



Product manual

IRB 910SC

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Overview of this manual

About this manual

This manual contains instructions for:

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

Usage

This manual should be used during:

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

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

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.

Organization of chapters

The manual is organized in the following chapters:

Chapter	Contents
Safety, service	Safety information that must be read through before performing any installation or service work on robot. Contains general safety aspects as well as more specific information on how to avoid personal injuries and damage to the product.
Installation and commissioning	Required information about lifting and installation of the robot.
Maintenance	Step-by-step procedures that describe how to perform maintenance of the robot. Based on a maintenance schedule that may be used to plan periodical maintenance.
Repair	Step-by-step procedures that describe how to perform repair activities of the robot. Based on available spare parts.
Calibration information	Procedures that do not require specific calibration equipment. General information about calibration.
Decommissioning	Environmental information about the robot and its components.
Reference information	Useful information when performing installation, maintenance or repair work. Includes lists of necessary tools, additional documents, safety standards, etc.

Continues on next page

Overview of this manual

Continued

Chapter	Contents
Spare parts and exploded views	Reference to the spare part list for the robot.
Circuit diagram	Reference to the circuit diagram for the robot.

References

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

Document name	Document ID
<i>Product manual, spare parts - IRB 910SC</i>	3HAC056433-001
<i>Product specification - IRB 910SC</i>	3HAC056431-001
<i>Circuit diagram - IRB 910SC</i>	3HAC056159-002
<i>Product manual - IRC5 Compact</i>	3HAC047138-001
<i>Operating manual - IRC5 with FlexPendant</i>	3HAC050941-001
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001
<i>Technical reference manual - System parameters</i>	3HAC050948-001

Revisions

Revision	Description
-	First edition.
A	The following updates are done in this revision: <ul style="list-style-type: none">• Working range of axis 4 has been updated. See Working range on page 60.• The force and torque values under endurance load and maximum load have been updated. See Loads on foundation, robot on page 55.• The interval of lubricating the ball screw spline unit is modified to every 100 km. See Activities and intervals, standard equipment on page 87.• The grease for lubricating the ball screw spline unit is changed from AFB-LF to AFA. See "Required consumables" in Lubricating the ball screw spline unit on page 118 and Replacing the ball screw spline unit on page 229.• The spare part numbers of base and lifting labels have been changed.• The instruction label of lifting the robot has been changed. See Location of labels on page 90.• Washers and locking liquid Loctite 243 are used when refitting the base rear cover and floor cables, and at the same time, the tightening torque of related screws changes from 4.5 Nm to 2 Nm.• The tightening torque of the screws on base bottom cover is added, which is 2 Nm.• A caution reminding not to mix axis-1 and axis-2 drive units has been added in procedures of refitting the drive units.• Screws for fitting the calibration pins of axes 1 and 2 have been removed. See Calibrating axis 1 on page 356 and Calibrating axis 2 on page 361.

Continues on next page

Revision	Description
B	<ul style="list-style-type: none"> • Information about customer connectors has been added. See Customer connections on page 84. • Dimension drawing for fitting the end effector is updated. See Fitting of end effector to the ball screw spline shaft on page 78. • Information about the grease used for lubricating the ball screw spline is updated. • Locking liquid Loctite 243 is not required when refitting the base rear cover and floor cables. • Calibration tools are not provided as a package so that the calibration toolkit is removed. • Fixing calibration block of axes 3 and 4 is fixed to the upper arm so that related repairing procedures are removed. • Minor corrections.
C	<p>Published in release R17.1. The following updates are done in this revision:</p> <ul style="list-style-type: none"> • The spare part number of the lower cover of the upper arm is changed from 3HAC055203-001 to 3HAC060106-001. • Upper and lower axis-3 and axis-4 stop blocks on the ball screw spline unit are added as spare parts. • Unnecessary screws on the lower cover of the upper arm are removed so that related figures are updated. • Every 100 miles column in Maintenance schedule is removed, the maintenance interval of inspecting the timing belt is updated • The Protection class is changed from IP30 to IP20.

Product documentation, IRC5

Categories for user documentation from ABB Robotics

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

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

Product manuals

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

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

Technical reference manuals

The technical reference manuals describe reference information for robotics products.

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

Continues on next page

Application manuals

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

An application manual generally contains information about:

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

Operating manuals

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

The group of manuals includes (among others):

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

How to read the product manual

Reading the procedures

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

Safety information

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

Read more in the chapter [Safety on page 15](#).

