

ROBOTICS

Product manual

CRB 1300



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OmniCore

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

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

- *Standard*
 - *IP67*
-

Usage

This manual should 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 must:

- 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 CRB 1300. Some variants and designs may have been removed from the business offer and are no longer available for purchase.

Continues on next page

References

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

Document name	Document ID
<i>Product manual, spare parts - CRB 1300</i>	3HAC083112-001
<i>Product specification - CRB 1300</i>	3HAC083113-001
<i>Safety manual for robot - Manipulator and IRC5 or OmniCore controllerⁱ</i>	3HAC031045-001
<i>Product manual - OmniCore C30</i>	3HAC060860-001
<i>Product manual - OmniCore C90XT</i>	3HAC073706-001
<i>Operating manual - OmniCore</i>	3HAC065036-001
<i>Application manual - Controller software OmniCore</i>	3HAC066554-001
<i>Application manual - CalibWare Field</i>	3HAC030421-001
<i>Technical reference manual - Event logs for RobotWare 7</i>	3HAC066553-001
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001
<i>Technical reference manual - System parameters</i>	3HAC065041-001
<i>Application manual - PROFINET Controller/Device</i>	3HAC066558-001
<i>Application manual - Functional safety and SafeMove</i>	3HAC066559-001
<i>Operating manual - RobotStudio</i>	3HAC032104-001
<i>Circuit diagram - CRB 1300</i>	3HAC080868-003
<i>Operating instructions microScan3 - PROFINET</i>	-
<i>Operating instructions microScan3 - Pro I/O</i>	-

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 23A. The following updates are done in this revision: <ul style="list-style-type: none"> Added the direct connection between the laser scanner and OmniCore controller.
C	Published in release 23B. The following updates are done in this revision: <ul style="list-style-type: none"> Added pin assignment on XG1 connector of SafetyIO-based laser scanner. Updated the logical expressions for SafeMove configuration using Visual SafeMove, see Configuring pre logic on page 131.
D	Published in release 23C. The following updates are done in this revision: <ul style="list-style-type: none"> Updated article number of robot signal cable from 3HAC067446-00X to 3HAC084767-00X. Updated the Ethernet floor cable list.
E	Published in release 23D. The following updates are done in this revision: <ul style="list-style-type: none"> Minor changes. Updated the installation procedure for the Collaborative Speed Control add-in. Added troubleshooting for issue that program execution stops because no safety configuration template loaded.

Continues on next page

Revision	Description
F	<p>Published in release 24A. The following updates are done in this revision:</p> <ul style="list-style-type: none"><li>• Updated maximum arm load information and updated the load area figure.<li>• Added troubleshooting about robot vibration.<li>• Updated information about timing belt inspection and refitting.

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

- 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.

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.

Network security

Network security

This product is designed to be connected to and to communicate information and data via a network interface. It is your sole responsibility to provide, and continuously ensure, a secure connection between the product and to your network or any other network (as the case may be).

You shall establish and maintain any appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Ltd and its entities are not liable for damage and/or loss related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

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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.

1 Safety

1.1.2 Requirements on personnel

1.1.2 Requirements on personnel

General

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

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

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

Personal protective equipment

Use personal protective equipment, as stated in the instructions.

1.2 Safety signals and symbols

1.2.1 Safety signals in the manual







Introduction to safety signals

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

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

Hazard levels

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


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

Continues on next page

1 Safety

1.2.1 Safety signals in the manual

Continued

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

1.2.2 Safety symbols on manipulator labels

Introduction to symbols

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



Note

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




Types of symbols

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

The safety labels are language independent, they only use graphics. See [Symbols on safety labels on page 21](#).

The information labels can contain information in text.

Symbols on safety labels

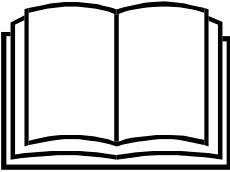
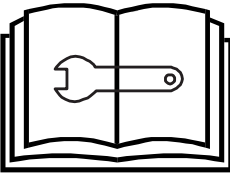
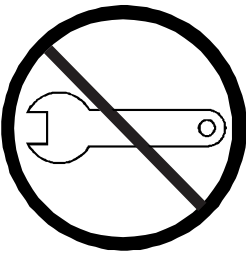
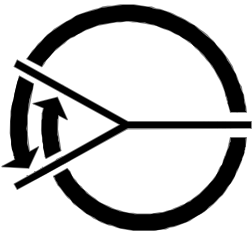

Symbol	Description
 xx0900000812	Warning! Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical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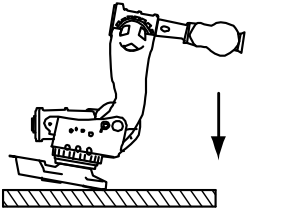

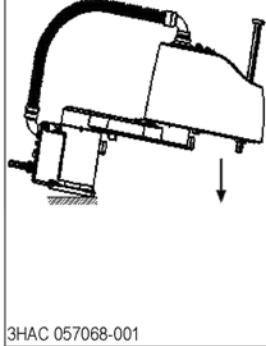

1 Safety

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: <ul style="list-style-type: none">No text: <i>Product manual</i>.
 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.



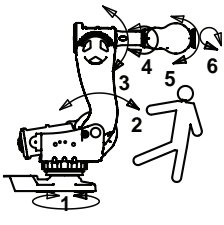
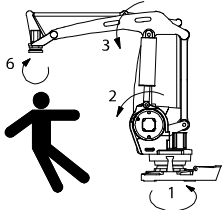
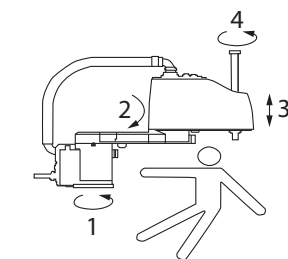
Continues on next page

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

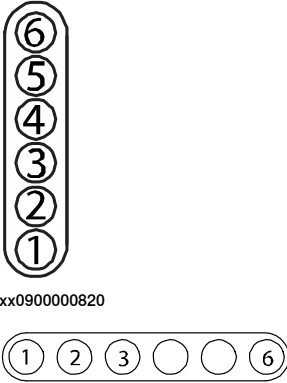

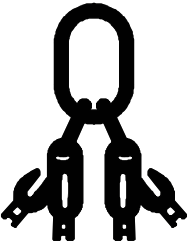



1 Safety

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)
 xx0900000819  xx1000001141  xx1500002616	Moving robot The robot can move unexpectedly.

Continues on next page



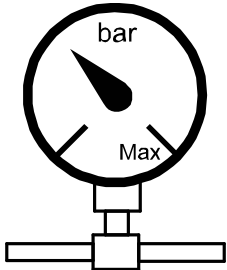
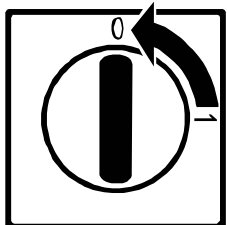

Symbol	Description
 <p>xx0900000820</p> <p>xx1000001140</p>	<p>Brake release buttons</p>
 <p>xx0900000821</p>	<p>Lifting bolt</p>
 <p>xx1000001242</p>	<p>Adjustable chain sling with shortener</p>
 <p>xx0900000822</p>	<p>Lifting of robot</p>
 <p>xx0900000823</p>	<p>Oil Can be used in combination with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

Continues on next page

1 Safety

1.2.2 Safety symbols on manipulator labels

Continued

Symbol	Description
 xx1000001144	No mechanical stop
 xx0900000825	Stored energy Warns that this part contains stored energy. Used in combination with <i>Do not disassemble</i> 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.

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*

1 Safety

1.4 Safety during installation and commissioning

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.

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.

Allergenic material

See [Environmental information on page 718](#) 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.

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 fulfill national regulations.

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

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

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

Continues on next page

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 (CO₂) 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

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.

Verify the safety functions

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

1 Safety

1.5 Safety during operation

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.

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.


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.
 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.

Continues on next page

1 Safety

1.6.1 Safety during maintenance and repair

Continued

Warning	Description	Elimination/Action
 Possible pressure build-up in gearbox	When opening the oil or grease plug, there may be pressure present in the gearbox, causing lubricant to spray from the opening.	Open the plug carefully and keep away from the opening. Do not overfill the gearbox when filling.
 Do not overfill	Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: <ul style="list-style-type: none">• 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 41](#).

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

Related information

See also the safety information related to installation and operation.

1.6.2 Emergency release of the robot axes

Description

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

How to release the brakes is described in the section:

- [Manually releasing the brakes on page 67](#).

1 Safety

1.6.3 Brake testing

1.6.3 Brake testing

When to test

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

How to test

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

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

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



Note

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](#).

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.

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

Related information

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

1 Safety

1.8 Safety during decommissioning

1.8 Safety during decommissioning

General

See section [Decommissioning on page 717](#).

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

2 Manipulator description

2.1 About CRB 1300

Introduction

The CRB 1300 is one of ABB Robotics latest generation of 6-axis robot, with a payload of 7 kg, 10 kg and 11 kg, designed based on industrial robot platform. It bridges the gap between industrial robots and robots designed for collaborative applications. Combining ABB SafeMove solution, safety separation technology and speed control with safety laser scanner(s) and lead-through programming with a lead-through device, CRB 1300 enables safe collaborative operations and harmless contacts between robot and the operator. The robot has an open structure that is especially adapted for flexible use, and can communicate extensively with external systems.

2 Manipulator description

2.2 Technical data

2.2 Technical data

Weight, robot

The table shows the weight of the robot.

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

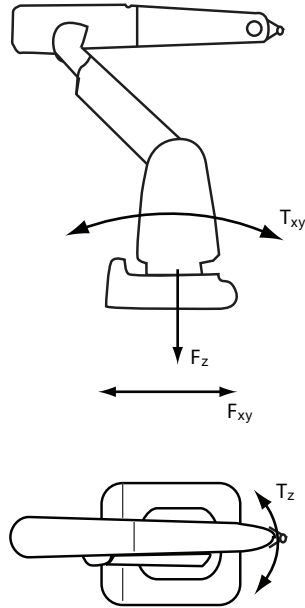
The actual mounting angle must always be configured in the system parameters, otherwise the performance and lifetime is affected. See [Setting the system parameters for an inverted or a tilted robot on page 73](#).

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

Continues on next page

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



xx110000521

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

Continues on next page

2 Manipulator description

2.2 Technical data

Continued

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 <i>Motion Process Mode</i> 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 possible to the floor.

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

Continues on next page

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

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

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	+5 °C ⁱ (41 °F)
Maximum ambient temperature	+45 °C (113 °F)
Maximum ambient humidity	95% at constant temperature

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

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)

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.*

2 Manipulator description

2.3 Safety data

2.3 Safety data

Prevailing standards and directives

For the use of industrial robots, regulations must be fulfilled as described in the following standards and directives:

- EN ISO 10218-1:2011

Risk assessment

The results of a risk assessment performed on the robot and its intended application may determine that a safety-related control system performance other than that stated in ISO 10218 is warranted for the application.

Safety functions and safety related data

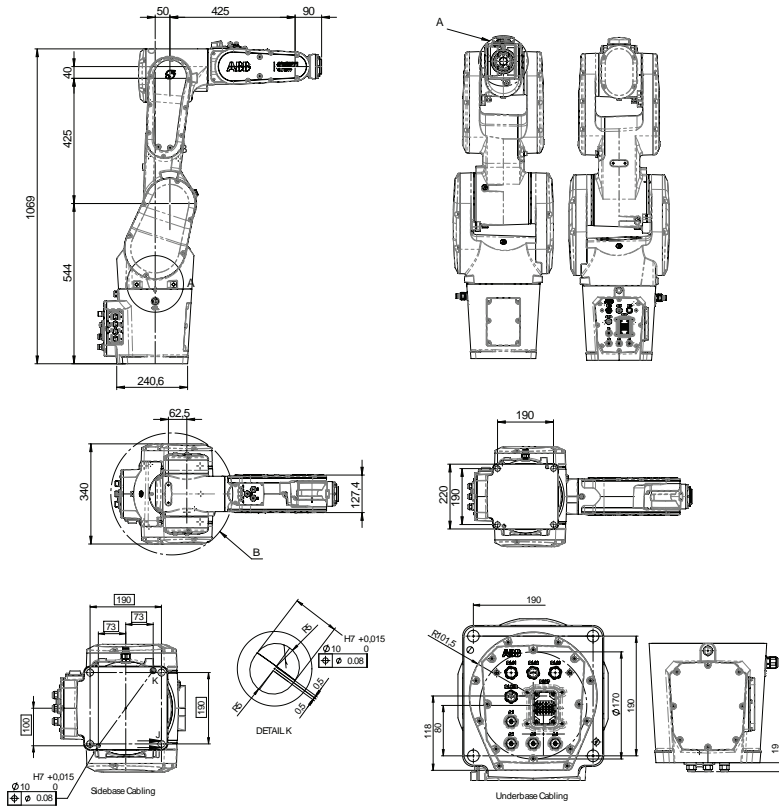
Safety functions and safety related data for CRB 1300 rely on the controller and safety laser scanners.

Safety data for the controller is detailed in the product manual of the robot controller, see [References on page 10](#).

Safety data for the safety laser scanners is detailed in the user manual from the vendor, see *Operating instructions microScan3 - PROFINET* and *Operating instructions microScan3 - Pro I/O* that are available on [SICK® website](#).

2.4 Dimensions

Main dimensions of CRB 1300-11/0.9



xx220000725

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

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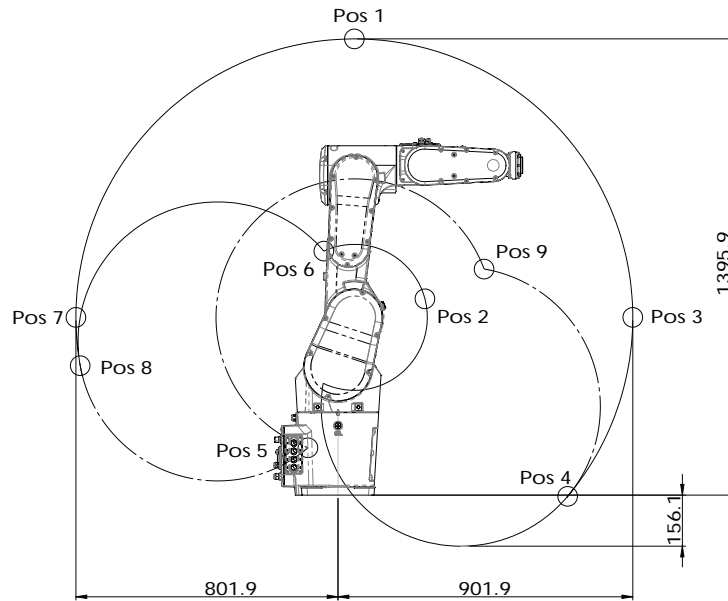
2 Manipulator description

2.5 Working range

2.5 Working range

Illustration, working range CRB 1300-11/0.9

This illustration shows the unrestricted working range of the robot.



xx1900001334

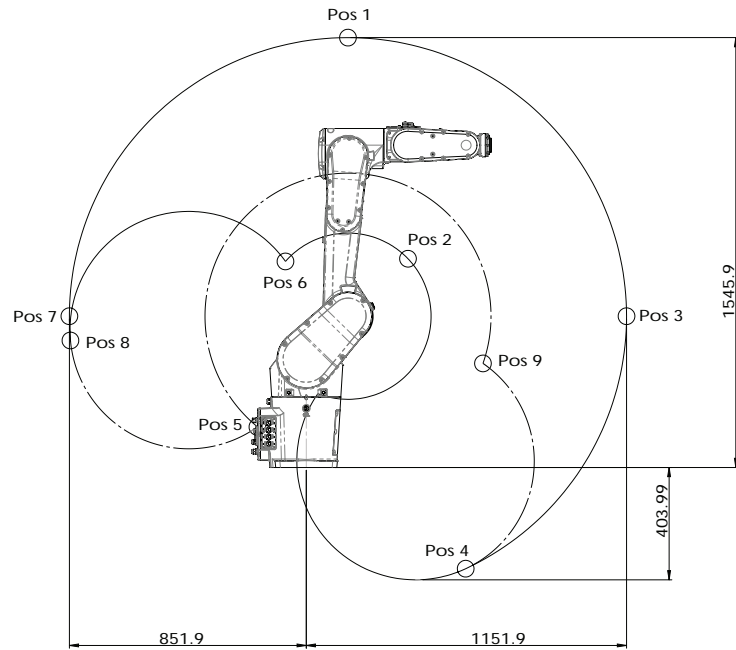
Positions at wrist center and angle of axes 2 and 3

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°

Continues on next page

Illustration, working range CRB 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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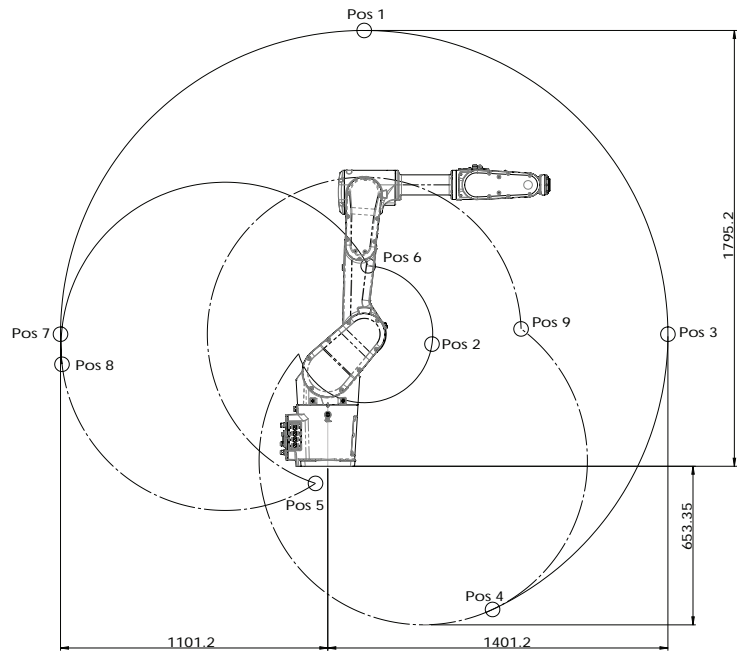
2 Manipulator description

2.5 Working range

Continued

Illustration, working range CRB 1300-7/1.4

This illustration shows the unrestricted working range of the robot.



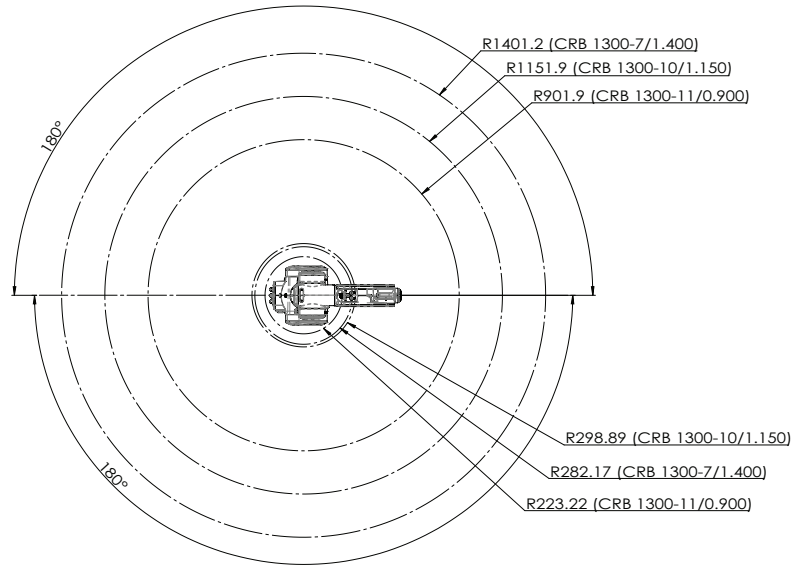
xx1900001336

Positions at wrist center and angle of axes 2 and 3

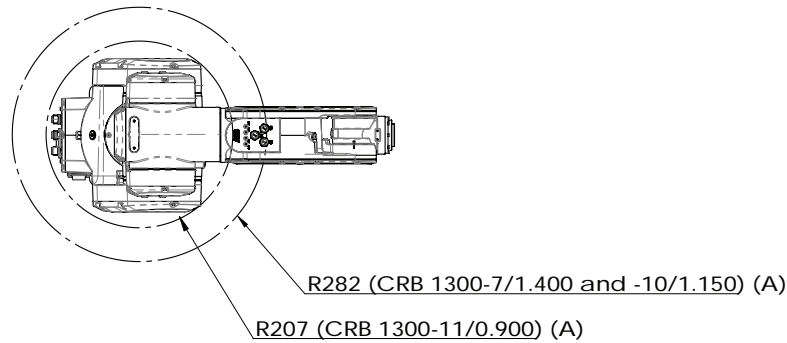
Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	825	1159	0°	0°
pos1	150	1,795.2	0°	-86.6°
pos2	429.2	503.2	0°	69°
pos3	1,401.2	544	90°	-86.6°
pos4	678.8	-590	155°	-86.6°
pos5	-2.9	-36.1	-95°	-210°
pos6	166.3	825.7	-95°	69°
pos7	-1,101.2	544	-90°	-86.6°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

Continues on next page

Top view of working range



xx220000972



xx220000973

Working range

Axis	Working range	Note
Axis 1	$\pm 180^\circ$	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	CRB 1300-10/1.15 and CRB 1300-7/1.4 $-95^\circ/+155^\circ$ CRB 1300-11/0.9 $-100^\circ/+130^\circ$	
Axis 3	CRB 1300-7/1.4 $-210^\circ/+69^\circ$ CRB 1300-10/1.15 and CRB 1300-11/0.9 $-210^\circ/+65^\circ$	
Axis 4	$\pm 230^\circ$	

Continues on next page

2 Manipulator description

2.5 Working range

Continued

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

2.6 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 CRB 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 38](#).

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 CRB 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*

3 Installation and commissioning

3.2.1 Pre-installation procedure

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 pre-requisites for installation

	Action
1	Make a visual inspection of the packaging and make sure that nothing is damaged.
2	Remove the packaging.
3	Check for any visible transport damage.  Note Stop unpacking and contact ABB if transport damages are found.
4	Clean the unit with a lint-free cloth, if necessary.
5	Make sure that the lifting accessory used (if required) is suitable to handle the weight of the robot as specified in: Weight, robot on page 38
6	If the robot is not installed directly, it must be stored as described in: Storage conditions, robot on page 41
7	Make sure that the expected operating environment of the robot conforms to the specifications as described in: Operating conditions, robot on page 41
8	Before taking the robot to its installation site, make sure that the site conforms to: <ul style="list-style-type: none">• Loads on foundation, robot on page 38• Protection classes, robot on page 41• Requirements, foundation on page 40
9	Before moving the robot, please observe the stability of the robot: Risk of tipping/stability on page 55
10	When these prerequisites are met, the robot can be taken to its installation site as described in section: On-site installation on page 60
11	Install required equipment, if any.

3.2.2 Risk of tipping/stability

Risk of tipping

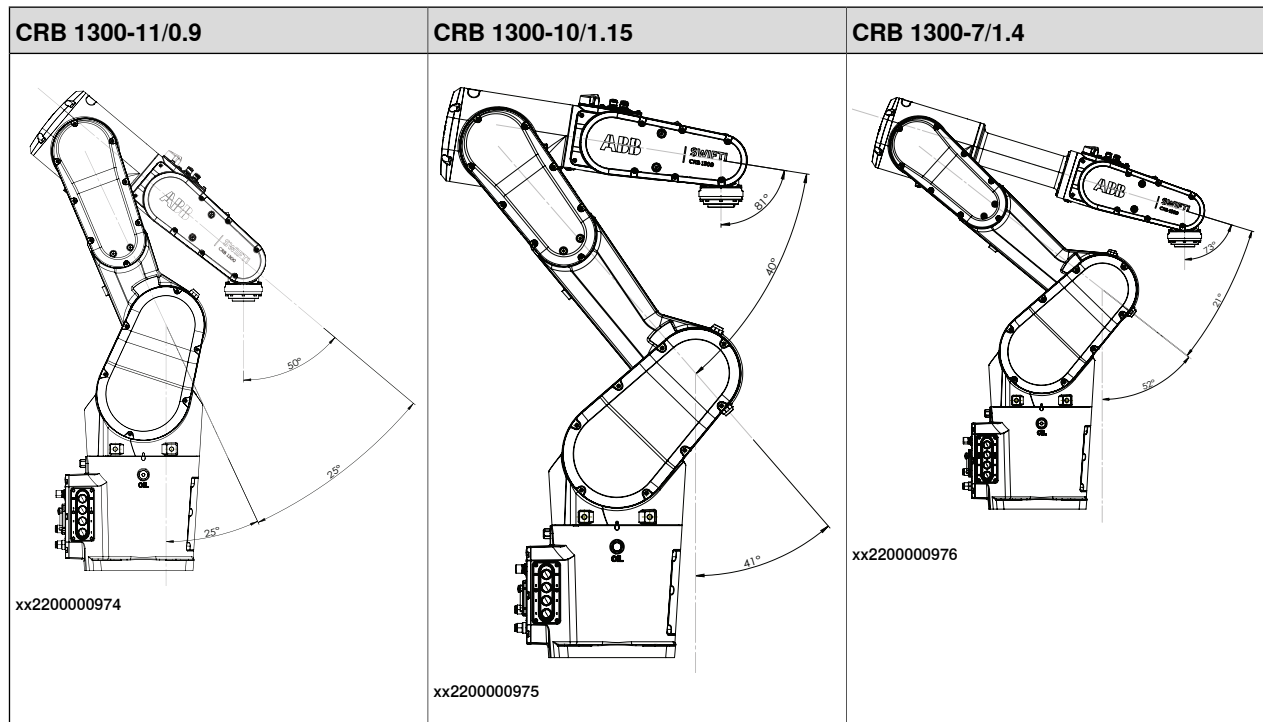
If the robot is not fastened to the foundation while moving the arm, the robot is not stable in the whole working area. Moving the arm will displace the center of gravity, which may cause the robot to tip over.

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.



Axis number	Angle of axis		
	-11/0.9	-10/1.15	-7/1.4
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

3 Installation and commissioning

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 58](#).



WARNING

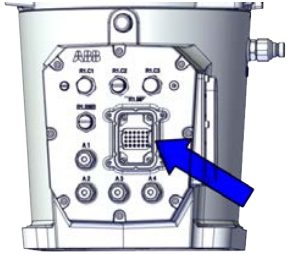
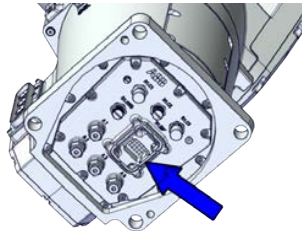
The robot is likely to be mechanically unstable if not secured to the foundation.

3.2.3 Extra O-rings

Installation of extra O-rings

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

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	<p>Used with protection class IP67. Used to seal between the main power cable and connector. Robots with manipulator cables routed from the rear of the base:</p>  <p>xx2000002338</p> <p>Robots with manipulator cables routed from below (3309-1):</p>  <p>xx2000002339</p>

Further information

For installation information, see [On-site installation on page 60](#) and [Electrical connections on page 101](#).

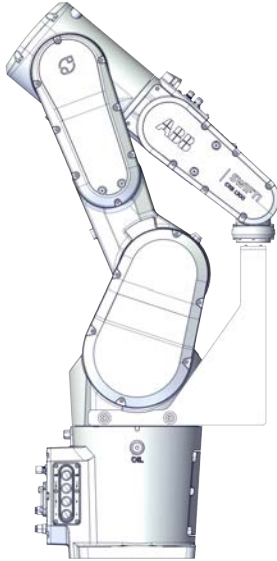
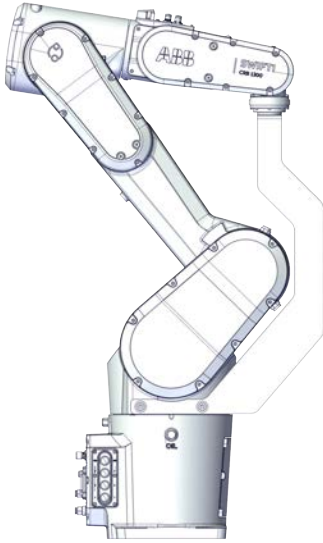
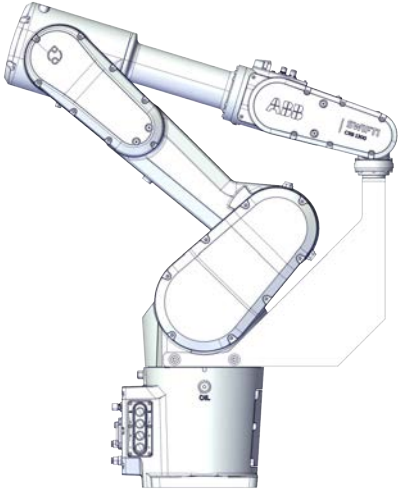
3 Installation and commissioning

3.2.4 Transportation bracket

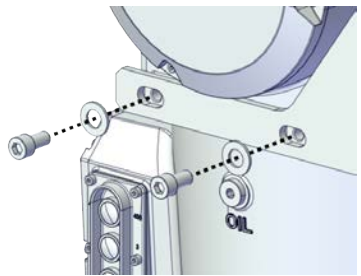
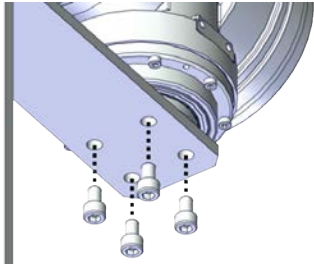
3.2.4 Transportation bracket

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.

CRB 1300-11/0.9	CRB 1300-10/1.15	CRB 1300-7/1.4
 <p>xx2200000977</p>	 <p>xx2200000978</p>	 <p>xx2200000979</p>

Removing the transportation bracket

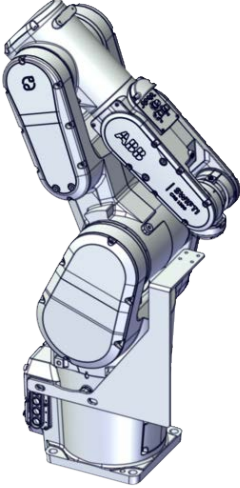
	Action	Note
1	Remove the screws and washers.	 <p>xx1900001529</p>  <p>xx1900001530</p>

Continues on next page

3 Installation and commissioning

3.2.4 Transportation bracket

Continued

	Action	Note
2	Remove the bracket.	<p>The transportation bracket of CRB 1300-11/0.9 is used as an example.</p>  <p>xx2200000980</p>

3 Installation and commissioning

3.3.1.1 Lifting the robot with roundslings

3.3 On-site installation

3.3.1 Lifting the robot

3.3.1.1 Lifting the robot with roundslings

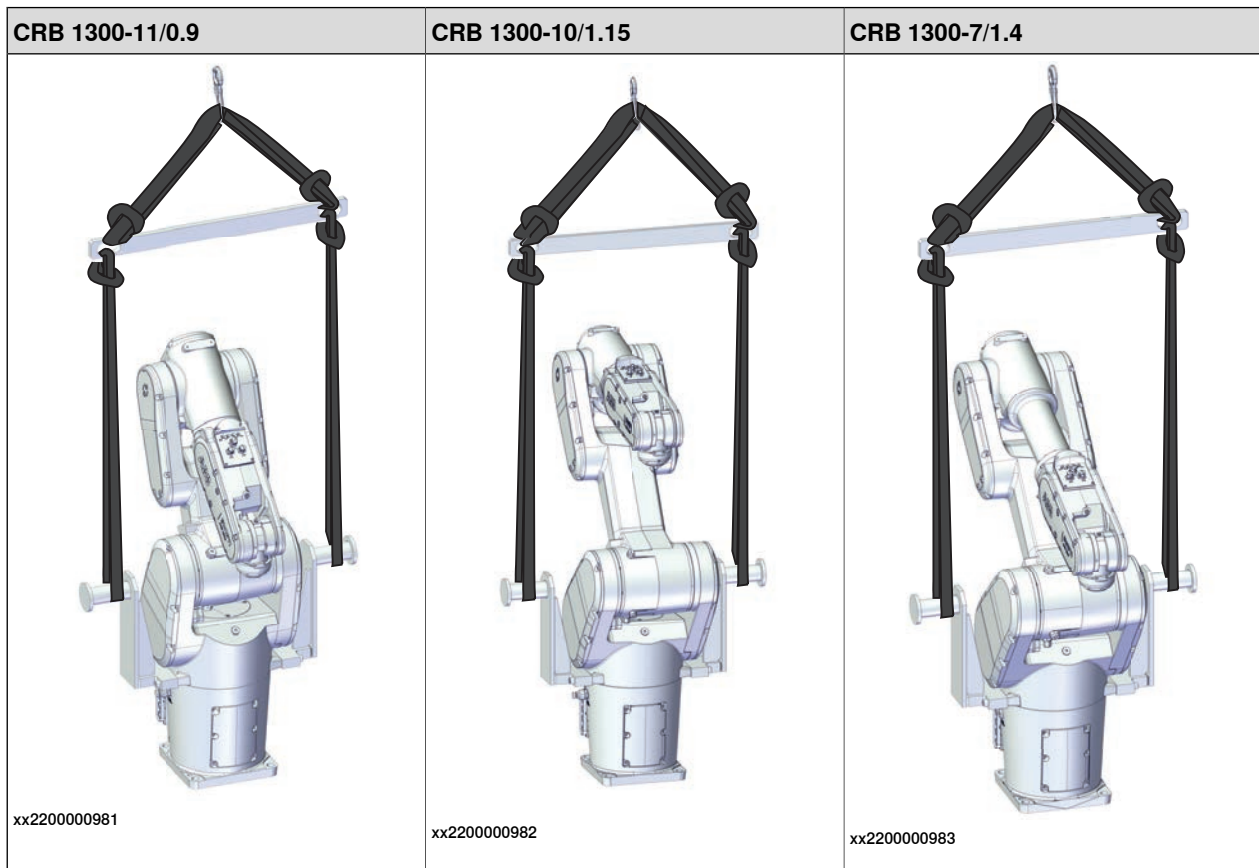
Illustration - attaching the roundslings



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 58](#).



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.

Continues on next page

3 Installation and commissioning

3.3.1.1 Lifting the robot with roundslings


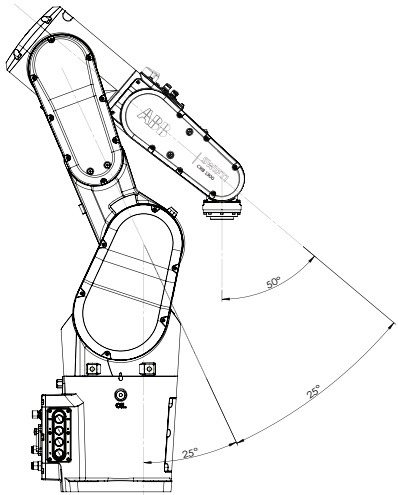
Continued

Required tools and equipment

Equipment	Article number	Note
Overhead crane	-	
Roundslings, 0.8 m	-	Length: 0.8 m Lifting capacity: >70 kg
Roundslings, 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 .


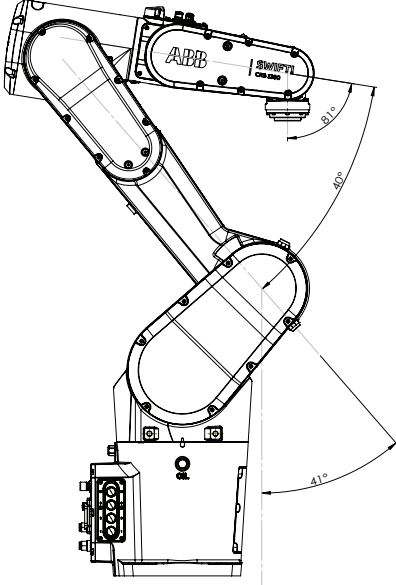

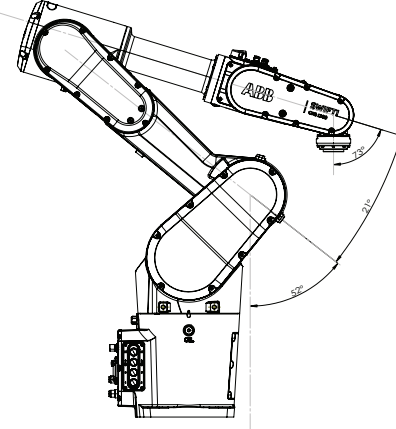
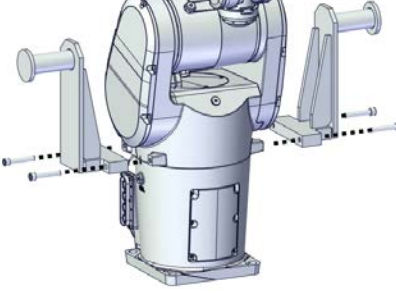
	Action	Note
1	<p>Valid for CRB 1300-11/0.9</p> <p>Jog the robot to the specified position:</p> <ul style="list-style-type: none">• Axis 1: 0°• Axis 2: -25°• Axis 3: 65°• Axis 4: 0°• Axis 5: 50°• Axis 6: 0° <p> WARNING</p> <p>The robot is mechanically unstable if not secured to the foundation.</p>	 <p>xx220000974</p>

Continues on next page

3 Installation and commissioning

3.3.1.1 Lifting the robot with roundslings

Continued

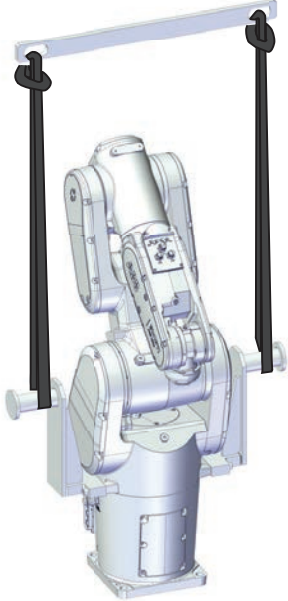

	Action	Note
2	<p>Valid for CRB 1300-10/1.15</p> <p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -41° • Axis 3: 50° • Axis 4: 0° • Axis 5: 81° • Axis 6: 0° <p> WARNING</p> <p>The robot is mechanically unstable if not secured to the foundation.</p>	 <p>xx2200000975</p>
3	<p>Valid for CRB 1300-7/1.4 and</p> <p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -52° • Axis 3: 69° • Axis 4: 0° • Axis 5: 73° • Axis 6: 0° <p> WARNING</p> <p>The robot is mechanically unstable if not secured to the foundation.</p>	 <p>xx2200000976</p>
4	<p>Fit the lifting tools to the robot. Use the enclosed screws.</p>	<p>Lifting accessory, robot: 3HAC077885-001</p> <p>Tightening torque: 15 Nm</p>  <p>xx1900001594</p>

Continues on next page

3 Installation and commissioning

3.3.1.1 Lifting the robot with roundslings

Continued



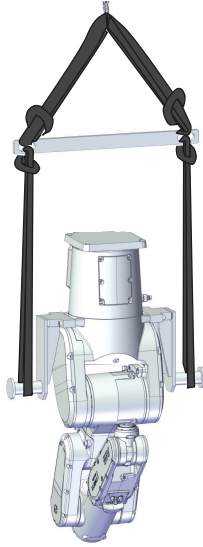
	Action	Note
5	Fit the roundslings to the lifting tools and attach them to the lifting beam.	<p>Make sure the roundsling has free space and does not wear against any part of the robot.</p> <p>Roundsling, 1.7 m</p>  <p>xx220000985</p>
6	Fit the roundslings to the lifting beam and to the overhead crane.	<p>Roundsling, 0.8 m</p>  <p>xx220000981</p>

Continues on next page

3 Installation and commissioning

3.3.1.1 Lifting the robot with roundslings

Continued

	Action	Note
7	 CAUTION The weight of the CRB 1300 robot is CRB 1300-11/0.9: 75 kg CRB 1300-10/1.15: 77 kg CRB 1300-7/1.4: 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.	 xx220000984

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 729](#). 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.

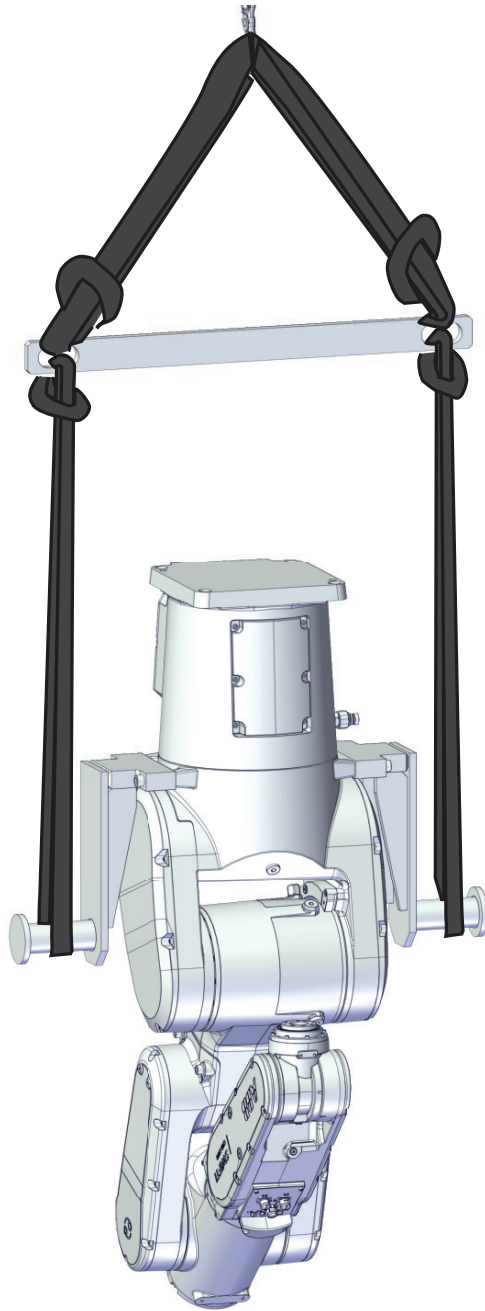
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3 Installation and commissioning

3.3.1.2 Lifting and rotating a suspended mounted manipulator

Continued

Illustration



xx220000984

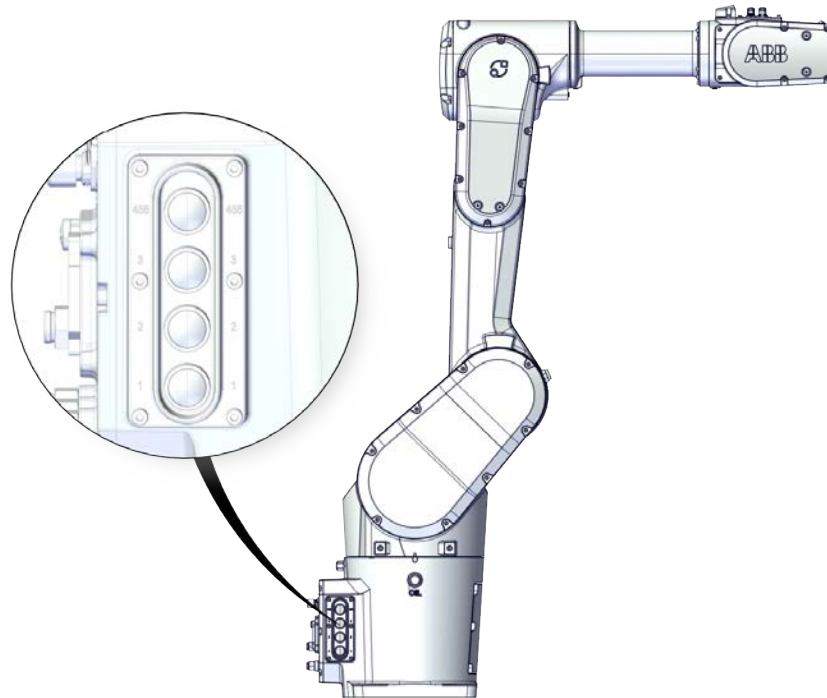
3.3.2 Manually releasing the brakes

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.



xx2200001133

Releasing the brakes

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

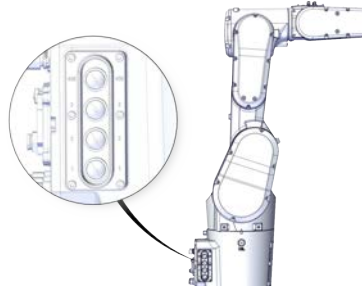
	Action	Note
1	 Note If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to the section Supplying power to connector R1.MP on page 68 .	
2	 DANGER When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways. Make sure no personnel is near or beneath the robot.	

Continues on next page

3 Installation and commissioning



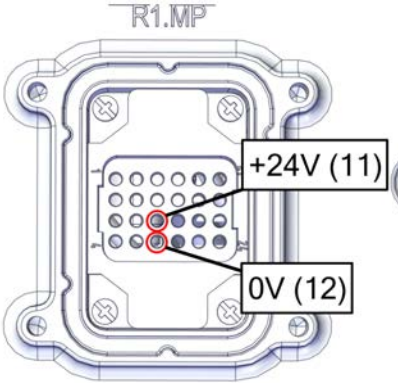
3.3.2 Manually releasing the brakes

Continued

	Action	Note
3	The brake will be enable as soon as the button is released.	 <p>xx1900001653</p>

Supplying power to connector R1.MP

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

	Action	Note
1	 <p>DANGER</p> <p>Incorrect connections, such as supplying power to the wrong pin, may cause all brakes to be released simultaneously and instantly!</p>	
2	<p>Supply</p> <ul style="list-style-type: none"> • 0V on pin 12. • 24V on pin 11.  <p>Note</p> <p>Do not interchange the 24V and 0V pins. If they are mixed up, damage can be caused to internal electrical components.</p>	 <p>xx1900001654</p>
3	Use the brake releasing button as described in Releasing the brakes on page 67 .	

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 40](#).

Continues on next page

3 Installation and commissioning

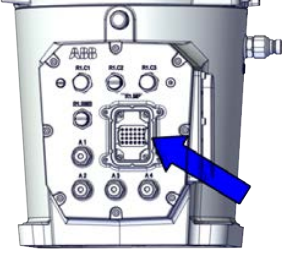
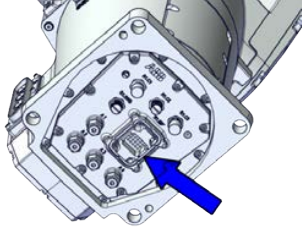
3.3.3 Orienting and securing the robot

Continued

Installation of extra O-rings


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

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	<p>Used with protection class IP67. Used to seal between the main power cable and connector. Robots with manipulator cables routed from the rear of the base:</p>  <p>xx2000002338</p> <p>Robots with manipulator cables routed from below (3309-1):</p>  <p>xx2000002339</p>

Securing a floor mounted robot

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


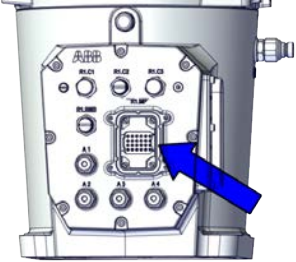
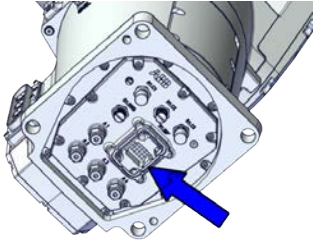
	Action	Note
1	Make sure the installation site for the robot conforms to the specifications in section Technical data on page 38 .	
2	Prepare the installation site with attachment holes. The foundation surface must be clean and unpainted.	The hole configuration of the base is shown in the figure in Hole configuration, base on page 72 .
3	 CAUTION The weight of the CRB 1300 robot is CRB 1300-11/0.9: 75 kg CRB 1300-10/1.15: 77 kg CRB 1300-7/1.4: 79 kg All lifting accessories used must be sized accordingly.	

Continues on next page

3 Installation and commissioning

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 60 .
6	Fit two pins to the holes in the base.	2 pcs, D10x30, ISO 2338 - 10m6x30 - A1
7	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.
8	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
9	Tighten the bolts in a crosswise pattern to ensure that the base is not distorted.	Tightening torque: 150 Nm±10 Nm
10	For robots with protection class IP67 (option 3350-670) 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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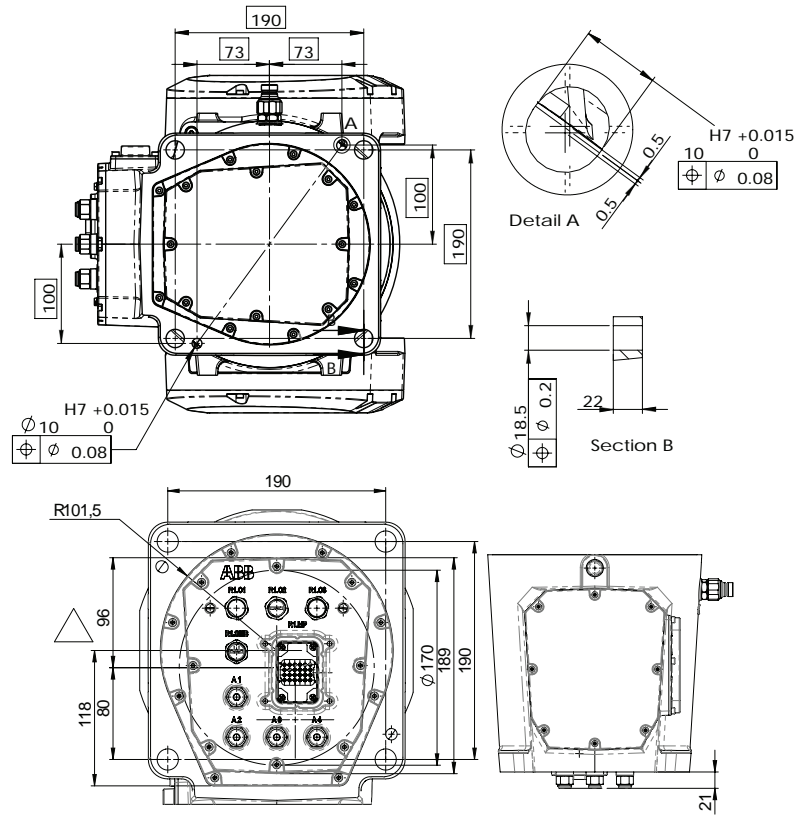
3 Installation and commissioning

3.3.3 Orienting and securing the robot

Continued

Hole configuration, base

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



xx1900001337

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 38](#), and the requirements on the foundation are described in [Requirements, foundation on page 40](#).

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 $\pm\pi/2$ (± 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 $\pm\pi/2$ (± 1.570796).

Continues on next page

3 Installation and commissioning

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

Continued

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



Note

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

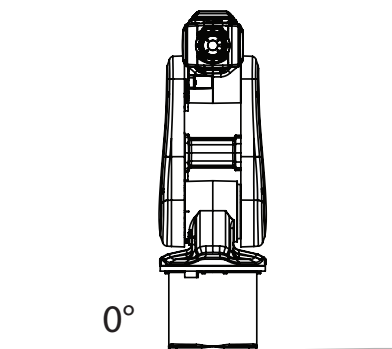
The parameter *Gravity Beta* (or *Gravity Alpha*) specifies the mounting angle of the robot in radians. It is calculated in the following way.

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

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

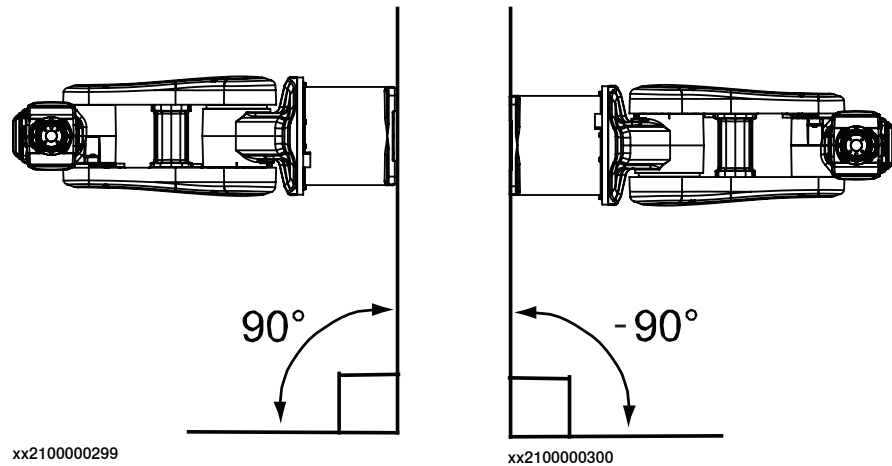
Examples of mounting angles tilted around the X axis (*Gravity Alpha*)

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



xx2100000297

Continues on next page



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 49](#).

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.

3 Installation and commissioning

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

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.

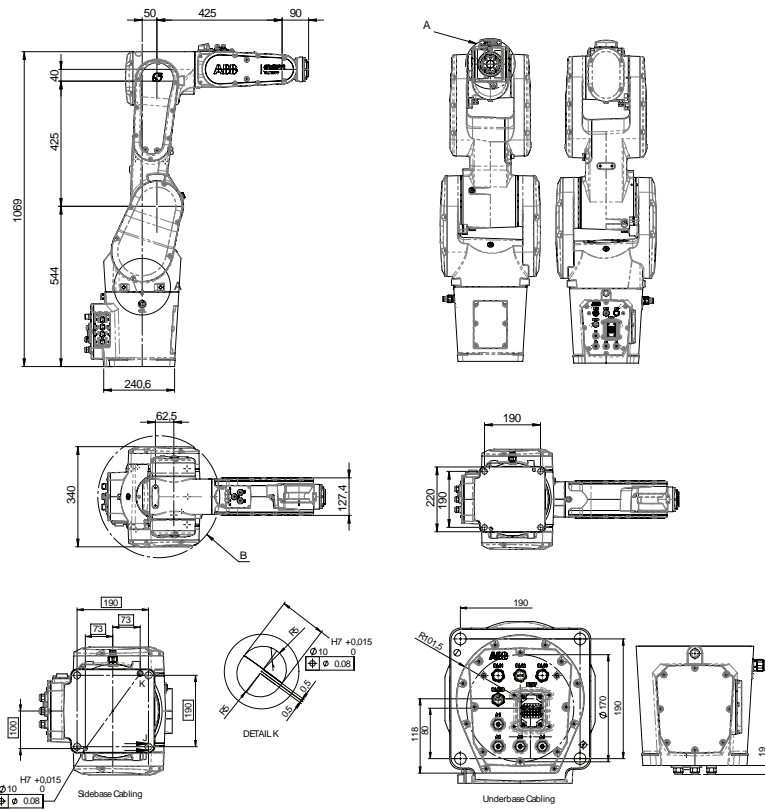
See the product specification for the robot, listed in [References on page 10](#).

3.3.6 Fitting equipment on the robot (robot dimensions)

Robot dimensions

The figure shows the dimension of the robot.

Main dimensions of CRB 1300-11/0.9



xx220000725

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

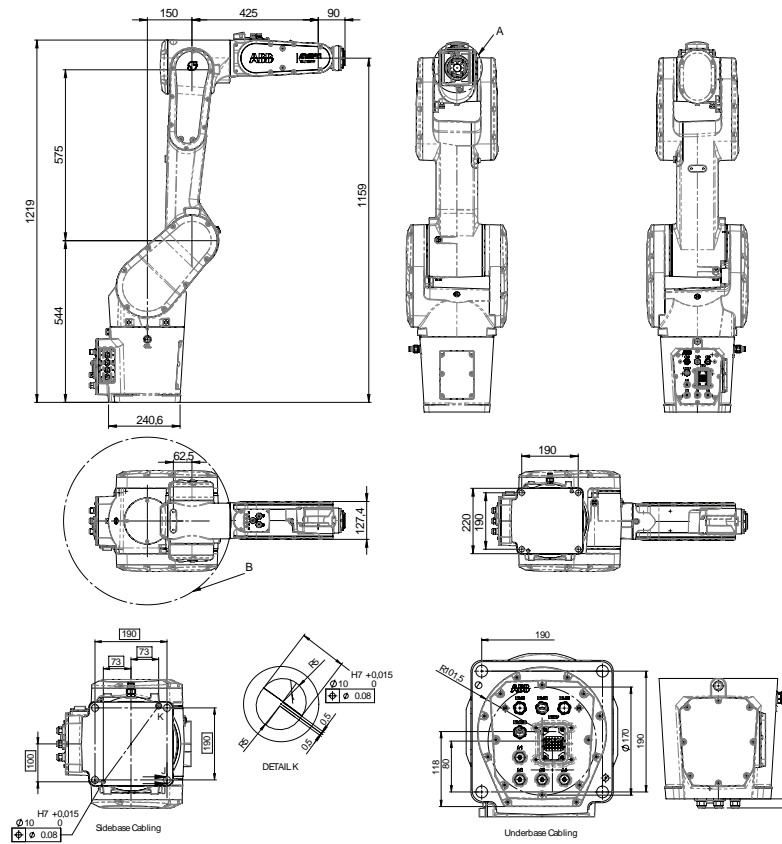
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3 Installation and commissioning

3.3.6 Fitting equipment on the robot (robot dimensions)

Continued

Main dimensions of CRB 1300-10/1.15



xx2200000726

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

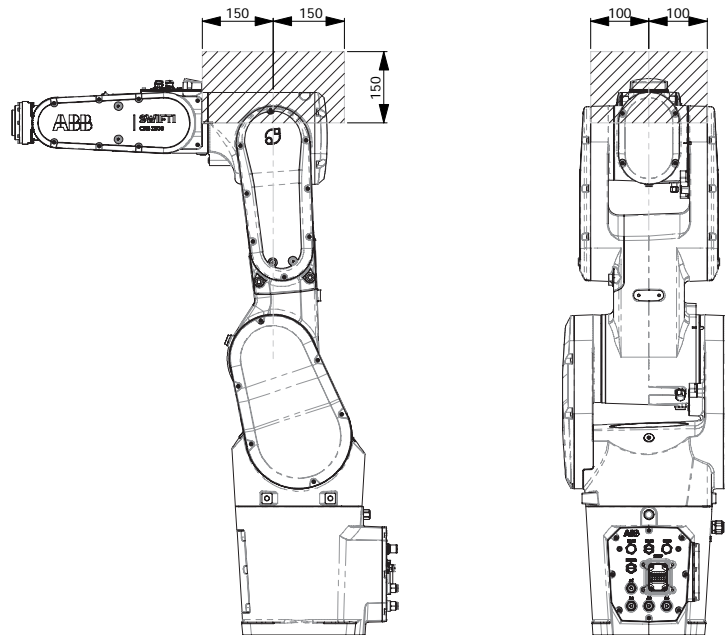
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3 Installation and commissioning

3.3.6 Fitting equipment on the robot (robot dimensions)

Continued

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



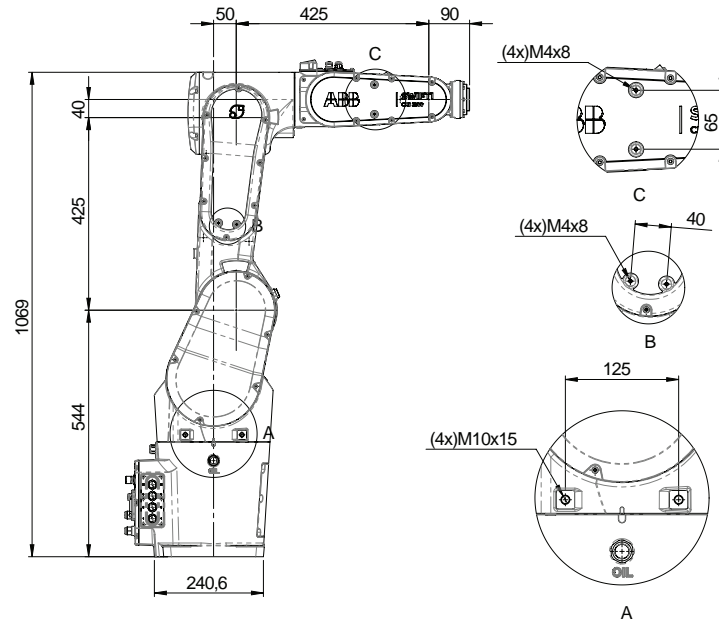
xx2200001155

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

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Holes for fitting extra equipment

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

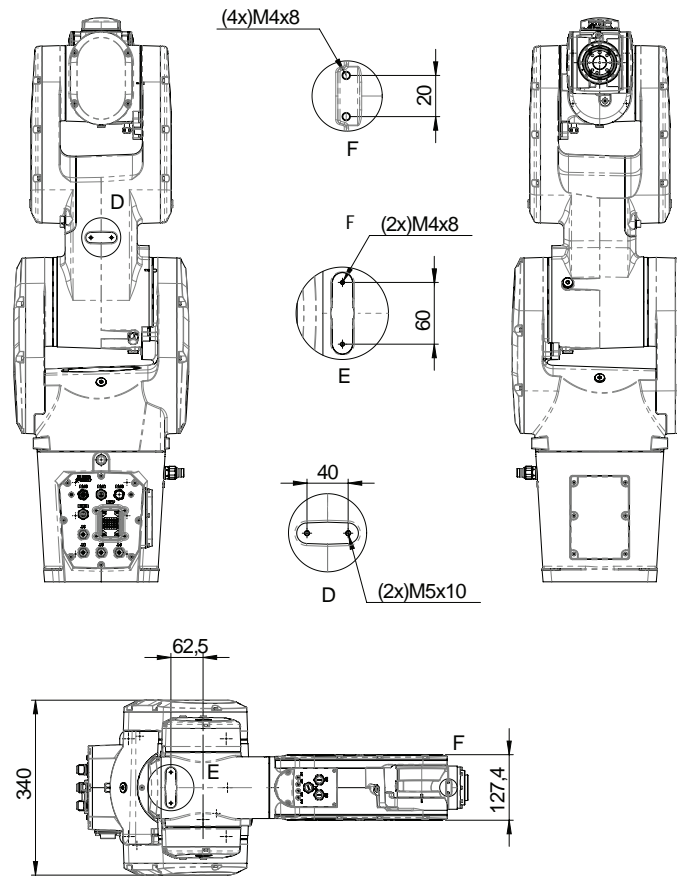


xx220000986

3 Installation and commissioning

3.3.6 Fitting equipment on the robot (robot dimensions)

Continued



xx220000987

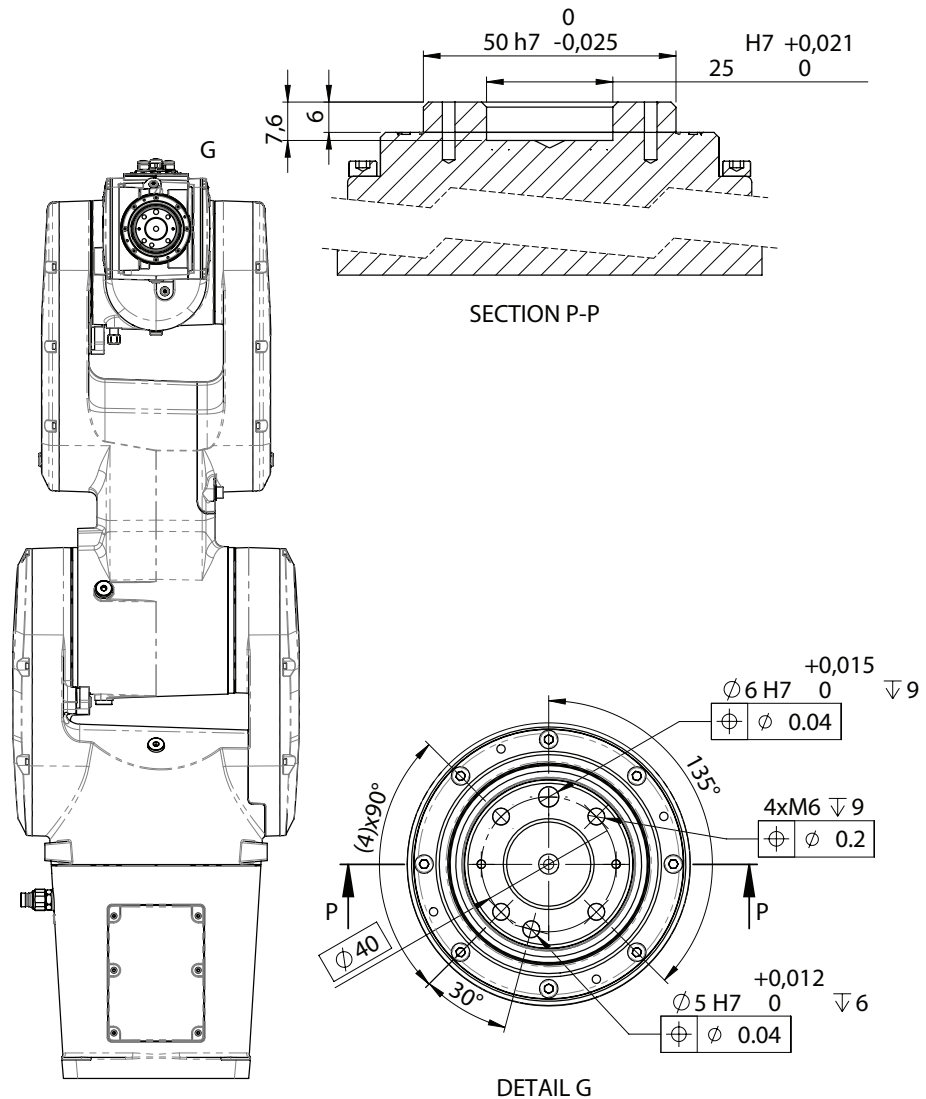
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3 Installation and commissioning

3.3.6 Fitting equipment on the robot (robot dimensions)

Continued

Tool flange standard



xx220000988

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.

3 Installation and commissioning

3.3.7 Installation of lead-through device

3.3.7 Installation of lead-through device

Introduction

The lead-through functionality is available for the CRB 1300 by mounting a lead-through device on axis 6. With the lead-through functionality enabled, you can hold the handler of the lead-through device and move the robot arm manually to the desired position, as an alternative to jogging.

To use lead-through, make sure the system is running in manual mode; otherwise, the functionality cannot be enabled. If running the system in auto mode, always remove the lead-through device from the robot first to prevent any unexpected damages.

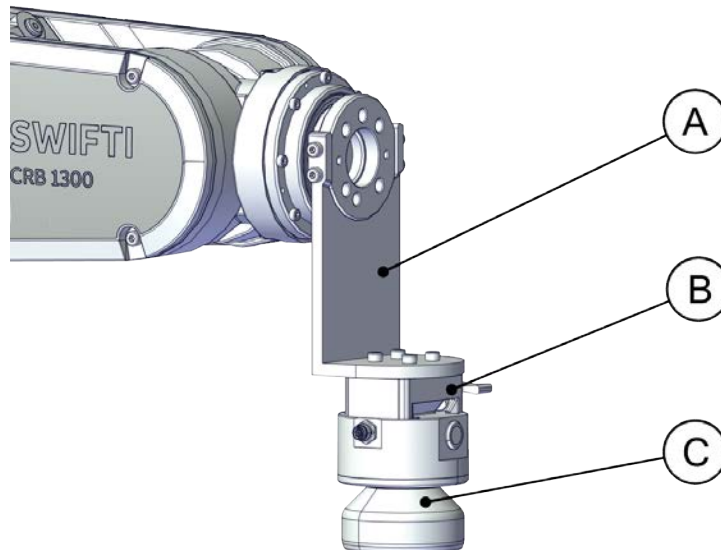


CAUTION

Be careful not to stretch or squeeze the device cabling when moving the robot with the lead-through device, especially to extreme positions. Otherwise, it will cause cabling damages.

Location of lead-through device

The lead-through device is located as shown in the figure.



xx2200000952

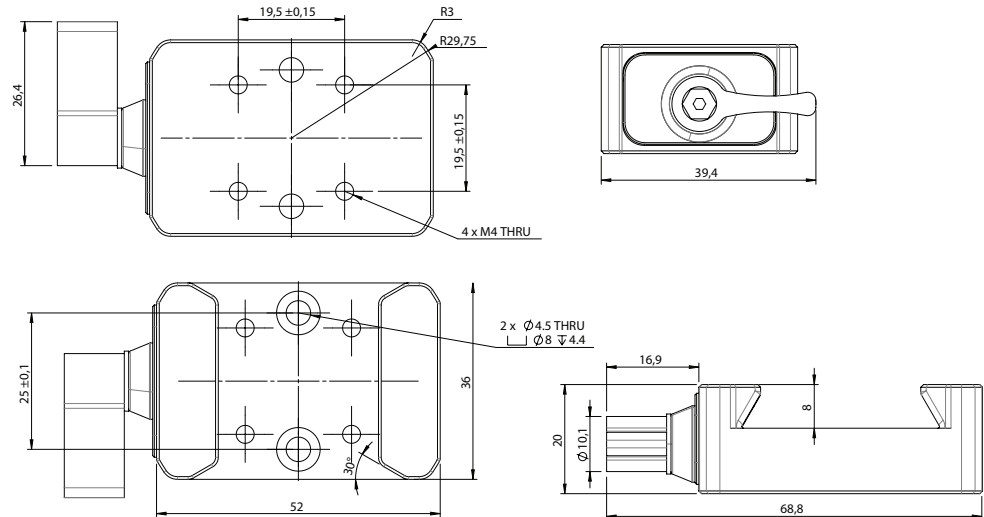
A	Adapter
B	Lead-through device base
C	Lead-through device

Continues on next page

Preparing the adapter

The lead-through device is mounted to the device base and then to the robot tool flange through an adapter. Customers can use an L-shape adapter offered by ABB (option 3314-1) or design adapters according to actual requirements. During adapter design, hole dimensions on the device base and robot tool flange shall be considered.

The following figure illustrates the hole dimensions on lead-through device base.



xx2200000767

For the hole dimensions on robot tool flange, see [Tool flange standard on page 83](#).

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Lead-through device with buttons	3HAC082590-001	
Lead-through device base	3HAC082591-001	
Cabling M8-M12, 700 mm (for lead-through device)	3HAC085155-001	
Ethernet cable M12- RJ45, 7m (for lead-through device)	3HAC077020-001	

Continues on next page

3 Installation and commissioning

3.3.7 Installation of lead-through device

Continued

Installing the lead-through device

Use the following procedure to install the lead-through device.



Note

The lead-through device can be installed in any position according to actual applications. Figures in the following procedures only illustrate an example position.

Preparations before installing the lead-through device


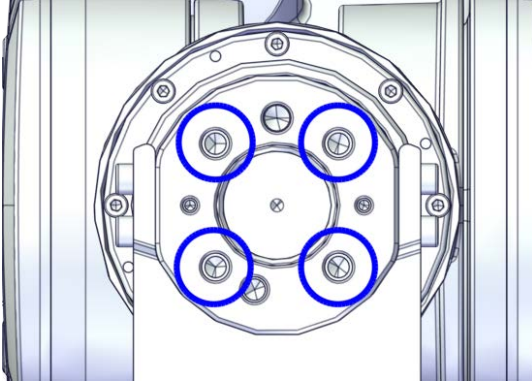
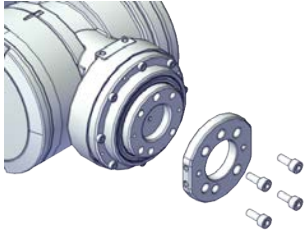
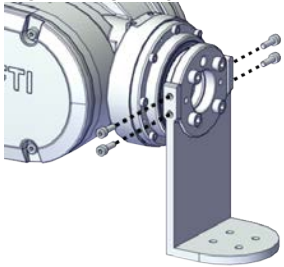
	Action	Note
1	Remove all tools from the mounting flange.	
2	Jog the robot to the synchronization position.	Calibration is detailed in section Calibration on page 673 .
3	<p>Prepare the lead-through device adapter.</p> <p> CAUTION</p> <p>To calibrate the axis 6, the notch on the wrist must be aligned with the marked pin hole on the tool flange. Before installing the adapter on the tool flange, make sure a visible mark has been made to the adapter at the corresponding position.</p> <p>For details about the synchronization mark, see Synchronization marks and synchronization position for axes on page 677.</p>	Refer to Preparing the adapter on page 85 .

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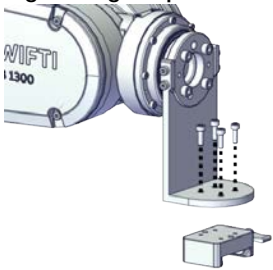
3 Installation and commissioning

3.3.7 Installation of lead-through device

Continued

	Action	Note
4	<p>Install the adapter to mounting flange.</p> <p> Note</p> <p>Secure the adapter to the tool flange using the screw holes circled in the following figure if there are no other tools to be fitted. Otherwise, the tools should use these holes as via holes to be fitted to the robot.</p>  <p>xx2200000990</p>	<p>Following figures illustrate installation of the offered L-shape adapter (option 3314-1).</p> <p>Specification and tightening torque of screws fixing the adapter to the tool flange vary according to actual applications.</p>  <p>xx2200000991</p> <p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2200000992</p>

Installing the lead-through device

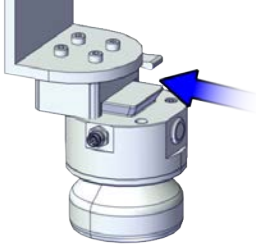


	Action	Note
1	<p>Install the device base to the adaptor.</p>	<p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2200000993</p>

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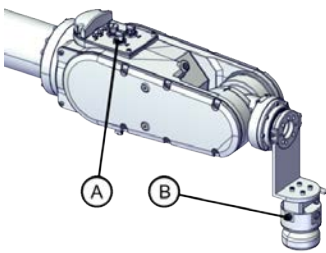


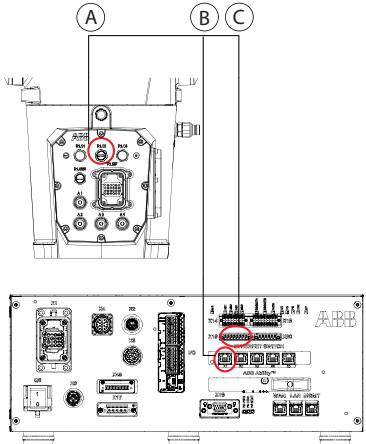
3 Installation and commissioning

3.3.7 Installation of lead-through device

Continued

	Action	Note
2	Insert the lead-through device to the base.	 <p>xx2200000994</p>
3	Turn the adjusting knob to lock the lead-through device.  Note Do not use excessive force! The arrow in the figure indicates the direction of locking the lead-through device.	 <p>xx2200000995</p>

Connecting the cables

	Action	Note
1	Connect the cabling between the lead-through device and robot. <ul style="list-style-type: none"> • R2.C2 connector on process hub of robot (A) • Lead through device connector (B) 	 <p>xx2200000996</p>
2	Connect the cable between robot and controller. <ul style="list-style-type: none"> • R1.C2 connector on robot base (A) • Ethernet switch port on controller (B) • X19 connector on controller (C)  Note Ethernet switch port is available for use only when the 5 Port Ethernet switch option is selected. Otherwise, connect the cable to the MGMT port.  Note Pins 3 and 4 of X19 connector are used for the lead-through device connection while pins 1 and 2 are occupied by the CP/CS cable for lamp unit.	 <p>xx2200000989</p>

Continues on next page

Configuring the lead-through functionality

The lead-through functionality is predefined for robots that are delivered with the option 3313-1 Lead-through Device ordered.

If the lead-through option is newly ordered for an existing robot, the Collaborative Speed Control add-in must be installed to the system to activate the lead-through functionality.

For details about how to install the add-in and configure the lead-through functionality, see [Lead-through on page 115](#).

3 Installation and commissioning

3.3.8 Installation of laser scanner

3.3.8 Installation of laser scanner

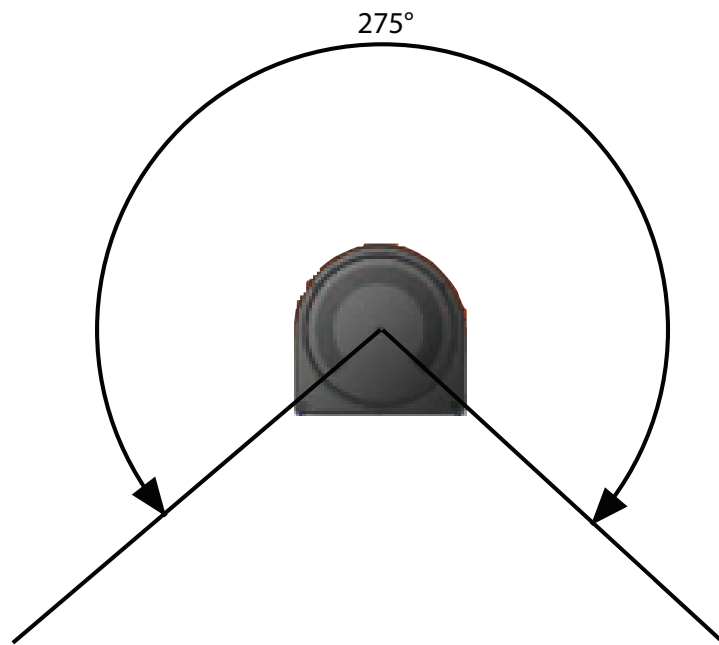
Overview

The safety separation technology and speed control for CRB 1300 is based on the connection and communication of one or two safety laser scanners in the robot. Laser scanner(s) provides a timely and continuous monitor on the activities within its scanning area and forms a protective field. One laser scanner can provide a scanning range of approximately 275°. The system integrator shall investigate the site environment and place the laser scanner to a suitable location according to the actual requirements.



CAUTION

Safety in the area that not in the scanning range must always be considered. The system integrator shall assess the potential risks within this area and make sure that proper measures have been applied to reduce risks.



xx2100000168

Laser scanner types

The following laser scanner package options are available:

- 1 PROFI-safe-based laser scanner (option 3051-1 PROFI-safe scanner)
- 2 PROFI-safe-based laser scanners (option 3051-3 Dual PROFI-safe scanner)
- 1 SafetyIO-based laser scanner (option 3051-2 I/O scanner)
- 2 SafetyIO-based laser scanners (option 3051-4 Dual I/O scanner)

Continues on next page

Connection between PROFIsafe-based laser scanners and the OmniCore controller differs according to the PROFINET options selected and installed in the system.

- If only options [3020-2] PROFINET Device and [3023-2] PROFIsafe Device are selected and installed, the laser scanners shall connect to a PLC acting as a master first and then to the OmniCore controller with SafeMove via the PROFINET safe (PROFIsafe) network. Users need to prepare a safety PLC of their own.
- If options [3020-1] PROFINET Controller and [3023-1] PROFIsafe Controller are selected and installed, the laser scanner could communicate with the OmniCore controller directly via the WAN port.

SafetyIO-based laser scanners connects to the OmniCore controller with SafeMove and installed with the scalable I/O device DSQC1042 Safety digital base (option 3037-2). For details about the scalable I/O device, see the product specification of the controller and *Application manual - Scalable I/O*.

The supported PROFINET- and SafetyIO-base laser scanners are *SICK® microScan 3 Core* and *SICK® microScan 3 Pro*, respectively. Detailed scanner model can be obtained on the scanner nameplate. Other scanner types or models might not provide full functionality.

For more details about the safety laser scanners, see *Operating instructions microScan3 - PROFINET* and *Operating instructions microScan3 - Pro I/O* from the vendor, which are available on *SICK®* website.

Connecting the laser scanner(s)

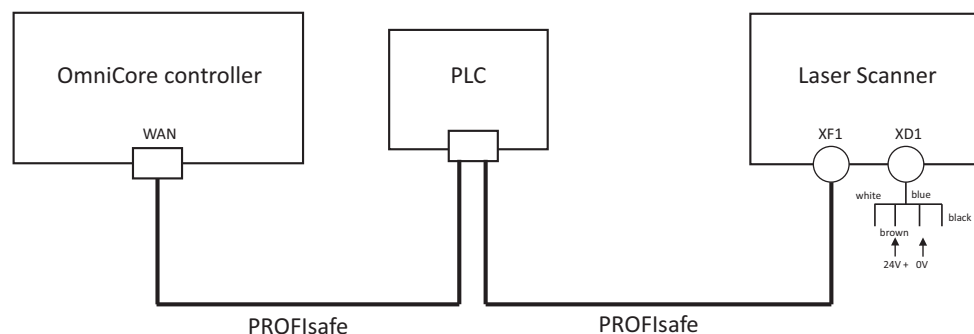
Safety laser scanners shall be connected properly according to the scanner type and system setup.



Note

External 24V power supply shall be prepared for power connection of laser scanners.

1 PROFIsafe-based laser scanner (option 3051-1), with PLC connected



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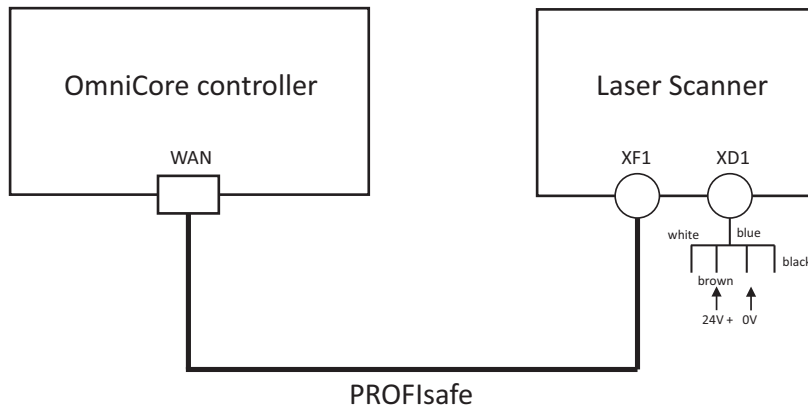
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3 Installation and commissioning

3.3.8 Installation of laser scanner

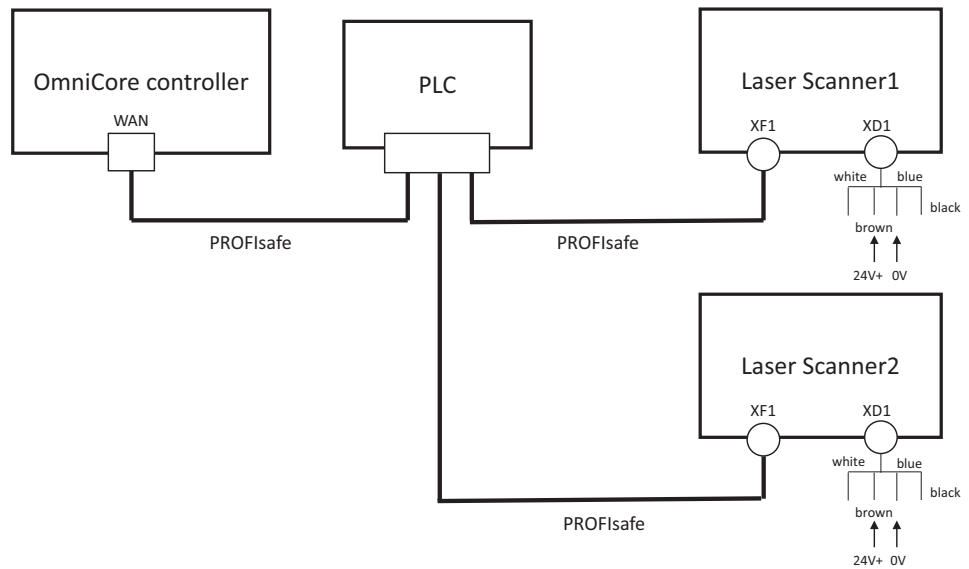
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1 PROFIsafe-based laser scanner (option 3051-1), without PLC connected



xx2300000226

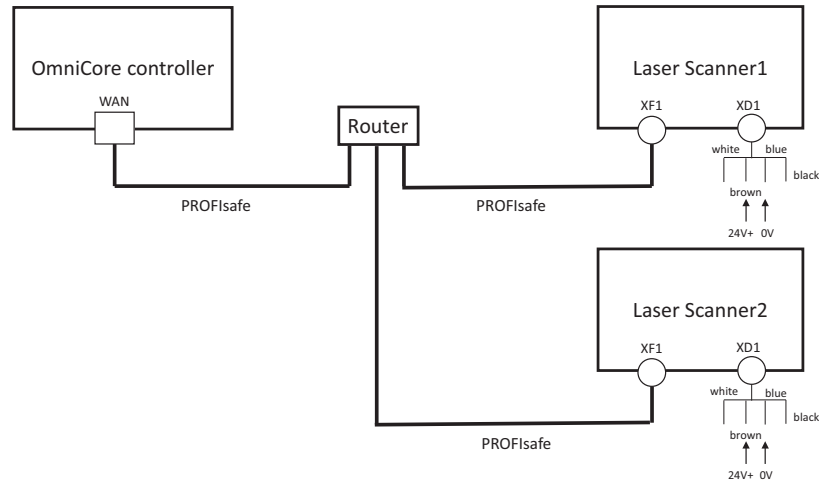
2 PROFIsafe-based laser scanners (option 3051-3), with PLC connected



xx2200000298

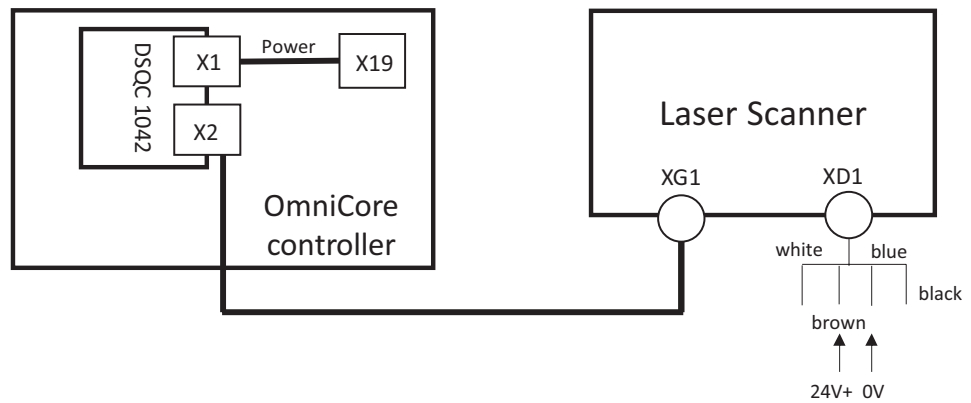
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2 PROFIsafe-based laser scanners (option 3051-3), without PLC connected



xx2300000227

1 SafetyIO-based laser scanner (option 3051-2)



xx2200000299

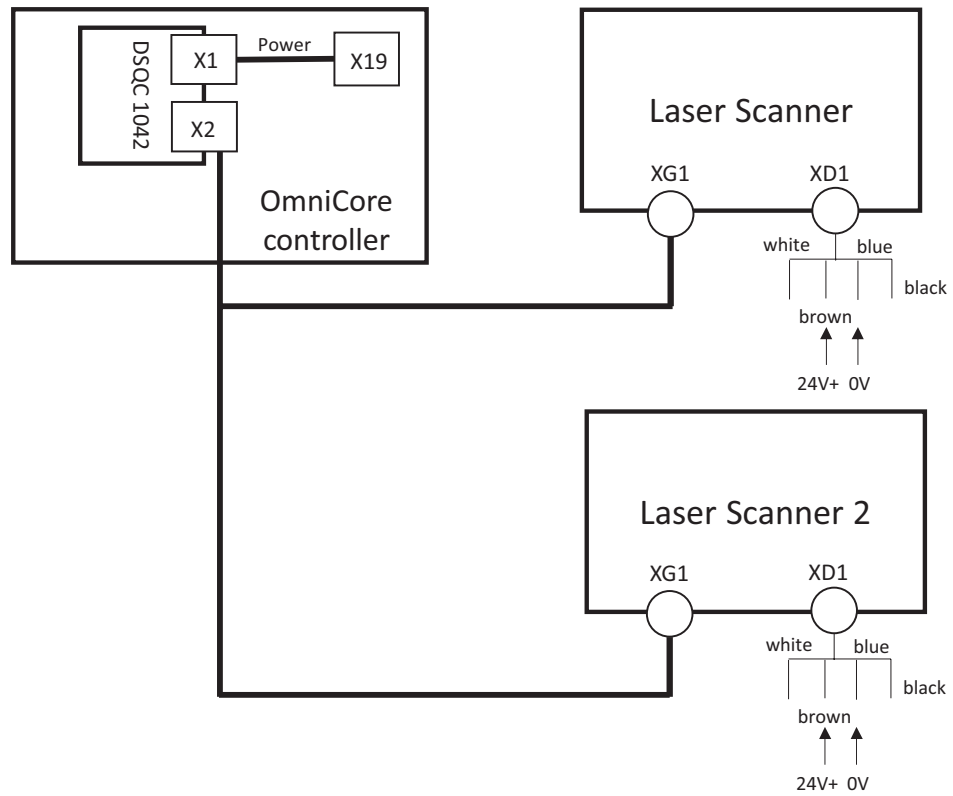
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3 Installation and commissioning

3.3.8 Installation of laser scanner

Continued

2 SafetyIO-based laser scanners (option 3051-4)



xx2200000300



Note

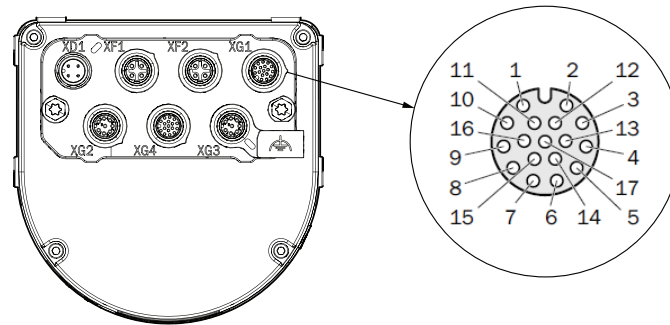
If there are additional scalable I/O devices available, install and configure the additional devices by following the detailed procedures in *Application manual - Scalable I/O*.

Continues on next page

Connector information

Pin assignment on XG1 of SafetyIO-based laser scanners

XG1 connector on SafetyIO-based laser scanner is a 17-pin, A-coded M12 female connector. Pins 1-4 and pin 17 on XG1 are occupied for connecting the laser scanner and scalable I/O device, while other 12 pins can be used for local inputs and outputs.



xx230000750

Pin	Description	Wiring color
1	OSSD pair 1, OSSD A	Brown
2	OSSD pair 1, OSSD B	Blue
3	OSSD pair 2, OSSD A	White
4	OSSD pair 2, OSSD B	Green
5	Universal input 1	Pink
6	Universal input 2	Yellow
7	Universal input 3	Black
8	Universal input 4	Grey
9	Universal input 5	Red
10	Universal input 6	Violet
11	Universal input 7	Grey with pink
12	Universal input 8	Red with blue
13	Universal input 9	White with green
14	Universal input 10	Brown with green
15	Universal output 1	White with yellow
16	Universal output 2	Yellow with brown
17	Voltage 0 V DC	White with grey

Continues on next page

3 Installation and commissioning

3.3.8 Installation of laser scanner

Continued

Configuring the laser scanner(s)

Laser scanner configuration depends on the type and number of scanners connecting to the robot and RobotWare version. Refer to the following table for applicable scenario and proceed to specific section for configuration details.

Scanner type	Works with...			Number of connected scanners	RobotWare version	Require... Collaborative Speed Control add-in	Refer to...
	PLC	Scalable I/O device DSQC1042	OmniCore controller with SafeMove				
PROFIsafe-based	Y	N	Y	1	RobotWare 7.7 or later	Y	Configuration of one PROFIsafe-based laser scanner (RobotWare 7.6 or later and PLC acting as Master) on page 136
	Y	N	Y	2	RobotWare 7.7 or later	Y	Configuration of two PROFIsafe-based laser scanners (RobotWare 7.6 or later and PLC acting as Master) on page 140
	N	N	Y	1	RobotWare 7.10 or later	Y	Configuration of one PROFIsafe-based laser scanner (RobotWare 7.10 or later and OmniCore acting as Master) on page 144
	N	N	Y	2	RobotWare 7.10 or later	Y	Configuration of two PROFIsafe-based laser scanners (RobotWare 7.10 or later and OmniCore acting as Master) on page 148
SafetyIO-based	N	Y	Y	1	RobotWare 7.7 or later	Y	Configuration of one SafetyIO-base laser scanner (RobotWare 7.6 or later) on page 152
	N	Y	Y	2	RobotWare 7.7 or later	Y	Configuration of two SafetyIO-base laser scanners (RobotWare 7.6 or later) on page 157

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.

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 49](#).

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.

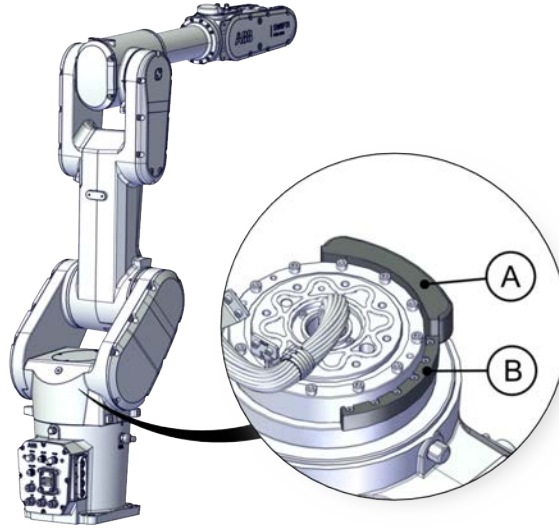
3 Installation and commissioning

3.4.2 Mechanically restricting the working range

3.4.2 Mechanically restricting the working range

Location of mechanical stops

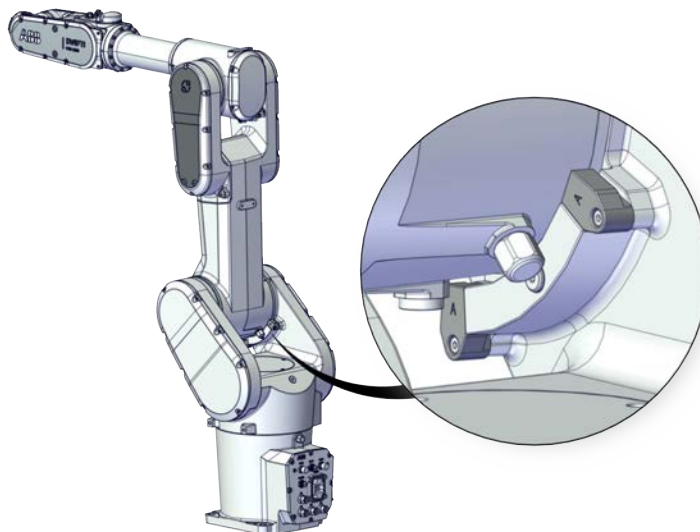
Axis 1



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

Axis 2



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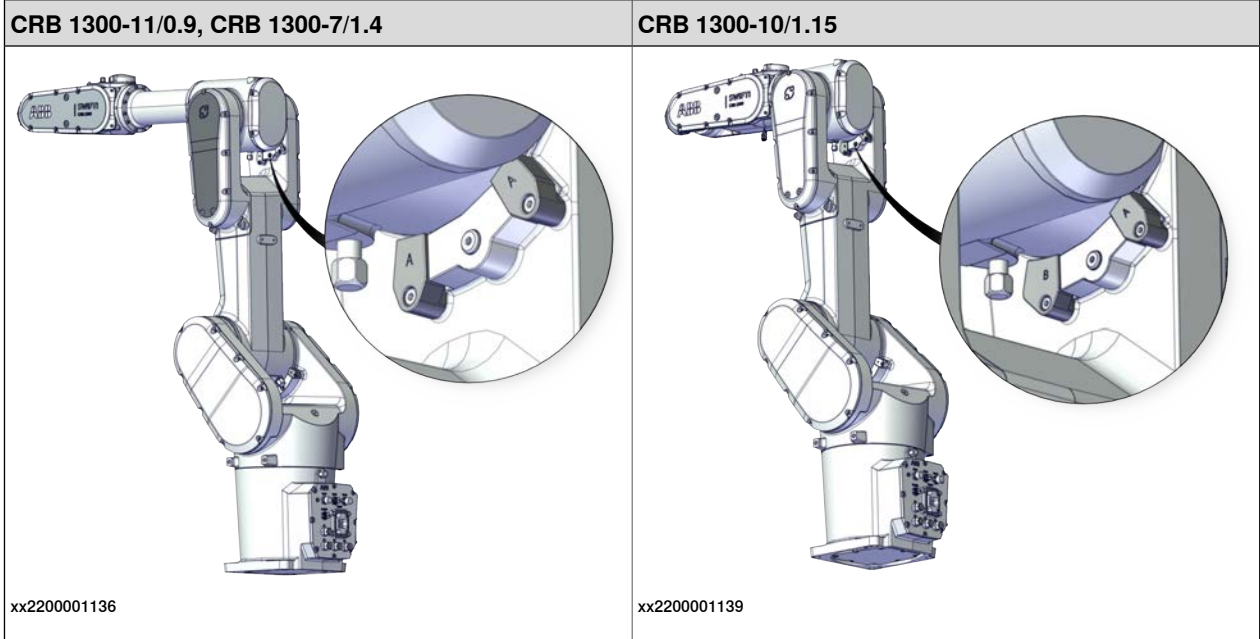
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3 Installation and commissioning

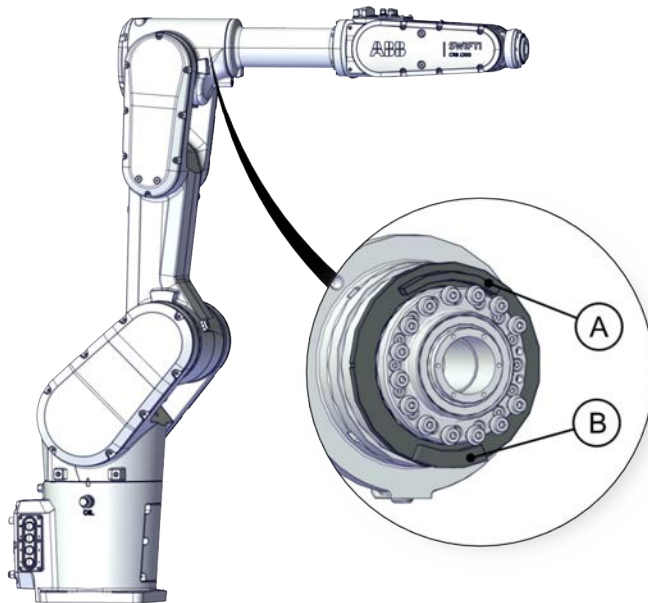
3.4.2 Mechanically restricting the working range

Continued

Axis 3



Axis 4



xx2200001137

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

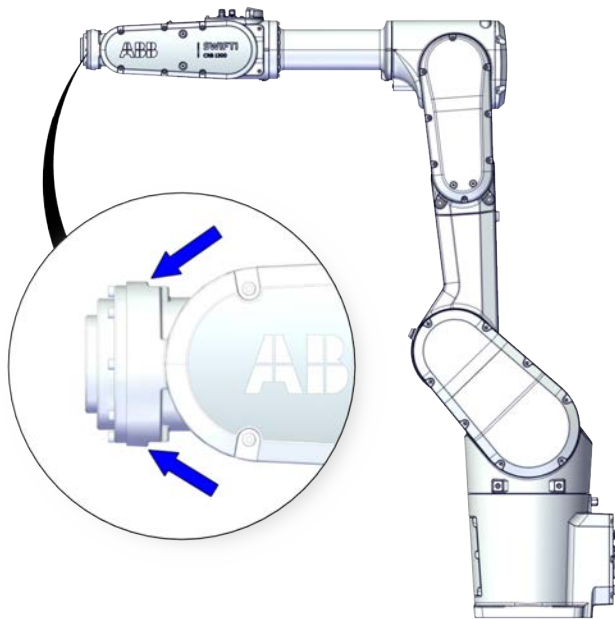
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3 Installation and commissioning

3.4.2 Mechanically restricting the working range

Continued

Axis 5



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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 333](#)
- [Replacing the axis-2 mechanical stops on page 335](#)
- [Replacing the axis-3 mechanical stops on page 488](#)
- [Replacing the axis-4 mechanical stops on page 491](#)

3.5 Electrical connections

3.5.1 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 101 .
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

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3 Installation and commissioning

3.5.1 Robot cabling and connection points

Continued

Robot cable, power

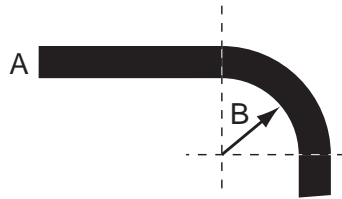
Power cable length	Article number
Power cable, straight connector, 3 m	3HAC077245-001
Power cable, straight connector, 7 m	3HAC077245-002
Power cable, straight connector, 15 m	3HAC077245-003
Power cable, angled connector, 3 m	3HAC077247-001
Power cable, angled connector, 7 m	3HAC077247-002
Power cable, angled connector, 15 m	3HAC077247-003

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

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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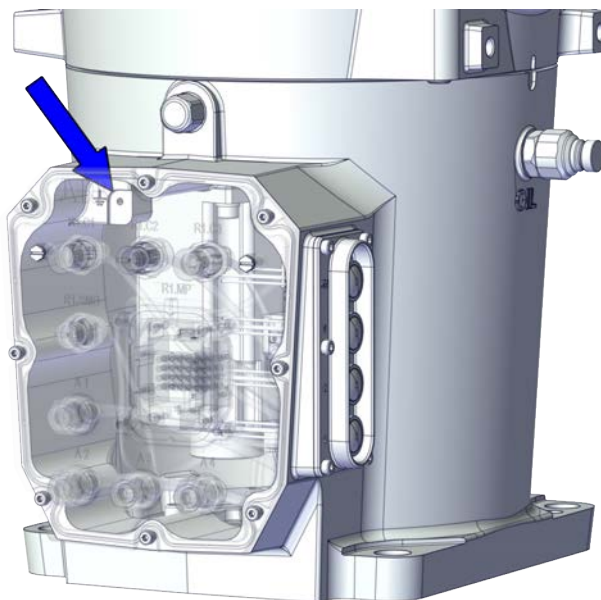
3 Installation and commissioning

3.5.1 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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3 Installation and commissioning

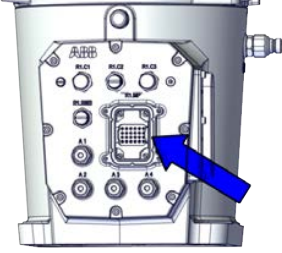
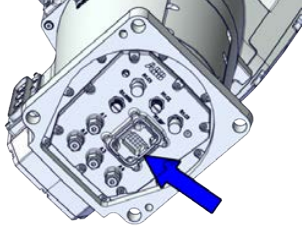
3.5.1 Robot cabling and connection points

Continued

Installation of extra O-rings

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

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	<p>Used with protection class IP67. Used to seal between the main power cable and connector. Robots with manipulator cables routed from the rear of the base:</p>  <p>xx2000002338</p> <p>Robots with manipulator cables routed from below (3309-1):</p>  <p>xx2000002339</p>

Customer cables - CP/CS cable

CP/CS cable length ⁱ	Article number
3 m, with lamp unit cabling	3HAC078069-001
7 m, with lamp unit cabling	3HAC078069-002
15 m, with lamp unit cabling	3HAC078069-003

ⁱ CP/CS cable for CRB 1300 also includes lamp unit cabling used for communication with the lamp unit on the process hub. The cable is also designed with free ends for more I/O connections and shall always be used properly in applications. It is recommended to shield the free ends not in use. Do not use other types of CP/CS cables or use in an improper way; otherwise, the lamp unit will not work and other unknown faulty may be raised.

Customer cables - Ethernet floor cable

Ethernet floor cable length	Article number
7 m	3HAC067447-002
15 m	3HAC067447-003

Continues on next page

3 Installation and commissioning

3.5.1 Robot cabling and connection points

Continued

Ethernet floor cable length	Article number
7 m, with lead-through device cabling ⁱ	3HAC077020-001

ⁱ Ethernet floor cable with lead-through device cabling is used for communication with the lead-through device when installed. Another Ethernet cable of 700 mm is used between the lead-through device and R2.C2 connector on robot wrist.

3 Installation and commissioning

3.5.2 Customer connections

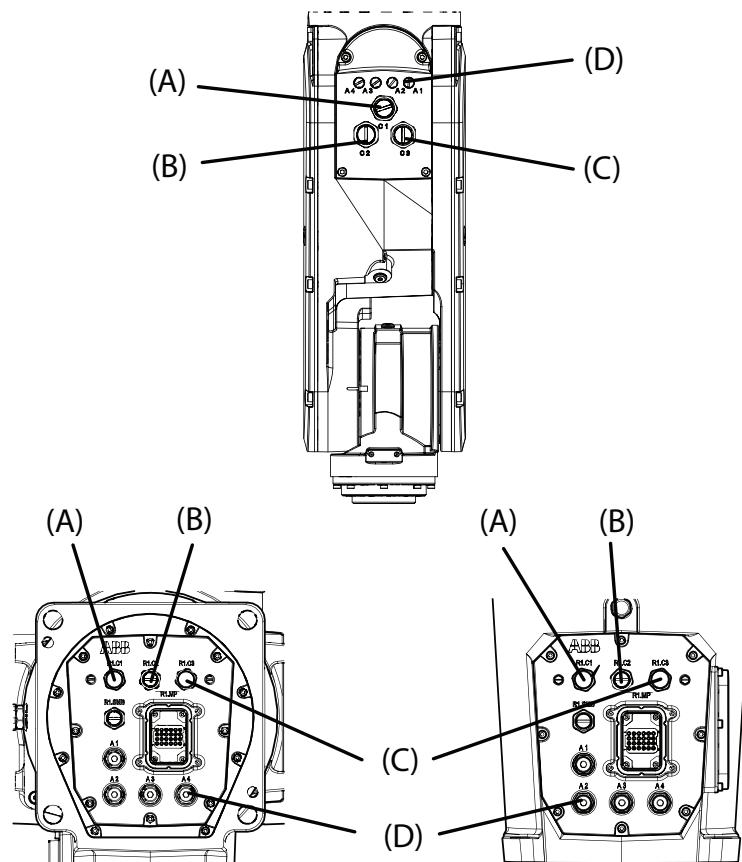
3.5.2 Customer connections

Introduction to customer connections

The cables for customer connection are integrated in the robot and the connectors are placed on the tubular 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.



xx2200000997

Position	Connection	Description	Number	Value
A	(R1)R2.C1	Customer power/signal	12 wires ⁱ	30 V, 1.5 A
B	(R1)R2.C2	Customer power/signal or Ethernet	8 wires ⁱⁱ	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 ⁱⁱⁱ
D	Air	Max. 6 bar	4	Outer diameter of air hose: 6 mm

ⁱ The connector has 12 pins. Only pins 5 to 12 are available for use. Pins 1 to 4 are used for LED indicator.

Continues on next page

- ii If the lead-through device is installed, the C2 connector will be used for the lead-through device and 6 wires are occupied.
- iii Contact ABB for more information if to use the (R1)R2.C3 connection for an application with a higher voltage.

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 101](#).

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.

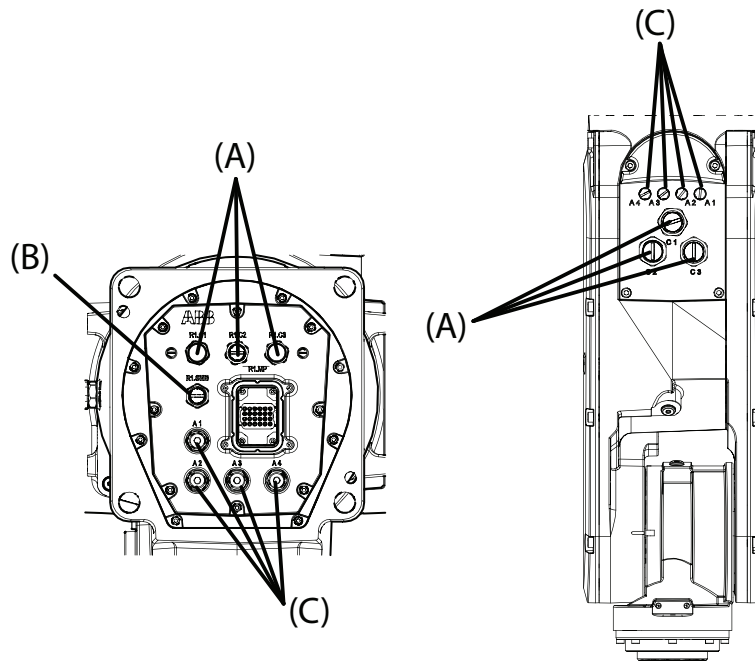
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3 Installation and commissioning

3.5.2 Customer connections

Continued

Always remember to refit the protection covers after removing them.



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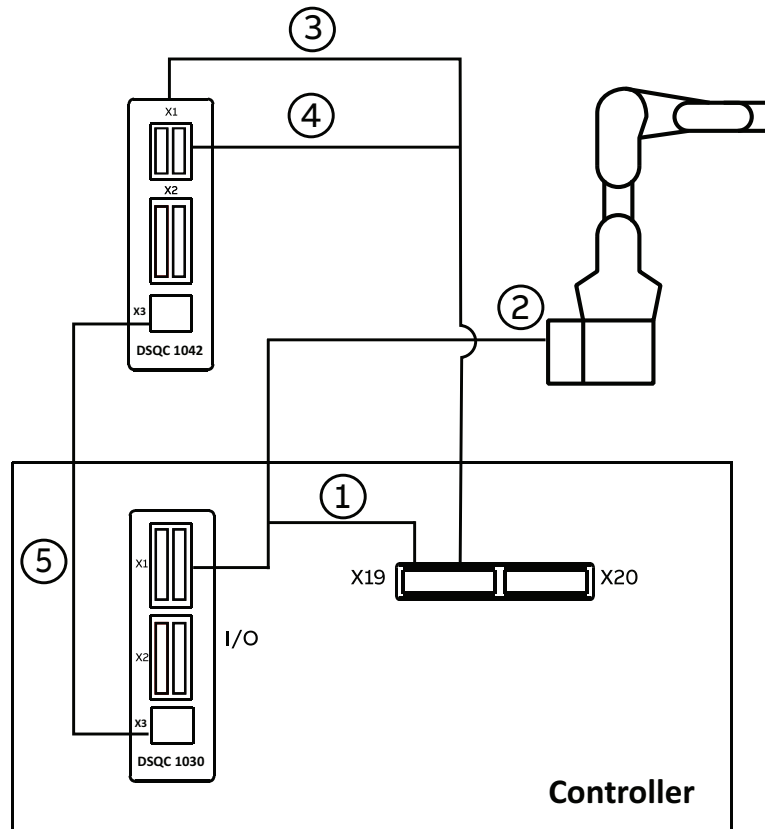
A	CP/CS or Ethernet connector protection covers
B	SMB connector protection cover
C	Air hose connector protection covers

Scalable I/O device connection

For robot working with safetyIO-based laser scanners, a safety I/O device DSQC1042 will be available and required to be connected with the base I/O device DSQC1030 installed on the controller.

Continues on next page

The following figure illustrates the connection among manipulator, controller with base I/O device configured and the safety I/O device.



xx2200001154

1	Ethernet connection	Between X3 connectors on DSQC1030 and on DSQC1042
2	Lamp unit cabling	Using CP/CS cable to connect, <ul style="list-style-type: none"> • X1 connector on DSQC1030 Pins GND, DO1, DO2 and DO3 are occupied for lamp unit • X19 connector on controller Pins 1 and 2 are occupied for lamp unit • R1.C1 connector on manipulator base
3	Power connection	Between X4 connector on DSQC1030 and X19 connector on controller

For details about the I/O module models, see *Application manual - Scalable I/O*.

3 Installation and commissioning

3.6 Start of robot in cold environments

3.6 Start of robot in cold environments

Introduction

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

Problems with starting the robot

Event message from Motion Supervision

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

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

Robot stopping with other event message

Use this procedure if the robot is not starting.

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

Adjusting the speed and acceleration during warm-up

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

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

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

3.7 Configuring the software

Overview

This section is intended for guiding users to set up robot system and configure necessary software for CRB 1300. It also contains information of some customizable safety configurations.

A general software configuration procedure is listed as below.

