Ethernet connector protection covers
B	SMB connector protection cover
C	Air hose connector protection covers **Note** IRB 1300 with option 3303-3 Solenoid Valves Ext. selected also has protection covers on 3 pairs of the connectors used for air from solenoid valve, which are the same as those use for air hose connectors.

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3.7 Start of robot in cold environments

Introduction

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

Problems with starting the robot

Event message from Motion Supervision

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

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

Robot stopping with other event message

Use this procedure if the robot is not starting.

	Action	Note
1	Start the robot with its normal program but with reduced speed. **Note** It is recommended to reduce the speed to a value smaller than 30% of the normal programmed speed.	The speed can be regulated with the RAPID instruction `VelSet` or the speed regulator on the FlexPendent.
2	After 10 minutes or more, run the robot with the normal speed again.	The warm up duration varies according to the working cycle. If the working cycle is not tough enough, a longer warm up duration is required.

Adjusting the speed and acceleration during warm-up

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

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

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

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3.8 Test run after installation, maintenance, or repair

Safe handling

Use the following procedure after installation, maintenance, or repair, before initiating motion.

DANGER

Initiating motion without fulfilling the following aspects, may increase the risk for injury or cause damage to the robot.

	Action
1	Remove all tools and foreign objects from the robot and its working area.
2	Verify that the robot is properly secured to its position by all screws, before it is powered up.
3	Verify that any safety equipment installed to secure the position or restrict the robot motion during service activity is removed.
4	Verify that the fixture and work piece are well secured, if applicable.
5	Verify that all safety equipment is installed, as designed for the application.
6	Verify that no personnel are inside the safeguarded space.
7	If maintenance or repair has been done, verify the function of the part that was maintained.
8	Verify the application in the operating mode manual reduced speed.

Collision risks

CAUTION

When programming the movements of the robot, always identify potential collision risks before initiating motion.

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4 Maintenance

4.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 1300.

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 maintenance 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 maintenance work.

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

Note

If the IRB 1300 is connected to power, always make sure that the IRB 1300 is connected to protective earth and a residual current device (RCD) before starting any maintenance work.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C90XT Type A*
- *Product manual - OmniCore E10*
- *Product manual - OmniCore V250XT Type B*
- *Product manual - OmniCore V400XT*
- *Robot cabling and connection points on page 96*.

Moving the robot out of Clean Room working spaces before service activities

The robots must be moved out of the Clean Room working spaces before proceeding with the maintenance and repair works.

During the working space layout planning, reserve sufficient space to ensure that the robot can be moved in and out of the Clean Room working spaces smoothly.

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The minimum space required for the equipment or device that are used to moveor lift the robot should also be considered.

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4.2 Maintenance schedule and expected component life

4.2.1 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 1300:

- 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.
- SIS: specified by the robot's SIS (Service Information System). A typical value is given for a typical work cycle, but the value will differ depending on how hard each part is run.

  The SIS used in OmniCore is further described in the *Operating manual - OmniCore*.

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

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4.2.2 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*

Maintenance schedule

Maintenance activities	Regularly [i]	Every 12 months	Every 36 months	Every 6,000 hours [ii]	Every 12,000 hours [ii]	Every 24,000 hours [ii]	Every 30,000 hours [ii]	Reference
Cleaning the robot	x							*Cleaning the IRB 1300 on page 116*
Inspecting the robot	x							Check for abnormal wear or contamination. For robots with protection type Clean Room: Inspect daily
Inspecting the paint	x							*Inspection of robot paint on page 124*
Inspecting the oil level in gearboxes								Inspect the oil level of axis 2 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. See *Inspecting the oil level in axis-2 gearbox on page 134*.
Inspecting the information labels		x						*Inspecting the information labels on page 122*
Inspecting the robot harness		x [iii]						*Inspecting the robot cabling on page 125*
Inspecting the mechanical stop		x						*Inspecting mechanical stops on page 126*
Inspecting the timing belt			x					*Inspecting timing belts on page 131*
Inspecting the solenoid valve	x							Check for air leakage.

Continues on next page

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Maintenance activities	Regularly [i]	Every 12 months	Every 36 months	Every 6,000 hours [ii]	Every 12,000 hours [ii]	Every 24,000 hours [ii]	Every 30,000 hours [ii]	Reference
Lubricating the robot harness		x [iv]						*Lubricating the cable package on page 138*
Replacing the mechanical stops, axes 2 and 3				x				Replace the mechanical stops of the Clean Room robots that are cleaned or disinfected with cleaning detergents. See *Cleaning and disinfection instructions for Clean Room robots*. Mechanical stop replacement procedures are specified in *Repair on page 161*.
Replacing the SMB battery pack			x [v]					*Replacing the battery pack on page 141*
Changing the oil in axis-1 gearbox						x		First change when DTC [ii] reads: • 6000 hours Second change when DTC [ii] reads: • 24000 hours Following changes: • 24000 hours *Changing oil, axis-1 gearbox on page 149*
Changing the oil in axis-2 gearbox						x		First change when DTC [ii] reads: • 6000 hours Second change when DTC [ii] reads: • 24000 hours Following changes: • 24000 hours *Changing oil, axis-2 gearbox on page 155*
Running the *Brake Check* routine [vi]	x [vii]							Recommended to robots without the SafeMove option. See *Operating manual - OmniCore*.
Running the *Cyclic Brake Check* routine [vi]	x [vii]							Recommended to robots with the SafeMove option. See *Application manual - Functional safety and SafeMove*.

Continues on next page

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4.2.2 Maintenance schedule

Continued

Maintenance activities	Regularly[i]	Every 12 months	Every 36 months	Every 6,000 hours [ii]	Every 12,000 hours [ii]	Every 24,000 hours [ii]	Every 30,000 hours[ii]	Reference
Overhaul of complete robot							x	

i "Regularly" implies that the activity is to be performed regularly, but the actual interval may not be specified by the robot manufacturer. The interval depends on the operation cycle of the robot, its working environment and movement pattern. Generally, the more contaminated environment, the shorter intervals. The more demanding movement pattern (sharper bending cable harness), the shorter intervals.

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

iii Replace when damage or cracks is detected or life limit is approaching.

iv Replace when damage or cracks is detected or life limit is approaching.

v The battery is to be replaced at given maintenance interval or at battery low alert.

vi Not needed separately if already included in the application.

vii Recommended test interval is within the range 8-48 hours.

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4.2.3 Expected component life

Expected life depends on usage

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

Expected component life

Component	Expected life	Note
Cable harness, normal usage [i]	40000 hours [ii]	
Cable harness, extreme usage [iii]	20000 hours [ii]	
Gearboxes	30000 hours	

[i] Examples of "normal usage" in regard to movement: most material handling applications and limited use of bending backwards mode of axis 3.

[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 and major use of bending backwards of axis 3.

Expected component life - for L/H/P applications

The demanding nature of using IRB 1300 with protection type Clean Room in a Lifescience, Healthcare,and Pharmaceutical (L/H/P) application where extensive cleaning are applied can shorten the life of the robot's components compared to that of standard robots in a typical robotic application. See *Expected component life on page 115* for standard robots. Depending on the actual cleaning in the L/H/P application, the compromise of lifetime of IRB 1300 with protection type Clean Room in L/H/P applications will depend on a number of factors. The most important factors are:

- The cleaning detergent and cleaning protocol/regime applied.
- The ambient environment including temperature, humidity, water quality, etc. Using elevated temperature for cleaning bath is not recommended.
- Installation, maintenance, and repair procedures.
- The operation cycle of the robot.

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4.3 Cleaning activities

4.3.1 Cleaning the IRB 1300

General

To secure high uptime it is important that the IRB 1300 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 1300.

Note

Always verify the protection type of the robot before cleaning.

WARNING

Turn off all electrical power supplies to the robot before starting the cleaning.

Special cleaning considerations

This section specifies some special considerations when cleaning the robot.

- Always use cleaning equipment as specified. Any other cleaning equipment may shorten the life of the robot.
- Always check that all protective covers are fitted to the robot before cleaning.
- Do not point the water jet at connectors, joints, sealings or gaskets.
- Do not use compressed air to clean the robot.
- Do not use solvents that are not approved by ABB to clean the robot.
- Do not remove any covers or other protective devices before cleaning the robot.

Cleaning methods

This 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, steam or spray
Standard IP40	Yes	Yes. With mild cleaning detergent.	No	No
IP67 (option)	Yes	Yes. With mild cleaning detergent.	Yes. It is highly recommended that the water contains a rust-prevention solution and that the manipulator is dried afterwards.	No

Continues on next page

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Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water, steam or spray
Foundry Plus	Yes	Yes. With mild cleaning detergent or spirit.	Yes. It is highly recommended that the water contains a rust-prevention solution.	No
Clean room	Yes	Yes. With mild cleaning detergent.[i] See *Cleaning and disinfection instructions for Clean Room robots*.	No	No

[i] Clean Room robots shall be cleaned with recommended cleaning detergent in recommended cleaning frequency, which are specified in *Cleaning and disinfection instructions for Clean Room robots*.

Usable detergents

Wipe-down cleaning method is recommended for ABB robots with protection types *Clean Room*. Robot surfaces shall be wiped with clean and low particle emission cleanroom cloth which is soaked with following cleaning detergents.

Functional components	Concentration	Maximum cleaning frequency
Alcohol	70%	Daily
Isopropyl Alcohol (IPA)	70%	Daily
Peroxide (H_2O_2)	3%	Weekly

Ready-to-use pre-wetted wipes are allowed to use in condition of that the main detergent component and its concentration in the wipes meet the detergent specifciation specified in the previous table.

Followings are some recommended examples of detergent brands and types:

- Ecolab Klerwipe™ Alcodes GF
- Ecolab Klerwipe™ DrySan Duo
- Diversey® Clearklens Wipes
- Diversey® Suma Wipes
- Diversey® Oxivir Excel Wipes

Wiping with cloth

Cleaning and disinfection instructions for Clean Room robots

ABB robots with protection types *Clean Room* are designed to be cleaned at a low cleaning frequency, before entering the cleanroom environment, after robot commissioning or during cleanroom maintenance.

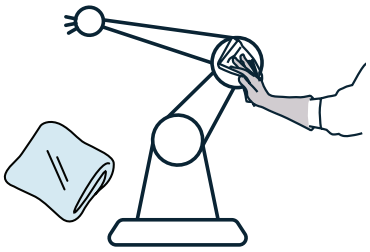
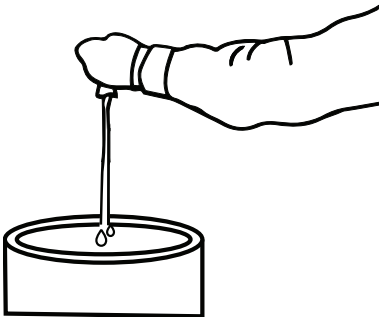
Wipe-down cleaning method is recommended. Robot surfaces shall be wiped with clean and low particle emission cleanroom cloth which is soaked with cleaning detergents specified in *Usable detergents on page 117*.

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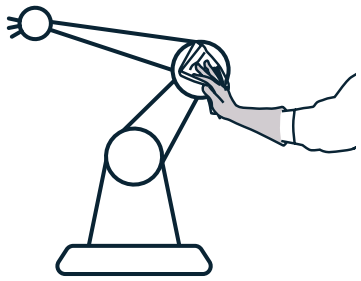
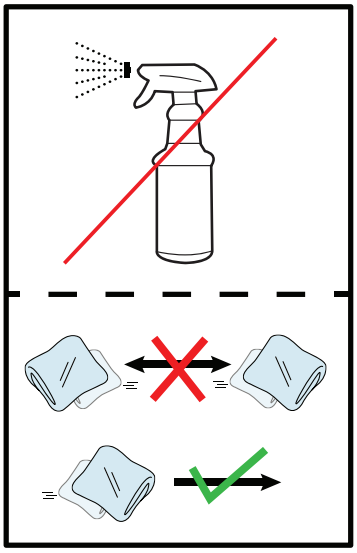
4.3.1 Cleaning the IRB 1300
Continued

Use the following procedure to clean the robots.

	Action	Illustration/Note
1	Turn off all electric power supply, hydraulic pressure supply and air pressure supply to the robot before cleaning.	
2	Before cleaning, use the lint free cloth to remove dirt, debris or any other contaminant from the to-be cleaned surfaces. • Make sure no visible residues left. • Never apply hard forces on or rub against the robot surfaces to remove dirt or debris; otherwise, protective paint layers may be damaged. • Always read the Material Safety Date Sheet (MSDS) of the selected wipe product for safe handling before cleaning.	 xx2500000705
3	Wet a clean cloth with the cleaning detergent.	Only use cleaning agents whose functional components or concentrations are listed in *Usable detergents on page 117*. Contact ABB if using other unlisted detergents before conducting cleaning activities.
4	Express excess liquid before wiping. The wipe should be wet, but not dripping liquid.	 xx2500000706

Continues on next page

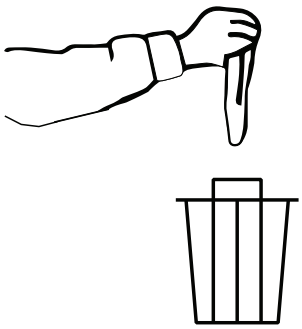
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	Action	Illustration/Note
5	Wipe the painting surfaces on the robot. Do not apply cleaning detergents to mechnical stops. See *Clean Room robot components not wiped on page 120*.	 xx2500000707
	Make sure, • no cleaning agents are sprayed onto robot surfaces or into the robot structure. • the wiped surfaces covered by two sequential wiping movements are covered by 20%-30%. • Wipe from the surface center to edge and always in the same direction, or from the least contaminated area to most contaminated area, until covering all the exposed surfaces.	 xx2500000708
	Never, • force the clean cloth or wipes into joints or cover gaps. • apply the cleaning agents to unpainted surfaces such as screw holes, mounting surfaces and tool flange. Do not wipe too close to unpainted edges to prevent the cleaning agents from accumulating or running onto these surfaces.	
6	Wait a few minutes for detergent volatilization. Make sure no residue of cleaning agents left on the robot surfaces after wipe down cleaning.	

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4.3.1 Cleaning the IRB 1300
Continued

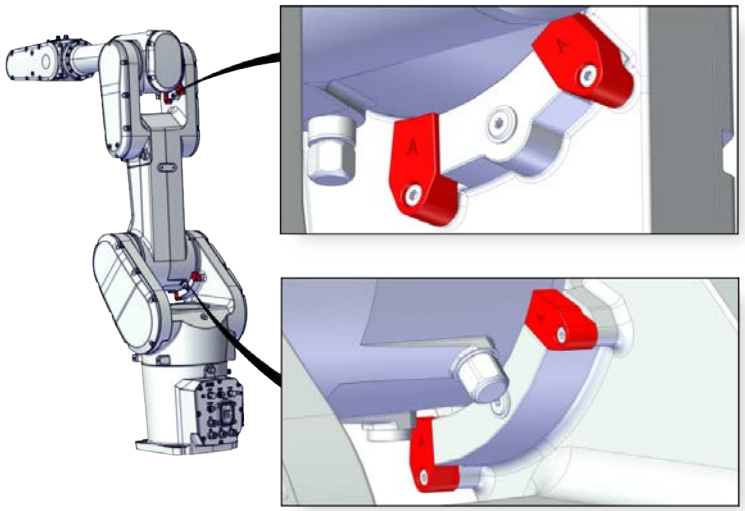
	Action	Illustration/Note
7	Dispose the wipe properly.	 xx2500000709

Note

End users/system integrators shall take the responsibility of assessing whether the disinfection is sufficiently implemented and reaches the disinfection degree required for the intended application and environment.

Clean Room robot components not wiped

Do not apply cleaning detergents to mechnical stops.



xx2500000375

Cleaning with water

Instructions for rinsing with water

ABB robots with following protection types can be cleaned by rinsing with water (water cleaner).[2]

- *IP67*

2 See *Cleaning methods on page 116* for exceptions.

Continues on next page

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- *Foundry Plus*

The following list defines the prerequisites:

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

I Typical tap water pressure and flow

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.

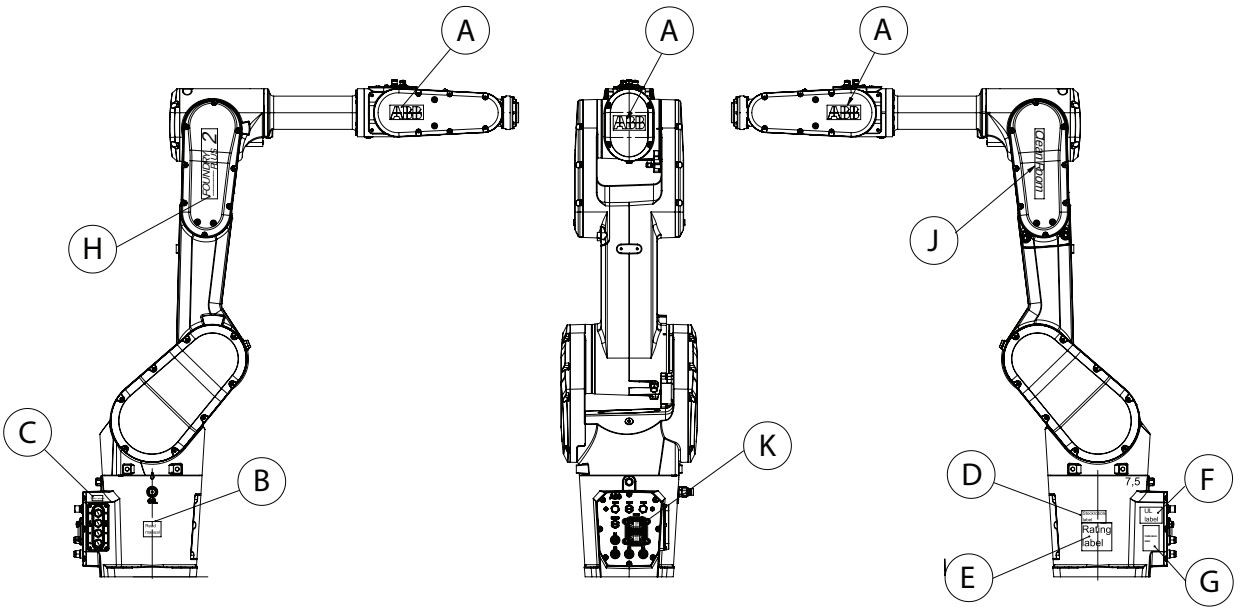
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4.4 Inspection activities

4.4.1 Inspecting the information labels

Location of labels

These figures show the location of the information labels to be inspected. The symbols are described in section *Safety symbols on manipulator labels on page 21*.



xx2000000500

A	ABB logo
B	Read manual label, also specifying warning labels
C	Instruction label **Brake release**
D	Stockrobots label
E	Rating label, CE label and AbsAcc label
F	UL label
G	Calibration label
H	Foundry Plus label
J	Clean Room label
K	Extra O-ring fitting label

Required tools and equipment

Visual inspection, no tools are required.

Continues on next page

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Inspecting, labels

	Action	Note
1	 **DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Inspect the labels, located as shown in the figures.	
3	Replace any missing or damaged labels.	

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4.4.2 Inspection of robot paint

General

For robots working in Clean Room environments, there is a risk of surface corrosion or paint peeling in case of mechanical damage to the coated surface. Therefore, it is important to regularly inspect robot surfaces for any paint breaking or damage.

Required tools and equipment

Equipment	Spare parts	Note
Lint free cloth		
Touch up paint Clean Room/Hygienic	3HAC036639-001	White

Inspection, robot paint

	Action	Description
1	Visually inspect the robot surface paint for any paint breaking.	
2	If there is paint breaking, clean the surface so that it is free from oil and grease.	Use a lint free cloth.
3	Use Touch up paint Clean Room/Hygienic, white to paint any damaged surfaces. **Note** Always read the instruction in the product data sheet in the paint repair kit for Clean Room/Hygienic.	3HAC036639-001

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4.4.3 Inspecting the robot cabling

Introduction

CAUTION

For robots with protection type Clean Room

Always read the specific instructions before doing any repair work, see *Cut the paint or surface on the robot before replacing parts on page 167*

Location of robot cabling

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

Required tools and equipment

Visual inspection, no tools are required.

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

Inspection, robot cabling

Use this procedure to inspect the robot cabling.

	Action	Note
1	**DANGER** Turn off all: • 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	Visually inspect: • the control cabling between the robot and control cabinet Look for abrasions, cuts or crush damage.	
3	Replace the cabling if wear or damage is detected.	

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4.4.4 Inspecting mechanical stops

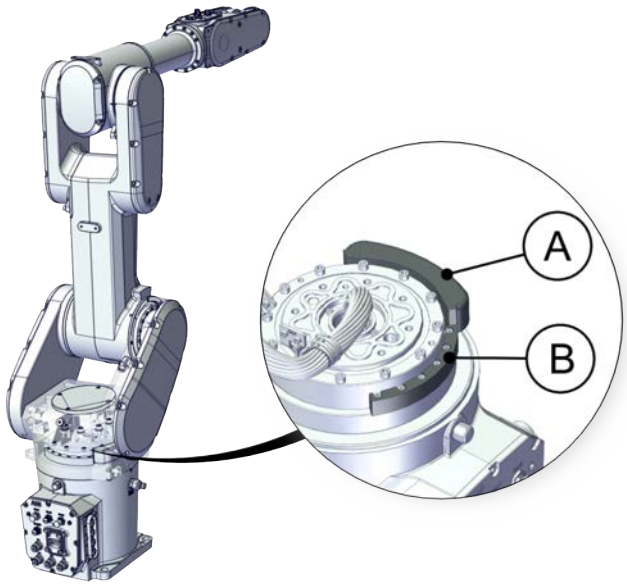
Introduction

CAUTION

Always read the specific instructions if the robot has protection type Clean Room, before doing any repair work, see *Cut the paint or surface on the robot before replacing parts on page 167*

Location of mechanical stops

Axis 1



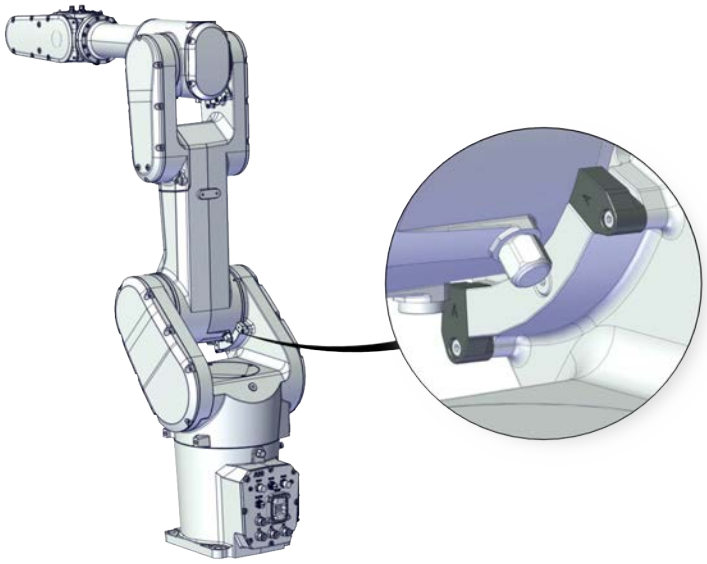
xx2000000406

A	Mechanical stop, axis 1, slider
B	Mechanical stop, axis 1, fixed block

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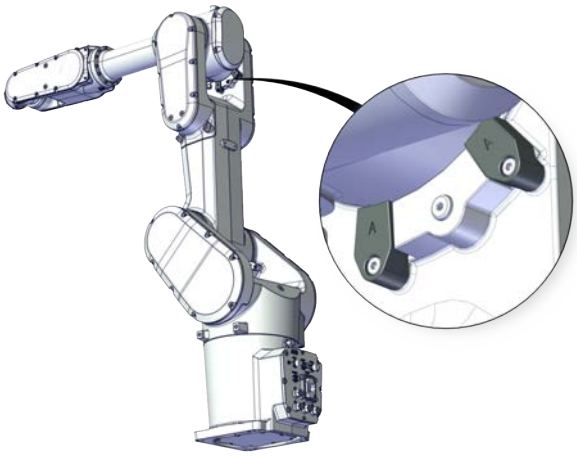
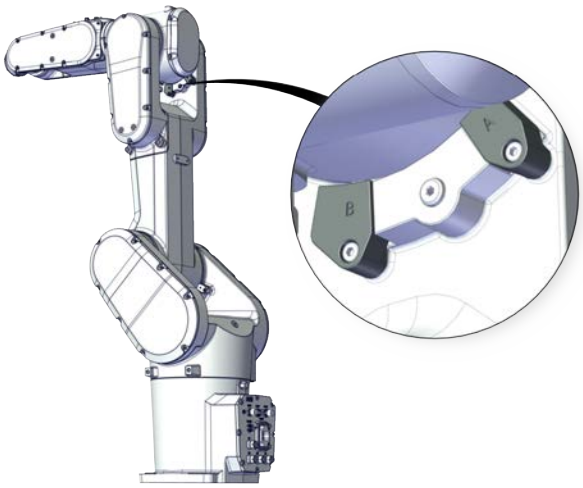
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Axis 2



xx2000000407

Axis 3

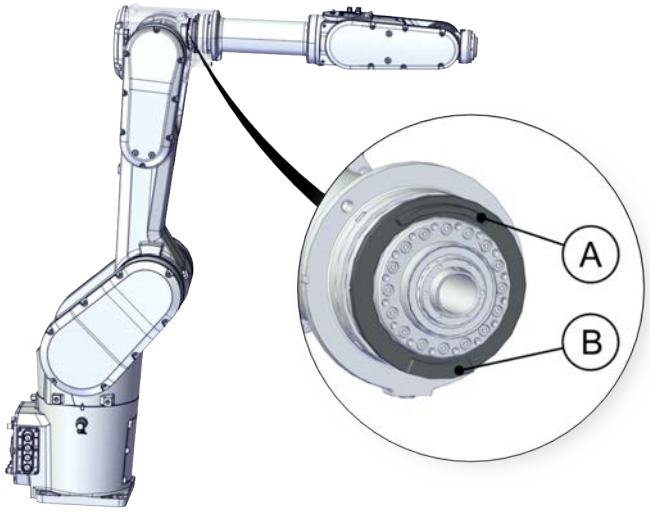
IRB 1300-11/0.9, IRB 1300-7/1.4 and IRB 1300-12/1.4	IRB 1300-10/1.15
	
xx2000000408	xx2000000471

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4.4.4 Inspecting mechanical stops
Continued

Axis 4



xx2000000409

A	Mechanical stop, axis 4, flange
B	Mechanical stop, axis 4, slider

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Mechanical stop, axis 1, fixed block	3HAC064478-001	Replace if damaged.
Mechanical stop, axis 1, slider	3HAC065755-001	Replace if damaged.
Mechanical stop, block A	3HAC065651-001	Replace if damaged.
Mechanical stop, block B	3HAC065671-001	Used for axis 3 of IRB 1300-10/1.15. Replace if damaged.
Mechanical stop, axis 4, flange	3HAC065805-001	Replace if damaged.
Mechanical stop, axis 4, slider	3HAC065804-001	Replace if damaged.

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Required tools and equipment

Note

The axis-1 mechanical stops are accessible after removing the base, see *Replacing the base on page 231*.

The axis-4 mechanical stops are accessible after removing the housing, see *Replacing the housing and extender unit on page 390*.

Visual inspection, no tools are required.

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

Inspecting mechanical stops

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

	Action	Information
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Inspect the mechanical stops.	See figures in *Location of mechanical stops on page 126*.
4	Replace if the mechanical stop is: • bent • loose • damaged. **Note** The expected life of gearboxes can be reduced as a result of collisions with the mechanical stop.	

Continues on next page

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4.4.4 Inspecting mechanical stops

Continued

	Action	Information
5	For Clean Room robots that are disinfected with specific cleaning detergents, replace the mechanical stops if some of the below is discovered: • discoloration • loss of gloss	See *Cleaning and disinfection instructions for Clean Room robots*.

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4.4.5 Inspecting timing belts

Introduction

CAUTION

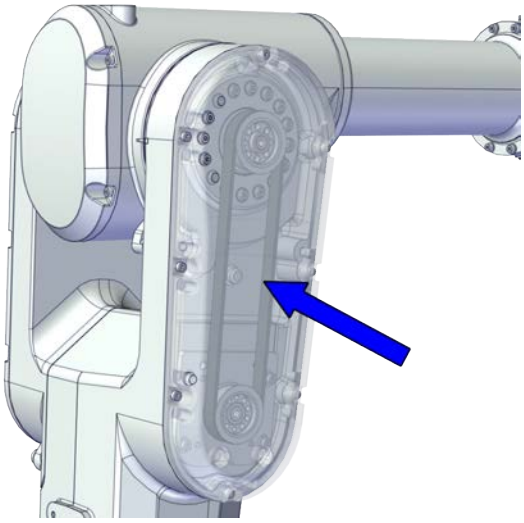
Always read the section "General procedures" before doing any repair work.
Cut the paint or surface on the robot before replacing parts on page 167.

Location of timing belts

Note

It is recommended to inspect the axis-4 timing belt when replacing the motor.

The timing belts are located as shown in the figures.

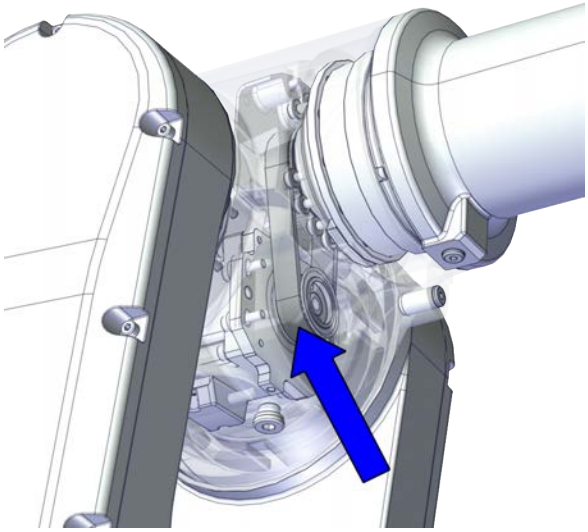
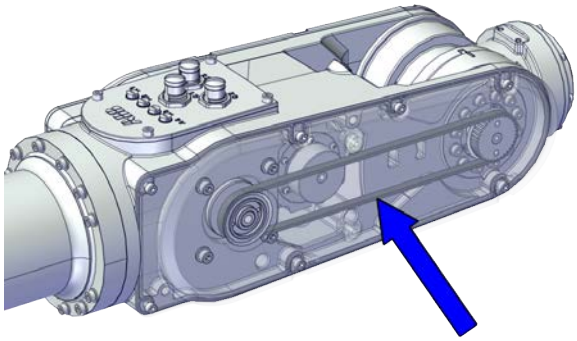
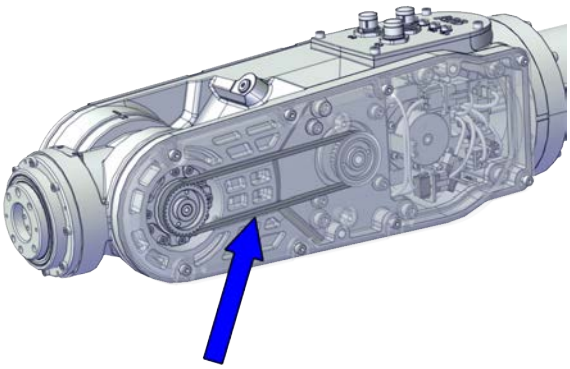
Axis	Location
3	 xx2000001490

Continues on next page

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4.4.5 Inspecting timing belts

Continued

Axis	Location
4	 xx2000001491
5	 xx2000001492
6	 xx2000001493

Continues on next page

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Required tools and equipment

Equipment	Note
Standard toolkit	The content is defined in the section *Standard toolkit on page 817*.
Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.	

Inspecting timing belts

Use this procedure to inspect timing belts.

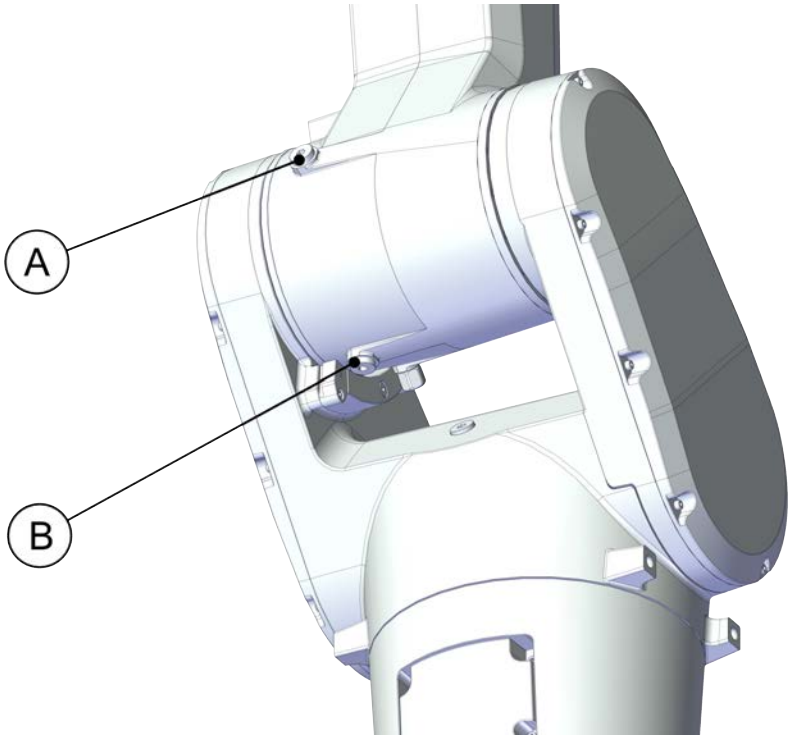
	Action	Information
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	Gain access to each *timing belt* by removing the cover.	
3	Check the timing belts for damage or wear.	
4	Check the *timing belt pulleys* for damage.	
5	If any damage or wear is detected, the part must be replaced!	

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4.4.6 Inspecting the oil level in axis-2 gearbox

Location of the oil level plug

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



xx2000001512

A	Oil plug, filling and venting
B	Oil plug, filling, draining and venting

Tightening torque: 10 Nm

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.

Required consumables

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

Required documents

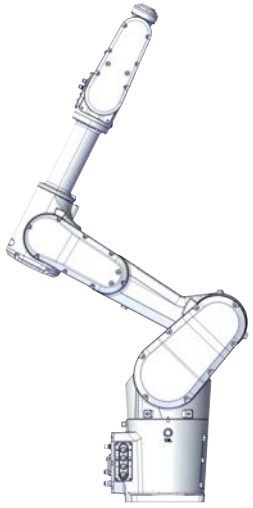
Document name	Document number
Technical reference manual - Lubrication in gearboxes	*3HAC042927-001*

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Inspecting the oil level in axis-2 gearbox

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

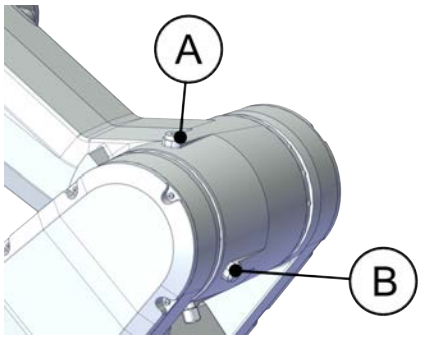
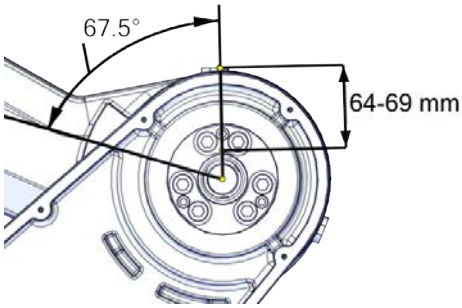
	Action	Note
1	Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance.	 xx2000001519
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Make sure that the oil temperature is +25°C ± 10°C.	
4	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
5	**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.	

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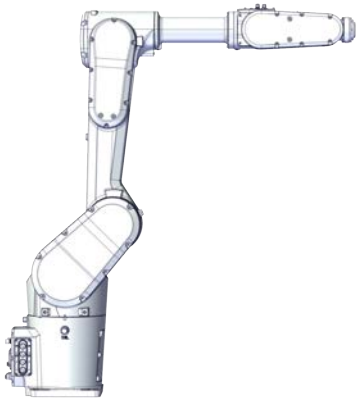
4.4.6 Inspecting the oil level in axis-2 gearbox

Continued

	Action	Note
6	Open the upper oil plug. **Note** The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.	 xx2000001518 A: Oil plug, opened B: Oil plug, closed
7	**WARNING** Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	
8	Inspect the oil level by measuring the level at the upper oil plug hole. Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole. **CAUTION** The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.	 xx2000001580
9	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 155*.
10	Refit the oil plug.	Tightening torque: 10 Nm
11	**DANGER** Make sure all safety requirements are met when performing the first test run. These are further detailed in the section *Test run after installation, maintenance, or repair on page 108*.	

Continues on next page

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	Action	Note
12	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
13	Jog all axes to zero position.	 xx2000001520
14	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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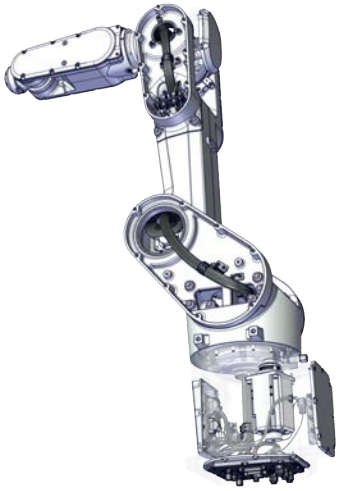
4.5 Lubrication activities

4.5.1 Lubricating the cable package

Location of the cable package

The IRB 1300 main cable package has three lengths corresponding to three robot variants, and is also differentiated by connector interface location.

The cable packages are located as shown in the figures.

Robot type	Rear connector interface	Bottom connector interface
IRB 1300-11/0.9	 xx2000001260	 xx2000001261
IRB 1300-10/1.15	 xx2000001258	 xx2000001259

Continues on next page

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Robot type	Rear connector interface	Bottom connector interface
IRB 1300-7/1.4 and IRB 1300-12/1.4	 xx2000001256	 xx2000001257

Required tools and equipment

Equipment	Note
Standard toolkit	The content is defined in the section *Standard toolkit on page 817*.
Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.	

Required consumables

Consumable	Article number	Note
Grease	3HAC029132-001	FM 222

Lubricating the cable package

Use this procedure to lubricate the cable package.

	Action	Information
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	Gain access to the cable package by removing the covers.	

Continues on next page

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4.5.1 Lubricating the cable package

Continued

	Action	Information
3	Check the cable package for damage or wear.	
4	If any damage or wear is detected, the part must be replaced!	See *Replacing the cable package on page 170*.
5	Apply grease to the cable package, cover all moving area of the package.	
6	Apply grease to the covers that have contacting area with the cable package.	

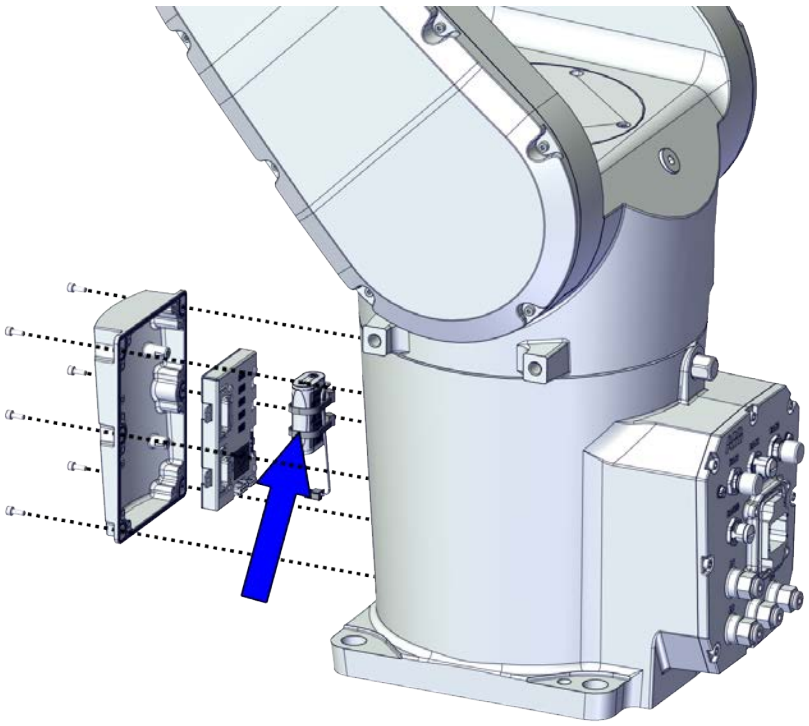
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4.6 Replacement activities

4.6.1 Replacing the battery pack

Location of the battery pack

The battery pack is located as shown in the figure.



xx2000001495

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Battery pack	3HAC044075-001	Battery includes protection circuits. Only replace with the specified spare part or an ABB-approved equivalent.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.

Continues on next page

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4.6.1 Replacing the battery pack
Continued

Equipment	Article number	Note
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.

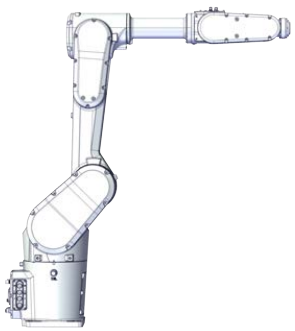
Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

Removing the battery pack

Use these procedures to remove the battery pack.

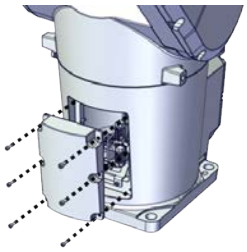
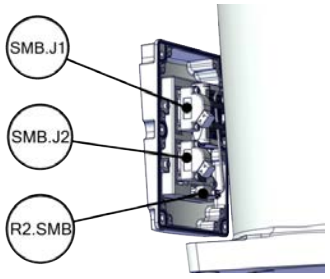
Preparations before removing the battery pack

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Continues on next page

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Disconnecting the SMB connectors

	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 read the safety information in section *The unit is sensitive to ESD on page 53*.	
3	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
4	Remove the SMB cover attachment screws and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** There are cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001503
5	Disconnect the connectors. • SMB.J1 • SMB.J2 • R2.SMB **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001504
6	Remove the SMB cover completely from the base.	

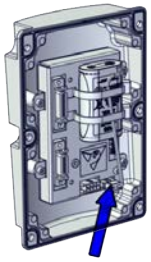
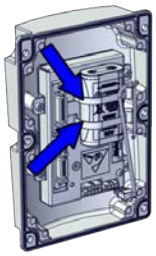
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4.6.1 Replacing the battery pack

Continued

Removing the battery pack

	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 read the safety information in section *The unit is sensitive to ESD on page 53*.	
3	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
4	Disconnect the battery cable.	 xx2000001505
5	Remove the battery pack by cutting the cable strap.	 xx2000001506

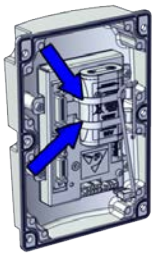
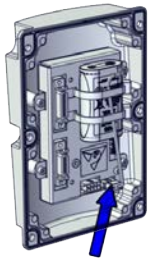
Refitting the battery pack

Use these procedures to refit the battery pack.

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Refitting the battery pack

	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	
2	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Secure the battery pack using the cable strap.	 xx2000001506
4	Reconnect the battery cable.	 xx2000001505

Reconnecting the SMB connectors

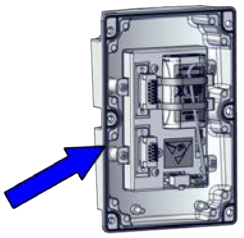
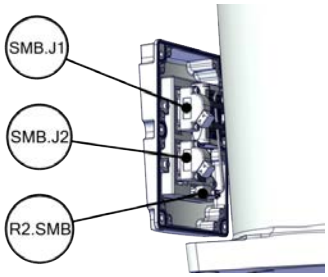
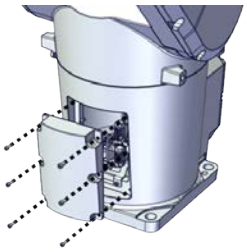
	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	
2	**For robots with protection type Clean Room** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.6.1 Replacing the battery pack

Continued

	Action	Note
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for SMB cover: 3HAC067820-001  xx2000002508
4	Reconnect the connectors. • SMB.J1 • SMB.J2 • R2.SMB **Tip** See the number markings on the connectors for help to find the corresponding connector.	Tightening torque: 0.3 Nm  xx2000001504
5	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	
6	Refit the SMB cover to the base.	Screw: M4x10 12.9 Lafre (6 pcs) Tightening torque: 2.6 Nm  xx2000001503

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Concluding procedure

	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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4.7 Changing activities

4.7.1 Type of lubrication in gearboxes

Introduction

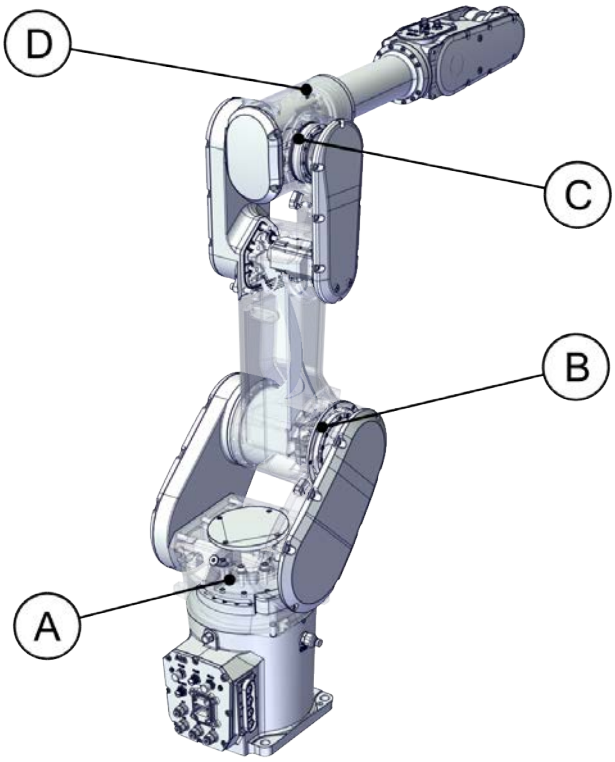
This section describes where to find information about the type of lubrication, article number and the amount of lubrication in the specific gearbox. It also describes the equipment needed when working with lubrication.

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 *Lubrication in gearboxes on page 816*.

Location of gearboxes

The figure shows the location of the gearboxes.



xx2000001510

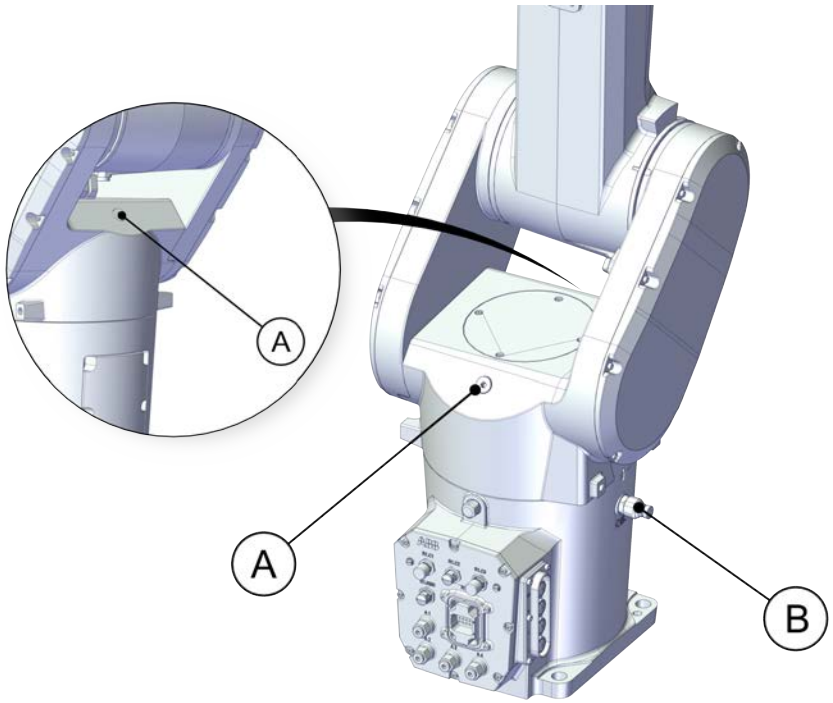
A	Gearbox, axis 1 (inside base)
B	Gearbox, axis 2
C	Gearbox, axis 3
D	Gearbox, axis 4 (inside housing)

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4.7.2 Changing oil, axis-1 gearbox

Location of oil plugs

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



xx2000001511

A	Oil plug, filling and venting
B	Quick coupling, draining

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.
Connector for quick coupling, with outlet pipe	-	Used for draining and filling oil to axis-1 gearbox. Connector specification: G3/8
Oil dispenser	-	Includes pump with outlet pipe.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.

Consumable

Material	Note
Lubricating oil	Information about the oil is found in *Lubrication in gearboxes on page 816*.
Cable straps	

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4.7.2 Changing oil, axis-1 gearbox
Continued

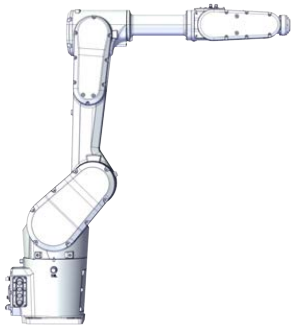
Required documents

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

Draining the axis-1 gearbox

Use this procedure to drain the gearbox.

Preparations before draining oil

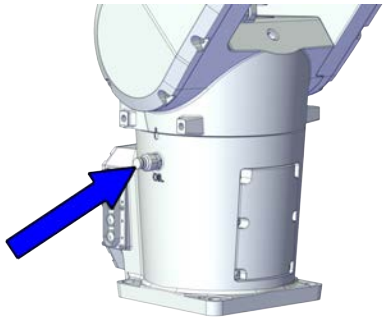
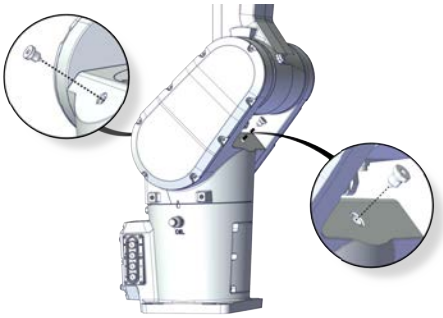
	Action	Note
1	Jog all axes to zero position.	 xx2000001520
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Draining oil of axis-1 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	

Continues on next page

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	Action	Note
2	**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.	
3	Place the oil collecting vessel underneath the quick coupling.	 xx2000001514
4	Remove the oil plugs and keep them opened to speed up the drainage.	 xx2000001513
5	Plug a G3/8 quick coupling connector with pipe to the quick coupling on base.	
6	**WARNING** Used oil is hazardous material and must be disposed of in a safe way. See *Decommissioning on page 805* for more information.	
7	Drain the gearbox oil.	**Note** Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.
8	Remove the quick coupling connector and clean the pipe after the oil is drained. **Note** There will be some oil left in the gearbox after draining.	

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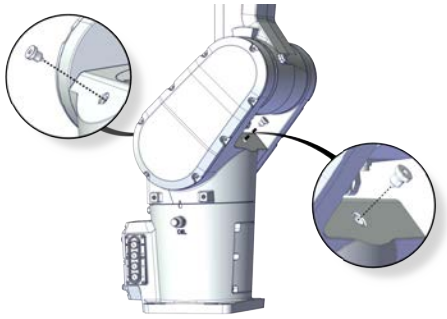
4.7.2 Changing oil, axis-1 gearbox
Continued

	Action	Note
9	Refit oil plugs.	Tightening torque: 10 Nm

Filling oil into the axis-1 gearbox

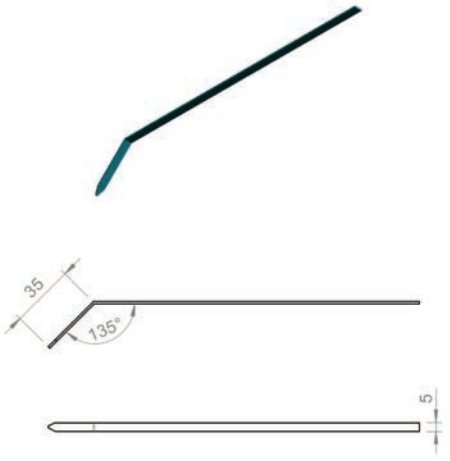
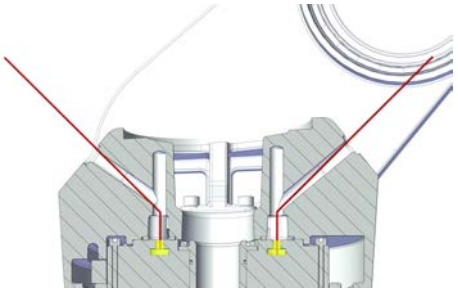
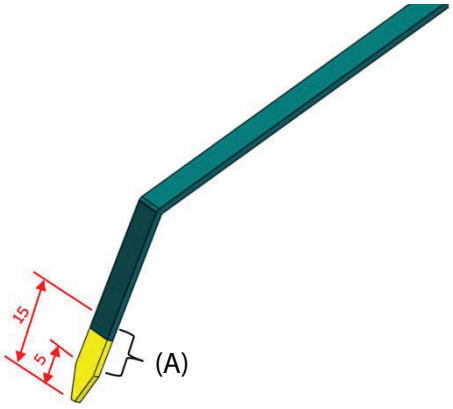
Use this procedure to refill the gearbox with oil.

Refilling oil to axis-1 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**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.	
3	Open the oil plugs, one for filling and the other for venting.	 xx2000001513
4	**WARNING** Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	
5	Refill the gearbox with oil. **CAUTION** Oil filling must be slow to make sure air venting is fluent.	Type of oil and total amount is detailed in *Lubrication in gearboxes on page 816*.

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	Action	Note
6	Measure the oil level by inserting two bent cable straps into the oil filling/venting holes. **CAUTION** After oil filling, the oil level may continue raising at the venting hole side until the level is balanced within the gearbox. Wait until the oil stops raising, before measuring the oil level. **Note** Make sure that the cable strap ends are fully inserted into the gearbox cavity, that is, reaching the bottom of the yellow-marked holes in the figure. You can try to rotate the cable straps after inserting. If it feels obstructed and the straps cannot be rotated freely, they are in place.	Bending specification of the cable straps  xx2400000882  xx2400000881
7	Make sure the measured oil level is within the height range of 5 mm to 15 mm at the ends of the cable straps. **Note** Oil shall be obviously observed all around the cable strap ends, rather than unevenly adhered to the cable strap sides.	 xx2400000883
8	Refit the oil plugs.	Tightening torque: 10 Nm

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4.7.2 Changing oil, axis-1 gearbox
Continued

Concluding procedure

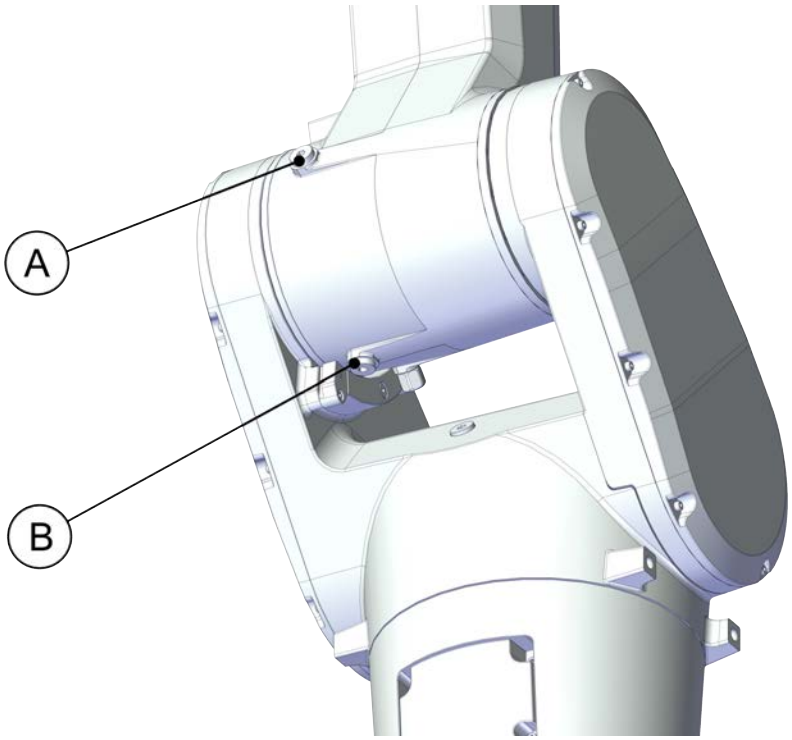
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*.  **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	 **DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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4.7.3 Changing oil, axis-2 gearbox

Location of oil plugs

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



xx2000001512

A	Oil plug, filling and venting
B	Oil plug, filling, draining and venting

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	-	Includes pump with outlet pipe.
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.

Consumable

Material	Note
Lubricating oil	Information about the oil is found in *Lubrication in gearboxes on page 816*.

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4.7.3 Changing oil, axis-2 gearbox
Continued

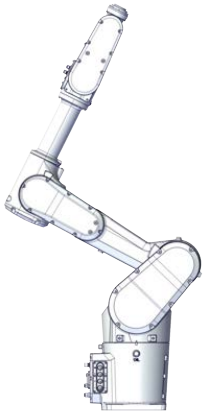
Required documents

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

Draining the axis-2 gearbox

Use this procedure to drain the gearbox.

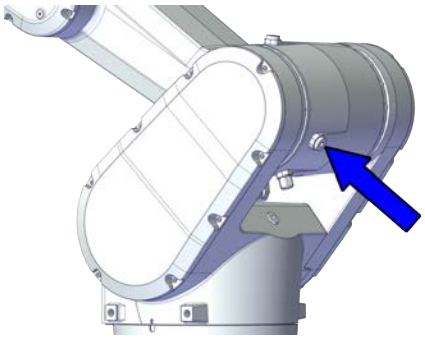
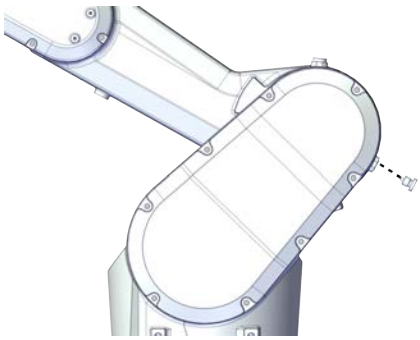
Preparations before draining oil

	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 specified position: • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance.	 xx2000001519
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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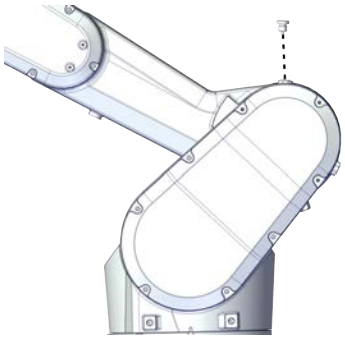
Draining oil of axis-2 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**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.	
3	Place the oil collecting vessel underneath the oil plug, draining.	 xx2000001515
4	Remove the oil plug, draining.	 xx2000001516
5	Plug a clean pipe to the oil plug, draining, with the other end to the oil collecting vessel.	

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4.7.3 Changing oil, axis-2 gearbox
Continued

	Action	Note
6	Remove the oil plug, venting and keep it opened to speed up the drainage.	 xx2000001517
7	**WARNING** Used oil is hazardous material and must be disposed of in a safe way. See *Decommissioning on page 805* for more information.	
8	Drain the gearbox oil.	**Note** Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.
9	Remove and clean the pipe after the oil is drained. **Note** There will be some oil left in the gearbox after draining.	
10	Refit oil plugs.	Tightening torque: 10 Nm

Filling oil into the axis-2 gearbox

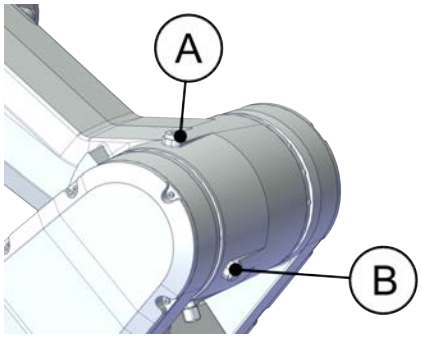
Use this procedure to refill the gearbox with oil.

Refilling oil to axis-2 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	

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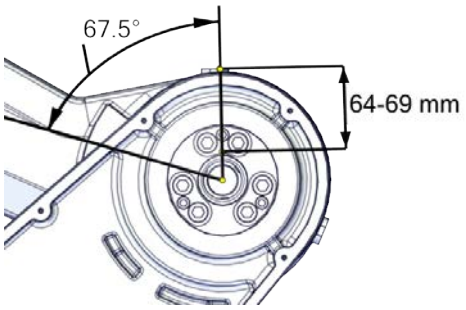
	Action	Note
2	**CAUTION** The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
3	Open the upper oil plug. **Note** The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.	 xx2000001518 A – Oil plug, opened B – Oil plug, closed
4	**WARNING** Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	
5	Refill the gearbox with oil. **Note** The amount of oil to be filled depends on the amount previously being drained. **CAUTION** Oil filling must be slow to make sure air venting is fluent.	Type of oil and total amount is detailed in *Lubrication in gearboxes on page 816*.

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4.7.3 Changing oil, axis-2 gearbox

Continued

	Action	Note
6	Inspect the oil level by measuring the level at the upper oil plug hole. Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole. **CAUTION** The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.	 xx2000001580
7	Refit the oil plug.	Tightening torque: 10 Nm
8	**DANGER** Make sure all safety requirements are met when performing the first test run.	

Concluding procedure

	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5 Repair

5.1 Introduction

Structure of this chapter

This chapter describes repair activities for the IRB 1300. Each procedure contains the information required to perform the activity, for example spare parts numbers, required special tools, and materials.

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

Report replaced units

> **Note**
>
> When replacing a part on the IRB 1300, report to your local ABB the serial number, the article number, and the revision of both the replaced unit and the replacement unit.
>
> This is particularly important for safety equipment to maintain the safety integrity of the installation.

Safety information

Make sure to read through the chapter *Safety on page 17* before commencing any service work.

> **Note**
>
> The robot should be secured with the transportation brackets during removing from/refitting to the foundation.

Moving the robot out of Clean Room working spaces before service activities

The robots must be moved out of the Clean Room working spaces before proceeding with the maintenance and repair works.

During the working space layout planning, reserve sufficient space to ensure that the robot can be moved in and out of the Clean Room working spaces smoothly. The minimum space required for the equipment or device that are used to moveor lift the robot should also be considered.

Continues on next page

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Note

If the IRB 1300 is connected to power, always make sure that the IRB 1300 is connected to protective earth and a residual current device (RCD) before starting any repair work.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C90XT Type A*
- *Product manual - OmniCore E10*
- *Product manual - OmniCore V250XT Type B*
- *Product manual - OmniCore V400XT*

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5.2 General procedures

5.2.1 Mounting instructions for sealings

General

This section describes how to mount different types of sealings.

Equipment

Consumable	Article number	Note
Grease	3HAC037302-001	Used to lubricate the seals.

Rotating sealings

The following procedures describe how to fit rotating sealings.

CAUTION

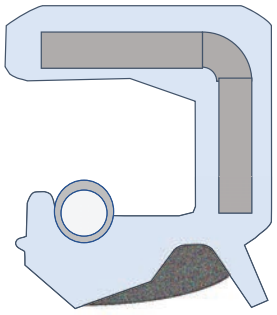
Please observe the following before commencing any assembly of sealings:

- Protect the sealing during transport and mounting, especially the main lip on radial sealings.
- Keep the sealing in its original wrappings or protect it well before actual mounting.
- The fitting of sealings and gears must be carried out on clean workbenches.
- Use a protective sleeve for the main lip during mounting, when sliding over threads, keyways or other sharp edges.
- Do not lubricate a static side of a sealing with grease, since this may result in movement of the sealing during operation.

  The only exception for lubrication of static sides of a sealing, is to use P-80 rubber lubrication gel against certain aluminium surfaces. If usage of P-80 is relevant, it is stated in the repair procedures.

Radial sealings

A radial sealing consists of a flexible rubber lip bonded to a rigid metal case. Only one side of the sealing is static with a metal insert.



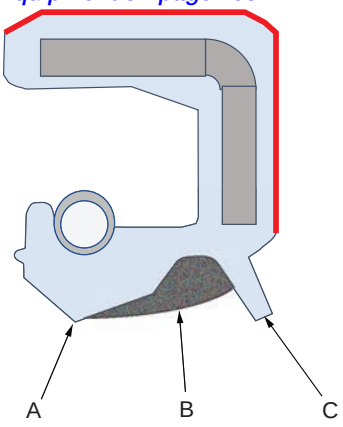
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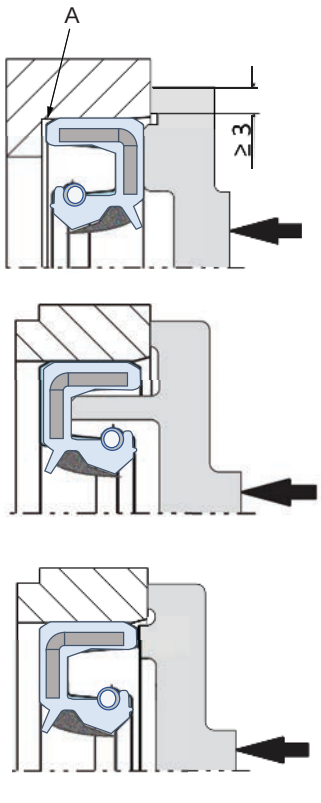
5.2.1 Mounting instructions for sealings

Continued

	Action	Note
1	Check the sealing to ensure that: • The sealing is of the correct type. • There is no damage on the main lip.	
2	Inspect the shaft surface before mounting. If scratches or damage are found, the shaft must be replaced since it may result in future leakage. Do not try to grind or polish the shaft surface to get rid of the defect.	
3	Lubricate the sealing with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the sealing.) Fill 2/3 of the space between the dust lip and the main lip with grease. If the sealing is without dust lip, just lubricate the main lip with a thin layer of grease.	Article number is specified in *Equipment on page 163*.  xx2000000071 A Main lip B Grease C Dust lip **Note** Ensure that no grease is applied to the red marked surface.

Continues on next page

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	Action	Note
4	Mount the sealing correctly with a mounting tool. Never hammer directly on the sealing as this may result in leakage.	 xx2000000072 A Gap
5	Make sure that no grease is left on the robot surface.	

Flange sealings and static sealings

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

	Action
1	Check the flange surfaces. They must be even and free from pores. 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.
4	Tighten the screws evenly when fastening the flange joint.

O-rings

The following procedure describes how to fit o-rings.

	Action	Note
1	Ensure that the correct o-ring size is used.	
2	Check the o-ring for surface defects, burrs, shape accuracy, or deformation.	Defective o-rings, including damaged or deformed o-rings, may not be used.

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5.2.1 Mounting instructions for sealings

Continued

	Action	Note
3	Check the o-ring grooves and mating surfaces. They should be free of pores, contamination and obvious scratches/damage.	
4	Lubricate the o-ring with grease.	
5	Tighten the screws evenly while assembling.	
6	Check that the o-ring is not squashed outside the o-ring groove.	
7	Make sure that no grease is left on the robot surface.	

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5.2.2 Cut the paint or surface on the robot before replacing parts

General

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

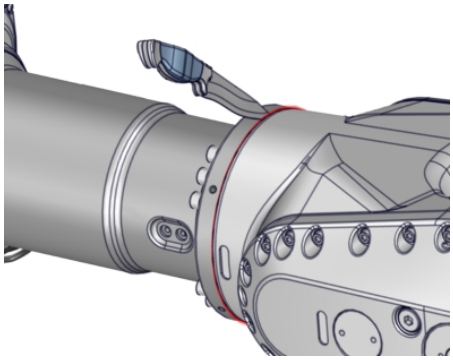
For robots with protection type Clean Room

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

Required equipment

Equipment	Spare parts	Note
Sealing compound	3HAC026759-001	Sikaflex 521 FC. Color white.
Tooling pin		Width 6-9 mm, made of wood.
Cleaning agent		Ethanol
Knife		
Lint free cloth		
Touch up paint Clean Room/Hygienic	3HAC036639-001	White
Touch up paint Standard/Foundry Plus	3HAC067974-001	Graphite White

Removing

	Action	Description
1	Cut the paint with a knife in the joint between the part that will be removed and the structure, to avoid that the paint cracks.	 xx2300000950
2	Carefully grind the paint edge that is left on the structure to a smooth surface.	

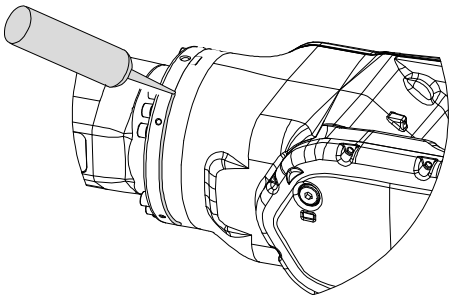
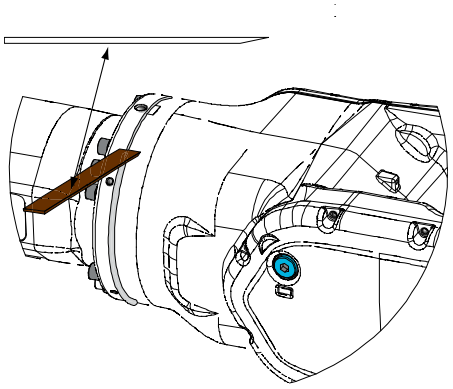
Refitting

	Action	Description
1	Before the parts are refitted, clean the joint so that it is free from oil and grease.	Use ethanol on a lint free cloth.
2	Place the tooling pin in hot water.	

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5.2.2 Cut the paint or surface on the robot before replacing parts
Continued

	Action	Description
3	Seal all refitted joints with sealing compound.	 xx0900000122
4	Use the tooling pin to even out the surface of the sealing compound.	 xx0900000125
5	**For robots with protection type Clean Room** Wait 10 minutes.	**For robots with protection type Clean Room** Sikaflex 521FC skin dry time (10 minutes).
6	Use Touch up paint Clean Room/Hygienic, white to paint any damaged surfaces. **Note** Always read the instruction in the product data sheet in the paint repair kit for Clean Room/Hygienic.	3HAC036639-001

Note

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

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5.2.3 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.

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5.3 Cable harness

5.3.1 Replacing the cable package

Location of the cable package

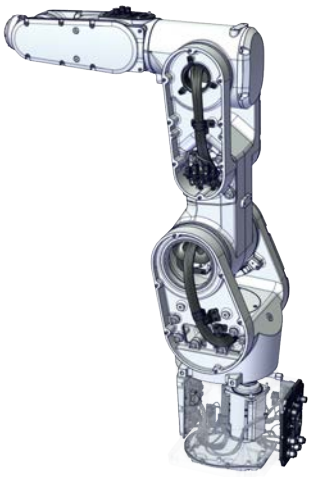
The main cable package runs from the base, up through the swing, lower arm and housing, and into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and tubular.

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

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

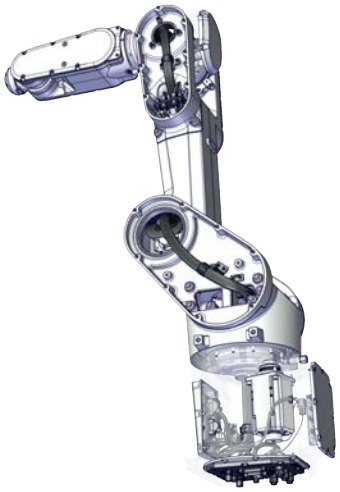
As standard feature, the connector interface is located at the rear of the base. The interface can also be bottom mounted, as an option. This section describes both configurations.

The cable packages are located as shown in the figures.

Robot type	Rear connector interface	Bottom connector interface
IRB 1300-11/0.9	 xx2000001260	 xx2000001261

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Robot type	Rear connector interface	Bottom connector interface
IRB 1300-10/1.15	 xx2000001258	 xx2000001259
IRB 1300-7/1.4 and IRB 1300-12/1.4	 xx2000001256	 xx2000001257

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

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5.3.1 Replacing the cable package
Continued

Spare part	Article number	Note
Main cable harness, S, basic	3HAC073303-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S (CP/CS and air hose, without Ethernet)	3HAC073304-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S (CP/CS and air hose, with Ethernet)	3HAC073305-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M, basic	3HAC073300-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M (CP/CS and air hose, without Ethernet)	3HAC073301-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M (CP/CS and air hose, with Ethernet)	3HAC073302-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L, basic	3HAC073297-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L (CP/CS and air hose, without Ethernet)	3HAC073298-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L (CP/CS and air hose, with Ethernet)	3HAC073299-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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Spare part	Article number	Note
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S, basic, Clean Room	3HAC077833-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, S, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077834-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, S, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077835-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, M, basic, Clean Room	3HAC077830-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, M, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077831-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, M, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077832-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, L, basic, Clean Room	3HAC077827-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Main cable harness, L, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077828-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Main cable harness, L, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077829-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.

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5.3.1 Replacing the cable package
Continued

Spare part	Article number	Note
Plastic cable protector, axis 2	3HAC067816-001	
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, short	3HAC073095-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, long	3HAC073096-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing top cover	3HAC073091-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Base cover	3HAC073090-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
SMB cover	3HAC076475-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Brake release unit	3HAC073296-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Swing cover, short, Clean Room	3HAC077824-001	Used with protection type Clean Room.

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Spare part	Article number	Note
Swing cover, long, Clean Room	3HAC077825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Swing top cover, Clean Room	3HAC077820-001	Used with protection type Clean Room.
Base cover, Clean Room	3HAC077819-001	Used with protection type Clean Room.
SMB cover, Clean Room	3HAC077839-001	Used with protection type Clean Room.
Brake release unit, Clean Room	3HAC077826-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for SMB cover	3HAC067820-001	Not used with protection class IP40. Replace if damaged.
Gasket for brake release unit	3HAC070274-001	Not used with protection class IP40. Replace if damaged.
Gasket for base cover	3HAC067819-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing support, long	3HAC067823-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.

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5.3.1 Replacing the cable package
Continued

Spare part	Article number	Note
Gasket for swing cover, long	3HAC067825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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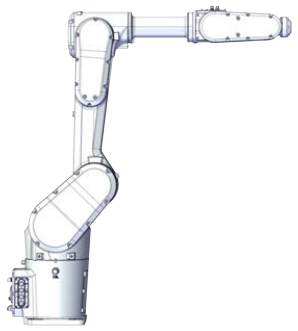
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	Action	Note
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. 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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the cable package

Use these procedures to remove the cable package.

Preparations before removing the cable package

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

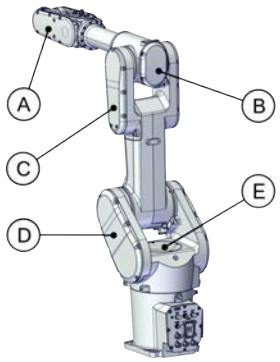
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5.3.1 Replacing the cable package

Continued

Removing the covers

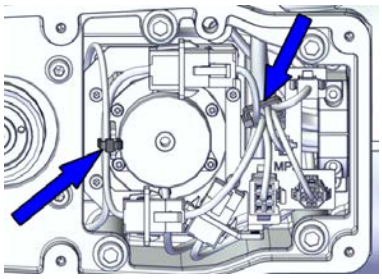
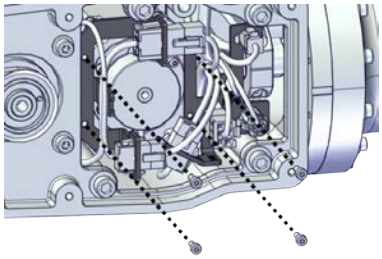
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing support cover (D) • Swing top cover (E)	 xx2000001572

Loosening the cables in the tubular

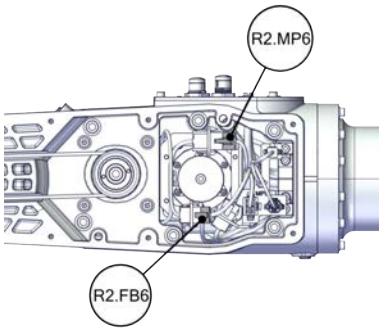
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001531

Disconnecting the axis-6 motor connectors

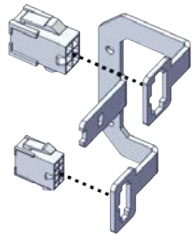
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532

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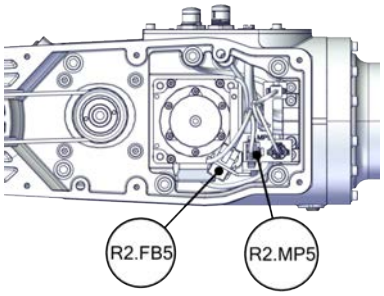
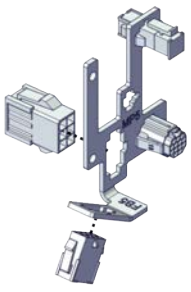
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5.3.1 Replacing the cable package

Continued

	Action	Note
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

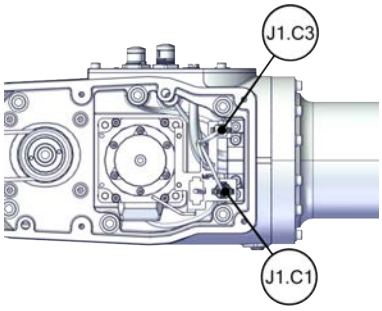
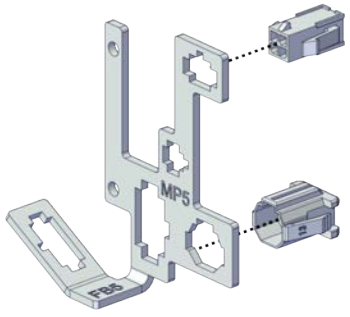
Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

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Disconnecting CP/CS cabling (if equipped)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

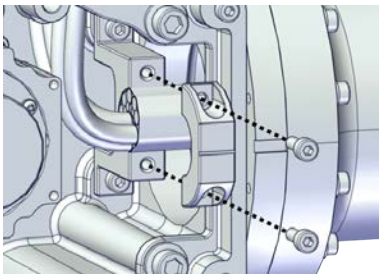
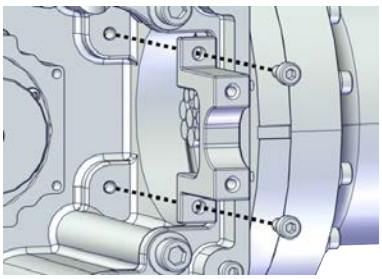
Separating the cable package from the tubular

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

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5.3.1 Replacing the cable package
Continued

	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

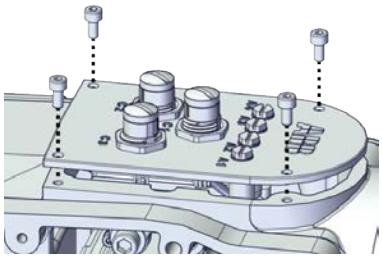
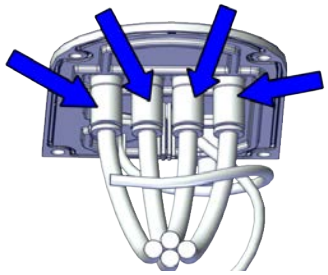
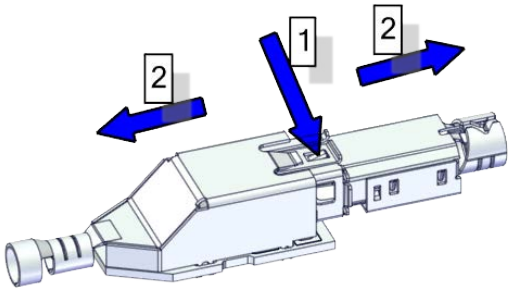
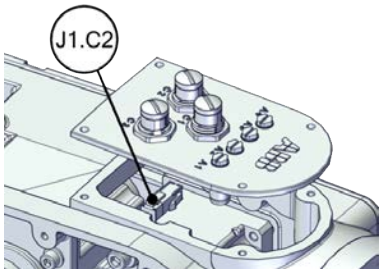
Removing the process hub (without solenoid valve)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538
4	Disconnect the air hoses.	 xx2000001539
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

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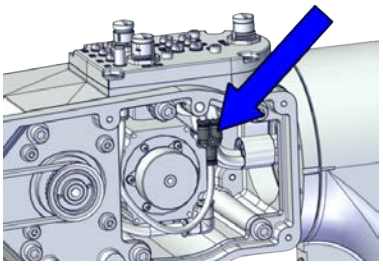
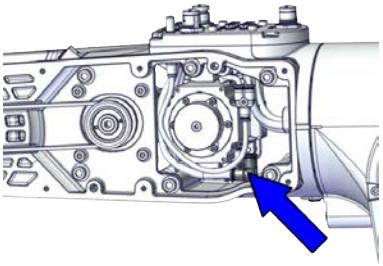
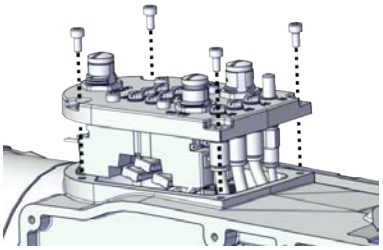
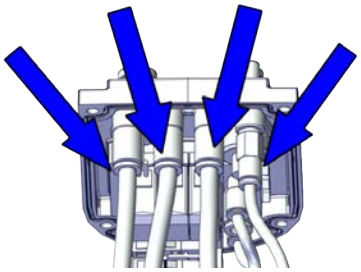
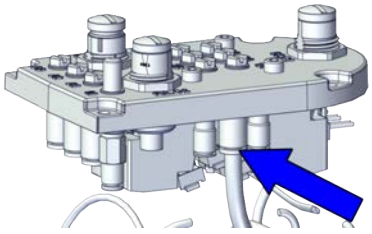
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5.3.1 Replacing the cable package

Continued

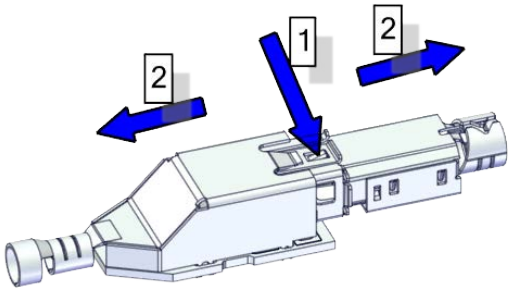
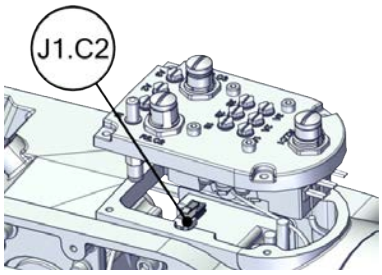
Removing the process hub (with solenoid valve)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370
2	Disconnect the three L-shape connectors.	 xx2300001371
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

Disconnecting the axis-4 motor connectors

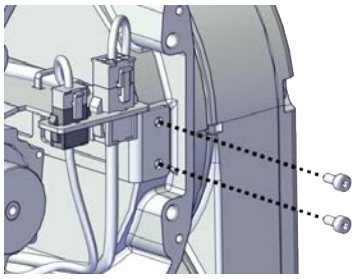
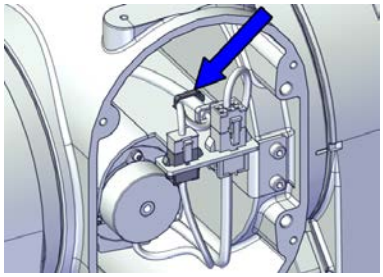
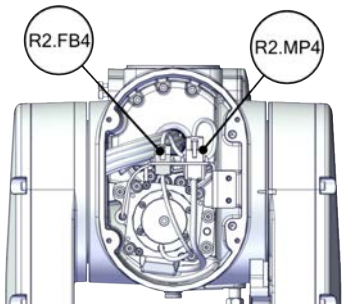
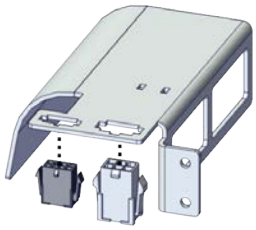
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.3.1 Replacing the cable package

Continued

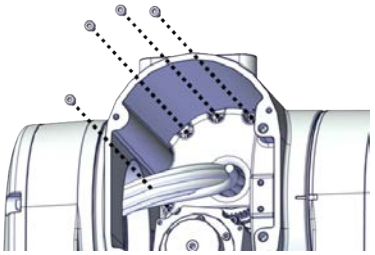
	Action	Note
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001542
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

Separating the cable package from the housing

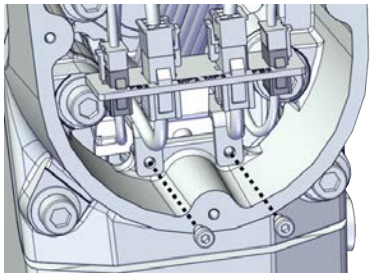
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 cable protector.	 xx2000001546

Disconnecting the axis-2 and -3 motor connectors

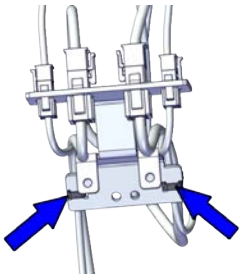
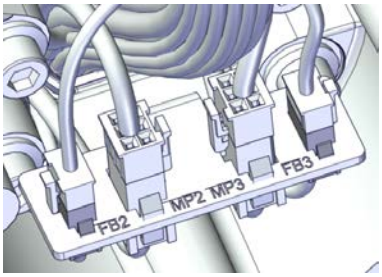
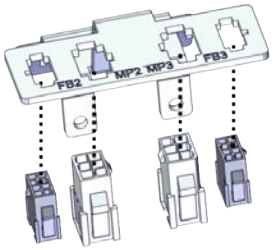
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate, as shown in following step.	 xx2000001548

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5.3.1 Replacing the cable package

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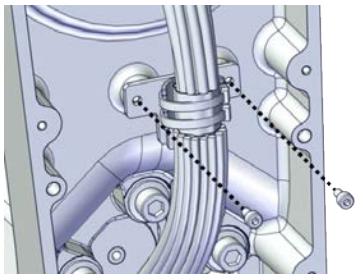
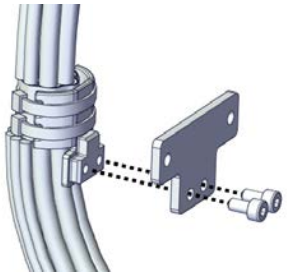
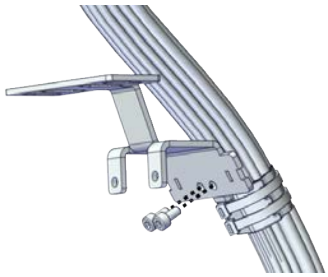
	Action	Note
4	Cut the cable straps.	 xx2000001549
5	Disconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001550
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001551

Separating the cable package from the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the cable bracket from the lower arm first and then from the cable package.	 xx2000001553  xx2100001465
4	Remove the connector plate.	 xx2000001554

Separating the cable package from the swing

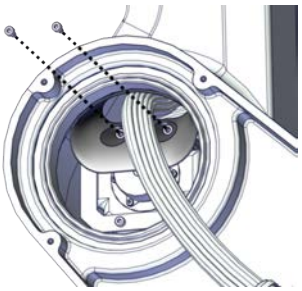
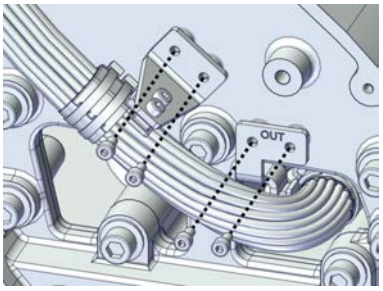
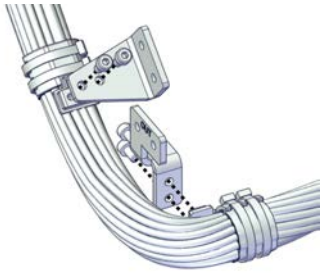
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.3.1 Replacing the cable package

Continued

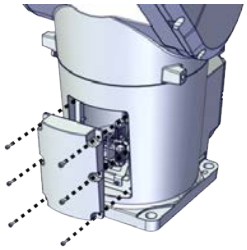
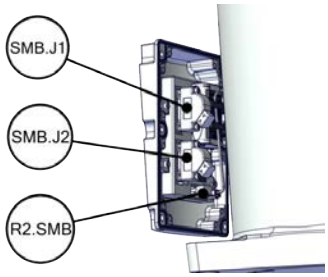
	Action	Note
3	Remove the axis-2 cable protector.	 xx2000001556
4	Remove the cable brackets from the swing first and then from the cable package.	 xx2000001557  xx2100001466

Disconnecting the SMB connectors

	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 read the safety information in section *The unit is sensitive to ESD on page 53*.	

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	Action	Note
3	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
4	Remove the SMB cover attachment screws and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** There are cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001503
5	Disconnect the connectors. • SMB.J1 • SMB.J2 • R2.SMB **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001504
6	Remove the SMB cover completely from the base.	

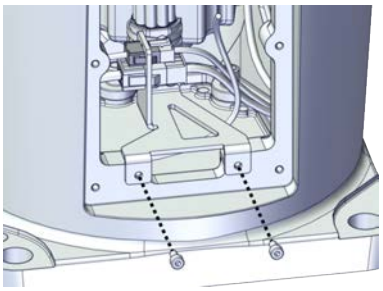
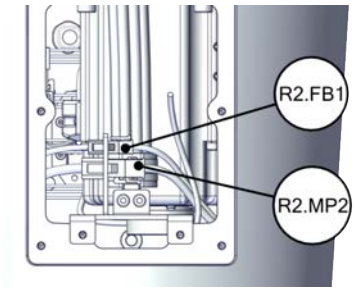
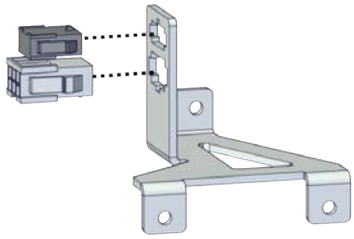
Disconnecting the axis-1 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.3.1 Replacing the cable package
Continued

	Action	Note
3	Remove the connector plate from the base. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate, as shown in following step.	 xx2000001559
4	Disconnect the motor connectors. • FB1 • MP1 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001560
5	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001561

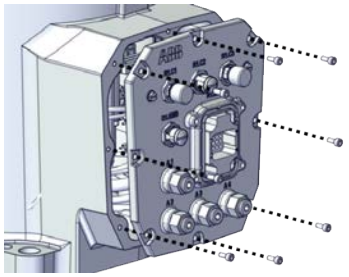
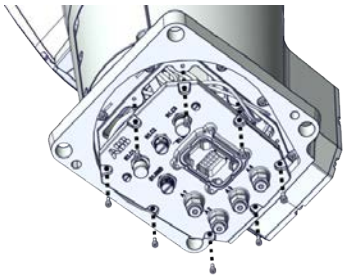
Opening the connector interface plate

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

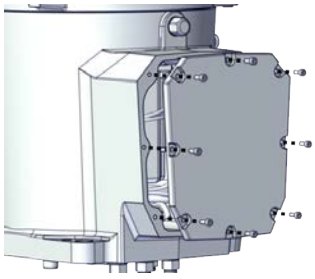
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the connector interface plate attachment screws and carefully open the plate. **CAUTION** There are cabling attached to the plate. The plate cannot be removed completely until the connectors are removed.	**Valid for cabling with rear interface**  xx2000001558 **Valid for cabling with bottom interface (option 3309-1)**  xx2000001575

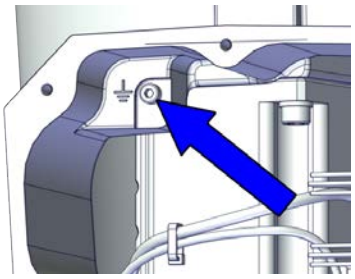
Disconnecting the earth cable

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**Valid for cabling with bottom interface (option 3309-1)** Remove the base rear cover.	 xx2000001573

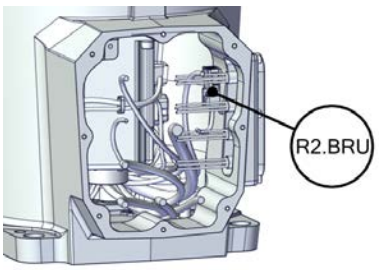
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5.3.1 Replacing the cable package
Continued

	Action	Note
4	Disconnect the earth cable.	 xx2000001574

Disconnecting the brake release connector

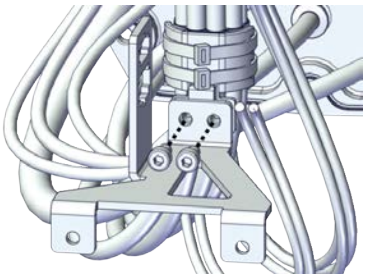
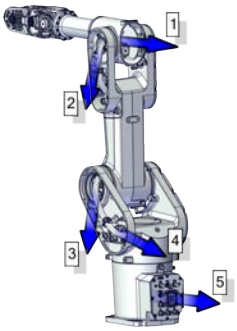
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	
3	Cut the cable strap.	
4	Disconnect the connector. • R2.BRU **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2100001480

Pulling out the cable package

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

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-1 connector plate.	 xx2000001564
4	Wrap the connectors with the masking tape.	
5	Pull out the cable package in the direction as shown in the figure. **Note** Slip out the cable protectors while pulling out the cable package.	 xx2000001563
6	Slip out the cable protectors.	

Refitting the cable package

Use these procedures to refit the cable package.

Securing the cable package in the base

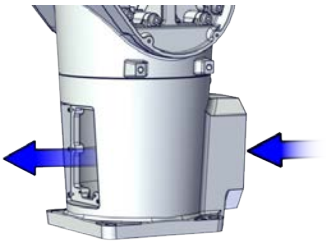
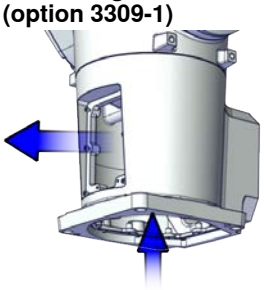
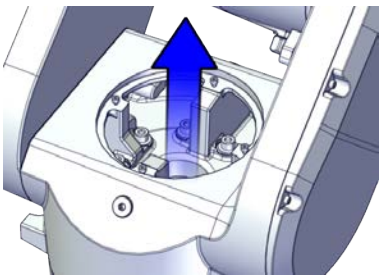
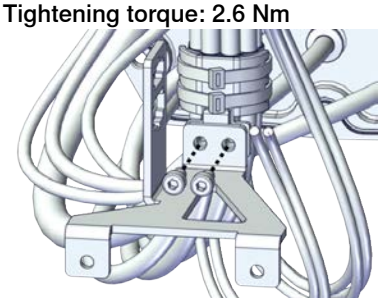
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Wrap the connectors with the masking tape.	