Illustrations

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

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

1 Safety

1.1 Introduction to safety information

Overview

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

- General safety aspects, important to attend to before performing any service work on the robot. These are applicable for all service work and are found in [*General safety information on page 16*](#).
- Safety signals and symbols shown in the manual and on the robot, warning for different types of dangers, are found in [*Safety signals and symbols on page 36*](#).
- Specific safety information, pointed out in the procedures. How to avoid and eliminate the danger is either described directly in the procedure, or in specific instructions in the section [*Safety related instructions on page 44*](#).

1 Safety

1.2.1 Introduction to general safety information

1.2 General safety information

1.2.1 Introduction to general safety information

Definitions

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

Sections

The general safety information is divided into the following sections.

Section	Examples of content
<i>Safety in the manipulator system on page 17</i>	This section describes the following: <ul style="list-style-type: none">• safety, service• limitation of liability• related information
<i>Protective stop and emergency stop on page 19</i>	This section describes protective stop and emergency stop.
<i>Safety risks on page 20</i>	This section lists dangers relevant when working with the product. The dangers are split into different categories. <ul style="list-style-type: none">• safety risks during installation or service• risks associated with live electrical parts
<i>Safety actions on page 29</i>	This section describes actions which may be taken to remedy or avoid dangers. <ul style="list-style-type: none">• fire extinguishing• safe use of the teach pendant or jogging device

1.2.2 Safety in the manipulator system

Validity and responsibility

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

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

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

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

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

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

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

Connection of external safety devices

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

Limitation of liability

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

Related information

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

Continues on next page

1 Safety

1.2.2 Safety in the manipulator system

Continued

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

1.2.3 Protective stop and emergency stop

Overview

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

1 Safety

1.2.4.1 Safety risks during installation and service work on robots

1.2.4 Safety risks

1.2.4.1 Safety risks during installation and service work on robots

Overview

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

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

General risks during installation and service

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

Spare parts and special equipment

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

Personal protective equipment

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

Nation/region specific regulations

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

Non-voltage related risks

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

Continues on next page

1.2.4.1 Safety risks during installation and service work on robots

Continued

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

To be observed by the supplier of the complete system

When integrating the robot with external devices and machines:

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

Complete robot

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

Continues on next page

1 Safety

1.2.4.1 Safety risks during installation and service work on robots

Continued

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

Cabling

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

Gearboxes and motors

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

1.2.4.2 CAUTION - Hot parts may cause burns!

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

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

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

Elimination

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

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

1 Safety

1.2.4.3 Safety risks related to tools/work pieces

1.2.4.3 Safety risks related to tools/work pieces

Safe handling

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

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

Safe design

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

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



CAUTION

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

1.2.4.4 Safety risks related to pneumatic/hydraulic systems

General

Special safety regulations apply to pneumatic and hydraulic systems.



Note

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

Residual energy

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

Safe design

- Gravity may cause any parts or objects held by these systems to drop.
- Dump valves should be used in case of emergency.
- Shot bolts should be used to prevent tools, etc., from falling due to gravity.

1 Safety

1.2.4.5 Safety risks during operational disturbances

General

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

Qualified personnel

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

Extraordinary risks

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

1.2.4.6 Risks associated with live electric parts

Voltage related risks, general

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

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

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

All work must be performed:

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

Voltage related risks, IRC5 controller

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

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

Continues on next page

1 Safety

1.2.4.6 Risks associated with live electric parts

Continued

Voltage related risks, robot

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

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

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

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

1.2.5 Safety actions

1.2.5.1 Safety fence dimensions

General

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

Dimensioning

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

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

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

1 Safety

1.2.5.2 Fire extinguishing



Note

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

1.2.5.3 Emergency release of the robot arm

Description

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

How to release the brakes is detailed in the section:

- [Manually releasing the brakes on page 71](#).

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

Increased injury

Before releasing the brakes, make sure that the weight of the arms does not increase the pressure on the trapped person, further increasing any injury!



DANGER

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

Make sure no personnel is near or beneath the robot arm.

1 Safety

1.2.5.4 Brake testing

1.2.5.4 Brake testing

When to test

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

How to test

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

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

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

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



Note

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

1 Safety

1.2.5.6 Safe use of the jogging device

1.2.5.6 Safe use of the jogging device

Three-position enabling device

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

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



Note

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

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

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

Hold-to-run function

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

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

Delay circuit

IRB 910SC has an inherent delay circuit to enhance the lifetime of speed reducers. This circuit allows an extended time period for soft stop by enabling a delay of about 0.5 s before motor brakes are engaged, e.g. when the hold-to-run button is released or emergency stop is pressed. During this period, the robot axes 1 and 2 may continue their movement until they are stopped by the motor or eventually by brakes. Make sure the robot working area is free from collisions, even during manual operations. Note that this delay does not apply to axes 3 and 4.