	Action	Reference to...
1	Configure RobotWare as required.	<ul style="list-style-type: none"> • Information about RobotWare and CRB 1300 on page 112 • Operating manual - Integrator's guide OmniCore
2	Download the Collaborative Speed Control add-in and install required options.	Information about Collaborative Speed Control add-in on page 113
3	Configure the lead-through functions.	Lead-through on page 115
4	Configure SafeMove.	
	For PROFIsafe-based scenarios with a PLC acting as the master connected (any supported RobotWare version) For SafetyIO-based scenarios Upload the template SafeMove configuration file using the SafeMove configurator app on FlexPendant.	<ul style="list-style-type: none"> • The SafeMove configurator app on FlexPendant on page 120 • Application manual - Functional safety and SafeMove
	For PROFIsafe-based scenarios with the controller acting as the master (RobotWare 7.10 or later) Configure the template SafeMove configuration file using Visual SafeMove in RobotStudio and upload to the controller.	<ul style="list-style-type: none"> • Configuration of SafeMove using Visual SafeMove in RobotStudio on page 131 • Application manual - Functional safety and SafeMove
5	Configure laser scanner(s) and apply speed control strategies.	Speed control on page 136
6	Get knowledge of the robot status indications shown by the lamp unit.	Robot status indication on page 164
7	If required, modify customizable safety configurations.	Use cases of safety configurations on page 166

Continues on next page

3 Installation and commissioning

3.7.1 Information about RobotWare and CRB 1300

3.7.1 Information about RobotWare and CRB 1300

Overview

CRB 1300 is designed to simplify collaborative applications. Therefore some software features work somewhat different compared with standard industrial robots. Some of them are listed in this section.

How to configure RobotWare is described in *Operating manual - Integrator's guide OmniCore*.

SafeMove

See *Application manual - Functional safety and SafeMove*.

3.7.2 Information about Collaborative Speed Control add-in

Overview



Note

The Collaborative Speed Control add-in is required only for robots operating in RobotWare 7.6 or later.

The Collaborative Speed Control add-in is integrated in the robot system at delivery if option 3313-1 Lead-through device or any of laser scanner options 3351-X are ordered. It is also available separately in the add-ins section in RobotStudio. To add it to an existing controller or do an update, see the installation procedure to install and add it to the robot.

With the Collaborative Speed Control add-in installed, the configuration of the lamp indicator, lead-through, and speed control are activated for the robot.

For PROFI-safe-based scenarios where a PLC is connected to act as a master and SafetyIO-based scenarios, after the add-in is installed, a predefined template SafeMove configuration file is also available for easy configuration of basic SafeMove functions.

Installing the Collaborative Speed Control add-in

Perform the following procedure to install the Collaborative Speed Control add-in:

- 1 Start RobotStudio and click **Gallery** in the **Add-Ins** ribbon.
- 2 In the displayed **Gallery** window, use the **Search** function or **Common tags** to find the Collaborative Speed Control add-in.
- 3 Click the displayed add-in icon.
- 4 In the right pane, click **Add**.
The package is automatically installed and listed in the **Add-in** navigation tree in the left pane of the window.
- 5 Select **Add Controller** > **Connect to Controller** in the **Controller** ribbon.
- 6 In the **Connect to Controller** window, connect to a real controller or select/create a virtual controller and tap **OK**.
- 7 Request write access.
- 8 Launch the **Modify Installation** dialog from the **Controller** ribbon.
- 9 Select **Software** > **Available**.
The **Available Software** window displays all distribution packages that have been installed with RobotStudio.
Select the Collaborative Speed Control add-in package and required version to be added to the system and click **Include**.
- 10 Proceed to the **Features** tab page and modify the system as required.

Continues on next page

3 Installation and commissioning

3.7.2 Information about Collaborative Speed Control add-in

Continued

- 11 Choose required option in the **Collaborative Features** group.



Note

If a real controller is connected, the **Collaborative Features** options are available only when corresponding license for Lead-through device or Safety laser scanner is added.

- 12 The **Summary** tab shows an overview of all the changes.

- 13 Select **Apply** to confirm and save the changes.

The controller is restarted automatically to apply the changes.

See more details about how to use Modify Installation for RobotWare 7 and how to install a distribution package, see *Operating manual - RobotStudio*.

3.7.3 Lead-through

What is lead-through?

The lead-through functionality is available for robots designed for collaborative applications. Using lead-through, you can move the robot manually to a desired position, as an alternative to jogging.

Using lead-through



Note

The Collaborative Speed Control add-in with the option [3313-1] *Lead-through Device* selected must be installed first. See [Installing the Collaborative Speed Control add-in on page 113](#).

Checking lead-through status

The lead-through device is not configured by default. Users can perform the following procedure to check the configuration status:

- 1 In the FlexPendant, on the status bar, tap the **QuickSet** button.
The **QuickSet** window is displayed.
- 2 Tap **Lead-through**.
The **Lead-through Settings** tab page is displayed.
- 3 Check the lead-through device setting.
The device is not configured by default and the **Enable Lead-through** switch is unavailable for use.

Configuring installation information of the lead-through device

Use the following procedure to configure the installation information of the lead-through device and get it ready for use:

- 1 Tap **Settings** on the home page of the FlexPendant.
- 2 Tap **Lead-through Device**.
- 3 Choose the lead-through device type from the drop-down list.



Tip

You can click **About the versions** and refer to the pictures to figure out your device type.

- 4 In the **Installation** page of the displayed window, select the installation position of the lead-through device.
Four installation configurations are predefined, **Up**, **Right**, **Down** and **Left**. Observe your device and make sure the actual device installation position is consistent with the selected configuration.

Continues on next page

3 Installation and commissioning

3.7.3 Lead-through

Continued

The indicator and locking knob on the lead-through are in the correct relative position with the lamp unit on the process hub. The following figure takes the configuration **Up** as an example.



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The device details are as follows.



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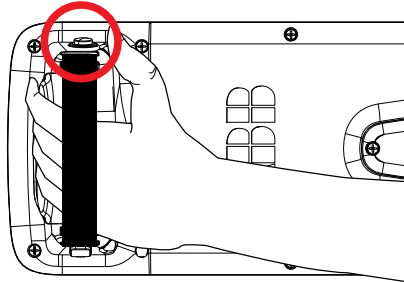
- 5 If users want to define customized installation position, tap **Advanced installation**.
- 6 In the displayed window, set corresponding parameters according to actual requirements.
The device offset, orientation, tool load mass and mass center are available to set.
- 7 Tap **Apply**.

Continues on next page

Enabling lead-through

Use the following procedure to enable lead-through:

- 1 Make sure the robot is in Manual mode.
- 2 Enable lead-through in one of the following ways:
 - Press the thumb button on the FlexPendant.



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- On the start screen, tap **Jog** and select the **Lead-through** menu.
- In the **QuickSet** menu, select the **Lead-through** tab.

Note

If the robot is in motors off state, set the controller to Motors On state first by pressing the three-position enabling device or changing the state in the **Control Panel** tab page.

Note

For robots operating in RobotWare version earlier than 7.7, the lead-through device can only be enabled from the **Jog Setting** tab page by tapping **Jog** in the **QuickSet** window.

- 3 In the **Lead-through Mode** section select a mode.
- 4 If required, in the **Lead-through lock** section use the lock button next to a axis to lock it.
- 5 Hold the handle of the lead-through device and gently move the robot to the desired position.

The robot moves to the selected position. If the **Lead-through lock** option is selected, the robot moves in such a way that the movement is restricted in the locked direction.

Note

You can feel if an axis reaches its end position. Do not try to force the axis beyond this position.

- 6 If desired, save the position.

Continues on next page

3 Installation and commissioning

3.7.3 Lead-through

Continued



Note

The speed at which the robot moves when using the Lead-through functionality is managed using the horizontal scroll bar available in the **Lead-through Speed** section.

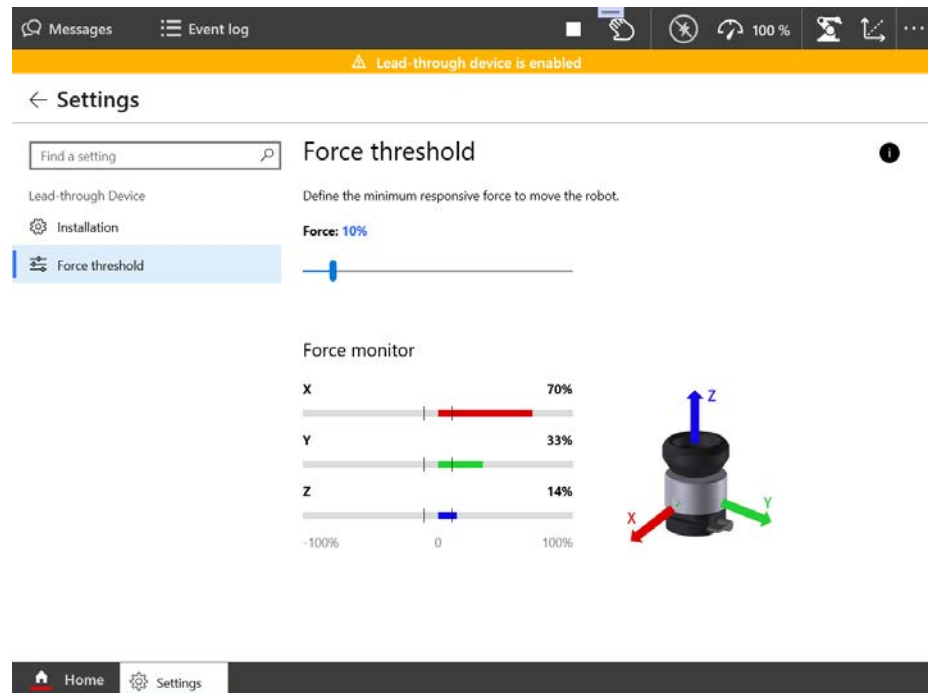
Setting force threshold

In actual applications, some strong background noises, for example, EMC and radiation, may be treated as a force by the lead-through device, which may result in an unexpected movement of the robot. To reduce such affections, users are allowed to set a force threshold. All the forces that are lower than the threshold will be filtered out.

Use the following procedure to set the force threshold:

- 1 Tap **Settings** on the home page of the FlexPendant.
- 2 Tap **Lead-through Device**.
- 3 Tap **Force threshold** on the left pane.
- 4 In the displayed window, drag the **Force slider** to define a response force to move the robot.

The default force threshold is 10%.



- 5 Observe the forces applied on the lead-through device in real time in the **Force monitor** area.

Continues on next page

Configuring button functions

The button-type lead-through device provides two buttons, flat and raised, for users to configure specific functions according to application requirements. The button function configuration is only available to robots:

- operating in RobotWare version 7.7 or later, and,
- installing with the Collaborative Speed Control add-in in version 1.1 or later

Use the following procedure to configure the button functions:

- 1 Tap **Settings** on the home page of the FlexPendant.
- 2 Tap **Lead-through Device**.
- 3 Tap **Configurable buttons** on the left pane.
- 4 Select desired function from the drop-down list for the required button.
 - **Add a move location:** a **Move** block will be added to Wizard app. This is the default configuration for the flat button.
 - **Linear / Reorient:** the lead-through mode will be changed between linear and reorient. This is the default configuration for the raised button.
 - **Lock Z:** the movement along the Z direction will be locked.
 - **Lock XY:** the movement along the X and Y directions will be locked.

After selection, configured action takes effect when pressing the button.

3 Installation and commissioning

3.7.4.1 The SafeMove configurator app on FlexPendant

3.7.4 SafeMove

3.7.4.1 The SafeMove configurator app on FlexPendant

Introduction

The application **SafeMove** on the FlexPendant offers an intuitive way to visualize and configure a safety configuration for systems with the option *SafeMove Collaborative*. This includes stop functions and *Cyclic Brake Check*. To get started, see [Use cases on page 123](#).



Tip

Use the online user guide tool, included in the SafeMove configurator app, for help with the SafeMove configuration setup process.



Note

The SafeMove configurator app is available for the following robots:

- CRB 1100
- CRB 1300
- CRB 15000

The configuration follows the same principles as when using Visual SafeMove in RobotStudio but the functionality is not as extensive.

Overview of the user interface

The user interface consists of a configurator and a 3D model that visualizes the robot with the configured encapsulations and zones. The first time that the app is opened, a default factory setting is loaded. If a safety configuration is loaded, this will be shown.

- The tab **Robot Encapsulation** contains the configuration of the encapsulations of the robot itself.
- The tab **Tool Encapsulation** contains the configuration of the encapsulations of the tools.
- The tab **Tool Data** contains the configuration for the tools.
- The tab **Safe Zones** contains the configuration of the safe zones.
- The tab **Global Settings** contains the configuration for Cyclic Brake Check and supervision settings.
- The tab **Synchronization** contains functions for software synchronization.
- The **Context** menu (...) contains functionality for loading, saving, and viewing configurations, and to reset the configuration.

The functionality is described in detail in *Application manual - Functional safety and SafeMove*.

Continues on next page

Prerequisites

- The option *SafeMove Collaborative* is required.
- To edit a configuration, the grant *Safety Services* is required. A user without this grant can view a configuration, but not modify, write it to the controller, or apply it to the controller.

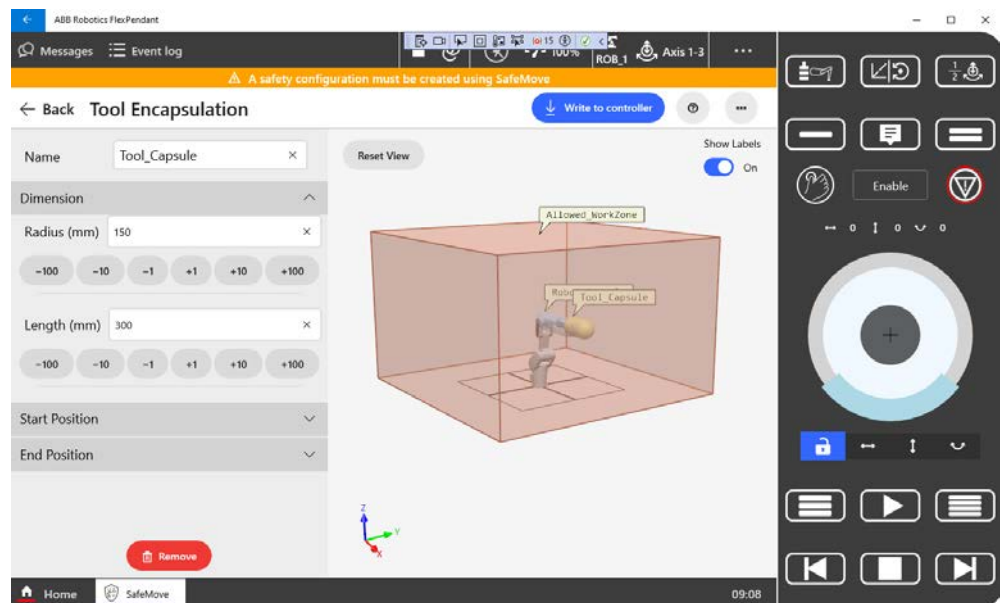
Template configurations

The template configuration is adapted for the specific manipulator, and typically contains one or two encapsulations of the arm, one encapsulation of the wrist (intended for the tool), one or two safe zones, and a Cyclic Brake Check setting. This configuration is typically a good start for a generic application with a smaller tool.

The factory setting is an empty safety configuration. A loaded configuration can be removed and the system is then reset to the factory setting.

Encapsulations

The encapsulations are geometries that can be in the shape of a sphere, capsule, or lozenge. A sphere or capsule encapsulation can be modified in dimension, length, and position. A lozenge capsule can also be modified in rotation.



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Note

For the CRB 1100 and CRB 1300, the SafeMove configurator app offers the same functionality. The screenshots used in the manual can therefore show either one of the robots.

Continues on next page

3 Installation and commissioning

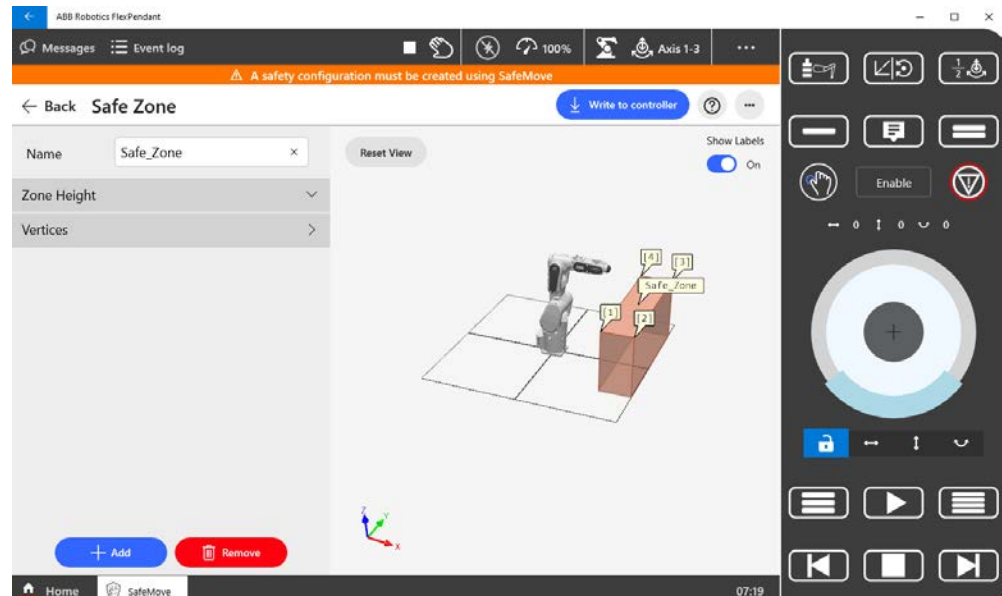
3.7.4.1 The SafeMove configurator app on FlexPendant

Continued

Safe zones

The default safe zone is a rectangular box with four vertices. The vertices defines the shape of the safe zone, and the position in space. More vertices can be added to define the safe zone. The minimum number of vertices is 4, and the maximum is 24.

Each vertex can be edited in x and y values.



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Each vertex is numbered, from 1 and up. When a new vertex is added between two existing vertices the vertex numbers will be automatically adjusted so that they come in order. For example, if a new vertex is added between vertices 2 and 3, the vertex with index 3 will change to 4 and the new vertex will be indexed 3.

Display of safety violations

During the validation of a robot cell using the SafeMove app, it is possible to check whether the robot is committing a safety violation. For example, robot crossing a forbidden zone, robot speed or force exceeding a certain value, and so on. Once a violation is detected and displayed on the SafeMove app, it is possible to take the necessary actions.

For more information about the Display of safety violations, see *Application manual - Functional safety and SafeMove*.

Supervision functions

The global supervision functions are not connected to a specific safe zone or safe range. They can be added, modified, and deactivated.

For more information about the global supervision functions, see *Application manual - Functional safety and SafeMove*.

Continues on next page

Synchronization

The **Synchronization** tab is used to manually set the current joint positions for the robot.

For more information about synchronization, see *Application manual - Functional safety and SafeMove*.

Recommended working procedure

Use this procedure when configuring SafeMove in the configurator app on FlexPendant.

- 1 Log in as a user with safety user grants.
- 2 Start the SafeMove configurator app.
- 3 Load a safety configuration template or an existing configuration from the **Context** menu (...).
- 4 Configure encapsulations.
- 5 Configure zones and the supervision functions.
- 6 Load the configuration to the safety controller.
The robot controller is automatically restarted in this step.
- 7 Validate the configuration.
- 8 Set the safety configuration to validated and lock it.

For more details, see [Use cases on page 123](#).

For functionality not supported in the SafeMove configurator app, use Visual SafeMove in RobotStudio.

Use cases

Start the SafeMove configurator app

The SafeMove configurator app is available on the home screen of the FlexPendant for systems with the option *SafeMove Collaborative*. If the app is not shown, then review the system settings using the **Modify Installation** function in RobotStudio and add that option.

The first time that the app is opened, a default factory setting is loaded. This contains only the manipulator with *Cyclic Brake Check* activated. There are no encapsulations, safe zones, or tool data defined.

The factory setting can always be resumed, if needed.

To continue and create a safety configuration, see [Load a safety configuration template on page 123](#).

Load a safety configuration template

The safety configuration template feature is available from RW 7.12 onwards. Systems with RW 7.10 or earlier will still have the default template solution.

Use the following procedure to load a predefined safety configuration template and apply it to the robot controller.

- 1 Log in as a user with safety user grants.
- 2 Open the SafeMove app.
- 3 Tap **Enable Edit Mode**.

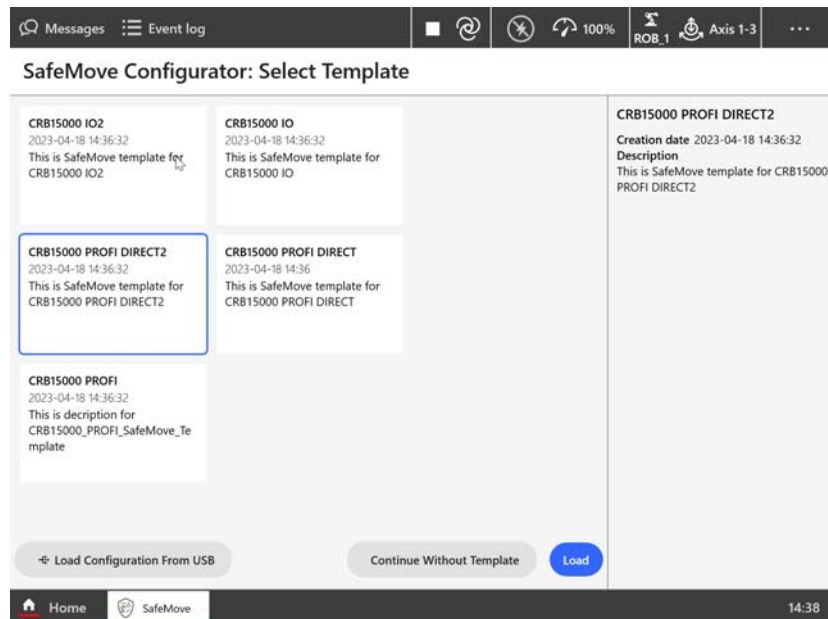
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3 Installation and commissioning

3.7.4.1 The SafeMove configurator app on FlexPendant

Continued

The **SafeMove Configurator: Select Template** page is displayed with a list of available templates.



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- 4 Select a template from the list.

The metadata of the selected template is displayed on the right side panel.

- 5 Tap **Load**.

The **Load Safety Configuration** dialogue is displayed.

- 6 Tap **Yes**.

The selected safety configuration template is loaded on the FlexPendant.

- 7 Review that the selected template configuration is suitable for the intended application.

If modifications are needed, see [Modify a loaded safety configuration on page 125](#).



Note

A SafeMove configuration must always be validated to verify that the desired safety is achieved. If no validation is performed, or the validation is inadequate, the configuration cannot be relied on for personal safety.

- 8 If the template configuration is suitable, select **Write to controller**.

The safety report is presented on the screen.

- 9 Save the safety report. Take a print out and sign this safety report.

See [ABB Safety Configuration Report on page 129](#). More information about the safety report and how to validate is described in *Application manual - Functional safety and SafeMove*.

- 10 Tap **Apply to controller**.

The **Saved** dialogue is displayed

Continues on next page

11 Tap **Restart Controller**.

The controller is restarted and loads the newly saved safety configuration template.



Note

To change the loaded safety configuration template, tap the **Context** menu, select **Open Template Selector**, select the required template from the list, and follow the rest of the steps.

Modify a loaded safety configuration

Use the following procedure to modify a loaded safety configuration and apply it to the robot controller.

1 Log in as a user with safety user grants.

2 Open the SafeMove app.

The **SafeMove Configurator** page is displayed along with the saved safety configuration.

3 Select **Enable Edit Mode** to edit the loaded safety configuration.

4 To add or modify an encapsulation, tap **Add** and select a geometry for **Robot Encapsulation** or **Tool Encapsulation**.

To modify the encapsulation, select it and modify the attributes.

5 To add or modify a zone, tap **Add** and **Add Zone**.

Select the safe zone and modify the attributes. See [Modify a safe zone on page 126](#).

6 To add or modify a global setting, tap **Add** and select which supervision to modify.

7 When the configuration is done, select **Write to controller**.

The safety report is presented on the screen.



Note

A SafeMove configuration must always be validated to verify that the desired safety is achieved. If no validation is performed, or the validation is inadequate, the configuration cannot be relied on for personal safety.

8 Save the safety report. Take a print out and sign this safety report.

The safety report and how to validate is described in detail in *Application manual - Functional safety and SafeMove*.

9 Tap **Apply to controller**.

The **Saved** dialogue is displayed

10 Tap **Restart Controller**.

The controller is restarted and loads the newly saved safety configuration.

Continues on next page

3 Installation and commissioning

3.7.4.1 The SafeMove configurator app on FlexPendant

Continued

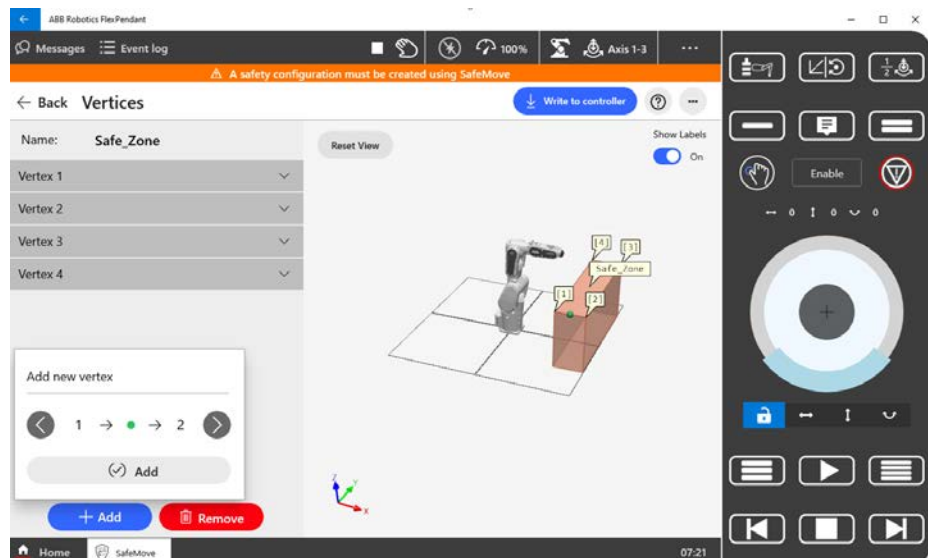
Modify a safe zone

Use the following procedure to modify a safe zone.

- 1 Add a new safe zone or select an existing safe zone.
- 2 Tap **Safe Zones** to open the attributes.
- 3 Add, modify, or remove vertices as needed to create the desired shape of the safe zone.

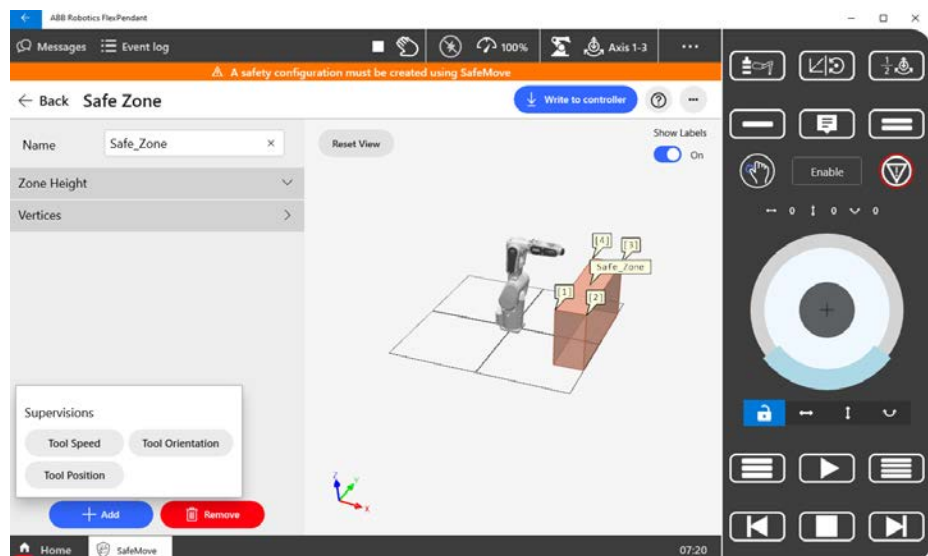
The green dot in the 3D visualization shows where the new vertex is located. Use the arrows to change the position (index).

Tap the grey **Add** button to place the vertex.



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- 4 To add a supervision to a safe zone, tap to select the safe zone in the 3D view, then tap **Add**.
- 5 Select a supervision function or guide.



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- 6 For supervision functions, select stop category, signal, and any other available setting applicable for the function.



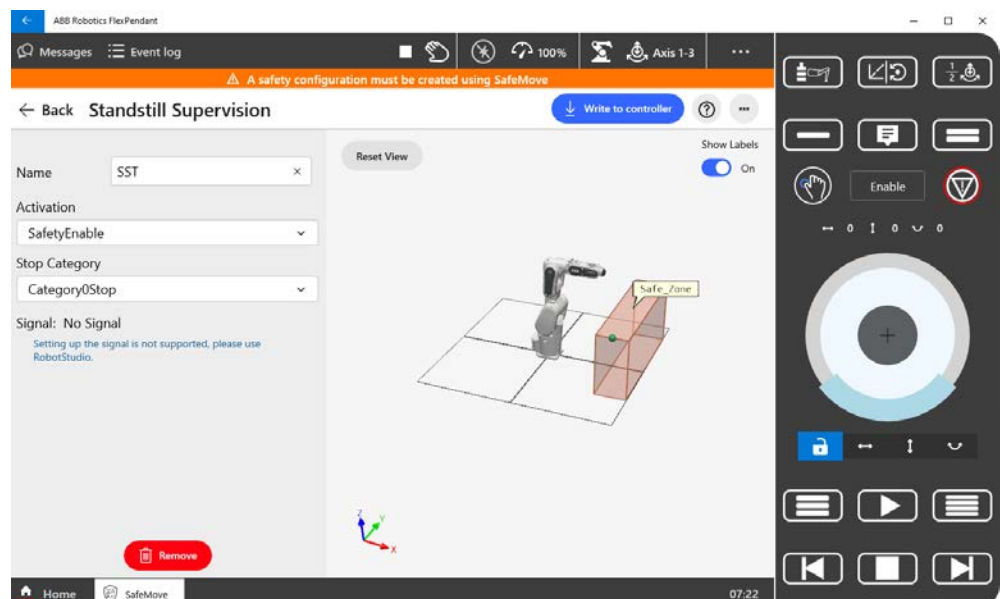
Tip

The functionality is described in detail in *Application manual - Functional safety and SafeMove*.

Modify the Standstill Supervision settings

The Standstill Supervision functionality is not active by default. It can be added, modified, and deactivated.

The CRB 1300 has support for both category 0 stop and category 1 stop.



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Modify the global supervision settings

The global supervision functions are not connected to a specific safe zone or safe range. They can be added, modified, and deactivated.

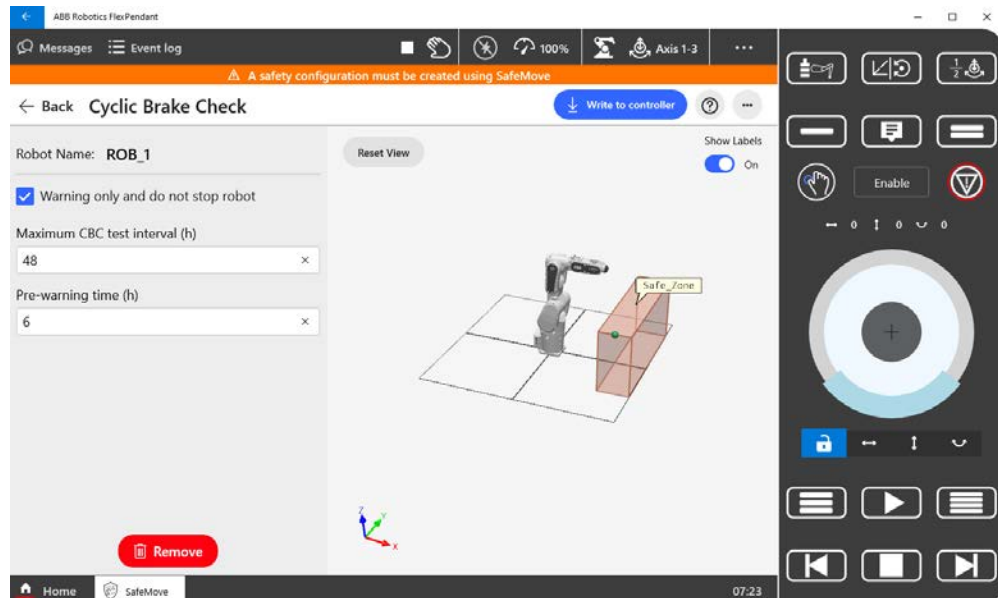
3 Installation and commissioning

3.7.4.1 The SafeMove configurator app on FlexPendant

Continued

Modify the Cyclic Brake Check settings

The Cyclic Brake Check functionality is active by default. It can be modified and deactivated.



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Viewing the configuration report

The configuration report is available both on the FlexPendant and on the controller. It can be viewed from the **Context** menu.

Loading and exporting a safety configuration

An existing safety configuration on the FlexPendant can be exported from the **Context** menu, **Save Configuration To File**. It is also possible to load a safety configuration from a file.

Validate the safety configuration



DANGER

A SafeMove configuration must always be validated to verify that the desired safety is achieved. If no validation is performed, or the validation is inadequate, the configuration cannot be relied on for personal safety.

Each new or modified safety configuration must be validated before running in production. The validation should verify that the following is configured correctly:

- All I/O settings and signals used for safety interlocking including connected functionality
- All Stop configuration functions
- All safety zones with connected supervision functions and signals used for safety interlocking
- All global supervision functions
- All tools with corresponding supervision functions

Continues on next page



Note

Depending on the combination of functions, the validation procedures have to be modified for the specific configuration.

A more detailed description of validation of the safety configuration is found in *Application manual - Functional safety and SafeMove*.

After safety configuration is validated, it must be set to validated and locked in the system.

Preparations before validation

Do the following checks before you start the validation procedure:

- 1 Carry out the synchronization procedure.
- 2 If configured, run the service routine for the function Cyclic Break Check.
- 3 Turn off the *SafeMove Assistant* functionality, with the system parameter *Disable SafeMove Assistant*.
- 4 Turn off collision detection during validation of any tool force supervision
- 5 Start the validation procedure.

If using protected groups in the safety configuration, only the modified parts must be validated.

ABB Safety Configuration Report

The validation of each function should be documented in the safety report by signature of the validator.

The safety configuration report lists all parameters that are set for the installation. The report also includes a visual representation of the installation, a floor plan. This shows the robot and safety zones as seen from above.

The configuration report includes the checksum (multiple checksums if using protected groups in the safety configuration). The checksum can also be read using the RAPID function `SafetyControllerGetChecksum` or `SafetyControllerGetGroupChecksum`.

Setting the configuration to validated

When the safety technician has validated the configuration and signed the safety report, the status of the configuration shall be changed to **Validated** on the FlexPendant.

- 1 Log in as a user with the grant **Safety Services**.
- 2 In the **Settings** app, select the **Safety Controller**, and then **Configuration**.
- 3 Select the checkbox **Validated**.

Setting the configuration to locked

When the responsible safety user has approved the validation of the configuration, the status of the configuration should be changed to **Locked** on the FlexPendant.

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3 Installation and commissioning

3.7.4.1 The SafeMove configurator app on FlexPendant

Continued

Running the robot in auto mode with the configuration unlocked will result in a warning message.

- 1 Log in as a user with the grant **Lock Safety Controller Configuration**.
- 2 In the **Settings** app, select the **Safety Controller**, and then **Configuration**.
- 3 Select the checkbox **Locked**.

Concluding steps

After the validation is concluded, turn on the the *SafeMove Assistant* functionality, with the system parameter *Disable SafeMove Assistant*.

3.7.4.2 Configuration of SafeMove using Visual SafeMove in RobotStudio

General

This section describes SafeMove configuration using Visual SafeMove for scenarios with PROFIsafe-based laser scanners connected and OmniCore controller acting as master.

What is Visual SafeMove

Visual SafeMove is the configuration tool for SafeMove and the functional safety options. The tool is completely integrated into the RobotStudio user interface and takes full advantage of the user interface elements such as tabs, browsers, and 3D graphics.

Visual SafeMove is enabled for robots with the safety module. It offers an intuitive way to visualize and configure safety zones. Zones can be adjusted by direct manipulation in the 3D window. Users with previous experience from SafeMove will recognize the same terminology used as before.

Visual SafeMove is used to configure safety stops. For this purpose, the SafeMove options are not required, that is, this functionality is available for all robots. More information about the configuration is available in the product manual for the robot controller.

Visual SafeMove works both with the real controller and the virtual controller. For a virtual controller, a RobotStudio station should be used, which allows zones to be generated automatically. When not running a RobotStudio station, **Online Monitor** is used to visualize the robot.

Starting Visual SafeMove

	Action
1	Start RobotStudio with a virtual controller (with or without a station) or connect a real controller. <ul style="list-style-type: none"> • The user account logging in the controller must be granted with the Safety Services permission. • The write access to the controller is also requested
2	In the Controller tab, click Online Monitor . (Not needed when running a RobotStudio station.)
3	In the Controller tab, click Safety , then select Visual SafeMove .

Configuring SafeMove

Configuring pre logic

- 1 On the **Visual SafeMove** tab page, click **Safe IO Configurator** in the **Configuration** group.
- 2 Click **Pre Logic** view in the **Safe IO Configuration** page.
- 3 Click **New expression** and create the following expressions.
 - ISH_Activate_SST
 - ISH_Activate_TSP
 - ISH_Delay_SST

Continues on next page

3 Installation and commissioning

3.7.4.2 Configuration of SafeMove using Visual SafeMove in RobotStudio

Continued

- ISH_Delay_TSP
- ISH_EnableDelay_Protecting
- ISH_EnableDelay_Warning
- ISH_Combination_Protecting
- ISH_Combination_Waning

In which, the expressions *ISH_Combination_Protecting* and *ISH_Combination_Waning* are required only when two PROFIsafe-based laser scanners are connected.

- 4 At the bottom of the **Safe IO Configuration** page, type the corresponding logical expression in the text box for each expression and click **Create signals**.

Expression	Logic
ISH_Activate_SST	Valid for scenarios with 1 PROFIsafe-based laser scanner connected ISH_Supervise_SST := ((NOT EDGE((NOT ProtectingArea1),ISH_Delayed_SST)) OR (NOT ISH_Enabler_Delay_SST))
	Valid for scenarios with 2 PROFIsafe-based laser scanners connected ISH_Supervise_SST := ((NOT EDGE((NOT ProtectingAreaSM),ISH_Delayed_SST)) OR (NOT ISH_Enabler_Delay_SST))
ISH_Activate_TSP	Valid for scenarios with 1 PROFIsafe-based laser scanner connected ISH_Supervise_TSP := ((NOT EDGE((NOT WarningArea1),ISH_Delayed_TSP)) OR (NOT ISH_Enabler_Delay_TSP))
	Valid for scenarios with 2 PROFIsafe-based laser scanners connected ISH_Supervise_TSP := ((NOT EDGE((NOT WarningAreaSM),ISH_Delayed_TSP)) OR (NOT ISH_Enabler_Delay_TSP))
ISH_Delay_SST	Valid for scenarios with 1 PROFIsafe-based laser scanner connected DELAY(ISH_Enabler_Delay_SST,ProtectingArea1,(ISH_AtUser_Period_ms_Until_SST / ISH_SMctrl_Frequency),ISH_Count-Delay_SST,ISH_Delayed_SST)
	Valid for scenarios with 2 PROFIsafe-based laser scanners connected DELAY(ISH_Enabler_Delay_SST,ProtectingAreaSM,(ISH_AtUser_Period_ms_Until_SST / ISH_SMctrl_Frequency),ISH_Count-Delay_SST,ISH_Delayed_SST)

Continues on next page

Expression	Logic
ISH_Delay_TSP	Valid for scenarios with 1 PROFIsafe-based laser scanner connected DELAY(ISH_Enabler_Delay_TSP,WarningArea1,(ISH_AtUser_Period_ms_Until_TSP / ISH_SMctrl_Frequency),ISH_Count-Delay_TSP,ISH_Delayed_TSP)
	Valid for scenarios with 2 PROFIsafe-based laser scanners connected DELAY(ISH_Enabler_Delay_TSP,WarningAreaSM,(ISH_AtUser_Period_ms_Until_TSP / ISH_SMctrl_Frequency),ISH_Count-Delay_TSP,ISH_Delayed_TSP)
ISH_EnableDelay_Protecting ⁱ	ISH_Enabler_Delay_SST := (NOT ISH_UserMODE_bNot_IntermitCollab)
ISH_EnableDelay_Warning ⁱ	ISH_Enabler_Delay_TSP := ((NOT ISH_UserMODE_bNot_Cooperation) OR (NOT ISH_UserMODE_bNot_IntermitCollab))
ISH_Combination_Protecting ⁱⁱ	ProtectingAreaSM := (ProtectingArea1 AND ProtectingArea2)
ISH_Combination_Warning ⁱⁱ	WarningAreaSM := (WarningArea1 AND WarningArea2)

ⁱ Required no matter one or two PROFIsafe-based laser scanners are connected.

ⁱⁱ Required only when two PROFIsafe-based laser scanners are connected.

- 5 Click **Signals** view in the **Safe IO Configuration** page and then click **Global signals** to expand the signal list.
- 6 Click on the **Create new signal** row and create the following signals.
 - ISH_TFO_Active
 - ISH_TSP_Active
 - ISH_TSP_Viol
 - ISH_SST_Active
 - ISH_SST_Viol
- 7 Change the default value of following signals.

Signal	Default value
ISH_AtUser_Period_ms_Until_SST	650
ISH_AtUser_Period_ms_Until_TSP	550
ISH_SMctrl_Frequency	4
ISH_UserMODE_bNot_Cooperation	1

Creating encapsulation

- 1 In the **Visual SafeMove** browser on the left pane of the window, select the robot (ROB_1) and click **Capsule** in the **Visual SafeMove** ribbon tab.
- 2 Set capsule properties for the robot.

Parameter	Value
Radius (mm)	150
Length (mm)	650

Continues on next page

3 Installation and commissioning

3.7.4.2 Configuration of SafeMove using Visual SafeMove in RobotStudio

Continued

Parameter		Value
Start (Flange coordinates) (mm)	X value	0
	Y value	0
	Z value	0
End (Flange coordinates) (mm)	X value	650
	Y value	0
	Z value	0

- 3 In the **Visual SafeMove** browser, select the tool and click **Capsule** in the **Visual SafeMove** ribbon tab.
- 4 Set capsule properties for the tool.

Parameter		Value
Radius (mm)		150
Length (mm)		300
Start (Flange coordinates) (mm)	X value	0
	Y value	0
	Z value	0
End (Flange coordinates) (mm)	X value	0
	Y value	300
	Z value	300

Configuring Cyclic Brake Check

- 1 In the **Visual SafeMove** ribbon tab, click **Cyclic Brake Check**.
- 2 Select the **Warning only, no stop** check box, enable CBC for all the joints, and set other cyclic brake check properties.

Parameter	Value
Max CRC test interval (h)	48
Pre warning time (h)	6
Standstill tolerance	2
Supervision threshold	0.02

Configuring the supervision functions

- 1 In the **Visual SafeMove** ribbon tab, choose **Create Safe Zone** from the **Safe Zone** list.
- 2 Set zone properties.

Parameter		Value
Tool Speed Supervision Priority		BASE
Reference		Task frame
Bottom, Top (mm)	Bottom value	0.000
	Top value	2100.000

Continues on next page

Parameter		Value
Vertices X, Y (mm)	X and Y values for vertices 1	-1400, -1400
	X and Y values for vertices 2	1400, -1400
	X and Y values for vertices 3	1400, 1400
	X and Y values for vertices 4	-1400, 1400

- 3 Click **Tool Position Supervision** in the **Modify** ribbon tab and set the properties.

Parameter		Value
Activation		PermanentlyActive
Function active status		No signal
Violation action	Stop category	Category1Stop
	Signal	No signal
Settings		Checked the Include upper arm geometry and Allow inside check boxes.

- 4 In the **Visual SafeMove** browser, right-click **Tool Speed Supervisions** and choose **Create Global Tool Speed Supervision**.

Parameter		Value
Activation		ISH_Supervise_TSP
Function active status		ISH_TSP_Active
Violation action	Stop category	Category1Stop
	Signal	ISH_TSP_Viol
Settings	Max speed (mm/s)	250.000
	Min speed (mm/s)	Leave blank

- 5 In the **Visual SafeMove** browser, right-click **Stand Still Supervisions** and choose **Create Global Stand Still Supervision**.

Parameter		Value
Activation		ISH_Supervise_SST
Function active status		ISH_SST_Active
Violation action	Stop category	Category0Stop
	Signal	ISH_SST_Viol
Tolerances		Enabled for all joints and remain default tolerance values.

Uploading the settings to the controller

- 1 In the **Visual SafeMove** ribbon tab, click **Controller** in the **Configuration** group.
- 2 Click **Write to controller**.

The configurations are uploaded to the controller after the controller restarts.

3 Installation and commissioning

3.7.5.1 Configuration of one PROFINET-based laser scanner (RobotWare 7.6 or later and PLC acting as Master)

3.7.5 Speed control

3.7.5.1 Configuration of one PROFINET-based laser scanner (RobotWare 7.6 or later and PLC acting as Master)

Preparing the robot system

Required options for system setup

When setting up the system using the **Modify Installation** function in RobotStudio, select the options [3020-2] PROFINET Device, [3023-2] PROFINET Device, [3043-3] SafeMove Collaborative and [3051-1] Profisafe Package, and the correct robot variant. The option *Drive System IRB Small Robot* is selected automatically after the robot type is determined.

Supported parameters for connections to scanner and PLC

Both the laser scanner and the PLC uses a PC-based software tool to configure the connection parameters that are used to connect to the OmniCore system. The supported parameters of the OmniCore system are predefined in the configuration file which could be loaded after the Collaborative Speed Control add-in is installed, see [Information about Collaborative Speed Control add-in on page 113](#). The I/O configuration can be seen using I/O Engineering Tool in RobotStudio.

The following list shows the configuration parameters. They need to be correctly configured in the software tools to enable communication between the scanner, PLC, and OmniCore system.

- After the robot system is set up, the default IP address of the WAN port is automatically configured as 192.168.10.10/24. Make sure the scanner and PLC are also configured in the 192.168.10.XXX segment.
- In RobotStudio, open the configuration editor: Controller > Configuration > I/O Engineering Tool, and get the:
 - PROFINET parameter values

Device slot	Parameter	Value
SDI	Source address	4
SDI	Destination address	5

- device mapping information

Signal name	Device mapping (default)	Category	Device	Device slot
ProtectingArea	0	ProfiSafe	OmniCore_Internal	SDI
WarningArea	1	ProfiSafe	OmniCore_Internal	SDI
SafetyCommunicationEnable	2	ProfiSafe	OmniCore_Internal	SDI

- The PROFINET device name of the controller must be set to *omnicoreprofisafe*.

Continues on next page

3.7.5.1 Configuration of one PROFI-safe-based laser scanner (RobotWare 7.6 or later and PLC acting as Master)

Continued

GSD file

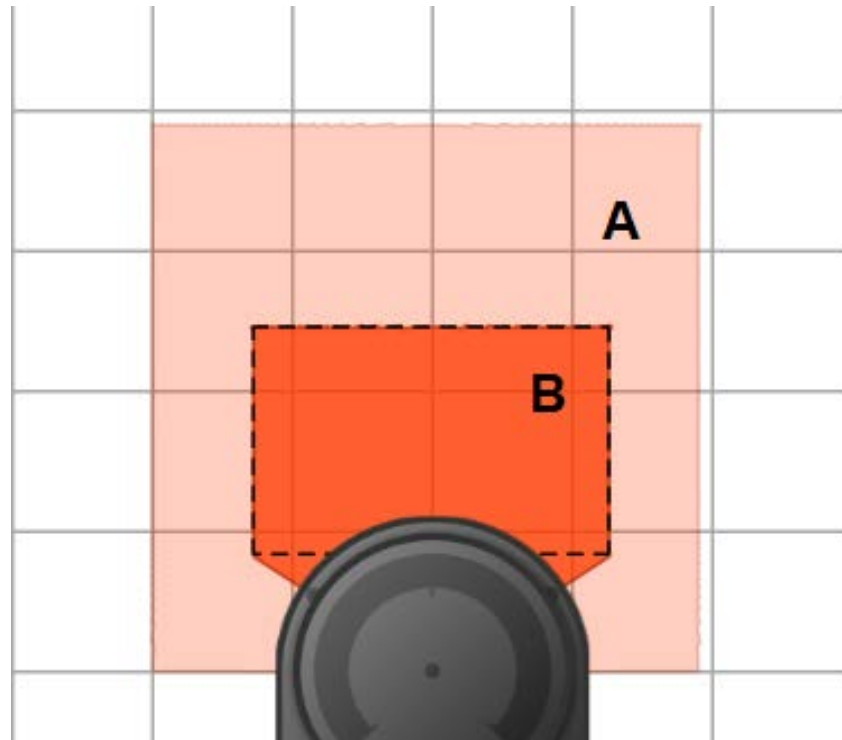
The GSD file, *GSDML-V2.xx-ABB-Robotics-OmniCore-YYYYMMDD.xml*, can be obtained from the RobotStudio or the OmniCore controller.

- **In the RobotWare installation folder in RobotStudio:**
`...\\DistributionPackages\\ABB.RobotWare-x.x.x-xxx\\RobotPackages\\RobotControl_x.x.xxx\\utility\\service\\GSDML\\`
- **On the OmniCore Controller:**
`...\\products\\RobotControl_x.x.x\\utility\\service\\GSDML\\`

Configuring the laser scanner

Protection fields

Two protection fields are defined to provide a progressive safety protection. The following figure illustrates the field ranges.



xx220000301

	Field	Device mapping (default)	Lamp color	Description
A	WarningArea	1	Yellow	The warning area field defines the largest range, but it shall be within the scanning range of the scanner. Within in this field range, the lamp unit on the process hub lights up yellow, and the robot movement speed reduces to a lower speed that is set by the user.
B	ProtectingArea	0	Red	Within this field range, the lamp unit turns to red and the robot movement speed is reduced to 0. The robot stands still.

Continues on next page

3 Installation and commissioning

3.7.5.1 Configuration of one PROFIsafe-based laser scanner (RobotWare 7.6 or later and PLC acting as Master)

Continued

Configuration procedure

Before starting the configuration, obtain the *microScan 3 Core - PROFINET GSDML* file and the software tool *Safety Designer®* from SICK's website first. Make sure both the file and the software tool are in the latest versions.

Detailed procedures about how to configure the laser scanner are detailed in *SICK microScan3 Siemens PLC integration instruction manual - TIA Portal* and *SICK microScan3 Siemens PLC integration instruction manual - SIMATIC Step 7*.

Following described roughly:

- 1 Connect the laser scanner to the PLC and controller.
See the physical connection in [Connecting the laser scanner\(s\) on page 91](#).
- 2 Open configuration software tool *Safety Designer®*.
- 3 Set IP address and PROFINET name in **Configuration > Addressing**.
 - The scanner IP address must be in the same network segment with the PLC and controller, that is, 192.168.10.XXX.
 - The PROFINET name must be the same in the PLC configuration.
- 4 Set **F-destination address** to 12 in PROFINET area in **Configuration > Protocol Settings**.
- 5 Define the two protection fields in **Configuration > Fields**.
- 6 Define the source for input signals of the scanner and configure basic settings for the inputs and outputs in **Configuration > Inputs and outputs**.
The **Use one input source** checkbox must be selected and choose **Rx: Process image (6 Bytes)** from the drop-down list.
- 7 Create monitoring cases and assign the fields that are to be monitored to each monitoring cases in **Configuration > Monitoring cases**.

Configuring the PLC

The safety PLC connecting to the laser scanner and controller must support PROFIsafe and can act as a master. Before configuration, make sure the PLC is loaded with the GSD files of the controller and laser scanner.

Detailed procedures about how to add an external device to the PLC and how to configure detailed settings, see the user manual from the vendor. Following lists the necessary settings during PLC configuration:

- Add the scanner to the PLC by adding a **mS3 6Byte In/Out PROFIsafe V2.6.1** module.
The parameters **f_dest_address** and **f_source_address** are set to 12 and 1, respectively.
- Add the controller to the PLC by adding the **DI 8 bytes, DO 8 bytes, SDI 8 bytes** and **SDO 8 bytes** modules.
The parameters **f_dest_address** and **f_source_address** for the SDI are set to 3 and 2, respectively, and for the SDO are set to 5 and 4, respectively.
- Make sure the address for the SDO signal is the first address of **SDO 8 bytes** slot.

Continues on next page

3.7.5.1 Configuration of one PROFIsafe-based laser scanner (RobotWare 7.6 or later and PLC acting as Master)

Continued

- Create variables.

Name	Type	Example address ⁱ
ProtectingTrigger	Bool	%I3.0
WarningTrigger	Bool	%I4.1
ProtectingArea	Bool	%Q68.0
WarningArea	Bool	%Q68.1
SafetyCommunicationEnable	Bool	%Q68.2
ActivateScanner	Bool	%Q3.0

ⁱ %I3.X and %I4.X are the addresses of the laser scanner; %Q68.X is the address of the OmniCore controller.
%Q3.0 is for activating the monitoring cases of the laser scanner.

- Check the communication between the PLC and controller is well and activate the laser scanner; set up the communication between the laser scanner, PLC and OmniCore controller.

Configuring SafeMove

To enable SafeMove, perform the following procedure:

- 1 Log in the FlexPendant.
Make sure the user logged in have access grants to lock safety controller configurations, safety services and software synchronization.
- 2 Tap **SafeMove** on the home page.
- 3 Tap **Load** in the pop-up message box to confirm loading of template SafeMove configuration files.
The controller restarts.
- 4 After the controller is restarted, tap **Settings** on the home page.
- 5 Tap **Safety Controller**.
- 6 Tap **Synchronization** in the left pane.
- 7 Jog the robot to match the **Actual Positions** values with the **Sync Positions** values.
Make sure the values are the same.
- 8 Tap **Synchronize**.

3 Installation and commissioning

3.7.5.2 Configuration of two PROFINET-based laser scanners (RobotWare 7.6 or later and PLC acting as Master)

3.7.5.2 Configuration of two PROFINET-based laser scanners (RobotWare 7.6 or later and PLC acting as Master)

Preparing the robot system

Required options for system setup

When setting up the system using the **Modify Installation** function in RobotStudio, select the options [3020-2] PROFINET Device, [3023-2] PROFINET Device, [3043-3] SafeMove Collaborative and [3051-3] Dual Profisafe Package, and the correct robot variant. The option *Drive System IRB Small Robot* is selected automatically after the robot type is determined.

Supported parameters for connections to scanners and PLC

Both laser scanners and the PLC uses a PC-based software tool to configure the connection parameters that are used to connect to the OmniCore system. The supported parameters of the OmniCore system are predefined in the configuration file which could be loaded after the Collaborative Speed Control add-in is installed, see [Information about Collaborative Speed Control add-in on page 113](#). The I/O configuration can be seen using I/O Engineering Tool in RobotStudio.

The following list shows the configuration parameters. They need to be correctly configured in the software tools to enable communication between the scanners, PLC, and OmniCore system.

- After the robot system is set up, the default IP address of the WAN port is automatically configured as 192.168.10.10/24. Make sure the scanners and PLC are also configured in the 192.168.10.XXX segment.
- In RobotStudio, open the configuration editor: Controller > Configuration > I/O Engineering Tool, and get the:
 - PROFINET parameter values

Device slot	Parameter	Value
SDI	Source address	4
SDI	Destination address	5

- device mapping information

Signal name	Device mapping (default)	Category	Device	Device slot
ProtectingArea	0	ProfiSafe	OmniCore_Internal	SDI
WarningArea	1	ProfiSafe	OmniCore_Internal	SDI
SafetyCommunicationEnable	2	ProfiSafe	OmniCore_Internal	SDI

- The PROFINET device name of the controller must be set to *omnicoreprofisafe*.

Continues on next page

3.7.5.2 Configuration of two PROFIsafe-based laser scanners (RobotWare 7.6 or later and PLC acting as Master)

Continued

GSD file

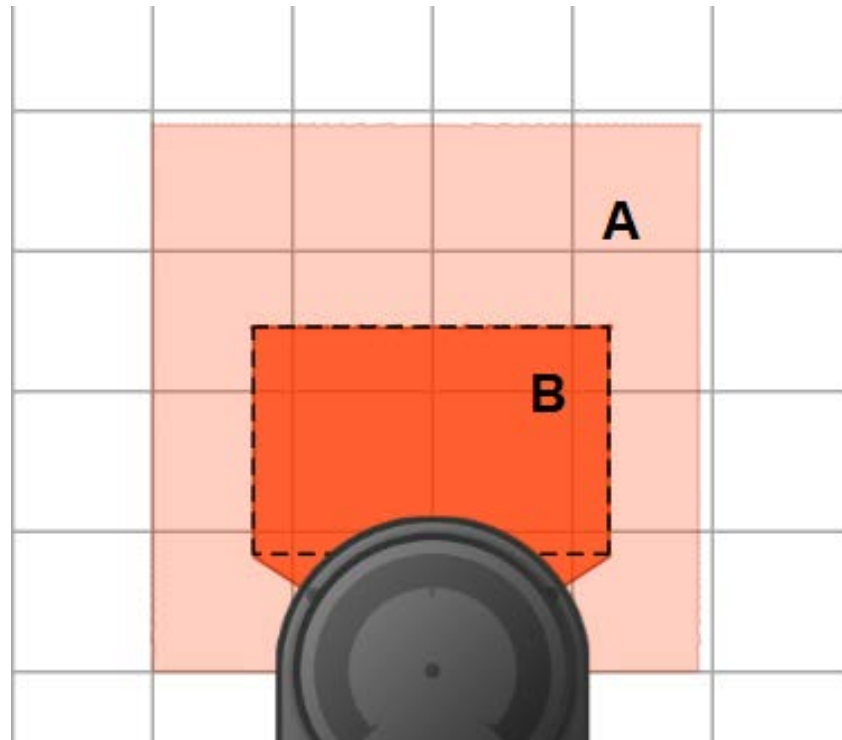
The GSD file, *GSDML-V2.xx-ABB-Robotics-OmniCore-YYYYMMDD.xml*, can be obtained from the RobotStudio or the OmniCore controller.

- **In the RobotWare installation folder in RobotStudio:**
`...\\DistributionPackages\\ABB.RobotWare-x.x.x-xxx\\RobotPackages\\RobotControl_x.x.xxx\\utility\\service\\GSDML\\`
- **On the OmniCore Controller:**
`...\\products\\RobotControl_x.x.x\\utility\\service\\GSDML\\`

Configuring the laser scanner

Protection fields

Two protection fields are defined to provide a progressive safety protection. The following figure illustrates the field ranges.



xx220000301

	Field	Device mapping (default)	Lamp color	Description
A	WarningArea	1	Yellow	The warning area field defines the largest range, but it shall be within the scanning range of the scanner. Within in this field range, the lamp unit on the process hub lights up yellow, and the robot movement speed reduces to a lower speed that is set by the user.
B	ProtectingArea	0	Red	Within this field range, the lamp unit turns to red and the robot movement speed is reduced to 0. The robot stands still.

Continues on next page

3 Installation and commissioning

3.7.5.2 Configuration of two PROFIsafe-based laser scanners (RobotWare 7.6 or later and PLC acting as Master)

Continued

Configuration procedure

Before starting the configuration, obtain the *microScan 3 Core - PROFINET GSDML* file and the software tool *Safety Designer®* from SICK's website first. Make sure both the file and the software tool are in the latest versions.

Detailed procedures about how to configure the laser scanners are detailed in *SICK microScan3 Siemens PLC integration instruction manual - TIA Portal* and *SICK microScan3 Siemens PLC integration instruction manual - SIMATIC Step 7*. Following described roughly:

- 1 Connect the laser scanners to the PLC and controller.
See the physical connection in [Connecting the laser scanner\(s\) on page 91](#).
- 2 Open configuration software tool *Safety Designer®*.
- 3 Set IP address, F-destination and PROFINET name in **Configuration > Addressing**.
 - The scanner IP address must be in the same network segment with the PLC and controller, that is, 192.168.10.XXX.
 - The PROFINET name must be the same in the PLC configuration.
 - The two scanners must be set to different IP address, F-destination and PROFINET name.
- 4 Set **F-destination address** to 12 for the first scanner and to 13 for the second scanner, in **PROFINET** area in **Configuration > Protocol Settings**.
- 5 Define the two protection fields for each scanners in **Configuration > Fields**.
- 6 Define the source for input signals of each scanner and configure basic settings for the inputs and outputs in **Configuration > Inputs and outputs**.
The **Use one input source** checkbox must be selected and choose **Rx: Process image (6 Bytes)** from the drop-down list.
- 7 Create monitoring cases and assign the fields that are to be monitored to each monitoring cases in **Configuration > Monitoring cases**.

Configuring the PLC

The safety PLC connecting to the laser scanners and controller must support PROFIsafe and can act as a master. Before configuration, make sure the PLC is loaded with the GSD files of the controller and laser scanners.

Detailed procedures about how to add an external device to the PLC and how to configure detailed settings, see the user manual from the vendor. Following lists the necessary settings during PLC configuration:

- Add two scanners to the PLC by adding two **mS3 6Byte In/Out PROFIsafe V2.6.1** modules.
 - The parameters **f_dest_address** and **f_source_address** are set to 12 and 1, for the first scanner, respectively.
 - The parameters **f_dest_address** and **f_source_address** are set to 13 and 1, for the second scanner, respectively.
- Add the controller to the PLC by adding the **DI 8 bytes, DO 8 bytes, SDI 8 bytes** and **SDO 8 bytes** modules.

Continues on next page

3.7.5.2 Configuration of two PROFIsafe-based laser scanners (RobotWare 7.6 or later and PLC acting as Master)

Continued

The parameters `f_dest_address` and `f_source_address` for the SDI are set to 3 and 2, respectively, and for the SDO are set to 5 and 4, respectively.

- Make sure the address for the SDO signal is the first address of **SDO 8 bytes** slot.
- Create variables.

Name	Type	Example address ⁱ
ProtectingTrigger	Bool	%I3.0
WarningTrigger	Bool	%I4.1
ProtectingTrigger1	Bool	%I14.0
WarningTrigger1	Bool	%I15.1
ProtectingArea ⁱⁱ	Bool	%Q68.0
WarningArea ⁱⁱⁱ	Bool	%Q68.1
SafetyCommunicationEnable	Bool	%Q68.2
ActivateScanner	Bool	%Q3.0
ActivateScanner1	Bool	%Q14.0

ⁱ %I3.X, %I4.X, %I14.X and %I15.X are the addresses of laser scanners; %Q68.X is the address of the OmniCore controller.

%Q3.0 and %Q14.0 are for activating the monitoring cases of the laser scanners.

ⁱⁱ Value of ProtectingArea depends on logic AND value of ProtectingTrigger and ProtectingTrigger1.

ⁱⁱⁱ Value of WarningArea depends on logic AND value of WarningTrigger and WarningTrigger1.

- Check the communication between the PLC and controller is well and activate the laser scanner; set up the communication between the laser scanner, PLC and OmniCore controller.

Configuring SafeMove

To enable SafeMove, perform the following procedure:

- 1 Log in the FlexPendant.
Make sure the user logged in have access grants to lock safety controller configurations, safety services and software synchronization.
- 2 Tap **SafeMove** on the home page.
- 3 Tap **Load** in the pop-up message box to confirm loading of template SafeMove configuration files.
The controller restarts.
- 4 After the controller is restarted, tap **Settings** on the home page.
- 5 Tap **Safety Controller**.
- 6 Tap **Synchronization** in the left pane.
- 7 Jog the robot to match the **Actual Positions** values with the **Sync Positions** values.
Make sure the values are the same.
- 8 Tap **Synchronize**.

3 Installation and commissioning

3.7.5.3 Configuration of one PROFINET-based laser scanner (RobotWare 7.10 or later and OmniCore acting as Master)

3.7.5.3 Configuration of one PROFINET-based laser scanner (RobotWare 7.10 or later and OmniCore acting as Master)

Preparing the robot system

Required options for system setup

When setting up the system using the **Modify Installation** function in RobotStudio, select the options [3020-1] PROFINET Controller, [3023-1] PROFINET Controller, [3043-3] SafeMove Collaborative and [3051-1] Profisafe Package, and the correct robot variant. The option *Drive System IRB Small Robot* is selected automatically after the robot type is determined.

Configuring supported parameters of the robot system

The laser scanner needs to use a PC-based software tool to configure the connection parameters that are used to connect to the OmniCore system. The supported parameters of the OmniCore system are configured using I/O Engineering Tool in RobotStudio. Use the following procedure to perform the configuration:

- 1 Start RobotStudio and connect the controller.
 - The user account logging in the controller must be granted with the Safety Services permission.
 - The write access to the controller is requested.

- 2 In the **Controller** tab, click **I/O Engineering**.

The **I/O Engineering** window is displayed.

- 3 In the **Configuration** tab page on the left pane of the window, right-click **PROFINET** under **I/O system** and select **Scan Network**.

The connected laser scanner is displayed.

- 4 Right-click on the laser scanner and choose **Add as**.

The laser scanner is added under **Controller** in the **Configuration** tab page.



Note

Two device names are displayed in the list by default. You shall right-click on the device name *mS3 12Byte In/Out PROFINET V2.6.1* and choose **Delete** to delete it. The name may vary according to the actual laser scanner connected.

- 5 Click the laser scanner with the asterisk(*) mark, and then in the **Device Catalog** tab page on the right pane of the window, double-click **mS3 6Byte In/Out PROFINET V2.6.1**.
- 6 In the displayed **Signal Editor** tab page, add signals with following settings.

Name	Type of Signal	Device Mapping ⁱ	Default value
ActiveDevice1	Digital Output	8	1
ProtectingArea1	Digital Input	17	0
WarningArea1	Digital Input	8	0

ⁱ The mappings are only for examples. Refer to the cut-off setting defined in the *Safety Designer* software and enter the actual value.

Continues on next page

3.7.5.3 Configuration of one PROFIsafe-based laser scanner (RobotWare 7.10 or later and OmniCore acting as Master)

Continued

A new device name *mS3 6Byte In/Out PROFIsafe V2.6.1* is displayed under the scanner in the **Configuration** tab page.

- 7 Click the new device name and check the settings in the **Properties** tab page on the right pane of the window.

Make sure the Destination value is the same as the F-Destination address value for the scanner in the *Safety Designer* software.

- 8 In the **I/O Engineering** tab, click **Cross Connections** in the **Configuration** group, and check the created signals.

Make sure the created signals are in the same name as the displayed signals.

- 9 In the **I/O Engineering** tab, click **Write Config** to write the configurations to the controller.

- 10 Restart the controller.

- 11 After the controller is restarted, check the laser scanner name in the RAPID program *InternalSpeedHandling_User* in task *T_ROB1*, and make sure it is consistent with the name that the user defines for the laser scanner.

If the names are inconsistent, use the following steps to modify:

- a In the **Controller** pane, double-click the RAPID program *InternalSpeedHandling_User* in task *T_ROB1*.

The RAPID program is displayed in the right pane.

- b Find the parameter *Scanner1* and modify its value to the user-defined laser scanner name.

Continues on next page

3 Installation and commissioning

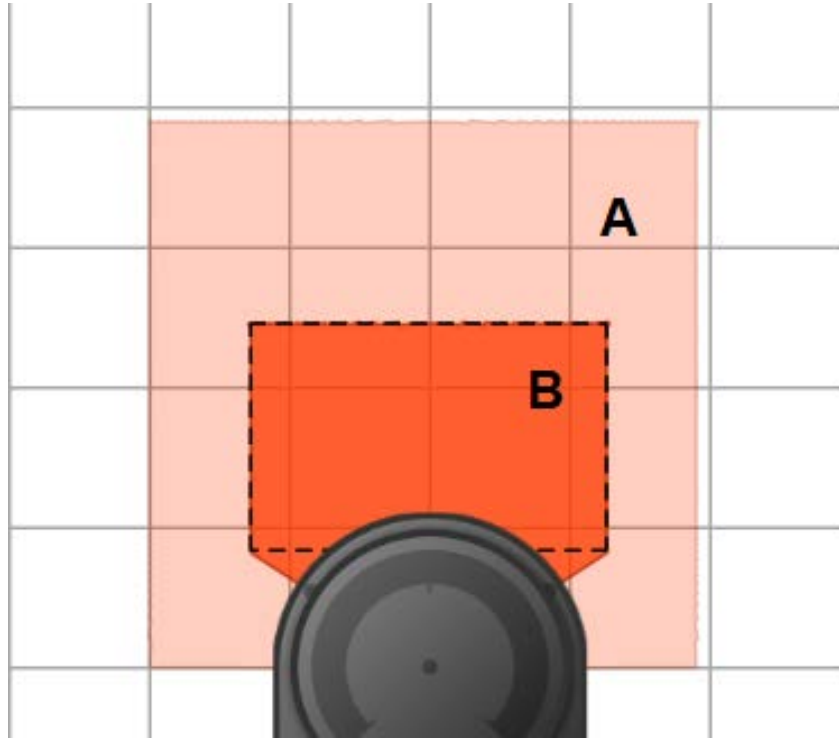
3.7.5.3 Configuration of one PROFI-safe-based laser scanner (RobotWare 7.10 or later and OmniCore acting as Master)

Continued

Configuring the laser scanner

Protection fields

Two protection fields are defined to provide a progressive safety protection. The following figure illustrates the field ranges.



xx220000301

	Field	Device mapping (default)	Lamp color	Description
A	WarningArea	1	Yellow	The warning area field defines the largest range, but it shall be within the scanning range of the scanner. Within in this field range, the lamp unit on the process hub lights up yellow, and the robot movement speed reduces to a lower speed that is set by the user.
B	ProtectingArea	0	Red	Within this field range, the lamp unit turns to red and the robot movement speed is reduced to 0. The robot stands still.

Configuration procedure

Before starting the configuration, obtain the *microScan 3 Core - PROFINET GSDML* file and the software tool *Safety Designer®* from SICK's website first. Make sure both the file and the software tool are in the latest versions.

Detailed procedures about how to configure the laser scanner are detailed in *Operating instructions microScan3 - PROFINET*. Following described roughly:

- 1 Connect the laser scanner to the PC using a network cable.

See the physical connection in [Connecting the laser scanner\(s\) on page 91](#).

Continues on next page

3.7.5.3 Configuration of one PROFIsafe-based laser scanner (RobotWare 7.10 or later and OmniCore acting as Master)

Continued

- 2 Open configuration software tool *Safety Designer®*.
- 3 Set IP address and PROFINET name in **Configuration > Addressing**.
The scanner IP address must be in the same network segment with the controller, that is, 192.168.10.XXX.
- 4 Set **F-destination address** to 12 in PROFINET area in **Configuration > Protocol Settings**.
- 5 Define the two protection fields in **Configuration > Fields**.
- 6 Define the source for input signals of the scanner and configure basic settings for the inputs and outputs in **Configuration > Inputs and outputs**.
The **Use one input source** checkbox must be selected and choose **Rx: Process image (6 Bytes)** from the drop-down list.
- 7 Create monitoring cases and assign the fields that are to be monitored to each monitoring cases in **Configuration > Monitoring cases**.

Configuring SafeMove

To enable SafeMove, perform the following procedure:

- 1 Start RobotStudio and connect the controller.
 - The user account logging in the controller must be granted with the Safety Services permission.
 - The write access to the controller is requested.
- 2 In the **Controller** tab, click **Safety**, then select **Visual SafeMove**.
- 3 In the **Visual SafeMove** window, configure SafeMove function as instructed in [Configuration of SafeMove using Visual SafeMove in RobotStudio on page 131](#).

3 Installation and commissioning

3.7.5.4 Configuration of two PROFINET-based laser scanners (RobotWare 7.10 or later and OmniCore acting as Master)

3.7.5.4 Configuration of two PROFINET-based laser scanners (RobotWare 7.10 or later and OmniCore acting as Master)

Preparing the robot system

Required options for system setup

When setting up the system using the **Modify Installation** function in RobotStudio, select the options [3020-1] *PROFINET Controller*, [3023-1] *PROFINET Controller*, [3043-3] *SafeMove Collaborative* and [3051-3] *Dual Profisafe Package*, and the correct robot variant. The option *Drive System IRB Small Robot* is selected automatically after the robot type is determined.

Configuring supported parameters of the robot system

The laser scanners need to use a PC-based software tool to configure the connection parameters that are used to connect to the OmniCore system. The supported parameters of the OmniCore system are configured using I/O Engineering Tool in RobotStudio. Use the following procedure to perform the configuration:

- 1 Start RobotStudio and connect the controller.
 - The user account logging in the controller must be granted with the Safety Services permission.
 - The write access to the controller is requested.

- 2 In the **Controller** tab, click **I/O Engineering**.

The **I/O Engineering** window is displayed.

- 3 In the **Configuration** tab page on the left pane of the window, right-click **PROFINET** under **I/O system** and select **Scan Network**.

The connected laser scanners are displayed.

- 4 Right-click one of the laser scanners and choose **Add as**.

The laser scanner is added under **Controller** in the **Configuration** tab page.



Note

Two device names are displayed in the list by default. You shall right-click on the device name *mS3 12Byte In/Out PROFINET V2.6.1* and choose **Delete** to delete it. The name may vary according to the actual laser scanner connected.

- 5 Click the laser scanner with the asterisk(*) mark, and then in the **Device Catalog** tab page on the right pane of the window, double-click **mS3 6Byte In/Out PROFINET V2.6.1**.

- 6 In the displayed **Signal Editor** tab page, add signals with following settings.

Name	Type of Signal	Device Mapping ⁱ	Default value
ActiveDevice1	Digital Output	8	1
ProtectingArea1	Digital Input	17	0
WarningArea1	Digital Input	8	0

ⁱ The mappings are only for examples. Refer to the cut-off setting defined in the *Safety Designer* software and enter the actual value.

Continues on next page

3.7.5.4 Configuration of two PROFIsafe-based laser scanners (RobotWare 7.10 or later and OmniCore acting as Master)

Continued

A new device name *mS3 6Byte In/Out PROFIsafe V2.6.1* is displayed under the scanner in the **Configuration** tab page.

- 7 Click the new device name and check the settings in the **Properties** tab page on the right pane of the window.

Make sure the Destination value is the same as the F-Destination address value for the scanner in the *Safety Designer* software.

- 8 In the **I/O Engineering** tab, click **Cross Connections** in the **Configuration** group, and check the created signals.

Make sure the created signals are in the same name as the displayed signals.

- 9 Repeat steps 4 to 8 to add the other laser scanner, for which the signal settings shall be as follows.

Name	Type of Signal	Device Mapping ⁱ	Default value
ActiveDevice2	Digital Output	8	1
ProtectingArea2	Digital Input	17	0
WarningArea2	Digital Input	8	0

ⁱ The mappings are only for examples. Refer to the cut-off setting defined in the *Safety Designer* software and enter the actual value.

- 10 In the **I/O Engineering** tab, click **Write Config** to write the configurations to the controller.

- 11 Restart the controller.

- 12 After the controller is restarted, check the laser scanner name in RAPID program *InternalSpeedHandling_User* in task *T_ROB1*, and make sure it is consistent with the name that the user defines for the laser scanner.

If the names are inconsistent, use the following steps to modify:

- a In the **Controller** pane, double-click the RAPID program *InternalSpeedHandling_User* in task *T_ROB1*.

The RAPID program is displayed in the right pane.

- b Find the parameters *Scanner1* and *Scanner2*, and modify their values to the user-defined laser scanner names.

Continues on next page

3 Installation and commissioning

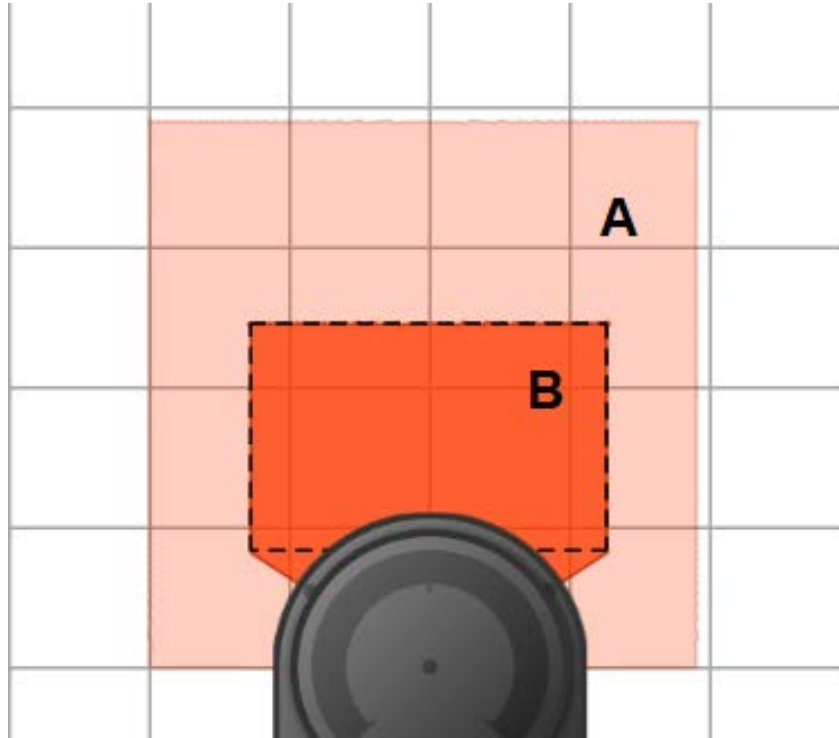
3.7.5.4 Configuration of two PROFI-safe-based laser scanners (RobotWare 7.10 or later and OmniCore acting as Master)

Continued

Configuring the laser scanner

Protection fields

Two protection fields are defined to provide a progressive safety protection. The following figure illustrates the field ranges.



xx220000301

	Field	Device mapping (default)	Lamp color	Description
A	WarningArea	1	Yellow	The warning area field defines the largest range, but it shall be within the scanning range of the scanner. Within in this field range, the lamp unit on the process hub lights up yellow, and the robot movement speed reduces to a lower speed that is set by the user.
B	ProtectingArea	0	Red	Within this field range, the lamp unit turns to red and the robot movement speed is reduced to 0. The robot stands still.

Configuration procedure

Before starting the configuration, obtain the *microScan 3 Core - PROFINET GSDML* file and the software tool *Safety Designer®* from SICK's website first. Make sure both the file and the software tool are in the latest versions.

Detailed procedures about how to configure the laser scanner are detailed in *Operating instructions microScan3 - PROFINET*. Following described roughly:

- 1 Connect the laser scanner to the controller using a network cable.
See the physical connection in [Connecting the laser scanner\(s\) on page 91](#).

Continues on next page

3.7.5.4 Configuration of two PROFIsafe-based laser scanners (RobotWare 7.10 or later and OmniCore acting as Master)

Continued

- 2 Open configuration software tool *Safety Designer®*.
- 3 Set IP address, F-destination and PROFINET name in **Configuration > Addressing**.
 - The scanner IP address must be in the same network segment with the controller, that is, 192.168.10.XXX.
 - The two scanners must be set to different IP address, F-destination and PROFINET name.
- 4 Set **F-destination address** to **12** for the first scanner and to **13** for the second scanner, in **PROFINET** area in **Configuration > Protocol Settings**.
- 5 Define the two protection fields in **Configuration > Fields**.
- 6 Define the source for input signals of the scanner and configure basic settings for the inputs and outputs in **Configuration > Inputs and outputs**.

The **Use one input source** checkbox must be selected and choose **Rx: Process image (6 Bytes)** from the drop-down list.
- 7 Create monitoring cases and assign the fields that are to be monitored to each monitoring cases in **Configuration > Monitoring cases**.

Configuring SafeMove

To enable SafeMove, perform the following procedure:

- 1 Start RobotStudio and connect the controller.
 - The user account logging in the controller must be granted with the Safety Services permission.
 - The write access to the controller is requested.
- 2 In the **Controller** tab, click **Safety**, then select **Visual SafeMove**.
- 3 In the **Visual SafeMove** window, configure SafeMove function as instructed in [Configuration of SafeMove using Visual SafeMove in RobotStudio on page 131](#).

3 Installation and commissioning

3.7.5.5 Configuration of one SafetyIO-base laser scanner (RobotWare 7.6 or later)

3.7.5.5 Configuration of one SafetyIO-base laser scanner (RobotWare 7.6 or later)

Preparing the robot system

Required options for system setup

When setting up the system using the **Modify Installation** function in RobotStudio, select the options [3043-3] *SafeMove Collaborative* and [3051-2] *IO Package*, and the correct robot variant. The option *Drive System IRB Small Robot* is selected automatically after the robot type is determined.

Supported parameters for connections to scanners and scalable I/O device

The laser scanner uses a PC-based software tool to configure the connection parameters that are used to connect to the OmniCore system. The supported parameters of the OmniCore system are predefined in the configuration file which could be loaded to the system after the Collaborative Speed Control add-in is installed, see [Information about Collaborative Speed Control add-in on page 113](#).

The I/O configuration can be seen using I/O Engineering Tool in RobotStudio.

The following table lists the device mapping information of Scalable_IO signals, which are automatically configured after the add-in installation.

Signal name	Device mapping	Device
ABB_Scalable_IO_0_DI1 ⁱ	0	ABB_Scalable_IO
ABB_Scalable_IO_0_DI2 ⁱ	1	ABB_Scalable_IO
ABB_Scalable_IO_0_DI3 ⁱⁱ	2	ABB_Scalable_IO
ABB_Scalable_IO_0_DI4 ⁱⁱ	3	ABB_Scalable_IO

ⁱ Value of ProtectingArea depends on logic AND value of ABB_Scalable_IO_0_DI1 and ABB_Scalable_IO_0_DI2. For definition of ProtectingArea, see [Configuring the laser scanner on page 153](#).

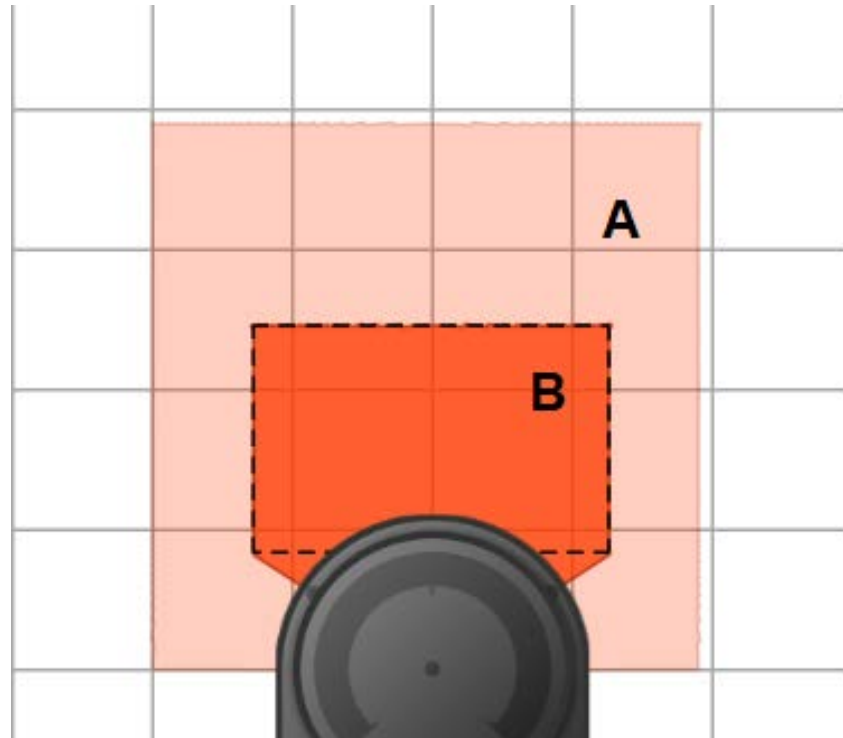
ⁱⁱ Value of WarningArea depends on logic AND value of ABB_Scalable_IO_0_DI3 and ABB_Scalable_IO_0_DI4. For definition of WarningArea, see [Configuring the laser scanner on page 153](#).

Continues on next page

Configuring the laser scanner

Protection fields

Two protection fields are defined to provide a progressive safety protection. The following figure illustrates the field ranges.



xx220000301

	Field	Lamp color	Description
A	WarningArea	Yellow	The warning area field defines the largest range, but it shall be within the scanning range of the scanner. Within in this field range, the lamp unit on the process hub lights up yellow, and the robot movement speed reduces to a lower speed that is set by the user.
B	ProtectingArea	Red	Within this field range, the lamp unit turns to red and the robot movement speed is reduced to 0. The robot stands still.

Configuration procedure

Before starting the configuration, obtain the software tool *Safety Designer®* from SICK's website first. Make sure the software tool is in the latest version.

Detailed procedures about how to configure the laser scanner are detailed in *Operating instructions microScan3 - Pro I/O* from the vendor. Following described the procedure roughly:

- 1 Open configuration software tool *Safety Designer®*.
- 2 Set IP address in **Configuration > Addressing**.

Make sure the scanner IP address is in the same network segment with the PC used for configuring the scanner.

Continues on next page

3 Installation and commissioning

3.7.5.5 Configuration of one SafetyIO-base laser scanner (RobotWare 7.6 or later)

Continued

- 3 Define the two protection fields for the scanner in **Configuration > Fields**.
- 4 Define the source for input signals of the scanner and configure basic settings for the inputs and outputs in **Configuration > Inputs and outputs**.
- 5 Select one OSSD pair from the **Signals** panel to pin1 and pin2, and select another OSSD pair to pin3 and pin4.

The two OSSD pairs will be used for defining the monitoring cases.

- 6 Create monitoring cases and assign the fields that are to be monitored to each monitoring cases in **Configuration > Monitoring cases**.
- 7 Refer to the following table to obtain the pins defined to OSSD pairs. The pins are from a 17-pin cable that will be used to connect the laser scanner and scalable I/O device.

Pin	Wiring color	Name	Function
1	Brown	OSSD1A	OSSD pair 1, OSSD A
2	Blue	OSSD1B	OSSD pair 1, OSSD B
3	White	OSSD2A	OSSD pair 2, OSSD A
4	Green	OSSD2B	OSSD pair 2, OSSD B
17	White with grey	0 V DC	0 DC

- 8 Connect the laser scanner to scalable I/O device with the defined pins.

Pin in cable	Pin position number in X2 connector of the device ⁱ
Pin1 (OSSD1A)	D101+
Pin2 (OSSD1B)	DI02+
Pin3 (OSSD2A)	DI03+
Pin4 (OSSD2B)	DI04+
Pin17	Circuit of D101-, D102-, D103- and D104-

ⁱ For detailed information of pin definitions in connector X2 Digital inputs of the scalable I/O device DSQC1042, see the product specification of the controller and *Application manual - Scalable I/O*.

Configuring the scalable I/O device

Detailed procedures about how to connect and configure the scalable I/O device DSQC1042 are specified in *Application manual - Scalable I/O*. Following provides a rough procedure:

- 1 Make sure that the laser scanner and scalable I/O device is connected as instructed in previous configuration procedure of laser scanner.
- 2 Connect the process power supply to connector X1 of the scalable I/O device via pin locations PWR DO and GND DO.
- 3 Connect the logic power supply to connector X4 of the scalable I/O device via pin locations PWR and GND.
- 4 Connect the Ethernet cable from the robot controller to connector X5.

Continues on next page

3.7.5.5 Configuration of one SafetyIO-base laser scanner (RobotWare 7.6 or later) *Continued*

- 5 Log in the RobotStudio using the admin use account and configure the device to make sure the device communication works.

- a Click the **Controller** tab and, in the **Controller** pane, choose **I/O System > EtherNetIP**.

Information of three devices can be observed:

- CabinetIO is used for the I/O device DSQC1030, and the communication status is normal.

- ABB_Scalable_IO and ABB_Scalable_IO1 are used for the I/O device DSQC1042, and the communication status is abnormal.

- b Check the IP address and serial numbers associated with ABB_Scalable_IO and ABB_Scalable_IO1, which will display as follows.

Device name	IP address	Serial number
ABB_Scalable_IO	192.168.125.130	0
ABB_Scalable_IO1	192.168.125.131	Actual serial number of the device

- c Right-click **ABB_Scalable_IO1** and choose **Configure** from the shortcut menu.
- d In the displayed dialog box, choose the **Configure as replacement device** option and select **ABB_Scalable_IO** from the drop-down list.
- e Remove the texts in the **Create new I/O signals using name prefix** text box and then click **OK**.

Information of two devices can be observed, CabinetIO and ABB_Scalable_IO. Communication status of ABB_Scalable_IO will turn to normal after the SafeMove template file is uploaded using the SafeMove configurator app.



Note

The configuration could also be done using the I/O application in FlexPendant.



Note

If there are additional scalable I/O devices available, install and configure the additional devices by following the detailed procedures in *Application manual - Scalable I/O*.

Configuring SafeMove

To enable SafeMove, perform the following procedure:

- 1 Log in the FlexPendant.

Make sure the user logged in have access grants to lock safety controller configurations, safety services and software synchronization.

- 2 Tap **SafeMove** on the home page.

Continues on next page

3 Installation and commissioning

3.7.5.5 Configuration of one SafetyIO-base laser scanner (RobotWare 7.6 or later)

Continued

- 3 Tap **Load** in the pop-up message box to confirm loading of template SafeMove configuration files.

The controller restarts.

- 4 After the controller is restarted, tap **Settings** on the home page.
- 5 Tap **Safety Controller**.
- 6 Tap **Synchronization** in the left pane.
- 7 Jog the robot to match the **Actual Positions** values with the **Sync Positions** values.

Make sure the values are the same.

- 8 Tap **Synchronize**.

3.7.5.6 Configuration of two SafetyIO-base laser scanners (RobotWare 7.6 or later)

Preparing the robot system

Required options for system setup

When setting up the system using the **Modify Installation** function in RobotStudio, select the options *[3043-3] SafeMove Collaborative* and *[3051-4] Dual IO Package*, and the correct robot variant. The option *Drive System IRB Small Robot* is selected automatically after the robot type is determined.

Supported parameters for connections to scanners and scalable I/O device

The laser scanners use a PC-based software tool to configure the connection parameters that are used to connect to the OmniCore system. The supported parameters of the OmniCore system are predefined in the configuration file which could be loaded to the system after the Collaborative Speed Control add-in is installed, see [Information about Collaborative Speed Control add-in on page 113](#). The I/O configuration can be seen using I/O Engineering Tool in RobotStudio.

The following table lists the device mapping information of Scalable_IO signals, which are automatically configured after the add-in installation.

Signal name	Device mapping	Device
ABB_Scalable_IO_0_DI1 ⁱ	0	ABB_Scalable_IO
ABB_Scalable_IO_0_DI2 ⁱ	1	ABB_Scalable_IO
ABB_Scalable_IO_0_DI3 ⁱⁱ	2	ABB_Scalable_IO
ABB_Scalable_IO_0_DI4 ⁱⁱ	3	ABB_Scalable_IO
ABB_Scalable_IO_0_DI5 ⁱ	4	ABB_Scalable_IO
ABB_Scalable_IO_0_DI6 ⁱ	5	ABB_Scalable_IO
ABB_Scalable_IO_0_DI7 ⁱⁱ	6	ABB_Scalable_IO
ABB_Scalable_IO_0_DI8 ⁱⁱ	7	ABB_Scalable_IO

ⁱ Value of ProtectingArea depends on logic AND value of ABB_Scalable_IO_0_DI1, ABB_Scalable_IO_0_DI2, ABB_Scalable_IO_0_DI5 and ABB_Scalable_IO_0_DI6. For definition of ProtectingArea, see [Configuring the laser scanner on page 158](#).

ⁱⁱ Value of WarningArea depends on logic AND value of ABB_Scalable_IO_0_DI3, ABB_Scalable_IO_0_DI4, ABB_Scalable_IO_0_DI7 and ABB_Scalable_IO_0_DI8. For definition of WarningArea, see [Configuring the laser scanner on page 158](#).

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3 Installation and commissioning

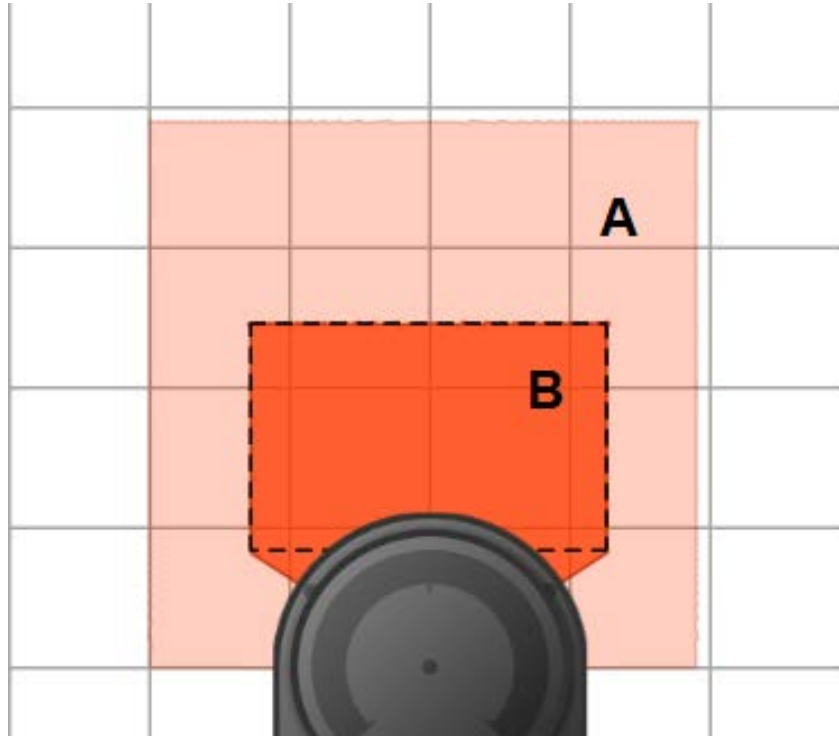
3.7.5.6 Configuration of two SafetyIO-base laser scanners (RobotWare 7.6 or later)

Continued

Configuring the laser scanner

Protection fields

Two protection fields are defined to provide a progressive safety protection. The following figure illustrates the field ranges.



xx220000301

	Field	Lamp color	Description
A	WarningArea	Yellow	The warning area field defines the largest range, but it shall be within the scanning range of the scanner. Within in this field range, the lamp unit on the process hub lights up yellow, and the robot movement speed reduces to a lower speed that is set by the user.
B	ProtectingArea	Red	Within this field range, the lamp unit turns to red and the robot movement speed is reduced to 0. The robot stands still.

Configuration procedure

Before starting the configuration, obtain the software tool *Safety Designer®* from SICK's website first. Make sure the software tool is in the latest version.

Detailed procedures about how to configure the laser scanners are detailed in *Operating instructions microScan3 - Pro I/O* from the vendor. Following described the procedure roughly:

- 1 Open configuration software tool *Safety Designer®*.
- 2 Set IP address in **Configuration > Addressing**.
 - Make sure the scanner IP addresses are in the same network segment with the PC used for configuring the scanner.

Continues on next page

3.7.5.6 Configuration of two SafetyIO-base laser scanners (RobotWare 7.6 or later)

Continued

- The two scanners must be set to different IP addresses.
- 3 Define the two protection fields for each scanner in **Configuration > Fields**.
 - 4 Define the source for input signals of each scanner and configure basic settings for the inputs and outputs in **Configuration > Inputs and outputs**.
 - 5 For both scanners, select one OSSD pair from the **Signals** panel to pin1 and pin2, and select another OSSD pair to pin3 and pin4.
The two OSSD pairs will be used for defining the monitoring cases.
 - 6 Create monitoring cases and assign the fields that are to be monitored to each monitoring cases in **Configuration > Monitoring cases**.
 - 7 Refer to the following table to obtain the pins defined to OSSD pairs. The pins are from a 17-pin cable that will be used to connect a laser scanner and scalable I/O device.

Pin	Wiring color	Name	Function
1	Brown	OSSD1A	OSSD pair 1, OSSD A
2	Blue	OSSD1B	OSSD pair 1, OSSD B
3	White	OSSD2A	OSSD pair 2, OSSD A
4	Green	OSSD2B	OSSD pair 2, OSSD B
17	White with grey	0 V DC	0 DC

- 8 Connect the laser scanners to safety module with the defined pins.

Scanner	Pin in cable	Pin position number in X2 connector of the device ⁱ
Scanner 1	Pin1 (OSSD1A)	D101+
	Pin2 (OSSD1B)	D102+
	Pin3 (OSSD2A)	D103+
	Pin4 (OSSD2B)	D104+
	Pin17	Circuit of D101-, D102-, D103- and D104-
Scanner 2	Pin1 (OSSD1A)	D105+
	Pin2 (OSSD1B)	D106+
	Pin3 (OSSD2A)	D107+
	Pin4 (OSSD2B)	D108+
	Pin17	Circuit of D105-, D106-, D107- and D108-

ⁱ For detailed information of pin definitions in connector X2 Digital inputs of the scalable I/O device DSQC1042, see the product specification of the controller and *Application manual - Scalable I/O*.

Configuring the scalable I/O device

Detailed procedures about how to connect and configure the scalable I/O device DSQC1042 are specified in *Application manual - Scalable I/O*. Following provides a rough procedure:

- 1 Make sure that the laser scanner and scalable I/O device is connected as instructed in previous configuration procedure of laser scanner.

Continues on next page

3 Installation and commissioning

3.7.5.6 Configuration of two SafetyIO-base laser scanners (RobotWare 7.6 or later)

Continued

- 2 Connect the process power supply to connector X1 of the scalable I/O device via pin locations PWR DO and GND DO.
- 3 Connect the logic power supply to connector X4 of the scalable I/O device via pin locations PWR and GND.
- 4 Connect the Ethernet cable from the robot controller to connector X5.
- 5 Log in the RobotStudio using the admin use account and configure the device to make sure the device communication works.

- a Click the **Controller** tab and, in the **Controller** pane, choose **I/O System > EtherNetIP**.

Information of three devices can be observed:

- CabinetIO is used for the I/O device DSQC1030, and the communication status is normal.

- ABB_Scalable_IO and ABB_Scalable_IO1 are used for the I/O device DSQC1042, and the communication status is abnormal.

- b Check the IP address and serial numbers associated with ABB_Scalable_IO and ABB_Scalable_IO1, which will display as follows.

Device name	IP address	Serial number
ABB_Scalable_IO	192.168.125.130	0
ABB_Scalable_IO1	192.168.125.131	Actual serial number of the device

- c Right-click **ABB_Scalable_IO1** and choose **Configure** from the shortcut menu.
- d In the displayed dialog box, choose the **Configure as replacement device** option and select **ABB_Scalable_IO** from the drop-down list.
- e Remove the texts in the **Create new I/O signals using name prefix** text box and then click **OK**.

Information of two devices can be observed, CabinetIO and ABB_Scalable_IO. Communication status of ABB_Scalable_IO will turn to normal after the SafeMove template file is uploaded using the SafeMove configurator app.



Note

The configuration could also be done using the I/O application in FlexPendant.



Note

If there are additional scalable I/O devices available, install and configure the additional devices by following the detailed procedures in *Application manual - Scalable I/O*.

Continues on next page

Configuring SafeMove

To enable SafeMove, perform the following procedure:

- 1 Log in the FlexPendant.

Make sure the user logged in have access grants to lock safety controller configurations, safety services and software synchronization.

- 2 Tap **SafeMove** on the home page.
- 3 Tap **Load** in the pop-up message box to confirm loading of template SafeMove configuration files.

The controller restarts.

- 4 After the controller is restarted, tap **Settings** on the home page.
- 5 Tap **Safety Controller**.
- 6 Tap **Synchronization** in the left pane.
- 7 Jog the robot to match the **Actual Positions** values with the **Sync Positions** values.

Make sure the values are the same.

- 8 Tap **Synchronize**.

3 Installation and commissioning

3.7.5.7 Speed control strategies

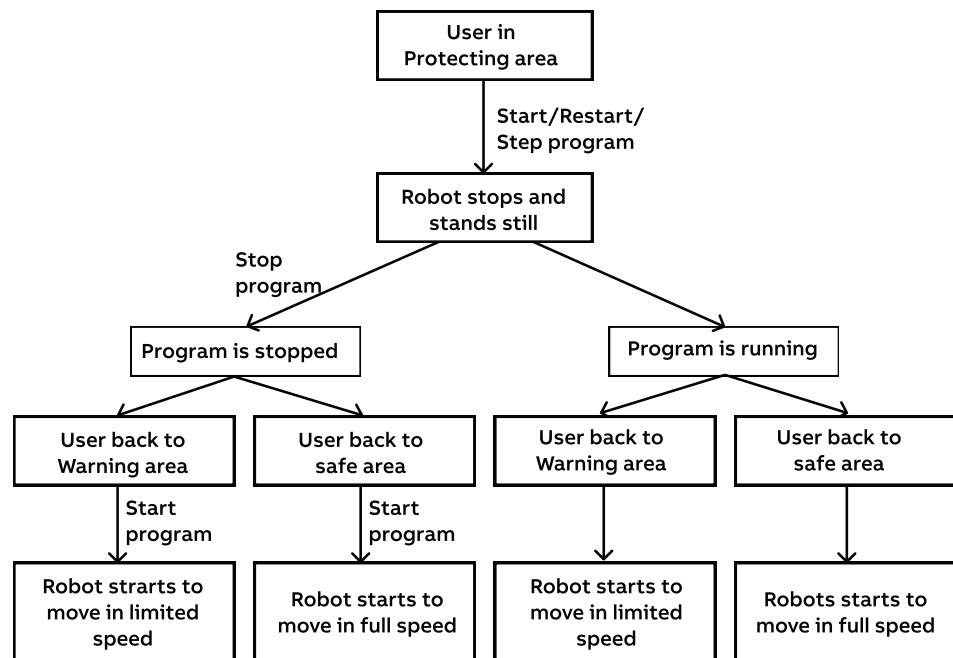
3.7.5.7 Speed control strategies

General

The speed control of CRB 1300 is affected by several factors, such as, the RobotWare version, the speed setting in the FlexPendant, the speed setting in motion instruction and the `SpeedRefresh` value. Users in different protection fields defined for laser scanner to monitor and perform different program execution actions may result in different movement speed. This section describes the speed control strategies for typical scenarios.

Strategies (RobotWare 7.6 or later)

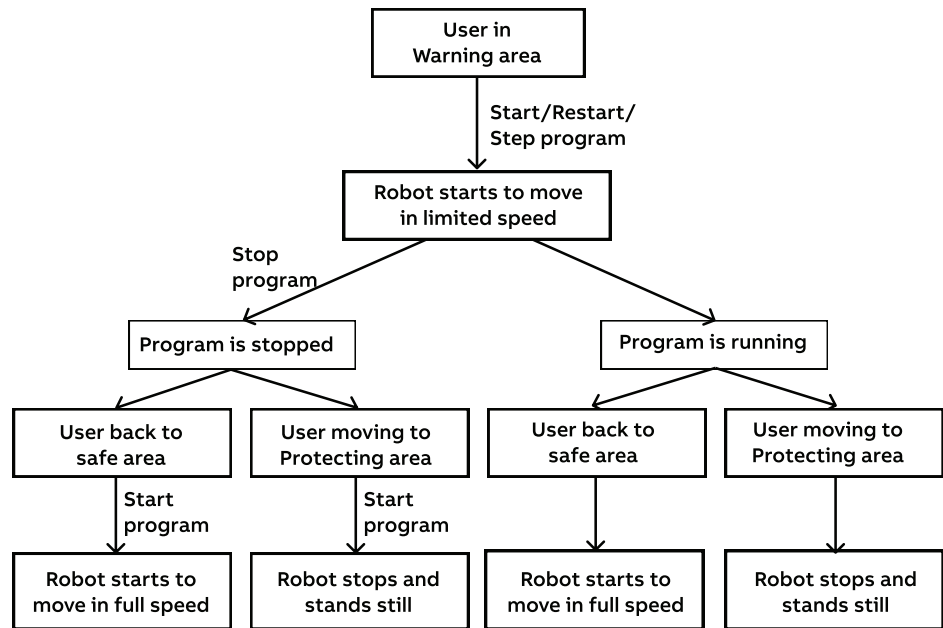
Users in Protecting area



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Users in Warning area



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3 Installation and commissioning

3.7.6 Robot status indication

3.7.6 Robot status indication

Description

The lamp unit on process hub of CRB 1300 indicates robot status in four colors. Operators should always be aware of the indicator color and handle the situation correspondingly.

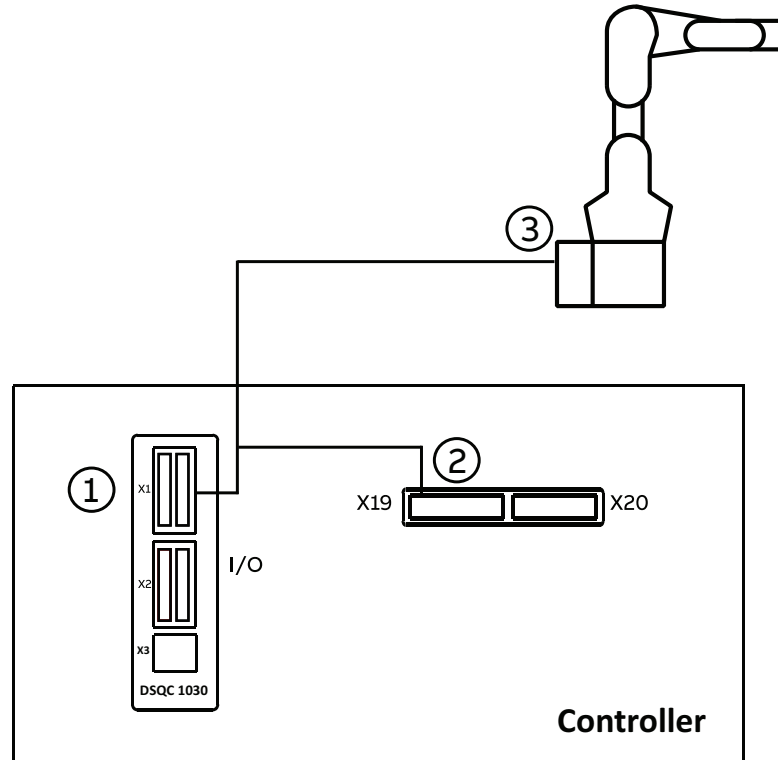
Cabling

The lamp unit cabling is integrated in the CP/CS cable. Do not use other types of CP/CS cables that are not provided by ABB; otherwise, the lamp unit will not work. See [Robot cabling and connection points on page 101](#).

The cable end connecting the manipulator connects to the R1.C1 connector on the robot base; the other end of the cable is divided to two connectors, which connect to the X1 connector of the base I/O device (DSQC 1030) and X19 connector on the controller respectively.

Continues on next page

The following figure illustrates the lamp unit cabling connection between the manipulator base and controller with base I/O module configured. For more details about cabling, see the circuit diagram of the manipulator.



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1	X1 connector on DSQC1030	Pins GND, DO1, DO2 and DO3 are occupied for lamp unit
2	X19 connector on controller	Pins 1 and 2 are occupied for lamp unit
3	R1.C1 connector on robot base	

Functionality

Color	Manual mode	Automatic mode	Manual full speed mode
White	Standby (in motor on/off state and program is stopped, available for users to perform next actions)		
Green	Program is executing		
Yellow	Lead-through function is enabled	Yellow warning area is triggered (manipulator speed will be limited according to the actual configured value)	
Red	Emergency stop or error is raised	Emergency stop, error is raised or red protecting area is triggered. For RobotWare 7.6 or later, the speed shown on the FlexPendant remains but the manipulator will stand still.	

3 Installation and commissioning

3.7.7 Use cases of safety configurations

3.7.7 Use cases of safety configurations

General

Configurations of lamp indicator and speed control are allowed to be modified in RAPID programs, which are loaded to the system after the Collaborative Speed Control add-in is installed.



Note

Safety configurations can only be modified for robots running in RobotWare 7.6 and later versions.

Modified configuration must always be validated to verify that the desired safety is achieved. If no validation is performed, or the validation is inadequate, the configuration cannot be relied on for personal safety.

Modifying lamp indicator colors

RGB of the LED lamp is controlled by values defined in RAPID instruction SWIFTI_SetCustomizedLEDColor in routine SWIFTI_LedMain, which can affect the color that the lamp shows. The routine exists in the system module SWIFTI_Main of task T_SWIFTI_LED.

```
T_SWIFTI_LED/SWIFTI_Main* x
1  MODULE SWIFTI_Main(SYSMODULE)
2     PROC SWIFTI_LedMain()
3         SWIFTI_SetCustomizedLEDColor TRUE,FALSE,FALSE;
4         SWIFTI_DefaultCtrlMain;
5     ENDPROC
6  ENDMODULE
```

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The following table lists the logical value combinations and corresponding lamp colors.

Color	Parameter value 1	Parameter value 2	Parameter value 3
White	TRUE	TRUE	TRUE
Blue	FALSE	FALSE	TRUE
Green	FALSE	TRUE	FALSE
Red	TRUE	FALSE	FALSE
Yellow	TRUE	TRUE	FALSE
Cyan	FALSE	TRUE	TRUE
Purple	TRUE	FALSE	TRUE

Continues on next page

Deactivating the SpeedHandling function



Note

Modified configuration must always be validated to verify that the desired safety is achieved. If no validation is performed, or the validation is inadequate, the configuration cannot be relied on for personal safety.

The SpeedHandling function is activated by default after the Collaborative Speed Control add-in is installed and the SafeMove template is loaded. The function is used to enable or disable speed-related actions for speed control.

It is possible to use the following procedure to deactivate the SpeedHandling function based on risk assessment of the final application:

- 1 In RobotStudio, open the RAPID program InternalSpeedHandling_User in task T_ROB1.
- 2 Navigate to the function ISH_b_FunctionalityIsUsed and set its value from default TRUE to FALSE.

```
T_ROB1/InternalSpeedHandling_User" x
49      ! In addition, the SafeMove Parameters must be set correctly!
50      ! Following Global-SafeMove-Signals need to be configured::
51      !   -> AtUser_MODE_IsNot_Cooperation
52      !   -> AtUser_MODE_IsNot_IntermitCollab
53      !   -> AtUser_Period_ms_Until_SST
54      !   -> AtUser_Period_ms_Until_TSP
55
56      ! DEFAULT is 250 mm/s, change according to the TSP max velocity set in SafeMove Configuration
57      TASK PERS num   ISH_n_Speed_In_WarningArea_mm_s := 250;
58      ! DEFAULT is TRUE, set to FALSE to disable the InternalSpeedHandling completely
59      TASK PERS bool  ISH_b_FunctionalityIsUsed := FALSE;
60      ! DEFAULT is TRUE, set to FALSE if you don't want to get Logs from the InternalSpeedHandling
61      TASK PERS bool  ISH_b_ErrorLogShowIsUsed := TRUE;
62      ! DEFAULT is TRUE, set to FALSE if you don't want to get TPWrite notifications from the InternalSpeedHandling displayed
63      TASK PERS bool  ISH_b_TPinformationIsUsed := TRUE;
64
```

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- 3 Save the change and apply to the controller.

SafeMove configurations also affect the speed control on the robot to achieve further safety. SafeMove is still functional after the SpeedHandling function in RAPID program is deactivated.

Use the following procedure to disable the speed control function provided by SafeMove:

- 1 Open the RobotStudio.
- 2 Log in the controller using the Admin account and request the write access.
- 3 In the **Controller** tab, choose **Visual SafeMove** from the **Safety** group in the **Configuration** category.
- 4 In the **Visual SafeMove** tab, click **Safe IO Configurator** in the **Configuration** group.