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5.3.1 Replacing the cable package

Continued

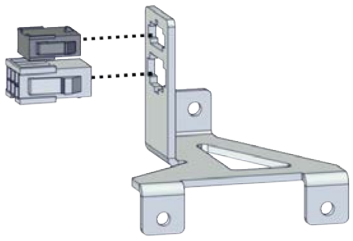
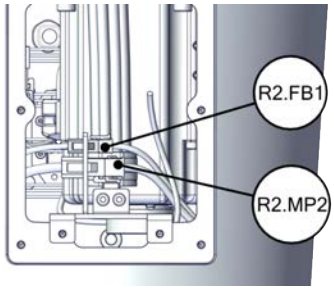
	Action	Note
3	Insert the cable package in the base and out from the SMB side. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	**Valid for cabling with rear interface**  xx2000001565 **Valid for cabling with bottom interface (option 3309-1)**  xx2000001579
4	Insert the cable package up through the axis-1 gearbox and out from the swing top cover side. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001566
5	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001564

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	Action	Note
6	Arrange the connectors as follows (facing the SMB side): • Right of the connector plate: - SMB.J1 - SMB.J2 - R2.MP1 on axis-1 motor - R2.FB1 on axis-1 motor • Left of the connector plate: - R2.SMB - R2.MP1 on main cable package - R2.FB1 on main cable package	

Reconnecting the axis-1 motor connectors

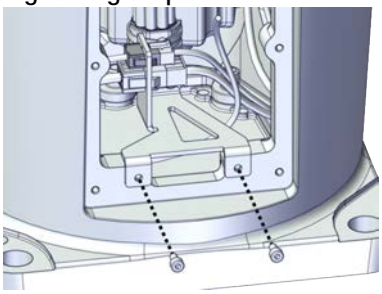
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001561
3	Reconnect the connectors. • FB1 • MP1 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001560
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

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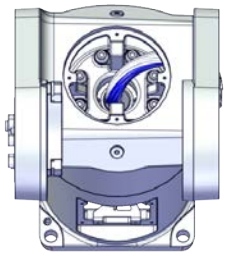
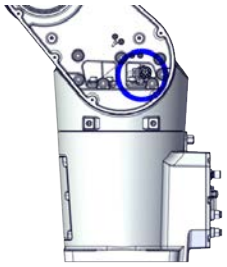
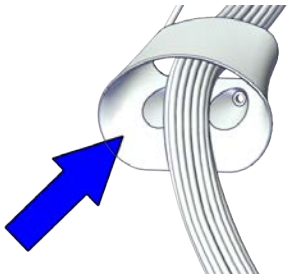
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5.3.1 Replacing the cable package

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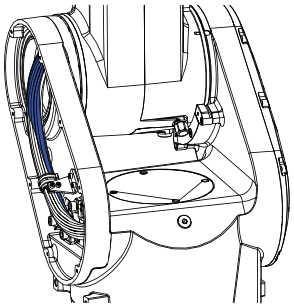
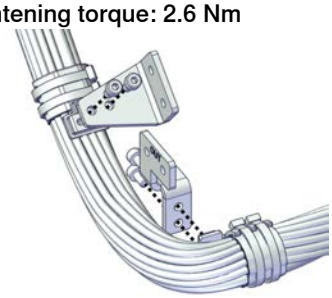
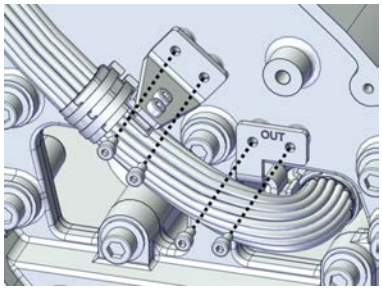
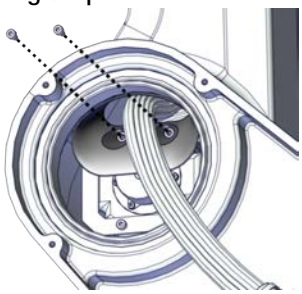
	Action	Note
5	Refit the connector plate to the base.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001559

Securing the cable package in the swing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Route the cable package through the swing support. Make sure that: • the air hoses are facing the SMB side in the hollow tube of axis-1 gearbox. • the cable package is out from the hole near the base rear, as circled in the figure. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001745  xx2000001747
3	Apply grease to the axis-2 cable protector and slip it over the cable harness. **Note** Note the correct direction of the cable protector.	Grease: 3HAC029132-001 Plastic cable protector, axis 2: 3HAC067816-001  xx2000001567

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	Action	Note
4	Route the cable package up into the lower arm. Make sure that: • the air hoses are facing outside in the axis-2 cable protector, see the figure as a guidance for the cable twisting way. • the axis-2 motor cablings are routed together with the main cable package up to the lower arm. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001746
5	Refit the cable brackets to the cable package first and then to the swing.	Screw: M4x8 12.9 Lafre (2 pcs for each bracket on cable package and 2 pcs on swing) Tightening torque: 2.6 Nm  xx2100001466  xx2000001557
6	Refit the axis-2 cable protector.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001556

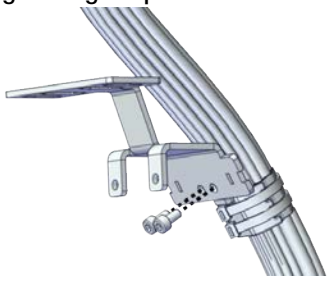
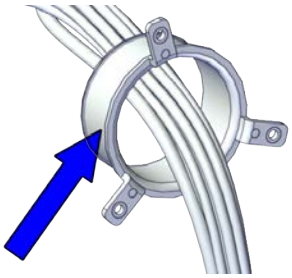
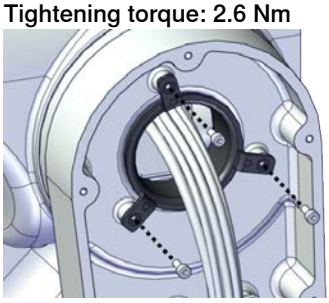
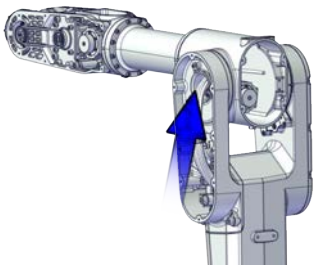
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5.3.1 Replacing the cable package

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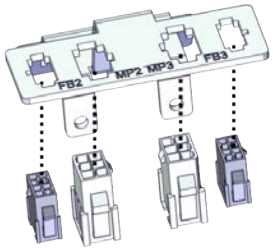
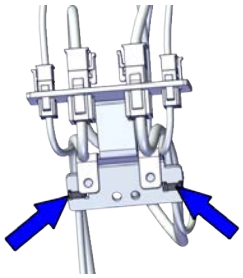
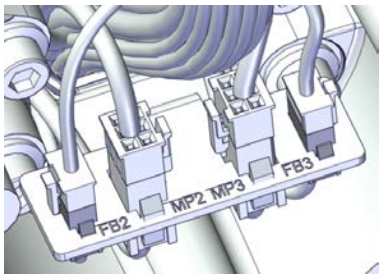
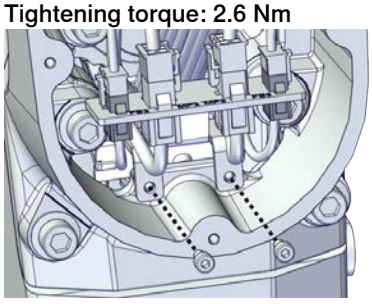
Routing the cable package in the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001554
3	Check the axis-3 cable protector. Replace if damaged. **Note** If replaced, apply grease to the axis-3 cable protector before refitting.	Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001  xx2000001568 Screw: M4x10 12.9 Lafre (3 pcs) Tightening torque: 2.6 Nm  xx2000001552
4	Route the cable package through the lower arm support and up into the housing. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001569

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Reconnecting the axis-2 and -3 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001551
3	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001549
4	Reconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001550
5	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001548

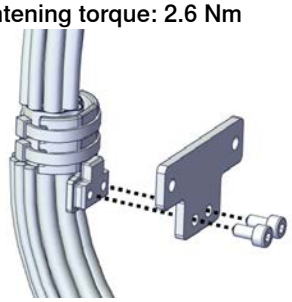
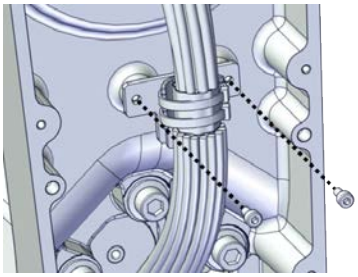
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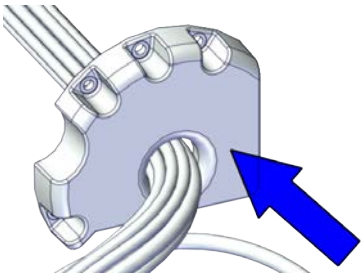
5.3.1 Replacing the cable package

Continued

Securing the cable package in the lower arm

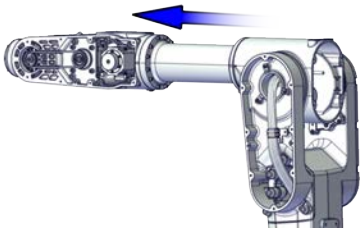
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the cable bracket.	Screw: M4x8 12.9 Lafre (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm  xx2100001465  xx2000001553

Routing the cable package in the housing

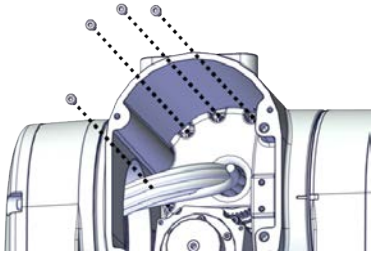
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Slip the axis-4 cable protector over the cable package.	Plastic cable protector, axis 4: 3HAC064694-001:  xx2000001570

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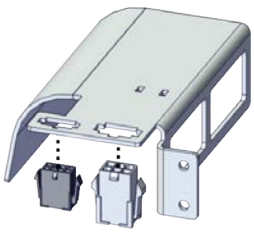
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	Action	Note
3	Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and into the tubular. Make sure that: • the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001571

Securing the cable package in the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 cable protector.	Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001546

Reconnecting the axis-4 motor connectors

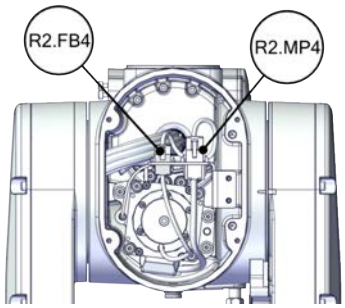
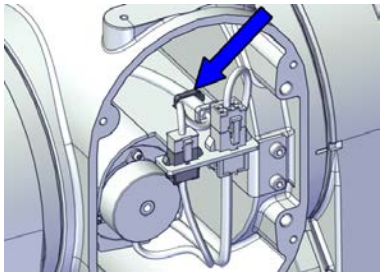
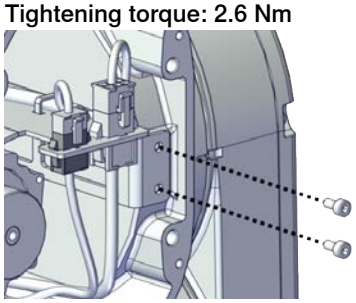
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545

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5.3.1 Replacing the cable package

Continued

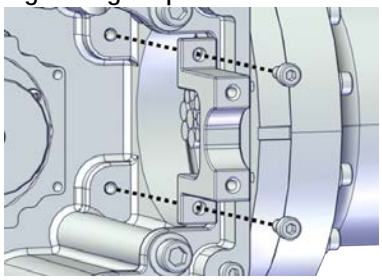
	Action	Note
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

Routing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

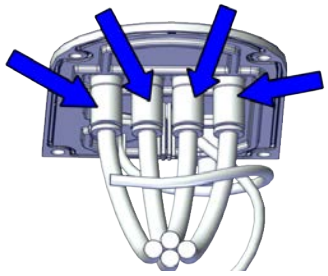
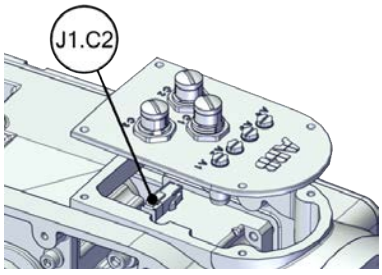
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	Action	Note
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

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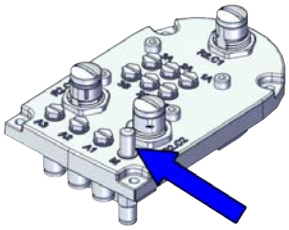
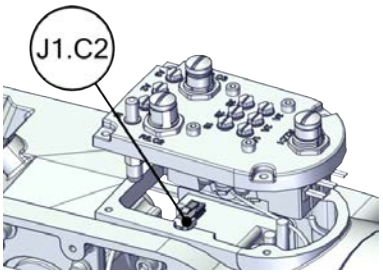
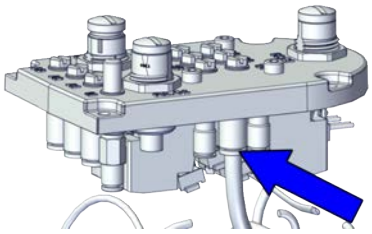
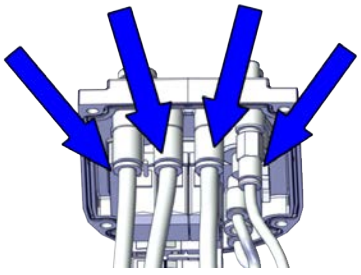
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5.3.1 Replacing the cable package

Continued

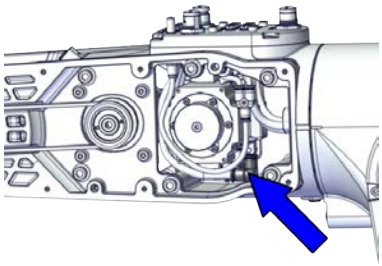
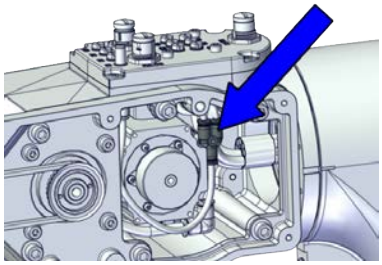
Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

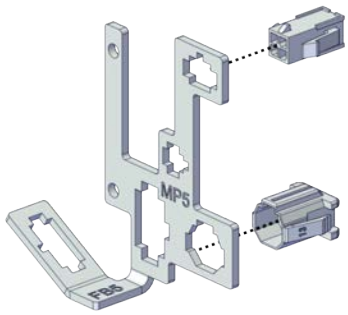
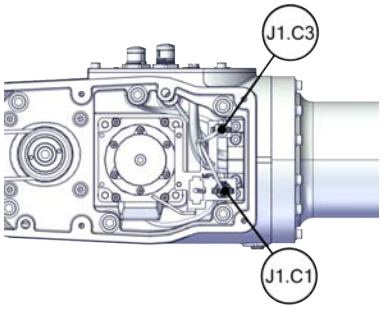
	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373

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	Action	Note
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

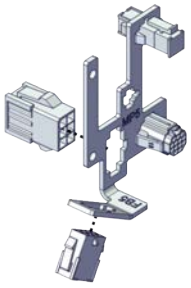
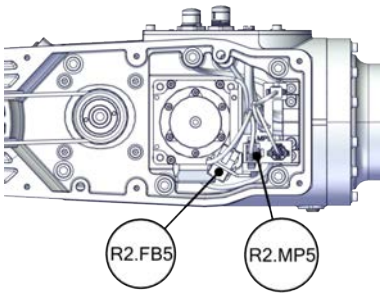
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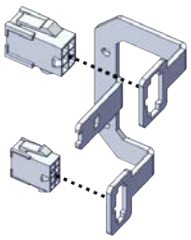
5.3.1 Replacing the cable package

Continued

Reconnecting the axis-5 motor connectors

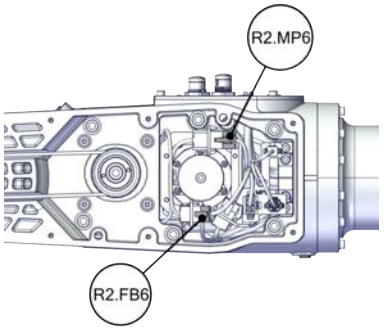
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

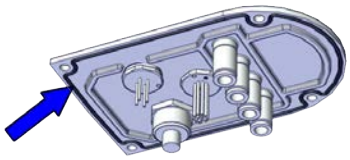
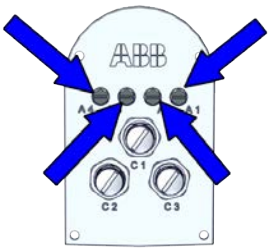
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533

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	Action	Note
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

Refitting the process hub

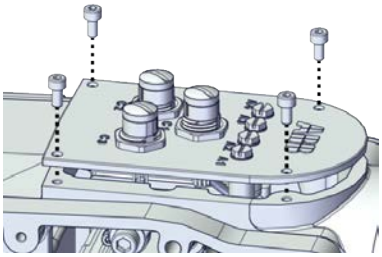
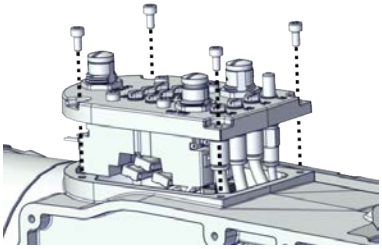
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

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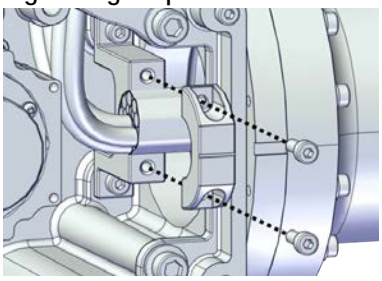
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5.3.1 Replacing the cable package

Continued

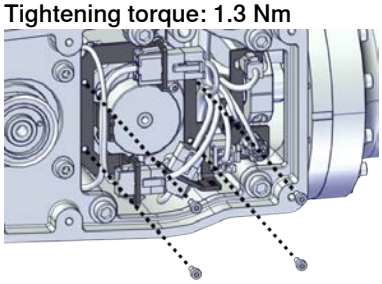
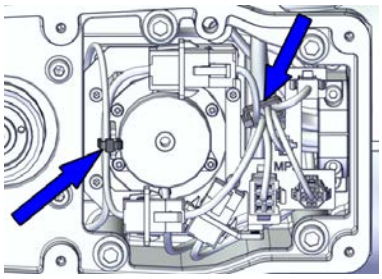
	Action	Note
5	Refit the process hub.	**Not valid for robots with solenoid valve (3303-3)** Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538
		Valid for robots with solenoid valve (3303-3) Screw: M4x12 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2300001372

Securing the cable package in the tubular

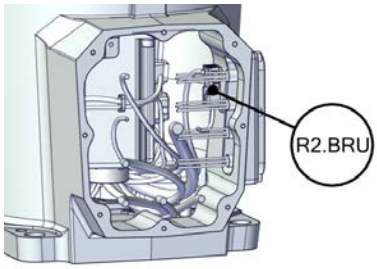
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748

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	Action	Note
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

Reconnecting the brake release connector

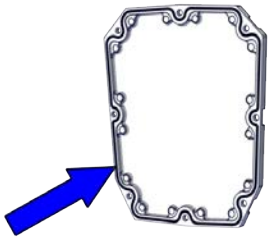
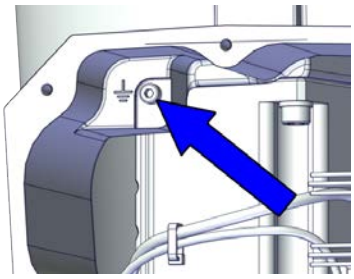
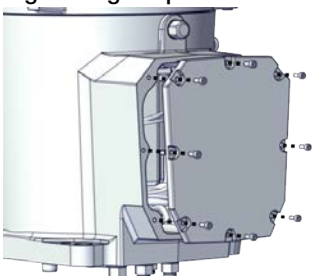
	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	
2	Reconnect the connector. • R2.BRU **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2100001480
3	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

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5.3.1 Replacing the cable package
Continued

Reconnecting the earth cable

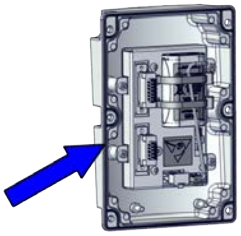
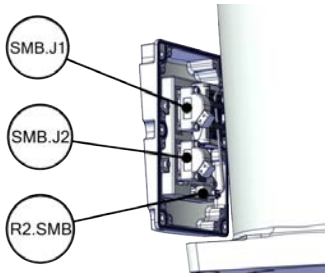
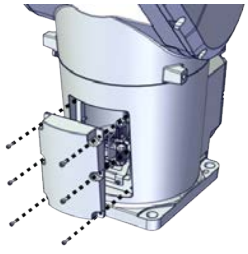
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for base cover: 3HAC067819-001  xx2000002526
3	Reconnect the earth cable.	 xx2000001574
4	**Valid for cabling with bottom interface (option 3309-1)** Refit the base rear cover.	Screw: M4x10 12.9 Lafre (8 pcs) Tightening torque: 2.6 Nm  xx2000001573

Reconnecting the SMB connectors

	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	

Continues on next page

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	Action	Note
2	**For robots with protection type Clean Room** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for SMB cover: 3HAC067820-001  xx2000002508
4	Reconnect the connectors. • SMB.J1 • SMB.J2 • R2.SMB **Tip** See the number markings on the connectors for help to find the corresponding connector.	Tightening torque: 0.3 Nm  xx2000001504
5	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	
6	Refit the SMB cover to the base.	Screw: M4x10 12.9 Lafre (6 pcs) Tightening torque: 2.6 Nm  xx2000001503

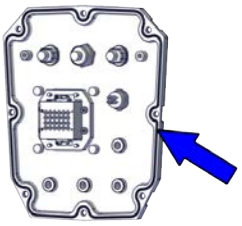
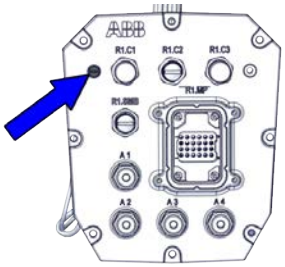
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5.3.1 Replacing the cable package

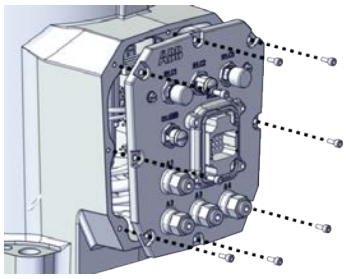
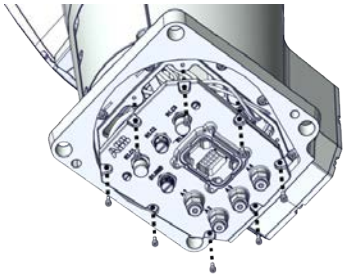
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Refitting the connector interface plate

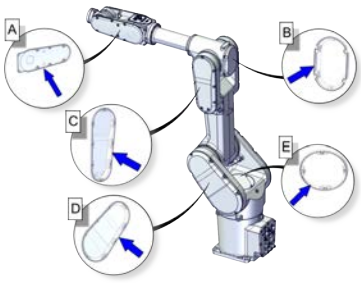
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for base cover: 3HAC067819-001  xx2000002514
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolt. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002515
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

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	Action	Note
5	Refit the connector interface plate to the base.	Screw: M4x10 12.9 Lafre (8 pcs) Tightening torque: 2.6 Nm **Valid for cabling with rear interface**  xx2000001558 **Valid for cabling with bottom interface (option 3309-1)**  xx2000001575

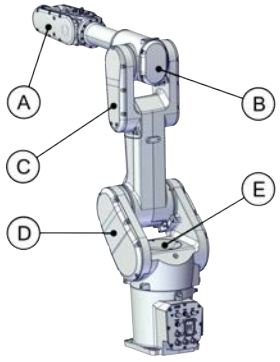
Refitting the covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing support cover (D) • Swing top cover (E) Replace if damaged.	 xx2000002497
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

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5.3.1 Replacing the cable package
Continued

	Action	Note
5	Refit the covers. • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm support cover (C) • Gasket for swing support cover (D) • Gasket for swing top cover (E)	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001572

Concluding procedure

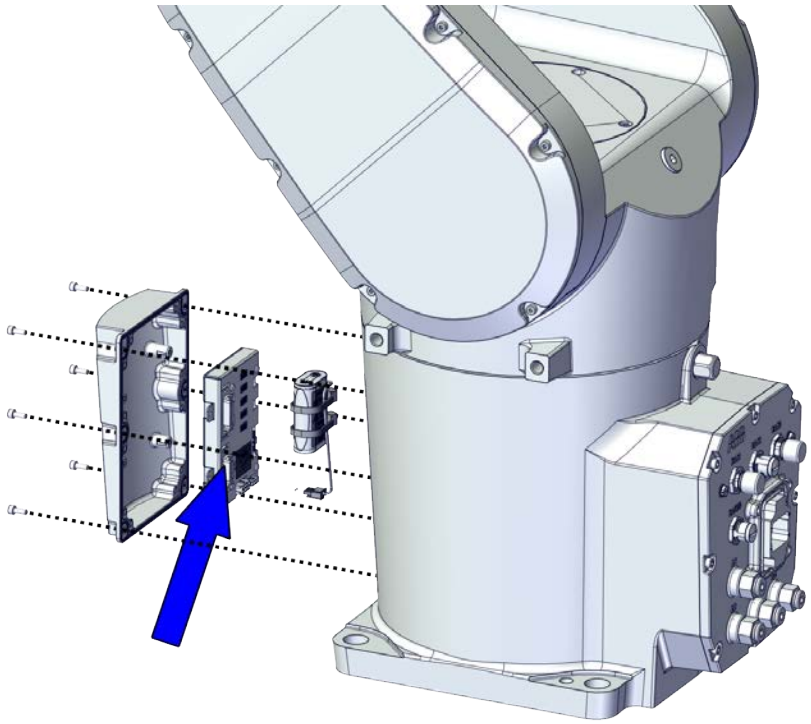
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.3.2 Replacing the SMB unit

Location of the SMB unit

The SMB unit is located as shown in the figure.



xx2000001494

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Serial measurement unit	3HAC063968-001	
SMB cover	3HAC076475-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
SMB cover, Clean Room	3HAC077839-001	Used with protection type Clean Room.
Gasket for SMB cover	3HAC067820-001	Not used with protection class IP40. Replace if damaged.

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5.3.2 Replacing the SMB unit
Continued

Spare part	Article number	Note
Battery pack	3HAC044075-001	Battery includes protection circuits. Only replace with the specified spare part or an ABB-approved equivalent.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.

Required consumables and wear parts

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

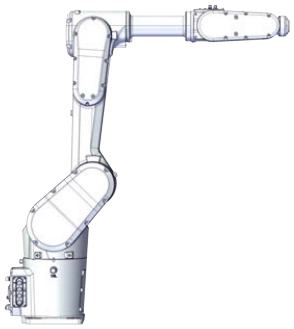
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Removing the SMB unit

Use these procedures to remove the SMB unit.

Preparations before removing the SMB unit

	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.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

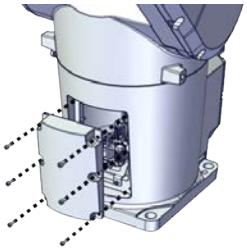
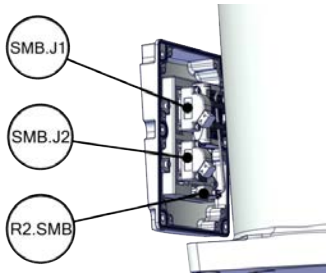
Disconnecting the SMB connectors

	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 read the safety information in section *The unit is sensitive to ESD on page 53*.	

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5.3.2 Replacing the SMB unit
Continued

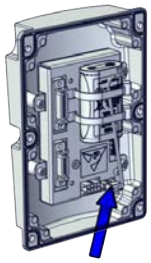
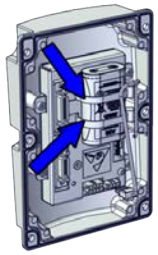
	Action	Note
3	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
4	Remove the SMB cover attachment screws and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** There are cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001503
5	Disconnect the connectors. • SMB.J1 • SMB.J2 • R2.SMB **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001504
6	Remove the SMB cover completely from the base.	

Removing the battery pack

	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 read the safety information in section *The unit is sensitive to ESD on page 53*.	

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	Action	Note
3	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
4	Disconnect the battery cable.	 xx2000001505
5	Remove the battery pack by cutting the cable strap.	 xx2000001506

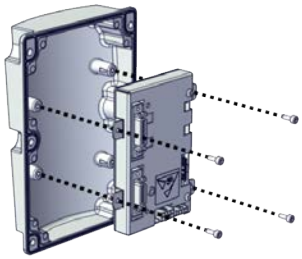
Removing the SMB unit

	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 read the safety information in section *The unit is sensitive to ESD on page 53*.	
3	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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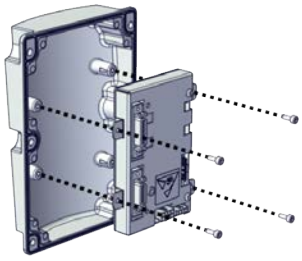
5.3.2 Replacing the SMB unit
Continued

	Action	Note
4	Remove the screws.	 xx2000001507

Refitting the SMB unit

Use these procedures to refit the SMB unit.

Refitting the SMB unit

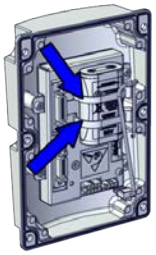
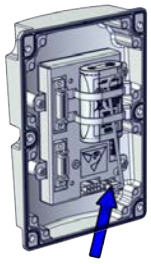
	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	
2	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Refit the screws.	Screw: M3x8 12.9 Lafre (4 pcs) Tightening torque: 1.3 Nm  xx2000001507

Refitting the battery pack

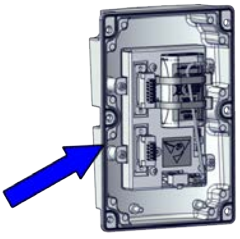
	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	

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	Action	Note
2	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Secure the battery pack using the cable strap.	 xx2000001506
4	Reconnect the battery cable.	 xx2000001505

Reconnecting the SMB connectors

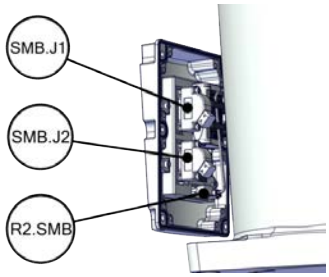
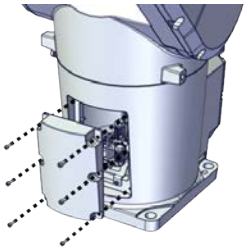
	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	
2	**For robots with protection type Clean Room** Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for SMB cover: 3HAC067820-001  xx2000002508

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5.3.2 Replacing the SMB unit

Continued

	Action	Note
4	Reconnect the connectors. • SMB.J1 • SMB.J2 • R2.SMB **Tip** See the number markings on the connectors for help to find the corresponding connector.	Tightening torque: 0.3 Nm  xx2000001504
5	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	
6	Refit the SMB cover to the base.	Screw: M4x10 12.9 Lafre (6 pcs) Tightening torque: 2.6 Nm  xx2000001503

Concluding procedure

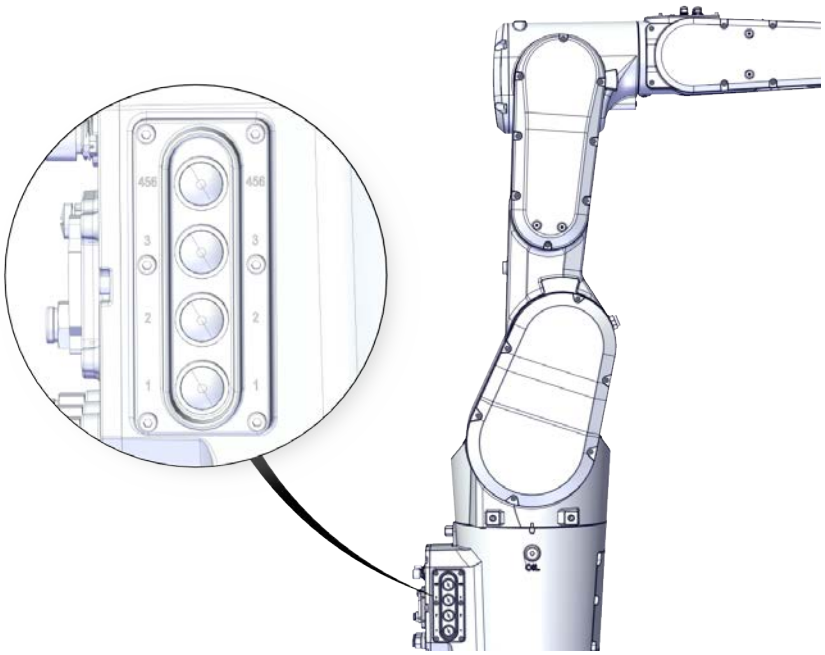
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.3.3 Replacing the brake release unit

Location of the brake release unit

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



xx1900001653

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Brake release unit	3HAC073296-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Brake release unit, Clean Room	3HAC077826-001	Used with protection type Clean Room.
Gasket for brake release unit	3HAC070274-001	Not used with protection class IP40. Replace if damaged.

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5.3.3 Replacing the brake release unit
Continued

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the brake release unit

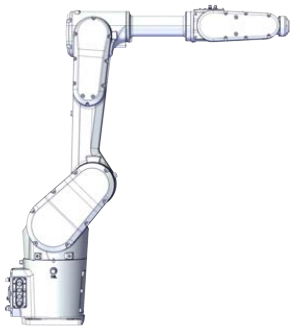
Use these procedures to remove the brake release unit.

Preparations before removing the brake release unit

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

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	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

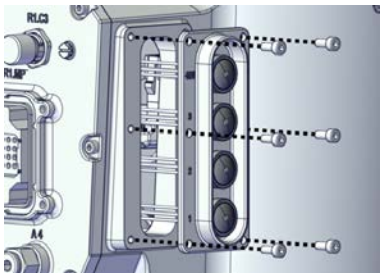
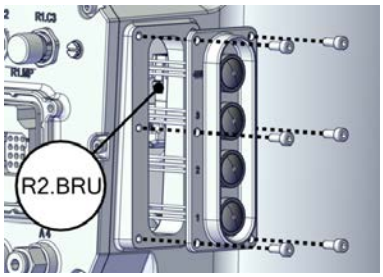
Removing the brake release unit

	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 read the safety information in section *The unit is sensitive to ESD on page 53*.	

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5.3.3 Replacing the brake release unit
Continued

	Action	Note
3	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
4	Remove the screws and carefully open the cover. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures. **CAUTION** There are cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001577
5	Cut the cable strap.	
6	Disconnect the connector. • R2.BRU **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001578
7	Remove the brake release unit completely from the base.	

Refitting the brake release unit

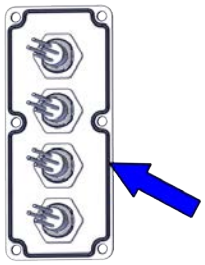
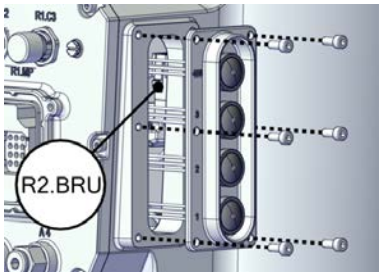
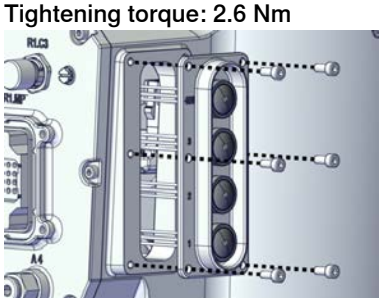
Use these procedures to refit the brake release unit.

Refitting the brake release unit

	Action	Note
1	**ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 53*.	
2	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

Continues on next page

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	Action	Note
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for brake release unit: 3HAC070274-001  xx2000002509
4	Reconnect the connector. • R2.BRU **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001578
5	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	
6	Refit the brake release unit.	Screw: M4x10 12.9 Lafre (6 pcs) Tightening torque: 2.6 Nm  xx2000001577

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5.3.3 Replacing the brake release unit
Continued

Concluding procedure

	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

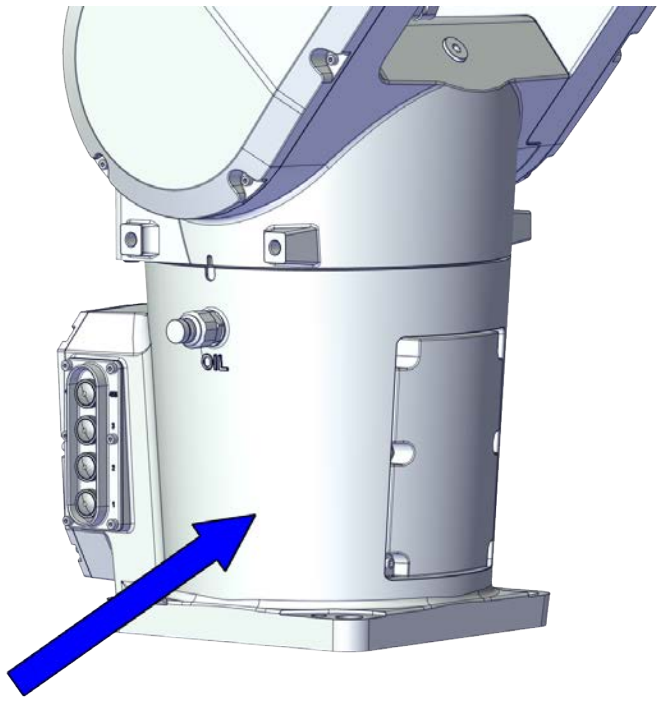
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5.4 Swing and base

5.4.1 Replacing the base

Location of the base

The base is located as shown in the figure.



xx2000001473

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Base	3HAC073029-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4. Used with protection classes IP40 and IP67.
Base, Clean Room	3HAC077806-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4. Used with protection type Clean Room.

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5.4.1 Replacing the base
Continued

Spare part	Article number	Note
Base, Foundry Plus	3HAC077840-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4. Used with protection type Foundry Plus.
Base (IRB 1300-12/1.4)	3HAC082393-001	Used for IRB 1300-12/1.4. Used with protection classes IP40 and IP67.
Base, Clean Room (IRB 1300-12/1.4)	3HAC082394-001	Used for IRB 1300-12/1.4. Used with protection type Clean Room.
Base, Foundry Plus (IRB 1300-12/1.4)	3HAC082395-001	Used for IRB 1300-12/1.4. Used with protection type Foundry Plus.
Gear unit, axis 1	3HAC063187-001	
O-ring on axis-1 gear unit	3HAC063187-007	
Motor unit, axis 1	3HAC073039-001	
O-ring on motor unit	3HAC061327-037	
Resolver cover on axis-1 motor	3HAC060261-001	Used for robots with bottom connector interface.
Radial sealing	3HAC066433-001	
Radial sealing	3HAC070148-002	
Quick coupling	3HAC074630-001	
Gasket on swing	3HAC067626-001	
Mechanical stop, axis 1, fixed block	3HAC064478-001	Replace if damaged.
Mechanical stop, axis 1, slider	3HAC065755-001	Replace if damaged.
Main cable harness, S, basic	3HAC073303-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S (CP/CS and air hose, without Ethernet)	3HAC073304-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S (CP/CS and air hose, with Ethernet)	3HAC073305-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M, basic	3HAC073300-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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Spare part	Article number	Note
Main cable harness, M (CP/CS and air hose, without Ethernet)	3HAC073301-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M (CP/CS and air hose, with Ethernet)	3HAC073302-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L, basic	3HAC073297-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L (CP/CS and air hose, without Ethernet)	3HAC073298-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L (CP/CS and air hose, with Ethernet)	3HAC073299-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S, basic, Clean Room	3HAC077833-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, S, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077834-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, S, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077835-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.

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5.4.1 Replacing the base
Continued

Spare part	Article number	Note
Main cable harness, M, basic, Clean Room	3HAC077830-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, M, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077831-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, M, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077832-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, L, basic, Clean Room	3HAC077827-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Main cable harness, L, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077828-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Main cable harness, L, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077829-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 2	3HAC067816-001	
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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Spare part	Article number	Note
Swing cover, short	3HAC073095-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, long	3HAC073096-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing top cover	3HAC073091-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Base cover	3HAC073090-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
SMB cover	3HAC076475-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Brake release unit	3HAC073296-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Swing cover, short, Clean Room	3HAC077824-001	Used with protection type Clean Room.
Swing cover, long, Clean Room	3HAC077825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Swing top cover, Clean Room	3HAC077820-001	Used with protection type Clean Room.
Base cover, Clean Room	3HAC077819-001	Used with protection type Clean Room.
SMB cover, Clean Room	3HAC077839-001	Used with protection type Clean Room.
Brake release unit, Clean Room	3HAC077826-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.

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5.4.1 Replacing the base
Continued

Spare part	Article number	Note
Gasket for SMB cover	3HAC067820-001	Not used with protection class IP40. Replace if damaged.
Gasket for brake release unit	3HAC070274-001	Not used with protection class IP40. Replace if damaged.
Gasket for base cover	3HAC067819-001	Not used with protection class IP40. Replace if damaged.
Gasket for base adapter	3HAC067818-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing support, long	3HAC067823-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on swing (to base)	3HAC070148-003	Used with protection types Clean Room and Foundry Plus. Replace if damaged.

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Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Connector for quick coupling, with outlet pipe	-	Used for draining and filling oil to axis-1 gearbox. Connector specification: G3/8
Oil dispenser	-	Includes pump with outlet pipe.
Quick coupling assembly tool	-	Included in special toolkit 3HAC076396-001.
Axis-1 gearbox assembly cap	-	Included in special toolkit 3HAC076396-001.
Axis-1 gearbox/motor sealing pressfit tool	-	Included in special toolkit 3HAC076396-001.
Axis-1 gearbox/motor sealing pressfit base	-	Included in special toolkit 3HAC076396-001.
Roundsling, 1.7 m	-	Length: 1.7 m Lifting capacity: >70 kg
Overhead crane	-	
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-009	Kyodo Yushi TMO150
Flange sealant for conical fittings	-	Loctite 5400 (or equivalent Loctite 577)

Removing the base

Use these procedures to remove the base.

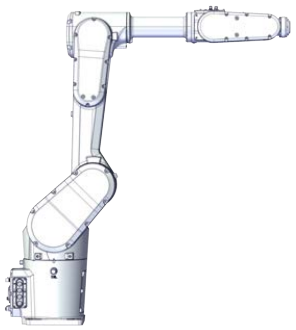
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5.4.1 Replacing the base

Continued

Preparations before removing the base

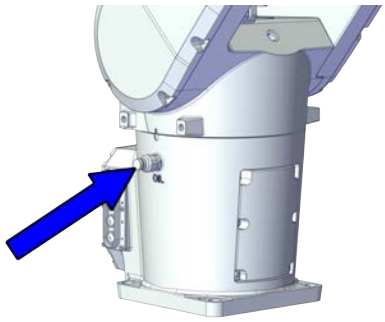
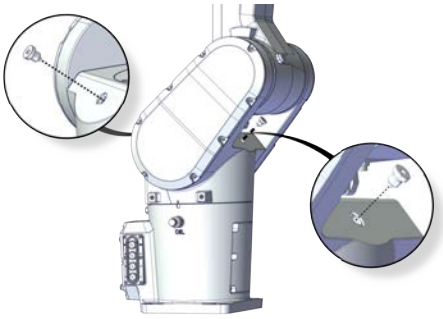
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Draining oil of axis-1 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**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.	

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	Action	Note
3	Place the oil collecting vessel underneath the quick coupling.	 xx2000001514
4	Remove the oil plugs and keep them opened to speed up the drainage.	 xx2000001513
5	Plug a G3/8 quick coupling connector with pipe to the quick coupling on base.	
6	**WARNING** Used oil is hazardous material and must be disposed of in a safe way. See *Decommissioning on page 805* for more information.	
7	Drain the gearbox oil.	**Note** Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.
8	Remove the quick coupling connector and clean the pipe after the oil is drained. **Note** There will be some oil left in the gearbox after draining.	
9	Refit oil plugs.	Tightening torque: 10 Nm

Removing the complete cable package

Follow the instructions detailed in *Removing the cable package on page 177* to remove the complete cable package.

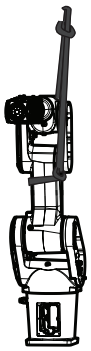
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5.4.1 Replacing the base

Continued

Supporting the arm system with roundsling

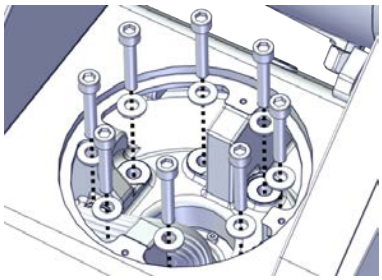
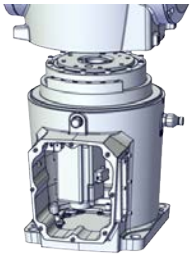
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Run a roundsling around the lower arm.	Roundsling, 1.7 m, Lifting capacity: >70 kg  xx2000001651
4	**CAUTION** The arm system weighs 52 kg. All lifting accessories used must be sized accordingly!	
5	**WARNING** The robot is likely to be mechanically unstable if not secured to the foundation.	
6	**WARNING** Personnel must not, under any circumstances, be present under the suspended load.	

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	Action	Note
7	Stretch the roundsling to take the weight of the arm system. **Note** Do not stretch the roundsling too much.	

Separating the arm system from base

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove screws and washers.	 xx2000000502
4	Lift the arm system little by little to separate the arm system from the base.	 xx2000001702

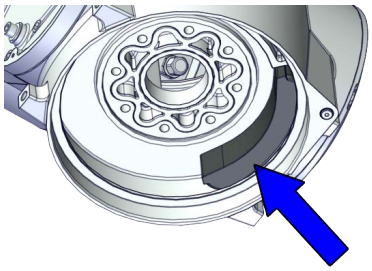
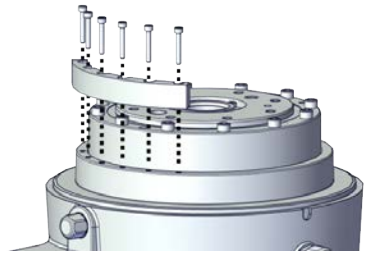
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5.4.1 Replacing the base

Continued

Removing the axis-1 mechanical stops

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Access the axis-1 mechanical stop slider from the swing. Put it aside for later refitting.	 xx2000001703
4	Remove the axis-1 mechanical stop fixed block.	 xx2000001693

Removing the base from foundation

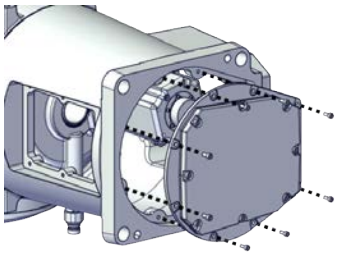
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**WARNING** The robot is likely to be mechanically unstable if not secured to the foundation.	
4	Loosen the base from the foundation by removing the foundation attachment screws.	

Removing the base covers

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**Valid for cabling with rear interface** Remove the base bottom cover together with the base adapter.	 xx2000001642

Removing the axis-1 motor

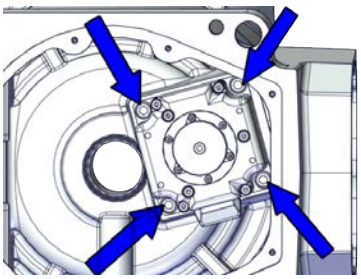
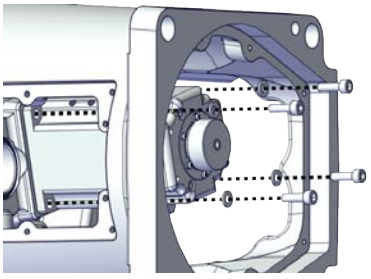
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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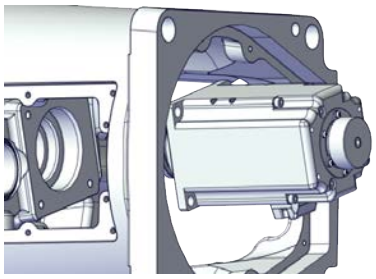
5.4.1 Replacing the base

Continued

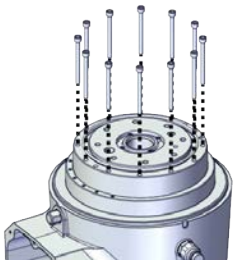
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**WARNING** When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section *Gearbox lubricants (oil or grease) on page 32*.	
4	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
5	Access the screws and washers securing the axis-1 motor from the base bottom.	 xx2000001643
6	Remove the screws and washers.	 xx2000001644

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	Action	Note
7	Carefully lift out the motor.	 xx2000001645

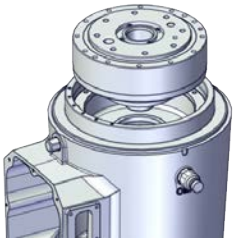
Removing the axis-1 gearbox

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
4	Remove the screws.	 xx2000001694

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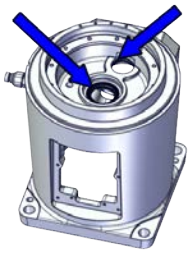
5.4.1 Replacing the base
Continued

	Action	Note
5	Pull out the gearbox.	 xx2000001695

Refitting the base

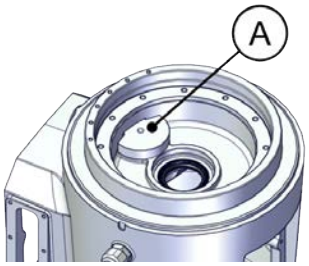
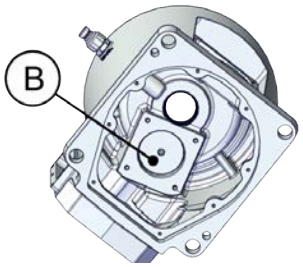
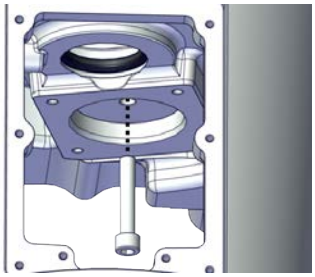
Use these procedures to refit the base.

Checking the radial sealings on the base

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealings on the base. Replace if damaged, as described below.	 xx2000001713
3	Place the new motor-side radial sealing in its groove in the base. The sealing lip is towards the swing side.	Radial sealing: 3HAC066433-001  xx2000001714

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	Action	Note
4	Place the pressfit base (A) against one side of the sealing and the pressfit tool (B) against the other side, as shown in the figures.	Axis-1 gearbox/motor sealing pressfit base. Included in special toolkit 3HAC076396-001.  xx2000001715 Axis-1 gearbox/motor sealing pressfit tool. Included in special toolkit 3HAC076396-001.  xx2000001716
5	Fix the pressift tool with an M8 screw.	 xx2000001717
6	Screw the screw, little by little and evenly, to press the sealing into place.	
7	Repeat steps *3* to *6* to replace the gearbox-side radial sealing.	Radial sealing: 3HAC070148-002

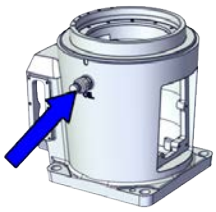
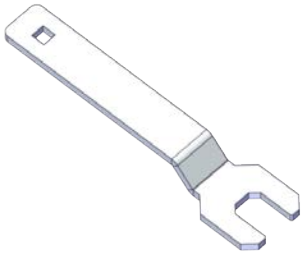
Checking the quick coupling on the base

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

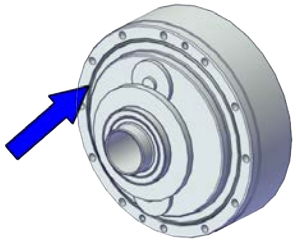
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5.4.1 Replacing the base
Continued

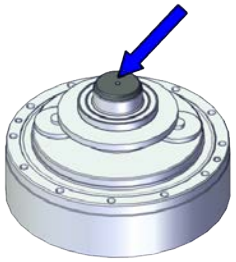
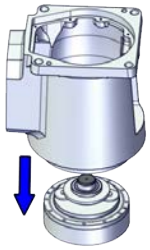
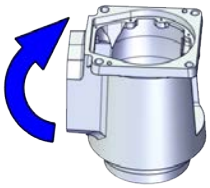
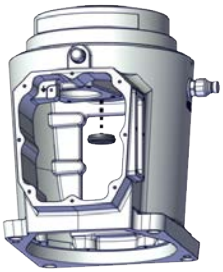
	Action	Note
2	Check the quick coupling. Replace if damaged.	Quick coupling: 3HAC074630-001  xx2000001681
3	Use the quick coupling assembly tool to remove and refit the quick coupling. Apply flange sealing Loctite 577 on the mounting surfaces of the quick coupling and wipe clean if there is any overflowing Loctite 577.	Quick coupling assembly tool. Included in special toolkit 3HAC076396-001. Tightening torque: N/A, tighten up properly.  xx2000001335

Refitting the axis-1 gearbox

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the O-ring. Replace if damaged.	O-ring on axis-1 gear unit: 3HAC063187-007  xx2000001696

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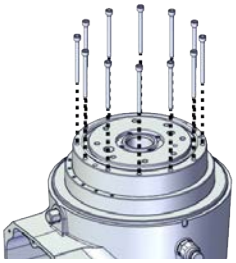
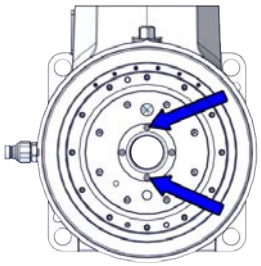
	Action	Note
3	Put the axis-1 gearbox on the workbench with the gear side towards upside and place the assembly cap to the gearbox.	Axis-1 gearbox assembly cap. Included in special toolkit 3HAC076396-001.  xx2000001709
4	Put the base onto the gearbox.	 xx2000001710
5	Turn the base together with the gearbox over to the standing position.	 xx2000001711
6	Remove the assembly cap.	 xx2000001712

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5.4.1 Replacing the base

Continued

	Action	Note
7	Secure with screws.	Screw: M6x65 12.9 Gleitmo 603+Geomet 500 (12 pcs) Tightening torque: 11.5 Nm  xx2000001694
8	Mark the screws aligned with the oil openings.	 xx2000001698

Putting the base on its side

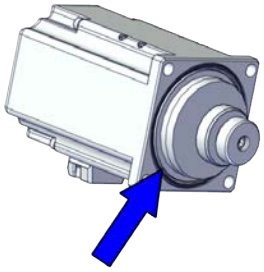
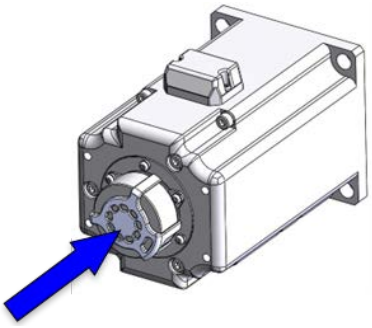
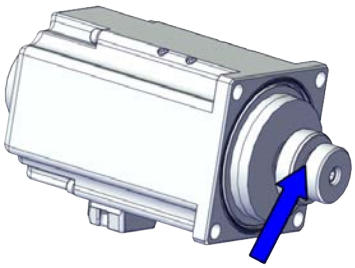
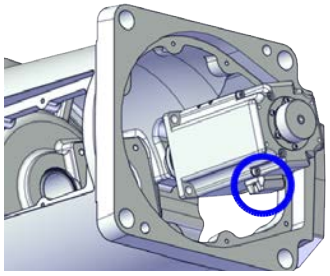
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Put the base on its side for easily refitting the motor and base cover.	

Refitting the axis-1 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	

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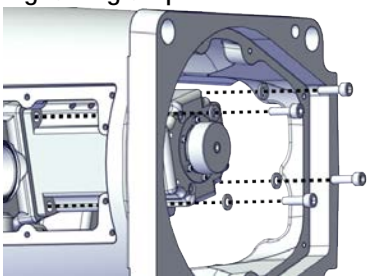
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	Action	Note
3	Check the O-ring. Replace if damaged.	O-ring on motor unit: 3HAC061327-037  xx2000001646
4	**Valid for cabling with bottom interface (option 3309-1)** Check the resolver cover. Replace if damaged.	Resolver cover on axis-1 motor: 3HAC060261-001  xx2500001211
5	Apply lubricating oil to the motor that has contacting area with the gearbox.	Kyodo Yushi TMO150: 3HAC032140-009  xx2000001700
6	Orient the motor correctly and fit it into the swing. Make sure the motor is properly fit to gearbox.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001647

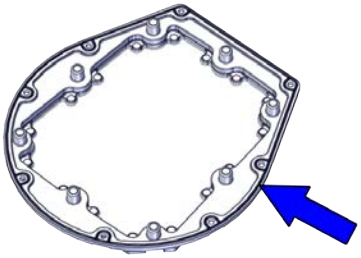
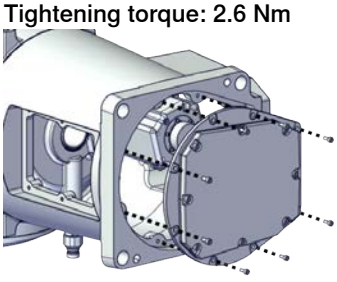
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5.4.1 Replacing the base
Continued

	Action	Note
7	Refit the screws and washers.	Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm  xx2000001644

Refitting the base covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** **Valid for cabling with rear interface** Check the gasket. Replace if damaged.	Gasket for base adapter: 3HAC067818-001  xx2000002510
3	**Valid for cabling with rear interface** Refit the base bottom cover together with the base adapter.	Screw: M4x10 12.9 Lafre (8 pcs) Tightening torque: 2.6 Nm  xx2000001642

Securing the base to the foundation

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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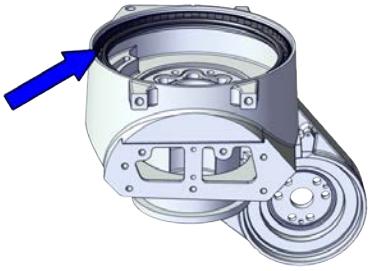
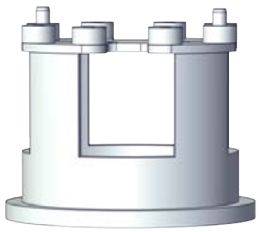
	Action	Note
2	Secure the base to the foundation with the attachment screws and washers.	Attachment screws: M16x50, quality: 8.8. Washers: 17 x 30 x 3, steel hardness class 200HV. Tightening Torque: 150 Nm±10 Nm.

Check the radial sealing on the swing bottom

Note

This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection type Foundry Plus (option 3352-10)

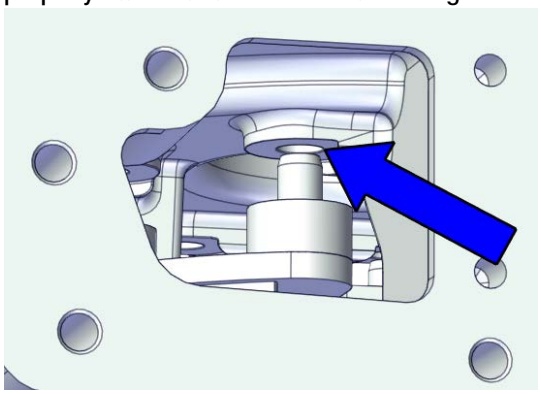
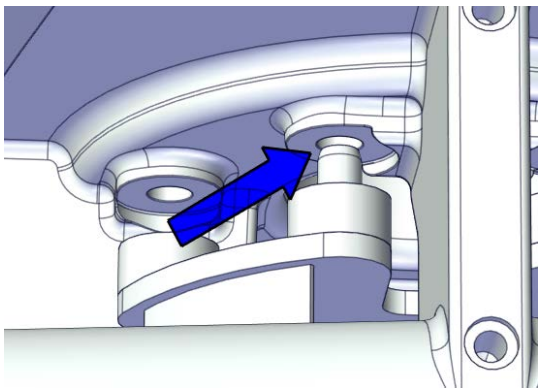
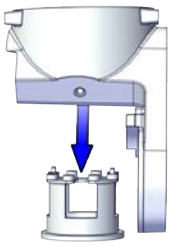
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the swing bottom. Replace if damaged, as described below. **Note** If the radial sealing requires to be replaced during the replacement of the base, remove the swing from the lower arm first. See *Replacing the swing on page 261*.	 xx2000002452
3	Place the pressfit support of the axis-1 sealing assembly tool on the workbench, positioning as shown in the figure.	Pressfit support of the axis-1 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002453

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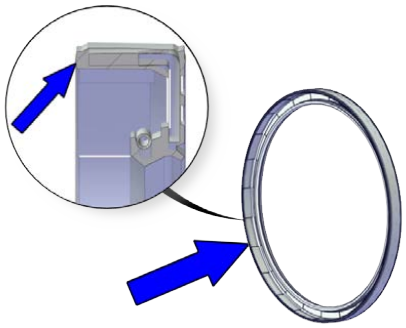
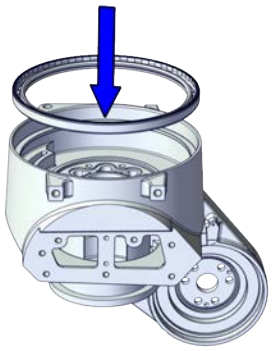
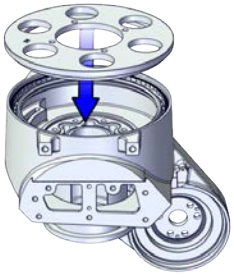
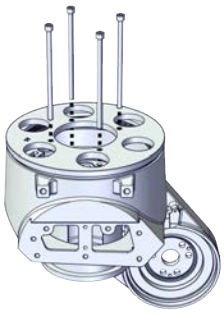
5.4.1 Replacing the base

Continued

	Action	Note
4	Turn the swing upside down and place it on to the pressfit support. Make sure the convex pins on the support are properly fitted into the holes on the swing.  xx2000002455  xx2000002456	 xx2000002454
5	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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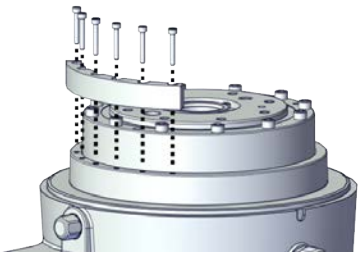
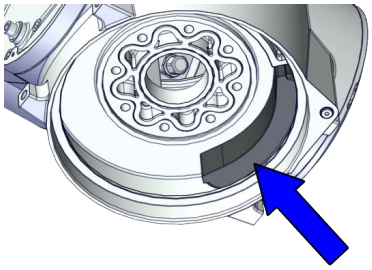
	Action	Note
6	Fit the new sealing into the swing. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002457
7	Fit the circular plate of the axis-1 sealing assembly tool against the sealing and fix with four M8x145 screws.	Circular plate of the axis-1 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002458  xx2000002459
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

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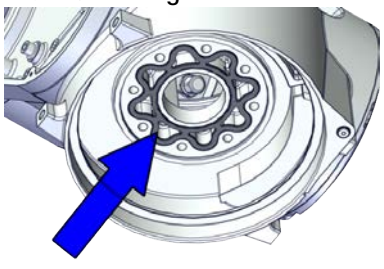
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5.4.1 Replacing the base
Continued

Refitting the axis-1 mechanical stops

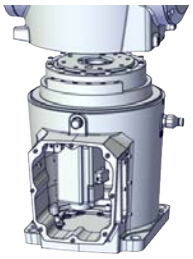
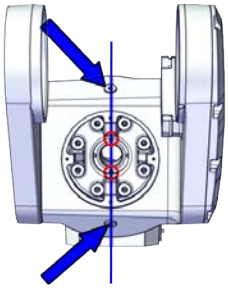
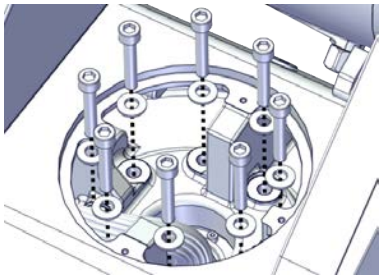
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-1 mechanical stop fixed block.	Screw: M4x25 12.9 Lafre (6 pcs) Tightening torque: 3.8 Nm  xx2000001693
3	Apply grease to the axis-1 mechanical stop slider and refit it to the swing.	Grease: 3HAC029132-001  xx2000001703

Securing the arm system to the base

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the gasket. Replace if damaged.	Gasket on swing: 3HAC067626-001  xx2000001704

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	Action	Note
3	Place the arm system slowly down to the base.	 xx2000001702
4	Align the oil plugs on the swing with the marked screws on the axis-1 gearbox.	 xx2000001699
5	Secure with screws and washers.	Screw: M8x45 12.9 Gleitmo 603+Geomet 500 (8 pcs) Tightening torque: 36 Nm  xx2000000502

Refitting the complete cable package

Follow the instructions detailed in *Refitting the cable package on page 195* to refit the complete cable package.

Refilling oil to axis-1 gearbox

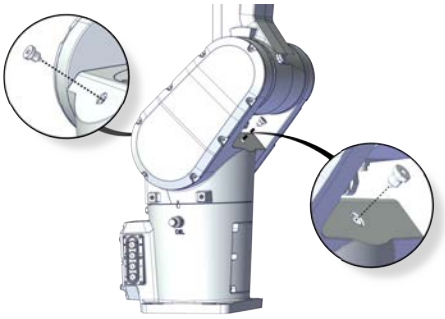
	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	

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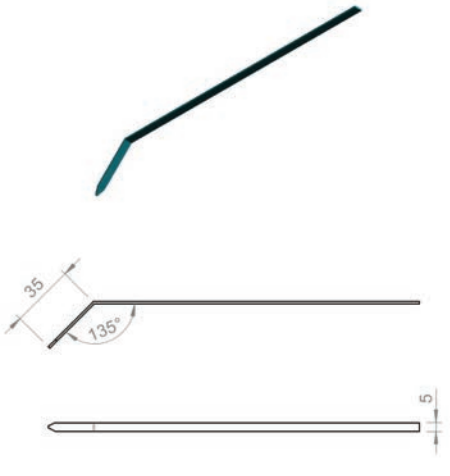
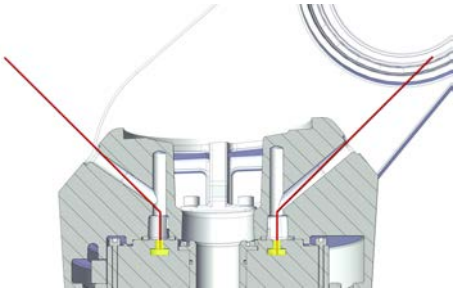
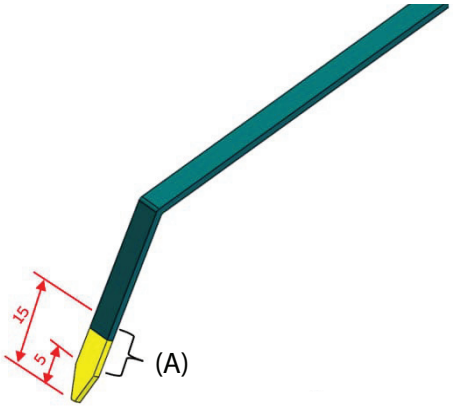
5.4.1 Replacing the base

Continued

	Action	Note
2	**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.	
3	Open the oil plugs, one for filling and the other for venting.	 xx2000001513
4	**WARNING** Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	
5	Refill the gearbox with oil. **CAUTION** Oil filling must be slow to make sure air venting is fluent.	Type of oil and total amount is detailed in *Lubrication in gearboxes on page 816*.

Continues on next page

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	Action	Note
6	Measure the oil level by inserting two bent cable straps into the oil filling/venting holes. **CAUTION** After oil filling, the oil level may continue raising at the venting hole side until the level is balanced within the gearbox. Wait until the oil stops raising, before measuring the oil level. **Note** Make sure that the cable strap ends are fully inserted into the gearbox cavity, that is, reaching the bottom of the yellow-marked holes in the figure. You can try to rotate the cable straps after inserting. If it feels obstructed and the straps cannot be rotated freely, they are in place.	Bending specification of the cable straps  xx2400000882  xx2400000881
7	Make sure the measured oil level is within the height range of 5 mm to 15 mm at the ends of the cable straps. **Note** Oil shall be obviously observed all around the cable strap ends, rather than unevenly adhered to the cable strap sides.	 xx2400000883
8	Refit the oil plugs.	Tightening torque: 10 Nm

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5.4.1 Replacing the base

Continued

Concluding procedure

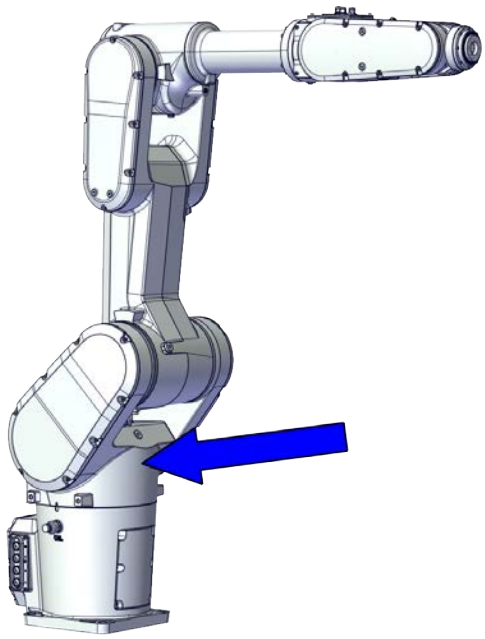
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.4.2 Replacing the swing

Location of the swing

The swing is located as shown in the figure.



xx2000001474

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Swing, short	3HAC073040-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing, short, Clean Room	3HAC077807-001	Used for IRB 1300-11/0.9. Used with protection type Clean Room.

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5.4.2 Replacing the swing
Continued

Spare part	Article number	Note
Swing, long	3HAC073047-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing, long, Clean Room	3HAC077809-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Swing support, short	3HAC073041-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing support, short, Clean Room	3HAC077808-001	Used for IRB 1300-11/0.9. Used with protection type Clean Room.
Swing support, long	3HAC073052-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing support, long, Clean Room	3HAC077810-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Motor unit, axis 2	3HAC073078-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4.
Motor unit, axis 2 (IRB 1300-12/1.4)	3HAC082078-001	Used for IRB 1300-12/1.4.
O-ring on motor unit	3HAC061327-037	
Sealing ring, swing support side	3HAC065676-001	
O-ring on swing	3HAC061327-036	
Mechanical stop, block A	3HAC065651-001	Replace if damaged.
Magnetic oil plug, G 1/4"	3HAC037925-001	
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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Spare part	Article number	Note
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 2	3HAC067816-001	
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, short	3HAC073095-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, long	3HAC073096-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing top cover	3HAC073091-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.

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5.4.2 Replacing the swing
Continued

Spare part	Article number	Note
Swing cover, short, Clean Room	3HAC077824-001	Used with protection type Clean Room.
Swing cover, long, Clean Room	3HAC077825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Swing top cover, Clean Room	3HAC077820-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing support, long	3HAC067823-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on swing (to base)	3HAC070148-003	Used with protection types Clean Room and Foundry Plus. Replace if damaged.

Continues on next page

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Spare part	Article number	Note
Radial sealing on swing (to lower arm)	3HAC070148-004	Not used with protection class IP40. Replace if damaged.
Sealing ring, swing side	3HAC065675-001	Used with protection class IP67 and protection type Foundry Plus.
O-ring on lower arm	3HAC061327-015	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	Includes pump with outlet pipe.
Roundsling, 1.7 m	-	Length: 1.7 m Lifting capacity: >70 kg
Overhead crane	-	
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-009	Kyodo Yushi TMO150
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

Removing the swing

Use these procedures to remove the swing.

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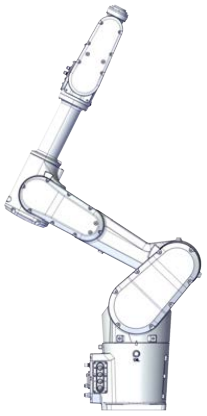
5.4.2 Replacing the swing

Continued

Preparations before removing the swing

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Jogging the robot to oil draining position

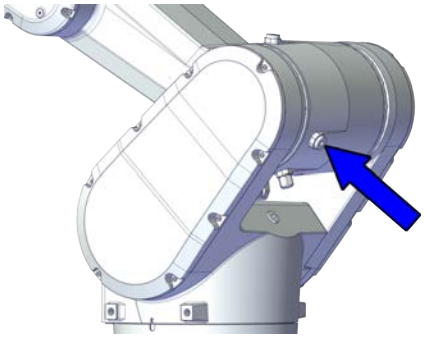
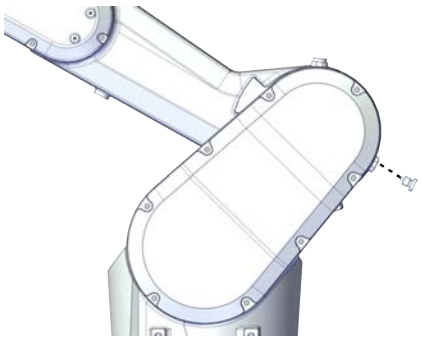
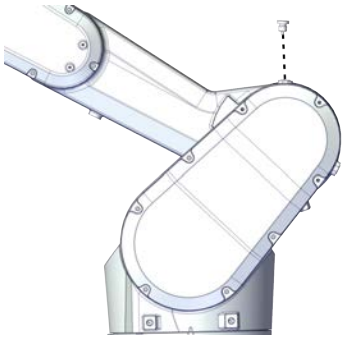
	Action	Note
1	Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance.	 xx2000001519
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Draining oil of axis-2 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	

Continues on next page

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	Action	Note
2	**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.	
3	Place the oil collecting vessel underneath the oil plug, draining.	 xx2000001515
4	Remove the oil plug, draining.	 xx2000001516
5	Plug a clean pipe to the oil plug, draining, with the other end to the oil collecting vessel.	
6	Remove the oil plug, venting and keep it opened to speed up the drainage.	 xx2000001517
7	**WARNING** Used oil is hazardous material and must be disposed of in a safe way. See *Decommissioning on page 805* for more information.	

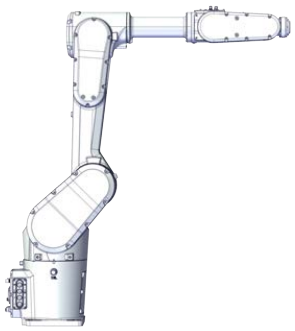
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5.4.2 Replacing the swing
Continued

	Action	Note
8	Drain the gearbox oil.	**Note** Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.
9	Remove and clean the pipe after the oil is drained. **Note** There will be some oil left in the gearbox after draining.	
10	Refit oil plugs.	Tightening torque: 10 Nm

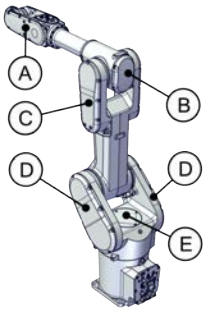
Jogging the robot to zero position

	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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Removing the covers

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing covers (D) • Swing top cover (E)	 xx2000001722

Loosening the cables in the tubular

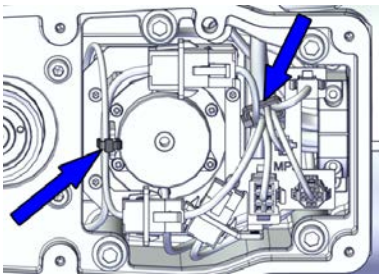
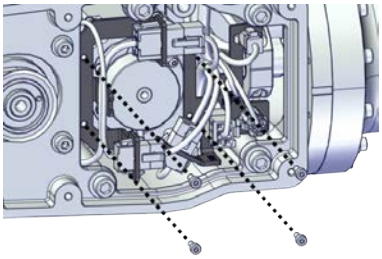
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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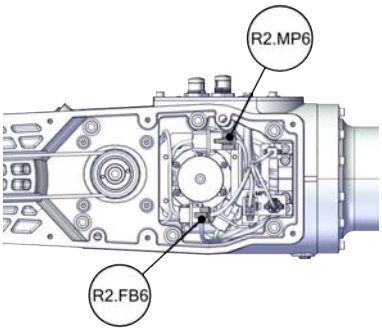
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5.4.2 Replacing the swing

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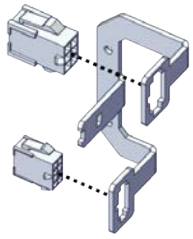
	Action	Note
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001531

Disconnecting the axis-6 motor connectors

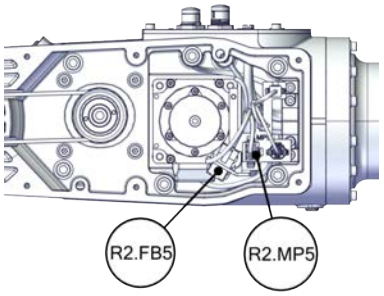
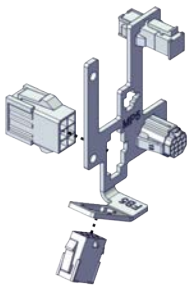
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532

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	Action	Note
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

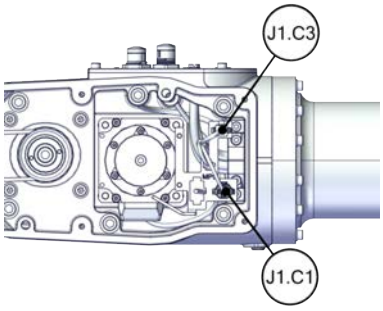
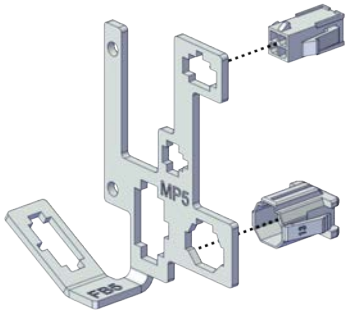
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5.4.2 Replacing the swing

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Disconnecting CP/CS cabling (if equipped)

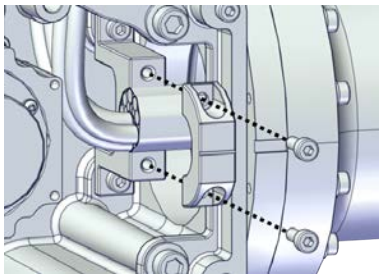
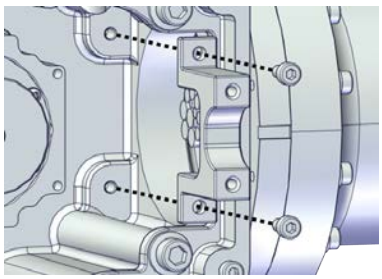
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

Separating the cable package from the tubular

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

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub (without solenoid valve)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

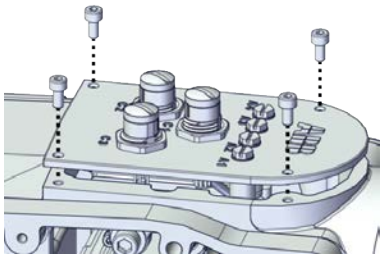
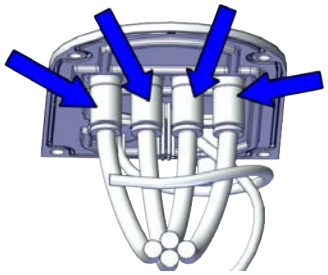
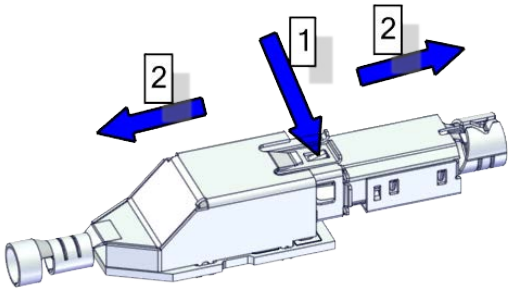
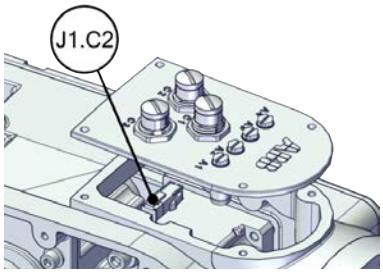
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.4.2 Replacing the swing

Continued

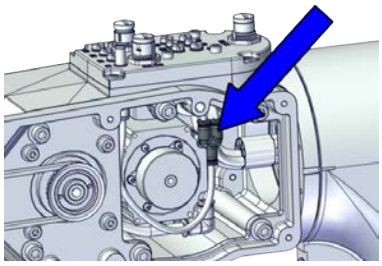
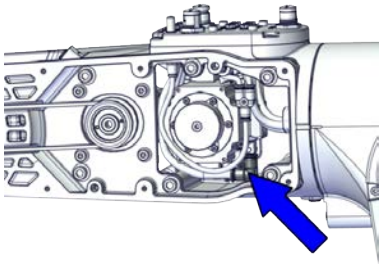
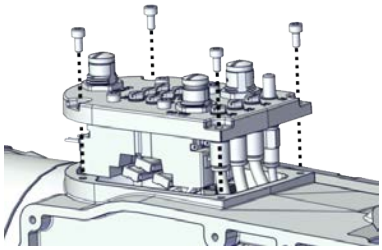
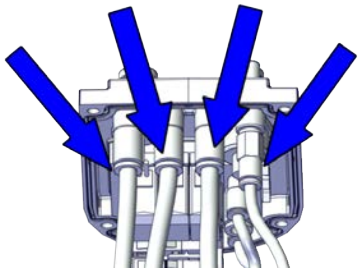
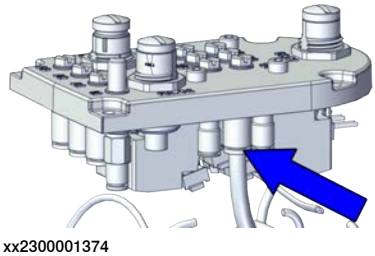
	Action	Note
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538
4	Disconnect the air hoses.	 xx2000001539
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

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Removing the process hub (with solenoid valve)

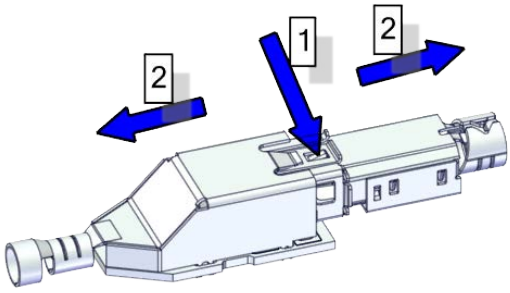
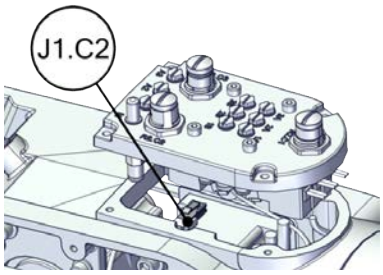
Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370
2	Disconnect the three L-shape connectors.	 xx2300001371
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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5.4.2 Replacing the swing
Continued

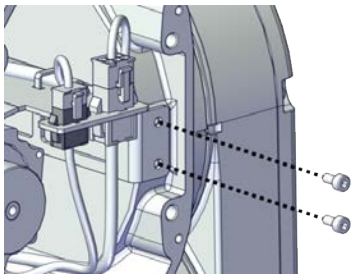
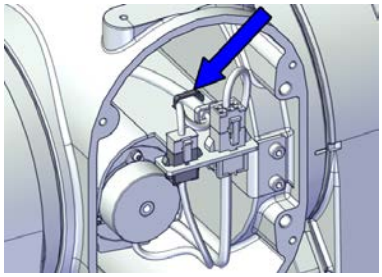
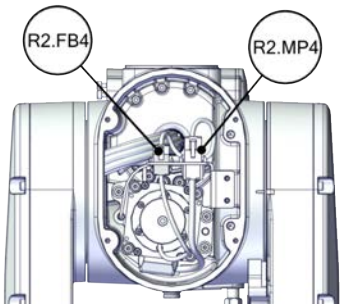
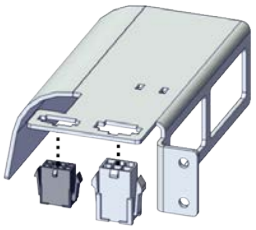
	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Continues on next page

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	Action	Note
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001542
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

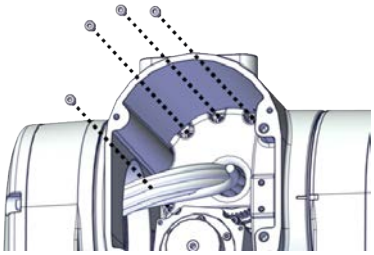
Separating the cable package from the housing

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

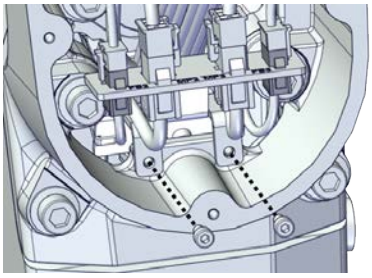
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5.4.2 Replacing the swing
Continued

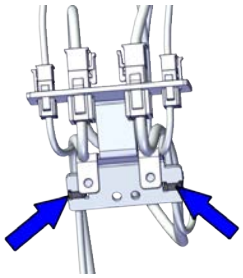
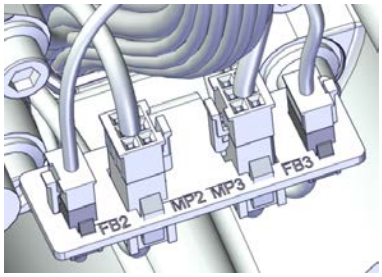
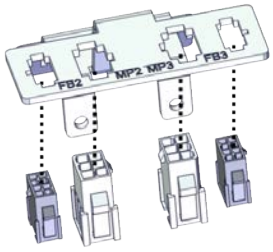
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 cable protector.	 xx2000001546

Disconnecting the axis-2 and -3 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate, as shown in following step.	 xx2000001548

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	Action	Note
4	Cut the cable straps.	 xx2000001549
5	Disconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001550
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001551

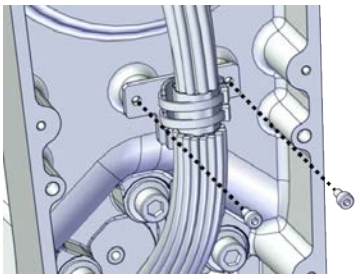
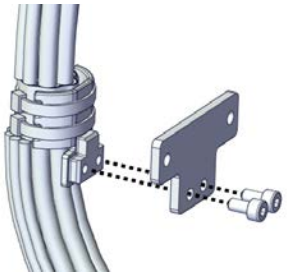
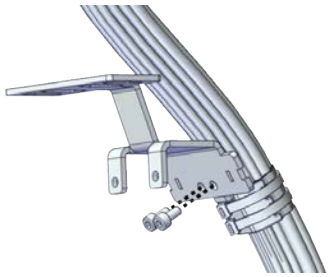
Separating the cable package from the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.4.2 Replacing the swing
Continued

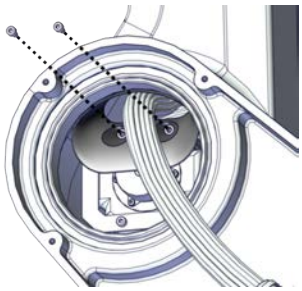
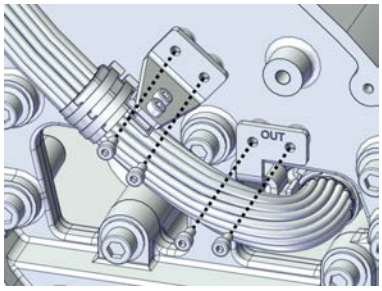
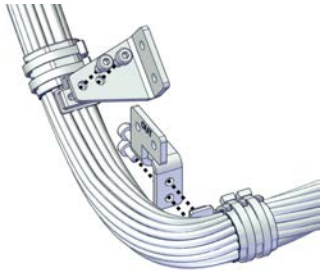
	Action	Note
3	Remove the cable bracket from the lower arm first and then from the cable package.	 xx2000001553  xx2100001465
4	Remove the connector plate.	 xx2000001554

Separating the cable package from the swing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the axis-2 cable protector.	 xx2000001556
4	Remove the cable brackets from the swing first and then from the cable package.	 xx2000001557  xx2100001466

Pulling out the cable package

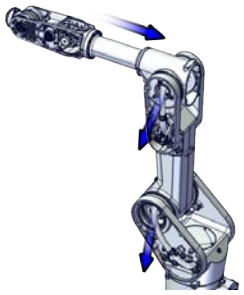
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Wrap the connectors with the masking tape.	

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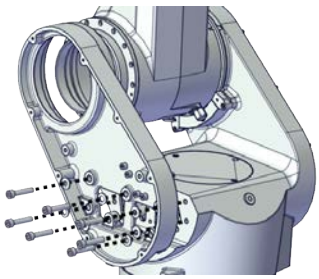
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5.4.2 Replacing the swing

Continued

	Action	Note
4	Pull the cable package out to the swing support.	 xx2000001683

Removing the swing support

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the swing support. **Tip** If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.	 xx2000001684

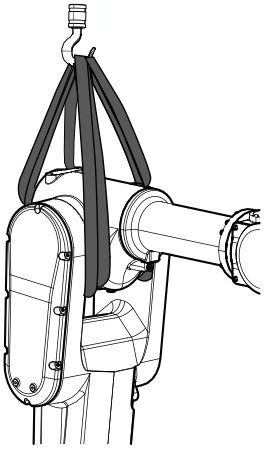
Supporting the lower and upper arms with roundslings

Note

The lower and upper arms include the lower arm, housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit.

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	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Run two roundslings between the housing and the lower arm.	Roundsling, 1.7 m (2 pcs), Lifting capacity: >70 kg  xx2000001685
4	**CAUTION** The lower and upper arms weighs 38 kg. All lifting accessories used must be sized accordingly!	
5	**WARNING** The robot is likely to be mechanically unstable if not secured to the foundation!	
6	**WARNING** Personnel must not, under any circumstances, be present under the suspended load.	

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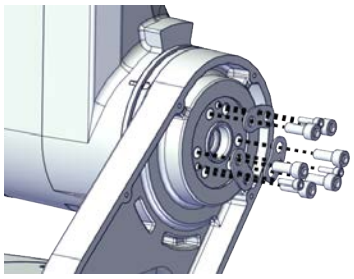
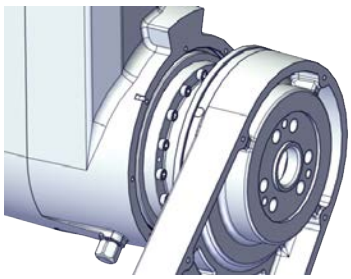
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5.4.2 Replacing the swing

Continued

	Action	Note
7	Stretch the roundslings to take the weight of the lower and upper arms. **Note** Do not stretch the roundslings too much.	

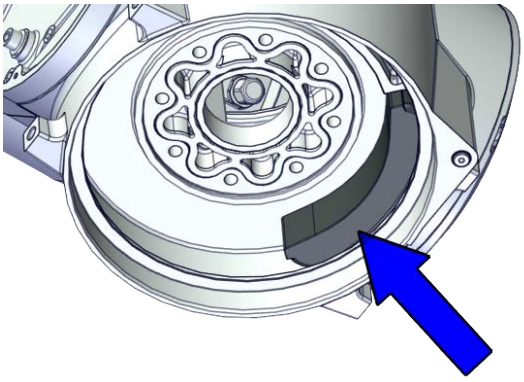
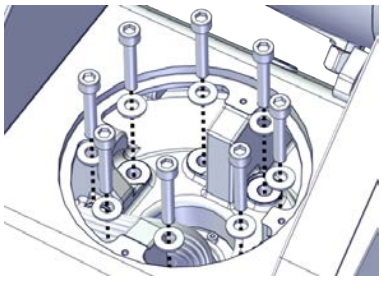
Separating the swing from the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws.	 xx2000001686
4	Separate the swing from the lower arm. **Tip** If the swing is hard to loosen from the lower arm, use a plastic hammer to knock on the swing lightly.	 xx2000001687

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Separating the swing from the base

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Separate the swing from the base. **Note** The axis-1 mechanical stop slider is accessible from the swing. Put it aside for later refitting.  xx2000001703	 xx2000000502
4	Pull the cable package completely out from the swing.	

Refitting the swing

Use these procedures to refit the swing.

Check the radial sealing on the swing bottom

Note

This procedure is valid for robots with:

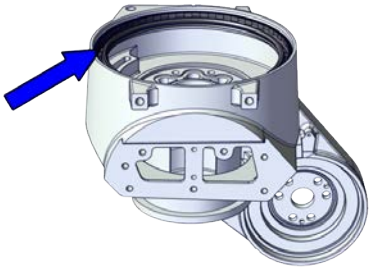
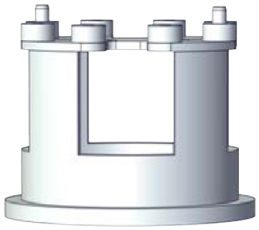
- protection type Clean Room (option 3351-4)
- protection type Foundry Plus (option 3352-10)

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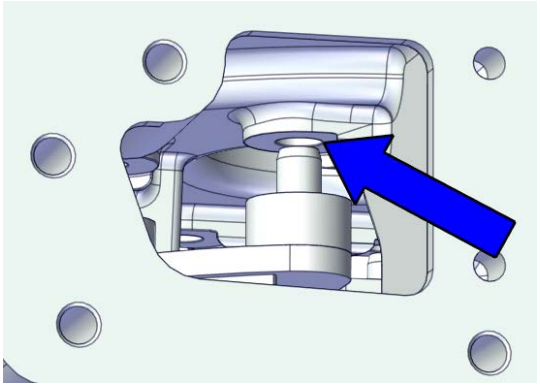
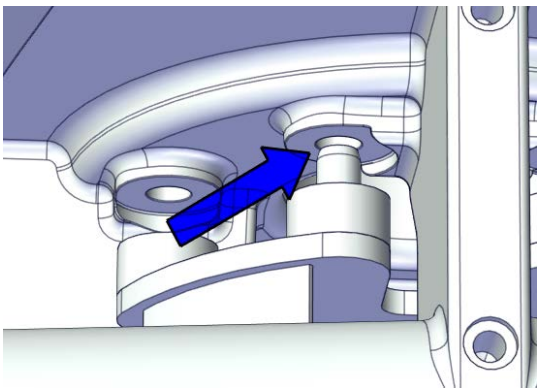
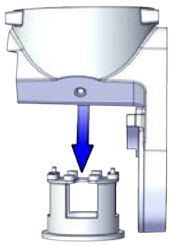
5.4.2 Replacing the swing

Continued

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the swing bottom. Replace if damaged, as described below. **Note** If the radial sealing requires to be replaced during the replacement of the base, remove the swing from the lower arm first. See *Replacing the swing on page 261*.	 xx2000002452
3	Place the pressfit support of the axis-1 sealing assembly tool on the workbench, positioning as shown in the figure.	Pressfit support of the axis-1 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002453

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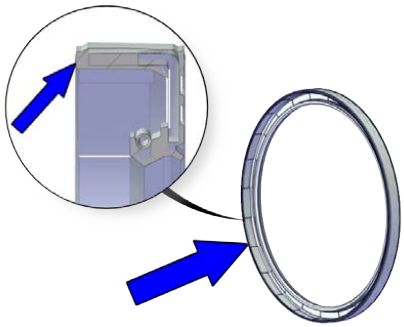
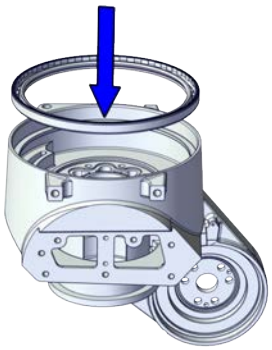
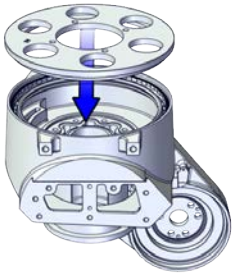
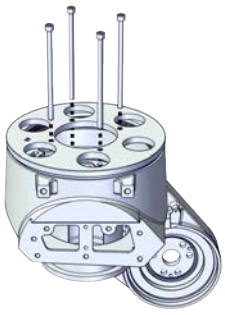
	Action	Note
4	Turn the swing upside down and place it on to the pressfit support. Make sure the convex pins on the support are properly fitted into the holes on the swing.  xx2000002455  xx2000002456	 xx2000002454
5	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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5.4.2 Replacing the swing

Continued

	Action	Note
6	Fit the new sealing into the swing. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002457
7	Fit the circular plate of the axis-1 sealing assembly tool against the sealing and fix with four M8x145 screws.	Circular plate of the axis-1 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002458  xx2000002459
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

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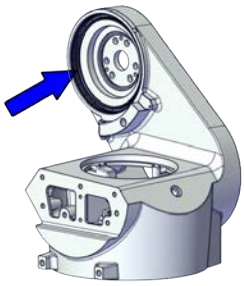
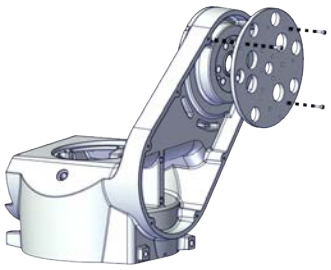
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Check the radial sealing on the swing top

Note

This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

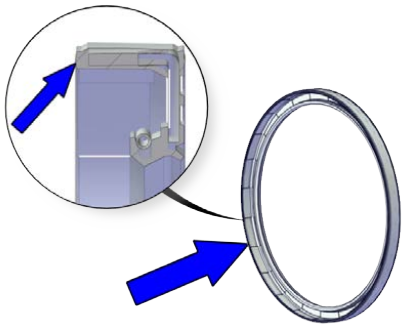
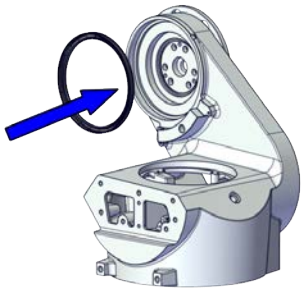
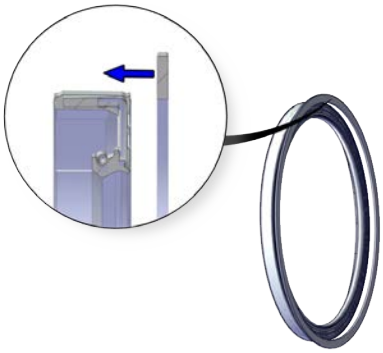
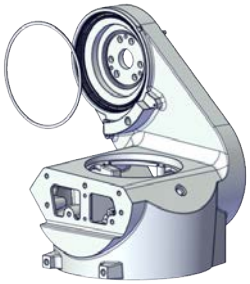
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the swing top. Replace if damaged, as described below.	 xx2000002460
3	Fit the big circular plate of the axis-2 sealing assembly tool to the swing (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002461
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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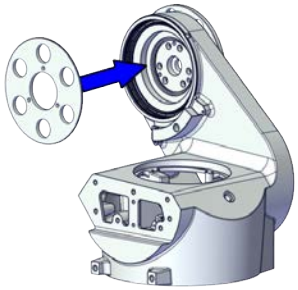
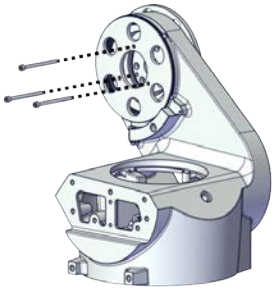
5.4.2 Replacing the swing

Continued

	Action	Note
5	Fit the new sealing into the swing. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002462
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-2 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002463

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	Action	Note
7	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002464  xx2000002465
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the swing to the base

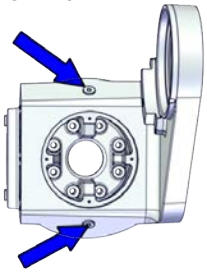
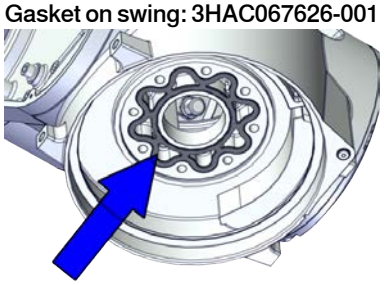
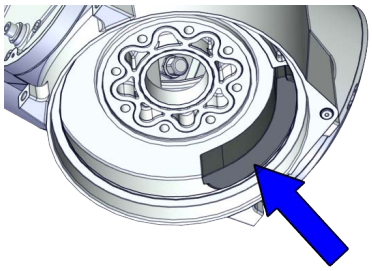
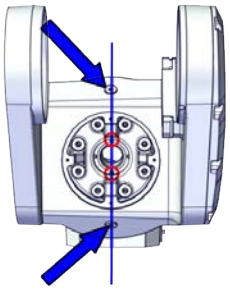
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the axis-2 mechanical stops. Replace if damaged.	See *Replacing the axis-2 mechanical stops on page 320*.

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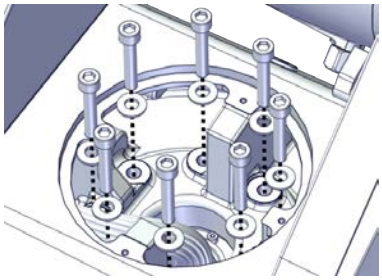
5.4.2 Replacing the swing

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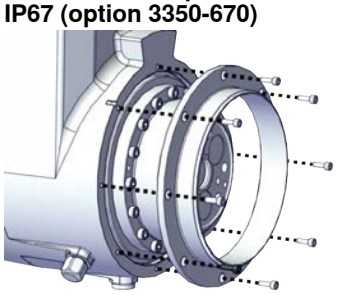
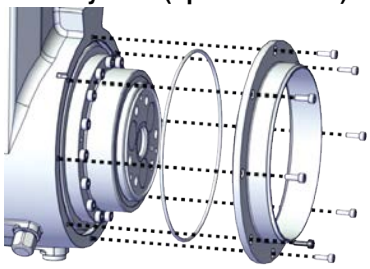
	Action	Note
3	Check the oil plugs. Replace if damaged.	Magnetic oil plug, G 1/4": 3HAC037925-001 Tightening torque: 10 Nm  xx2000001723
4	Check the gasket. Replace if damaged.	Gasket on swing: 3HAC067626-001  xx2000001704
5	Apply grease to the axis-1 mechanical stop slider and refit it to the swing.	Grease: 3HAC029132-001  xx2000001703
6	Route the cable package through the swing and out from the swing support side.	
7	Place the swing down to the base.	
8	Align the oil plugs on the swing with the marked screws on the axis-1 gearbox.	 xx2000001699

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	Action	Note
9	Secure with screws and washers.	Screw: M8x45 12.9 Gleitmo 603+Geomet 500 (8 pcs) Tightening torque: 36 Nm  xx2000000502

Refitting the swing to the lower arm

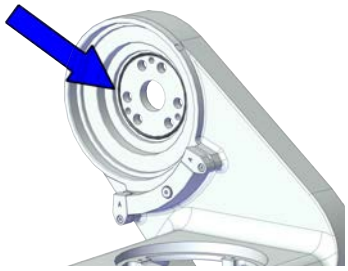
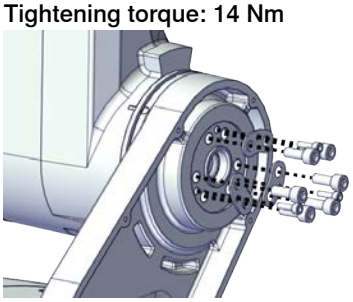
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** Check the sealing ring. Replace if damaged. **For robots with protection type Foundry Plus (option 3352-10)** Check the sealing ring and the O-ring. Replace if damaged.	O-ring on lower arm: 3HAC061327-015 Sealing ring, swing side: 3HAC065675-001 Screw: M4x12 12.9 Lafre (8 pcs) Tightening torque: 3.8 Nm **For robots with protection class IP67 (option 3350-670)**  xx2000002516 **For robots with protection type Foundry Plus (option 3352-10)**  xx2000002527

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5.4.2 Replacing the swing

Continued

	Action	Note
3	Check the O-ring. Replace if damaged.	O-ring on swing: 3HAC061327-036  xx2000001750
4	Refit the swing to the lower arm.	**M10 screws** Screw: M10x25 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 72 Nm **M6 screws** Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (3 pcs) Tightening torque: 14 Nm  xx2000001686

Releasing the weight support for lower and upper arms

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**WARNING** Personnel must not, under any circumstances, be present under the suspended load.	
3	Make sure the lower and upper arms are firmly secured with the swing.	
4	Remove the roundslings.	

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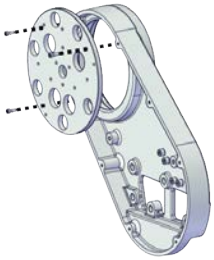
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Check the radial sealing on the swing support

Note

This procedure is valid for robots with:

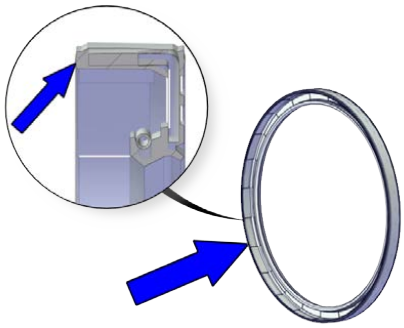
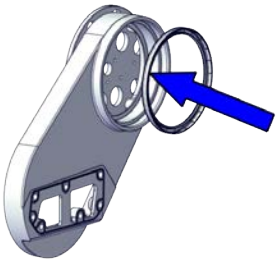
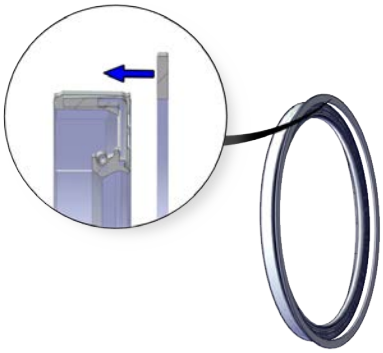
- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the swing support. Replace if damaged, as described below.	 xx2000002466
3	Fit the big circular plate of the axis-2 sealing assembly tool to the swing support (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002467
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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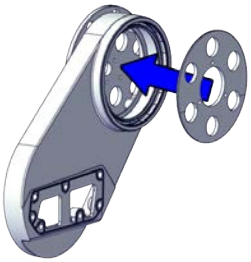
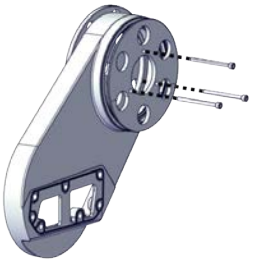
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5.4.2 Replacing the swing
Continued

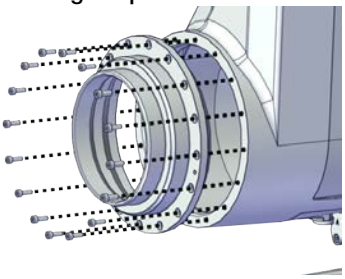
	Action	Note
5	Fit the new sealing into the swing support. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002468
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-2 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002469

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	Action	Note
7	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002470  xx2000002471
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

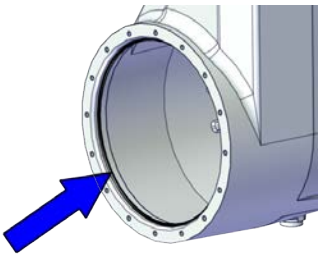
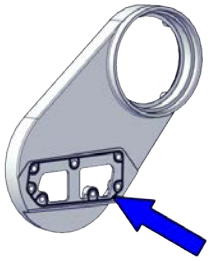
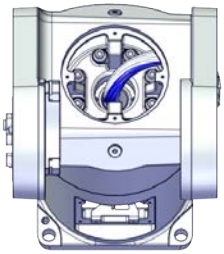
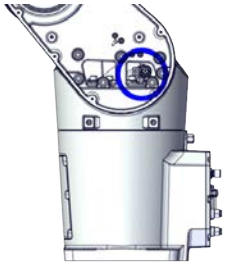
Refitting the swing support

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the sealing ring. Replace if damaged.	Sealing ring, swing support side: 3HAC065676-001 Screw: M4x12 12.9 Lafre (16 pcs) Tightening torque: 3.8 Nm  xx2000001692

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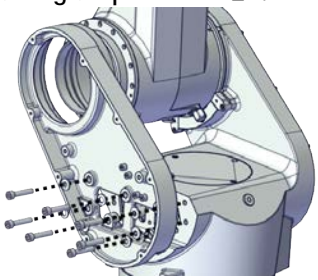
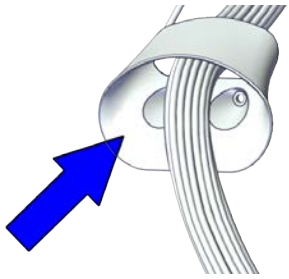
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5.4.2 Replacing the swing
Continued

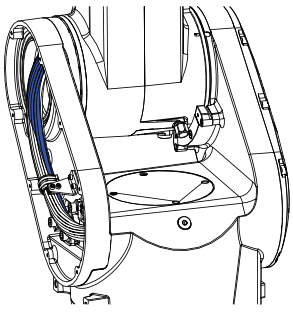
	Action	Note
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the O-ring. Replace if damaged.	O-ring on lower arm: 3HAC061327-015  xx2000002518
4	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for swing support, short: 3HAC067822-001 Gasket for swing support, long: 3HAC067823-001  xx2000002520
5	Route the cable package through the swing support. Make sure that: • the air hoses are facing the SMB side in the hollow tube of axis-1 gearbox. • the cable package is out from the hole near the base rear, as circled in the figure. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001745  xx2000001747

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	Action	Note
6	Refit the swing support.	Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm±3%  xx2000001684
7	Apply grease to the axis-2 cable protector and slip it over the cable harness.	Grease: 3HAC029132-001 Plastic cable protector, axis 2: 3HAC067816-001  xx2000001567

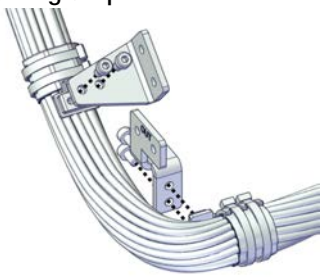
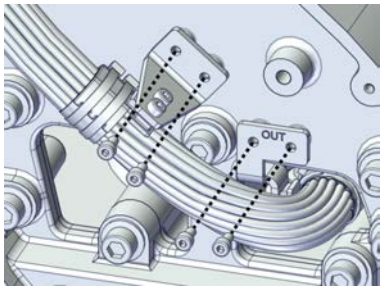
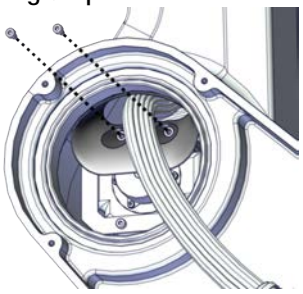
Securing the cable package in the swing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Route the cable package up into the lower arm. Make sure that the the air hoses are facing outside in the axis-2 cable protector, see the figure as a guidance for the cable twisting way.	 xx2000001746

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5.4.2 Replacing the swing
Continued

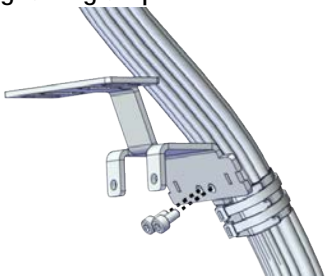
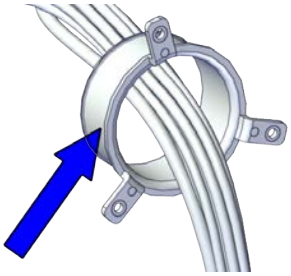
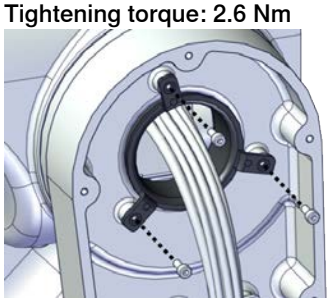
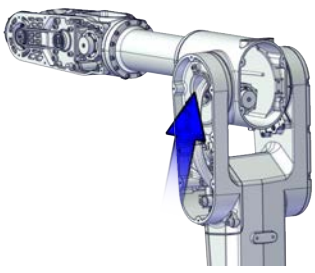
	Action	Note
3	Refit the cable brackets.	Screw: M4x8 12.9 Lafre (2 pcs for each bracket on cable package and 2 pcs on swing) Tightening torque: 2.6 Nm  xx2100001466  xx2000001557
4	Refit the axis-2 cable protector.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001556

Routing the cable package in the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001554
3	Check the axis-3 cable protector. Replace if damaged. **Note** If replaced, apply grease to the axis-3 cable protector before refitting.	Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001  xx2000001568 Screw: M4x10 12.9 Lafre (3 pcs) Tightening torque: 2.6 Nm  xx2000001552
4	Route the cable package through the lower arm support and up into the housing. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001569

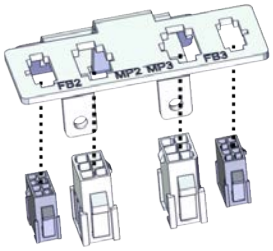
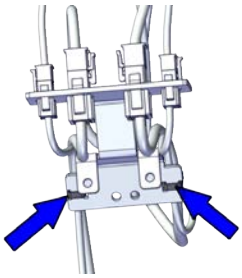
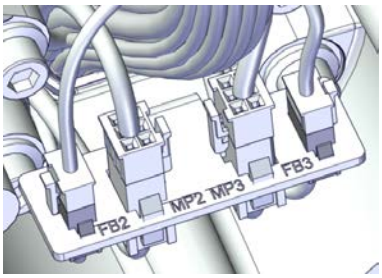
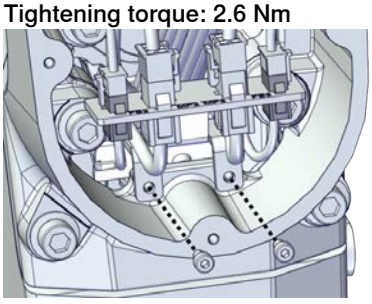
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5.4.2 Replacing the swing

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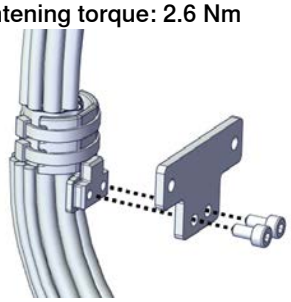
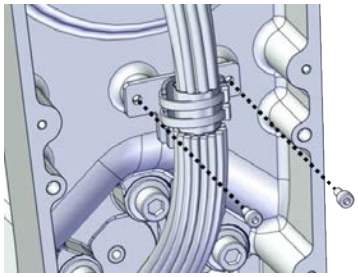
Reconnecting the axis-2 and -3 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001551
3	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001549
4	Reconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001550
5	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001548

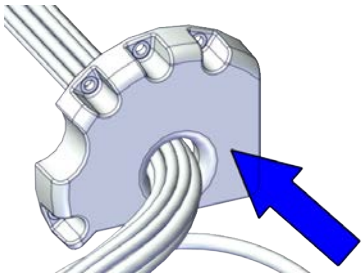
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Securing the cable package in the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the cable bracket.	Screw: M4x8 12.9 Lafre (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm  xx2100001465  xx2000001553

Routing the cable package in the housing

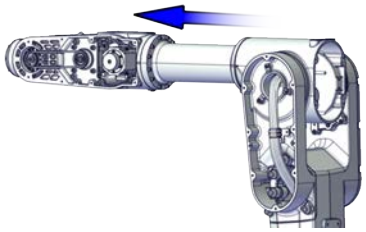
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Slip the axis-4 cable protector over the cable package.	Plastic cable protector, axis 4: 3HAC064694-001:  xx2000001570

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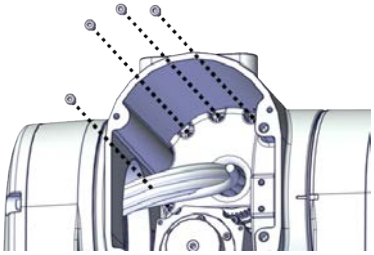
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5.4.2 Replacing the swing

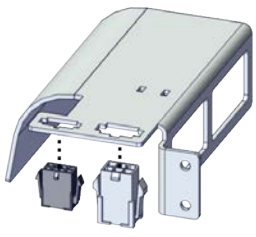
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	Action	Note
3	Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and into the tubular. Make sure that: • the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001571

Securing the cable package in the housing

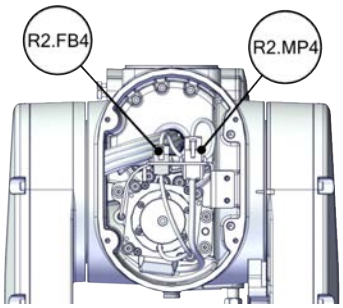
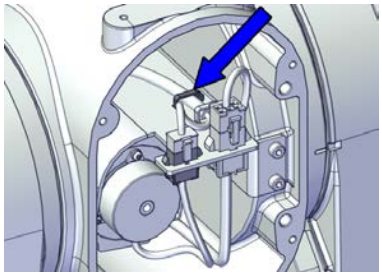
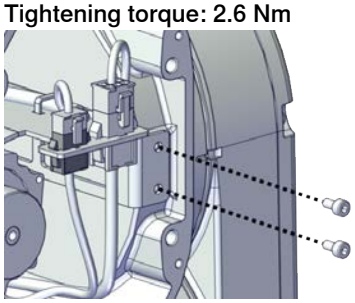
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 cable protector.	Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001546

Reconnecting the axis-4 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545

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	Action	Note
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

Routing the cable package in the tubular

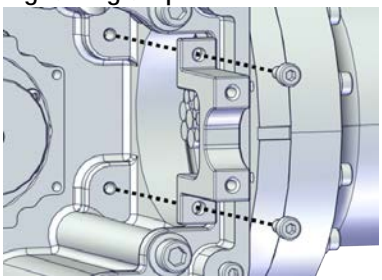
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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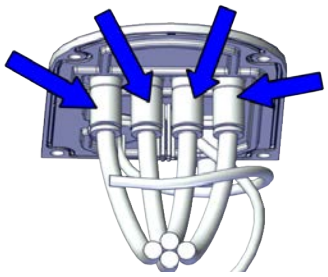
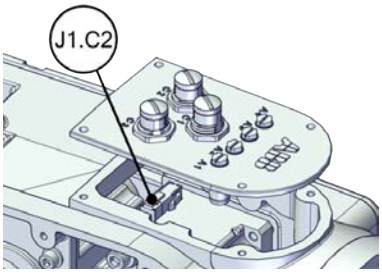
5.4.2 Replacing the swing

Continued

	Action	Note
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

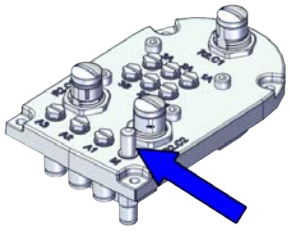
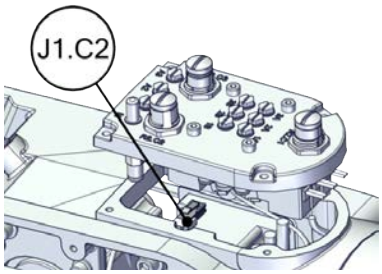
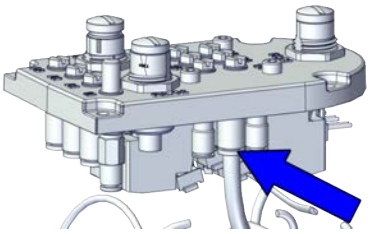
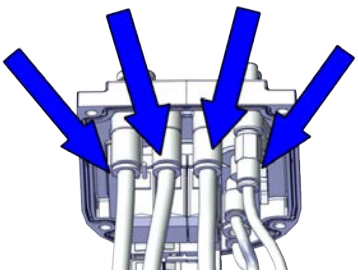
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

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Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

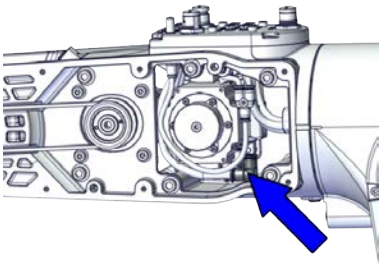
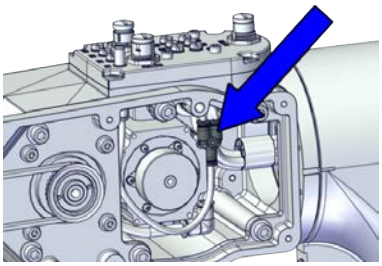
	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373

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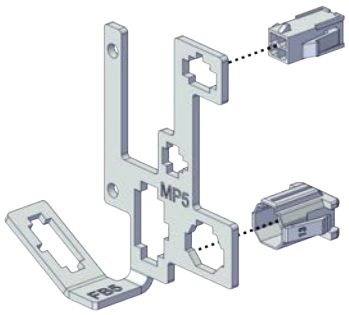
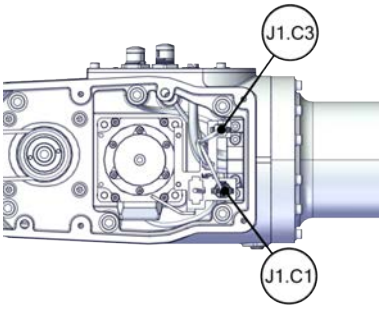
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5.4.2 Replacing the swing

Continued

	Action	Note
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

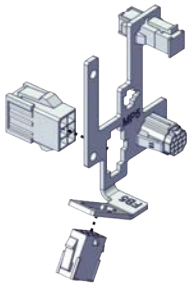
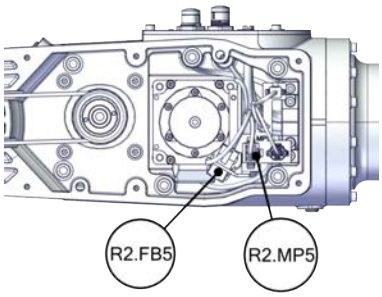
Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

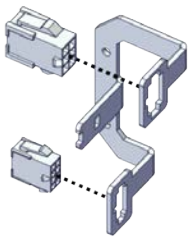
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Reconnecting the axis-5 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

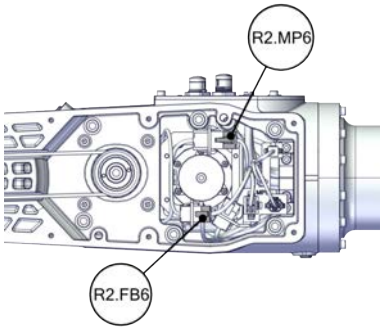
Reconnecting the axis-6 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533

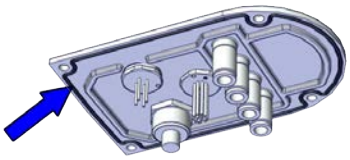
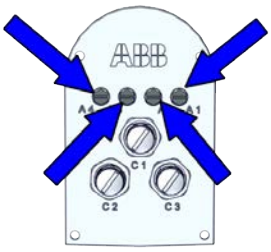
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5.4.2 Replacing the swing
Continued

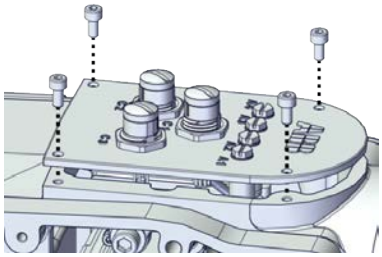
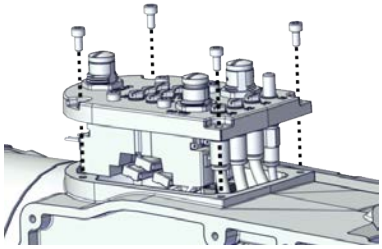
	Action	Note
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

Refitting the process hub

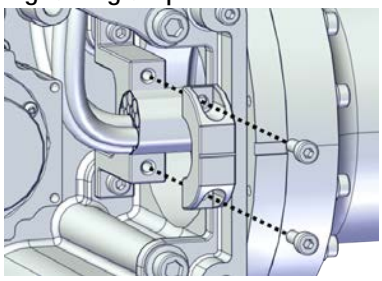
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

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	Action	Note
5	Refit the process hub.	**Not valid for robots with solenoid valve (3303-3)** Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538
		Valid for robots with solenoid valve (3303-3) Screw: M4x12 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2300001372

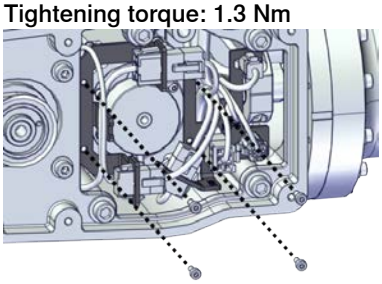
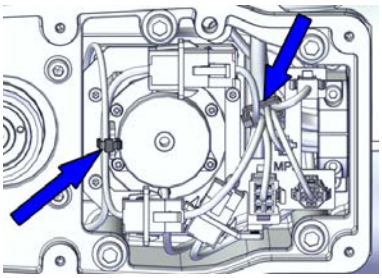
Securing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748

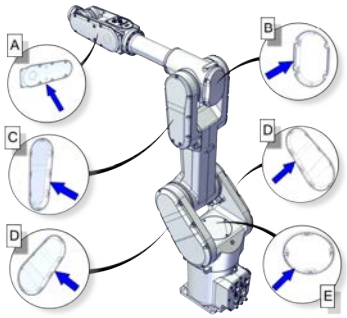
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5.4.2 Replacing the swing
Continued

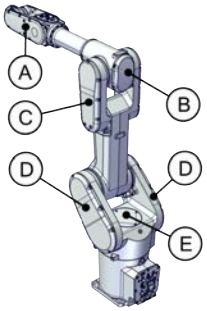
	Action	Note
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

Refitting the covers

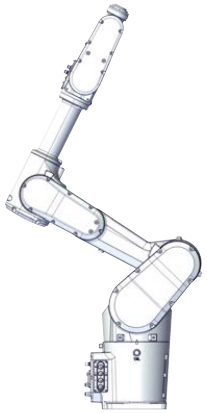
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm support cover (C) • Gasket for swing covers (D) • Gasket for swing top cover (E) Replace if damaged.	 xx2000002500
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

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	Action	Note
5	Refit the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing covers (D) • Swing top cover (E)	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001722

Jogging the robot to oil filling position

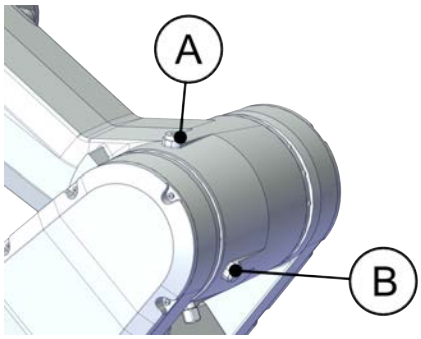
	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
2	Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance.	 xx2000001519
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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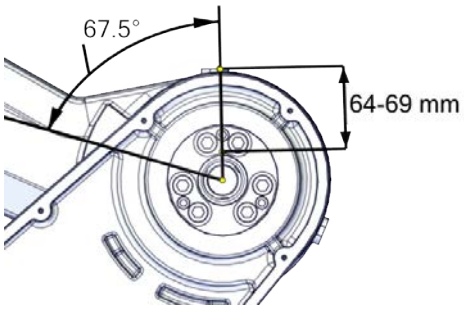
5.4.2 Replacing the swing
Continued

Refilling oil to axis-2 gearbox

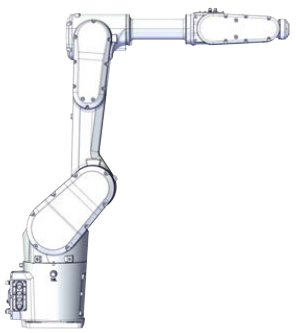
	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**CAUTION** The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
3	Open the upper oil plug. **Note** The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.	 xx2000001518 A – Oil plug, opened B – Oil plug, closed
4	**WARNING** Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	
5	Refill the gearbox with oil. **Note** The amount of oil to be filled depends on the amount previously being drained. **CAUTION** Oil filling must be slow to make sure air venting is fluent.	Type of oil and total amount is detailed in *Lubrication in gearboxes on page 816*.

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	Action	Note
6	Inspect the oil level by measuring the level at the upper oil plug hole. Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole. **CAUTION** The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.	 xx2000001580
7	Refit the oil plug.	Tightening torque: 10 Nm
8	**DANGER** Make sure all safety requirements are met when performing the first test run.	

Jogging the robot to zero position

	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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5.4.2 Replacing the swing

Continued

Concluding procedure

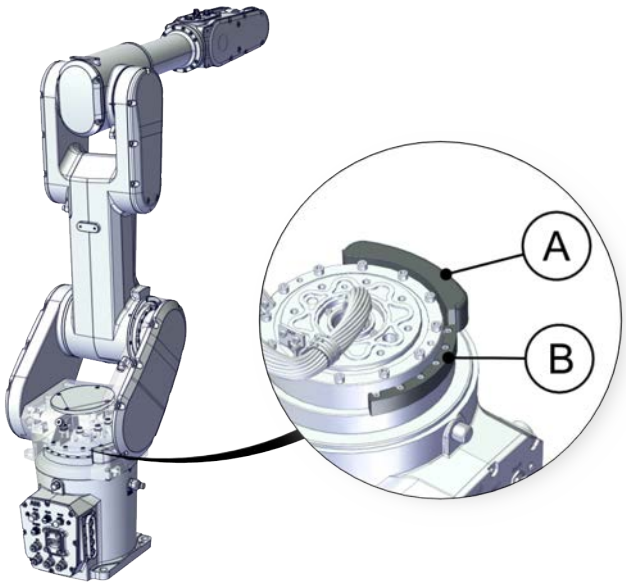
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.4.3 Replacing the axis-1 mechanical stops

Location of the mechanical stops

The mechanical stops are located as shown in the figure.



xx2000000406

A	Mechanical stop, axis 1, slider
B	Mechanical stop, axis 1, fixed block

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Mechanical stop, axis 1, fixed block	3HAC064478-001	Replace if damaged.
Mechanical stop, axis 1, slider	3HAC065755-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.

Continues on next page

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5.4.3 Replacing the axis-1 mechanical stops
Continued

Equipment	Article number	Note
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Roundsling, 1.7 m	-	Length: 1.7 m Lifting capacity: >70 kg
Overhead crane	-	
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Replacement of axis-1 mechanical stops

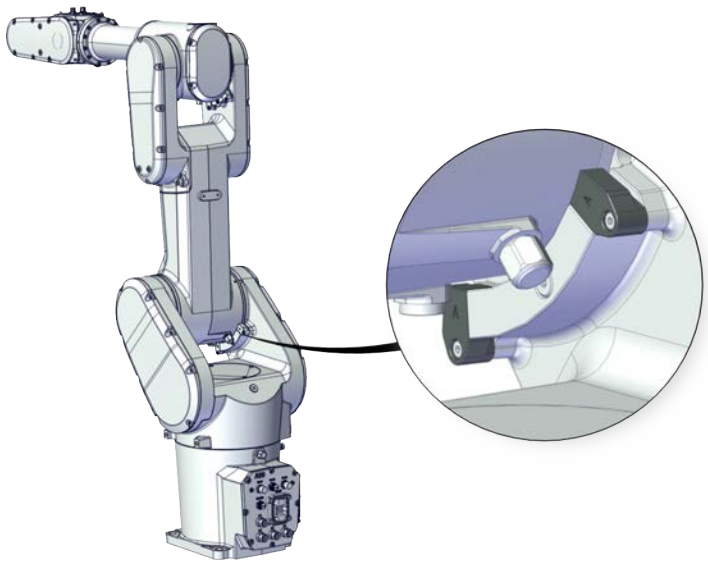
The axis-1 mechanical stops, both block and slider, are accessible after removing the base, see *Replacing the base on page 231*.

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5.4.4 Replacing the axis-2 mechanical stops

Location of the mechanical stops

The mechanical stops are located as shown in the figure.



xx2000000407

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Mechanical stop, block A	3HAC065651-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.

Required consumables

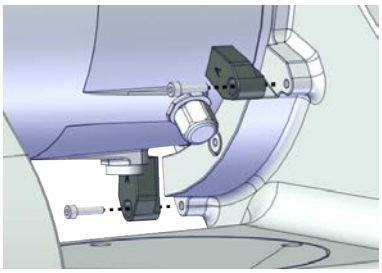
Consumable	Article number	Note
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

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5.4.4 Replacing the axis-2 mechanical stops
Continued

Replacing the axis-2 mechanical stops

	Action	Note
1	Jog the robot to a position where the mechanical stops are most easily accessed.	
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove the mechanical stops.	 xx2000000506
4	Discard the old stops and refit with new ones.	Mechanical stop, block A: 3HAC065651-001 (2 pcs)
5	Apply a little locking liquid to the screws. **Note** If there is locking liquid residues on the screw, please clean it before refitting. Remove residual locking liquid after refitting.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)
6	Secure the mechanical stops.	Screw: M4x16 stainless steel (1 pcs per stop) Tightening torque: 1 Nm

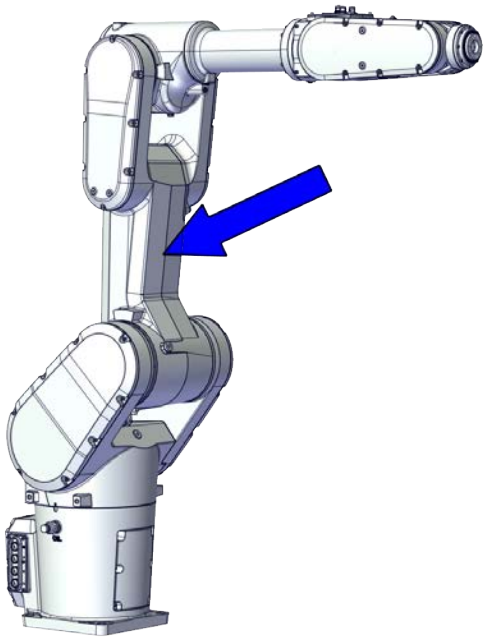
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5.5 Upper and lower arms

5.5.1 Replacing the lower arm

Location of the lower arm

The lower arm is located as shown in the figure.



xx2000001475

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Lower arm, short	3HAC073073-001	Used for IRB 1300-11/0.9. Used with protection class IP40 and protection type Foundry Plus.
Lower arm, short, IP67	3HAC077798-001	Used for IRB 1300-11/0.9. Used with protection class IP67.
Lower arm, short, Clean Room	3HAC077811-001	Used for IRB 1300-11/0.9. Used with protection type Clean Room.

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5.5.1 Replacing the lower arm
Continued

Spare part	Article number	Note
Lower arm, long	3HAC073074-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection class IP40 and protection type Foundry Plus.
Lower arm, long, IP67	3HAC077799-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection class IP67.
Lower arm, long, Clean Room	3HAC077812-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Lower arm support	3HAC073076-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm support, Clean Room	3HAC077813-001	Used with protection type Clean Room.
Swing support, short	3HAC073041-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing support, short, Clean Room	3HAC077808-001	Used for IRB 1300-11/0.9. Used with protection type Clean Room.
Swing support, long	3HAC073052-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing support, long, Clean Room	3HAC077810-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Gear unit, axis 2	3HAC064977-001	
Motor unit, axis 2	3HAC073078-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4.
Motor unit, axis 2 (IRB 1300-12/1.4)	3HAC082078-001	Used for IRB 1300-12/1.4.
O-ring on motor unit	3HAC061327-037	
Sealing ring, swing support side	3HAC065676-001	
O-ring on swing	3HAC061327-036	
Motor unit, axis 3	3HAC073086-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4.
Motor unit, axis 3 (IRB 1300-12/1.4)	3HAC082079-001	Used for IRB 1300-12/1.4.
Resolver cover on axis-3 motor (IRB 1300-12/1.4)	3HAC060261-001	Used for IRB 1300-12/1.4.
Timing belt, axis 3	3HAC067040-001	

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Spare part	Article number	Note
Mechanical stop, block A	3HAC065651-001	Replace if damaged.
Mechanical stop, block B	3HAC065671-001	Used for axis 3 of IRB 1300-10/1.15. Replace if damaged.
Magnetic oil plug, G 1/4"	3HAC037925-001	
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 2	3HAC067816-001	
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, short	3HAC073095-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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5.5.1 Replacing the lower arm
Continued

Spare part	Article number	Note
Swing cover, long	3HAC073096-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Swing cover, short, Clean Room	3HAC077824-001	Used with protection type Clean Room.
Swing cover, long, Clean Room	3HAC077825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm support	3HAC067826-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing support, long	3HAC067823-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.

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Spare part	Article number	Note
Gasket for swing cover, long	3HAC067825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on swing (to lower arm)	3HAC070148-004	Not used with protection class IP40. Replace if damaged.
Radial sealing on lower arm	3HAC070148-005	Not used with protection class IP40. Replace if damaged.
Sealing ring, swing side	3HAC065675-001	Used with protection class IP67 and protection type Foundry Plus.
O-ring on lower arm	3HAC061327-015	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	Includes pump with outlet pipe.
Guide pin for axis-2 gearbox	-	Included in special toolkit 3HAC076396-001.
Sonic tension meter	-	Used for measuring the timing belt tension.
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

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5.5.1 Replacing the lower arm
Continued

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-009	Kyodo Yushi TMO150
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

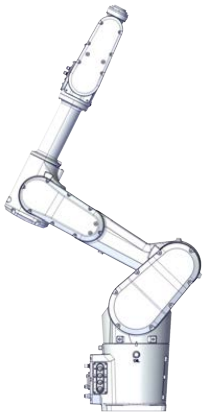
Removing the lower arm

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.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Jogging the robot to oil draining position

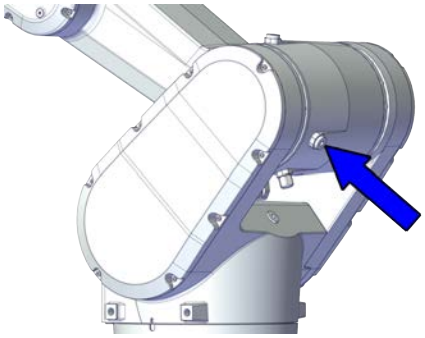
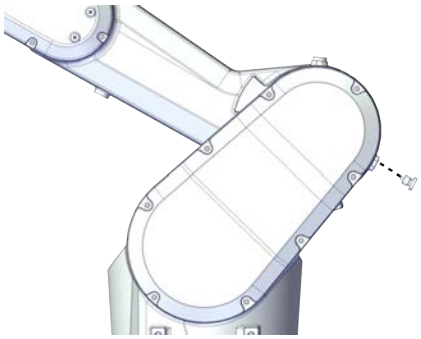
	Action	Note
1	Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance.	 xx2000001519

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	Action	Note
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Draining oil of axis-2 gearbox

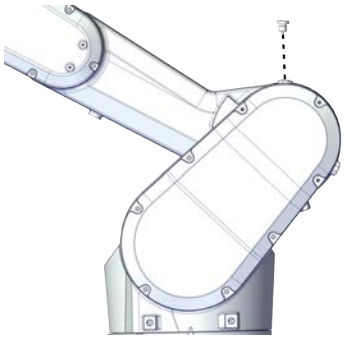
	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**CAUTION** The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
3	Place the oil collecting vessel underneath the oil plug, draining.	 xx2000001515
4	Remove the oil plug, draining.	 xx2000001516
5	Plug a clean pipe to the oil plug, draining, with the other end to the oil collecting vessel.	

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5.5.1 Replacing the lower arm

Continued

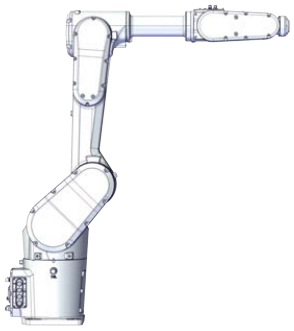
	Action	Note
6	Remove the oil plug, venting and keep it opened to speed up the drainage.	 xx2000001517
7	**WARNING** Used oil is hazardous material and must be disposed of in a safe way. See *Decommissioning on page 805* for more information.	
8	Drain the gearbox oil.	**Note** Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.
9	Remove and clean the pipe after the oil is drained. **Note** There will be some oil left in the gearbox after draining.	
10	Refit oil plugs.	Tightening torque: 10 Nm

Jogging the robot to zero position

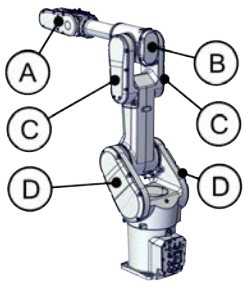
	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	

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	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Removing the covers

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) • Swing covers (D)	 xx2000001724

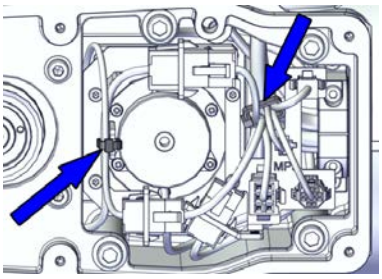
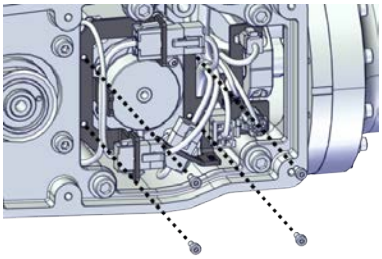
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5.5.1 Replacing the lower arm

Continued

Loosening the cables in the tubular

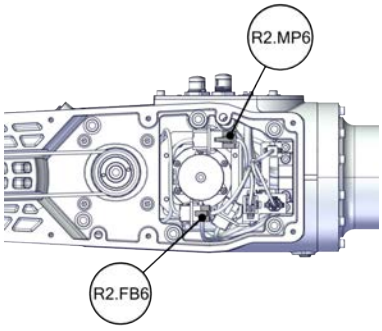
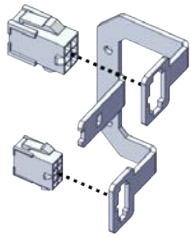
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001531

Disconnecting the axis-6 motor connectors

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

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

Disconnecting the axis-5 motor connectors

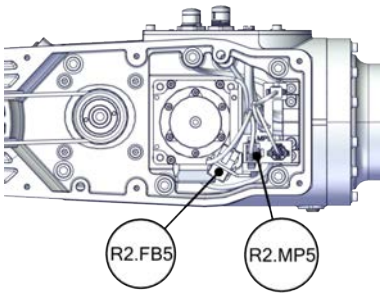
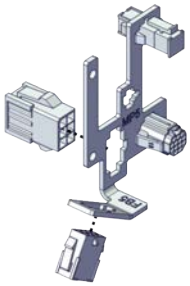
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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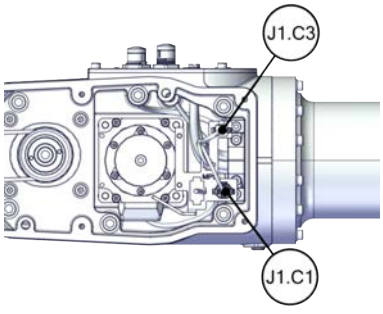
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5.5.1 Replacing the lower arm

Continued

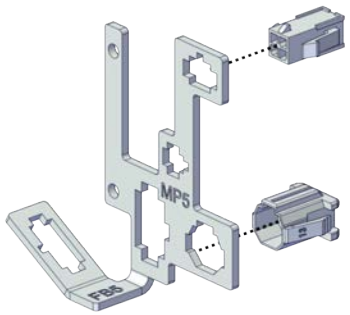
	Action	Note
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

Disconnecting CP/CS cabling (if equipped)

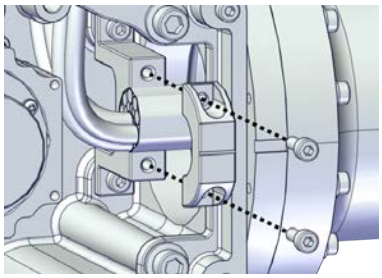
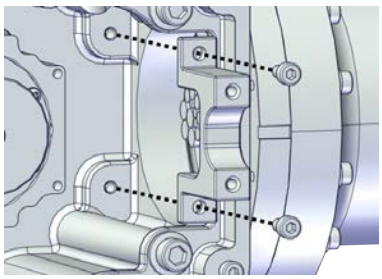
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536

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	Action	Note
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

Separating the cable package from the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

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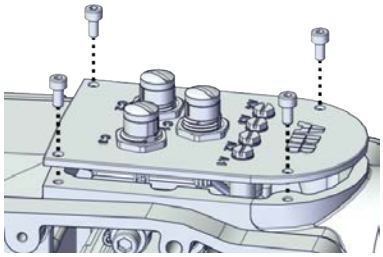
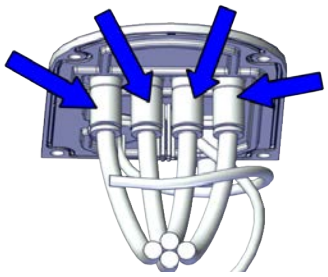
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5.5.1 Replacing the lower arm

Continued

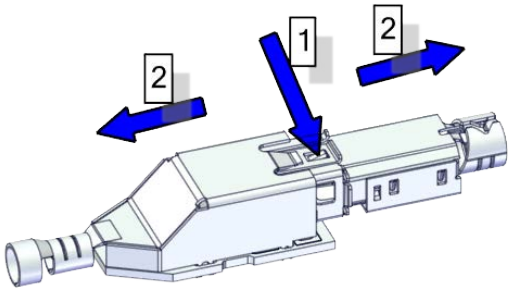
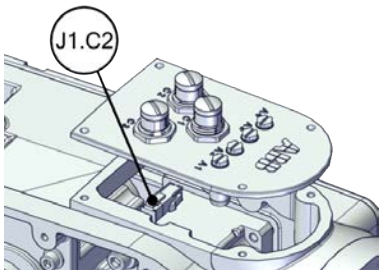
Removing the process hub (without solenoid valve)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538
4	Disconnect the air hoses.	 xx2000001539

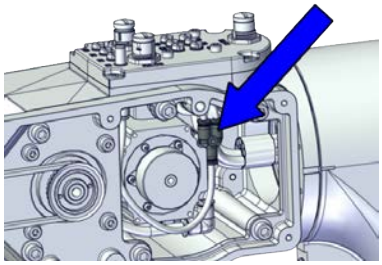
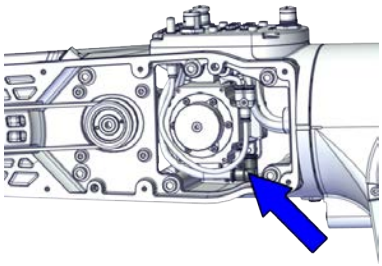
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	Action	Note
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

Removing the process hub (with solenoid valve)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

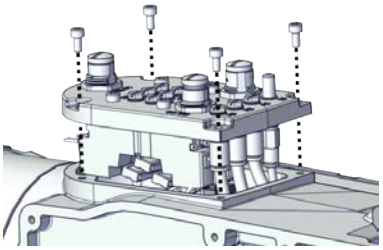
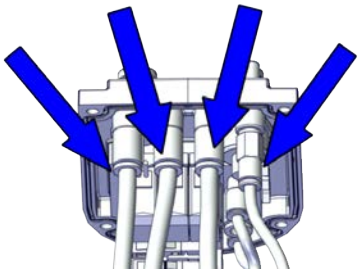
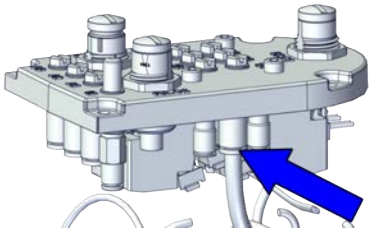
	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370
2	Disconnect the three L-shape connectors.	 xx2300001371

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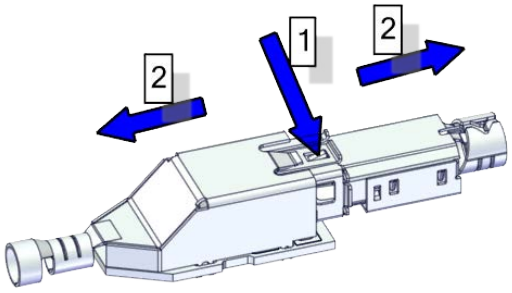
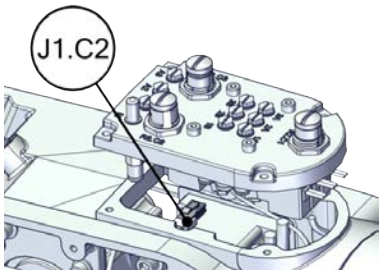
5.5.1 Replacing the lower arm

Continued

	Action	Note
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

Disconnecting the axis-4 motor connectors

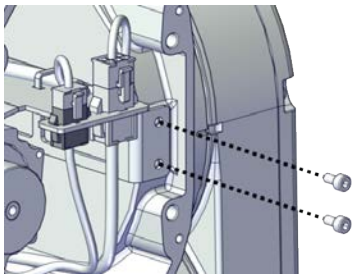
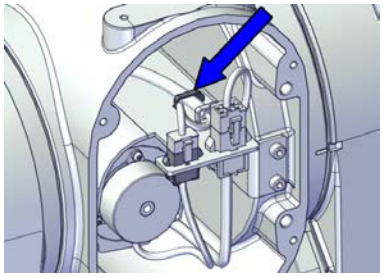
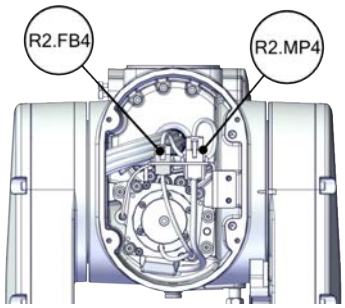
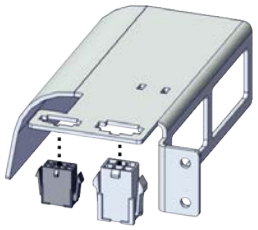
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.5.1 Replacing the lower arm

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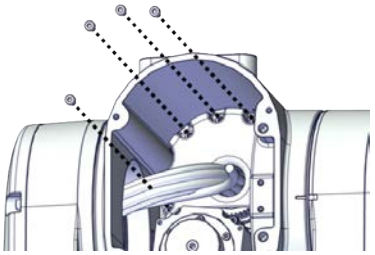
	Action	Note
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001542
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

Separating the cable package from the housing

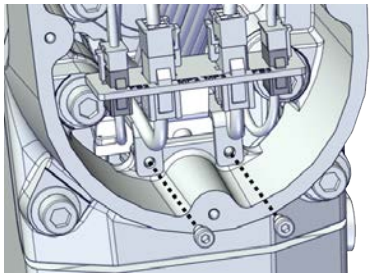
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 cable protector.	 xx2000001546

Disconnecting the axis-2 and -3 motor connectors

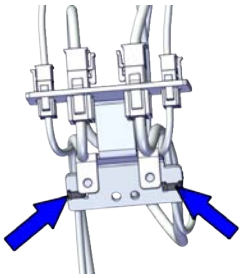
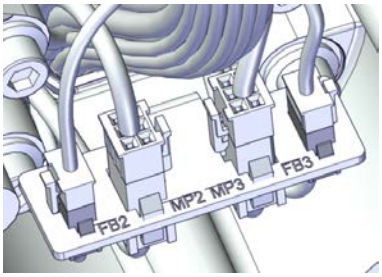
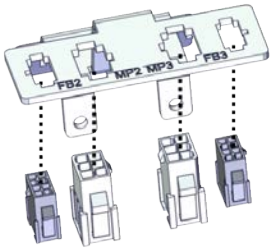
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate, as shown in following step.	 xx2000001548

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5.5.1 Replacing the lower arm

Continued

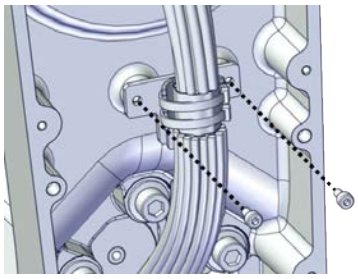
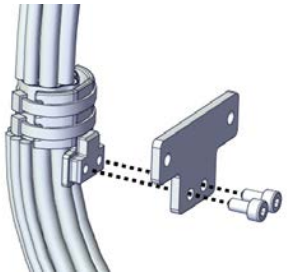
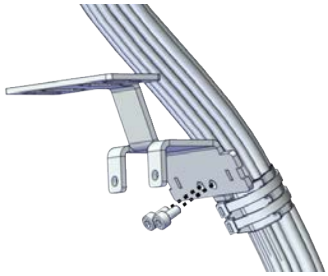
	Action	Note
4	Cut the cable straps.	 xx2000001549
5	Disconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001550
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001551

Separating the cable package from the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the cable bracket from the lower arm first and then from the cable package.	 xx2000001553  xx2100001465
4	Remove the connector plate.	 xx2000001554

Separating the cable package from the swing

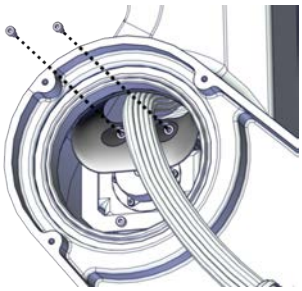
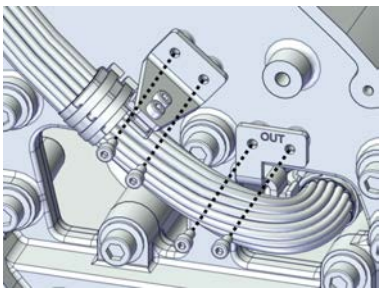
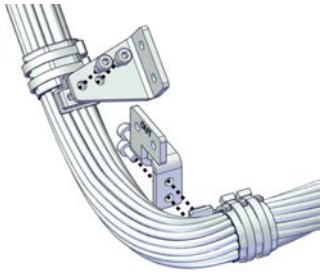
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.5.1 Replacing the lower arm

Continued

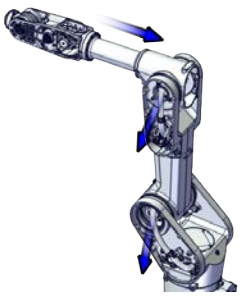
	Action	Note
3	Remove the axis-2 cable protector.	 xx2000001556
4	Remove the cable brackets from the swing first and then from the cable package.	 xx2000001557  xx2100001466

Pulling out the cable package

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Wrap the connectors with the masking tape.	

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	Action	Note
4	Pull the cable package out to the swing support.	 xx2000001683

Removing the axis-3 timing belt

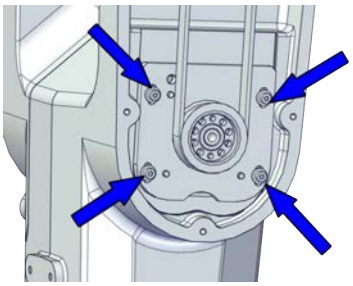
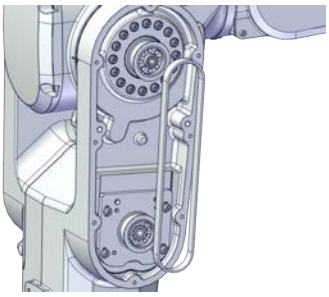
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
4	**CAUTION** The upper arms, which includes housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit weighs 17 kg. All lifting accessories used must be sized accordingly!	
5	Fit a roundsling to the upper arm to support the weight (no force).	

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5.5.1 Replacing the lower arm

Continued

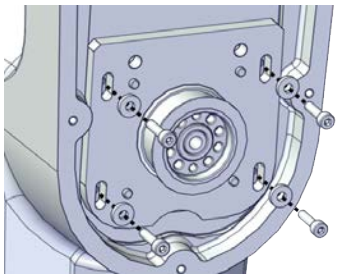
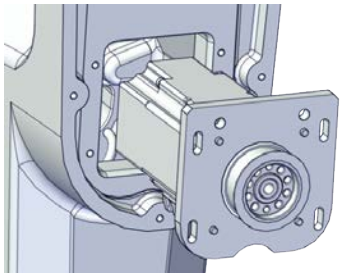
	Action	Note
6	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001614
7	Remove the timing belt from its groove on the motor.	 xx2000001615

Removing the axis-3 motor

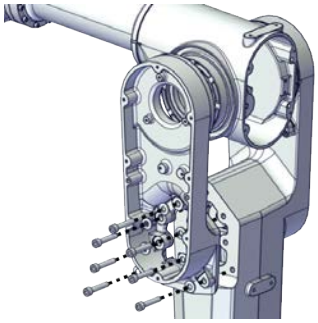
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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	Action	Note
4	Remove the screws and washers.	 xx2000001616
5	Carefully lift out the motor.	 xx2000001617

Removing the lower arm support

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the lower arm support. **Tip** If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.	 xx2000001663

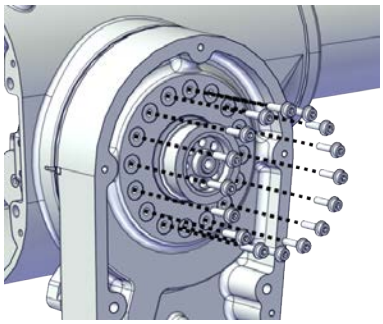
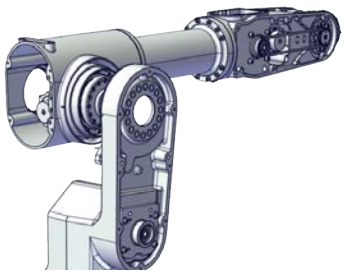
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5.5.1 Replacing the lower arm

Continued

Separating the lower arm from the housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws. **WARNING** This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured. The upper arm, including housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit, weighs 17 kg.	 xx2000001664
4	Separate the lower arm from the housing. **Tip** If the lower arm is hard to loosen from the housing, use a plastic hammer to knock on the lower arm lightly.	 xx2000001665
5	Lay down the upper arm on a workbench. Make sure to support the gravity center of the upper arm.	

Supporting the lower arm

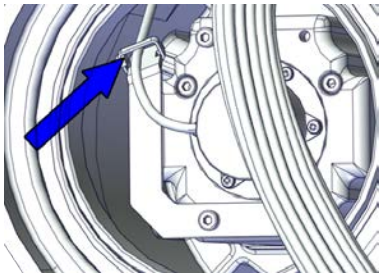
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Support the weight of the lower arm.	

Removing the axis-2 motor

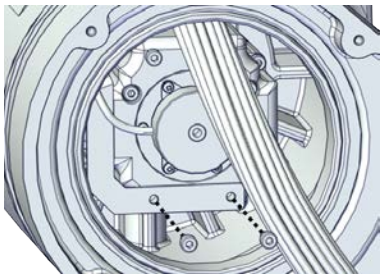
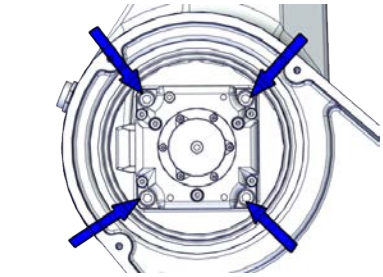
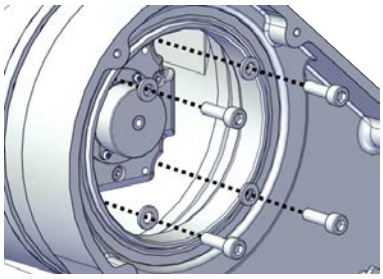
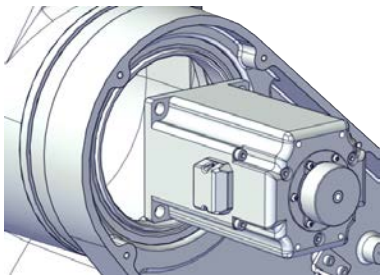
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**WARNING** When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section *Gearbox lubricants (oil or grease) on page 32*.	
4	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
5	Cut the cable strap.	 xx2000001624

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5.5.1 Replacing the lower arm

Continued

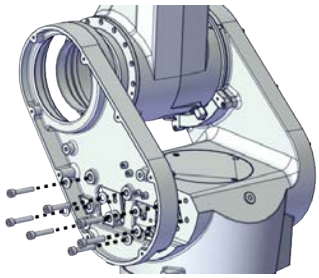
	Action	Note
6	Remove the cable bracket.	 xx2000001625
7	Access the screws and washers securing the axis-2 motor from the swing support.	 xx2000001627
8	Remove the screws and washers.	 xx2000001626
9	Carefully lift out the motor.	 xx2000001628

Removing the swing support

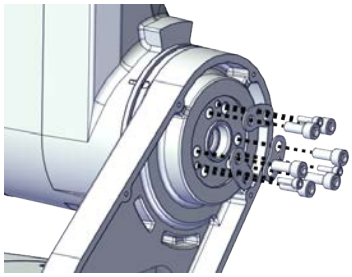
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the swing support. **Tip** If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.	 xx2000001684

Separating the swing from the lower arm

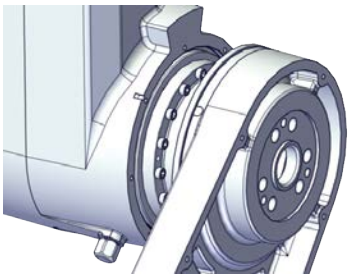
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws.	 xx2000001686

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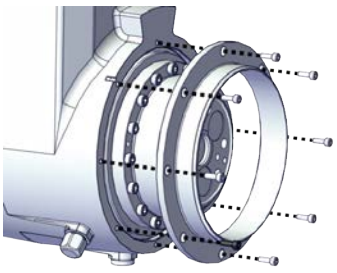
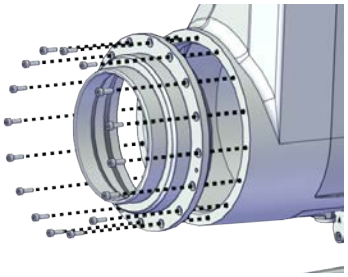
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5.5.1 Replacing the lower arm

Continued

	Action	Note
4	Separate the swing from the lower arm. **Tip** If the swing is hard to loosen from the lower arm, use a plastic hammer to knock on the swing lightly.	 xx2000001687

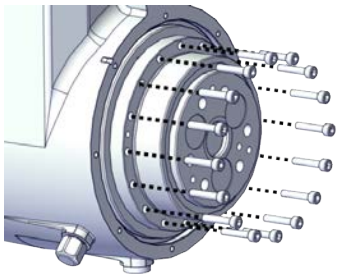
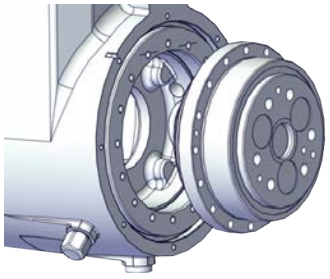
Removing the axis-2 sealing rings

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Remove the sealing ring on the swing side.	 xx2000002516
4	Remove the sealing ring on the swing support side.	 xx2000001692

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Removing the axis-2 gearbox

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
4	Remove the screws.	 xx2000001688
5	Pull out the gearbox.	 xx2000001689

Refitting the lower arm

Use these procedures to refit the lower arm.

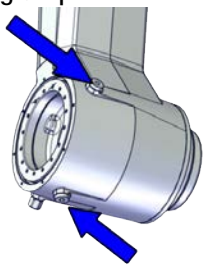
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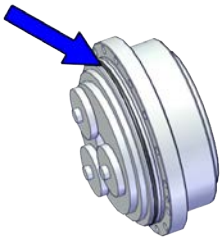
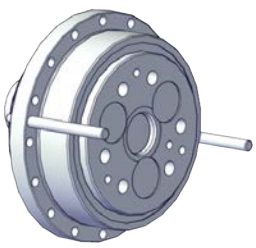
5.5.1 Replacing the lower arm

Continued

Checking mechanical stops and oil plugs

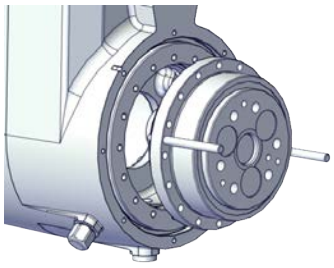
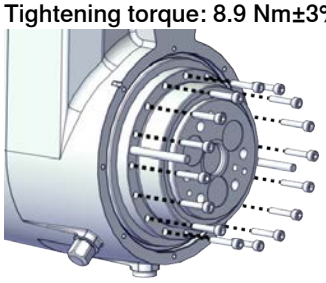
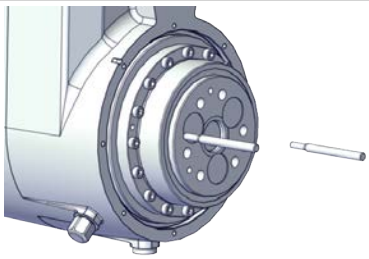
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the axis-3 mechanical stops. Replace if damaged.	See *Replacing the axis-3 mechanical stops on page 529*.
3	Check the oil plugs. Replace if damaged.	Magnetic oil plug, G 1/4": 3HAC037925-001 Tightening torque: 10 Nm  xx2000001726

Refitting the axis-2 gearbox

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the O-ring. Replace if damaged.	O-ring on axis-2 gear unit: 3HAC064977-004  xx2000001690
3	Fit guide pins to the axis-2 gearbox. **Note** Always use two guide pins together.	Guide pin for axis-2 gearbox. Included in special toolkit 3HAC076396-001.  xx2000001705

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	Action	Note
4	Refit the axis-2 gearbox, with guidance from the guide pins.	 xx2000001706
5	Secure with screws.	Screw: M5x25 12.9 Lafre (16 pcs) Tightening torque: 8.9 Nm±3%  xx2000001707
6	Remove the guide pins.	 xx2000001708

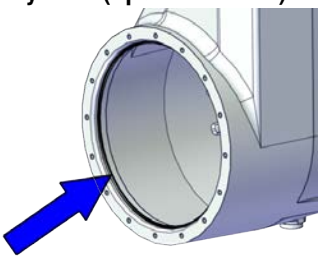
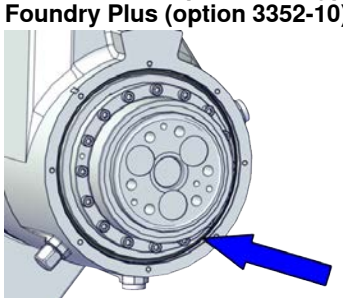
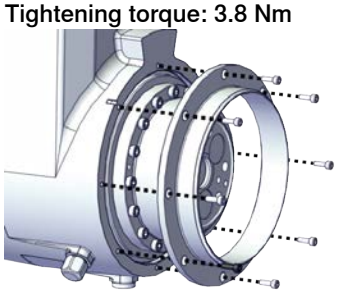
Refitting the axis-2 sealing rings

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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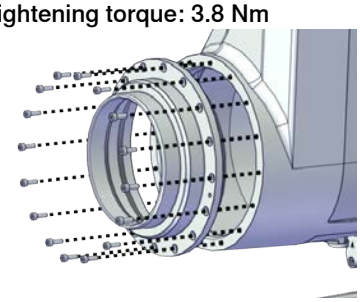
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5.5.1 Replacing the lower arm
Continued

	Action	Note
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** Check the O-ring on the swing support side. **For robots with protection type Foundry Plus (option 3352-10)** Check the O-rings on both swing and swing support sides.	O-ring on lower arm: 3HAC061327-015 **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)**  xx2000002518 **For robots with protection type Foundry Plus (option 3352-10)**  xx2000002517
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Refit the sealing ring on the swing side.	Sealing ring, swing side: 3HAC065675-001 Screw: M4x12 12.9 Lafre (8 pcs) Tightening torque: 3.8 Nm  xx2000002516

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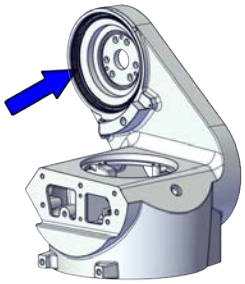
	Action	Note
4	Refit the sealing ring on the swing support side.	Sealing ring, swing support side: 3HAC065676-001 Screw: M4x12 12.9 Lafre (16 pcs) Tightening torque: 3.8 Nm  xx2000001692

Check the radial sealing on the swing top

Note

This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

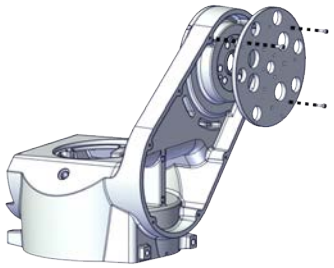
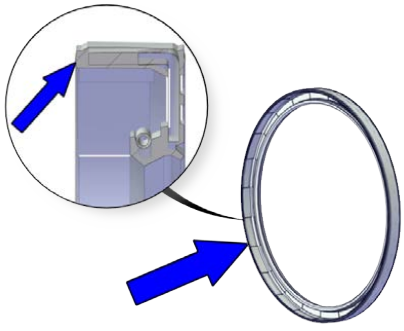
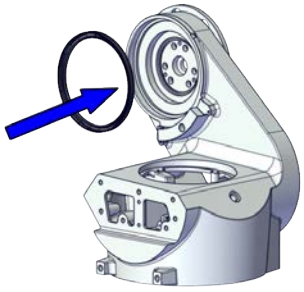
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the swing top. Replace if damaged, as described below.	 xx2000002460

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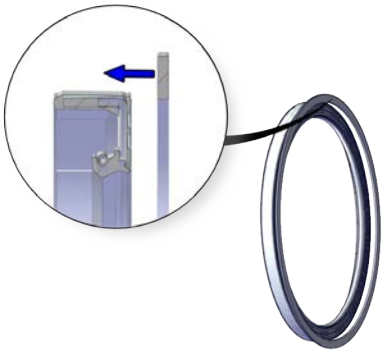
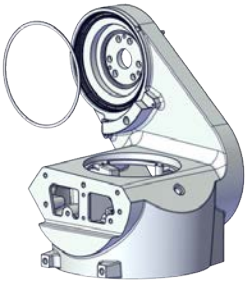
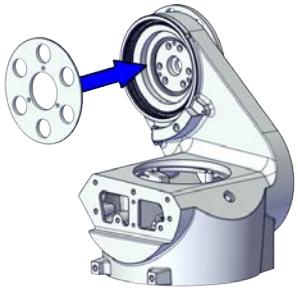
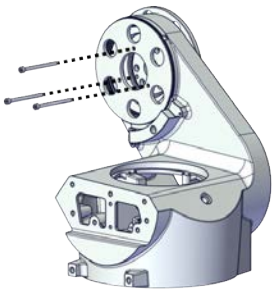
5.5.1 Replacing the lower arm

Continued

	Action	Note
3	Fit the big circular plate of the axis-2 sealing assembly tool to the swing (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002461
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001
5	Fit the new sealing into the swing. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002462

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	Action	Note
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-2 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002463
7	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002464  xx2000002465
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

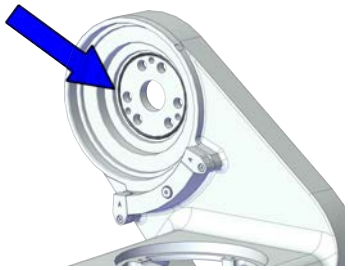
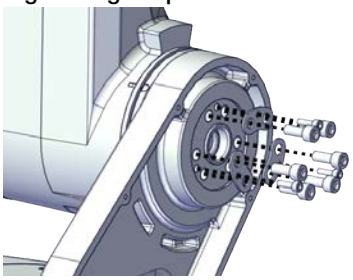
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5.5.1 Replacing the lower arm

Continued

Refitting the swing to the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the O-ring. Replace if damaged.	O-ring on swing: 3HAC061327-036  xx2000001750
3	Refit the swing to the lower arm.	**M10 screws** Screw: M10x25 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 72 Nm **M6 screws** Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (3 pcs) Tightening torque: 14 Nm  xx2000001686

Check the radial sealing on the swing support

Note

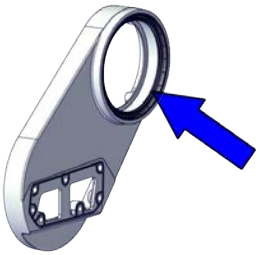
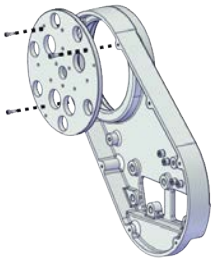
This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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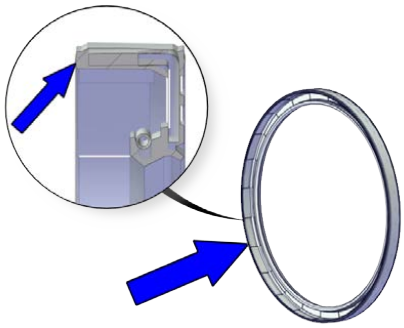
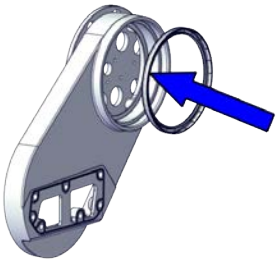
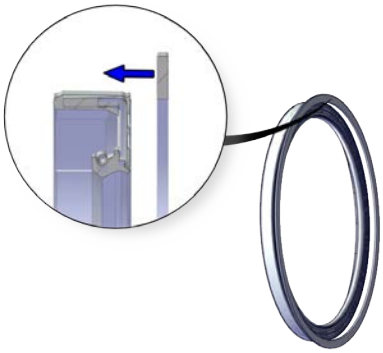
	Action	Note
2	Check the radial sealing on the swing support. Replace if damaged, as described below.	 xx2000002466
3	Fit the big circular plate of the axis-2 sealing assembly tool to the swing support (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002467
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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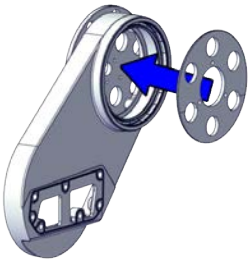
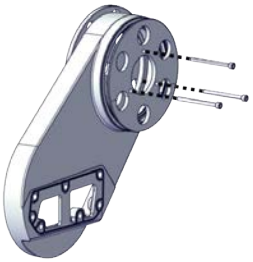
5.5.1 Replacing the lower arm

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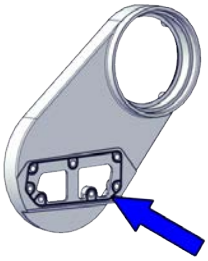
	Action	Note
5	Fit the new sealing into the swing support. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002468
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-2 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002469

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	Action	Note
7	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002470  xx2000002471
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

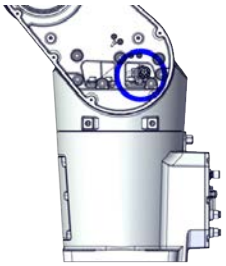
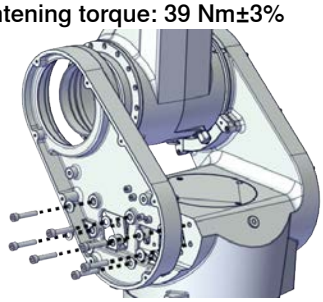
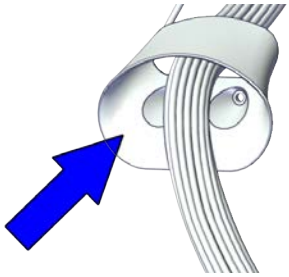
Refitting the swing support

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for swing support, short: 3HAC067822-001 Gasket for swing support, long: 3HAC067823-001  xx2000002520

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5.5.1 Replacing the lower arm
Continued

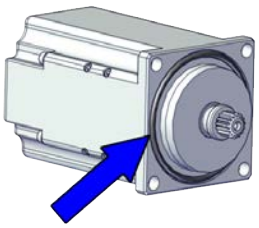
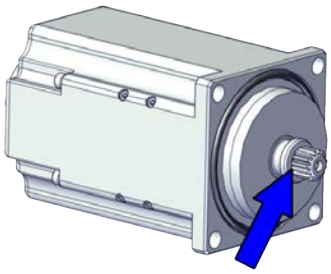
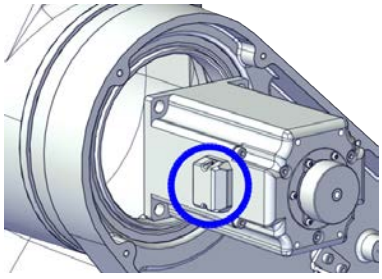
	Action	Note
3	Route the cable package through the swing support. Make sure that the cable package is out from the hole near the base rear, as circled in the figure. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001747
4	Refit the swing support.	Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm±3%  xx2000001684
5	Apply grease to the axis-2 cable protector and slip it over the cable harness.	Grease: 3HAC029132-001 Plastic cable protector, axis 2: 3HAC067816-001  xx2000001567

Refitting the axis-2 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**CAUTION** Do not mix the axis-2 motor used for IRB 1300-7/1.4 and IRB 1300-12/1.4. Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-2 motor for IRB 1300-7/1.4: 3HAC073078-001 Axis-2 motor for IRB 1300-12/1.4: 3HAC082078-001

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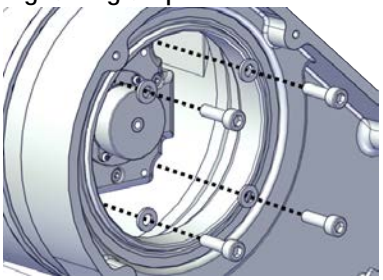
	Action	Note
3	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
4	Check the O-ring. Replace if damaged.	O-ring on motor unit: 3HAC061327-037  xx2000001629
5	Apply lubricating oil to the motor that has contacting area with the gearbox.	Kyodo Yushi TMO150: 3HAC032140-009  xx2000001701
6	Orient the motor correctly and fit it into the swing. Make sure the motor is properly fit to gearbox.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001630

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5.5.1 Replacing the lower arm

Continued

	Action	Note
7	Refit the screws and washers.	Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm  xx2000001626

Checking the radial sealing on the lower arm

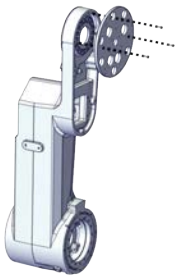
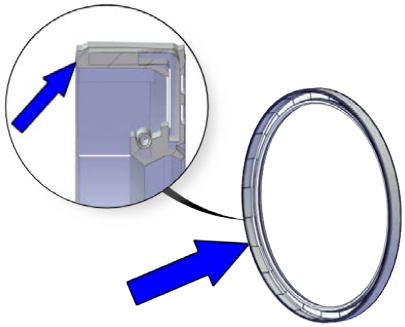
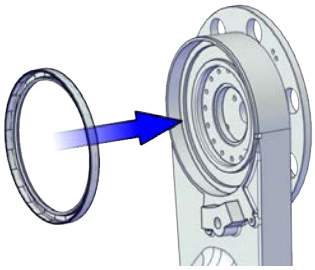
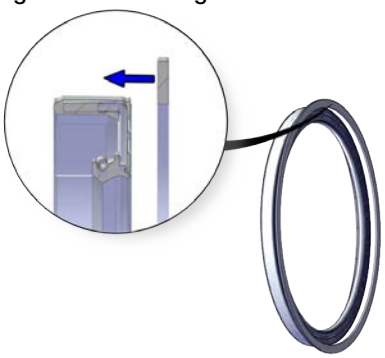
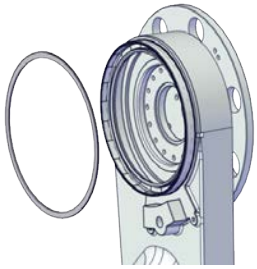
Note

This procedure is valid for robots with:

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the lower arm. Replace if damaged, as described below.	 xx2000002472 *Figure 5.1:*

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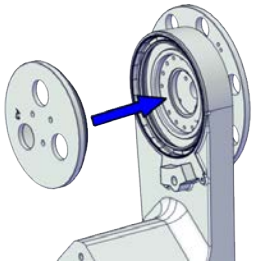
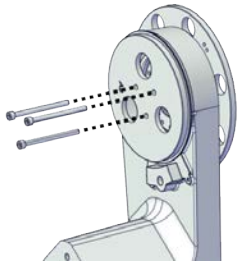
	Action	Note
3	Fit the big circular plate of the axis-3 sealing assembly tool to the lower arm (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002473
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
5	Fit the new sealing into the lower arm. The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002474
6	Place the ring of the axis-3 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002499

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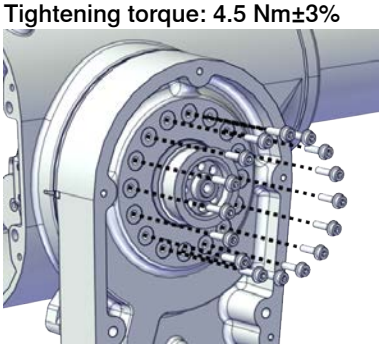
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5.5.1 Replacing the lower arm

Continued

	Action	Note
7	Fit the small circular plate of the axis-3 sealing assembly tool against the sealing and fix with three M6x75 screws.	Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002475  xx2000002476
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the lower arm to the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the lower arm to the housing.	Screw: M4x16 12.9 Lafre (16 pcs) Tightening torque: 4.5 Nm±3%  xx2000001664

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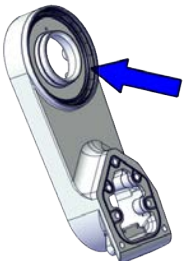
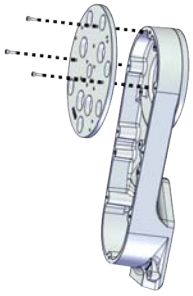
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Checking the radial sealing on the lower arm support

Note

This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

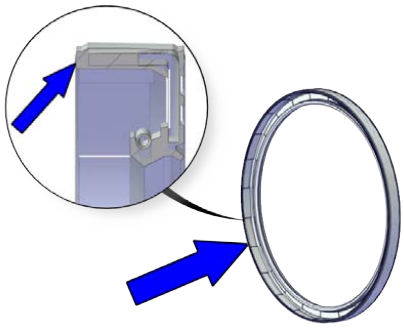
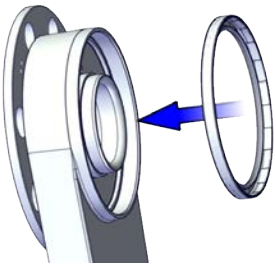
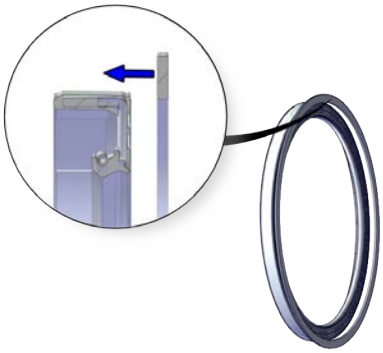
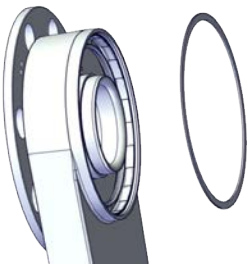
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the lower arm support. Replace if damaged, as described below.	 xx2000002477
3	Fit the big circular plate of the axis-3 sealing assembly tool to the lower arm support (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002478
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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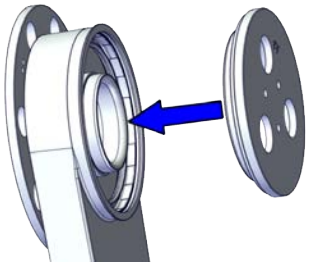
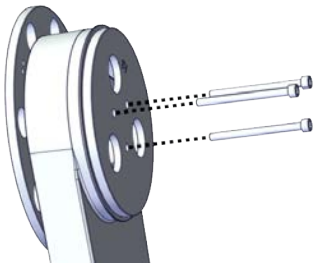
5.5.1 Replacing the lower arm

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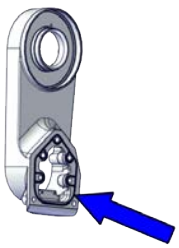
	Action	Note
5	Fit the new sealing into the lower arm support. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002479
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-3 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002480

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	Action	Note
7	Fit the small circular plate of the axis-3 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002481  xx2000002482
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

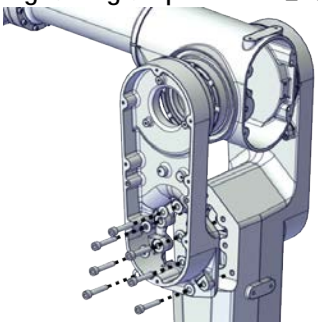
Refitting the lower arm support

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for lower arm support: 3HAC067826-001  xx2000002521

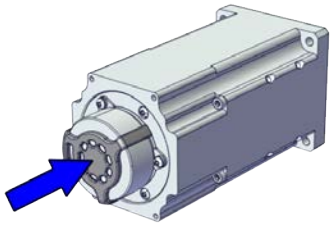
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5.5.1 Replacing the lower arm
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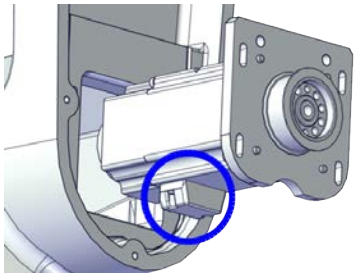
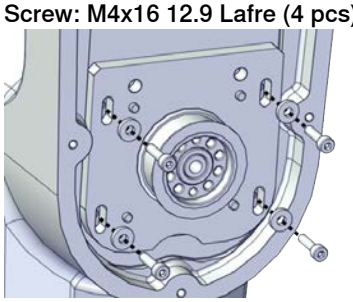
	Action	Note
3	Refit the lower arm support.	Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm±3%  xx2000001663

Refitting the axis-3 motor

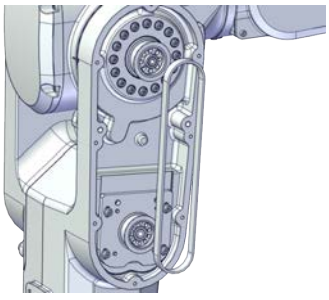
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**CAUTION** Do not mix the axis-3 motor used for IRB 1300-7/1.4 and IRB 1300-12/1.4. Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-3 motor for IRB 1300-7/1.4: 3HAC073086-001 Axis-3 motor for IRB 1300-12/1.4: 3HAC082079-001
3	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
4	**Valid for IRB 1300-12/1.4** Check the resolver cover. Replace if damaged.	Resolver cover on axis-3 motor (IRB 1300-12/1.4): 3HAC060261-001  xx2100002770

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	Action	Note
5	Orient the motor correctly and fit it into the lower arm.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001618
6	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre (4 pcs)  xx2000001616

Refitting the axis-3 timing belt

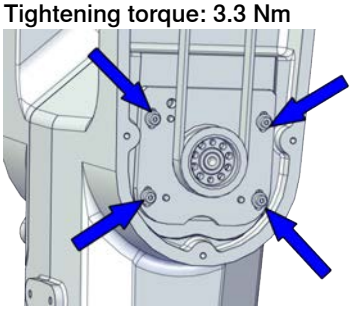
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001615
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	

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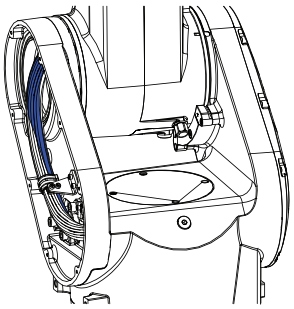
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5.5.1 Replacing the lower arm

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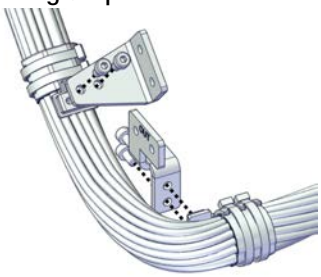
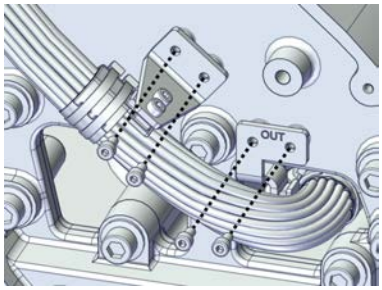
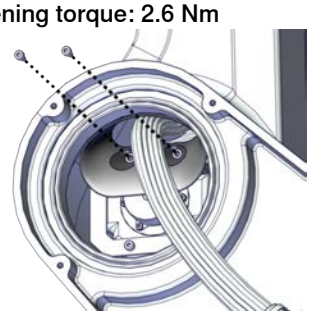
	Action	Note
4	Tighten the motor screws.	Tightening torque: 3.3 Nm  xx2000001614
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 73.4-78.5 Hz New belt: 87.8-92.1 Hz
6	Release the support to the upper arm.	