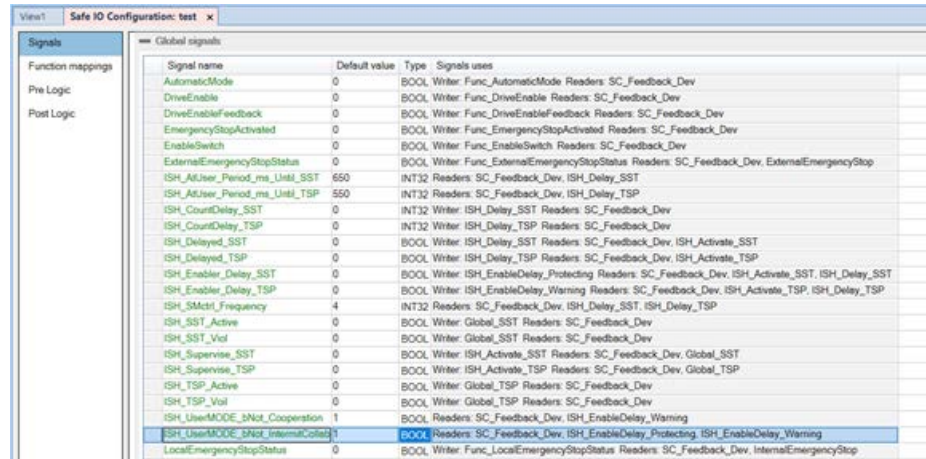
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3 Installation and commissioning

3.7.7 Use cases of safety configurations

Continued

- 5 In the displayed **Safe IO Configuration** window, go to the signal **ISH_UserMODE_bNot_IntemitCollab** in the global signal list and set the value to 1.



Signal name	Default value	Type	Signals uses
AutomaticMode	0	BOOL	Writer: Func_AutomaticMode; Readers: SC_Feedback_Dev
DriveEnable	0	BOOL	Writer: Func_DriveEnable; Readers: SC_Feedback_Dev
DriveEnableFeedback	0	BOOL	Writer: Func_DriveEnableFeedback; Readers: SC_Feedback_Dev
EmergencyStopActivated	0	BOOL	Writer: Func_EmergencyStopActivated; Readers: SC_Feedback_Dev
EnableSwitch	0	BOOL	Writer: Func_EnableSwitch; Readers: SC_Feedback_Dev
ExternalEmergencyStopStatus	0	BOOL	Writer: Func_ExternalEmergencyStopStatus; Readers: SC_Feedback_Dev, ExternalEmergencyStop
ISH_AkUser_Period_ms_Until_SST	650	INT12	Readers: SC_Feedback_Dev, ISH_Delay_SST
ISH_AkUser_Period_ms_Until_TSP	550	INT12	Readers: SC_Feedback_Dev, ISH_Delay_TSP
ISH_CountDelay_SST	0	INT12	Writer: ISH_Delay_SST; Readers: SC_Feedback_Dev
ISH_CountDelay_TSP	0	INT12	Writer: ISH_Delay_TSP; Readers: SC_Feedback_Dev
ISH_Delayed_SST	0	BOOL	Writer: ISH_Delay_SST; Readers: SC_Feedback_Dev, ISH_Activate_SST
ISH_Delayed_TSP	0	BOOL	Writer: ISH_Delay_TSP; Readers: SC_Feedback_Dev, ISH_Activate_TSP
ISH_EnableDelay_SST	0	BOOL	Writer: ISH_EnableDelay_Protecting; Readers: SC_Feedback_Dev, ISH_Activate_SST, ISH_Delay_SST
ISH_EnableDelay_TSP	0	BOOL	Writer: ISH_EnableDelay_Protecting; Readers: SC_Feedback_Dev, ISH_Activate_TSP, ISH_Delay_TSP
ISH_SMatr_Frequency	4	INT12	Readers: SC_Feedback_Dev, ISH_Delay_SST, ISH_Delay_TSP
ISH_SST_Active	0	BOOL	Writer: Global_SST; Readers: SC_Feedback_Dev
ISH_SST_Vul	0	BOOL	Writer: Global_SST; Readers: SC_Feedback_Dev
ISH_Supervis_SST	0	BOOL	Writer: ISH_Activate_SST; Readers: SC_Feedback_Dev, Global_SST
ISH_Supervis_TSP	0	BOOL	Writer: ISH_Activate_TSP; Readers: SC_Feedback_Dev, Global_SST
ISH_TSP_Active	0	BOOL	Writer: Global_TSP; Readers: SC_Feedback_Dev
ISH_TSP_Vul	0	BOOL	Writer: Global_TSP; Readers: SC_Feedback_Dev
ISH_UserMODE_bNot_IntemitCollab	1	BOOL	Readers: SC_Feedback_Dev, ISH_EnableDelay_Protecting, ISH_EnableDelay_Warning
LocalEmergencyStopStatus	0	BOOL	Writer: Func_LocalEmergencyStopStatus; Readers: SC_Feedback_Dev, InternalEmergencyStop

xx2200000436

- 6 Apply the configuration to the controller by clicking **Write to Controller** in the **Controller** group in the **Configuration** category.

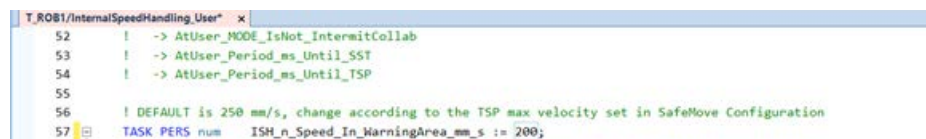
If the **SpeedHandling** function requires to be reactivated after deactivation, make sure:

- the signal **ISH_UserMODE_bNot_IntemitCollab** in **SafeMove** configuration is set to **0**, and,
- the function **ISH_b_FunctionlityIsUsed** in **RAPID** program is set to **TRUE**.

Changing the speed limit when **WarningArea** is triggered

When users enter the warning area, the robot speed is limited to 250 mm/sec by default. Use the following procedure to change the speed limit based on risk assessment of the final application:

- 1 In **RobotStudio**, open the **RAPID** program **InternalSpeedHandling_User** in task **T_ROB1**.
- 2 Navigate to the function **ISH_n_Speed_In_WarningArea_mm_s** and set its value from default 250 to any required value.



```
T_ROB1/InternalSpeedHandling_User*
52 ! -> AtUser_MODE_IsNot_IntemitCollab
53 ! -> AtUser_Period_ms_Until_SST
54 ! -> AtUser_Period_ms_Until_TSP
55
56 ! DEFAULT is 250 mm/s, change according to the TSP max velocity set in SafeMove Configuration
57 TASK PERS num ISH_n_Speed_In_WarningArea_mm_s := 200;
```

xx2200000437

- 3 Save the change and apply to the controller.

The speed limit can also be changed in **SafeMove** configurations using the following procedure:

- 1 Open the **RobotStudio**.
- 2 Log in the controller using the **Admin** account and request the write access.

Continues on next page

- 3 In the **Controller** tab, choose **Visual SafeMove** from the **Safety** group in the **Configuration** category.
- 4 In the left pane of the window, choose **Global_TSP** under the **Tool Speed Supervisions** from the navigation tree.



xx2200000438

- 5 In the **Visual SafeMove Properties** window, set the **Max speed (mm/s)** in the **Speed limits** area to a required value.



xx2200000439

- 6 Apply the configuration to the controller by clicking **Write to Controller** in the **Controller** group in the **Configuration** category.

3 Installation and commissioning

3.7.7 Use cases of safety configurations

Continued

Changing the execution delay time in template SafeMove configuration file

Configurations of SST and TSP are predefined in the template SafeMove configuration file as two global signals ISH_AtUser_Period_ms_Until_SST and ISH_AtUser_Period_ms_Until_TSP.

- ISH_AtUser_Period_ms_Until_SST: default value is 650 ms. If a period of 650 ms elapses after ProtectingArea is triggered but the robot still moves, the SST will be triggered to stop robot movement immediately.
- ISH_AtUser_Period_ms_Until_TSP: default value is 550 ms. If a period of 550 ms elapses after WarningArea is triggered but the robot still moves in a speed larger than the defined speed limit value, the TSP will be triggered to stop robot movement immediately.

It is possible to change the values of ISH_AtUser_Period_ms_Until_SST and ISH_AtUser_Period_ms_Until_TSP according to application requirements using the following procedure. The change must be based on the risk assessment of the final application.

- 1 Open the RobotStudio.
- 2 Log in the controller using the Admin account and request the write access.
- 3 In the **Controller** tab, choose **Visual SafeMove** from the **Safety** group in the **Configuration** category.
- 4 In the **Visual SafeMove** tab, click **Safe IO Configurator** in the **Configuration** group.
- 5 In the displayed **Safe IO Configuration** window, go to the signals **ISH_AtUser_Period_ms_Until_SST** and **ISH_AtUser_Period_ms_Until_TSP** in the global signal list and reset the value as required.

Signal name	Default value	Type	Signals uses
AutomaticMode	0	BOOL	Writer: Func_AutomaticMode Readers: SC_Feedback_Dev
DriveEnable	0	BOOL	Writer: Func_DriveEnable Readers: SC_Feedback_Dev
DriveEnableFeedback	0	BOOL	Writer: Func_DriveEnableFeedback Readers: SC_Feedback_Dev
EmergencyStopActivated	0	BOOL	Writer: Func_EmergencyStopActivated Readers: SC_Feedback_Dev
EnableSwitch	0	BOOL	Writer: Func_EnableSwitch Readers: SC_Feedback_Dev
ExternalEmergencyStopStatus	0	BOOL	Writer: Func_ExternalEmergencyStopStatus Readers: SC_Feedback_Dev, ExternalEmergencyStop
ISH_AtUser_Period_ms_Until_SST	200	INT32	Readers: SC_Feedback_Dev, ISH_Delay_SST
ISH_AtUser_Period_ms_Until_TSP	150	INT32	Readers: SC_Feedback_Dev, ISH_Delay_TSP
ISH_CountDelay_SST	0	INT32	Writer: ISH_Delay_SST Readers: SC_Feedback_Dev
ISH_CountDelay_TSP	0	INT32	Writer: ISH_Delay_TSP Readers: SC_Feedback_Dev

xx220000440

- 6 Apply the configuration to the controller by clicking **Write to Controller** in the **Controller** group in the **Configuration** category.

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 no personnel is leaning on, or have their head or neck close to the robot.
6	Verify that all arm covers and paddings, if any, are properly secured to the robot.
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.

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4 Maintenance

4.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the CRB 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 service work.

There are general safety aspects that must be read through, as well as more specific safety information that describes the danger and safety risks when performing the procedures. Read the chapter [Safety on page 17](#) before performing any service work.

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 CRB 1300 is connected to power, always make sure that the CRB 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*
- [Robot cabling and connection points on page 101](#).

4 Maintenance

4.2.1 Specification of maintenance intervals

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 CRB 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.

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 177](#)

Maintenance schedule

Maintenance activities	Regularly ⁱ	Every 12 months	Every 36 months	Every 12,000 hours ⁱⁱ	Every 24,000 hours ⁱⁱ	Every 30,000 hours ⁱⁱ	Reference
Cleaning the robot	x						Cleaning the CRB 1300 on page 178
Inspecting the robot	x						Check for abnormal wear or contamination.
Inspecting the laser scanners	x						Check for damages, defective or lack of effectiveness.
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 190 .
Inspecting the information labels		x					Inspecting the information labels on page 180
Inspecting the robot harness		x ⁱⁱⁱ					Inspecting the robot cabling on page 182
Inspecting the mechanical stop		x					Inspecting mechanical stops on page 183
Inspecting the timing belt			x				Inspecting timing belts on page 187
Lubricating the robot harness		x ^{iv}					Lubricating the cable package on page 194
Replacing the SMB battery pack			x ^v				Replacing the battery pack on page 197

Continues on next page

4 Maintenance

4.2.2 Maintenance schedule

Continued

Maintenance activities	Regularly ⁱ	Every 12 months	Every 36 months	Every 12,000 hours ⁱⁱ	Every 24,000 hours ⁱⁱ	Every 30,000 hours ⁱⁱ	Reference
Changing the oil in axis-1 gearbox					x		First change when DTC ⁱⁱ reads: <ul style="list-style-type: none"> • 6000 hours Second change when DTC ⁱⁱ reads: <ul style="list-style-type: none"> • 24000 hours Following changes: <ul style="list-style-type: none"> • 24000 hours Changing oil, axis-1 gearbox on page 204
Changing the oil in axis-2 gearbox					x		First change when DTC ⁱⁱ reads: <ul style="list-style-type: none"> • 6000 hours Second change when DTC ⁱⁱ reads: <ul style="list-style-type: none"> • 24000 hours Following changes: <ul style="list-style-type: none"> • 24000 hours Changing oil, axis-2 gearbox on page 209
Running the <i>Brake Check</i> routine ^{vi}	x ^{vii}						Recommended to robots without the SafeMove option. See <i>Operating manual - OmniCore</i> .
Running the <i>Cyclic Brake Check</i> routine ^{vi}	x ^{vii}						Recommended to robots with the SafeMove option. See <i>Application manual - Functional safety and SafeMove</i> .
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.

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.

4 Maintenance

4.3.1 Cleaning the CRB 1300

4.3 Cleaning activities

4.3.1 Cleaning the CRB 1300

General

To secure high uptime it is important that the CRB 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 CRB 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

The 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 light cleaning detergent.	No	No
IP67 (option)	Yes	Yes. With light cleaning detergent.	Yes. It is highly recommended that the water contains a rust-prevention solution and that the manipulator is dried afterwards.	No

Continues on next page

Cleaning with water

Instructions for rinsing with water

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

CRB 1300 with protection class IP67 (option) can be cleaned by rinsing with water (water cleaner).²

The following list defines the prerequisites:

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

¹ Typical tap water pressure and flow

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.

¹ See [Cleaning methods on page 178](#) for exceptions.

² See [Cleaning methods on page 178](#) for exceptions.

4 Maintenance

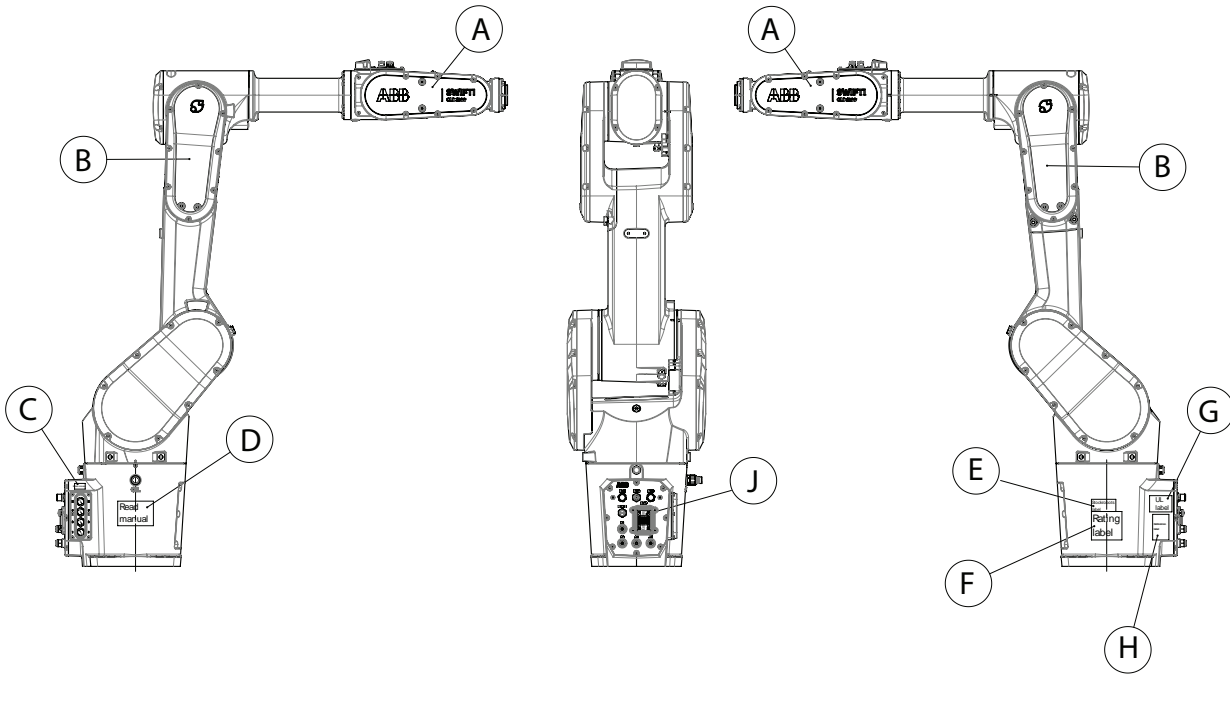
4.4.1 Inspecting the information labels

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](#).



xx2200001130


A	ABB logo, also specifying robot type
B	Cobot label
C	Instruction label Brake release
D	Read manual label, also specifying warning labels
E	Stockrobots label
F	Rating label, CE label and AbsAcc label
G	UL label
H	Calibration label
J	Extra O-ring fitting label

Required tools and equipment

Visual inspection, no tools are required.

Continues on next page

Inspecting, labels

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Inspect the labels, located as shown in the figures.	
3	Replace any missing or damaged labels.	Article numbers for the labels and plate set is specified in Spare parts on page 731 .

4 Maintenance

4.4.2 Inspecting the robot cabling

4.4.2 Inspecting the robot cabling


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

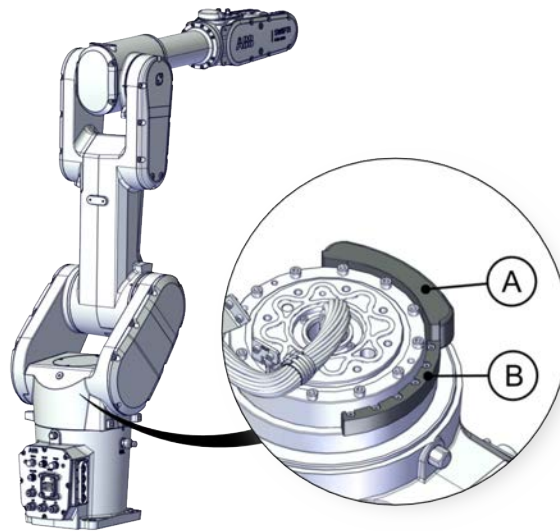
Use this procedure to inspect the robot cabling.

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

4.4.3 Inspecting mechanical stops

Location of mechanical stops

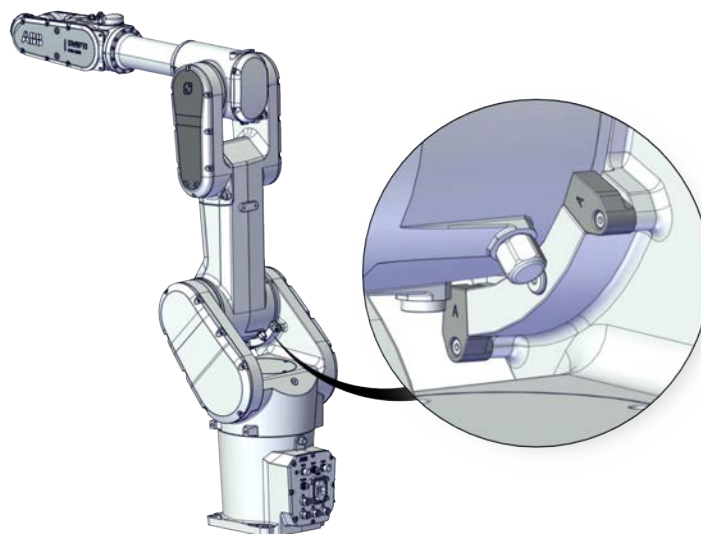
Axis 1



xx2200001134

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

Axis 2



xx2200001135

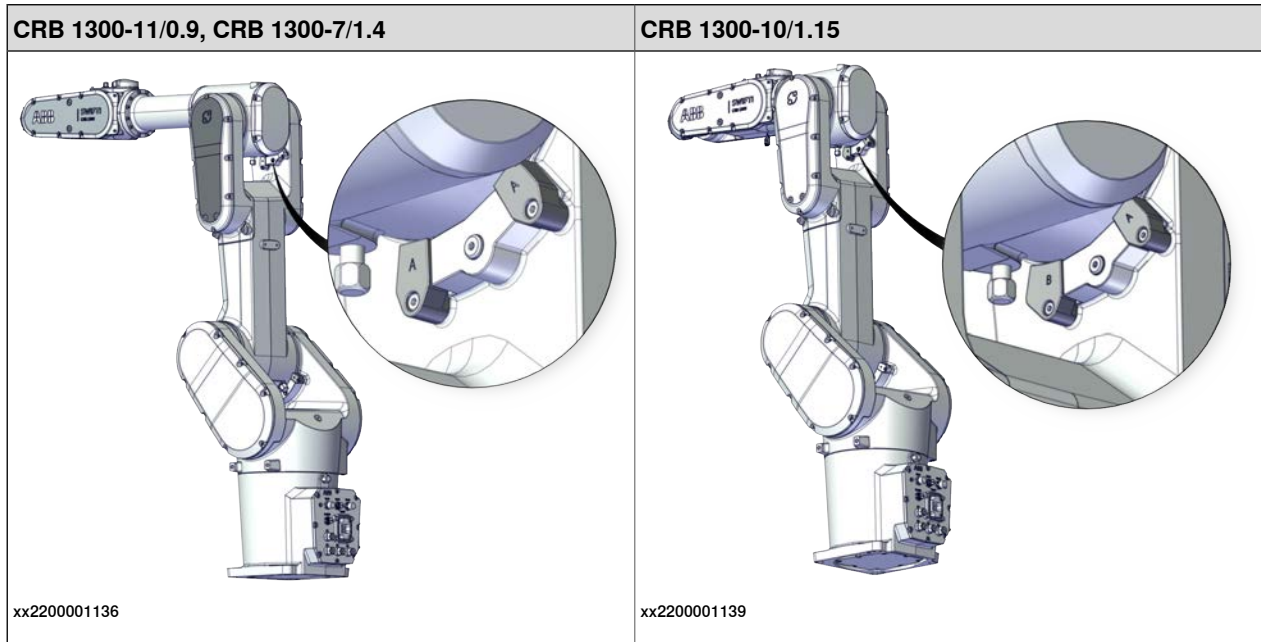
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4 Maintenance

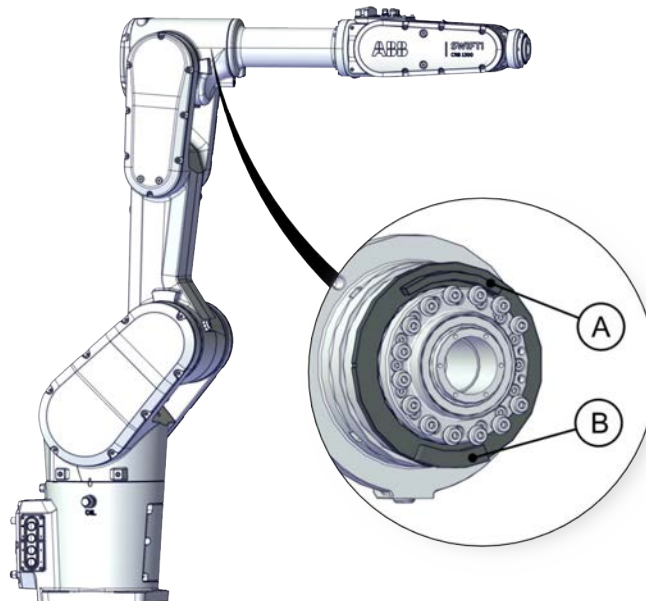
4.4.3 Inspecting mechanical stops

Continued

Axis 3



Axis 4



xx2200001137

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

Continues on next page

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 CRB 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 CRB 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.

Required tools and equipment



Note

The axis-1 mechanical stops are accessible after removing the base, see [Replacing the base on page 271](#).


The axis-4 mechanical stops are accessible after removing the housing, see [Replacing the housing and extender unit on page 389](#).

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: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	Inspect the mechanical stops.	See figures in Location of mechanical stops on page 183 .

Continues on next page

4 Maintenance

4.4.3 Inspecting mechanical stops

Continued

	Action	Information
3	<p>Replace if the mechanical stop is:</p> <ul style="list-style-type: none">• bent• loose• damaged. <p> Note</p> <p>The expected life of gearboxes can be reduced as a result of collisions with the mechanical stop.</p>	

4.4.4 Inspecting timing belts

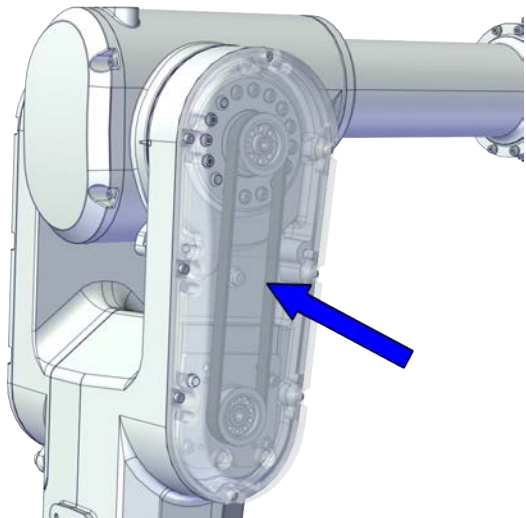
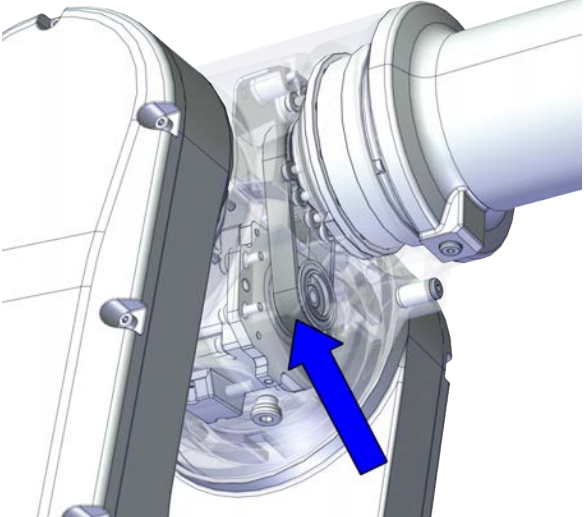
Location of timing belts



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.

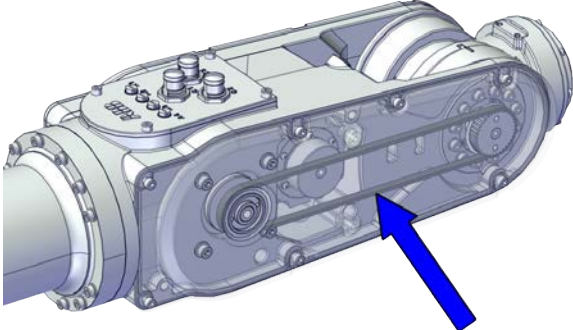
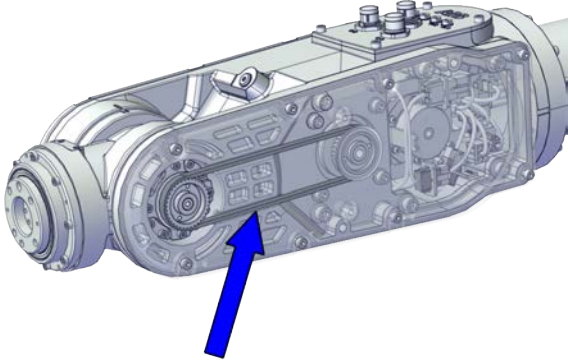
Axis	Location
3	 <p>xx2000001490</p>
4	 <p>xx2000001491</p>

Continues on next page

4 Maintenance

4.4.4 Inspecting timing belts

Continued

Axis	Location
5	 <p>xx2000001492</p>
6	 <p>xx2000001493</p>


Required tools and equipment

Equipment	Note
Standard toolkit	The content is defined in the section Standard toolkit on page 728 .
Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.	

Continues on next page

Inspecting timing belts

Use this procedure to inspect timing belts.

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

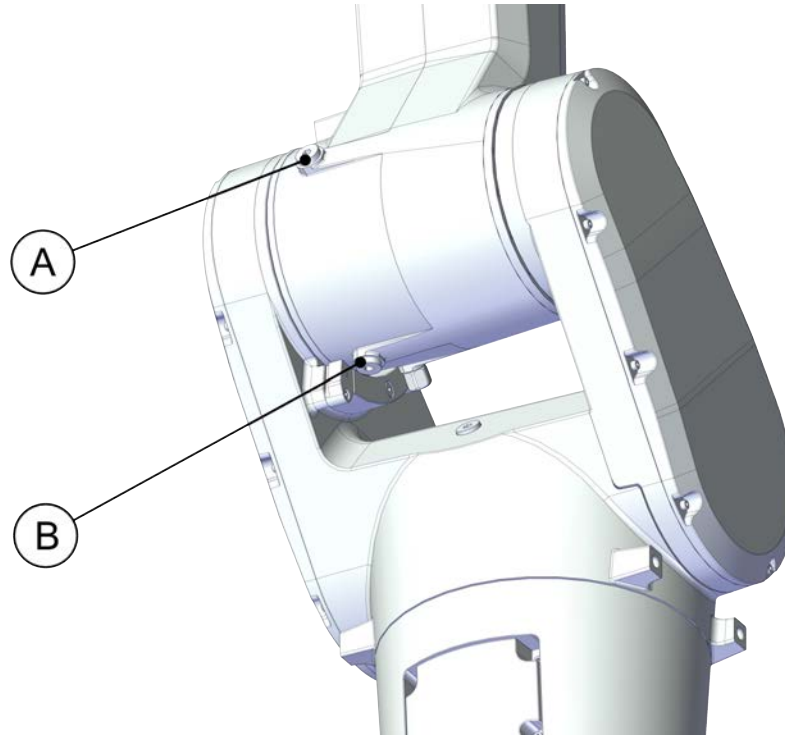
4 Maintenance

4.4.5 Inspecting the oil level in axis-2 gearbox

4.4.5 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 728 .

Required consumables

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

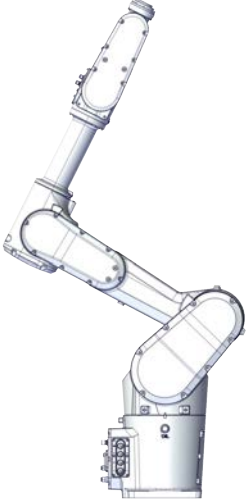



Required documents

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

Continues on next page

Inspecting the oil level in axis-2 gearbox

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


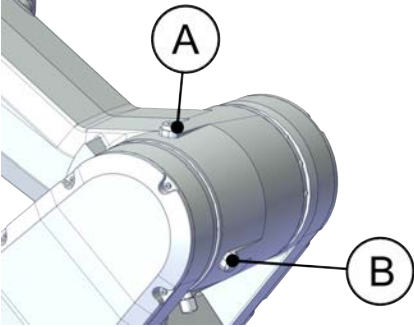


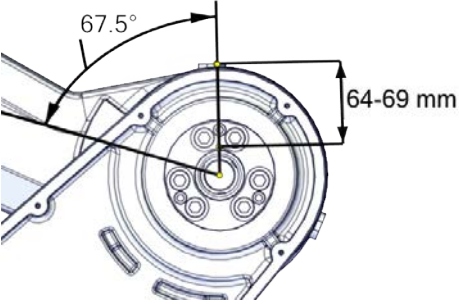

	Action	Note
1	<p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance. 	 <p>xx2000001519</p>
2	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safe-guarded space.</p>	
3	<p>Make sure that the oil temperature is +25°C ± 10°C.</p>	
4	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31.</p>	
5	<p> CAUTION</p> <p>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.</p>	

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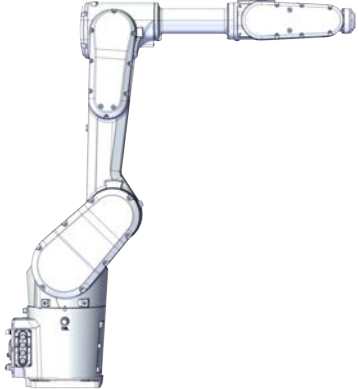

4 Maintenance

4.4.5 Inspecting the oil level in axis-2 gearbox

Continued

	Action	Note				
6	<p>Open the upper oil plug.</p> <p> Note</p> <p>The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.</p>	 <p>xx2000001518</p> <table border="1"> <tr> <td>A</td> <td>Oil plug, opened</td> </tr> <tr> <td>B</td> <td>Oil plug, closed</td> </tr> </table>	A	Oil plug, opened	B	Oil plug, closed
A	Oil plug, opened					
B	Oil plug, closed					
7	<p> WARNING</p> <p>Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may:</p> <ul style="list-style-type: none"> • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely. 					
8	<p>Inspect the oil level by measuring the level at the upper oil plug hole.</p> <p>Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole.</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>	 <p>xx2000001580</p>				
9	<p>Add or drain oil, if required.</p>	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p> <p>Further information about how to drain or fill with oil is found in section Changing oil, axis-2 gearbox on page 209.</p>				
10	<p>Refit the oil plug.</p>	<p>Tightening torque: 10 Nm</p>				
11	<p> DANGER</p> <p>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 171.</p>					

Continues on next page

	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 68 .	
13	Jog all axes to zero position.	 <p>xx2000001520</p>
14	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

4 Maintenance

4.5.1 Lubricating the cable package




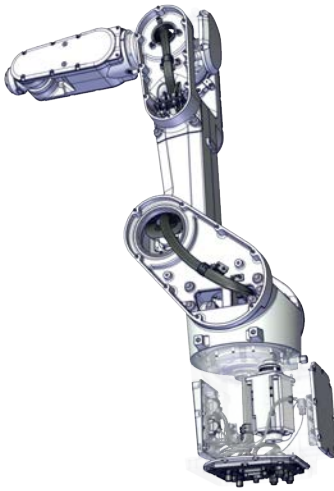
4.5 Lubrication activities

4.5.1 Lubricating the cable package



Location of the cable package

The CRB 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
CRB 1300-11/0.9	 xx2000001260	 xx2000001261
CRB 1300-10/1.15	 xx2000001258	 xx2000001259

Continues on next page

Robot type	Rear connector interface	Bottom connector interface
CRB 1300-7/1.4 and	 <p>xx2000001256</p>	 <p>xx2000001257</p>

Required tools and equipment


Equipment	Note
Standard toolkit	The content is defined in the section Standard toolkit on page 728 .
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	 <p>DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
2	Gain access to the cable package by removing the covers.	

Continues on next page

4 Maintenance

4.5.1 Lubricating the cable package

Continued

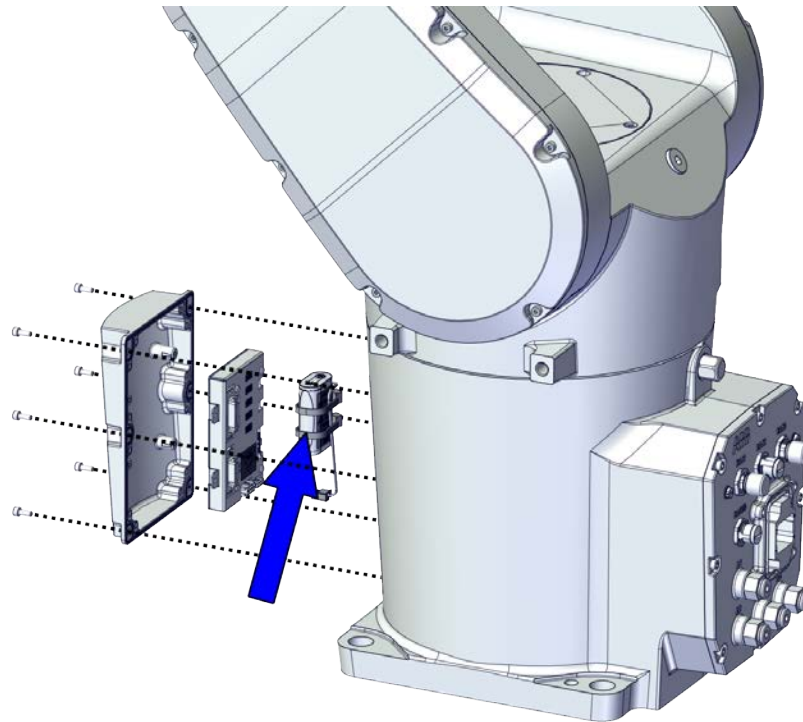
	Action	Information
3	Check the cable package for damage or wear.	
4	If any damage or wear is detected, the part must be replaced!	See Replacing the cable package on page 222 .
5	Apply grease to the cable package, cover all moving area of the package.	
6	Apply grease to the covers that have contacting area with the cable package.	

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 CRB 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 728 .

Continues on next page

4 Maintenance

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.

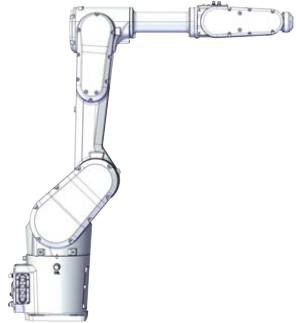

Required consumables

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

Removing the battery pack





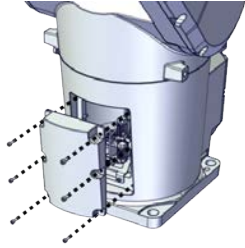

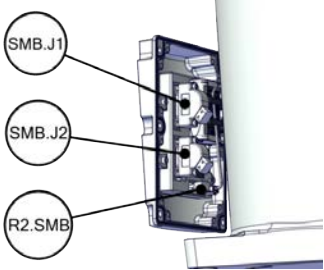
Use these procedures to remove the battery pack.

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: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Continues on next page

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 51 .	
3	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
4	Disconnect the connectors. <ul style="list-style-type: none"> • 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
5	Remove the SMB cover completely from the base.	

Removing the battery pack


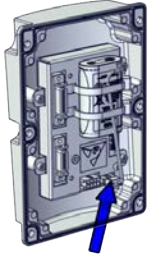
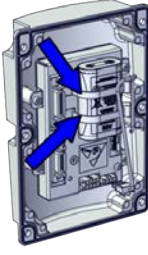
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Maintenance

4.6.1 Replacing the battery pack


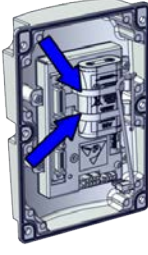
Continued

	Action	Note
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 51 .	
3	Disconnect the battery cable.	 xx2000001505
4	Remove the battery pack by cutting the cable strap.	 xx2000001506

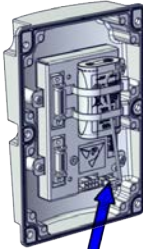
Refitting the battery pack

Use these procedures to refit the battery pack.



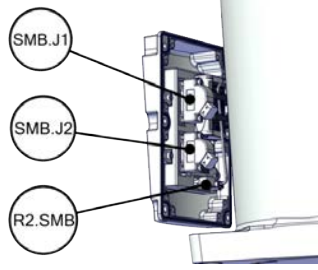

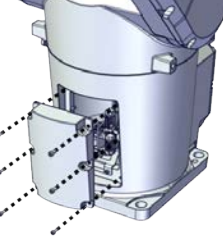
Refitting the battery pack

	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 51 .	
2	Secure the battery pack using the cable strap.	 xx2000001506

Continues on next page

	Action	Note
3	Reconnect the battery cable.	 <p>xx2000001505</p>

Reconnecting the SMB connectors

	Action	Note
1	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51.</p>	
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • SMB.J1 • SMB.J2 • R2.SMB  <p>Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx2000001504</p>
3	<p>Route and secure the cabling with cable straps.</p>  <p>CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	
4	Refit the SMB cover to the base.	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (6 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001503</p>


Continues on next page

4 Maintenance

4.6.1 Replacing the battery pack

Continued

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

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 *Technical reference manual - Lubrication in gearboxes* available for registered users on myABB Business Portal, www.abb.com/myABB.

Location of gearboxes

The figure shows the location of the gearboxes.

Equipment

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

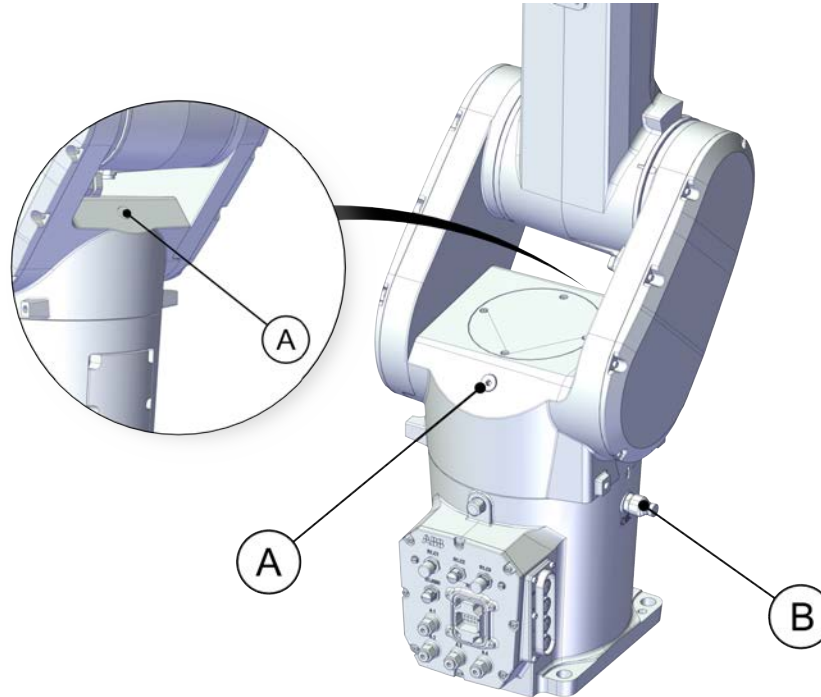
4 Maintenance

4.7.2 Changing oil, axis-1 gearbox

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 728 .

Consumable

Material	Note
Lubricating oil	Information about the oil is found in <i>Technical reference manual - Lubrication in gearboxes</i> . See Type and amount of oil in gearboxes on page 203 .

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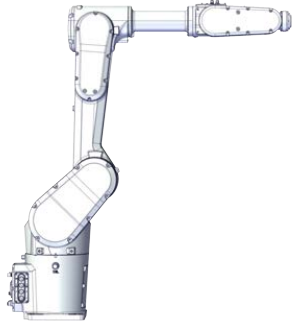

Required documents

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: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Draining oil of axis-1 gearbox

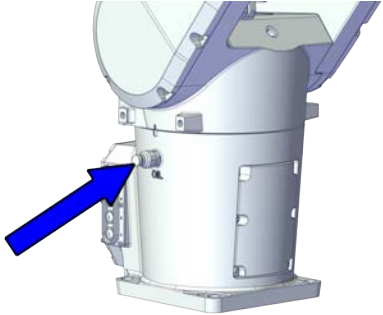
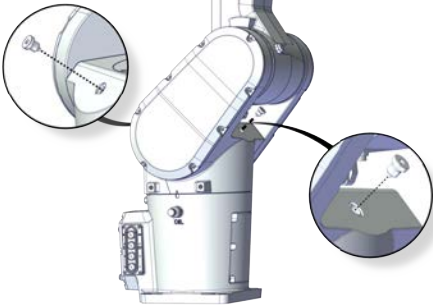



	Action	Note
1	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31 .	
2	 CAUTION The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	

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4 Maintenance

4.7.2 Changing oil, axis-1 gearbox

Continued



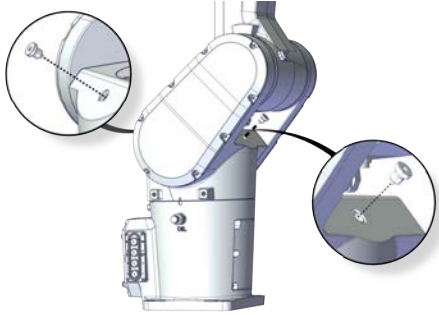


	Action	Note
3	Place the oil collecting vessel underneath the quick coupling.	 <p>xx2000001514</p>
4	Remove the oil plugs and keep them opened to speed up the drainage.	 <p>xx2000001513</p>
5	Plug a G3/8 quick coupling connector with pipe to the quick coupling on base.	
6	 <p>WARNING</p> <p>Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 717 for more information.</p>	
7	Drain the gearbox oil.	 <p>Note</p> <p>Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.</p>
8	<p>Remove the quick coupling connector and clean the pipe after the oil is drained.</p>  <p>Note</p> <p>There will be some oil left in the gearbox after draining.</p>	
9	Refit oil plugs.	Tightening torque: 10 Nm

Continues on next page

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 31 .	
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: <ul style="list-style-type: none"> • 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.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> .
6	Refit the oil plugs.	Tightening torque: 10 Nm


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4 Maintenance

4.7.2 Changing oil, axis-1 gearbox

Continued

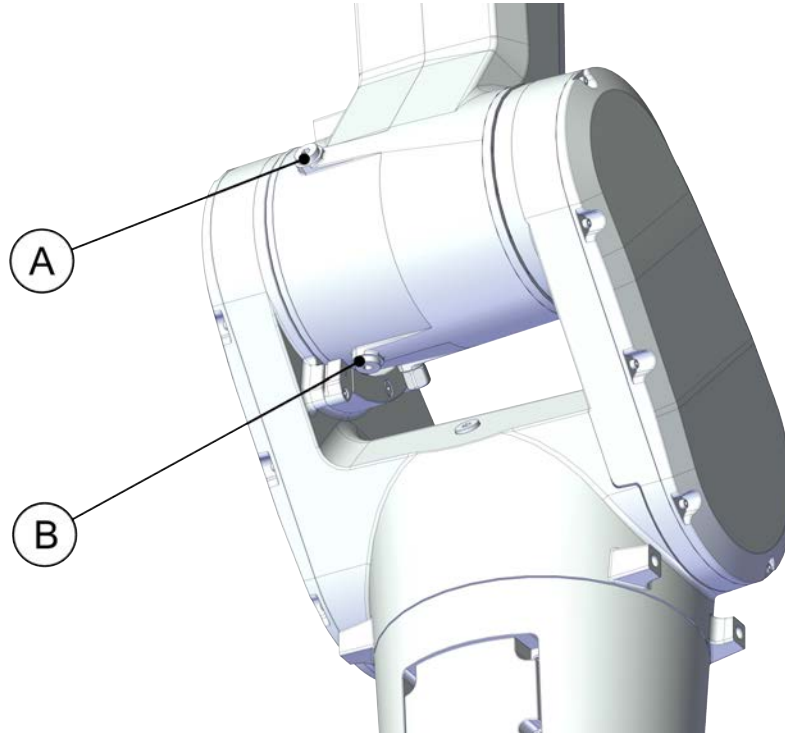
Concluding procedure

	Action	Note
1	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 171 .	

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 728 .

Consumable

Material	Note
Lubricating oil	Information about the oil is found in <i>Technical reference manual - Lubrication in gearboxes</i> . See Type and amount of oil in gearboxes on page 203 .

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4 Maintenance

4.7.3 Changing oil, axis-2 gearbox

Continued

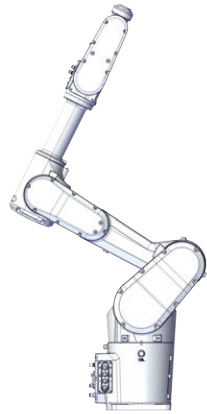

Required documents

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


Draining the axis-2 gearbox

Use this procedure to drain the gearbox.


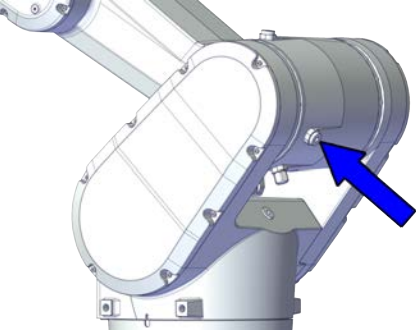
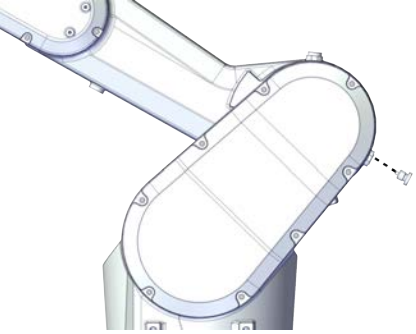
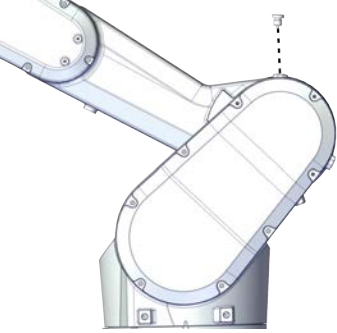

Preparations before draining oil

	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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 31 .	

Continues on next page



	Action	Note
2	<p> CAUTION</p> <p>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.</p>	
3	<p>Place the oil collecting vessel underneath the oil plug, draining.</p>	 <p>xx2000001515</p>
4	<p>Remove the oil plug, draining.</p>	 <p>xx2000001516</p>
5	<p>Plug a clean pipe to the oil plug, draining, with the other end to the oil collecting vessel.</p>	
6	<p>Remove the oil plug, venting and keep it opened to speed up the drainage.</p>	 <p>xx2000001517</p>
7	<p> WARNING</p> <p>Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 717 for more information.</p>	

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4 Maintenance

4.7.3 Changing oil, axis-2 gearbox




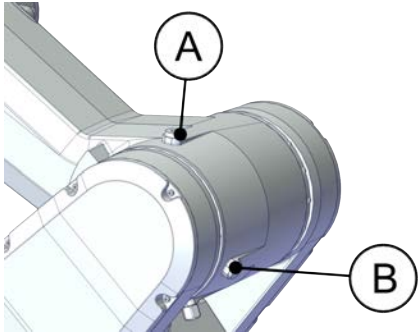
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	Action	Note
8	Drain the gearbox oil.	 Note Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.
9	Remove and clean the pipe after the oil is drained.  Note There will be some oil left in the gearbox after draining.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





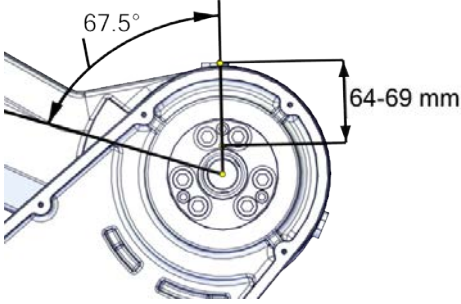

Filling oil into the axis-2 gearbox

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 31 .					
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.	 <p>xx2000001518</p> <table border="1"> <tbody> <tr> <td>A</td> <td>Oil plug, opened</td> </tr> <tr> <td>B</td> <td>Oil plug, closed</td> </tr> </tbody> </table>	A	Oil plug, opened	B	Oil plug, closed
A	Oil plug, opened					
B	Oil plug, closed					

Continues on next page

	Action	Note
4	 WARNING Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: <ul style="list-style-type: none"> • 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 <i>Technical reference manual - Lubrication in gearboxes</i> .
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.	 <p>xx2000001580</p>
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	 DANGER Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 171 .	

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5 Repair

5.1 Introduction

Structure of this chapter

This chapter describes repair activities for the CRB 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 CRB 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.



Note

If the CRB 1300 is connected to power, always make sure that the CRB 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*

5 Repair

5.2.1 Mounting instructions for sealings

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	3HAC042536-001	Shell Gadus S2

Rotating sealings

The following procedures describe how to fit rotating sealings.



CAUTION

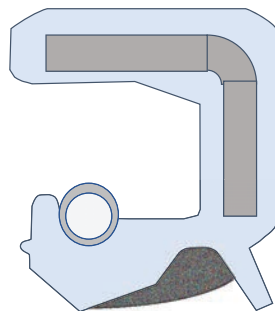
Please observe the following before commencing any assembly of sealings:

- 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

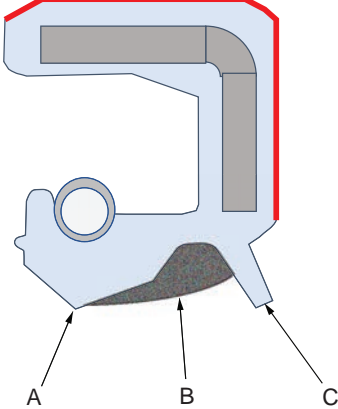

A radial sealing consists of a flexible rubber lip bonded to a rigid metal case. Only one side of the sealing is static with a metal insert.



xx230000433

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5.2.1 Mounting instructions for sealings
Continued

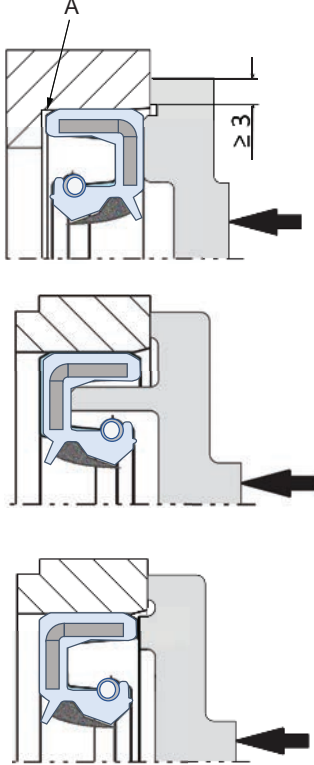
	Action	Note
1	Check the sealing to ensure that: <ul style="list-style-type: none"> • The sealing is of the correct type. • There is no damage on the main lip. 	
2	Inspect the shaft surface before mounting. If scratches or damage are found, the shaft must be replaced since it may result in future leakage. 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.	<p>Article number is specified in Equipment on page 216.</p>  <p>xx200000071</p> <p>A Main lip B Grease C Dust lip</p> <p> Note</p> <p>Ensure that no grease is applied to the red marked surface.</p>

Continues on next page

5 Repair

5.2.1 Mounting instructions for sealings

Continued

	Action	Note
4	<p>Mount the sealing correctly with a mounting tool. Never hammer directly on the sealing as this may result in leakage.</p>	 <p>xx2000000072</p> <p>A Gap</p>

Flange sealings and static sealings

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

	Action
1	<p>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.</p>
2	<p>Clean the surfaces properly in accordance with the recommendations of ABB.</p>
3	<p>Distribute the sealing compound evenly over the surface.</p>
4	<p>Tighten the screws evenly when fastening the flange joint.</p>

O-rings

The following procedure describes how to fit o-rings.

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

Continues on next page

	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.	

5 Repair

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

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

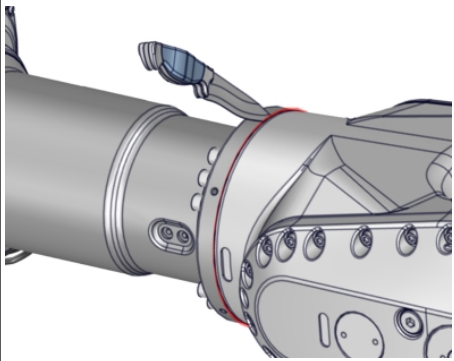
General

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

Required equipment

Equipment	Spare parts	Note
Cleaning agent		Ethanol
Knife		
Lint free cloth		
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.	 xx230000950
2	Carefully grind the paint edge that is left on the structure to a smooth surface.	

5.2.3 The brake release buttons may be jammed after service work

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.

5 Repair

5.3.1 Replacing the cable package

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 CRB 1300-7/1.4 and) 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.


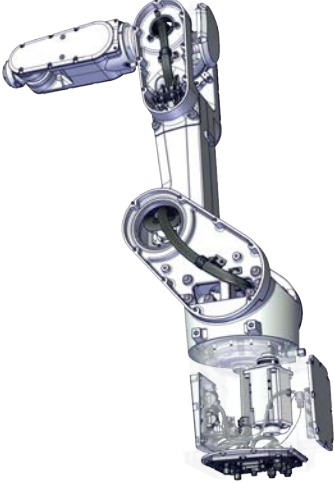


The air hoses and optional Ethernet must be disconnected inside the tubular before the cable package can be removed.

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
CRB 1300-11/0.9	 xx2000001260	 xx2000001261

Continues on next page

Robot type	Rear connector interface	Bottom connector interface
CRB 1300-10/1.15	 <p>xx2000001258</p>	 <p>xx2000001259</p>
CRB 1300-7/1.4 and	 <p>xx2000001256</p>	 <p>xx2000001257</p>

Required spare parts



Note

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

Spare part	Article number	Note
Main cable harness, S (CP/CS and air hose, with Ethernet)	3HAC073305-001	Used with CRB 1300-11/0.9.

Continues on next page

5 Repair

5.3.1 Replacing the cable package

Continued

Spare part	Article number	Note
Main cable harness, M (CP/CS and air hose, with Ethernet)	3HAC073302-001	Used with CRB 1300-10/1.15.
Main cable harness, L (CP/CS and air hose, with Ethernet)	3HAC073299-001	Used with CRB 1300-7/1.4.
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
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	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Swing cover, short	3HAC073095-001	Used for CRB 1300-11/0.9.
Swing cover, long	3HAC073096-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Swing top cover	3HAC073091-001	
Base cover	3HAC073090-001	
SMB cover	3HAC076475-001	
Brake release unit	3HAC073296-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for SMB cover	3HAC067820-001	Used with protection class IP67. Replace if damaged.
Gasket for brake release unit	3HAC070274-001	Used with protection class IP67. Replace if damaged.
Gasket for base cover	3HAC067819-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.

Continues on next page

5.3.1 Replacing the cable package
Continued

Spare part	Article number	Note
Gasket for swing support, long	3HAC067823-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment


Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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 Repair

5.3.1 Replacing the cable package

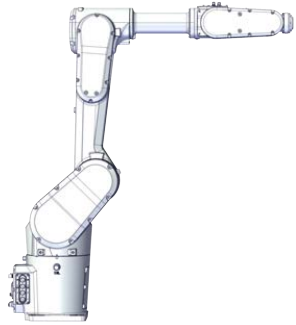

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Action	Note
<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the cable package


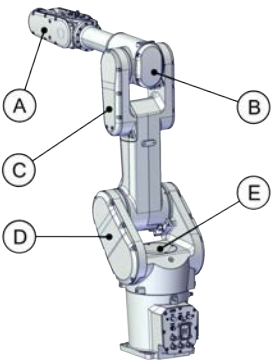
Use these procedures to remove the cable package.

Preparations before removing the cable package


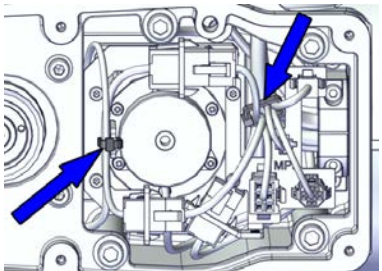

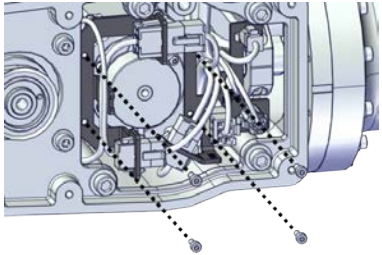
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 <p>xx2000001520</p>
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

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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	Remove the covers. <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing support cover (D) • Swing top cover (E) 	 <p>xx2000001572</p>

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	Cut the cable straps.	 <p>xx2000001530</p>
3	Remove the connector plates.  CAUTION Be aware of the cabling that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 <p>xx2000001531</p>



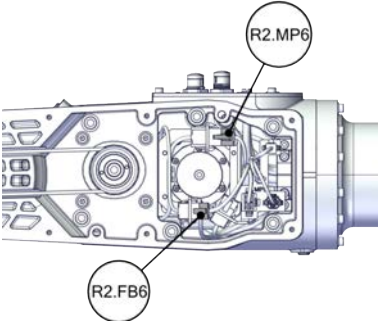
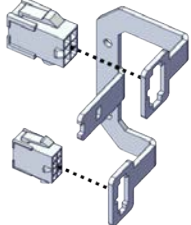
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5 Repair



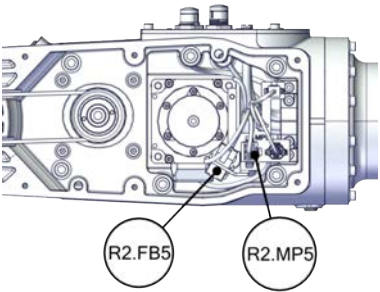
5.3.1 Replacing the cable package

Continued

Disconnecting the axis-6 motor connectors

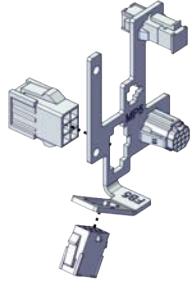
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP6 • FB6  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
3	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533

Disconnecting the axis-5 motor connectors



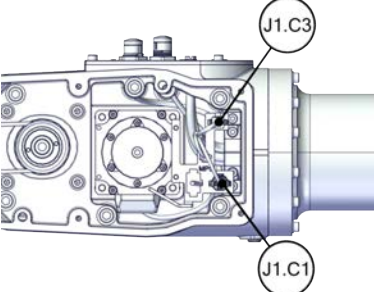
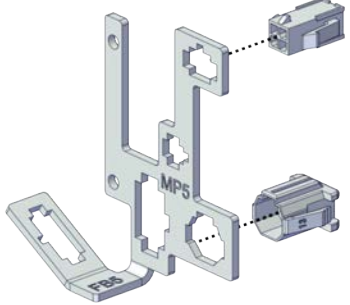
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP5 • FB5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534

Continues on next page

5.3.1 Replacing the cable package
Continued

	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001535</p>

Disconnecting CP/CS cabling (if equipped)

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>For robots with CP/CS cabling</p> <p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3  <p>Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001536</p>
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>


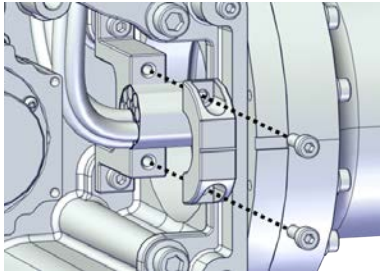
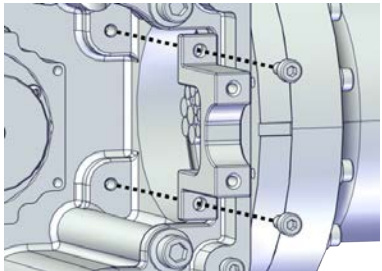
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5 Repair



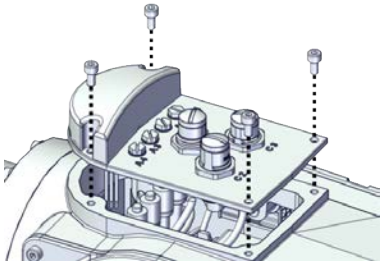
5.3.1 Replacing the cable package

Continued

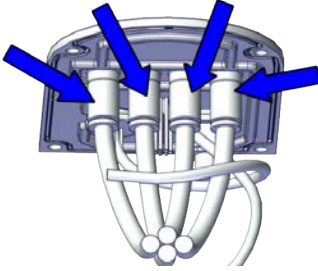


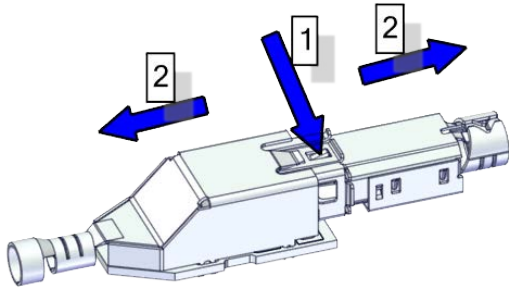
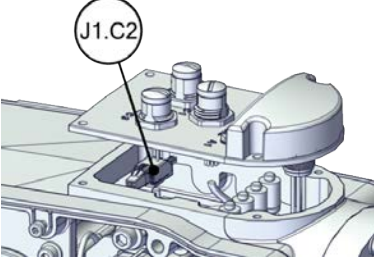
Separating the cable package from the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
3	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub

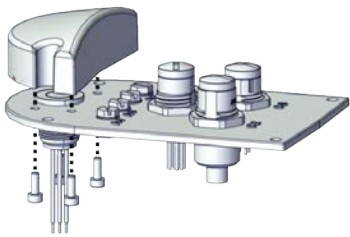
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the screws and carefully open the cover.  CAUTION There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2200001000

Continues on next page

	Action	Note
3	Disconnect the air hoses.	 <p>xx2000001539</p>
4	<p>For robots with Ethernet cabling Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>

Removing the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

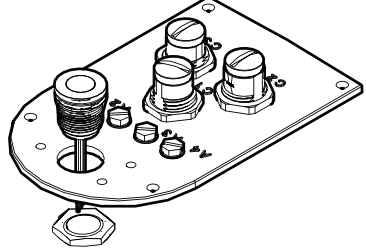
	Action	Note
1	Remove the lamp unit cover.	 <p>xx2200001002</p>

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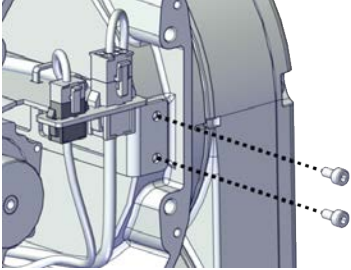

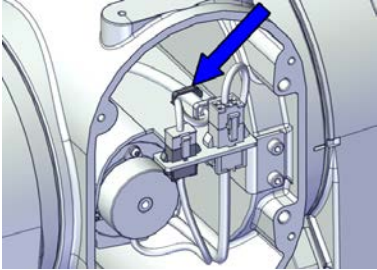

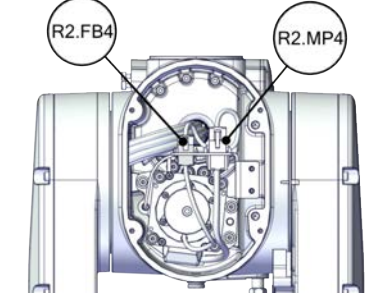
5 Repair

5.3.1 Replacing the cable package

Continued

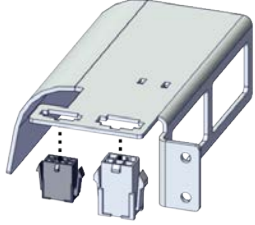
	Action	Note
2	Remove the lamp unit.	 xx2200001003

Disconnecting the axis-4 motor connectors


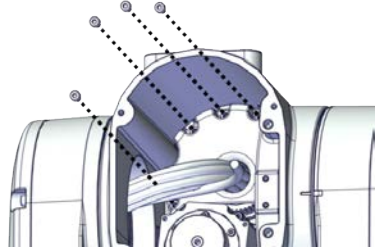
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the connector plate.  CAUTION Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001542
3	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
4	Disconnect the connectors. <ul style="list-style-type: none"> • MP4 • FB4  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544

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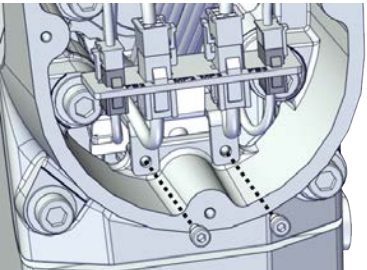
5.3.1 Replacing the cable package
Continued

	Action	Note
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001545</p>

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	Remove the axis-4 cable protector.	 <p>xx2000001546</p>

Disconnecting the axis-2 and -3 motor connectors

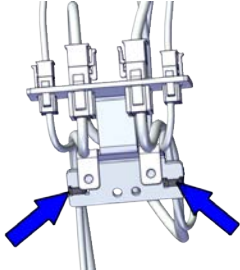

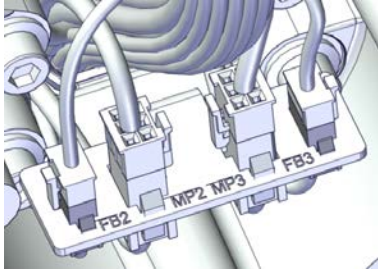
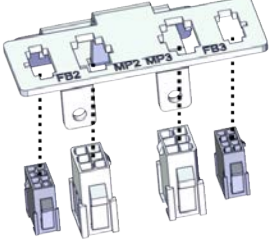
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the connector plate.  CAUTION Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate, as shown in following step.	 <p>xx2000001548</p>

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5 Repair

5.3.1 Replacing the cable package

Continued

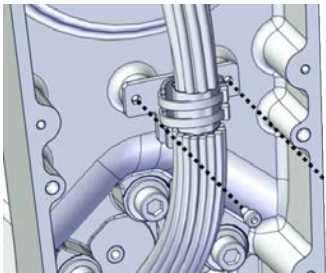
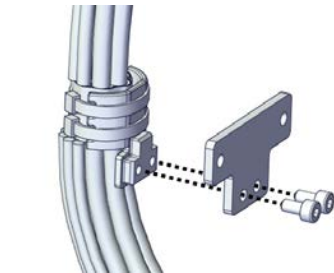
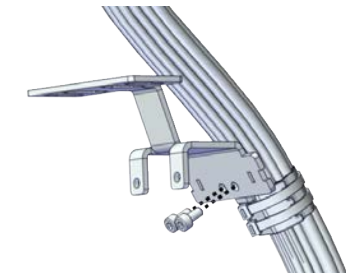
	Action	Note
3	Cut the cable straps.	 <p>xx2000001549</p>
4	Disconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001550</p>
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001551</p>

Separating the cable package from the lower arm


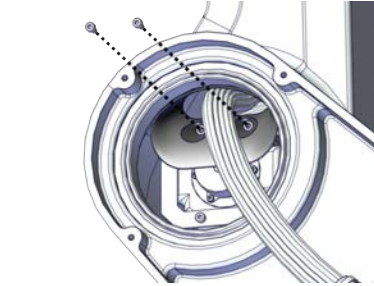
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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5.3.1 Replacing the cable package
Continued

	Action	Note
2	Remove the cable bracket from the lower arm first and then from the cable package.	 <p>xx2000001553</p>  <p>xx2100001465</p>
3	Remove the connector plate.	 <p>xx2000001554</p>

Separating the cable package from the swing

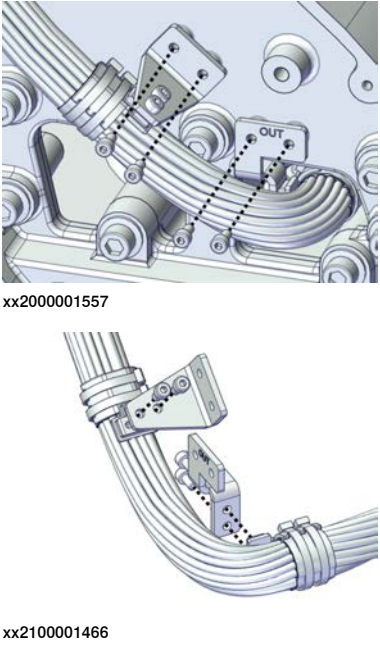
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	Remove the axis-2 cable protector.	 <p>xx2000001556</p>

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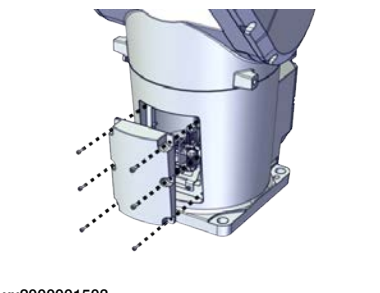
5 Repair

5.3.1 Replacing the cable package

Continued


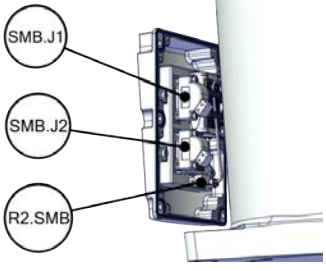
	Action	Note
3	Remove the cable brackets from the swing first and then from the cable package.	 <p>xx2000001557</p> <p>xx2100001466</p>

Disconnecting the SMB connectors



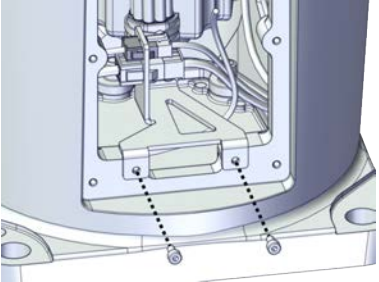

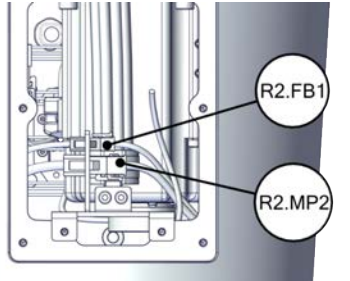
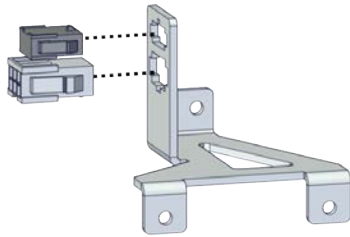
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51.</p>	
3	<p>Remove the SMB cover attachment screws and carefully open the cover.</p>  <p>CAUTION</p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p>  <p>CAUTION</p> <p>There are cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.</p>	 <p>xx2000001503</p>

Continues on next page

5.3.1 Replacing the cable package
Continued

	Action	Note
4	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • SMB.J1 • SMB.J2 • R2.SMB <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001504</p>
5	Remove the SMB cover completely from the base.	

Disconnecting the axis-1 motor connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the connector plate from the base.</p> <p> CAUTION</p> <p>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.</p>	 <p>xx2000001559</p>
3	<p>Disconnect the motor connectors.</p> <ul style="list-style-type: none"> • FB1 • MP1 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001560</p>
4	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001561</p>

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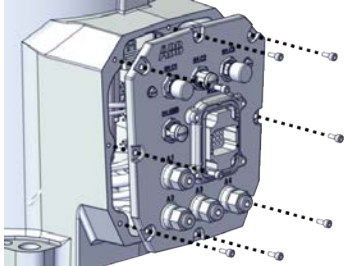
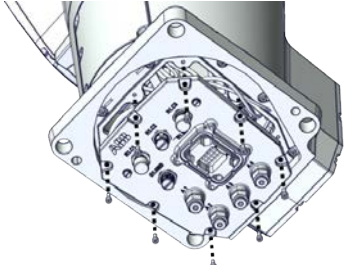
5 Repair

5.3.1 Replacing the cable package


Continued

Opening the connector interface plate

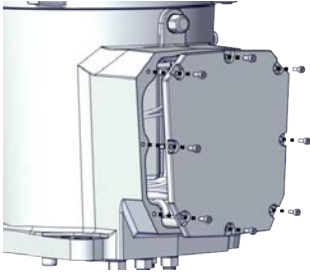
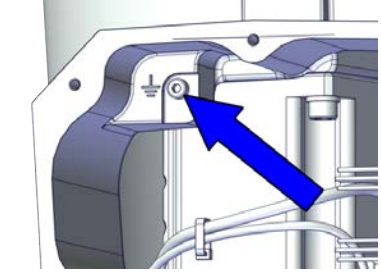
Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	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.	<p>Valid for cabling with rear interface</p>  <p>xx2000001558</p> <p>Valid for cabling with bottom interface (option 3309-1)</p>  <p>xx2000001575</p>




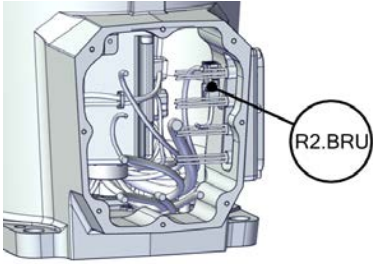
Disconnecting the earth cable

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

Continues on next page

	Action	Note
2	<p>Valid for cabling with bottom interface (option 3309-1)</p> <p>Remove the base rear cover.</p>	 <p>xx2000001573</p>
3	<p>Disconnect the earth cable.</p>	 <p>xx2000001574</p>

Disconnecting the brake release connector

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51.</p>	
3	<p>Cut the cable strap.</p>	
4	<p>Disconnect the connector.</p> <ul style="list-style-type: none"> R2.BRU  <p>Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2100001480</p>


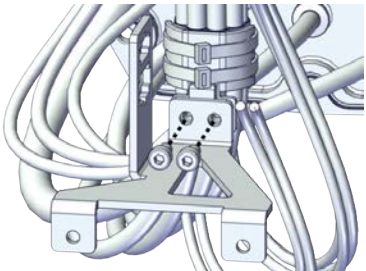

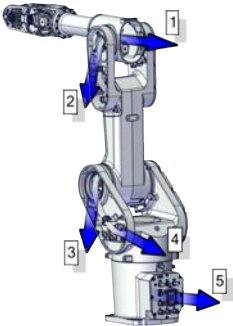
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5 Repair

5.3.1 Replacing the cable package

Continued

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	Remove the axis-1 connector plate.	 xx2000001564
3	Wrap the connectors with the masking tape.	
4	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
5	Slip out the cable protectors.	


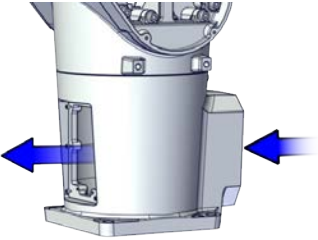
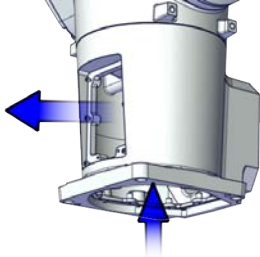

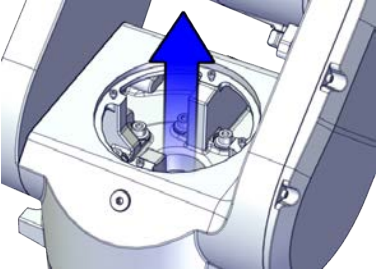
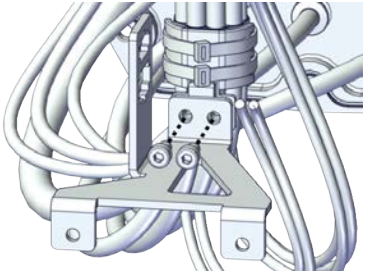
Refitting the cable package

Use these procedures to refit the cable package.

Securing the cable package in the base

	Action	Note
1	Wrap the connectors with the masking tape.	

Continues on next page

	Action	Note
2	<p>Insert the cable package in the base and out from the SMB side.</p> <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	<p>Valid for cabling with rear interface</p>  <p>xx2000001565</p> <p>Valid for cabling with bottom interface (option 3309-1)</p>  <p>xx2000001579</p>
3	<p>Insert the cable package up through the axis-1 gearbox and out from the swing top cover side.</p> <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001566</p>
4	<p>Refit the connector plate to the cable package.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001564</p>

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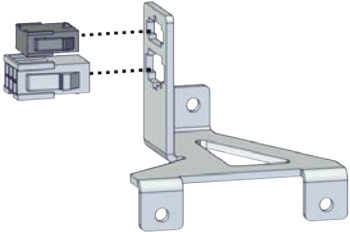

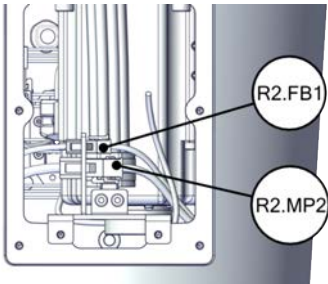

5 Repair

5.3.1 Replacing the cable package

Continued

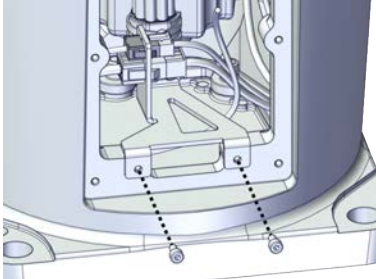
	Action	Note
5	<p>Arrange the connectors as follows (facing the SMB side):</p> <ul style="list-style-type: none"> • Right of the connector plate: <ul style="list-style-type: none"> - SMB.J1 - SMB.J2 - R2.MP1 on axis-1 motor - R2.FB1 on axis-1 motor • Left of the connector plate: <ul style="list-style-type: none"> - R2.SMB - R2.MP1 on main cable package - R2.FB1 on main cable package 	

Reconnecting the axis-1 motor connectors


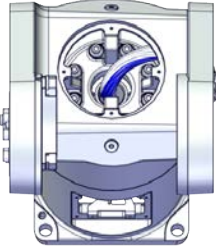
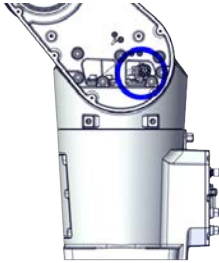

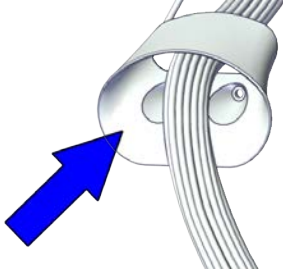
	Action	Note
1	<p>Insert the male header of the motor connectors to the connector plate.</p>	 <p>xx2000001561</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB1 • MP1 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001560</p>
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	

Continues on next page

5.3.1 Replacing the cable package
Continued

	Action	Note
4	Refit the connector plate to the base.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001559</p>

Securing the cable package in the swing


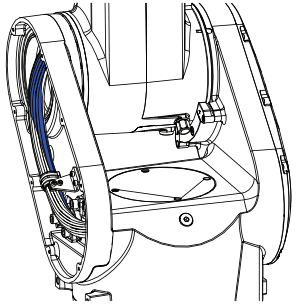
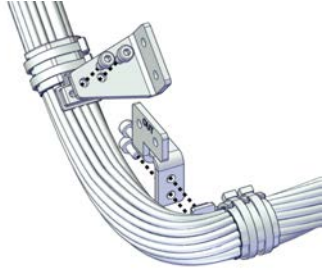
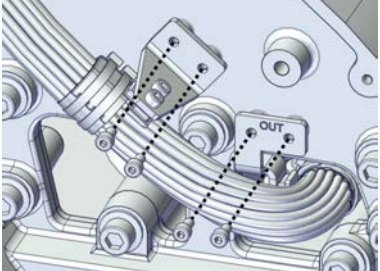
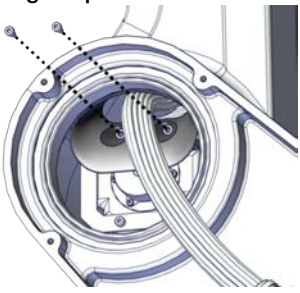
	Action	Note
1	<p>Route the cable package through the swing support.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the SMB side in the hollow tube of axis-1 gearbox. the cable package is out from the hole near the base rear, as circled in the figure. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001745</p>  <p>xx2000001747</p>
2	<p>Apply grease to the axis-2 cable protector and slip it over the cable harness.</p> <p> Note</p> <p>Note the correct direction of the cable protector.</p>	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 2: 3HAC067816-001</p>  <p>xx2000001567</p>

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5 Repair

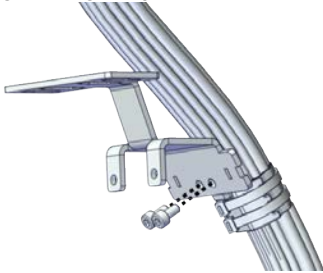

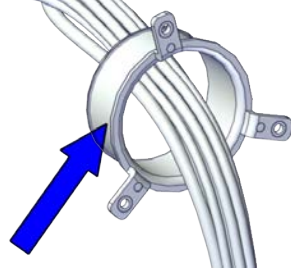
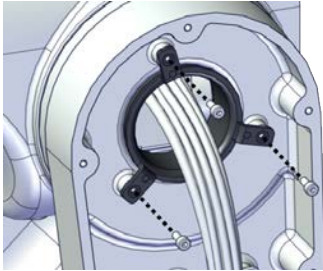

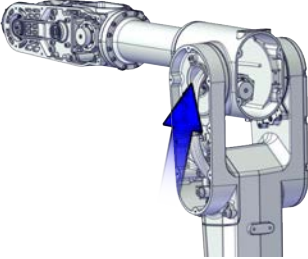
5.3.1 Replacing the cable package

Continued

	Action	Note
3	<p>Route the cable package up into the lower arm.</p> <p>Make sure that:</p> <ul style="list-style-type: none">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. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001746</p>
4	<p>Refit the cable brackets to the cable package first and then to the swing.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each bracket on cable package and 2 pcs on swing)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2100001466</p>  <p>xx2000001557</p>
5	<p>Refit the axis-2 cable protector.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001556</p>

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Routing the cable package in the lower arm

	Action	Note
1	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001554
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 2C2B/FC6.9 (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.	 xx2000001569

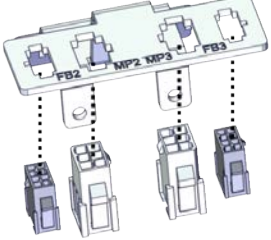

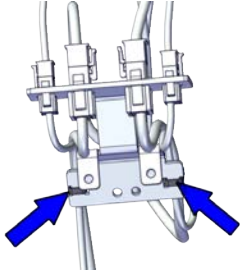

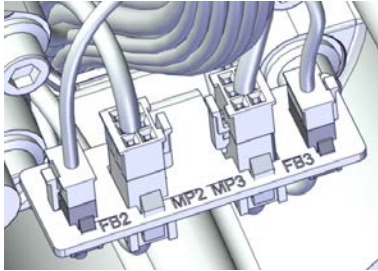
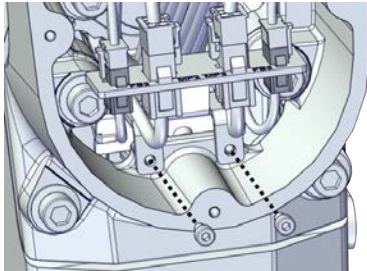
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5 Repair

5.3.1 Replacing the cable package

Continued

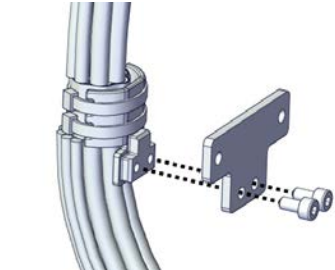
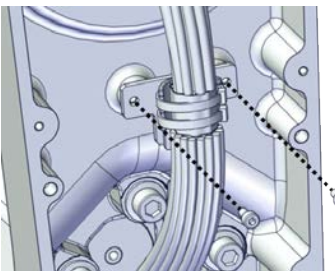
Reconnecting the axis-2 and -3 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001551</p>
2	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.	 <p>xx2000001549</p>
3	Reconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001550</p>
4	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  <p>xx2000001548</p>

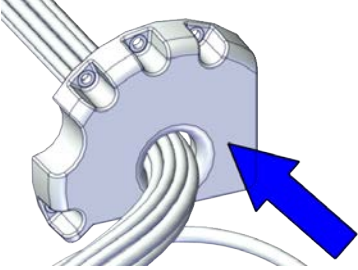

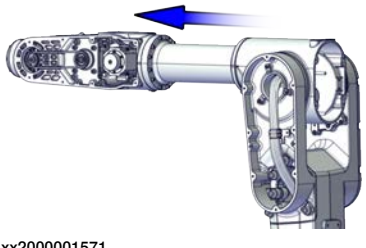
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5.3.1 Replacing the cable package
Continued

Securing the cable package in the lower arm

	Action	Note
1	Refit the cable bracket.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm</p>  <p>xx2100001465</p>  <p>xx2000001553</p>

Routing the cable package in the housing

	Action	Note
1	Slip the axis-4 cable protector over the cable package.	<p>Plastic cable protector, axis 4: 3HAC064694-001:</p>  <p>xx2000001570</p>
2	<p>Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for CRB 1300-7/1.4 and) and into the tubular.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001571</p>

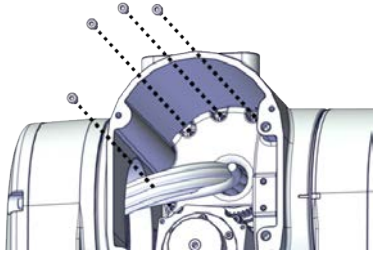
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5 Repair

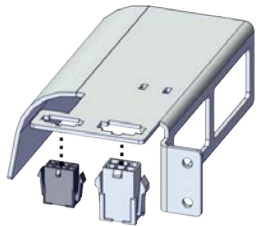

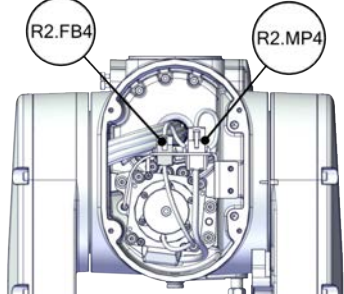


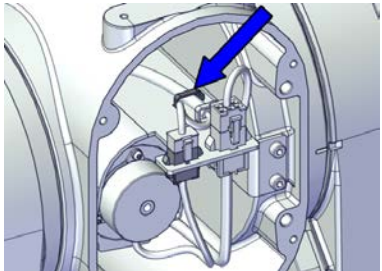
5.3.1 Replacing the cable package

Continued

Securing the cable package in the housing

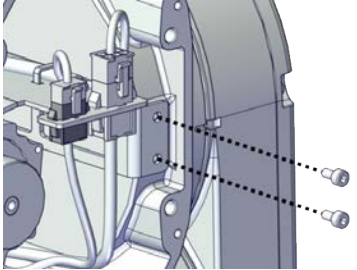
	Action	Note
1	Refit the axis-4 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001546</p>

Reconnecting the axis-4 motor connectors

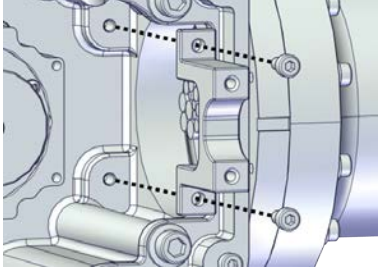
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001545</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB4 • MP4 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001544</p>
3	<p>Route and secure the cabling with a cable strap.</p> <p> Note</p> <p>The motor cabling has another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001543</p>

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5.3.1 Replacing the cable package
Continued

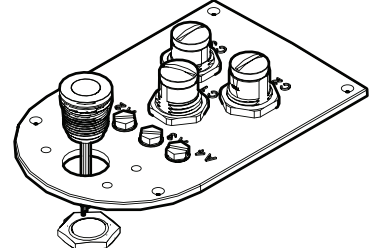
	Action	Note
4	Refit the connector plate.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001542</p>

Routing the cable package in the tubular

	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001749</p>
2	<p>Route the cablings.</p> <ul style="list-style-type: none"> • 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. 	

Refitting the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

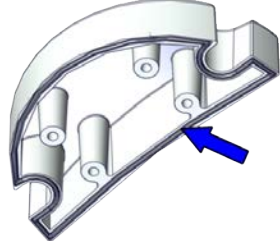
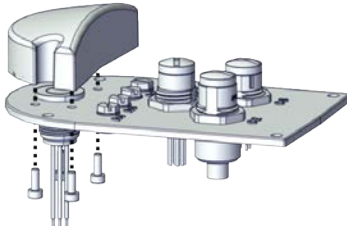
	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>

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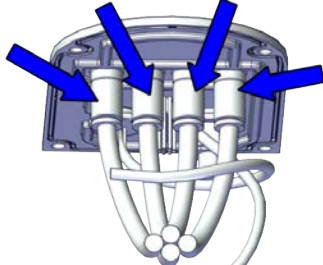

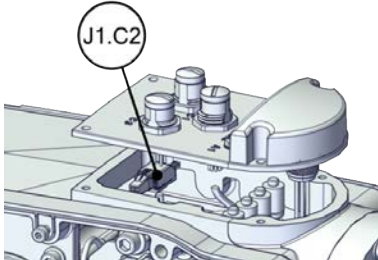
5 Repair

5.3.1 Replacing the cable package

Continued

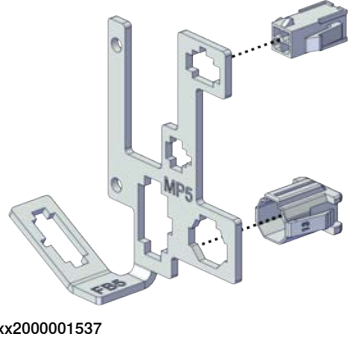

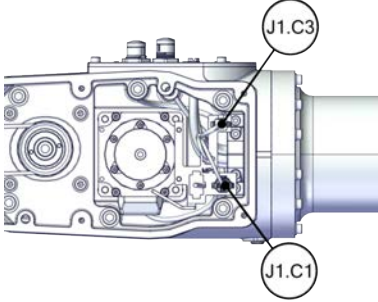
	Action	Note
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>
3	<p>Refit the lamp unit cover.</p>	<p>Lamp unit cover: 3HAC082320-001</p> <p>Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs)</p> <p>Tightening torque: 0.6 Nm</p>  <p>xx2200001002</p>

Reconnecting the air hoses and Ethernet cabling (if equipped)

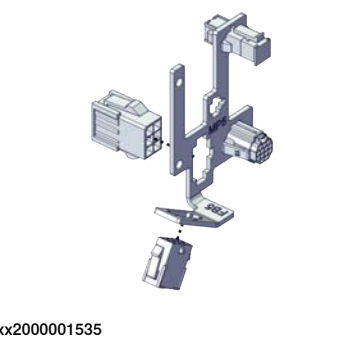

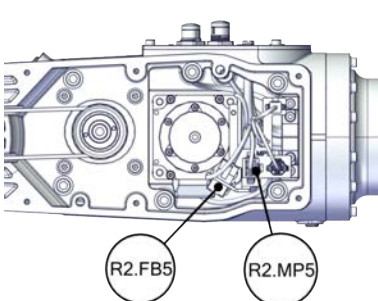
	Action	Note
1	<p>Reconnect the air hoses.</p>  <p>Note</p> <p>See the number markings on the air hoses for help to find the corresponding air hoses.</p>	 <p>xx2000001539</p>
2	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and reconnect the connector.</p> <ul style="list-style-type: none"> J1.C2  <p>Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2200001001</p>

Continues on next page

Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>
2	For robots with CP/CS cabling Reconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001536</p>

Reconnecting the axis-5 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001535</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB5 • MP5  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001534</p>

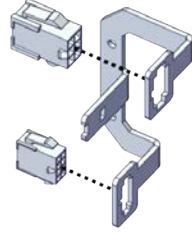

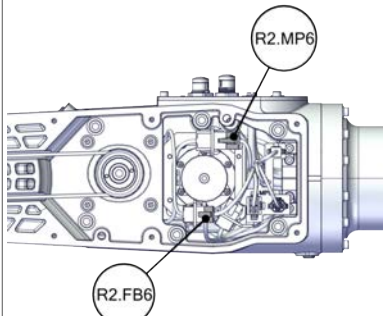
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5 Repair

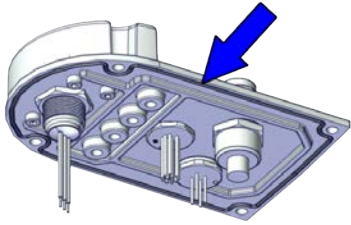
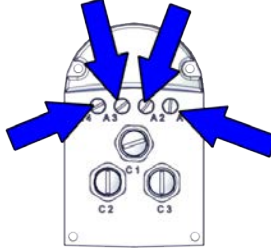
5.3.1 Replacing the cable package

Continued

Reconnecting the axis-6 motor connectors


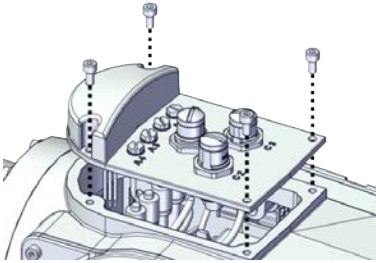
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 xx2000001533
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB6 • MP6  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

Refitting the process hub

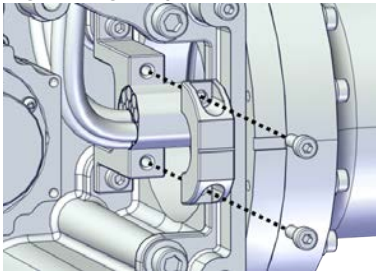
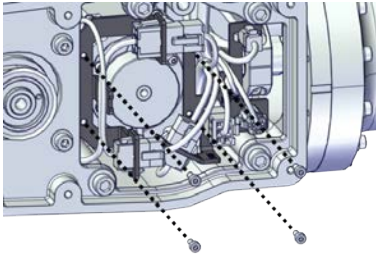
	Action	Note
1	For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2200001005
2	For robots with protection class IP67 (option 3350-670) Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2200001006

Continues on next page

5.3.1 Replacing the cable package
Continued

	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.	
4	Refit the process hub.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm  xx2200001000

Securing the cable package in the tubular


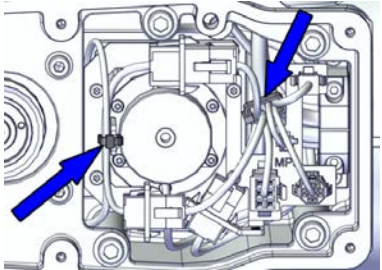
	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001748
2	Refit the connector plate.	Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531

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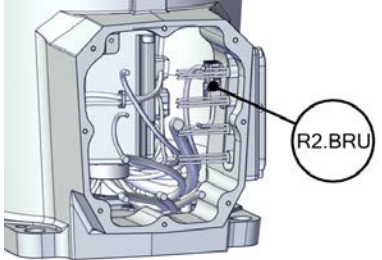

5 Repair

5.3.1 Replacing the cable package

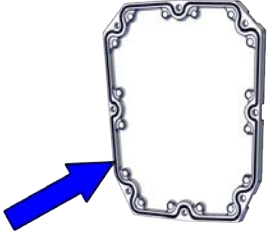
Continued

	Action	Note
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>

Reconnecting the brake release connector

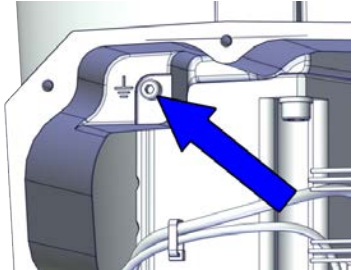
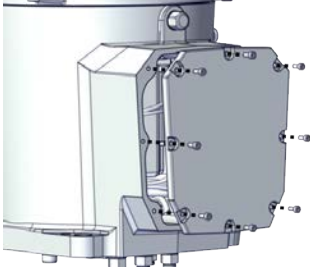
	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51.</p>	
2	<p>Reconnect the connector.</p> <ul style="list-style-type: none"> R2.BRU <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2100001480</p>
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	

Reconnecting the earth cable



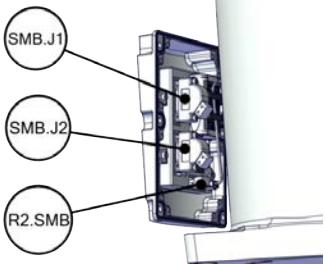

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for base cover: 3HAC067819-001</p>  <p>xx2000002526</p>

Continues on next page

5.3.1 Replacing the cable package
Continued

	Action	Note
2	Reconnect the earth cable.	 <p>xx2000001574</p>
3	<p>Valid for cabling with bottom interface (option 3309-1)</p> <p>Refit the base rear cover.</p>	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (8 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001573</p>

Reconnecting the SMB connectors

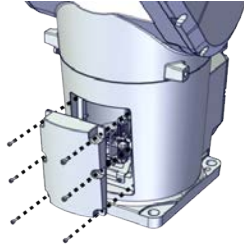
	Action	Note
1	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51.</p>	
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • SMB.J1 • SMB.J2 • R2.SMB  <p>Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx2000001504</p>
3	<p>Route and secure the cabling with cable straps.</p>  <p>CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	

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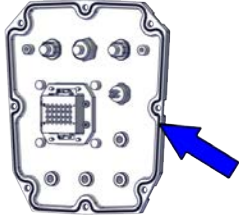
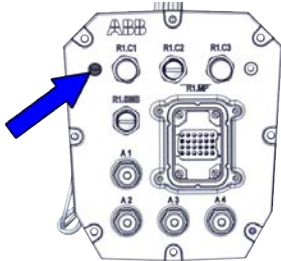

5 Repair

5.3.1 Replacing the cable package

Continued

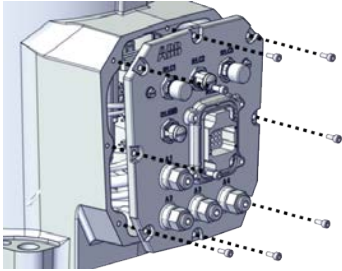
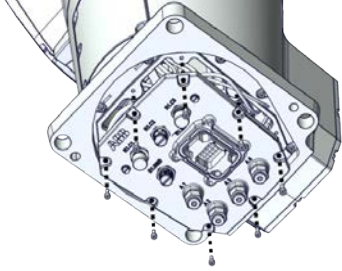
	Action	Note
4	Refit the SMB cover to the base.	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (6 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001503</p>

Refitting the connector interface plate

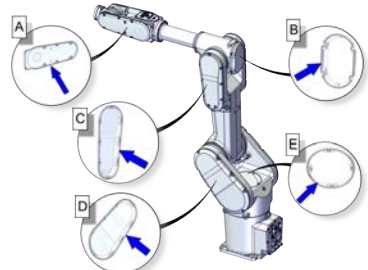
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.</p>	<p>Gasket for base cover: 3HAC067819-001</p>  <p>xx2000002514</p>
2	<p>For robots with protection class IP67 (option 3350-670) Check the seal bolt. Replace if damaged.</p>	<p>Seal bolt: 3HAC032050-001</p>  <p>xx2000002515</p>
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	

Continues on next page

5.3.1 Replacing the cable package
Continued

	Action	Note
4	Refit the connector interface plate to the base.	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (8 pcs) Tightening torque: 2.6 Nm Valid for cabling with rear interface</p>  <p>xx2000001558</p> <p>Valid for cabling with bottom interface (option 3309-1)</p>  <p>xx2000001575</p>

Refitting the covers

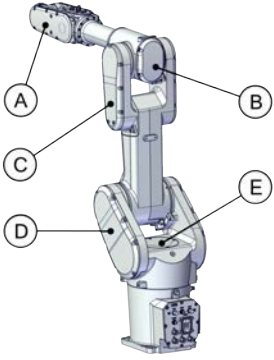
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the gaskets.</p> <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing support cover (D) • Swing top cover (E) <p>Replace if damaged.</p>	 <p>xx2000002497</p>
2	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
3	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001

Continues on next page


5 Repair

5.3.1 Replacing the cable package

Continued

	Action	Note
4	Refit the covers. <ul style="list-style-type: none"> • 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 2C2B/FC6.9 Tightening torque: 2.6 Nm  xx2000001572

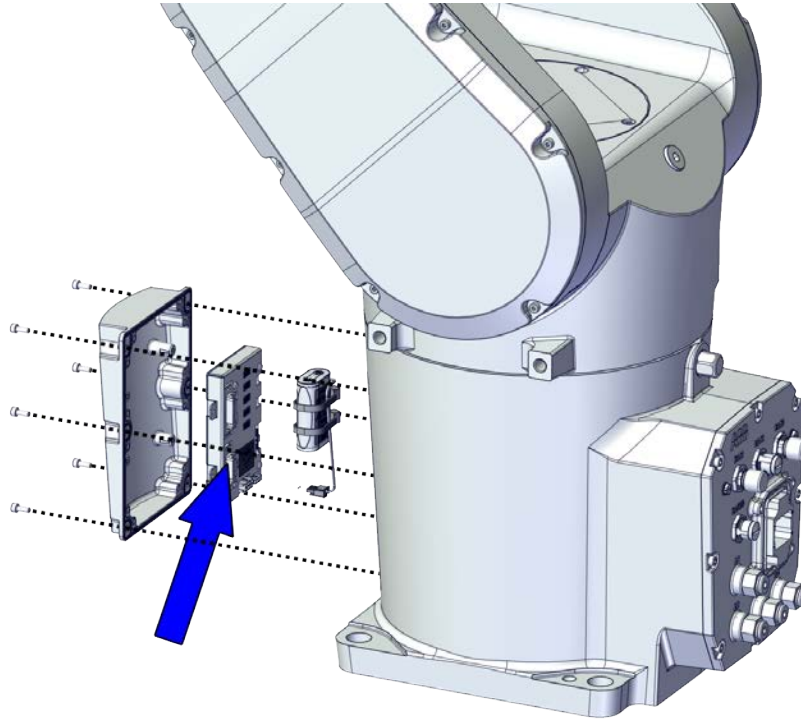
Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Serial measurement unit	3HAC063968-001	
SMB cover	3HAC076475-001	
Gasket for SMB cover	3HAC067820-001	Used with protection class IP67. Replace if damaged.
Battery pack	3HAC044075-001	Battery includes protection circuits. Only replace with the specified spare part or an ABB-approved equivalent.

Continues on next page

5 Repair

5.3.2 Replacing the SMB unit

Continued

Required tools and equipment


Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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.

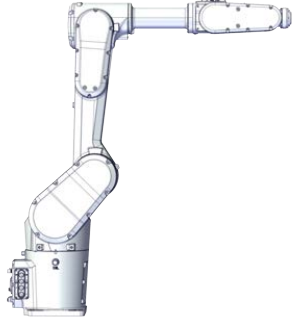

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none">Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	 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 681 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Continues on next page



Removing the 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: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Disconnecting the SMB connectors



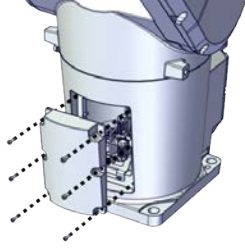

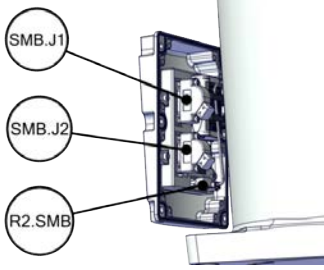
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51 .	

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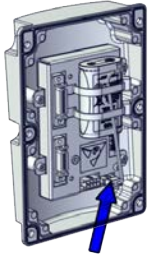
5 Repair

5.3.2 Replacing the SMB unit

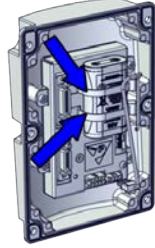
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	Action	Note
3	<p>Remove the SMB cover attachment screws and carefully open the cover.</p> <p> CAUTION</p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p> <p> CAUTION</p> <p>There are cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.</p>	 <p>xx2000001503</p>
4	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • SMB.J1 • SMB.J2 • R2.SMB <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001504</p>
5	Remove the SMB cover completely from the base.	



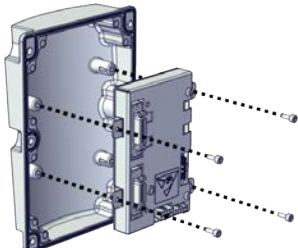
Removing the battery pack

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51.</p>	
3	Disconnect the battery cable.	 <p>xx2000001505</p>

Continues on next page

	Action	Note
4	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 51 .	
3	Remove the screws.	 xx2000001507

Refitting the SMB unit

Use these procedures to refit the SMB unit.

Refitting the SMB unit

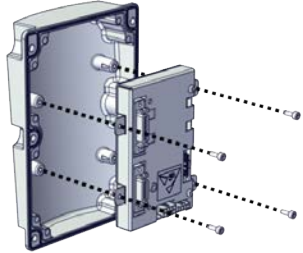
	Action	Note
1	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51 .	

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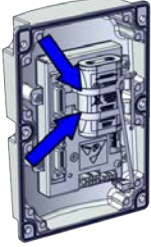
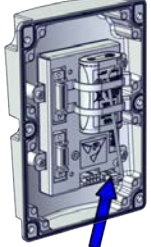
5 Repair

5.3.2 Replacing the SMB unit

Continued



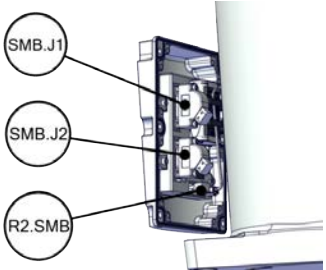

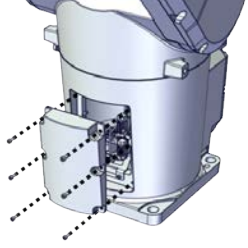
	Action	Note
2	Refit the screws.	<p>Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 1.3 Nm</p>  <p>xx2000001507</p>

Refitting the battery pack


	Action	Note
1	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51.</p>	
2	Secure the battery pack using the cable strap.	 <p>xx2000001506</p>
3	Reconnect the battery cable.	 <p>xx2000001505</p>

Continues on next page

Reconnecting the SMB connectors

	Action	Note
1	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51.</p>	
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • SMB.J1 • SMB.J2 • R2.SMB  <p>Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx2000001504</p>
3	<p>Route and secure the cabling with cable straps.</p>  <p>CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	
4	<p>Refit the SMB cover to the base.</p>	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (6 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001503</p>

Concluding procedure

	Action	Note
1	<p>Recalibrate the robot.</p>	<p>Calibration is detailed in section Calibration on page 673.</p>
2	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 171.</p>	

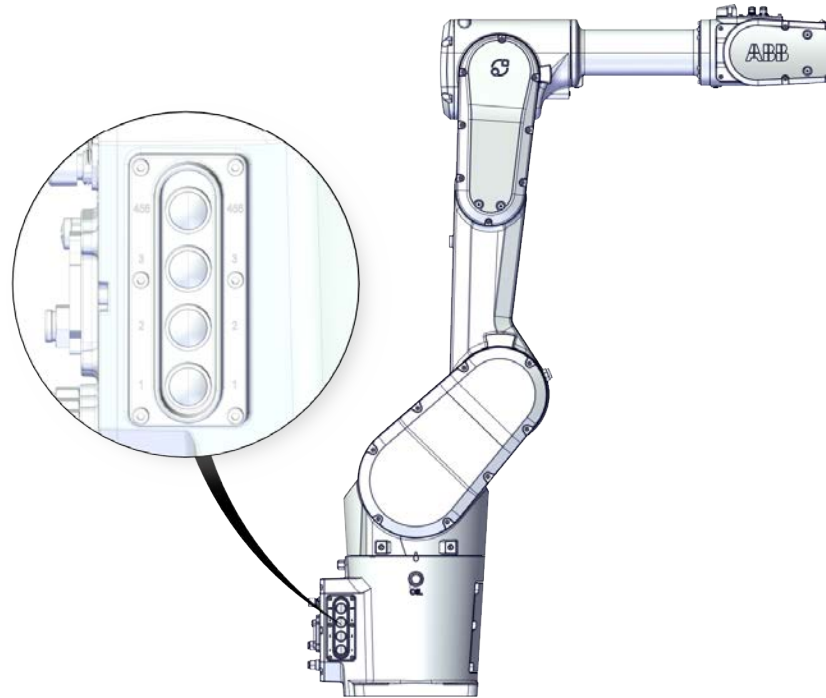
5 Repair

5.3.3 Replacing the brake release unit

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.



xx2200001133

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Brake release unit	3HAC073296-001	
Gasket for brake release unit	3HAC070274-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment


Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .

Continues on next page

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.

Deciding calibration routine

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

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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 681 .
	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

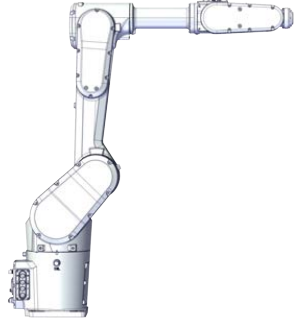

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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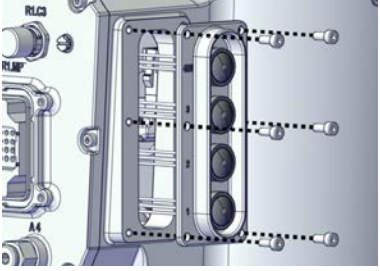
5 Repair

5.3.3 Replacing the brake release unit


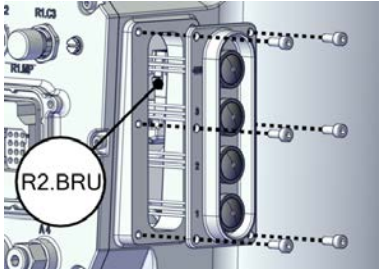
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	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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 51 .	
3	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
4	Cut the cable strap.	