Securing the cable package in the swing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Route the cable package up into the lower arm. Make sure that the the air hoses are facing outside in the axis-2 cable protector, see the figure as a guidance for the cable twisting way.	 xx2000001746

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	Action	Note
3	Refit the cable brackets.	Screw: M4x8 12.9 Lafre (2 pcs for each bracket on cable package and 2 pcs on swing) Tightening torque: 2.6 Nm  xx2100001466  xx2000001557
4	Refit the axis-2 cable protector.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001556

Routing the cable package in the lower arm

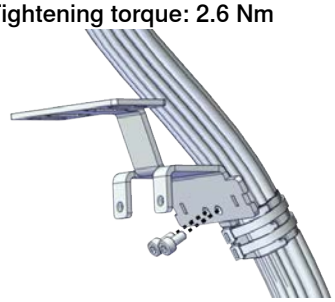
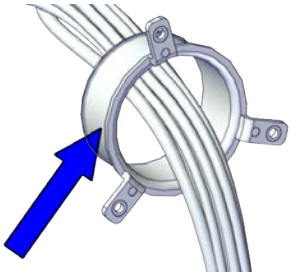
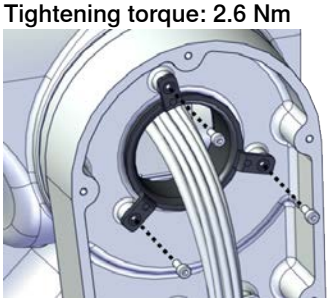
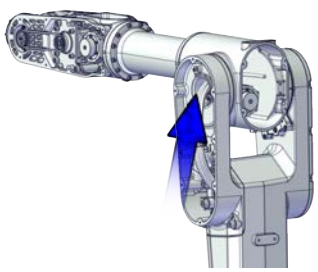
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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5.5.1 Replacing the lower arm

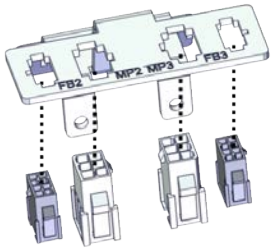
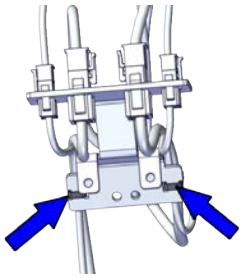
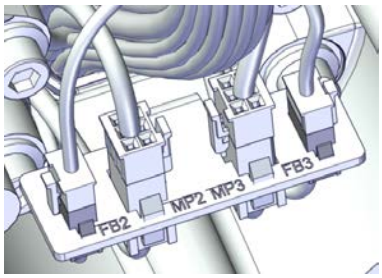
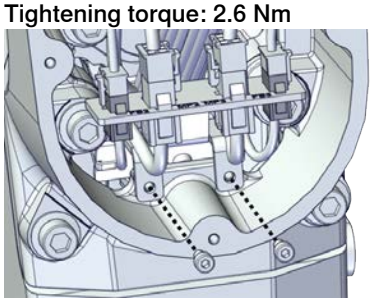
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	Action	Note
2	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001554
3	Check the axis-3 cable protector. Replace if damaged. **Note** If replaced, apply grease to the axis-3 cable protector before refitting.	Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001  xx2000001568 Screw: M4x10 12.9 Lafre (3 pcs) Tightening torque: 2.6 Nm  xx2000001552
4	Route the cable package through the lower arm support and up into the housing. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001569

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Reconnecting the axis-2 and -3 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001551
3	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001549
4	Reconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001550
5	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001548

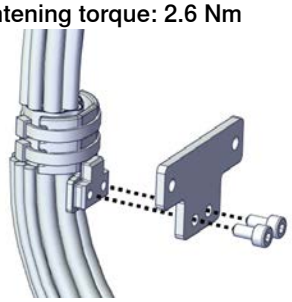
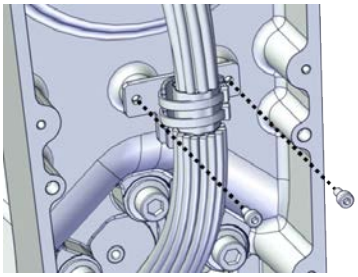
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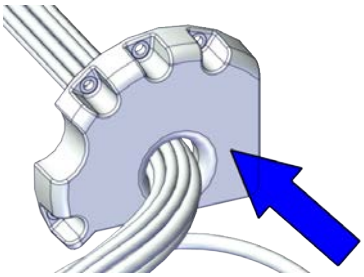
5.5.1 Replacing the lower arm

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Securing the cable package in the lower arm

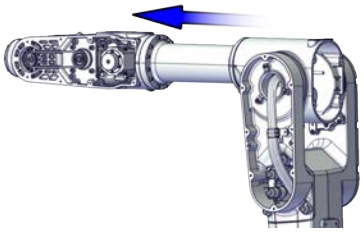
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the cable bracket.	Screw: M4x8 12.9 Lafre (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm  xx2100001465  xx2000001553

Routing the cable package in the housing

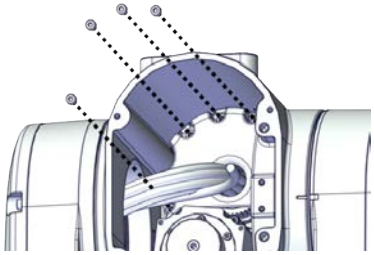
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Slip the axis-4 cable protector over the cable package.	Plastic cable protector, axis 4: 3HAC064694-001:  xx2000001570

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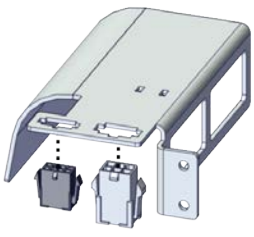
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	Action	Note
3	Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and into the tubular. Make sure that: • the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001571

Securing the cable package in the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 cable protector.	Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001546

Reconnecting the axis-4 motor connectors

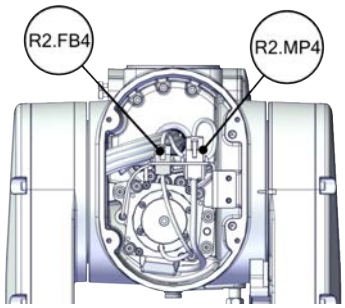
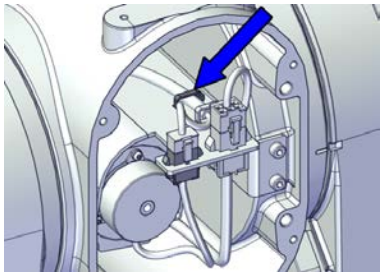
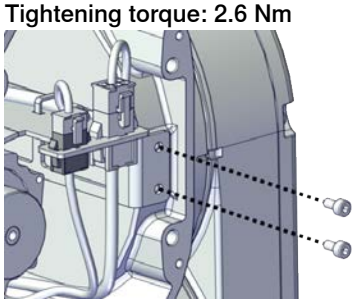
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545

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5.5.1 Replacing the lower arm

Continued

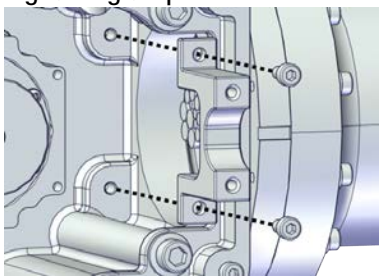
	Action	Note
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

Routing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

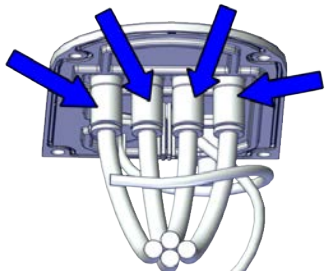
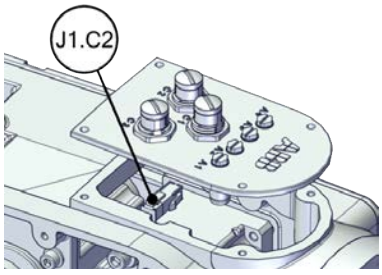
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	Action	Note
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

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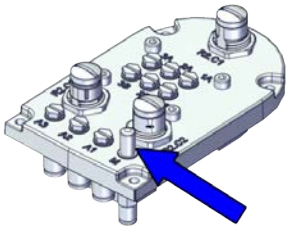
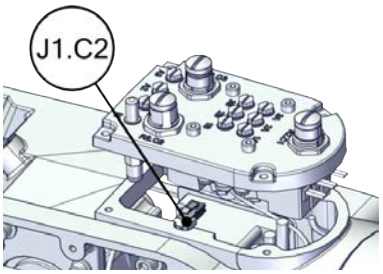
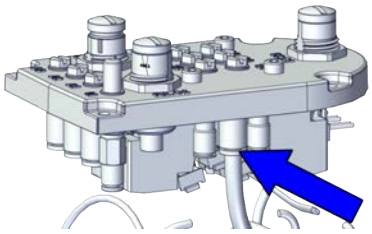
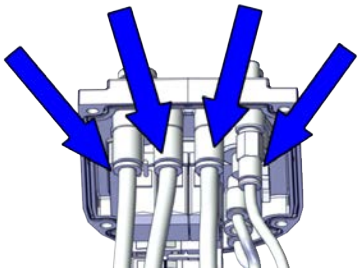
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5.5.1 Replacing the lower arm

Continued

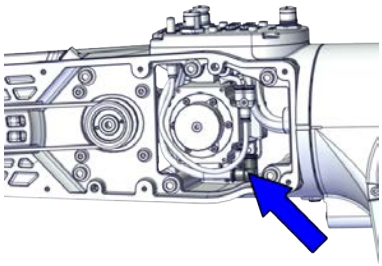
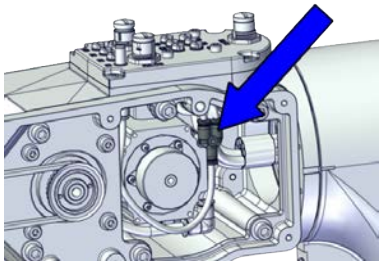
Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

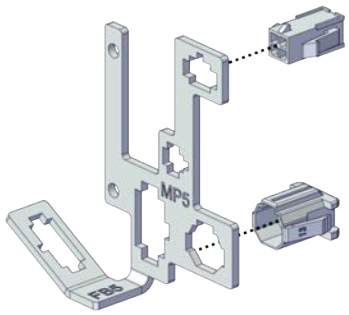
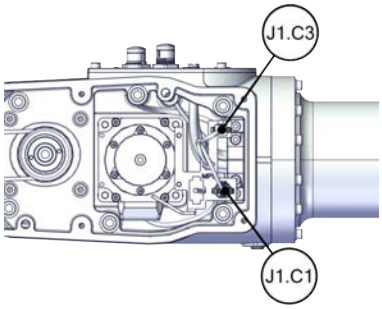
	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373

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	Action	Note
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

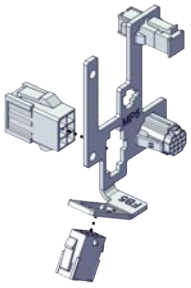
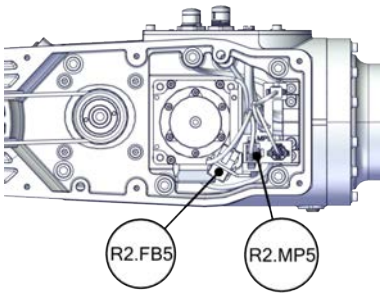
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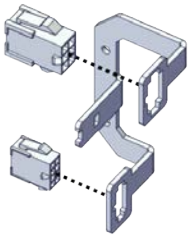
5.5.1 Replacing the lower arm

Continued

Reconnecting the axis-5 motor connectors

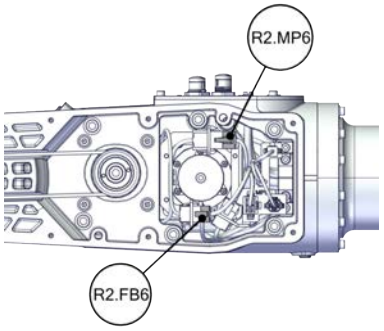
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

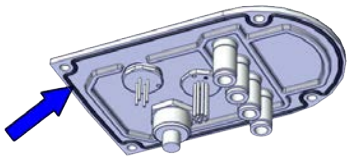
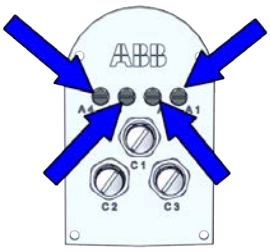
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533

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	Action	Note
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

Refitting the process hub

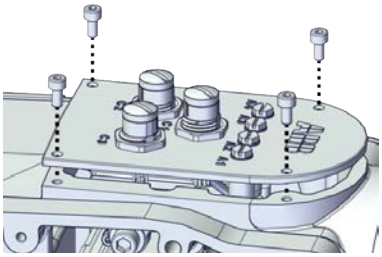
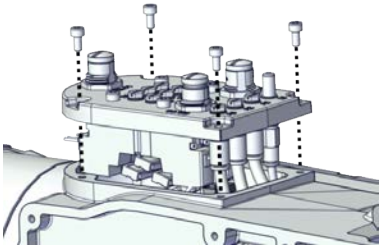
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

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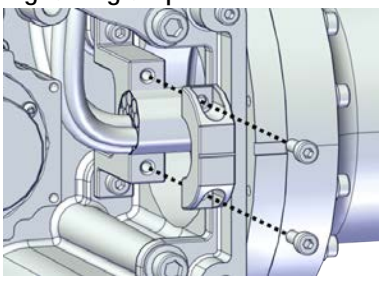
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5.5.1 Replacing the lower arm

Continued

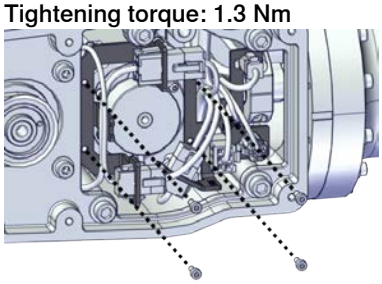
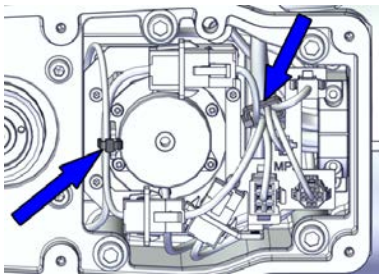
	Action	Note
5	Refit the process hub.	**Not valid for robots with solenoid valve (3303-3)** Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538
		Valid for robots with solenoid valve (3303-3) Screw: M4x12 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2300001372

Securing the cable package in the tubular

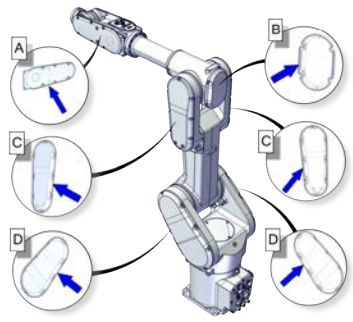
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748

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	Action	Note
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

Refitting the covers

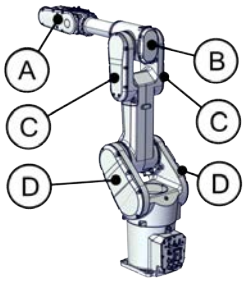
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm covers (C) • Gasket for swing covers (D) Replace if damaged.	 xx2000002501
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

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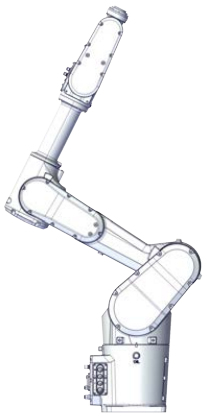
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5.5.1 Replacing the lower arm

Continued

	Action	Note
5	Refit the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) • Swing covers (D)	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001724

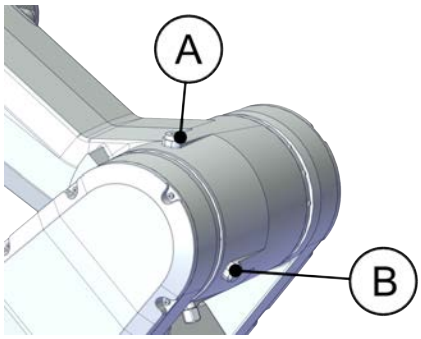
Jogging the robot to oil filling position

	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
2	Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance.	 xx2000001519
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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Refilling oil to axis-2 gearbox

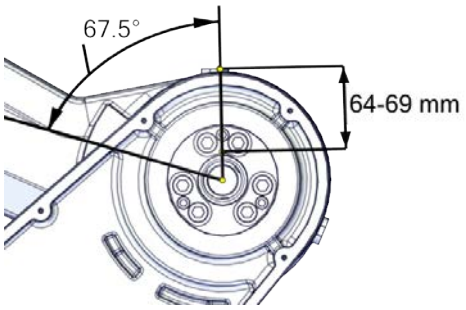
	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**CAUTION** The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
3	Open the upper oil plug. **Note** The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.	 xx2000001518 A – Oil plug, opened B – Oil plug, closed
4	**WARNING** Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	
5	Refill the gearbox with oil. **Note** The amount of oil to be filled depends on the amount previously being drained. **CAUTION** Oil filling must be slow to make sure air venting is fluent.	Type of oil and total amount is detailed in *Lubrication in gearboxes on page 816*.

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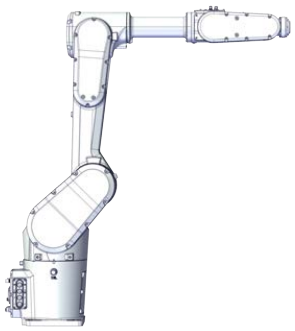
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5.5.1 Replacing the lower arm

Continued

	Action	Note
6	Inspect the oil level by measuring the level at the upper oil plug hole. Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole. **CAUTION** The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.	 xx2000001580
7	Refit the oil plug.	Tightening torque: 10 Nm
8	**DANGER** Make sure all safety requirements are met when performing the first test run.	

Jogging the robot to zero position

	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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Concluding procedure

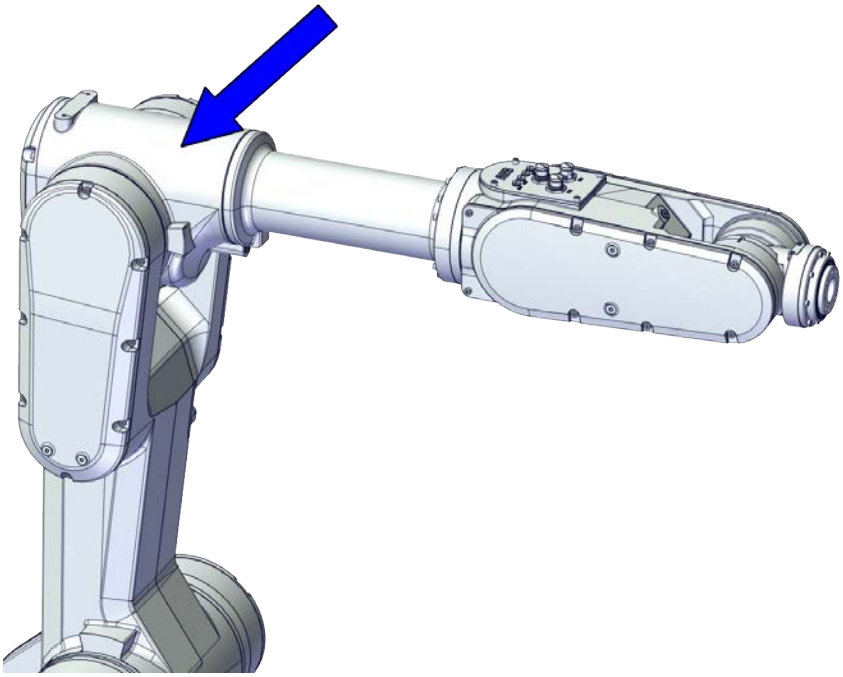
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.5.2 Replacing the housing and extender unit

Locations of the housing and extender unit

The housing is located as shown in the figure.

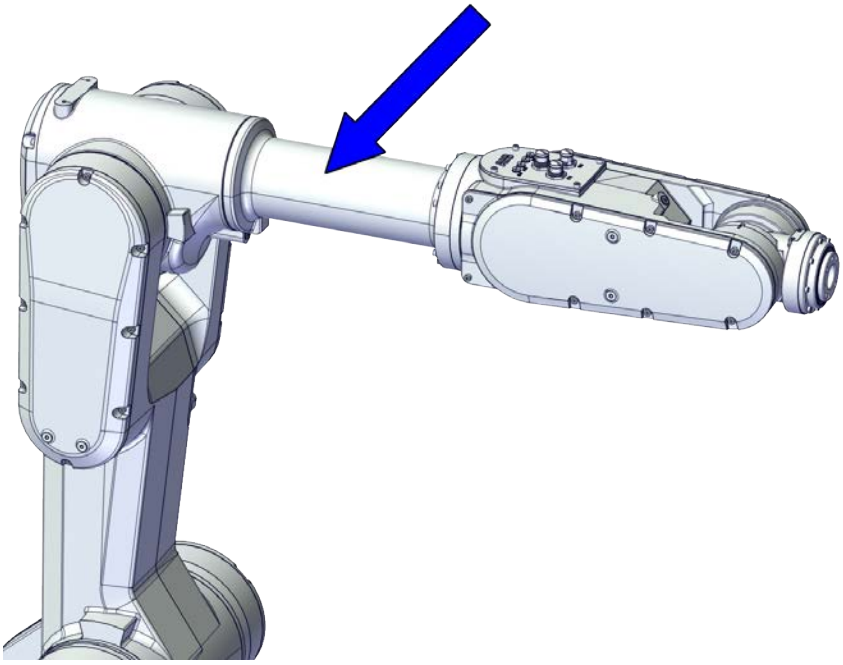


xx2000001476

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The extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) is located as shown in the figure.



xx2000001477

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Housing	3HAC073079-001	
Housing, IP67	3HAC077801-001	Used with protection class IP67.
Housing, Clean Room	3HAC077814-001	Used with protection type Clean Room.
Housing, Foundry Plus	3HAC077848-001	Used with protection type Foundry Plus.
Extender unit	3HAC073085-001	Used for IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67.
Extender unit, Clean Room	3HAC077818-001	Used for IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.

Continues on next page

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5.5.2 Replacing the housing and extender unit
Continued

Spare part	Article number	Note
Extender unit, Foundry Plus	3HAC077852-001	Used for IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Foundry Plus.
Lower arm support	3HAC073076-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm support, Clean Room	3HAC077813-001	Used with protection type Clean Room.
Gear unit, axis 4	3HAC073084-001	
O-ring on circular spline side, axis 4	3HAC061327-021	Not used with protection class IP40. Replace if damaged.
O-ring on flexible spline side, axis 4	3HAC061327-115	Not used with protection class IP40. Replace if damaged.
Motor unit, axis 4	3HAC073087-001	
Timing belt, axis 4	3HAC065806-001	
Mechanical stop, axis 4, flange	3HAC065805-001	Replace if damaged.
Mechanical stop, axis 4, slider	3HAC065804-001	Replace if damaged.
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	

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Spare part	Article number	Note
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm support	3HAC067826-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on lower arm	3HAC070148-005	Not used with protection class IP40. Replace if damaged.
Radial sealing on housing	3HAC070148-006	Used with protection types Clean Room and Foundry Plus. Replace if damaged.
O-ring on tubular	3HAC061327-018	Not used with protection class IP40. Replace if damaged.
Plug screw	3HAC078352-001	Not used with protection type Clean Room. Replace if damaged.

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5.5.2 Replacing the housing and extender unit
Continued

Spare part	Article number	Note
Plug screw, Clean Room	3HAC078351-001	Used with protection type Clean Room. Replace if damaged.
Rubber sealing washer	3HAC075325-001	Used with protection type Clean Room. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Sonic tension meter	-	Used for measuring the timing belt tension.
Tension adjustment tool for axis-4 timing belt	-	Included in special toolkit 3HAC076396-001.
Dynamometer	-	Used for measuring the timing belt tension.
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

Removing the housing

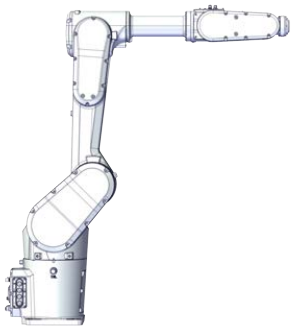
Use these procedures to remove the housing.

Preparations before removing the housing

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

Continues on next page

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	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

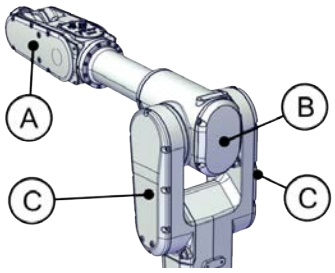
Removing the covers

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

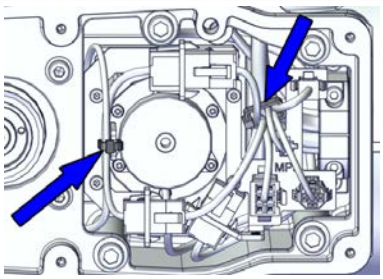
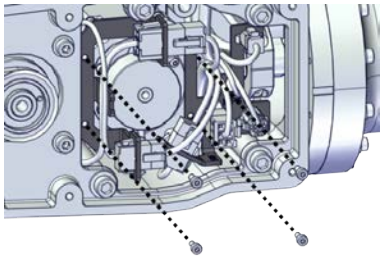
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5.5.2 Replacing the housing and extender unit
Continued

	Action	Note
3	Remove the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C)	 xx2000001661

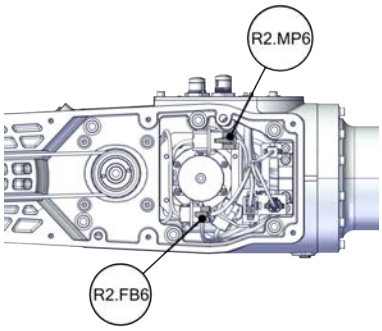
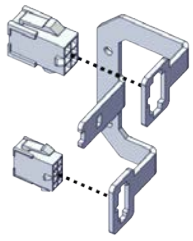
Loosening the cables in the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001531

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Disconnecting the axis-6 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

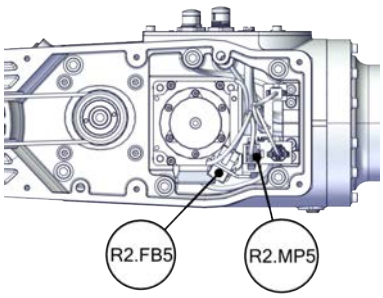
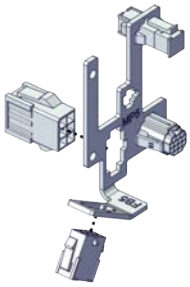
Disconnecting the axis-5 motor connectors

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

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5.5.2 Replacing the housing and extender unit
Continued

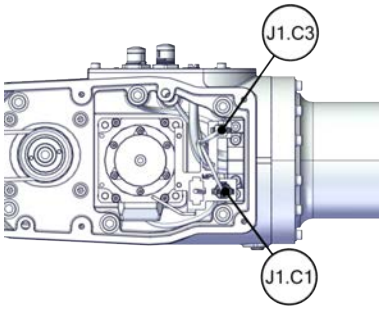
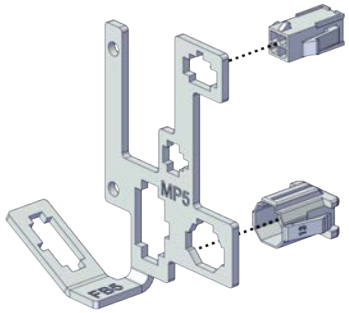
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

Disconnecting CP/CS cabling (if equipped)

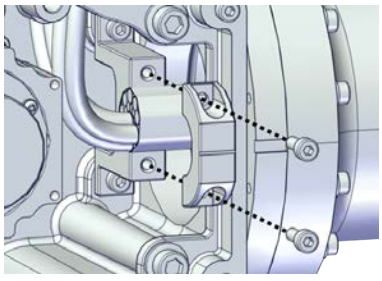
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

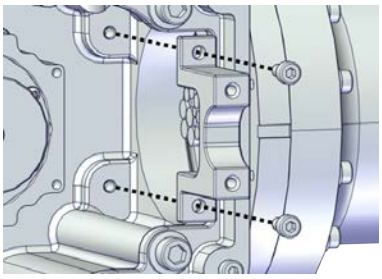
Separating the cable package from the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748

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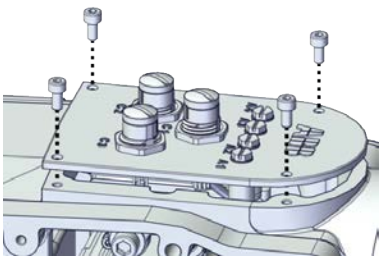
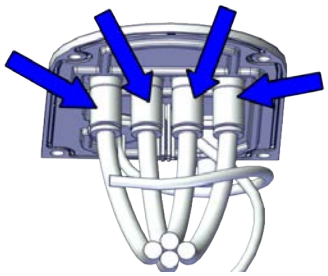
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5.5.2 Replacing the housing and extender unit
Continued

	Action	Note
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

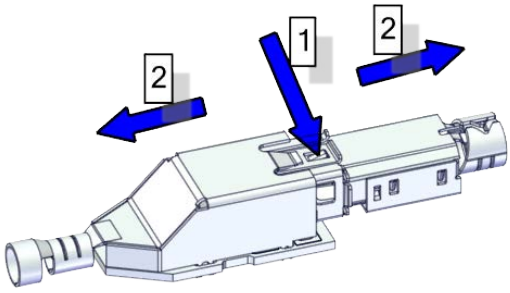
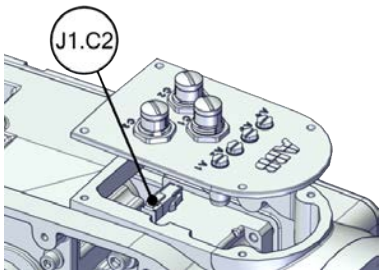
Removing the process hub (without solenoid valve)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538
4	Disconnect the air hoses.	 xx2000001539

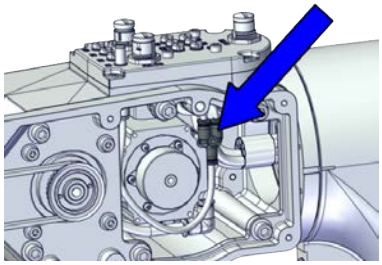
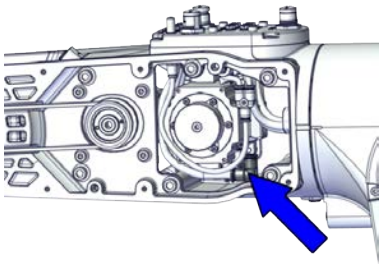
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	Action	Note
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

Removing the process hub (with solenoid valve)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

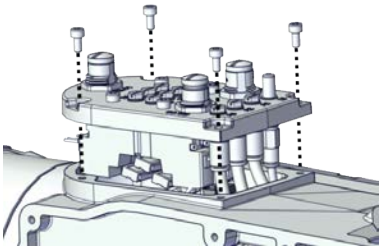
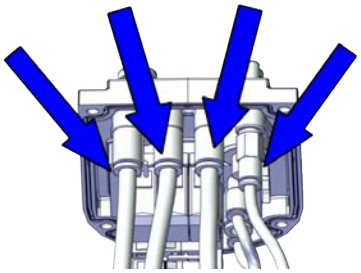
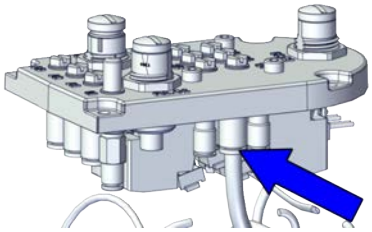
	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370
2	Disconnect the three L-shape connectors.	 xx2300001371

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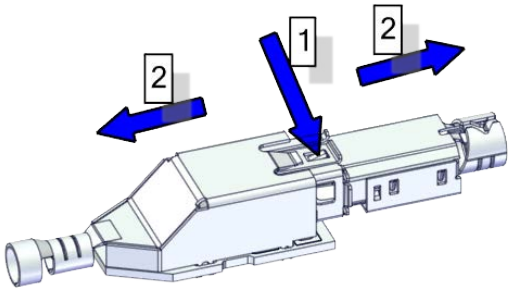
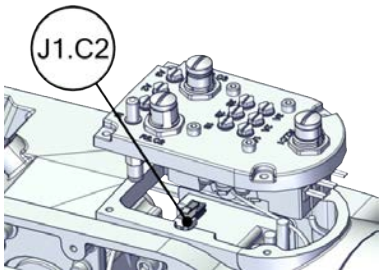
5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

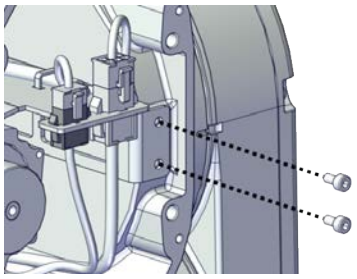
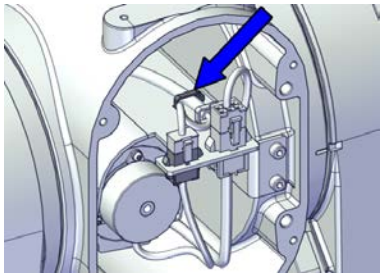
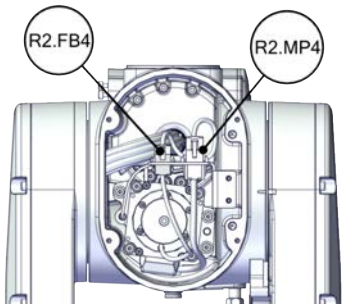
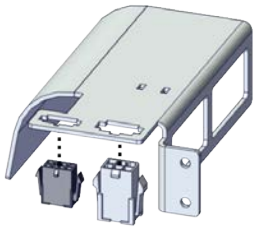
Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.5.2 Replacing the housing and extender unit
Continued

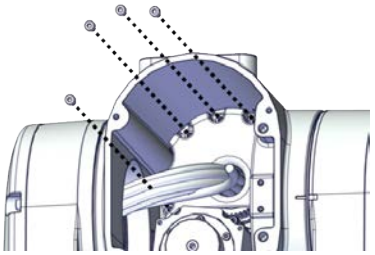
	Action	Note
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001542
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

Separating the cable package from the housing

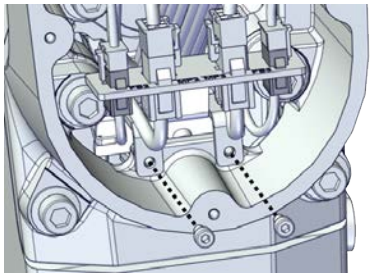
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 cable protector.	 xx2000001546

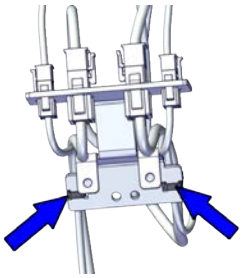
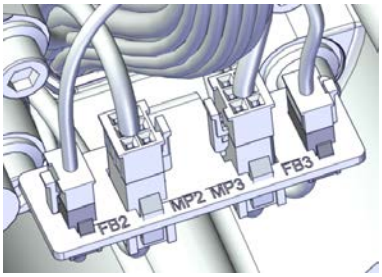
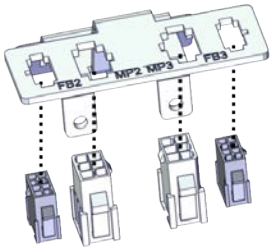
Disconnecting the axis-2 and -3 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate, as shown in following step.	 xx2000001548

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5.5.2 Replacing the housing and extender unit
Continued

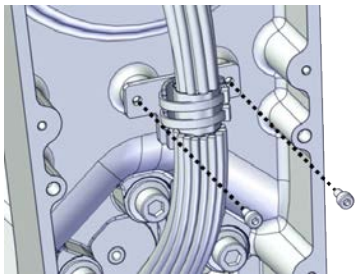
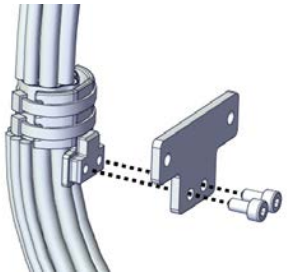
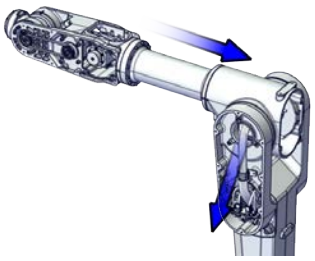
	Action	Note
4	Cut the cable straps.	 xx2000001549
5	Disconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001550
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001551

Pulling out the cable package

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the cable bracket from the lower arm first and then from the cable package.	 xx2000001553  xx2100001465
4	Wrap the connectors with the masking tape.	
5	Pull the cable package out to the lower arm support. **Note** During the routing, make sure the axis-2 motor cablings are kept visible and accessible from the lower arm support side.	 xx2000001662

Removing the axis-4 motor

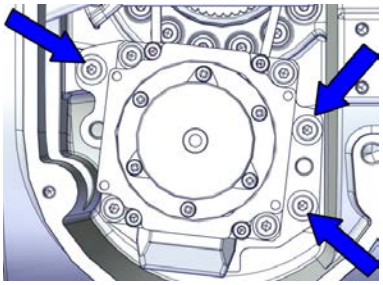
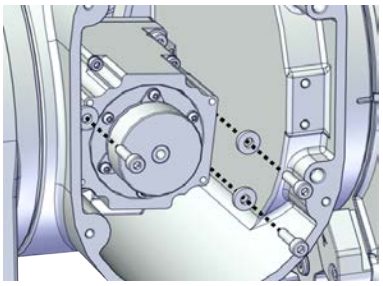
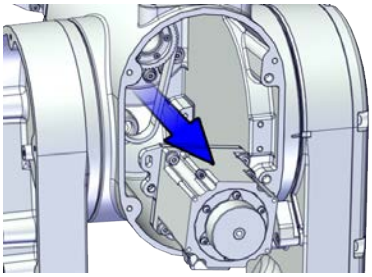
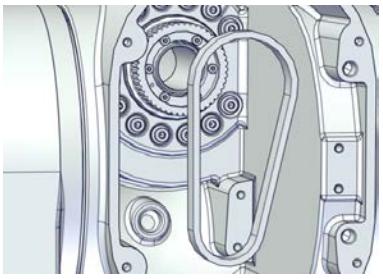
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.5.2 Replacing the housing and extender unit

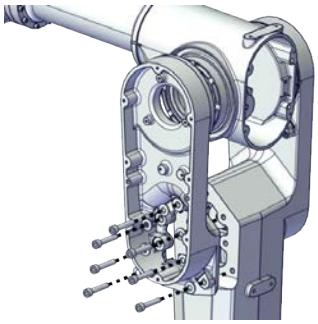
Continued

	Action	Note
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001604
5	Remove the timing belt from its groove on the motor.	
6	Remove the screws and washers.	 xx2000001605
7	Carefully lift out the motor.	 xx2000001669
8	Remove the timing belt.	 xx2000001670

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Removing the lower arm support

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the lower arm support. **Tip** If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.	 xx2000001663

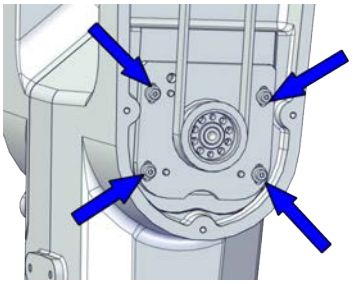
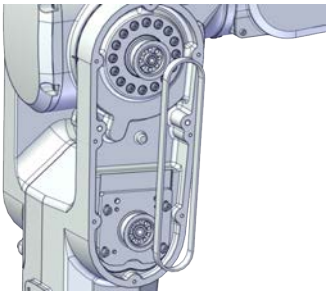
Removing the axis-3 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	

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5.5.2 Replacing the housing and extender unit
Continued

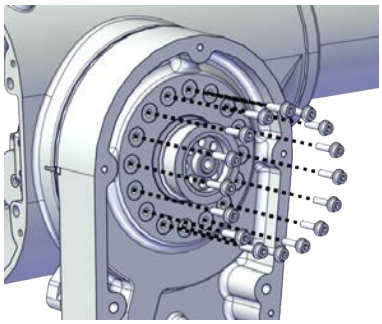
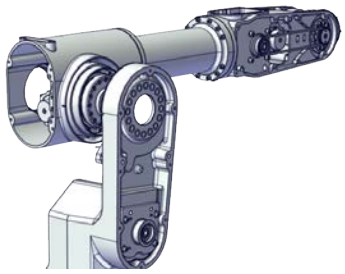
	Action	Note
4	**CAUTION** The upper arms, which includes housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit weighs 17 kg. All lifting accessories used must be sized accordingly!	
5	Fit a roundsling to the upper arm to support the weight (no force).	
6	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001614
7	Remove the timing belt from its groove on the motor.	 xx2000001615

Separating the lower arm from the housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the screws. **WARNING** This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured. The upper arm, including housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit, weighs 17 kg.	 xx2000001664
4	Separate the lower arm from the housing. **Tip** If the lower arm is hard to loosen from the housing, use a plastic hammer to knock on the lower arm lightly.	 xx2000001665
5	Lay down the upper arm on a workbench. Make sure to support the gravity center of the upper arm.	

Removing the axis-3 gearbox

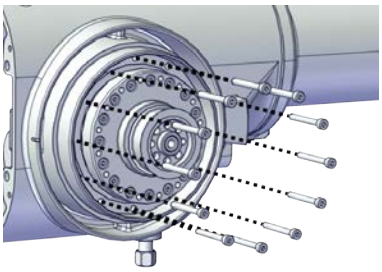
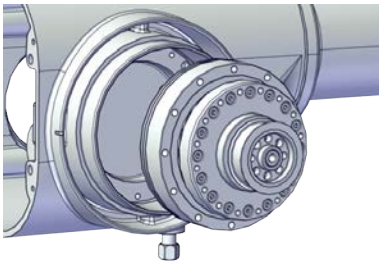
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	

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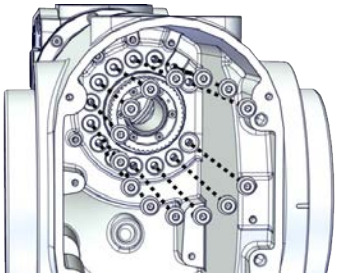
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5.5.2 Replacing the housing and extender unit

Continued

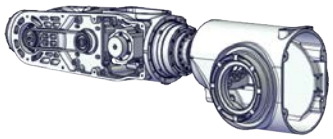
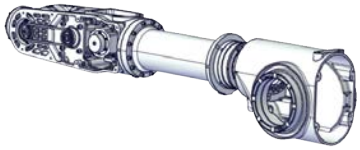
	Action	Note
4	Remove the screws.	 xx2000001666
5	Pull out the gearbox.	 xx2000001667

Separating the housing

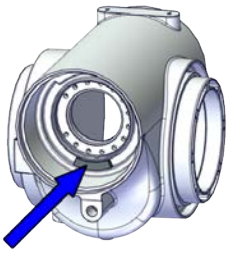
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Support the weight of the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit, and remove the screws.	 xx2000001729

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	Action	Note
4	**Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15** Separate the tubular from the housing.	 xx2000001728
5	**Valid for IRB 1300-7/1.4 and IRB 1300-12/1.4** Separate the extender unit from the housing.	 xx2000001727

Removing the axis-4 mechanical stop slider

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Access the axis-4 mechanical stop slider from the housing. Put it aside for later refitting.	 xx2000001732

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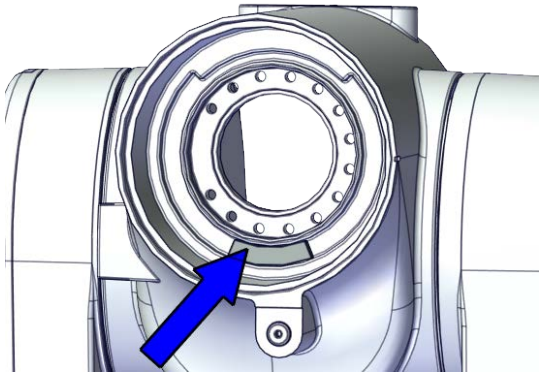
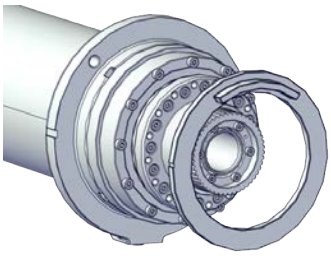
Removing the extender unit

Note

Only IRB 1300-7/1.4 and IRB 1300-12/1.4 have an extender unit, connecting the housing and tubular.

Use these procedures to continuously remove the extender unit after removing the housing.

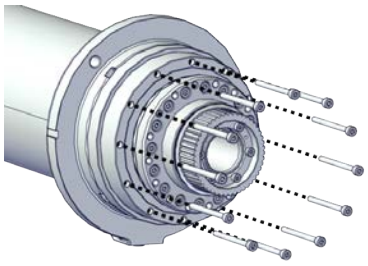
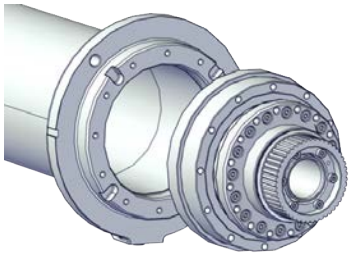
Removing the axis-4 mechanical stop flange

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 mechanical stop flange. **CAUTION** The axis-4 mechanical stop slider is accessible from the housing. Put it aside for later refitting.  xx2000001674	 xx2000001673

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Removing the axis-4 gearbox

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
4	Remove the screws.	 xx2000001675
5	Pull out the gearbox.	 xx2000001676

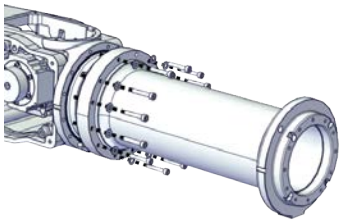
Separating the extender unit

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

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5.5.2 Replacing the housing and extender unit
Continued

	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Separate the extender unit from the tubular.	 xx2000001730

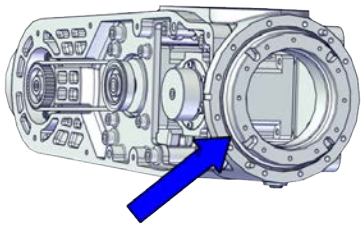
Refitting the extender unit

Note

Only IRB 1300-7/1.4 and IRB 1300-12/1.4 have an extender unit, connecting the housing and tubular.

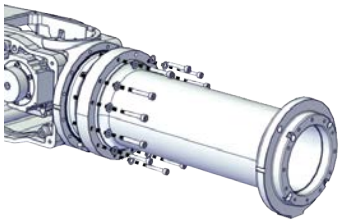
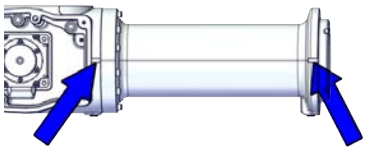
Use these procedures to refit the extender unit before refitting the housing.

Refitting the extender unit

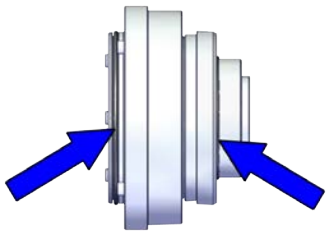
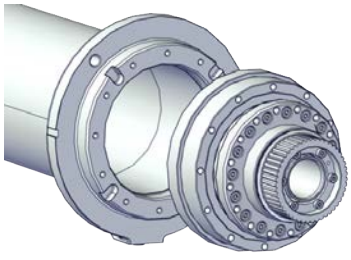
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the O-ring. Replace if damaged.	O-ring on tubular: 3HAC061327-018  xx2000002519

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	Action	Note
3	Refit the extender unit.	Screw: M4x25 12.9 Lafre (12 pcs) Tightening torque: 3.8 Nm  xx2000001730
4	Make sure that the notches on the extender unit and tubular are aligned.	 xx2000001731

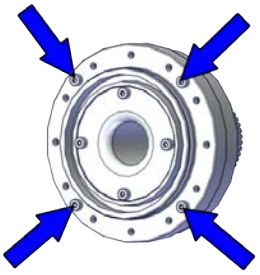
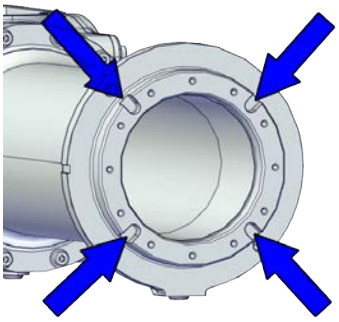
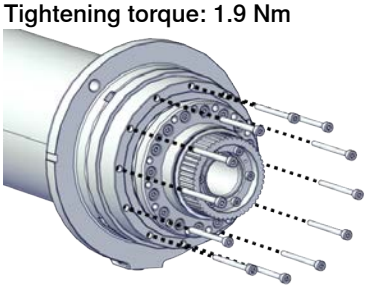
Refitting the axis-4 gearbox

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the o-rings. Replace if damaged.	O-ring on circular spline side, axis 4: 3HAC061327-021 O-ring on flexible spline side, axis 4: 3HAC061327-115  xx2000002525
3	Refit the axis-4 gearbox.	 xx2000001676

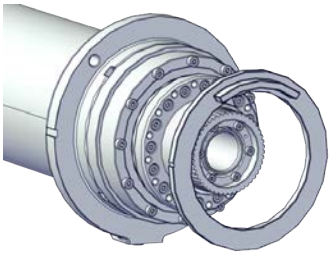
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5.5.2 Replacing the housing and extender unit
Continued

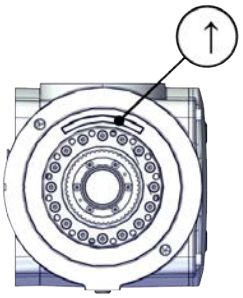
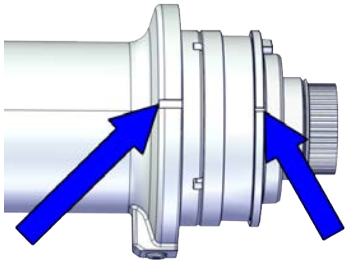
	Action	Note
4	Make sure that the screws on the gearbox are properly fitted into the notches on the extender unit.	 xx2000001720  xx2000001679
5	Secure with screws.	Screw: M3x35 12.9 Lafre (12 pcs) Tightening torque: 1.9 Nm  xx2000001675

Refitting the axis-4 mechanical stop flange

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 mechanical stop flange to the gearbox.	 xx2000001673

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	Action	Note
3	Make sure that : • the block on the mechanical stop flange is towards the upper side (process hub side). • the notches on the extender unit and the mechanical stop flange are aligned.	 xx2000001678  xx2000001677

Refitting the housing

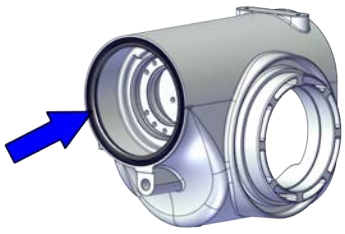
Use these procedures to refit the housing.

Check the radial sealing on the housing

Note

This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)

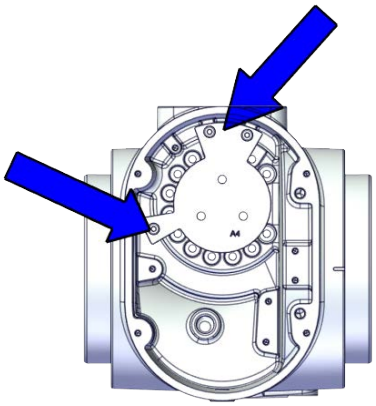
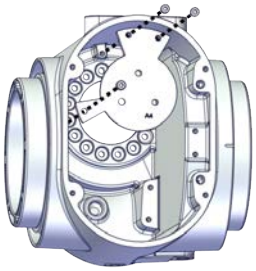
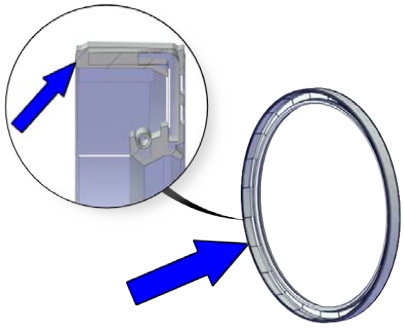
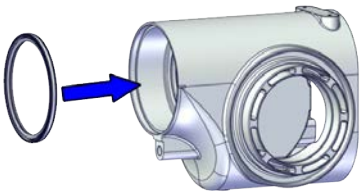
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the housing. Replace if damaged, as described below.	 xx2000002483

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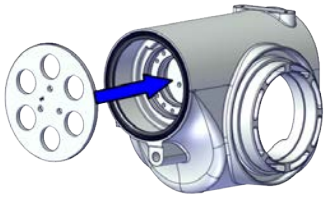
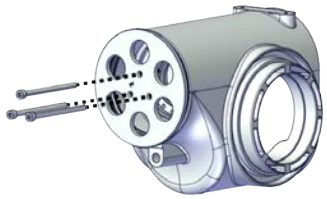
5.5.2 Replacing the housing and extender unit

Continued

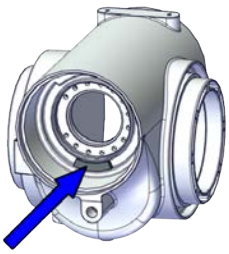
	Action	Note
3	Fit the lug plate of the axis-4 sealing assembly tool into the housing with three M4x10 screws. **Note** Pay attention to the location of the lugs.  xx2000002485	Lug plate of the axis-4 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002484
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001
5	Fit the new sealing into the housing. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002486

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	Action	Note
6	Fit the circular plate of the axis-4 sealing assembly tool against the sealing and fix with three M6x85 screws.	Circular plate of the axis-4 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002487  xx2000002488
7	Screw the screws, little by little and evenly, to press the sealing into place.	
8	Remove the assembly tool.	
9	Check that the sealing is undamaged and properly fitted.	

Refitting the axis-4 mechanical stop slider

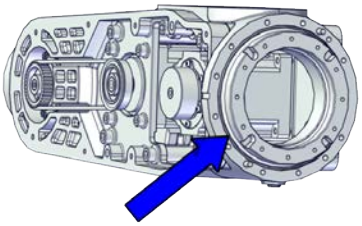
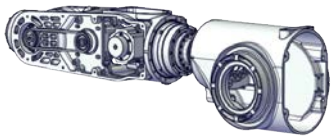
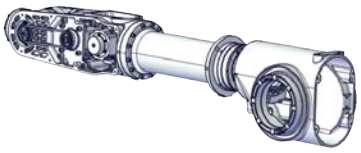
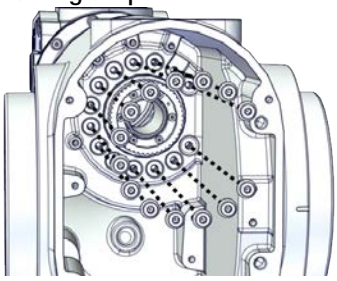
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Place the axis-4 mechanical stop slider in the housing.	 xx2000001732

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5.5.2 Replacing the housing and extender unit
Continued

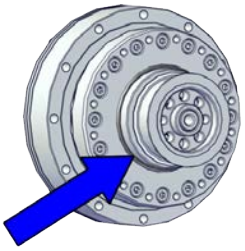
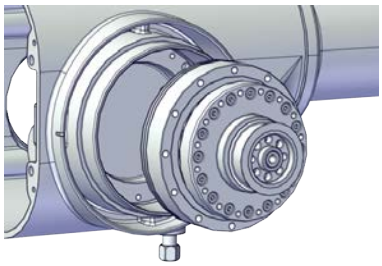
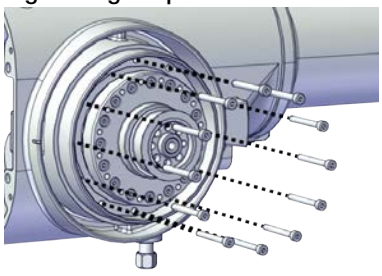
Refitting the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** **Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15** Check the O-ring. Replace if damaged.	O-ring on tubular: 3HAC061327-018  xx2000002519
3	**Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15** Refit the tubular to the housing.	 xx2000001728
4	**Valid for IRB 1300-7/1.4 and IRB 1300-12/1.4** Refit the extender unit to the housing.	 xx2000001727
5	Refit the screws.	Screw: M4x12 12.9 Lafre (14 pcs) Tightening torque: 3.3 Nm  xx2000001729

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Refitting the axis-3 gearbox

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the O-ring. Replace if damaged.	O-ring on circular spline side, axis 3: 3HAC061327-016  xx2000002524
3	Refit the axis-3 gearbox.	 xx2000001667
4	Secure with screws.	Screw: M4x35 12.9 Lafre (12 pcs) Tightening torque: 4.2 Nm±3%  xx2000001666

Checking the radial sealing on the lower arm

Note

This procedure is valid for robots with:

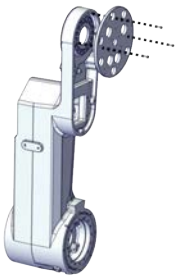
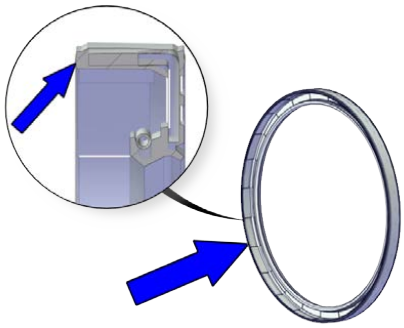
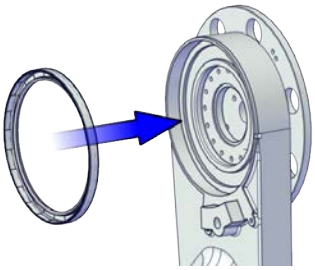
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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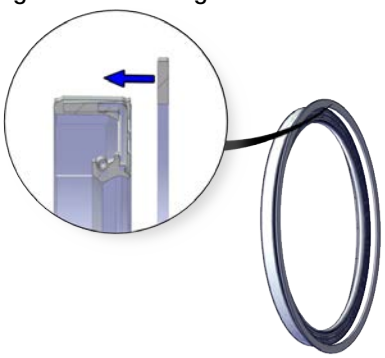
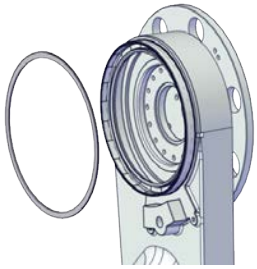
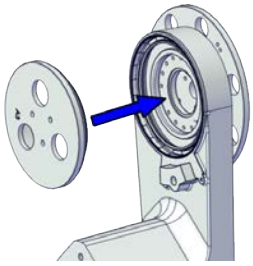
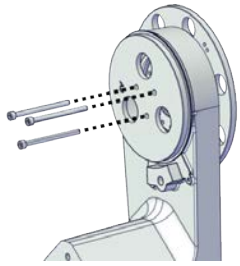
5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
2	Check the radial sealing on the lower arm. Replace if damaged, as described below.	 xx2000002472 *Figure 5.2:*
3	Fit the big circular plate of the axis-3 sealing assembly tool to the lower arm (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002473
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
5	Fit the new sealing into the lower arm. The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002474

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	Action	Note
6	Place the ring of the axis-3 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002499
7	Fit the small circular plate of the axis-3 sealing assembly tool against the sealing and fix with three M6x75 screws.	Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002475  xx2000002476
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

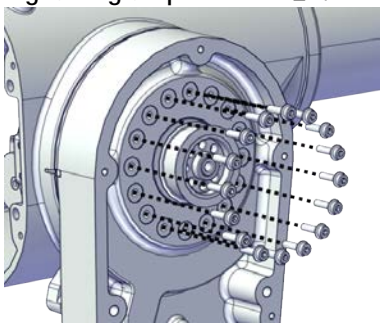
Refitting the lower arm to the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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5.5.2 Replacing the housing and extender unit
Continued

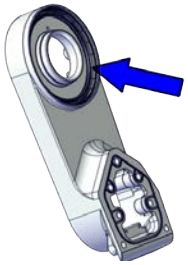
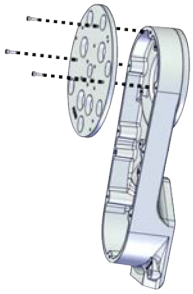
	Action	Note
2	Refit the lower arm to the housing.	Screw: M4x16 12.9 Lafre (16 pcs) Tightening torque: 4.5 Nm±3%  xx2000001664

Checking the radial sealing on the lower arm support

Note

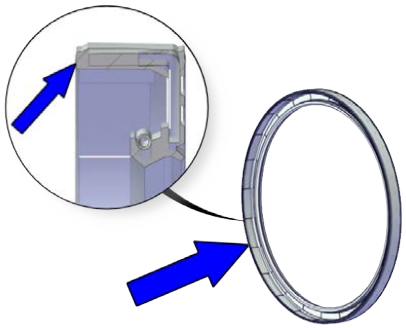
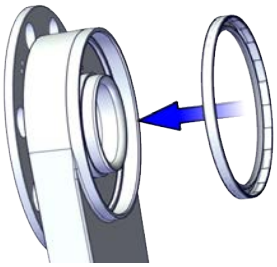
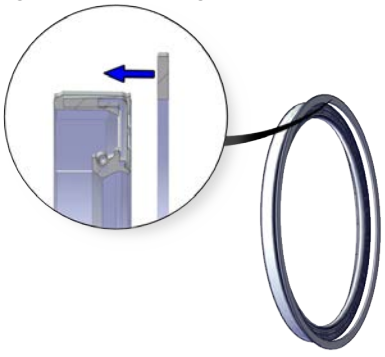
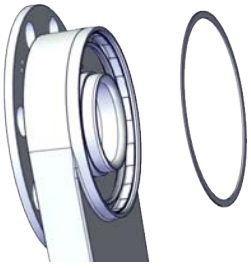
This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the lower arm support. Replace if damaged, as described below.	 xx2000002477
3	Fit the big circular plate of the axis-3 sealing assembly tool to the lower arm support (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002478

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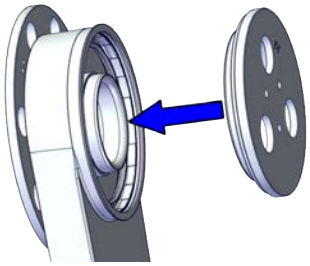
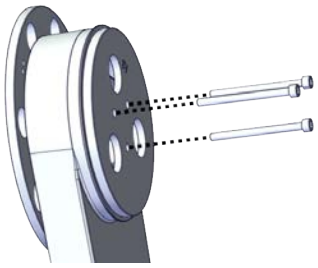
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	Action	Note
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001
5	Fit the new sealing into the lower arm support. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002479
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-3 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002480

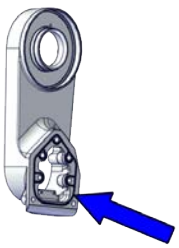
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5.5.2 Replacing the housing and extender unit
Continued

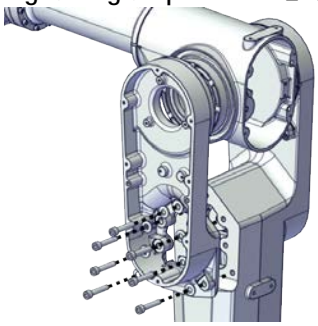
	Action	Note
7	Fit the small circular plate of the axis-3 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002481  xx2000002482
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the lower arm support

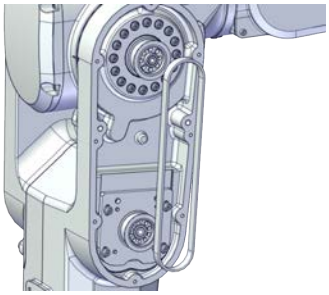
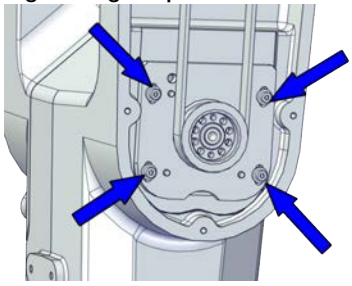
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for lower arm support: 3HAC067826-001  xx2000002521

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	Action	Note
3	Refit the lower arm support.	Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm±3%  xx2000001663

Refitting the axis-3 timing belt

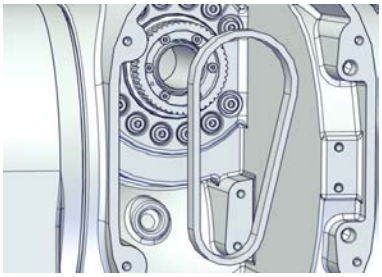
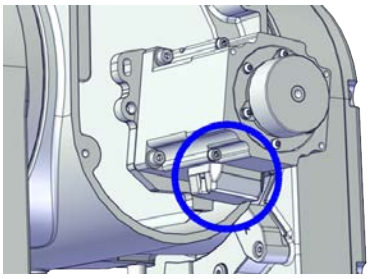
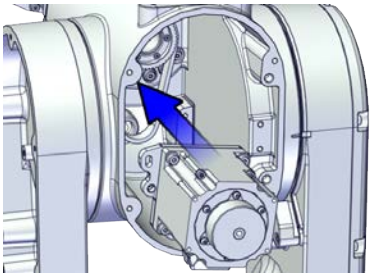
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001615
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	
4	Tighten the motor screws.	Tightening torque: 3.3 Nm  xx2000001614
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 73.4-78.5 Hz New belt: 87.8-92.1 Hz
6	Release the support to the upper arm.	

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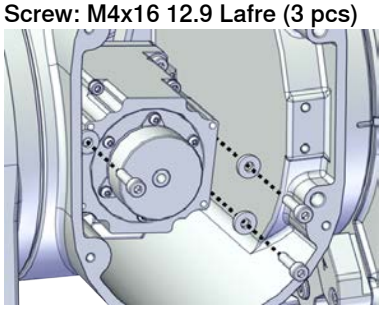
5.5.2 Replacing the housing and extender unit
Continued

Refitting the axis-4 motor

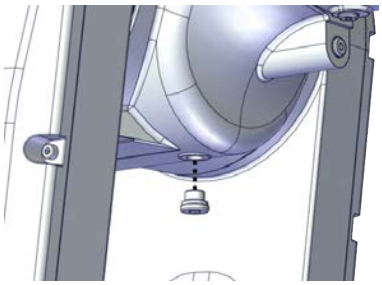
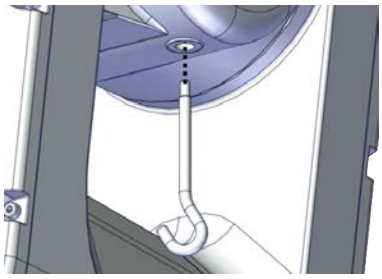
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Install the timing belt to the gearbox pulley and verify that the belt runs correctly in the grooves of the pulley.	 xx2000001670
4	Orient the motor correctly and fit it into the housing. **Note** Make sure the motor flange does not press on the timing belt.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001607
5	Refit the motor and verify that the timing belt runs correctly in the groove of the motor pulley.	 xx2000001680

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	Action	Note
6	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre (3 pcs)  xx2000001605

Adjusting the axis-4 timing belt tension

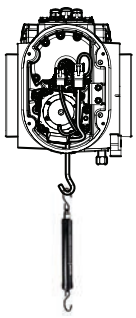
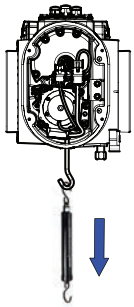
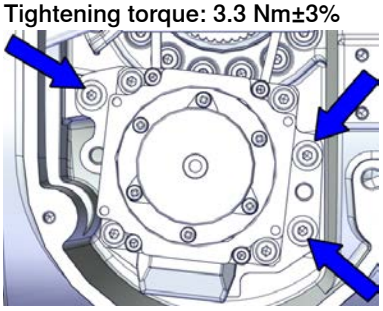
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Remove the screw below the housing.	 xx2000001609
3	Fit the tension adjustment tool for axis-4 timing belt to the screw hole.	Tension adjustment tool for axis-4 timing belt. Included in special toolkit 3HAC076396-001.  xx2000001610

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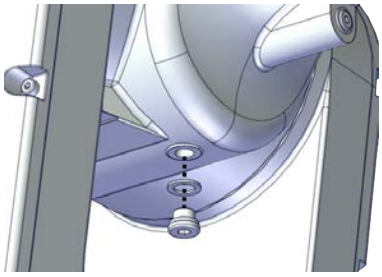
5.5.2 Replacing the housing and extender unit

Continued

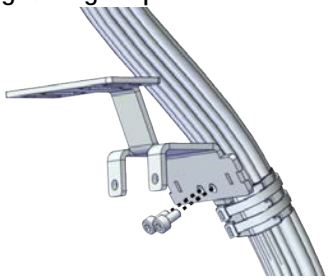
	Action	Note
4	Use a handheld dynamometer hooking to the tool.	 xx2000001611
5	Pull the dynamometer to make the tension falling in the allowed force range. **Note** During the measurement, make sure that all interferences that may affect the force are removed. Pay attention to the force application direction.	Used belt: 33.4-38.2 N New belt:47.8-52.4 N  xx2000001612
6	Secure the motor with the screws.	Tightening torque: 3.3 Nm±3%  xx2000001604

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	Action	Note
7	Remove the tool and refit the plug screw. **For robots with protection type Clean Room (option 3351-4)** Refit the plug screw with the rubber washer.	Tightening torque: 3 Nm **For robots NOT with protection type Clean Room** Plug screw: 3HAC078352-001  xx2000001609 **For robots with protection type Clean Room (option 3351-4)** Plug screw, Clean Room: 3HAC078351-001 Rubber sealing washer: 3HAC075325-001  xx2000002496

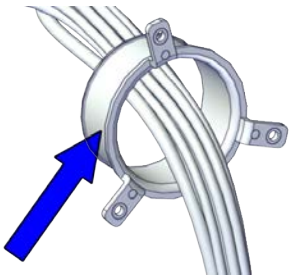
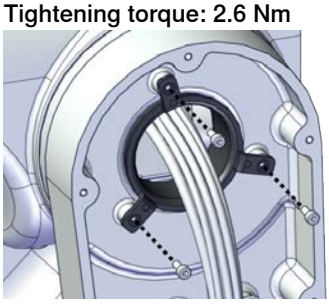
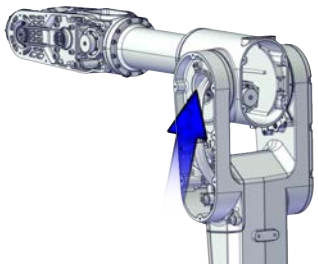
Routing the cable package in the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001554

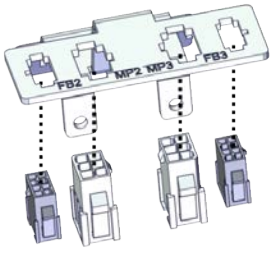
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5.5.2 Replacing the housing and extender unit
Continued

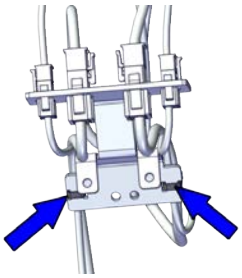
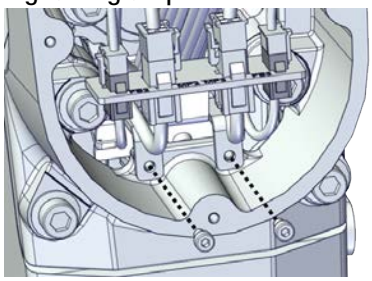
	Action	Note
3	Check the axis-3 cable protector. Replace if damaged. **Note** If replaced, apply grease to the axis-3 cable protector before refitting.	Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001  xx2000001568 Screw: M4x10 12.9 Lafre (3 pcs) Tightening torque: 2.6 Nm  xx2000001552
4	Route the cable package through the lower arm support and up into the housing. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001569

Reconnecting the axis-2 and -3 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001551

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	Action	Note
3	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001549
4	Reconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	FB2 MP2 MP3 FB3 xx2000001550
5	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001548

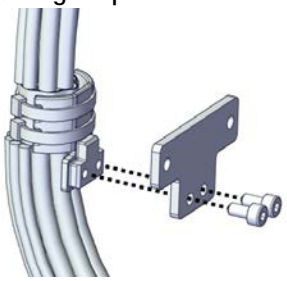
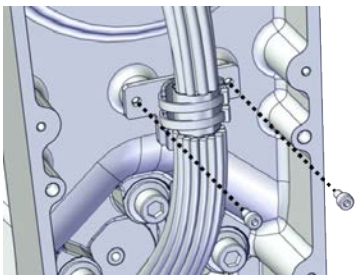
Securing the cable package in the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

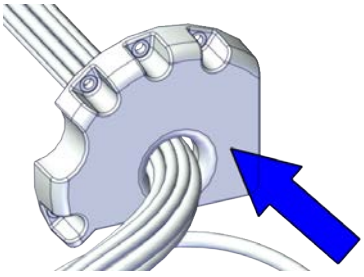
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5.5.2 Replacing the housing and extender unit
Continued

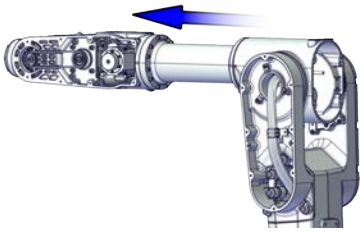
	Action	Note
2	Refit the cable bracket.	Screw: M4x8 12.9 Lafre (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm  xx2100001465  xx2000001553

Routing the cable package in the housing

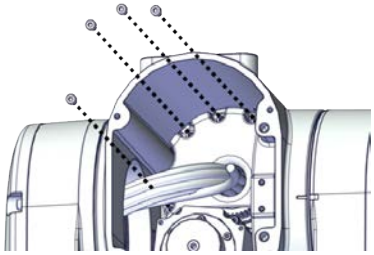
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Slip the axis-4 cable protector over the cable package.	Plastic cable protector, axis 4: 3HAC064694-001:  xx2000001570

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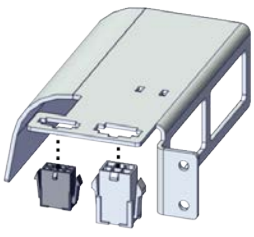
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	Action	Note
3	Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and into the tubular. Make sure that: • the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001571

Securing the cable package in the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 cable protector.	Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001546

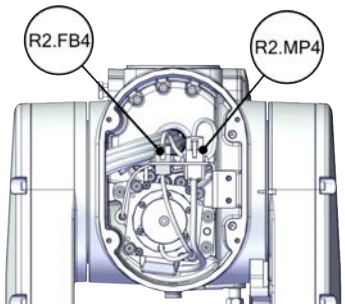
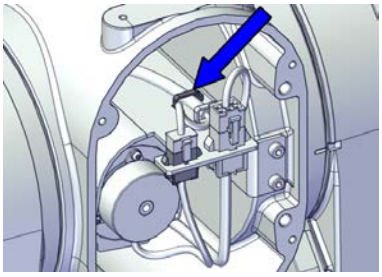
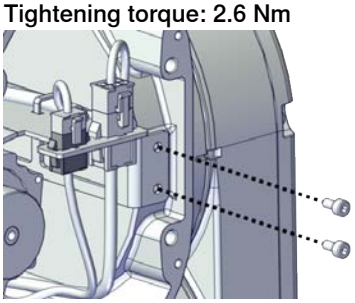
Reconnecting the axis-4 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545

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5.5.2 Replacing the housing and extender unit
Continued

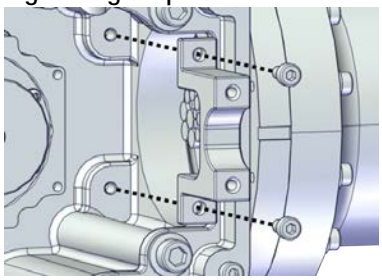
	Action	Note
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

Routing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

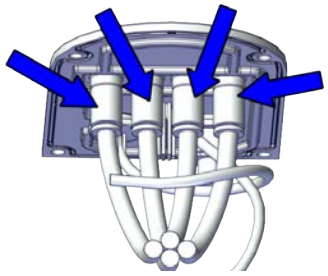
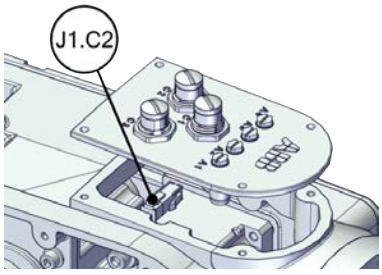
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	Action	Note
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

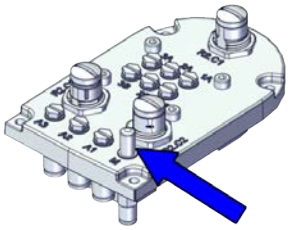
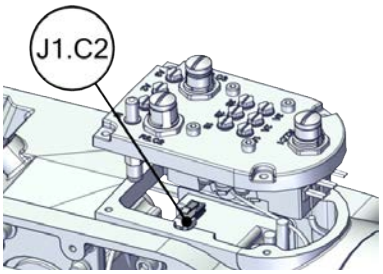
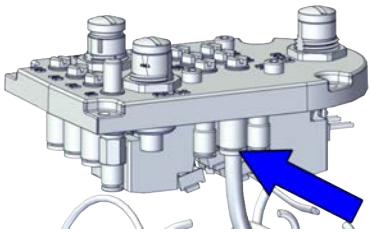
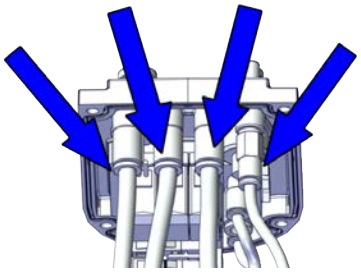
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5.5.2 Replacing the housing and extender unit
Continued

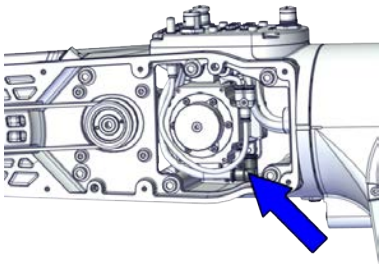
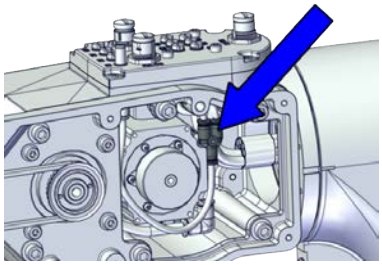
Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

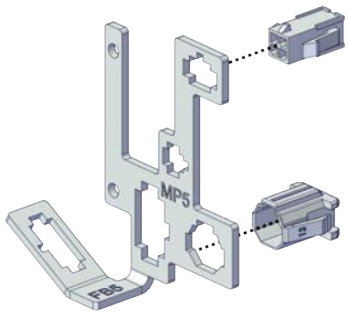
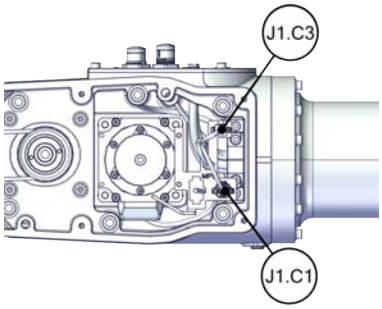
	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373

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	Action	Note
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

Reconnecting the CP/CS cabling (if equipped)

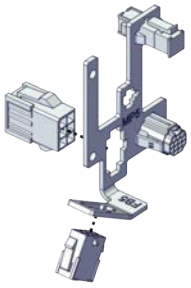
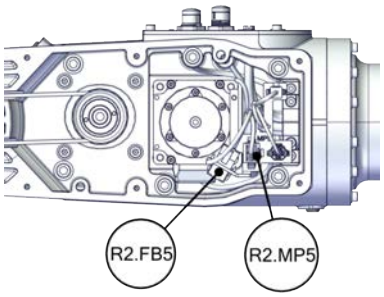
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

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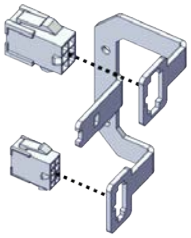
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5.5.2 Replacing the housing and extender unit
Continued

Reconnecting the axis-5 motor connectors

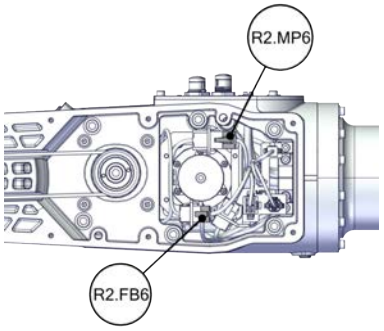
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

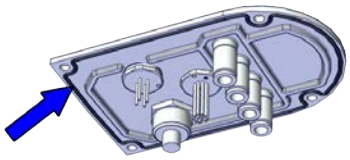
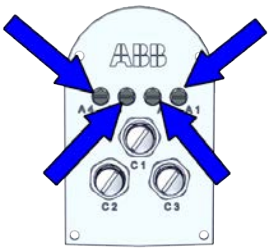
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533

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	Action	Note
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

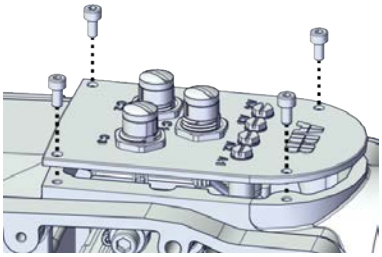
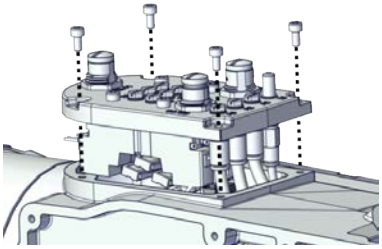
Refitting the process hub

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

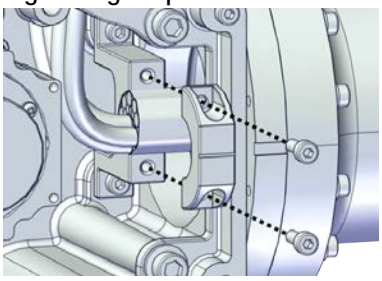
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5.5.2 Replacing the housing and extender unit
Continued

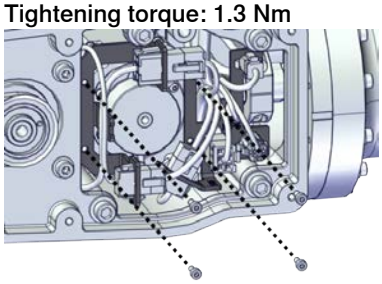
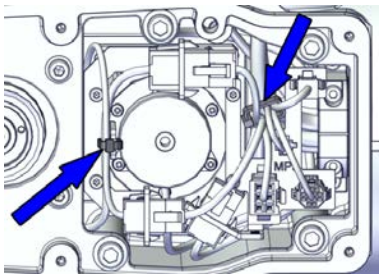
	Action	Note
5	Refit the process hub.	**Not valid for robots with solenoid valve (3303-3)** Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538
		Valid for robots with solenoid valve (3303-3) Screw: M4x12 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2300001372

Securing the cable package in the tubular

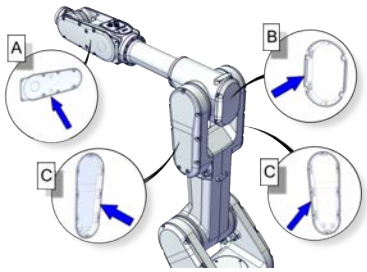
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748

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	Action	Note
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

Refitting the covers

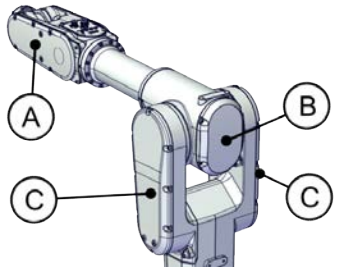
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm covers (C) Replace if damaged.	 xx2000002502
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

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5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
5	Refit the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C)	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001661

Concluding procedure

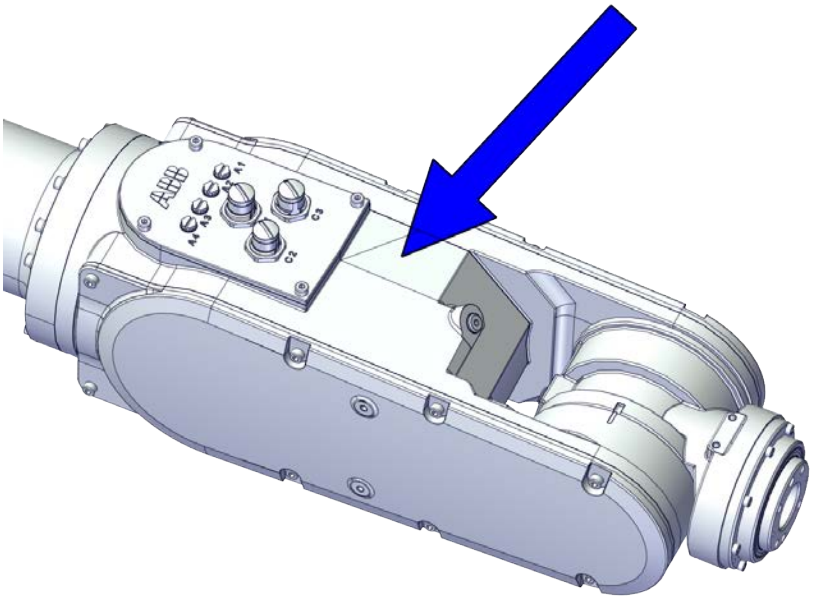
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.5.3 Replacing the tubular and tilt unit

Locations of the tubular and tilt unit

The tubular is located as shown in the figure.



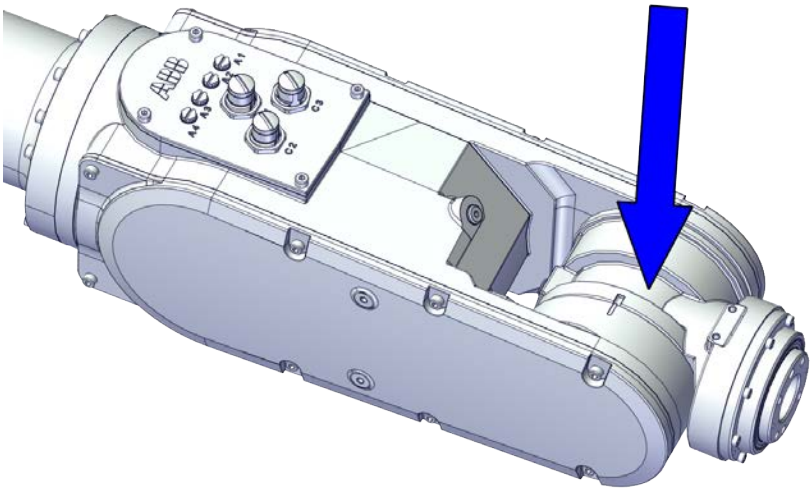
xx2000001478

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5.5.3 Replacing the tubular and tilt unit
Continued

The tilt unit is located as shown in the figure.



xx2000001479

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Tilt unit	3HAC073083-001	
Tilt unit, IP67	3HAC077804-001	Used with protection class IP67.
Tilt unit, Clean Room	3HAC077817-001	Used with protection type Clean Room.
Tilt unit, Foundry Plus	3HAC077851-001	Used with protection type Foundry Plus.
Tubular	3HAC073081-001	Used with protection classes IP40 and IP67.
Tubular, Clean Room	3HAC077815-001	Used with protection type Clean Room.
Tubular, Foundry Plus	3HAC077849-001	Used with protection type Foundry Plus.
Tubular support	3HAC073082-001	
Tubular support, IP67	3HAC077803-001	Used with protection class IP67.

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Spare part	Article number	Note
Tubular support, Clean Room	3HAC077816-001	Used with protection type Clean Room.
Tubular support, Foundry Plus	3HAC077850-001	Used with protection type Foundry Plus.
Gear unit, axis 4	3HAC073084-001	
Motor unit, axis 4	3HAC073087-001	
Motor unit, axis 5 and axis 6	3HAC073088-001	
Timing belt, axis 4	3HAC065806-001	
Timing belt, axis 5	3HAC065794-001	
Timing belt, axis 6	3HAC065788-001	
Mechanical stop, axis 4, flange	3HAC065805-001	Replace if damaged.
Mechanical stop, axis 4, slider	3HAC065804-001	Replace if damaged.
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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5.5.3 Replacing the tubular and tilt unit
Continued

Spare part	Article number	Note
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on lower arm	3HAC070148-005	Not used with protection class IP40. Replace if damaged.
Radial sealing on housing	3HAC070148-006	Used with protection types Clean Room and Foundry Plus. Replace if damaged.
O-ring on tubular	3HAC061327-018	Not used with protection class IP40. Replace if damaged.
Plug screw	3HAC078352-001	Not used with protection type Clean Room. Replace if damaged.
Plug screw, Clean Room	3HAC078351-001	Used with protection type Clean Room. Replace if damaged.
Rubber sealing washer	3HAC075325-001	Used with protection type Clean Room. Replace if damaged.
M2 variseal sealing	3HAC044641-008	Used with protection type Foundry Plus.
Sealing with dust lip	3HAC070148-010	Used with protection type Foundry Plus.

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Spare part	Article number	Note
Inner ring cover on tilt unit	3HAC075327-001	Used with protection type Foundry Plus.
Outer ring cover on tilt unit	3HAC075326-001	Used with protection type Foundry Plus.
Gasket for tool mounting	3HAC077475-001	Used with protection type Foundry Plus.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Sonic tension meter	-	Used for measuring the timing belt tension.
Tension adjustment tool for axis-4 timing belt	-	Included in special toolkit 3HAC076396-001.
Dynamometer	-	Used for measuring the timing belt tension.
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222
Flange sealant	-	Loctite 574 (or equivalent)
Cleaning agent	-	Isopropanol

Removing the tubular and tilt unit for IRB 1300-11/0.9 and IRB 1300-10/1.15

Use these procedures to remove the tubular and tilt unit for IRB 1300-11/0.9 and IRB 1300-10/1.15.

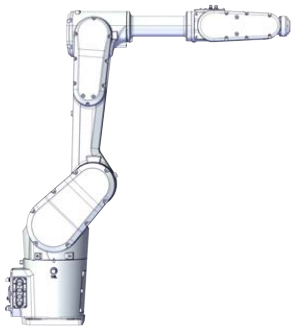
Preparations before removing the tubular and tilt unit

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

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5.5.3 Replacing the tubular and tilt unit
Continued

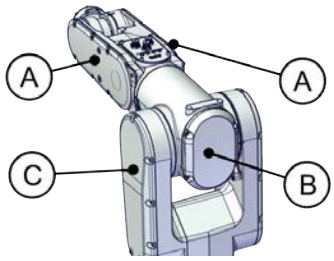
	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Removing the covers

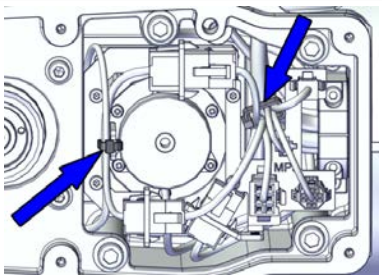
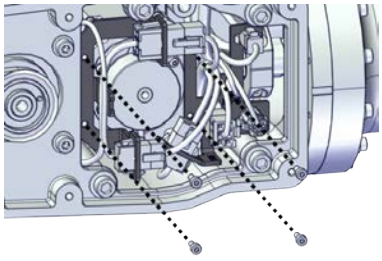
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the covers. • Tubular covers (A) • Housing cover (B) • Lower arm support cover (C)	 xx2000001733

Loosening the cables in the tubular

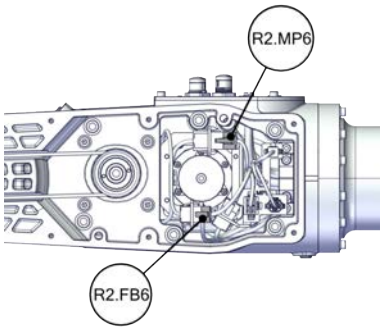
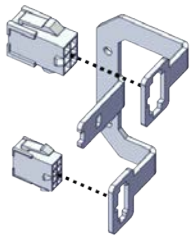
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001531

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5.5.3 Replacing the tubular and tilt unit
Continued

Disconnecting the axis-6 motor connectors

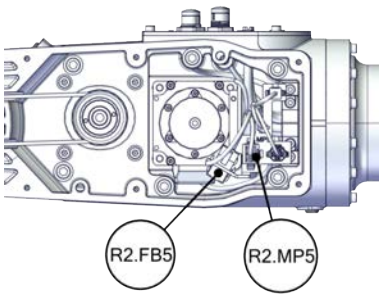
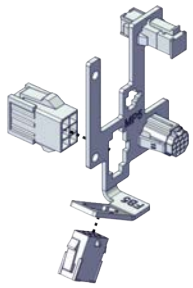
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

Disconnecting the axis-5 motor connectors

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

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

Disconnecting CP/CS cabling (if equipped)

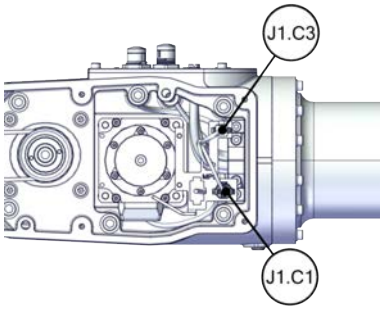
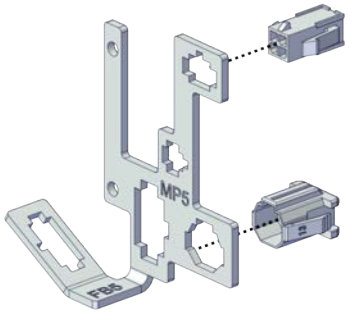
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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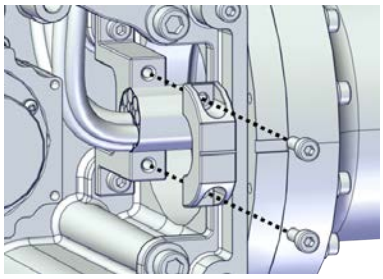
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5.5.3 Replacing the tubular and tilt unit

Continued

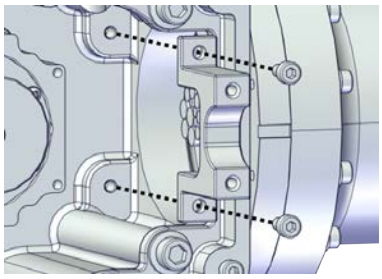
	Action	Note
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

Separating the cable package from the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748

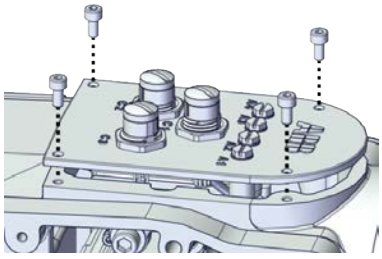
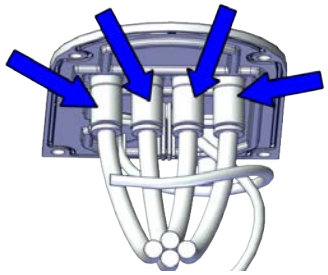
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	Action	Note
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub (without solenoid valve)

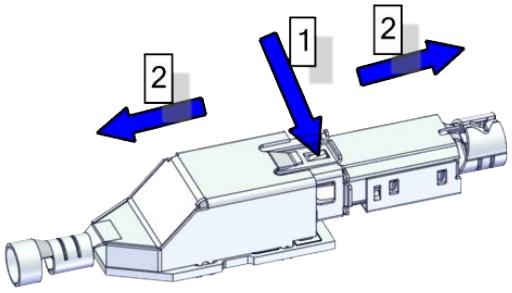
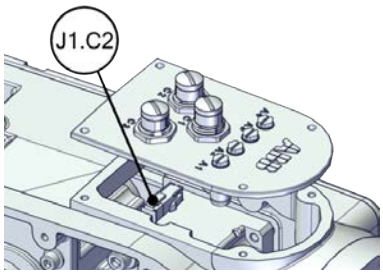
Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538
4	Disconnect the air hoses.	 xx2000001539

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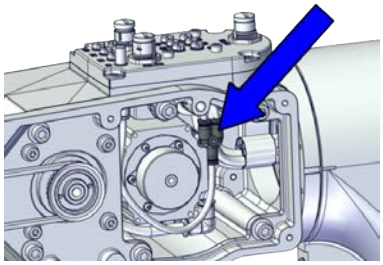
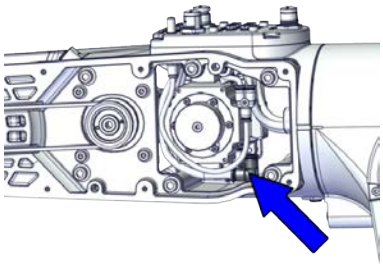
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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

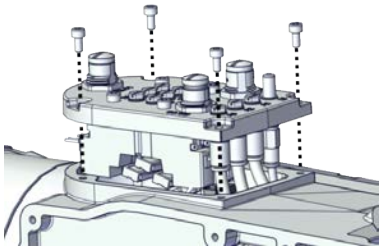
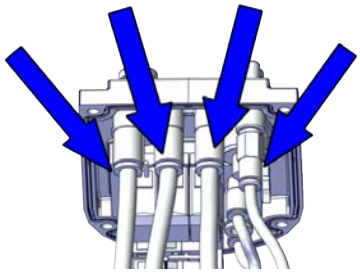
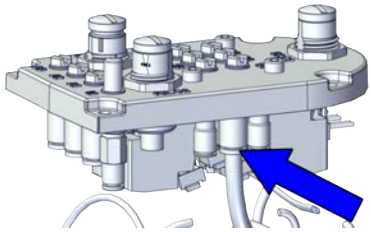
Removing the process hub (with solenoid valve)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370
2	Disconnect the three L-shape connectors.	 xx2300001371

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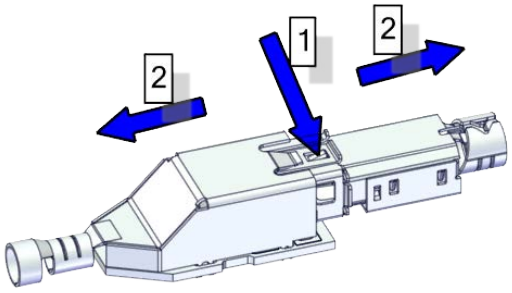
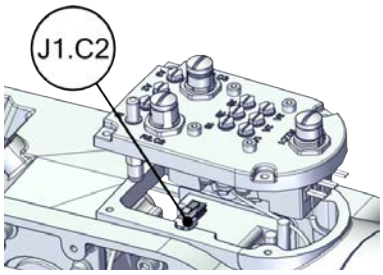
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	Action	Note
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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5.5.3 Replacing the tubular and tilt unit
Continued

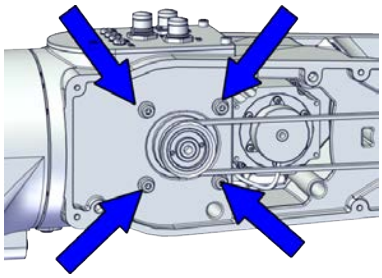
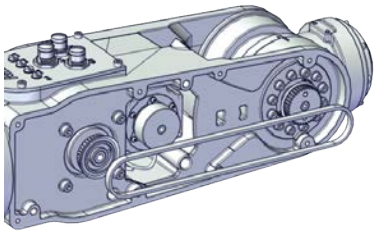
	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

Removing the axis-5 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	

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	Action	Note
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001594
5	Remove the timing belt from its groove on the motor.	 xx2000001595

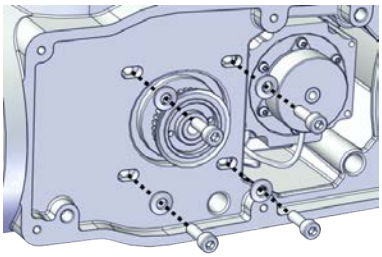
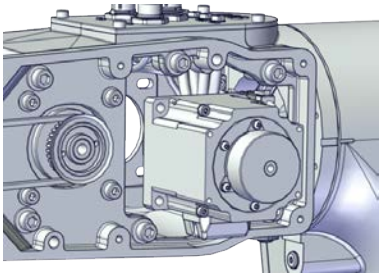
Removing the axis-5 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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5.5.3 Replacing the tubular and tilt unit
Continued

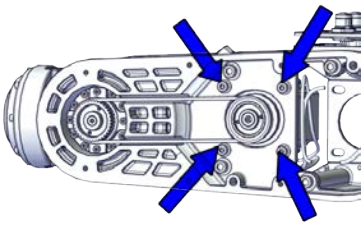
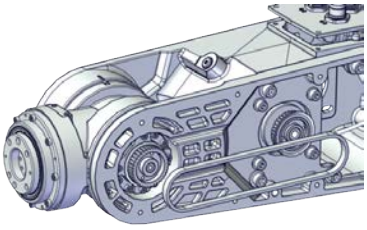
	Action	Note
4	Remove the screws and washers.	 xx2000001596
5	Carefully lift out the motor.	 xx2000001597

Removing the axis-6 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	

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	Action	Note
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001599
5	Remove the timing belt from its groove on the motor.	 xx2000001600

Removing the axis-6 motor

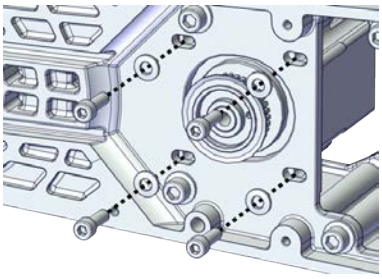
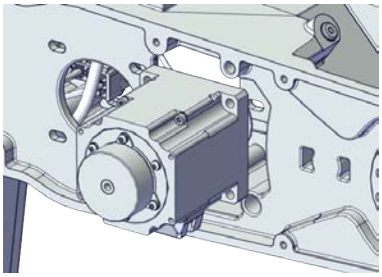
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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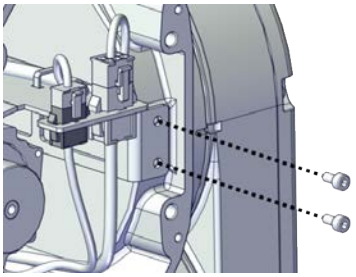
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5.5.3 Replacing the tubular and tilt unit

Continued

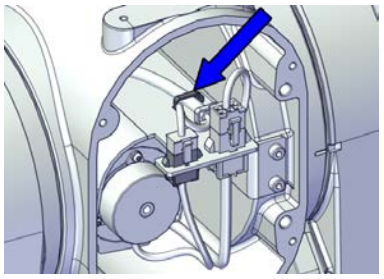
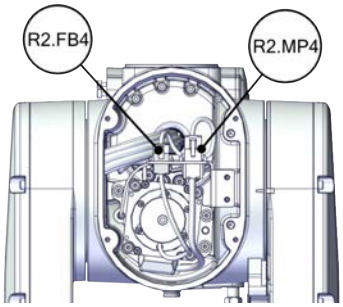
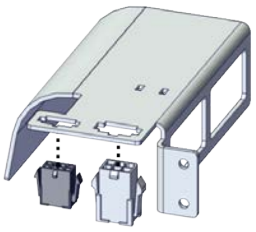
	Action	Note
4	Remove the screws and washers.	 xx2000001601
5	Carefully lift out the motor.	 xx2000001602

Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001542

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	Action	Note
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

Separating the cable package from the housing

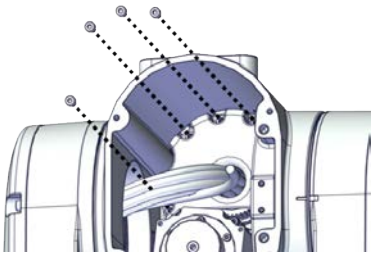
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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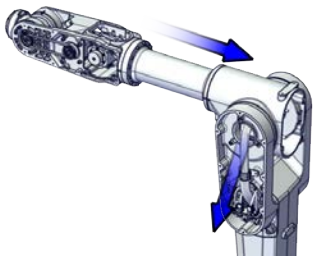
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5.5.3 Replacing the tubular and tilt unit

Continued

	Action	Note
3	Remove the axis-4 cable protector.	 xx2000001546

Pulling out the cable package

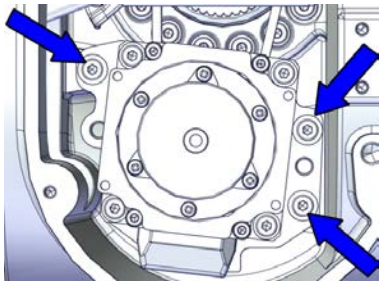
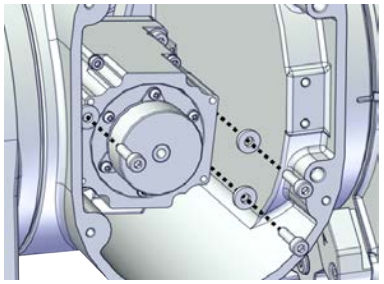
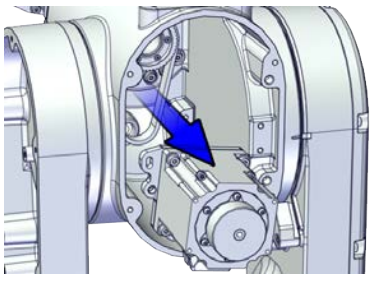
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Wrap the connectors with the masking tape.	
4	Pull the cable package out to the lower arm support.	 xx2000001662

Removing the axis-4 motor

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

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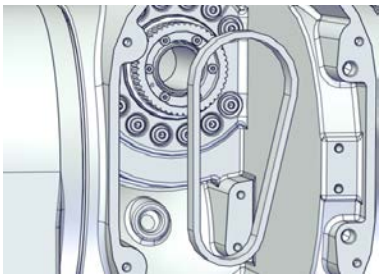
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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001604
5	Remove the timing belt from its groove on the motor.	
6	Remove the screws and washers.	 xx2000001605
7	Carefully lift out the motor.	 xx2000001669

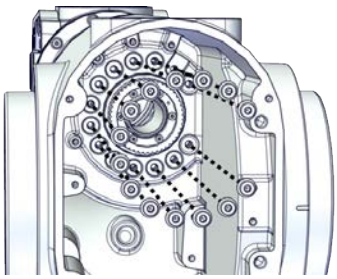
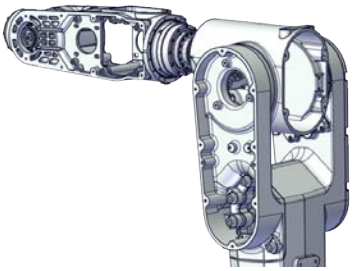
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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
8	Remove the timing belt.	 xx2000001670

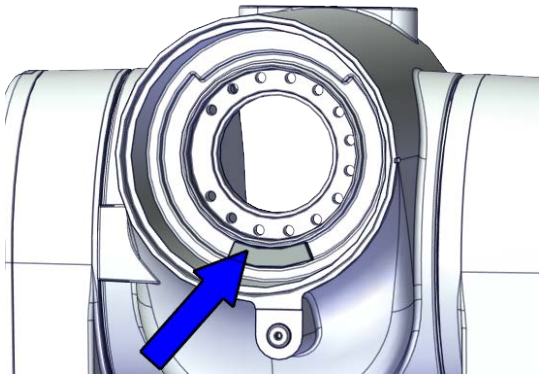
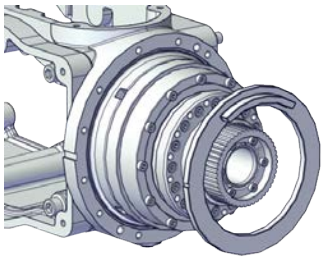
Separating the housing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Support the weight of the tubular and tilt unit, and remove the screws.	 xx2000001729
4	Separate the tubular from the housing.	 xx2000001734

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Removing the axis-4 mechanical stop flange

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 mechanical stop flange. **CAUTION** The axis-4 mechanical stop slider is accessible from the housing. Put it aside for later refitting.  xx2000001674	 xx2000001735

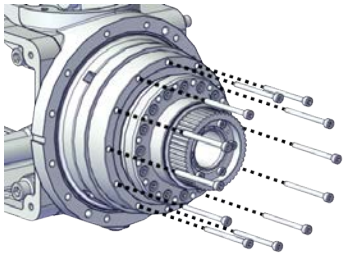
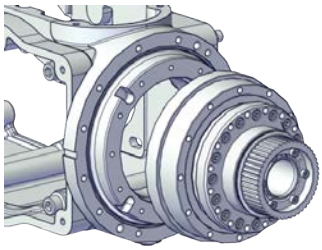
Removing the axis-4 gearbox

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

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5.5.3 Replacing the tubular and tilt unit
Continued

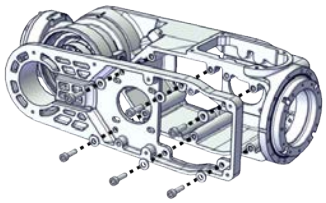
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
4	Remove the screws.	 xx2000001736
5	Pull out the gearbox.	 xx2000001737

Separating the tubular support

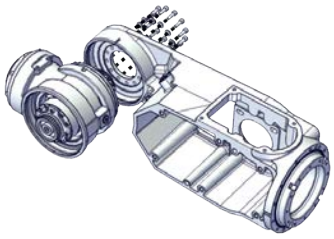
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the tubular support. **Tip** If the tubular support is hard to loosen from the tubular, use a plastic hammer to knock on the tubular support lightly.	 xx2000001740

Separating the tilt unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the tilt unit.	 xx2000001741

Removing the tubular and tilt unit for IRB 1300-7/1.4 and IRB 1300-12/1.4

Use these procedures to remove the tubular and tilt unit for IRB 1300-7/1.4 and IRB 1300-12/1.4.

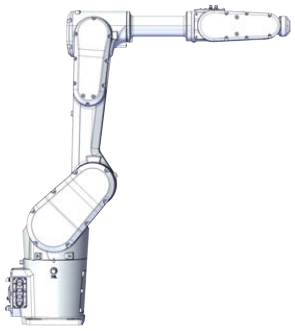
Preparations before removing the tubular and tilt unit

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

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5.5.3 Replacing the tubular and tilt unit
Continued

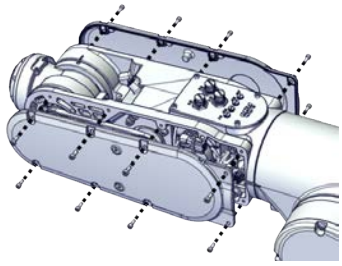
	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Removing the tubular covers

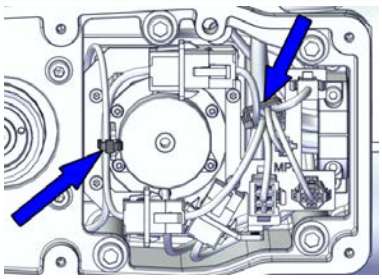
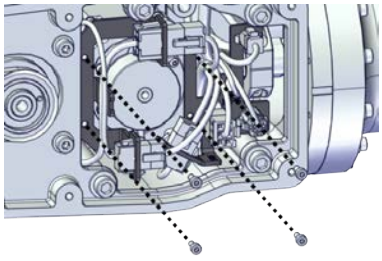
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the tubular covers.	 xx2000001593

Loosening the cables in the tubular

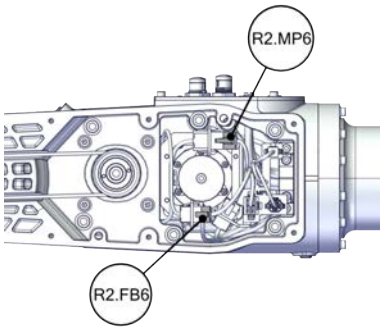
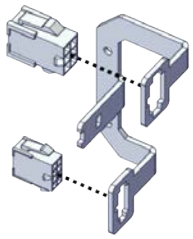
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001531

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5.5.3 Replacing the tubular and tilt unit
Continued

Disconnecting the axis-6 motor connectors

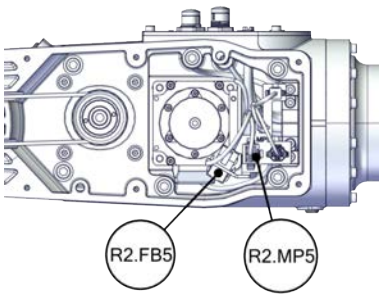
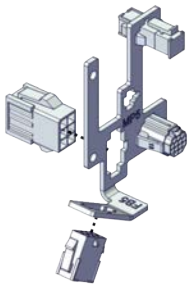
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

Disconnecting the axis-5 motor connectors

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

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

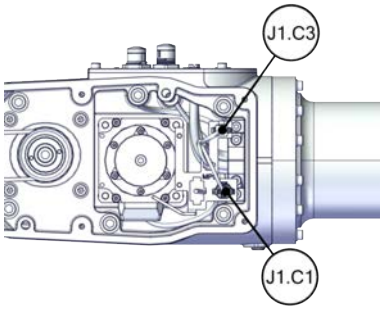
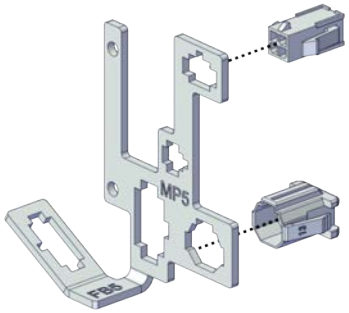
Disconnecting CP/CS cabling (if equipped)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

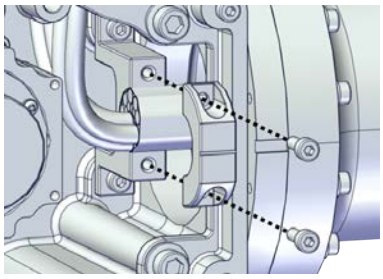
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5.5.3 Replacing the tubular and tilt unit
Continued

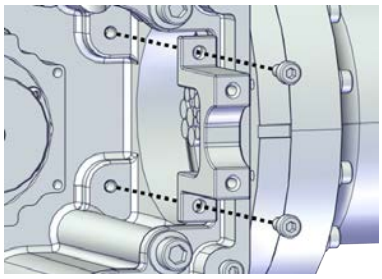
	Action	Note
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

Separating the cable package from the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748

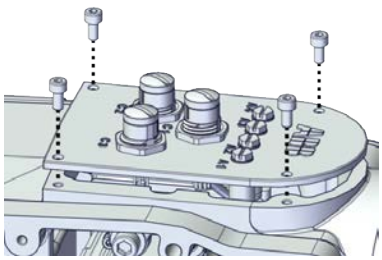
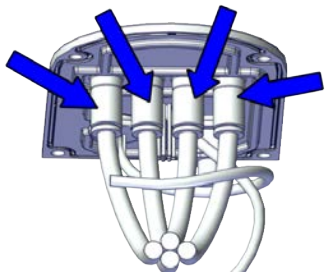
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	Action	Note
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub (without solenoid valve)

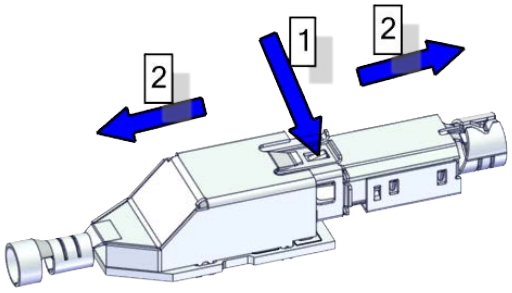
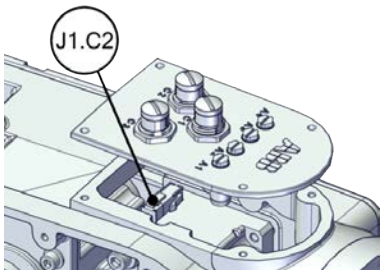
Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538
4	Disconnect the air hoses.	 xx2000001539

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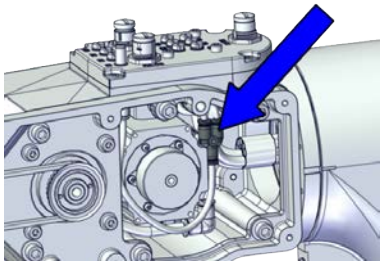
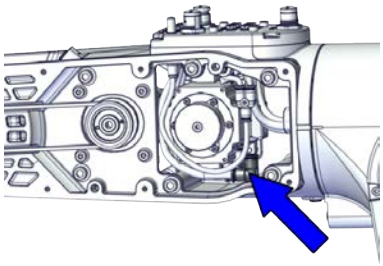
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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

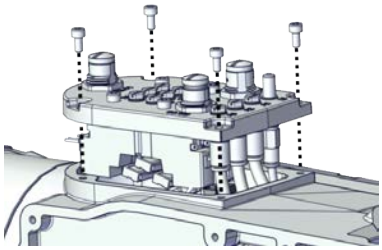
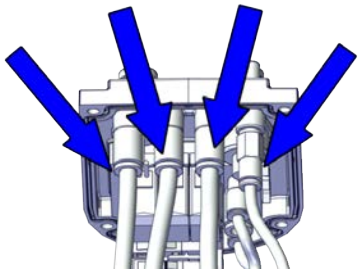
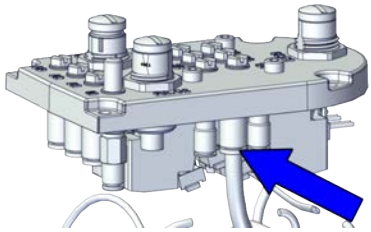
Removing the process hub (with solenoid valve)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370
2	Disconnect the three L-shape connectors.	 xx2300001371

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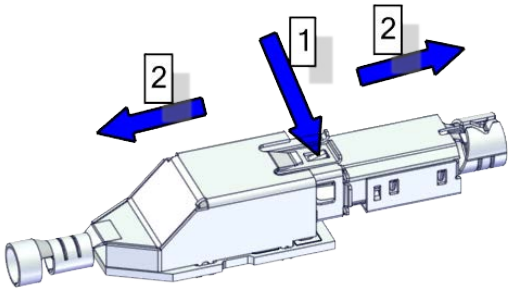
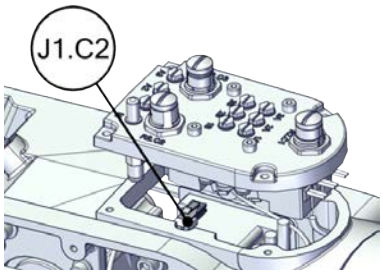
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	Action	Note
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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5.5.3 Replacing the tubular and tilt unit
Continued

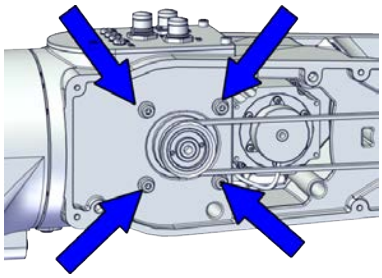
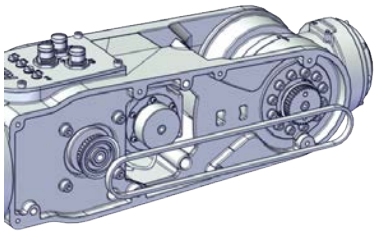
	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

Removing the axis-5 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	

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	Action	Note
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001594
5	Remove the timing belt from its groove on the motor.	 xx2000001595

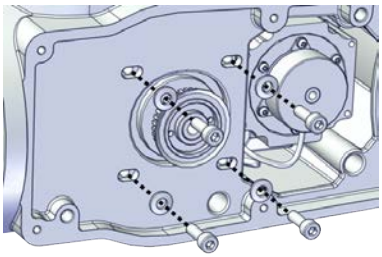
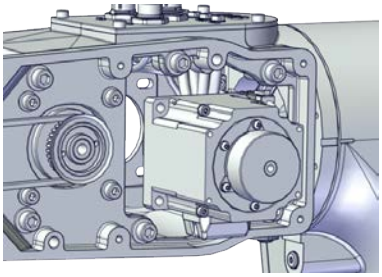
Removing the axis-5 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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5.5.3 Replacing the tubular and tilt unit
Continued

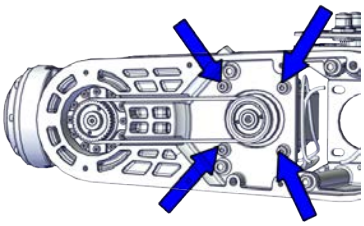
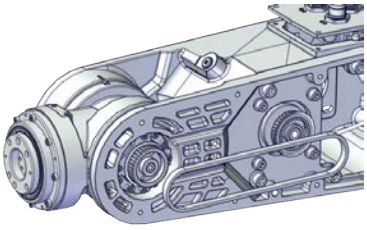
	Action	Note
4	Remove the screws and washers.	 xx2000001596
5	Carefully lift out the motor.	 xx2000001597

Removing the axis-6 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	

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	Action	Note
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001599
5	Remove the timing belt from its groove on the motor.	 xx2000001600

Removing the axis-6 motor

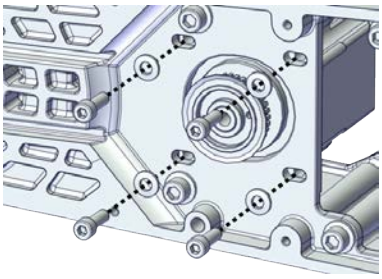
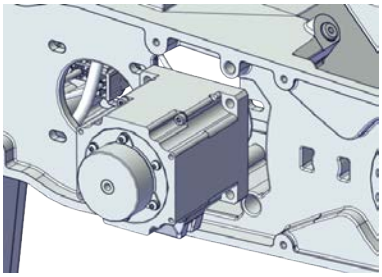
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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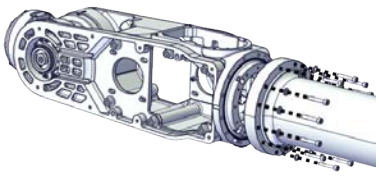
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5.5.3 Replacing the tubular and tilt unit

Continued

	Action	Note
4	Remove the screws and washers.	 xx2000001601
5	Carefully lift out the motor.	 xx2000001602

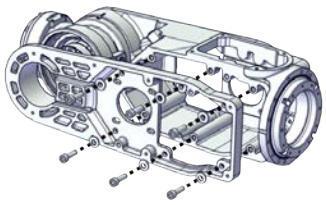
Separating the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the tubular and tilt unit from the extender unit.	 xx2000001739

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Separating the tubular support

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the tubular support. **Tip** If the tubular support is hard to loosen from the tubular, use a plastic hammer to knock on the tubular support lightly.	 xx2000001740

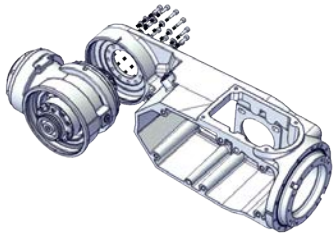
Separating the tilt unit

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
3	Remove the tilt unit.	 xx2000001741

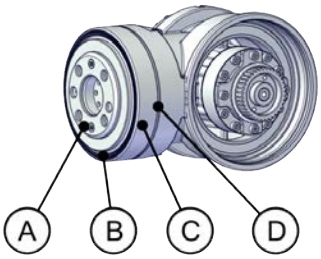
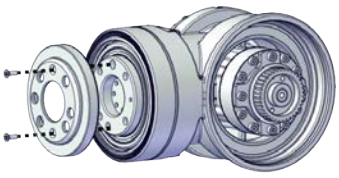
Refitting the tubular and tilt unit for IRB 1300-11/0.9 and IRB 1300-10/1.15

Use these procedures to refit the tubular and tilt unit for IRB 1300-11/0.9 and IRB 1300-10/1.15.

Checking the sealing set on the tilt unit

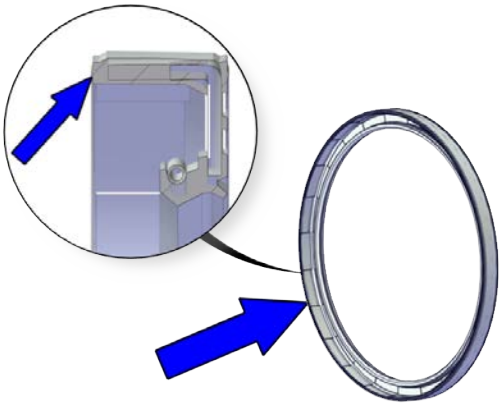
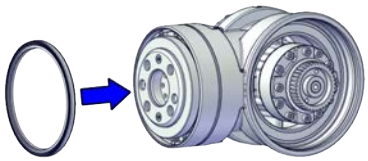
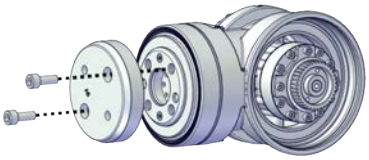
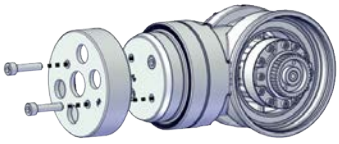
Note

This procedure is valid for robots with:

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the sealing set on the tilt unit. The sealing set includes an inner ring cover (A), a radial sealing (B), an outer ring cover (C) and a gasket (D). Replace the damaged part as described below: • If the inner ring cover is damaged, proceed to *3*. • If the radial sealing is damaged, proceed to *4*. • If the outer ring cover is damaged, proceed to *5*. • If the gasket is damaged, proceed to *6*.	 xx2000002489
3	Remove the old inner ring cover and fit the new one with two M3x8 countersunk screws.	 xx2000002490

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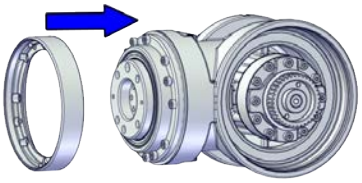
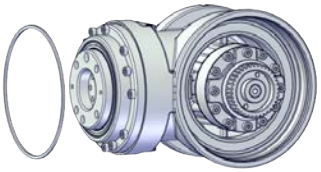
	Action	Note
4	Remove the old radial sealing and fit the new one as described below. The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002491
	1. Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
	2. Fit the small cap of the axis-6 sealing assembly tool against inner ring cover and fix with two M6x16 screws.	Small cap of the axis-6 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002492
	3. Fit the big cap of the axis-6 sealing assembly tool against the sealing and fix with two M6x25 screws.	Big cap of the axis-6 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002493
	4. Screw the screws, little by little and evenly, to press the sealing into place.	

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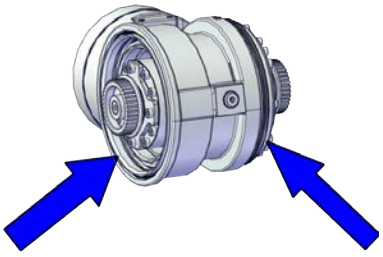
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5.5.3 Replacing the tubular and tilt unit

Continued

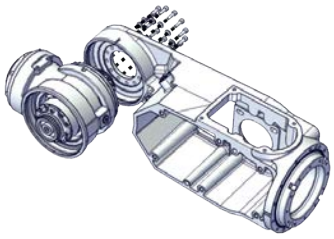
	Action	Note
	5. Remove the assembly tool.	
	6. Check that the sealing is undamaged and properly fitted.	
5	Remove the inner ring cover and radial sealing first, then, remove the outer ring cover and fit the new one. Remember to refit the radial sealing and inner ring cover after replacement of the outer ring cover.	 xx2000002494
6	Check the gasket after removing the outer ring cover. Replace if damaged.	 xx2000002495

Refitting the tilt unit

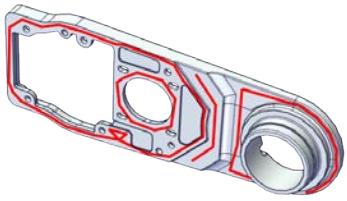
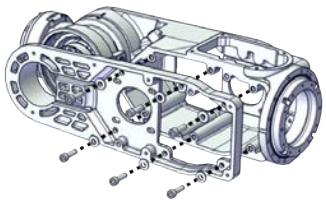
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection type Foundry Plus (option 3352-10)** Check the M2 variseal sealings on both sides. Replace if damaged. **Note** The sealing lip is facing outside of the robot.	M2 variseal sealing: 3HAC044641-008  xx2000002522

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	Action	Note
3	Refit the tilt unit.	Screw: M4x12 12.9 Lafre (12 pcs) Tightening torque: 4.5 Nm  xx2000001741

Refitting the tubular support

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.	 xx2000002523
3	Refit the tubular support.	Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 14 Nm  xx2000001740

Refitting the axis-4 gearbox

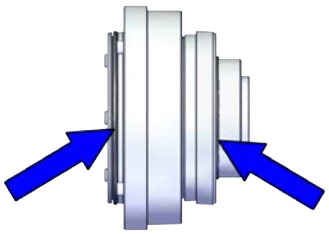
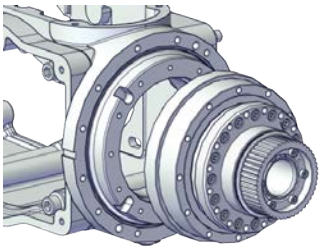
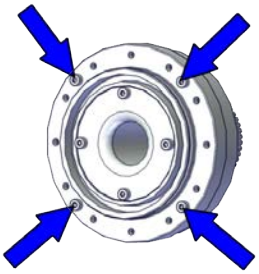
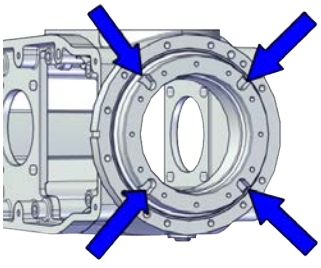
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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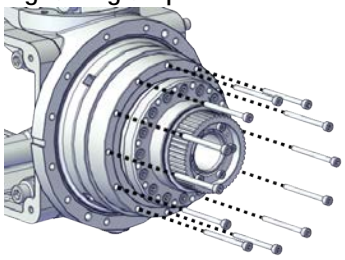
5.5.3 Replacing the tubular and tilt unit

Continued

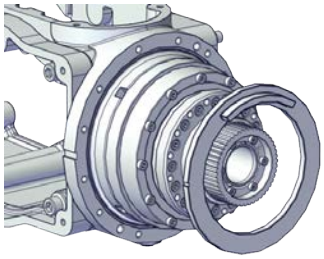
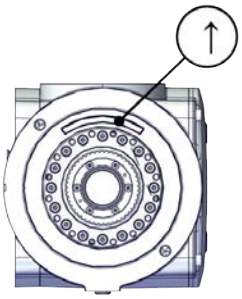
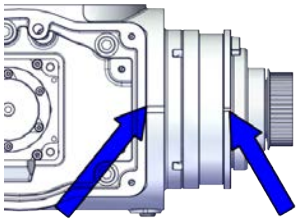
	Action	Note
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the o-rings. Replace if damaged.	O-ring on circular spline side, axis 4: 3HAC061327-021 O-ring on flexible spline side, axis 4: 3HAC061327-115  xx2000002525
3	Refit the axis-4 gearbox.	 xx2000001737
4	Make sure that the screws on the gearbox are properly fitted into the notches on the tubular.	 xx2000001720  xx2000001738

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	Action	Note
5	Secure with screws.	Screw: M3x35 12.9 Lafre (12 pcs) Tightening torque: 1.9 Nm  xx2000001736

Refitting the axis-4 mechanical stop flange

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 mechanical stop flange to the gearbox.	 xx2000001735
3	Make sure that : • the block on the mechanical stop flange is towards the upper side (process hub side). • the notches on the tubular and the mechanical stop flange are aligned.	 xx2000001678  xx2000001718

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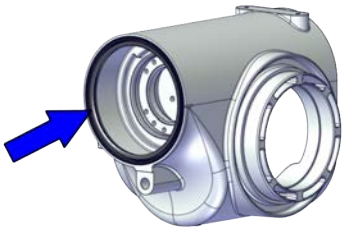
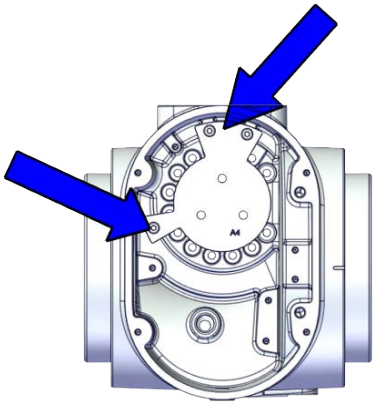
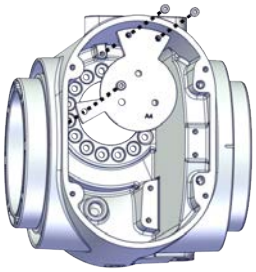
5.5.3 Replacing the tubular and tilt unit
Continued

Check the radial sealing on the housing

Note

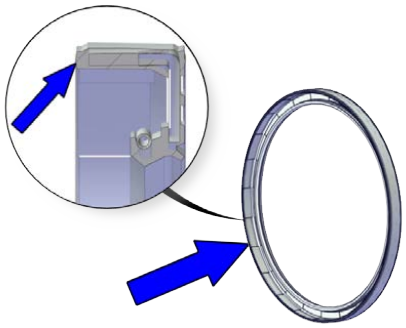
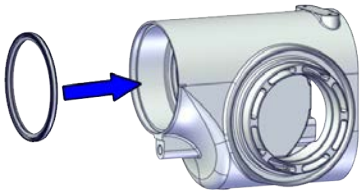
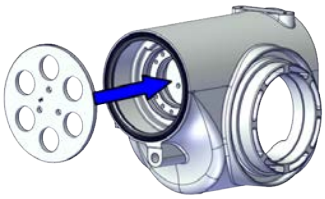
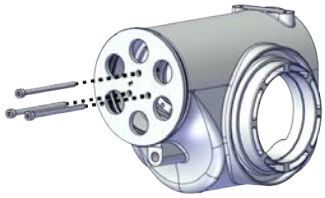
This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the housing. Replace if damaged, as described below.	 xx2000002483
3	Fit the lug plate of the axis-4 sealing assembly tool into the housing with three M4x10 screws. **Note** Pay attention to the location of the lugs.  xx2000002485	Lug plate of the axis-4 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002484
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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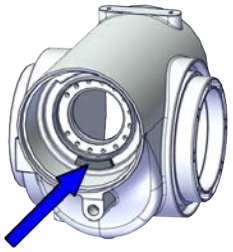
	Action	Note
5	Fit the new sealing into the housing. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002486
6	Fit the circular plate of the axis-4 sealing assembly tool against the sealing and fix with three M6x85 screws.	Circular plate of the axis-4 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002487  xx2000002488
7	Screw the screws, little by little and evenly, to press the sealing into place.	
8	Remove the assembly tool.	
9	Check that the sealing is undamaged and properly fitted.	

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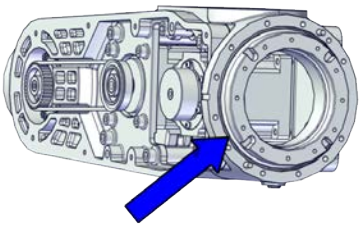
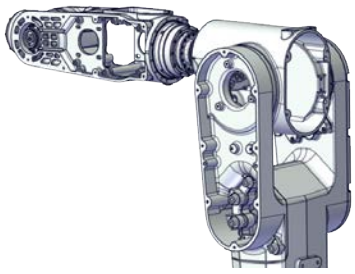
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5.5.3 Replacing the tubular and tilt unit
Continued

Refitting the axis-4 mechanical stop slider

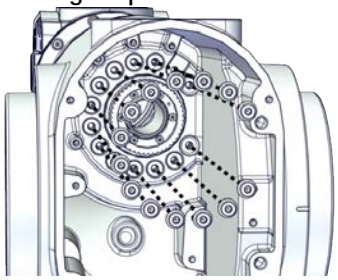
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Place the axis-4 mechanical stop slider in the housing.	 xx2000001732

Refitting the housing

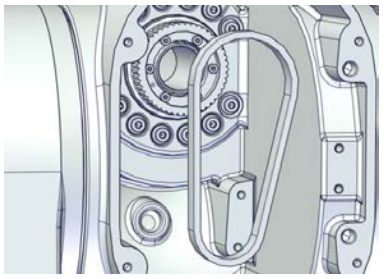
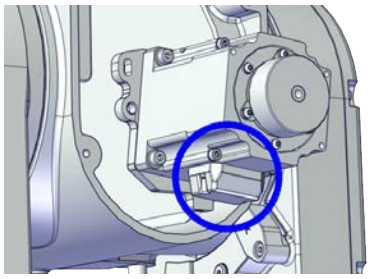
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** **Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15** Check the O-ring. Replace if damaged.	O-ring on tubular: 3HAC061327-018  xx2000002519
3	Refit the tubular to the housing.	 xx2000001734

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	Action	Note
4	Refit the screws.	Screw: M4x12 12.9 Lafre (14 pcs) Tightening torque: 3.3 Nm  xx2000001729

Refitting the axis-4 motor

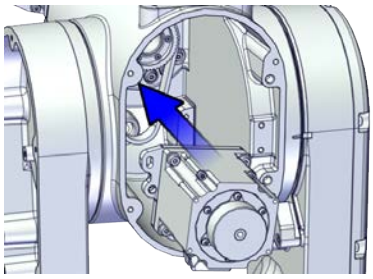
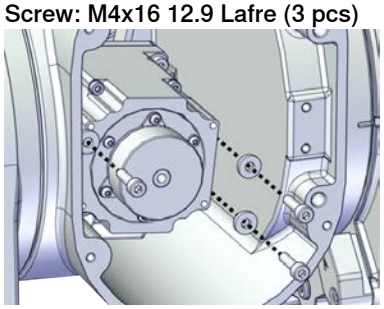
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Install the timing belt to the gearbox pulley and verify that the belt runs correctly in the grooves of the pulley.	 xx2000001670
4	Orient the motor correctly and fit it into the housing. **Note** Make sure the motor flange does not press on the timing belt.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001607

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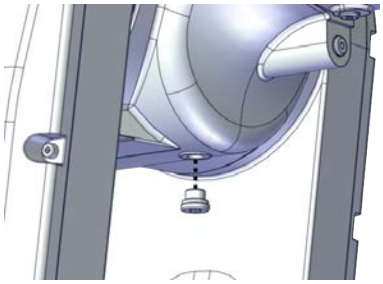
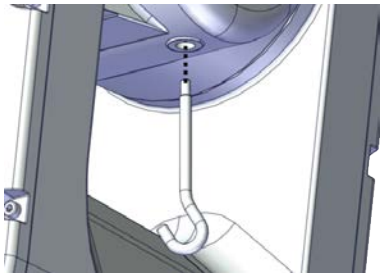
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5.5.3 Replacing the tubular and tilt unit

Continued

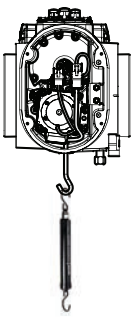
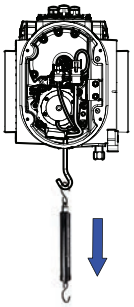
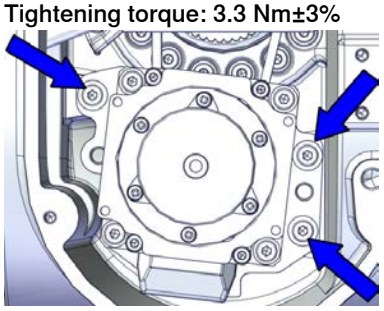
	Action	Note
5	Refit the motor and verify that the timing belt runs correctly in the groove of the motor pulley.	 xx2000001680
6	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre (3 pcs)  xx2000001605

Adjusting the axis-4 timing belt tension

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Remove the screw below the housing.	 xx2000001609
3	Fit the tension adjustment tool for axis-4 timing belt to the screw hole.	Tension adjustment tool for axis-4 timing belt. Included in special toolkit 3HAC076396-001.  xx2000001610

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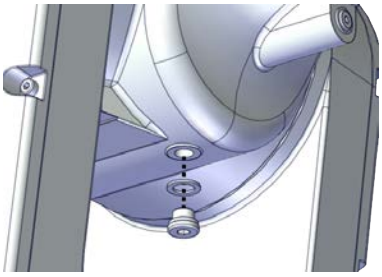
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	Action	Note
4	Use a handheld dynamometer hooking to the tool.	 xx2000001611
5	Pull the dynamometer to make the tension falling in the allowed force range. **Note** During the measurement, make sure that all interferences that may affect the force are removed. Pay attention to the force application direction.	Used belt: 33.4-38.2 N New belt:47.8-52.4 N  xx2000001612
6	Secure the motor with the screws.	Tightening torque: 3.3 Nm±3%  xx2000001604

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5.5.3 Replacing the tubular and tilt unit
Continued

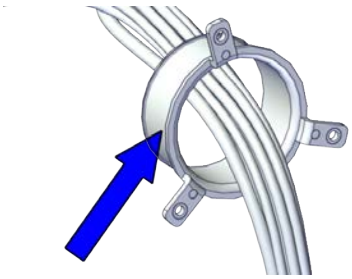
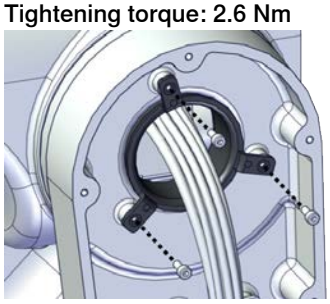
	Action	Note
7	Remove the tool and refit the plug screw. **For robots with protection type Clean Room (option 3351-4)** Refit the plug screw with the rubber washer.	Tightening torque: 3 Nm **For robots NOT with protection type Clean Room** Plug screw: 3HAC078352-001  xx2000001609 **For robots with protection type Clean Room (option 3351-4)** Plug screw, Clean Room: 3HAC078351-001 Rubber sealing washer: 3HAC075325-001  xx2000002496

Securing the cable package in the lower arm

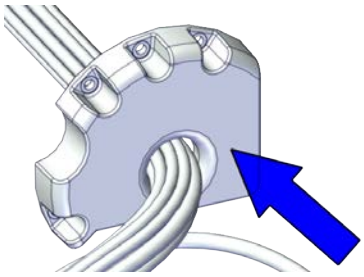
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Check the axis-3 cable protector. Replace if damaged. **Note** If replaced, apply grease to the axis-3 cable protector before refitting.	Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001  xx2000001568 Screw: M4x10 12.9 Lafre (3 pcs) Tightening torque: 2.6 Nm  xx2000001552
3	Route the cable package through the lower arm support and up into the housing. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	

Routing the cable package in the housing

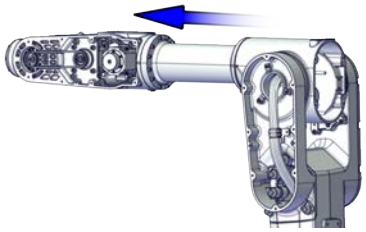
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Slip the axis-4 cable protector over the cable package.	Plastic cable protector, axis 4: 3HAC064694-001:  xx2000001570

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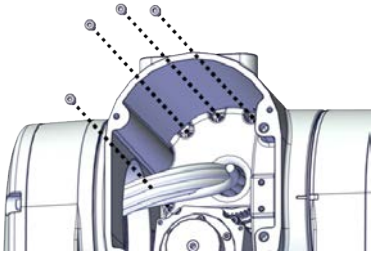
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5.5.3 Replacing the tubular and tilt unit

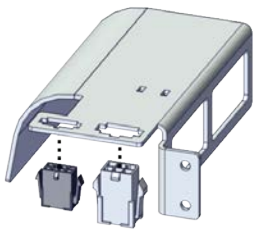
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	Action	Note
3	Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and into the tubular. Make sure that: • the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001571

Securing the cable package in the housing

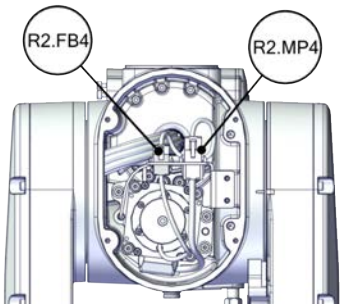
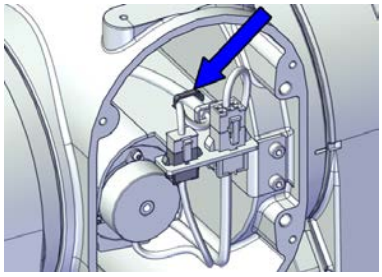
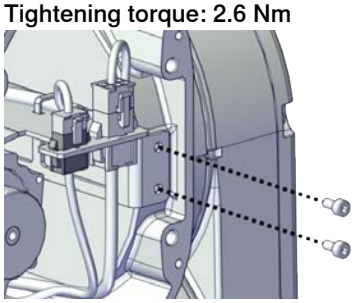
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 cable protector.	Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001546

Reconnecting the axis-4 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545

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	Action	Note
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

Routing the cable package in the tubular

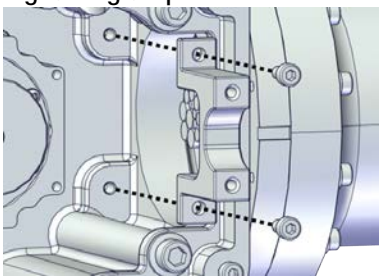
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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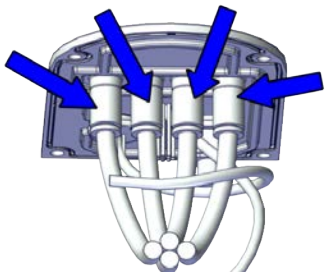
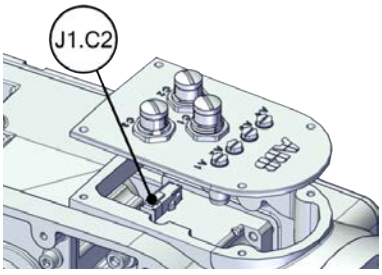
5.5.3 Replacing the tubular and tilt unit

Continued

	Action	Note
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

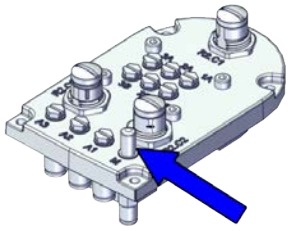
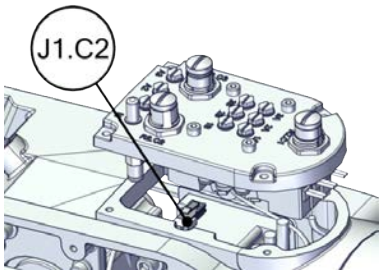
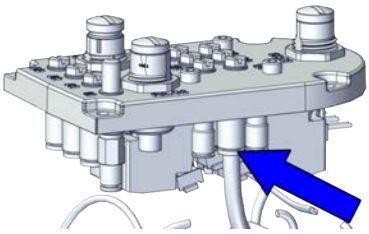
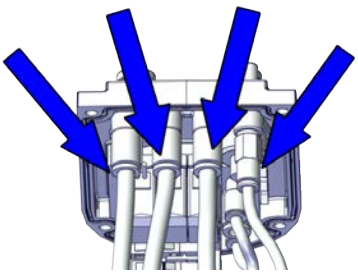
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

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Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

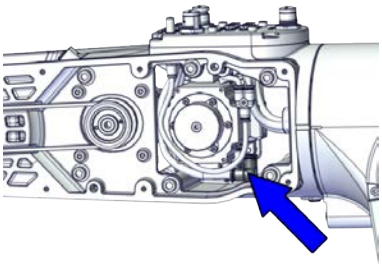
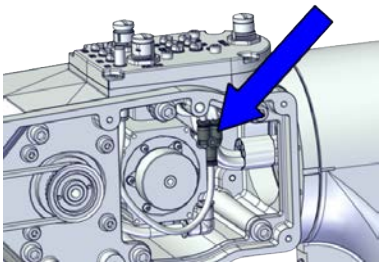
	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373

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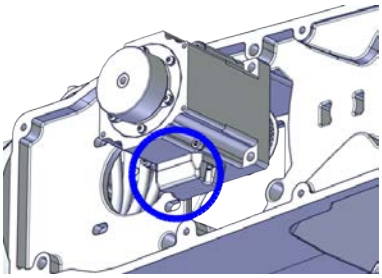
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5.5.3 Replacing the tubular and tilt unit

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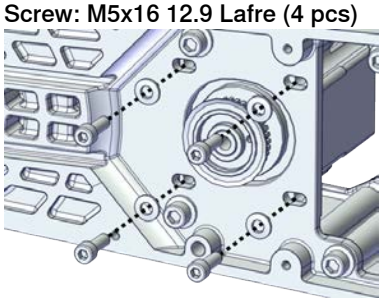
	Action	Note
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

Refitting the axis-6 motor

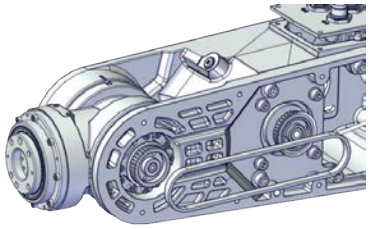
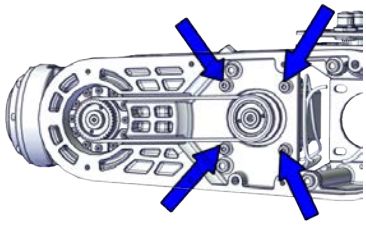
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Orient the motor correctly and fit it into the tubular. **Tip** Leave the axis-6 motor connectors accessible from the tubular support side.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001603

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	Action	Note
4	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre (4 pcs)  xx2000001601

Refitting the axis-6 timing belt

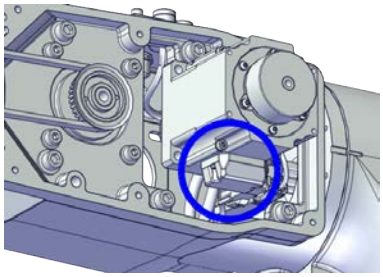
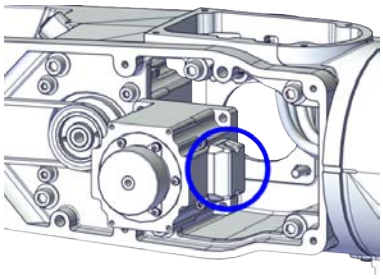
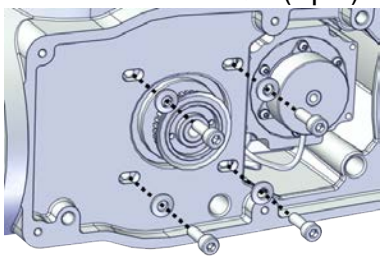
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001600
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	
4	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001599
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 85.7-91.6 Hz New belt: 102-107 Hz

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5.5.3 Replacing the tubular and tilt unit
Continued

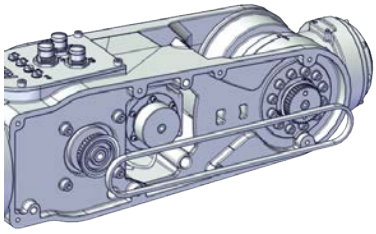
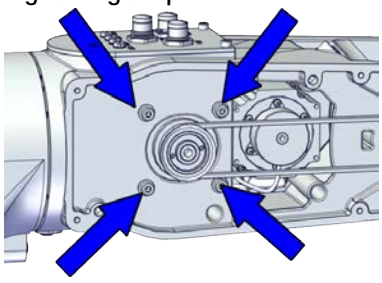
Refitting the axis-5 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Orient the motor correctly and fit it into the tubular. **Note** Pay attention to the motor orientation (see figures for a reference); otherwise, other cables would be hard to be refitted in the tubular.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001598 Note that motor orientation for robots with solenoid valve (option 3303-3) is different from that for other robot types. Take the figure below as a reference.  xx2300001376
4	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre (4 pcs)  xx2000001596

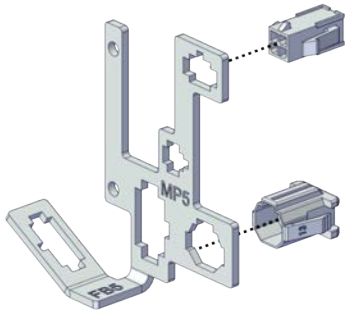
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Refitting the axis-5 timing belt

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001595
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	
4	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001594
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 59.3-63.4 Hz New belt: 70.8-74.3 Hz

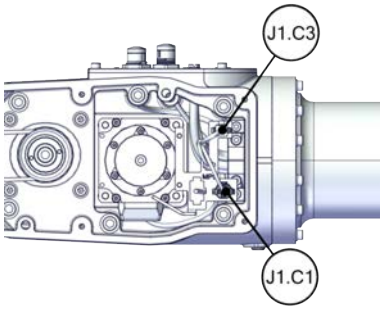
Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537

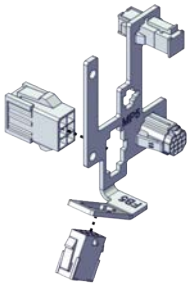
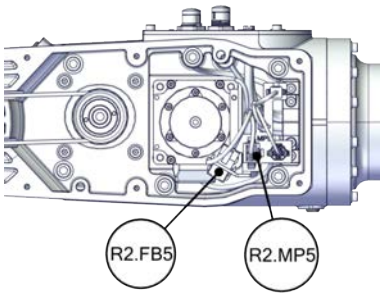
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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

Reconnecting the axis-5 motor connectors

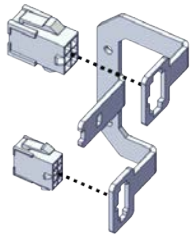
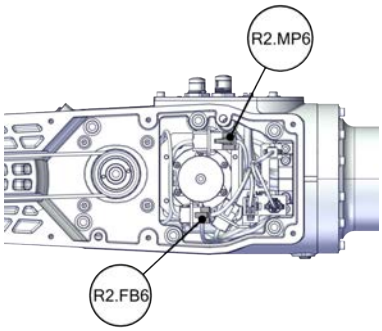
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

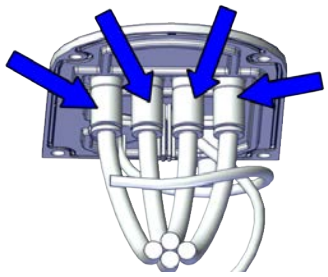
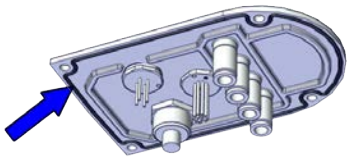
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

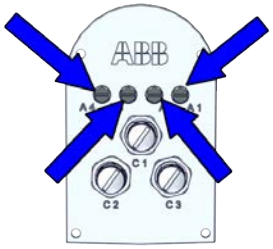
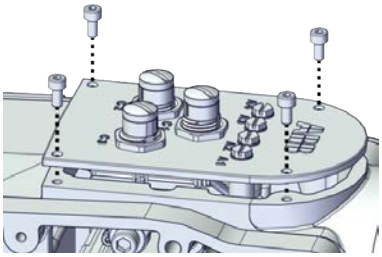
Refitting the process hub

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the air hoses. Replace the cable package if damaged. See *Replacing the cable package on page 170*.	 xx2000001539
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512

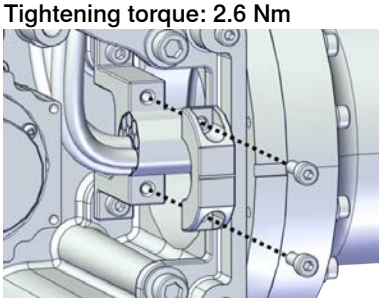
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5.5.3 Replacing the tubular and tilt unit
Continued

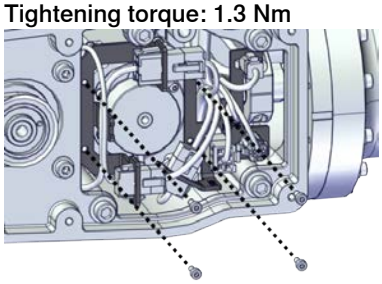
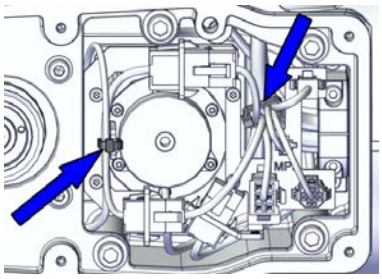
	Action	Note
4	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
5	Refit the process hub.	Screw: M4x10 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538

Securing the cable package in the tubular

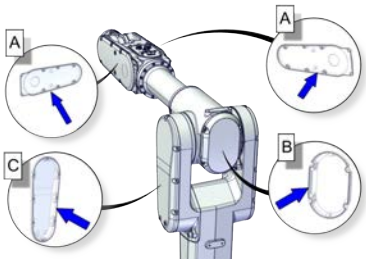
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748

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	Action	Note
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

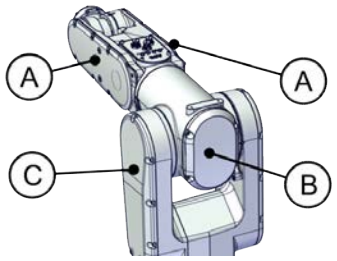
Refitting the covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. • Gasket for tubular covers (A) • Gasket for housing cover (B) • Gasket for lower arm support cover (C) Replace if damaged.	 xx2000002503
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
5	Refit the covers. • Tubular covers (A) • Housing cover (B) • Lower arm support cover (C)	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001733

Concluding procedure

	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

Refitting the tubular and tilt unit for IRB 1300-7/1.4 and IRB 1300-12/1.4

Use these procedures to refit the tubular and tilt unit for IRB 1300-7/1.4 and IRB 1300-12/1.4.

Checking the sealing set on the tilt unit

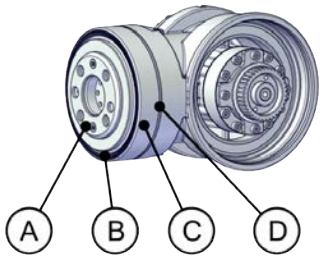
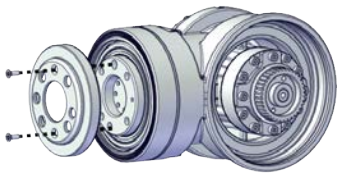
Note

This procedure is valid for robots with:

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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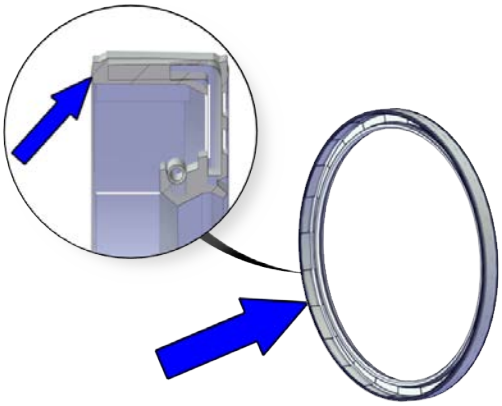
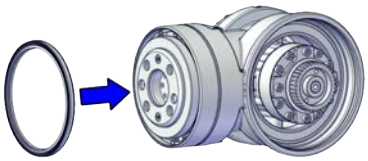
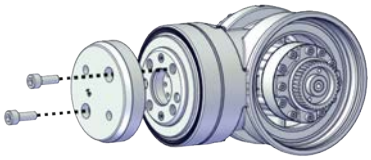
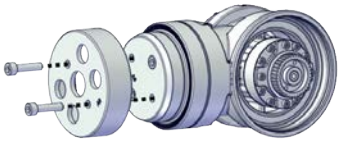
	Action	Note
2	Check the sealing set on the tilt unit. The sealing set includes an inner ring cover (A), a radial sealing (B), an outer ring cover (C) and a gasket (D). Replace the damaged part as described below: • If the inner ring cover is damaged, proceed to *3*. • If the radial sealing is damaged, proceed to *4*. • If the outer ring cover is damaged, proceed to *5*. • If the gasket is damaged, proceed to *6*.	 xx2000002489
3	Remove the old inner ring cover and fit the new one with two M3x8 countersunk screws.	 xx2000002490

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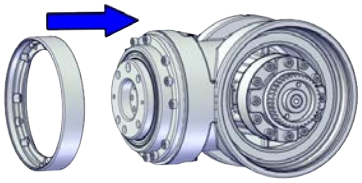
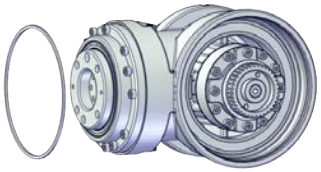
5.5.3 Replacing the tubular and tilt unit

Continued

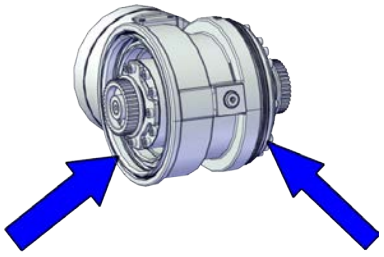
	Action	Note
4	Remove the old radial sealing and fit the new one as described below. The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002491
	1. Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
	2. Fit the small cap of the axis-6 sealing assembly tool against inner ring cover and fix with two M6x16 screws.	Small cap of the axis-6 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002492
	3. Fit the big cap of the axis-6 sealing assembly tool against the sealing and fix with two M6x25 screws.	Big cap of the axis-6 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002493
	4. Screw the screws, little by little and evenly, to press the sealing into place.	

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	Action	Note
	5. Remove the assembly tool.	
	6. Check that the sealing is undamaged and properly fitted.	
5	Remove the inner ring cover and radial sealing first, then, remove the outer ring cover and fit the new one. Remember to refit the radial sealing and inner ring cover after replacement of the outer ring cover.	 xx2000002494
6	Check the gasket after removing the outer ring cover. Replace if damaged.	 xx2000002495

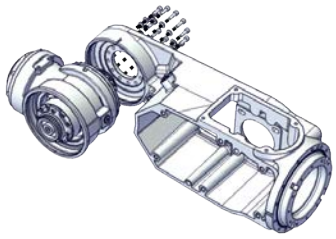
Refitting the tilt unit

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection type Foundry Plus (option 3352-10)** Check the M2 variseal sealings on both sides. Replace if damaged. **Note** The sealing lip is facing outside of the robot.	M2 variseal sealing: 3HAC044641-008  xx2000002522

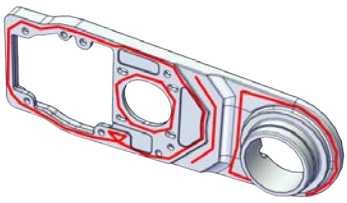
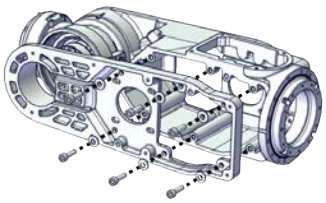
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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
3	Refit the tilt unit.	Screw: M4x12 12.9 Lafre (12 pcs) Tightening torque: 4.5 Nm  xx2000001741

Refitting the tubular support

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.	 xx2000002523
3	Refit the tubular support.	Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 14 Nm  xx2000001740

Refitting the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the O-ring. Replace if damaged.	O-ring on tubular: 3HAC061327-018 xx2000002519
3	Refit the tubular and tilt unit to the extender unit.	Screw: M4x25 12.9 Lafre (12 pcs) Tightening torque: 3.8 Nm xx2000001739
4	Make sure that the notches on the extender unit and tubular are aligned.	 xx2000001742

Refitting the axis-6 motor

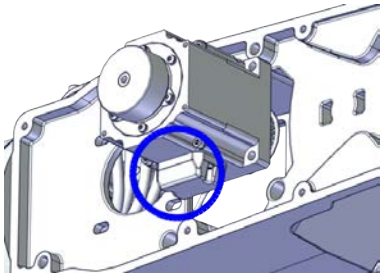
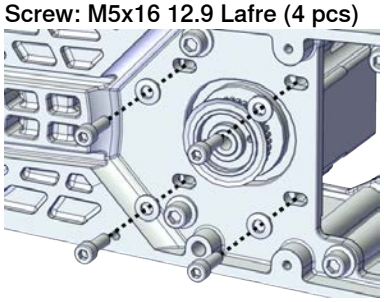
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	

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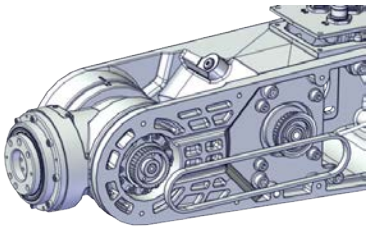
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5.5.3 Replacing the tubular and tilt unit

Continued

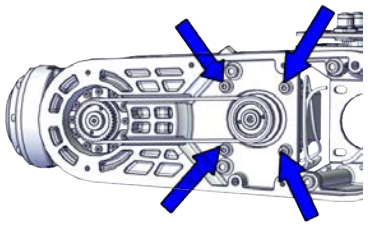
	Action	Note
3	Orient the motor correctly and fit it into the tubular. **Tip** Leave the axis-6 motor connectors accessible from the tubular support side.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001603
4	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre (4 pcs)  xx2000001601

Refitting the axis-6 timing belt

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001600
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	

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	Action	Note
4	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001599
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 85.7-91.6 Hz New belt: 102-107 Hz

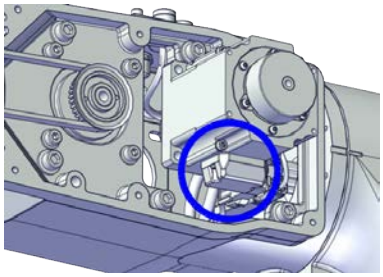
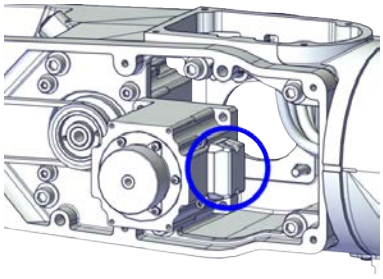
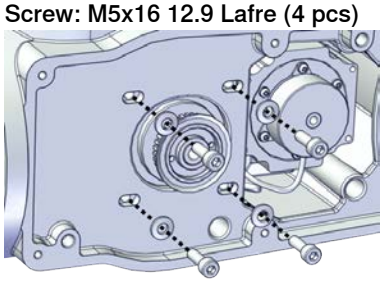
Refitting the axis-5 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	

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5.5.3 Replacing the tubular and tilt unit
Continued

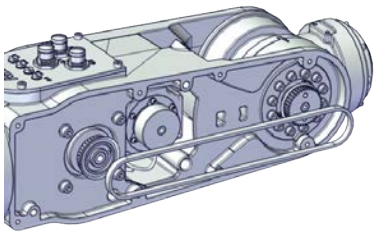
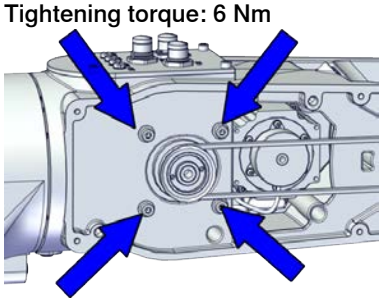
	Action	Note
3	Orient the motor correctly and fit it into the tubular. **Note** Pay attention to the motor orientation (see figures for a reference); otherwise, other cables would be hard to be refitted in the tubular.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001598 Note that motor orientation for robots with solenoid valve (option 3303-3) is different from that for other robot types. Take the figure below as a reference.  xx2300001376
4	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre (4 pcs)  xx2000001596

Refitting the axis-5 timing belt

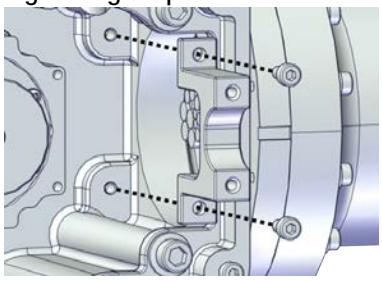
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001595
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	
4	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001594
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 59.3-63.4 Hz New belt: 70.8-74.3 Hz

Routing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749

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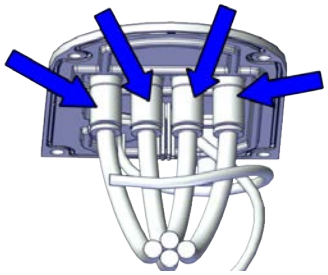
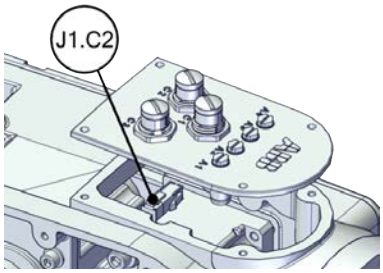
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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

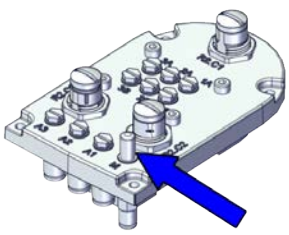
Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

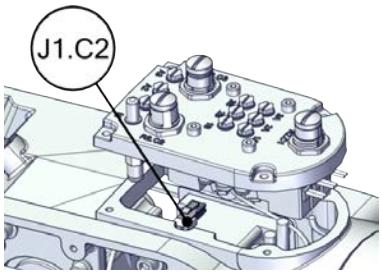
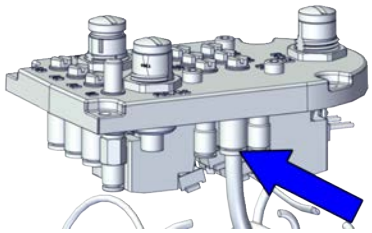
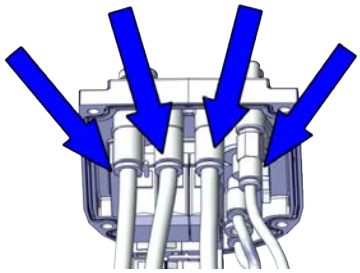
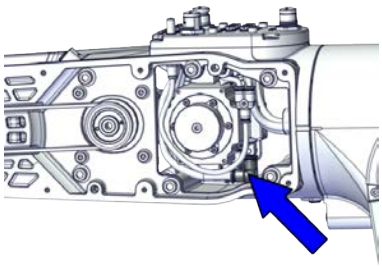
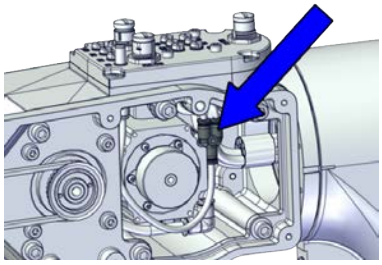
Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378

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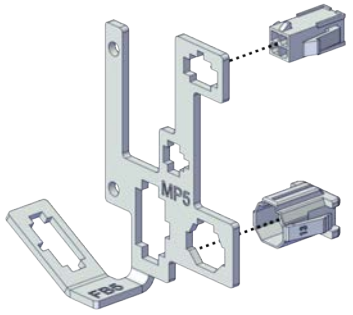
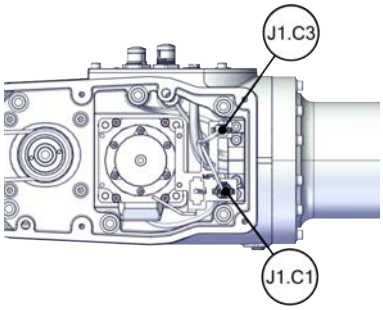
	Action	Note
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

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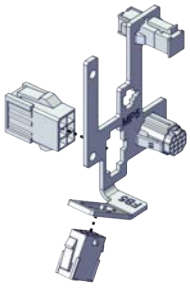
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5.5.3 Replacing the tubular and tilt unit
Continued

Reconnecting the CP/CS cabling (if equipped)

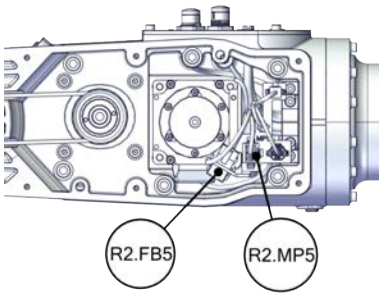
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

Reconnecting the axis-5 motor connectors

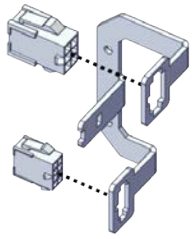
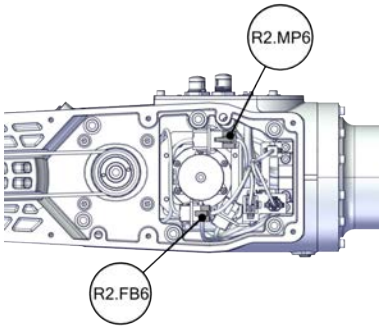
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535

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	Action	Note
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

Refitting the process hub

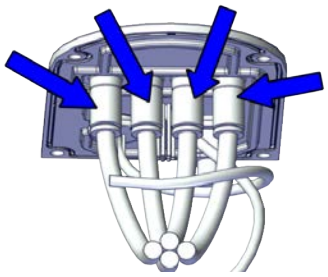
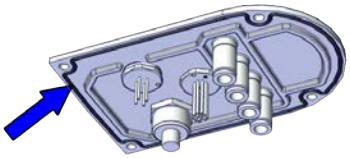
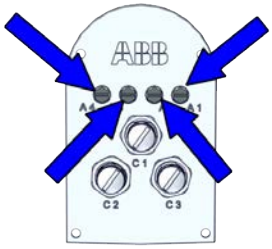
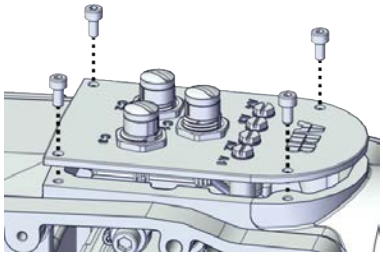
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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5.5.3 Replacing the tubular and tilt unit

Continued

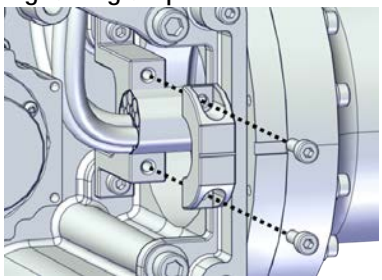
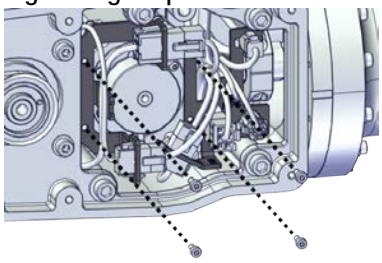
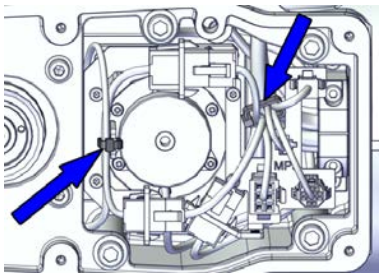
	Action	Note
2	Check the air hoses. Replace the cable package if damaged. See *Replacing the cable package on page 170*.	 xx2000001539
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
4	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
5	Refit the process hub.	Screw: M4x10 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538

Securing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

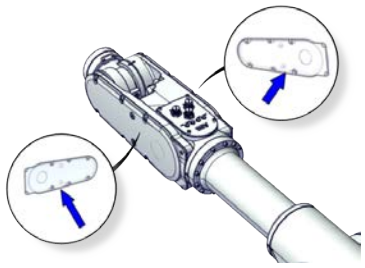
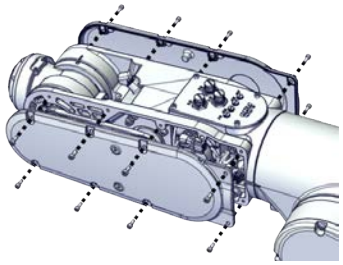
Refitting the tubular covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. Replace if damaged.	 xx2000002507
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
5	Refit the tubular covers.	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001593

Concluding procedure

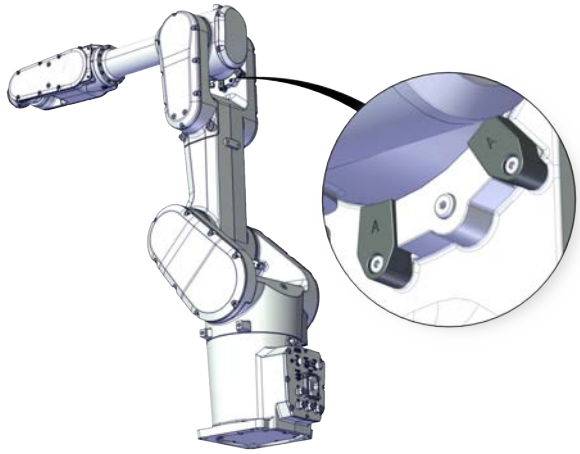
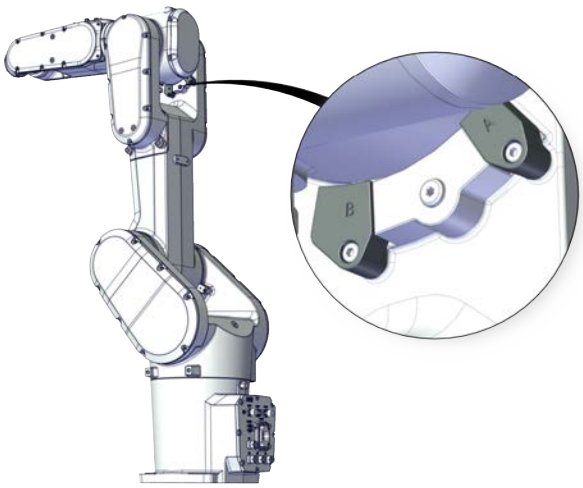
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.5.4 Replacing the axis-3 mechanical stops

Location of the mechanical stops

The mechanical stops are located as shown in the figure.

IRB 1300-11/0.9, IRB 1300-7/1.4 and IRB 1300-12/1.4	IRB 1300-10/1.15
 xx2000000408	 xx2000000471

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Mechanical stop, block A	3HAC065651-001	Replace if damaged.
Mechanical stop, block B	3HAC065671-001	Used for axis 3 of IRB 1300-10/1.15. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.

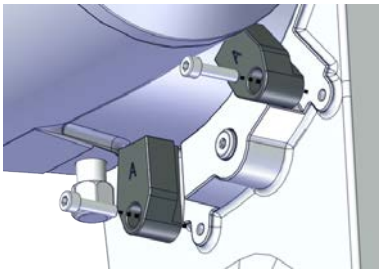
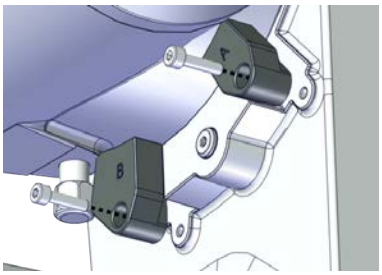
Required consumables

Consumable	Article number	Note
Locking liquid	-	Loctite 2400 (or equivalent Loctite 243)

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Replacing the axis-3 mechanical stops

	Action	Note
1	Jog the robot to a position where the mechanical stops are most easily accessed.	
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove the mechanical stops.	**For IRB 1300-11/0.9, IRB 1300-7/1.4 and IRB 1300-12/1.4**  xx2000000507 **For IRB 1300-10/1.15**  xx2000000508
4	Discard the old stops and refit with new ones.	**For IRB 1300-11/0.9, IRB 1300-7/1.4 and IRB 1300-12/1.4** Mechanical stop, block A: 3HAC065651-001 (2 pcs) **For IRB 1300-10/1.15** Mechanical stop, block A: 3HAC065651-001 (1 pcs) Mechanical stop, block B: 3HAC065671-001 (1 pcs)
5	Apply a little locking liquid to the screws. **Note** If there is locking liquid residues on the screw, please clean it before refitting. Remove residual locking liquid after refitting.	Locking liquid: Loctite 2400 (or equivalent Loctite 243)

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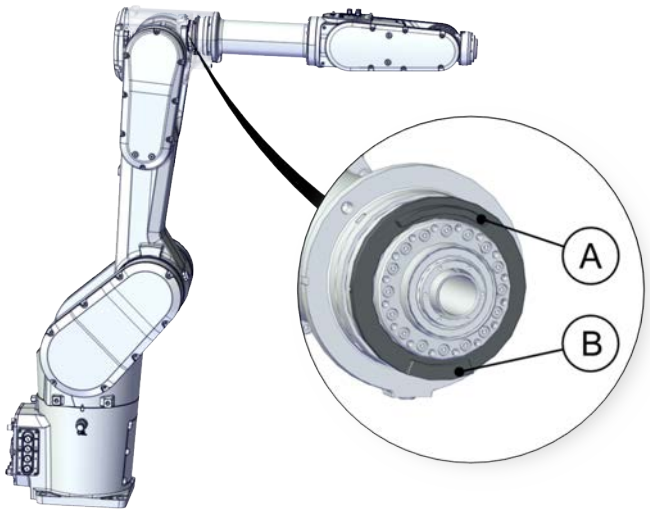
	Action	Note
6	Secure the mechanical stops.	Screw: M4x16 stainless steel (1 pcs per stop) Tightening torque: 1 Nm

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5.5.5 Replacing the axis-4 mechanical stops

Location of the mechanical stops

The mechanical stops are located as shown in the figure.



xx2000000409

A	Mechanical stop, axis 4, flange
B	Mechanical stop, axis 4, slider

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Mechanical stop, axis 4, flange	3HAC065805-001	Replace if damaged.
Mechanical stop, axis 4, slider	3HAC065804-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.

Continues on next page

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Equipment	Article number	Note
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Tension adjustment tool for axis-4 timing belt	-	Included in special toolkit 3HAC076396-001.
Dynamometer	-	Used for measuring the timing belt tension.
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Replacement of axis-4 mechanical stops

The axis-4 mechanical stops, both flange and slider, are accessible after removing the housing, see *Replacing the housing and extender unit on page 390*.

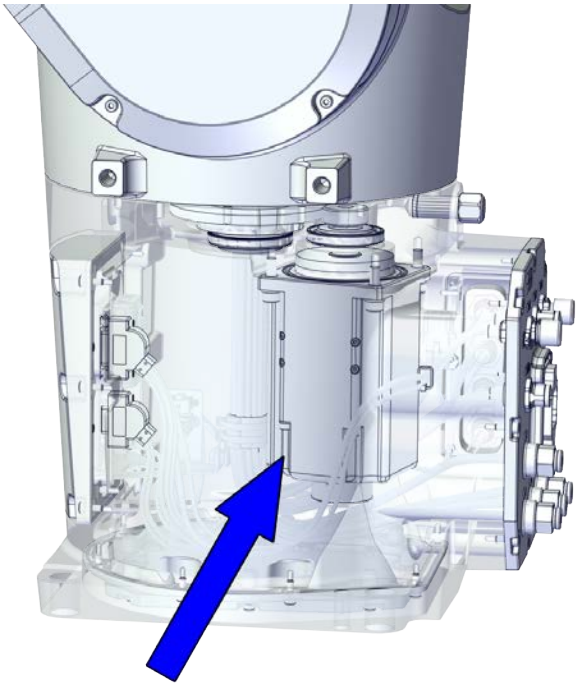
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5.6 Motors

5.6.1 Replacing the axis-1 motor

Location of the axis-1 motor

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



xx2000001480

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Motor unit, axis 1	3HAC073039-001	
O-ring on motor unit	3HAC061327-037	
Resolver cover on axis-1 motor	3HAC060261-001	Used for robots with bottom connector interface.
Main cable harness, S, basic	3HAC073303-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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Spare part	Article number	Note
Main cable harness, S (CP/CS and air hose, without Ethernet)	3HAC073304-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S (CP/CS and air hose, with Ethernet)	3HAC073305-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M, basic	3HAC073300-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M (CP/CS and air hose, without Ethernet)	3HAC073301-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M (CP/CS and air hose, with Ethernet)	3HAC073302-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L, basic	3HAC073297-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L (CP/CS and air hose, without Ethernet)	3HAC073298-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L (CP/CS and air hose, with Ethernet)	3HAC073299-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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5.6.1 Replacing the axis-1 motor
Continued

Spare part	Article number	Note
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S, basic, Clean Room	3HAC077833-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, S, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077834-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, S, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077835-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, M, basic, Clean Room	3HAC077830-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, M, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077831-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, M, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077832-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, L, basic, Clean Room	3HAC077827-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Main cable harness, L, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077828-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Main cable harness, L, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077829-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 2	3HAC067816-001	
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	

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Spare part	Article number	Note
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, short	3HAC073095-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, long	3HAC073096-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing top cover	3HAC073091-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Base cover	3HAC073090-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Base adapter	3HAC073089-001	Used for robots with bottom connector interface.
SMB cover	3HAC076475-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Brake release unit	3HAC073296-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Swing cover, short, Clean Room	3HAC077824-001	Used with protection type Clean Room.

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5.6.1 Replacing the axis-1 motor
Continued

Spare part	Article number	Note
Swing cover, long, Clean Room	3HAC077825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Swing top cover, Clean Room	3HAC077820-001	Used with protection type Clean Room.
Base cover, Clean Room	3HAC077819-001	Used with protection type Clean Room.
SMB cover, Clean Room	3HAC077839-001	Used with protection type Clean Room.
Brake release unit, Clean Room	3HAC077826-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for SMB cover	3HAC067820-001	Not used with protection class IP40. Replace if damaged.
Gasket for brake release unit	3HAC070274-001	Not used with protection class IP40. Replace if damaged.
Gasket for base cover	3HAC067819-001	Not used with protection class IP40. Replace if damaged.
Gasket for base adapter	3HAC067818-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Not used with protection class IP40. Replace if damaged.

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Spare part	Article number	Note
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Connector for quick coupling, with outlet pipe	-	Used for draining and filling oil to axis-1 gearbox. Connector specification: G3/8
Oil dispenser	-	Includes pump with outlet pipe.
Roundsling, 1.7 m	-	Length: 1.7 m Lifting capacity: >70 kg
Overhead crane	-	

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-009	Kyodo Yushi TMO150

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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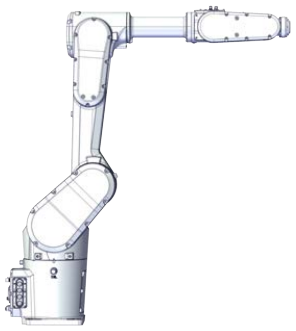
5.6.1 Replacing the axis-1 motor
Continued

	Action	Note
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor

Use these procedures to remove the axis-1 motor.

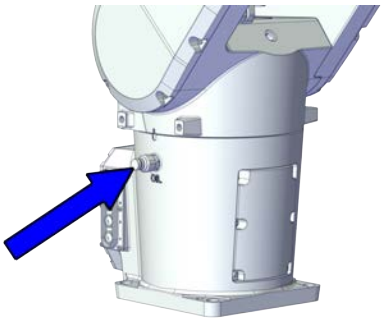
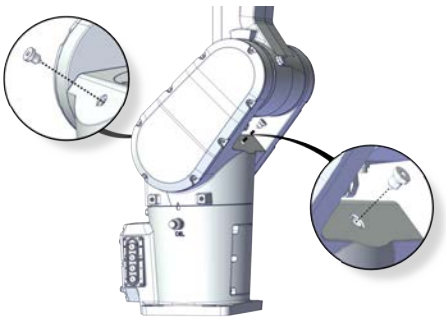
Preparations before removing the axis-1 motor

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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Draining oil of axis-1 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**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.	
3	Place the oil collecting vessel underneath the quick coupling.	 xx2000001514
4	Remove the oil plugs and keep them opened to speed up the drainage.	 xx2000001513
5	Plug a G3/8 quick coupling connector with pipe to the quick coupling on base.	
6	**WARNING** Used oil is hazardous material and must be disposed of in a safe way. See *Decommissioning on page 805* for more information.	

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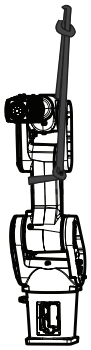
5.6.1 Replacing the axis-1 motor
Continued

	Action	Note
7	Drain the gearbox oil.	**Note** Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.
8	Remove the quick coupling connector and clean the pipe after the oil is drained. **Note** There will be some oil left in the gearbox after draining.	
9	Refit oil plugs.	Tightening torque: 10 Nm

Removing the complete cable package

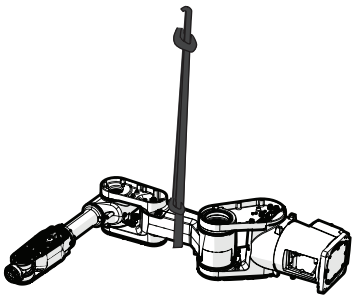
Follow the instructions detailed in *Removing the cable package on page 177* to remove the complete cable package.

Putting the robot on its side

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Run a roundsling around the lower arm.	Roundsling, 1.7 m (1 pcs), Lifting capacity: >70 kg  xx2000001651

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	Action	Note
4	**CAUTION** The IRB 1300 robot weighs . IRB 1300-11/0.9: 75 kg IRB 1300-10/1.15: 77 kg IRB 1300-7/1.4: 79 kg IRB 1300-12/1.4: 79 kg All lifting accessories used must be sized accordingly!	
5	**WARNING** The robot is likely to be mechanically unstable if not secured to the foundation.	
6	Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side. **Note** Lay the robot down with the lower arm support and swing support towards upside.	 xx2000001649

Removing the base covers

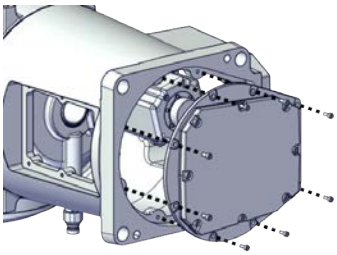
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.6.1 Replacing the axis-1 motor

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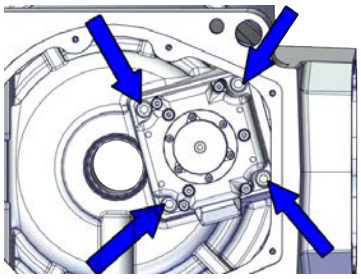
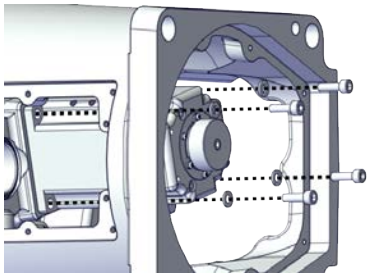
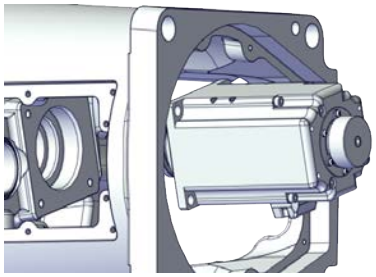
	Action	Note
3	**Valid for cabling with rear interface** Remove the base bottom cover together with the base adapter.	 xx2000001642

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	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**WARNING** When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section *Gearbox lubricants (oil or grease) on page 32*.	
4	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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	Action	Note
5	Access the screws and washers securing the axis-1 motor from the base bottom.	 xx2000001643
6	Remove the screws and washers.	 xx2000001644
7	Carefully lift out the motor.	 xx2000001645

Refitting the motor

Use these procedures to refit the axis-1 motor.

Refitting the axis-1 motor

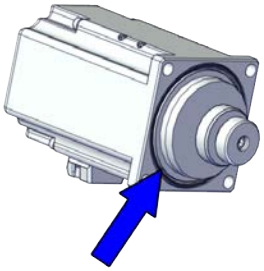
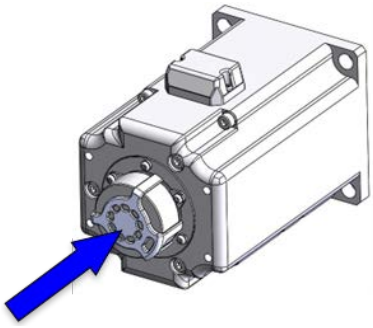
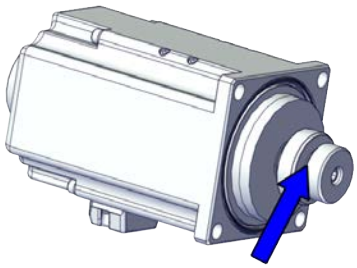
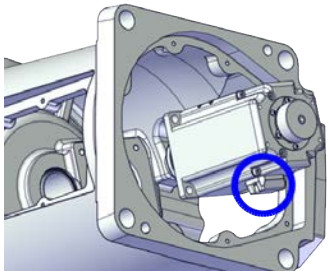
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	

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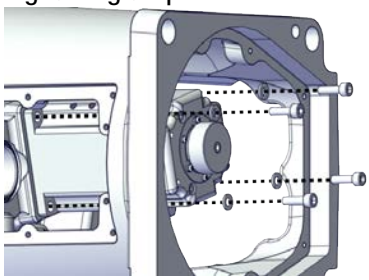
5.6.1 Replacing the axis-1 motor

Continued

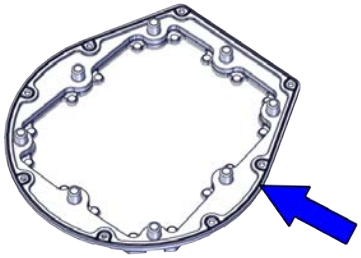
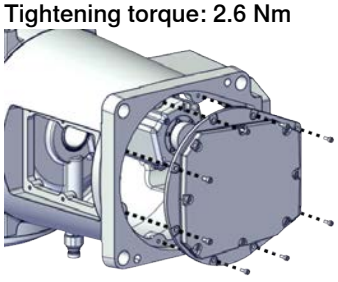
	Action	Note
3	Check the O-ring. Replace if damaged.	O-ring on motor unit: 3HAC061327-037  xx2000001646
4	**Valid for cabling with bottom interface (option 3309-1)** Check the resolver cover. Replace if damaged.	Resolver cover on axis-1 motor: 3HAC060261-001  xx2500001211
5	Apply lubricating oil to the motor that has contacting area with the gearbox.	Kyodo Yushi TMO150: 3HAC032140-009  xx2000001700
6	Orient the motor correctly and fit it into the swing. Make sure the motor is properly fit to gearbox.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001647

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	Action	Note
7	Refit the screws and washers.	Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm  xx2000001644

Refitting the base covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** **Valid for cabling with rear interface** Check the gasket. Replace if damaged.	Gasket for base adapter: 3HAC067818-001  xx2000002510
3	**Valid for cabling with rear interface** Refit the base bottom cover together with the base adapter.	Screw: M4x10 12.9 Lafre (8 pcs) Tightening torque: 2.6 Nm  xx2000001642

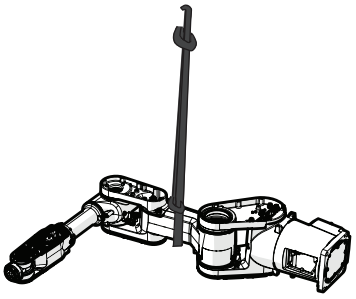
Securing the robot to the foundation

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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5.6.1 Replacing the axis-1 motor
Continued

	Action	Note
2	Run a roundsling around the lower arm.	Roundsling, 1.7 m, Lifting capacity: >70 kg  xx2000001649
3	**CAUTION** The IRB 1300 robot weighs . IRB 1300-11/0.9: 75 kg IRB 1300-10/1.15: 77 kg IRB 1300-7/1.4: 79 kg IRB 1300-12/1.4: 79 kg All lifting accessories used must be sized accordingly!	
4	Raise the robot to standing and secure to the foundation with the attachment screws and washers.	Attachment screws: M16x50, quality: 8.8. Washers: 17 x 30 x 3, steel hardness class 200HV. Tightening Torque: 150 Nm±10 Nm.