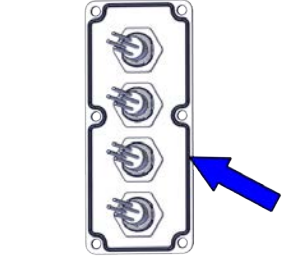

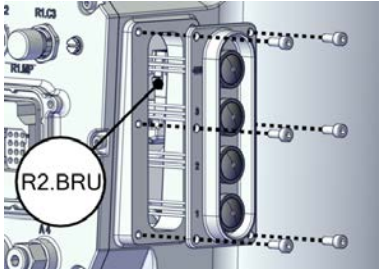
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	Action	Note
5	Disconnect the connector. <ul style="list-style-type: none"> R2.BRU  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>R2.BRU</p> <p>xx2000001578</p>
6	Remove 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


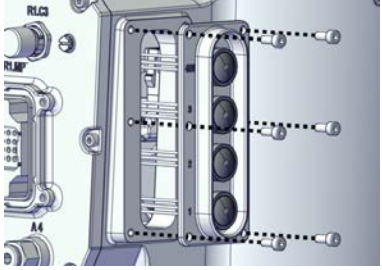
	Action	Note
1	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 51 .	
2	For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.	Gasket for brake release unit: 3HAC070274-001  <p>xx2000002509</p>
3	Reconnect the connector. <ul style="list-style-type: none"> R2.BRU  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>R2.BRU</p> <p>xx2000001578</p>

Continues on next page


5 Repair

5.3.3 Replacing the brake release unit

Continued

	Action	Note
4	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	
5	<p>Refit the brake release unit.</p>	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (6 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001577</p>

Concluding procedure

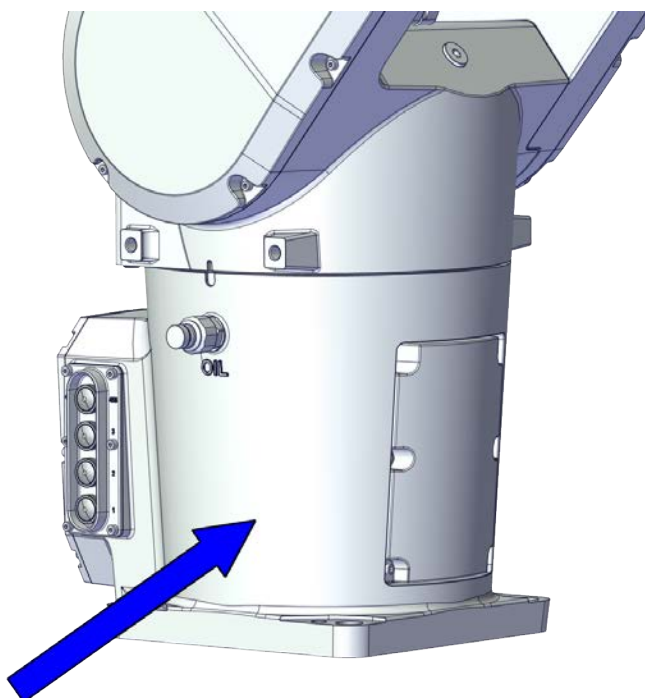
	Action	Note
1	<p>Recalibrate the robot.</p>	<p>Calibration is detailed in section Calibration on page 673.</p>
2	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 171.</p>	

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Base	3HAC073029-001	
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	
Quick coupling	3HAC074630-001	

Continues on next page

5 Repair

5.4.1 Replacing the base

Continued

Spare part	Article number	Note
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 (CP/CS and air hose, with Ethernet)	3HAC073305-001	Used with CRB 1300-11/0.9.
Main cable harness, M (CP/CS and air hose, with Ethernet)	3HAC073302-001	Used with CRB 1300-10/1.15.
Main cable harness, L (CP/CS and air hose, with Ethernet)	3HAC073299-001	Used with CRB 1300-7/1.4.
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
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	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Swing cover, short	3HAC073095-001	Used for CRB 1300-11/0.9.
Swing cover, long	3HAC073096-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Swing top cover	3HAC073091-001	
Base cover	3HAC073090-001	
SMB cover	3HAC076475-001	
Brake release unit	3HAC073296-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for SMB cover	3HAC067820-001	Used with protection class IP67. Replace if damaged.
Gasket for brake release unit	3HAC070274-001	Used with protection class IP67. Replace if damaged.
Gasket for base cover	3HAC067819-001	Used with protection class IP67. Replace if damaged.
Gasket for base adapter	3HAC067818-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.

Continues on next page

Spare part	Article number	Note
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing support, long	3HAC067823-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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.

Continues on next page

5 Repair

5.4.1 Replacing the base

Continued

Equipment	Article number	Note
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 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3.

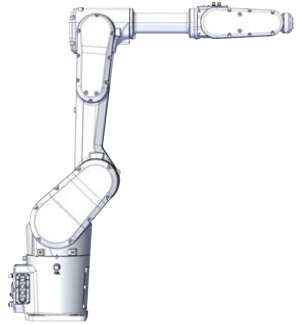

Required consumables

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

Removing the base



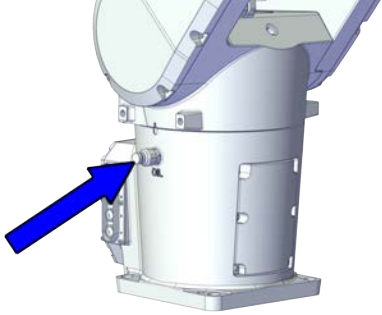
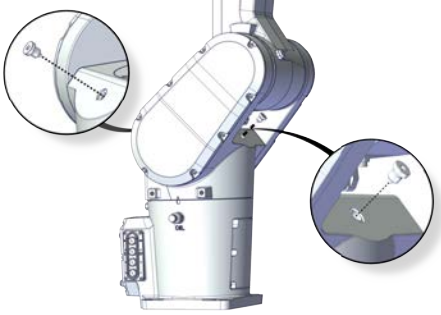

Use these procedures to remove the base.

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: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Continues on next page

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 31 .	
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 717 for more information.	

Continues on next page

5 Repair

5.4.1 Replacing the base




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 226](#) to remove the complete cable package.


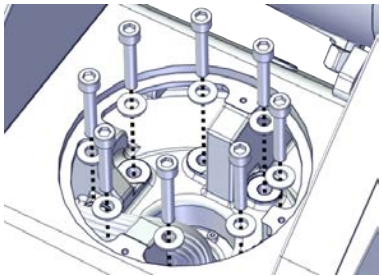
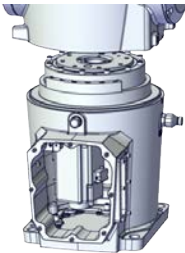
Supporting the arm system with roundsling

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Run a roundsling around the lower arm.	Roundsling, 1.7 m, Lifting capacity: >70 kg  xx2000001651
3	 CAUTION The arm system weighs 52 kg. All lifting accessories used must be sized accordingly!	

Continues on next page

	Action	Note
4	 WARNING The robot is likely to be mechanically unstable if not secured to the foundation.	
5	 WARNING Personnel must not, under any circumstances, be present under the suspended load.	
6	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	Remove screws and washers.	 xx2000000502
3	Lift the arm system little by little to separate the arm system from the base.	 xx2000001702


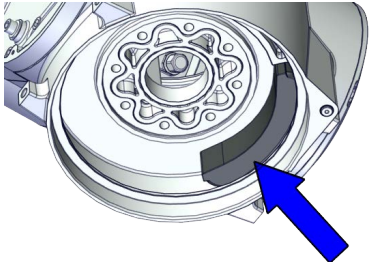
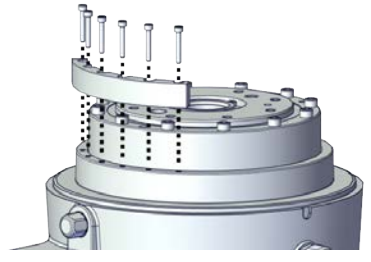
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5 Repair



5.4.1 Replacing the base

Continued

Removing the axis-1 mechanical stops


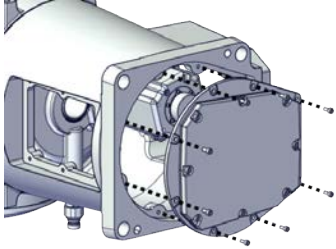
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Access the axis-1 mechanical stop slider from the swing. Put it aside for later refitting.	 <small>xx2000001703</small>
3	Remove the axis-1 mechanical stop fixed block.	 <small>xx2000001693</small>

Removing the base from foundation




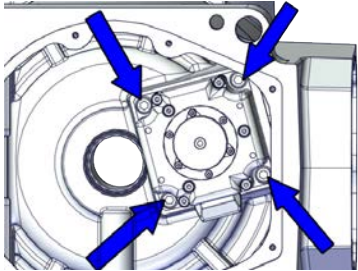
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 WARNING The robot is likely to be mechanically unstable if not secured to the foundation.	
3	Loosen the base from the foundation by removing the foundation attachment screws.	

Continues on next page

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	Valid for cabling with rear interface Remove the base bottom cover together with the base adapter.	 xx2000001642

Removing the axis-1 motor

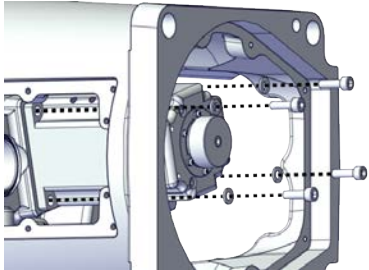
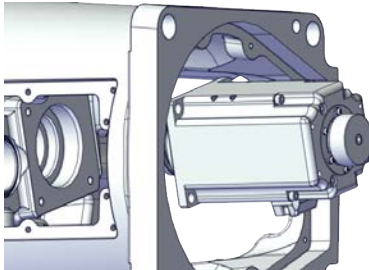
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 WARNING When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section Gearbox lubricants (oil or grease) on page 31 .	
3	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Access the screws and washers securing the axis-1 motor from the base bottom.	 xx2000001643

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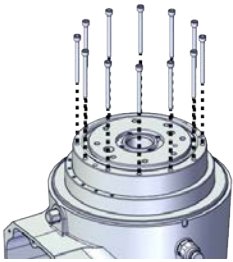
5 Repair

5.4.1 Replacing the base

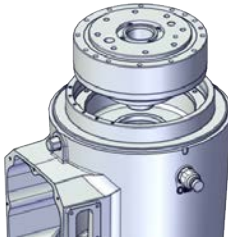
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	Action	Note
5	Remove the screws and washers.	 xx2000001644
6	Carefully lift out the motor.	 xx2000001645

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 Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
3	Remove the screws.	 xx2000001694

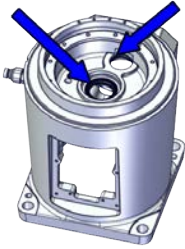

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	Action	Note
4	Pull out the gearbox.	 <p>xx2000001695</p>

Refitting the base

Use these procedures to refit the base.

Checking the radial sealings on the base

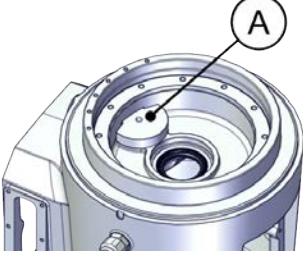
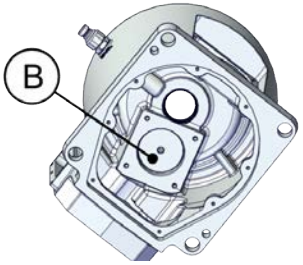
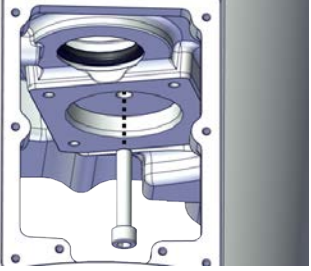
	Action	Note
1	Check the radial sealings on the base. Replace if damaged, as described below.	 <p>xx2000001713</p>
2	Place the new motor-side radial sealing in its groove in the base. The sealing lip is towards the swing side.	<p>Radial sealing: 3HAC066433-001</p>  <p>xx2000001714</p>

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5 Repair

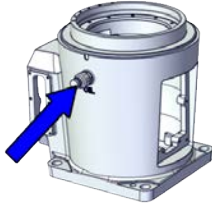
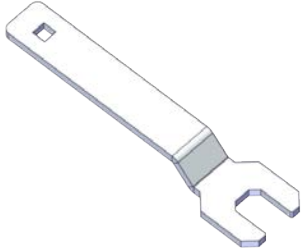
5.4.1 Replacing the base

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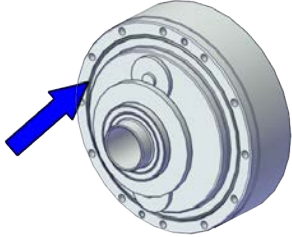
	Action	Note
3	Place the pressfit base (A) against one side of the sealing and the pressfit tool (B) against the other side, as shown in the figures.	<p>Axis-1 gearbox/motor sealing pressfit base. Included in special toolkit 3HAC076396-001.</p>  <p>xx2000001715</p> <p>Axis-1 gearbox/motor sealing pressfit tool. Included in special toolkit 3HAC076396-001.</p>  <p>xx2000001716</p>
4	Fix the pressfit tool with an M8 screw.	 <p>xx2000001717</p>
5	Screw the screw, little by little and evenly, to press the sealing into place.	
6	Repeat steps 2 to 5 to replace the gearbox-side radial sealing.	Radial sealing: 3HAC070148-002

Continues on next page

Checking the quick coupling on the base

	Action	Note
1	Check the quick coupling. Replace if damaged.	Quick coupling: 3HAC074630-001  xx2000001681
2	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

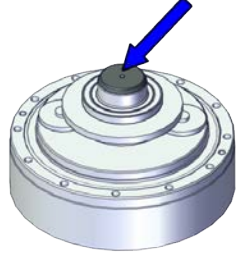
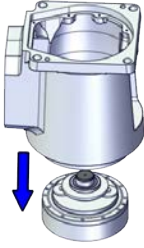
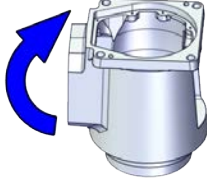
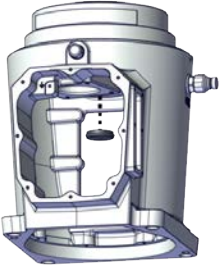
	Action	Note
1	Check the O-ring. Replace if damaged.	O-ring on axis-1 gear unit: 3HAC063187-007  xx2000001696

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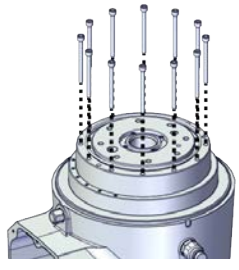
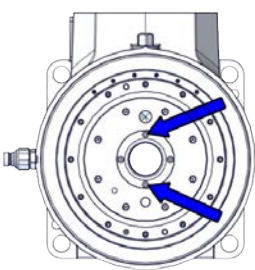
5 Repair

5.4.1 Replacing the base


Continued

	Action	Note
2	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
3	Put the base onto the gearbox.	 xx2000001710
4	Turn the base together with the gearbox over to the standing position.	 xx2000001711
5	Remove the assembly cap.	 xx2000001712

Continues on next page

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

Putting the base on its side

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

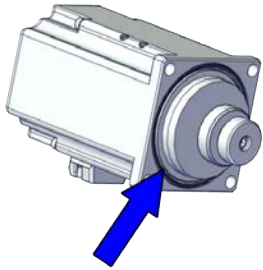
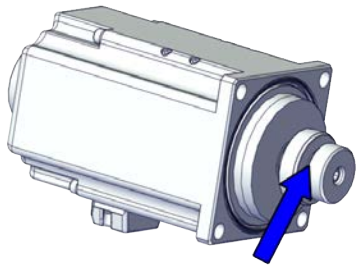
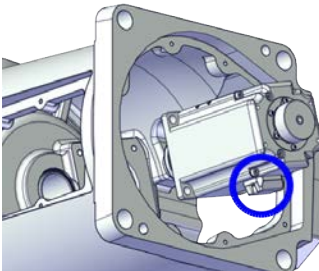
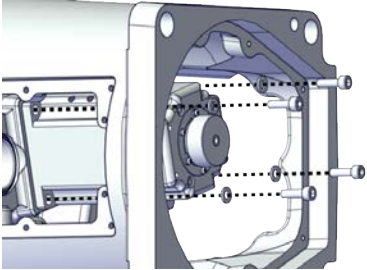
Refitting the axis-1 motor

	Action	Note
1	<p>Check that:</p> <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	

5 Repair

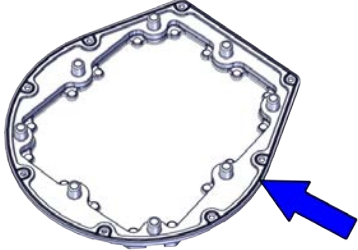
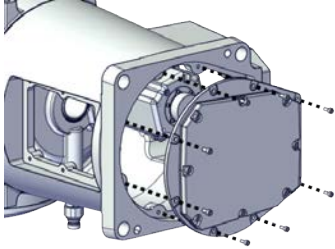
5.4.1 Replacing the base

Continued

	Action	Note
2	Check the O-ring. Replace if damaged.	<p>O-ring on motor unit: 3HAC061327-037</p>  <p>xx2000001646</p>
3	Apply lubricating oil to the motor that has contact- ing area with the gearbox.	<p>Kyodo Yushi TMO150: 3HAC032140-001</p>  <p>xx2000001700</p>
4	Orient the motor correctly and fit it into the swing. Make sure the motor is properly fit to gearbox.	<p>Motor orientation: orient the motor according to the figure below, in regard to the encircled motor con- nector.</p>  <p>xx2000001647</p>
5	Refit the screws and washers.	<p>Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm</p>  <p>xx2000001644</p>

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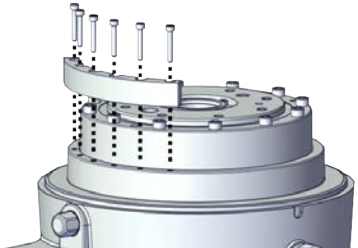
Refitting the base covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Valid for cabling with rear interface</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for base adapter: 3HAC067818-001</p>  <p>xx2000002510</p>
2	<p>Valid for cabling with rear interface</p> <p>Refit the base bottom cover together with the base adapter.</p>	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (8 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001642</p>

Securing the base to the foundation

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

Refitting the axis-1 mechanical stops

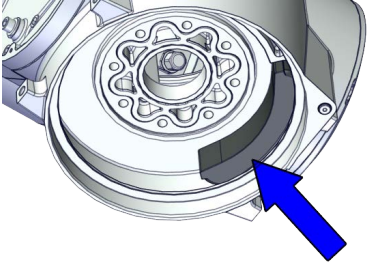
	Action	Note
1	<p>Refit the axis-1 mechanical stop fixed block.</p>	<p>Screw: M4x25 12.9 Lafre 2C2B/FC6.9 (6 pcs)</p> <p>Tightening torque: 3.8 Nm</p>  <p>xx2000001693</p>

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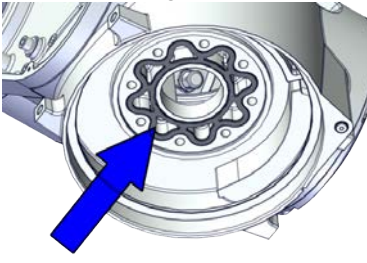
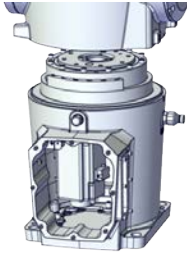
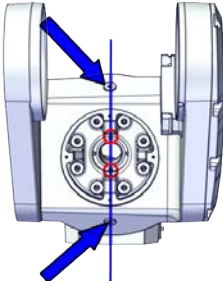
5 Repair

5.4.1 Replacing the base

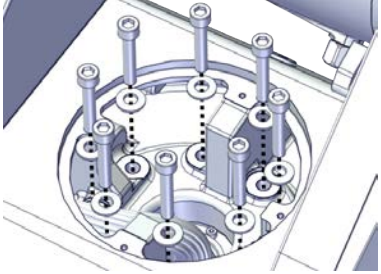
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	Action	Note
2	Apply grease to the axis-1 mechanical stop slider and refit it to the swing.	Grease: 3HAC029132-001  xx2000001703

Securing the arm system to the base

	Action	Note
1	Check the gasket. Replace if damaged.	Gasket on swing: 3HAC067626-001  xx2000001704
2	Place the arm system slowly down to the base.	 xx2000001702
3	Align the oil plugs on the swing with the marked screws on the axis-1 gearbox.	 xx2000001699



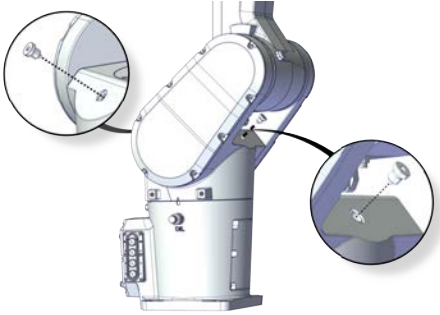
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	Action	Note
4	Secure with screws and washers.	<p>Screw: M8x45 12.9 Gleitmo 603+Geomet 500 (8 pcs) Tightening torque: 36 Nm</p>  <p>xx2000000502</p>

Refitting the complete cable package

Follow the instructions detailed in [Refitting the cable package on page 240](#) to refit the complete cable package.

Refilling oil to axis-1 gearbox



	Action	Note
1	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31.</p>	
2	<p> CAUTION</p> <p>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.</p>	
3	Open the oil plugs, one for filling and the other for venting.	 <p>xx2000001513</p>

Continues on next page


5 Repair

5.4.1 Replacing the base

Continued

	Action	Note
4	 WARNING Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: <ul style="list-style-type: none">• 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.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> .
6	Refit the oil plugs.	Tightening torque: 10 Nm

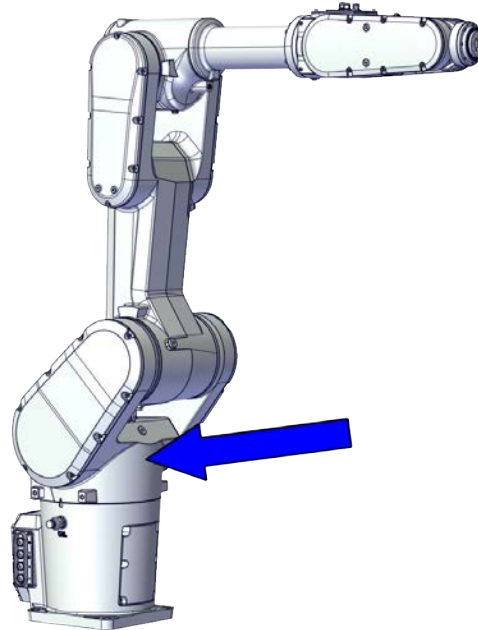
Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Swing, short	3HAC073040-001	Used for CRB 1300-11/0.9.
Swing, long	3HAC073047-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Swing support, short	3HAC073041-001	Used for CRB 1300-11/0.9.
Swing support, long	3HAC073052-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Motor unit, axis 2	3HAC073078-001	
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.

Continues on next page

5 Repair

5.4.2 Replacing the swing

Continued

Spare part	Article number	Note
Magnetic oil plug, G 1/4"	3HAC037925-001	
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
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	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Swing cover, short	3HAC073095-001	Used for CRB 1300-11/0.9.
Swing cover, long	3HAC073096-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Swing top cover	3HAC073091-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing support, long	3HAC067823-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.

Continues on next page

Spare part	Article number	Note
Radial sealing on swing (to lower arm)	3HAC070148-004	Used with protection class IP67. Replace if damaged.
Sealing ring, swing side	3HAC065675-001	Used with protection class IP67.
O-ring on lower arm	3HAC061327-015	Used with protection class IP67. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .

Required consumables

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

Removing the swing

Use these procedures to remove the swing.

Preparations before removing the swing

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

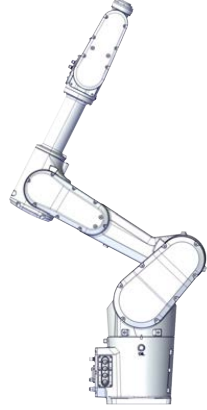

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5 Repair



5.4.2 Replacing the swing

Continued

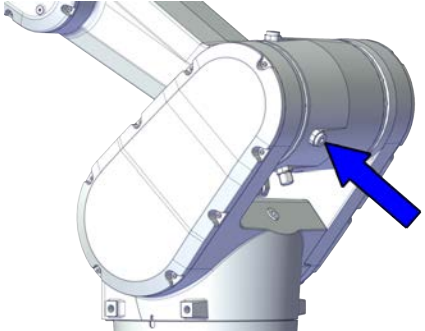
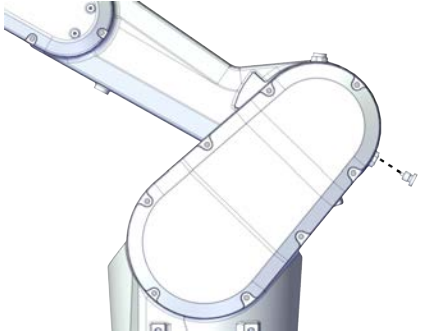
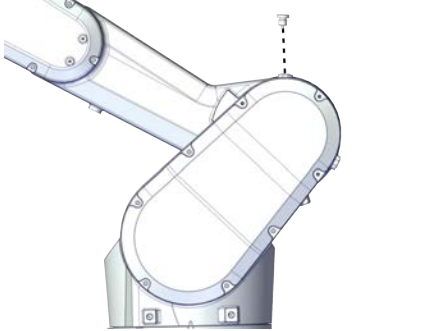


Jogging the robot to oil draining position

	Action	Note
1	<p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance. 	 <p>xx2000001519</p>
2	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

Draining oil of axis-2 gearbox

	Action	Note
1	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31.</p>	
2	<p> CAUTION</p> <p>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.</p>	

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	Action	Note
3	Place the oil collecting vessel underneath the oil plug, draining.	 <p>xx2000001515</p>
4	Remove the oil plug, draining.	 <p>xx2000001516</p>
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.	 <p>xx2000001517</p>
7	 <p>WARNING</p> <p>Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 717 for more information.</p>	
8	Drain the gearbox oil.	 <p>Note</p> <p>Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.</p>

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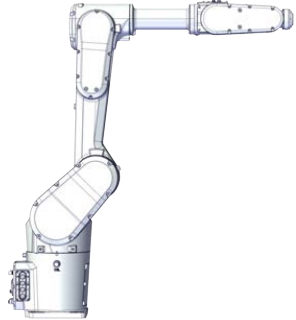

5 Repair

5.4.2 Replacing the swing


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

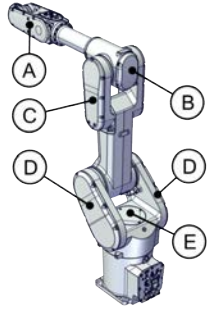
Jogging the robot to zero position

	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 68 .	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	


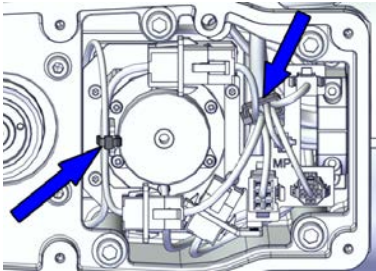

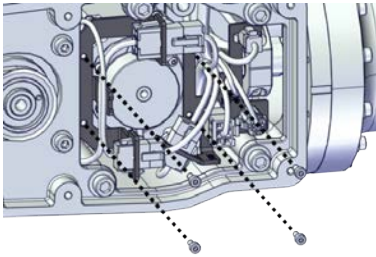
Removing the covers

	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	Remove the covers. <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing covers (D) • Swing top cover (E) 	 <p>xx2000001722</p>

Loosening the cables in the tubular

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	Cut the cable straps.	 <p>xx2000001530</p>
3	 <p>CAUTION</p> <p>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.</p>	 <p>xx2000001531</p>

Disconnecting the axis-6 motor connectors


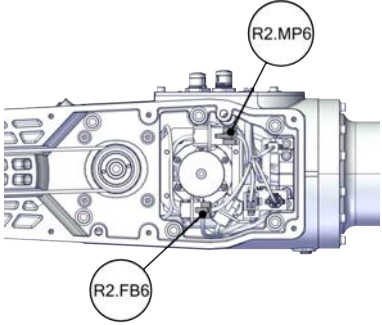
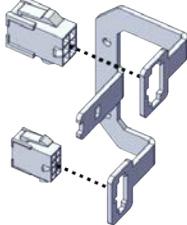
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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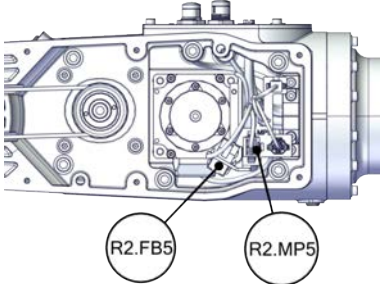
5 Repair

5.4.2 Replacing the swing

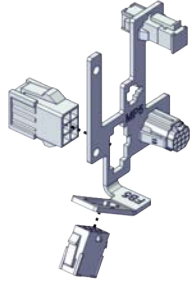
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	Action	Note
2	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP6 • FB6 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001532</p>
3	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001533</p>



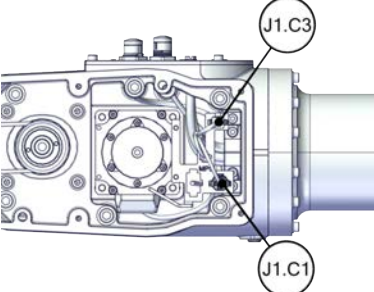
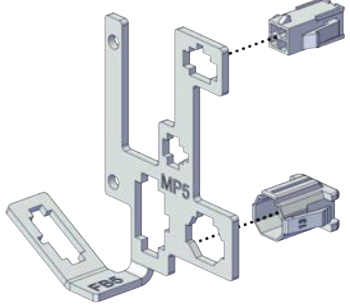
Disconnecting the axis-5 motor connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP5 • FB5 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001534</p>

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	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001535</p>

Disconnecting CP/CS cabling (if equipped)

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>For robots with CP/CS cabling</p> <p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3  <p>Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001536</p>
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>


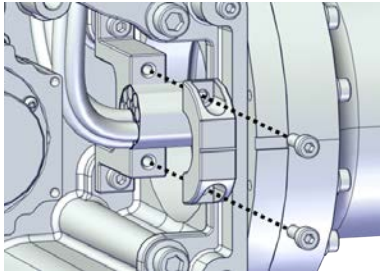
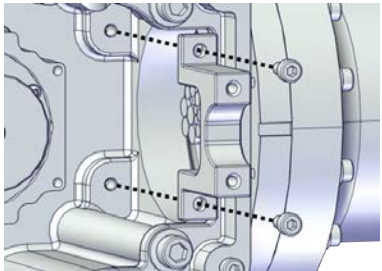
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5 Repair



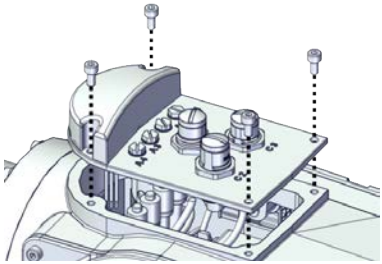
5.4.2 Replacing the swing

Continued

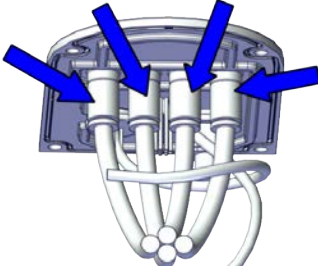


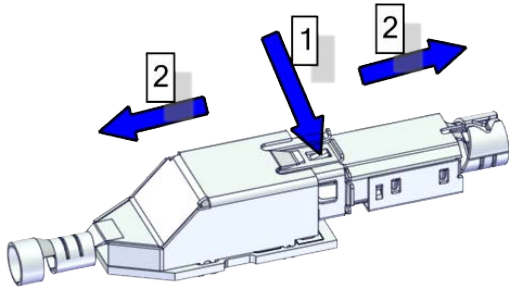
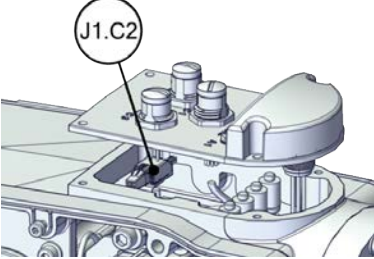
Separating the cable package from the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
3	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub

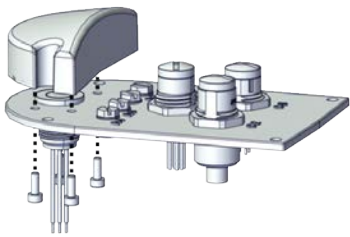
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the screws and carefully open the cover.  CAUTION There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2200001000

Continues on next page

	Action	Note
3	Disconnect the air hoses.	 <p>xx2000001539</p>
4	<p>For robots with Ethernet cabling Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>

Removing the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

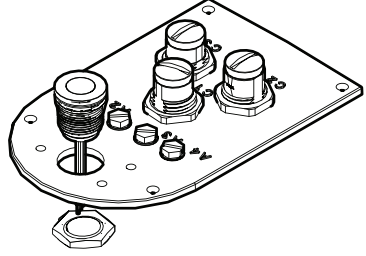
	Action	Note
1	Remove the lamp unit cover.	 <p>xx2200001002</p>

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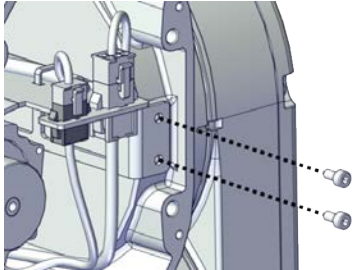

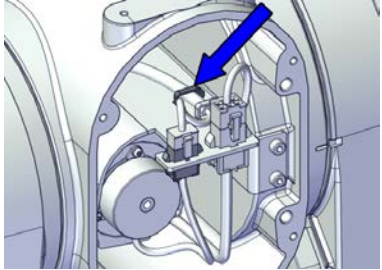

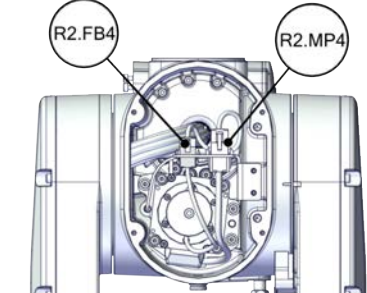
5 Repair

5.4.2 Replacing the swing

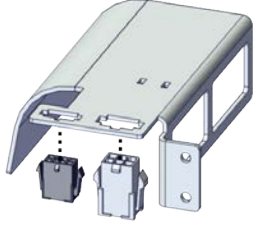
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	Action	Note
2	Remove the lamp unit.	 xx2200001003


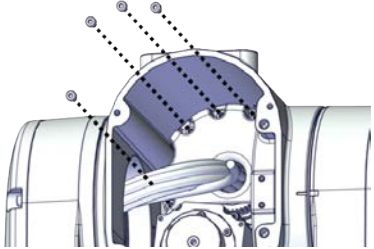
Disconnecting the axis-4 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	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
3	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
4	Disconnect the connectors. <ul style="list-style-type: none"> • MP4 • FB4  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544



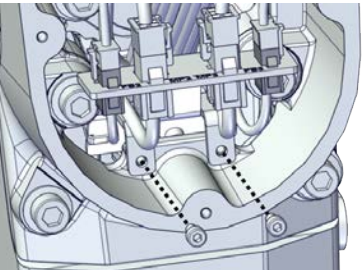
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	Action	Note
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001545</p>

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	Remove the axis-4 cable protector.	 <p>xx2000001546</p>

Disconnecting the axis-2 and -3 motor connectors

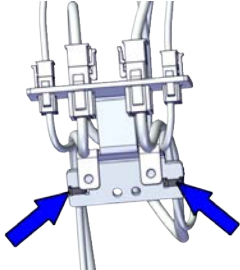

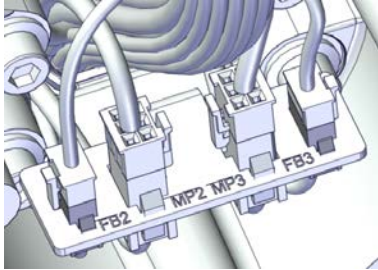
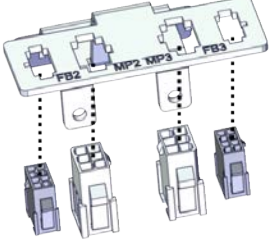
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the connector plate.  CAUTION Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate, as shown in following step.	 <p>xx2000001548</p>

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5 Repair

5.4.2 Replacing the swing

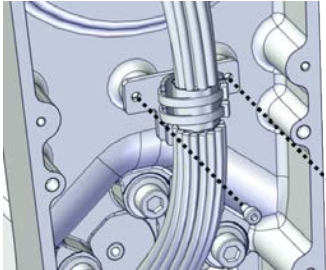
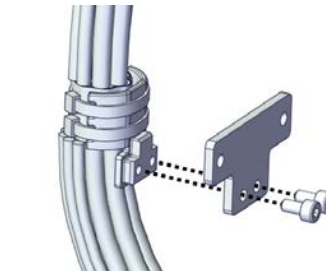
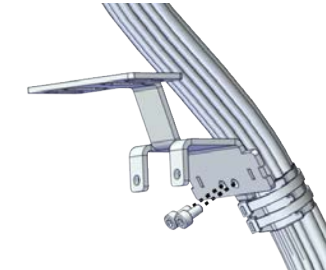
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	Action	Note
3	Cut the cable straps.	 <p>xx2000001549</p>
4	Disconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001550</p>
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001551</p>


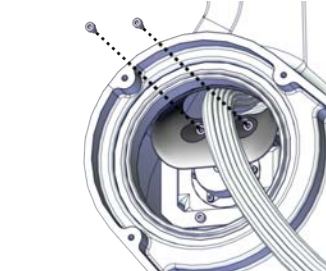
Separating the cable package from the lower arm

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

Continues on next page

	Action	Note
2	Remove the cable bracket from the lower arm first and then from the cable package.	 <p>xx2000001553</p>  <p>xx2100001465</p>
3	Remove the connector plate.	 <p>xx2000001554</p>

Separating the cable package from the swing

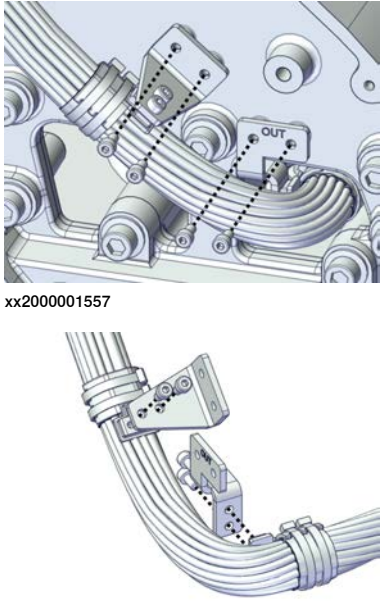
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	Remove the axis-2 cable protector.	 <p>xx2000001556</p>

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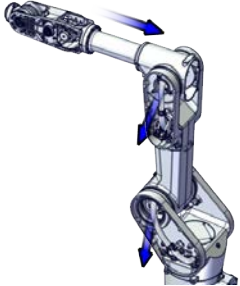
5 Repair

5.4.2 Replacing the swing


Continued

	Action	Note
3	Remove the cable brackets from the swing first and then from the cable package.	 <p>xx2000001557</p> <p>xx2100001466</p>


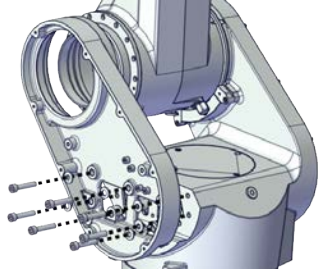
Pulling out the cable package

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Wrap the connectors with the masking tape.	
3	Pull the cable package out to the swing support.	 <p>xx2000001683</p>



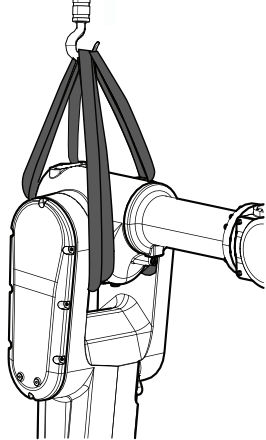

Removing the swing support

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

Continues on next page

	Action	Note
2	<p>Remove the swing support.</p> <p> Tip</p> <p>If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.</p>	 <p>xx2000001684</p>

Supporting the lower and upper arms with roundslings




<p> Note</p> <p>The lower and upper arms include the lower arm, housing, extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit.</p>		
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Run two roundslings between the housing and the lower arm.</p>	<p>Roundslings, 1.7 m (2 pcs), Lifting capacity: >70 kg</p>  <p>xx2000001685</p>
3	<p> CAUTION</p> <p>The lower and upper arms weighs 38 kg. All lifting accessories used must be sized accordingly!</p>	

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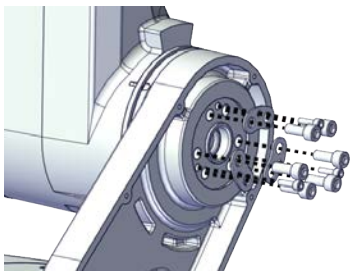

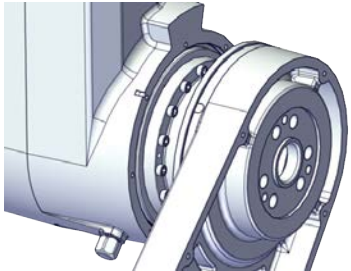
5 Repair

5.4.2 Replacing the swing

Continued



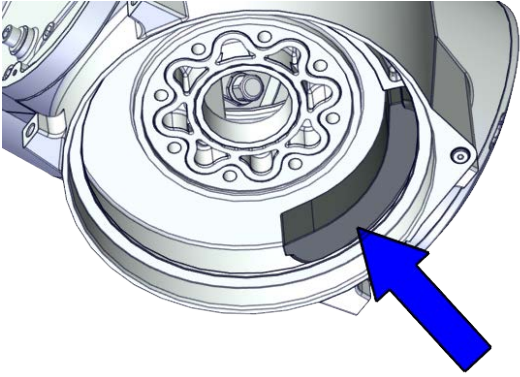
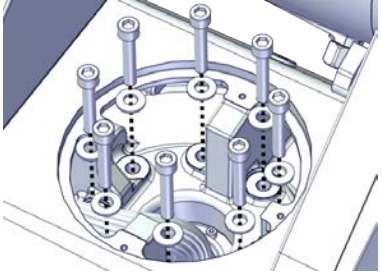
	Action	Note
4	 WARNING The robot is likely to be mechanically unstable if not secured to the foundation!	
5	 WARNING Personnel must not, under any circumstances, be present under the suspended load.	
6	Stretch the roundslings to take the weight of the lower and upper arms.  Note Do not stretch the roundslings 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	Remove the screws.	 <small>xx2000001686</small>
3	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.	 <small>xx2000001687</small>

Continues on next page


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	Separate the swing from the base.  Note The axis-1 mechanical stop slider is accessible from the swing. Put it aside for later refitting.  <small>xx2000001703</small>	 <small>xx2000000502</small>
3	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 top

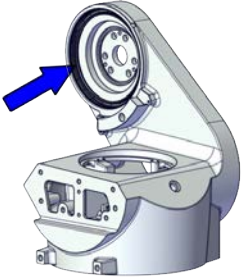
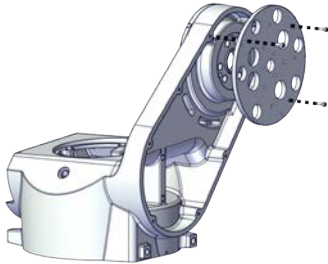
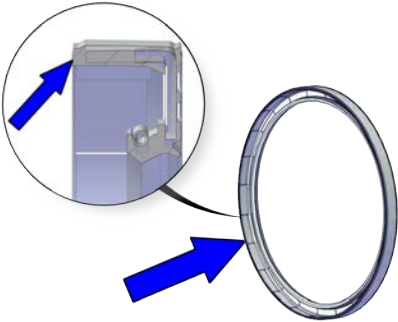
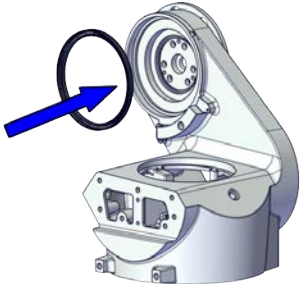
 Note This procedure is valid for robots with: <ul style="list-style-type: none"> • protection class IP67 (option 3350-670)

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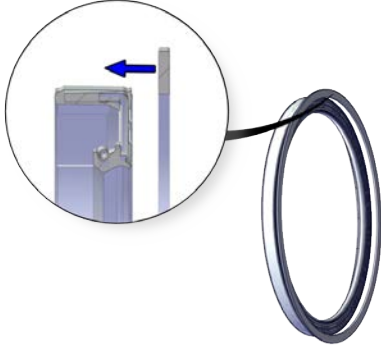
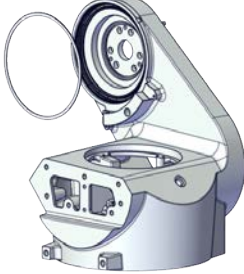
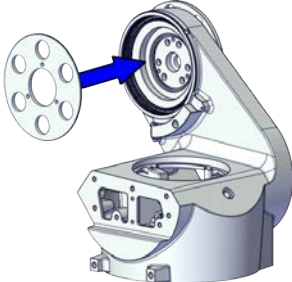
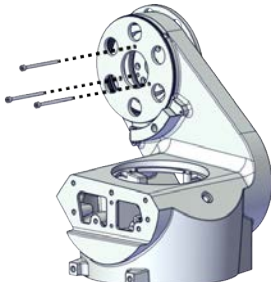
5 Repair

5.4.2 Replacing the swing

Continued

	Action	Note
1	<p>Check the radial sealing on the swing top. Replace if damaged, as described below.</p>	 <p>xx2000002460</p>
2	<p>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.</p>	<p>Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002461</p>
3	<p>Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.</p>	<p>Grease: 3HAC029132-001</p>
4	<p>Fit the new sealing into the swing. For robots with protection class IP67 (option 3350-670) The sealing lip as pointed in the following figure is facing the outer side of the robot.</p>  <p>xx2000002537</p>	 <p>xx2000002462</p>

Continues on next page

	Action	Note
5	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Place the ring of the axis-2 sealing assembly tool against the sealing.</p>  <p>xx2000002562</p>	<p>Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002463</p>
6	<p>Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.</p>	<p>Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002464</p>  <p>xx2000002465</p>
7	<p>Screw the screws, little by little and evenly, to press the sealing into place.</p>	
8	<p>Remove the assembly tool.</p>	
9	<p>Check that the sealing is undamaged and properly fitted.</p>	

Refitting the swing to the base

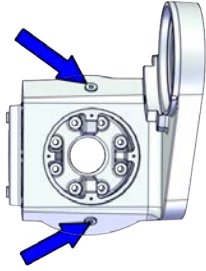
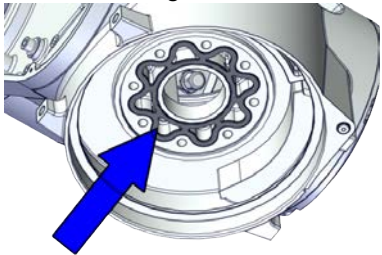
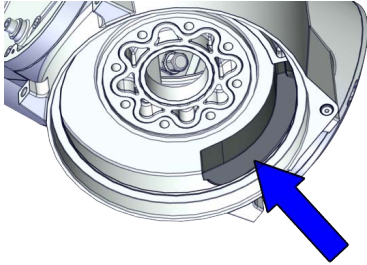
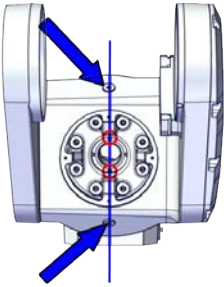
	Action	Note
1	<p>Check the axis-2 mechanical stops. Replace if damaged.</p>	<p>See Replacing the axis-2 mechanical stops on page 336.</p>

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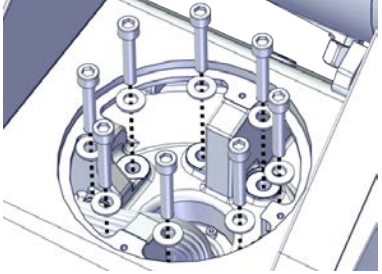
5 Repair

5.4.2 Replacing the swing

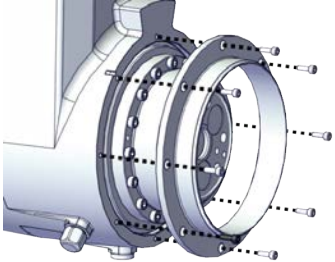
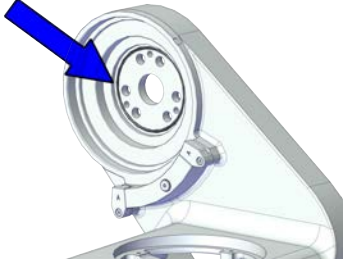
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	Action	Note
2	Check the oil plugs. Replace if damaged.	<p>Magnetic oil plug, G 1/4": 3HAC037925-001 Tightening torque: 10 Nm</p>  <p>xx2000001723</p>
3	Check the gasket. Replace if damaged.	<p>Gasket on swing: 3HAC067626-001</p>  <p>xx2000001704</p>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

Continues on next page

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

Refitting the swing to the lower arm

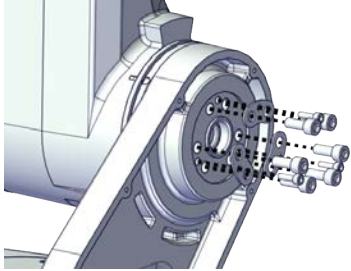
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the sealing ring. Replace if damaged.</p>	<p>O-ring on lower arm: 3HAC061327-015 Sealing ring, swing side: 3HAC065675-001 Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (8 pcs) Tightening torque: 3.8 Nm For robots with protection class IP67 (option 3350-670)</p>  <p>xx2000002516</p>
2	<p>Check the O-ring. Replace if damaged.</p>	<p>O-ring on swing: 3HAC061327-036</p>  <p>xx2000001750</p>

Continues on next page


5 Repair

5.4.2 Replacing the swing



Continued

	Action	Note
3	Refit the swing to the lower arm.	<p>M10 screws Screw: M10x25 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 72 Nm</p> <p>M6 screws Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (3 pcs) Tightening torque: 14 Nm</p>  <p>xx2000001686</p>

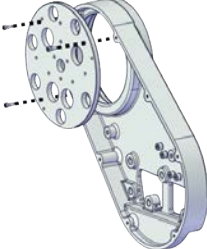
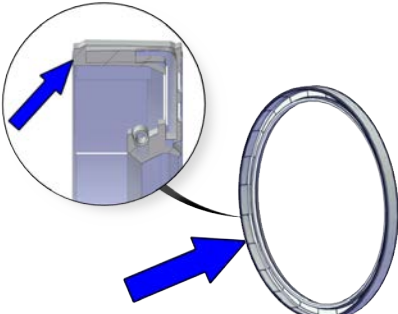
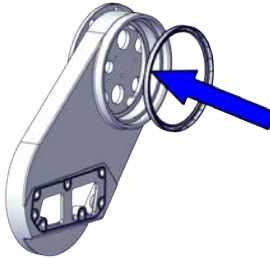
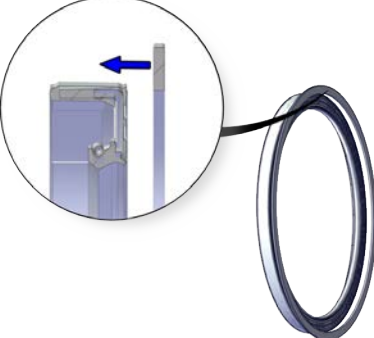

Releasing the weight support for lower and upper arms

	Action	Note
1	 WARNING Personnel must not, under any circumstances, be present under the suspended load.	
2	Make sure the lower and upper arms are firmly secured with the swing.	
3	Remove the roundslings.	

Check the radial sealing on the swing support

 Note This procedure is valid for robots with: <ul style="list-style-type: none"> • protection class IP67 (option 3350-670) 		
	Action	Note
1	Check the radial sealing on the swing support. Replace if damaged, as described below.	 <p>xx2000002466</p>

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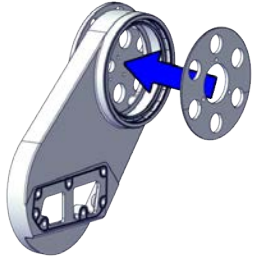
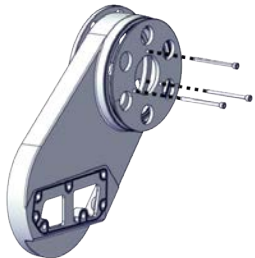
	Action	Note
2	Fit the big circular plate of the axis-2 sealing assembly tool to the swing support (opposite side of the radial sealing) with three M4x12 screws.	<p>Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002467</p>
3	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
4	<p>Fit the new sealing into the swing support. For robots with protection class IP67 (option 3350-670)</p> <p>The sealing lip as pointed in the following figure is facing the outer side of the robot.</p>  <p>xx2000002537</p>	 <p>xx2000002468</p>
5	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Place the ring of the axis-2 sealing assembly tool against the sealing.</p>  <p>xx2000002562</p>	<p>Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002469</p>

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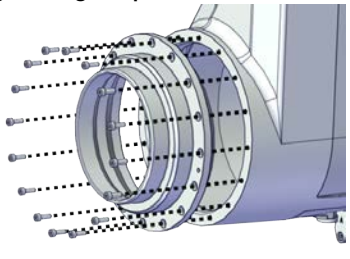
5 Repair

5.4.2 Replacing the swing

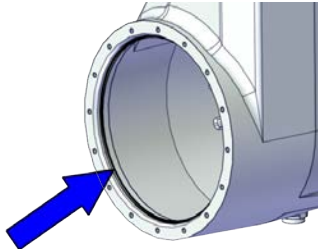
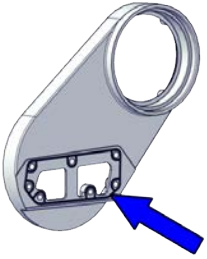

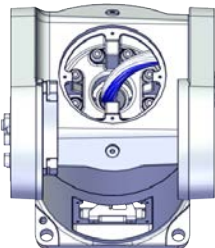
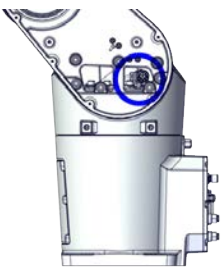
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	Action	Note
6	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	<p>Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002470</p>  <p>xx2000002471</p>
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 swing support

	Action	Note
1	Check the sealing ring. Replace if damaged.	<p>Sealing ring, swing support side: 3HAC065676-001</p> <p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (16 pcs)</p> <p>Tightening torque: 3.8 Nm</p>  <p>xx2000001692</p>

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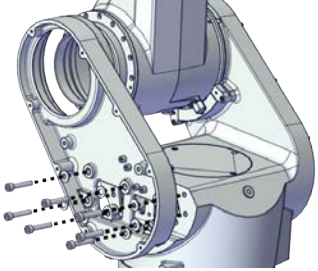
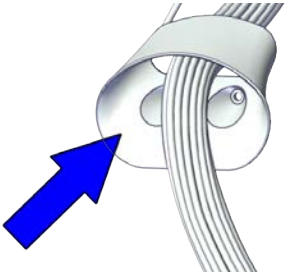
	Action	Note
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the O-ring. Replace if damaged.</p>	<p>O-ring on lower arm: 3HAC061327-015</p>  <p>xx2000002518</p>
3	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket for swing support, short: 3HAC067822-001 Gasket for swing support, long: 3HAC067823-001</p>  <p>xx2000002520</p>
4	<p>Route the cable package through the swing support.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> 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. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001745</p>  <p>xx2000001747</p>

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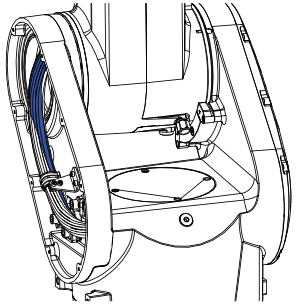
5 Repair

5.4.2 Replacing the swing

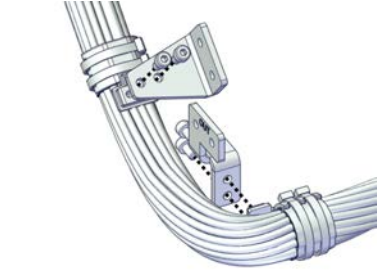
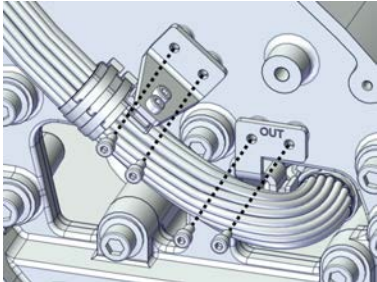
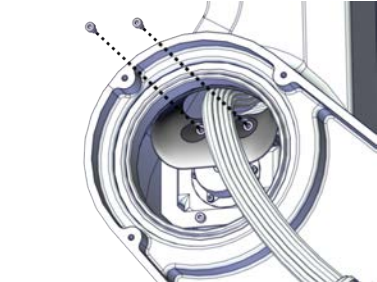
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	Action	Note
5	Refit the swing support.	<p>Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 36 Nm</p>  <p>xx2000001684</p>
6	Apply grease to the axis-2 cable protector and slip it over the cable harness.	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 2: 3HAC067816-001</p>  <p>xx2000001567</p>

Securing the cable package in the swing

	Action	Note
1	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.	 <p>xx2000001746</p>

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	Action	Note
2	Refit the cable brackets.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each bracket on cable package and 2 pcs on swing)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2100001466</p>  <p>xx2000001557</p>
3	Refit the axis-2 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001556</p>

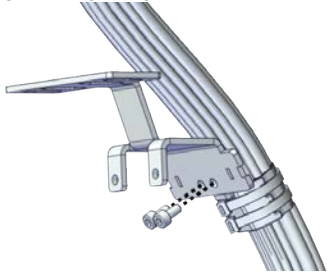

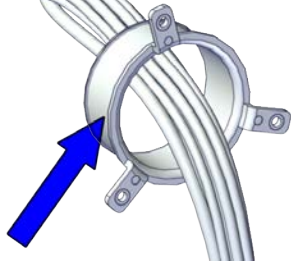
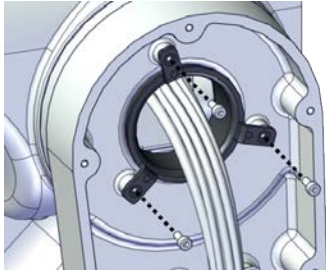

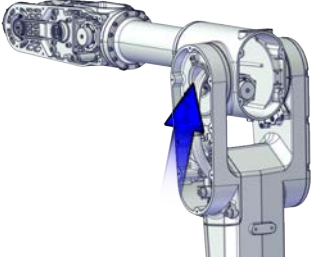
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5 Repair

5.4.2 Replacing the swing

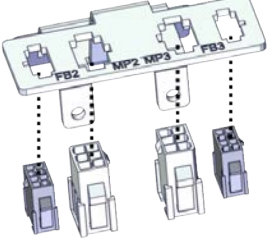

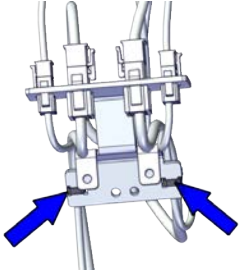

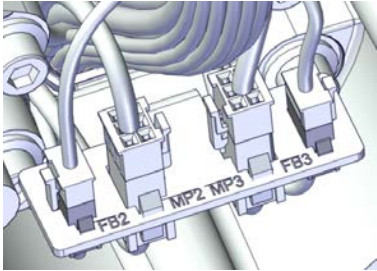
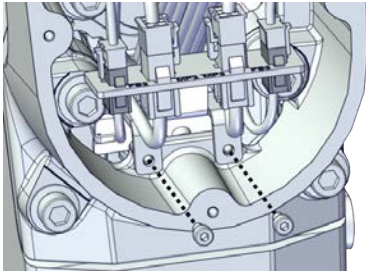
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Routing the cable package in the lower arm

	Action	Note
1	Refit the connector plate to the cable package.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001554</p>
2	<p>Check the axis-3 cable protector. Replace if damaged.</p> <p> Note</p> <p>If replaced, apply grease to the axis-3 cable protector before refitting.</p>	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001</p>  <p>xx2000001568</p> <p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (3 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001552</p>
3	<p>Route the cable package through the lower arm support and up into the housing.</p> <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001569</p>

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Reconnecting the axis-2 and -3 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001551</p>
2	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.	 <p>xx2000001549</p>
3	Reconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001550</p>
4	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  <p>xx2000001548</p>

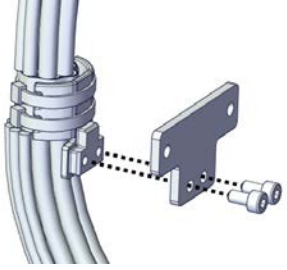
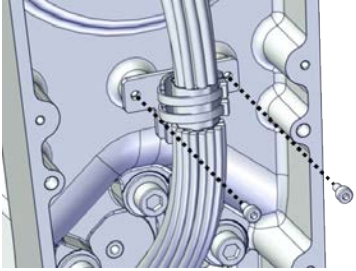
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5 Repair

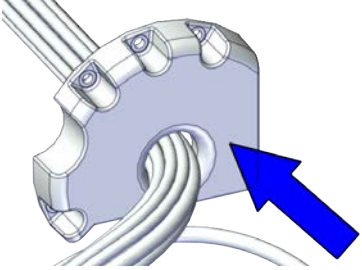

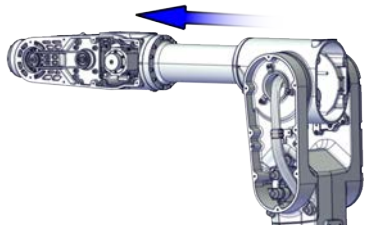
5.4.2 Replacing the swing

Continued

Securing the cable package in the lower arm

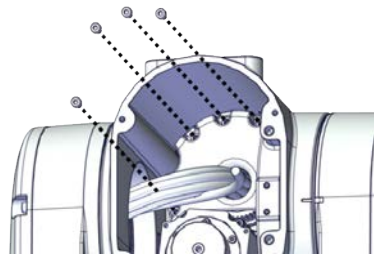
	Action	Note
1	Refit the cable bracket.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm</p>  <p>xx2100001465</p>  <p>xx2000001553</p>

Routing the cable package in the housing

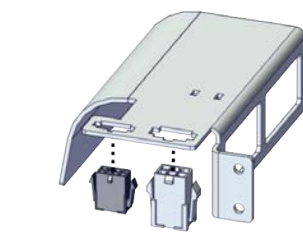

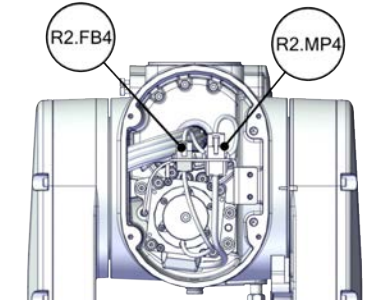


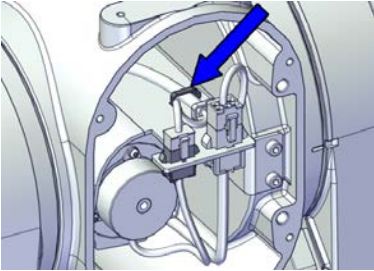
	Action	Note
1	Slip the axis-4 cable protector over the cable package.	<p>Plastic cable protector, axis 4: 3HAC064694-001:</p>  <p>xx2000001570</p>
2	<p>Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for CRB 1300-7/1.4 and) and into the tubular.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001571</p>

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Securing the cable package in the housing

	Action	Note
1	Refit the axis-4 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001546</p>

Reconnecting the axis-4 motor connectors

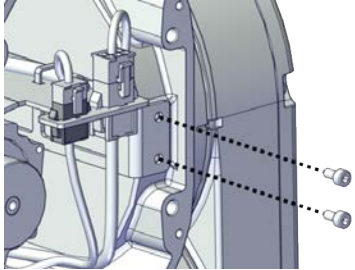
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001545</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB4 • MP4 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001544</p>
3	<p>Route and secure the cabling with a cable strap.</p> <p> Note</p> <p>The motor cabling has another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001543</p>

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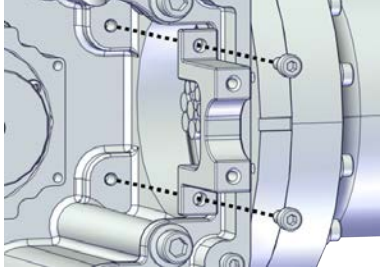
5 Repair

5.4.2 Replacing the swing

Continued

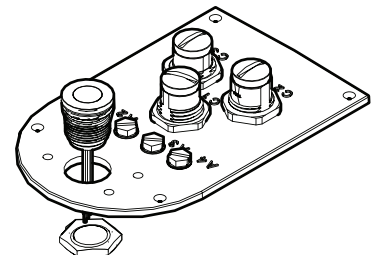
	Action	Note
4	Refit the connector plate.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001542</p>

Routing the cable package in the tubular

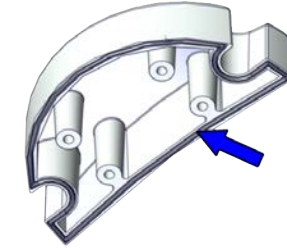
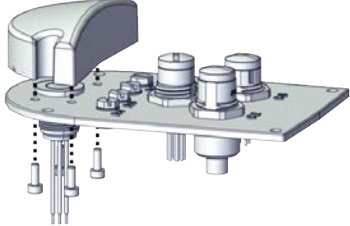
	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001749</p>
2	<p>Route the cablings.</p> <ul style="list-style-type: none"> • Leave the CP/CS connectors and motor connectors out from the tubular support, and Ethernet connectors and air hoses out from the process hub. • The air hoses are facing upside in the semicircular bracket. 	

Refitting the lamp unit


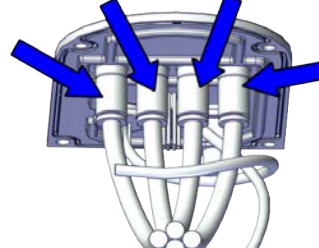

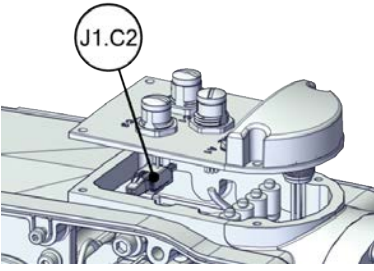
Notice that the procedure is valid only when the lamp unit needs a replacement.

	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>

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	Action	Note
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>
3	<p>Refit the lamp unit cover.</p>	<p>Lamp unit cover: 3HAC082320-001</p> <p>Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs)</p> <p>Tightening torque: 0.6 Nm</p>  <p>xx2200001002</p>

Reconnecting the air hoses and Ethernet cabling (if equipped)

	Action	Note
1	<p>Reconnect the air hoses.</p> <p> Note</p> <p>See the number markings on the air hoses for help to find the corresponding air hoses.</p>	 <p>xx2000001539</p>
2	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and reconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2200001001</p>

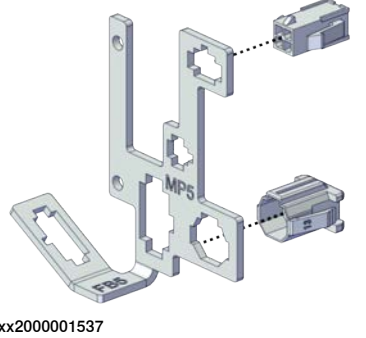

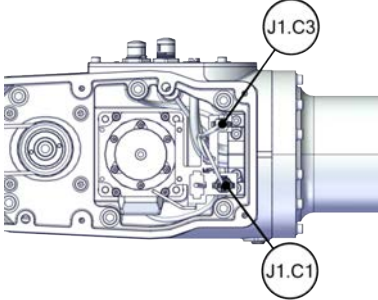
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5 Repair

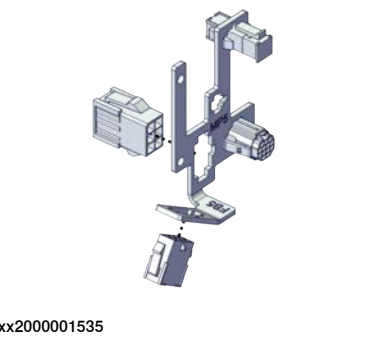

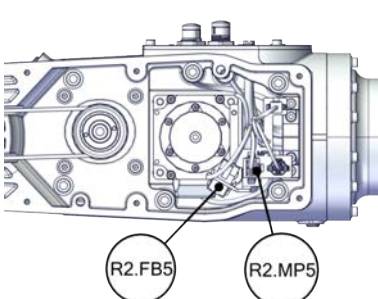
5.4.2 Replacing the swing

Continued

Reconnecting the CP/CS cabling (if equipped)

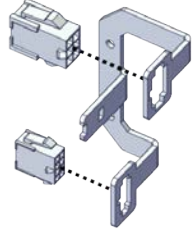

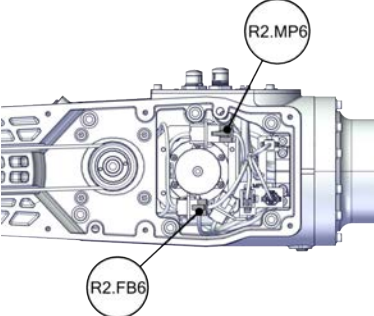
	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>
2	For robots with CP/CS cabling Reconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001536</p>

Reconnecting the axis-5 motor connectors

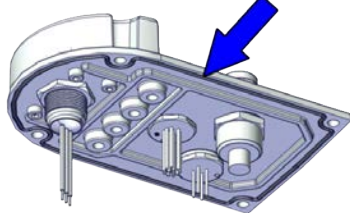
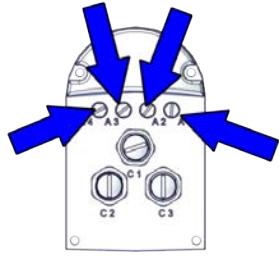
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001535</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB5 • MP5  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001534</p>

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Reconnecting the axis-6 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001533</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB6 • MP6  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001532</p>

Refitting the process hub


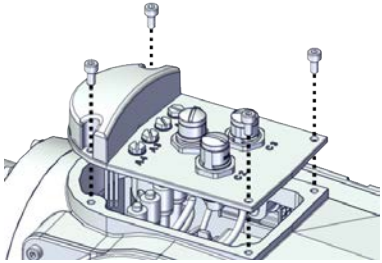
	Action	Note
1	For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  <p>xx2200001005</p>
2	For robots with protection class IP67 (option 3350-670) Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  <p>xx2200001006</p>

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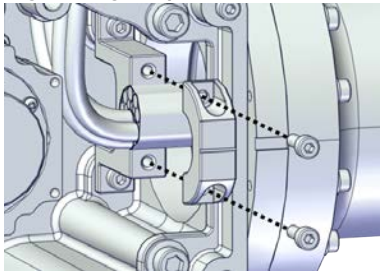
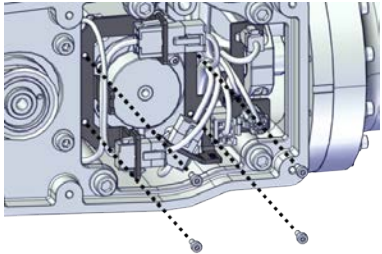
5 Repair

5.4.2 Replacing the swing


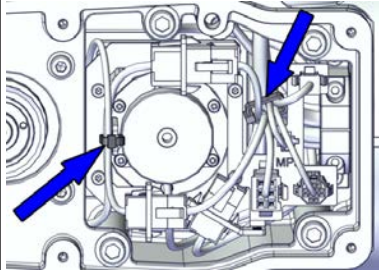
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	Action	Note
3	Route and secure the cabling with cable straps.  CAUTION Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	
4	Refit the process hub.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm  xx2200001000

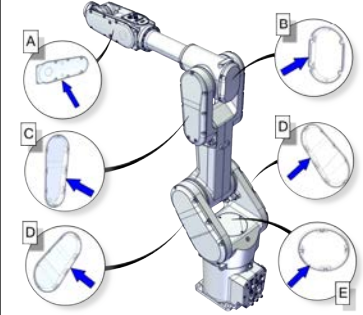
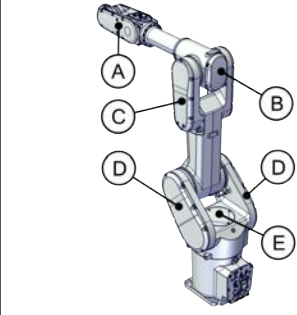
Securing the cable package in the tubular

	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001748
2	Refit the connector plate.	Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531

Continues on next page

	Action	Note
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>

Refitting the covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets.</p> <ul style="list-style-type: none"> • 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) <p>Replace if damaged.</p>	 <p>xx2000002500</p>
2	<p>Apply grease to the cable package, cover all moving area of the package.</p>	<p>Grease: 3HAC029132-001</p>
3	<p>Apply grease to the covers that have contacting area with the cable package.</p>	<p>Grease: 3HAC029132-001</p>
4	<p>Refit the covers.</p> <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing covers (D) • Swing top cover (E) 	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001722</p>

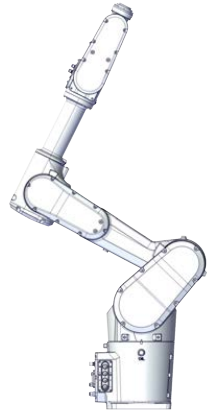

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5 Repair



5.4.2 Replacing the swing

Continued


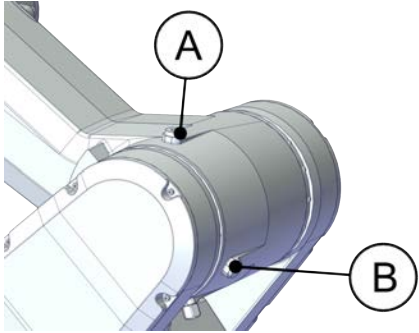




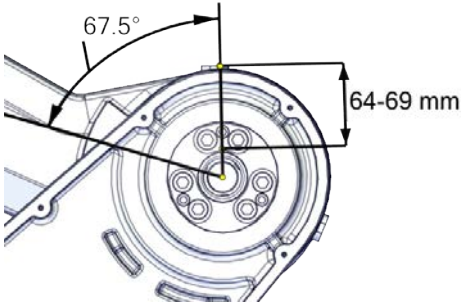
Jogging the robot to oil filling position

	Action	Note
1	<p>Turn on the electric power to the robot.</p> <p>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 68.</p>	
2	<p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance. 	 <p>xx2000001519</p>
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

Refilling oil to axis-2 gearbox

	Action	Note
1	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31.</p>	
2	<p> CAUTION</p> <p>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.</p>	

Continues on next page


	Action	Note				
3	<p>Open the upper oil plug.</p> <p> Note</p> <p>The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.</p>	 <table border="1"> <tr> <td>A</td> <td>Oil plug, opened</td> </tr> <tr> <td>B</td> <td>Oil plug, closed</td> </tr> </table>	A	Oil plug, opened	B	Oil plug, closed
A	Oil plug, opened					
B	Oil plug, closed					
4	<p> WARNING</p> <p>Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may:</p> <ul style="list-style-type: none"> • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely. 					
5	<p>Refill the gearbox with oil.</p> <p> Note</p> <p>The amount of oil to be filled depends on the amount previously being drained.</p> <p> CAUTION</p> <p>Oil filling must be slow to make sure air venting is fluent.</p>	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p>				
6	<p>Inspect the oil level by measuring the level at the upper oil plug hole.</p> <p>Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole.</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>					
7	<p>Refit the oil plug.</p>	<p>Tightening torque: 10 Nm</p>				

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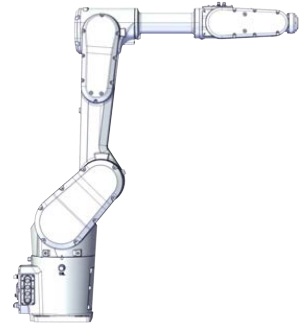

5 Repair

5.4.2 Replacing the swing


Continued

	Action	Note
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 68 .	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

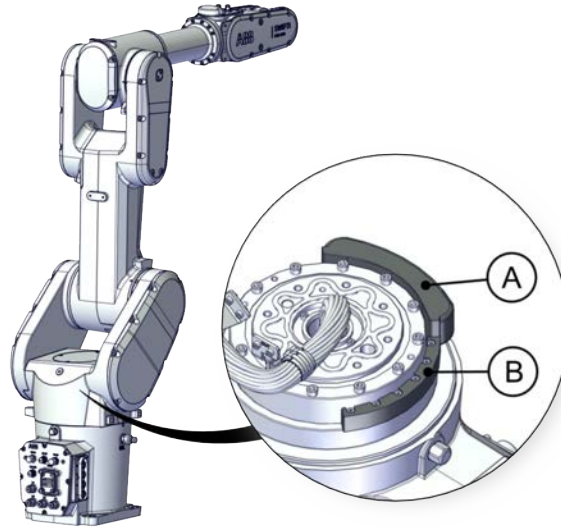
Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

5.4.3 Replacing the axis-1 mechanical stops

Location of the mechanical stops

The mechanical stops are located as shown in the figure.



xx2200001134

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 CRB 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 728 .

Continues on next page

5 Repair

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 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .

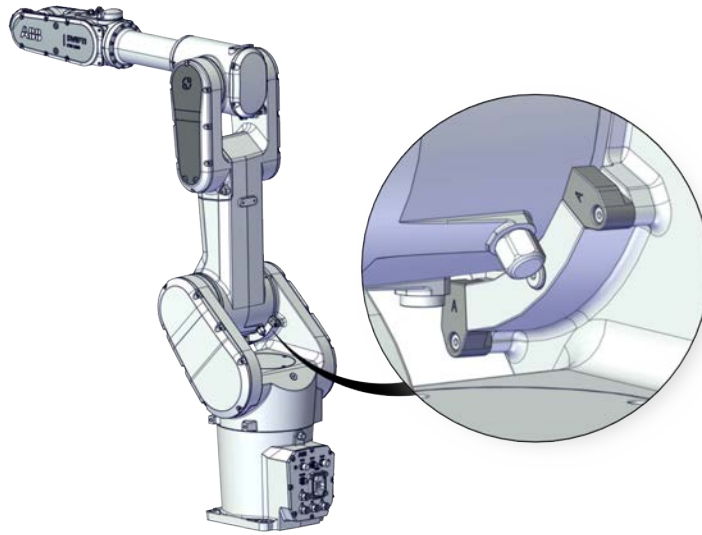
Replacement of axis-1 mechanical stops

The axis-1 mechanical stops, both block and slider, are accessible after removing the base, see [Replacing the base on page 271](#).

5.4.4 Replacing the axis-2 mechanical stops

Location of the mechanical stops

The mechanical stops are located as shown in the figure.



xx2200001135

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 CRB 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 728 .

Required consumables

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


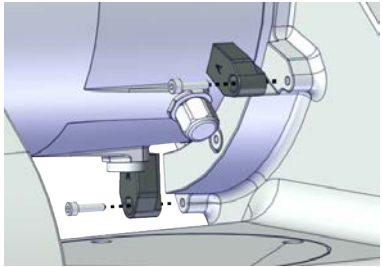

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5 Repair

5.4.4 Replacing the axis-2 mechanical stops

Continued

Replacing the axis-2 mechanical stops

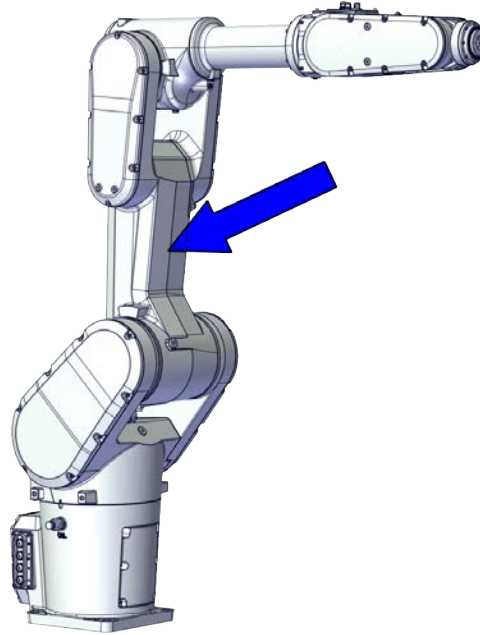
	Action	Note
1	Jog the robot to a position where the mechanical stops are most easily accessed.	
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove the mechanical stops.	 <small>xx2000000506</small>
4	Discard the old stops and refit with new ones.	Mechanical stop, block A: 3HAC065651-001 (2 pcs)
5	Apply a little Loctite 243 to the screws.  Note If there is locking liquid residues on the screw, please clean it before refitting. Remove residual locking liquid after refitting.	
6	Secure the mechanical stops.	Screw: M4x16 stainless steel (1 pcs per stop) Tightening torque: 1 Nm

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Lower arm, short	3HAC073073-001	Used for CRB 1300-11/0.9. Used with protection class IP40.
Lower arm, short, IP67	3HAC077798-001	Used for CRB 1300-11/0.9. Used with protection class IP67.
Lower arm, long	3HAC073074-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP40.
Lower arm, long, IP67	3HAC077799-001	Used for CRB 1300-10/1.15, CRB 1300-7/1.4 and . Used with protection class IP67.

Continues on next page

5 Repair

5.5.1 Replacing the lower arm

Continued

Spare part	Article number	Note
Lower arm support	3HAC073076-001	
Swing support, short	3HAC073041-001	Used for CRB 1300-11/0.9.
Swing support, long	3HAC073052-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Gear unit, axis 2	3HAC064977-001	
Motor unit, axis 2	3HAC073078-001	
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	
Timing belt, axis 3	3HAC067040-001	
Mechanical stop, block A	3HAC065651-001	Replace if damaged.
Mechanical stop, block B	3HAC065671-001	Used for axis 3 of CRB 1300-10/1.15. Replace if damaged.
Magnetic oil plug, G 1/4"	3HAC037925-001	
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
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	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Swing cover, short	3HAC073095-001	Used for CRB 1300-11/0.9.
Swing cover, long	3HAC073096-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm support	3HAC067826-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.

Continues on next page

Spare part	Article number	Note
Gasket for swing support, short	3HAC067822-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing support, long	3HAC067823-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.
Radial sealing on swing (to lower arm)	3HAC070148-004	Used with protection class IP67. Replace if damaged.
Radial sealing on lower arm	3HAC070148-005	Used with protection class IP67. Replace if damaged.
Sealing ring, swing side	3HAC065675-001	Used with protection class IP67.
O-ring on lower arm	3HAC061327-015	Used with protection class IP67. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .

Continues on next page

5 Repair

5.5.1 Replacing the lower arm

Continued

Required consumables

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

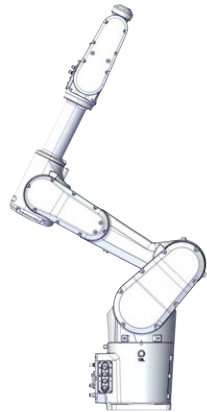

Removing the lower arm

Use these procedures to remove the lower arm.

Preparations before removing the lower arm



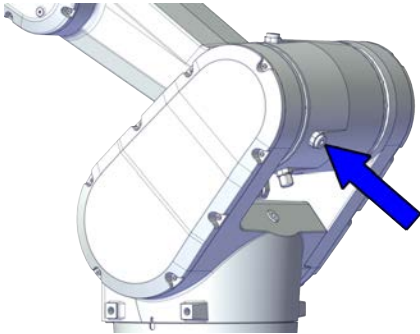
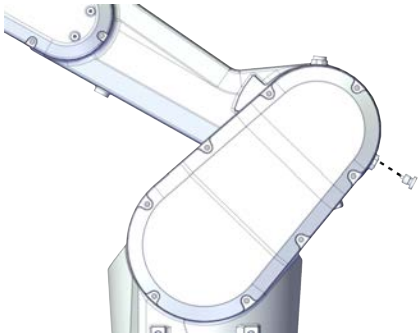
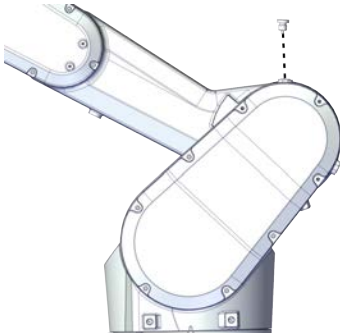
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

Jogging the robot to oil draining position

	Action	Note
1	Jog the robot to the specified position: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the safeguarded space.	

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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 31 .	
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

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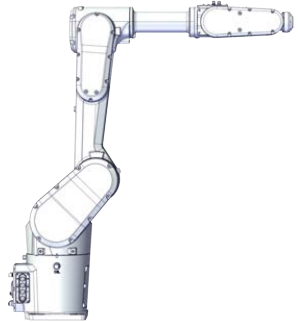

5 Repair

5.5.1 Replacing the lower arm

Continued


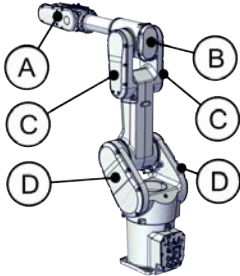
	Action	Note
7	 WARNING Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 717 for more information.	
8	Drain the gearbox oil.	 Note Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.
9	Remove and clean the pipe after 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


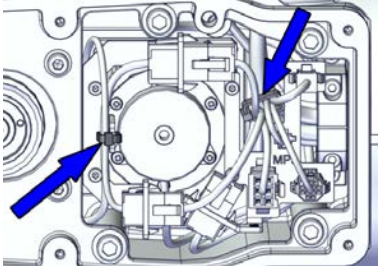

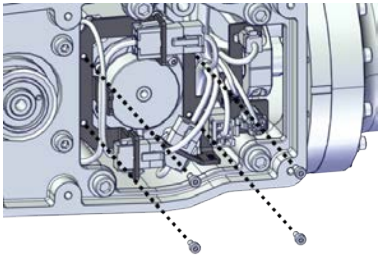
	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to Supplying power to connector R1.MP on page 68 .	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the 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	Remove the covers. <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) • Swing covers (D) 	 <p>xx2000001724</p>

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	Cut the cable straps.	 <p>xx2000001530</p>
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.	 <p>xx2000001531</p>



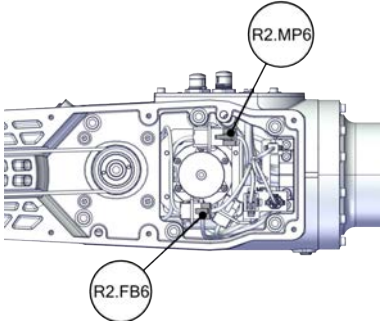
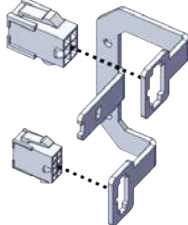
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5 Repair



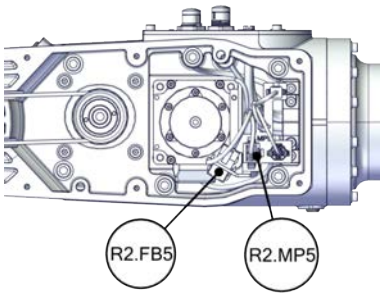
5.5.1 Replacing the lower arm

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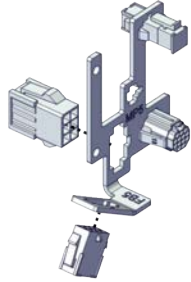
Disconnecting the axis-6 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP6 • FB6  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
3	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533



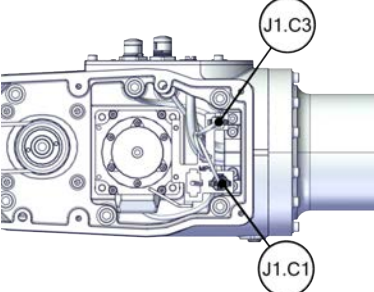
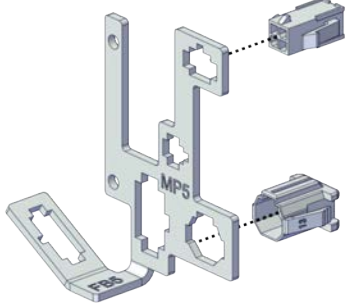
Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP5 • FB5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534

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	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001535</p>

Disconnecting CP/CS cabling (if equipped)

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>For robots with CP/CS cabling</p> <p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3  <p>Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001536</p>
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>


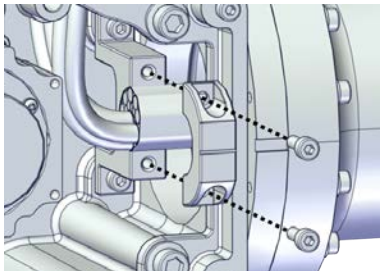
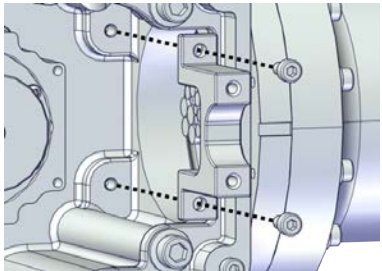
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5 Repair



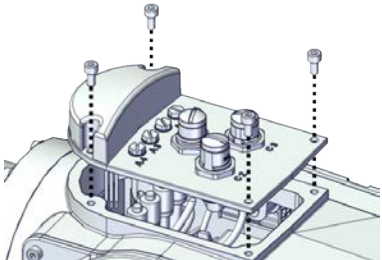
5.5.1 Replacing the lower arm

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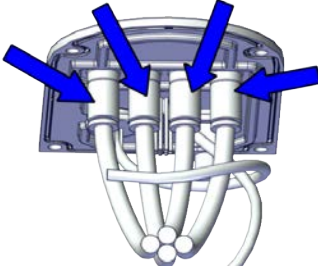


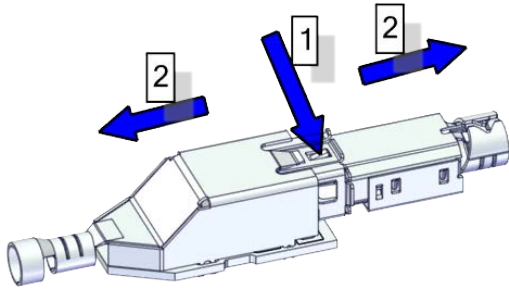
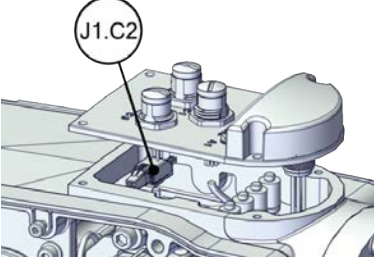
Separating the cable package from the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
3	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub

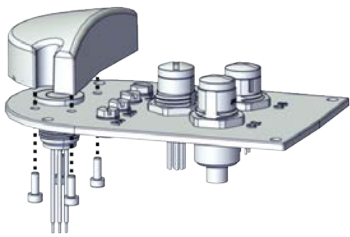
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the screws and carefully open the cover.  CAUTION There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2200001000

Continues on next page

	Action	Note
3	<p>Disconnect the air hoses.</p>	 <p>xx2000001539</p>
4	<p>For robots with Ethernet cabling Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip</p> <p>The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>

Removing the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

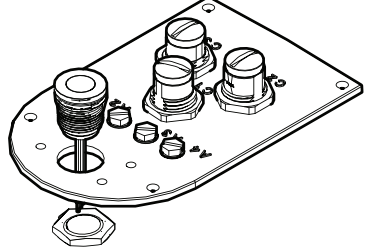
	Action	Note
1	<p>Remove the lamp unit cover.</p>	 <p>xx2200001002</p>

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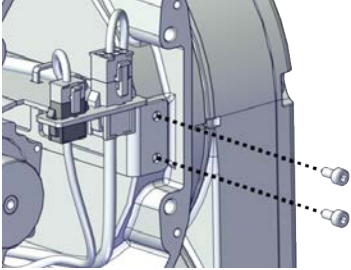

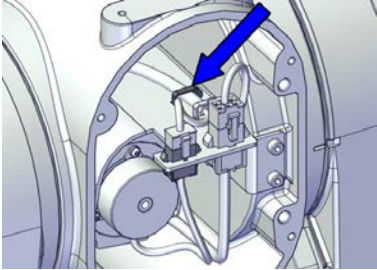

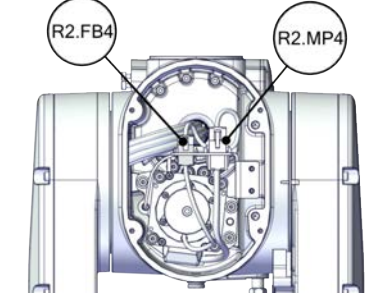
5 Repair

5.5.1 Replacing the lower arm

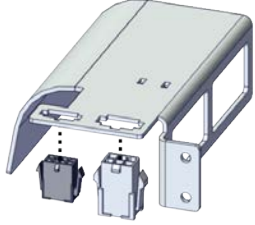
Continued

	Action	Note
2	Remove the lamp unit.	 xx2200001003


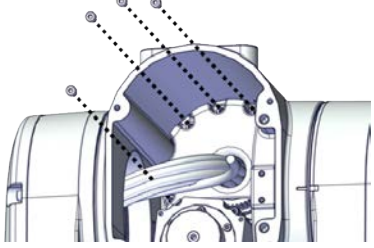
Disconnecting the axis-4 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	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
3	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
4	Disconnect the connectors. <ul style="list-style-type: none"> • MP4 • FB4  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001544



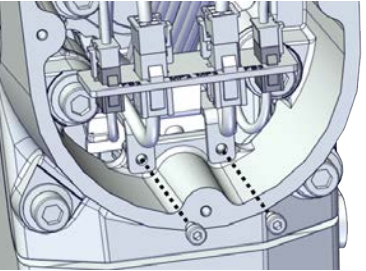
Continues on next page

	Action	Note
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001545</p>

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	Remove the axis-4 cable protector.	 <p>xx2000001546</p>

Disconnecting the axis-2 and -3 motor connectors

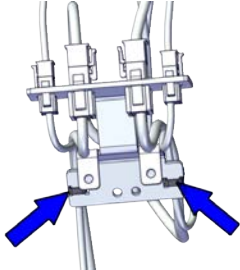

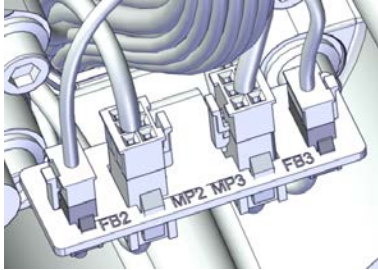
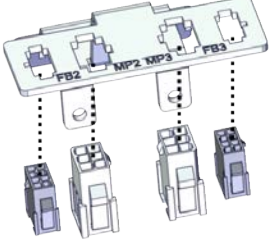
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the connector plate.  CAUTION Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate, as shown in following step.	 <p>xx2000001548</p>

Continues on next page


5 Repair

5.5.1 Replacing the lower arm

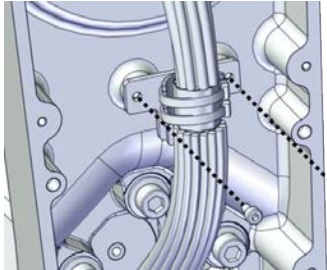
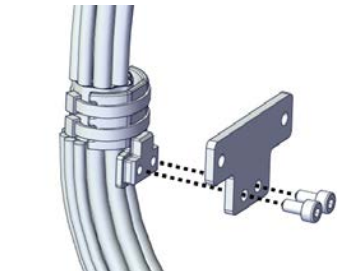
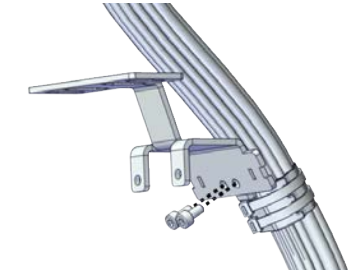
Continued

	Action	Note
3	Cut the cable straps.	 <p>xx2000001549</p>
4	Disconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001550</p>
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001551</p>


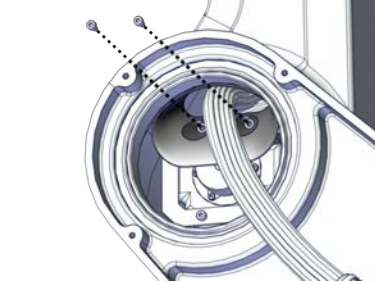
Separating the cable package from the lower arm

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

Continues on next page

	Action	Note
2	Remove the cable bracket from the lower arm first and then from the cable package.	 <p>xx2000001553</p>  <p>xx2100001465</p>
3	Remove the connector plate.	 <p>xx2000001554</p>

Separating the cable package from the swing

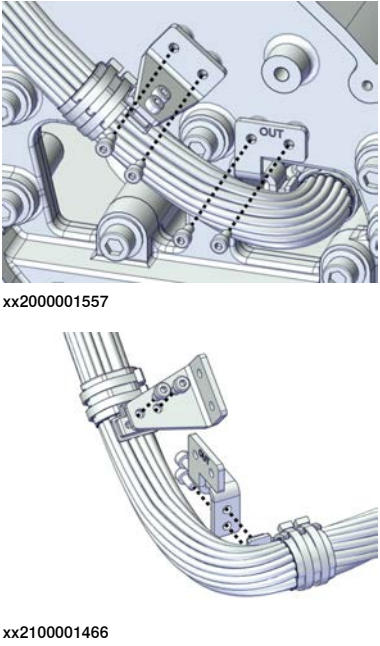
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	Remove the axis-2 cable protector.	 <p>xx2000001556</p>

Continues on next page


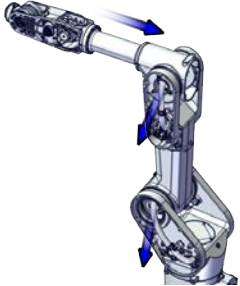
5 Repair

5.5.1 Replacing the lower arm


Continued

	Action	Note
3	Remove the cable brackets from the swing first and then from the cable package.	 <p>xx2000001557</p> <p>xx2100001466</p>



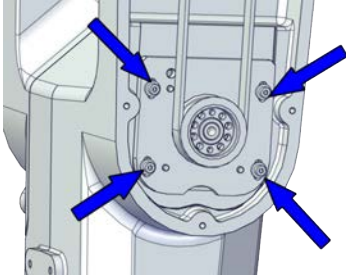
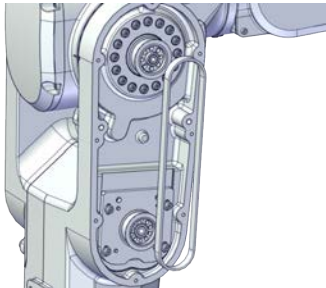
Pulling out the cable package

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Wrap the connectors with the masking tape.	
3	Pull the cable package out to the swing support.	 <p>xx2000001683</p>


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.	

Continues on next page

	Action	Note
2	 CAUTION Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
3	 CAUTION The upper arms, which includes housing, extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit weighs 17 kg. All lifting accessories used must be sized accordingly!	
4	Fit a roundsling to the upper arm to support the weight (no force).	
5	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001614
6	Remove the timing belt from its groove on the motor.	 xx2000001615

Removing the axis-3 motor


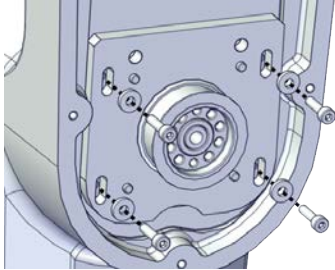
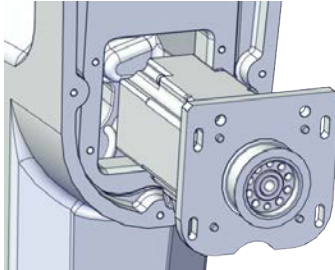
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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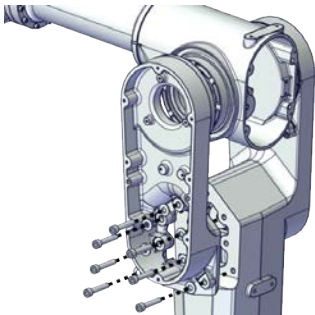
5 Repair

5.5.1 Replacing the lower arm

Continued



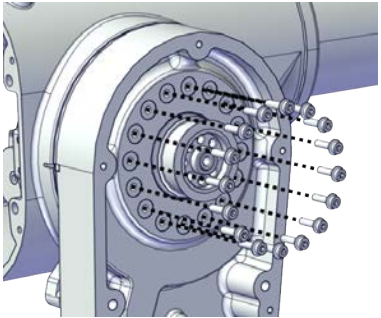

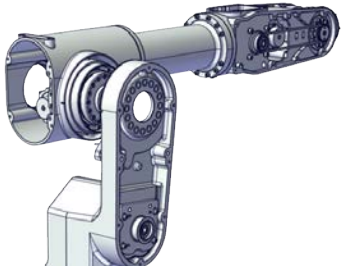
	Action	Note
2	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
3	Remove the screws and washers.	 xx2000001616
4	Carefully lift out the motor.	 xx2000001617

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	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

Continues on next page


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	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 CRB 1300-7/1.4 and), tubular and tilt unit, weighs 17 kg.	 xx2000001664
3	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
4	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.	
2	Support the weight of the lower arm.	

Removing the axis-2 motor



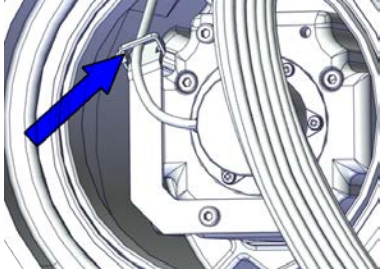
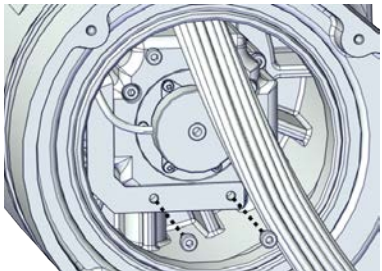
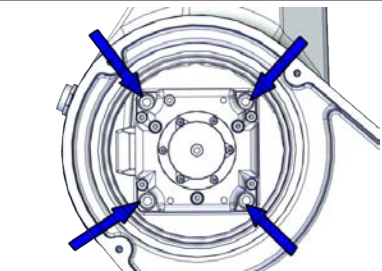
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

5 Repair

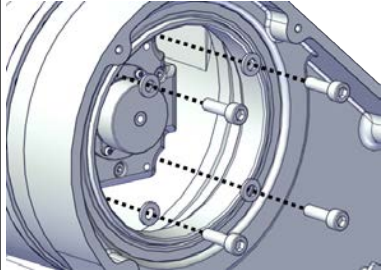
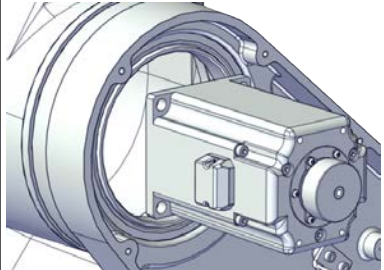
5.5.1 Replacing the lower arm

Continued



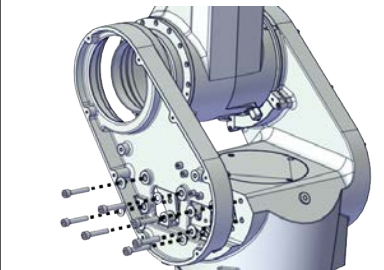
	Action	Note
2	 WARNING When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section Gearbox lubricants (oil or grease) on page 31 .	
3	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Cut the cable strap.	 xx2000001624
5	Remove the cable bracket.	 xx2000001625
6	Access the screws and washers securing the axis-2 motor from the swing support.	 xx2000001627

Continues on next page


5.5.1 Replacing the lower arm
Continued

	Action	Note
7	Remove the screws and washers.	 xx2000001626
8	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.	
2	 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

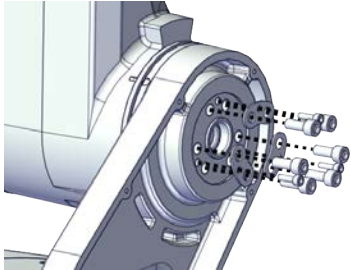

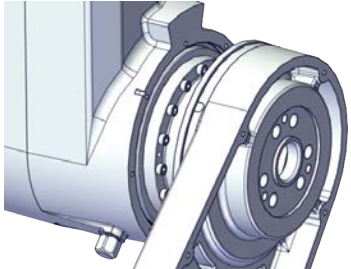
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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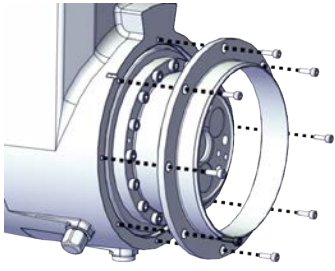
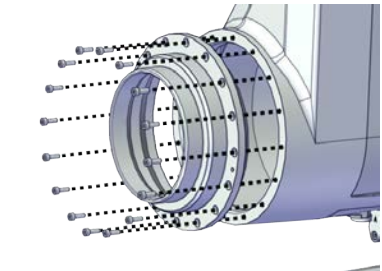
5 Repair

5.5.1 Replacing the lower arm

Continued



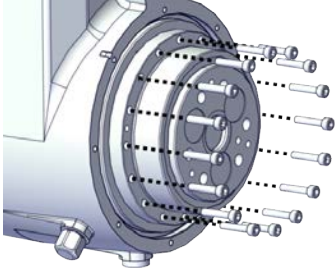
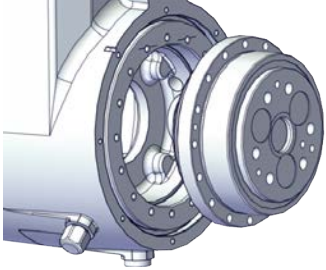
	Action	Note
2	Remove the screws.	 xx2000001686
3	Separate the swing from the lower arm.  Tip If the swing is hard to loosen from the lower arm, use a plastic hammer to knock on the swing lightly.	 xx2000001687

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	For robots with protection class IP67 (option 3350-670) Remove the sealing ring on the swing side.	 xx2000002516
3	Remove the sealing ring on the swing support side.	 xx2000001692

Continues on next page

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 Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
3	Remove the screws.	 xx2000001688
4	Pull out the gearbox.	 xx2000001689

Refitting the lower arm

Use these procedures to refit the lower arm.

Checking mechanical stops and oil plugs

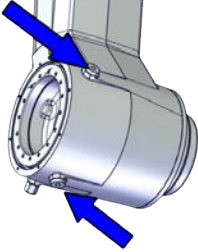
	Action	Note
1	Check the axis-3 mechanical stops. Replace if damaged.	See Replacing the axis-3 mechanical stops on page 488 .