Refitting the complete cable package

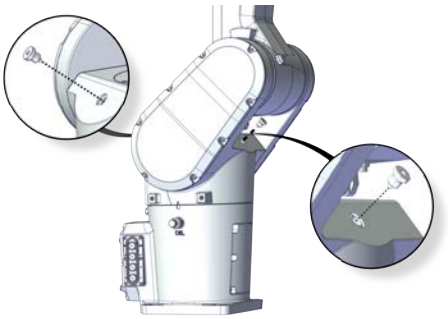
Follow the instructions detailed in *Refitting the cable package on page 195* to refit the complete cable package.

Refilling oil to axis-1 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**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.	

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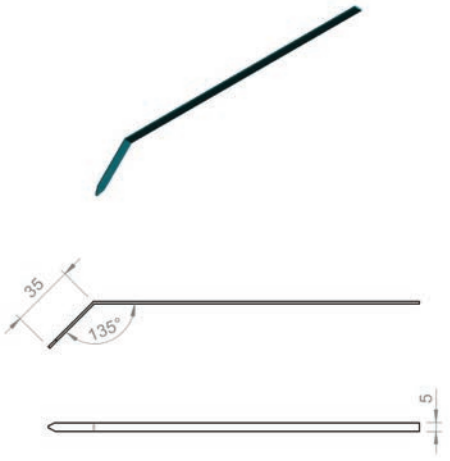
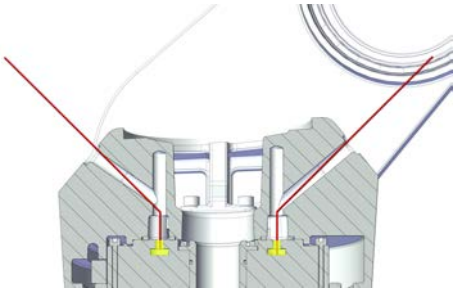
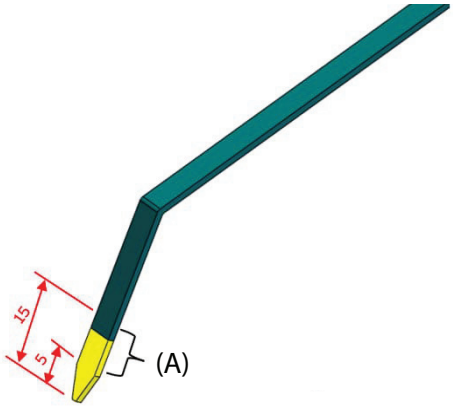
	Action	Note
3	Open the oil plugs, one for filling and the other for venting.	 xx2000001513
4	**WARNING** Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	
5	Refill the gearbox with oil. **CAUTION** Oil filling must be slow to make sure air venting is fluent.	Type of oil and total amount is detailed in *Lubrication in gearboxes on page 816*.

Continues on next page

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5.6.1 Replacing the axis-1 motor

Continued

	Action	Note
6	Measure the oil level by inserting two bent cable straps into the oil filling/venting holes. **CAUTION** After oil filling, the oil level may continue raising at the venting hole side until the level is balanced within the gearbox. Wait until the oil stops raising, before measuring the oil level. **Note** Make sure that the cable strap ends are fully inserted into the gearbox cavity, that is, reaching the bottom of the yellow-marked holes in the figure. You can try to rotate the cable straps after inserting. If it feels obstructed and the straps cannot be rotated freely, they are in place.	Bending specification of the cable straps  xx2400000882  xx2400000881
7	Make sure the measured oil level is within the height range of 5 mm to 15 mm at the ends of the cable straps. **Note** Oil shall be obviously observed all around the cable strap ends, rather than unevenly adhered to the cable strap sides.	 xx2400000883
8	Refit the oil plugs.	Tightening torque: 10 Nm

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Concluding procedure

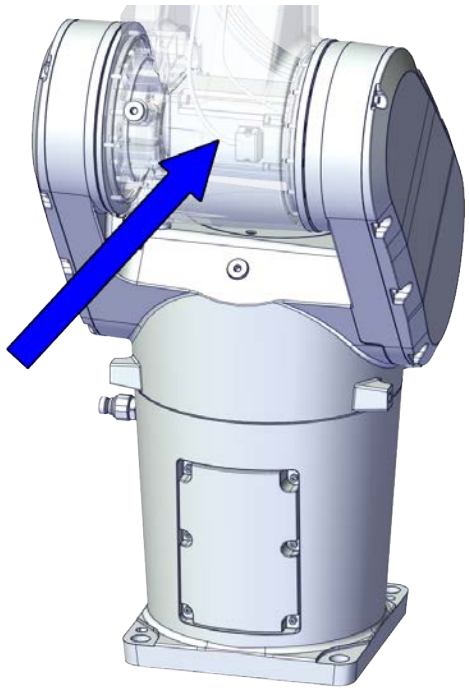
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.6.2 Replacing the axis-2 motor

Location of the axis-2 motor

The axis-2 motor is located as shown in the figure.



xx2000001481

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Motor unit, axis 2	3HAC073078-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4.
Motor unit, axis 2 (IRB 1300-12/1.4)	3HAC082078-001	Used for IRB 1300-12/1.4.
O-ring on motor unit	3HAC061327-037	
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, short	3HAC073095-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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Spare part	Article number	Note
Swing cover, long	3HAC073096-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, short, Clean Room	3HAC077824-001	Used with protection type Clean Room.
Swing cover, long, Clean Room	3HAC077825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Gasket for swing cover, short	3HAC067824-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Roundsling, 1.7 m	-	Length: 1.7 m Lifting capacity: >70 kg
Overhead crane	-	

Required consumables

Consumable	Article number	Note
Cable straps	-	

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5.6.2 Replacing the axis-2 motor
Continued

Consumable	Article number	Note
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-009	Kyodo Yushi TMO150

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor

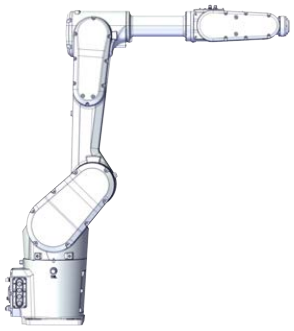
Use these procedures to remove the axis-2 motor.

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.	

Continues on next page

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	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Putting the robot on its side

CAUTION

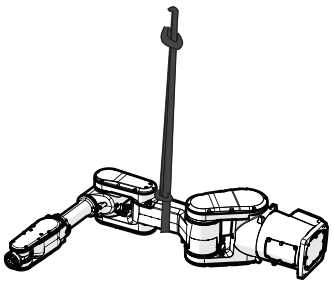
If the axis-2 motor is removed with the robot standing on floor, oil will leak from the axis-2 gearbox.

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.6.2 Replacing the axis-2 motor
Continued

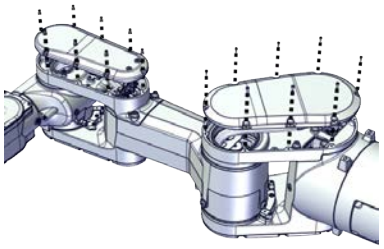
	Action	Note
3	Run a roundsling around the lower arm.	Roundsling, 1.7 m (1 pcs), Lifting capacity: >70 kg  xx2000001650
4	**CAUTION** The IRB 1300 robot weighs . IRB 1300-11/0.9: 75 kg IRB 1300-10/1.15: 77 kg IRB 1300-7/1.4: 79 kg IRB 1300-12/1.4: 79 kg All lifting accessories used must be sized accordingly!	
5	**WARNING** The robot is likely to be mechanically unstable if not secured to the foundation.	
6	Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side. **Note** Lay the robot down with the lower arm support and swing support towards upside.	 xx2000001648

Removing the covers

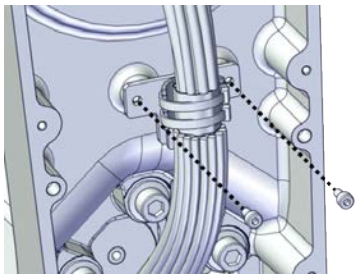
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the covers. • lower arm support cover • swing support cover	 xx2000001622

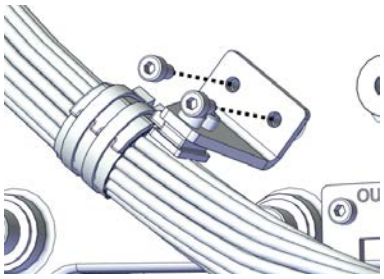
Loosening the cable package

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the cable bracket in the lower arm.	 xx2000001553

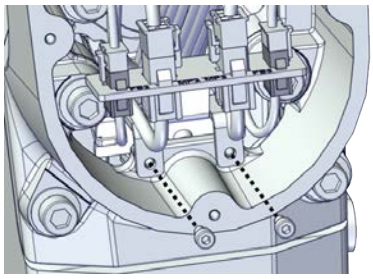
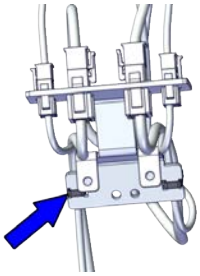
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5.6.2 Replacing the axis-2 motor
Continued

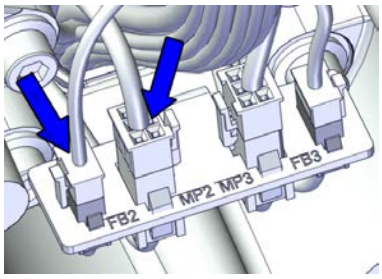
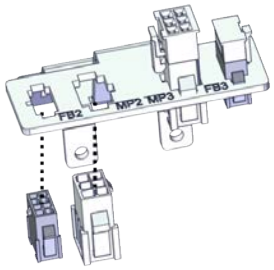
	Action	Note
4	Remove the cable bracket in the swing.	 xx2000001623

Disconnecting the axis-2 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate, as shown in following step.	 xx2000001548
4	Cut the cable strap.	 xx2000001640

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	Action	Note
5	Disconnect the connectors. • FB2 • MP2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001639
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001641

Removing the axis-2 motor

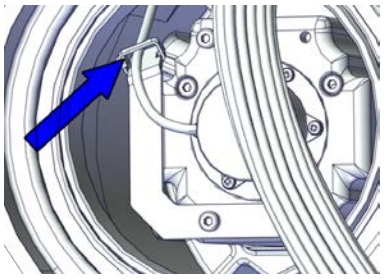
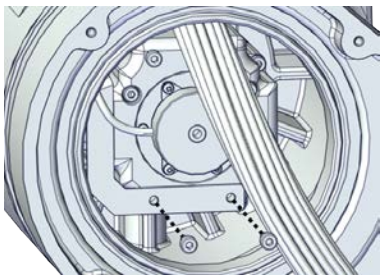
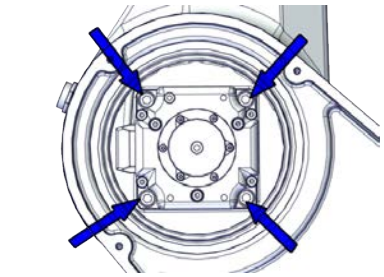
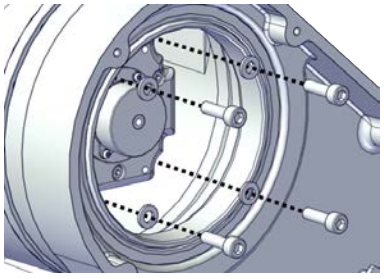
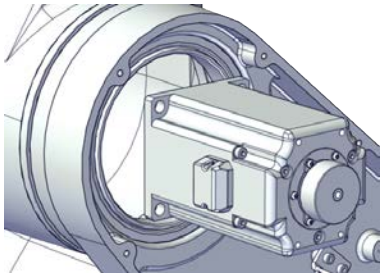
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**WARNING** When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section *Gearbox lubricants (oil or grease) on page 32*.	
4	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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5.6.2 Replacing the axis-2 motor

Continued

	Action	Note
5	Cut the cable strap.	 xx2000001624
6	Remove the cable bracket.	 xx2000001625
7	Wrap the connectors with the masking tape and pull the motor cablings carefully down to the swing from the lower arm.	
8	Access the screws and washers securing the axis-2 motor from the swing support.	 xx2000001627
9	Remove the screws and washers.	 xx2000001626
10	Carefully lift out the motor.	 xx2000001628

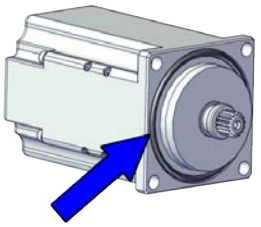
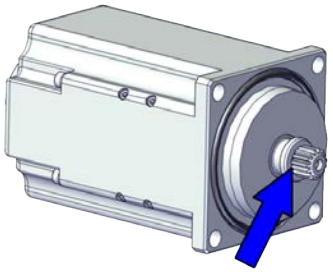
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Refitting the motor

Use these procedures to refit the axis-2 motor.

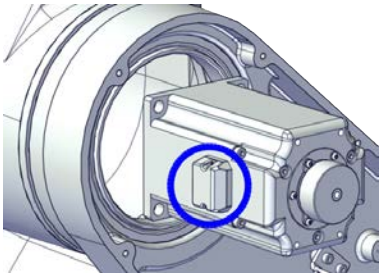
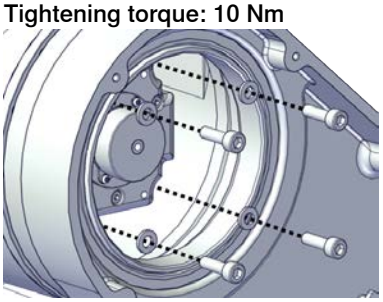
Refitting the axis-2 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**CAUTION** Do not mix the axis-2 motor used for IRB 1300-7/1.4 and IRB 1300-12/1.4. Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-2 motor for IRB 1300-7/1.4: 3HAC073078-001 Axis-2 motor for IRB 1300-12/1.4: 3HAC082078-001
3	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
4	Check the O-ring. Replace if damaged.	O-ring on motor unit: 3HAC061327-037  xx2000001629
5	Apply lubricating oil to the motor that has contacting area with the gearbox.	Kyodo Yushi TMO150: 3HAC032140-009  xx2000001701

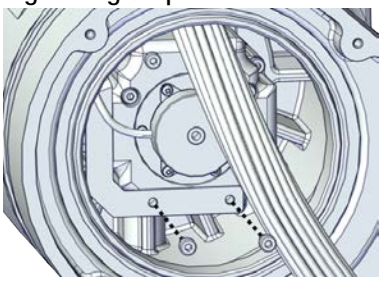
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5.6.2 Replacing the axis-2 motor
Continued

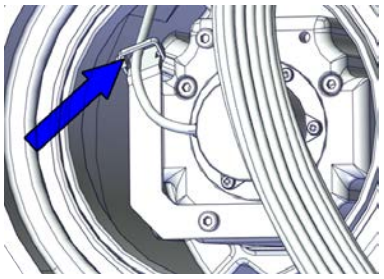
	Action	Note
6	Orient the motor correctly and fit it into the swing. Make sure the motor is properly fit to gearbox.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001630
7	Refit the screws and washers.	Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm  xx2000001626

Securing the motor cabling

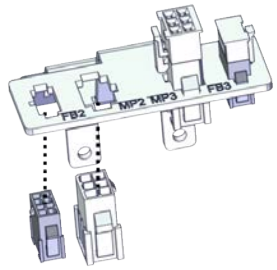
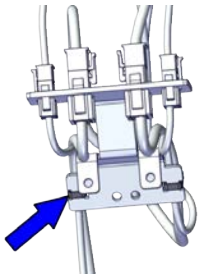
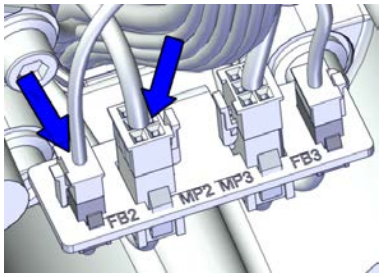
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the cable bracket.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001625

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	Action	Note
3	Secure the FB2 cabling to the bracket with cable strap.	 xx2000001624
4	Wrap the connectors and route the cablings up into the lower arm.	

Reconnecting the axis-2 motor connectors

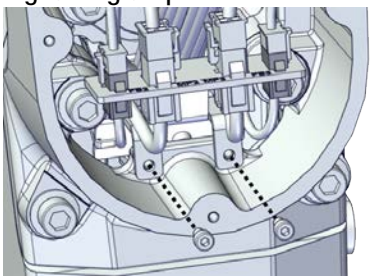
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001641
3	Route and secure the cabling with a cable strap. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001640
4	Reconnect the connectors. • FB2 • MP2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001639

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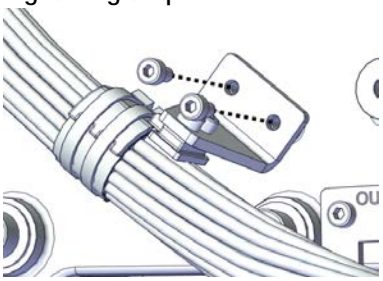
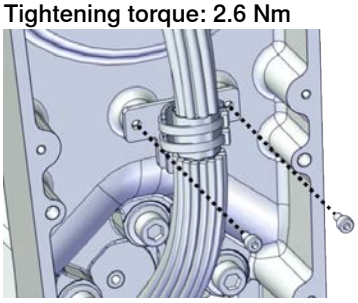
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5.6.2 Replacing the axis-2 motor

Continued

	Action	Note
5	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001548

Securing the cable package

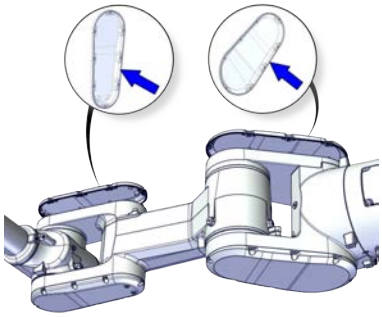
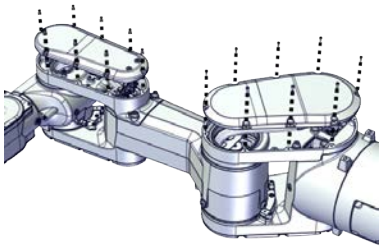
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the cable bracket in the swing.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001623
3	Refit the cable bracket in the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001553

Refitting the covers

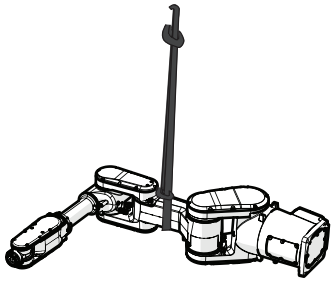
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. Replace if damaged.	 xx2000002504
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
5	Refit the covers. • lower arm support cover • swing support cover	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001622

Securing the robot to the foundation

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Run a roundsling around the lower arm.	Roundsling, 1.7 m, Lifting capacity: >70 kg  xx2000001648

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5.6.2 Replacing the axis-2 motor
Continued

	Action	Note
3	**CAUTION** The IRB 1300 robot weighs . IRB 1300-11/0.9: 75 kg IRB 1300-10/1.15: 77 kg IRB 1300-7/1.4: 79 kg IRB 1300-12/1.4: 79 kg All lifting accessories used must be sized accordingly!	
4	Raise the robot to standing and secure to the foundation with the attachment screws and washers.	Attachment screws: M16x50, quality: 8.8. Washers: 17 x 30 x 3, steel hardness class 200HV. Tightening Torque: 150 Nm±10 Nm.

Concluding procedure

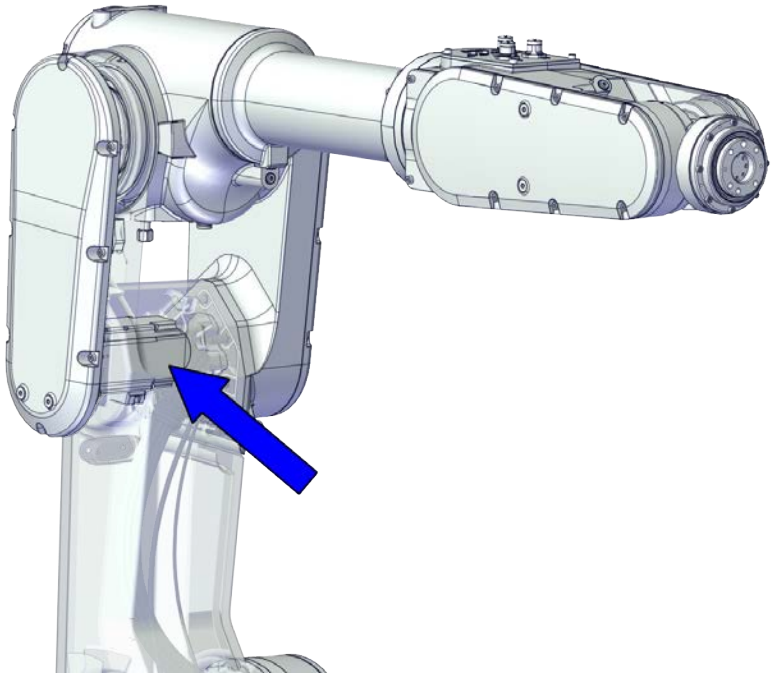
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.6.3 Replacing the axis-3 motor

Location of the axis-3 motor

The axis-3 motor is located as shown in the figure.



xx2000001482

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Motor unit, axis 3	3HAC073086-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4.
Motor unit, axis 3 (IRB 1300-12/1.4)	3HAC082079-001	Used for IRB 1300-12/1.4.
Resolver cover on axis-3 motor (IRB 1300-12/1.4)	3HAC060261-001	Used for IRB 1300-12/1.4.
Timing belt, axis 3	3HAC067040-001	
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.

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5.6.3 Replacing the axis-3 motor
Continued

Spare part	Article number	Note
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Sonic tension meter	-	Used for measuring the timing belt tension.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

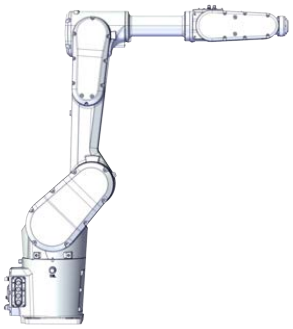
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Removing the motor

Use these procedures to remove the axis-3 motor.

Preparations before removing the axis-3 motor

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

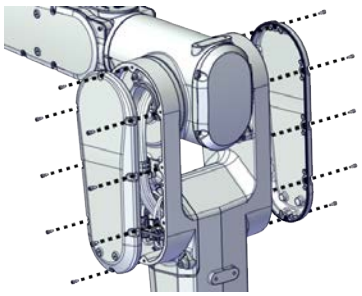
Removing the lower arm covers

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

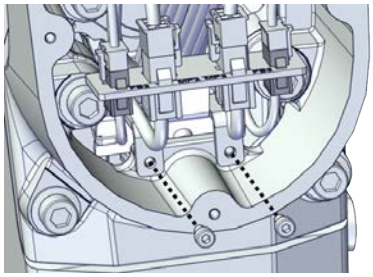
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5.6.3 Replacing the axis-3 motor
Continued

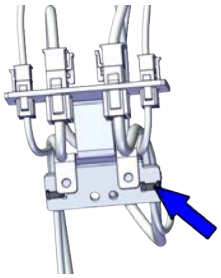
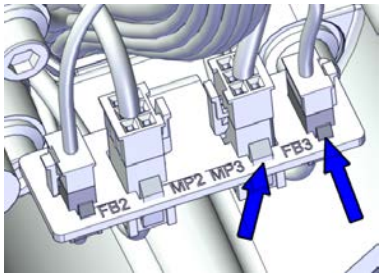
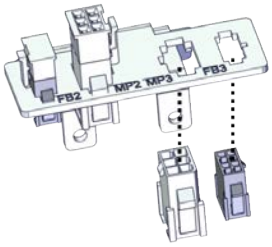
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the lower arm covers.	 xx2000001613

Disconnecting the axis-3 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate, as shown in following step.	 xx2000001548

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	Action	Note
4	Cut the cable strap.	 xx2000001620
5	Disconnect the connectors. • FB3 • MP3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001619
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001621

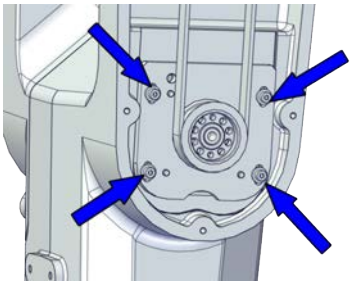
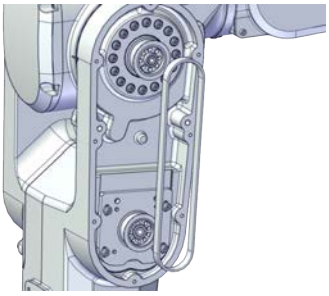
Removing the axis-3 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.6.3 Replacing the axis-3 motor
Continued

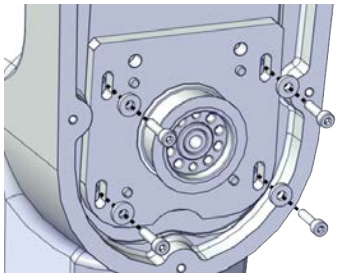
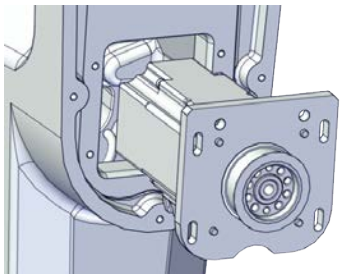
	Action	Note
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
4	**CAUTION** The upper arms, which includes housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit weighs 17 kg. All lifting accessories used must be sized accordingly!	
5	Fit a roundsling to the upper arm to support the weight (no force).	
6	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001614
7	Remove the timing belt from its groove on the motor.	 xx2000001615

Removing the axis-3 motor

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

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Remove the screws and washers.	 xx2000001616
5	Carefully lift out the motor.	 xx2000001617

Refitting the motor

Use these procedures to refit the axis-3 motor.

Refitting the axis-3 motor

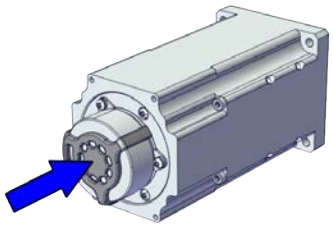
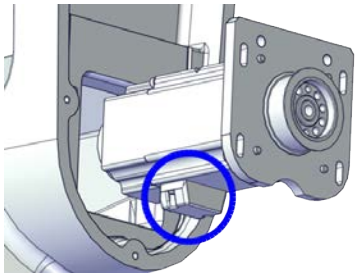
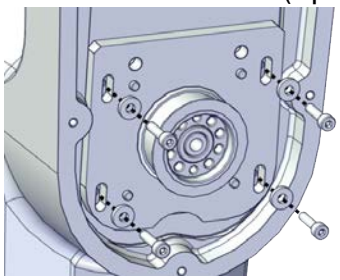
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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5.6.3 Replacing the axis-3 motor

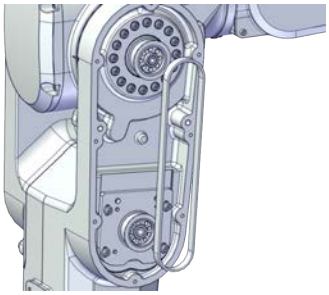
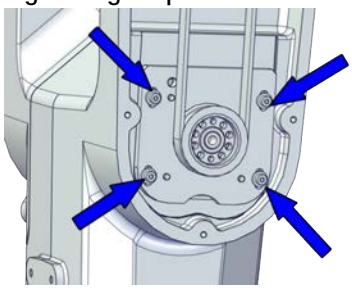
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	Action	Note
2	**CAUTION** Do not mix the axis-3 motor used for IRB 1300-7/1.4 and IRB 1300-12/1.4. Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-3 motor for IRB 1300-7/1.4: 3HAC073086-001 Axis-3 motor for IRB 1300-12/1.4: 3HAC082079-001
3	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
4	**Valid for IRB 1300-12/1.4** Check the resolver cover. Replace if damaged.	Resolver cover on axis-3 motor (IRB 1300-12/1.4): 3HAC060261-001  xx2100002770
5	Orient the motor correctly and fit it into the lower arm.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001618
6	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre (4 pcs)  xx2000001616

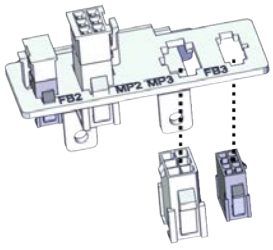
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Refitting the axis-3 timing belt

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001615
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	
4	Tighten the motor screws.	Tightening torque: 3.3 Nm  xx2000001614
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 73.4-78.5 Hz New belt: 87.8-92.1 Hz
6	Release the support to the upper arm.	

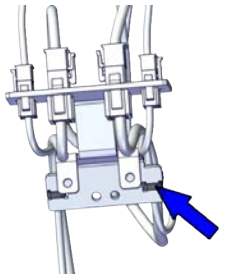
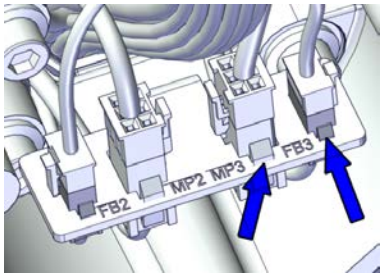
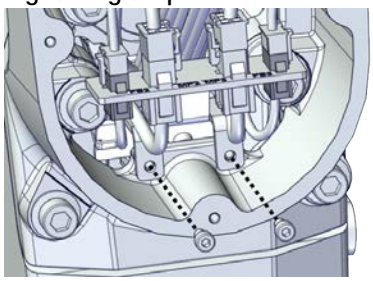
Reconnecting the axis-3 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001621

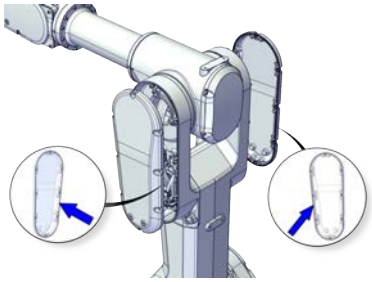
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5.6.3 Replacing the axis-3 motor
Continued

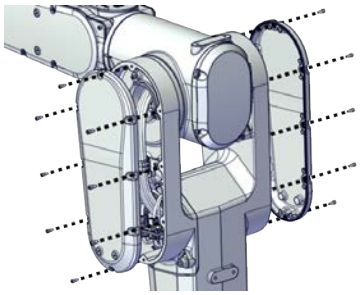
	Action	Note
3	Route and secure the cabling with a cable strap. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001620
4	Reconnect the connectors. • FB3 • MP3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001619
5	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001548

Refitting the lower arm covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. Replace if damaged.	 xx2000002505
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001

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	Action	Note
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
5	Refit the lower arm covers.	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001613

Concluding procedure

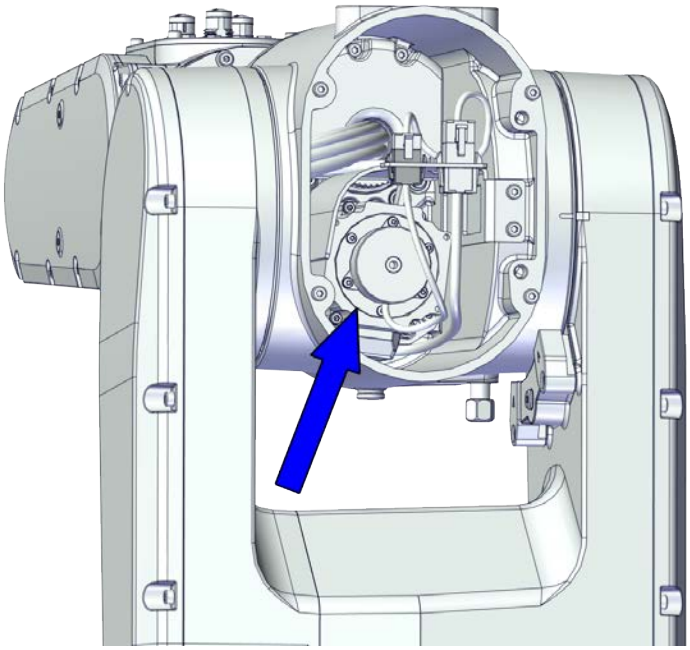
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.6.4 Replacing the axis-4 motor

Location of the axis-4 motor

The axis-4 motor is located as shown in the figure.



xx2000001483

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Motor unit, axis 4	3HAC073087-001	
Timing belt, axis 4	3HAC065806-001	
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.

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Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Tension adjustment tool for axis-4 timing belt	-	Included in special toolkit 3HAC076396-001.
Dynamometer	-	Used for measuring the timing belt tension.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor

Use these procedures to remove the axis-4 motor.

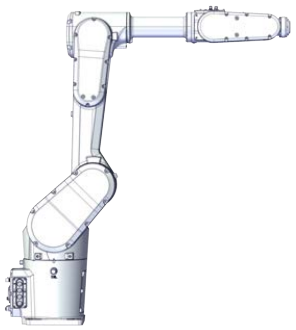
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5.6.4 Replacing the axis-4 motor

Continued

Preparations before removing the axis-4 motor

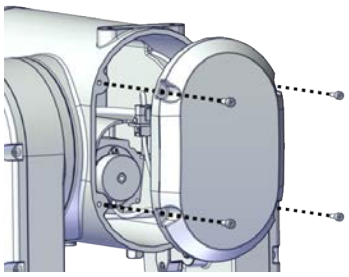
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Removing the housing cover

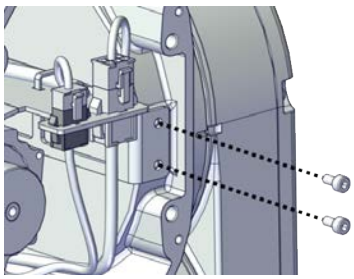
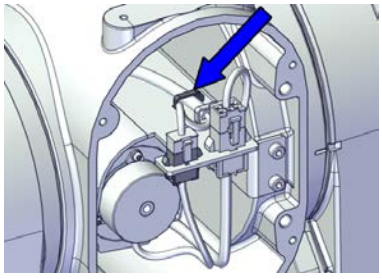
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the housing cover.	 xx2000001541

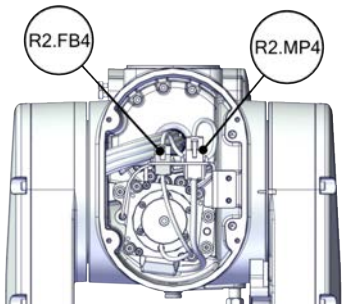
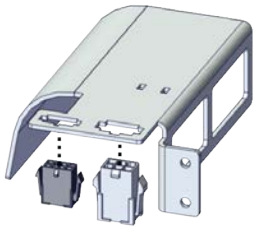
Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001542
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543

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5.6.4 Replacing the axis-4 motor
Continued

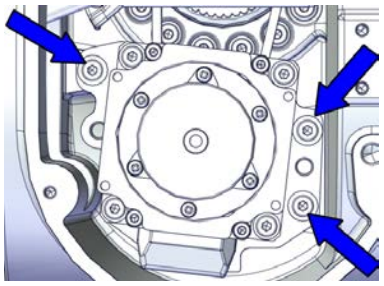
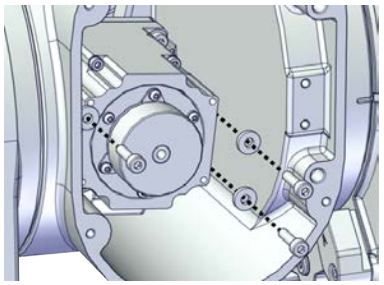
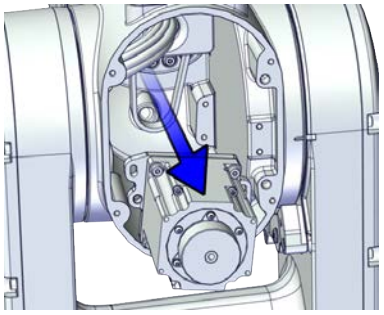
	Action	Note
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

Removing the axis-4 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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	Action	Note
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001604
5	Remove the timing belt from its groove on the motor.	
6	Remove the screws and washers.	 xx2000001605
7	Carefully lift out the motor.	 xx2000001606

Refitting the motor

Use these procedures to refit the axis-4 motor.

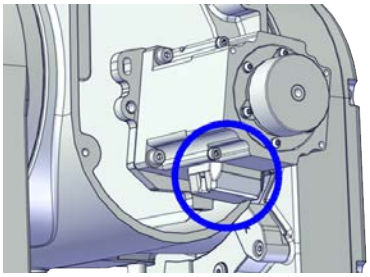
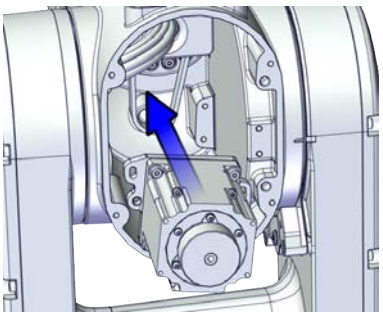
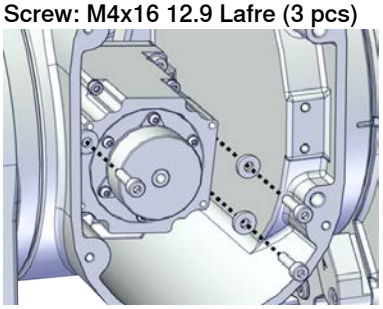
Refitting the axis-4 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	

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5.6.4 Replacing the axis-4 motor
Continued

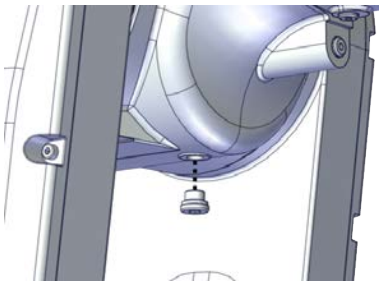
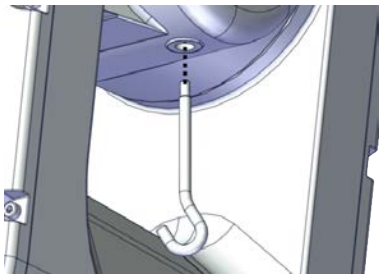
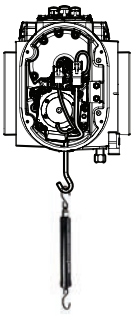
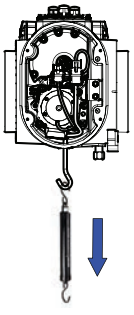
	Action	Note
3	Orient the motor correctly and fit it into the housing. **Note** Make sure the motor flange does not press on the timing belt.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001607
4	Install the timing belt to the motor pulley and verify that the belt runs correctly in the grooves of the pulley.	 xx2000001608
5	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre (3 pcs)  xx2000001605

Adjusting the axis-4 timing belt tension

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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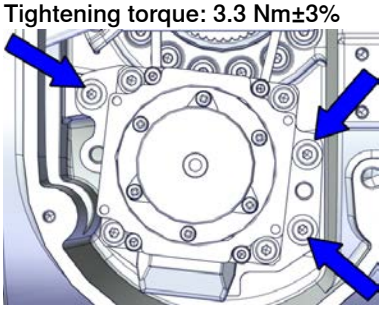
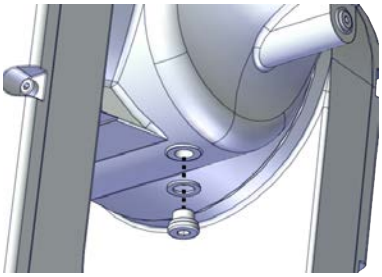
	Action	Note
2	Remove the screw below the housing.	 xx2000001609
3	Fit the tension adjustment tool for axis-4 timing belt to the screw hole.	Tension adjustment tool for axis-4 timing belt. Included in special toolkit 3HAC076396-001.  xx2000001610
4	Use a handheld dynamometer hooking to the tool.	 xx2000001611
5	Pull the dynamometer to make the tension falling in the allowed force range. **Note** During the measurement, make sure that all interferences that may affect the force are removed. Pay attention to the force application direction.	Used belt: 33.4-38.2 N New belt:47.8-52.4 N  xx2000001612

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5.6.4 Replacing the axis-4 motor

Continued

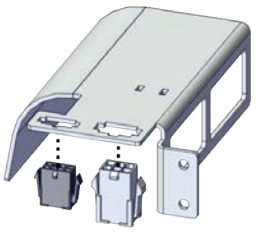
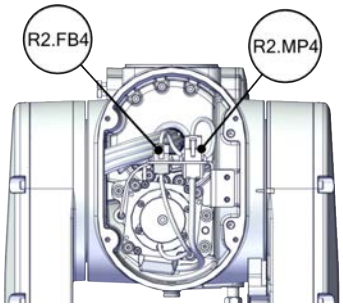
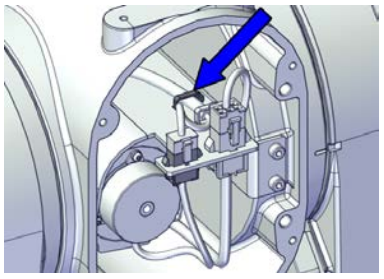
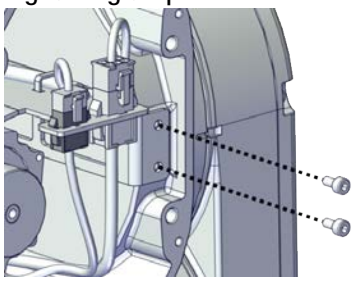
	Action	Note
6	Secure the motor with the screws.	Tightening torque: 3.3 Nm±3%  xx2000001604
7	Remove the tool and refit the plug screw. **For robots with protection type Clean Room (option 3351-4)** Refit the plug screw with the rubber washer.	Tightening torque: 3 Nm **For robots NOT with protection type Clean Room** Plug screw: 3HAC078352-001  xx2000001609 **For robots with protection type Clean Room (option 3351-4)** Plug screw, Clean Room: 3HAC078351-001 Rubber sealing washer: 3HAC075325-001  xx2000002496

Reconnecting the axis-4 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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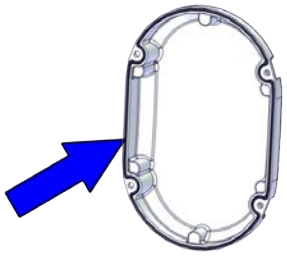
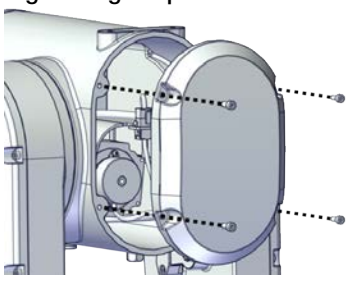
	Action	Note
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

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5.6.4 Replacing the axis-4 motor
Continued

Refitting the housing cover

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	 xx2000002511
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
5	Refit the housing cover.	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001541

Concluding procedure

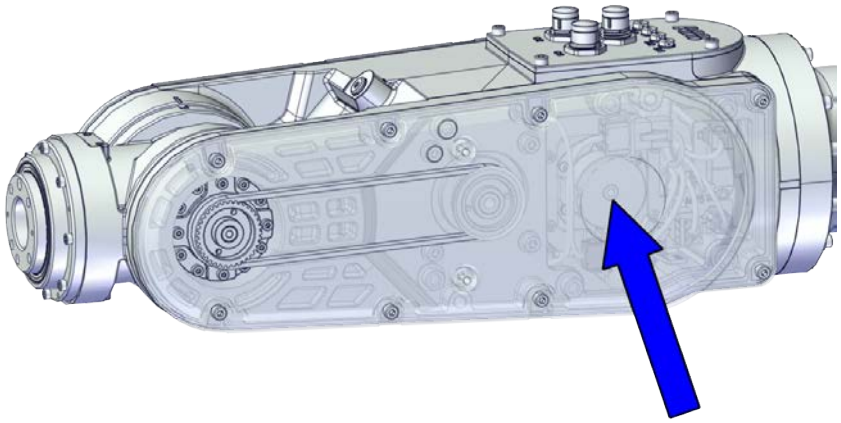
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.6.5 Replacing the axis-5 motor

Location of the axis-5 motor

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



xx2000001485

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Motor unit, axis 5 and axis 6	3HAC073088-001	
Timing belt, axis 5	3HAC065794-001	
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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5.6.5 Replacing the axis-5 motor
Continued

Spare part	Article number	Note
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Sonic tension meter	-	Used for measuring the timing belt tension.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

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Deciding calibration routine

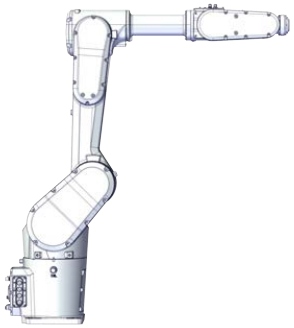
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor

Use these procedures to remove the axis-5 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.	
2	Jog all axes to zero position.	 xx2000001520

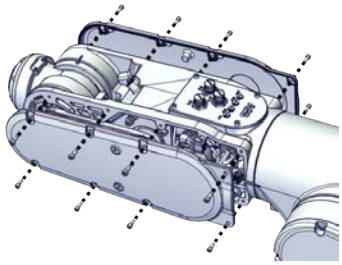
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5.6.5 Replacing the axis-5 motor
Continued

	Action	Note
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

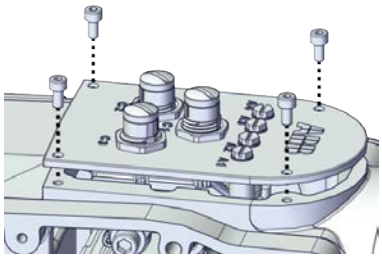
Removing the tubular covers

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the tubular covers.	 xx2000001593

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Loosening the process hub

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely.	 xx2000001538

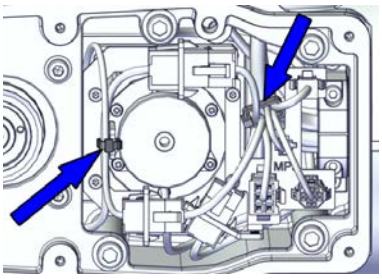
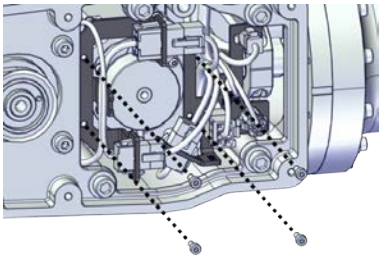
Loosening the cables in the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

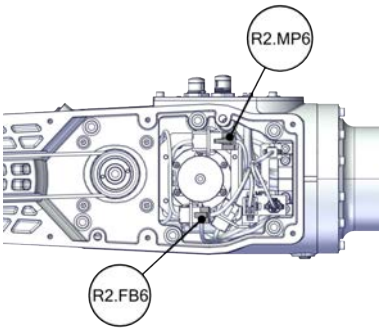
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5.6.5 Replacing the axis-5 motor
Continued

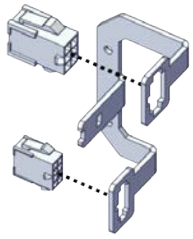
	Action	Note
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001531

Disconnecting the axis-6 motor connectors

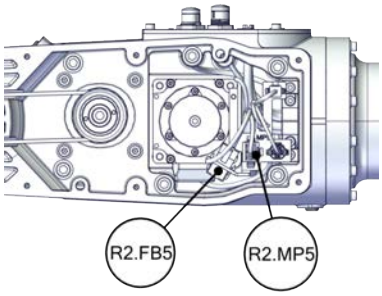
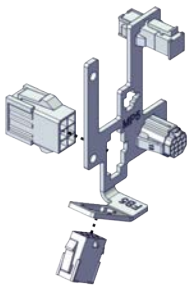
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532

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	Action	Note
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

Disconnecting the axis-5 motor connectors

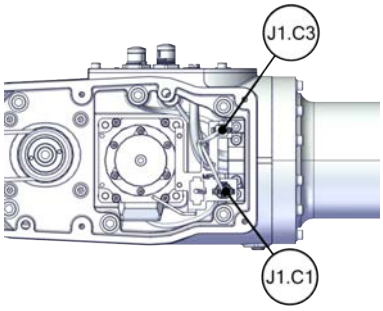
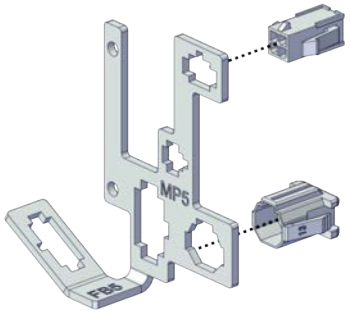
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

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5.6.5 Replacing the axis-5 motor
Continued

Disconnecting CP/CS cabling (if equipped)

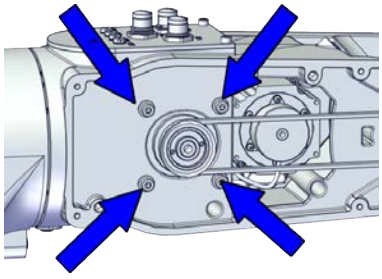
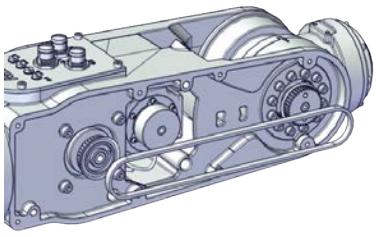
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

Removing the axis-5 timing belt

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

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001594
5	Remove the timing belt from its groove on the motor.	 xx2000001595

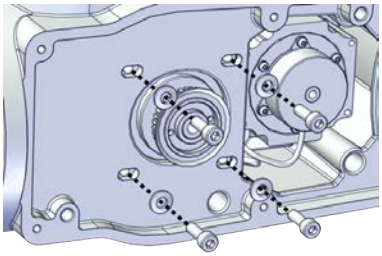
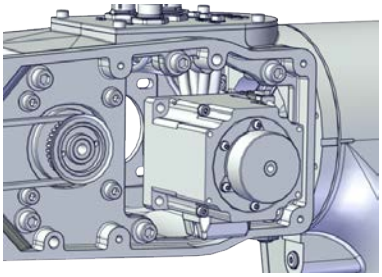
Removing the axis-5 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.6.5 Replacing the axis-5 motor
Continued

	Action	Note
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Remove the screws and washers.	 xx2000001596
5	Carefully lift out the motor.	 xx2000001597

Refitting the motor

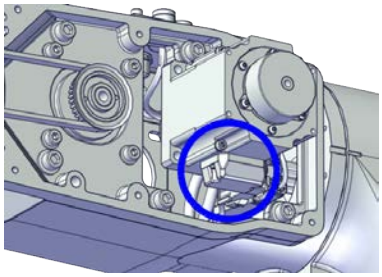
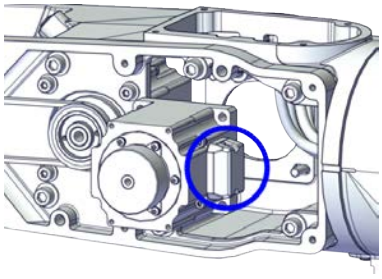
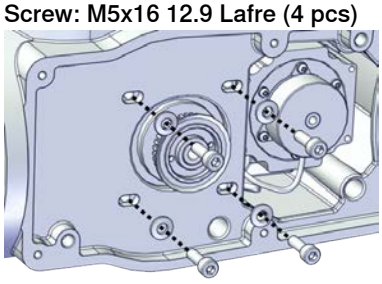
Use these procedures to refit the axis-5 motor.

Refitting the axis-5 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	

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	Action	Note
3	Orient the motor correctly and fit it into the tubular. **Note** Pay attention to the motor orientation (see figures for a reference); otherwise, other cables would be hard to be refitted in the tubular.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001598 Note that motor orientation for robots with solenoid valve (option 3303-3) is different from that for other robot types. Take the figure below as a reference.  xx2300001376
4	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre (4 pcs)  xx2000001596

Refitting the axis-5 timing belt

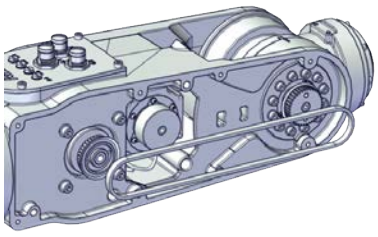
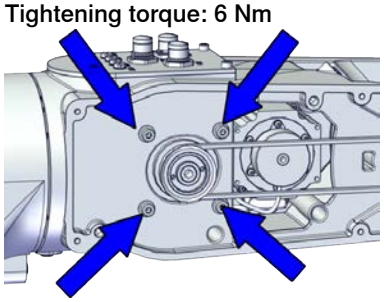
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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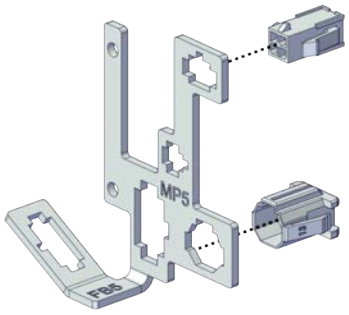
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5.6.5 Replacing the axis-5 motor

Continued

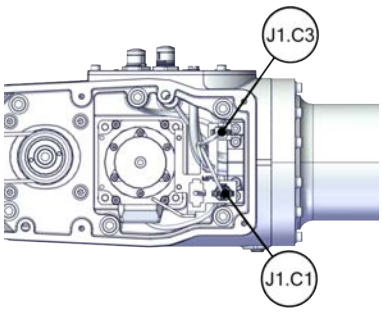
	Action	Note
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001595
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	
4	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001594
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 59.3-63.4 Hz New belt: 70.8-74.3 Hz

Reconnecting the CP/CS cabling (if equipped)

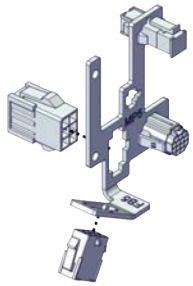
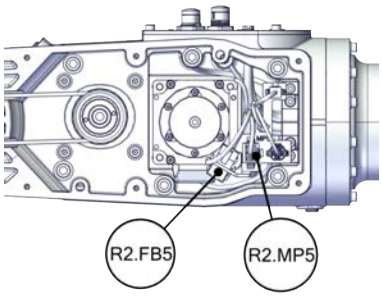
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537

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	Action	Note
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

Reconnecting the axis-5 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

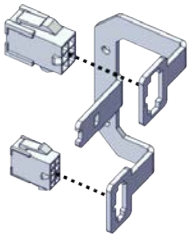
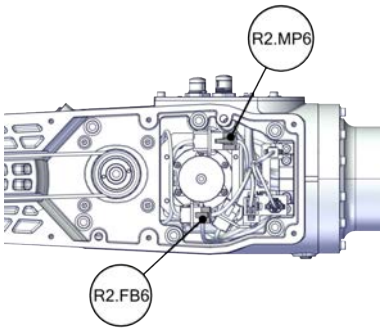
Reconnecting the axis-6 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

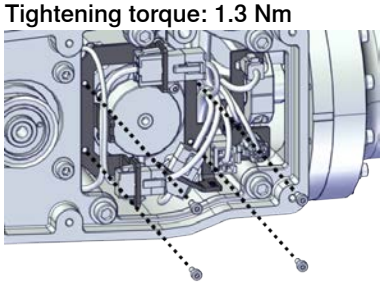
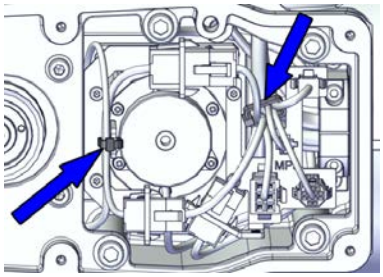
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5.6.5 Replacing the axis-5 motor
Continued

	Action	Note
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

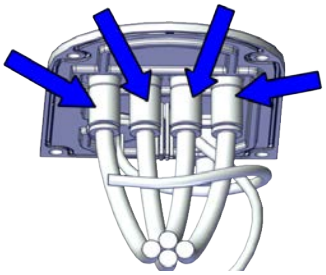
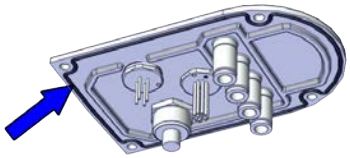
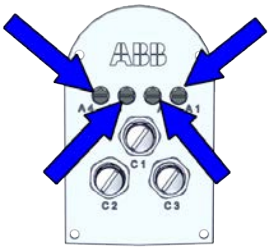
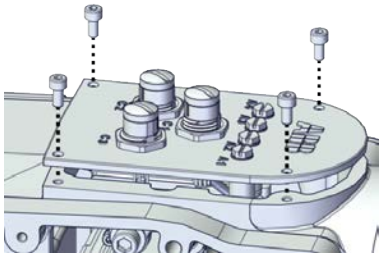
Securing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
3	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

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Refitting the process hub

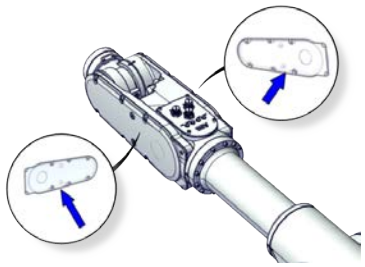
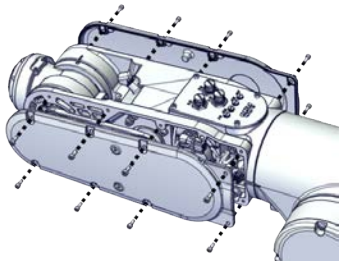
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the air hoses. Replace the cable package if damaged. See *Replacing the cable package on page 170*.	 xx2000001539
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
4	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
5	Refit the process hub.	Screw: M4x10 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538

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5.6.5 Replacing the axis-5 motor
Continued

Refitting the tubular covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. Replace if damaged.	 xx2000002507
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
5	Refit the tubular covers.	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001593

Concluding procedure

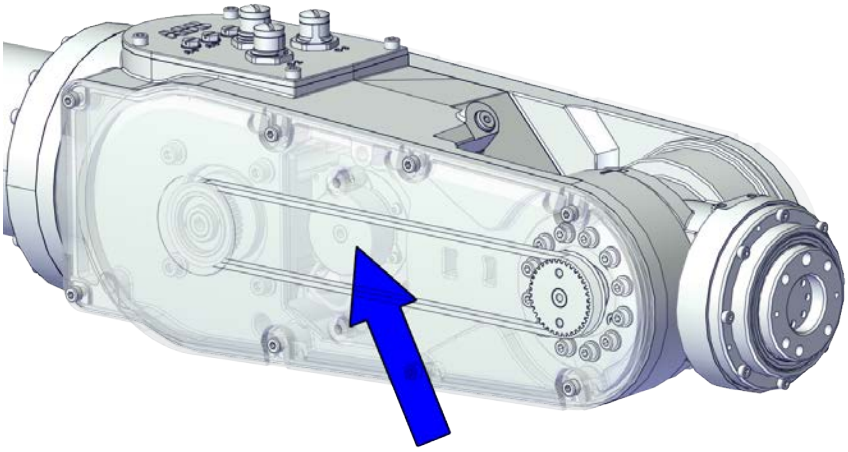
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.6.6 Replacing the axis-6 motor

Location of the axis-6 motor

The axis-6 motor is located as shown in the figure.



xx2000001484

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Motor unit, axis 5 and axis 6	3HAC073088-001	
Timing belt, axis 6	3HAC065788-001	
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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5.6.6 Replacing the axis-6 motor
Continued

Spare part	Article number	Note
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Sonic tension meter	-	Used for measuring the timing belt tension.

Required consumables

Consumable	Article number	Note
Cable straps	-	

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Consumable	Article number	Note
Grease	3HAC029132-001	FM 222

Deciding calibration routine

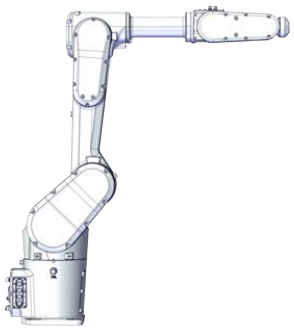
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	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 motor

Use these procedures to remove the axis-6 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 all axes to zero position.	 xx2000001520

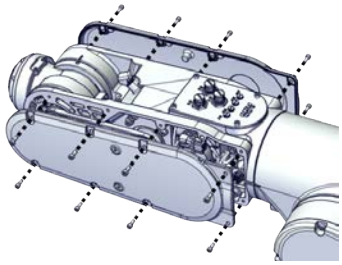
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5.6.6 Replacing the axis-6 motor
Continued

	Action	Note
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

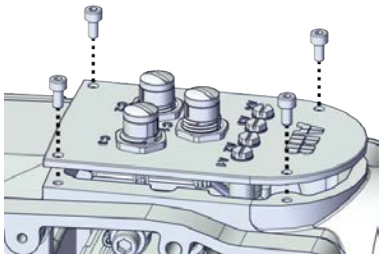
Removing the tubular covers

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the tubular covers.	 xx2000001593

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Loosening the process hub

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely.	 xx2000001538

Loosening the cables in the tubular

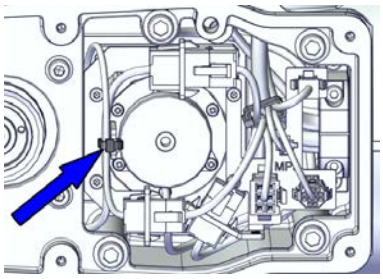
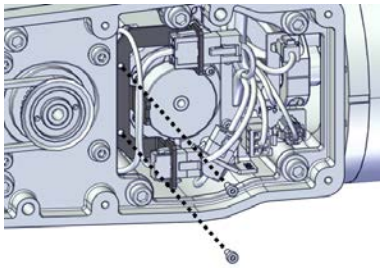
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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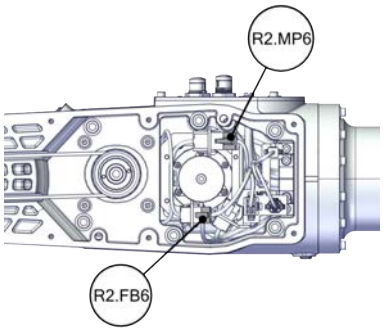
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5.6.6 Replacing the axis-6 motor

Continued

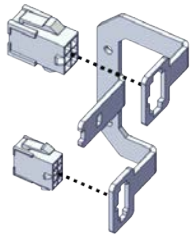
	Action	Note
3	Cut the cable strap.	 xx2100001483
4	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2100001484

Disconnecting the axis-6 motor connectors

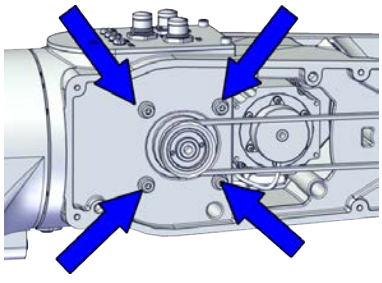
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532

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	Action	Note
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

Removing the axis-5 timing belt

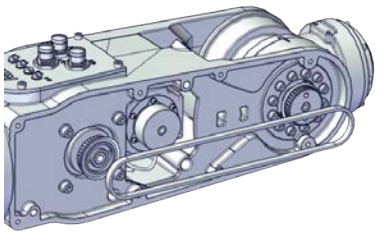
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001594

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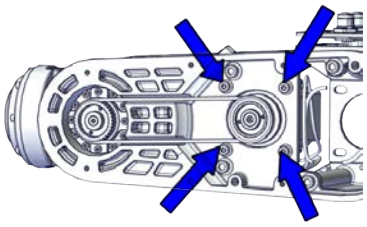
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5.6.6 Replacing the axis-6 motor

Continued

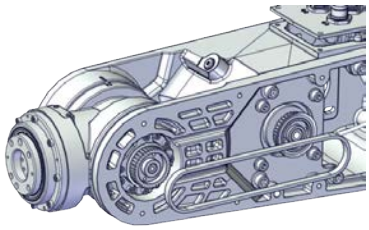
	Action	Note
5	Remove the timing belt from its groove on the motor.	 xx2000001595

Removing the axis-6 timing belt

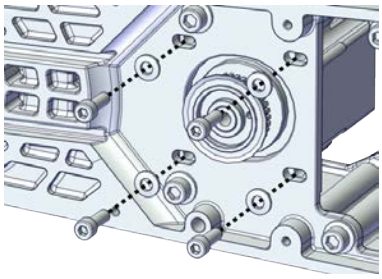
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001599

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	Action	Note
5	Remove the timing belt from its groove on the motor.	 xx2000001600

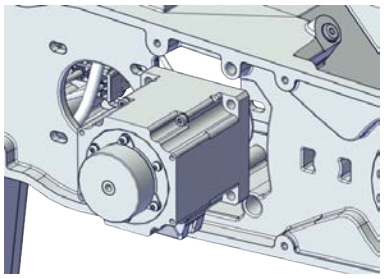
Removing the axis-6 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Remove the screws and washers.	 xx2000001601

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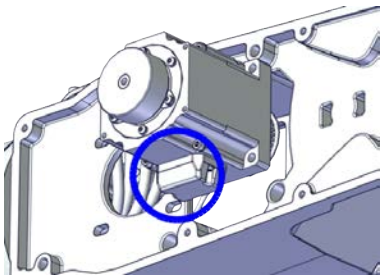
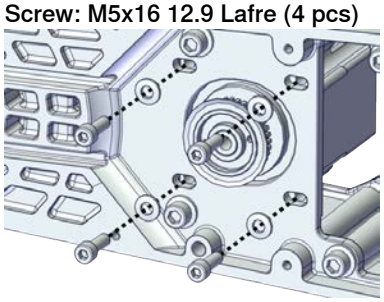
5.6.6 Replacing the axis-6 motor
Continued

	Action	Note
5	Carefully lift out the motor.	 xx2000001602

Refitting the axis-6 motor

Use these procedures to refit the axis-6 motor.

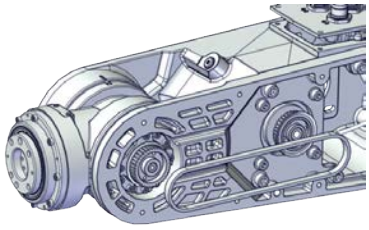
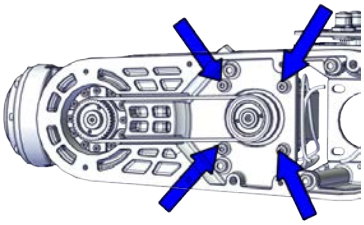
Refitting the axis-6 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Orient the motor correctly and fit it into the tubular. **Tip** Leave the axis-6 motor connectors accessible from the tubular support side.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001603
4	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre (4 pcs)  xx2000001601

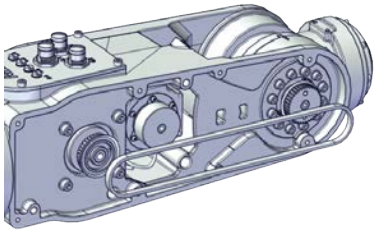
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Refitting the axis-6 timing belt

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001600
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	
4	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001599
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 85.7-91.6 Hz New belt: 102-107 Hz

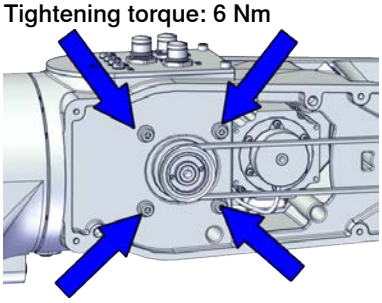
Refitting the axis-5 timing belt

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001595
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	

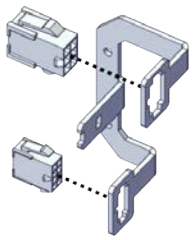
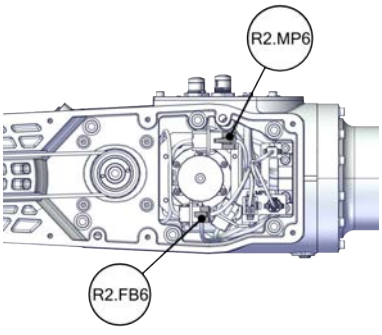
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5.6.6 Replacing the axis-6 motor
Continued

	Action	Note
4	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001594
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 59.3-63.4 Hz New belt: 70.8-74.3 Hz

Reconnecting the axis-6 motor connectors

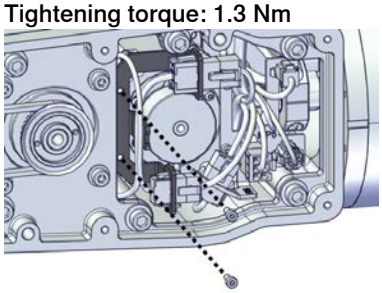
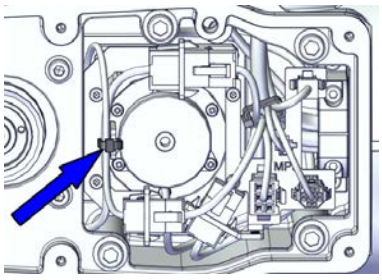
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

Securing the cable package in the tubular

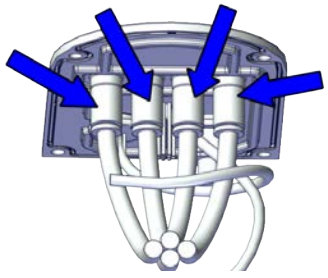
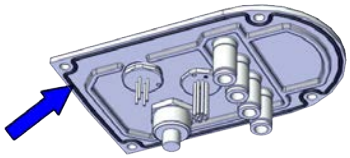
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs) Tightening torque: 1.3 Nm  xx2100001484
3	Route and secure the cabling with a cable strap. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2100001483

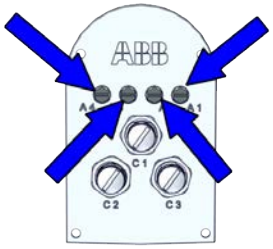
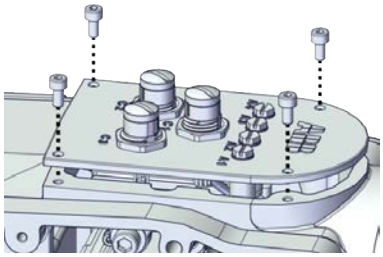
Refitting the process hub

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the air hoses. Replace the cable package if damaged. See *Replacing the cable package on page 170*.	 xx2000001539
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512

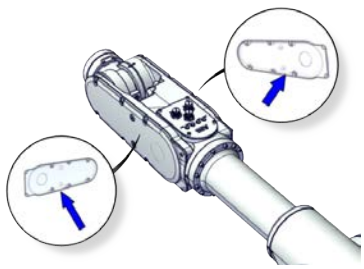
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5.6.6 Replacing the axis-6 motor
Continued

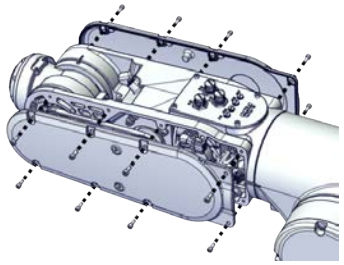
	Action	Note
4	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
5	Refit the process hub.	Screw: M4x10 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538

Refitting the tubular covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gaskets. Replace if damaged.	 xx2000002507
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

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	Action	Note
5	Refit the tubular covers.	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001593

Concluding procedure

	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

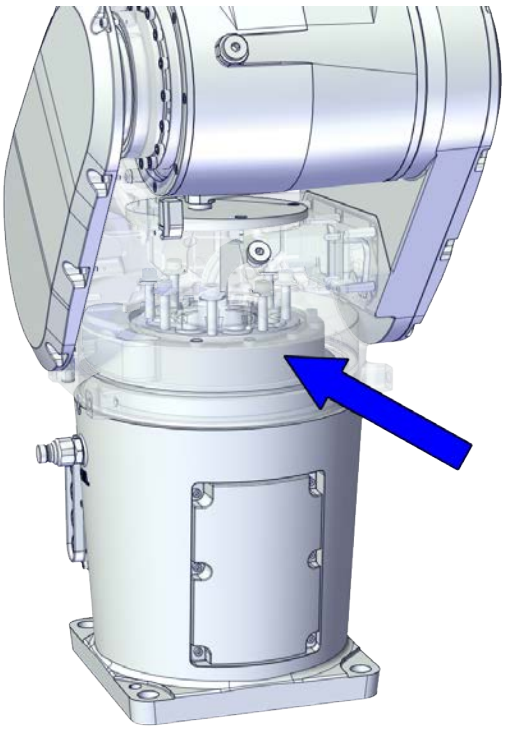
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5.7 Gearboxes

5.7.1 Replacing the axis-1 gearbox

Location of the axis-1 gearbox

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



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Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Gear unit, axis 1	3HAC063187-001	
O-ring on axis-1 gear unit	3HAC063187-007	
Motor unit, axis 1	3HAC073039-001	
O-ring on motor unit	3HAC061327-037	
Radial sealing	3HAC066433-001	
Radial sealing	3HAC070148-002	
Gasket on swing	3HAC067626-001	
Mechanical stop, axis 1, fixed block	3HAC064478-001	Replace if damaged.

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Spare part	Article number	Note
Mechanical stop, axis 1, slider	3HAC065755-001	Replace if damaged.
Main cable harness, S, basic	3HAC073303-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S (CP/CS and air hose, without Ethernet)	3HAC073304-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S (CP/CS and air hose, with Ethernet)	3HAC073305-001	Used with IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M, basic	3HAC073300-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M (CP/CS and air hose, without Ethernet)	3HAC073301-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, M (CP/CS and air hose, with Ethernet)	3HAC073302-001	Used with IRB 1300-10/1.15. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L, basic	3HAC073297-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L (CP/CS and air hose, without Ethernet)	3HAC073298-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, L (CP/CS and air hose, with Ethernet)	3HAC073299-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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5.7.1 Replacing the axis-1 gearbox
Continued

Spare part	Article number	Note
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Main cable harness, S, basic, Clean Room	3HAC077833-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, S, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077834-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, S, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077835-001	Used with IRB 1300-11/0.9. Used with protection type Clean Room.
Main cable harness, M, basic, Clean Room	3HAC077830-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, M, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077831-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, M, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077832-001	Used with IRB 1300-10/1.15. Used with protection type Clean Room.
Main cable harness, L, basic, Clean Room	3HAC077827-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Main cable harness, L, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077828-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Main cable harness, L, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077829-001	Used with IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.

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Spare part	Article number	Note
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 2	3HAC067816-001	
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, short	3HAC073095-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, long	3HAC073096-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing top cover	3HAC073091-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Base cover	3HAC073090-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
SMB cover	3HAC076475-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Brake release unit	3HAC073296-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.

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5.7.1 Replacing the axis-1 gearbox
Continued

Spare part	Article number	Note
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Swing cover, short, Clean Room	3HAC077824-001	Used with protection type Clean Room.
Swing cover, long, Clean Room	3HAC077825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Swing top cover, Clean Room	3HAC077820-001	Used with protection type Clean Room.
Base cover, Clean Room	3HAC077819-001	Used with protection type Clean Room.
SMB cover, Clean Room	3HAC077839-001	Used with protection type Clean Room.
Brake release unit, Clean Room	3HAC077826-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for SMB cover	3HAC067820-001	Not used with protection class IP40. Replace if damaged.
Gasket for brake release unit	3HAC070274-001	Not used with protection class IP40. Replace if damaged.
Gasket for base cover	3HAC067819-001	Not used with protection class IP40. Replace if damaged.
Gasket for base adapter	3HAC067818-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.

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Spare part	Article number	Note
Gasket for swing cover, long	3HAC067825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on swing (to base)	3HAC070148-003	Used with protection types Clean Room and Foundry Plus. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Connector for quick coupling, with outlet pipe	-	Used for draining and filling oil to axis-1 gearbox. Connector specification: G3/8
Oil dispenser	-	Includes pump with outlet pipe.
Axis-1 gearbox assembly cap	-	Included in special toolkit 3HAC076396-001.
Roundsling, 1.7 m	-	Length: 1.7 m Lifting capacity: >70 kg
Overhead crane	-	
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Required consumables

Consumable	Article number	Note
Cable straps	-	

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5.7.1 Replacing the axis-1 gearbox
Continued

Consumable	Article number	Note
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-009	Kyodo Yushi TMO150
Flange sealant for conical fittings	-	Loctite 5400 (or equivalent Loctite 577)

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Replacement of the axis-1 gearbox

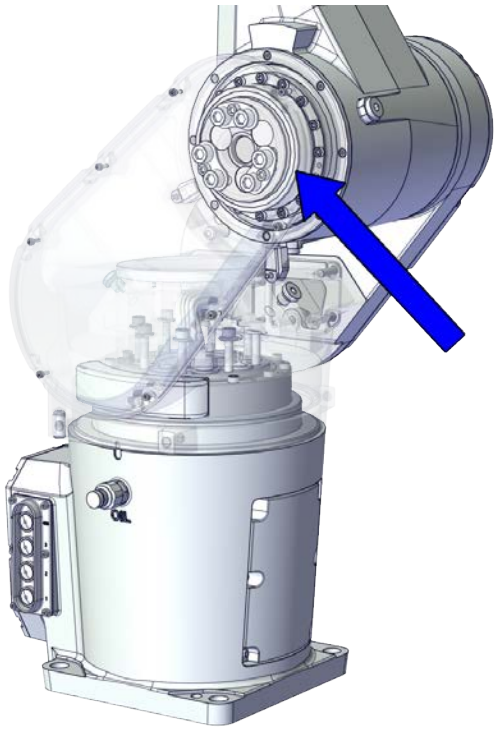
The axis-1 gearbox is accessible after removing the base, see *Replacing the base on page 231*.

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5.7.2 Replacing the axis-2 gearbox

Location of the axis-2 gearbox

The axis-2 gearbox is located as shown in the figure.



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Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Gear unit, axis 2	3HAC064977-001	
O-ring on axis-2 gear unit	3HAC064977-004	
Motor unit, axis 2	3HAC073078-001	Used for IRB 1300-11/0.9, IRB 1300-10/1.15 and IRB 1300-7/1.4.
Motor unit, axis 2 (IRB 1300-12/1.4)	3HAC082078-001	Used for IRB 1300-12/1.4.
O-ring on motor unit	3HAC061327-037	
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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5.7.2 Replacing the axis-2 gearbox
Continued

Spare part	Article number	Note
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 2	3HAC067816-001	
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Swing support, short	3HAC073041-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing support, short, Clean Room	3HAC077808-001	Used for IRB 1300-11/0.9. Used with protection type Clean Room.
Swing support, long	3HAC073052-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing support, long, Clean Room	3HAC077810-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Sealing ring, swing support side	3HAC065676-001	
O-ring on swing	3HAC061327-036	
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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Spare part	Article number	Note
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, short	3HAC073095-001	Used for IRB 1300-11/0.9. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Swing cover, long	3HAC073096-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Swing cover, short, Clean Room	3HAC077824-001	Used with protection type Clean Room.
Swing cover, long, Clean Room	3HAC077825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.

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Spare part	Article number	Note
Gasket for swing support, long	3HAC067823-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for IRB 1300-11/0.9. Not used with protection class IP40. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for IRB 1300-10/1.15, IRB 1300-7/1.4 and IRB 1300-12/1.4. Not used with protection class IP40. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on swing (to lower arm)	3HAC070148-004	Not used with protection class IP40. Replace if damaged.
Sealing ring, swing side	3HAC065675-001	Used with protection class IP67 and protection type Foundry Plus.
O-ring on lower arm	3HAC061327-015	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	Includes pump with outlet pipe.
Guide pin for axis-2 gearbox	-	Included in special toolkit 3HAC076396-001.
Roundsling, 1.7 m	-	Length: 1.7 m Lifting capacity: >70 kg
Overhead crane	-	

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Equipment	Article number	Note
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-009	Kyodo Yushi TMO150

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the gearbox

Use these procedures to remove the axis-2 gearbox.

Preparations before removing the axis-2 gearbox

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

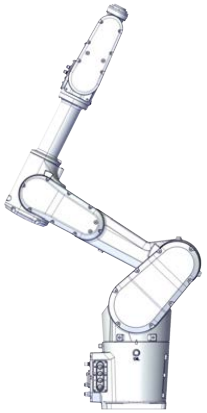
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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Jogging the robot to oil draining position

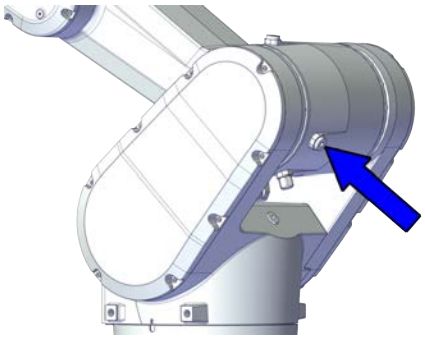
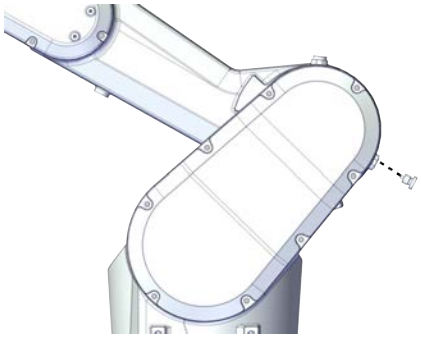
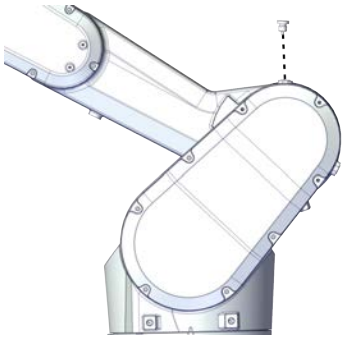
	Action	Note
1	Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance.	 xx2000001519
2	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Draining oil of axis-2 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**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.	

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	Action	Note
3	Place the oil collecting vessel underneath the oil plug, draining.	 xx2000001515
4	Remove the oil plug, draining.	 xx2000001516
5	Plug a clean pipe to the oil plug, draining, with the other end to the oil collecting vessel.	
6	Remove the oil plug, venting and keep it opened to speed up the drainage.	 xx2000001517
7	**WARNING** Used oil is hazardous material and must be disposed of in a safe way. See *Decommissioning on page 805* for more information.	
8	Drain the gearbox oil.	**Note** Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.

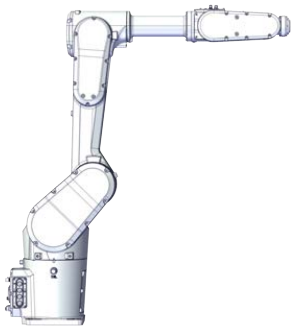
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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
9	Remove and clean the pipe after the oil is drained. **Note** There will be some oil left in the gearbox after draining.	
10	Refit oil plugs.	Tightening torque: 10 Nm

Jogging the robot to zero position

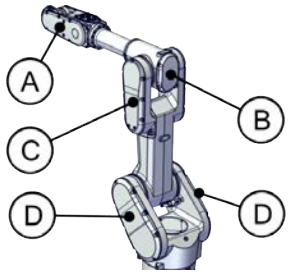
	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Removing the covers

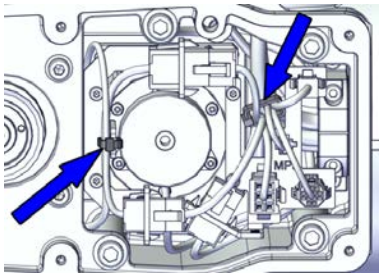
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing covers (D)	 xx2000001682

Loosening the cables in the tubular

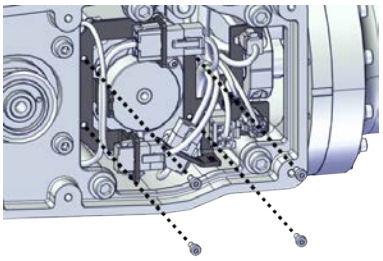
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Cut the cable straps.	 xx2000001530

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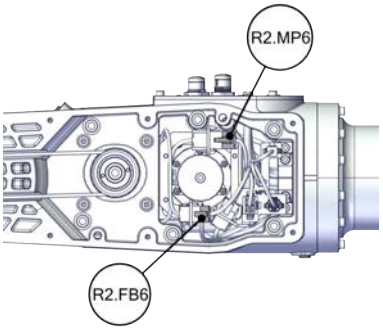
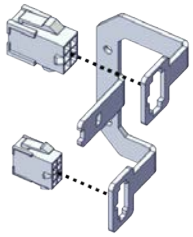
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5.7.2 Replacing the axis-2 gearbox

Continued

	Action	Note
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001531

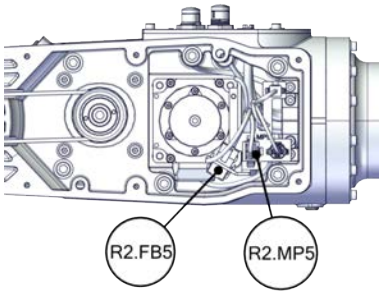
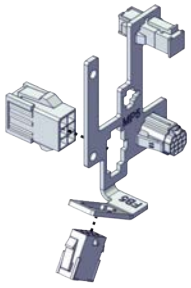
Disconnecting the axis-6 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

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Disconnecting the axis-5 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

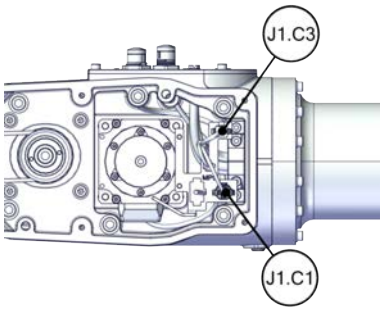
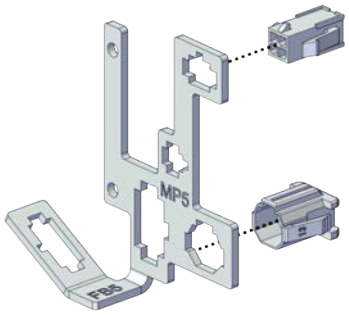
Disconnecting CP/CS cabling (if equipped)

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

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5.7.2 Replacing the axis-2 gearbox
Continued

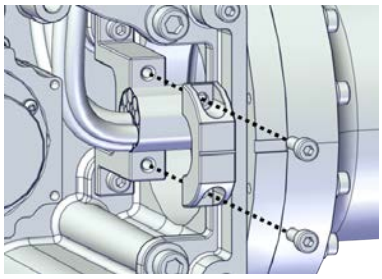
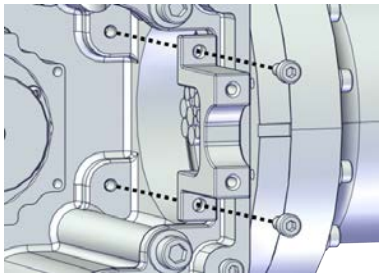
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

Separating the cable package from the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

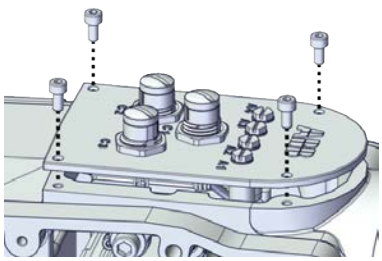
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	Action	Note
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub (without solenoid valve)

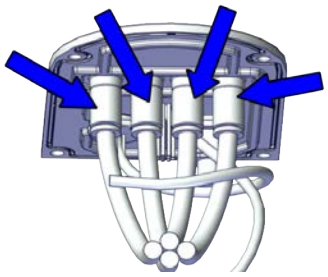
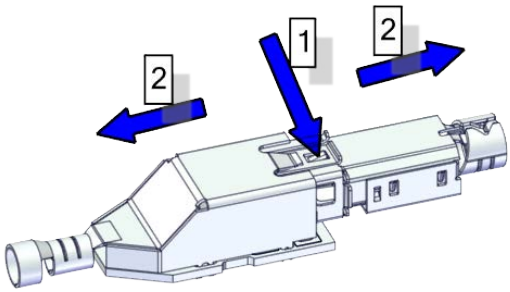
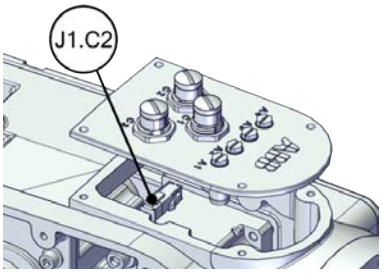
Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538

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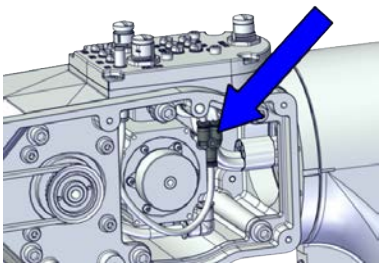
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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
4	Disconnect the air hoses.	 xx2000001539
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

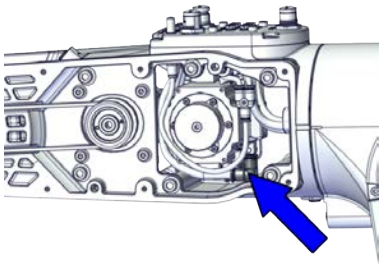
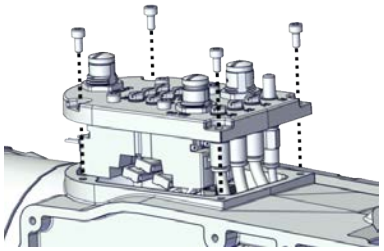
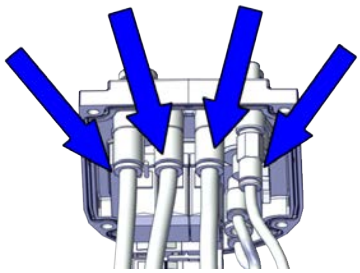
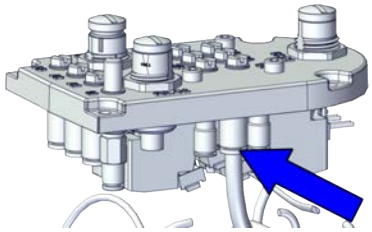
Removing the process hub (with solenoid valve)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370

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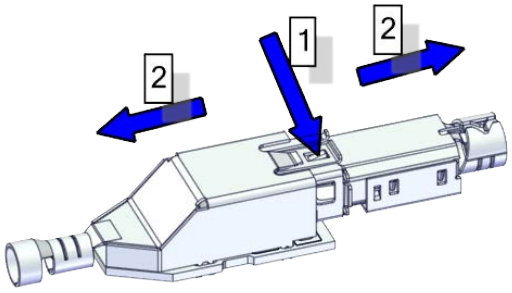
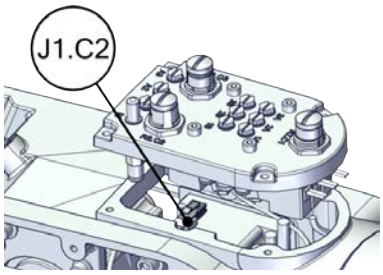
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	Action	Note
2	Disconnect the three L-shape connectors.	 xx2300001371
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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5.7.2 Replacing the axis-2 gearbox
Continued

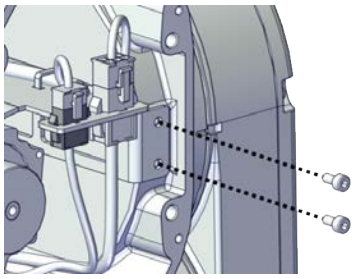
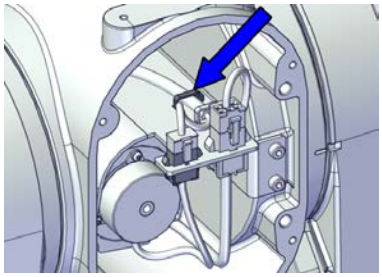
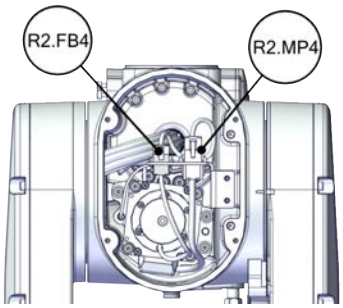
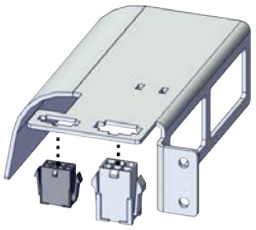
	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001542
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

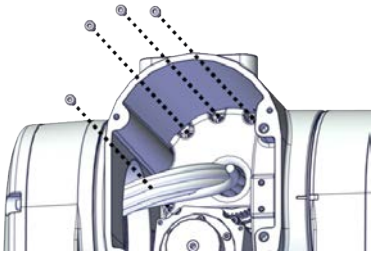
Separating the cable package from the housing

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

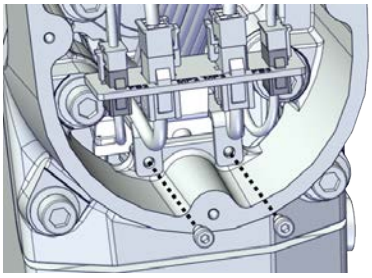
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5.7.2 Replacing the axis-2 gearbox
Continued

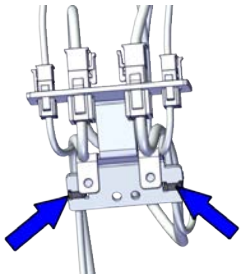
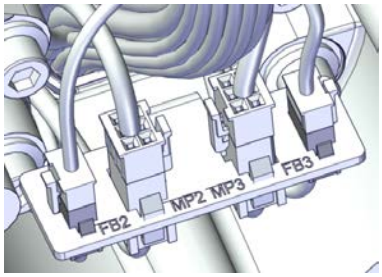
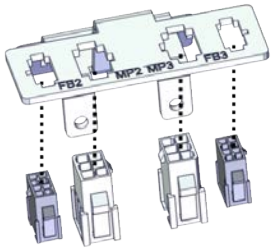
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 cable protector.	 xx2000001546

Disconnecting the axis-2 and -3 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate, as shown in following step.	 xx2000001548

Continues on next page

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	Action	Note
4	Cut the cable straps.	 xx2000001549
5	Disconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001550
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001551

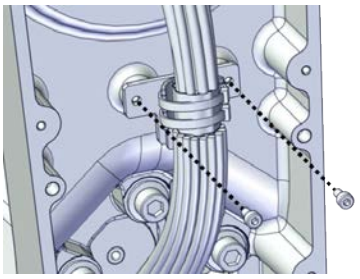
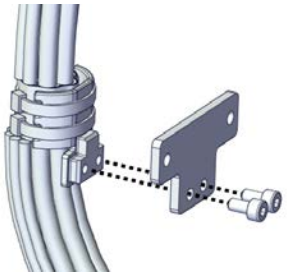
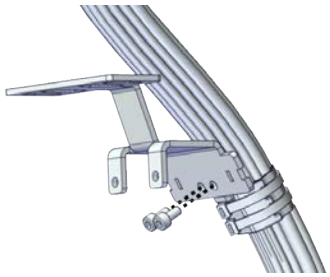
Separating the cable package from the lower arm

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.7.2 Replacing the axis-2 gearbox
Continued

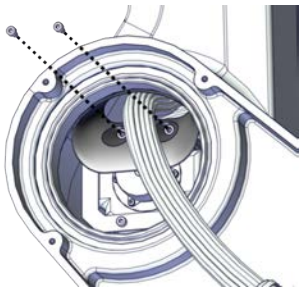
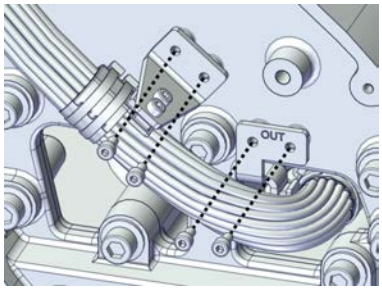
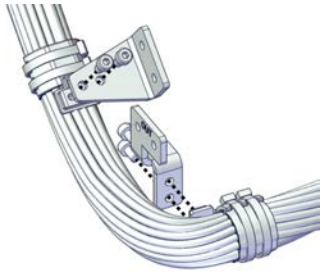
	Action	Note
3	Remove the cable bracket from the lower arm first and then from the cable package.	 xx2000001553  xx2100001465
4	Remove the connector plate.	 xx2000001554

Separating the cable package from the swing

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the axis-2 cable protector.	 xx2000001556
4	Remove the cable brackets from the swing first and then from the cable package.	 xx2000001557  xx2100001466

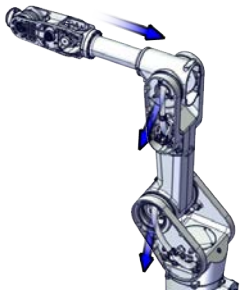
Pulling out the cable package

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Wrap the connectors with the masking tape.	

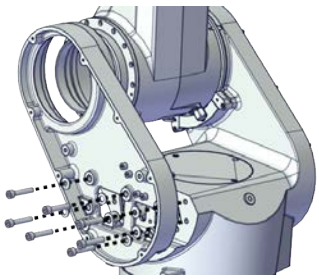
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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
4	Pull the cable package out to the swing support.	 xx2000001683

Removing the swing support

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the swing support. **Tip** If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.	 xx2000001684

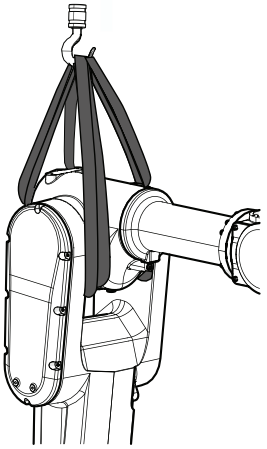
Supporting the lower and upper arms with roundslings

Note

The lower and upper arms include the lower arm, housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit.

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	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Run two roundslings between the housing and the lower arm.	Roundsling, 1.7 m (2 pcs), Lifting capacity: >70 kg  xx2000001685
4	**CAUTION** The lower and upper arms weighs 38 kg. All lifting accessories used must be sized accordingly!	
5	**WARNING** The robot is likely to be mechanically unstable if not secured to the foundation!	
6	**WARNING** Personnel must not, under any circumstances, be present under the suspended load.	

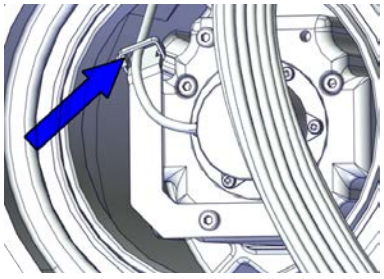
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5.7.2 Replacing the axis-2 gearbox
Continued

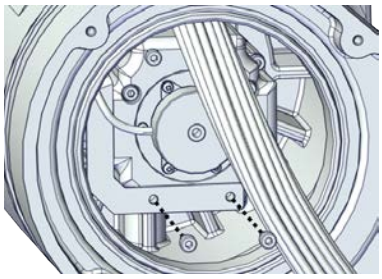
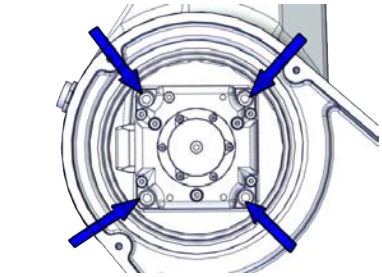
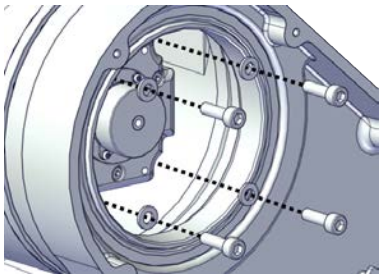
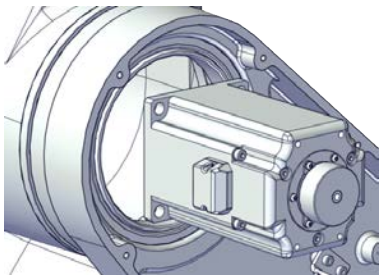
	Action	Note
7	Stretch the roundslings to take the weight of the lower and upper arms. **Note** Do not stretch the roundslings too much.	

Removing the axis-2 motor

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**WARNING** When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section *Gearbox lubricants (oil or grease) on page 32*.	
4	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
5	Cut the cable strap.	 xx2000001624

Continues on next page

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	Action	Note
6	Remove the cable bracket.	 xx2000001625
7	Access the screws and washers securing the axis-2 motor from the swing support.	 xx2000001627
8	Remove the screws and washers.	 xx2000001626
9	Carefully lift out the motor.	 xx2000001628

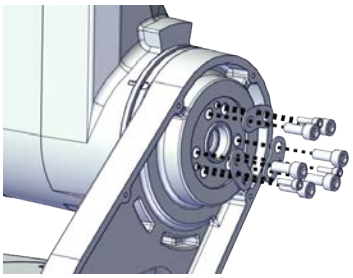
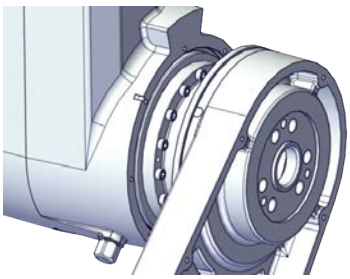
Separating the swing from the lower arm

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

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5.7.2 Replacing the axis-2 gearbox
Continued

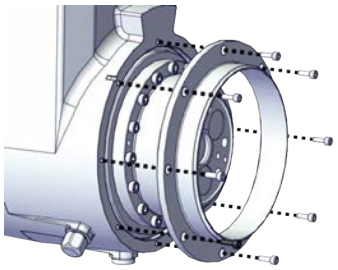
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws.	 xx2000001686
4	Separate the swing from the lower arm. **Tip** If the swing is hard to loosen from the lower arm, use a plastic hammer to knock on the swing lightly.	 xx2000001687

Removing the axis-2 sealing ring on the swing side

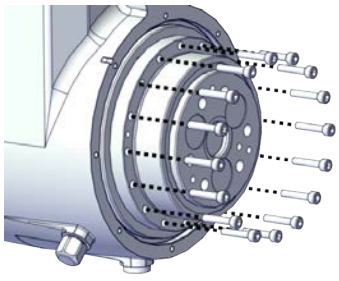
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Remove the sealing ring on the swing side.	 xx2000002516

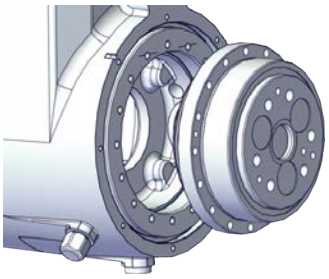
Removing the axis-2 gearbox

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
4	Remove the screws.	 xx2000001688

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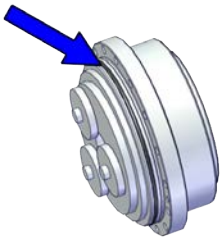
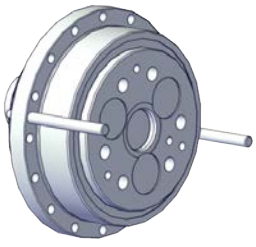
5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
5	Pull out the gearbox.	 xx2000001689

Refitting the gearbox

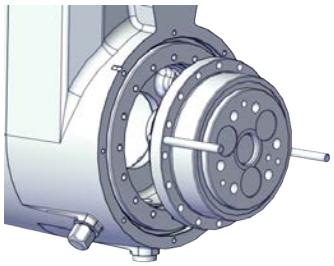
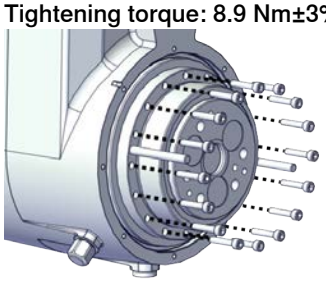
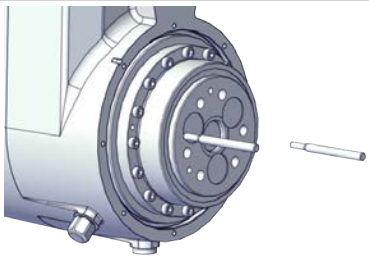
Use these procedures to refit the axis-2 gearbox.

Refitting the axis-2 gearbox

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the O-ring. Replace if damaged.	O-ring on axis-2 gear unit: 3HAC064977-004  xx2000001690
3	Fit guide pins to the axis-2 gearbox. **Note** Always use two guide pins together.	Guide pin for axis-2 gearbox. Included in special toolkit 3HAC076396-001.  xx2000001705

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	Action	Note
4	Refit the axis-2 gearbox, with guidance from the guide pins.	 xx2000001706
5	Secure with screws.	Screw: M5x25 12.9 Lafre (16 pcs) Tightening torque: 8.9 Nm±3%  xx2000001707
6	Remove the guide pins.	 xx2000001708

Check the radial sealing on the swing top

Note

This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

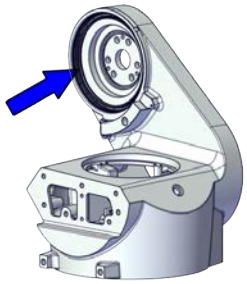
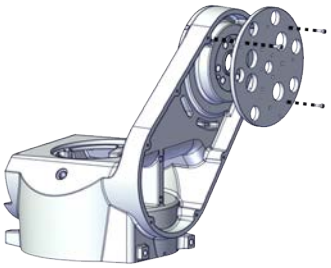
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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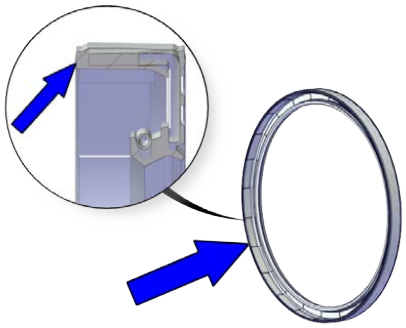
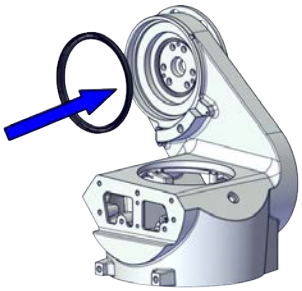
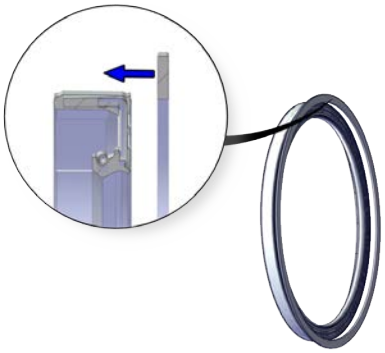
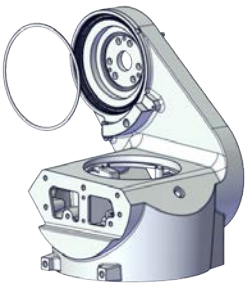
5.7.2 Replacing the axis-2 gearbox

Continued

	Action	Note
2	Check the radial sealing on the swing top. Replace if damaged, as described below.	 xx2000002460
3	Fit the big circular plate of the axis-2 sealing assembly tool to the swing (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002461
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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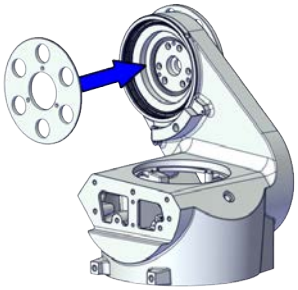
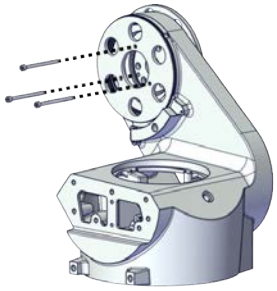
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	Action	Note
5	Fit the new sealing into the swing. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002462
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-2 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002463

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5.7.2 Replacing the axis-2 gearbox
Continued

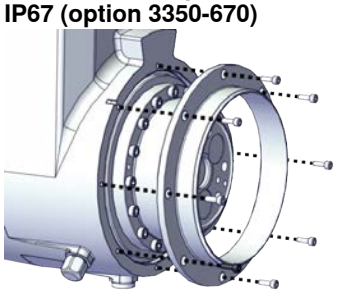
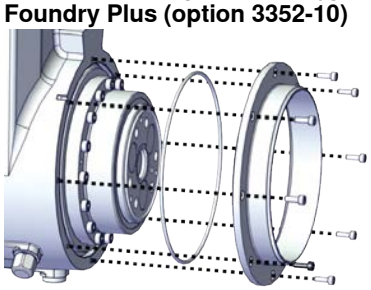
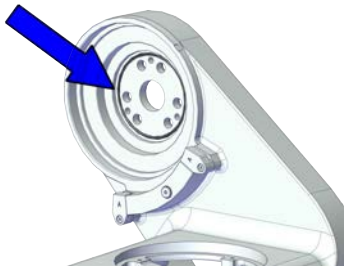
	Action	Note
7	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002464  xx2000002465
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the swing to the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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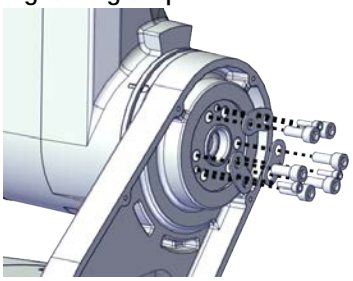
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	Action	Note
2	**For robots with protection class IP67 (option 3350-670)** Check the sealing ring. Replace if damaged. **For robots with protection type Foundry Plus (option 3352-10)** Check the sealing ring and the O-ring. Replace if damaged.	O-ring on lower arm: 3HAC061327-015 Sealing ring, swing side: 3HAC065675-001 Screw: M4x12 12.9 Lafre (8 pcs) Tightening torque: 3.8 Nm **For robots with protection class IP67 (option 3350-670)**  xx2000002516 **For robots with protection type Foundry Plus (option 3352-10)**  xx2000002527
3	Check the O-ring. Replace if damaged.	O-ring on swing: 3HAC061327-036  xx2000001750

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5.7.2 Replacing the axis-2 gearbox
Continued

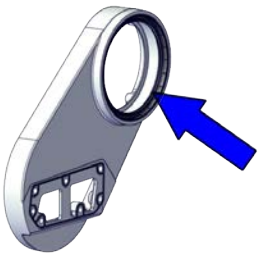
	Action	Note
4	Refit the swing to the lower arm.	**M10 screws** Screw: M10x25 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 72 Nm **M6 screws** Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (3 pcs) Tightening torque: 14 Nm  xx2000001686

Check the radial sealing on the swing support

Note

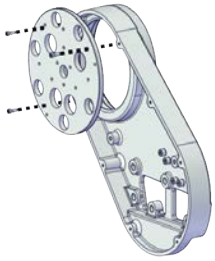
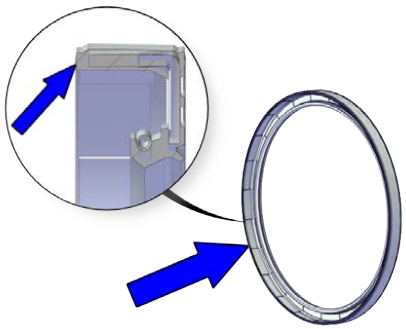
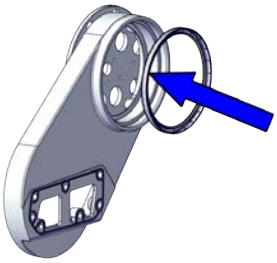
This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the swing support. Replace if damaged, as described below.	 xx2000002466

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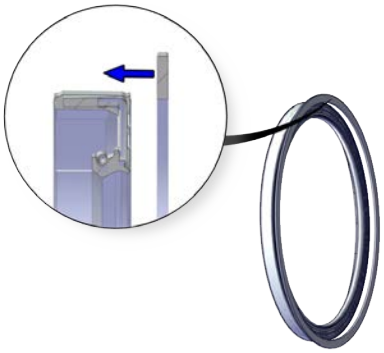
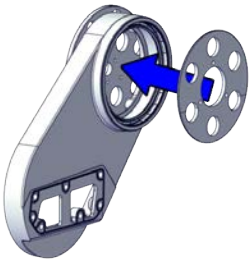
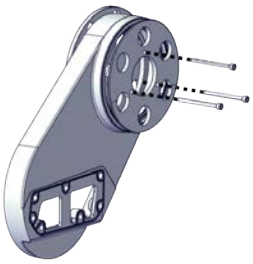
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	Action	Note
3	Fit the big circular plate of the axis-2 sealing assembly tool to the swing support (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002467
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001
5	Fit the new sealing into the swing support. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002468

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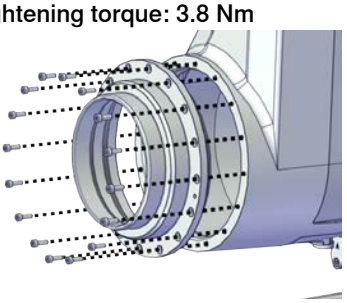
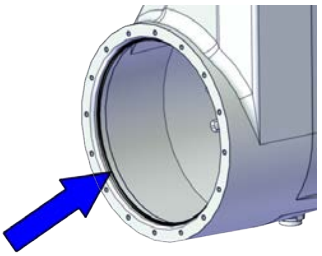
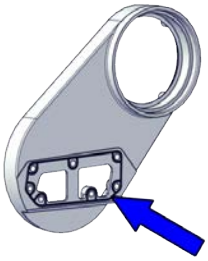
5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-2 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002469
7	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002470  xx2000002471
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

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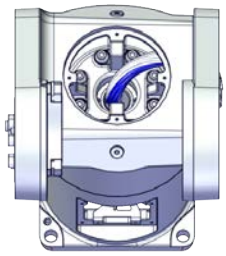
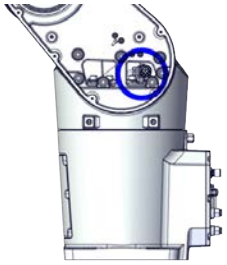
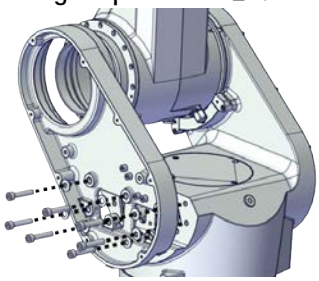
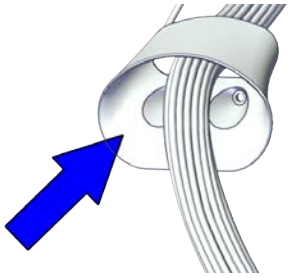
Refitting the swing support

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the sealing ring. Replace if damaged.	Sealing ring, swing support side: 3HAC065676-001 Screw: M4x12 12.9 Lafre (16 pcs) Tightening torque: 3.8 Nm  xx2000001692
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the O-ring. Replace if damaged.	O-ring on lower arm: 3HAC061327-015  xx2000002518
4	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for swing support, short: 3HAC067822-001 Gasket for swing support, long: 3HAC067823-001  xx2000002520

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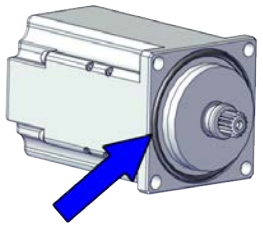
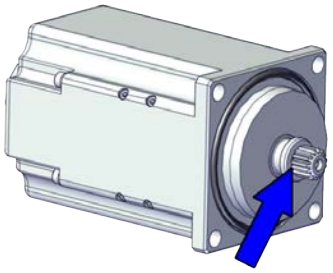
5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
5	Route the cable package through the swing support. Make sure that: • the air hoses are facing the SMB side in the hollow tube of axis-1 gearbox. • the cable package is out from the hole near the base rear, as circled in the figure. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001745  xx2000001747
6	Refit the swing support.	Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm±3%  xx2000001684
7	Apply grease to the axis-2 cable protector and slip it over the cable harness.	Grease: 3HAC029132-001 Plastic cable protector, axis 2: 3HAC067816-001  xx2000001567

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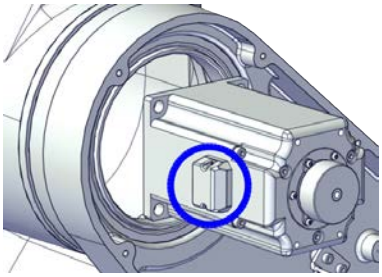
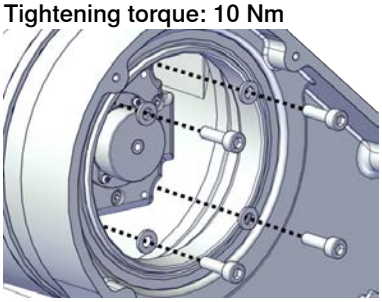
Refitting the axis-2 motor

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**CAUTION** Do not mix the axis-2 motor used for IRB 1300-7/1.4 and IRB 1300-12/1.4. Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-2 motor for IRB 1300-7/1.4: 3HAC073078-001 Axis-2 motor for IRB 1300-12/1.4: 3HAC082078-001
3	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
4	Check the O-ring. Replace if damaged.	O-ring on motor unit: 3HAC061327-037  xx2000001629
5	Apply lubricating oil to the motor that has contacting area with the gearbox.	Kyodo Yushi TMO150: 3HAC032140-009  xx2000001701

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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
6	Orient the motor correctly and fit it into the swing. Make sure the motor is properly fit to gearbox.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001630
7	Refit the screws and washers.	Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm  xx2000001626

Releasing the weight support for lower and upper arms

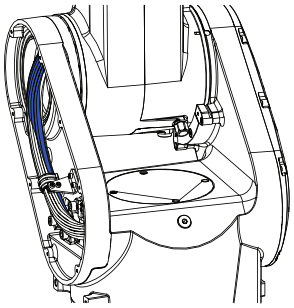
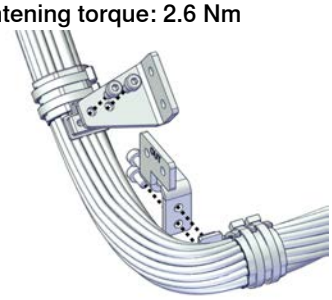
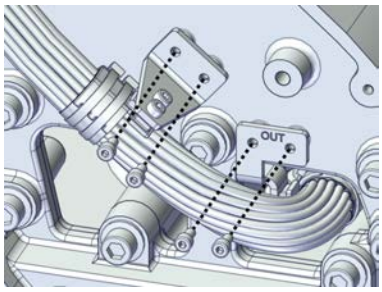
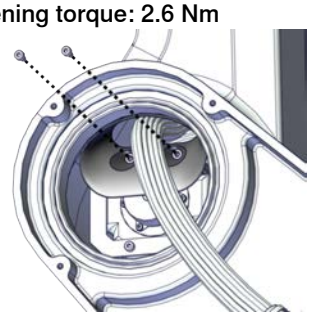
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**WARNING** Personnel must not, under any circumstances, be present under the suspended load.	
3	Make sure the lower and upper arms are firmly secured with the swing.	
4	Remove the roundslings.	

Securing the cable package in the swing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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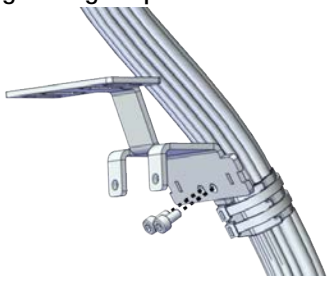
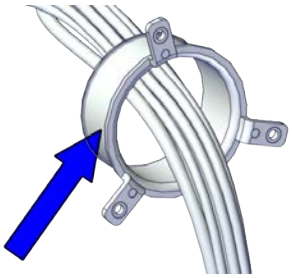
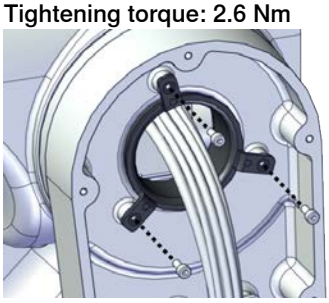
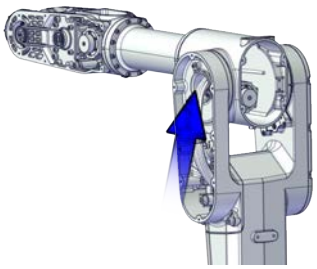
	Action	Note
2	Route the cable package up into the lower arm. Make sure that the the air hoses are facing outside in the axis-2 cable protector, see the figure as a guidance for the cable twisting way.	 xx2000001746
3	Refit the cable brackets.	Screw: M4x8 12.9 Lafre (2 pcs for each bracket on cable package and 2 pcs on swing) Tightening torque: 2.6 Nm  xx2100001466  xx2000001557
4	Refit the axis-2 cable protector.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001556

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5.7.2 Replacing the axis-2 gearbox
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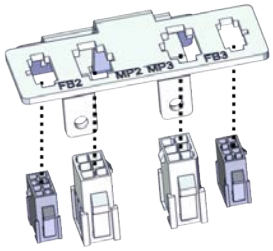
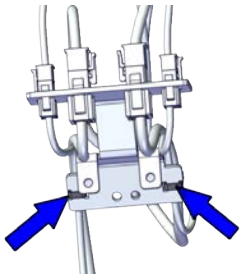
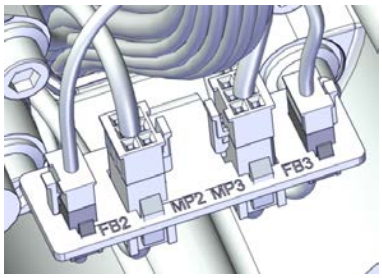
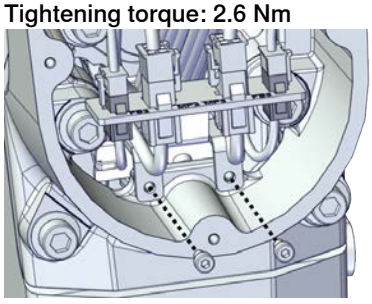
Routing the cable package in the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001554
3	Check the axis-3 cable protector. Replace if damaged. **Note** If replaced, apply grease to the axis-3 cable protector before refitting.	Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001  xx2000001568 Screw: M4x10 12.9 Lafre (3 pcs) Tightening torque: 2.6 Nm  xx2000001552
4	Route the cable package through the lower arm support and up into the housing. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001569

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Reconnecting the axis-2 and -3 motor connectors

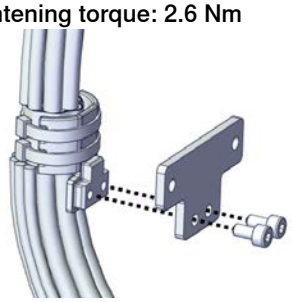
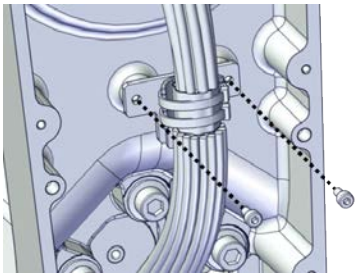
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001551
3	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001549
4	Reconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001550
5	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001548

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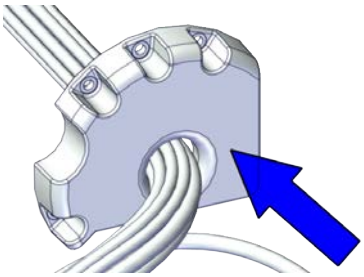
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5.7.2 Replacing the axis-2 gearbox
Continued

Securing the cable package in the lower arm

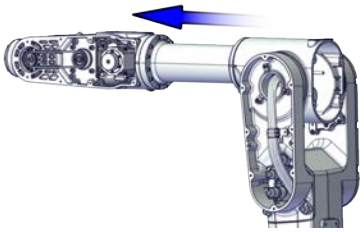
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the cable bracket.	Screw: M4x8 12.9 Lafre (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm  xx2100001465  xx2000001553

Routing the cable package in the housing

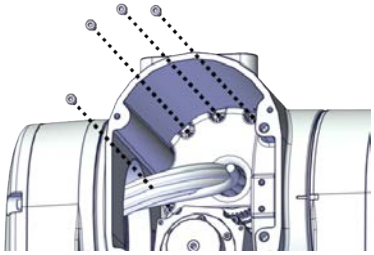
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Slip the axis-4 cable protector over the cable package.	Plastic cable protector, axis 4: 3HAC064694-001:  xx2000001570

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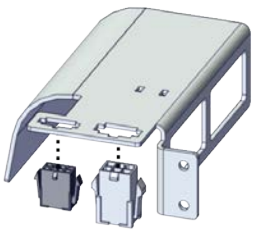
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	Action	Note
3	Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and into the tubular. Make sure that: • the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001571

Securing the cable package in the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 cable protector.	Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001546

Reconnecting the axis-4 motor connectors

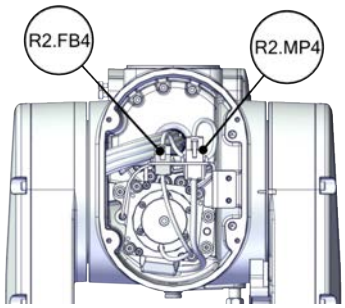
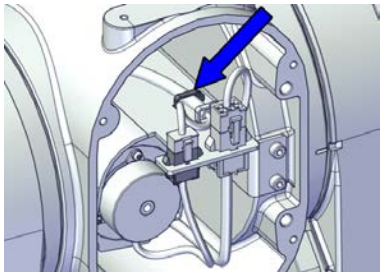
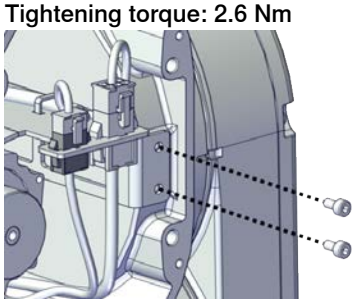
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545

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5.7.2 Replacing the axis-2 gearbox

Continued

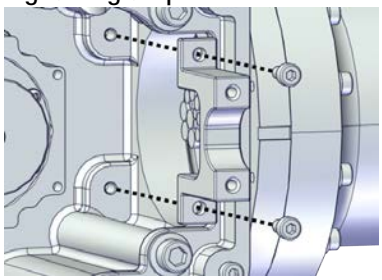
	Action	Note
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

Routing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

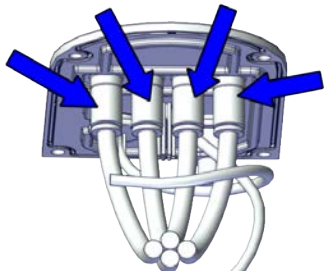
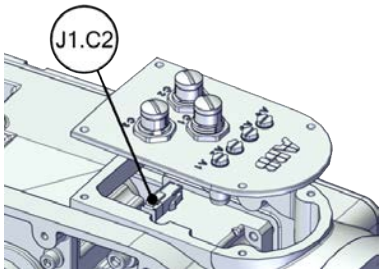
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	Action	Note
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

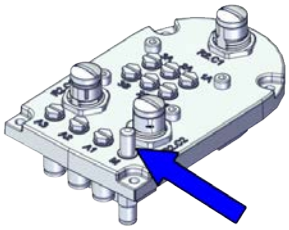
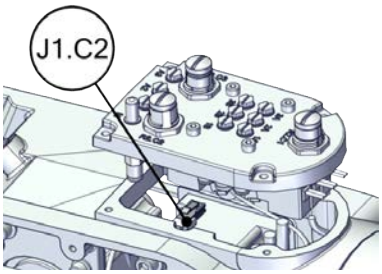
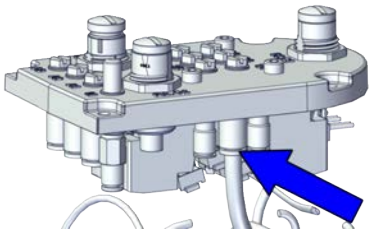
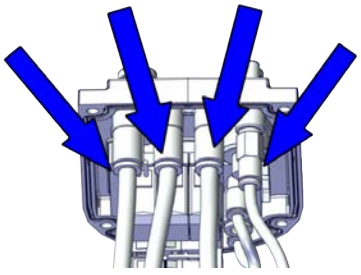
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5.7.2 Replacing the axis-2 gearbox
Continued

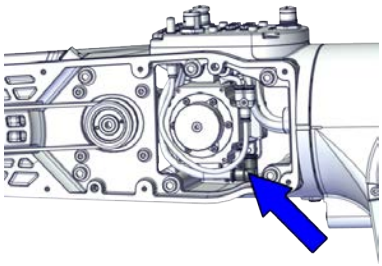
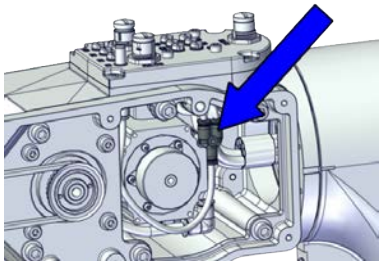
Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

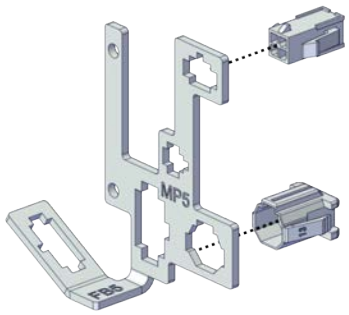
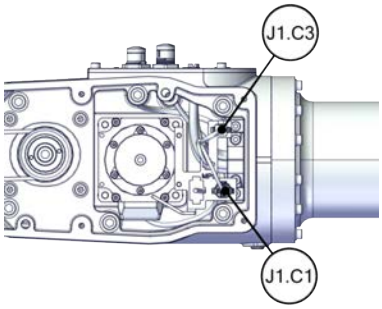
	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373

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	Action	Note
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

Reconnecting the CP/CS cabling (if equipped)

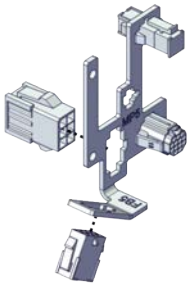
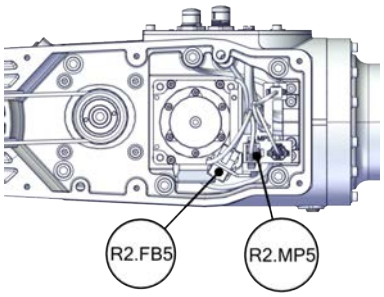
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

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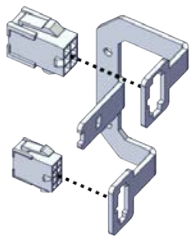
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5.7.2 Replacing the axis-2 gearbox
Continued

Reconnecting the axis-5 motor connectors

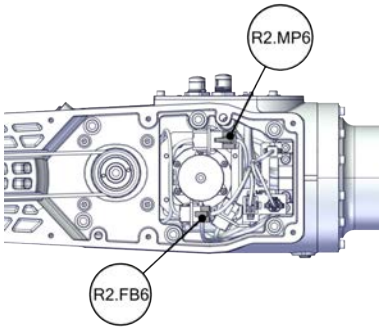
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

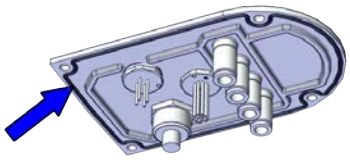
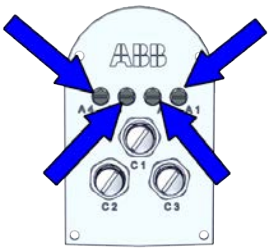
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533

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	Action	Note
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

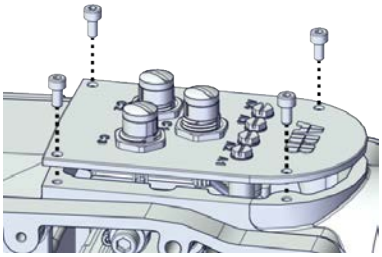
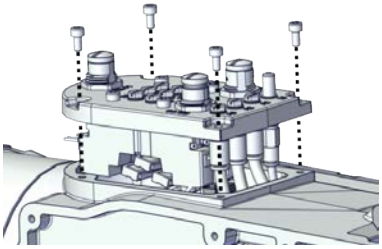
Refitting the process hub

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

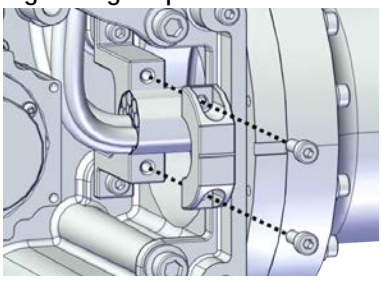
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5.7.2 Replacing the axis-2 gearbox
Continued

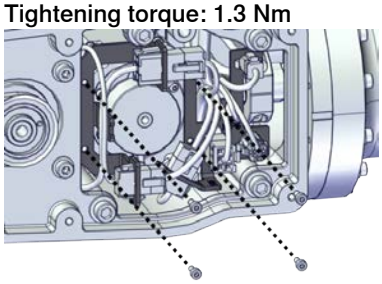
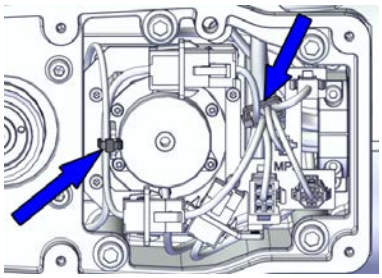
	Action	Note
5	Refit the process hub.	**Not valid for robots with solenoid valve (3303-3)** Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538
		Valid for robots with solenoid valve (3303-3) Screw: M4x12 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2300001372

Securing the cable package in the tubular

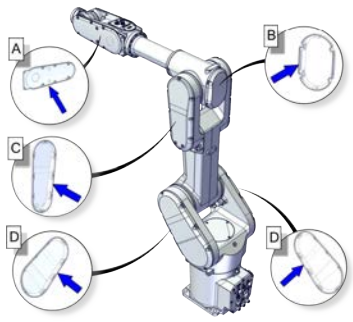
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748

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	Action	Note
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

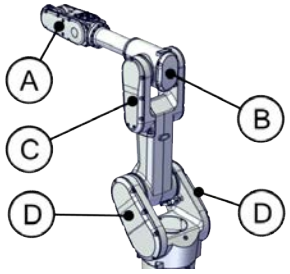
Refitting the covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** Check the gaskets. • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm support cover (C) • Gasket for swing covers (D) Replace if damaged.	 xx2000002498
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

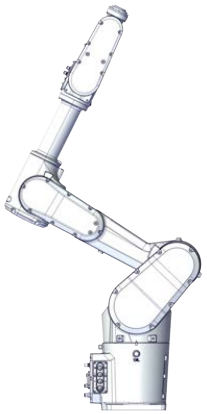
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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
5	Refit the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing covers (D)	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001682

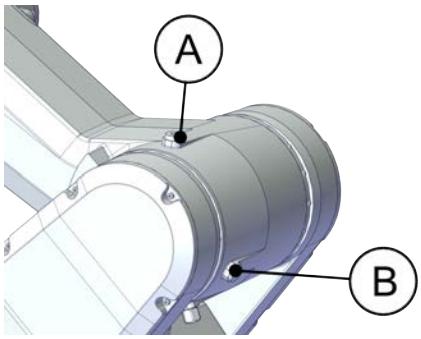
Jogging the robot to oil filling position

	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
2	Jog the robot to the specified position: • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance.	 xx2000001519
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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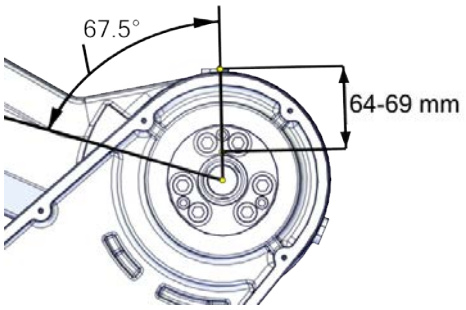
Refilling oil to axis-2 gearbox

	Action	Note
1	**WARNING** Handling gearbox oil involves several safety risks, see *Gearbox lubricants (oil or grease) on page 32*.	
2	**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.	
3	Open the upper oil plug. **Note** The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.	 xx2000001518 A – Oil plug, opened B – Oil plug, closed
4	**WARNING** Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	
5	Refill the gearbox with oil. **Note** The amount of oil to be filled depends on the amount previously being drained. **CAUTION** Oil filling must be slow to make sure air venting is fluent.	Type of oil and total amount is detailed in *Lubrication in gearboxes on page 816*.

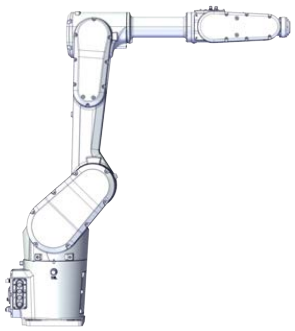
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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
6	Inspect the oil level by measuring the level at the upper oil plug hole. Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole. **CAUTION** The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.	 xx2000001580
7	Refit the oil plug.	Tightening torque: 10 Nm
8	**DANGER** Make sure all safety requirements are met when performing the first test run.	

Jogging the robot to zero position

	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to *Supplying power to connector R1.MP on page 69*.	
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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Concluding procedure

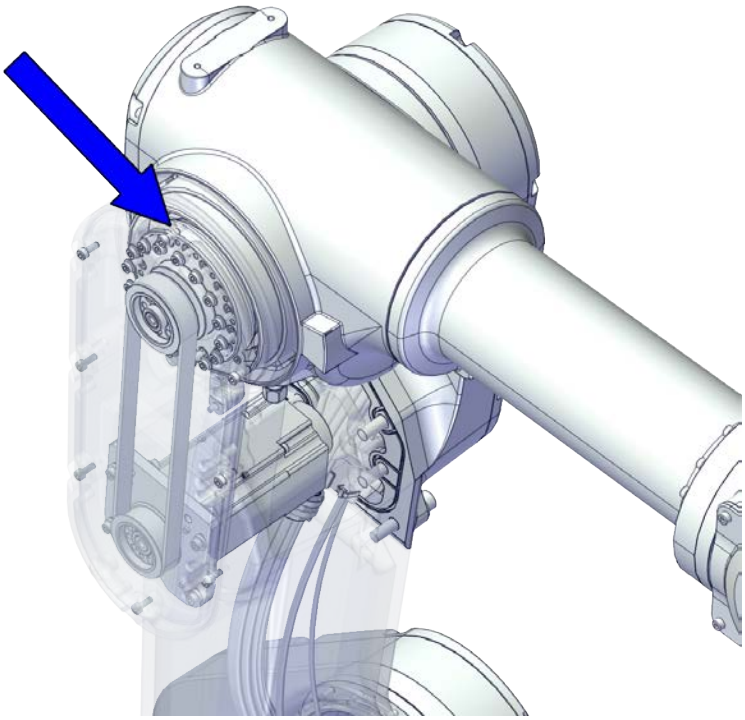
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.7.3 Replacing the axis-3 gearbox

Location of the axis-3 gearbox

The axis-3 gearbox is located as shown in the figure.



xx2000001488

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Gear unit, axis 3	3HAC073080-001	
O-ring on circular spline side, axis 3	3HAC061327-016	Not used with protection class IP40. Replace if damaged.
Timing belt, axis 3	3HAC067040-001	
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.

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Spare part	Article number	Note
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Lower arm support	3HAC073076-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm support, Clean Room	3HAC077813-001	Used with protection type Clean Room.
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.

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5.7.3 Replacing the axis-3 gearbox
Continued

Spare part	Article number	Note
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm support	3HAC067826-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on lower arm	3HAC070148-005	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Sonic tension meter	-	Used for measuring the timing belt tension.
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

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Deciding calibration routine

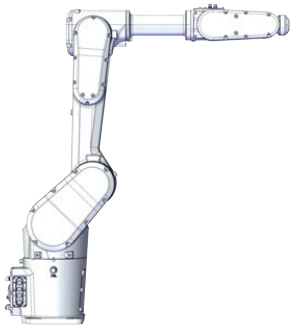
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the gearbox

Use these procedures to remove the axis-3 gearbox.

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 all axes to zero position.	 xx2000001520

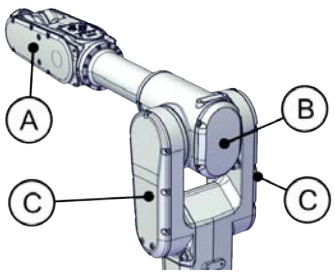
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5.7.3 Replacing the axis-3 gearbox
Continued

	Action	Note
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

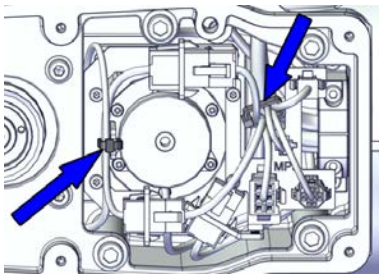
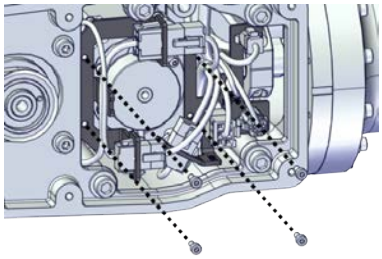
Removing the covers

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C)	 xx2000001661

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Loosening the cables in the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001531

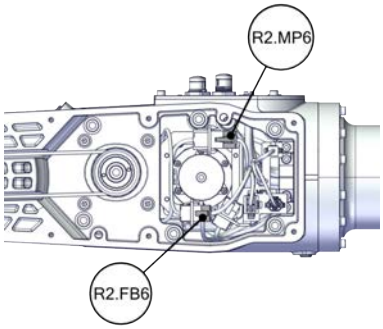
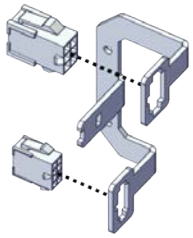
Disconnecting the axis-6 motor connectors

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

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5.7.3 Replacing the axis-3 gearbox
Continued

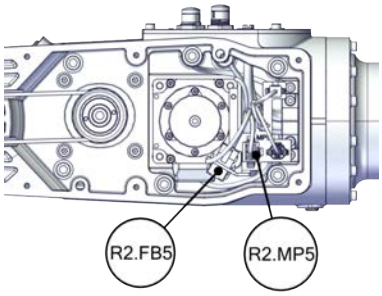
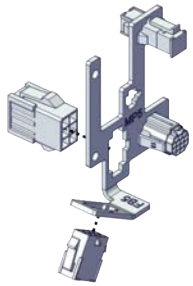
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

Disconnecting the axis-5 motor connectors

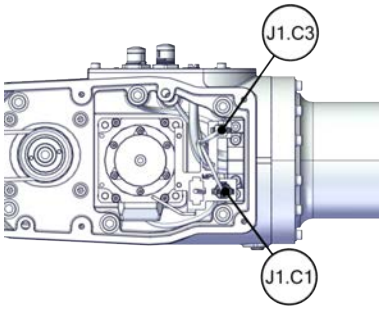
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

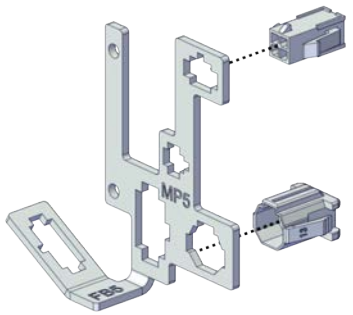
Disconnecting CP/CS cabling (if equipped)

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536

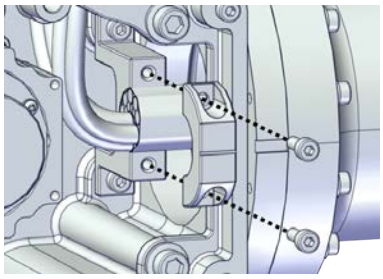
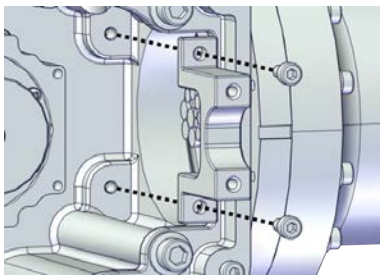
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5.7.3 Replacing the axis-3 gearbox
Continued

	Action	Note
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

Separating the cable package from the tubular

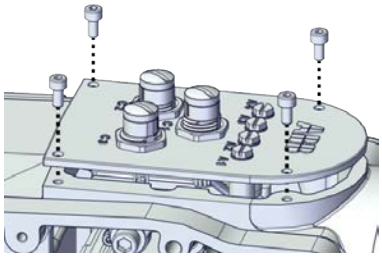
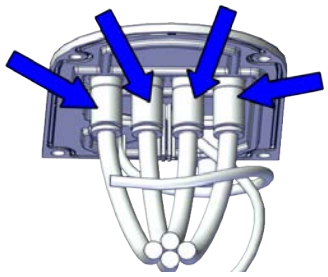
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

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Removing the process hub (without solenoid valve)

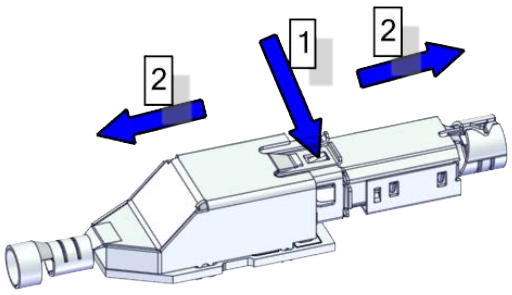
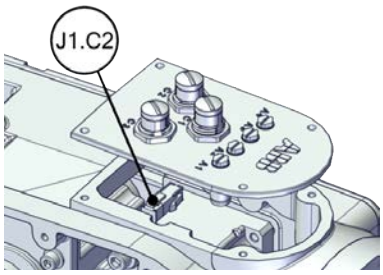
Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538
4	Disconnect the air hoses.	 xx2000001539

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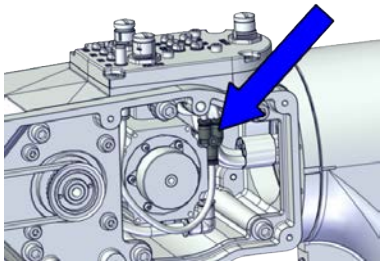
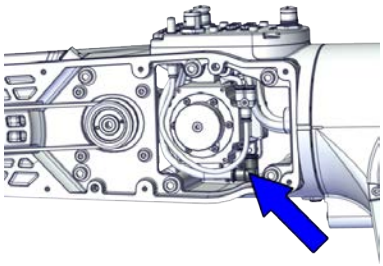
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5.7.3 Replacing the axis-3 gearbox
Continued

	Action	Note
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

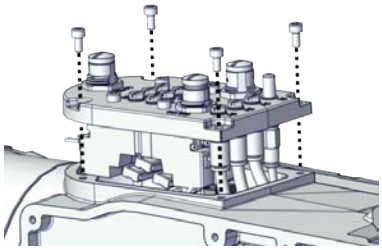
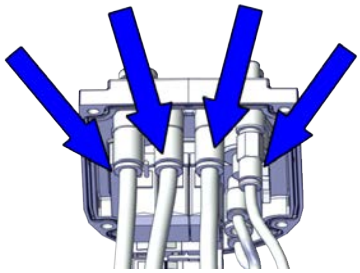
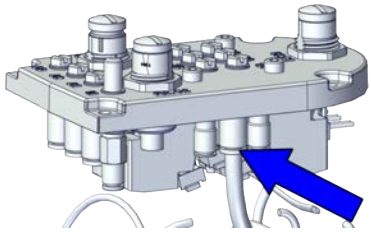
Removing the process hub (with solenoid valve)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370
2	Disconnect the three L-shape connectors.	 xx2300001371

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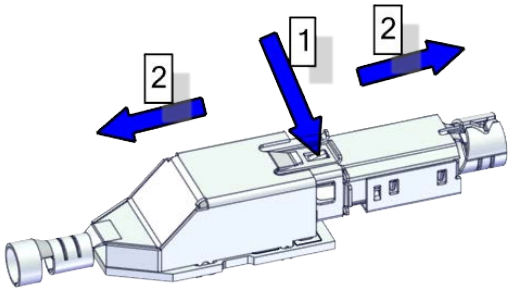
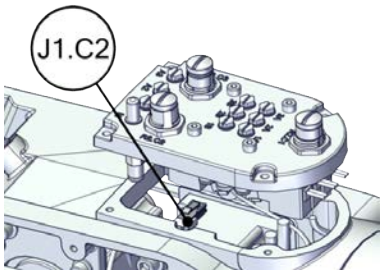
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	Action	Note
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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5.7.3 Replacing the axis-3 gearbox
Continued

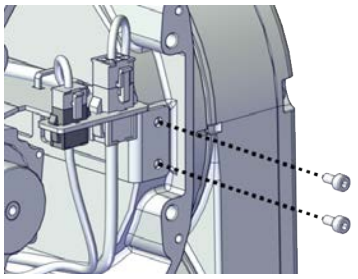
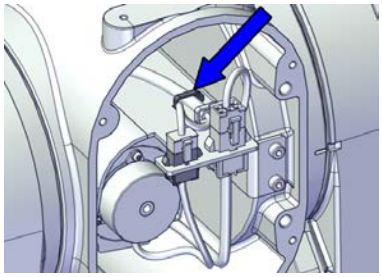
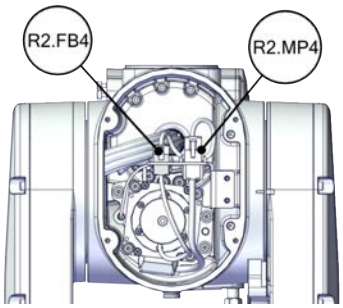
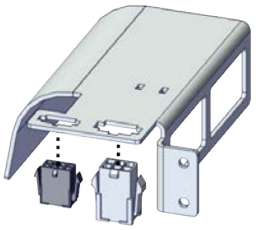
	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

Disconnecting the axis-4 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001542
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

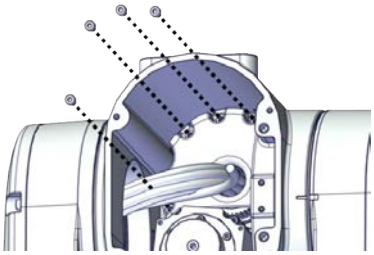
Separating the cable package from the housing

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

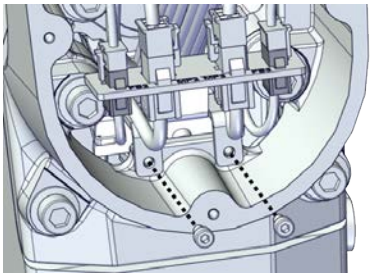
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5.7.3 Replacing the axis-3 gearbox
Continued

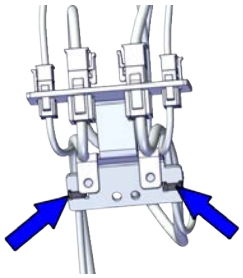
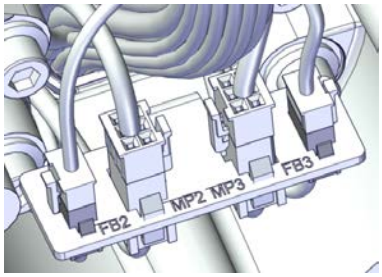
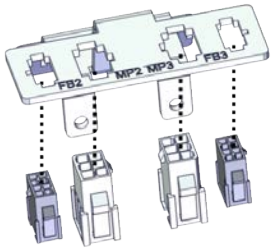
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 cable protector.	 xx2000001546

Disconnecting the axis-2 and -3 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate, as shown in following step.	 xx2000001548

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	Action	Note
4	Cut the cable straps.	 xx2000001549
5	Disconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001550
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001551

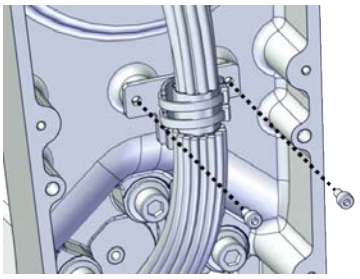
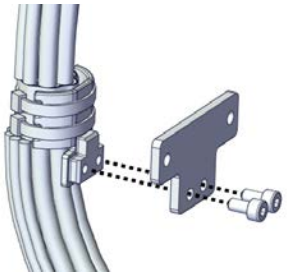
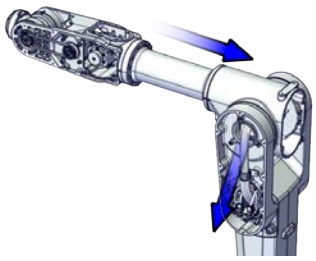
Pulling out the cable package

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.7.3 Replacing the axis-3 gearbox
Continued

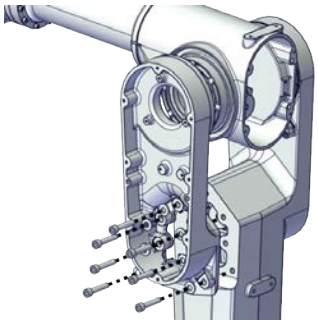
	Action	Note
3	Remove the cable bracket from the lower arm first and then from the cable package.	 xx2000001553  xx2100001465
4	Wrap the connectors with the masking tape.	
5	Pull the cable package out to the lower arm support. **Note** During the routing, make sure the axis-2 motor cablings are kept visible and accessible from the lower arm support side.	 xx2000001662

Removing the lower arm support

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	Remove the lower arm support. **Tip** If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.	 xx2000001663

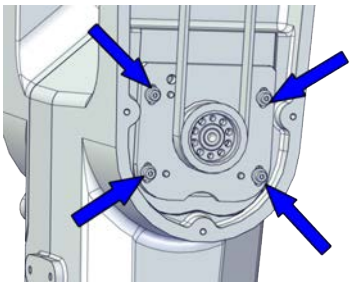
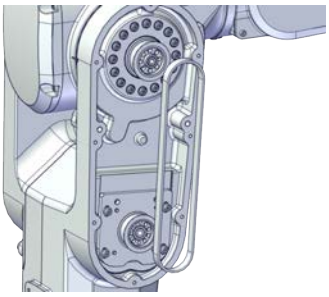
Removing the axis-3 timing belt

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
4	**CAUTION** The upper arms, which includes housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit weighs 17 kg. All lifting accessories used must be sized accordingly!	
5	Fit a roundsling to the upper arm to support the weight (no force).	

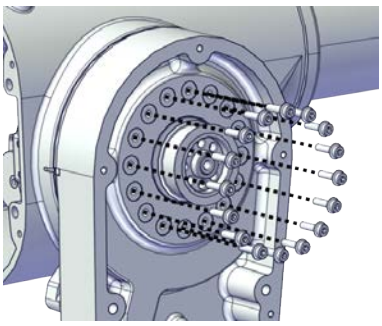
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5.7.3 Replacing the axis-3 gearbox
Continued

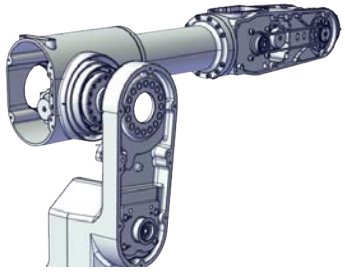
	Action	Note
6	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001614
7	Remove the timing belt from its groove on the motor.	 xx2000001615

Separating the lower arm from the housing

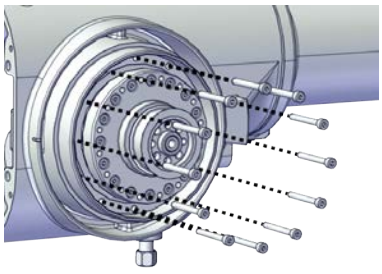
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws. **WARNING** This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured. The upper arm, including housing, extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4), tubular and tilt unit, weighs 17 kg.	 xx2000001664

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	Action	Note
4	Separate the lower arm from the housing. **Tip** If the lower arm is hard to loosen from the housing, use a plastic hammer to knock on the lower arm lightly.	 xx2000001665
5	Lay down the upper arm on a workbench. Make sure to support the gravity center of the upper arm.	

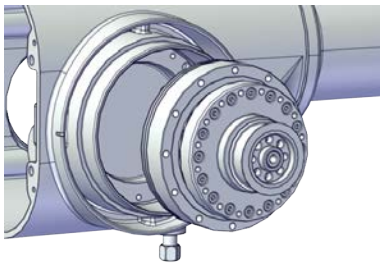
Removing the axis-3 gearbox

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
4	Remove the screws.	 xx2000001666

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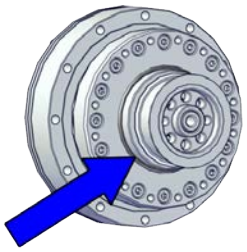
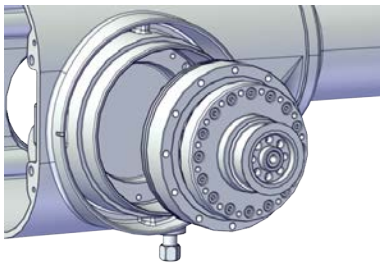
5.7.3 Replacing the axis-3 gearbox
Continued

	Action	Note
5	Pull out the gearbox.	 xx2000001667

Refitting the gearbox

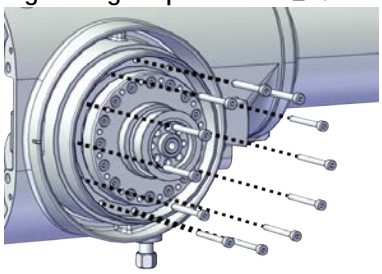
Use these procedures to refit the axis-3 gearbox.

Refitting the axis-3 gearbox

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the O-ring. Replace if damaged.	O-ring on circular spline side, axis 3: 3HAC061327-016  xx2000002524
3	Refit the axis-3 gearbox.	 xx2000001667

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	Action	Note
4	Secure with screws.	Screw: M4x35 12.9 Lafre (12 pcs) Tightening torque: 4.2 Nm±3%  xx2000001666

Checking the radial sealing on the lower arm

Note

This procedure is valid for robots with:

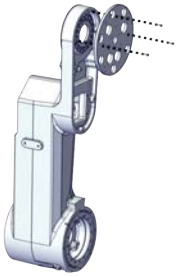
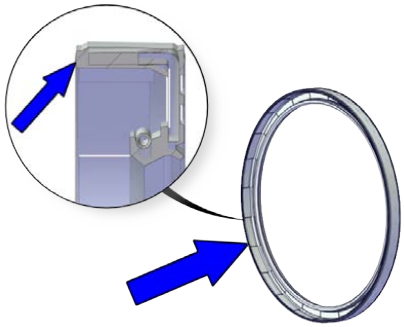
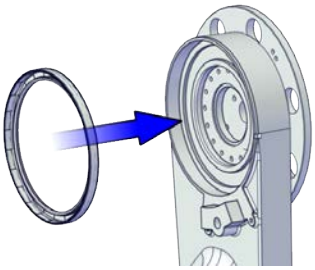
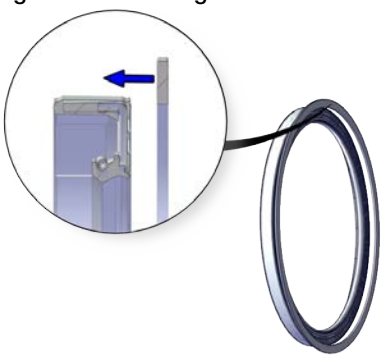
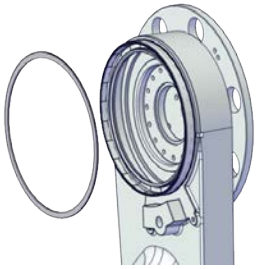
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the lower arm. Replace if damaged, as described below.	 xx2000002472 *Figure 5.3:*

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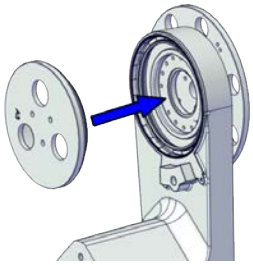
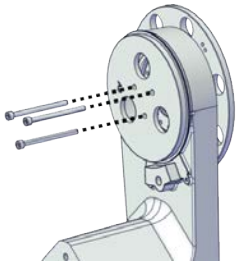
5.7.3 Replacing the axis-3 gearbox

Continued

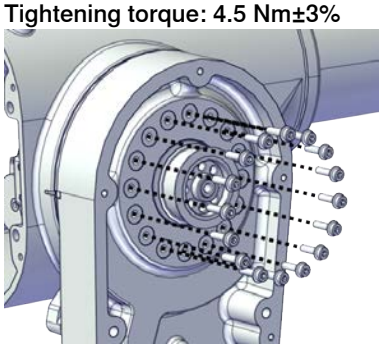
	Action	Note
3	Fit the big circular plate of the axis-3 sealing assembly tool to the lower arm (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002473
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
5	Fit the new sealing into the lower arm. The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002474
6	Place the ring of the axis-3 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002499

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	Action	Note
7	Fit the small circular plate of the axis-3 sealing assembly tool against the sealing and fix with three M6x75 screws.	Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002475  xx2000002476
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the lower arm to the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the lower arm to the housing.	Screw: M4x16 12.9 Lafre (16 pcs) Tightening torque: 4.5 Nm±3%  xx2000001664

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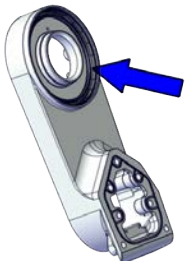
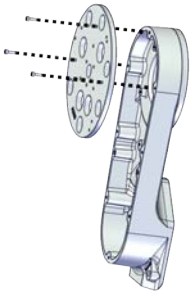
5.7.3 Replacing the axis-3 gearbox
Continued

Checking the radial sealing on the lower arm support

Note

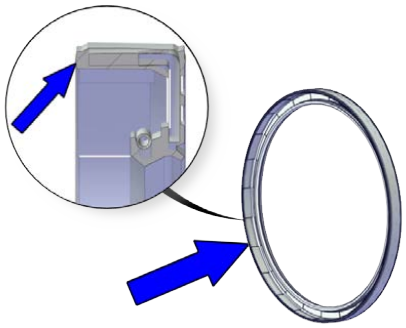
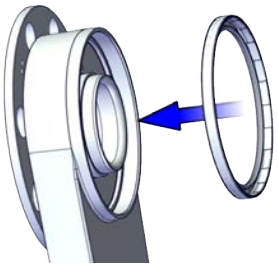
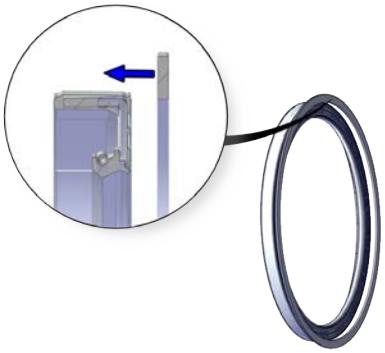
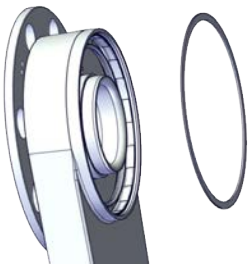
This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)
- protection class IP67 (option 3350-670)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the radial sealing on the lower arm support. Replace if damaged, as described below.	 xx2000002477
3	Fit the big circular plate of the axis-3 sealing assembly tool to the lower arm support (opposite side of the radial sealing) with three M4x12 screws.	Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002478
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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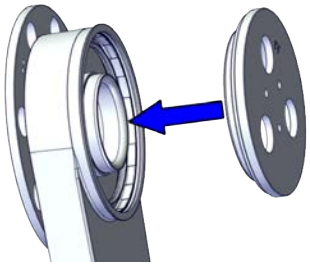
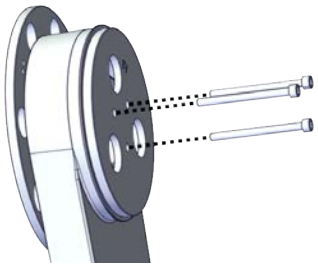
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	Action	Note
5	Fit the new sealing into the lower arm support. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002479
6	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Foundry Plus (option 3352-10)** Place the ring of the axis-3 sealing assembly tool against the sealing.  xx2000002562	Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002480

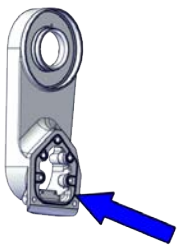
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5.7.3 Replacing the axis-3 gearbox
Continued

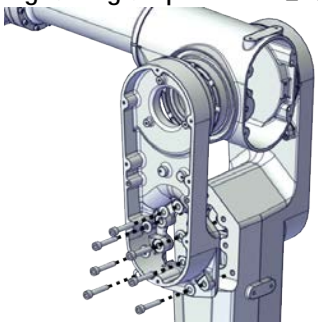
	Action	Note
7	Fit the small circular plate of the axis-3 sealing assembly tool and fix with three M6x75 screws.	Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002481  xx2000002482
8	Screw the screws, little by little and evenly, to press the sealing into place.	
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the lower arm support

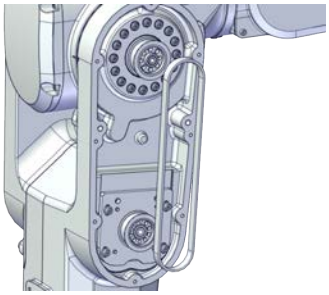
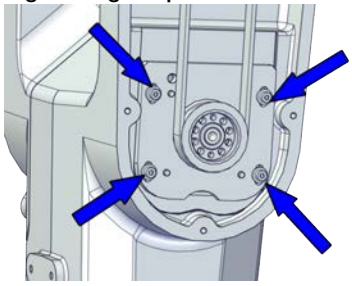
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for lower arm support: 3HAC067826-001  xx2000002521

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	Action	Note
3	Refit the lower arm support.	Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm±3%  xx2000001663

Refitting the axis-3 timing belt

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001615
3	Move the motor, and when the timing belt gets tensioned, secure the motor.	
4	Tighten the motor screws.	Tightening torque: 3.3 Nm  xx2000001614
5	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 73.4-78.5 Hz New belt: 87.8-92.1 Hz
6	Release the support to the upper arm.	

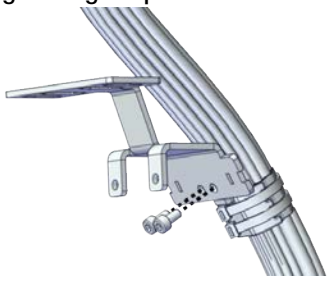
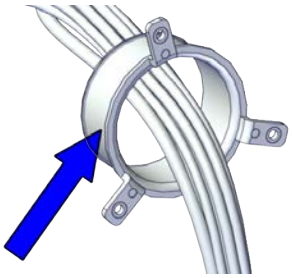
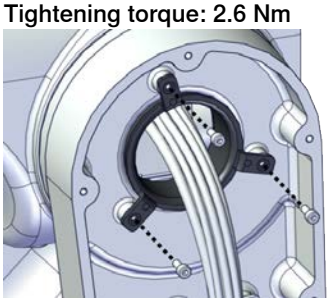
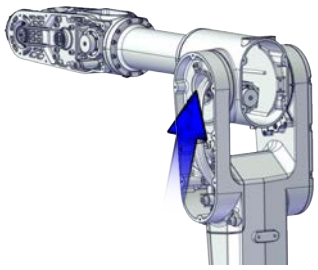
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5.7.3 Replacing the axis-3 gearbox

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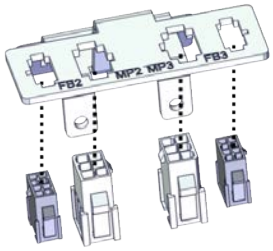
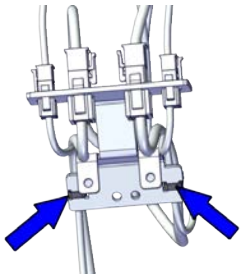
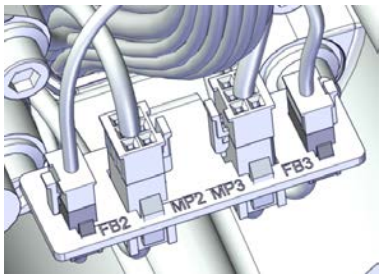
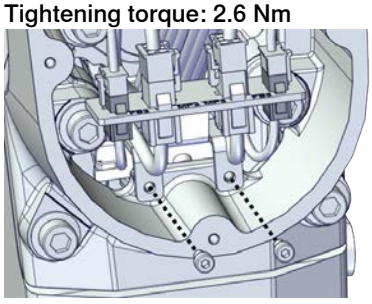
Routing the cable package in the lower arm

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001554
3	Check the axis-3 cable protector. Replace if damaged. **Note** If replaced, apply grease to the axis-3 cable protector before refitting.	Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001  xx2000001568 Screw: M4x10 12.9 Lafre (3 pcs) Tightening torque: 2.6 Nm  xx2000001552
4	Route the cable package through the lower arm support and up into the housing. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001569

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Reconnecting the axis-2 and -3 motor connectors

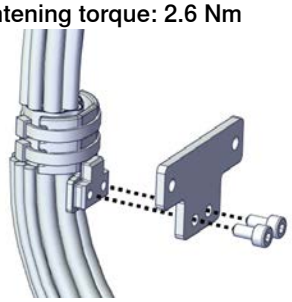
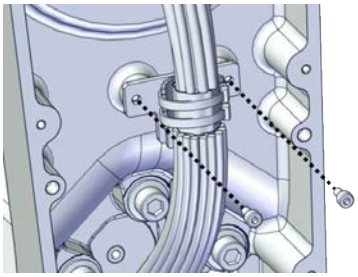
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001551
3	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001549
4	Reconnect the connectors. • FB2 • MP2 • FB3 • MP3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001550
5	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001548

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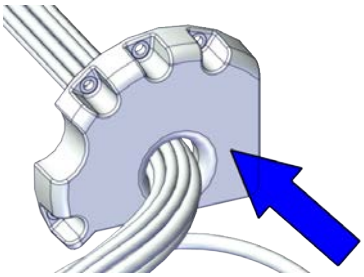
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5.7.3 Replacing the axis-3 gearbox
Continued

Securing the cable package in the lower arm

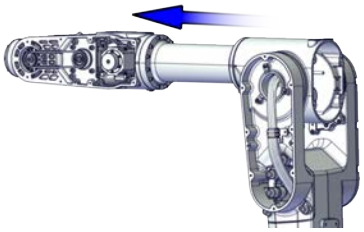
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the cable bracket.	Screw: M4x8 12.9 Lafre (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm  xx2100001465  xx2000001553

Routing the cable package in the housing

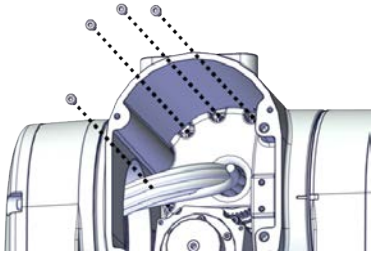
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Slip the axis-4 cable protector over the cable package.	Plastic cable protector, axis 4: 3HAC064694-001:  xx2000001570

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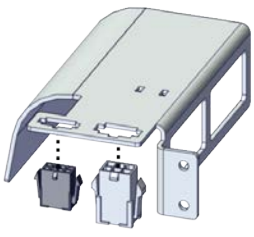
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	Action	Note
3	Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and into the tubular. Make sure that: • the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001571

Securing the cable package in the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 cable protector.	Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001546

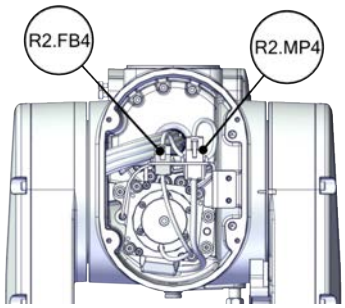
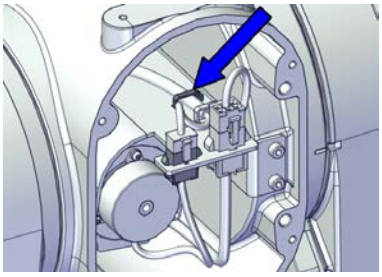
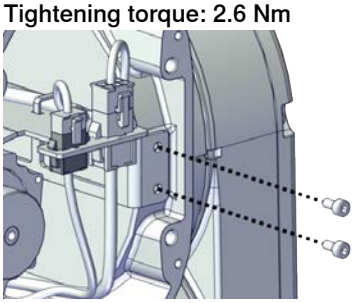
Reconnecting the axis-4 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545

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5.7.3 Replacing the axis-3 gearbox
Continued

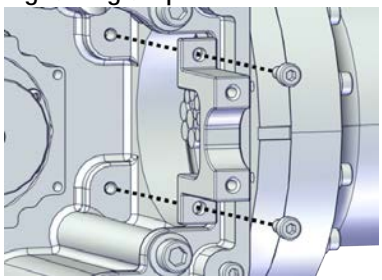
	Action	Note
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

Routing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

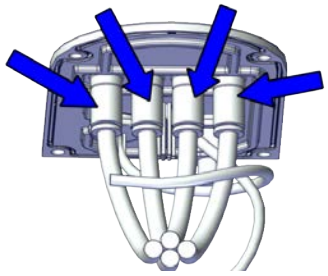
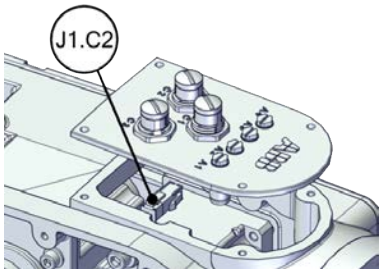
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	Action	Note
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

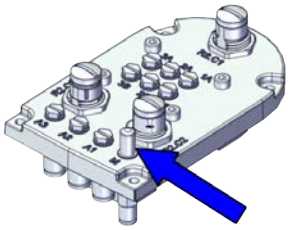
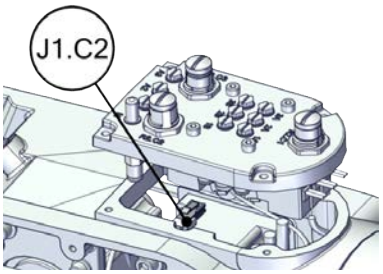
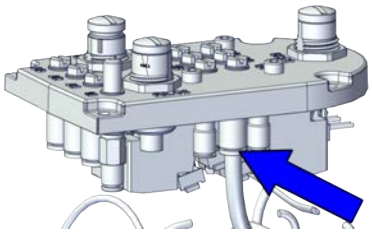
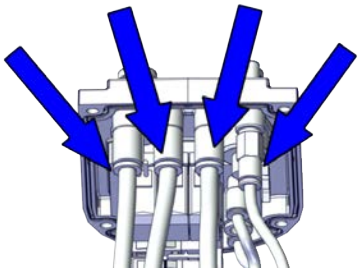
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5.7.3 Replacing the axis-3 gearbox
Continued

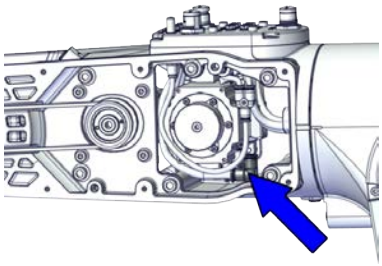
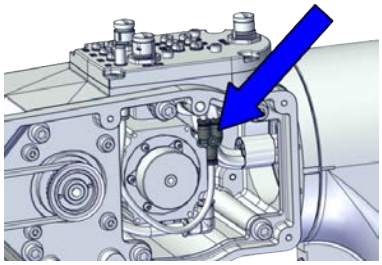
Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

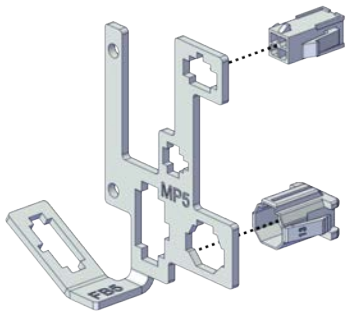
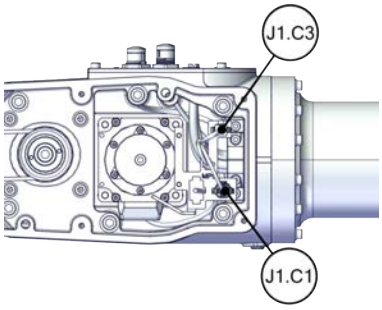
	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373

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	Action	Note
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

Reconnecting the CP/CS cabling (if equipped)

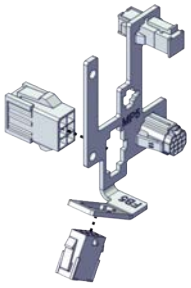
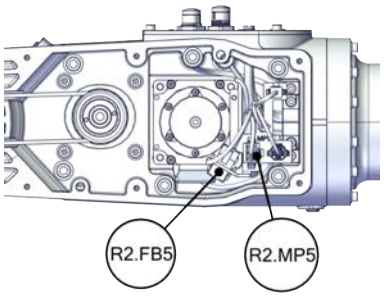
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

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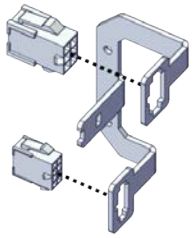
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5.7.3 Replacing the axis-3 gearbox
Continued

Reconnecting the axis-5 motor connectors

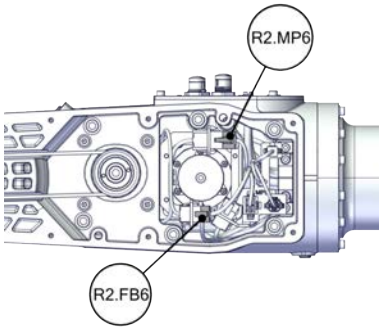
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

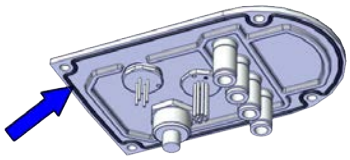
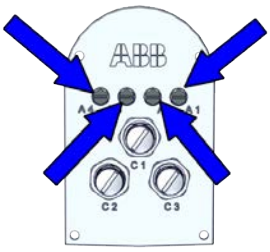
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533

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	Action	Note
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

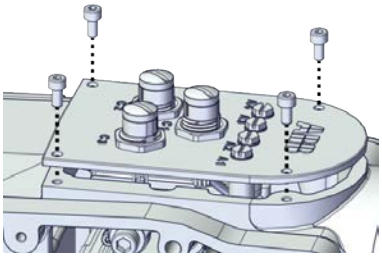
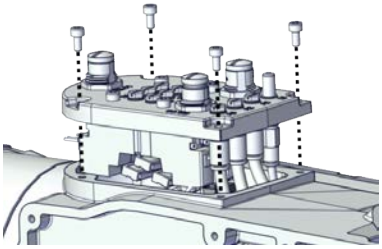
Refitting the process hub

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

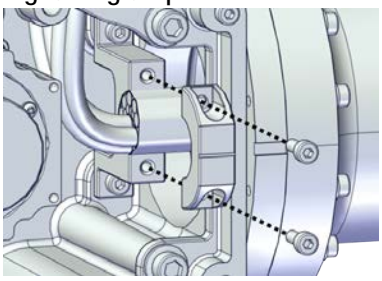
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5.7.3 Replacing the axis-3 gearbox
Continued

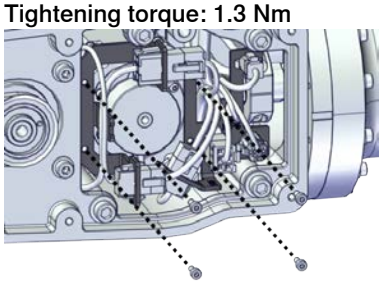
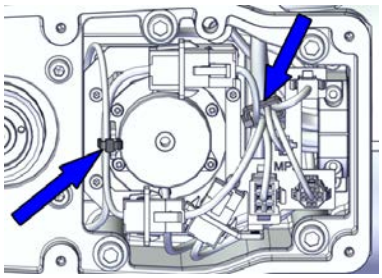
	Action	Note
5	Refit the process hub.	**Not valid for robots with solenoid valve (3303-3)** Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538
		Valid for robots with solenoid valve (3303-3) Screw: M4x12 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2300001372

Securing the cable package in the tubular

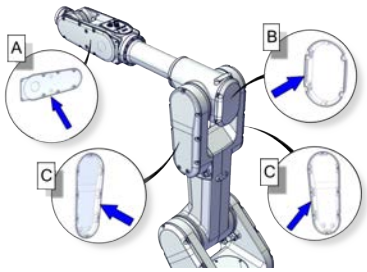
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748

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	Action	Note
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

Refitting the covers

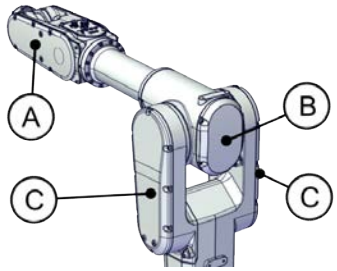
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** Check the gaskets. • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm covers (C) Replace if damaged.	 xx2000002502
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

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5.7.3 Replacing the axis-3 gearbox

Continued

	Action	Note
5	Refit the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C)	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001661

Concluding procedure

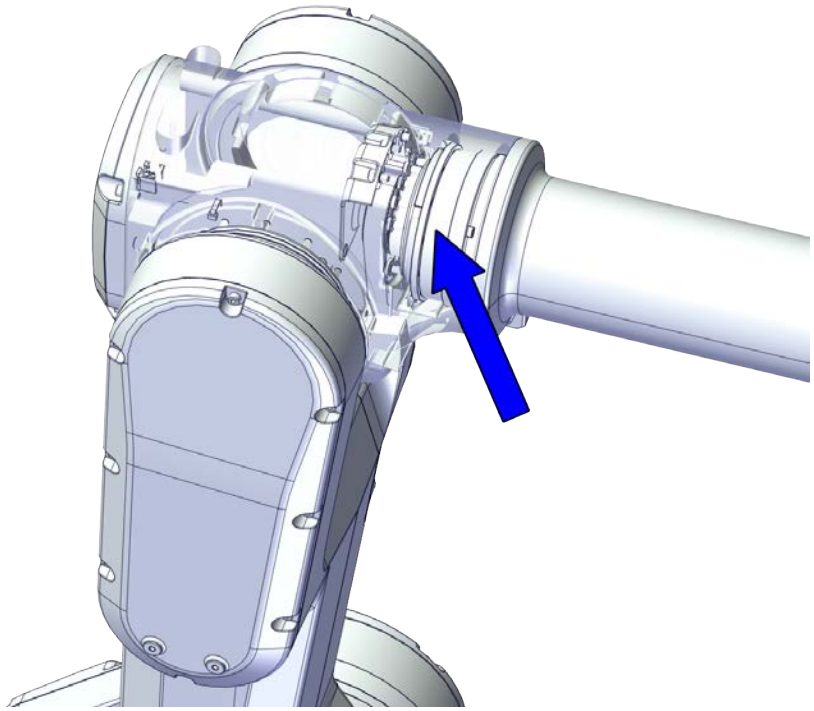
	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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5.7.4 Replacing the axis-4 gearbox

Location of the axis-4 gearbox

The axis-4 gearbox is located as shown in the figure.



xx2000001489

Required spare parts

Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1300 via myABB Business Portal, *www.abb.com/myABB*.

Spare part	Article number	Note
Gear unit, axis 4	3HAC073084-001	
O-ring on circular spline side, axis 4	3HAC061327-021	Not used with protection class IP40. Replace if damaged.
O-ring on flexible spline side, axis 4	3HAC061327-115	Not used with protection class IP40. Replace if damaged.
Timing belt, axis 4	3HAC065806-001	
Mechanical stop, axis 4, flange	3HAC065805-001	Replace if damaged.
Mechanical stop, axis 4, slider	3HAC065804-001	Replace if damaged.

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5.7.4 Replacing the axis-4 gearbox
Continued

Spare part	Article number	Note
Process hub, basic	3HAC073306-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, without Ethernet)	3HAC073307-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub (CP/CS and air hose, with Ethernet)	3HAC073308-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Process hub, basic, Clean Room	3HAC077836-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, without Ethernet)	3HAC077837-001	Used with protection type Clean Room.
Process hub, Clean Room (CP/CS and air hose, with Ethernet)	3HAC077838-001	Used with protection type Clean Room.
Process hub (with solenoid valve)	3HAC088301-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected. Also involves CP/CS, air hose and Ethernet.
Silencer, M5	3HAC070829-001	Used for robots with option 3303-3 Solenoid Valves Ext. selected.
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Housing cover	3HAC073093-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Lower arm cover	3HAC073092-001	Used with protection classes IP40 and IP67. Used with protection type Foundry Plus.
Tubular cover, Clean Room	3HAC077823-001	Used with protection type Clean Room.
Housing cover, Clean Room	3HAC077822-001	Used with protection type Clean Room.
Lower arm cover, Clean Room	3HAC077821-001	Used with protection type Clean Room.
Gasket for process hub	3HAC070887-001	Not used with protection class IP40. Replace if damaged.

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Spare part	Article number	Note
Gasket for tubular cover	3HAC067834-001	Not used with protection class IP40. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Not used with protection class IP40. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Not used with protection class IP40. Replace if damaged.
Seal bolt	3HAC032050-001	Not used with protection class IP40. Replace if damaged.
Radial sealing on housing	3HAC070148-006	Used with protection types Clean Room and Foundry Plus. Replace if damaged.
Plug screw	3HAC078352-001	Not used with protection type Clean Room. Replace if damaged.
Plug screw, Clean Room	3HAC078351-001	Used with protection type Clean Room. Replace if damaged.
Rubber sealing washer	3HAC075325-001	Used with protection type Clean Room. Replace if damaged.
Flange socket head screw with glue	3HAB3413-412	M4x12 12.9 Lafre, with glue

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 817*.
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
24 VDC power supply	-	Used to release the motor brakes.
Tension adjustment tool for axis-4 timing belt	-	Included in special toolkit 3HAC076396-001.
Dynamometer	-	Used for measuring the timing belt tension.
Special toolkit for IP67/Clean Room/Foundry Plus robots	3HAC078203-001	Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.

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5.7.4 Replacing the axis-4 gearbox
Continued

Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222

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. • 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.	**Note** Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	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*.
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the gearbox

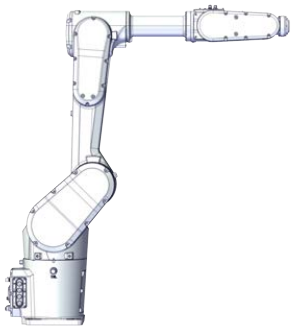
Use these procedures to remove the axis-4 gearbox.