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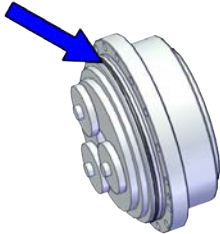

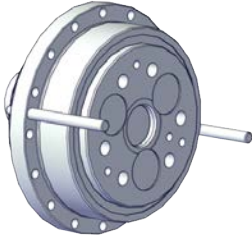
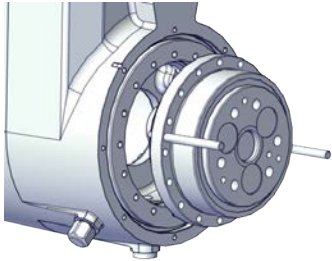
5 Repair

5.5.1 Replacing the lower arm

Continued

	Action	Note
2	Check the oil plugs. Replace if damaged.	<p>Magnetic oil plug, G 1/4": 3HAC037925-001 Tightening torque: 10 Nm</p>  <p>xx2000001726</p>

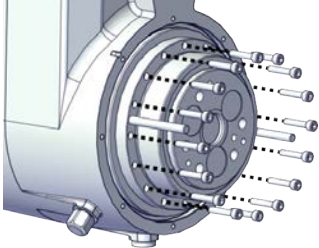
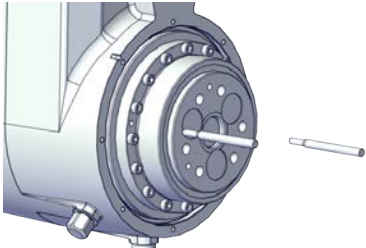
Refitting the axis-2 gearbox

	Action	Note
1	Check the O-ring. Replace if damaged.	<p>O-ring on axis-2 gear unit: 3HAC064977-004</p>  <p>xx2000001690</p>
2	<p>Fit guide pins to the axis-2 gearbox.</p> <p> Note Always use two guide pins together.</p>	<p>Guide pin for axis-2 gearbox. Included in special toolkit 3HAC076396-001.</p>  <p>xx2000001705</p>
3	Refit the axis-2 gearbox, with guidance from the guide pins.	 <p>xx2000001706</p>

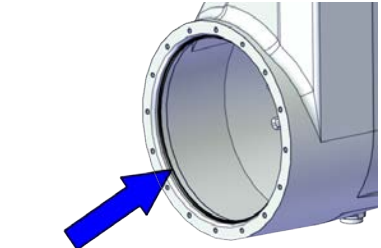
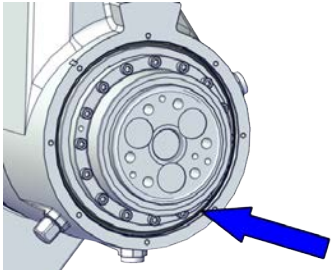
Continues on next page

5.5.1 Replacing the lower arm

Continued

	Action	Note
4	Secure with screws.	<p>Screw: M5x25 12.9 Lafre 2C2B/FC6.9 (16 pcs) Tightening torque: 8.9 Nm±3%</p>  <p>xx2000001707</p>
5	Remove the guide pins.	 <p>xx2000001708</p>

Refitting the axis-2 sealing rings

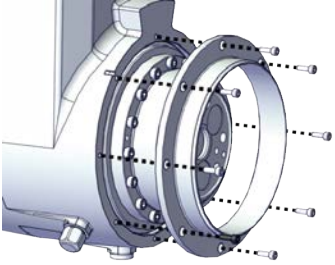
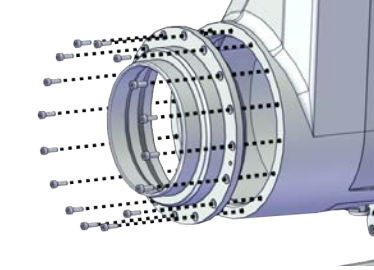
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the O-ring on the swing support side.</p>	<p>O-ring on lower arm: 3HAC061327-015 For robots with protection class IP67 (option 3350-670)</p>  <p>xx2000002518</p>  <p>xx2000002517</p>

Continues on next page

5 Repair

5.5.1 Replacing the lower arm

Continued

	Action	Note
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Refit the sealing ring on the swing side.</p>	<p>Sealing ring, swing side: 3HAC065675-001</p> <p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (8 pcs)</p> <p>Tightening torque: 3.8 Nm</p>  <p>xx2000002516</p>
3	<p>Refit the sealing ring on the swing support side.</p>	<p>Sealing ring, swing support side: 3HAC065676-001</p> <p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (16 pcs)</p> <p>Tightening torque: 3.8 Nm</p>  <p>xx2000001692</p>

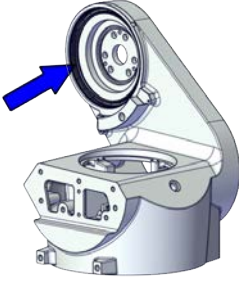
Check the radial sealing on the swing top



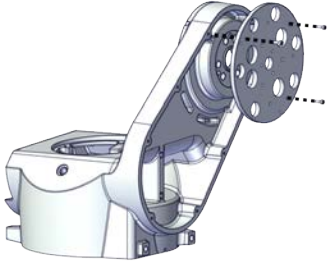
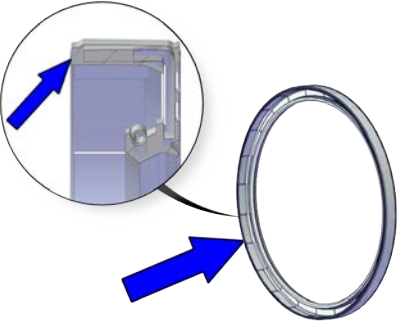
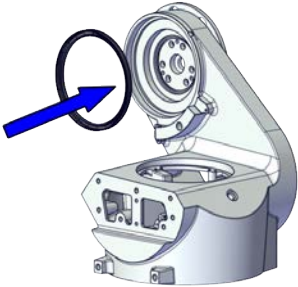
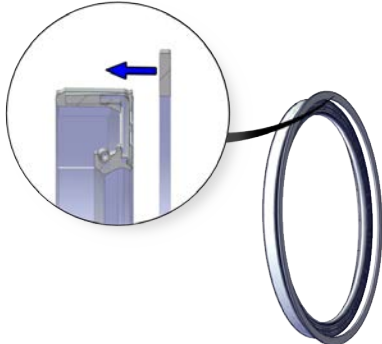
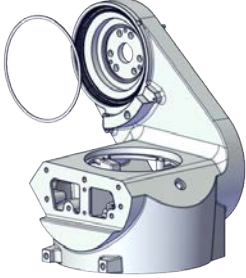
Note

This procedure is valid for robots with:

- protection class IP67 (option 3350-670)

	Action	Note
1	<p>Check the radial sealing on the swing top.</p> <p>Replace if damaged, as described below.</p>	 <p>xx2000002460</p>

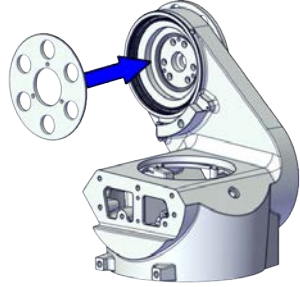
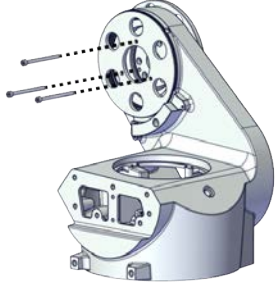
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	Action	Note
2	<p>Fit the big circular plate of the axis-2 sealing assembly tool to the swing (opposite side of the radial sealing) with three M4x12 screws.</p>	<p>Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002461</p>
3	<p>Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.</p>	<p>Grease: 3HAC029132-001</p>
4	<p>Fit the new sealing into the swing. For robots with protection class IP67 (option 3350-670) The sealing lip as pointed in the following figure is facing the outer side of the robot.</p>  <p>xx2000002537</p>	 <p>xx2000002462</p>
5	<p>For robots with protection class IP67 (option 3350-670) Place the ring of the axis-2 sealing assembly tool against the sealing.</p>  <p>xx2000002562</p>	<p>Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002463</p>

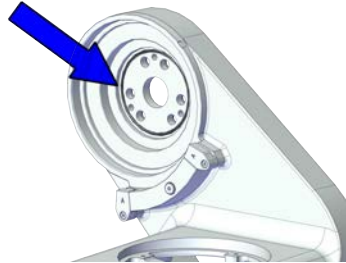
5 Repair

5.5.1 Replacing the lower arm

Continued

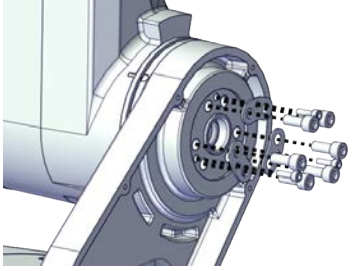
	Action	Note
6	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	<p>Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002464</p>  <p>xx2000002465</p>
7	Screw the screws, 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 swing to the lower arm

	Action	Note
1	Check the O-ring. Replace if damaged.	<p>O-ring on swing: 3HAC061327-036</p>  <p>xx2000001750</p>

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5.5.1 Replacing the lower arm
Continued

	Action	Note
2	Refit the swing to the lower arm.	<p>M10 screws Screw: M10x25 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 72 Nm</p> <p>M6 screws Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (3 pcs) Tightening torque: 14 Nm</p>  <p>xx2000001686</p>

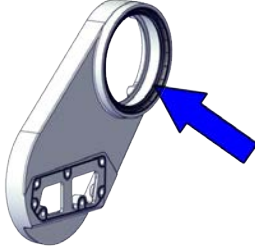
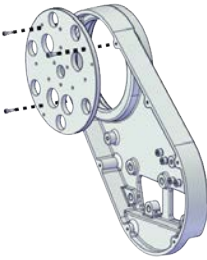
Check the radial sealing on the swing support



Note

This procedure is valid for robots with:

- protection class IP67 (option 3350-670)

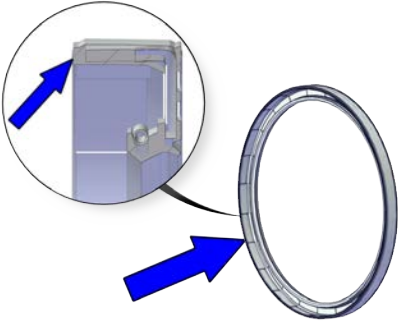
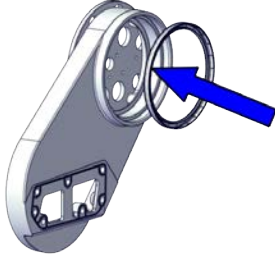
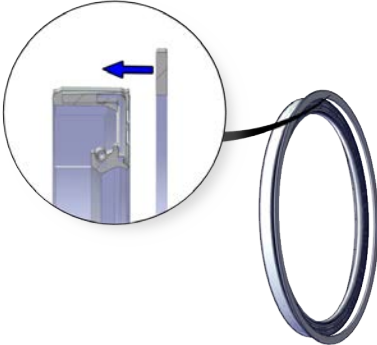

	Action	Note
1	Check the radial sealing on the swing support. Replace if damaged, as described below.	 <p>xx2000002466</p>
2	Fit the big circular plate of the axis-2 sealing assembly tool to the swing support (opposite side of the radial sealing) with three M4x12 screws.	<p>Big circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002467</p>

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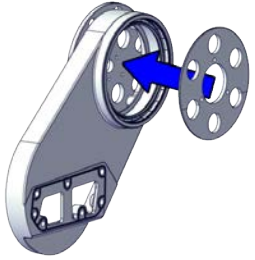
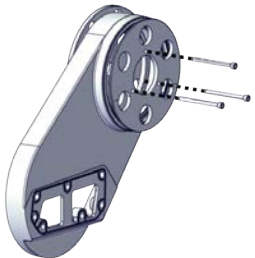
5 Repair

5.5.1 Replacing the lower arm

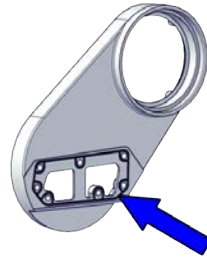
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	Action	Note
3	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
4	<p>Fit the new sealing into the swing support.</p> <p>For robots with protection class IP67 (option 3350-670)</p> <p>The sealing lip as pointed in the following figure is facing the outer side of the robot.</p>  <p>xx2000002537</p>	 <p>xx2000002468</p>
5	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Place the ring of the axis-2 sealing assembly tool against the sealing.</p>  <p>xx2000002562</p>	 <p>xx2000002469</p>

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	Action	Note
6	Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.	<p>Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002470</p>  <p>xx2000002471</p>
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 swing support


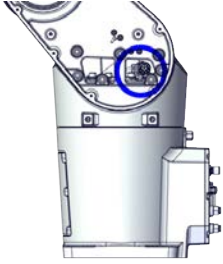
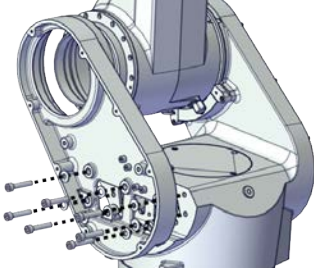
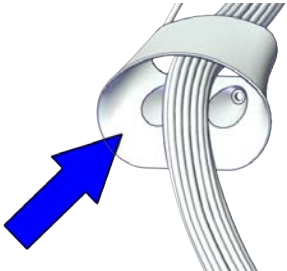
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket for swing support, short: 3HAC067822-001</p> <p>Gasket for swing support, long: 3HAC067823-001</p>  <p>xx2000002520</p>

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5 Repair

5.5.1 Replacing the lower arm

Continued

	Action	Note
2	<p>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.</p> <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001747</p>
3	<p>Refit the swing support.</p>	<p>Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 36 Nm</p>  <p>xx2000001684</p>
4	<p>Apply grease to the axis-2 cable protector and slip it over the cable harness.</p>	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 2: 3HAC067816-001</p>  <p>xx2000001567</p>

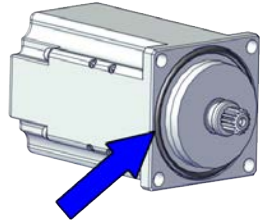
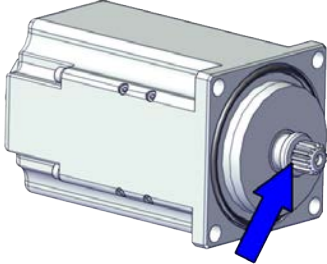
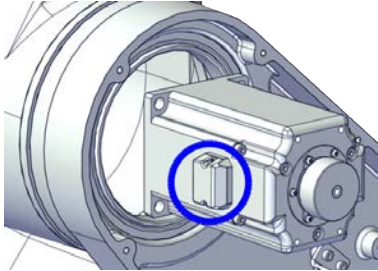
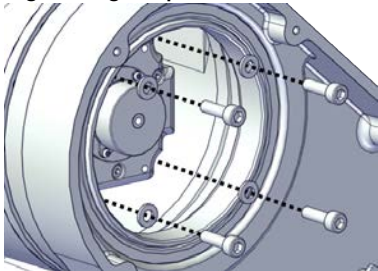
Refitting the axis-2 motor

	Action	Note
1	<p> CAUTION</p> <p>Do not mix the axis-2 motor used for CRB 1300-7/1.4 and . Always carefully check the part number attached to the motor and the robot type, and refit with the right one.</p>	<p>Axis-2 motor for CRB 1300-7/1.4: 3HAC073078-001</p>
2	<p>Check that:</p> <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	

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5.5.1 Replacing the lower arm

Continued

	Action	Note
3	Check the O-ring. Replace if damaged.	<p>O-ring on motor unit: 3HAC061327-037</p>  <p>xx2000001629</p>
4	Apply lubricating oil to the motor that has contacting area with the gearbox.	<p>Kyodo Yushi TMO150: 3HAC032140-001</p>  <p>xx2000001701</p>
5	Orient the motor correctly and fit it into the swing. Make sure the motor is properly fit to gearbox.	<p>Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.</p>  <p>xx2000001630</p>
6	Refit the screws and washers.	<p>Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm</p>  <p>xx2000001626</p>

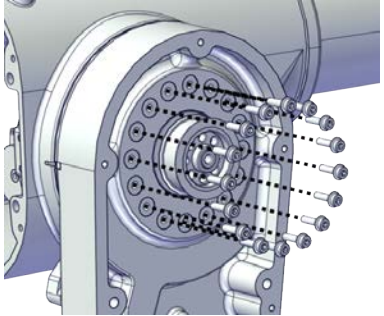
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5 Repair

5.5.1 Replacing the lower arm

Continued

Refitting the lower arm to the housing

	Action	Note
1	Refit the lower arm to the housing.	<p>Screw: M4x16 12.9 Lafre 2C2B/FC6.9+PrO-COat111 (16 pcs) Tightening torque: 4.5 Nm±3%</p>  <p>xx200001664</p>

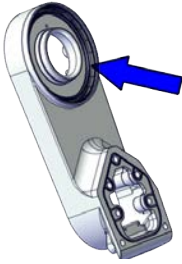
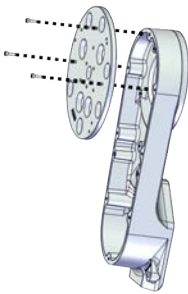
Checking the radial sealing on the lower arm support



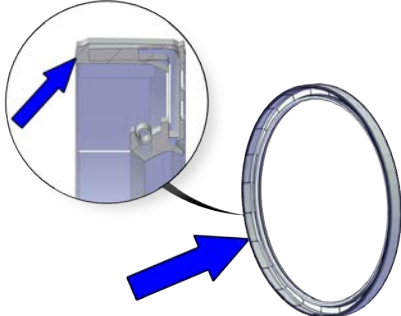
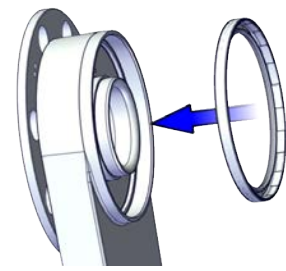
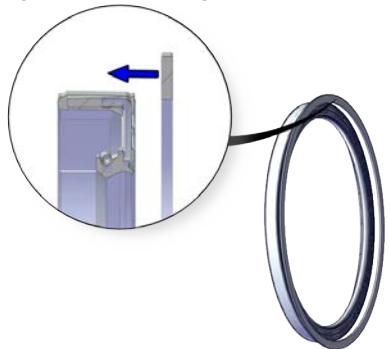
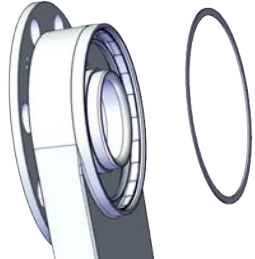
Note

This procedure is valid for robots with:

- protection class IP67 (option 3350-670)

	Action	Note
1	Check the radial sealing on the lower arm support. Replace if damaged, as described below.	 <p>xx2000002477</p>
2	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.	<p>Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002478</p>
3	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001

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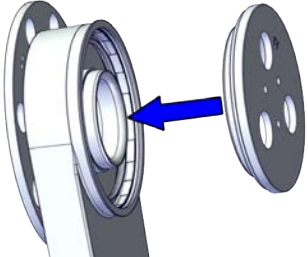
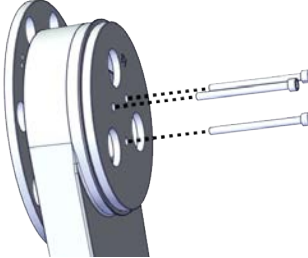
	Action	Note
4	<p>Fit the new sealing into the lower arm support. For robots with protection class IP67 (option 3350-670) The sealing lip as pointed in the following figure is facing the outer side of the robot.</p>  <p>xx2000002537</p>	 <p>xx2000002479</p>
5	<p>For robots with protection class IP67 (option 3350-670) Place the ring of the axis-3 sealing assembly tool against the sealing.</p>  <p>xx2000002562</p>	<p>Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002480</p>

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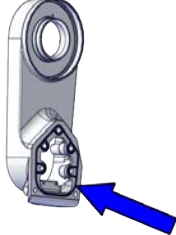
5 Repair

5.5.1 Replacing the lower arm

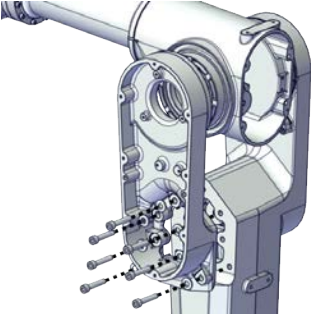
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	Action	Note
6	Fit the small circular plate of the axis-3 sealing assembly tool and fix with three M6x75 screws.	<p>Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002481</p>  <p>xx2000002482</p>
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.	


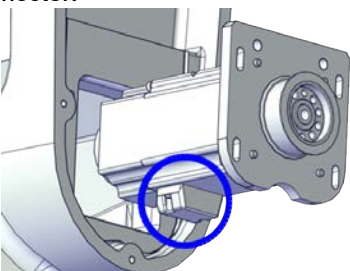
Refitting the lower arm support

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for lower arm support: 3HAC067826-001</p>  <p>xx2000002521</p>

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	Action	Note
2	Refit the lower arm support.	Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm  xx2000001663


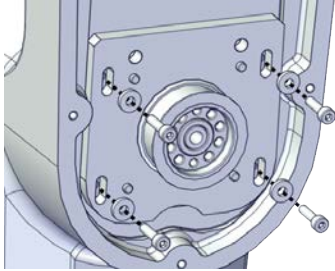
Refitting the axis-3 motor

	Action	Note
1	 CAUTION Do not mix the axis-3 motor used for CRB 1300-7/1.4 and . Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-3 motor for CRB 1300-7/1.4: 3HAC073086-001
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
3	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

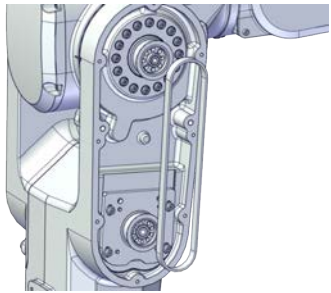
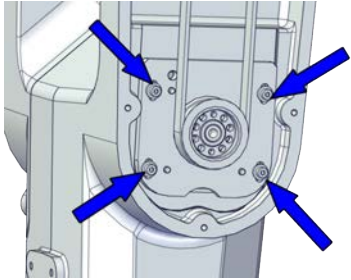
5 Repair

5.5.1 Replacing the lower arm

Continued

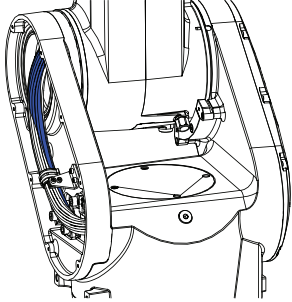
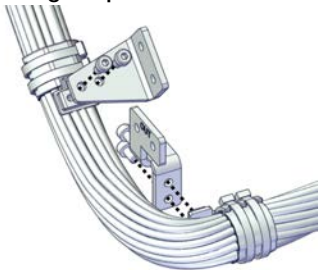
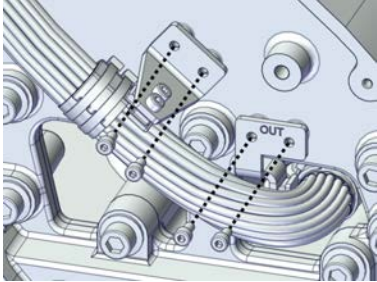
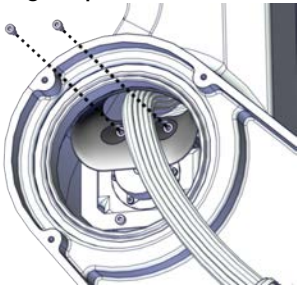
	Action	Note
4	Refit the screws and washers.  Note Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre 2C2B/FC6.9 (4 pcs)  xx2000001616

Refitting the axis-3 timing belt

	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001615
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	
3	Tighten the motor screws.	Tightening torque: 3.3 Nm  xx2000001614
4	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
5	Release the support to the upper arm.	

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Securing the cable package in the swing

	Action	Note
1	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.	 <p>xx2000001746</p>
2	Refit the cable brackets.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each bracket on cable package and 2 pcs on swing) Tightening torque: 2.6 Nm</p>  <p>xx2100001466</p>  <p>xx2000001557</p>
3	Refit the axis-2 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001556</p>

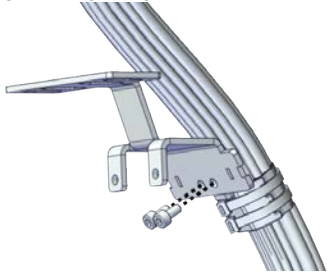

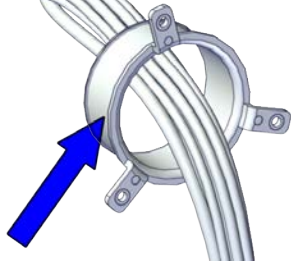
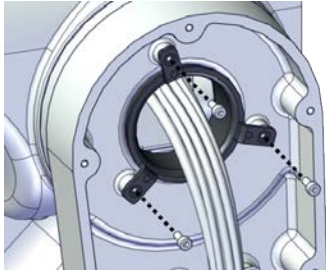

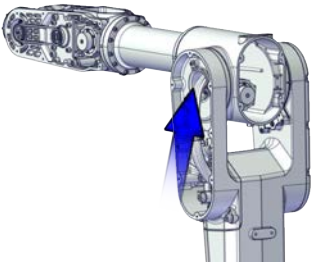
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5 Repair

5.5.1 Replacing the lower arm

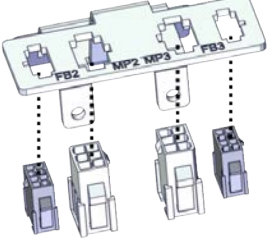

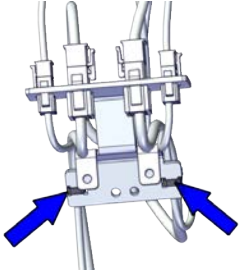

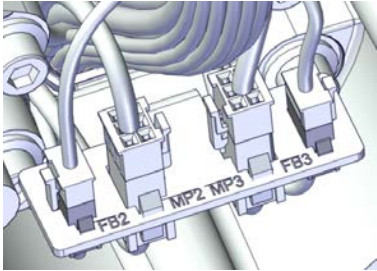
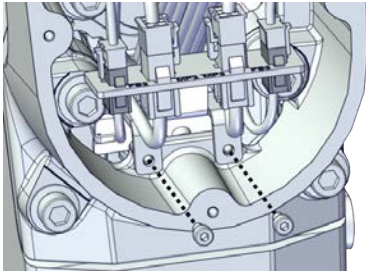
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Routing the cable package in the lower arm

	Action	Note
1	Refit the connector plate to the cable package.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001554</p>
2	<p>Check the axis-3 cable protector. Replace if damaged.</p> <p> Note</p> <p>If replaced, apply grease to the axis-3 cable protector before refitting.</p>	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001</p>  <p>xx2000001568</p> <p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (3 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001552</p>
3	<p>Route the cable package through the lower arm support and up into the housing.</p> <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001569</p>

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Reconnecting the axis-2 and -3 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001551</p>
2	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.	 <p>xx2000001549</p>
3	Reconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001550</p>
4	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  <p>xx2000001548</p>

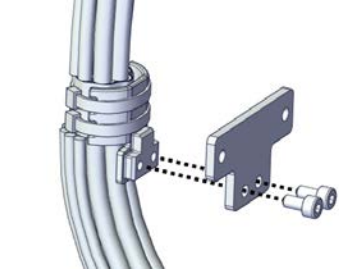
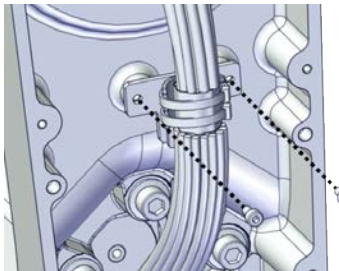
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5 Repair

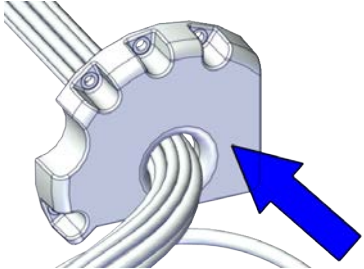

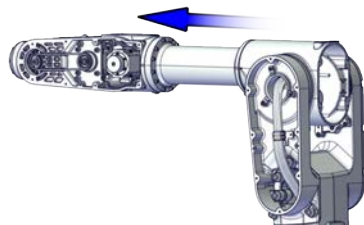
5.5.1 Replacing the lower arm

Continued

Securing the cable package in the lower arm

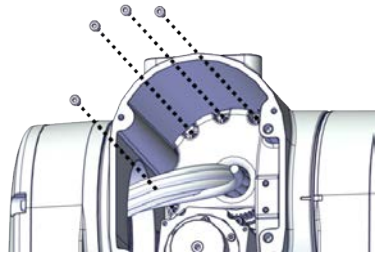
	Action	Note
1	Refit the cable bracket.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm</p>  <p>xx2100001465</p>  <p>xx2000001553</p>

Routing the cable package in the housing

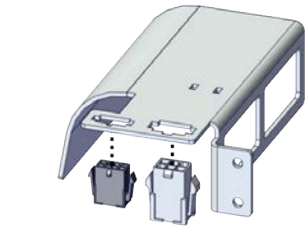

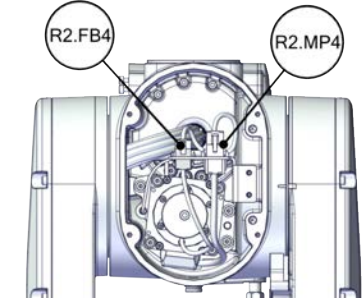


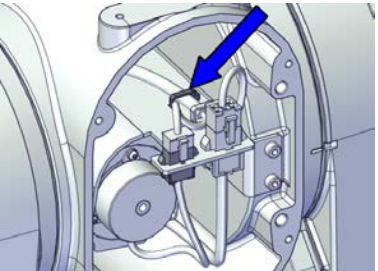
	Action	Note
1	Slip the axis-4 cable protector over the cable package.	<p>Plastic cable protector, axis 4: 3HAC064694-001:</p>  <p>xx2000001570</p>
2	<p>Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for CRB 1300-7/1.4 and) and into the tubular.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001571</p>

Continues on next page

Securing the cable package in the housing

	Action	Note
1	Refit the axis-4 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001546</p>

Reconnecting the axis-4 motor connectors

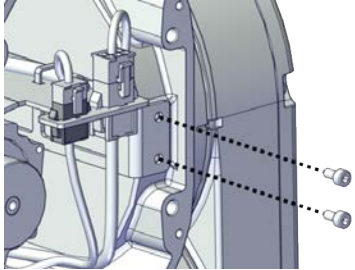
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001545</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB4 • MP4 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001544</p>
3	<p>Route and secure the cabling with a cable strap.</p> <p> Note</p> <p>The motor cabling has another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001543</p>

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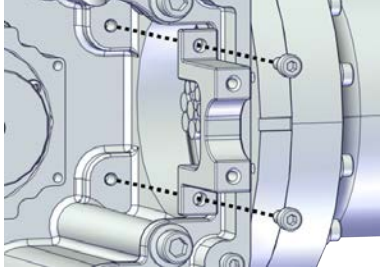
5 Repair

5.5.1 Replacing the lower arm

Continued

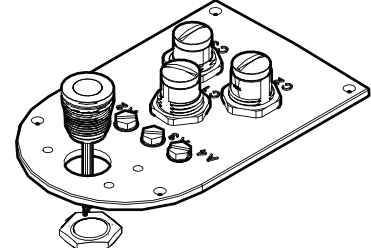
	Action	Note
4	Refit the connector plate.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001542</p>

Routing the cable package in the tubular

	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001749</p>
2	<p>Route the cablings.</p> <ul style="list-style-type: none"> • 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. 	

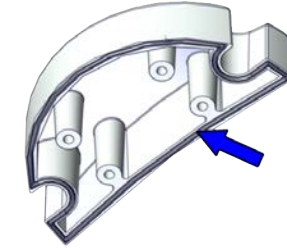
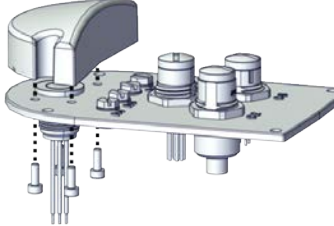
Refitting the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.


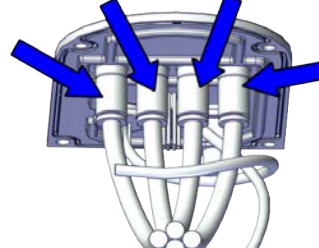

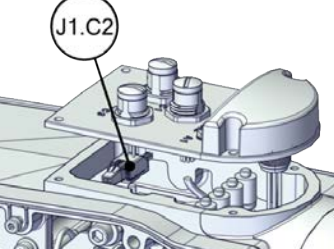
	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>

Continues on next page

5.5.1 Replacing the lower arm
Continued

	Action	Note
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>
3	<p>Refit the lamp unit cover.</p>	<p>Lamp unit cover: 3HAC082320-001 Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 0.6 Nm</p>  <p>xx2200001002</p>

Reconnecting the air hoses and Ethernet cabling (if equipped)

	Action	Note
1	<p>Reconnect the air hoses.</p> <p> Note</p> <p>See the number markings on the air hoses for help to find the corresponding air hoses.</p>	 <p>xx2000001539</p>
2	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and reconnect the connector.</p> <ul style="list-style-type: none"> • J1.C2 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2200001001</p>

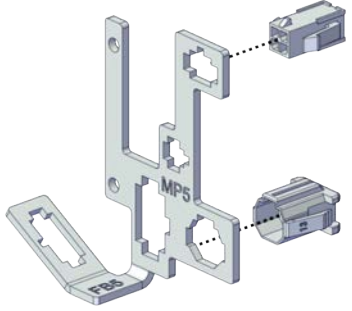

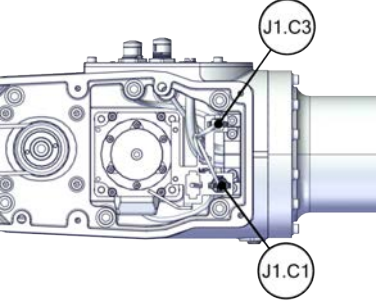
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5 Repair

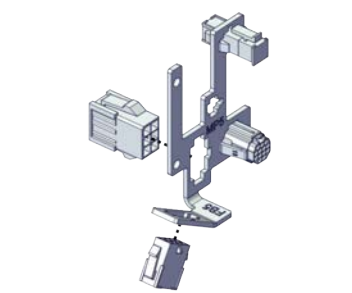

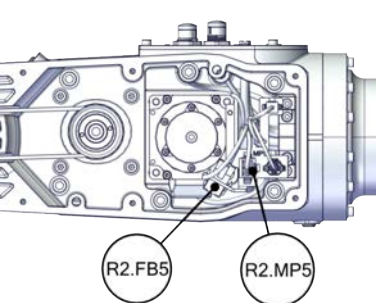
5.5.1 Replacing the lower arm

Continued

Reconnecting the CP/CS cabling (if equipped)

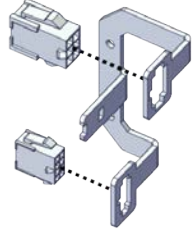

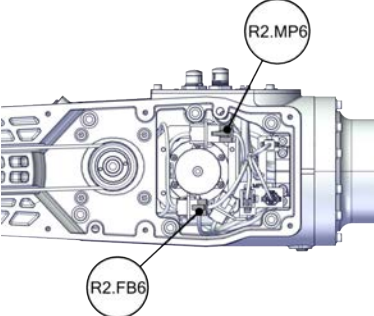
	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>
2	For robots with CP/CS cabling Reconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001536</p>

Reconnecting the axis-5 motor connectors

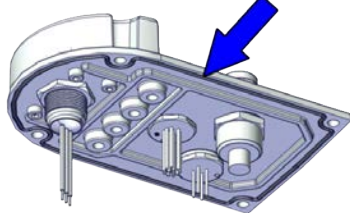
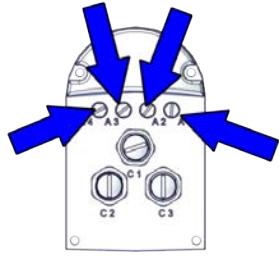
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001535</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB5 • MP5  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001534</p>

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Reconnecting the axis-6 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001533</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB6 • MP6  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001532</p>

Refitting the process hub


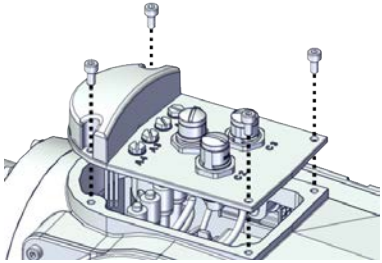
	Action	Note
1	For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  <p>xx2200001005</p>
2	For robots with protection class IP67 (option 3350-670) Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  <p>xx2200001006</p>

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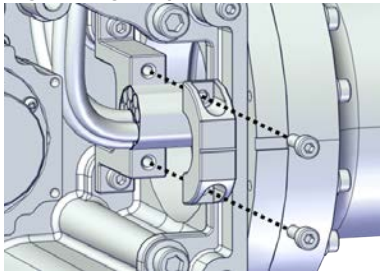
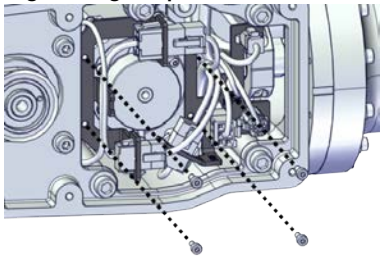
5 Repair

5.5.1 Replacing the lower arm

Continued


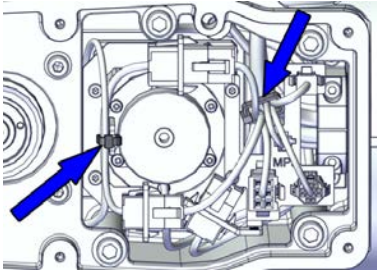
	Action	Note
3	Route and secure the cabling with cable straps.  CAUTION Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	
4	Refit the process hub.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm  xx2200001000

Securing the cable package in the tubular

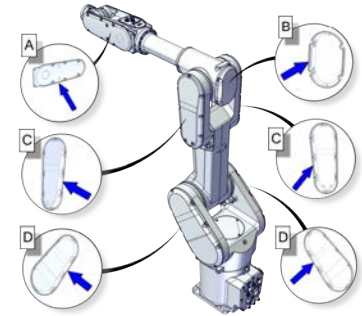
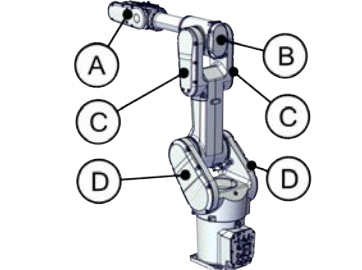
	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001748
2	Refit the connector plate.	Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531

Continues on next page

5.5.1 Replacing the lower arm
Continued

	Action	Note
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>

Refitting the covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets.</p> <ul style="list-style-type: none"> • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm covers (C) • Gasket for swing covers (D) <p>Replace if damaged.</p>	 <p>xx2000002501</p>
2	<p>Apply grease to the cable package, cover all moving area of the package.</p>	<p>Grease: 3HAC029132-001</p>
3	<p>Apply grease to the covers that have contacting area with the cable package.</p>	<p>Grease: 3HAC029132-001</p>
4	<p>Refit the covers.</p> <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) • Swing covers (D) 	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001724</p>

Jogging the robot to oil filling position

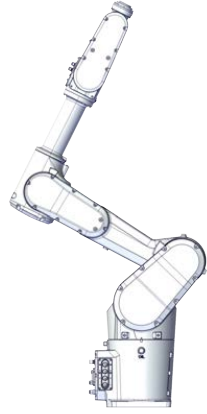

	Action	Note
1	<p>Turn on the electric power to the robot.</p> <p>If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to Supplying power to connector R1.MP on page 68.</p>	

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5 Repair

5.5.1 Replacing the lower arm


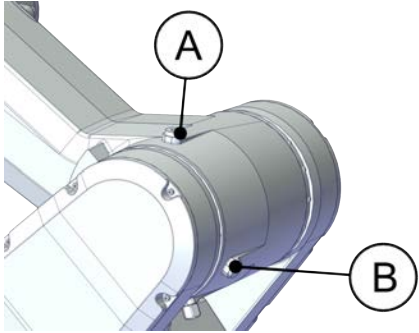




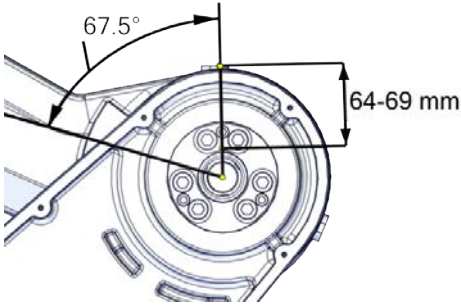
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	Action	Note
2	<p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance. 	 <p>xx2000001519</p>
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

Refilling oil to axis-2 gearbox

	Action	Note
1	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31.</p>	
2	<p> CAUTION</p> <p>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.</p>	

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	Action	Note				
3	<p>Open the upper oil plug.</p> <p> Note</p> <p>The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.</p>	 <table border="1"> <tr> <td>A</td> <td>Oil plug, opened</td> </tr> <tr> <td>B</td> <td>Oil plug, closed</td> </tr> </table>	A	Oil plug, opened	B	Oil plug, closed
A	Oil plug, opened					
B	Oil plug, closed					
4	<p> WARNING</p> <p>Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may:</p> <ul style="list-style-type: none"> • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely. 					
5	<p>Refill the gearbox with oil.</p> <p> Note</p> <p>The amount of oil to be filled depends on the amount previously being drained.</p> <p> CAUTION</p> <p>Oil filling must be slow to make sure air venting is fluent.</p>	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p>				
6	<p>Inspect the oil level by measuring the level at the upper oil plug hole.</p> <p>Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole.</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>					
7	<p>Refit the oil plug.</p>	<p>Tightening torque: 10 Nm</p>				

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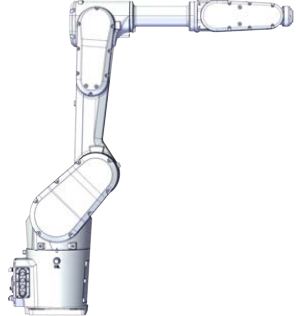

5 Repair

5.5.1 Replacing the lower arm


Continued

	Action	Note
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 68 .	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

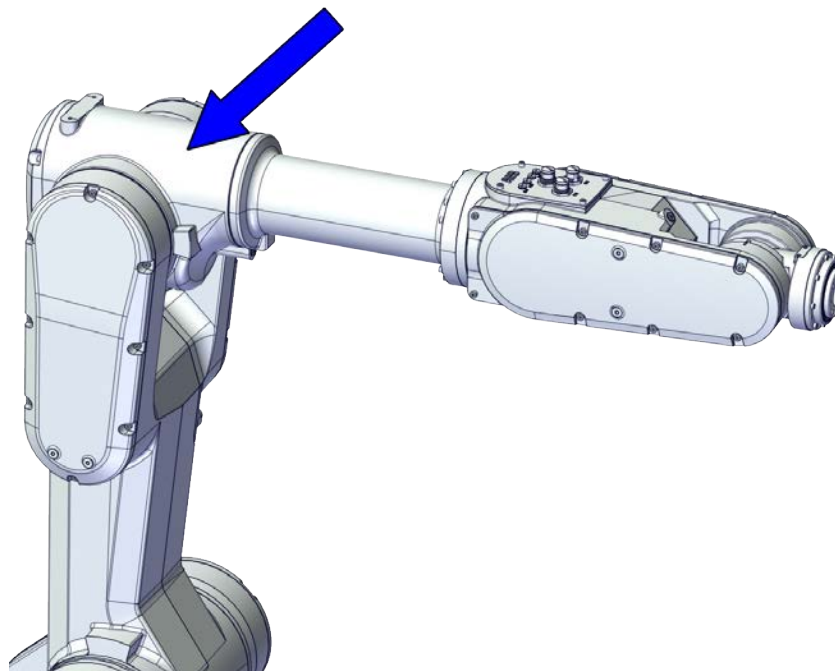
Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

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

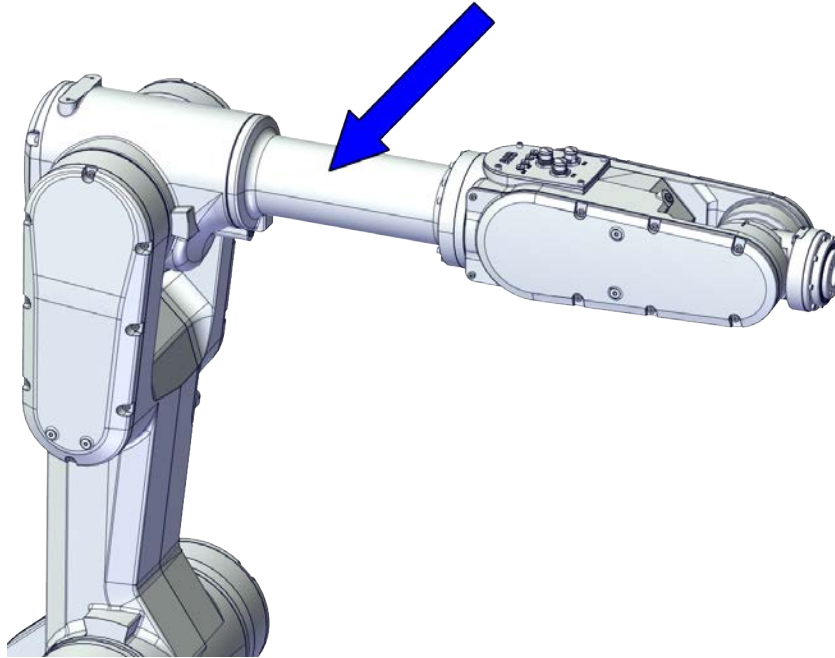
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5 Repair

5.5.2 Replacing the housing and extender unit

Continued

The extender unit (only for CRB 1300-7/1.4 and) 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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Housing	3HAC073079-001	Used with protection class IP40.
Housing, IP67	3HAC077801-001	Used with protection class IP67.
Extender unit	3HAC073085-001	Used for CRB 1300-7/1.4.
Lower arm support	3HAC073076-001	
Gear unit, axis 4	3HAC073084-001	
O-ring on circular spline side, axis 4	3HAC061327-021	Used with protection class IP67. Replace if damaged.
O-ring on flexible spline side, axis 4	3HAC061327-017	Used with protection class IP67. 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.

Continues on next page

Spare part	Article number	Note
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm support	3HAC067826-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.
Radial sealing on lower arm	3HAC070148-005	Used with protection class IP67. Replace if damaged.
O-ring on tubular	3HAC061327-018	Used with protection class IP67. Replace if damaged.
Plug screw	3HAC078352-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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.

Continues on next page

5 Repair

5.5.2 Replacing the housing and extender unit

Continued

Equipment	Article number	Note
Dynamometer	-	Used for measuring the timing belt tension.
Special toolkit for IP67 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .

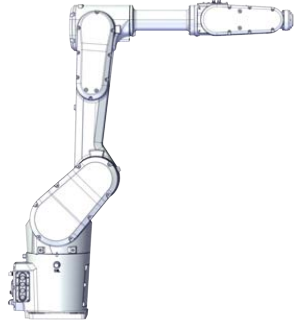

Required consumables

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

Removing the housing


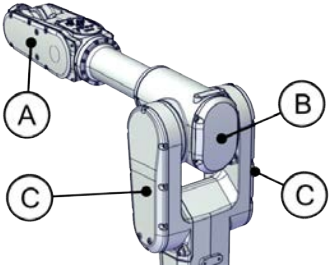
Use these procedures to remove the housing.

Preparations before removing the housing


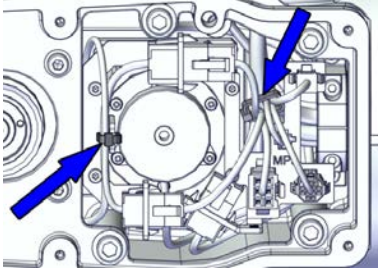

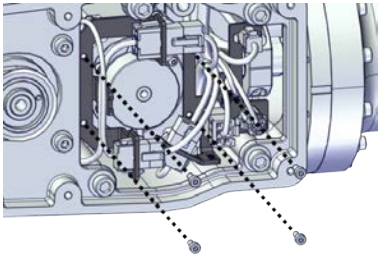
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Continues on next page

Removing the covers

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the covers. <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) 	 <p>xx2000001661</p>

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	Cut the cable straps.	 <p>xx2000001530</p>
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.	 <p>xx2000001531</p>



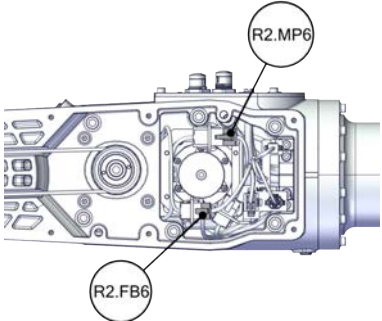
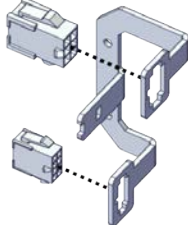
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5 Repair



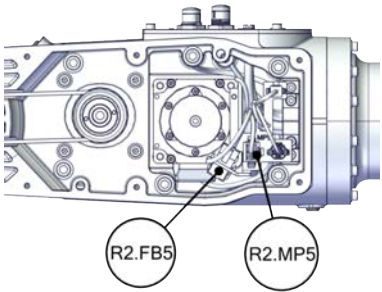
5.5.2 Replacing the housing and extender unit

Continued

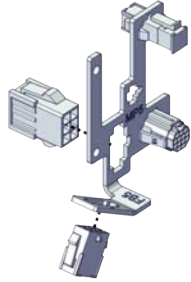
Disconnecting the axis-6 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP6 • FB6  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
3	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533



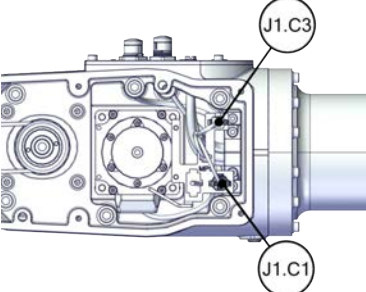
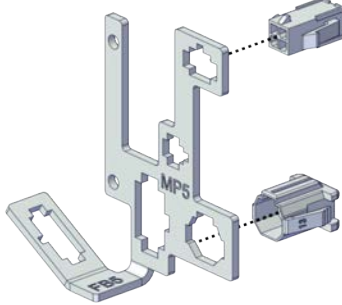
Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP5 • FB5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534

Continues on next page

	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001535</p>

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	For robots with CP/CS cabling Disconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001536</p>
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>


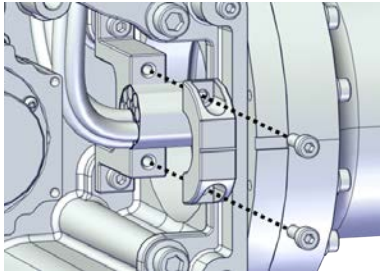
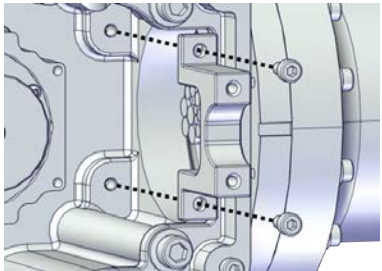
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5 Repair



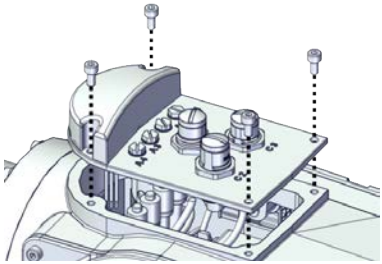
5.5.2 Replacing the housing and extender unit

Continued

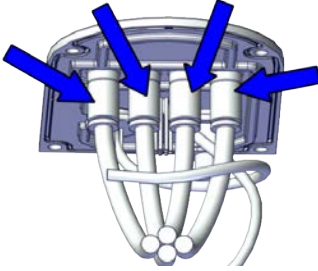


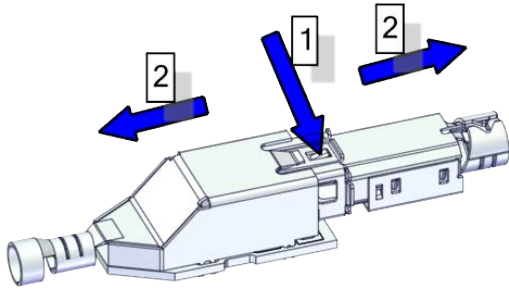
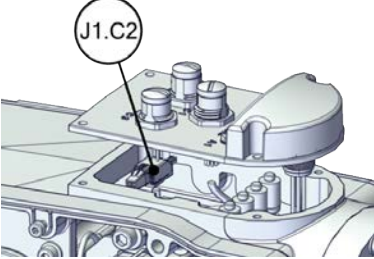
Separating the cable package from the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
3	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub

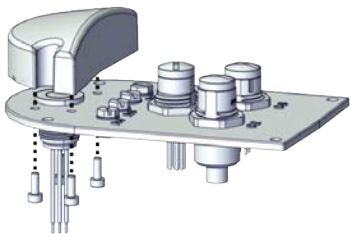
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the screws and carefully open the cover.  CAUTION There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2200001000

Continues on next page

	Action	Note
3	<p>Disconnect the air hoses.</p>	 <p>xx2000001539</p>
4	<p>For robots with Ethernet cabling Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip</p> <p>The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>

Removing the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

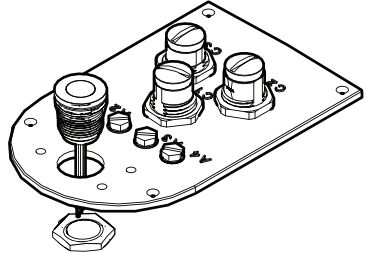
	Action	Note
1	<p>Remove the lamp unit cover.</p>	 <p>xx2200001002</p>

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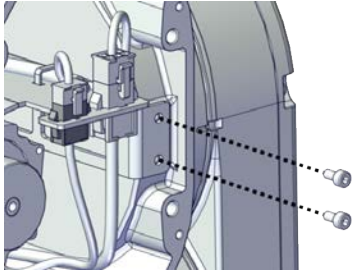

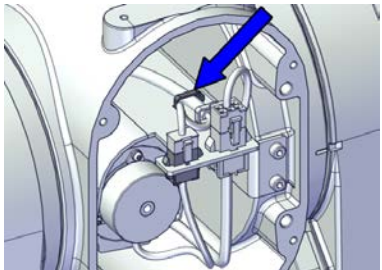

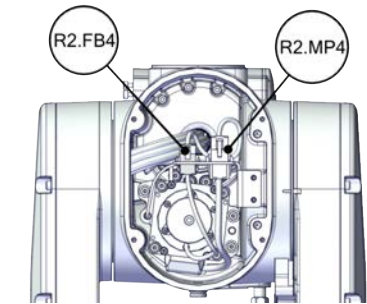
5 Repair

5.5.2 Replacing the housing and extender unit

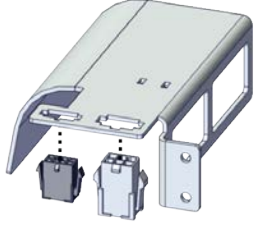
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	Action	Note
2	Remove the lamp unit.	 <p>xx2200001003</p>


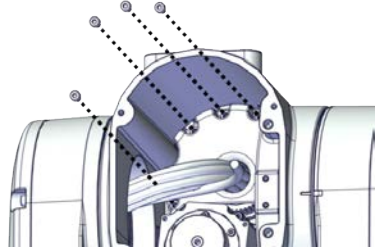
Disconnecting the axis-4 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	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.	 <p>xx2000001542</p>
3	Cut the cable strap.  Note The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 <p>xx2000001543</p>
4	Disconnect the connectors. <ul style="list-style-type: none"> • MP4 • FB4  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001544</p>



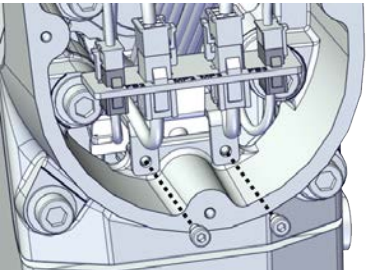
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	Action	Note
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001545</p>

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	Remove the axis-4 cable protector.	 <p>xx2000001546</p>

Disconnecting the axis-2 and -3 motor connectors

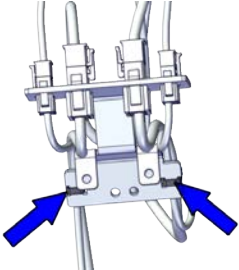

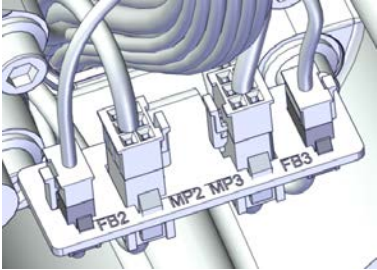
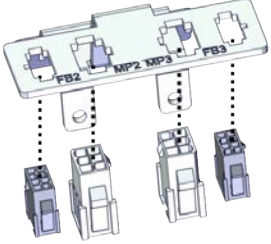
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the connector plate.  CAUTION Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate, as shown in following step.	 <p>xx2000001548</p>

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5 Repair

5.5.2 Replacing the housing and extender unit

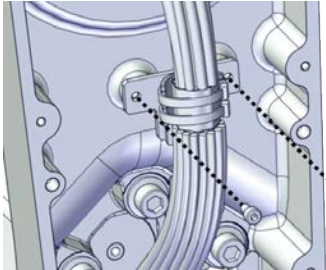
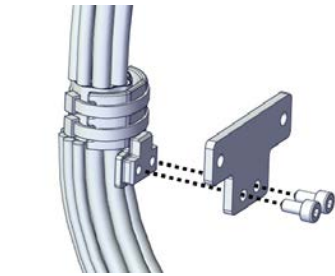

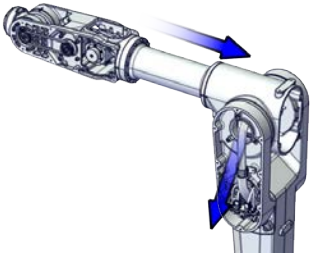
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	Action	Note
3	Cut the cable straps.	 xx2000001549
4	Disconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001550
5	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.	

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	Action	Note
2	Remove the cable bracket from the lower arm first and then from the cable package.	 <p>xx2000001553</p>  <p>xx2100001465</p>
3	Wrap the connectors with the masking tape.	
4	<p>Pull the cable package out to the lower arm support.</p> <p> Note</p> <p>During the routing, make sure the axis-2 motor cablings are kept visible and accessible from the lower arm support side.</p>	 <p>xx2000001662</p>

Removing the axis-4 motor

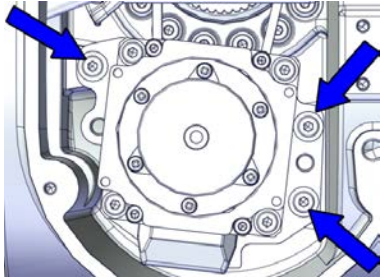
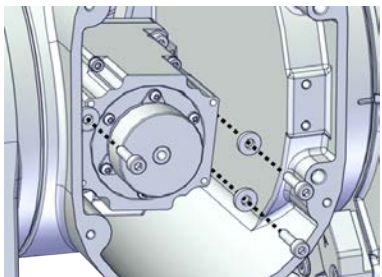
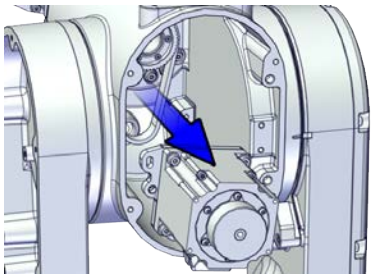

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>Removing motors will release axes. This means the axes can fall down.</p> <p>Make sure axes are well supported before removing motors.</p>	

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5 Repair

5.5.2 Replacing the housing and extender unit


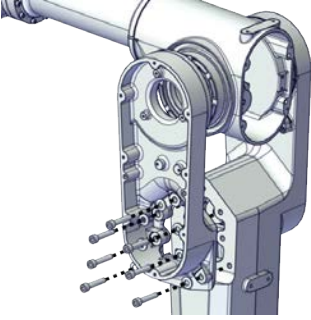
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	Action	Note
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001604
4	Remove the timing belt from its groove on the motor.	
5	Remove the screws and washers.	 xx2000001605
6	Carefully lift out the motor.	 xx2000001669
7	Remove the timing belt.	 xx2000001670




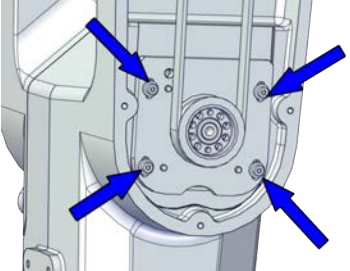
Removing the lower arm support

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

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	Action	Note
2	<p>Remove the lower arm support.</p> <p> Tip</p> <p>If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.</p>	 <p>xx2000001663</p>

Removing the axis-3 timing belt

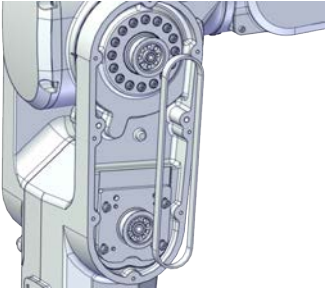
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.</p>	
3	<p> CAUTION</p> <p>The upper arms, which includes housing, extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit weighs 17 kg. All lifting accessories used must be sized accordingly!</p>	
4	<p>Fit a roundsling to the upper arm to support the weight (no force).</p>	
5	<p>Loosen the screws and move the motor slightly to slacken the timing belt.</p>	 <p>xx2000001614</p>

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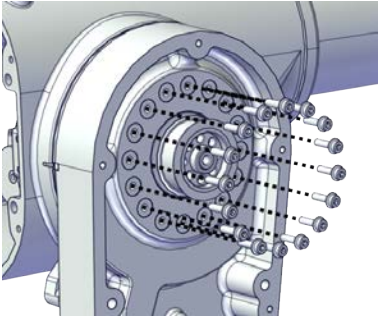

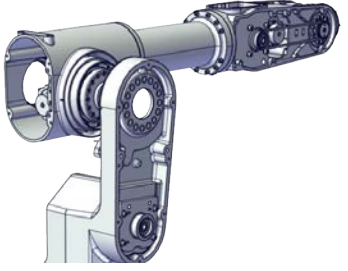
5 Repair

5.5.2 Replacing the housing and extender unit

Continued



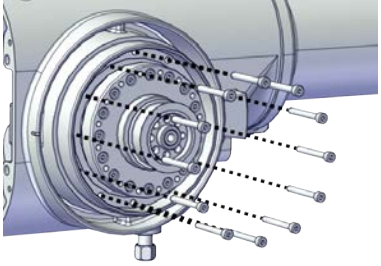
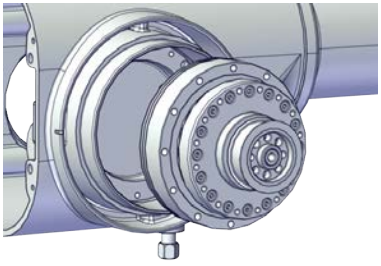
	Action	Note
6	Remove the timing belt from its groove on the motor.	 <p>xx2000001615</p>

Separating the lower arm from the housing


	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the screws.</p>  <p>WARNING</p> <p>This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured.</p> <p>The upper arm, including housing, extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit, weighs 17 kg.</p>	 <p>xx2000001664</p>
3	<p>Separate the lower arm from the housing.</p>  <p>Tip</p> <p>If the lower arm is hard to loosen from the housing, use a plastic hammer to knock on the lower arm lightly.</p>	 <p>xx2000001665</p>
4	Lay down the upper arm on a workbench. Make sure to support the gravity center of the upper arm.	

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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 Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
3	Remove the screws.	 xx2000001666
4	Pull out the gearbox.	 xx2000001667

Separating the housing

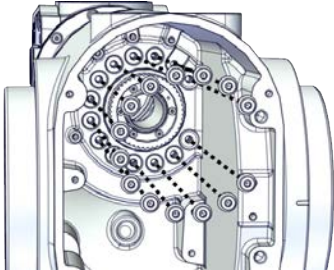
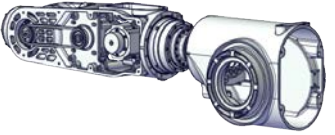
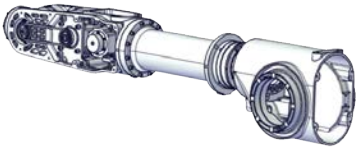
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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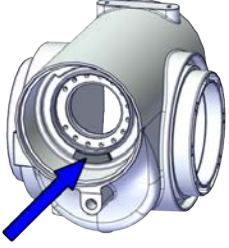
5 Repair

5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
2	Support the weight of the extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit, and remove the screws.	 xx2000001729
3	Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15 Separate the tubular from the housing.	 xx2000001728
4	Valid for CRB 1300-7/1.4 and 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	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



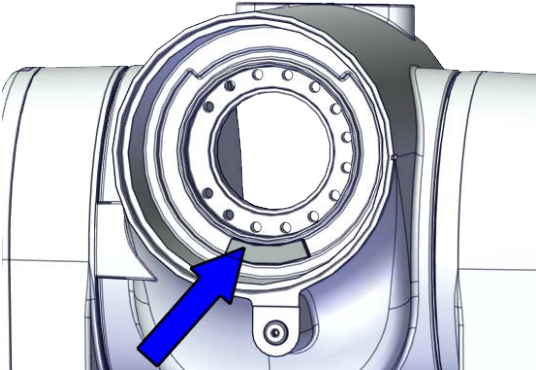
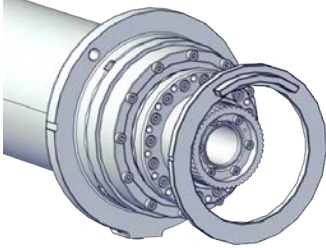


Note


Only CRB 1300-7/1.4 and 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	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. 	 xx2000001673

Removing the axis-4 gearbox


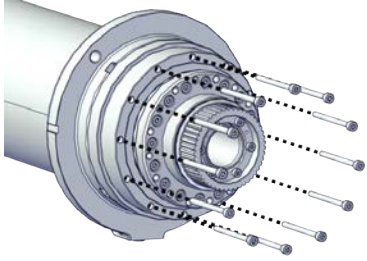
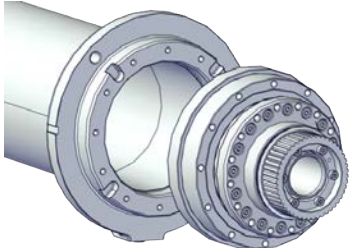
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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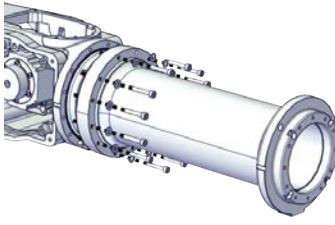
5 Repair

5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
2	 CAUTION Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
3	Remove the screws.	 xx2000001675
4	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.	
2	Separate the extender unit from the tubular.	 xx2000001730

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Refitting the extender unit

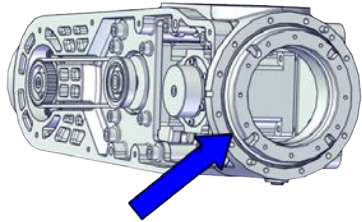
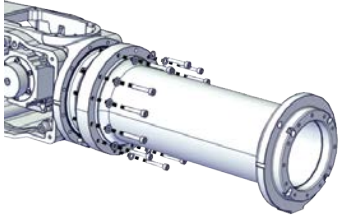
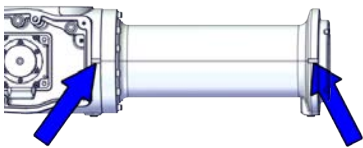


Note

Only CRB 1300-7/1.4 and 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	<p>For robots with protection class IP67 (option 3350-670) Check the O-ring. Replace if damaged.</p>	<p>O-ring on tubular: 3HAC061327-018</p>  <p>xx2000002519</p>
2	<p>Refit the extender unit.</p>	<p>Screw: M4x25 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 3.8 Nm</p>  <p>xx2000001730</p>
3	<p>Make sure that the notches on the extender unit and tubular are aligned.</p>	 <p>xx2000001731</p>

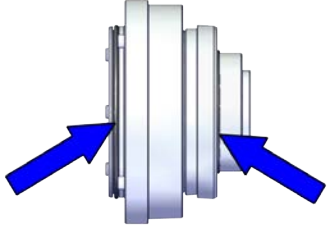
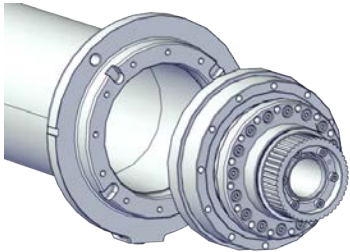
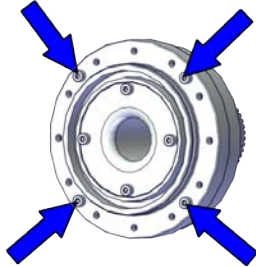
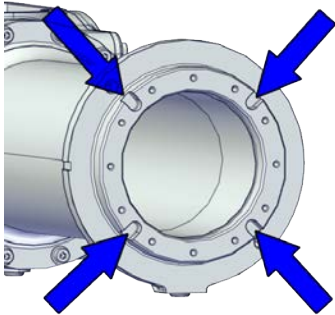
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5 Repair

5.5.2 Replacing the housing and extender unit

Continued

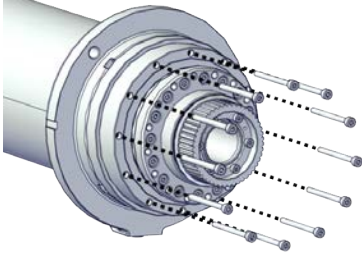
Refitting the axis-4 gearbox

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the o-rings.</p> <p>Replace if damaged.</p>	<p>O-ring on circular spline side, axis 4: 3HAC061327-021</p> <p>O-ring on flexible spline side, axis 4: 3HAC061327-017</p>  <p>xx2000002525</p>
2	<p>Refit the axis-4 gearbox.</p>	 <p>xx2000001676</p>
3	<p>Make sure that the screws on the gearbox are properly fitted into the notches on the extender unit.</p>	 <p>xx2000001720</p>  <p>xx2000001679</p>

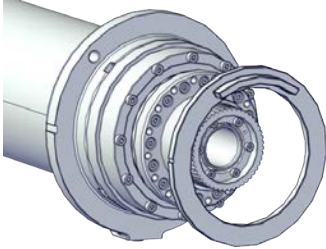
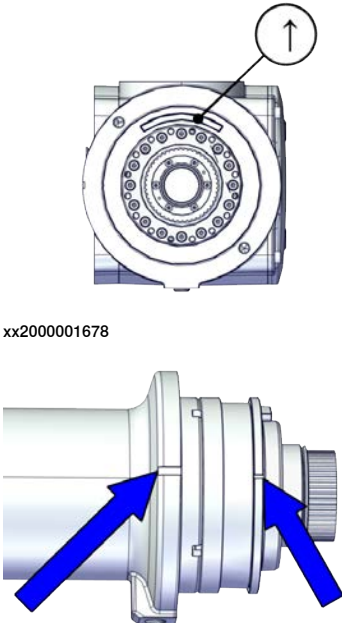
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5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
4	Secure with screws.	<p>Screw: M3x35 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 1.9 Nm</p>  <p>xx2000001675</p>

Refitting the axis-4 mechanical stop flange

	Action	Note
1	Refit the axis-4 mechanical stop flange to the gearbox.	 <p>xx2000001673</p>
2	<p>Make sure that :</p> <ul style="list-style-type: none"> 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. 	 <p>xx2000001678</p> <p>xx2000001677</p>

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5 Repair

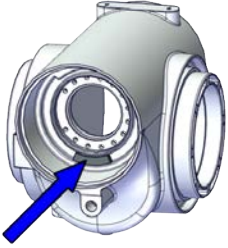
5.5.2 Replacing the housing and extender unit

Continued

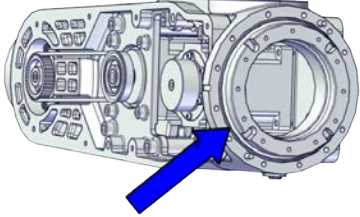
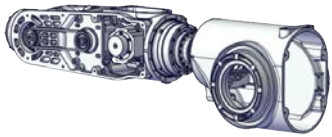
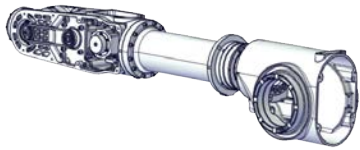
Refitting the housing

Use these procedures to refit the housing.

Refitting the axis-4 mechanical stop slider

	Action	Note
1	Place the axis-4 mechanical stop slider in the housing.	 xx2000001732

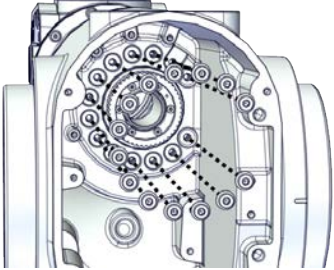
Refitting the housing

	Action	Note
1	For robots with protection class IP67 (option 3350-670) Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15 Check the O-ring. Replace if damaged.	O-ring on tubular: 3HAC061327-018  xx2000002519
2	Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15 Refit the tubular to the housing.	 xx2000001728
3	Valid for CRB 1300-7/1.4 and Refit the extender unit to the housing.	 xx2000001727

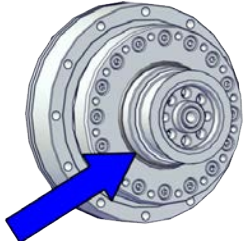
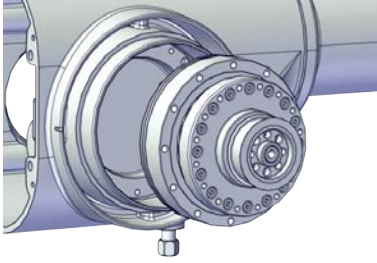
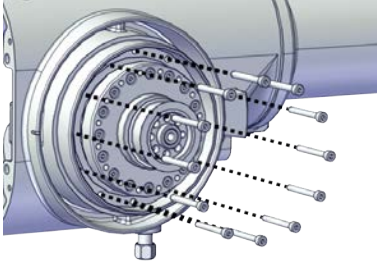
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5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
4	Refit the screws.	<p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9+PrO-COat111 (14 pcs) Tightening torque: 3.3 Nm</p>  <p>xx2000001729</p>

Refitting the axis-3 gearbox

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the O-ring. Replace if damaged.</p>	<p>O-ring on circular spline side, axis 3: 3HAC061327-016</p>  <p>xx2000002524</p>
2	Refit the axis-3 gearbox.	 <p>xx2000001667</p>
3	Secure with screws.	<p>Screw: M4x35 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 4.2 Nm±3%</p>  <p>xx2000001666</p>

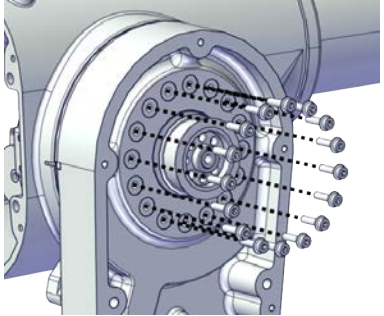
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5 Repair

5.5.2 Replacing the housing and extender unit

Continued

Refitting the lower arm to the housing

	Action	Note
1	Refit the lower arm to the housing.	<p>Screw: M4x16 12.9 Lafre 2C2B/FC6.9+PrO-COat111 (16 pcs) Tightening torque: 4.5 Nm±3%</p>  <p>xx2000001664</p>

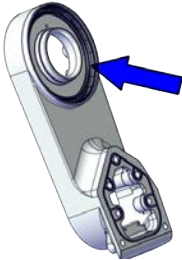
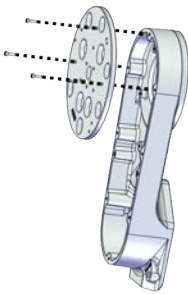
Checking the radial sealing on the lower arm support



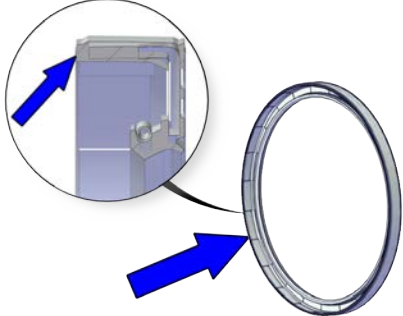
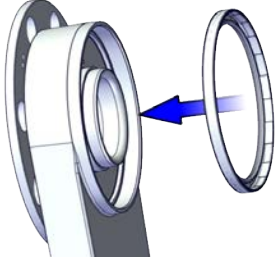
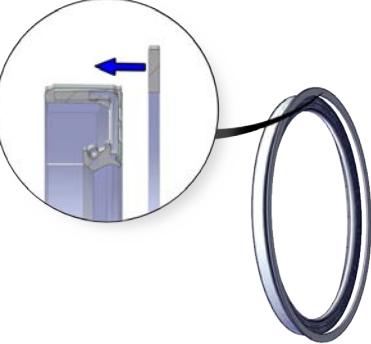
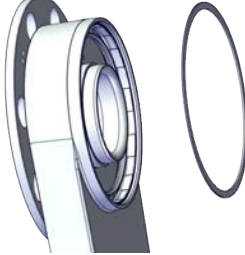
Note

This procedure is valid for robots with:

- protection class IP67 (option 3350-670)

	Action	Note
1	Check the radial sealing on the lower arm support. Replace if damaged, as described below.	 <p>xx2000002477</p>
2	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.	<p>Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002478</p>
3	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001

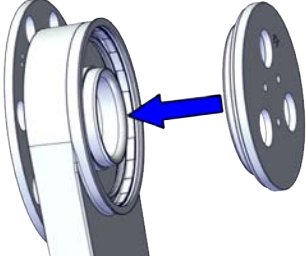
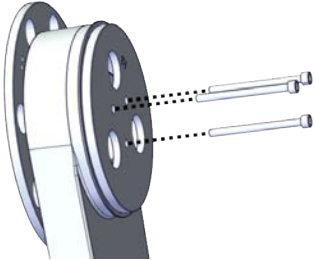
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	Action	Note
4	<p>Fit the new sealing into the lower arm support. For robots with protection class IP67 (option 3350-670) The sealing lip as pointed in the following figure is facing the outer side of the robot.</p>  <p>xx2000002537</p>	 <p>xx2000002479</p>
5	<p>For robots with protection class IP67 (option 3350-670) Place the ring of the axis-3 sealing assembly tool against the sealing.</p>  <p>xx2000002562</p>	<p>Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002480</p>

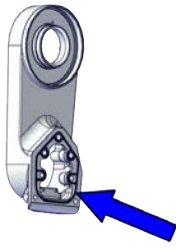
5 Repair

5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
6	Fit the small circular plate of the axis-3 sealing assembly tool and fix with three M6x75 screws.	<p>Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002481</p>  <p>xx2000002482</p>
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.	

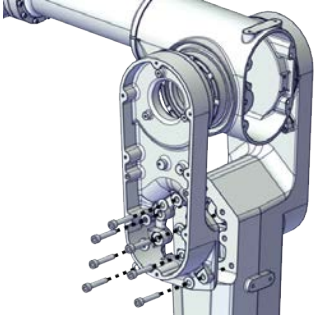
Refitting the lower arm support

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket for lower arm support: 3HAC067826-001</p>  <p>xx2000002521</p>

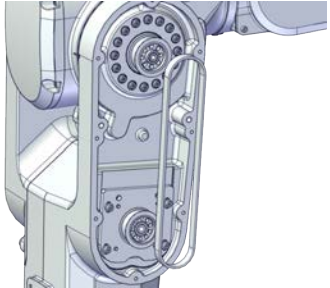
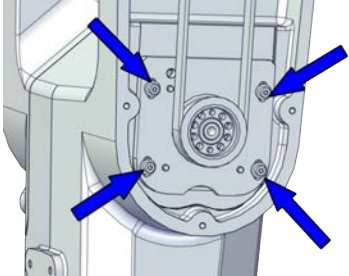
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5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
2	Refit the lower arm support.	<p>Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm</p>  <p>xx2000001663</p>

Refitting the axis-3 timing belt

	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 <p>xx2000001615</p>
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	
3	Tighten the motor screws.	<p>Tightening torque: 3.3 Nm</p>  <p>xx2000001614</p>
4	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.	<p>Used belt: 73.4-78.5 Hz New belt: 87.8-92.1 Hz</p>
5	Release the support to the upper arm.	

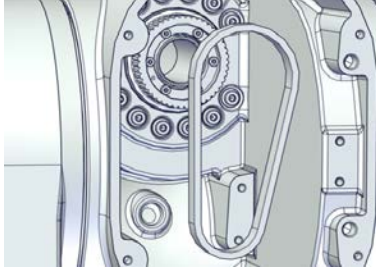

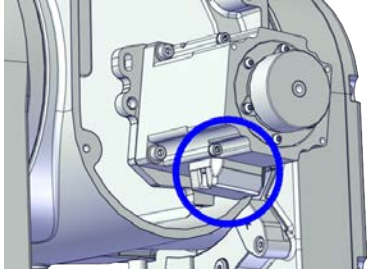
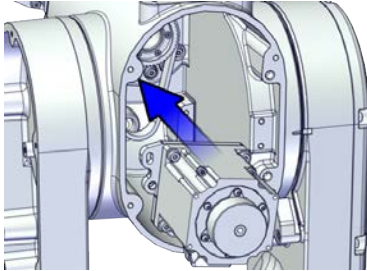

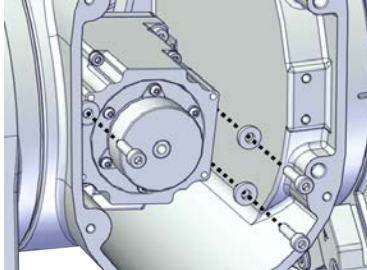
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5 Repair

5.5.2 Replacing the housing and extender unit

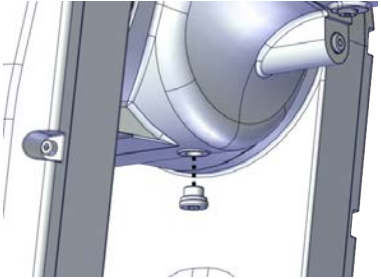
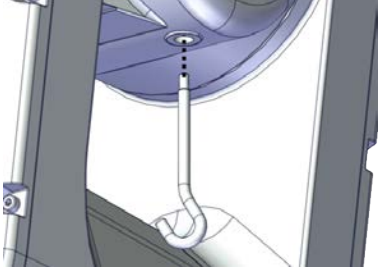
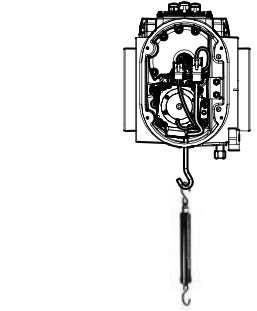

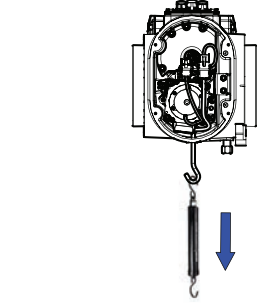
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Refitting the axis-4 motor

	Action	Note
1	Check that: <ul style="list-style-type: none"> all assembly surfaces are clean and without damages the motor is clean and undamaged. 	
2	Install the timing belt to the gearbox pulley and verify that the belt runs correctly in the grooves of the pulley.	 <p>xx2000001670</p>
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.  <p>xx2000001607</p>
4	Refit the motor and verify that the timing belt runs correctly in the groove of the motor pulley.	 <p>xx2000001680</p>
5	Refit the screws and washers.  Note Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre 2C2B/FC6.9 (3 pcs)  <p>xx2000001605</p>

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Adjusting the axis-4 timing belt tension

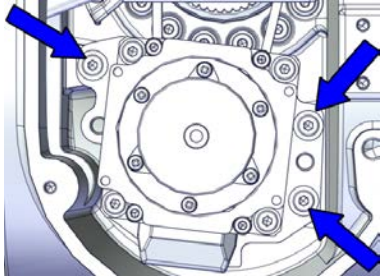
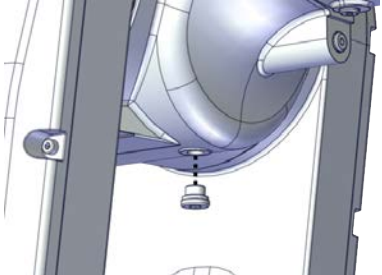
	Action	Note
1	Remove the screw below the housing.	 <p>xx2000001609</p>
2	Fit the tension adjustment tool for axis-4 timing belt to the screw hole.	<p>Tension adjustment tool for axis-4 timing belt. Included in special toolkit 3HAC076396-001.</p>  <p>xx2000001610</p>
3	Use a handheld dynamometer hooking to the tool.	 <p>xx2000001611</p>
4	<p>Pull the dynamometer to make the tension falling in the allowed force range.</p> <p> Note</p> <p>During the measurement, make sure that all interferences that may affect the force are removed. Pay attention to the force application direction.</p>	<p>Used belt: 33.4-38.2 N New belt: 47.8-52.4 N</p>  <p>xx2000001612</p>

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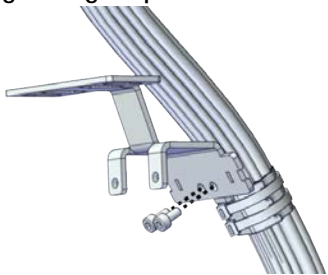
5 Repair

5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
5	Secure the motor with the screws.	<p>Tightening torque: 3.3 Nm\pm3%</p>  <p>xx2000001604</p>
6	Remove the tool and refit the plug screw.	<p>Tightening torque: 3 Nm Plug screw: 3HAC078352-001</p>  <p>xx2000001609</p>


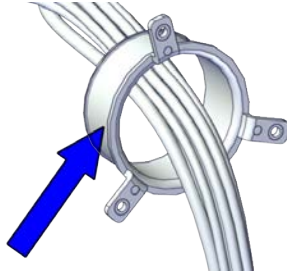
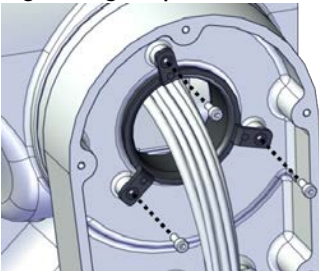

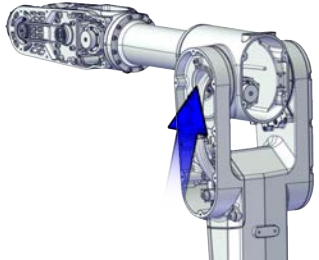
Routing the cable package in the lower arm

	Action	Note
1	Refit the connector plate to the cable package.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001554</p>

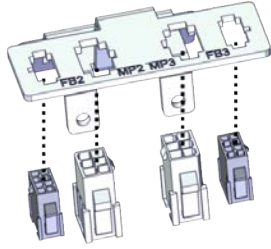
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5.5.2 Replacing the housing and extender unit

Continued

	Action	Note
2	<p>Check the axis-3 cable protector. Replace if damaged.</p> <p> Note</p> <p>If replaced, apply grease to the axis-3 cable protector before refitting.</p>	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001</p>  <p>xx2000001568</p> <p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (3 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001552</p>
3	<p>Route the cable package through the lower arm support and up into the housing.</p> <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001569</p>

Reconnecting the axis-2 and -3 motor connectors


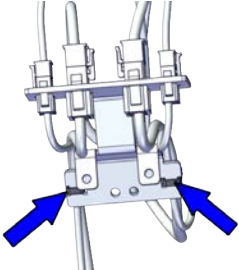

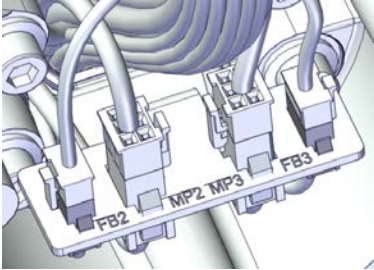
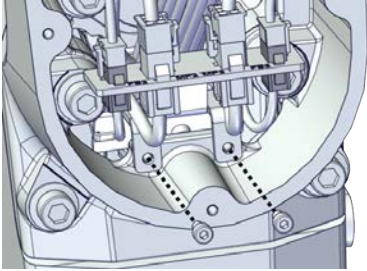
	Action	Note
1	<p>Insert the male header of the motor connectors to the connector plate.</p>	 <p>xx2000001551</p>

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5 Repair

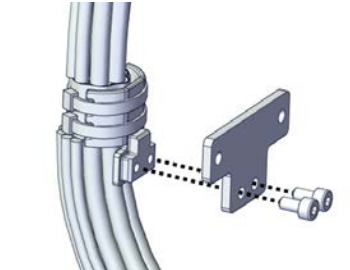
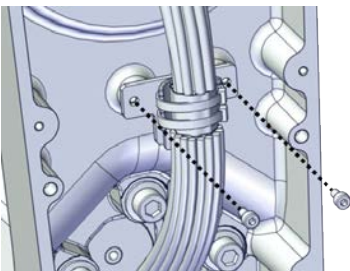
5.5.2 Replacing the housing and extender unit

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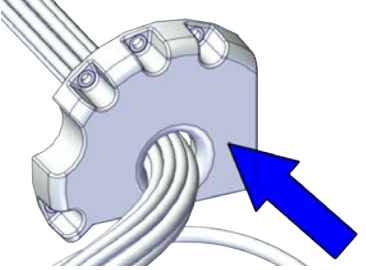

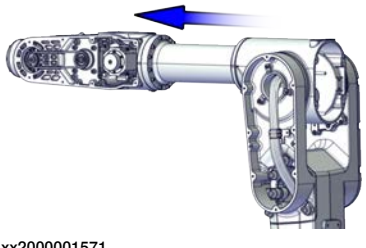
	Action	Note
2	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001549</p>
3	<p>Reconnect the connectors.</p> <ul style="list-style-type: none">• FB2• MP2• FB3• MP3 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001550</p>
4	<p>Refit the connector plate to the lower arm.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001548</p>

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Securing the cable package in the lower arm

	Action	Note
1	Refit the cable bracket.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm</p>  <p>xx2100001465</p>  <p>xx2000001553</p>

Routing the cable package in the housing

	Action	Note
1	Slip the axis-4 cable protector over the cable package.	<p>Plastic cable protector, axis 4: 3HAC064694-001:</p>  <p>xx2000001570</p>
2	<p>Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for CRB 1300-7/1.4 and) and into the tubular.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001571</p>

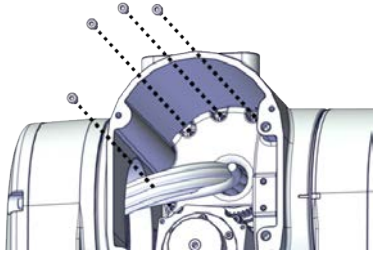
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5 Repair

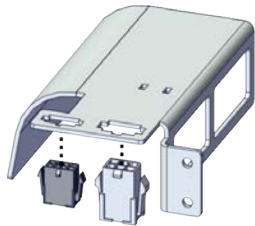

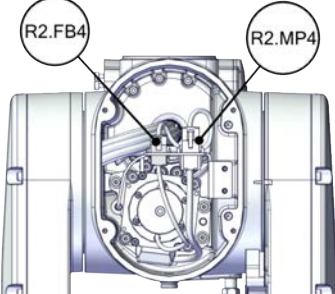


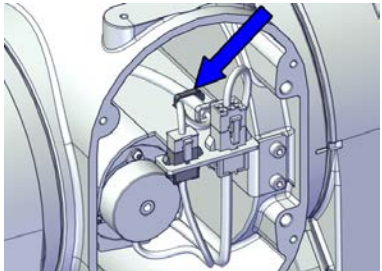
5.5.2 Replacing the housing and extender unit

Continued

Securing the cable package in the housing

	Action	Note
1	Refit the axis-4 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001546</p>

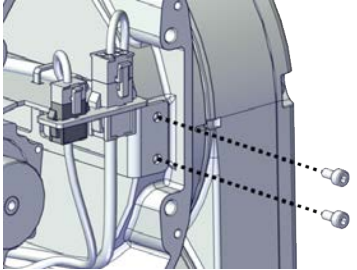
Reconnecting the axis-4 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001545</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB4 • MP4 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001544</p>
3	<p>Route and secure the cabling with a cable strap.</p> <p> Note</p> <p>The motor cabling has another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001543</p>

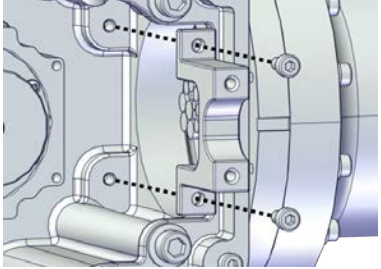
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5.5.2 Replacing the housing and extender unit

Continued

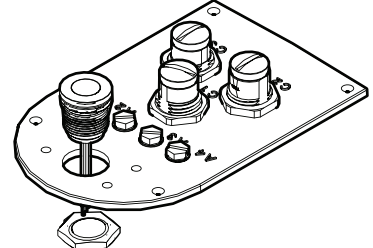
	Action	Note
4	Refit the connector plate.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001542</p>

Routing the cable package in the tubular

	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001749</p>
2	<p>Route the cablings.</p> <ul style="list-style-type: none"> • 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. 	

Refitting the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

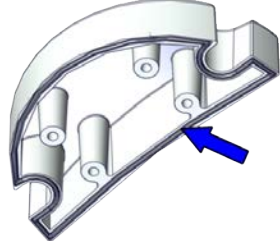
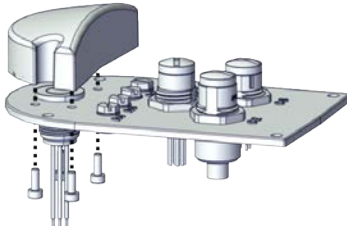
	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>

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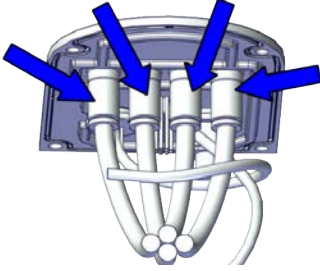

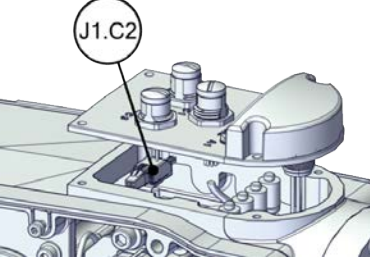
5 Repair

5.5.2 Replacing the housing and extender unit

Continued

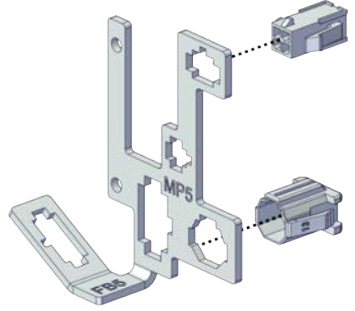

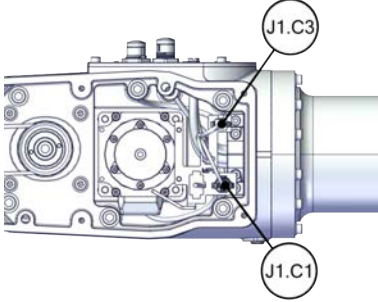
	Action	Note
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>
3	<p>Refit the lamp unit cover.</p>	<p>Lamp unit cover: 3HAC082320-001 Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 0.6 Nm</p>  <p>xx2200001002</p>

Reconnecting the air hoses and Ethernet cabling (if equipped)

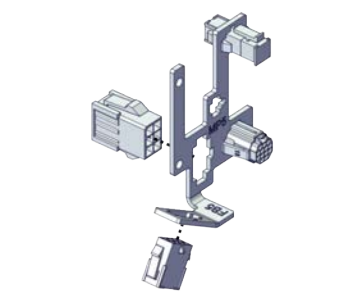

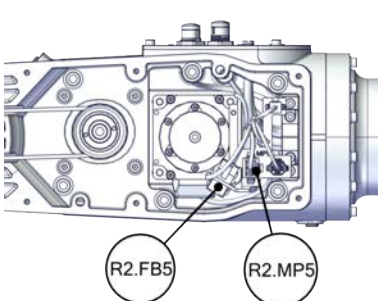
	Action	Note
1	<p>Reconnect the air hoses.</p> <p> Note</p> <p>See the number markings on the air hoses for help to find the corresponding air hoses.</p>	 <p>xx2000001539</p>
2	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and reconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2200001001</p>

Continues on next page

Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>
2	For robots with CP/CS cabling Reconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001536</p>

Reconnecting the axis-5 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001535</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB5 • MP5  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001534</p>

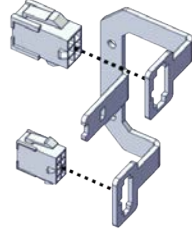

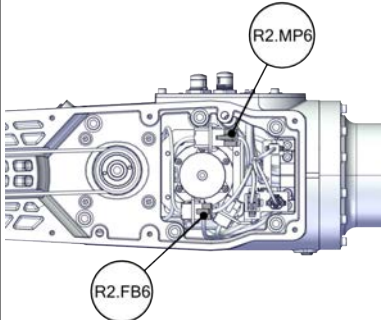
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5 Repair

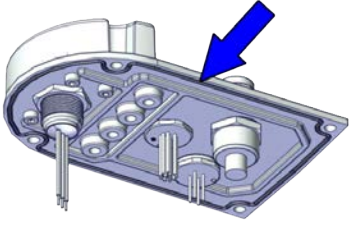
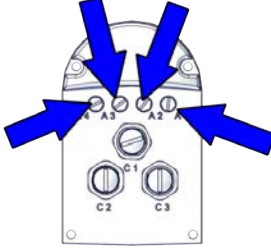
5.5.2 Replacing the housing and extender unit

Continued

Reconnecting the axis-6 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 xx2000001533
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB6 • MP6  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532


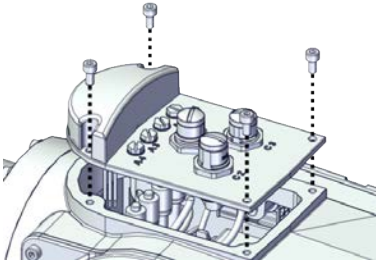
Refitting the process hub

	Action	Note
1	For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2200001005
2	For robots with protection class IP67 (option 3350-670) Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2200001006

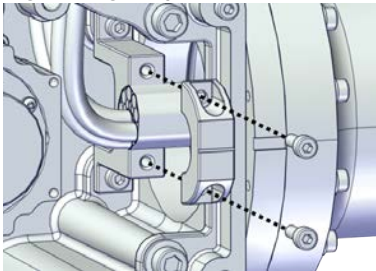
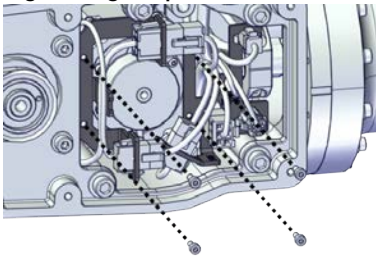
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5.5.2 Replacing the housing and extender unit

Continued

	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.	
4	Refit the process hub.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm  xx2200001000

Securing the cable package in the tubular


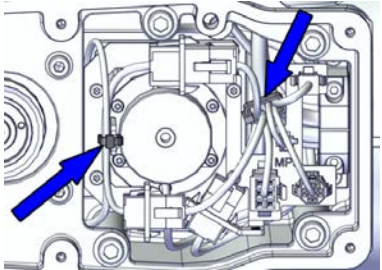
	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001748
2	Refit the connector plate.	Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531

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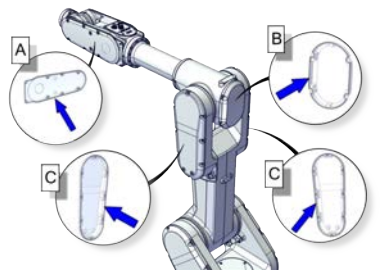
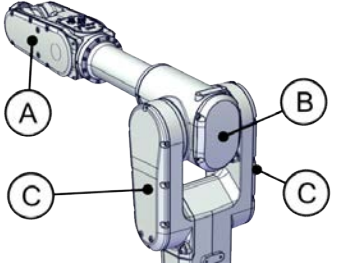
5 Repair

5.5.2 Replacing the housing and extender unit


Continued

	Action	Note
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>

Refitting the covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets.</p> <ul style="list-style-type: none"> • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm covers (C) <p>Replace if damaged.</p>	 <p>xx2000002502</p>
2	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
3	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
4	<p>Refit the covers.</p> <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) 	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001661</p>

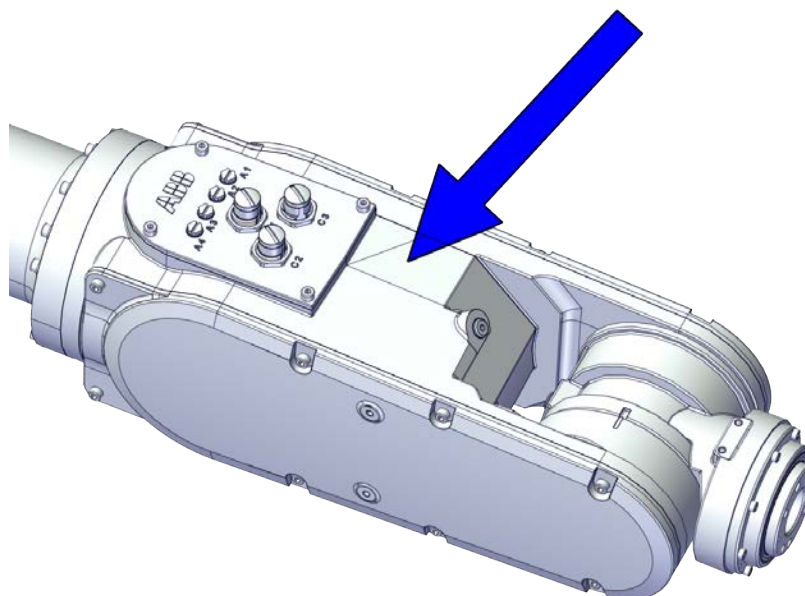
Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
2	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 171.</p>	

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

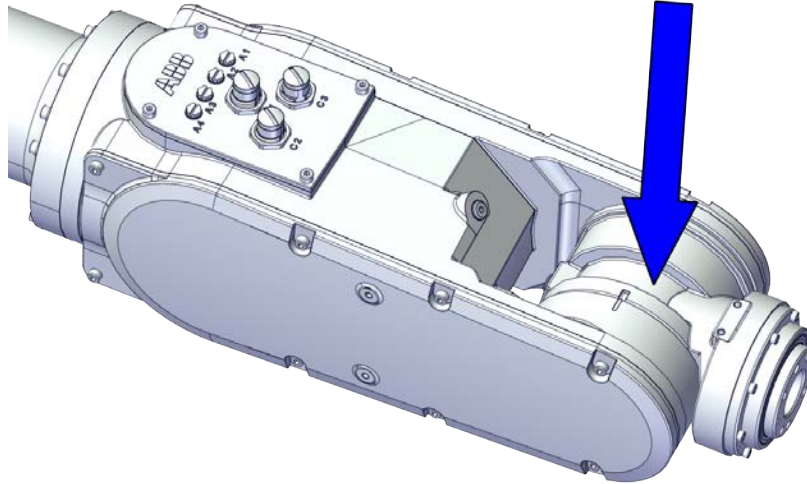
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5 Repair

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Tilt unit	3HAC073083-001	Used with protection class IP40.
Tilt unit, IP67	3HAC077804-001	Used with protection class IP67.
Tubular	3HAC073081-001	
Tubular support	3HAC073082-001	Used with protection class IP40.
Tubular support, IP67	3HAC077803-001	Used with protection class IP67.
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.

Continues on next page

Spare part	Article number	Note
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.
Radial sealing on lower arm	3HAC070148-005	Used with protection class IP67. Replace if damaged.
O-ring on tubular	3HAC061327-018	Used with protection class IP67. Replace if damaged.
Plug screw	3HAC078352-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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.

Continues on next page

5 Repair

5.5.3 Replacing the tubular and tilt unit

Continued

Equipment	Article number	Note
Special toolkit for IP67 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .

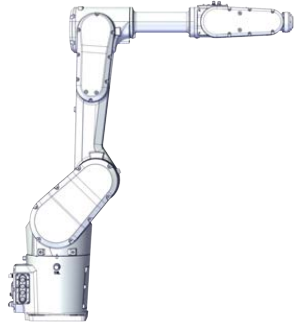

Required consumables

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 CRB 1300-11/0.9 and CRB 1300-10/1.15


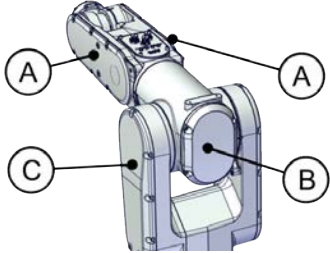
Use these procedures to remove the tubular and tilt unit for CRB 1300-11/0.9 and CRB 1300-10/1.15.

Preparations before removing the tubular and tilt unit


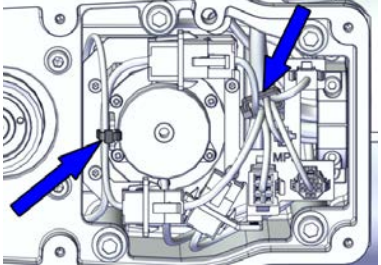

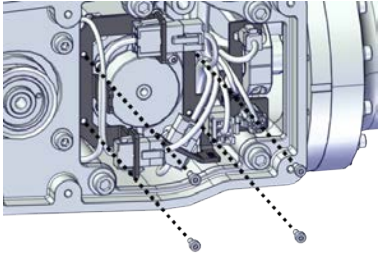
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the safeguarded space.	

Continues on next page

Removing the covers

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the covers.</p> <ul style="list-style-type: none"> • Tubular covers (A) • Housing cover (B) • Lower arm support cover (C) 	 <p>xx2000001733</p>

Loosening the cables in the tubular

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Cut the cable straps.</p>	 <p>xx2000001530</p>
3	<p>Remove the connector plates.</p>  <p>CAUTION</p> <p>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.</p>	 <p>xx2000001531</p>



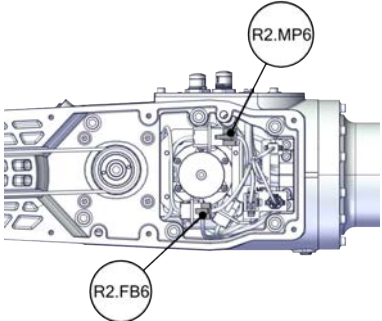
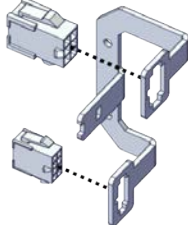
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5 Repair



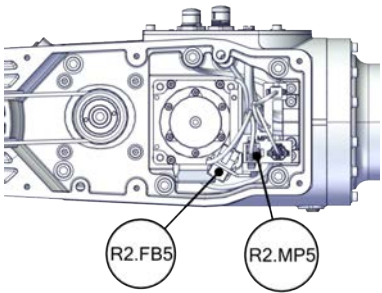
5.5.3 Replacing the tubular and tilt unit

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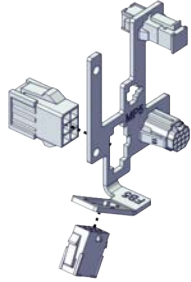
Disconnecting the axis-6 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP6 • FB6  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
3	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533



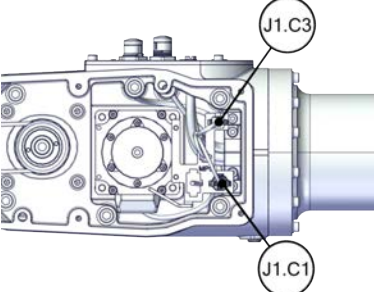
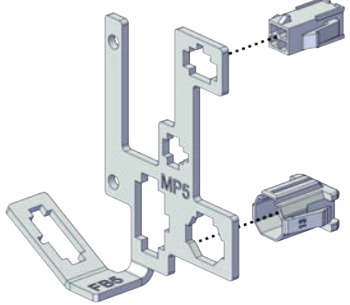
Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP5 • FB5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534

Continues on next page

	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001535</p>

Disconnecting CP/CS cabling (if equipped)

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>For robots with CP/CS cabling</p> <p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3  <p>Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001536</p>
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>


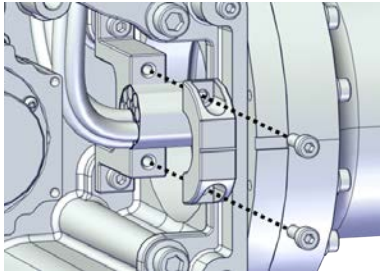
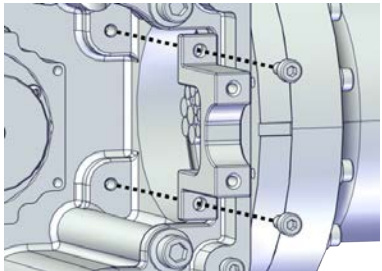
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5 Repair



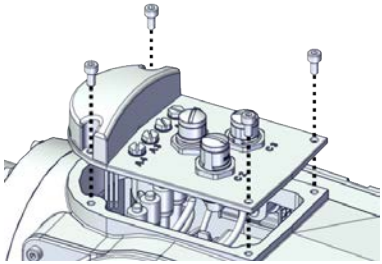
5.5.3 Replacing the tubular and tilt unit

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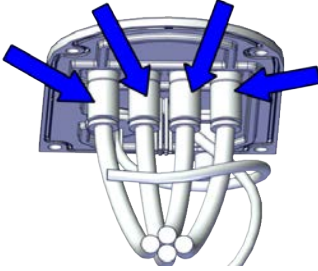


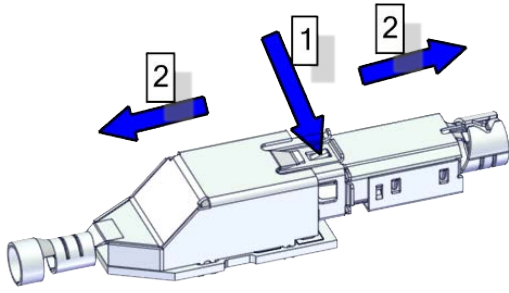
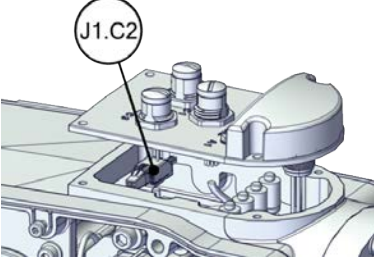
Separating the cable package from the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
3	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub

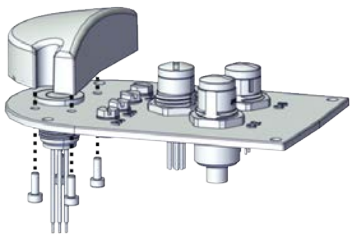
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the screws and carefully open the cover.  CAUTION There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2200001000

Continues on next page

	Action	Note
3	<p>Disconnect the air hoses.</p>	 <p>xx2000001539</p>
4	<p>For robots with Ethernet cabling Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip</p> <p>The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>

Removing the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

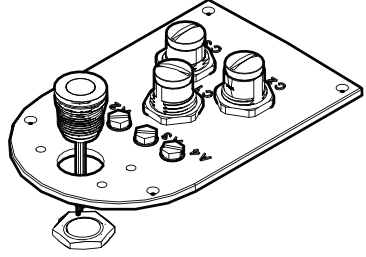
	Action	Note
1	<p>Remove the lamp unit cover.</p>	 <p>xx2200001002</p>

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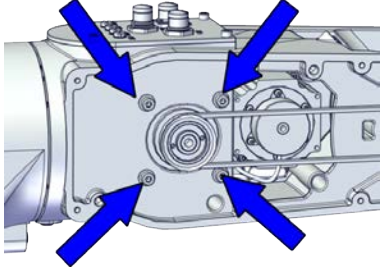
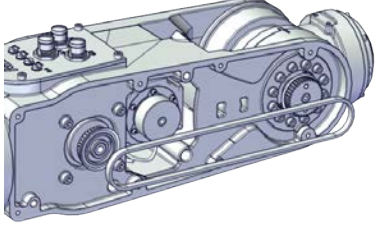
5 Repair

5.5.3 Replacing the tubular and tilt unit

Continued



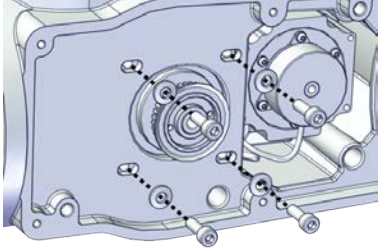
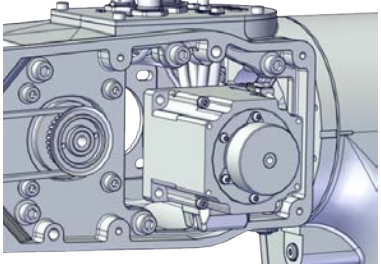
	Action	Note
2	Remove the lamp unit.	 xx2200001003

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 Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001594
4	Remove the timing belt from its groove on the motor.	 xx2000001595

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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 Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
3	Remove the screws and washers.	 xx2000001596
4	Carefully lift out the motor.	 xx2000001597

Removing the axis-6 timing belt

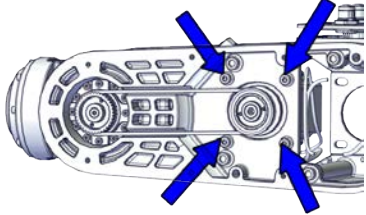
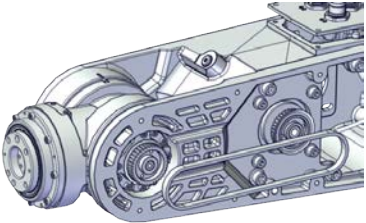
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	

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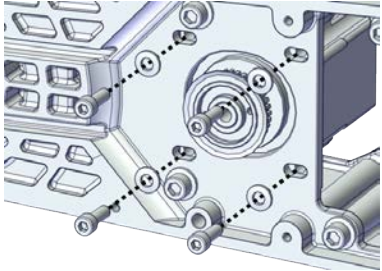
5 Repair

5.5.3 Replacing the tubular and tilt unit

Continued

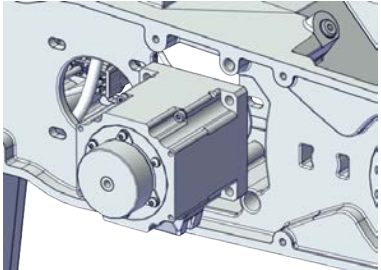
	Action	Note
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001599
4	Remove the timing belt from its groove on the motor.	 xx2000001600

Removing the axis-6 motor



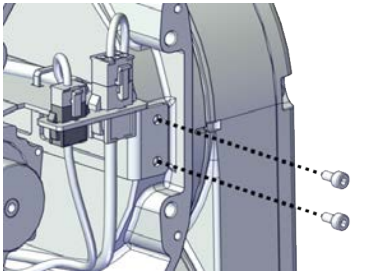

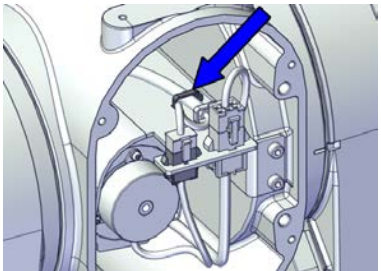

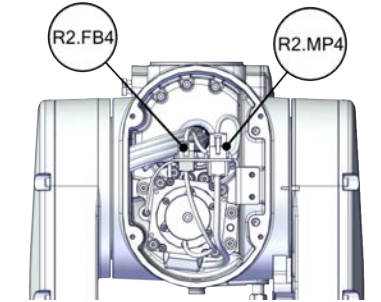
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
3	Remove the screws and washers.	 xx2000001601

Continues on next page

5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
4	Carefully lift out the motor.	 <p>xx2000001602</p>

Disconnecting the axis-4 motor connectors

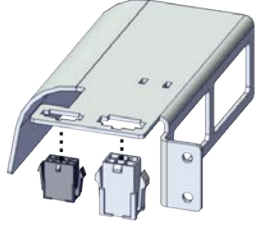
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 <p>xx2000001542</p>
3	 Note The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 <p>xx2000001543</p>
4	Disconnect the connectors. <ul style="list-style-type: none"> • MP4 • FB4  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001544</p>

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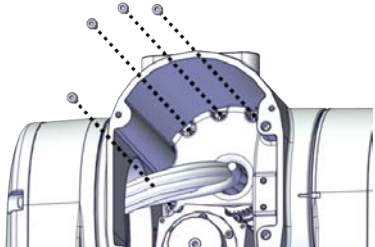
5 Repair

5.5.3 Replacing the tubular and tilt unit


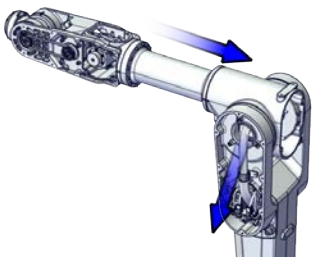
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	Action	Note
5	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001545

Separating the cable package from the housing



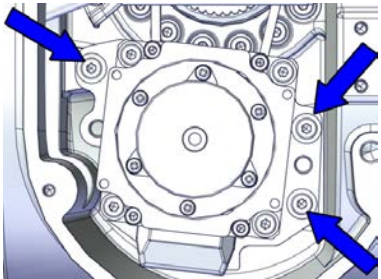
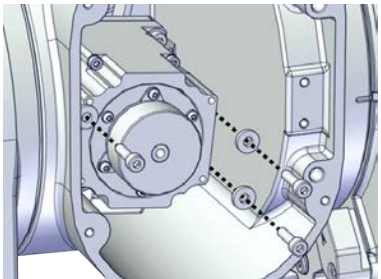
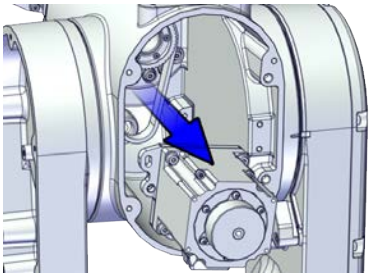
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the axis-4 cable protector.	 xx2000001546

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	Wrap the connectors with the masking tape.	
3	Pull the cable package out to the lower arm support.	 xx2000001662

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Removing the axis-4 motor

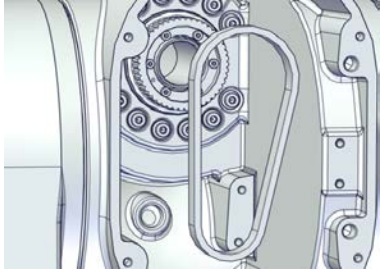
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>Removing motors will release axes. This means the axes can fall down.</p> <p>Make sure axes are well supported before removing motors.</p>	
3	<p>Loosen the screws and move the motor slightly to slacken the timing belt.</p>	 <p>xx2000001604</p>
4	<p>Remove the timing belt from its groove on the motor.</p>	
5	<p>Remove the screws and washers.</p>	 <p>xx2000001605</p>
6	<p>Carefully lift out the motor.</p>	 <p>xx2000001669</p>

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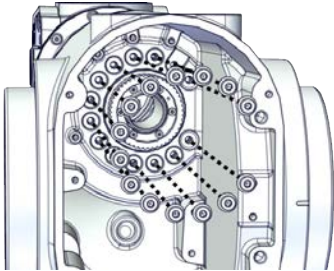
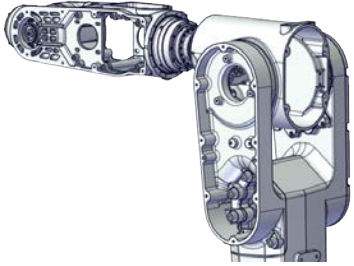
5 Repair

5.5.3 Replacing the tubular and tilt unit


Continued

	Action	Note
7	Remove the timing belt.	 <p>xx2000001670</p>


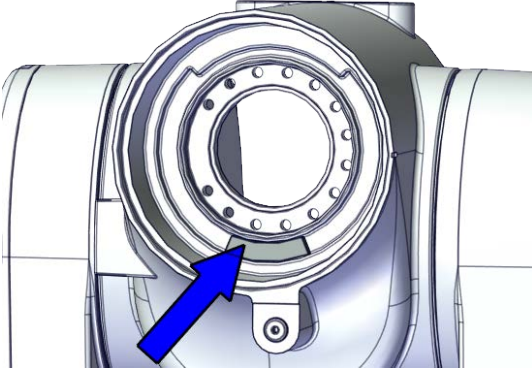
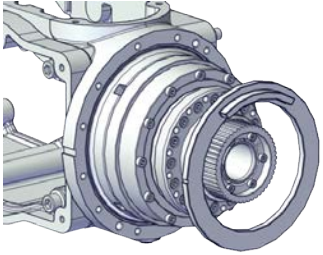
Separating the housing

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Support the weight of the tubular and tilt unit, and remove the screws.	 <p>xx2000001729</p>
3	Separate the tubular from the housing.	 <p>xx2000001734</p>



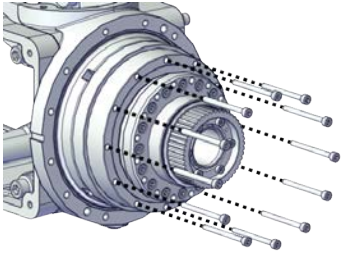
Removing the axis-4 mechanical stop flange

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

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	Action	Note
2	<p>Remove the axis-4 mechanical stop flange.</p> <p> CAUTION</p> <p>The axis-4 mechanical stop slider is accessible from the housing. Put it aside for later refitting.</p>  <p>xx2000001674</p>	 <p>xx2000001735</p>

Removing the axis-4 gearbox

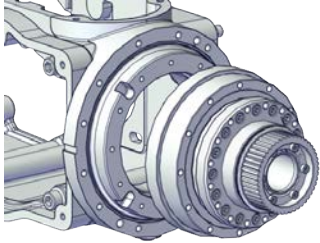
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.</p>	
3	<p>Remove the screws.</p>	 <p>xx2000001736</p>

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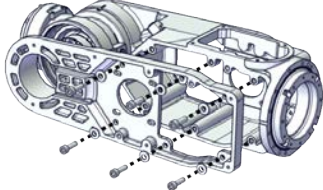
5 Repair

5.5.3 Replacing the tubular and tilt unit


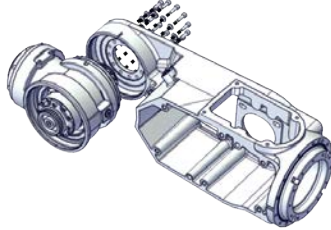
Continued

	Action	Note
4	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	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

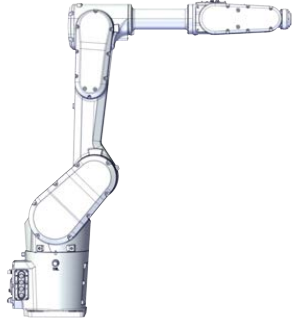

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the tilt unit.	 xx2000001741

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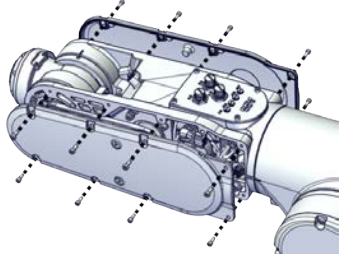
Removing the tubular and tilt unit for CRB 1300-7/1.4

Use these procedures to remove the tubular and tilt unit for CRB 1300-7/1.4

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.	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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	Remove the tubular covers.	 xx2000001593


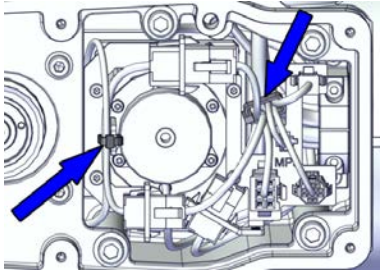

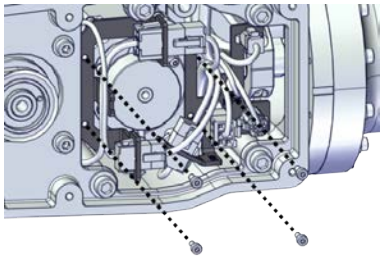
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5 Repair



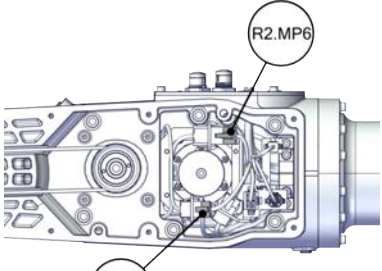
5.5.3 Replacing the tubular and tilt unit

Continued

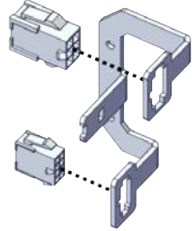
Loosening the cables in the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Cut the cable straps.	 xx2000001530
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



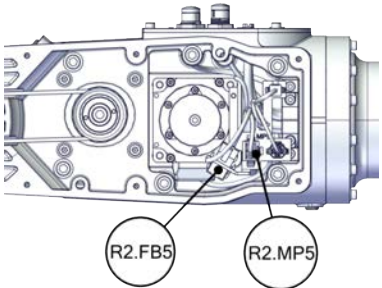
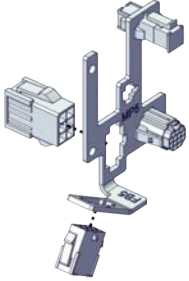
Disconnecting the axis-6 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP6 • FB6  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532


Continues on next page

	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001533</p>

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	Disconnect the connectors. <ul style="list-style-type: none"> • MP5 • FB5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001534</p>
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001535</p>

Disconnecting CP/CS cabling (if equipped)


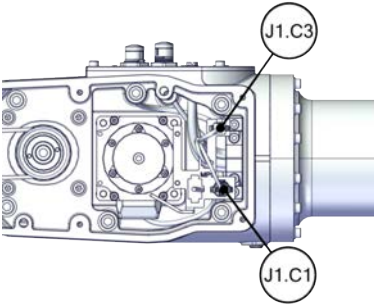
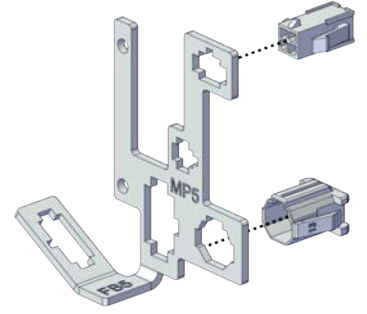
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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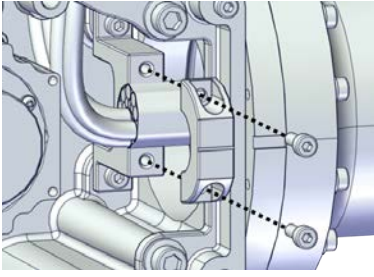
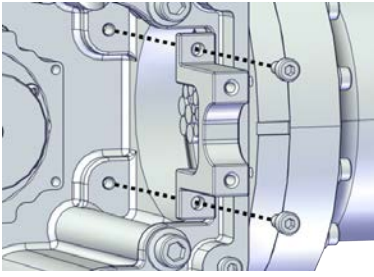
5 Repair

5.5.3 Replacing the tubular and tilt unit

Continued



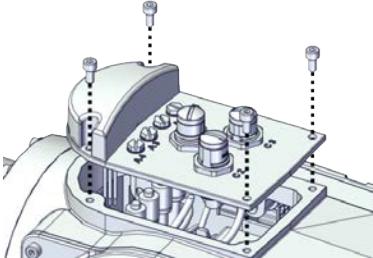
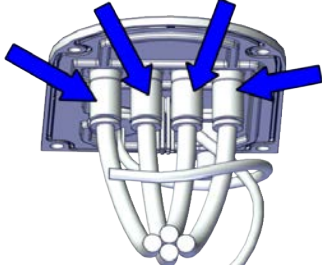
	Action	Note
2	<p>For robots with CP/CS cabling Disconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001536</p>
3	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001537</p>

Separating the cable package from the tubular

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the first semicircular bracket that fixes the cable package.</p>	 <p>xx2000001748</p>
3	<p>Remove the second semicircular bracket from the tubular.</p>	 <p>xx2000001749</p>

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Removing the process hub



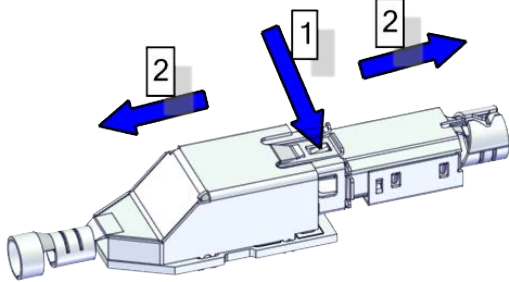
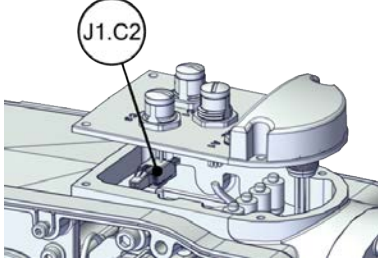
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the screws and carefully open the cover.</p> <p> CAUTION</p> <p>There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.</p>	 <p>xx2200001000</p>
3	<p>Disconnect the air hoses.</p>	 <p>xx2000001539</p>

Continues on next page

5 Repair

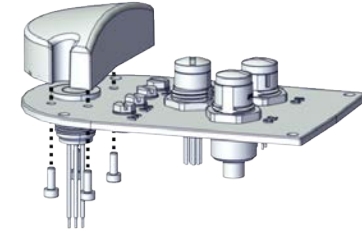
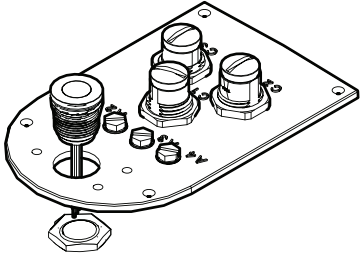
5.5.3 Replacing the tubular and tilt unit

Continued

	Action	Note
4	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip</p> <p>The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>



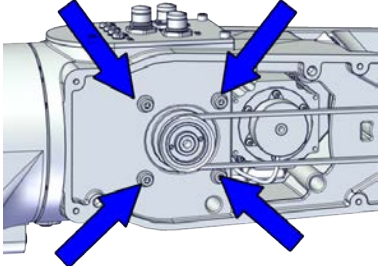
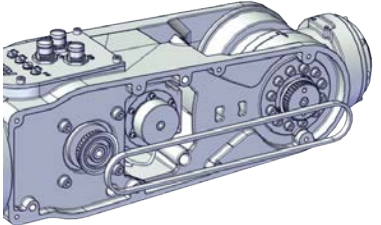
Removing the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.



	Action	Note
1	Remove the lamp unit cover.	 <p>xx2200001002</p>
2	Remove the lamp unit.	 <p>xx2200001003</p>

Continues on next page

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 Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001594
4	Remove the timing belt from its groove on the motor.	 xx2000001595

Removing the axis-5 motor

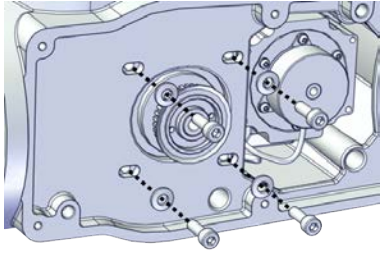
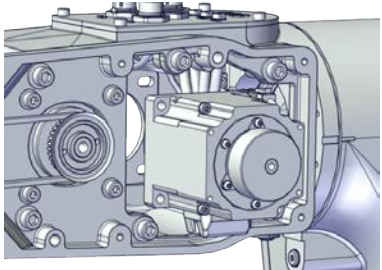
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	

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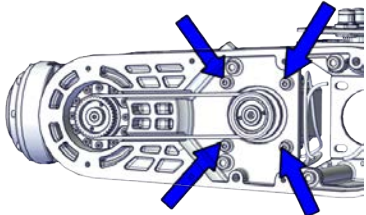
5 Repair

5.5.3 Replacing the tubular and tilt unit

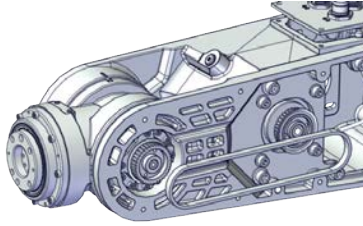
Continued

	Action	Note
3	Remove the screws and washers.	 xx2000001596
4	Carefully lift out the motor.	 xx2000001597



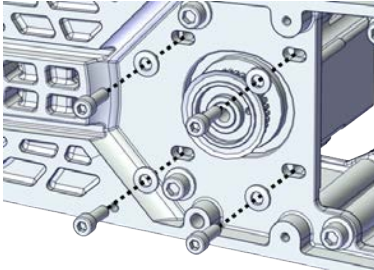
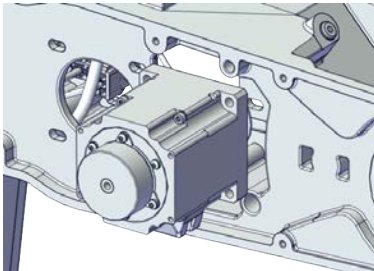
Removing the axis-6 timing belt

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001599

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	Action	Note
4	Remove the timing belt from its groove on the motor.	 <p>xx2000001600</p>

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 Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
3	Remove the screws and washers.	 <p>xx2000001601</p>
4	Carefully lift out the motor.	 <p>xx2000001602</p>


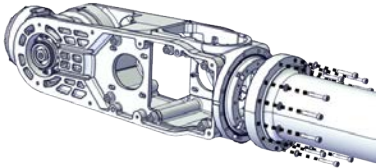
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5 Repair



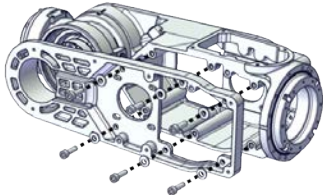
5.5.3 Replacing the tubular and tilt unit

Continued


Separating the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the tubular and tilt unit from the extender unit.	 xx2000001739

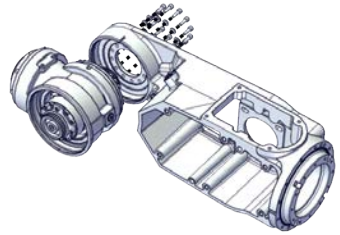
Separating the tubular support

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	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.	

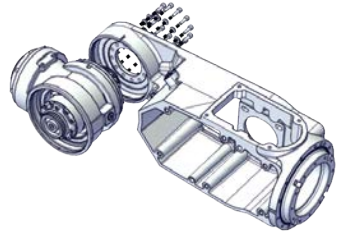
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	Action	Note
2	Remove the tilt unit.	 <p>xx2000001741</p>

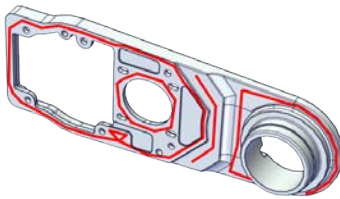
Refitting the tubular and tilt unit for CRB 1300-11/0.9 and CRB 1300-10/1.15

Use these procedures to refit the tubular and tilt unit for CRB 1300-11/0.9 and CRB 1300-10/1.15.

Refitting the tilt unit

	Action	Note
1	Refit the tilt unit.	<p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 4.5 Nm</p>  <p>xx2000001741</p>

Refitting the tubular support

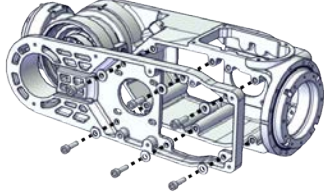
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <ol style="list-style-type: none"> 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574. 	 <p>xx2000002523</p>

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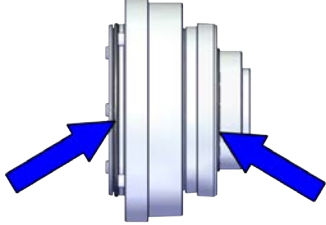
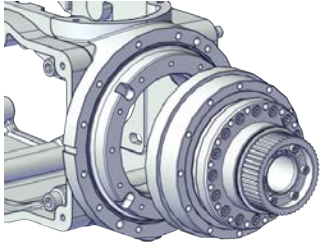
5 Repair

5.5.3 Replacing the tubular and tilt unit

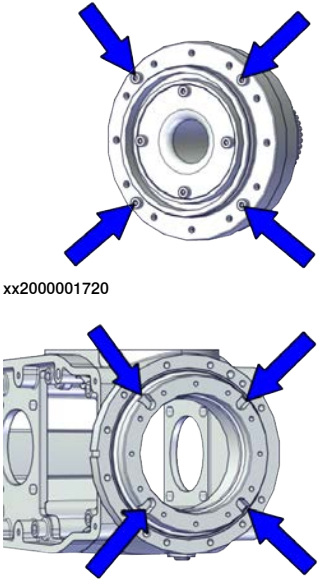
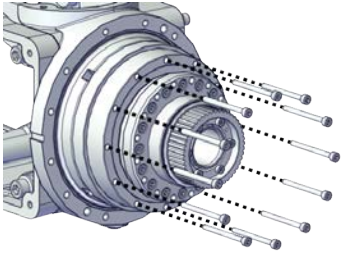
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	Action	Note
2	Refit the tubular support.	<p>Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 14 Nm</p>  <p>xx2000001740</p>

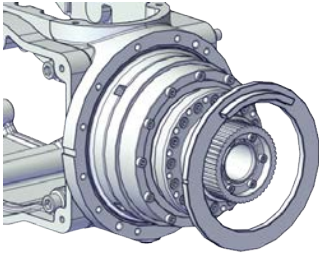
Refitting the axis-4 gearbox

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the o-rings. Replace if damaged.</p>	<p>O-ring on circular spline side, axis 4: 3HAC061327-021 O-ring on flexible spline side, axis 4: 3HAC061327-017</p>  <p>xx2000002525</p>
2	Refit the axis-4 gearbox.	 <p>xx2000001737</p>

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	Action	Note
3	Make sure that the screws on the gearbox are properly fitted into the notches on the tubular.	 <p>xx2000001720</p> <p>xx2000001738</p>
4	Secure with screws.	<p>Screw: M3x35 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 1.9 Nm</p>  <p>xx2000001736</p>

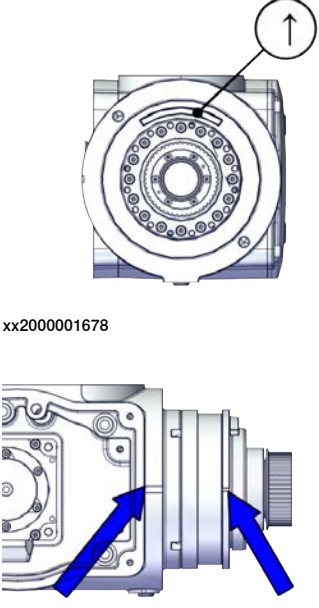
Refitting the axis-4 mechanical stop flange

	Action	Note
1	Refit the axis-4 mechanical stop flange to the gearbox.	 <p>xx2000001735</p>

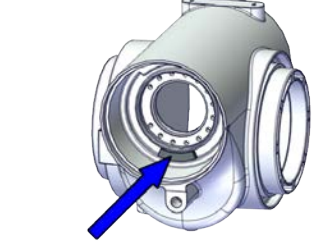
5 Repair

5.5.3 Replacing the tubular and tilt unit

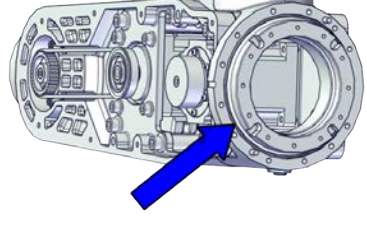
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	Action	Note
2	Make sure that : <ul style="list-style-type: none"> • the block on the mechanical stop flange is towards the upper side (process hub side). • the notches on the tubular and the mechanical stop flange are aligned. 	 <p>xx2000001678</p> <p>xx2000001718</p>

Refitting the axis-4 mechanical stop slider

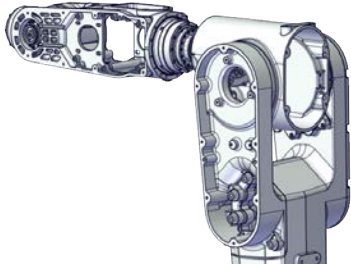
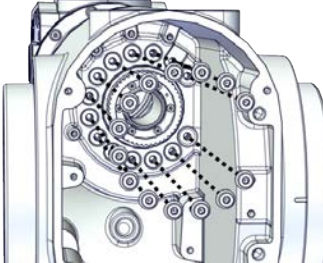
	Action	Note
1	Place the axis-4 mechanical stop slider in the housing.	 <p>xx2000001732</p>

Refitting the housing

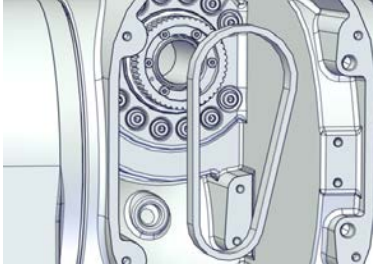
	Action	Note
1	For robots with protection class IP67 (option 3350-670) Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15 Check the O-ring. Replace if damaged.	O-ring on tubular: 3HAC061327-018  <p>xx2000002519</p>

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5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
2	Refit the tubular to the housing.	 <p>xx2000001734</p>
3	Refit the screws.	<p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9+PrO-COat111 (14 pcs) Tightening torque: 3.3 Nm</p>  <p>xx2000001729</p>

Refitting the axis-4 motor


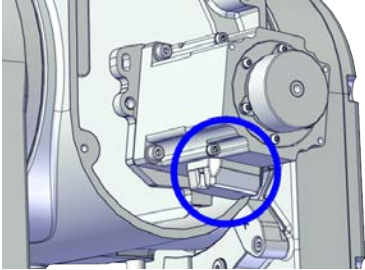
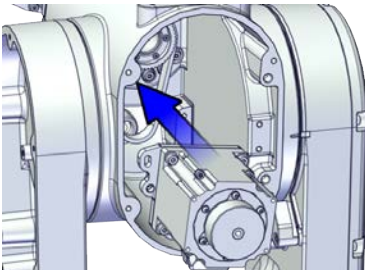

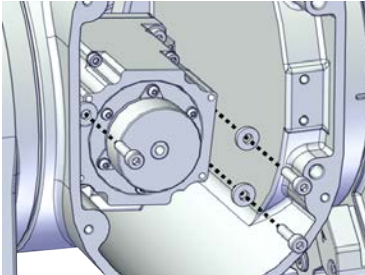
	Action	Note
1	<p>Check that:</p> <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
2	Install the timing belt to the gearbox pulley and verify that the belt runs correctly in the grooves of the pulley.	 <p>xx2000001670</p>

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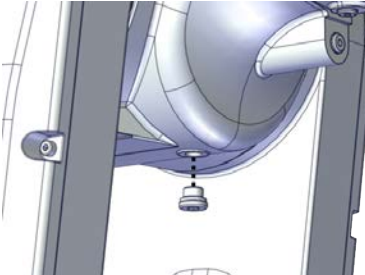
5 Repair

5.5.3 Replacing the tubular and tilt unit

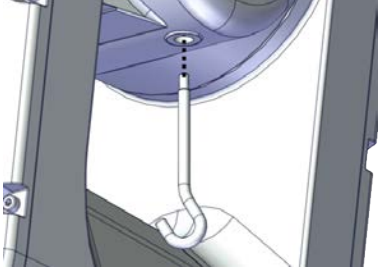
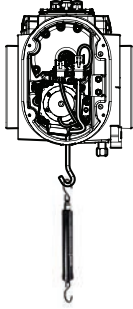

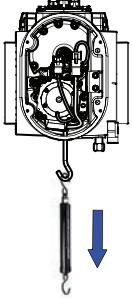
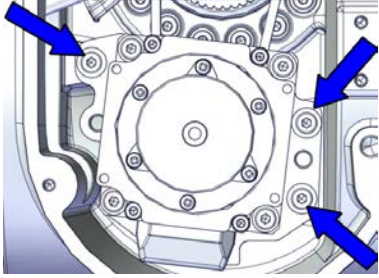
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	Action	Note
3	<p>Orient the motor correctly and fit it into the housing.</p> <p> Note</p> <p>Make sure the motor flange does not press on the timing belt.</p>	<p>Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.</p>  <p>xx2000001607</p>
4	<p>Refit the motor and verify that the timing belt runs correctly in the groove of the motor pulley.</p>	 <p>xx2000001680</p>
5	<p>Refit the screws and washers.</p> <p> Note</p> <p>Do not tighten the screws yet.</p>	<p>Screw: M4x16 12.9 Lafre 2C2B/FC6.9 (3 pcs)</p>  <p>xx2000001605</p>

Adjusting the axis-4 timing belt tension

	Action	Note
1	<p>Remove the screw below the housing.</p>	 <p>xx2000001609</p>

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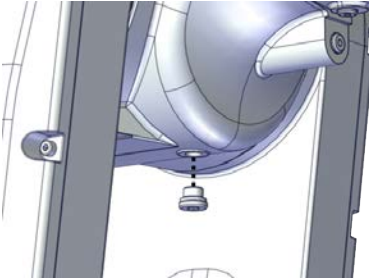
	Action	Note
2	Fit the tension adjustment tool for axis-4 timing belt to the screw hole.	<p>Tension adjustment tool for axis-4 timing belt. Included in special toolkit 3HAC076396-001.</p>  <p>xx2000001610</p>
3	Use a handheld dynamometer hooking to the tool.	 <p>xx2000001611</p>
4	<p>Pull the dynamometer to make the tension falling in the allowed force range.</p> <p> Note</p> <p>During the measurement, make sure that all interferences that may affect the force are removed. Pay attention to the force application direction.</p>	<p>Used belt: 33.4-38.2 N New belt: 47.8-52.4 N</p>  <p>xx2000001612</p>
5	Secure the motor with the screws.	<p>Tightening torque: 3.3 Nm±3%</p>  <p>xx2000001604</p>

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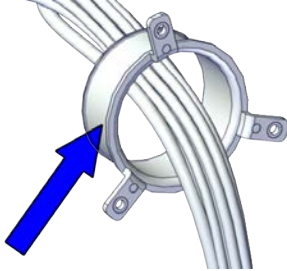
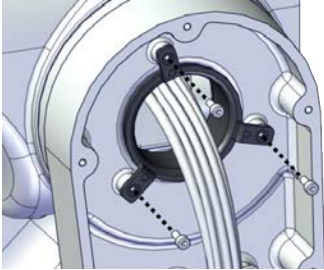

5 Repair

5.5.3 Replacing the tubular and tilt unit

Continued

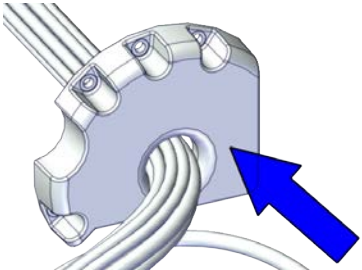

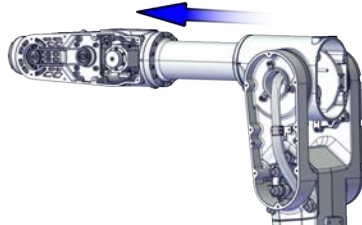
	Action	Note
6	Remove the tool and refit the plug screw.	<p>Tightening torque: 3 Nm Plug screw: 3HAC078352-001</p>  <p>xx2000001609</p>

Securing the cable package in the lower arm

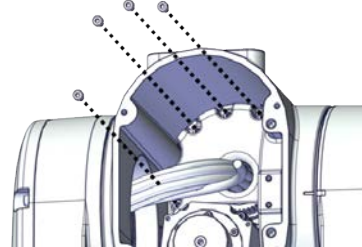
	Action	Note
1	<p>Check the axis-3 cable protector. Replace if damaged.</p> <p> Note</p> <p>If replaced, apply grease to the axis-3 cable protector before refitting.</p>	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001</p>  <p>xx2000001568</p> <p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (3 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001552</p>
2	<p>Route the cable package through the lower arm support and up into the housing.</p> <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	

Continues on next page

Routing the cable package in the housing

	Action	Note
1	Slip the axis-4 cable protector over the cable package.	<p>Plastic cable protector, axis 4: 3HAC064694-001:</p>  <p>xx2000001570</p>
2	<p>Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for CRB 1300-7/1.4 and) and into the tubular.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001571</p>

Securing the cable package in the housing

	Action	Note
1	Refit the axis-4 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001546</p>

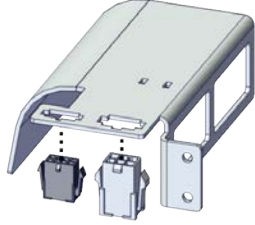

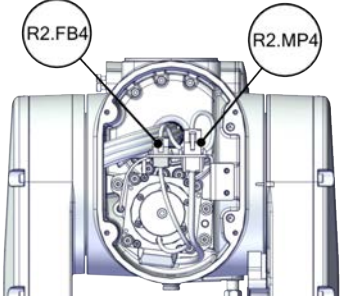


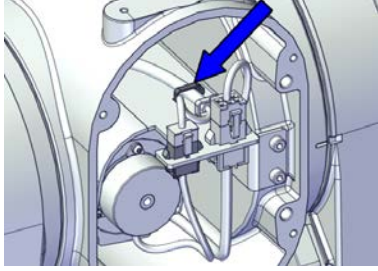
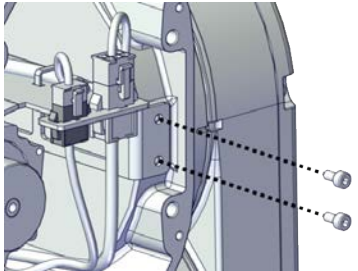
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5 Repair

5.5.3 Replacing the tubular and tilt unit

Continued

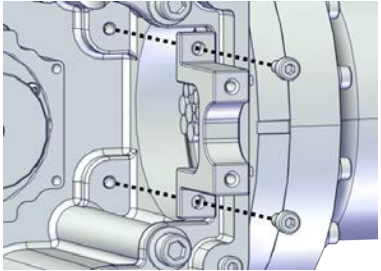
Reconnecting the axis-4 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 xx2000001545
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB4 • MP4  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx2000001544
3	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
4	Refit the connector plate.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001542

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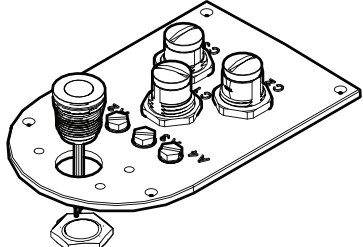
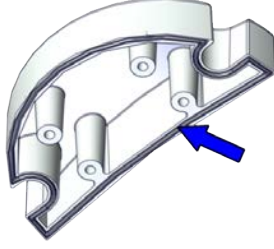
5.5.3 Replacing the tubular and tilt unit
Continued

Routing the cable package in the tubular

	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001749</p>
2	<p>Route the cabling.</p> <ul style="list-style-type: none"> • 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. 	

Refitting the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

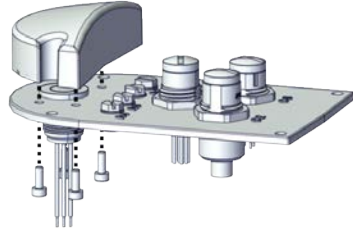
	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>
2	<p>For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>

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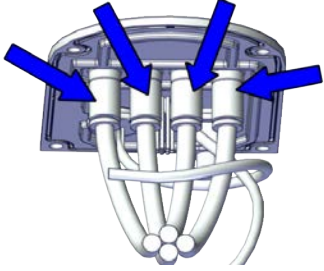

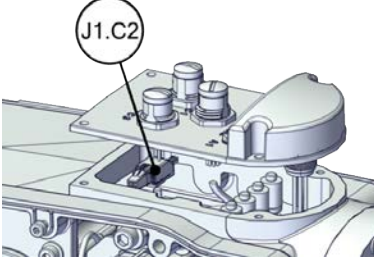
5 Repair

5.5.3 Replacing the tubular and tilt unit

Continued

	Action	Note
3	Refit the lamp unit cover.	<p>Lamp unit cover: 3HAC082320-001 Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 0.6 Nm</p>  <p>xx2200001002</p>

Reconnecting the air hoses and Ethernet cabling (if equipped)

	Action	Note
1	<p>Reconnect the air hoses.</p> <p> Note</p> <p>See the number markings on the air hoses for help to find the corresponding air hoses.</p>	 <p>xx2000001539</p>
2	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and reconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2200001001</p>


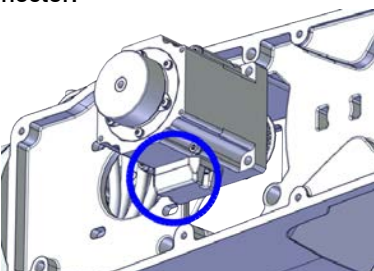

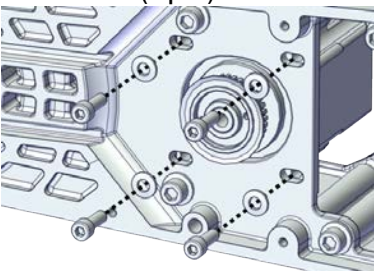
Refitting the axis-6 motor

	Action	Note
1	<p>Check that:</p> <ul style="list-style-type: none"> all assembly surfaces are clean and without damages the motor is clean and undamaged. 	

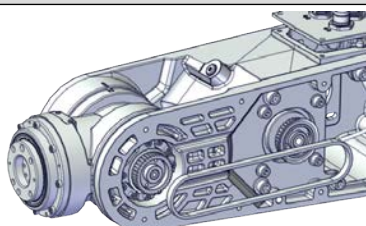
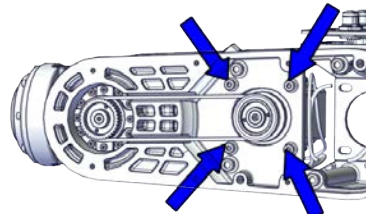
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5.5.3 Replacing the tubular and tilt unit

Continued

	Action	Note
2	<p>Orient the motor correctly and fit it into the tubular.</p> <p> Tip</p> <p>Leave the axis-6 motor connectors accessible from the tubular support side.</p>	<p>Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.</p>  <p>xx2000001603</p>
3	<p>Refit the screws and washers.</p> <p> Note</p> <p>Do not tighten the screws yet.</p>	<p>Screw: M5x16 12.9 Lafre 2C2B/FC6.9 (4 pcs)</p>  <p>xx2000001601</p>

Refitting the axis-6 timing belt

	Action	Note
1	<p>Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.</p>	 <p>xx2000001600</p>
2	<p>Move the motor, and when the timing belt gets tensioned, secure the motor.</p>	
3	<p>Tighten the motor screws.</p>	<p>Tightening torque: 6 Nm</p>  <p>xx2000001599</p>

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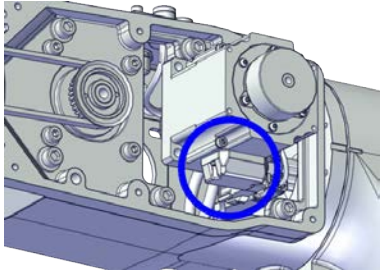

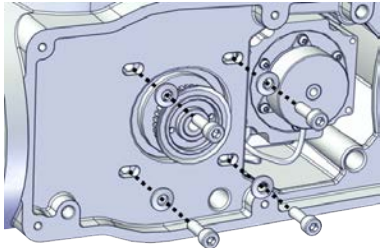
5 Repair

5.5.3 Replacing the tubular and tilt unit

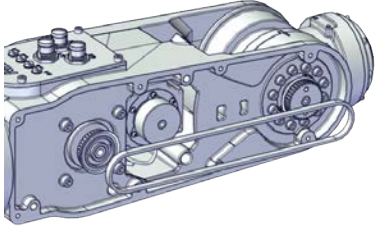
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	Action	Note
4	Use a sonic tension meter to measure the timing belt tension. If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.	Used belt: 85.7-91.6 Hz New belt: 102-107 Hz

Refitting the axis-5 motor

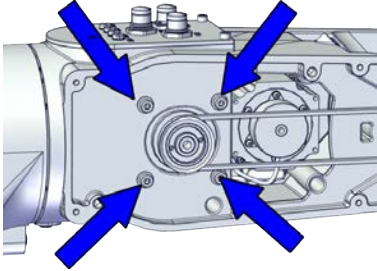
	Action	Note
1	Check that: <ul style="list-style-type: none"> all assembly surfaces are clean and without damages the motor is clean and undamaged. 	
2	Orient the motor correctly and fit it into the tubular.  Note Pay attention to the motor orientation (see figures for a reference); otherwise, other cables 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
3	Refit the screws and washers.  Note Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre 2C2B/FC6.9 (4 pcs)  xx2000001596

Refitting the axis-5 timing belt

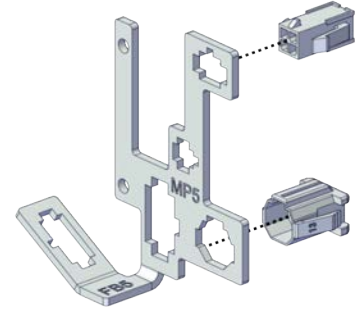

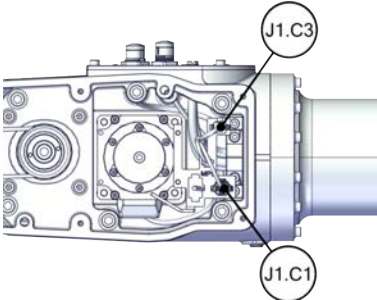
	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001595
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	

Continues on next page

5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
3	Tighten the motor screws.	<p>Tightening torque: 6 Nm</p>  <p>xx2000001594</p>
4	<p>Use a sonic tension meter to measure the timing belt tension.</p> <p>If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.</p>	<p>Used belt: 59.3-63.4 Hz</p> <p>New belt: 70.8-74.3 Hz</p>

Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>
2	<p>For robots with CP/CS cabling</p> <p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001536</p>

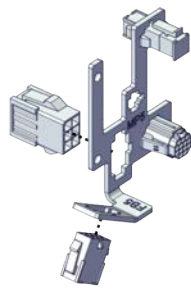

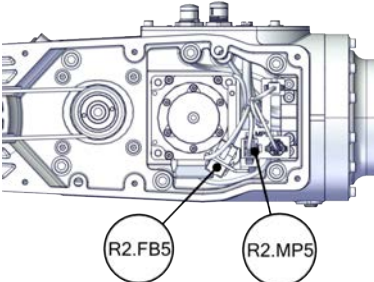
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5 Repair

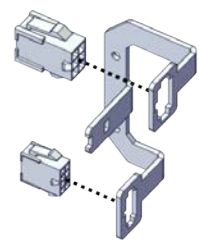

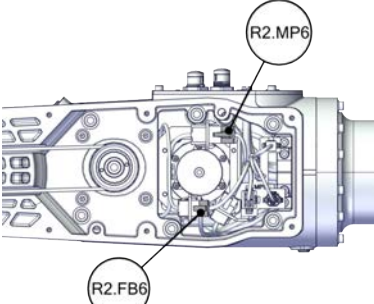
5.5.3 Replacing the tubular and tilt unit

Continued

Reconnecting the axis-5 motor connectors

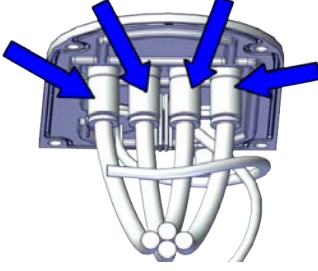
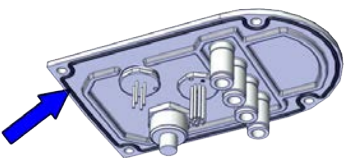
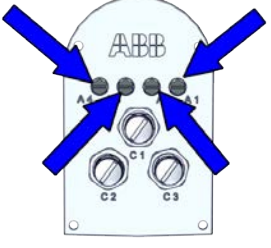
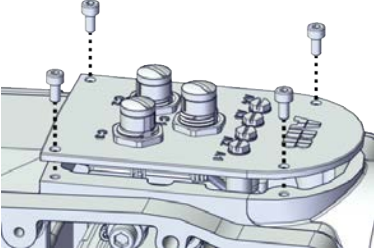
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 xx2000001535
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB5 • MP5  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx2000001534

Reconnecting the axis-6 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 xx2000001533
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB6 • MP6  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

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Refitting the process hub

	Action	Note
1	<p>Check the air hoses. Replace the cable package if damaged. See Replacing the cable package on page 222.</p>	 <p>xx2000001539</p>
2	<p>For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.</p>	<p>Gasket for process hub: 3HAC070887-001</p>  <p>xx2000002512</p>
3	<p>For robots with protection class IP67 (option 3350-670) Check the seal bolts. Replace if damaged.</p>	<p>Seal bolt: 3HAC032050-001</p>  <p>xx2000002513</p>
4	<p>Refit the process hub.</p>	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001538</p>

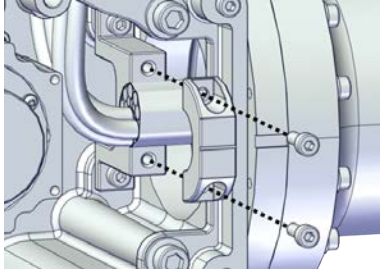
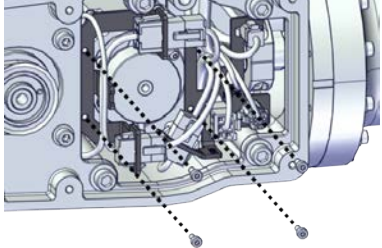

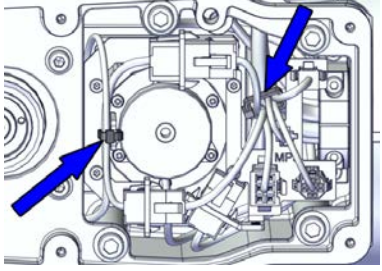
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5 Repair

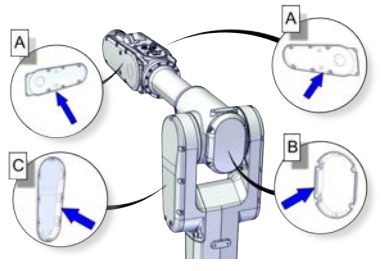
5.5.3 Replacing the tubular and tilt unit

Continued

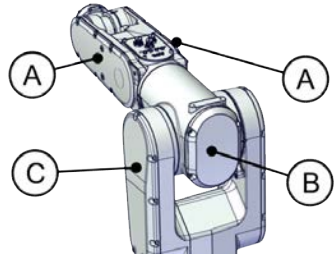
Securing the cable package in the tubular

	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	<p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001748</p>
2	Refit the connector plate.	<p>Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm</p>  <p>xx2000001531</p>
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>


Refitting the covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets.</p> <ul style="list-style-type: none"> • Gasket for tubular covers (A) • Gasket for housing cover (B) • Gasket for lower arm support cover (C) <p>Replace if damaged.</p>	 <p>xx2000002503</p>

Continues on next page

	Action	Note
2	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
3	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
4	Refit the covers. <ul style="list-style-type: none"> • Tubular covers (A) • Housing cover (B) • Lower arm support cover (C) 	Screw: M4x10 12.9 Lafre 2C2B/FC6.9 Tightening torque: 2.6 Nm  xx2000001733

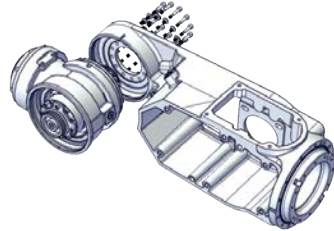
Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

Refitting the tubular and tilt unit for CRB 1300-7/1.4

Use these procedures to refit the tubular and tilt unit for CRB 1300-7/1.4

Refitting the tilt unit

	Action	Note
1	Refit the tilt unit.	Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 4.5 Nm  xx2000001741

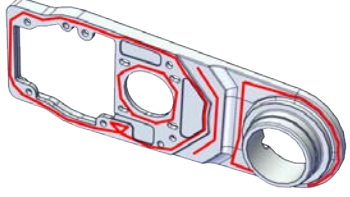
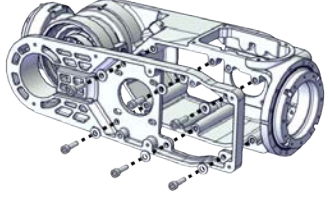
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5 Repair

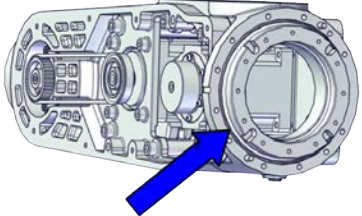
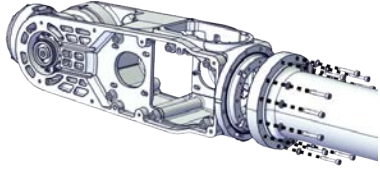
5.5.3 Replacing the tubular and tilt unit

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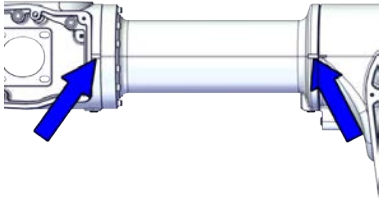
Refitting the tubular support

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <ol style="list-style-type: none"> 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. 	 <p>xx2000002523</p>
2	Refit the tubular support.	<p>Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (6 pcs) Tightening torque: 14 Nm</p>  <p>xx2000001740</p>


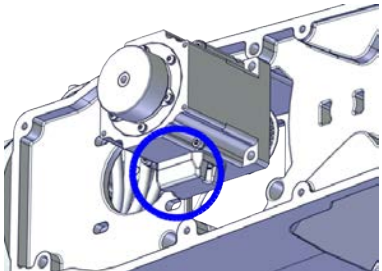

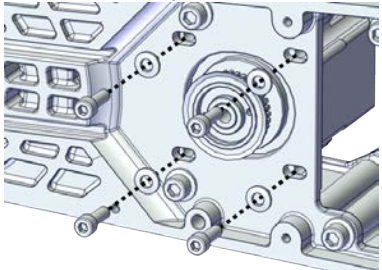
Refitting the tubular

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the O-ring. Replace if damaged.</p>	<p>O-ring on tubular: 3HAC061327-018</p>  <p>xx2000002519</p>
2	Refit the tubular and tilt unit to the extender unit.	<p>Screw: M4x25 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 3.8 Nm</p>  <p>xx2000001739</p>

Continues on next page

	Action	Note
3	<p>Make sure that the notches on the extender unit and tubular are aligned.</p>	 <p>xx2000001742</p>

Refitting the axis-6 motor

	Action	Note
1	<p>Check that:</p> <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
2	<p>Orient the motor correctly and fit it into the tubular.</p> <p> Tip</p> <p>Leave the axis-6 motor connectors accessible from the tubular support side.</p>	<p>Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.</p>  <p>xx2000001603</p>
3	<p>Refit the screws and washers.</p> <p> Note</p> <p>Do not tighten the screws yet.</p>	<p>Screw: M5x16 12.9 Lafre 2C2B/FC6.9 (4 pcs)</p>  <p>xx2000001601</p>

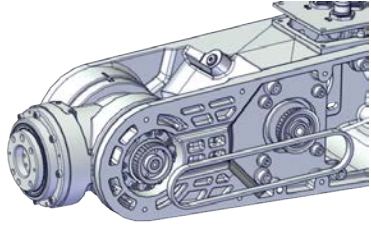
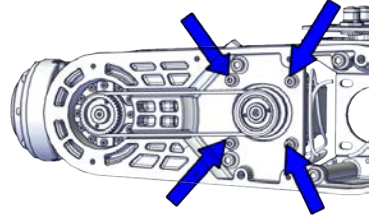
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5 Repair


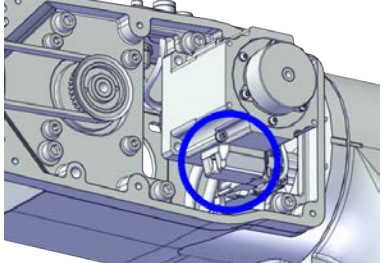
5.5.3 Replacing the tubular and tilt unit

Continued


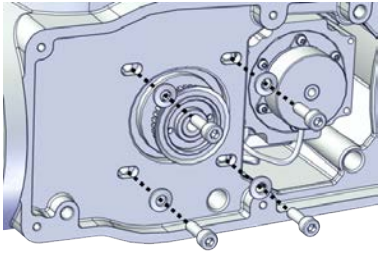
Refitting the axis-6 timing belt

	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001600
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	
3	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001599
4	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

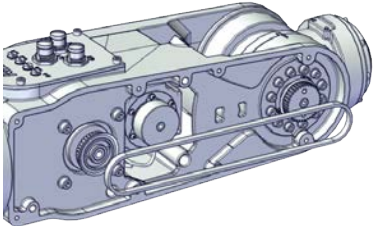
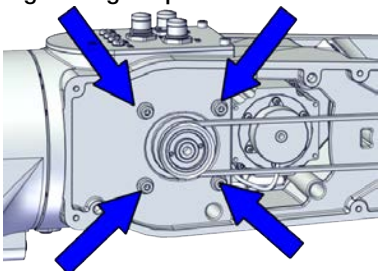
Refitting the axis-5 motor

	Action	Note
1	Check that: <ul style="list-style-type: none"> all assembly surfaces are clean and without damages the motor is clean and undamaged. 	
2	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

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	Action	Note
3	Refit the screws and washers.  Note Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre 2C2B/FC6.9 (4 pcs)  xx2000001596

Refitting the axis-5 timing belt

	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001595
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	
3	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001594
4	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

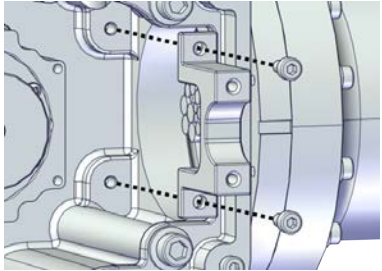
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5 Repair

5.5.3 Replacing the tubular and tilt unit

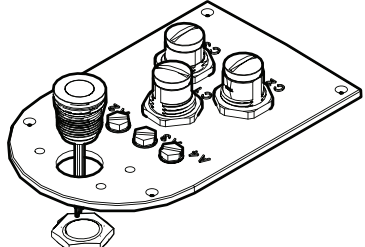
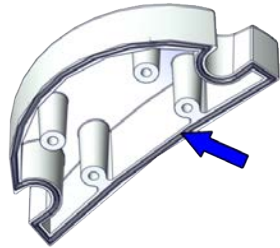
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Routing the cable package in the tubular

	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001749</p>
2	<p>Route the cablings.</p> <ul style="list-style-type: none"> • 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. 	

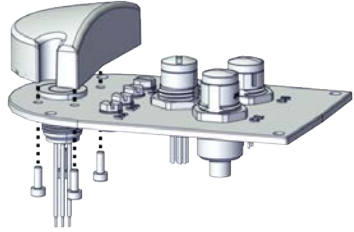
Refitting the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.


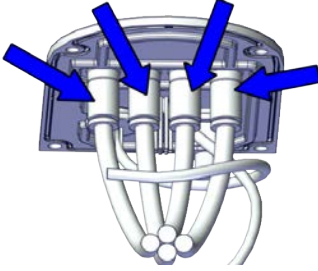

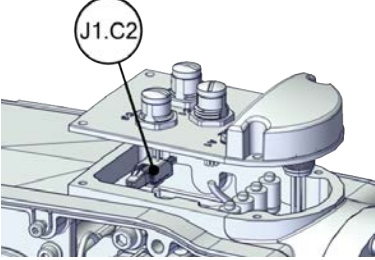
	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>
2	<p>For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>

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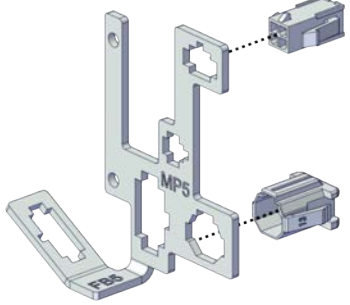
5.5.3 Replacing the tubular and tilt unit
Continued

	Action	Note
3	Refit the lamp unit cover.	<p>Lamp unit cover: 3HAC082320-001 Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 0.6 Nm</p>  <p>xx2200001002</p>

Reconnecting the air hoses and Ethernet cabling (if equipped)

	Action	Note
1	<p>Reconnect the air hoses.</p> <p> Note</p> <p>See the number markings on the air hoses for help to find the corresponding air hoses.</p>	 <p>xx2000001539</p>
2	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and reconnect the connector.</p> <ul style="list-style-type: none"> • J1.C2 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2200001001</p>

Reconnecting the CP/CS cabling (if equipped)


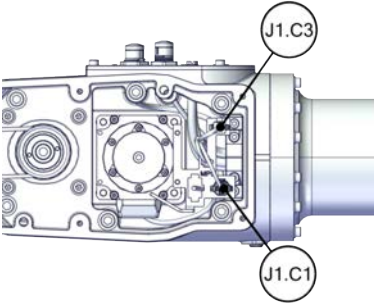
	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>

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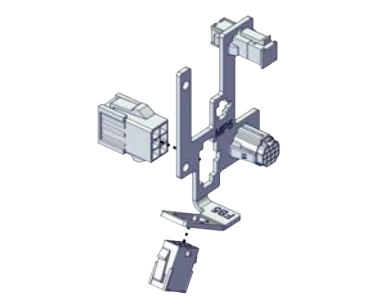

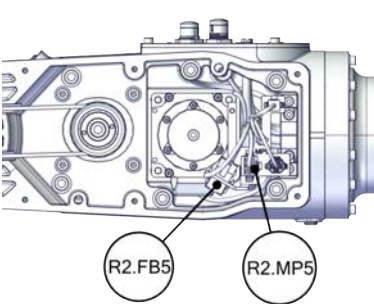
5 Repair

5.5.3 Replacing the tubular and tilt unit

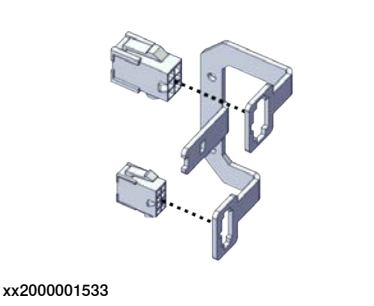
Continued

	Action	Note
2	<p>For robots with CP/CS cabling</p> <p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001536</p>


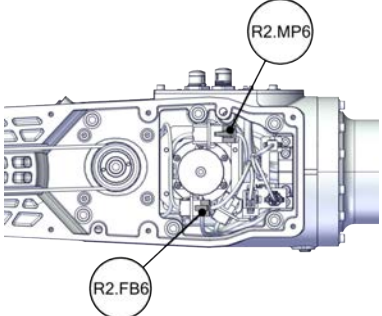
Reconnecting the axis-5 motor connectors

	Action	Note
1	<p>Insert the male header of the motor connectors to the connector plate.</p>	 <p>xx2000001535</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB5 • MP5 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001534</p>

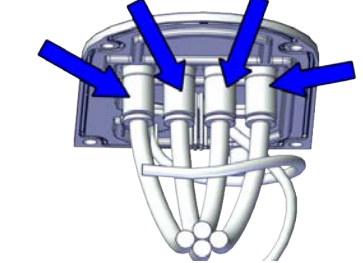
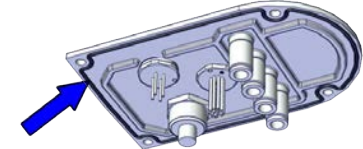
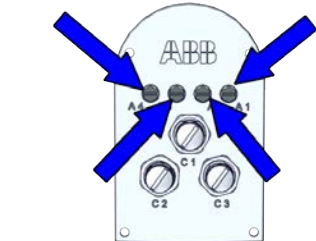
Reconnecting the axis-6 motor connectors

	Action	Note
1	<p>Insert the male header of the motor connectors to the connector plate.</p>	 <p>xx2000001533</p>

Continues on next page

	Action	Note
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB6 • MP6 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001532</p>

Refitting the process hub

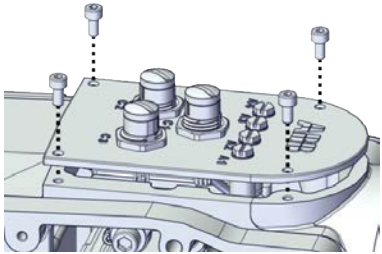
	Action	Note
1	<p>Check the air hoses.</p> <p>Replace the cable package if damaged. See Replacing the cable package on page 222.</p>	 <p>xx2000001539</p>
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for process hub: 3HAC070887-001</p>  <p>xx2000002512</p>
3	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the seal bolts.</p> <p>Replace if damaged.</p>	<p>Seal bolt: 3HAC032050-001</p>  <p>xx2000002513</p>

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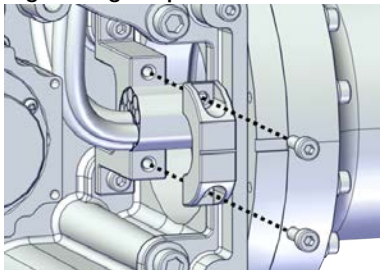
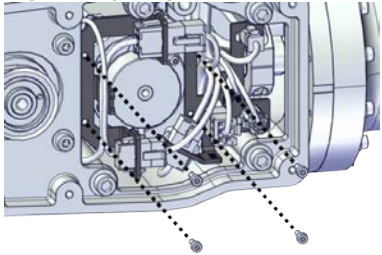

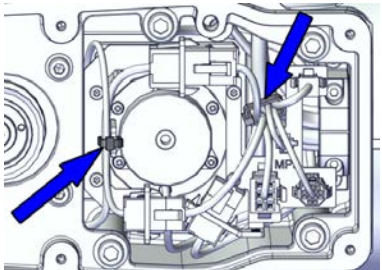
5 Repair

5.5.3 Replacing the tubular and tilt unit

Continued

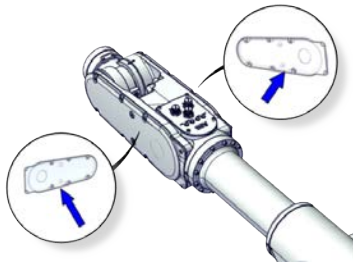
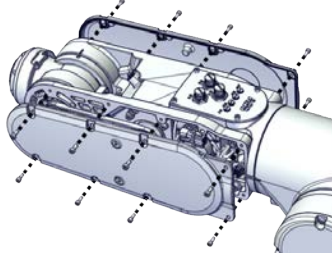
	Action	Note
4	Refit the process hub.	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001538</p>

Securing the cable package in the tubular


	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	<p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001748</p>
2	Refit the connector plate.	<p>Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm</p>  <p>xx2000001531</p>
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>

Continues on next page

Refitting the tubular covers

	Action	Note
1	For robots with protection class IP67 (option 3350-670) Check the gaskets. Replace if damaged.	 xx2000002507
2	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
3	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
4	Refit the tubular covers.	Screw: M4x10 12.9 Lafre 2C2B/FC6.9 Tightening torque: 2.6 Nm  xx2000001593

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

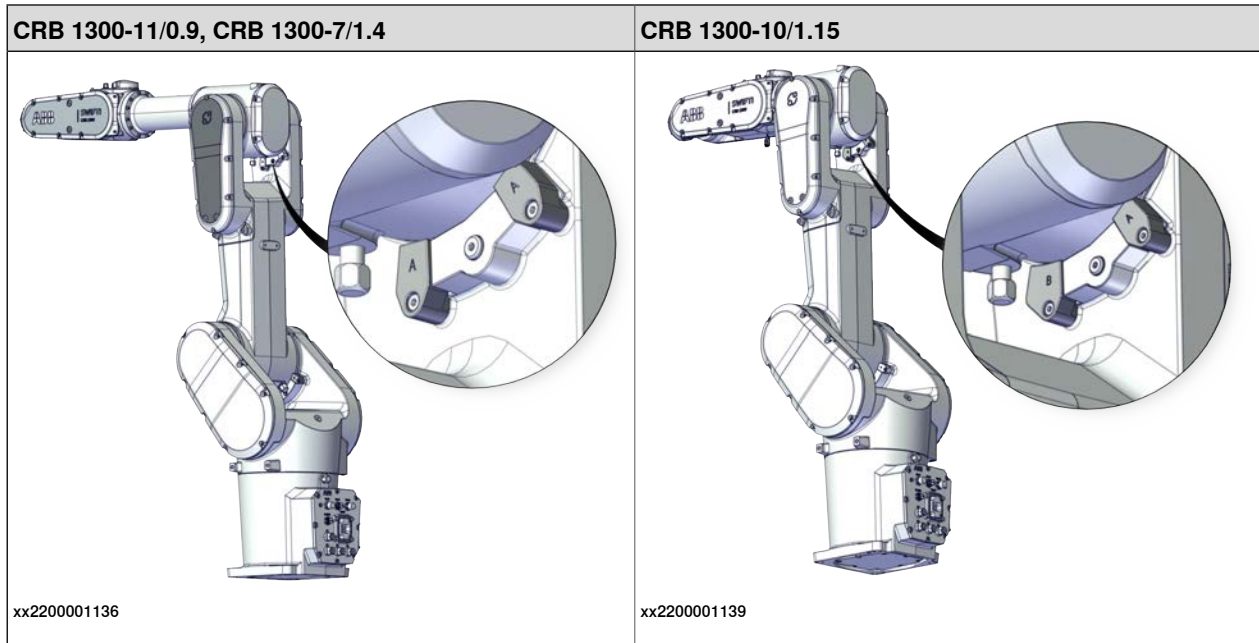
5 Repair

5.5.4 Replacing the axis-3 mechanical stops

5.5.4 Replacing the axis-3 mechanical stops

Location of the mechanical stops

The mechanical stops are located as shown in the figure.



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 CRB 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 CRB 1300-10/1.15. Replace if damaged.

Required tools and equipment


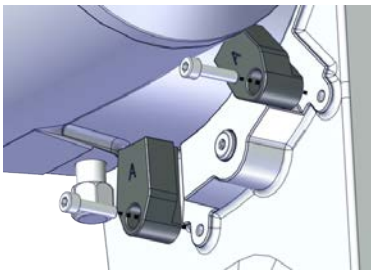
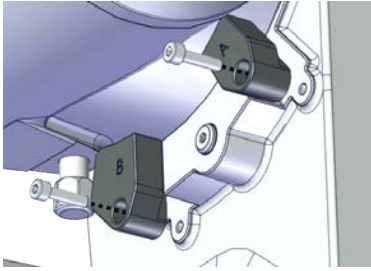

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .

Required consumables

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

Continues on next page

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: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	Remove the mechanical stops.	<p>For CRB 1300-11/0.9, CRB 1300-7/1.4 and</p>  <p>xx2000000507</p> <p>For CRB 1300-10/1.15</p>  <p>xx2000000508</p>
4	Discard the old stops and refit with new ones.	<p>For CRB 1300-11/0.9, CRB 1300-7/1.4 and</p> <p>Mechanical stop, block A: 3HAC065651-001 (2 pcs)</p> <p>For CRB 1300-10/1.15</p> <p>Mechanical stop, block A: 3HAC065651-001 (1 pcs)</p> <p>Mechanical stop, block B: 3HAC065671-001 (1 pcs)</p>
5	Apply a little Loctite 243 to the screws.	
	 Note If there is locking liquid residues on the screw, please clean it before refitting. Remove residual locking liquid after refitting.	

Continues on next page

5 Repair

5.5.4 Replacing the axis-3 mechanical stops

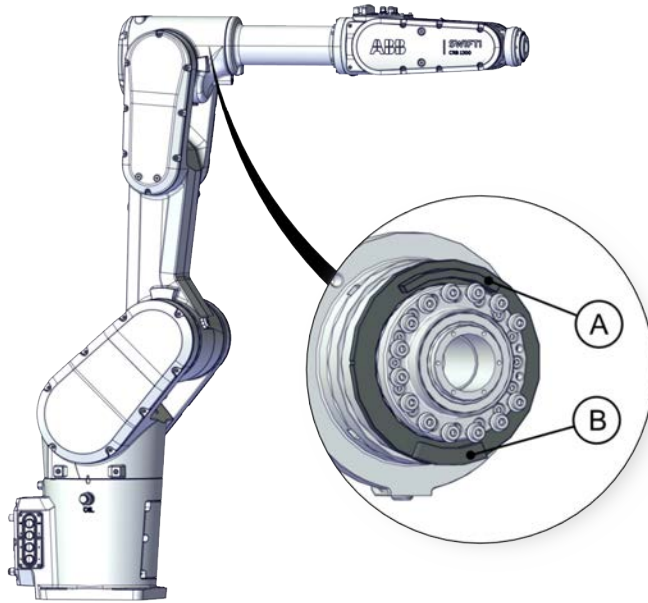
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	Action	Note
6	Secure the mechanical stops.	Screw: M4x16 stainless steel (1 pcs per stop) Tightening torque: 1 Nm

5.5.5 Replacing the axis-4 mechanical stops

Location of the mechanical stops

The mechanical stops are located as shown in the figure.



xx2200001137

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 CRB 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 728 .

Continues on next page

5 Repair

5.5.5 Replacing the axis-4 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.
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 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .

Replacement of axis-4 mechanical stops

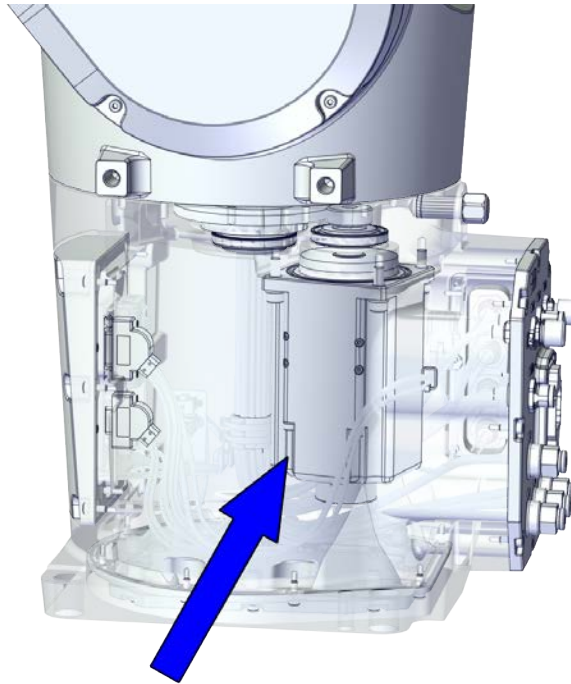
The axis-4 mechanical stops, both flange and slider, are accessible after removing the housing, see [Replacing the housing and extender unit on page 389](#).

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 CRB 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	
Main cable harness, S (CP/CS and air hose, with Ethernet)	3HAC073305-001	Used with CRB 1300-11/0.9.
Main cable harness, M (CP/CS and air hose, with Ethernet)	3HAC073302-001	Used with CRB 1300-10/1.15.
Main cable harness, L (CP/CS and air hose, with Ethernet)	3HAC073299-001	Used with CRB 1300-7/1.4.
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	

Continues on next page

5 Repair

5.6.1 Replacing the axis-1 motor

Continued

Spare part	Article number	Note
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
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	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Swing cover, short	3HAC073095-001	Used for CRB 1300-11/0.9.
Swing cover, long	3HAC073096-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Swing top cover	3HAC073091-001	
Base cover	3HAC073090-001	
Base adapter	3HAC073089-001	Used for robots with bottom connector interface.
SMB cover	3HAC076475-001	
Brake release unit	3HAC073296-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for SMB cover	3HAC067820-001	Used with protection class IP67. Replace if damaged.
Gasket for brake release unit	3HAC070274-001	Used with protection class IP67. Replace if damaged.
Gasket for base cover	3HAC067819-001	Used with protection class IP67. Replace if damaged.
Gasket for base adapter	3HAC067818-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.

Continues on next page

Spare part	Article number	Note
Gasket for swing top cover	3HAC067821-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment


Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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	3HAC032140-001	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	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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.

Continues on next page

5 Repair

5.6.1 Replacing the axis-1 motor

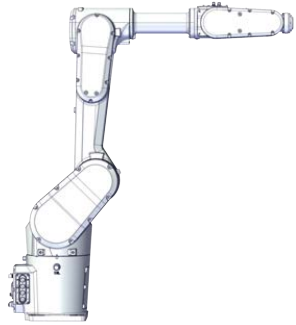

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Action	Note
<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the motor



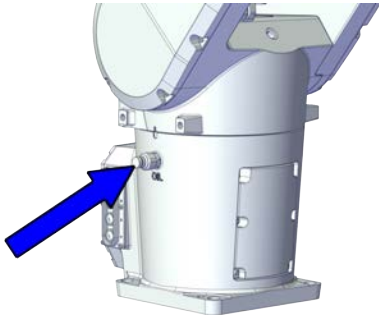
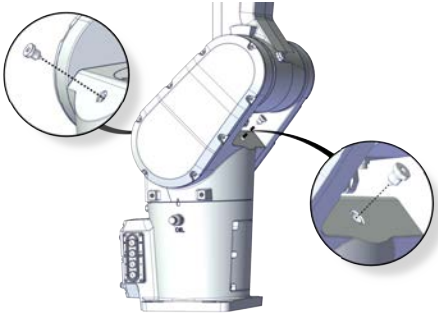

Use these procedures to remove the axis-1 motor.

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.	 <p>xx2000001520</p>
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

Continues on next page

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 31 .	
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 717 for more information.	

Continues on next page

5 Repair

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



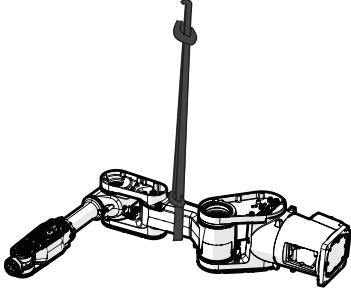
Removing the complete cable package

Follow the instructions detailed in [Removing the cable package on page 226](#) to remove the complete cable package.


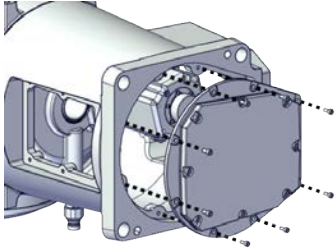
Putting the robot on its side

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Run a roundsling around the lower arm.	Roundsling, 1.7 m (1 pcs), Lifting capacity: >70 kg  xx2000001651
3	 CAUTION The CRB 1300 robot weighs . CRB 1300-11/0.9: 75 kg CRB 1300-10/1.15: 77 kg CRB 1300-7/1.4: 79 kg All lifting accessories used must be sized accordingly!	


Continues on next page

	Action	Note
4	 <p>WARNING</p> <p>The robot is likely to be mechanically unstable if not secured to the foundation.</p>	
5	<p>Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side.</p>  <p>Note</p> <p>Lay the robot down with the lower arm support and swing support towards upside.</p>	 <p>xx2000001649</p>

Removing the base covers

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Valid for cabling with rear interface</p> <p>Remove the base bottom cover together with the base adapter.</p>	 <p>xx2000001642</p>

Removing the axis-1 motor



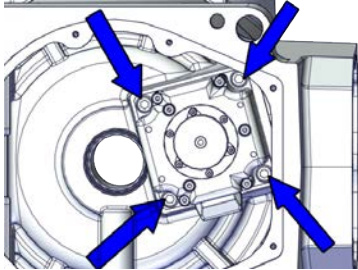
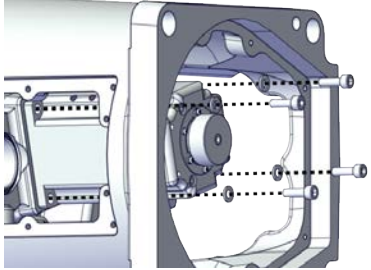
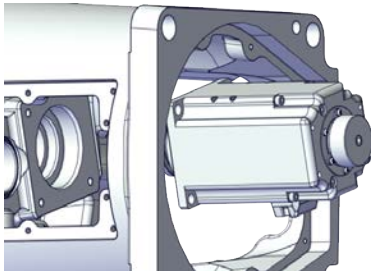
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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5 Repair

5.6.1 Replacing the axis-1 motor

Continued

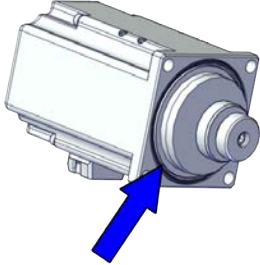
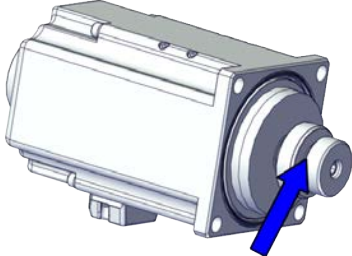
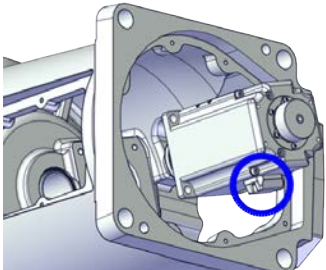
	Action	Note
2	 WARNING When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section <i>Gearbox lubricants (oil or grease)</i> on page 31.	
3	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Access the screws and washers securing the axis-1 motor from the base bottom.	 xx2000001643
5	Remove the screws and washers.	 xx2000001644
6	Carefully lift out the motor.	 xx2000001645

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Refitting the motor

Use these procedures to refit the axis-1 motor.

Refitting the axis-1 motor

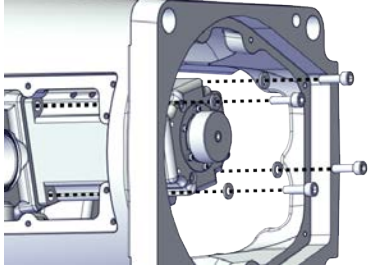
	Action	Note
1	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
2	Check the O-ring. Replace if damaged.	O-ring on motor unit: 3HAC061327-037  xx2000001646
3	Apply lubricating oil to the motor that has contacting area with the gearbox.	Kyodo Yushi TMO150: 3HAC032140-001  xx2000001700
4	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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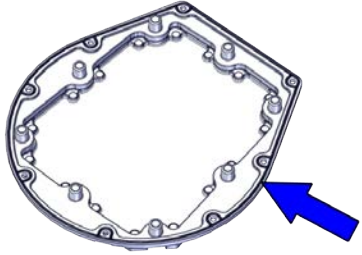
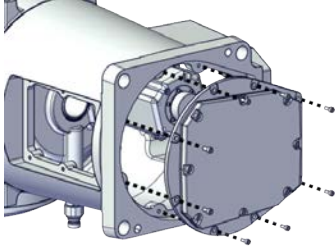
5 Repair

5.6.1 Replacing the axis-1 motor

Continued

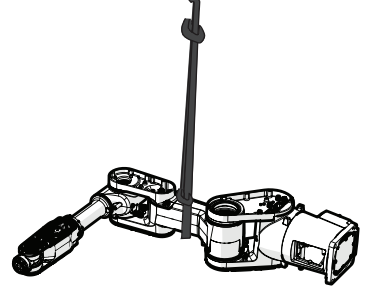

	Action	Note
5	Refit the screws and washers.	<p>Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm</p>  <p>xx2000001644</p>

Refitting the base covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Valid for cabling with rear interface Check the gasket. Replace if damaged.</p>	<p>Gasket for base adapter: 3HAC067818-001</p>  <p>xx2000002510</p>
2	<p>Valid for cabling with rear interface Refit the base bottom cover together with the base adapter.</p>	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (8 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001642</p>

Continues on next page



Securing the robot to the foundation

	Action	Note
1	Run a roundsling around the lower arm.	Roundsling, 1.7 m, Lifting capacity: >70 kg  <small>xx2000001649</small>
2	 CAUTION The CRB 1300 robot weighs . CRB 1300-11/0.9: 75 kg CRB 1300-10/1.15: 77 kg CRB 1300-7/1.4: 79 kg All lifting accessories used must be sized accordingly!	
3	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 240](#) to refit the complete cable package.

Refilling oil to axis-1 gearbox

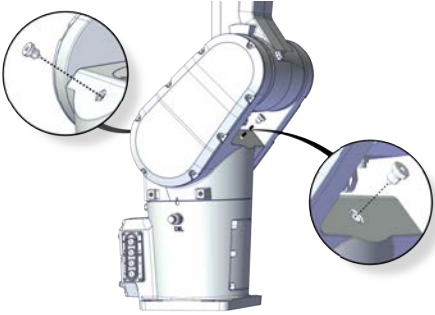


	Action	Note
1	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31 .	
2	 CAUTION The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	

Continues on next page


5 Repair

5.6.1 Replacing the axis-1 motor

Continued

	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: <ul style="list-style-type: none"> • 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.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> .
6	Refit the oil plugs.	Tightening torque: 10 Nm

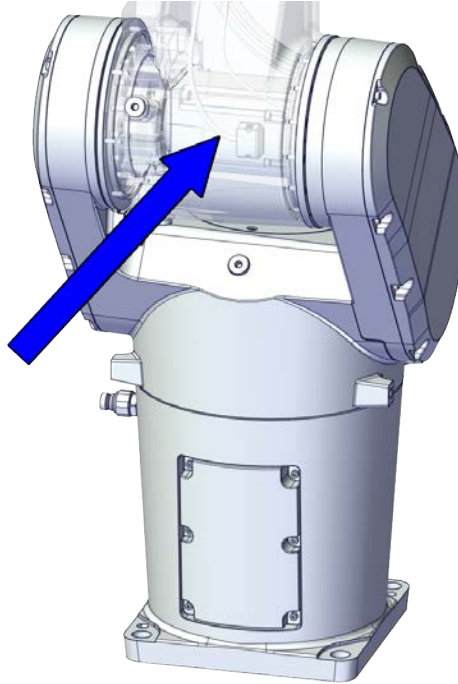
Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Motor unit, axis 2	3HAC073078-001	
O-ring on motor unit	3HAC061327-037	
Lower arm cover	3HAC073092-001	
Swing cover, short	3HAC073095-001	Used for CRB 1300-11/0.9.
Swing cover, long	3HAC073096-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Lower arm cover	3HAC073092-001	
Gasket for swing cover, short	3HAC067824-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.

Continues on next page

5 Repair

5.6.2 Replacing the axis-2 motor

Continued

Spare part	Article number	Note
Gasket for swing cover, long	3HAC067825-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment


Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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	-	
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-001	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. <ul style="list-style-type: none">Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	 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.

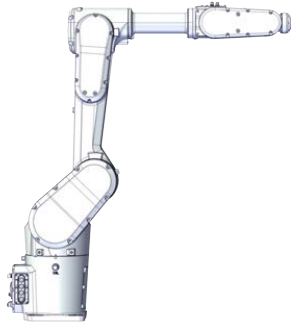

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Action	Note
<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	


Removing the 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.	
2	Jog all axes to zero position.	 <p>xx2000001520</p>
3	 <p>DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

Putting the robot on its side






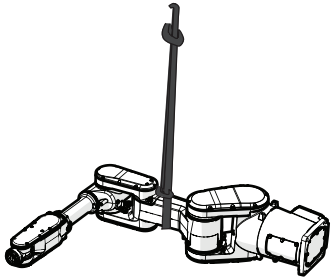
 <p>CAUTION</p> <p>If the axis-2 motor is removed with the robot standing on floor, oil will leak from the axis-2 gearbox.</p>
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5 Repair


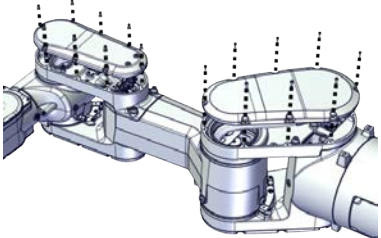
5.6.2 Replacing the axis-2 motor

Continued


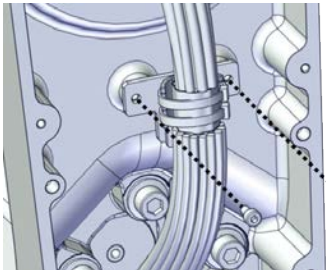
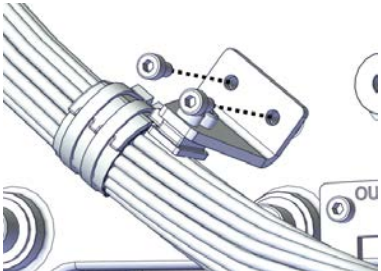
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Run a roundsling around the lower arm.</p>	<p>Roundsling, 1.7 m (1 pcs), Lifting capacity: >70 kg</p>  <p>xx2000001650</p>
3	 <p>CAUTION</p> <p>The CRB 1300 robot weighs . CRB 1300-11/0.9: 75 kg CRB 1300-10/1.15: 77 kg CRB 1300-7/1.4: 79 kg All lifting accessories used must be sized accordingly!</p>	
4	 <p>WARNING</p> <p>The robot is likely to be mechanically unstable if not secured to the foundation.</p>	
5	<p>Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side.</p>  <p>Note</p> <p>Lay the robot down with the lower arm support and swing support towards upside.</p>	 <p>xx2000001648</p>

Continues on next page

Removing the covers

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the covers.</p> <ul style="list-style-type: none"> • lower arm support cover • swing support cover 	 <p>xx2000001622</p>

Loosening the cable package

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the cable bracket in the lower arm.</p>	 <p>xx2000001553</p>
3	<p>Remove the cable bracket in the swing.</p>	 <p>xx2000001623</p>



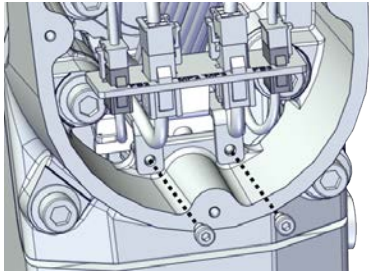
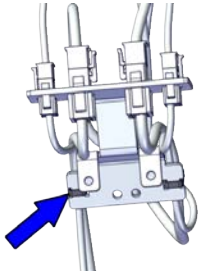

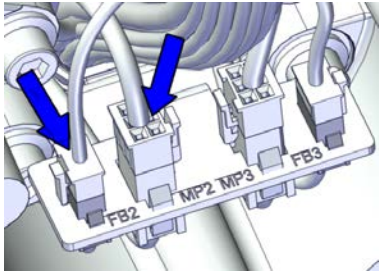
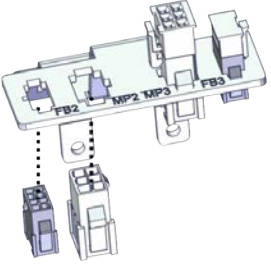
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5 Repair

5.6.2 Replacing the axis-2 motor




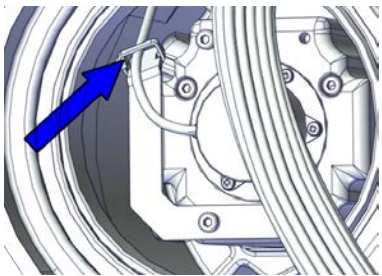
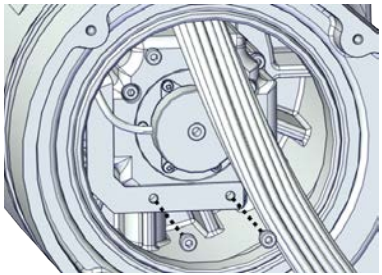
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Disconnecting the axis-2 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	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
3	Cut the cable strap.	 xx2000001640
4	Disconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001639
5	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001641

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Removing the axis-2 motor

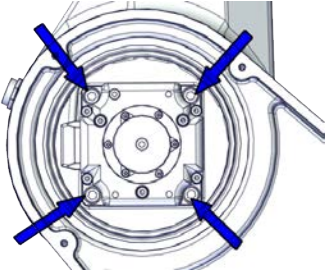
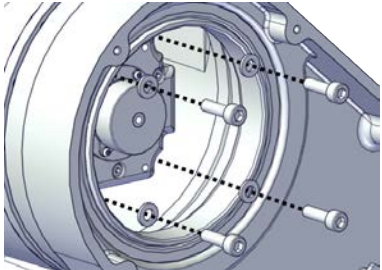
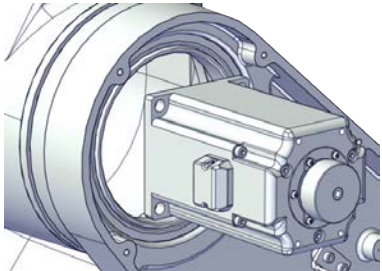
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 WARNING When separating the motor from the gearbox, there may be pressure present in the gearbox, causing lubricant to spray from the opening. Before proceeding, please read the safety information in the section Gearbox lubricants (oil or grease) on page 31 .	
3	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Cut the cable strap.	 xx2000001624
5	Remove the cable bracket.	 xx2000001625
6	Wrap the connectors with the masking tape and pull the motor cabling carefully down to the swing from the lower arm.	

Continues on next page

5 Repair

5.6.2 Replacing the axis-2 motor


Continued

	Action	Note
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

Refitting the motor

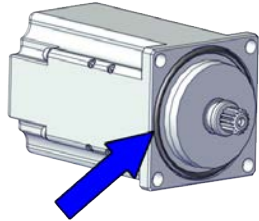
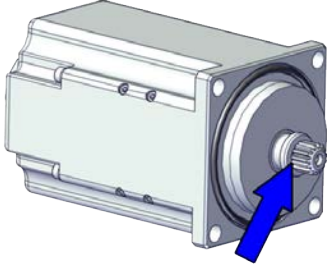
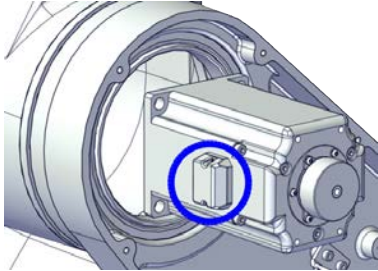
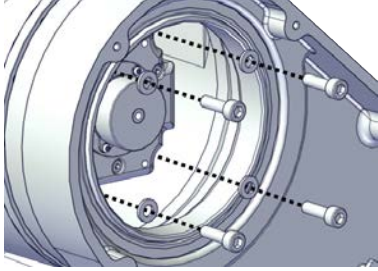
Use these procedures to refit the axis-2 motor.

Refitting the axis-2 motor

	Action	Note
1	 CAUTION Do not mix the axis-2 motor used for CRB 1300-7/1.4 and . Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-2 motor for CRB 1300-7/1.4: 3HAC073078-001
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	

Continues on next page

5.6.2 Replacing the axis-2 motor
Continued

	Action	Note
3	Check the O-ring. Replace if damaged.	<p>O-ring on motor unit: 3HAC061327-037</p>  <p>xx2000001629</p>
4	Apply lubricating oil to the motor that has contacting area with the gearbox.	<p>Kyodo Yushi TMO150: 3HAC032140-001</p>  <p>xx2000001701</p>
5	Orient the motor correctly and fit it into the swing. Make sure the motor is properly fit to gearbox.	<p>Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.</p>  <p>xx2000001630</p>
6	Refit the screws and washers.	<p>Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm</p>  <p>xx2000001626</p>

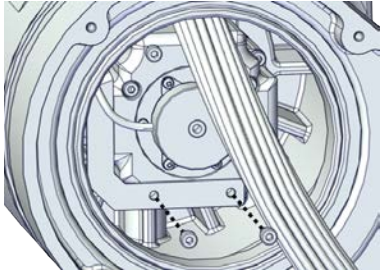
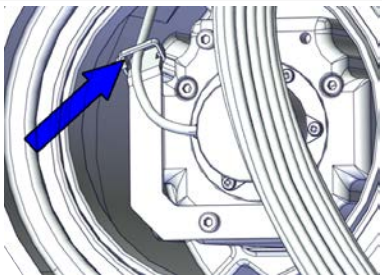
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5 Repair

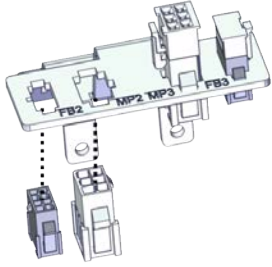

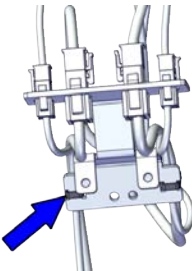
5.6.2 Replacing the axis-2 motor

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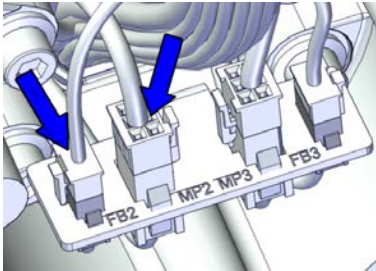
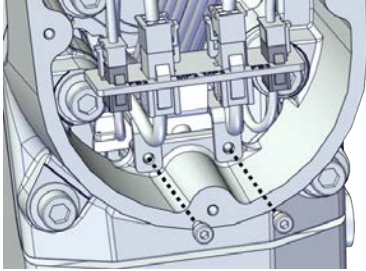
Securing the motor cabling

	Action	Note
1	Refit the cable bracket.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001625</p>
2	Secure the FB2 cabling to the bracket with cable strap.	 <p>xx2000001624</p>
3	Wrap the connectors and route the cabling up into the lower arm.	

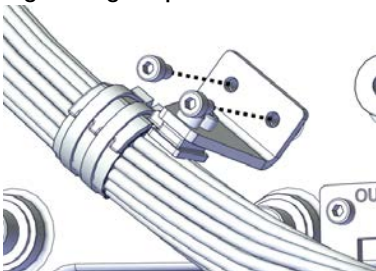
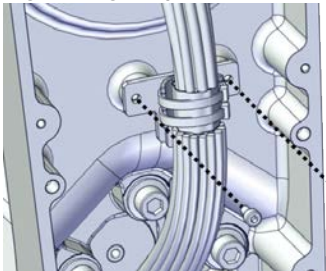
Reconnecting the axis-2 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001641</p>
2	<p>Route and secure the cabling with a cable strap.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001640</p>

Continues on next page

	Action	Note
3	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB2 • MP2 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001639</p>
4	<p>Refit the connector plate to the lower arm.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001548</p>

Securing the cable package

	Action	Note
1	<p>Refit the cable bracket in the swing.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001623</p>
2	<p>Refit the cable bracket in the lower arm.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001553</p>

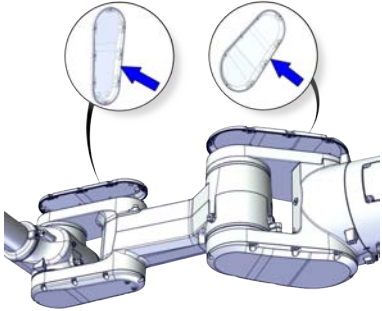
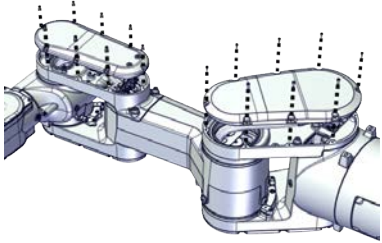
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5 Repair

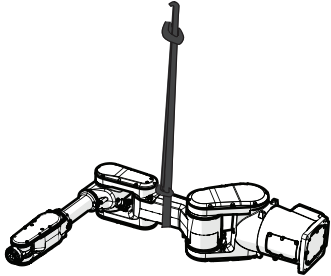
5.6.2 Replacing the axis-2 motor

Continued


Refitting the covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets. Replace if damaged.</p>	 <p>xx2000002504</p>
2	<p>Apply grease to the cable package, cover all moving area of the package.</p>	<p>Grease: 3HAC029132-001</p>
3	<p>Apply grease to the covers that have contacting area with the cable package.</p>	<p>Grease: 3HAC029132-001</p>
4	<p>Refit the covers.</p> <ul style="list-style-type: none"> • lower arm support cover • swing support cover 	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001622</p>


Securing the robot to the foundation

	Action	Note
1	<p>Run a roundsling around the lower arm.</p>	<p>Roundsling, 1.7 m, Lifting capacity: >70 kg</p>  <p>xx2000001648</p>

Continues on next page

	Action	Note
2	 CAUTION The CRB 1300 robot weighs . CRB 1300-11/0.9: 75 kg CRB 1300-10/1.15: 77 kg CRB 1300-7/1.4: 79 kg All lifting accessories used must be sized accordingly!	
3	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	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

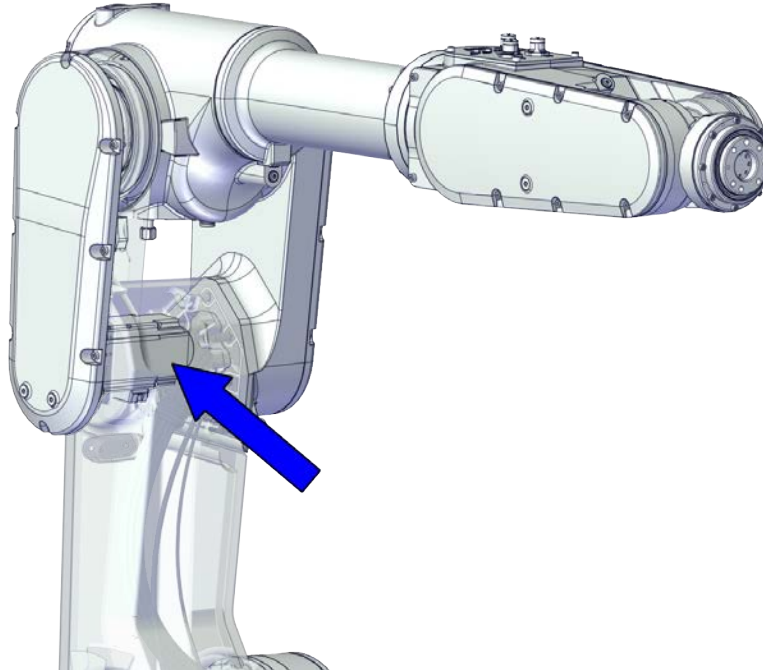
5 Repair

5.6.3 Replacing the axis-3 motor

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 CRB 1300 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Motor unit, axis 3	3HAC073086-001	
Timing belt, axis 3	3HAC067040-001	
Lower arm cover	3HAC073092-001	
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .

Continues on next page


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.
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	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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.
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

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5 Repair

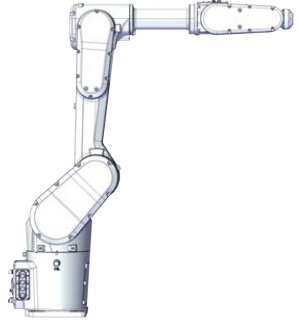

5.6.3 Replacing the axis-3 motor

Continued


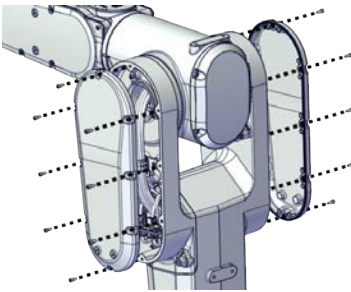
Removing the motor

Use these procedures to remove the axis-3 motor.

Preparations before removing the axis-3 motor



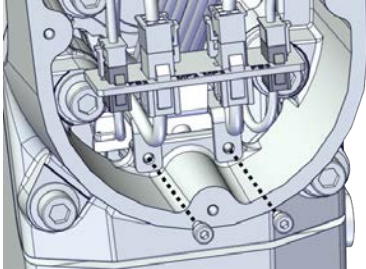
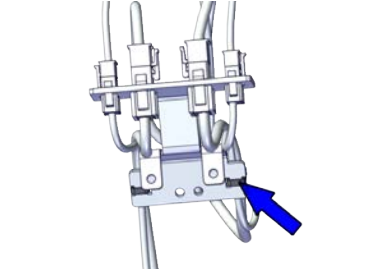

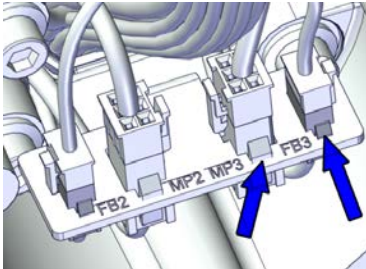
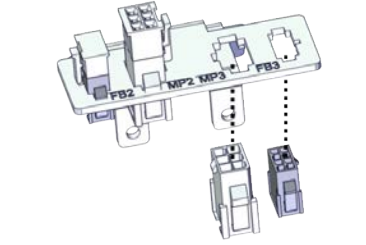
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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.	
2	Remove the lower arm covers.	 xx2000001613

Continues on next page

Disconnecting the axis-3 motor connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the connector plate.</p> <p> CAUTION</p> <p>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.</p>	 <p>xx2000001548</p>
3	<p>Cut the cable strap.</p>	 <p>xx2000001620</p>
4	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • FB3 • MP3 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001619</p>
5	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001621</p>




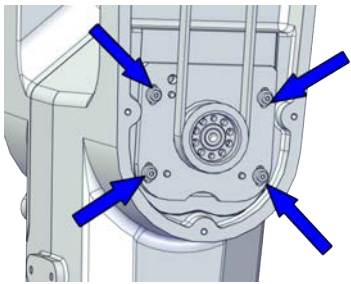
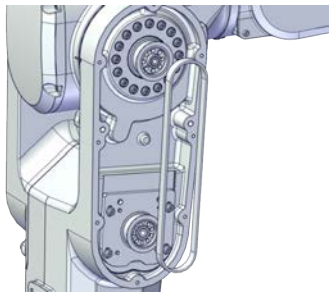
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5 Repair

5.6.3 Replacing the axis-3 motor



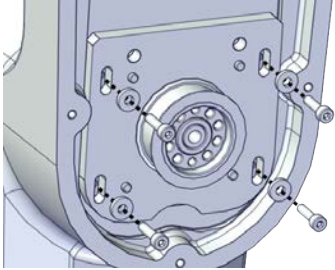
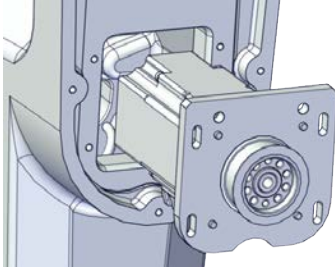
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Removing the axis-3 timing belt

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
3	 CAUTION The upper arms, which includes housing, extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit weighs 17 kg. All lifting accessories used must be sized accordingly!	
4	Fit a roundsling to the upper arm to support the weight (no force).	
5	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001614
6	Remove the timing belt from its groove on the motor.	 xx2000001615

Continues on next page


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 Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
3	Remove the screws and washers.	 xx2000001616
4	Carefully lift out the motor.	 xx2000001617

Refitting the motor

Use these procedures to refit the axis-3 motor.

Refitting the axis-3 motor

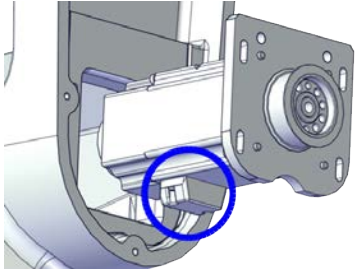

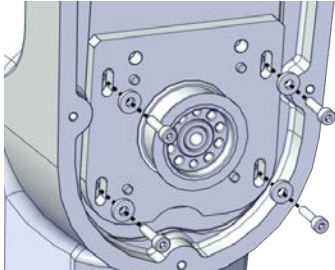
	Action	Note
1	 CAUTION Do not mix the axis-3 motor used for CRB 1300-7/1.4 and . Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-3 motor for CRB 1300-7/1.4: 3HAC073086-001

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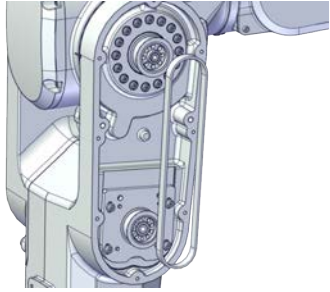
5 Repair

5.6.3 Replacing the axis-3 motor

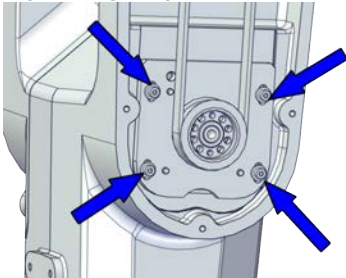
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	Action	Note
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
3	Orient the motor correctly and fit it into the lower arm.	Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.  xx2000001618
4	Refit the screws and washers.  Note Do not tighten the screws yet.	Screw: M4x16 12.9 Lafre 2C2B/FC6.9 (4 pcs)  xx2000001616

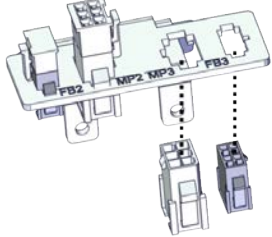

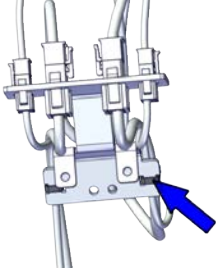

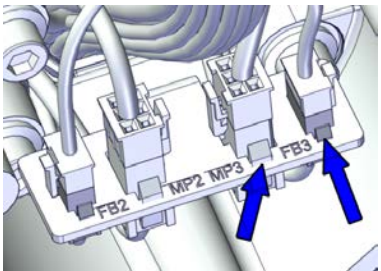
Refitting the axis-3 timing belt

	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001615
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	

Continues on next page

	Action	Note
3	Tighten the motor screws.	<p>Tightening torque: 3.3 Nm</p>  <p>xx2000001614</p>
4	<p>Use a sonic tension meter to measure the timing belt tension.</p> <p>If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.</p>	<p>Used belt: 73.4-78.5 Hz</p> <p>New belt: 87.8-92.1 Hz</p>
5	Release the support to the upper arm.	

Reconnecting the axis-3 motor connectors

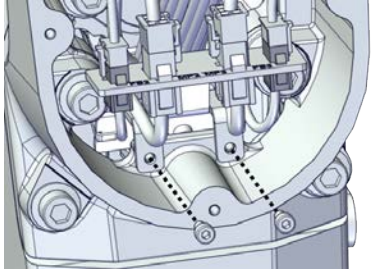
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001621</p>
2	<p>Route and secure the cabling with a cable strap.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001620</p>
3	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB3 • MP3 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001619</p>

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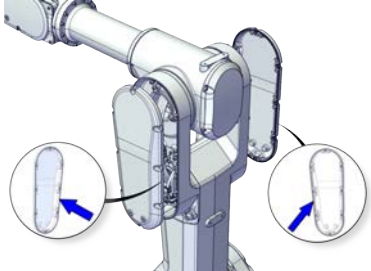
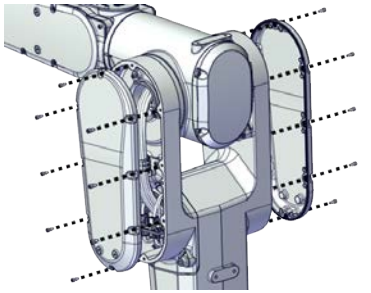
5 Repair

5.6.3 Replacing the axis-3 motor

Continued

	Action	Note
4	Refit the connector plate to the lower arm.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001548</p>


Refitting the lower arm covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the gaskets. Replace if damaged.</p>	 <p>xx2000002505</p>
2	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
3	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
4	Refit the lower arm covers.	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 Tightening torque: 2.6 Nm</p>  <p>xx2000001613</p>

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .

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	Action	Note
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 171 .	

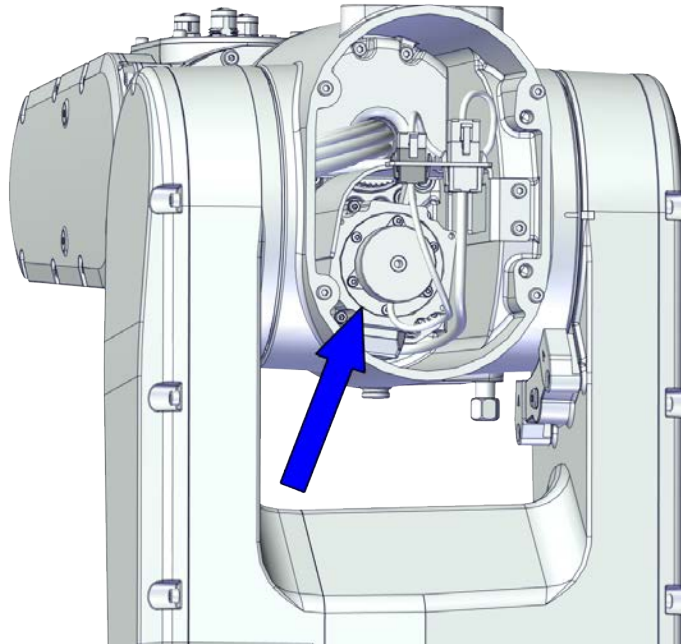
5 Repair

5.6.4 Replacing the axis-4 motor

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 CRB 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	
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .

Continues on next page


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.

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	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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.
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

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5 Repair

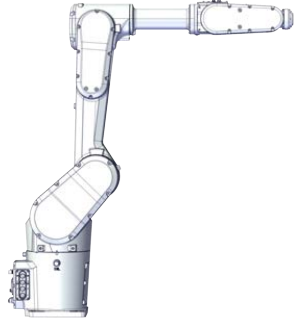

5.6.4 Replacing the axis-4 motor

Continued


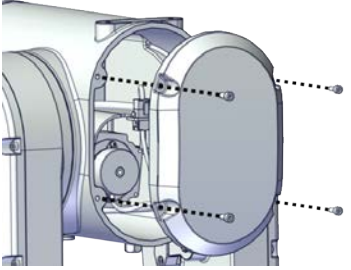
Removing the motor

Use these procedures to remove the axis-4 motor.

Preparations before removing the axis-4 motor



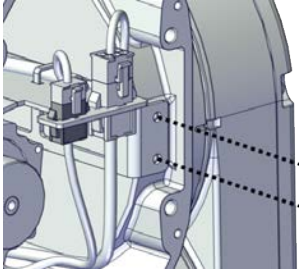

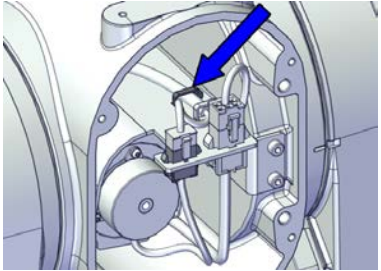

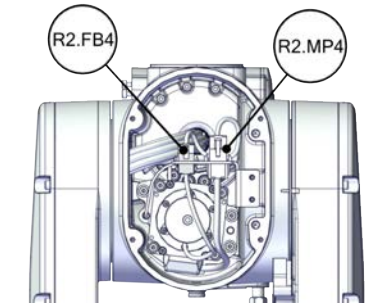
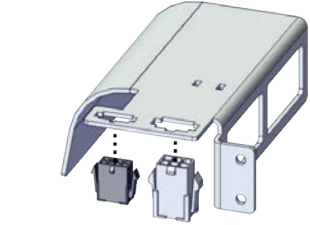
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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	Remove the housing cover.	 xx2000001541

Continues on next page

Disconnecting the axis-4 motor connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the connector plate.</p> <p> CAUTION</p> <p>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.</p>	 <p>xx2000001542</p>
3	<p>Cut the cable strap.</p> <p> Note</p> <p>The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.</p>	 <p>xx2000001543</p>
4	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP4 • FB4 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001544</p>
5	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001545</p>



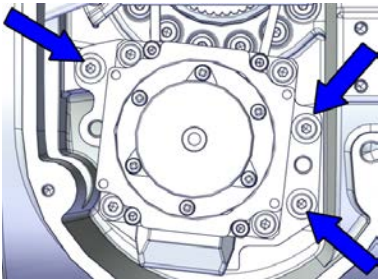
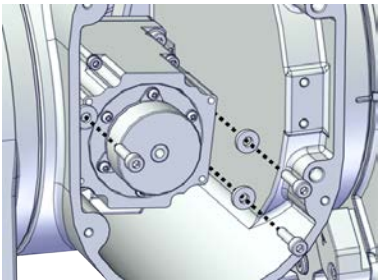
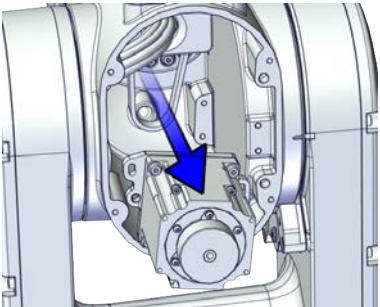
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5 Repair

5.6.4 Replacing the axis-4 motor

Continued

Removing the axis-4 motor


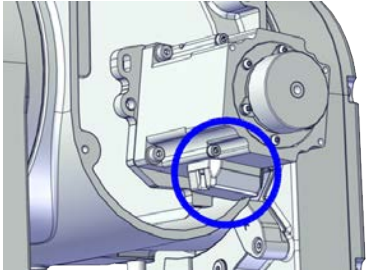
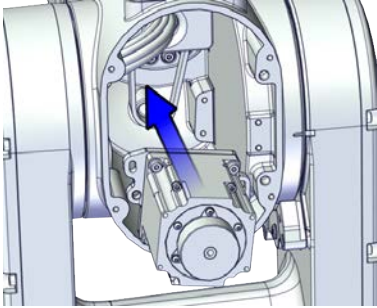

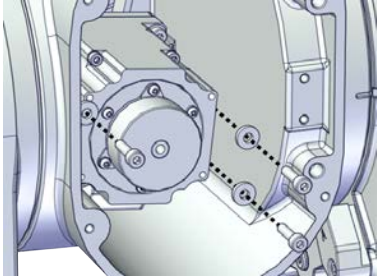
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001604
4	Remove the timing belt from its groove on the motor.	
5	Remove the screws and washers.	 xx2000001605
6	Carefully lift out the motor.	 xx2000001606

Continues on next page

Refitting the motor

Use these procedures to refit the axis-4 motor.