Preparations before removing the axis-4 gearbox

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

Continues on next page

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	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Removing the covers

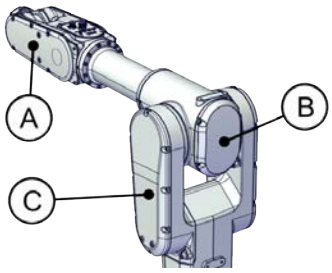
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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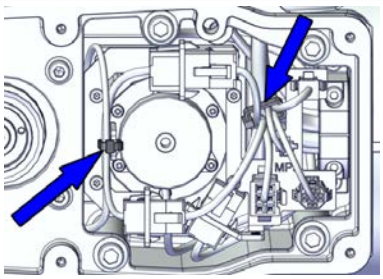
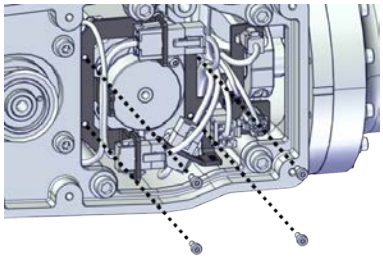
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5.7.4 Replacing the axis-4 gearbox

Continued

	Action	Note
3	Remove the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C)	 xx2000001668

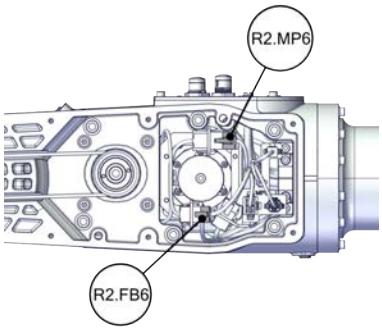
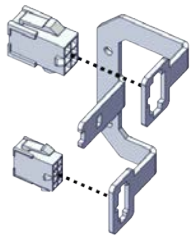
Loosening the cables in the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Cut the cable straps.	 xx2000001530
4	**Not valid for robots with solenoid valve (3303-3)** Remove the connector plates. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001531

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Disconnecting the axis-6 motor connectors

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP6 • FB6 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

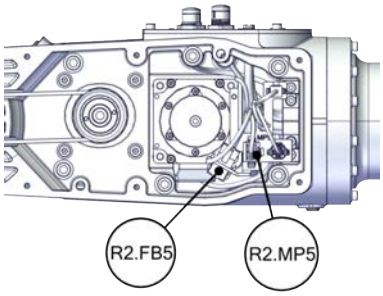
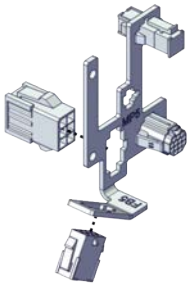
Disconnecting the axis-5 motor connectors

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

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5.7.4 Replacing the axis-4 gearbox
Continued

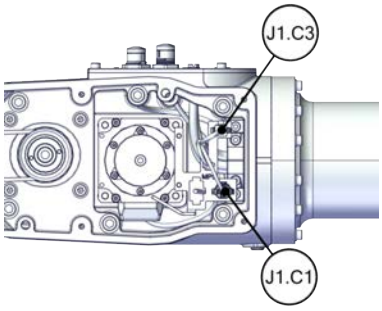
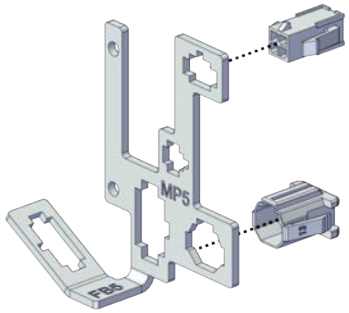
	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Disconnect the connectors. • MP5 • FB5 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

Disconnecting CP/CS cabling (if equipped)

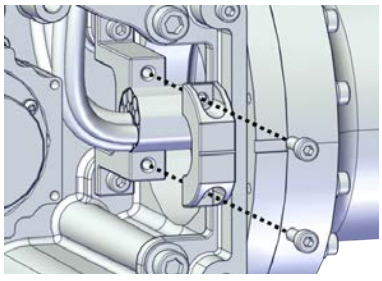
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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	Action	Note
3	**For robots with CP/CS cabling** Disconnect the connectors. • J1.C1 • J1.C3 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536
4	**Not valid for robots with solenoid valve (3303-3)** Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001537

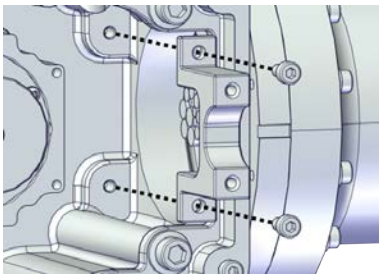
Separating the cable package from the tubular

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748

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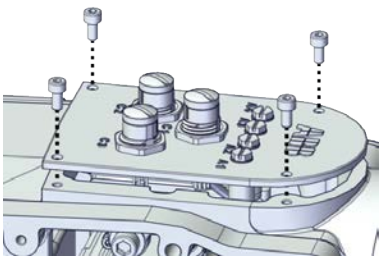
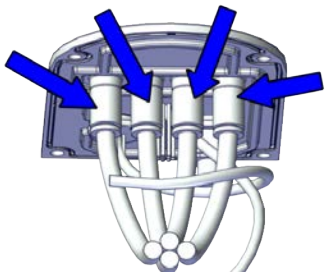
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5.7.4 Replacing the axis-4 gearbox
Continued

	Action	Note
4	Remove the second semicircular bracket from the tubular.	 xx2000001749

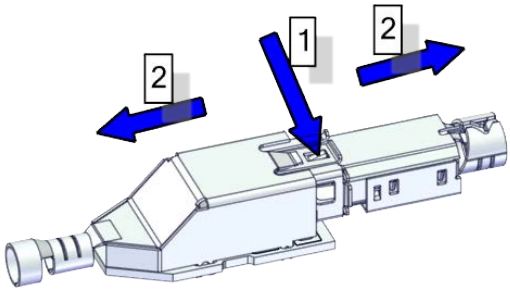
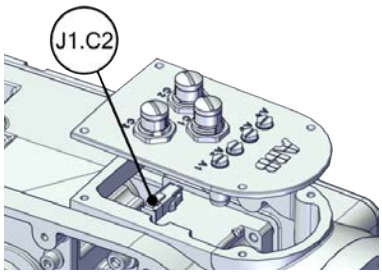
Removing the process hub (without solenoid valve)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2000001538
4	Disconnect the air hoses.	 xx2000001539

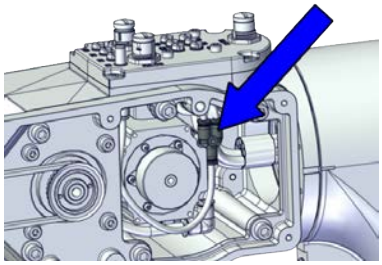
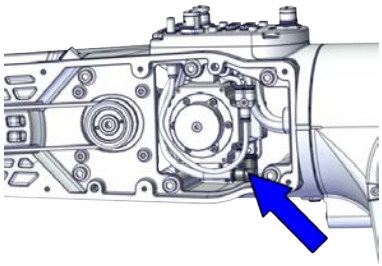
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	Action	Note
5	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2000001540

Removing the process hub (with solenoid valve)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

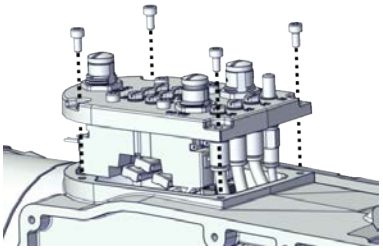
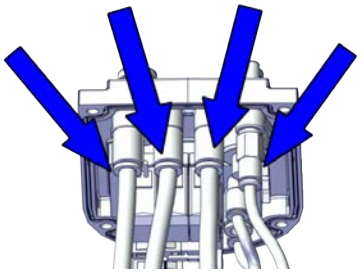
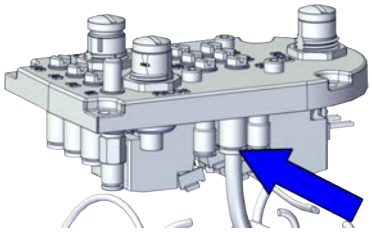
	Action	Note
1	Disconnect the Y-shape connector.	 xx2300001370
2	Disconnect the three L-shape connectors.	 xx2300001371

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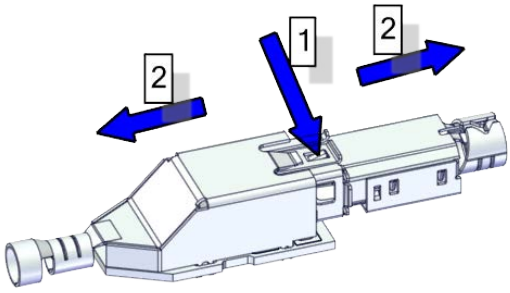
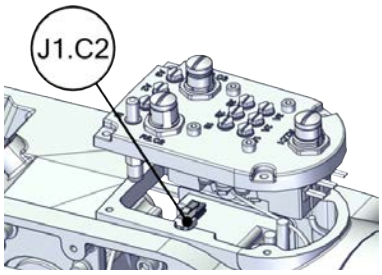
5.7.4 Replacing the axis-4 gearbox

Continued

	Action	Note
3	Remove the screws and carefully open the cover. **CAUTION** There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2300001372
4	Disconnect the air hoses and hose connecting to the silencer.	 xx2300001373
5	Disconnect the hose to the solenoid valve.	 xx2300001374

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	Action	Note
6	**For robots with Ethernet cabling** Access the connector from the process hub and disconnect the connector. • J1.C2 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting. **Tip** The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).  xx1800002943	 xx2300001375

Disconnecting the axis-4 motor connectors

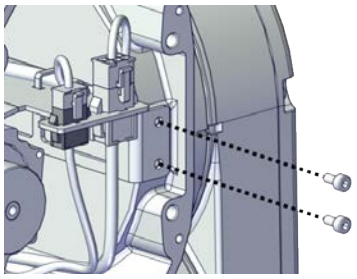
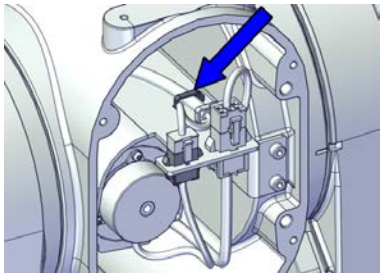
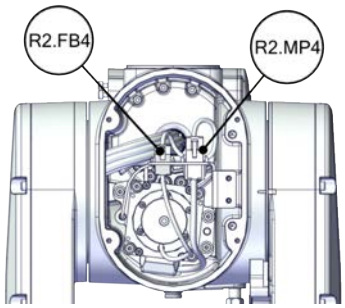
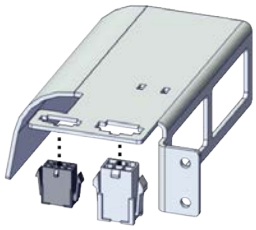
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

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5.7.4 Replacing the axis-4 gearbox

Continued

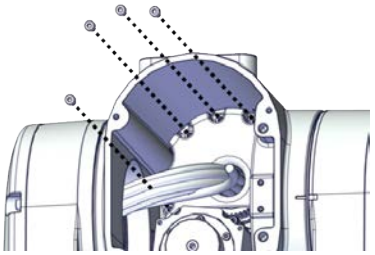
	Action	Note
3	Remove the connector plate. **CAUTION** Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are remove from the plate.	 xx2000001542
4	Cut the cable strap. **Note** The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 xx2000001543
5	Disconnect the connectors. • MP4 • FB4 **Tip** Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544
6	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

Separating the cable package from the housing

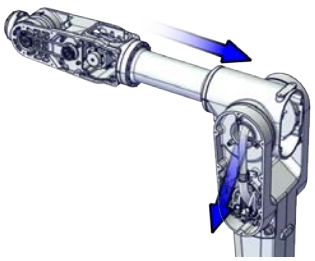
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Remove the axis-4 cable protector.	 xx2000001546

Pulling out the cable package

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Wrap the connectors with the masking tape.	
4	Pull the cable package out to the lower arm support.	 xx2000001662

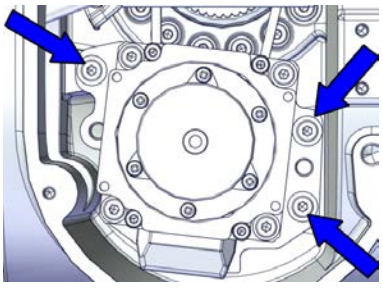
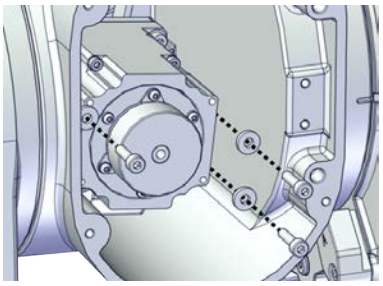
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5.7.4 Replacing the axis-4 gearbox

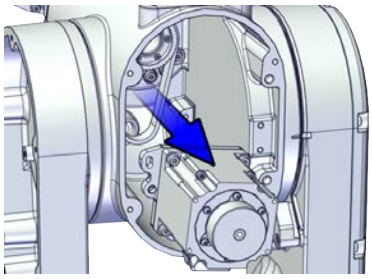
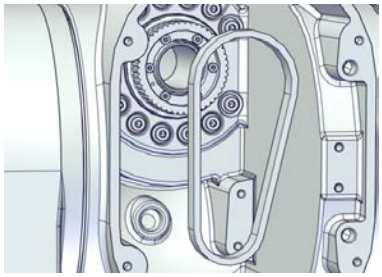
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Removing the axis-4 motor

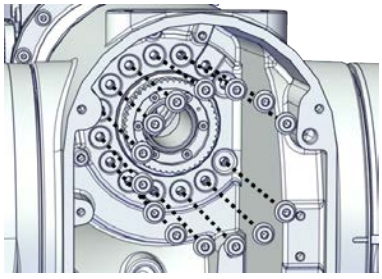
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001604
5	Remove the timing belt from its groove on the motor.	
6	Remove the screws and washers.	 xx2000001605

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	Action	Note
7	Carefully lift out the motor.	 xx2000001669
8	Remove the timing belt.	 xx2000001670

Separating the housing

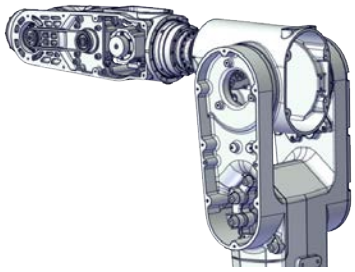
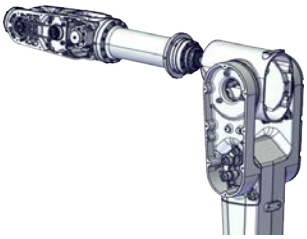
	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	Support the weight of the extender unit (only for IRB 1300-7/1.4), tubular and tilt unit, and remove the screws.	 xx2000001671

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5.7.4 Replacing the axis-4 gearbox

Continued

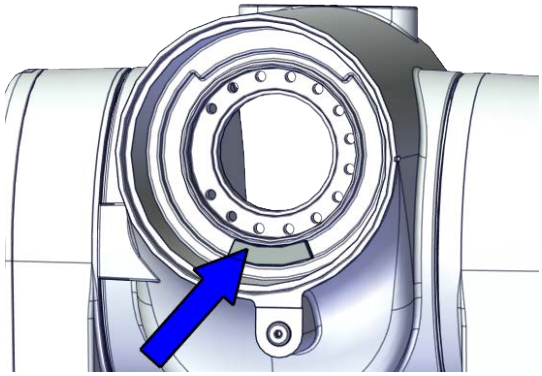
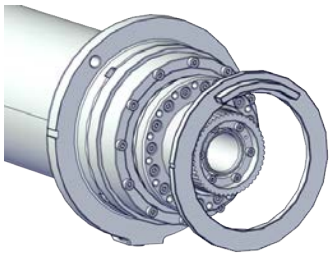
	Action	Note
4	**Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15** Separate the tubular from the housing.	 xx2000001721
5	**Valid for IRB 1300-7/1.4 and IRB 1300-12/1.4** Separate the extender unit from the housing.	 xx2000001672

Removing the axis-4 mechanical stops

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	

Continues on next page

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	Action	Note
3	Remove the axis-4 mechanical stop flange. **CAUTION** The axis-4 mechanical stop slider is accessible from the housing. Put it aside for later refitting.  xx2000001674	 xx2000001673

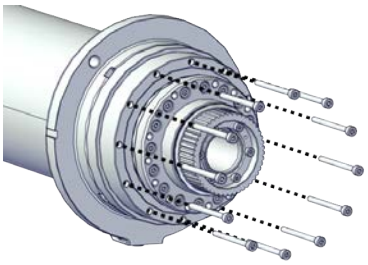
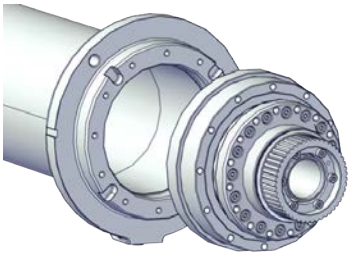
Removing the axis-4 gearbox

	Action	Note
1	**DANGER** Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	**CAUTION** **For robots with protection type Clean Room** Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See *Cut the paint or surface on the robot before replacing parts on page 167*.	
3	**CAUTION** Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	

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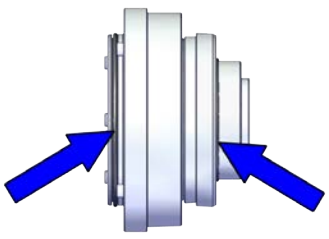
5.7.4 Replacing the axis-4 gearbox
Continued

	Action	Note
4	Remove the screws.	 xx2000001675
5	Pull out the gearbox.	 xx2000001676

Refitting the gearbox

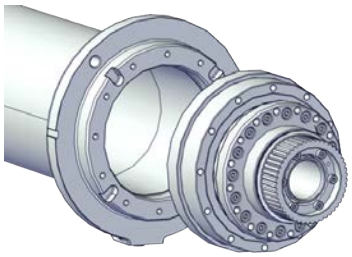
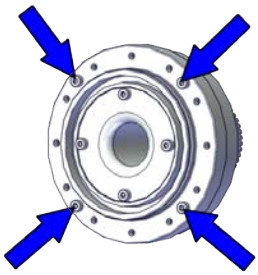
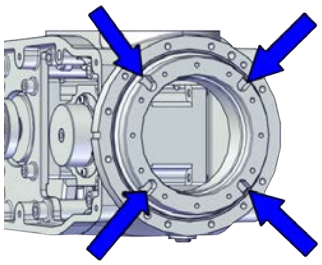
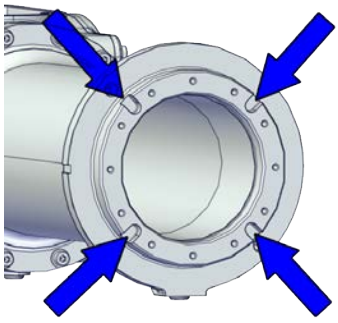
Use these procedures to refit the axis-4 gearbox.

Refitting the axis-4 gearbox

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the o-rings. Replace if damaged.	O-ring on circular spline side, axis 4: 3HAC061327-021 O-ring on flexible spline side, axis 4: 3HAC061327-115  xx2000002525

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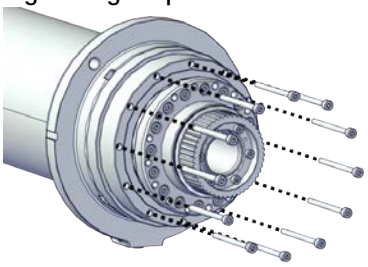
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	Action	Note
3	Refit the axis-4 gearbox.	 xx2000001676
4	Make sure that the screws on the gearbox are properly fitted into the notches on the extender unit/tubular.	 xx2000001720 **Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15**  xx2000001719 **Valid for IRB 1300-7/1.4 and IRB 1300-12/1.4**  xx2000001679

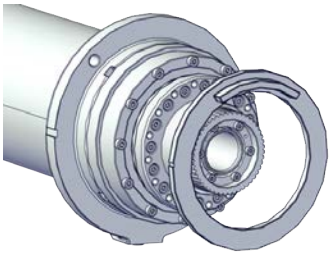
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5.7.4 Replacing the axis-4 gearbox
Continued

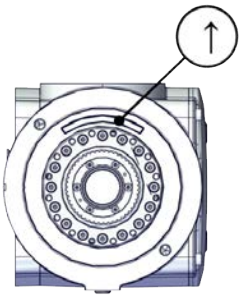
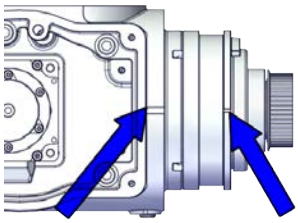
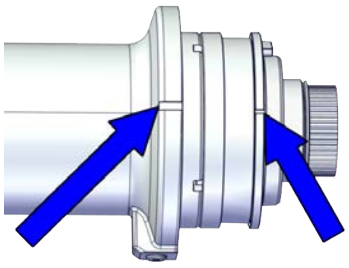
	Action	Note
5	Secure with screws.	Screw: M3x35 12.9 Lafre (12 pcs) Tightening torque: 1.9 Nm  xx2000001675

Refitting the axis-4 mechanical stop flange

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 mechanical stop flange to the gearbox.	 xx2000001673

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	Action	Note
3	Make sure that : • the block on the mechanical stop flange is towards the upper side (process hub side). • the notches on the extender unit/tubular and the mechanical stop flange are aligned.	 xx2000001678 **Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15**  xx2000001718 **Valid for IRB 1300-7/1.4 and IRB 1300-12/1.4**  xx2000001677

Check the radial sealing on the housing

Note

This procedure is valid for robots with:

- protection type Clean Room (option 3351-4)

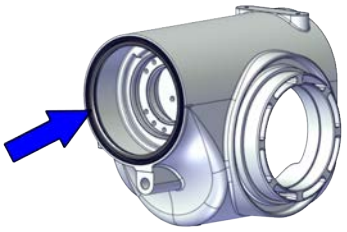
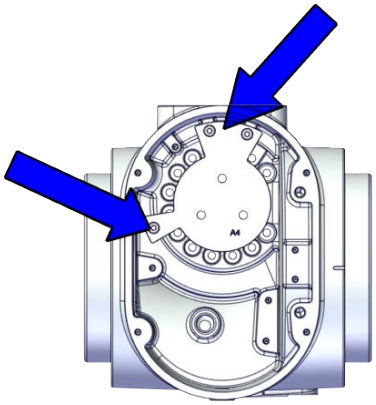
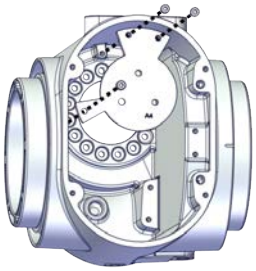
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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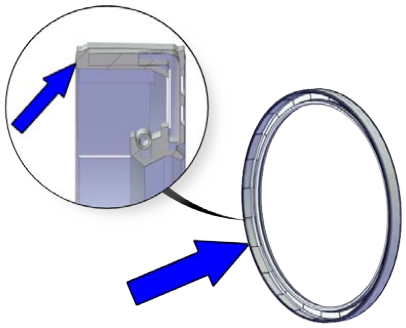
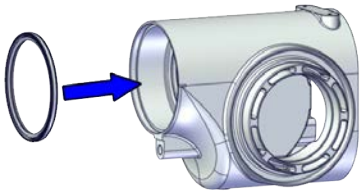
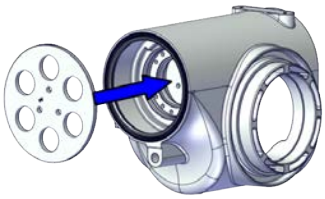
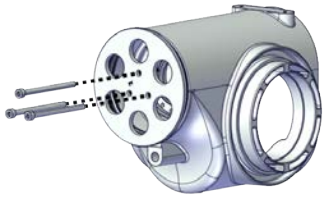
5.7.4 Replacing the axis-4 gearbox

Continued

	Action	Note
2	Check the radial sealing on the housing. Replace if damaged, as described below.	 xx2000002483
3	Fit the lug plate of the axis-4 sealing assembly tool into the housing with three M4x10 screws. **Note** Pay attention to the location of the lugs.  xx2000002485	Lug plate of the axis-4 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002484
4	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement. **Note** For Clean Room robots, make sure no grease is applied to the sealing grooves.	Grease: 3HAC029132-001

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	Action	Note
5	Fit the new sealing into the housing. **For robots with protection type Clean Room (option 3351-4)** The sealing lip as pointed in the following figure is facing the inner side of the robot. **For robots with protection type Foundry Plus (option 3352-10)** The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002486
6	Fit the circular plate of the axis-4 sealing assembly tool against the sealing and fix with three M6x85 screws.	Circular plate of the axis-4 sealing assembly tool, included in Special toolkit for IP67/Clean Room/Foundry Plus robots (3HAC078203-001).  xx2000002487  xx2000002488
7	Screw the screws, little by little and evenly, to press the sealing into place.	
8	Remove the assembly tool.	
9	Check that the sealing is undamaged and properly fitted.	

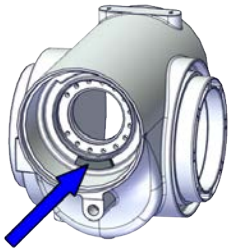
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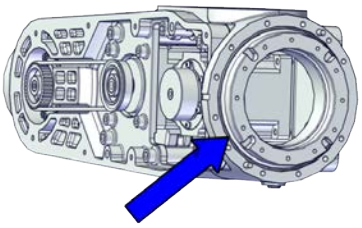
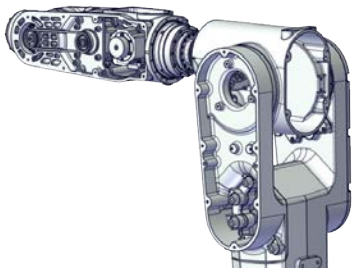
5.7.4 Replacing the axis-4 gearbox

Continued

Refitting the axis-4 mechanical stop slider

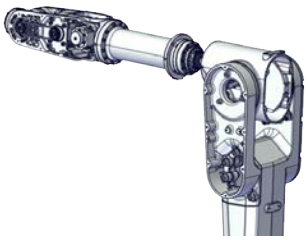
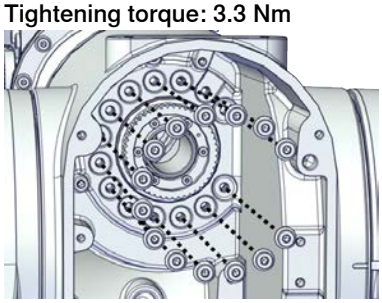
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Place the axis-4 mechanical stop slider in the housing.	 xx2000001732

Refitting the housing

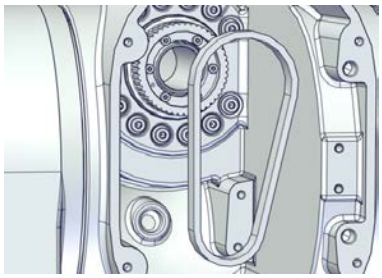
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** **Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15** Check the O-ring. Replace if damaged.	O-ring on tubular: 3HAC061327-018  xx2000002519
3	**Valid for IRB 1300-11/0.9 and IRB 1300-10/1.15** Refit the tubular to the housing.	 xx2000001721

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	Action	Note
4	**Valid for IRB 1300-7/1.4 and IRB 1300-12/1.4** Refit the extender unit to the housing.	 xx2000001672
5	Refit the screws.	Flange socket head screw with glue: 3HAB3413-412, M4x12 12.9 Lafre, with glue (14 pcs) Tightening torque: 3.3 Nm  xx2000001671

Refitting the axis-4 motor

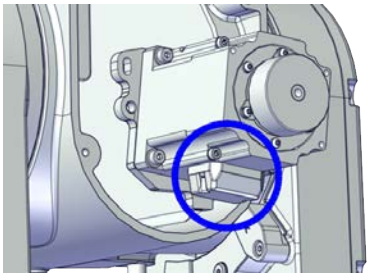
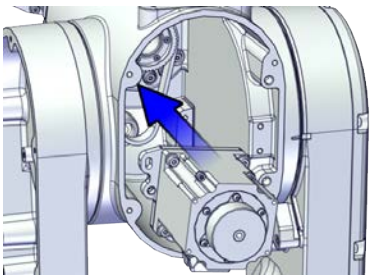
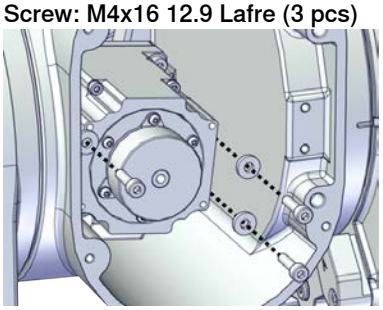
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: • all assembly surfaces are clean and without damages • the motor is clean and undamaged.	
3	Install the timing belt to the gearbox pulley and verify that the belt runs correctly in the grooves of the pulley.	 xx2000001670

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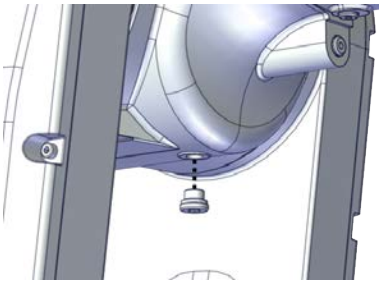
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5.7.4 Replacing the axis-4 gearbox

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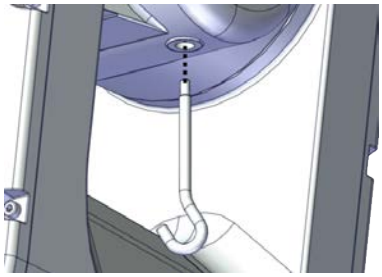
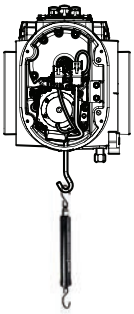
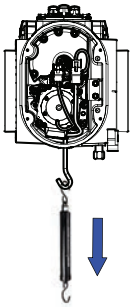
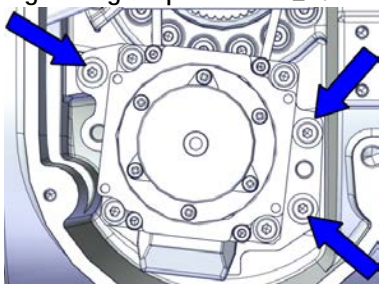
	Action	Note
4	Orient the motor correctly and fit it into the housing. **Note** Make sure the motor flange does not press on the timing belt.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001607
5	Refit the motor and verify that the timing belt runs correctly in the groove of the motor pulley.	 xx2000001680
6	Refit the screws and washers. **Note** Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre (3 pcs)  xx2000001605

Adjusting the axis-4 timing belt tension

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Remove the screw below the housing.	 xx2000001609

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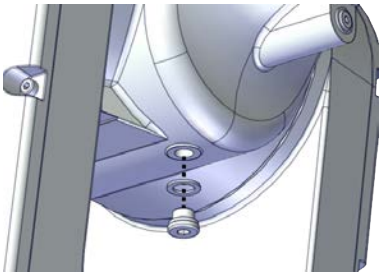
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	Action	Note
3	Fit the tension adjustment tool for axis-4 timing belt to the screw hole.	Tension adjustment tool for axis-4 timing belt. Included in special toolkit 3HAC076396-001.  xx2000001610
4	Use a handheld dynamometer hooking to the tool.	 xx2000001611
5	Pull the dynamometer to make the tension falling in the allowed force range. **Note** During the measurement, make sure that all interferences that may affect the force are removed. Pay attention to the force application direction.	Used belt: 33.4-38.2 N New belt:47.8-52.4 N  xx2000001612
6	Secure the motor with the screws.	Tightening torque: 3.3 Nm±3%  xx2000001604

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5.7.4 Replacing the axis-4 gearbox
Continued

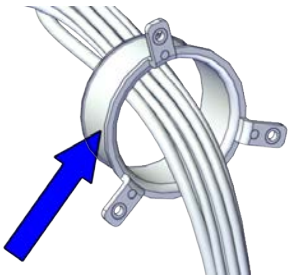
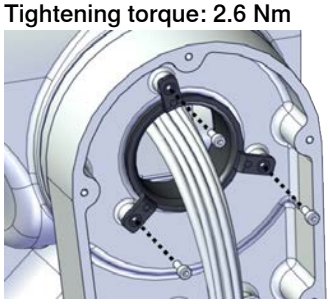
	Action	Note
7	Remove the tool and refit the plug screw. **For robots with protection type Clean Room (option 3351-4)** Refit the plug screw with the rubber washer.	Tightening torque: 3 Nm **For robots NOT with protection type Clean Room** Plug screw: 3HAC078352-001  xx2000001609 **For robots with protection type Clean Room (option 3351-4)** Plug screw, Clean Room: 3HAC078351-001 Rubber sealing washer: 3HAC075325-001  xx2000002496

Securing the cable package in the lower arm

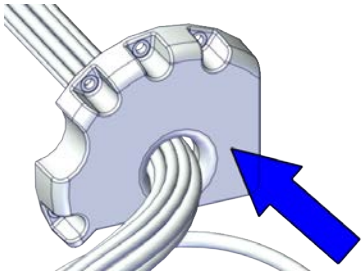
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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	Action	Note
2	Check the axis-3 cable protector. Replace if damaged. **Note** If replaced, apply grease to the axis-3 cable protector before refitting.	Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001  xx2000001568 Screw: M4x10 12.9 Lafre (3 pcs) Tightening torque: 2.6 Nm  xx2000001552
3	Route the cable package through the lower arm support and up into the housing. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	

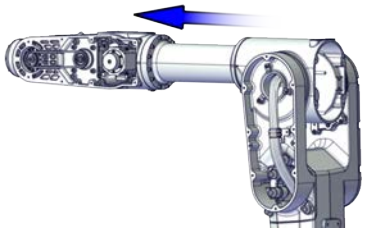
Routing the cable package in the housing

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Slip the axis-4 cable protector over the cable package.	Plastic cable protector, axis 4: 3HAC064694-001:  xx2000001570

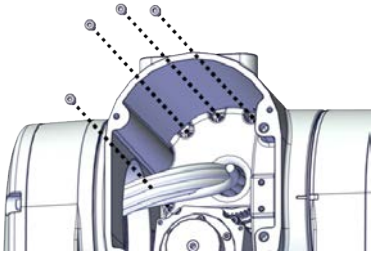
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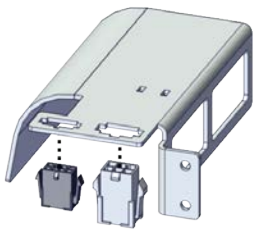
5.7.4 Replacing the axis-4 gearbox
Continued

	Action	Note
3	Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for IRB 1300-7/1.4 and IRB 1300-12/1.4) and into the tubular. Make sure that: • the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. **CAUTION** Make sure that no cables or hoses are twisted or strained. Reroute if necessary.	 xx2000001571

Securing the cable package in the housing

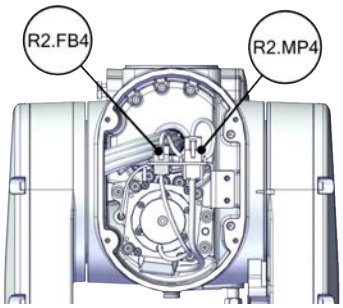
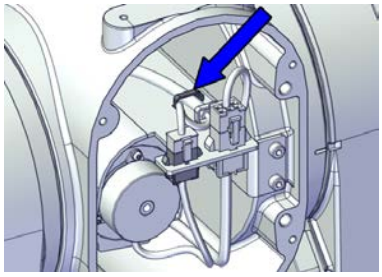
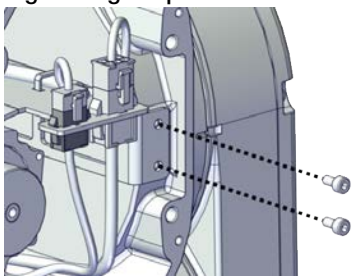
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the axis-4 cable protector.	Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001546

Reconnecting the axis-4 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Insert the male header of the motor connectors to the connector plate.	 xx2000001545

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	Action	Note
3	Reconnect the connectors. • FB4 • MP4 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
4	Route and secure the cabling with a cable strap. **Note** The motor cablings have another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001543
5	Refit the connector plate.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

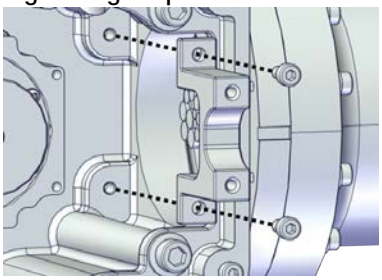
Routing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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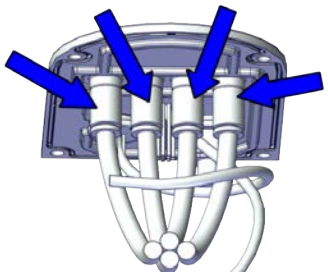
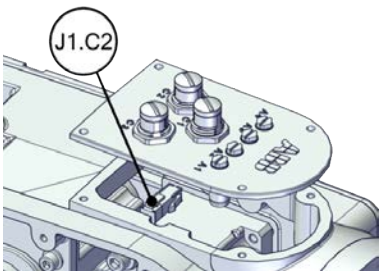
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5.7.4 Replacing the axis-4 gearbox
Continued

	Action	Note
2	Refit the second semicircular bracket to the tubular.	Screw: M4x8 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001749
3	Route the cablings. • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket.	

Reconnecting the air hoses and Ethernet cabling (if equipped)

Note that this procedure is not valid for robots with solenoid valve (option 3303-3).

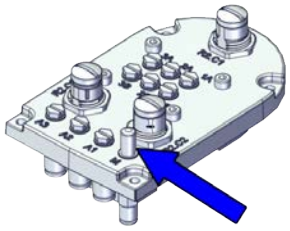
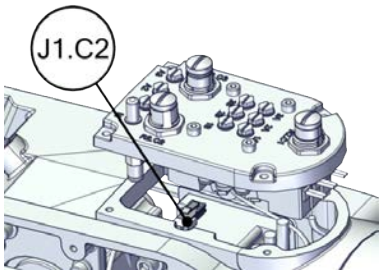
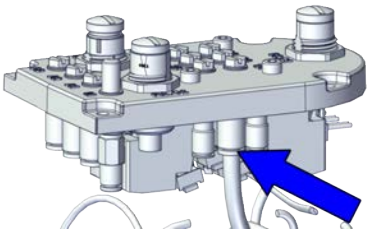
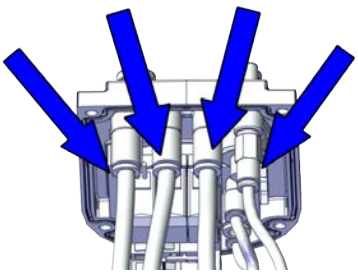
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the air hoses. **Note** See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
3	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001540

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Reconnecting the hoses and Ethernet cabling (if equipped)

Note that this procedure is valid only for robots with solenoid valve (option 3303-3).

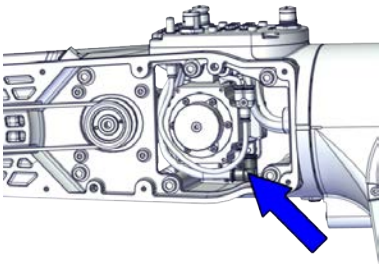
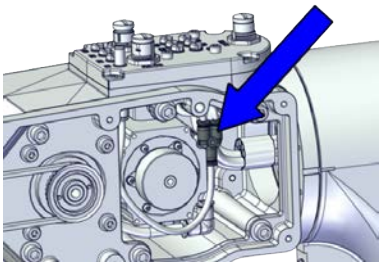
	Action	Note
1	Check the silencer. Replace if damaged. **Note** When replacing the silencer, apply a little locking liquid to the thread and tighten slightly by hands. Do not overtighten.	Locking liquid: Loctite 2400 (or equivalent Loctite 243) Silencer, M5: 3HAC070829-001  xx2300001378
2	**For robots with Ethernet cabling** Access the connector from the process hub and reconnect the connector. • J1.C2 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2300001375
3	Reconnect the hose to the solenoid valve.	 xx2300001374
4	Reconnect the air hoses and hose connecting to the silencer.	 xx2300001373

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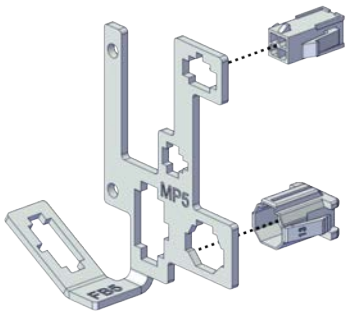
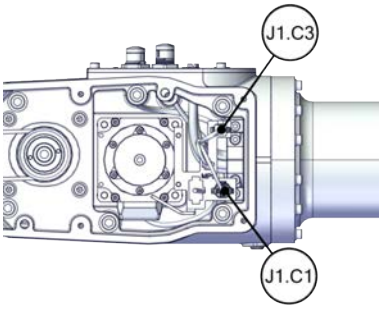
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5.7.4 Replacing the axis-4 gearbox

Continued

	Action	Note
5	Reconnect the three L-shape connectors from the side of tubular.	 xx2300001371
6	Reconnect the Y-shape connector from the side of tubular.	 xx2300001370

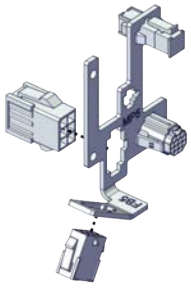
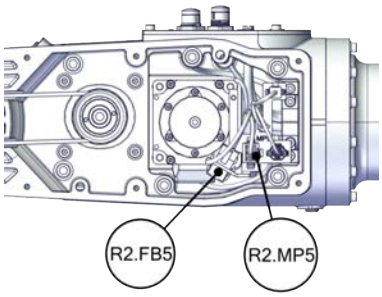
Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the connectors to the connector plate.	 xx2000001537
3	**For robots with CP/CS cabling** Reconnect the connectors. • J1.C1 • J1.C3 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001536

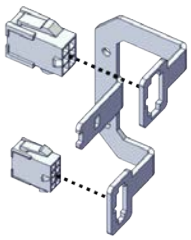
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Reconnecting the axis-5 motor connectors

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001535
3	Reconnect the connectors. • FB5 • MP5 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

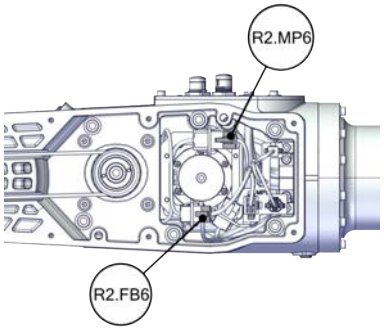
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**Not valid for robots with solenoid valve (3303-3)** Insert the male header of the motor connectors to the connector plate.	 xx2000001533

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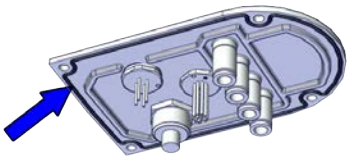
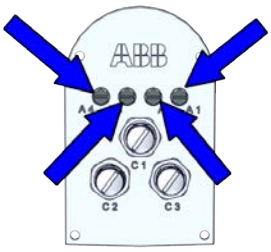
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5.7.4 Replacing the axis-4 gearbox

Continued

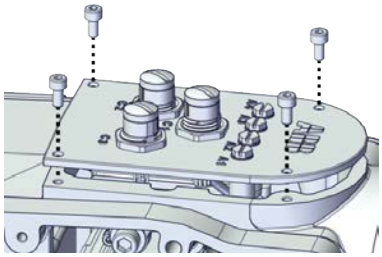
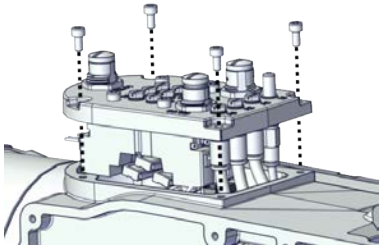
	Action	Note
3	Reconnect the connectors. • FB6 • MP6 **Tip** See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

Refitting the process hub

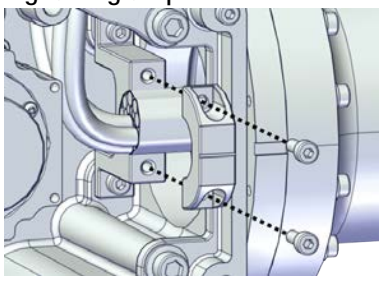
	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2000002512
3	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** **For robots with protection type Foundry Plus (option 3352-10)** Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2000002513
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	

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	Action	Note
5	Refit the process hub.	**Not valid for robots with solenoid valve (3303-3)** Screw: M4x8 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2000001538
		Valid for robots with solenoid valve (3303-3) Screw: M4x12 12.9 Lafre (4 pcs) Tightening torque: 2.6 Nm  xx2300001372

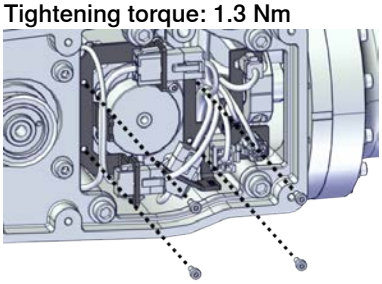
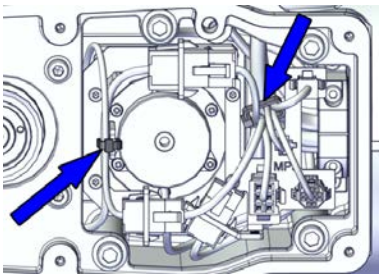
Securing the cable package in the tubular

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre (2 pcs) Tightening torque: 2.6 Nm  xx2000001748

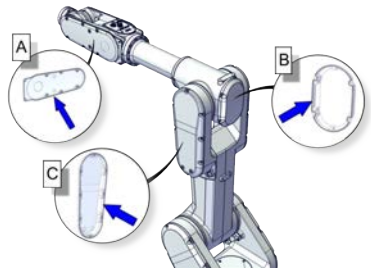
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5.7.4 Replacing the axis-4 gearbox
Continued

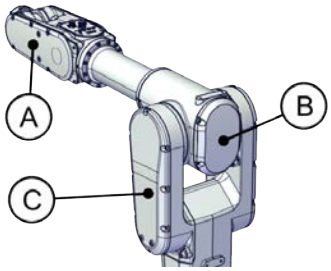
	Action	Note
3	**Not valid for robots with solenoid valve (3303-3)** Refit the connector plate.	Screw: M3x8 12.9 Lafre (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531
4	Route and secure the cabling with cable straps. **CAUTION** Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 xx2000001530

Refitting the covers

	Action	Note
1	For robots with protection type Clean Room: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	**For robots with protection class IP67 (option 3350-670)** **For robots with protection type Clean Room (option 3351-4)** Check the gaskets. • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm covers (C) Replace if damaged.	 xx2000002506
3	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
4	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

Continues on next page

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	Action	Note
5	Refit the covers. • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C)	Screw: M4x10 12.9 Lafre Tightening torque: 2.6 Nm  xx2000001668

Concluding procedure

	Action	Note
1	For robots with protection type Clean Room: Clean and paint the joints that have been opened. See *Cut the paint or surface on the robot before replacing parts on page 167*. **Note** After all repair work, wipe the Clean Room robot free from particles with spirit on a lint free cloth.	
2	Recalibrate the robot.	Calibration is detailed in section *Calibration on page 767*.
3	**DANGER** Make sure all safety requirements are met when performing the first test run. See *Test run after installation, maintenance, or repair on page 108*.	

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6 Calibration

6.1 Introduction to calibration

6.1.1 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*.

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 in the first step generates a reference to current zero position of the robot. The same calibration routine can later on be used to recalibrate the robot back to the same position as when the reference was stored. 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. Requires that the robot is dressed with the same tools and process equipment during calibration as during creation of the reference values.
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.

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6.1.2 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	The calibrated robot is positioned at calibration position. Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot.	Axis Calibration
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: • Mechanical tolerances in the robot structure • Deflection due to load Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot. Absolute accuracy calibration data is found on the serial measurement board (SMB) or other robot memory. A robot calibrated with Absolute accuracy has the option information printed on its name plate (OmniCore). To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.	CalibWare
Optimization	Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing. Wrist optimization will update standard calibration data for axes 4, 5 and 6. **Note** For advanced users, it is also possible to use the do the wrist optimization using the RAPID instruction `WristOpt`, see *Technical reference manual - RAPID Instructions, Functions and Data types*. This instruction is only available for OmniCore robots.	Wrist Optimization

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1300. It is the recommended method in order to achieve proper performance.

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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.

Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing and is a complement to the standard calibration method.

The actual instructions of how to perform the wrist optimization procedure is given on the FlexPendant.

CalibWare - Absolute Accuracy calibration

The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field*.

If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

The Absolute Accuracy option varies according to the robot mounting position. This is printed on the robot name plate for each robot. The robot must be in the correct mounting position when it is recalibrated for absolute accuracy.

References

Article numbers for the calibration tools are listed in the section *Special tools on page 818*.

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6.1.3 When to calibrate

When to calibrate

The system must be calibrated if any of the following situations occur.

The resolver values are changed

If resolver values are changed, the robot must be re-calibrated using the calibration methods supplied by ABB. Calibrate the robot carefully with standard calibration, according to information in this manual.

If the robot has *absolute accuracy* calibration, it is also recommended, but not always necessary to calibrate for new absolute accuracy.

The resolver values will change when parts affecting the calibration position are replaced on the robot, for example motors or parts of the transmission.

The revolution counter memory is lost

If the revolution counter memory is lost, the counters must be updated. See *Updating revolution counters on page 773*. 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 reachability of a robot is changed, it needs to be re-calibrated for new resolver values.

If the robot has *absolute accuracy* calibration, it needs to be calibrated for new absolute accuracy.

Robot is not floor mounted

The original calibration data delivered with the robot is generated when the robot is floor mounted. If the robot is not floor mounted, then the robot accuracy could be affected. The robot needs to be calibrated after it is mounted.

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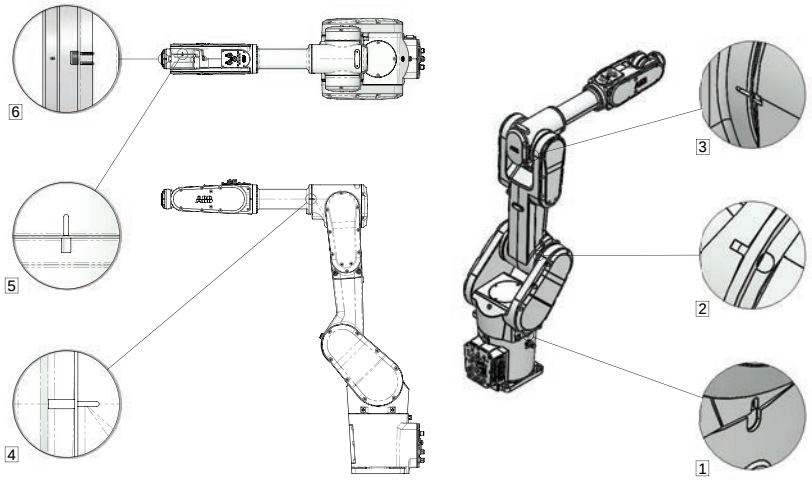
6.2 Synchronization marks and axis movement directions

6.2.1 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 1300



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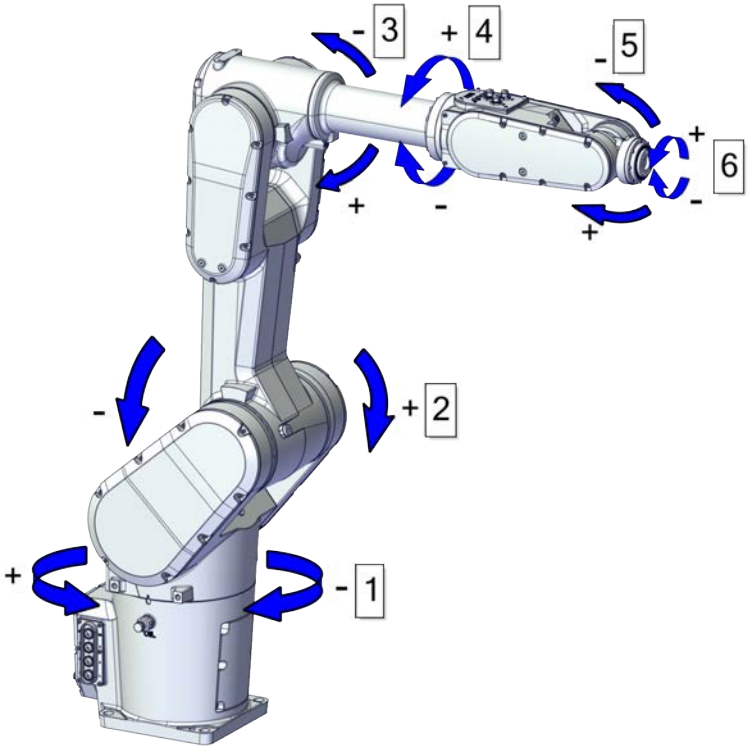
6.2.2 Calibration movement directions for all axes

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



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6.3 Updating revolution counters

6.3.1 Updating revolution counters on OmniCore robots

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 771*.
3	When all axes are positioned, update the revolution counter.	*Step 2 - Updating the revolution counter with the FlexPendant on page 773*.

Step 2 - Updating the revolution counter with the FlexPendant

Use this procedure to update the revolution counter with the FlexPendant (OmniCore).

	Action
1	On the start screen, tap **Calibrate**. The calibration summary page for the mechanical unit is displayed.
2	In the **Calibration Methods** menu, select **Revolution Counters**.
3	In the **Selection** column select the axes for which revolution counters need to be updated.
4	Tap **Update**. A dialog box is displayed warning that the updating operation cannot be undone.
5	Tap **OK** to update the revolution counter.
6	**CAUTION** If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury! Check the synchronization position very carefully after each update. See *Checking the synchronization position on page 794*.

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6.4 Calibrating with Axis Calibration method

6.4.1 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.

For axis 6 calibration there is one bushing on the wrist and one mounting hole on the tool flange.

The Axis Calibration procedure described roughly:

1 A removable calibration tool is inserted by the operator into a calibration bushing on the axis chosen for calibration, according to instructions on the FlexPendant.

WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration bushings may cause severe damage to the robot and/or personnel.

WARNING

The calibration tool must be fully inserted into the calibration bushing, until the steel spring ring snaps into place.

2 During the calibration procedure, RobotWare moves the robot axis chosen for calibration so that the calibration tools get into contact. RobotWare records values of the axis position and repeats the coming-in-contact procedure several times to get an exact value of the axis position.

WARNING

Risk of pinching! The contact force for large robots can be up to 150 kg. Keep a safe distance to the robot.

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3 The axis position is stored in RobotWare with an active choice from the operator.

Routines in the calibration procedure

The following routines are available in the Axis Calibration procedure, given at the beginning of the procedure on the FlexPendant.

Fine calibration routine

Choose this routine to calibrate the robot when there are no tools, process cabling or equipment fitted to the robot.

Reference calibration routine

Choose this routine to create reference values and to calibrate the robot when the robot is dressed with tools, process cabling or other equipment.

Also choose this routine if the robot is wall mounted or suspended.

Note

When calibrating the robot with the reference calibration routine, the robot must be dressed with the same tools, process cabling and any other equipment as when the reference values were created.

Note

When using reference calibration with some tools, typically large or flexible tools, oscillations in the robot can cause issues leading to failure of the calibration.

If calibrating the robot with reference calibration there must be reference values created before repair is made to the robot, if values are not already available. Creating new values requires possibility to move the robot. The reference values contain positions of all axes, torque of axes and technical data about the tool installed. A benefit with reference calibration is that the current state of the robot is stored and not the state when the robot left the ABB factory. The reference value will be named according to tool name, date etc.

Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.

When reference calibration is performed, the robot is restored to the status given by the reference values.

Update revolution counters

Choose this routine to make a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

Validation

In the mentioned routines, it is also possible to validate the calibration data.

Position of robot axes

The robot axes should be positioned close to 0 degrees before commencing the calibration program. The axis chosen for calibration is then automatically run by

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the calibration program to its exact calibration position during the calibration procedure.

It is possible to position some of the other axes in positions different from 0 degrees. Information about which axes are allowed to be jogged is given on the FlexPendant. These axes are marked with **Unrestricted** in the FlexPendant window. Also the following table shows the dependencies between the axes.

Requirements for axis positioning during calibration

	Axis to calibrate					
Required position of axis	**Axis 1**	**Axis 2**	**Axis 3**	**Axis 4**	**Axis 5**	**Axis 6**
Axis 1	-	*	*	*	*	*
Axis 2	0	-	0	*	*	*
Axis 3	0	0	-	*	*	*
Axis 4	*	*	*	-	*	*
Axis 5	*	*	*	*	-	X
Axis 6	*	*	*	*	*	-

-	Axis to be calibrated
*	Unrestricted. Axis is allowed to be jogged to other position than 0 degrees.
0	Axis must be put in position 0 degrees.
X	Special requirement

System containing SafeMove

SafeMove will lose its synchronization to the controller if a new calibration is done. New calibration values have to be downloaded to SafeMove, and a new SafeMove calibration has to be done. Make sure that the user rights admit to change the safety settings and to synchronize SafeMove.

How to calibrate a suspended or wall mounted robot

The IRB 1300 is fine calibrated floor standing in factory, prior to shipping.

To calibrate a suspended or wall mounted robot, reference calibration could be used. Reference values for a suspended or a wall mounted robot must be created with the robot mounted at its working position, not standing on a floor.

To calibrate a suspended or wall mounted robot with the fine calibration routine, the robot must first be taken down and mounted standing on the floor.

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6.4.2 Calibration tools for Axis Calibration

Calibration tool set

The calibration tools used for Axis Calibration are designed to meet requirements for calibration performance, durability and safety in case of accidental damage.

The calibration tool will eventually break from fatigue after longer period of use and then needs to be replaced. There is no risk for bad calibrations as long as the calibration tool is in one piece.

WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration bushings may cause severe damage to the robot and/or personnel.

Equipment, etc.	Article number	Note
Calibration toolbox, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.

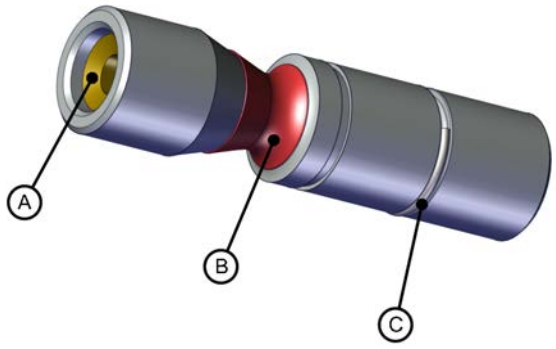
Examining the calibration tool

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.



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A	Tube insert
B	Plastic protection
C	Steel spring ring

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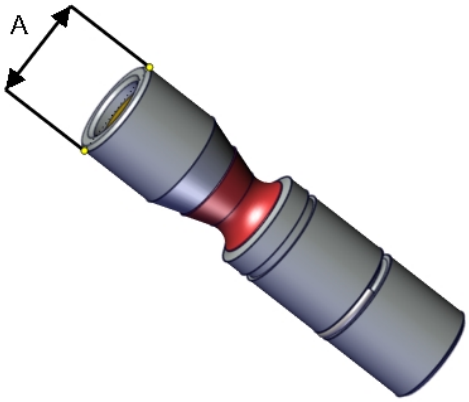
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6.4.2 Calibration tools for Axis Calibration
Continued

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).
- Straightness within 0.005 mm.



xx1500000951

A	Outer diameter

Periodic check of the calibration tool for the tool flange (3HAC058238-001)

If including the tool flange calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within Ø5g5 mm.
- Straightness within 0.005 mm.

.



xx1600001142

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.

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	Action	Note
1	It is possible to use any RFID solution, with the correct dimensions. ABB has verifed function on some suppliers fulfilling the requirements of NFC compatible devices (13.56 Mhz) according to ISO 14443 or ISO 15693.  **Note** 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).	
2	There is a cavity on one end of the calibration tool in which the RFID chip can be installed. Install the RFID chip according to supplier instructions. Install the chip in flush with the tool end.	

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6.4.3 Installation locations for the calibration tools

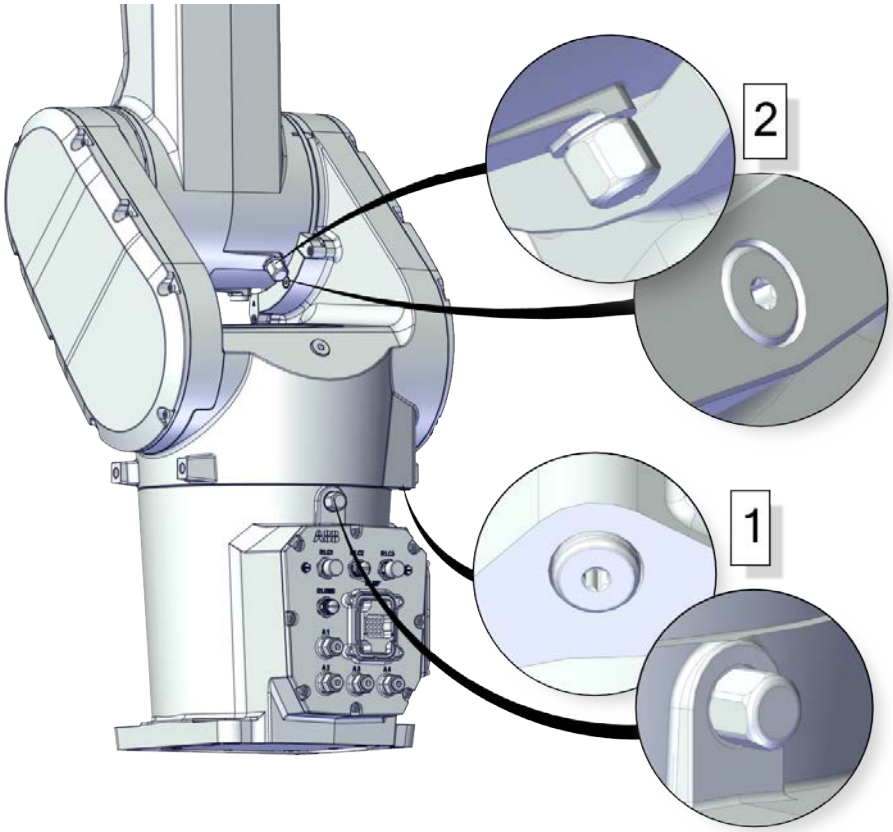
Location of fixed calibration items

This section shows how the robot is equipped with items for installation of calibration tools for Axis Calibration (fixed calibration pins and/or bushings). Installed calibration tools are not shown.

A fixed calibration pin and a bushing for the movable calibration tool are located on each axis as follows.

If there is not enough space on an axis to install a fixed calibration pin, the axis is equipped with two bushings instead, for installation of two calibration tools when calibration is carried out. This is shown in the figure.

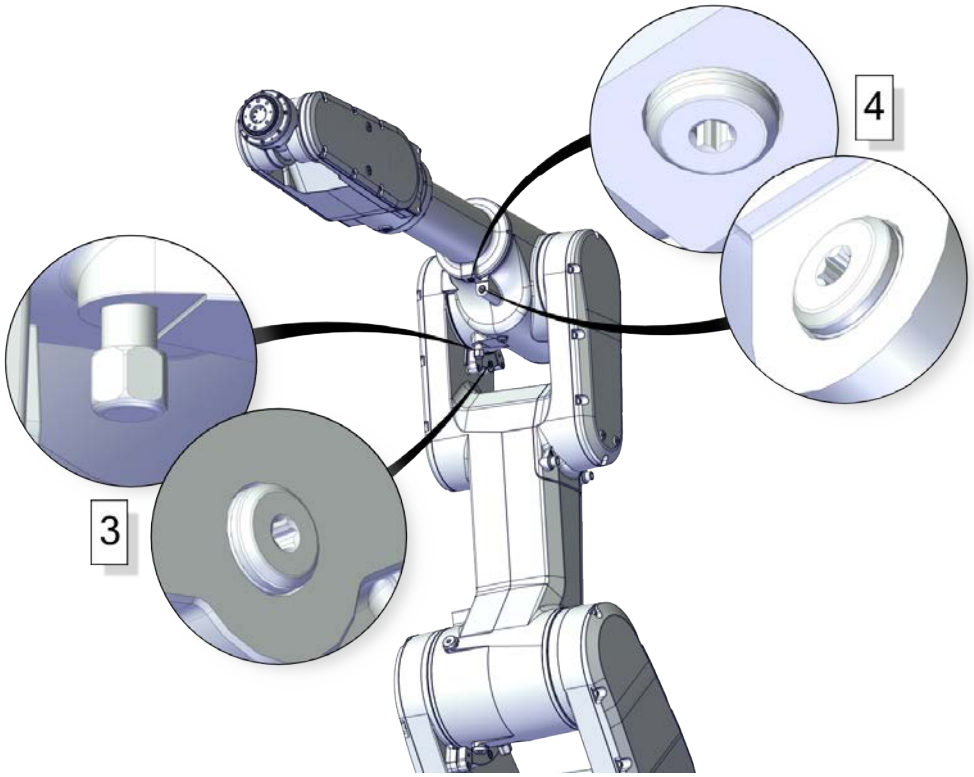
For axis 6 there is only one bushing, the second calibration tool is installed at the mounting flange of the turning disk.



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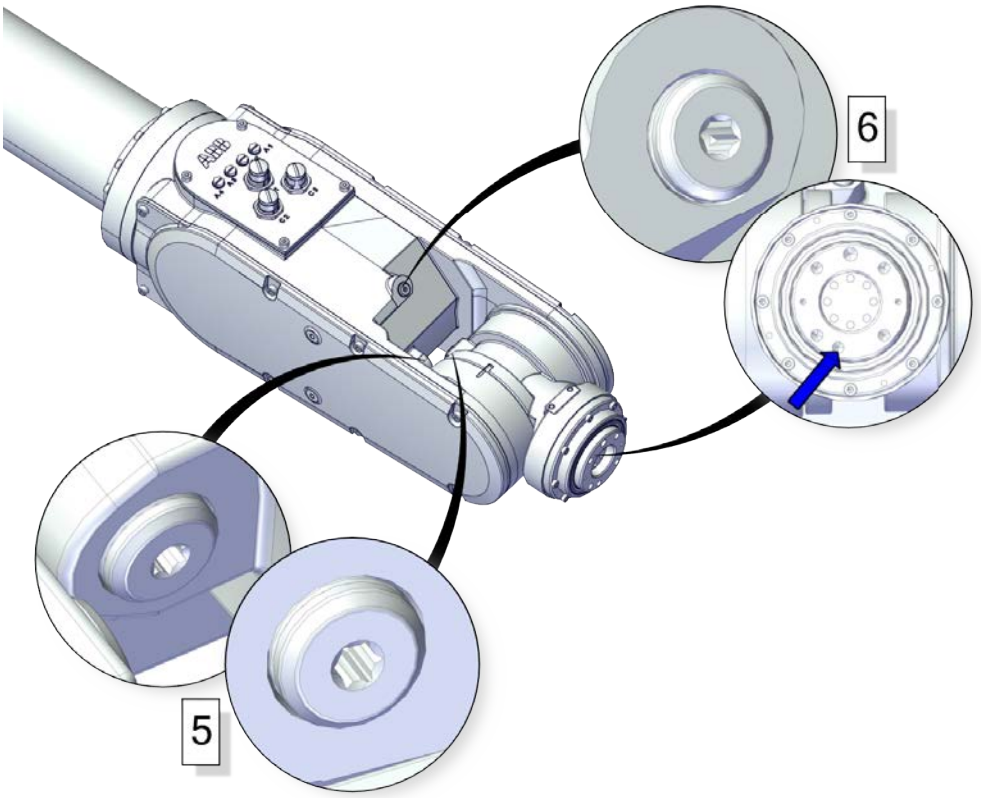


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6.4.3 Installation locations for the calibration tools
Continued



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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.

Spare part	Article number	Note
Protective plug for 10-mm bushing	3HAC053237-003	Replace if damaged or missing.
Protective plug for 12-mm bushing	3HAC053237-002	Replace if damaged or missing.
Calibration pin cover, 10 mm	3HAC056253-003	Replace if damaged or missing.
Calibration pin cover, 14 mm	3HAC056253-002	Replace if damaged or missing.
O-ring on calibration pin	3HAC061327-022	Replace if damaged or missing.
O-ring on calibration pin	3HAC061327-011	Replace if damaged or missing.
Rubber sealing washer with 10-mm protective cover	3HAC077381-001	Used with protection type Clean Room. Replace if damaged or missing.
Rubber sealing washer with 12-mm protective cover	3HAC075324-001	Used with protection type Clean Room. Replace if damaged or missing.
Rubber sealing washer for 10-mm calibration pin cover	3HAC075325-001	Used with protection type Clean Room. Replace if damaged or missing.

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Spare part	Article number	Note
Rubber sealing washer for 14-mm calibration pin cover	3HAC075323-001	Used with protection type Clean Room. Replace if damaged or missing.

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6.4.4 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 toolbox, Axis Calibration	3HAC074119-001	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
Protective plug for 10-mm bushing	3HAC053237-003	Replace if damaged or missing.
Protective plug for 12-mm bushing	3HAC053237-002	Replace if damaged or missing.
Calibration pin cover, 10 mm	3HAC056253-003	Replace if damaged or missing.
Calibration pin cover, 14 mm	3HAC056253-002	Replace if damaged or missing.
O-ring on calibration pin	3HAC061327-022	Replace if damaged or missing.
O-ring on calibration pin	3HAC061327-011	Replace if damaged or missing.
Rubber sealing washer with 10-mm protective cover	3HAC077381-001	Used with protection type Clean Room. Replace if damaged or missing.
Rubber sealing washer with 12-mm protective cover	3HAC075324-001	Used with protection type Clean Room. Replace if damaged or missing.
Rubber sealing washer for 10-mm calibration pin cover	3HAC075325-001	Used with protection type Clean Room. Replace if damaged or missing.
Rubber sealing washer for 14-mm calibration pin cover	3HAC075323-001	Used with protection type Clean Room. Replace if damaged or missing.

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.

Continues on next page

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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.

After the calibration method has been started 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.
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 robot's 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.
3	Check if the standard calibration data for axes 4, 5 or 6 are updated with wrist optimization. This is shown in the calibration overview/summary window on the FlexPendant.	If the data is optimized, the calibration routine **Wrist Optimization** must be re-run after standard calibration. See *Calibrating with Wrist Optimization method on page 791*.

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6.4.4 Axis Calibration - Running the calibration procedure
Continued

Starting the calibration procedure

Use this procedure to start the Axis Calibration routine on the FlexPendant.

	Action	Note
1	Tap the calibration icon and enter the calibration main page.	
2	All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question. **Note** For RobotWare 7, the mechanical unit page is displayed only if there is more than one mechanical unit available.	
3	The calibration method used at ABB factory for each axis is shown, as well as calibration method used for the robot during last field calibration.	The FlexPendant will give all information needed to proceed with Axis Calibration.
4	**Valid for RobotWare 7** Tap **Calibration Methods** on the right pane and then tap **Calibration**. The software will automatically call for the procedure for the valid calibration method.	
5	Follow the instructions given on the FlexPendant.	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 784*.

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**.
The RobotWare program is terminated with **PP to Main**.	Remove the calibration tool, if it is installed, and restart the calibration procedure from the beginning. See *Starting the calibration procedure*. 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 772*

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.

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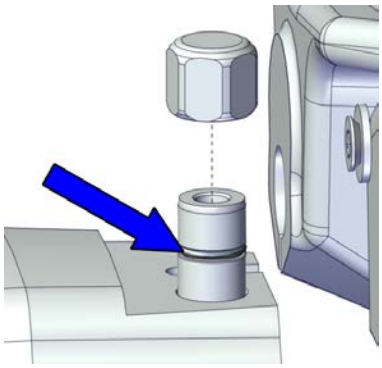
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However, SafeMove may generate other warning messages anytime during the Axis Calibration routine. When a warning message is displayed, tap **Acknowledge** to confirm the unsynchronized state and continue Axis Calibration procedure.

CAUTION

SafeMove must be synchronized after the calibration is completed.

After calibration

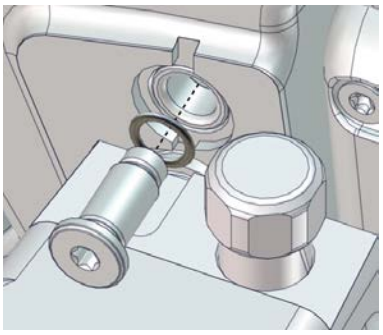
	Action	Note
1	Check the o-ring on the fixed calibration pin. Replace if damaged or missing.	 xx1600002102 O-ring on calibration pin: 3HAC061327-022 O-ring on calibration pin: 3HAC061327-011 Calibration pin cover, 10 mm: 3HAC056253-003 Calibration pin cover, 14 mm: 3HAC056253-002 Rubber sealing washer with 10-mm protective cover: 3HAC077381-001 Rubber sealing washer with 12-mm protective cover: 3HAC075324-001 Rubber sealing washer for 10-mm calibration pin cover: 3HAC075325-001 Rubber sealing washer for 14-mm calibration pin cover: 3HAC075323-001
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.	

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6.4.4 Axis Calibration - Running the calibration procedure

Continued

	Action	Note
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.	 xx1500000952 Protective plug for 10-mm bushing: 3HAC053237-003. Protective plug for 12-mm bushing: 3HAC053237-002.
4	If the standard calibration data for axes 4, 5 or 6 should be updated with wrist optimization, run the calibration routine **Wrist Optimization**.	See *Calibrating with Wrist Optimization method on page 791*.

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6.4.5 Reference calibration

Brief introduction to Reference Calibration

Reference calibration is a faster method compared to Fine calibration, as it refers to a previously made calibration.

1. Create a backup of the current robot system.
2. Check that the active calibration offset values corresponds to the values on the calibration label (located on the lower arm or the base).
3. Jog the manipulator so that all axes are in zero position (ex use `MoveAbsJ` instruction). Check that all axis scales are aligned with calibration marks.
4. If the scales differ from calibration marks it might depend on wrong turns of the revolution counters. Make a marker line on the corresponding axis to be able to validate the result of the calibration. If more than one motor revolutions are wrong, the calibration will fail.
5. Use a verification position. This is especially recommended if all axes were not aligned with the synchronization marks (step 3). Reuse an existing position that is suitable and accurate so it can be used to validate the repair. Use a position where a deviation in axis calibration gives a big deviation in positioning. Note! Check the position after each repair in one axis.
6. Use Reference calibration to save reference values for all axes that is to be replaced. Make sure that the values are saved in RobotStudio or FTP program. The files are located in "Active system folder name/HOME/RefCalibFiles".
7. Perform the repair.
8. Make sure that the tooling and process equipment are the same as when creating the reference. Use Reference calibration to update the system with new calibration offset value for the repaired axis.
9. Check the position against the verification position (step 5).
10. Proceed with the repair of the next axis, if necessary, and repeat (step 8-9) for every axis.
11. (For system containing SafeMove) Download new calibration values to SafeMove. Use Visual SafeMove in RobotStudio.
12. (For system containing SafeMove) Synchronize SafeMove to activate SafeMove.
13. Perform test run.
14. Update the calibration label with new resolver values (calibration values).

Manual tuning of calibration offset

Manual tuning of calibration offset is normally not needed, but can be useful in some situations. The requirement to do manual tuning is that there is a known accurate position, that worked accurately before the repair (step 5, see *Brief introduction to Reference Calibration on page 789*).

Example "Adjust axis 4":

1. Create a backup.

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6.4.5 Reference calibration
Continued

2 Run the manipulator to the verification position. (The manipulator position is now deviating from the verification position.)
3 Read and note current axis 4 value in degrees (example: 96.3 degrees).
4 Manually jog, only axis 4, so that the manipulator is correctly positioned to the verification position.
5 Read and note current axis 4 value in degrees (example: 94.2 degrees).
6 Move the manipulator to its calibration position.
7 Calculate the angle difference (ie 96.3-94.2=2.1 degrees).
8 Manually jog axis 4 the calculated angle difference (-2.1). NOTE! The direction +/- shall be the same direction as the direction used when axis 4 was manually jogged to coincide with the verification process. In the example -2.1 degrees.
9 Make a new manual fine calibration of axis 4 with axis in -2.1 degrees position.
10 Check again against the verification position.
11 Repeat the manual tuning if needed.
12 Create a new reference if the intention is to use the reference in the future.

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6.5 Calibrating with Wrist Optimization method

When to run Wrist Optimization

Wrist Optimization routine is run to improve TCP reorientation performance.

Calibrating the robot with standard calibration method overwrites the optimized positions of axes 4, 5, 6. Re-run the **Wrist Optimization** routine after standard calibration to re-achieve the optimized positions of the wrist axes.

Overview of the calibration procedure on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Use the following list to learn about the calibration procedure before running the RobotWare program on the FlexPendant. It gives you a brief overview of the calibration procedure sequence.

After the calibration method has been called for on the FlexPendant, the following sequence will be run.

1 Choose calibration routine Wrist Optimization.

2 Modify targets for 4-point tool frame definition, in Wrist Optimization routine.

> **Tip**
>
> Select positions with large reorientations around the TCP. For best results, make sure that axis 4 and 5 have large movements.

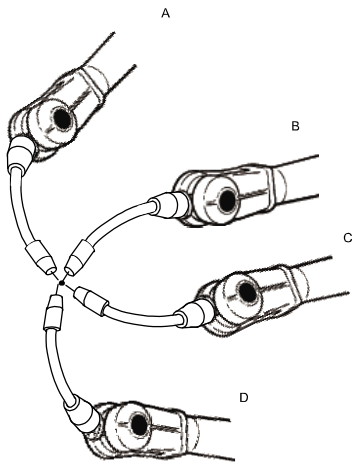
a Jog the robot to an appropriate position, A, for the first approach point.

Use small increments to accurately position the tool tip as close to the reference point as possible.

b Tap **Modify Position** to define the point.

c Repeat for each approach point to be defined, positions B, C, and D.

Jog away from the fixed world point to achieve the best result. Just changing the tool orientation will not give as good a result.



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3 Improved calibration data to the wrist axes is identified and presented.

4 Optimized positions for the wrist axes are presented.

5 The robot moves to the optimized positions for the wrist axes and automatically overwrites previous calibration data.

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WARNING

Robot moves automatically when pressing **Calibrate**.

6 Wrist optimization is finished.

7 Redefine / verify TCP for all tools.

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6.6 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 794*.
2	Adjust the *synchronization marks* when the calibration is done, if necessary.	This is detailed in section *Synchronization marks and synchronization position for axes on page 771*.
3	Write down the values on a new label and stick it on top of the calibration label. The label is located on the base.	

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6.7 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 **Jog** window on the FlexPendant.

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6.7.1 Checking the synchronization position on OmniCore robots

Using a MoveAbsJ instruction

Use this procedure to create a program that runs all the robot axes to their synchronization position.

	Action	Note
1	Tap **Code**.	
2	Create a new program.	
3	Use **MoveAbsJ** in the **Add Instruction** menu.	

4	Create the following program:
	`MoveAbsJ [[0,0,0,0,0,0],`
	`[9E9,9E9,9E9,9E9,9E9,9E9]]`
	`\NoEOffs, v1000, fine, tool0`	

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 771* and *Updating revolution counters on page 773*.

Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

	Action	Note
1	Tap **Jog**.	
2	From the **Mechanical unit** list select a mechanical unit.	
3	From the **Motion mode** section, select an axis-set that need to be jogged. For example, to jog axis 2, select the axis set **Axis 1-3**.	
4	Follow the screen instruction on joystick movements to understand the direction of the axis that you want to move and move the joystick.	
5	Manually run the robots axes to a position where the axis position value read on the FlexPendant, is equal to zero.	
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 771* and *Updating revolution counters on page 773*.

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7 Troubleshooting

7.1 Introduction to troubleshooting

Introduction

The product manual and the circuit diagram contains information that can be good when troubleshooting.

For OmniCore, all event logs from the software can be seen on the FlexPendant, or in *Technical reference manual - Event logs for RobotWare 7*.

Make sure to read through the section *Safety on page 17* before starting.

Troubleshooting strategies

1. Isolate the fault to pinpoint the cause of the problem from consequential problems.
2. Divide the fault chain in two.
3. Check communication parameters and cables.
4. Check that the software version is compatible with the hardware.

Work systematically

1. Take a look around to make sure that all screws, connectors, and cables are secured, and that the robot and other parts are clean, not damaged, and correctly fitted.
2. Replace one thing at a time.
3. Do not replace units randomly.
4. Make sure that there are no loose screws, turnings, or other unexpected parts remaining after work has been performed.
5. When the work is completed, verify that the safety functions are working as intended.

Keep a track of history

- Make a historical fault log to keep track of problems over time.
- Consult those working with the robot when the problem occurred.

Basic scenarios

What to look for during troubleshooting depends on when the fault occurred. Was the robot recently installed or was it recently repaired? The following table gives hints on what to look for in specific situations.

The robot has recently been installed	Check: • the configuration files • connectors • options and their configuration • changes in the robot working space/movements.

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7.1 Introduction to troubleshooting

Continued

The robot has recently been repaired	Check: • all connections to the replaced part • power supplies • that the correct part has been fitted • the last repair documents.
The robot recently had a software upgrade	Check: • software versions • compatibilities between hardware and software • options and their configuration
The robot has recently been moved from one site to another (an already working robot)	Check: • connections • software versions

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7.2 Oil and grease stains on motors and gearboxes

Description

The area surrounding the motor, gearbox or seal lip shows signs of oil leaks. This can be at the base, closest to the mating surface, at the furthest end of the motor at the resolver, or around the joints of the covers (closest to the edge) on the robot surface.

Consequences

Besides the dirty appearance, in most cases there are no serious consequences if the leaked amount of oil is very small.

Possible causes

The symptom can be caused by:

- Leakage of rust preventives or mounting grease. This should be wiped off.
- Leaking sealing between gearbox and motor.
- Gearbox overfilled with oil.
- Gearbox oil too hot.

Recommended actions

The following actions are recommended:

	Action	Information
1	**CAUTION** Allow hot parts to cool down.	
2	Wipe off the oil or grease, see *Cleaning the IRB 1300 on page 116*. Monitor the robot over time to see if new oil or grease occurs.	If the oil spill is small, this step is sufficient.
3	Check the gearbox oil level.	
4	Too hot gearbox oil may be caused by: • Incorrect oil quality or level. • The robot work cycle runs a specific axis too hard. Investigate whether it is possible to program small "cooling periods" into the application. • Overpressure created inside gearbox.	Robots performing certain, extremely heavy duty work cycles may be fitted with vented oil plugs. These are not fitted to normal duty robots, but can be purchased from your local ABB representative.
5	Inspect all sealings and gaskets between motor and gearbox. Replace broken parts.	

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7.3 Mechanical noise or dissonance

Description

Mechanical noise or dissonance that has not been observed before can indicate problems in bearings, motors, gearboxes, or similar. Be observant of changes over time.

A faulty bearing often emits scraping, grinding, or clicking noises shortly before failing.

Consequences

Failing bearings cause the path accuracy to become inconsistent, and in severe cases, the joint can seize completely.

Possible causes

The symptom can be caused by:

- Worn bearings.
- Contaminations have entered the bearing grooves.
- Loss of lubrication in bearings.
- Loose heat sinks, fans, or metal parts.

If the noise is emitted from a gearbox, the following can also apply:

- Overheating.

Recommended actions

The following actions are recommended:

	Action	Information
1	**CAUTION** Allow hot parts to cool down.	
2	Verify that the service is done according to the maintenance schedule.	
3	If a bearing is emitting the noise, determine which one and make sure that it has sufficient lubrication.	
4	If possible, disassemble the joint and measure the clearance.	
5	Bearings inside motors are not to be replaced individually, but the complete motor is replaced.	
6	Make sure the bearings are fitted correctly.	
7	Tighten the screws if a heat sink, fan, or metal sheet is loose.	

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7.4 Manipulator collapses on power down

Description

The manipulator is able to work correctly while Motors ON is active, but when Motors OFF is active, one or more axes drops or collapses under its own weight.

The holding brakes (normally one in each motor), is not able to hold the weight of the manipulator arm.

Consequences

For a heavy robot, the collapse can cause severe injury to personnel working in the area or severe damage to the robot and/or surrounding equipment.

For a small robot, the collapse can cause injury to personnel working close to the robot or damage to the robot and/or surrounding equipment.

Possible causes

The symptom can be caused by:

- Faulty brake.
- Faulty power supply to the brake.

Recommended actions

The following actions are recommended:

	Action	Information
1	Determine which motor(s) causes the robot to collapse.	
2	Check the brake power supply to the collapsing motor during the Motors OFF state.	See the circuit diagram.
3	Remove the resolver or resolver cover of the motor to see if there are any signs of oil leaks.	If found faulty, the motor must be replaced as a complete unit.
4	Remove the motor from the gearbox to inspect it from the drive side.	If found faulty, the motor must be replaced as a complete unit.

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7.5 Motor temperature too high

Description

The robot stops and the motor temperature for joint arg is too high.

Consequences

It is not possible to continue until the motor has cooled down. The system goes to Motors Off.

Possible causes

The symptom can be caused by:

- The values for payload and arm load are not consistent with the actual ones.
- The value for ambient temperature setting in the controller is not consistent with the actual operating temperature environment.
- The user program may contain too much high acceleration and deceleration of the joint.
- Gravity torque or external forces for the joint can also be too high.

Recommended actions

The following actions are recommended:

	Action	Information
1	**CAUTION** Allow hot parts to cool down.	
2	Verify that the values for payload and arm load are set correctly.	
3	Verify that the value for ambient temperature setting in the controller is consistent with the actual operating temperature environment.	
4	Rewrite the user program to reduce the motor utilization.	The ways could be but not limited to optimizing robot movement cycle, adjusting acc, dec as well as external force, adding wait time, and introducing alternative path/RAPID, etc.

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7.6 Robot vibration during low speed movement

Description

Robot vibration, especially at the wrist, can be observed when the robot moves at a low speed.

Consequences

Slight vibration that is invisible will not affect the use of the robot. However, a clear robot vibration will decrease path accuracy and affect user applications.

Possible causes

Vibration might be caused by external factors:

- Incorrect robot installation
- Insufficient stiffness of robot pedestal
- Resonance with nearby moving machines
- Incorrect definition of payloads and tools
- Part malfunction, such as motor, gearbox, timing belt or main cable harness

Vibration might also happen when the robot moves at a low speed or in some specific poses. This is generally caused by mechanical resonance between servo system, gearbox and robot body, which is considered as an internal factor. Such vibration is a normal physical phenomenon, which is not a quality-related issue.

Recommended actions

The following actions are recommended:

	Action	Information
1	Verify that the robot is firmly secured to the foundation.	The attachment screws used for securing the robot to the foundation must be tightened with correct tightening torque. See *Orienting and securing the robot on page 70*.
2	Verify that the stiffness of robot pedestal meets the requirement.	
3	Turn off all the moving machines near to the robot and then check robot vibration again. If no vibration can be observed any more, move either the machines or the robot to another place to remove the external resonance source.	
4	Verify the payload and tools are correctly defined. If not correctly defined, redefine them.	
5	Jog the robot joint by joint to verify the functionality of each joint. If anything abnormal is found on a joint, locate the possible malfunction part with other measurements such as noise, warnings on the FlexPendant, and then replace it.	

Continues on next page

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7.6 Robot vibration during low speed movement
Continued

	Action	Information
6	Make sure all the external factors have been checked and excluded. If vibration remains, it might be caused by the internal factor. Contact ABB for further assistance.	

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8 Decommissioning

8.1 Introduction to decommissioning

Introduction

This section contains information to consider when taking a product, robot or controller, out of operation.

It deals with how to handle potentially dangerous components and potentially hazardous materials.

> **Note**
>
> The decommissioning process shall be preceded by a risk assessment.

Disposal of materials used in the robot

All used grease/oils and dead batteries **must** be disposed of in accordance with the current legislation of the country in which the robot and the control unit are installed.

If the robot or the control unit is partially or completely disposed of, the various parts **must** be grouped together according to their nature (which is all iron together and all plastic together), and disposed of accordingly. These parts **must** also be disposed of in accordance with the current legislation of the country in which the robot and control unit are installed.

See also *Environmental information on page 806*.

Transportation

Prepare the robot or parts before transport, this to avoid hazards.

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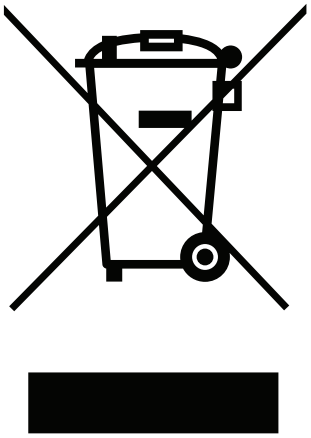
8.2 Environmental information

Introduction

ABB robots contain components in different materials. During decommissioning, all materials shall be dismantled, recycled, or reused responsibly, according to the relevant laws and industrial standards. Robots or parts that can be reused or upcycled helps to reduce the usage of natural resources.

Disposal symbol

The following symbol indicates that the product must not be disposed of as common garbage. Handle each product according to local regulations for the respective content (see table below).



xx1800000058

Materials used in the product

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly according to local regulations to prevent health or environmental hazards.

Material	Example application
Aluminium	Base, swing, lower arm, etc
Batteries, Lithium	Serial measurement board
Copper	Cables, motors
Neodymium	Brakes, motors
Oil, grease	Gearboxes
Plastic/rubber	Cables, connectors, etc
Steel	Gearboxes, screws

China RoHS symbol

The following symbol shows the information to hazardous substances and the environmental protection use period of IRB 1300 according to "Management

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Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products (SJ/T 11364-2014) ".



xx1900000803

Green symbol with "e" in it: The product does not contain any hazardous substances exceeding concentration limits and is a green environmentally friendly product which can be recycled.

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.

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8.3 Scrapping of robot

Note

The decommissioning process shall be preceded by a risk assessment.

Important when scrapping the robot

DANGER

The risk assessment should consider hazards arising in the decommissioning, such as, but not limited to:

- Always remove all batteries. If a battery is exposed to heat, for example from a blow torch, it will explode.
- Always remove all oil/grease in gearboxes. If exposed to heat, for example from a blow torch, the oil/grease will catch fire.
- When motors are removed from the robot, the robot will collapse if it is not properly supported before the motor is removed.
- A used robot does not have the same performance as on delivery. Springs, brakes, bearings, and other parts might be worn or broken.

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9 Reference information

9.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

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9.2 Applicable standards

General

The product is compliant with ISO 10218-1:2011, *Robots for industrial environments - Safety requirements - Part 1 Robots*, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviation from ISO 10218-1:2011, these are listed in the declaration of incorporation. The declaration of incorporation is part of the delivery.

Robot standards

Standard	Description
ISO 9283	Manipulating industrial robots – Performance criteria and related test methods
ISO 9787	Robots and robotic devices – Coordinate systems and motion nomenclatures
ISO 9946	Manipulating industrial robots – Presentation of characteristics

Other standards used in design

Standard	Description
IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements, normative reference from ISO 10218-1
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
ISO 13849-1:2006	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design, normative reference from ISO 10218-1
IEC 61340-5-1	Protection of electronic devices from electrostatic phenomena - General requirements
UL 1740 (option) CSA Z434 (option)	Standards For Safety - Robots and Robotic Equipment Industrial robots and robot Systems - General safety requirements Valid for USA and Canada.

Deviations

Deviation for IRB 1300

The IRB 1300 does not provide means of installing adjustable mechanical stops on axis 1. Optional features provided by SafeMove, safety-rated soft axis and space limiting can be used as risk reduction measures in specific applications.

For details about SafeMove, see *Application manual - Functional safety and SafeMove*.

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9.3 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	

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9.4 Screw joints

General

This section describes how to tighten the various types of screw joints on ABB robots.

The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.

UNBRAKO screws

UNBRAKO is a special type of screw recommended by ABB for certain screw joints. It features special surface treatment (Gleitmo as described below) and is extremely resistant to fatigue.

Whenever used, this is specified in the instructions, and in such cases, *no other type of replacement screw* is allowed. Using other types of screws will void any warranty and may potentially cause serious damage or injury.

Gleitmo treated screws

Gleitmo is a special surface treatment to reduce the friction when tightening the screw joint. It is recommended by ABB for M6-M20 screw joints. 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.

Generally, screws are lubricated with *Gleitmo 603* mixed with *Geomet 500* or *Geomet 702* in proportion 1:3. *Geomet* thickness varies according to screw dimensions, refer to the following.

Dimension	Lubricant	Geomet thickness
M6-M20 (any length except M20x60)	*Gleitmo 603 + Geomet 500*	3-5 µm
M6-M20 (any length except M20x60)	*Gleitmo 603 + Geomet 720*	3-5 µm
M20x60	*Gleitmo 603 + Geomet 500*	8-12 µm
M20x60	*Gleitmo 603 + Geomet 720*	6-10 µm

Screws lubricated in other ways

Screws lubricated with Molykote 1000 or Molykote P1900 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.

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Lubricant	Article number
Molykote 1000 (molybdenum disulphide grease)	3HAC042472-001
Molykote P1900 (molybdenum disulphide grease)	3HAC070875-001

Tightening torque

Before tightening any screw, note the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard torques** are specified in the following tables. Any **special torques** are specified in the repair, maintenance or installation procedure descriptions. **Any special torque specified overrides the standard torque!**
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- Always *tighten the joint by hand,* and never use pneumatic tools.
- 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%**!

Tightening torque for oil-lubricated screws with slotted or cross-recess head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws* with *slotted or cross-recess head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Tightening torque for oil-lubricated screws with allen head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws* with *allen head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Dimension	Tightening torque (Nm) 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

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9.4 Screw joints
Continued

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
M24	680	960	1150

Tightening torque for lubricated screws (Molykote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for *screws lubricated with Molycote 1000, Gleitmo 603 or equivalent* with *allen head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Dimension	Tightening torque (Nm) Class 10.9, lubricated [i]	Tightening torque (Nm) Class 12.9, lubricated [i]
M5		8
M6		14
M8	28	35
M10	55	70
M12	96	120
M16	235	300
M20	460	550
M24	790	950

[i] Lubricated with Molycote 1000, Gleitmo 603 or equivalent

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9.5 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 arm weighs 25 kg. All lifting accessories used must be sized accordingly.	

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9.6 Lubrication in gearboxes

General

This section describes the lubrication grease/oil required for maintenance and repair of gearboxes of the IRB 1300.

For amount the lubrication with spare part numbers can be ordered, see *Technical reference manual - Lubrication in gearboxes*.

Type of oil - currently used

CAUTION

The stated amount of lubrication is only indicative. Always judge the correct amount of filling by inspecting the oil level according to the oil changing procedures in chapter *Maintenance on page 109*. By doing this, the following risks are avoided:

- Too much lubrication may cause leakage due to over pressure in the gearbox.
- Too little lubrication may cause reduced lifetime of the gearbox due to lack of lubrication.

Axis	Spare part number	Type	Amount
1	3HAC032140-009	Kyodo Yushi TMO 150	580 ml [i]
2	3HAC032140-009	Kyodo Yushi TMO 150	245 ml [ii]

i The stated amount of lubrication is only indicative. Always judge the correct amount of filling by inspecting the oil level. The oil level must be within the range specified in the oil changing procedures in chapter *Maintenance on page 109*.

ii The oil level must be within the range of 64 mm-69 mm, as specified in the oil changing procedures in chapter *Maintenance on page 109*.

Note

Gearboxes of axis-3 to -6 contain lubrication grease at delivery and no grease amount is available.

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9.7 Standard toolkit

General

All service (repairs, maintenance, and installation) procedures contains lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the following table.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

Contents, standard toolkit

Qty	Tool	Rem.
1	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 head allen wrench drill bit set M2-M8 (φ 2.5 mm - φ 10 mm)	
1	Plastic mallet	

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9.8 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 817*, and of special tools, listed directly in the instructions and also gathered in this section.

Special tools

Note

If the replacing procedure is not listed in the table below, only standard tools are needed for the procedure.

Tools and equipment with spare part number: (These tools can be ordered from ABB)	
-	24 VDC power supply
3HAC074119-001	Calibration toolbox, Axis Calibration Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
-	Sonic tension meter Used for measuring the timing belt tension.
-	Dynamometer Used for measuring the timing belt tension.
-	Oil dispenser Includes pump with outlet pipe.
-	Oil collecting vessel The capacity of the vessel must be sufficient to take the complete amount of oil.
-	Connector for quick coupling, with outlet pipe Used for draining and filling oil to axis-1 gearbox. Connector specification: G3/8
3HAC076396-001	Special toolkit Includes Axis-1 gearbox assembly cap, Axis-1 gearbox/motor sealing pressfit tool, Axis-1 gearbox/motor sealing pressfit base, Guide pin for axis-2 gearbox, Quick coupling assembly tool and Tension adjustment tool for axis-4 timing belt.
3HAC078203-001	Special toolkit for IP67/Clean Room/Foundry Plus robots Used with protection class IP67, and protection types Clean Room and Foundry Plus. Used for the press-fitting of radial sealings. Includes five sets of radial sealing assembly tool for axes 1 to 4 and axis 6.
3HAC077885-001	Lifting accessory, robot Includes lifting accessories, lifting beam and screws.

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9.9 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.

The instructions delivered with the lifting accessories should be stored for later reference.

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10 Spare parts

10.1 Spare part lists and illustrations

Location

Spare parts and exploded views are not included in the manual but delivered as a separate document for registered users on myABB Business Portal, *www.abb.com/myABB*.



Tip

All documents can be found via myABB Business Portal, *www.abb.com/myABB*.

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ABB AB
Robotics & Discrete Automation
S-721 68 VÄSTERÅS, Sweden
Telephone +46 10-732 50 00

ABB AS
Robotics & Discrete Automation
Nordlysvegen 7, N-4340 BRYNE, Norway
Box 265, N-4349 BRYNE, Norway
Telephone: +47 22 87 2000

ABB Engineering (Shanghai) Ltd.
Robotics & Discrete Automation
No. 4528 Kangxin Highway
PuDong New District
SHANGHAI 201315, China
Telephone: +86 21 6105 6666

ABB Inc.
Robotics & Discrete Automation
1250 Brown Road
Auburn Hills, MI 48326
USA
Telephone: +1 248 391 9000

abb.com/robotics

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