Refitting the axis-4 motor

	Action	Note
1	<p>Check that:</p> <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
2	<p>Orient the motor correctly and fit it into the housing.</p> <p> Note</p> <p>Make sure the motor flange does not press on the timing belt.</p>	<p>Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.</p>  <p>xx2000001607</p>
3	<p>Install the timing belt to the motor pulley and verify that the belt runs correctly in the grooves of the pulley.</p>	 <p>xx2000001608</p>
4	<p>Refit the screws and washers.</p> <p> Note</p> <p>Do not tighten the screws yet.</p>	<p>Screw: M4x16 12.9 Lafre 2C2B/FC6.9 (3 pcs)</p>  <p>xx2000001605</p>

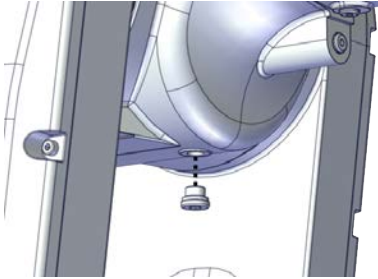
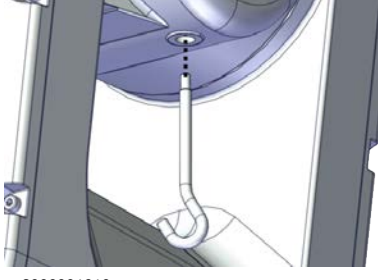
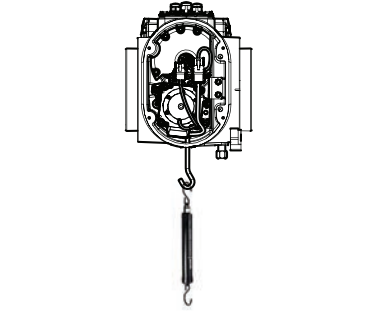

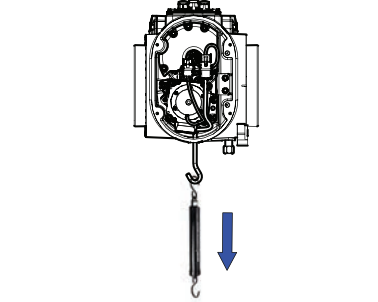
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5 Repair

5.6.4 Replacing the axis-4 motor

Continued

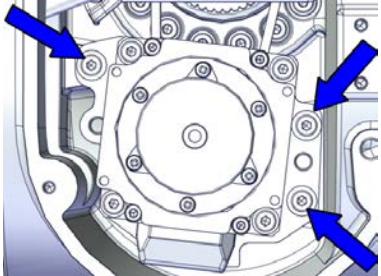
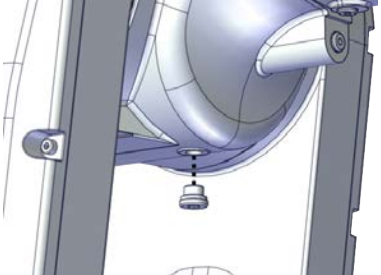
Adjusting the axis-4 timing belt tension

	Action	Note
1	Remove the screw below the housing.	 <p>xx2000001609</p>
2	Fit the tension adjustment tool for axis-4 timing belt to the screw hole.	<p>Tension adjustment tool for axis-4 timing belt. Included in special toolkit 3HAC076396-001.</p>  <p>xx2000001610</p>
3	Use a handheld dynamometer hooking to the tool.	 <p>xx2000001611</p>
4	<p>Pull the dynamometer to make the tension falling in the allowed force range.</p> <p> Note</p> <p>During the measurement, make sure that all interferences that may affect the force are removed. Pay attention to the force application direction.</p>	<p>Used belt: 33.4-38.2 N New belt: 47.8-52.4 N</p>  <p>xx2000001612</p>

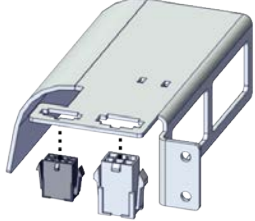

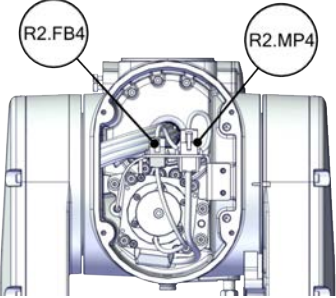
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5.6.4 Replacing the axis-4 motor

Continued

	Action	Note
5	Secure the motor with the screws.	<p>Tightening torque: 3.3 Nm±3%</p>  <p>xx2000001604</p>
6	Remove the tool and refit the plug screw.	<p>Tightening torque: 3 Nm Plug screw: 3HAC078352-001</p>  <p>xx2000001609</p>

Reconnecting the axis-4 motor connectors



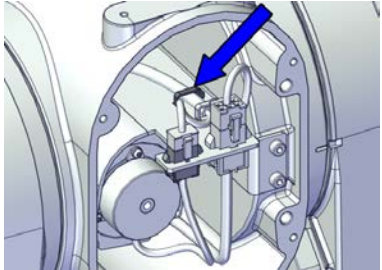
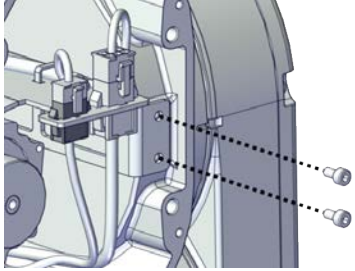
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001545</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB4 • MP4 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001544</p>

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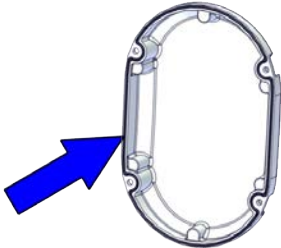
5 Repair

5.6.4 Replacing the axis-4 motor

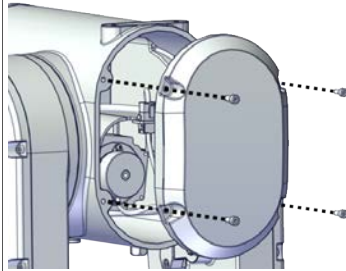
Continued

	Action	Note
3	<p>Route and secure the cabling with a cable strap.</p> <p> Note</p> <p>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.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001543</p>
4	<p>Refit the connector plate.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001542</p>


Refitting the housing cover

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	 <p>xx2000002511</p>
2	<p>Apply grease to the cable package, cover all moving area of the package.</p>	<p>Grease: 3HAC029132-001</p>
3	<p>Apply grease to the covers that have contacting area with the cable package.</p>	<p>Grease: 3HAC029132-001</p>

Continues on next page

	Action	Note
4	Refit the housing cover.	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 Tightening torque: 2.6 Nm</p>  <p>xx2000001541</p>

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

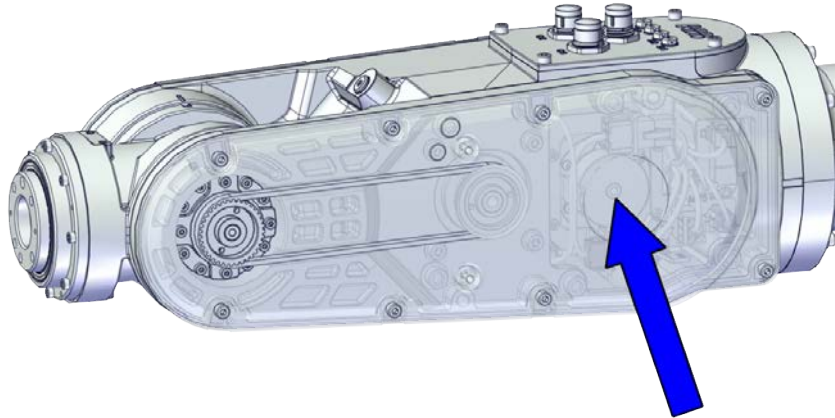
5 Repair

5.6.5 Replacing the axis-5 motor

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 CRB 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 with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
Tubular cover	3HAC073094-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.

Continues on next page

Spare part	Article number	Note
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment


Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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.
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

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5 Repair

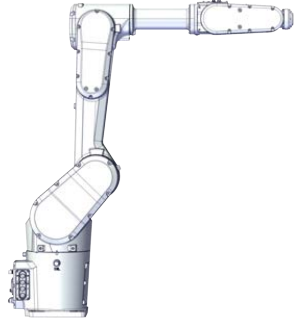

5.6.5 Replacing the axis-5 motor

Continued


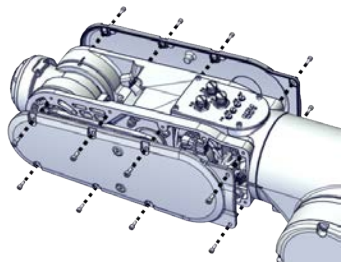
Removing the motor

Use these procedures to remove the axis-5 motor.

Preparations before removing the axis-5 motor



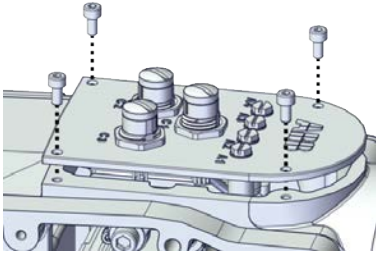
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Removing the tubular covers


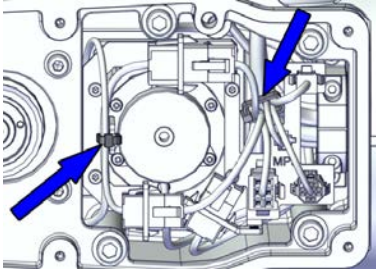

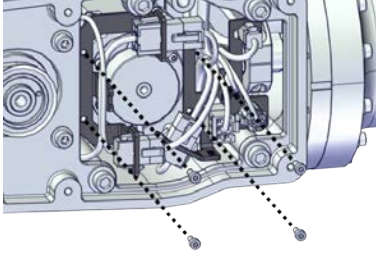
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the tubular covers.	 xx2000001593

Continues on next page

Loosening the process hub

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the screws and carefully open the cover.</p>  <p>CAUTION</p> <p>There is cabling attached to the cover. The cover cannot be removed completely.</p>	 <p>xx2000001538</p>

Loosening the cables in the tubular

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Cut the cable straps.</p>	 <p>xx2000001530</p>
3	<p>Remove the connector plates.</p>  <p>CAUTION</p> <p>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.</p>	 <p>xx2000001531</p>



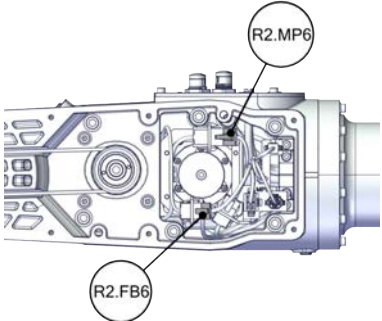
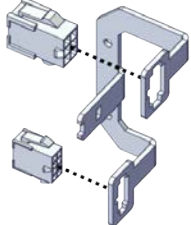
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5 Repair



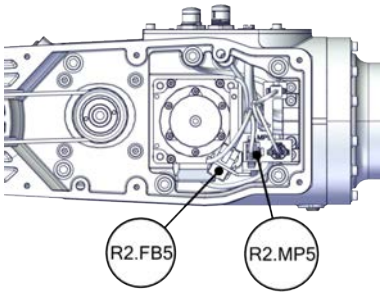
5.6.5 Replacing the axis-5 motor

Continued

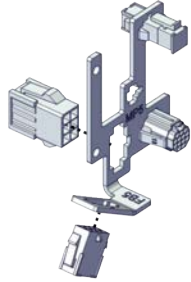
Disconnecting the axis-6 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP6 • FB6  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001532
3	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001533



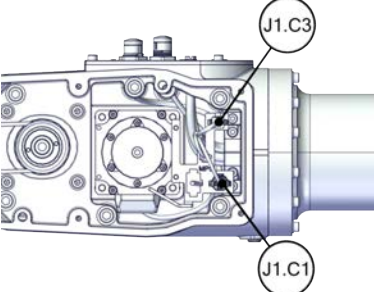
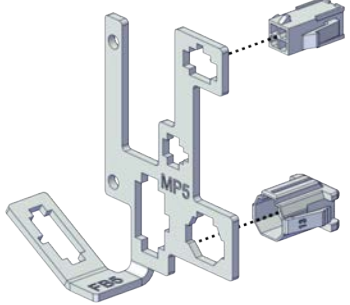
Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP5 • FB5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534

Continues on next page

	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001535</p>

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	<p>For robots with CP/CS cabling Disconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001536</p>
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>



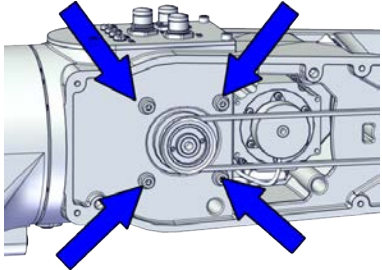
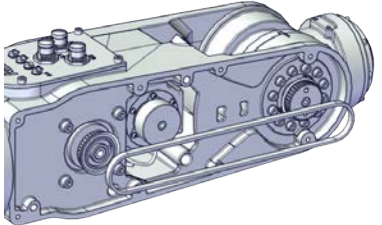
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5 Repair



5.6.5 Replacing the axis-5 motor

Continued

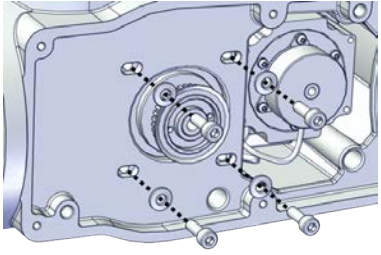
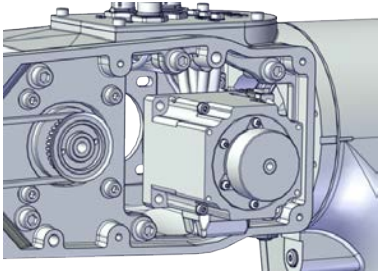
Removing the axis-5 timing belt

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001594
4	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 Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	


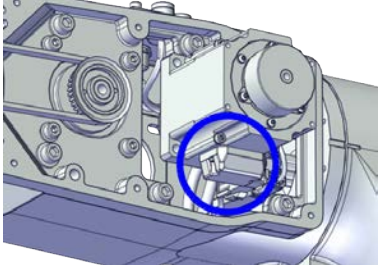
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	Action	Note
3	Remove the screws and washers.	 xx2000001596
4	Carefully lift out the motor.	 xx2000001597

Refitting the motor

Use these procedures to refit the axis-5 motor.

Refitting the axis-5 motor


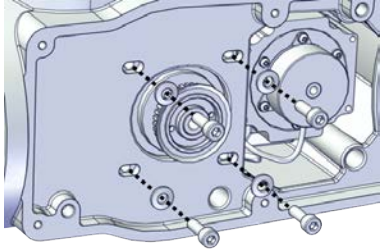
	Action	Note
1	Check that: <ul style="list-style-type: none"> all assembly surfaces are clean and without damages the motor is clean and undamaged. 	
2	Orient the motor correctly and fit it into the tubular.  Note Pay attention to the motor orientation (see figures for a reference); otherwise, other cables 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

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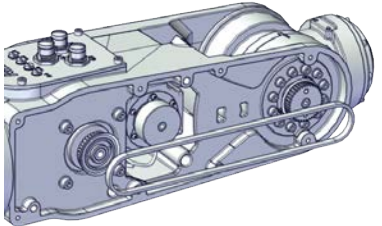
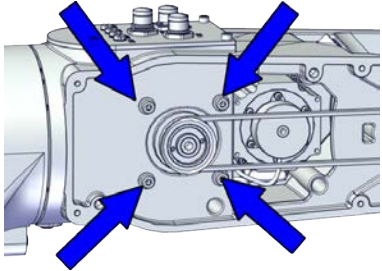
5 Repair

5.6.5 Replacing the axis-5 motor

Continued

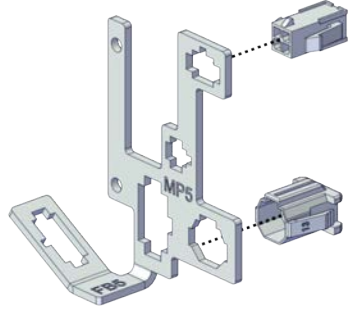

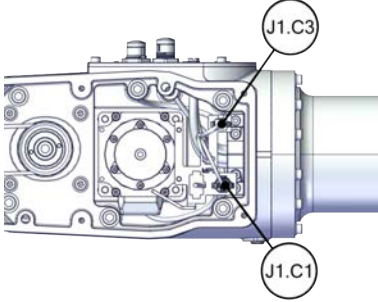
	Action	Note
3	Refit the screws and washers.  Note Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre 2C2B/FC6.9 (4 pcs)  xx2000001596

Refitting the axis-5 timing belt

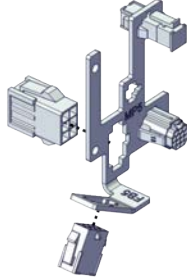

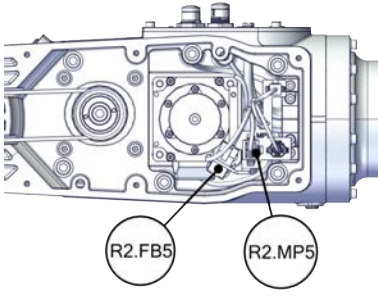
	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001595
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	
3	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001594
4	Use a sonic tension 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

Continues on next page

Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>
2	For robots with CP/CS cabling Reconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001536</p>

Reconnecting the axis-5 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001535</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB5 • MP5  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001534</p>

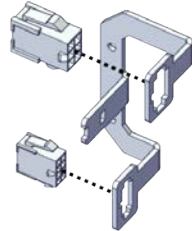

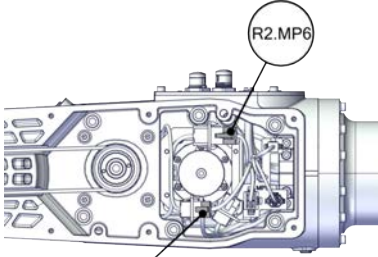
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5 Repair

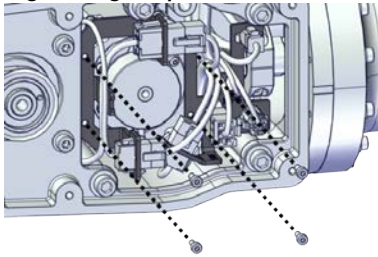

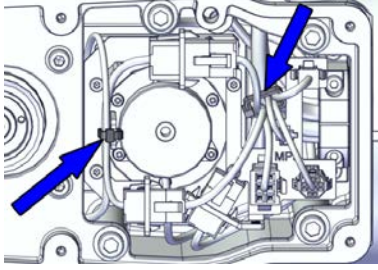
5.6.5 Replacing the axis-5 motor

Continued

Reconnecting the axis-6 motor connectors

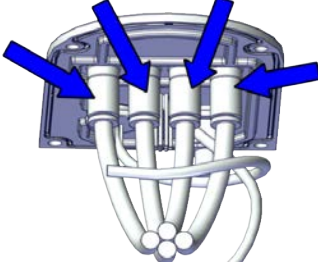
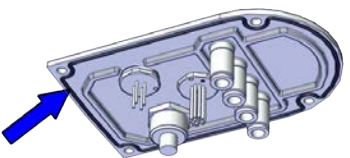
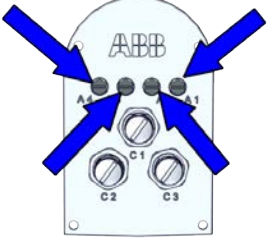
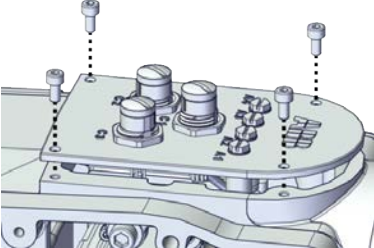
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001533</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB6 • MP6  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001532</p>

Securing the cable package in the tubular

	Action	Note
1	Refit the connector plate.	Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm  <p>xx2000001531</p>
2	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.	 <p>xx2000001530</p>

Continues on next page

Refitting the process hub

	Action	Note
1	<p>Check the air hoses. Replace the cable package if damaged. See Replacing the cable package on page 222.</p>	 <p>xx2000001539</p>
2	<p>For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.</p>	<p>Gasket for process hub: 3HAC070887-001</p>  <p>xx2000002512</p>
3	<p>For robots with protection class IP67 (option 3350-670) Check the seal bolts. Replace if damaged.</p>	<p>Seal bolt: 3HAC032050-001</p>  <p>xx2000002513</p>
4	<p>Refit the process hub.</p>	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001538</p>

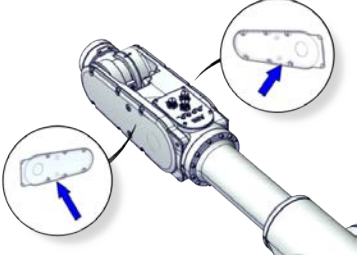
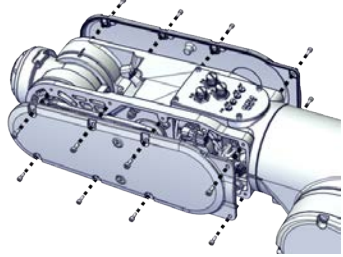
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5 Repair


5.6.5 Replacing the axis-5 motor

Continued

Refitting the tubular covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets. Replace if damaged.</p>	 <p>xx2000002507</p>
2	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
3	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
4	Refit the tubular covers.	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001593</p>

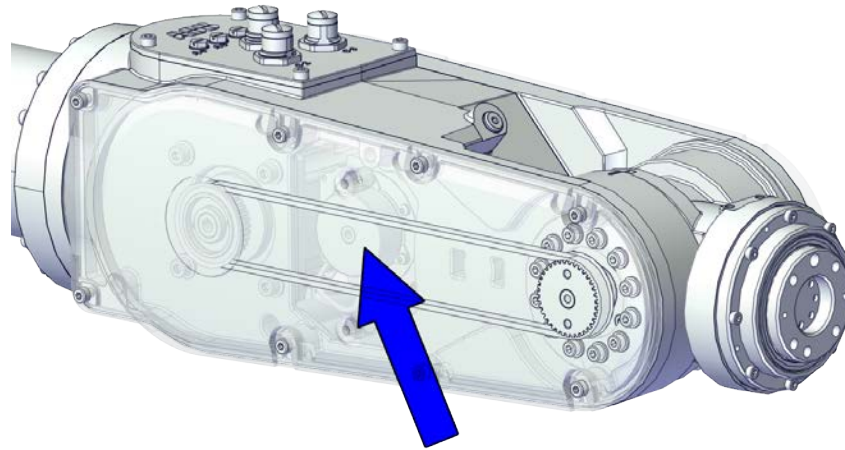
Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
2	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 171.</p>	

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 CRB 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 with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
Tubular cover	3HAC073094-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.

Continues on next page

5 Repair

5.6.6 Replacing the axis-6 motor

Continued

Spare part	Article number	Note
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment


Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none">Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	 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.
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>

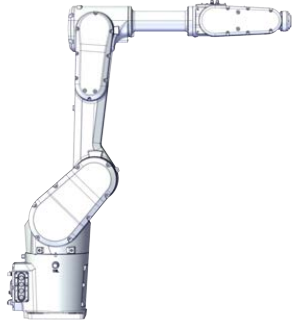

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Action	Note
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	


Removing the axis-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	<p>Jog all axes to zero position.</p>  <p>xx2000001520</p>
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>

Removing the tubular covers

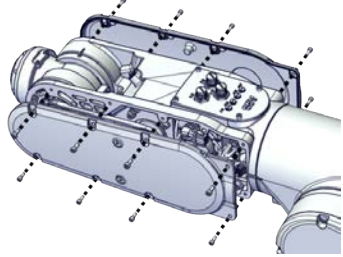
Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>

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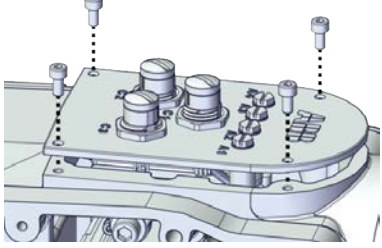
5 Repair

5.6.6 Replacing the axis-6 motor


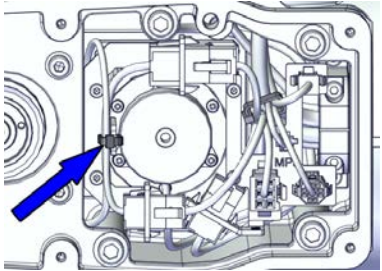
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	Action	Note
2	Remove the tubular covers.	 <p>xx2000001593</p>


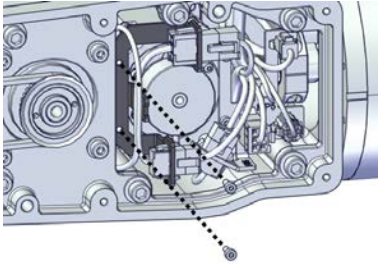
Loosening the process hub

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the screws and carefully open the cover.  CAUTION There is cabling attached to the cover. The cover cannot be removed completely.	 <p>xx2000001538</p>



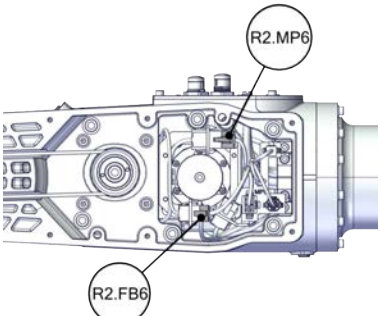
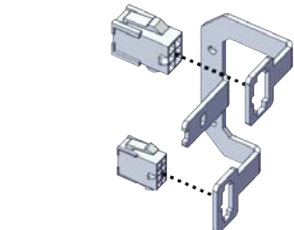
Loosening the cables in the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Cut the cable strap.	 <p>xx2100001483</p>


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	Action	Note
3	<p>Remove the connector plate.</p> <p> CAUTION</p> <p>Be aware of the cabling that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.</p>	 <p>xx2100001484</p>

Disconnecting the axis-6 motor connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP6 • FB6 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001532</p>
3	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001533</p>

Removing the axis-5 timing belt


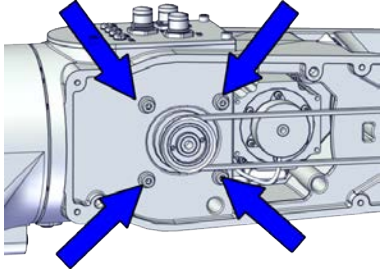
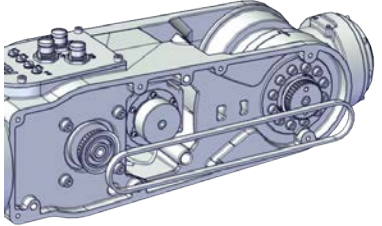
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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5 Repair

5.6.6 Replacing the axis-6 motor

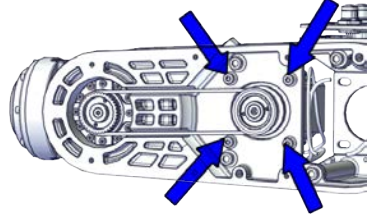
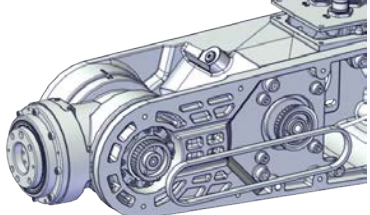
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	Action	Note
2	 CAUTION Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001594
4	Remove the timing belt from its groove on the motor.	 xx2000001595



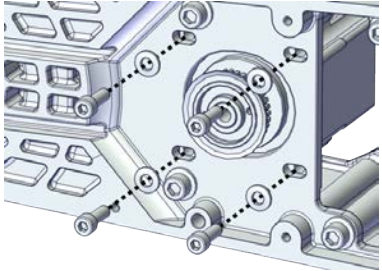
Removing the axis-6 timing belt

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	

Continues on next page

	Action	Note
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 <p>xx2000001599</p>
4	Remove the timing belt from its groove on the motor.	 <p>xx2000001600</p>

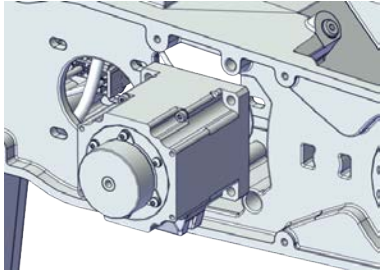
Removing the axis-6 motor

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.</p>	
3	Remove the screws and washers.	 <p>xx2000001601</p>

5 Repair

5.6.6 Replacing the axis-6 motor


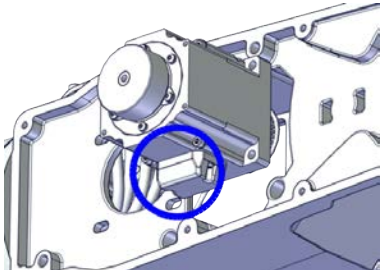

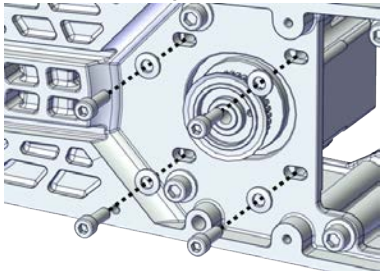
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	Action	Note
4	Carefully lift out the motor.	 <p>xx2000001602</p>

Refitting the axis-6 motor

Use these procedures to refit the axis-6 motor.

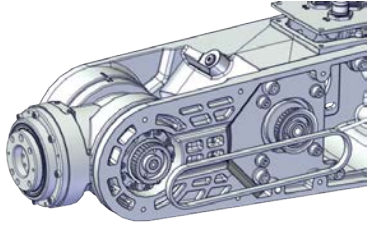
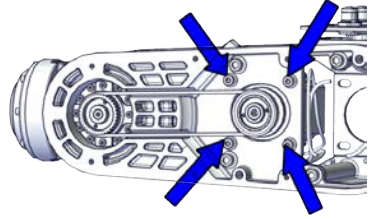
Refitting the axis-6 motor

	Action	Note
1	Check that: <ul style="list-style-type: none"> all assembly surfaces are clean and without damages the motor is clean and undamaged. 	
2	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.  <p>xx2000001603</p>
3	Refit the screws and washers.  Note Do not tighten the screws yet.	Screw: M5x16 12.9 Lafre 2C2B/FC6.9 (4 pcs)  <p>xx2000001601</p>

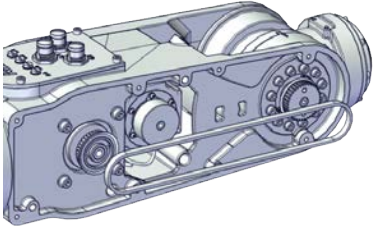
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5.6.6 Replacing the axis-6 motor
Continued

Refitting the axis-6 timing belt

	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001600
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	
3	Tighten the motor screws.	Tightening torque: 6 Nm  xx2000001599
4	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

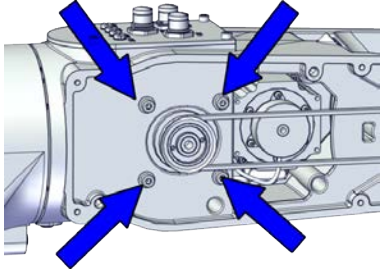
	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 xx2000001595
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	

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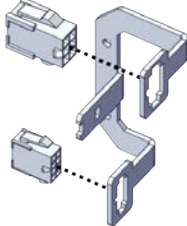

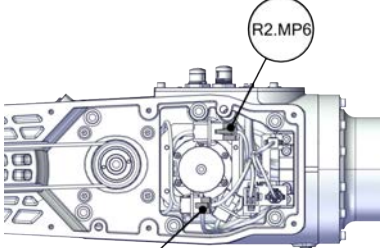
5 Repair

5.6.6 Replacing the axis-6 motor

Continued

	Action	Note
3	Tighten the motor screws.	<p>Tightening torque: 6 Nm</p>  <p>xx2000001594</p>
4	<p>Use a sonic tension meter to measure the timing belt tension.</p> <p>If the timing belt tension does not meet the requirement, loosen the motor screws and readjust.</p>	<p>Used belt: 59.3-63.4 Hz</p> <p>New belt: 70.8-74.3 Hz</p>

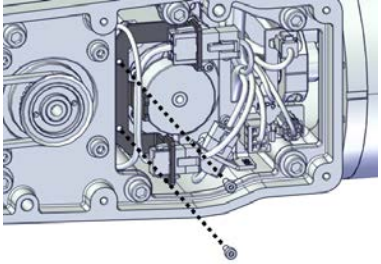

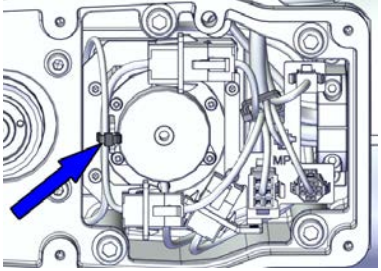
Reconnecting the axis-6 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001533</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB6 • MP6 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001532</p>

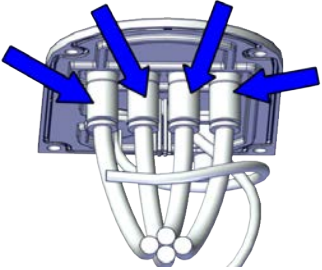
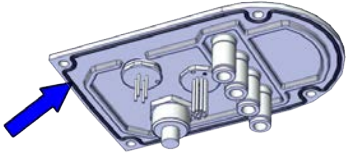
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5.6.6 Replacing the axis-6 motor
Continued

Securing the cable package in the tubular

	Action	Note
1	Refit the connector plate.	<p>Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 1.3 Nm</p>  <p>xx2100001484</p>
2	<p>Route and secure the cabling with a cable strap.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2100001483</p>

Refitting the process hub

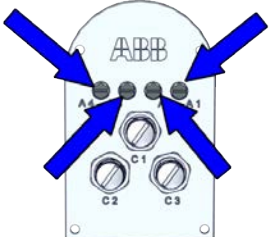
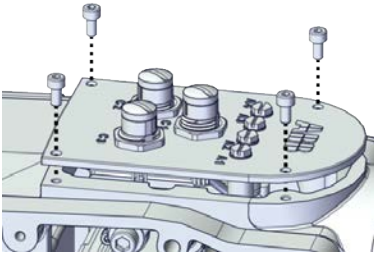
	Action	Note
1	<p>Check the air hoses. Replace the cable package if damaged. See Replacing the cable package on page 222.</p>	 <p>xx2000001539</p>
2	<p>For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.</p>	<p>Gasket for process hub: 3HAC070887-001</p>  <p>xx2000002512</p>

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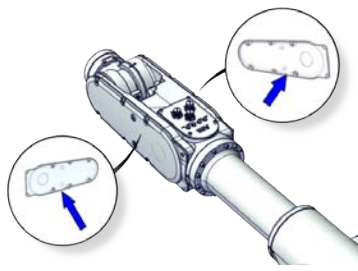
5 Repair

5.6.6 Replacing the axis-6 motor

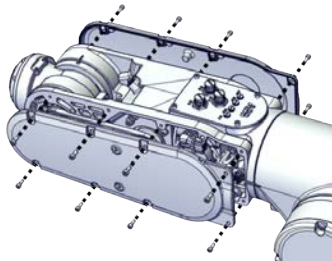
Continued

	Action	Note
3	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the seal bolts.</p> <p>Replace if damaged.</p>	<p>Seal bolt: 3HAC032050-001</p>  <p>xx2000002513</p>
4	<p>Refit the process hub.</p>	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (4 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001538</p>


Refitting the tubular covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets.</p> <p>Replace if damaged.</p>	 <p>xx2000002507</p>
2	<p>Apply grease to the cable package, cover all moving area of the package.</p>	<p>Grease: 3HAC029132-001</p>
3	<p>Apply grease to the covers that have contacting area with the cable package.</p>	<p>Grease: 3HAC029132-001</p>

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	Action	Note
4	Refit the tubular covers.	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 Tightening torque: 2.6 Nm</p>  <p>xx2000001593</p>

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

5 Repair

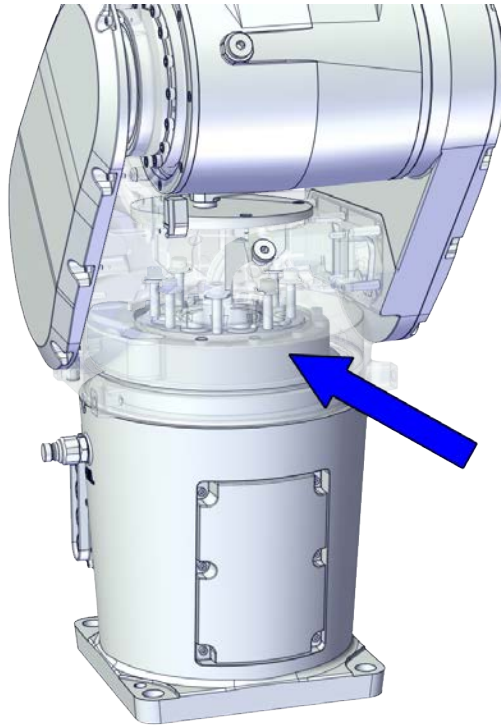
5.7.1 Replacing the axis-1 gearbox

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.



xx2000001486

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 CRB 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.

Continues on next page

Spare part	Article number	Note
Mechanical stop, axis 1, slider	3HAC065755-001	Replace if damaged.
Main cable harness, S (CP/CS and air hose, with Ethernet)	3HAC073305-001	Used with CRB 1300-11/0.9.
Main cable harness, M (CP/CS and air hose, with Ethernet)	3HAC073302-001	Used with CRB 1300-10/1.15.
Main cable harness, L (CP/CS and air hose, with Ethernet)	3HAC073299-001	Used with CRB 1300-7/1.4.
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
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	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Swing cover, short	3HAC073095-001	Used for CRB 1300-11/0.9.
Swing cover, long	3HAC073096-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Swing top cover	3HAC073091-001	
Base cover	3HAC073090-001	
SMB cover	3HAC076475-001	
Brake release unit	3HAC073296-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for SMB cover	3HAC067820-001	Used with protection class IP67. Replace if damaged.
Gasket for brake release unit	3HAC070274-001	Used with protection class IP67. Replace if damaged.
Gasket for base cover	3HAC067819-001	Used with protection class IP67. Replace if damaged.
Gasket for base adapter	3HAC067818-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.

Continues on next page

5 Repair

5.7.1 Replacing the axis-1 gearbox

Continued

Spare part	Article number	Note
Gasket for swing cover, short	3HAC067824-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of ra- dial sealing assembly tool for axes 2 to 3 .

Required consumables


Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-001	Kyodo Yushi TMO150

Continues on next page

Consumable	Article number	Note
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	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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.
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

Replacement of the axis-1 gearbox

The axis-1 gearbox is accessible after removing the base, see [Replacing the base on page 271](#).

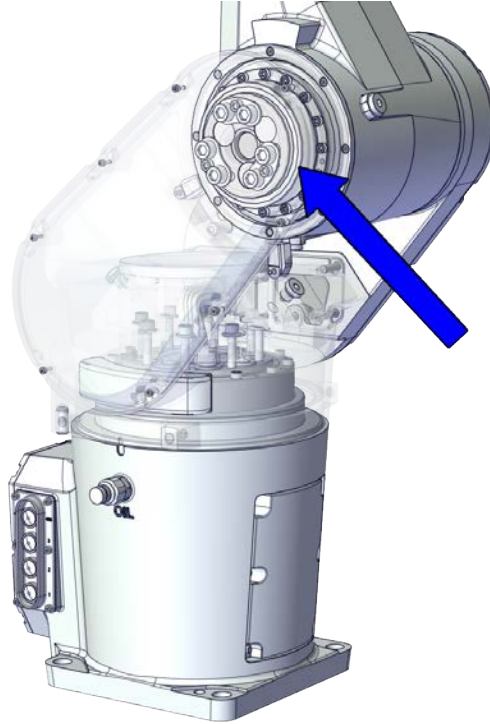
5 Repair

5.7.2 Replacing the axis-2 gearbox

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 CRB 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	
O-ring on motor unit	3HAC061327-037	
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.

Continues on next page

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	
Swing support, short	3HAC073041-001	Used for CRB 1300-11/0.9.
Swing support, long	3HAC073052-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Sealing ring, swing support side	3HAC065676-001	
O-ring on swing	3HAC061327-036	
Tubular cover	3HAC073094-001	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Swing cover, short	3HAC073095-001	Used for CRB 1300-11/0.9.
Swing cover, long	3HAC073096-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4.
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Gasket for swing support, short	3HAC067822-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing support, long	3HAC067823-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, short	3HAC067824-001	Used for CRB 1300-11/0.9. Used with protection class IP67. Replace if damaged.
Gasket for swing cover, long	3HAC067825-001	Used for CRB 1300-10/1.15 and CRB 1300-7/1.4. Used with protection class IP67. Replace if damaged.
Gasket for swing top cover	3HAC067821-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.
Radial sealing on swing (to lower arm)	3HAC070148-004	Used with protection class IP67. Replace if damaged.
Sealing ring, swing side	3HAC065675-001	Used with protection class IP67.

Continues on next page

5 Repair

5.7.2 Replacing the axis-2 gearbox

Continued

Spare part	Article number	Note
O-ring on lower arm	3HAC061327-015	Used with protection class IP67. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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	-	
Special toolkit for IP67 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .


Required consumables

Consumable	Article number	Note
Cable straps	-	
Grease	3HAC029132-001	FM 222
Lubricating oil	3HAC032140-001	Kyodo Yushi TMO150

Continues on next page

Deciding calibration routine

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

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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 681 .
	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.	

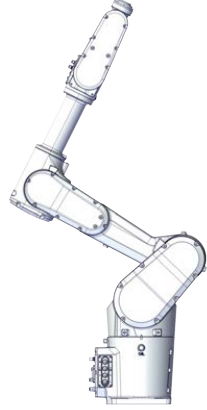

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5 Repair



5.7.2 Replacing the axis-2 gearbox

Continued

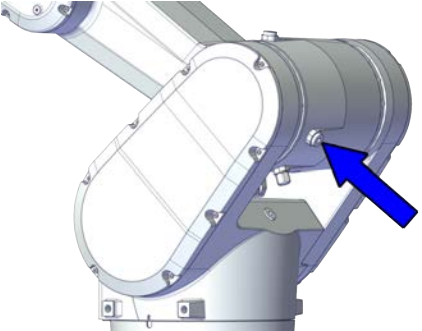
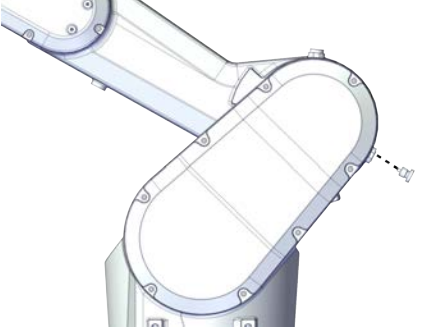
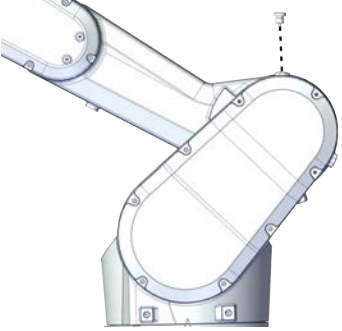


Jogging the robot to oil draining position

	Action	Note
1	<p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance. 	 <p>xx2000001519</p>
2	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

Draining oil of axis-2 gearbox

	Action	Note
1	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31.</p>	
2	<p> CAUTION</p> <p>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.</p>	

Continues on next page


Action	Note
3	Place the oil collecting vessel underneath the oil plug, draining.
 <p>xx2000001515</p>	
4	Remove the oil plug, draining.
 <p>xx2000001516</p>	
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.
 <p>xx2000001517</p>	
7	 <p>WARNING</p> <p>Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 717 for more information.</p>
8	Drain the gearbox oil.
 <p>Note</p> <p>Draining is time-consuming. Elapsed time varies depending on the temperature of the oil.</p>	

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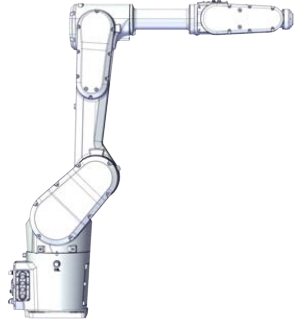

5 Repair

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

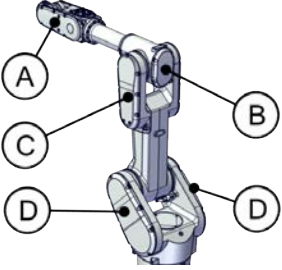
	Action	Note
1	Turn on the electric power to the robot. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to Supplying power to connector R1.MP on page 68 .	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Removing the covers


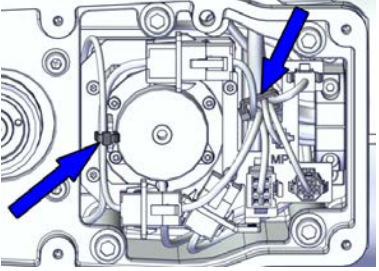

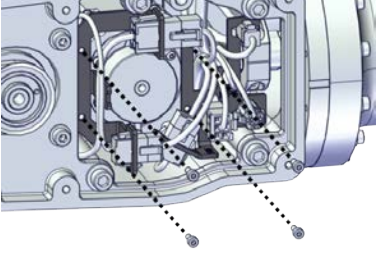
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
2	Remove the covers. <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing covers (D) 	 <p>xx2000001682</p>

Loosening the cables in the tubular

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	Cut the cable straps.	 <p>xx2000001530</p>
3	Remove the connector plates.  <p>CAUTION</p> <p>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.</p>	 <p>xx2000001531</p>

Disconnecting the axis-6 motor connectors


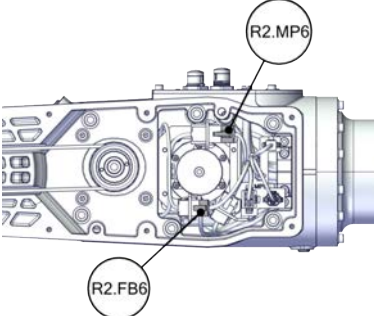
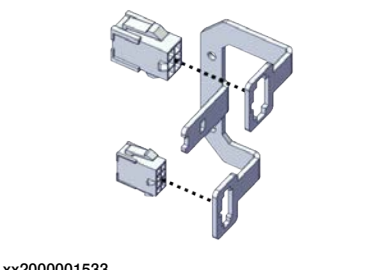
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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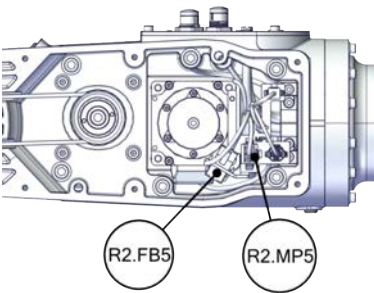
5 Repair

5.7.2 Replacing the axis-2 gearbox

Continued

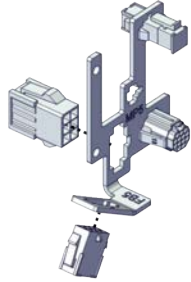
	Action	Note
2	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP6 • FB6 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001532</p>
3	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001533</p>

Disconnecting the axis-5 motor connectors



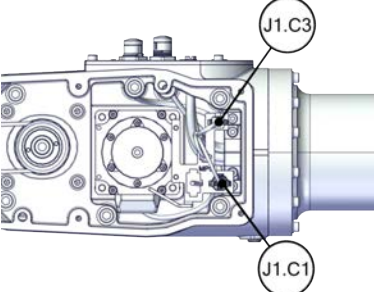
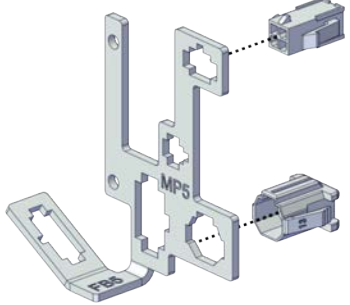
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP5 • FB5 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001534</p>

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5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001535</p>

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	<p>For robots with CP/CS cabling Disconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3 <p> Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001536</p>
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>


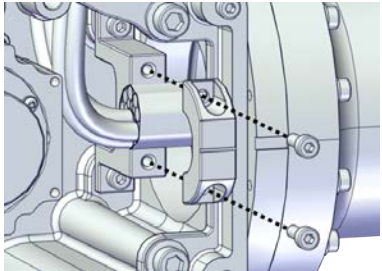
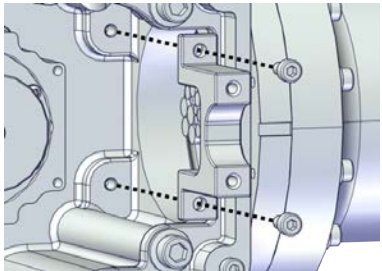
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5 Repair



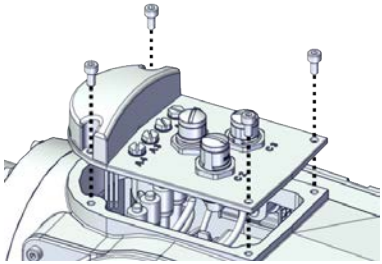
5.7.2 Replacing the axis-2 gearbox

Continued

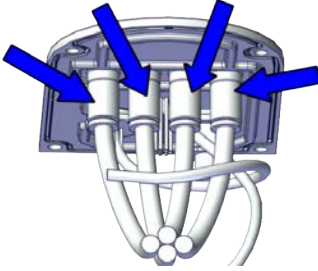


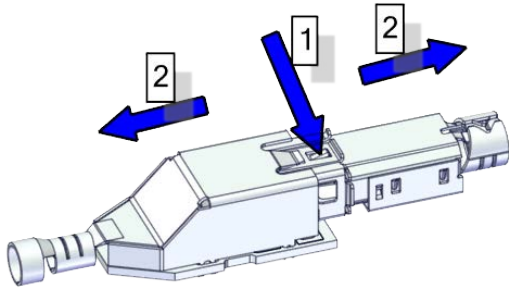
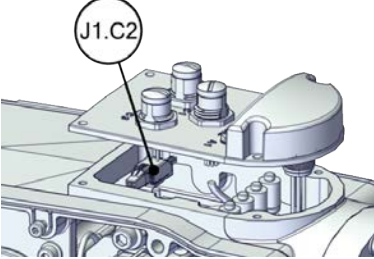
Separating the cable package from the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the first semicircular bracket that fixes the cable package.	 xx2000001748
3	Remove the second semicircular bracket from the tubular.	 xx2000001749

Removing the process hub

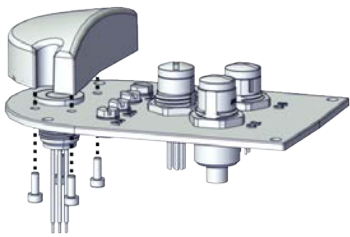
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the screws and carefully open the cover.  CAUTION There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.	 xx2200001000

Continues on next page

	Action	Note
3	Disconnect the air hoses.	 <p>xx2000001539</p>
4	<p>For robots with Ethernet cabling Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>

Removing the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

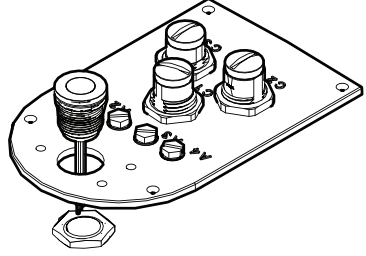
	Action	Note
1	Remove the lamp unit cover.	 <p>xx2200001002</p>

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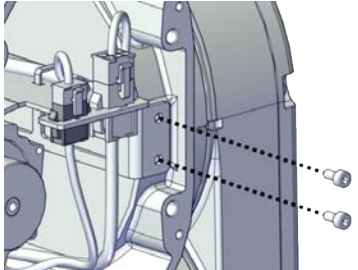

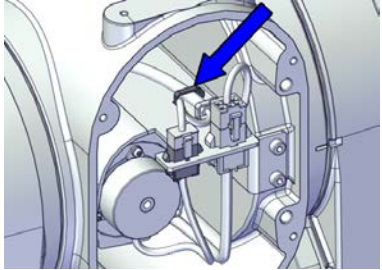

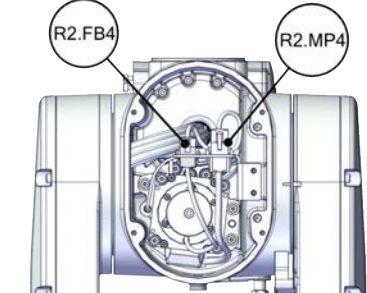
5 Repair

5.7.2 Replacing the axis-2 gearbox

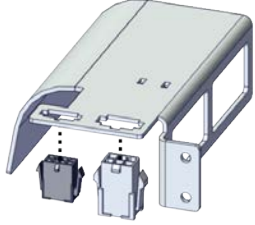
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	Action	Note
2	Remove the lamp unit.	 <p>xx2200001003</p>


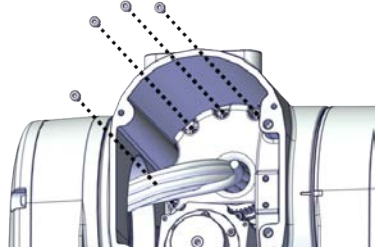
Disconnecting the axis-4 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	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.	 <p>xx2000001542</p>
3	Cut the cable strap.  Note The motor cablings have another strap fixed. Always cut the strap that fixes the cable package to the plate.	 <p>xx2000001543</p>
4	Disconnect the connectors. <ul style="list-style-type: none"> • MP4 • FB4  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001544</p>



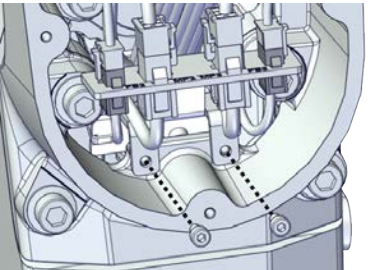
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	Action	Note
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001545</p>

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	Remove the axis-4 cable protector.	 <p>xx2000001546</p>

Disconnecting the axis-2 and -3 motor connectors

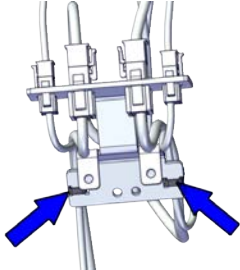

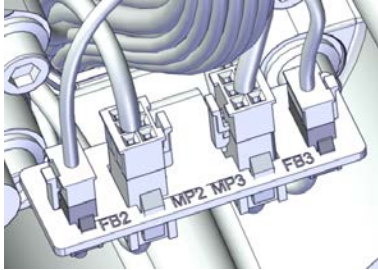
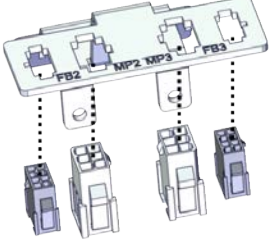
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the connector plate.  CAUTION Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate, as shown in following step.	 <p>xx2000001548</p>

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5 Repair

5.7.2 Replacing the axis-2 gearbox

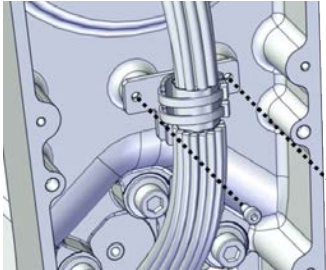
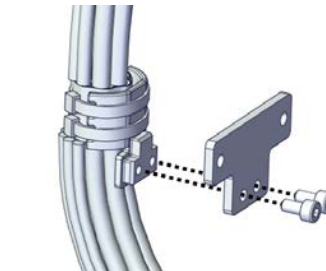
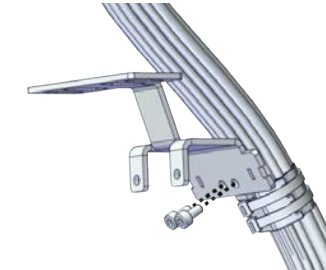
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	Action	Note
3	Cut the cable straps.	 <p>xx2000001549</p>
4	Disconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx2000001550</p>
5	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001551</p>


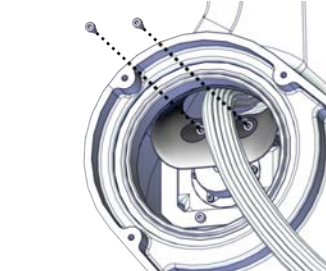
Separating the cable package from the lower arm

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

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	Action	Note
2	Remove the cable bracket from the lower arm first and then from the cable package.	 <p>xx2000001553</p>  <p>xx2100001465</p>
3	Remove the connector plate.	 <p>xx2000001554</p>

Separating the cable package from the swing

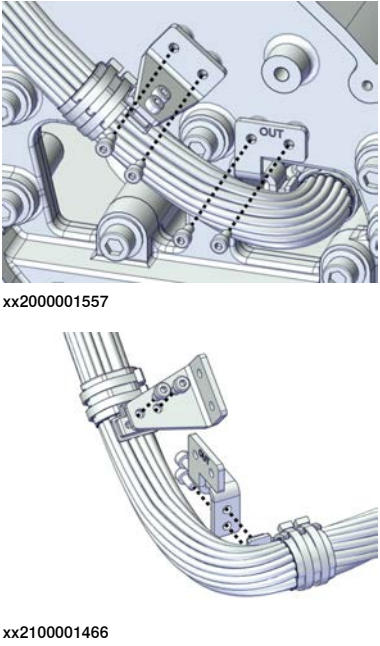
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	Remove the axis-2 cable protector.	 <p>xx2000001556</p>

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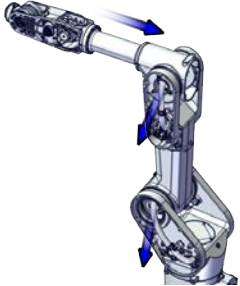
5 Repair

5.7.2 Replacing the axis-2 gearbox


Continued

	Action	Note
3	Remove the cable brackets from the swing first and then from the cable package.	 <p>xx2000001557</p> <p>xx2100001466</p>


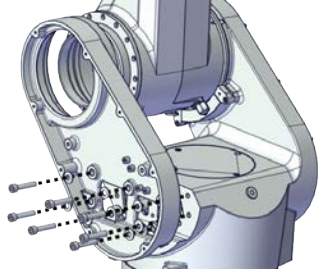
Pulling out the cable package

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Wrap the connectors with the masking tape.	
3	Pull the cable package out to the swing support.	 <p>xx2000001683</p>



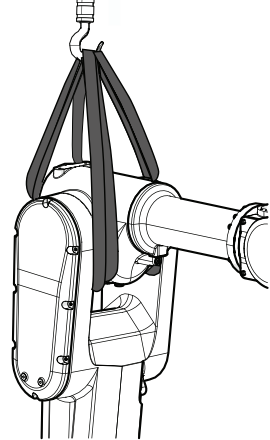

Removing the swing support

	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	<p>Remove the swing support.</p> <p> Tip</p> <p>If the lower arm support is hard to loosen from the swing, use a plastic hammer to knock on the lower arm support lightly.</p>	 <p>xx2000001684</p>

Supporting the lower and upper arms with roundslings




<p> Note</p> <p>The lower and upper arms include the lower arm, housing, extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit.</p>		
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Run two roundslings between the housing and the lower arm.</p>	<p>Roundslings, 1.7 m (2 pcs), Lifting capacity: >70 kg</p>  <p>xx2000001685</p>
3	<p> CAUTION</p> <p>The lower and upper arms weighs 38 kg. All lifting accessories used must be sized accordingly!</p>	

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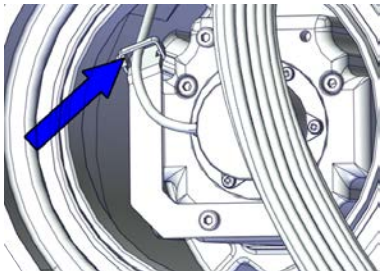
5 Repair

5.7.2 Replacing the axis-2 gearbox

Continued

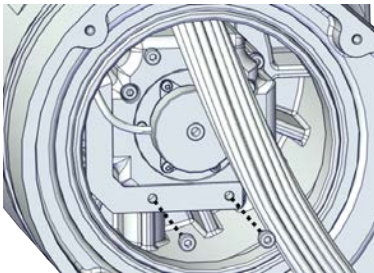
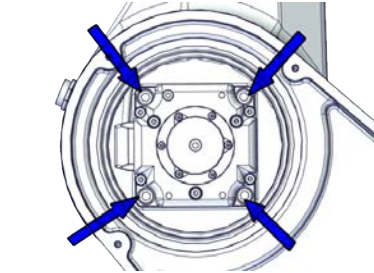
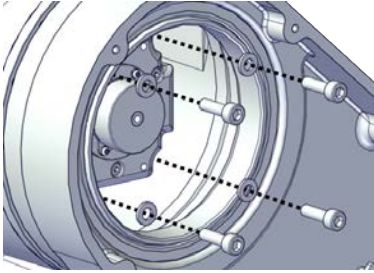
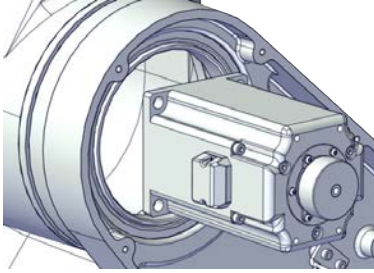
	Action	Note
4	 WARNING The robot is likely to be mechanically unstable if not secured to the foundation!	
5	 WARNING Personnel must not, under any circumstances, be present under the suspended load.	
6	Stretch the roundslings to take the weight of the lower and upper arms.  Note Do not stretch the roundslings 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	 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 31 .	
3	 CAUTION Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.	
4	Cut the cable strap.	 xx2000001624

Continues on next page

5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
5	Remove the cable bracket.	 <p>xx2000001625</p>
6	Access the screws and washers securing the axis-2 motor from the swing support.	 <p>xx2000001627</p>
7	Remove the screws and washers.	 <p>xx2000001626</p>
8	Carefully lift out the motor.	 <p>xx2000001628</p>

Separating the swing from the lower arm

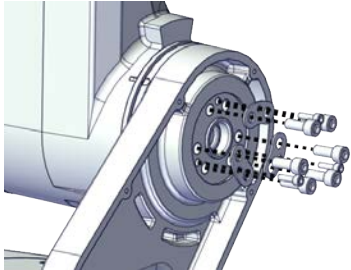

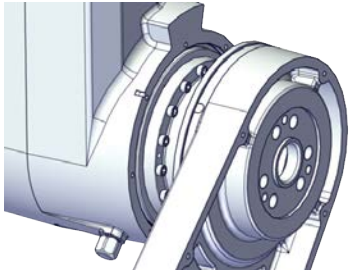
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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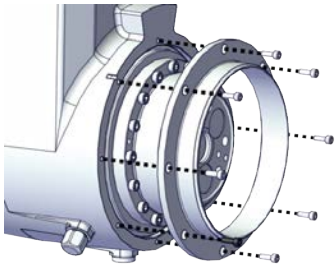
5 Repair

5.7.2 Replacing the axis-2 gearbox


Continued

	Action	Note
2	Remove the screws.	 xx2000001686
3	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


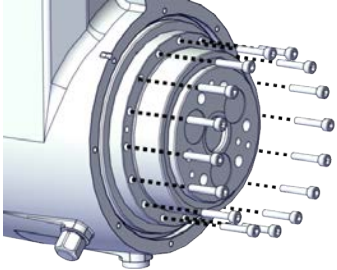
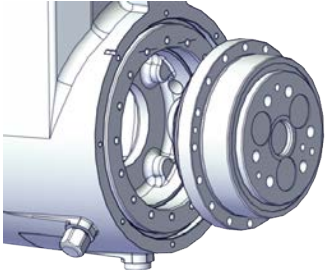
Removing the axis-2 sealing ring on the swing side

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	For robots with protection class IP67 (option 3350-670) 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.	

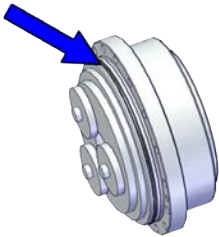
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	Action	Note
2	 CAUTION Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
3	Remove the screws.	 xx2000001688
4	Pull out the gearbox.	 xx2000001689

Refitting the gearbox

Use these procedures to refit the axis-2 gearbox.

Refitting the axis-2 gearbox


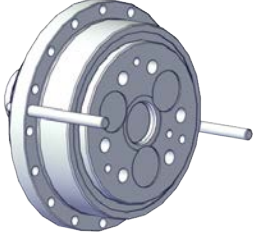
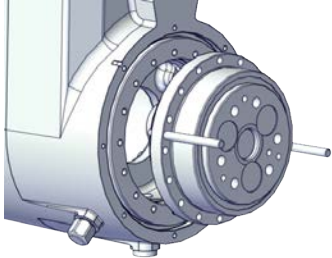
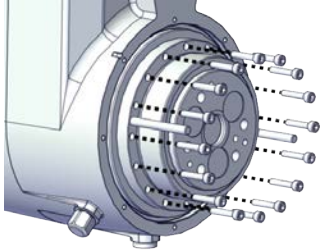
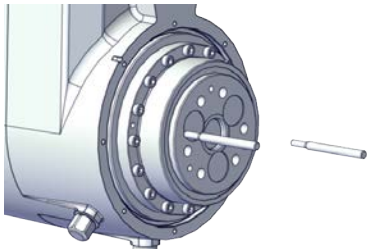
	Action	Note
1	Check the O-ring. Replace if damaged.	O-ring on axis-2 gear unit: 3HAC064977-004  xx2000001690

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5 Repair

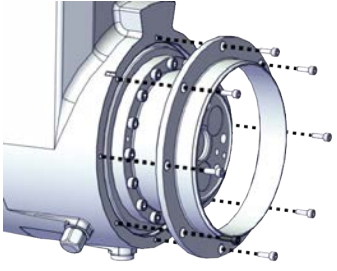
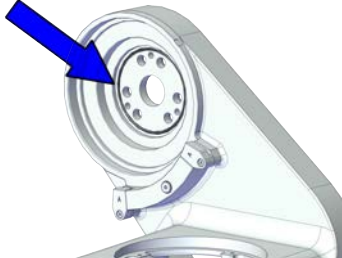
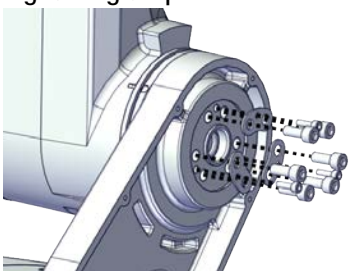
5.7.2 Replacing the axis-2 gearbox

Continued

	Action	Note
2	<p>Fit guide pins to the axis-2 gearbox.</p> <p> Note</p> <p>Always use two guide pins together.</p>	<p>Guide pin for axis-2 gearbox. Included in special toolkit 3HAC076396-001.</p>  <p>xx2000001705</p>
3	<p>Refit the axis-2 gearbox, with guidance from the guide pins.</p>	 <p>xx2000001706</p>
4	<p>Secure with screws.</p>	<p>Screw: M5x25 12.9 Lafre 2C2B/FC6.9 (16 pcs) Tightening torque: 8.9 Nm±3%</p>  <p>xx2000001707</p>
5	<p>Remove the guide pins.</p>	 <p>xx2000001708</p>

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Refitting the swing to the lower arm

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the sealing ring. Replace if damaged.</p>	<p>O-ring on lower arm: 3HAC061327-015 Sealing ring, swing side: 3HAC065675-001 Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (8 pcs) Tightening torque: 3.8 Nm For robots with protection class IP67 (option 3350-670)</p>  <p>xx2000002516</p>
2	<p>Check the O-ring. Replace if damaged.</p>	<p>O-ring on swing: 3HAC061327-036</p>  <p>xx2000001750</p>
3	<p>Refit the swing to the lower arm.</p>	<p>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</p>  <p>xx2000001686</p>


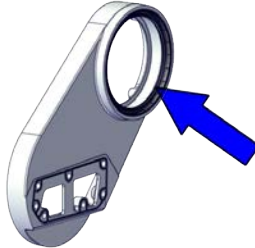
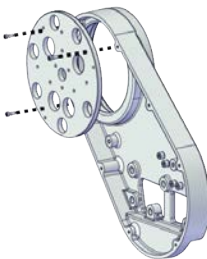
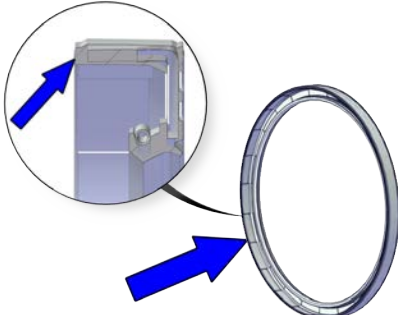
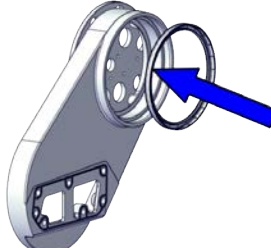
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5 Repair

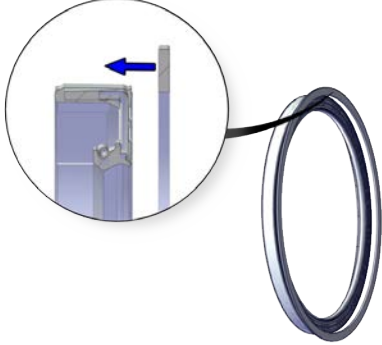

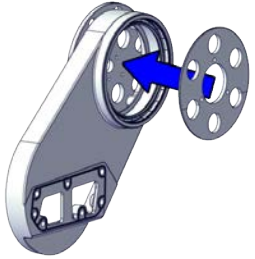
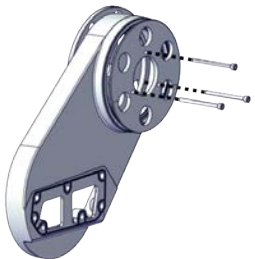
5.7.2 Replacing the axis-2 gearbox

Continued

Check the radial sealing on the swing support

	Action	Note
 Note This procedure is valid for robots with: <ul style="list-style-type: none"> • protection class IP67 (option 3350-670) 		
1	Check the radial sealing on the swing support. Replace if damaged, as described below.	 xx2000002466
2	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 robots (3HAC078203-001).  xx2000002467
3	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
4	Fit the new sealing into the swing support. For robots with protection class IP67 (option 3350-670) The sealing lip as pointed in the following figure is facing the outer side of the robot.  xx2000002537	 xx2000002468

Continues on next page

	Action	Note
5	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Place the ring of the axis-2 sealing assembly tool against the sealing.</p>  <p>xx2000002562</p>	<p>Ring of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002469</p>
6	<p>Fit the small circular plate of the axis-2 sealing assembly tool and fix with three M6x75 screws.</p>	<p>Small circular plate of the axis-2 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002470</p>  <p>xx2000002471</p>
7	<p>Screw the screws, little by little and evenly, to press the sealing into place.</p>	
8	<p>Remove the assembly tool.</p>	
9	<p>Check that the sealing is undamaged and properly fitted.</p>	

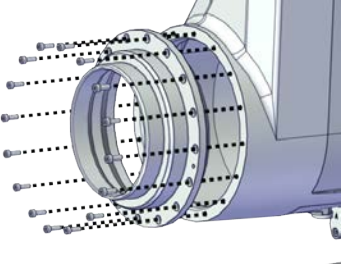
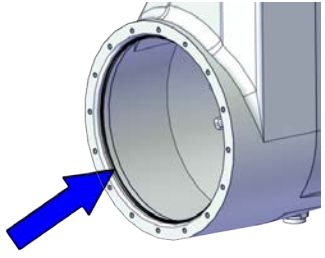
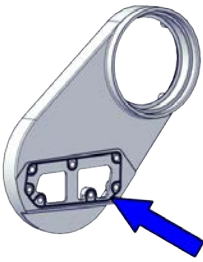
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5 Repair


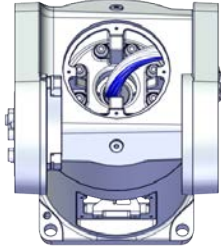
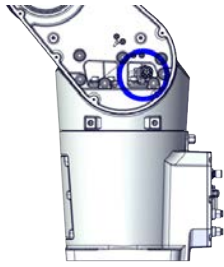
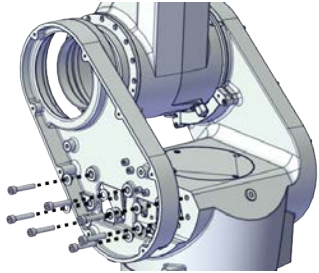
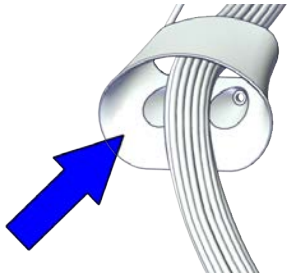
5.7.2 Replacing the axis-2 gearbox

Continued

Refitting the swing support

	Action	Note
1	<p>Check the sealing ring. Replace if damaged.</p>	<p>Sealing ring, swing support side: 3HAC065676-001 Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (16 pcs) Tightening torque: 3.8 Nm</p>  <p>xx2000001692</p>
2	<p>For robots with protection class IP67 (option 3350-670) Check the O-ring. Replace if damaged.</p>	<p>O-ring on lower arm: 3HAC061327-015</p>  <p>xx2000002518</p>
3	<p>For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.</p>	<p>Gasket for swing support, short: 3HAC067822-001 Gasket for swing support, long: 3HAC067823-001</p>  <p>xx2000002520</p>

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	Action	Note
4	<p>Route the cable package through the swing support.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> 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. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001745</p>  <p>xx2000001747</p>
5	<p>Refit the swing support.</p>	<p>Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 36 Nm</p>  <p>xx2000001684</p>
6	<p>Apply grease to the axis-2 cable protector and slip it over the cable harness.</p>	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 2: 3HAC067816-001</p>  <p>xx2000001567</p>


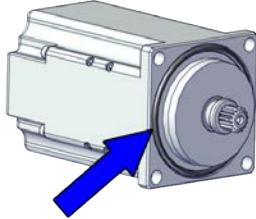
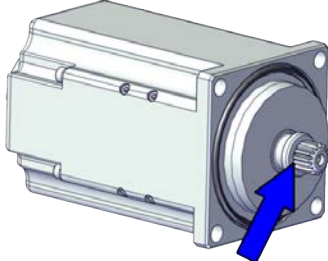
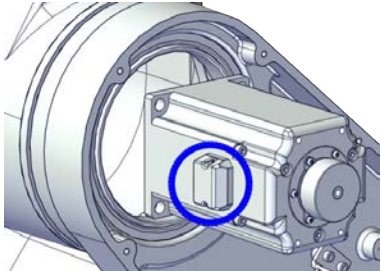
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5 Repair

5.7.2 Replacing the axis-2 gearbox

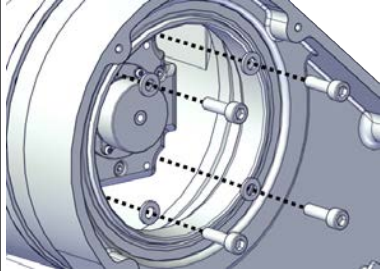
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Refitting the axis-2 motor


	Action	Note
1	 CAUTION Do not mix the axis-2 motor used for CRB 1300-7/1.4 and . Always carefully check the part number attached to the motor and the robot type, and refit with the right one.	Axis-2 motor for CRB 1300-7/1.4: 3HAC073078-001
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
3	Check the O-ring. Replace if damaged.	O-ring on motor unit: 3HAC061327-037  <small>xx2000001629</small>
4	Apply lubricating oil to the motor that has contacting area with the gearbox.	Kyodo Yushi TMO150: 3HAC032140-001  <small>xx2000001701</small>
5	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.  <small>xx2000001630</small>

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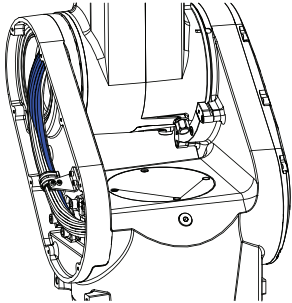
5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
6	Refit the screws and washers.	<p>Screw: M6x20 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm</p>  <p>xx2000001626</p>

Releasing the weight support for lower and upper arms

	Action	Note
1	 <p>WARNING</p> <p>Personnel must not, under any circumstances, be present under the suspended load.</p>	
2	Make sure the lower and upper arms are firmly secured with the swing.	
3	Remove the roundslings.	

Securing the cable package in the swing

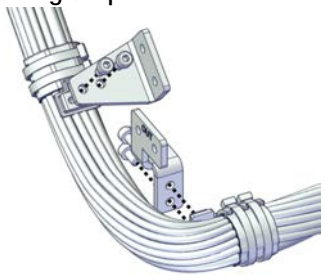
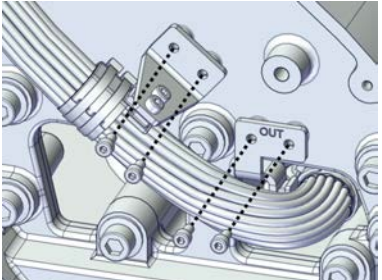
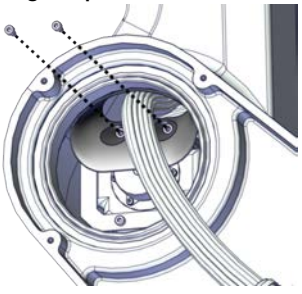
	Action	Note
1	Route the cable package up into the lower arm. Make sure that the air hoses are facing outside in the axis-2 cable protector, see the figure as a guidance for the cable twisting way.	 <p>xx2000001746</p>

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5 Repair

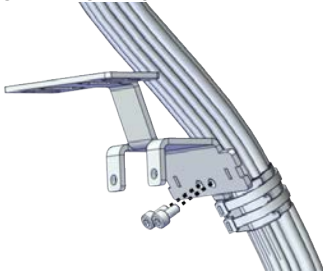

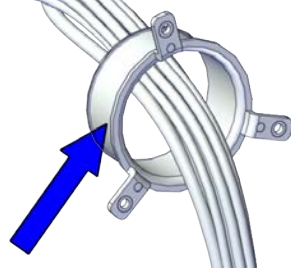
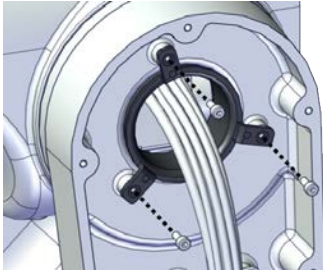

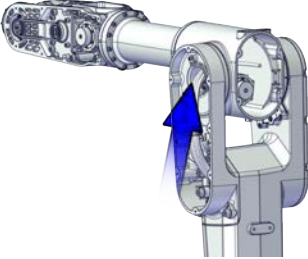
5.7.2 Replacing the axis-2 gearbox

Continued

	Action	Note
2	Refit the cable brackets.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each bracket on cable package and 2 pcs on swing)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2100001466</p>  <p>xx2000001557</p>
3	Refit the axis-2 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs)</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001556</p>

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Routing the cable package in the lower arm

	Action	Note
1	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001554
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 2C2B/FC6.9 (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.	 xx2000001569

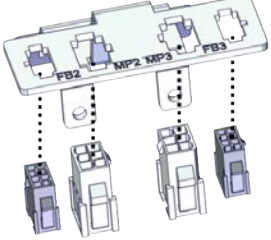

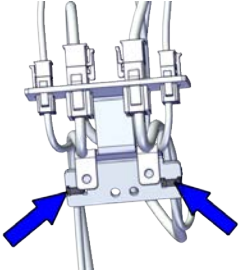

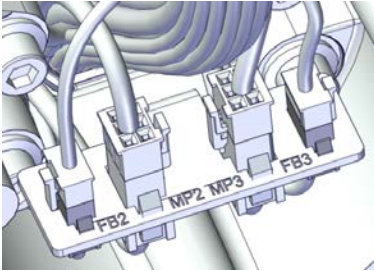
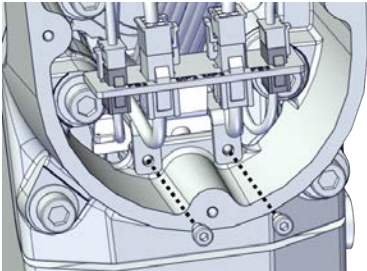
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5 Repair

5.7.2 Replacing the axis-2 gearbox

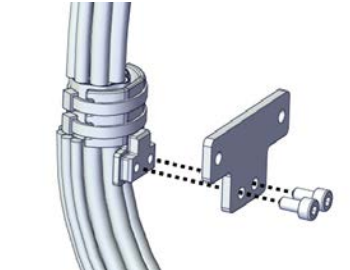
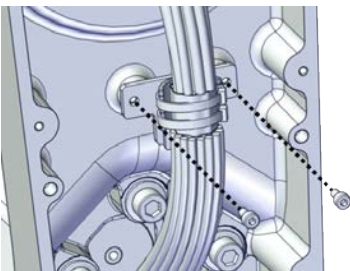
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Reconnecting the axis-2 and -3 motor connectors

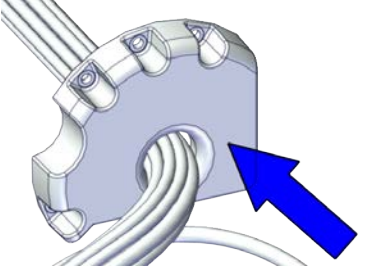

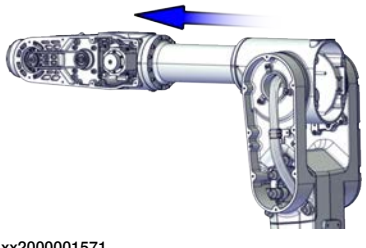
	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001551</p>
2	Route and secure the cabling with cable straps.  CAUTION Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.	 <p>xx2000001549</p>
3	Reconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001550</p>
4	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  <p>xx2000001548</p>

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Securing the cable package in the lower arm

	Action	Note
1	Refit the cable bracket.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm</p>  

Routing the cable package in the housing

	Action	Note
1	Slip the axis-4 cable protector over the cable package.	<p>Plastic cable protector, axis 4: 3HAC064694-001:</p> 
2	<p>Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for CRB 1300-7/1.4 and) and into the tubular.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	

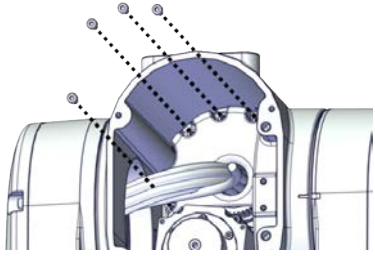
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5 Repair

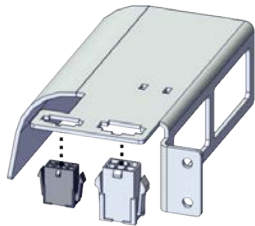

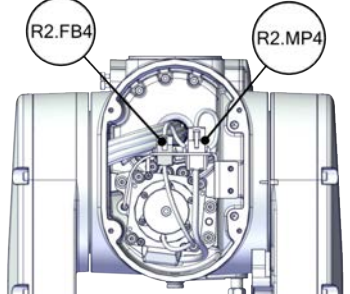


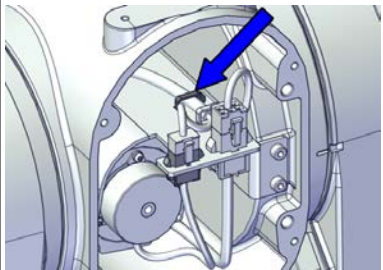
5.7.2 Replacing the axis-2 gearbox

Continued

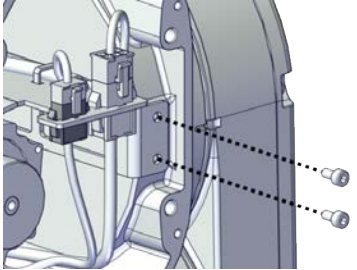
Securing the cable package in the housing

	Action	Note
1	Refit the axis-4 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001546</p>

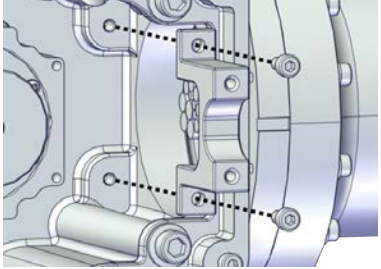
Reconnecting the axis-4 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001545</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB4 • MP4 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001544</p>
3	<p>Route and secure the cabling with a cable strap.</p> <p> Note</p> <p>The motor cabling has another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001543</p>

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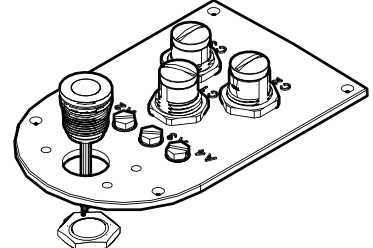
	Action	Note
4	Refit the connector plate.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx200001542</p>

Routing the cable package in the tubular

	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx200001749</p>
2	<p>Route the cablings.</p> <ul style="list-style-type: none"> • 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. 	

Refitting the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

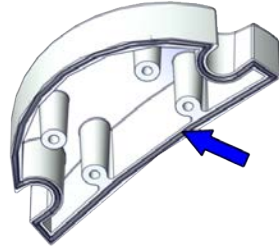
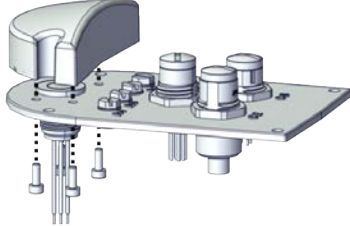
	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>

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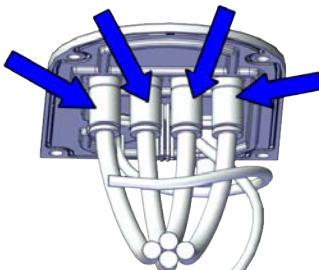

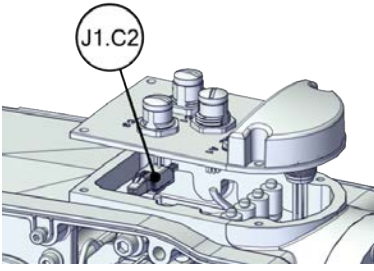
5 Repair

5.7.2 Replacing the axis-2 gearbox

Continued

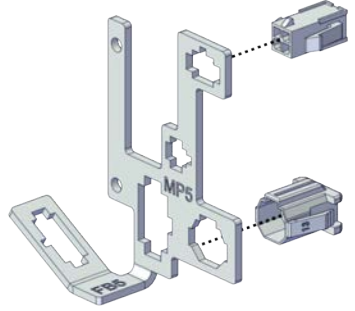

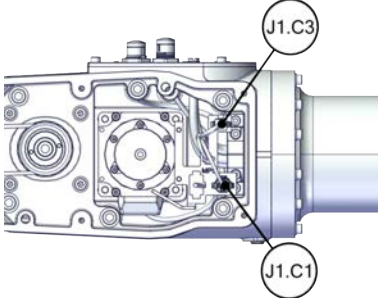
	Action	Note
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>
3	<p>Refit the lamp unit cover.</p>	<p>Lamp unit cover: 3HAC082320-001 Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 0.6 Nm</p>  <p>xx2200001002</p>

Reconnecting the air hoses and Ethernet cabling (if equipped)

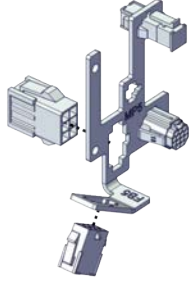

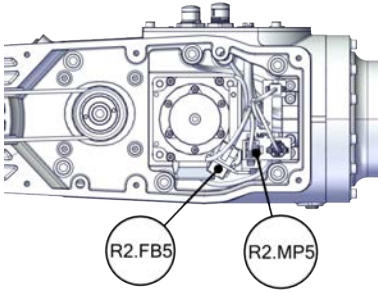
	Action	Note
1	<p>Reconnect the air hoses.</p> <p> Note</p> <p>See the number markings on the air hoses for help to find the corresponding air hoses.</p>	 <p>xx2000001539</p>
2	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and reconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2200001001</p>

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Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>
2	For robots with CP/CS cabling Reconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001536</p>

Reconnecting the axis-5 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001535</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB5 • MP5  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001534</p>

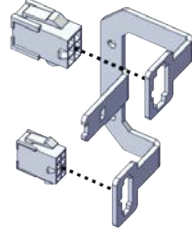

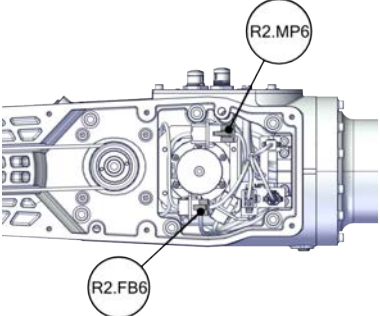
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5 Repair

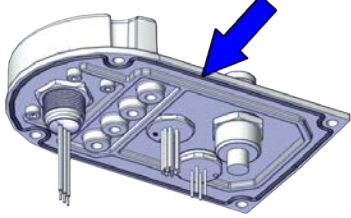
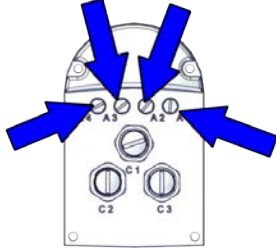
5.7.2 Replacing the axis-2 gearbox

Continued


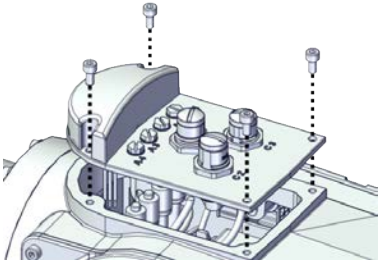
Reconnecting the axis-6 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 xx2000001533
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB6 • MP6  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

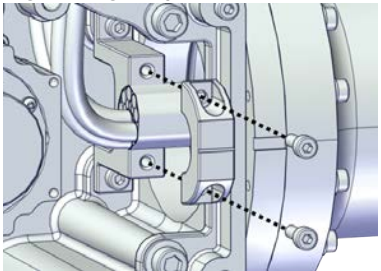
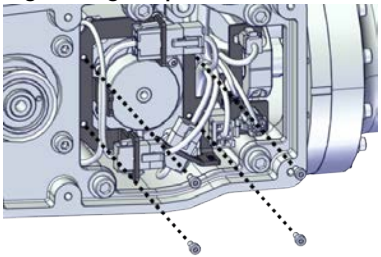
Refitting the process hub

	Action	Note
1	For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2200001005
2	For robots with protection class IP67 (option 3350-670) Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2200001006

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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.	
4	Refit the process hub.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm  xx2200001000

Securing the cable package in the tubular


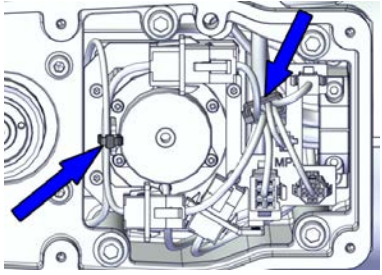
	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001748
2	Refit the connector plate.	Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531

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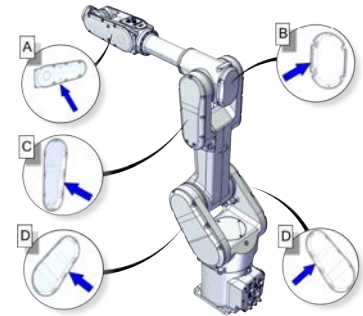
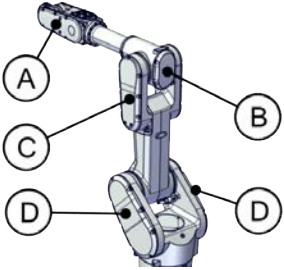
5 Repair

5.7.2 Replacing the axis-2 gearbox

Continued

	Action	Note
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>

Refitting the covers

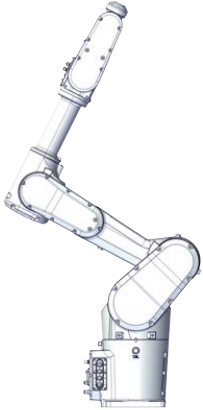

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets.</p> <ul style="list-style-type: none"> • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm support cover (C) • Gasket for swing covers (D) <p>Replace if damaged.</p>	 <p>xx2000002498</p>
2	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
3	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
4	<p>Refit the covers.</p> <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) • Swing covers (D) 	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001682</p>

Jogging the robot to oil filling position



	Action	Note
1	<p>Turn on the electric power to the robot.</p> <p>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 68.</p>	

Continues on next page

5.7.2 Replacing the axis-2 gearbox
Continued

	Action	Note
2	<p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -67.5 • Axis 3: 0° • Axis 4: 0° • Axis 5: 0° • Axis 6: No significance. 	 <p>xx2000001519</p>
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	

Refilling oil to axis-2 gearbox


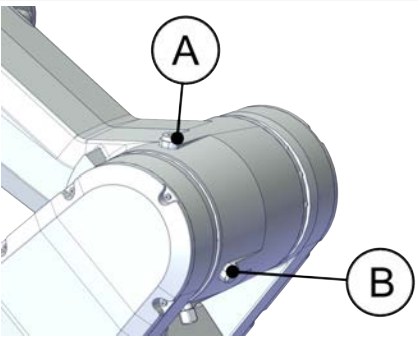




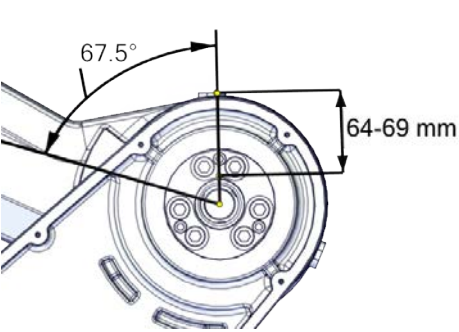
	Action	Note
1	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 31.</p>	
2	<p> CAUTION</p> <p>The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.</p>	

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5 Repair

5.7.2 Replacing the axis-2 gearbox

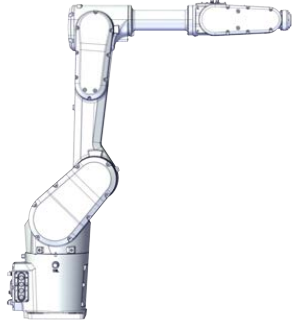

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	Action	Note				
3	<p>Open the upper oil plug.</p> <p> Note</p> <p>The lower oil plug has to be closed; otherwise, the oil may leak before required oil amount is filled.</p>	 <p>xx2000001518</p> <table border="1"> <tr> <td>A</td> <td>Oil plug, opened</td> </tr> <tr> <td>B</td> <td>Oil plug, closed</td> </tr> </table>	A	Oil plug, opened	B	Oil plug, closed
A	Oil plug, opened					
B	Oil plug, closed					
4	<p> WARNING</p> <p>Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may:</p> <ul style="list-style-type: none"> • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely. 					
5	<p>Refill the gearbox with oil.</p> <p> Note</p> <p>The amount of oil to be filled depends on the amount previously being drained.</p> <p> CAUTION</p> <p>Oil filling must be slow to make sure air venting is fluent.</p>	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p>				
6	<p>Inspect the oil level by measuring the level at the upper oil plug hole.</p> <p>Required oil level: within the range of 64 mm to 69 mm below the edge of the oil plug hole.</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>	 <p>xx2000001580</p>				
7	<p>Refit the oil plug.</p>	<p>Tightening torque: 10 Nm</p>				


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	Action	Note
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 68 .	
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
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 171 .	

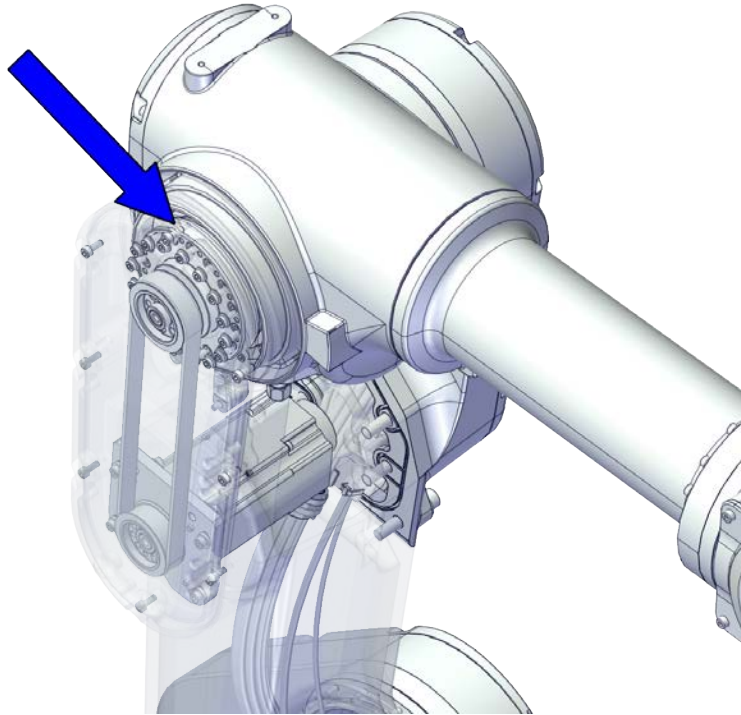
5 Repair

5.7.3 Replacing the axis-3 gearbox

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 CRB 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	Used with protection class IP67. Replace if damaged.
Timing belt, axis 3	3HAC067040-001	
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
Plastic cable protector, axis 3	3HAC064693-001	

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Spare part	Article number	Note
Plastic cable protector, axis 4	3HAC064694-001	
Lower arm support	3HAC073076-001	
Tubular cover	3HAC073094-001	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm support	3HAC067826-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.
Radial sealing on lower arm	3HAC070148-005	Used with protection class IP67. Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .

Required consumables

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

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5 Repair

5.7.3 Replacing the axis-3 gearbox

Continued

Deciding calibration routine

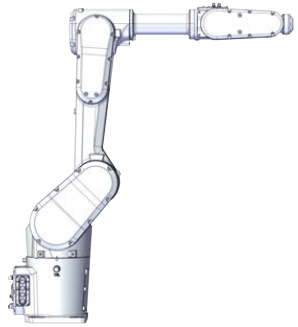
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	<p> Note</p> <p>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.</p>
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	


Removing the gearbox

Use these procedures to remove the axis-3 gearbox.


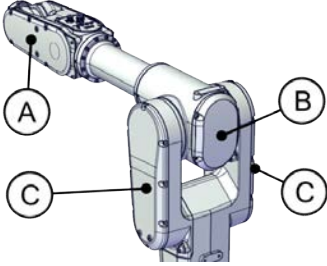
Preparations before removing the axis-3 gearbox

	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.	 <p>xx2000001520</p>


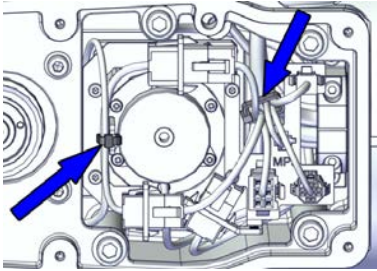
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	Action	Note
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Removing the covers

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the covers. <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) 	 <p>xx2000001661</p>

Loosening the cables in the tubular


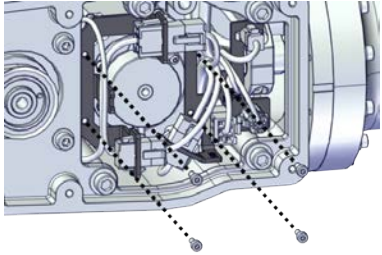
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Cut the cable straps.	 <p>xx2000001530</p>

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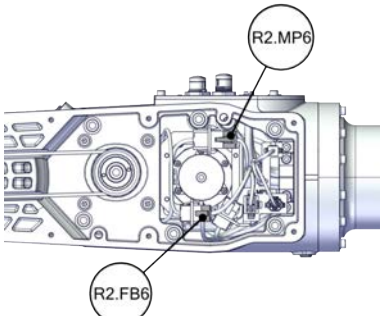
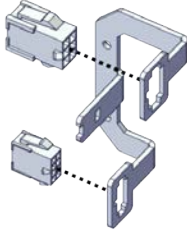
5 Repair

5.7.3 Replacing the axis-3 gearbox


Continued

	Action	Note
3	<p>Remove the connector plates.</p> <p> CAUTION</p> <p>Be aware of the cabling that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.</p>	 <p>xx2000001531</p>


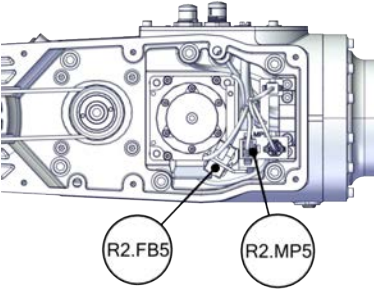
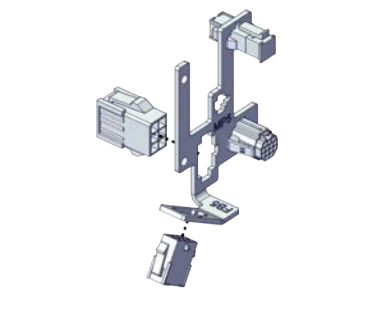
Disconnecting the axis-6 motor connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP6 • FB6 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001532</p>
3	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001533</p>



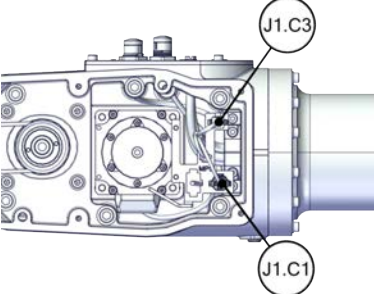
Disconnecting the axis-5 motor connectors

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

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	Action	Note
2	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP5 • FB5 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001534</p>
3	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001535</p>

Disconnecting CP/CS cabling (if equipped)

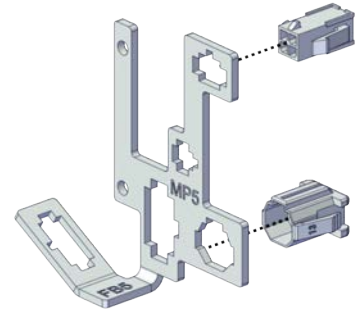
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>For robots with CP/CS cabling</p> <p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001536</p>

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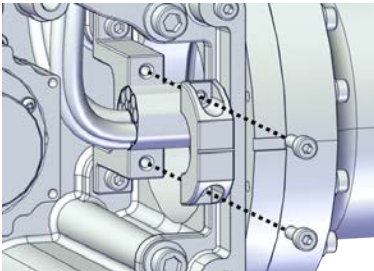
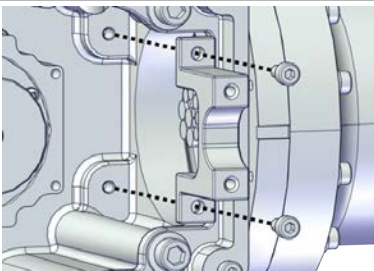
5 Repair

5.7.3 Replacing the axis-3 gearbox


Continued

	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>


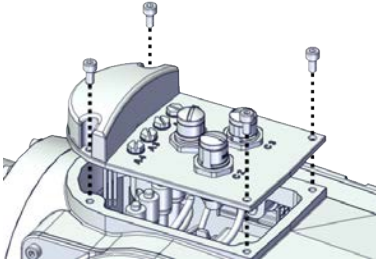
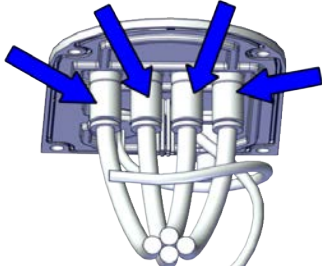


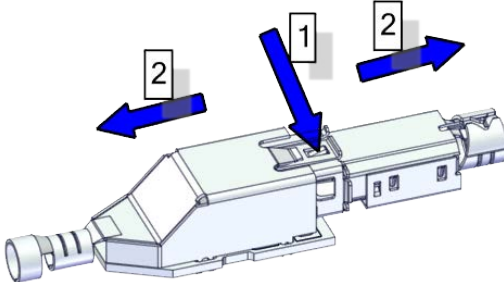
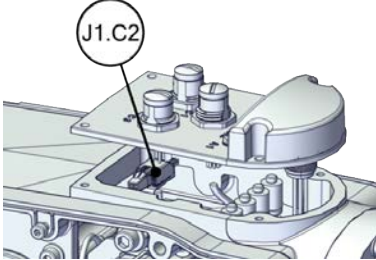
Separating the cable package from the tubular

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the first semicircular bracket that fixes the cable package.	 <p>xx2000001748</p>
3	Remove the second semicircular bracket from the tubular.	 <p>xx2000001749</p>

Removing the process hub

	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	<p>Remove the screws and carefully open the cover.</p> <p> CAUTION</p> <p>There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.</p>	 <p>xx2200001000</p>
3	<p>Disconnect the air hoses.</p>	 <p>xx2000001539</p>
4	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip</p> <p>The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>

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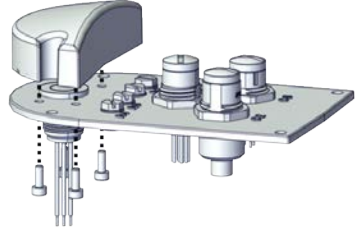
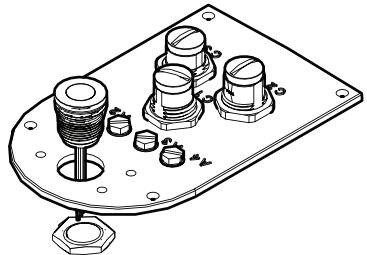
5 Repair

5.7.3 Replacing the axis-3 gearbox



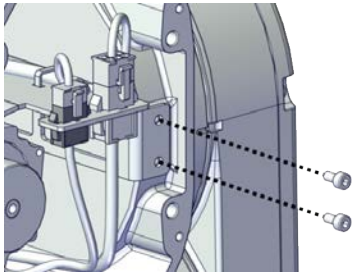

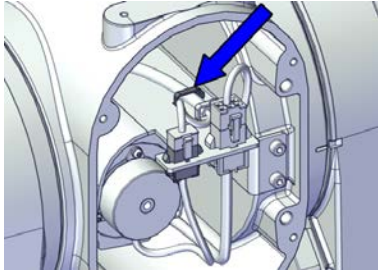
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Removing the lamp unit


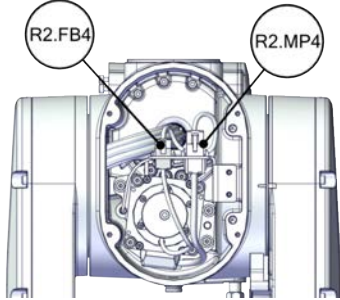
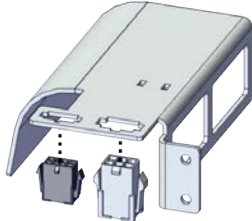
Notice that the procedure is valid only when the lamp unit needs a replacement.

	Action	Note
1	Remove the lamp unit cover.	 xx2200001002
2	Remove the lamp unit.	 xx2200001003


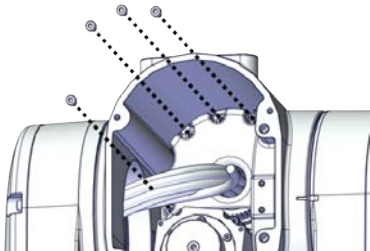
Disconnecting the axis-4 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	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
3	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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	Action	Note
4	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP4 • FB4 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001544</p>
5	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001545</p>

Separating the cable package from the housing

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the axis-4 cable protector.</p>	 <p>xx2000001546</p>

Disconnecting the axis-2 and -3 motor connectors


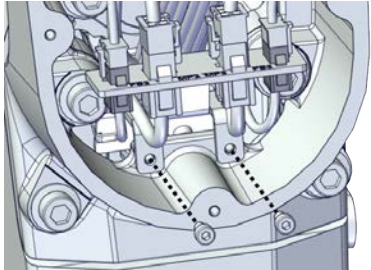
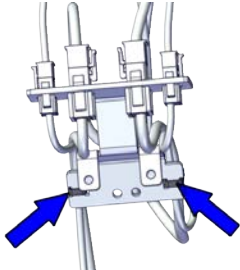

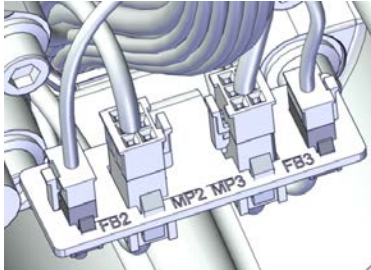
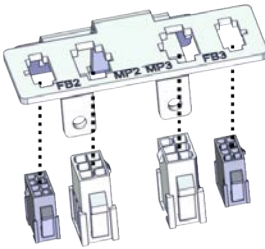
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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5 Repair

5.7.3 Replacing the axis-3 gearbox

Continued

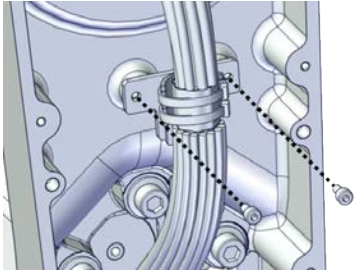
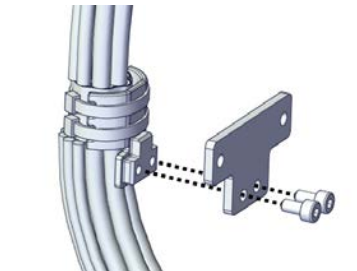

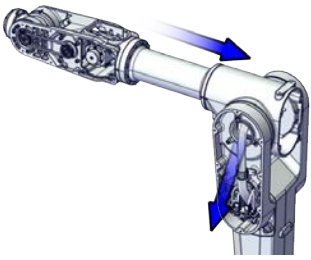
	Action	Note
2	<p>Remove the connector plate.</p> <p> CAUTION</p> <p>Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate, as shown in following step.</p>	 <p>xx2000001548</p>
3	<p>Cut the cable straps.</p>	 <p>xx2000001549</p>
4	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001550</p>
5	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001551</p>

Pulling out the cable package



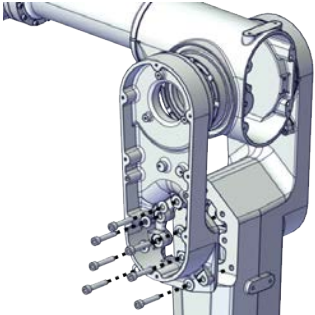
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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5.7.3 Replacing the axis-3 gearbox
Continued

	Action	Note
2	Remove the cable bracket from the lower arm first and then from the cable package.	 <p>xx2000001553</p>  <p>xx2100001465</p>
3	Wrap the connectors with the masking tape.	
4	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.	 <p>xx2000001662</p>

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	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.	 <p>xx2000001663</p>




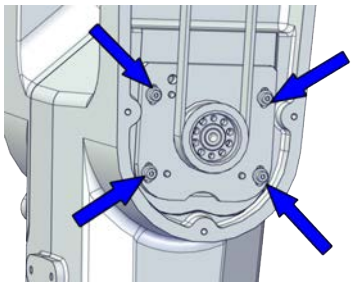
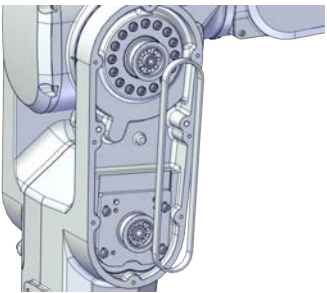
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5 Repair

5.7.3 Replacing the axis-3 gearbox



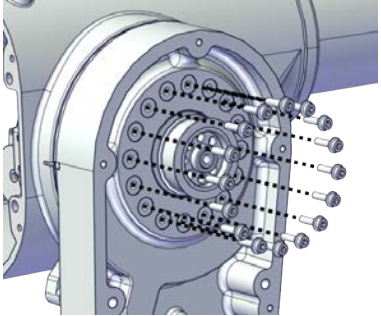

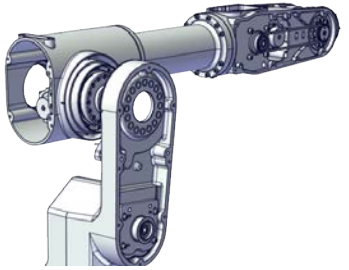
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Removing the axis-3 timing belt



	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Loosening timing belts will release axes. This means the axes can fall down. Make sure axes are well supported before loosening timing belts.	
3	 CAUTION The upper arms, which includes housing, extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit weighs 17 kg. All lifting accessories used must be sized accordingly!	
4	Fit a roundsling to the upper arm to support the weight (no force).	
5	Loosen the screws and move the motor slightly to slacken the timing belt.	 xx2000001614
6	Remove the timing belt from its groove on the motor.	 xx2000001615

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Separating the lower arm from the housing

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the screws.</p>  <p>WARNING</p> <p>This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured.</p> <p>The upper arm, including housing, extender unit (only for CRB 1300-7/1.4 and), tubular and tilt unit, weighs 17 kg.</p>	 <p>xx2000001664</p>
3	<p>Separate the lower arm from the housing.</p>  <p>Tip</p> <p>If the lower arm is hard to loosen from the housing, use a plastic hammer to knock on the lower arm lightly.</p>	 <p>xx2000001665</p>
4	<p>Lay down the upper arm on a workbench. Make sure to support the gravity center of the upper arm.</p>	

Removing the axis-3 gearbox

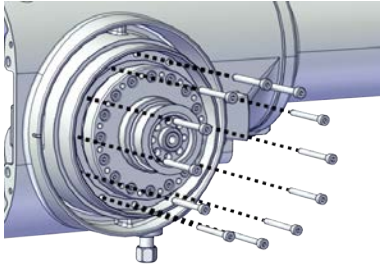
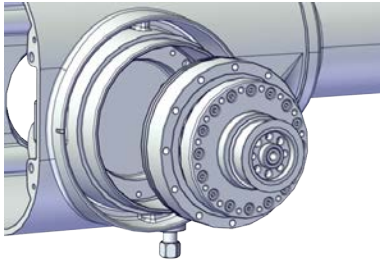
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>Removing gearboxes will release axes. This means the axes can fall down.</p> <p>Make sure axes are well supported before removing gearboxes.</p>	

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5 Repair

5.7.3 Replacing the axis-3 gearbox

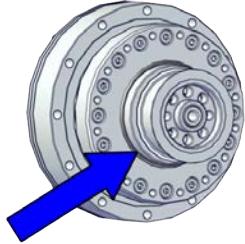
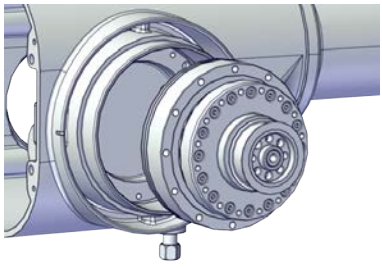
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	Action	Note
3	Remove the screws.	 xx2000001666
4	Pull out the gearbox.	 xx2000001667

Refitting the gearbox

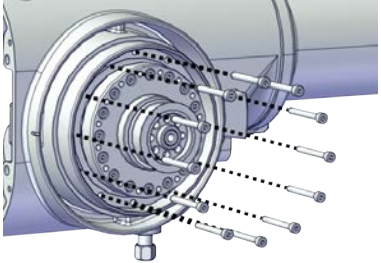
Use these procedures to refit the axis-3 gearbox.

Refitting the axis-3 gearbox

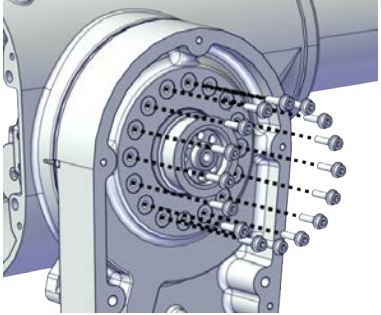
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Check the O-ring. Replace if damaged.</p>	<p>O-ring on circular spline side, axis 3: 3HAC061327-016</p>  xx2000002524
2	Refit the axis-3 gearbox.	 xx2000001667

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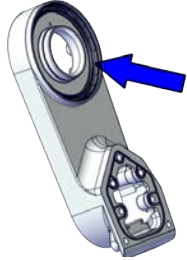
5.7.3 Replacing the axis-3 gearbox
Continued

	Action	Note
3	Secure with screws.	<p>Screw: M4x35 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 4.2 Nm±3%</p>  <p>xx2000001666</p>

Refitting the lower arm to the housing

	Action	Note
1	Refit the lower arm to the housing.	<p>Screw: M4x16 12.9 Lafre 2C2B/FC6.9+PrO-COat111 (16 pcs) Tightening torque: 4.5 Nm±3%</p>  <p>xx2000001664</p>

Checking the radial sealing on the lower arm support

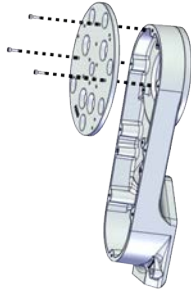
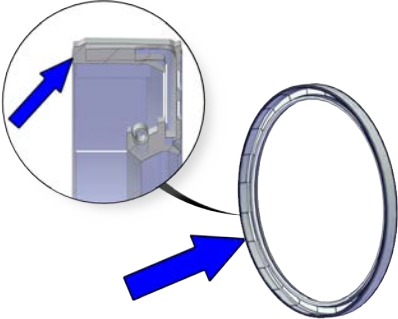
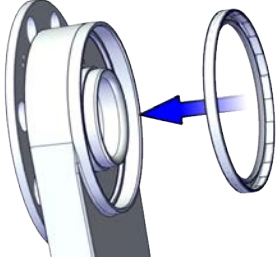
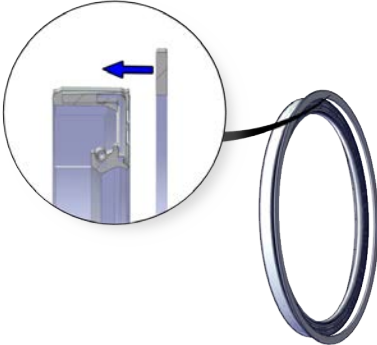
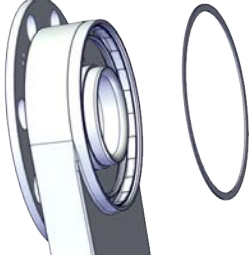
	<p>Note</p> <p>This procedure is valid for robots with:</p> <ul style="list-style-type: none"> • protection class IP67 (option 3350-670) 	
	Action	Note
1	Check the radial sealing on the lower arm support. Replace if damaged, as described below.	 <p>xx2000002477</p>

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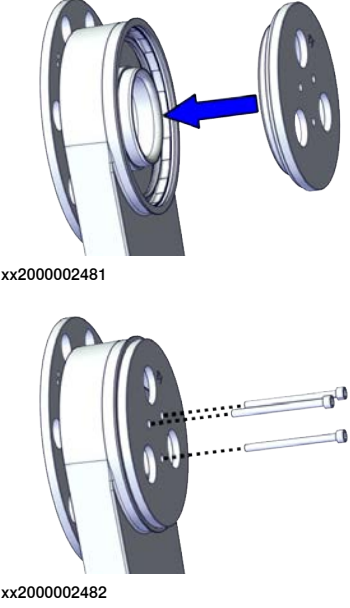
5 Repair

5.7.3 Replacing the axis-3 gearbox

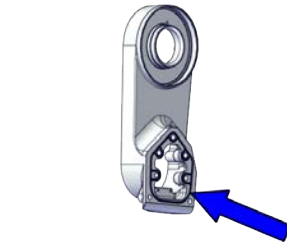
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	Action	Note
2	Fit the big circular plate of the axis-3 sealing assembly tool to the lower arm support (opposite side of the radial sealing) with three M4x12 screws.	<p>Big circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002478</p>
3	Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.	Grease: 3HAC029132-001
4	<p>Fit the new sealing into the lower arm support. For robots with protection class IP67 (option 3350-670) The sealing lip as pointed in the following figure is facing the outer side of the robot.</p>  <p>xx2000002537</p>	 <p>xx2000002479</p>
5	<p>For robots with protection class IP67 (option 3350-670) Place the ring of the axis-3 sealing assembly tool against the sealing.</p>  <p>xx2000002562</p>	<p>Ring of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002480</p>

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	Action	Note
6	Fit the small circular plate of the axis-3 sealing assembly tool and fix with three M6x75 screws.	<p>Small circular plate of the axis-3 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002481</p> <p>xx2000002482</p>
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 lower arm support

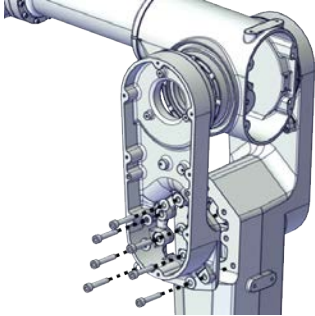
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for lower arm support: 3HAC067826-001</p>  <p>xx2000002521</p>

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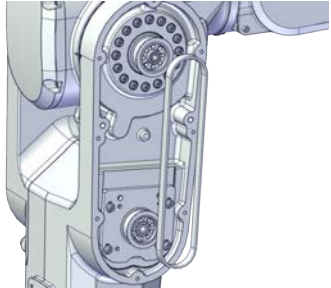
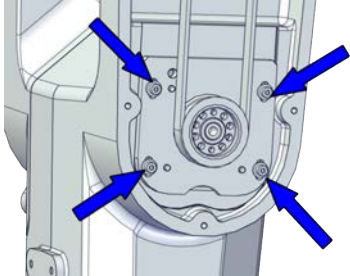
5 Repair

5.7.3 Replacing the axis-3 gearbox

Continued

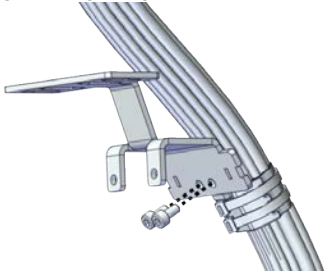

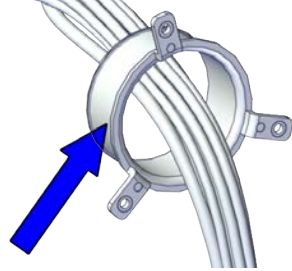
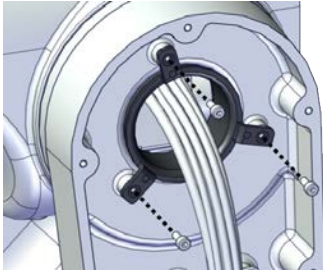

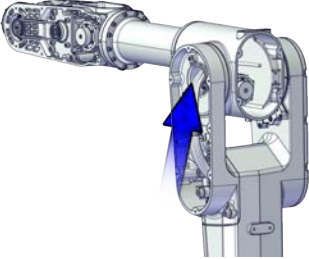
	Action	Note
2	Refit the lower arm support.	<p>Screw: M8x40 12.9 Gleitmo 603+Geomet 500 (7 pcs) Tightening torque: 39 Nm</p>  <p>xx2000001663</p>

Refitting the axis-3 timing belt

	Action	Note
1	Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.	 <p>xx2000001615</p>
2	Move the motor, and when the timing belt gets tensioned, secure the motor.	
3	Tighten the motor screws.	<p>Tightening torque: 3.3 Nm</p>  <p>xx2000001614</p>
4	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.	<p>Used belt: 73.4-78.5 Hz New belt: 87.8-92.1 Hz</p>
5	Release the support to the upper arm.	

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Routing the cable package in the lower arm

	Action	Note
1	Refit the connector plate to the cable package.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001554
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 2C2B/FC6.9 (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.	 xx2000001569

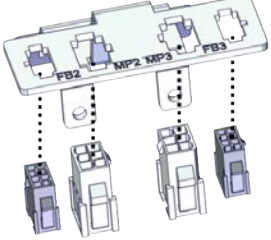

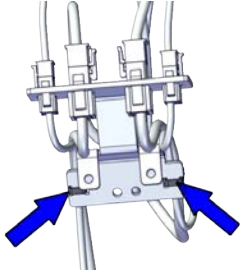

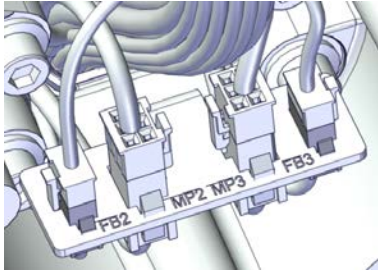
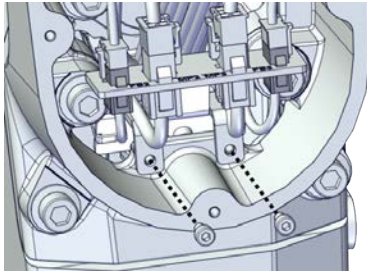
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5 Repair

5.7.3 Replacing the axis-3 gearbox

Continued

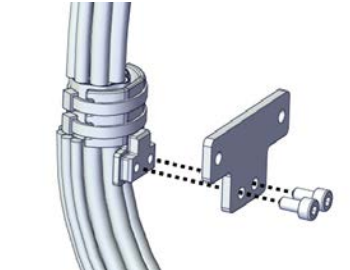
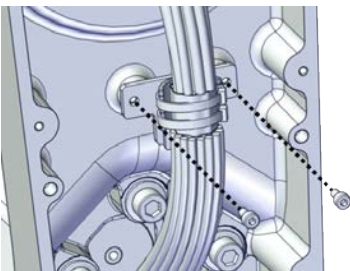
Reconnecting the axis-2 and -3 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001551</p>
2	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.	 <p>xx2000001549</p>
3	Reconnect the connectors. <ul style="list-style-type: none"> • FB2 • MP2 • FB3 • MP3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001550</p>
4	Refit the connector plate to the lower arm.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  <p>xx2000001548</p>

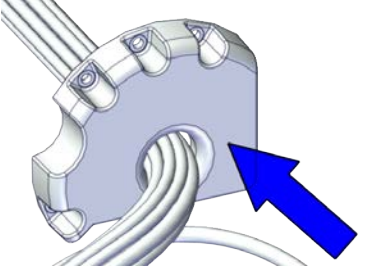

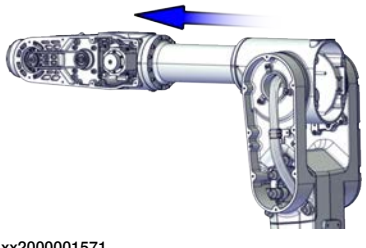
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5.7.3 Replacing the axis-3 gearbox
Continued

Securing the cable package in the lower arm

	Action	Note
1	Refit the cable bracket.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs on the cable package and 2 pcs on lower arm) Tightening torque: 2.6 Nm</p>  <p>xx2100001465</p>  <p>xx2000001553</p>

Routing the cable package in the housing

	Action	Note
1	Slip the axis-4 cable protector over the cable package.	<p>Plastic cable protector, axis 4: 3HAC064694-001:</p>  <p>xx2000001570</p>
2	<p>Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for CRB 1300-7/1.4 and) and into the tubular.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001571</p>

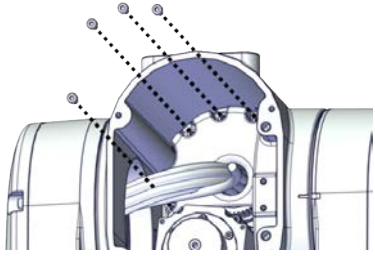
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5 Repair

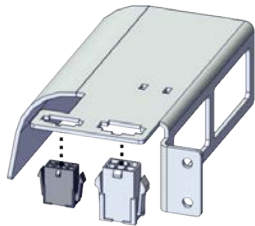

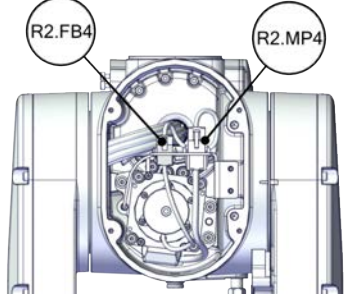


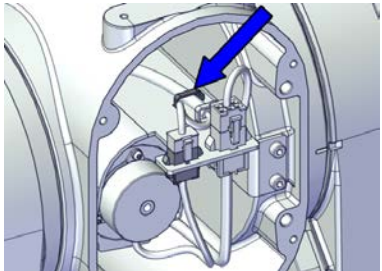
5.7.3 Replacing the axis-3 gearbox

Continued

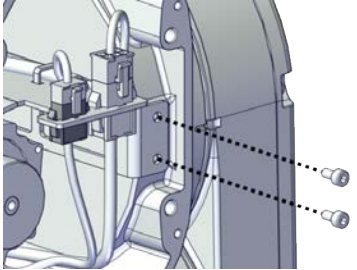
Securing the cable package in the housing

	Action	Note
1	Refit the axis-4 cable protector.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001546</p>

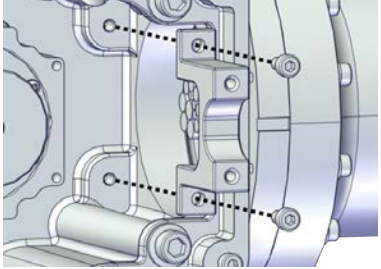
Reconnecting the axis-4 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001545</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB4 • MP4 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001544</p>
3	<p>Route and secure the cabling with a cable strap.</p> <p> Note</p> <p>The motor cabling has another strap fixed. Pay attention to the location where the new strap to be fixed, see the figure as a guidance.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001543</p>

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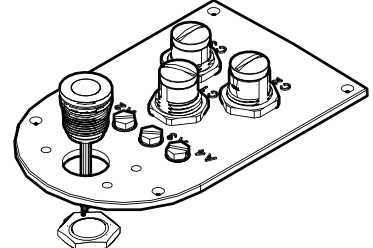
	Action	Note
4	Refit the connector plate.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001542</p>

Routing the cable package in the tubular

	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001749</p>
2	<p>Route the cablings.</p> <ul style="list-style-type: none"> • 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. 	

Refitting the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

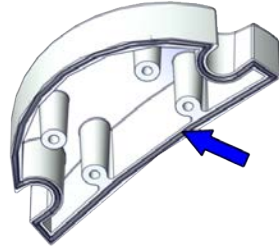
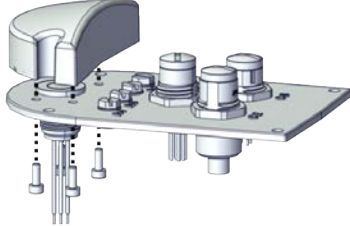
	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>

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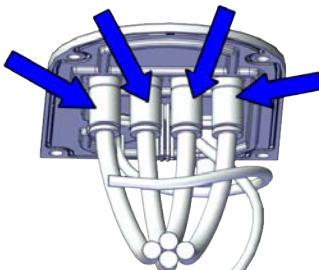

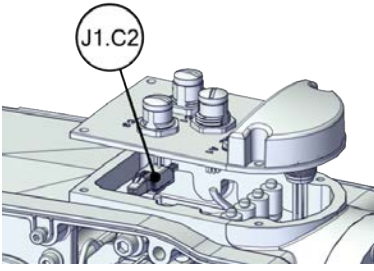
5 Repair

5.7.3 Replacing the axis-3 gearbox

Continued

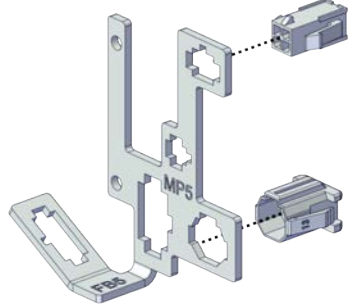

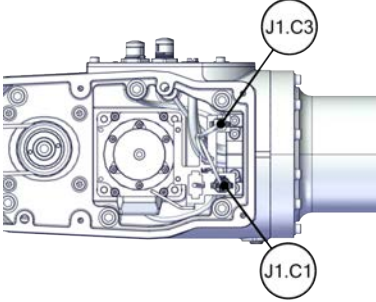
	Action	Note
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>
3	<p>Refit the lamp unit cover.</p>	<p>Lamp unit cover: 3HAC082320-001 Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 0.6 Nm</p>  <p>xx2200001002</p>

Reconnecting the air hoses and Ethernet cabling (if equipped)

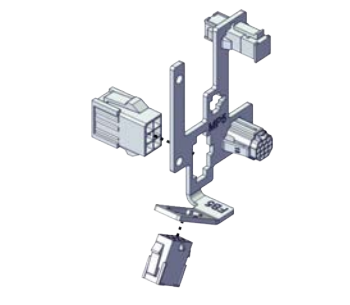

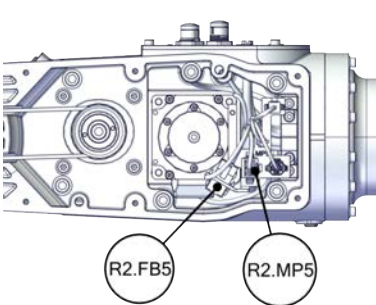
	Action	Note
1	<p>Reconnect the air hoses.</p> <p> Note</p> <p>See the number markings on the air hoses for help to find the corresponding air hoses.</p>	 <p>xx2000001539</p>
2	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and reconnect the connector.</p> <ul style="list-style-type: none"> J1.C2 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2200001001</p>

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Reconnecting the CP/CS cabling (if equipped)

	Action	Note
1	Insert the male header of the connectors to the connector plate.	 <p>xx2000001537</p>
2	For robots with CP/CS cabling Reconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001536</p>

Reconnecting the axis-5 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001535</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB5 • MP5  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001534</p>

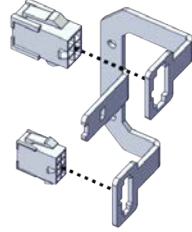

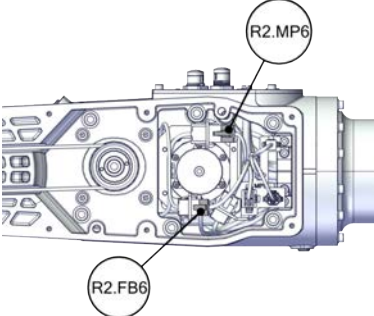
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5 Repair

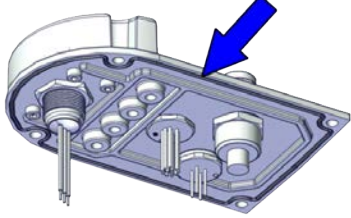
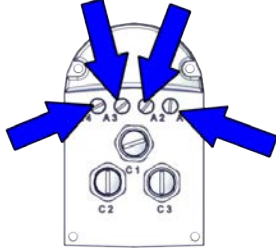
5.7.3 Replacing the axis-3 gearbox

Continued


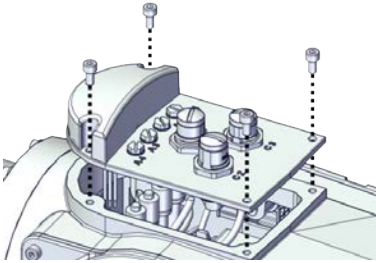
Reconnecting the axis-6 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 xx2000001533
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB6 • MP6  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx2000001532

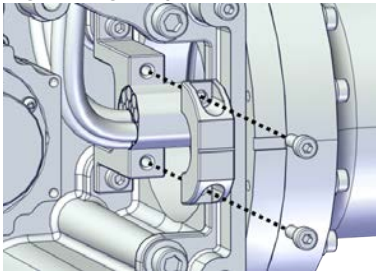
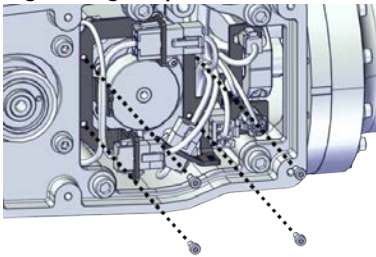
Refitting the process hub

	Action	Note
1	For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.	Gasket for process hub: 3HAC070887-001  xx2200001005
2	For robots with protection class IP67 (option 3350-670) Check the seal bolts. Replace if damaged.	Seal bolt: 3HAC032050-001  xx2200001006

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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.	
4	Refit the process hub.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm  xx2200001000

Securing the cable package in the tubular


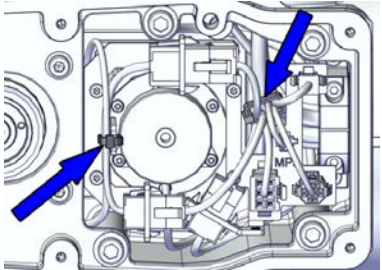
	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  xx2000001748
2	Refit the connector plate.	Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm  xx2000001531

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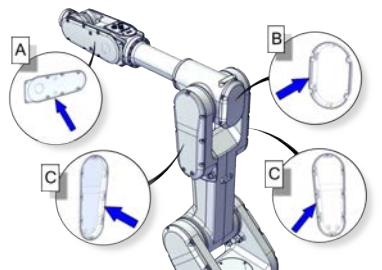
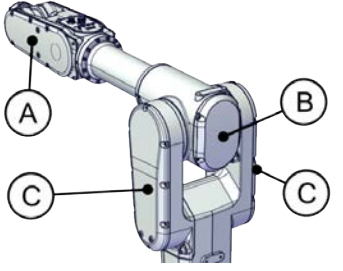
5 Repair

5.7.3 Replacing the axis-3 gearbox


Continued

	Action	Note
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>

Refitting the covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets.</p> <ul style="list-style-type: none"> • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm covers (C) <p>Replace if damaged.</p>	 <p>xx2000002502</p>
2	<p>Apply grease to the cable package, cover all moving area of the package.</p>	<p>Grease: 3HAC029132-001</p>
3	<p>Apply grease to the covers that have contacting area with the cable package.</p>	<p>Grease: 3HAC029132-001</p>
4	<p>Refit the covers.</p> <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) 	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001661</p>

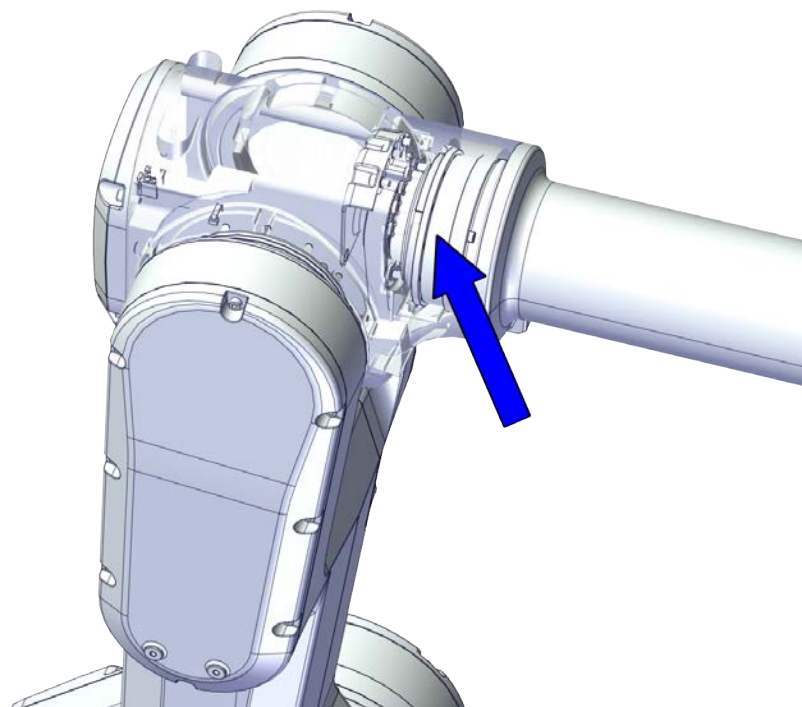
Concluding procedure

	Action	Note
1	<p>Recalibrate the robot.</p>	<p>Calibration is detailed in section Calibration on page 673.</p>
2	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 171.</p>	

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 CRB 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	Used with protection class IP67. Replace if damaged.
O-ring on flexible spline side, axis 4	3HAC061327-017	Used with protection class IP67. 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.
Process hub with lamp unit (CP/CS and air hose, with Ethernet)	3HAC085071-001	
Multi-color lamp unit (16 mm)	3HAC081993-004	

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5 Repair

5.7.4 Replacing the axis-4 gearbox

Continued

Spare part	Article number	Note
Lamp unit cover	3HAC082320-001	
Gasket for lamp unit cover	3HAC082935-001	Used with protection class IP67. Replace if damaged.
Plastic cable protector, axis 3	3HAC064693-001	
Plastic cable protector, axis 4	3HAC064694-001	
Tubular cover	3HAC073094-001	
Housing cover	3HAC073093-001	
Lower arm cover	3HAC073092-001	
Gasket for process hub	3HAC070887-001	Used with protection class IP67. Replace if damaged.
Gasket for tubular cover	3HAC067834-001	Used with protection class IP67. Replace if damaged.
Gasket for housing cover	3HAC067833-001	Used with protection class IP67. Replace if damaged.
Gasket for lower arm cover	3HAC067832-001	Used with protection class IP67. Replace if damaged.
Seal bolt	3HAC032050-001	Used with protection class IP67. Replace if damaged.
Plug screw	3HAC078352-001	Replace if damaged.
Flange socket head screw with glue	3HAB3413-412	M4x12 12.9 Lafre 2C2B/FC6.9+PrO-COat111, with NYPLAS glue

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 728 .
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 robots	3HAC078203-001	Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .


Continues on next page

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	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 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.
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 681.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the gearbox

Use these procedures to remove the axis-4 gearbox.

Preparations before removing the axis-4 gearbox

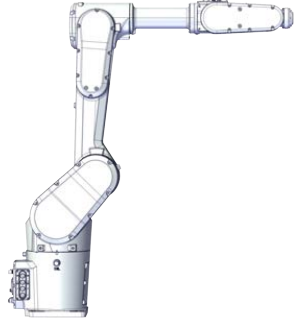

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

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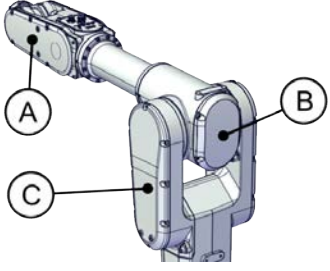
5 Repair

5.7.4 Replacing the axis-4 gearbox


Continued

	Action	Note
2	Jog all axes to zero position.	 xx2000001520
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Removing the covers

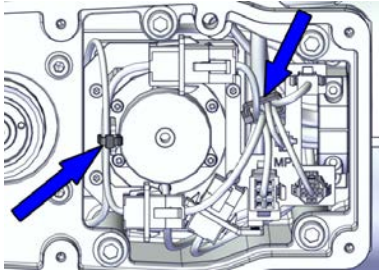

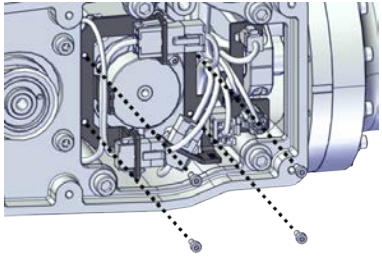
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the covers. <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm support cover (C) 	 xx2000001668

Loosening the cables in the tubular



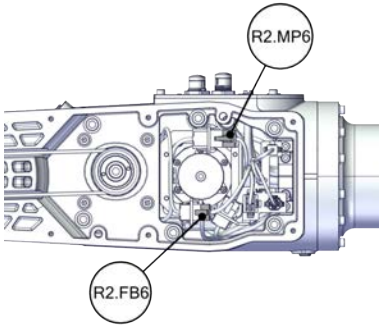
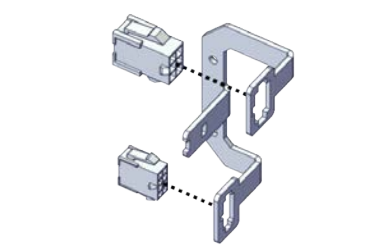
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

5.7.4 Replacing the axis-4 gearbox
Continued

	Action	Note
2	Cut the cable straps.	 <p>xx2000001530</p>
3	<p>Remove the connector plates.</p> <p> CAUTION</p> <p>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.</p>	 <p>xx2000001531</p>

Disconnecting the axis-6 motor connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP6 • FB6 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001532</p>
3	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001533</p>



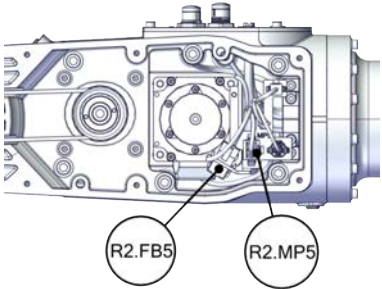
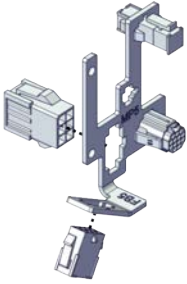
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5 Repair



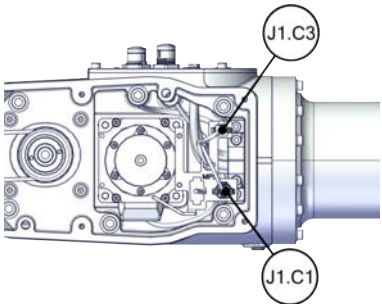
5.7.4 Replacing the axis-4 gearbox

Continued

Disconnecting the axis-5 motor connectors

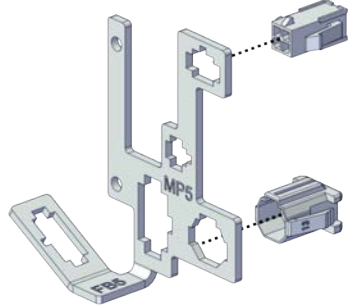
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Disconnect the connectors. <ul style="list-style-type: none"> • MP5 • FB5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001534
3	Snap loose and remove the male head of the connectors from the connector plate.	 xx2000001535

Disconnecting CP/CS cabling (if equipped)


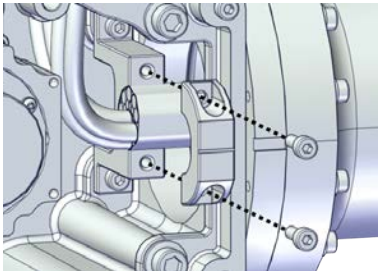
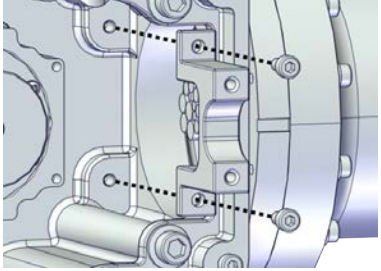
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	For robots with CP/CS cabling Disconnect the connectors. <ul style="list-style-type: none"> • J1.C1 • J1.C3  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx2000001536

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5.7.4 Replacing the axis-4 gearbox
Continued

	Action	Note
3	Snap loose and remove the male head of the connectors from the connector plate.	 <p>xx2000001537</p>

Separating the cable package from the tubular

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	Remove the first semicircular bracket that fixes the cable package.	 <p>xx2000001748</p>
3	Remove the second semicircular bracket from the tubular.	 <p>xx2000001749</p>

Removing the process hub


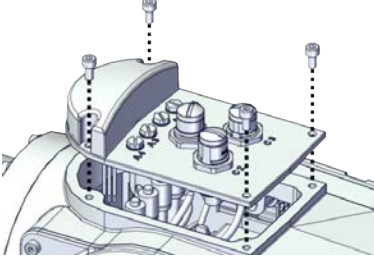
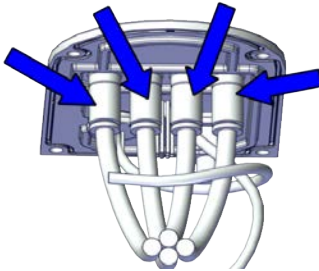


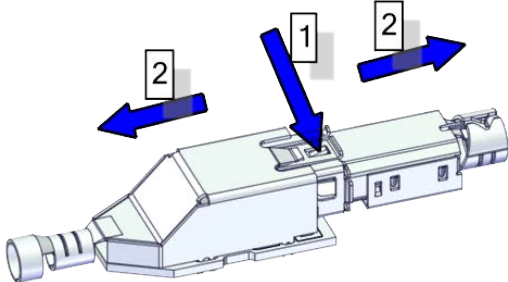
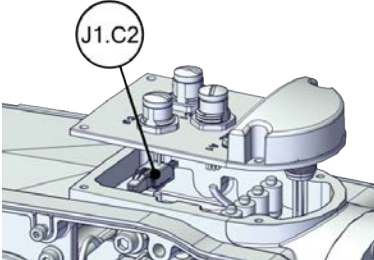
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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5 Repair

5.7.4 Replacing the axis-4 gearbox

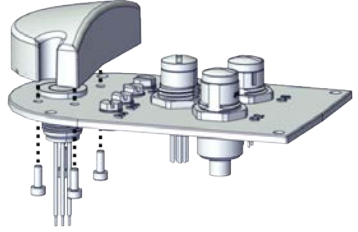
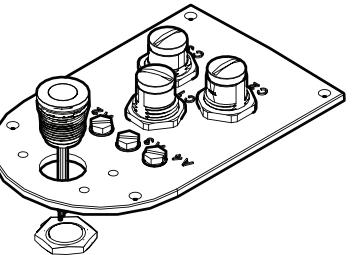
Continued

	Action	Note
2	<p>Remove the screws and carefully open the cover.</p> <p> CAUTION</p> <p>There is cabling attached to the cover. The cover cannot be removed completely until the connectors are removed.</p>	 <p>xx2200001000</p>
3	<p>Disconnect the air hoses.</p>	 <p>xx2000001539</p>
4	<p>For robots with Ethernet cabling</p> <p>Access the connector from the process hub and disconnect the connector.</p> <ul style="list-style-type: none">• J1.C2 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p> <p> Tip</p> <p>The connector clip has to be pressed (1) and pushed forward (2) to separate the J2.C2 (for Ethernet cabling).</p>  <p>xx1800002943</p>	 <p>xx2200001001</p>



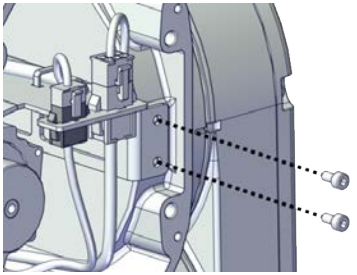

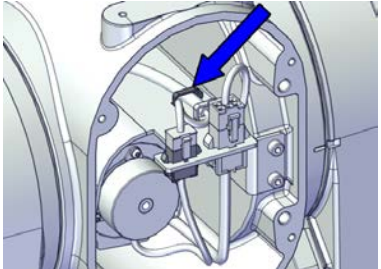
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Removing the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.

	Action	Note
1	Remove the lamp unit cover.	 xx2200001002
2	Remove the lamp unit.	 xx2200001003

Disconnecting the axis-4 motor connectors


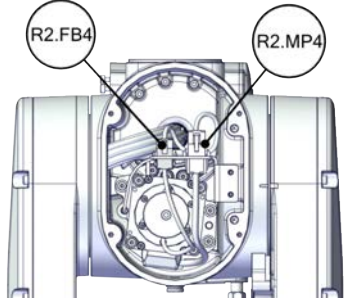
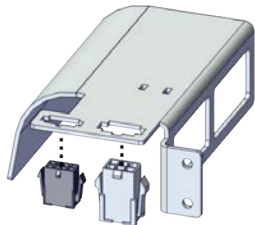
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION Be aware of the cablings that are attached to the connector plate! The connector plate cannot be removed completely until the connectors are removed from the plate.	 xx2000001542
3	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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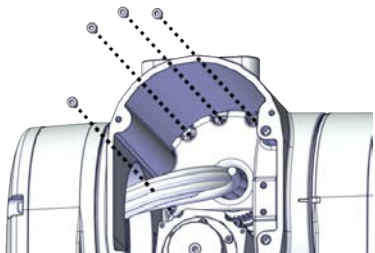
5 Repair

5.7.4 Replacing the axis-4 gearbox


Continued

	Action	Note
4	<p>Disconnect the connectors.</p> <ul style="list-style-type: none"> • MP4 • FB4 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx2000001544</p>
5	<p>Snap loose and remove the male head of the connectors from the connector plate.</p>	 <p>xx2000001545</p>

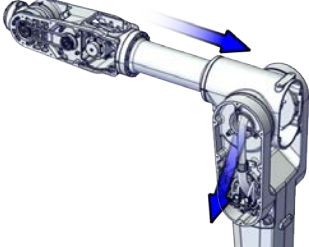
Separating the cable package from the housing

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the axis-4 cable protector.</p>	 <p>xx2000001546</p>



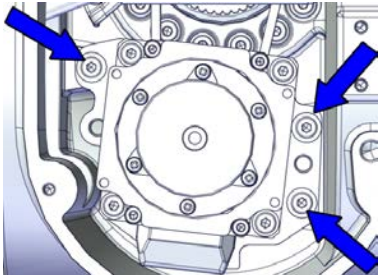
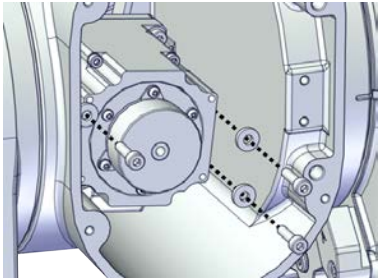
Pulling out the cable package

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Wrap the connectors with the masking tape.</p>	

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	Action	Note
3	Pull the cable package out to the lower arm support.	 <p>xx2000001662</p>

Removing the axis-4 motor

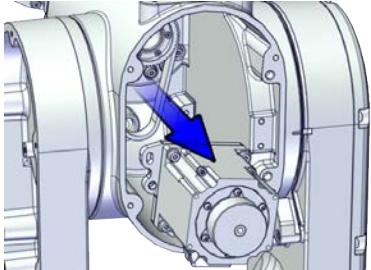
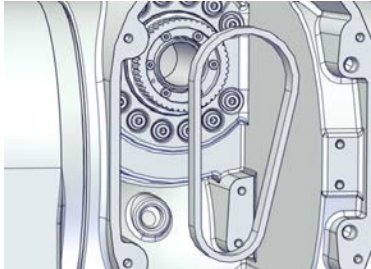
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>Removing motors will release axes. This means the axes can fall down. Make sure axes are well supported before removing motors.</p>	
3	Loosen the screws and move the motor slightly to slacken the timing belt.	 <p>xx2000001604</p>
4	Remove the timing belt from its groove on the motor.	
5	Remove the screws and washers.	 <p>xx2000001605</p>

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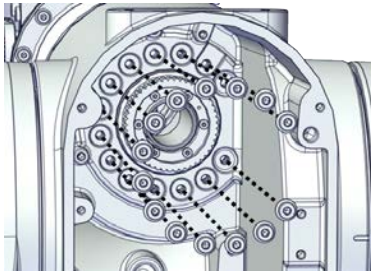
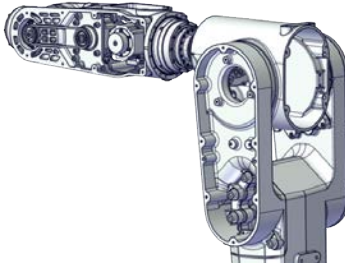
5 Repair

5.7.4 Replacing the axis-4 gearbox

Continued

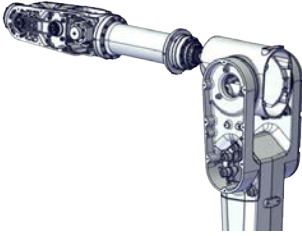
	Action	Note
6	Carefully lift out the motor.	 xx2000001669
7	Remove the timing belt.	 xx2000001670

Separating the housing



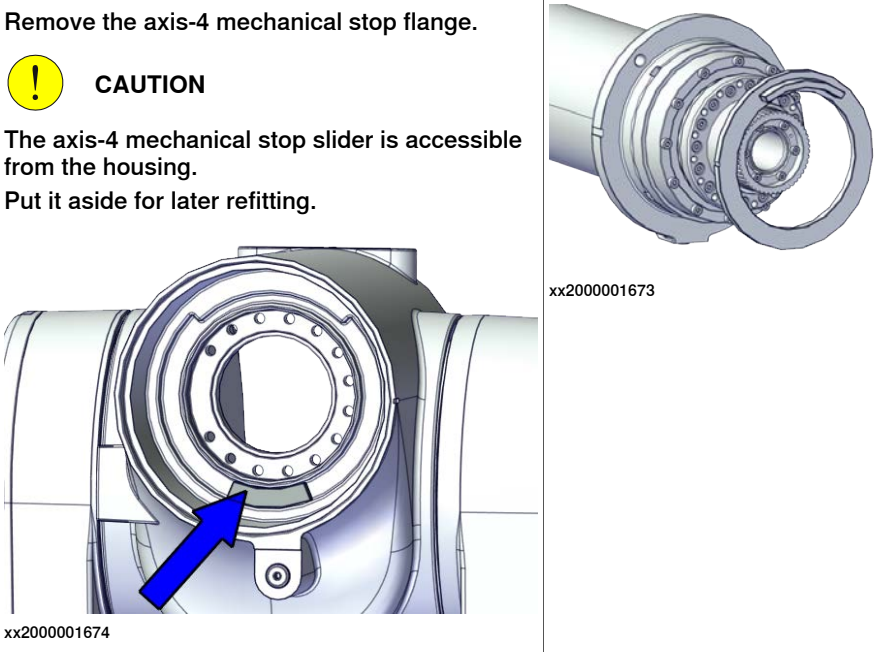
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Support the weight of the extender unit (only for CRB 1300-7/1.4), tubular and tilt unit, and remove the screws.	 xx2000001671
3	Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15 Separate the tubular from the housing.	 xx2000001721

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5.7.4 Replacing the axis-4 gearbox
Continued

	Action	Note
4	Valid for CRB 1300-7/1.4 and Separate the extender unit from the housing.	 <p>xx2000001672</p>

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	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.	 <p>xx2000001673</p> <p>xx2000001674</p>

Removing the axis-4 gearbox


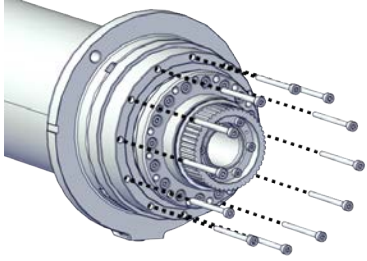
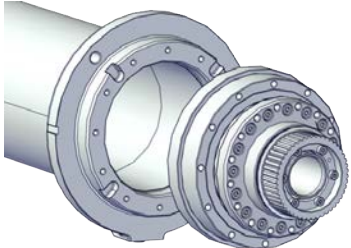
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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5 Repair

5.7.4 Replacing the axis-4 gearbox

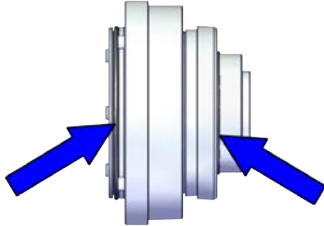
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	Action	Note
2	 CAUTION Removing gearboxes will release axes. This means the axes can fall down. Make sure axes are well supported before removing gearboxes.	
3	Remove the screws.	 xx2000001675
4	Pull out the gearbox.	 xx2000001676

Refitting the gearbox

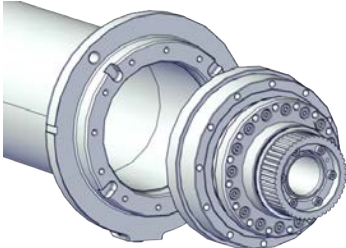
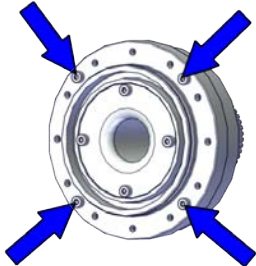
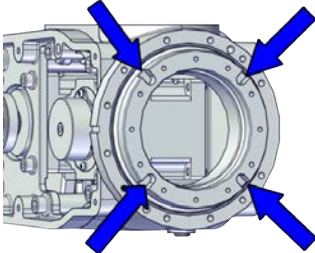
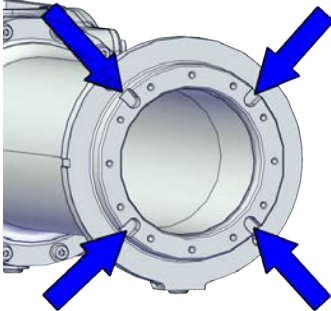
Use these procedures to refit the axis-4 gearbox.

Refitting the axis-4 gearbox

	Action	Note
1	For robots with protection class IP67 (option 3350-670) 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: 3HAC061327-017  xx2000002525

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5.7.4 Replacing the axis-4 gearbox
Continued

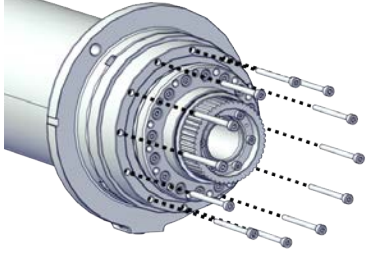
	Action	Note
2	Refit the axis-4 gearbox.	 <p>xx2000001676</p>
3	Make sure that the screws on the gearbox are properly fitted into the notches on the extender unit/tubular.	 <p>xx2000001720</p> <p>Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15</p>  <p>xx2000001719</p> <p>Valid for CRB 1300-7/1.4 and</p>  <p>xx2000001679</p>

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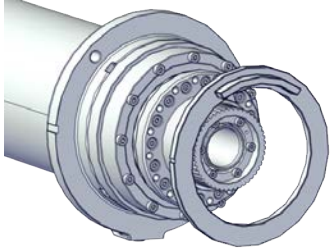
5 Repair

5.7.4 Replacing the axis-4 gearbox

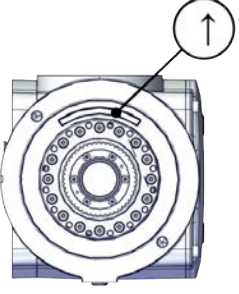
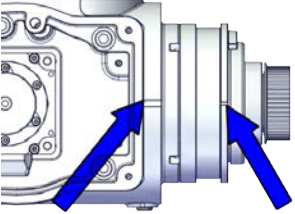
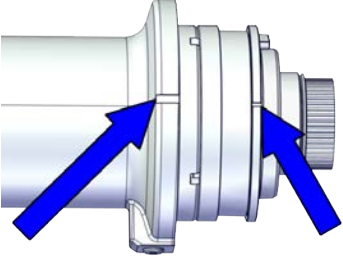
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	Action	Note
4	Secure with screws.	<p>Screw: M3x35 12.9 Lafre 2C2B/FC6.9 (12 pcs) Tightening torque: 1.9 Nm</p>  <p>xx2000001675</p>

Refitting the axis-4 mechanical stop flange

	Action	Note
1	Refit the axis-4 mechanical stop flange to the gearbox.	 <p>xx2000001673</p>

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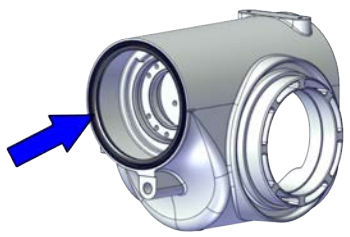
	Action	Note
2	<p>Make sure that :</p> <ul style="list-style-type: none"> the block on the mechanical stop flange is towards the upper side (process hub side). the notches on the extender unit/tubular and the mechanical stop flange are aligned. 	 <p>xx2000001678</p> <p>Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15</p>  <p>xx2000001718</p> <p>Valid for CRB 1300-7/1.4 and</p>  <p>xx2000001677</p>

Check the radial sealing on the housing



Note

This procedure is valid for robots with:


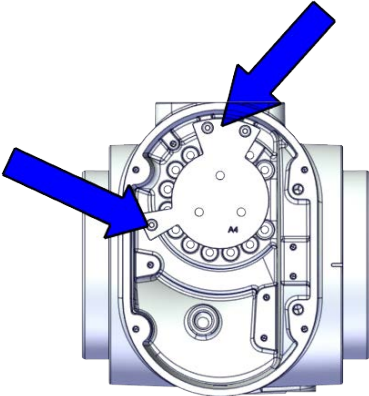
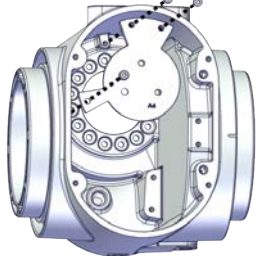
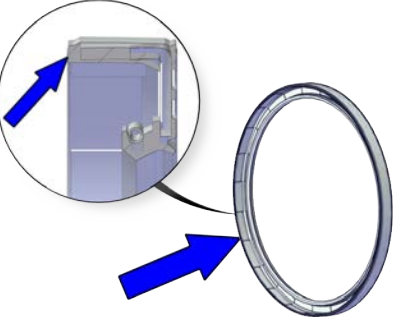
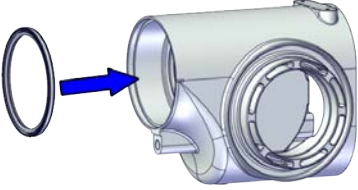
	Action	Note
1	<p>Check the radial sealing on the housing. Replace if damaged, as described below.</p>	 <p>xx2000002483</p>

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5 Repair

5.7.4 Replacing the axis-4 gearbox

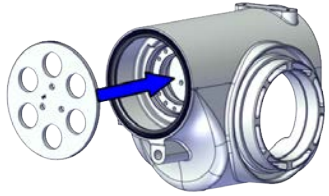
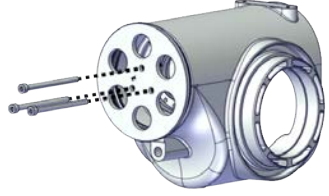
Continued

	Action	Note
2	<p>Fit the lug plate of the axis-4 sealing assembly tool into the housing with three M4x10 screws.</p> <p> Note</p> <p>Pay attention to the location of the lugs.</p>  <small>xx2000002485</small>	<p>Lug plate of the axis-4 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <small>xx2000002484</small>
3	<p>Apply a little grease to the sealing lip when replacing the radial sealing and wipe clean after the replacement.</p>	<p>Grease: 3HAC029132-001</p>
4	<p>Fit the new sealing into the housing.</p>  <small>xx2000002537</small>	 <small>xx2000002486</small>

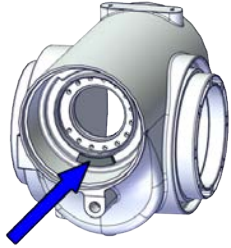
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5.7.4 Replacing the axis-4 gearbox

Continued

	Action	Note
5	Fit the circular plate of the axis-4 sealing assembly tool against the sealing and fix with three M6x85 screws.	<p>Circular plate of the axis-4 sealing assembly tool, included in Special toolkit for IP67 robots (3HAC078203-001).</p>  <p>xx2000002487</p>  <p>xx2000002488</p>
6	Screw the screws, little by little and evenly, to press the sealing into place.	
7	Remove the assembly tool.	
8	Check that the sealing is undamaged and properly fitted.	

Refitting the axis-4 mechanical stop slider

	Action	Note
1	Place the axis-4 mechanical stop slider in the housing.	 <p>xx2000001732</p>

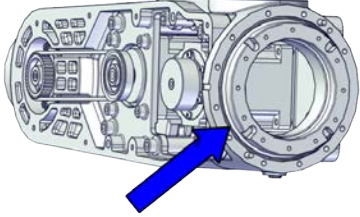
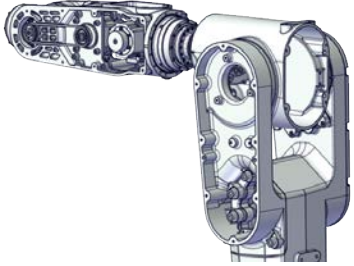
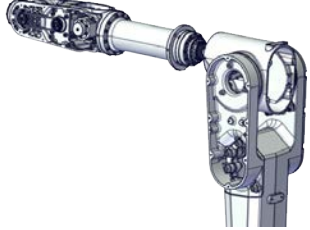
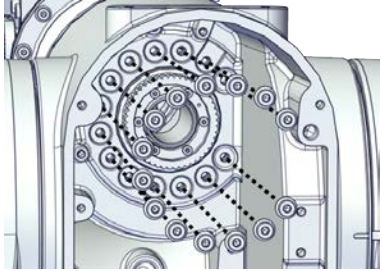
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5 Repair

5.7.4 Replacing the axis-4 gearbox

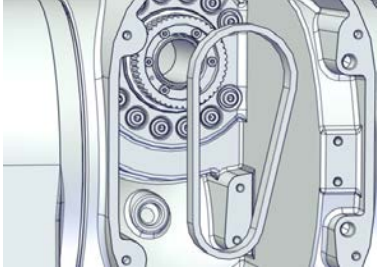

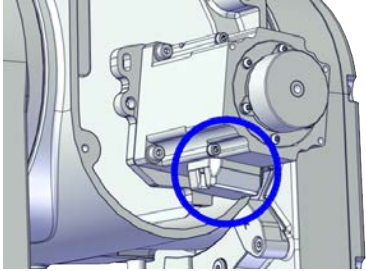
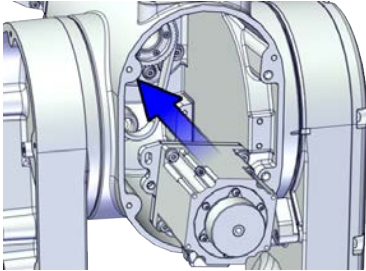

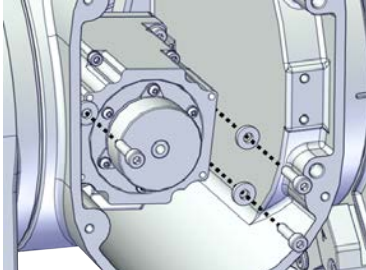
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Refitting the housing

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670) Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15 Check the O-ring. Replace if damaged.</p>	<p>O-ring on tubular: 3HAC061327-018</p>  <p>xx2000002519</p>
2	<p>Valid for CRB 1300-11/0.9 and CRB 1300-10/1.15 Refit the tubular to the housing.</p>	 <p>xx2000001721</p>
3	<p>Valid for CRB 1300-7/1.4 and Refit the extender unit to the housing.</p>	 <p>xx2000001672</p>
4	<p>Refit the screws.</p>	<p>Flange socket head screw with glue: 3HAB3413-412, M4x12 12.9 Lafre 2C2B/FC6.9+PrO-COat111, with NYPLAS glue (14 pcs) Tightening torque: 3.3 Nm</p>  <p>xx2000001671</p>

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Refitting the axis-4 motor

	Action	Note
1	<p>Check that:</p> <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
2	<p>Install the timing belt to the gearbox pulley and verify that the belt runs correctly in the grooves of the pulley.</p>	 <p>xx2000001670</p>
3	<p>Orient the motor correctly and fit it into the housing.</p> <p> Note</p> <p>Make sure the motor flange does not press on the timing belt.</p>	<p>Motor orientation: orient the motor according to the figure below, in regard to the encircled motor connector.</p>  <p>xx2000001607</p>
4	<p>Refit the motor and verify that the timing belt runs correctly in the groove of the motor pulley.</p>	 <p>xx2000001680</p>
5	<p>Refit the screws and washers.</p> <p> Note</p> <p>Do not tighten the screws yet.</p>	<p>Screw: M4x16 12.9 Lafre 2C2B/FC6.9 (3 pcs)</p>  <p>xx2000001605</p>

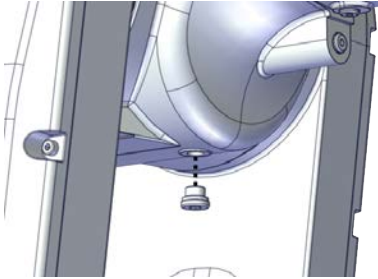
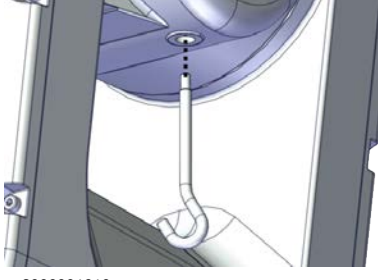
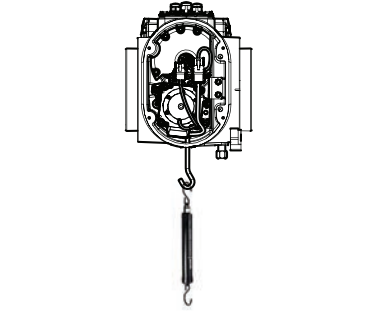

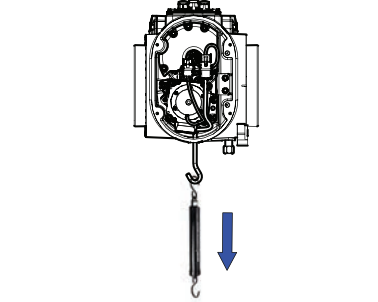
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5 Repair

5.7.4 Replacing the axis-4 gearbox

Continued

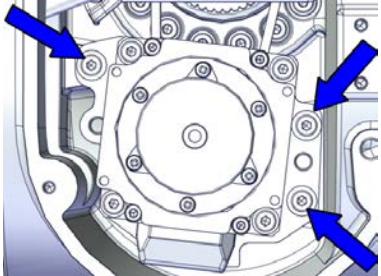
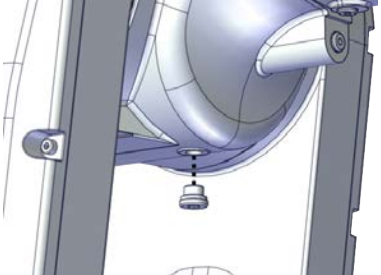
Adjusting the axis-4 timing belt tension

	Action	Note
1	Remove the screw below the housing.	 <p>xx2000001609</p>
2	Fit the tension adjustment tool for axis-4 timing belt to the screw hole.	<p>Tension adjustment tool for axis-4 timing belt. Included in special toolkit 3HAC076396-001.</p>  <p>xx2000001610</p>
3	Use a handheld dynamometer hooking to the tool.	 <p>xx2000001611</p>
4	<p>Pull the dynamometer to make the tension falling in the allowed force range.</p> <p> Note</p> <p>During the measurement, make sure that all interferences that may affect the force are removed. Pay attention to the force application direction.</p>	<p>Used belt: 33.4-38.2 N New belt: 47.8-52.4 N</p>  <p>xx2000001612</p>


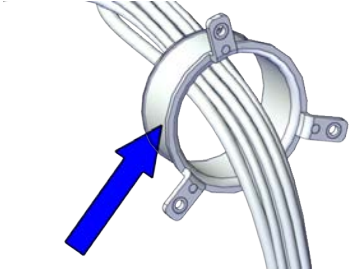
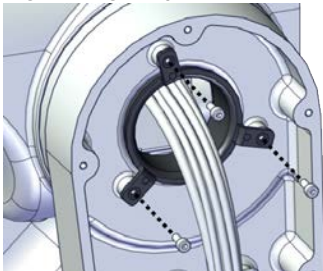
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5.7.4 Replacing the axis-4 gearbox

Continued

	Action	Note
5	Secure the motor with the screws.	<p>Tightening torque: 3.3 Nm±3%</p>  <p>xx2000001604</p>
6	Remove the tool and refit the plug screw.	<p>Tightening torque: 3 Nm Plug screw: 3HAC078352-001</p>  <p>xx2000001609</p>

Securing the cable package in the lower arm


	Action	Note
1	<p>Check the axis-3 cable protector. Replace if damaged.</p> <p> Note If replaced, apply grease to the axis-3 cable protector before refitting.</p>	<p>Grease: 3HAC029132-001 Plastic cable protector, axis 3: 3HAC064693-001</p>  <p>xx2000001568</p> <p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9 (3 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001552</p>

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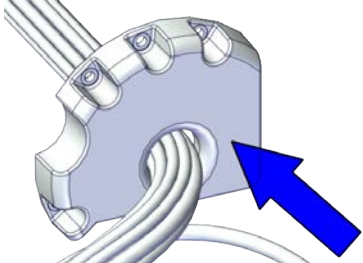

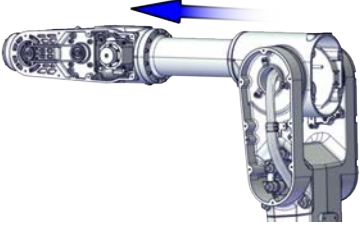
5 Repair

5.7.4 Replacing the axis-4 gearbox

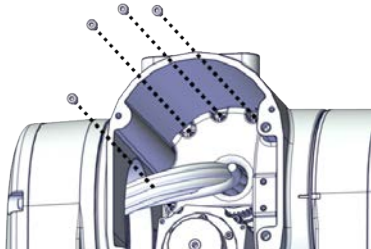
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	Action	Note
2	<p>Route the cable package through the lower arm support and up into the housing.</p> <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	

Routing the cable package in the housing

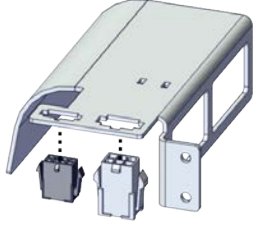

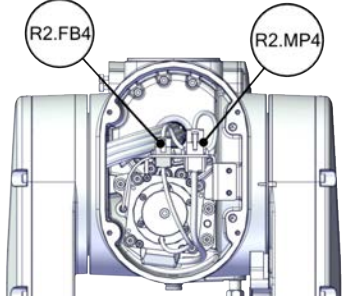


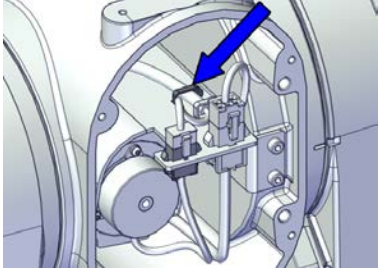
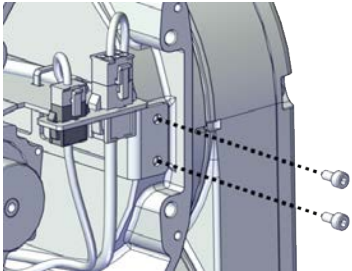
	Action	Note
1	<p>Slip the axis-4 cable protector over the cable package.</p>	<p>Plastic cable protector, axis 4: 3HAC064694-001:</p>  <p>xx2000001570</p>
2	<p>Insert the cable package through the hollow tube of the axis-4 gearbox, into the extender unit (only for CRB 1300-7/1.4 and) and into the tubular.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> the air hoses are facing the axis-3 gearbox side in the hollow tube of axis-4 gearbox. <p> CAUTION</p> <p>Make sure that no cables or hoses are twisted or strained. Reroute if necessary.</p>	 <p>xx2000001571</p>

Securing the cable package in the housing

	Action	Note
1	<p>Refit the axis-4 cable protector.</p>	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001546</p>

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Reconnecting the axis-4 motor connectors

	Action	Note
1	Insert the male header of the motor connectors to the connector plate.	 <p>xx2000001545</p>
2	Reconnect the connectors. <ul style="list-style-type: none"> • FB4 • MP4  Tip See the number markings on the connectors for help to find the corresponding connector.	 <p>xx2000001544</p>
3	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.	 <p>xx2000001543</p>
4	Refit the connector plate.	Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm  <p>xx2000001542</p>

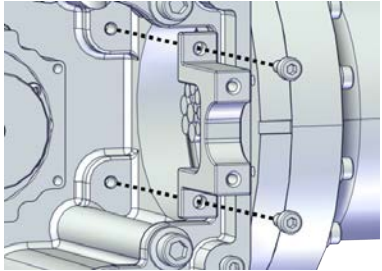
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5 Repair

5.7.4 Replacing the axis-4 gearbox

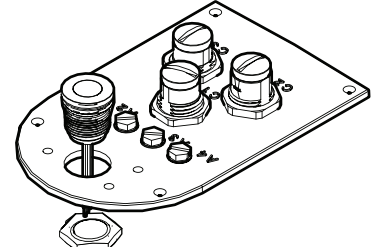
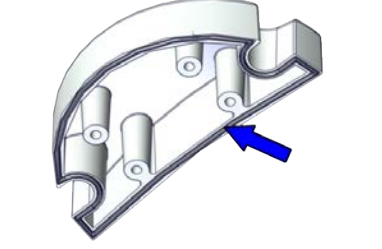
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Routing the cable package in the tubular

	Action	Note
1	Refit the second semicircular bracket to the tubular.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001749</p>
2	<p>Route the cablings.</p> <ul style="list-style-type: none"> • 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. 	

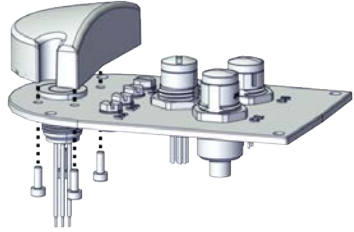
Refitting the lamp unit

Notice that the procedure is valid only when the lamp unit needs a replacement.


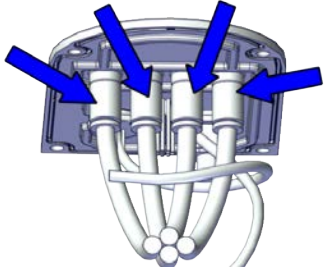

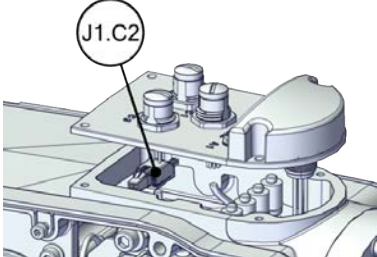
	Action	Note
1	Refit the lamp unit.	<p>Multi-color lamp unit (16 mm): 3HAC081993-004</p>  <p>xx2200001003</p>
2	<p>For robots with protection class IP67 (option 3350-670) Check the gasket. Replace if damaged.</p>	<p>Gasket for lamp unit cover: 3HAC082935-001</p>  <p>xx2200001004</p>

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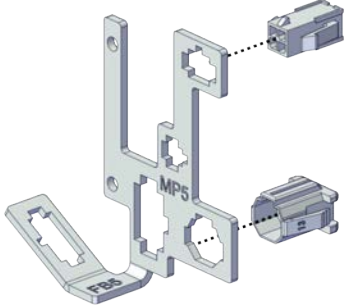
5.7.4 Replacing the axis-4 gearbox
Continued

	Action	Note
3	Refit the lamp unit cover.	Lamp unit cover: 3HAC082320-001 Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 0.6 Nm  xx2200001002

Reconnecting the air hoses and Ethernet cabling (if equipped)

	Action	Note
1	Reconnect the air hoses.  Note See the number markings on the air hoses for help to find the corresponding air hoses.	 xx2000001539
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.	 xx2200001001

Reconnecting the CP/CS cabling (if equipped)


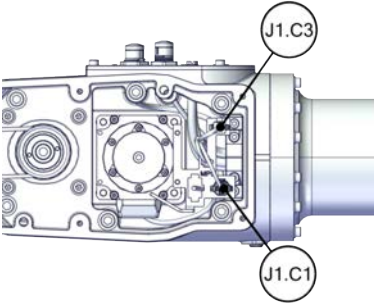
	Action	Note
1	Insert the male header of the connectors to the connector plate.	 xx2000001537

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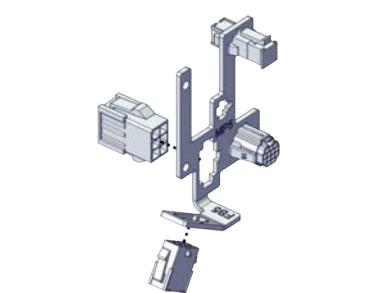

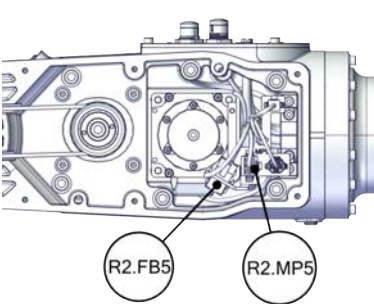
5 Repair

5.7.4 Replacing the axis-4 gearbox

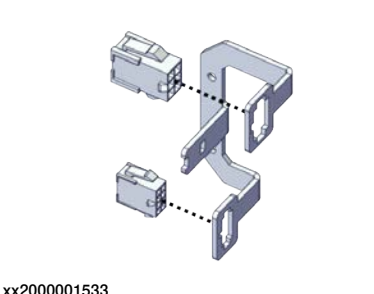
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	Action	Note
2	<p>For robots with CP/CS cabling</p> <p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • J1.C1 • J1.C3 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001536</p>


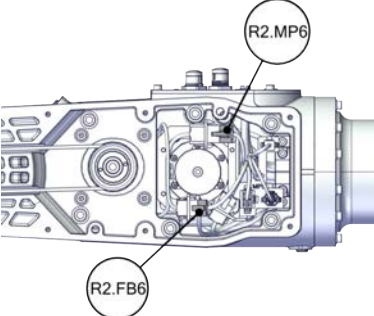
Reconnecting the axis-5 motor connectors

	Action	Note
1	<p>Insert the male header of the motor connectors to the connector plate.</p>	 <p>xx2000001535</p>
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB5 • MP5 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001534</p>

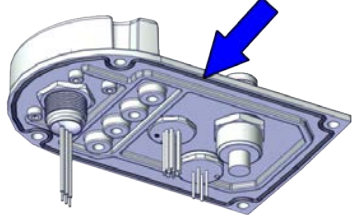
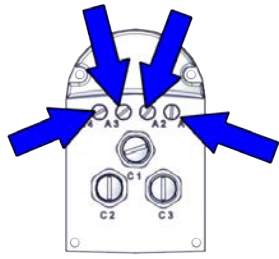

Reconnecting the axis-6 motor connectors

	Action	Note
1	<p>Insert the male header of the motor connectors to the connector plate.</p>	 <p>xx2000001533</p>

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	Action	Note
2	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • FB6 • MP6 <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx2000001532</p>

Refitting the process hub

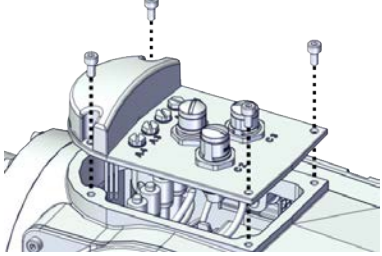
	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for process hub: 3HAC070887-001</p>  <p>xx2200001005</p>
2	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the seal bolts.</p> <p>Replace if damaged.</p>	<p>Seal bolt: 3HAC032050-001</p>  <p>xx2200001006</p>
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important.</p> <p>If the cables are routed and secured incorrectly the cables can be damaged.</p>	

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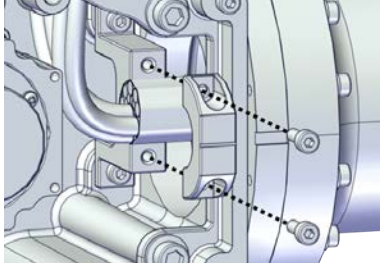
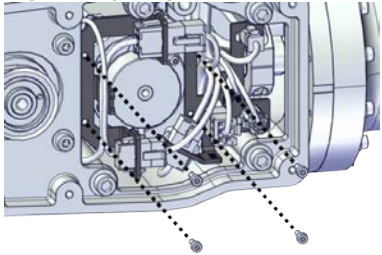

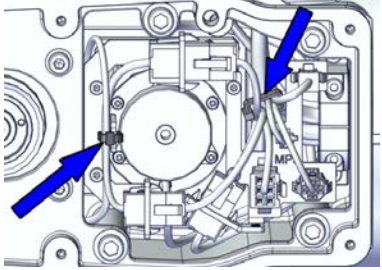
5 Repair

5.7.4 Replacing the axis-4 gearbox

Continued

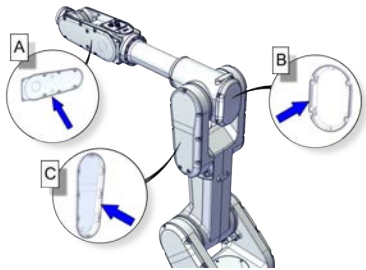
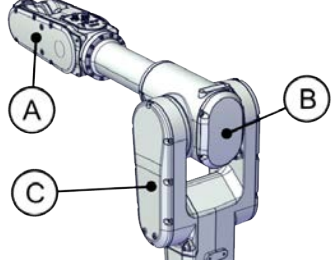
	Action	Note
4	Refit the process hub.	<p>Screw: M4x8 12.9 Lafre 2C2B/FC6.9 (4 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2200001000</p>

Securing the cable package in the tubular


	Action	Note
1	Refit the first semicircular bracket to fix the cable package.	<p>Screw: M4x12 12.9 Lafre 2C2B/FC6.9 (2 pcs) Tightening torque: 2.6 Nm</p>  <p>xx2000001748</p>
2	Refit the connector plate.	<p>Screw: M3x8 12.9 Lafre 2C2B/FC6.9 (2 pcs for each plate) Tightening torque: 1.3 Nm</p>  <p>xx2000001531</p>
3	<p>Route and secure the cabling with cable straps.</p> <p> CAUTION</p> <p>Correct cable routing is highly important. If the cables are routed and secured incorrectly the cables can be damaged.</p>	 <p>xx2000001530</p>

Continues on next page

Refitting the covers

	Action	Note
1	<p>For robots with protection class IP67 (option 3350-670)</p> <p>Check the gaskets.</p> <ul style="list-style-type: none"> • Gasket for tubular support cover (A) • Gasket for housing cover (B) • Gasket for lower arm covers (C) <p>Replace if damaged.</p>	 <p>xx2000002506</p>
2	Apply grease to the cable package, cover all moving area of the package.	Grease: 3HAC029132-001
3	Apply grease to the covers that have contacting area with the cable package.	Grease: 3HAC029132-001
4	<p>Refit the covers.</p> <ul style="list-style-type: none"> • Tubular support cover (A) • Housing cover (B) • Lower arm covers (C) 	<p>Screw: M4x10 12.9 Lafre 2C2B/FC6.9</p> <p>Tightening torque: 2.6 Nm</p>  <p>xx2000001668</p>

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 673 .
2	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run. See Test run after installation, maintenance, or repair on page 171.</p>	

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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 680](#).

Calibration terminology

Term	Definition
Calibration method	A collective term for several methods that might be available for calibrating the ABB robot. Each method contains calibration routines.
Synchronization position	Known position of the complete robot where the angle of each axis can be checked against visual synchronization marks.
Calibration position	Known position of the complete robot that is used for calibration of the robot.
Standard calibration	A generic term for all calibration methods that aim to move the robot to calibration position.
Fine calibration	A calibration routine that generates a new zero position of the robot.
Reference calibration	<p>A calibration routine that in the first step generates a reference to current zero position of the robot. The same calibration routine can later on be used to recalibrate the robot back to the same position as when the reference was stored.</p> <p>This routine is more flexible compared to fine calibration and is used when tools and process equipment are installed.</p> <p>Requires that a reference is created before being used for recalibrating the robot.</p> <p>Requires that the robot is dressed with the same tools and process equipment during calibration as during creation of the reference values.</p>
Update revolution counter	A calibration routine to make a rough calibration of each manipulator axis.
Synchronization mark	Visual marks on the robot axes. When marks are aligned, the robot is in synchronization position.

6 Calibration


6.1.2 Calibration methods

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: <ul style="list-style-type: none">Mechanical tolerances in the robot structureDeflection 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 <code>WristOpt</code> , see <i>Technical reference manual - RAPID Instructions, Functions and Data types</i> . 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 CRB 1300. It is the recommended method in order to achieve proper performance.

Continues on next page

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 680](#).

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 729](#).

6 Calibration

6.1.3 When to calibrate

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 679](#). 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.

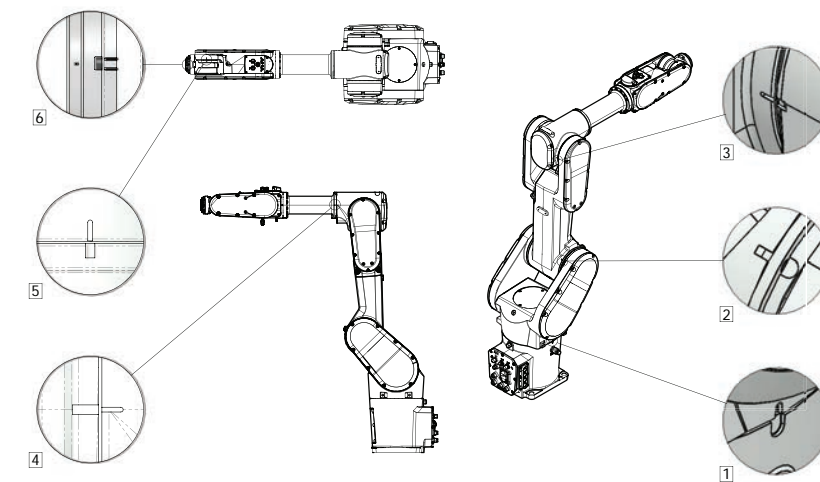
6.2 Synchronization marks and axis movement directions

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, CRB 1300



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6 Calibration

6.2.2 Calibration movement directions for all axes

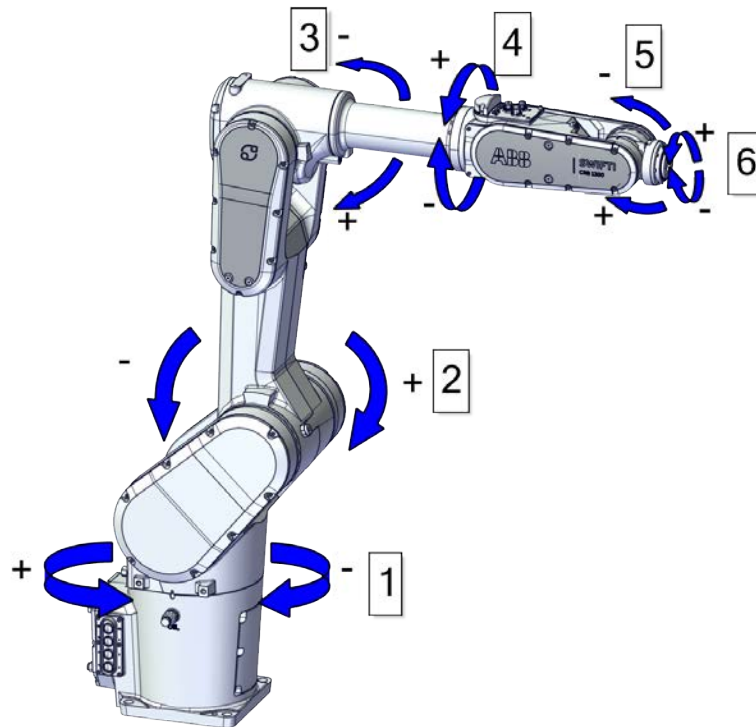
6.2.2 Calibration movement directions for all axes

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



xx2200001140

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 677 .
3	When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 679 .

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 698 .

6 Calibration

6.4.1 Description of Axis Calibration

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.

Continues on next page

- 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.

Continues on next page

6 Calibration

6.4.1 Description of Axis Calibration

Continued

Position of robot axes

The robot axes should be positioned close to 0 degrees before commencing the calibration program. The axis chosen for calibration is then automatically run by the calibration program to its exact calibration position during the calibration procedure.

It is possible to position some of the other axes in positions different from 0 degrees. Information about which axes are allowed to be jogged is given on the FlexPendant. These axes are marked with **Unrestricted** in the FlexPendant window. Also the following table shows the dependencies between the axes.

Requirements for axis positioning during calibration

Required position of axis	Axis to calibrate					
	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
Axis 1	-	*	*	*	*	*
Axis 2	0	-	0	*	*	*
Axis 3	0	0	-	*	*	*
Axis 4	*	*	*	-	*	*
Axis 5	*	*	*	*	-	X
Axis 6	*	*	*	*	*	-

-	Axis to be calibrated
*	Unrestricted. Axis is allowed to be jogged to other position than 0 degrees.
0	Axis must be put in position 0 degrees.
X	Special requirement

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 CRB 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.

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

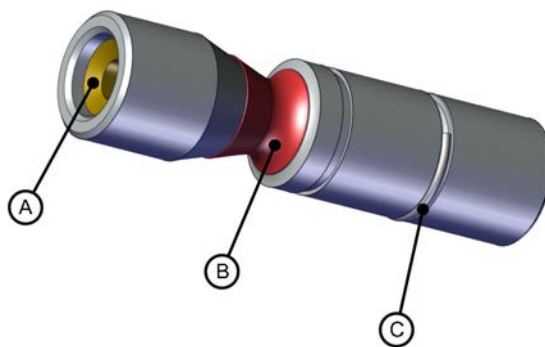
Check prior to usage

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.



xx1500001914

A	Tube insert
B	Plastic protection
C	Steel spring ring

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6 Calibration

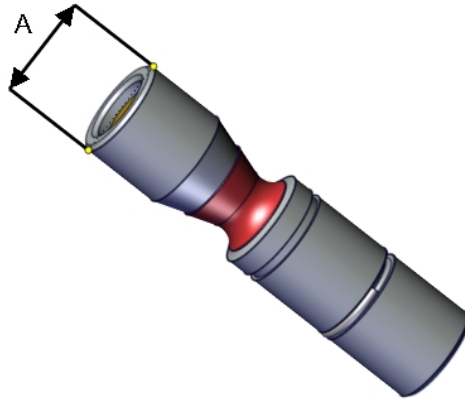
6.4.2 Calibration tools for Axis Calibration

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 $\varnothing 12g4$ mm, $\varnothing 8g4$ mm or $\varnothing 6g5$ mm (depending on calibration tool size).
- Straightness within 0.005 mm.



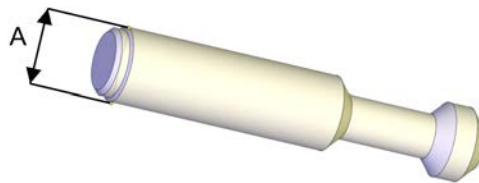
xx150000951

A	Outer diameter
---	----------------

Periodic check of the calibration tool for the tool flange (3HAC058238-001)

If including the tool flange calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within $\varnothing 5g5$ mm.
- Straightness within 0.005 mm.



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.

Continues on next page

	Action	Note
1	<p>It is possible to use any RFID solution, with the correct dimensions. ABB has verified function on some suppliers fulfilling the requirements of NFC compatible devices (13.56 Mhz) according to ISO 14443 or ISO 15693.</p> <p> Note</p> <p>The maximum dimensions on the RFID chip must not exceed Ø7.9 mm x 8.0 mm, Ø5.9 mm x 8.0 mm or Ø3.9 mm x 8.0 mm (depending on calibration tool size).</p>	
2	<p>There is a cavity on one end of the calibration tool in which the RFID chip can be installed.</p> <p>Install the RFID chip according to supplier instructions.</p> <p>Install the chip in flush with the tool end.</p>	

6 Calibration

6.4.3 Installation locations for the calibration tools

6.4.3 Installation locations for the calibration tools

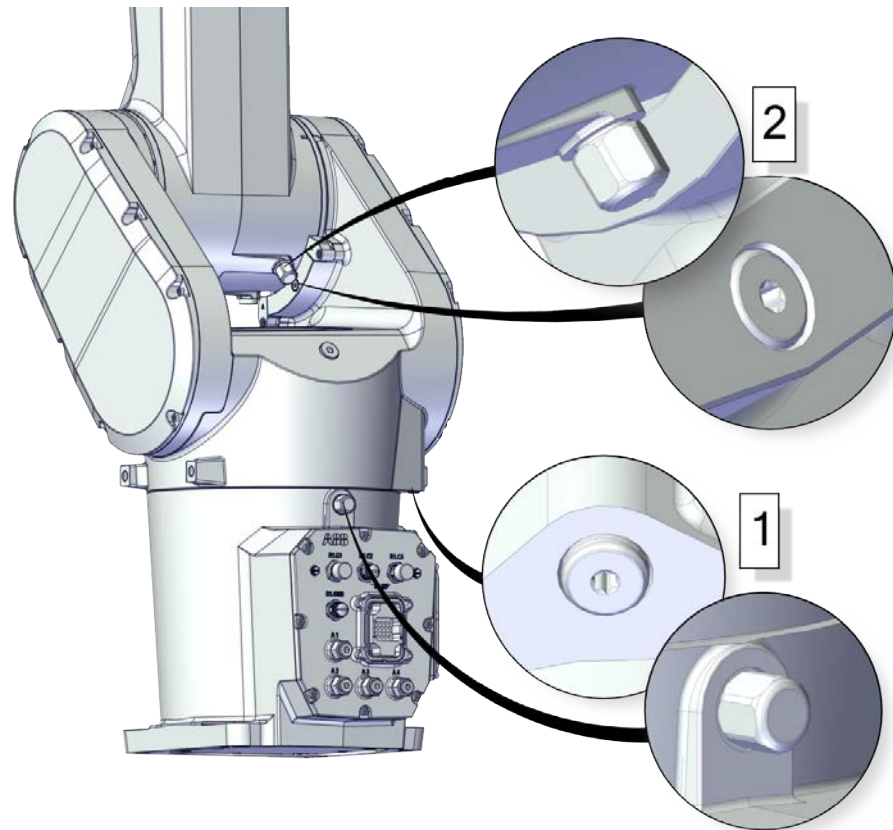
Location of fixed calibration items

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.

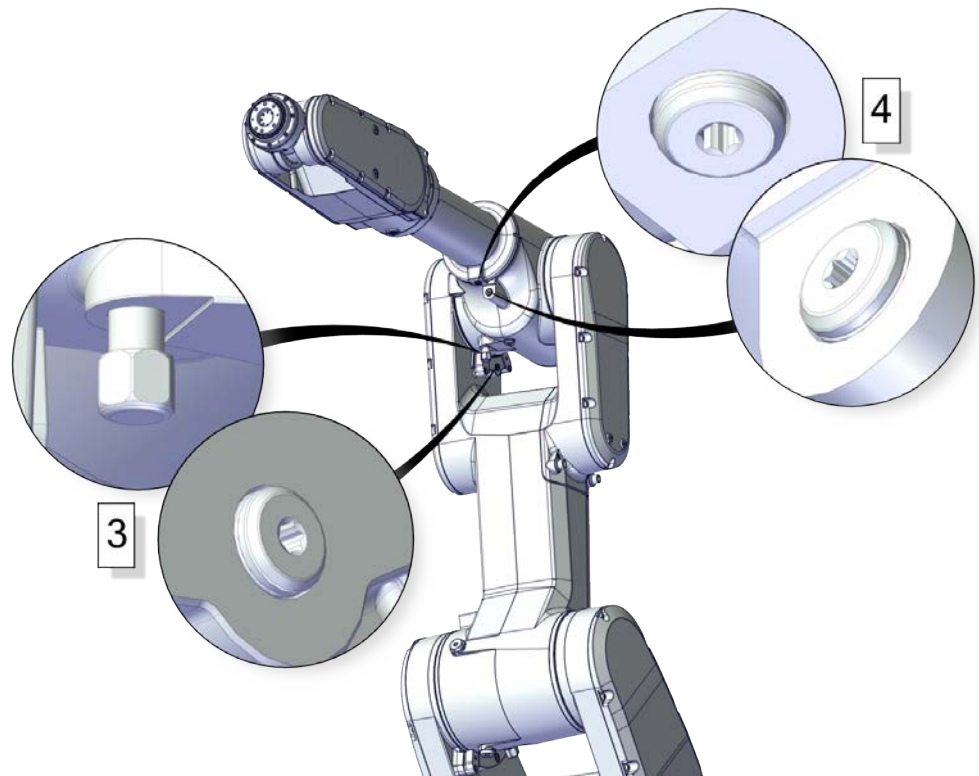
If there is not enough space on an axis to install a fixed calibration pin, the axis is equipped with two bushings instead, for installation of two calibration tools when calibration is carried out. This is shown in the figure.

For axis 6 there is only one bushing, the second calibration tool is installed at the mounting flange of the turning disk.

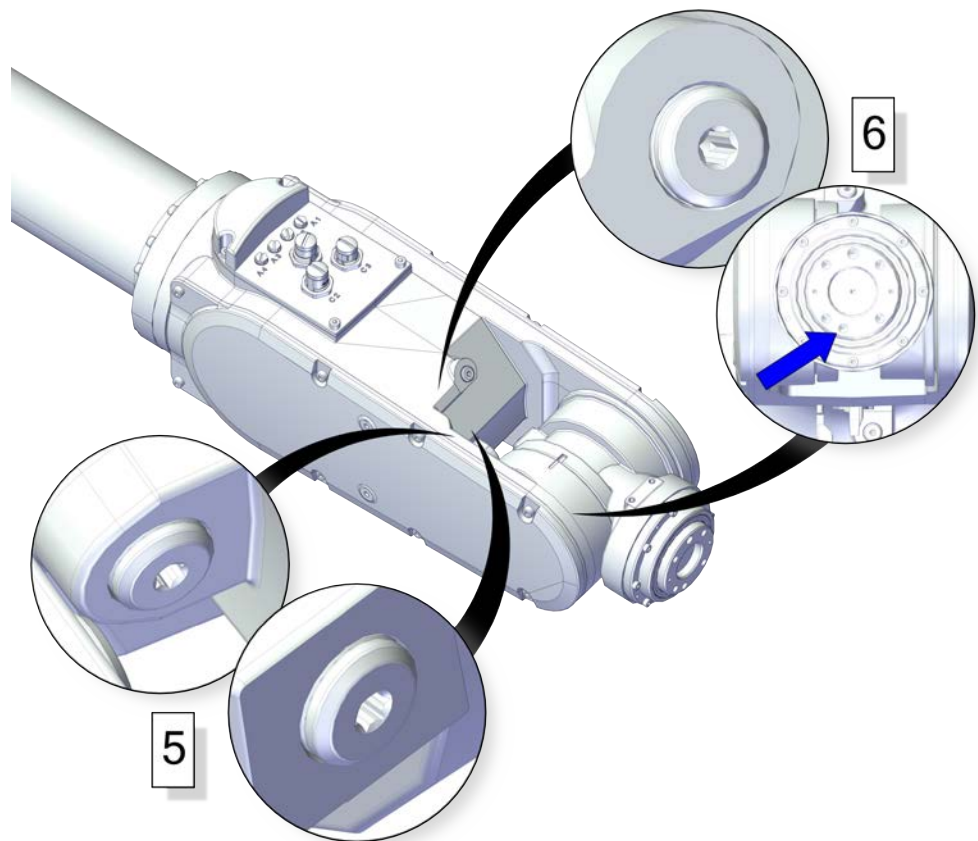


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6 Calibration

6.4.3 Installation locations for the calibration tools

Continued

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.

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.

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.

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 681](#).
- 2 Choose which axis/axes to calibrate.
- 3 The robot moves to synchronization position.

Continues on next page

6 Calibration

6.4.4 Axis Calibration - Running the calibration procedure



Continued

- 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 695 .

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.	

Continues on next page

6.4.4 Axis Calibration - Running the calibration procedure

Continued

	Action	Note
2	<p>All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.</p> <p> Note</p> <p>For RobotWare 7, the mechanical unit page is displayed only if there is more than one mechanical unit available.</p>	
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	<p>Valid for RobotWare 7</p> <p>Tap Calibration Methods on the right pane and then tap Calibration. The software will automatically call for the procedure for the valid calibration method.</p>	
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 689 .

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 .	<p>Remove the calibration tool, if it is installed, and restart the calibration procedure from the beginning. See Starting the calibration procedure.</p> <p>If the calibration tool is in contact the robot axis needs to be jogged in order to release the calibration tool. Jogging the axis in wrong direction will cause the calibration tool to break. Directions of axis movement is shown in Calibration movement directions for all axes on page 678</p>

Axis Calibration with SafeMove option

To be able to run Axis Calibration, SafeMove needs to be unsynchronized. The Axis Calibration routine recognizes if the robot is equipped with SafeMove and will force SafeMove to unsynchronize automatically.

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6 Calibration

6.4.4 Axis Calibration - Running the calibration procedure

Continued

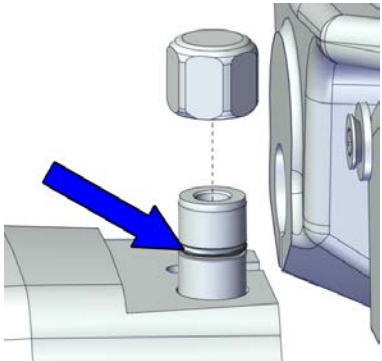
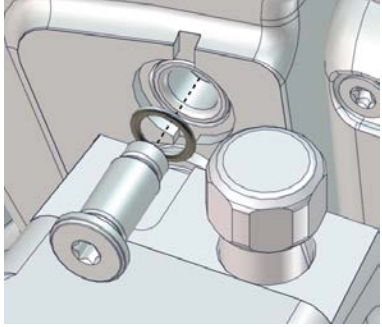
However, SafeMove may generate other warning messages anytime during the Axis Calibration routine. When a warning message is displayed, tap **Acknowledge** to confirm the unsynchronized state and continue Axis Calibration procedure.



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.	 <p>xx1600002102</p> <p>O-ring on calibration pin: 3HAC061327-022</p> <p>O-ring on calibration pin: 3HAC061327-011</p> <p>Calibration pin cover, 10 mm: 3HAC056253-003</p> <p>Calibration pin cover, 14 mm: 3HAC056253-002</p>
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.	
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.	 <p>xx1500000952</p> <p>Protective plug for 10-mm bushing: 3HAC053237-003.</p> <p>Protective plug for 12-mm bushing: 3HAC053237-002.</p>
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 695 .

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 693](#)).

Example "Adjust axis 4":

- 1 Create a backup.

Continues on next page

6 Calibration

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.

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.

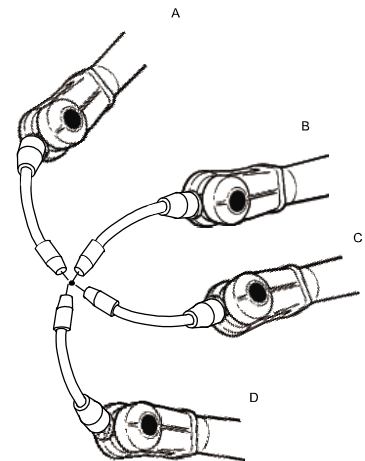
- 1 Choose calibration routine Wrist Optimization.
- 2 Modify targets for 4-point tool frame definition, in Wrist Optimization routine.



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.

Continues on next page

6 Calibration

6.5 Calibrating with Wrist Optimization method

Continued

- 5 The robot moves to the optimized positions for the wrist axes and automatically overwrites previous calibration data.



WARNING

Robot moves automatically when pressing **Calibrate**.

- 6 Wrist optimization is finished.
- 7 Redefine / verify TCP for all tools.

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 698 .
2	Adjust the <i>synchronization marks</i> when the calibration is done, if necessary.	This is detailed in section Synchronization marks and synchronization position for axes on page 677 .
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.	

6 Calibration

6.7 Checking the synchronization position

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.

Continues on next page

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: <pre>MoveAbsJ [[0,0,0,0,0,0], [9E9,9E9,9E9,9E9,9E9,9E9]] \NoEOffs, v1000, fine, tool0</pre>	
5	Run the program in manual mode.	
6	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See Synchronization marks and synchronization position for axes on page 677 and Updating revolution counters on page 679 .

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 677 and Updating revolution counters on page 679 .

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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: <ul style="list-style-type: none"> • the configuration files • connectors • options and their configuration • changes in the robot working space/movements.
---------------------------------------	--

Continues on next page

7 Troubleshooting

7.1 Introduction to troubleshooting

Continued

The robot has recently been repaired	Check: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• connections• software versions

7.2 Oil and grease stains on motors and gearboxes

Description

The area surrounding the motor or gearbox shows signs of oil leaks. This can be at the base, closest to the mating surface, or at the furthest end of the motor at the resolver.

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 CRB 1300 on page 178 . 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: <ul style="list-style-type: none"> • 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.	

7 Troubleshooting

7.3 Mechanical noise or dissonance

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.	

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.

7 Troubleshooting

7.5 Motor temperature too high

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.

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 69 .
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

7 Troubleshooting

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.	

7.7 Communication failure between PROFI-safe-based laser scanner, PLC, and controller

Description

The ProfiNet LED on the laser scanner is not lit up, indicating that the profinet communication between the laser scanner, PLC, and OmniCore controller fails to be set up. However, the cable connection is properly connected and necessary parameters are correctly set during the laser scanner configuration.

This issue may occur when PROFI-safe-based laser scanner(s) is connected.

Consequences

Communication fails to be set up between the laser scanner, PLC, and OmniCore. The safety separation function with the laser scanner cannot be applied.

Possible causes

The firewall for the ProfiNet network is disabled.

Recommended actions

- 1 Open RobotStudio.
- 2 In the **Controller** tab page, choose **Communication** from the **Configuration** group.
- 3 Select **Firewall Manager** in the **Type** pane.
- 4 Set **Enable on Public Network** to **Yes** for the network service **ProfiNet**.

7 Troubleshooting

7.8 Communication failure between PLC and controller

7.8 Communication failure between PLC and controller

Description

The OmniCore controller and PLC are configured with all parameters correctly set. However, the communication between the OmniCore controller and PLC still fails. This issue may occur when the PROFIsafe-based laser scanner(s) is connected.

Consequence

The safety configurations do not take effect.

Possible causes

During configuration of communication between the OmniCore controller and PLC, the PROFIsafe device information must be configured on the OmniCore controller's side first. Otherwise, the configured signals will not be saved in the safety module in the OmniCore controller.

Recommended actions

- 1 Open the RobotStudio.
- 2 In the **Controller** tab page, choose **Visual SafeMove** from **Safety** in the **Configuration** group.
- 3 Check the Safe I/O configurations.

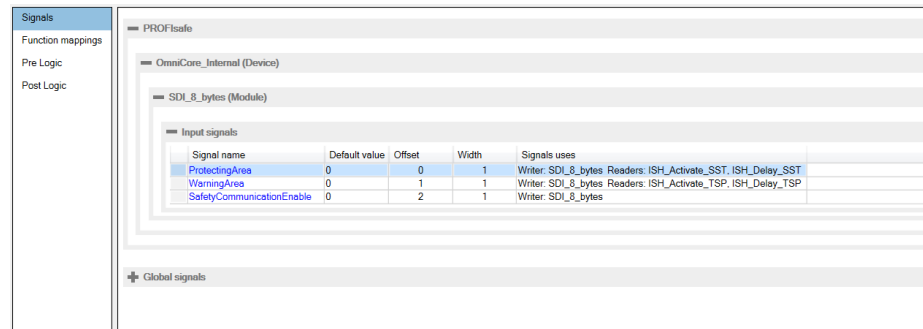
For robots running RobotWare 7.5 or earlier, the following signals can be observed.

Signal name	Default value	Offset	Width	Signals uses
ProtectingArea	0	0	1	Writer: SDI_8_bytes
WarningArea	0	1	1	Writer: SDI_8_bytes
ProtectingAreaSST	0	2	1	Writer: SDI_8_bytes
WarningAreaTSP	0	3	1	Writer: SDI_8_bytes
SafetyCommunicationEnable	0	4	1	Writer: SDI_8_bytes

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Continues on next page

For robots running RobotWare 7.6 or later, the following signals can be observed.



The screenshot shows the PROFIsafe configuration window. On the left, there is a sidebar with 'Signals' selected. The main area displays a tree view of the configuration: PROFIsafe > OmniCore_Internal (Device) > SDI_8_bytes (Module) > Input signals. A table lists the input signals with their properties and uses.

Signal name	Default value	Offset	Width	Signals uses
ProtectingArea	0	0	1	Writer: SDI_8_bytes Readers: ISH_Activate_SST, ISH_Delay_SST
WarningArea	0	1	1	Writer: SDI_8_bytes Readers: ISH_Activate_TSP, ISH_Delay_TSP
SafetyCommunicationEnable	0	2	1	Writer: SDI_8_bytes

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4 If the signals cannot be observed, choose **I/O Engineering Tool** from **Configuration** in the **Configuration** group.

5 Go back to the **Visual SafeMove** window and write the SafeMove configurations to the controller again.

You will observe the signals and the communication is correctly set up.

7 Troubleshooting

7.9 Communication failure between scalable I/O device and controller

7.9 Communication failure between scalable I/O device and controller

Description

The OmniCore controller and scalable I/O device DSQC1042 are configured with all parameters correctly set. However, the communication between the OmniCore controller and scalable I/O device still fails.

This issue may occur when the SafetyIO-based laser scanner(s) is connected.

Consequence

The safety configurations do not take effect.

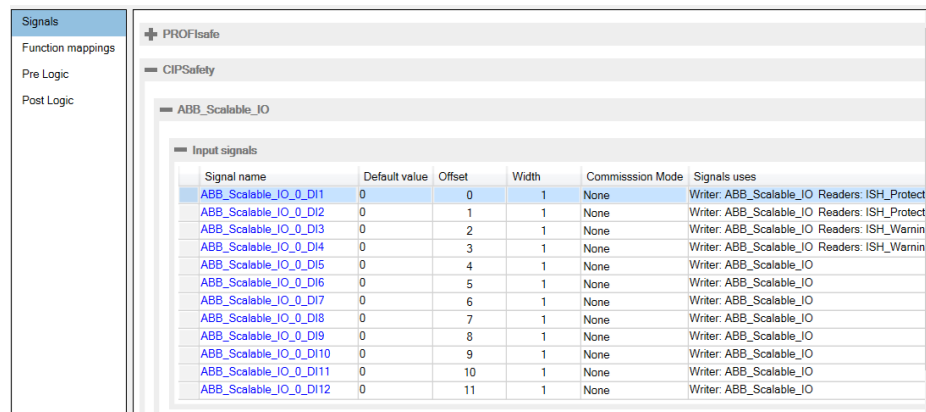
Possible causes

During configuration of communication between the OmniCore controller and scalable I/O device, the scalable I/O device information must be configured on the OmniCore controller's side first. Otherwise, the configured signals will not be saved in the OmniCore controller.

Recommended actions

- 1 Open the RobotStudio.
- 2 In the **Controller** tab page, choose **Visual SafeMove** from **Safety** in the **Configuration** group.
- 3 Check the Safe I/O configurations.

The following signals can be observed.



The screenshot shows the configuration window for the ABB_Scalable_IO device. The 'Input signals' table is expanded, displaying the following data:

Signal name	Default value	Offset	Width	Commission Mode	Signals uses
ABB_Scalable_IO_0_DI1	0	0	1	None	Writer: ABB_Scalable_IO Readers: ISH_Protect
ABB_Scalable_IO_0_DI2	0	1	1	None	Writer: ABB_Scalable_IO Readers: ISH_Protect
ABB_Scalable_IO_0_DI3	0	2	1	None	Writer: ABB_Scalable_IO Readers: ISH_Warmin
ABB_Scalable_IO_0_DI4	0	3	1	None	Writer: ABB_Scalable_IO Readers: ISH_Warmin
ABB_Scalable_IO_0_DI5	0	4	1	None	Writer: ABB_Scalable_IO
ABB_Scalable_IO_0_DI6	0	5	1	None	Writer: ABB_Scalable_IO
ABB_Scalable_IO_0_DI7	0	6	1	None	Writer: ABB_Scalable_IO
ABB_Scalable_IO_0_DI8	0	7	1	None	Writer: ABB_Scalable_IO
ABB_Scalable_IO_0_DI9	0	8	1	None	Writer: ABB_Scalable_IO
ABB_Scalable_IO_0_DI10	0	9	1	None	Writer: ABB_Scalable_IO
ABB_Scalable_IO_0_DI11	0	10	1	None	Writer: ABB_Scalable_IO
ABB_Scalable_IO_0_DI12	0	11	1	None	Writer: ABB_Scalable_IO

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- 4 If the signals cannot be observed, choose **I/O Engineering Tool** from **Configuration** in the **Configuration** group.
- 5 Go back to the **Visual SafeMove** window and write the SafeMove configurations to the controller again.

You will observe the signals and the communication is correctly set up.

7.10 Errors related to stopped background task T_SWIFTI_LED

Description

Execution errors are reported because the background task T_SWIFTI_LED is stopped.

Consequences

Program execution is halted.

Possible causes

The I/O module is changed or reset.

Recommended actions

- 1 Tap I/O in the main page of the FlexPendant.
- 2 Check the device status, whether the **CabinetIO** device with address **192.168.125.100** is in **Not connected** state, and there is another device in **Unknown** state.
- 3 If in previous situation, tap the menu button after the unknown device and tap **Identify** in the list.
Verify whether the unknown device is the I/O module installed on the controller. If yes, the LED blinks on the I/O module.
- 4 Tap **Configure** in the list for the unknown device.
- 5 In the displayed **I/O Modernization** window, choose **Update device** in the **Configuration** area and select **CabinetIO** from the drop-down list.
This will update the unknown device to CabinetIO.
- 6 Tap **Apply**.
- 7 Restart the controller.
The system works normally.

7 Troubleshooting

7.11 Unable to remove or reselect installed options in Collaborative Speed Control add-in

7.11 Unable to remove or reselect installed options in Collaborative Speed Control add-in

Description

The installed lead-through or laser scanner options fail to be removed or reselected in the Collaborative Speed Control add-in using the **Modify Installation** function.

Consequence

- Lamp indicator does not light up after the installed options are reselected.
- Modules of the SpeedHandling function remain in task T_ROB1 after the installed options are removed.
- Existing template SafeMove configuration file is not removed after the installed options are removed or not synchronized with new configuration file for the new option after the installed options are reselected.

Recommended actions

- 1 Reset the template SafeMove configuration file to factory settings and apply it to the controller.
- 2 For scenarios to remove options, de-select the checkboxes of the options that require to be removed in the Collaborative Speed Control add-in and apply it to the controller.
- 3 For scenarios to reselect options, de-select the checkboxes of the options not required first and then select the required options in the Collaborative Speed Control add-in and apply it to the controller.
- 4 Reset the RAPID programs and parameters in RobotStudio and restart the controller.
- 5 Load the template SafeMove configuration file using the SafeMove configurator app on FlexPendant.

7.12 Unexpected robot movement when starting the program in Protecting Area

Description

The robot moves unexpectedly in a speed not larger than 250 mm/sec when the user starts the program in Protecting area, in which situation the robot should be stopped and stand still.

Consequence

The unexpected robot movement may cause damages or injuries to objects or persons within its movement range.

Possible causes

The robot moves in mentioned scenario only when all of the following conditions are met:

- The function ISH_b_FunctionalityUsed in RAPID program InternalSpeedHandling_User is set to TRUE.
- The template SafeMove configuration file provided with the Collaborative Speed Control add-in is not loaded, or is loaded but Global_SST configuration is removed or the ISH_UserMODE_bNot_IntemitCollab is set to 1.
- The system is in Auto mode or Manual Full Speed mode.
- The robot was stopped during running a program, and then manually moved to another position which is within the range of the robot return path.
- The user stands in Protecting area and restarts the program using FlexPendant.

Recommended actions

Reset the template SafeMove configuration file to factory setting and then load the configuration file provided with the Collaborative Speed Control add-in. See detailed procedures in [The SafeMove configurator app on FlexPendant on page 120](#).

7 Troubleshooting

7.13 Program execution stops because no safety configuration template loaded

7.13 Program execution stops because no safety configuration template loaded

Description

The robots installed with the Collaborative Speed Control add-in that provides safety configuration templates for easy use. However, the templates are not loaded after selecting **Enable Edit Mode** and **Use template configuration** in the SafeMove configurator app on FlexPendant.

When executing the program, a message box is displayed, prompting users to load templates from the controller file system.

Consequence

Program execution cannot proceed until a safety configuration template is loaded.

Possible causes

If the robot operating in RW 7.12 with a Collaborative Speed Control add-in earlier than 1.2.1, the safety configuration templates are unavailable in the controller file system for loading.

Recommended actions

- 1 Check the Collaborative Speed Control add-in version and make sure the version 1.2.1 is installed.
- 2 Log in the FlexPendant as a user with safety user grants.
- 3 Open the SafeMove app.
- 4 Tap **Enable Edit Mode**.
- 5 Tap **Load Configuration From File** from the **Context** menu (...).
- 6 Browse templates in the controller file folder:
"*PRODUCTS/CollaborativeSpeedControl/SafeMove/<your robot type>/Templates*" and select the template for your option.
- 7 Tap **OK** and then **Yes** to load the template.
- 8 Tap **Write to controller**.
- 9 Select **Apply to controller** to proceed.

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 718](#).

Transportation

Prepare the robot or parts before transport, this to avoid hazards.

8 Decommissioning

8.2 Environmental information

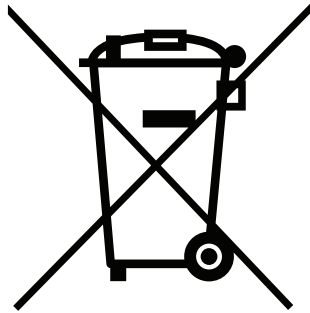
8.2 Environmental information

Introduction

ABB robots contain components in different materials. During decommissioning, all materials should 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.

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).



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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

Continues on next page

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.

8 Decommissioning

8.3 Scrapping of robot

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.

9 Reference information

9.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

9 Reference information

9.2 Applicable standards

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
ISO/TS 15066	Robots and robotic devices - Collaborative robots This Technical Specification specifies safety requirements for collaborative industrial robot systems and the work environment, and supplements the requirements and guidance on collaborative industrial robot operation given in ISO 10218-1 and ISO 10218-2.

Region specific standards and regulations

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-03	Industrial robots and robot Systems - General safety requirements
EN ISO 10218-1	Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots

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	

9 Reference information

9.4 Screw joints

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)	<i>Gleitmo 603 + Geomet 500</i>	3-5 µm
M6-M20 (any length except M20x60)	<i>Gleitmo 603 + Geomet 720</i>	3-5 µm
M20x60	<i>Gleitmo 603 + Geomet 500</i>	8-12 µm
M20x60	<i>Gleitmo 603 + Geomet 720</i>	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.

Continues on next page

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

Continues on next page

9 Reference information

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 Molykote 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 Molykote 1000, Gleitmo 603 or equivalent

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.	

9 Reference information

9.6 Standard toolkit

9.6 Standard toolkit

General

All service (repairs, maintenance, and installation) procedures contains lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the following table.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

Contents, standard toolkit

Qty	Tool	Rem.
1	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 (\varnothing 2.5 mm - \varnothing 10 mm)	
1	Plastic mallet	

9.7 Special tools

General

All service instructions contain lists of tools required to perform the specified activity. The required tools are a sum of standard tools, defined in the section [Standard toolkit on page 728](#), 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 robots Used with protection class IP67. Used for the press-fitting of radial sealings. Includes two sets of radial sealing assembly tool for axes 2 to 3 .
3HAC077885-001	Lifting accessory, robot Includes lifting accessories, lifting beam and screws.

9 Reference information

9.8 Lifting accessories and lifting instructions

9.8 Lifting accessories and lifting instructions

General

Many repair and maintenance activities require different pieces of lifting accessories, which are specified in each procedure.

The use of each piece of lifting accessories is *not* detailed in the activity procedure, but in the instruction delivered with each piece of lifting accessories.

The instructions delivered with the lifting accessories should be stored for later reference.

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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