For more details regarding braking distances, see *Product specification - IRB 910SC*.

1.2.5.7 Work inside the working range of the robot



WARNING

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

- The operating mode selector on the controller must be in the manual mode position to render the three-position enabling device operational and to block operation from a computer link or remote control panel.
- The maximum speed of the robot is limited to 250 mm/s when the operating mode selector is in the position *Manual mode with reduced speed*. This should be the normal position when entering the working space.
The position *Manual mode with full speed (100%)* may only be used by trained personnel who are aware of the risks that this entails. *Manual mode with full speed (100%)* is not available in USA or Canada.
- Pay attention to the rotating axes of the robot. Keep away from axes to not get entangled with hair or clothing. Also, be aware of any danger that may be caused by rotating tools or other devices mounted on the robot or inside the cell.
- Test the motor brake on each axis, according to the section [Brake testing on page 32](#).
- To prevent anyone else from taking control of the robot, always put a safety lock on the cell door and bring the three-position enabling device with you when entering the working space.



WARNING

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

1 Safety

1.3.1 Safety signals in the manual

1.3 Safety signals and symbols

1.3.1 Safety signals in the manual

Introduction to safety signals

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

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

Danger levels

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

Symbol	Designation	Significance
 xx0200000022	DANGER	Warns that an accident <i>will</i> occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, and so on.
 xx0100000002	WARNING	Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
 xx0200000024	ELECTRICAL SHOCK	Warns for electrical hazards which could result in severe personal injury or death.
 xx0100000003	CAUTION	Warns that an accident 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.
 xx0200000023	ELECTROSTATIC DISCHARGE (ESD)	Warns for electrostatic hazards which could result in severe damage to the product.

Continues on next page

1.3.1 Safety signals in the manual

Continued

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

1 Safety

1.3.2 Safety symbols on product labels

1.3.2 Safety symbols on product labels

Introduction to labels

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

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



Note

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

Types of labels

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

The safety labels are language independent, they only use graphics. See [Symbols on safety labels on page 38](#).

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

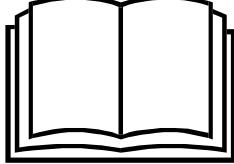
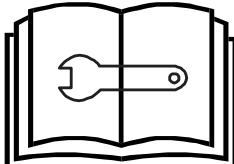
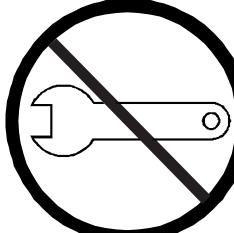
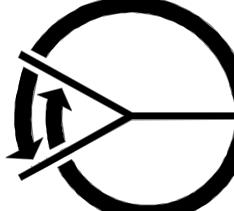
Symbols on safety labels

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.

Continues on next page

1.3.2 Safety symbols on product labels

Continued

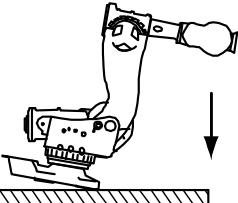
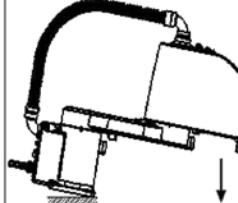
Symbol	Description
 xx0900000813	See user documentation Read user documentation for details. Which manual to read is defined by the symbol: <ul style="list-style-type: none"> • No text: <i>Product manual</i>. • EPS: <i>Application manual - Electronic Position Switches</i>.
 xx0900000816	Before disassemble,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

Continues on next page

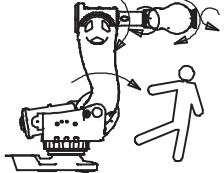
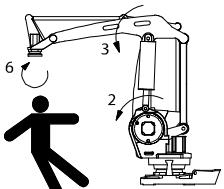
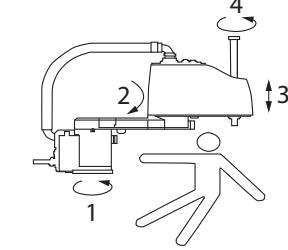
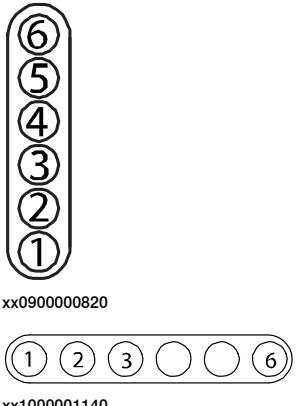
1 Safety

1.3.2 Safety symbols on product labels

Continued

Symbol	Description
 xx0900000810	Tip risk when loosening bolts The robot can tip over if the bolts are not securely fastened.
  3HAC 057068-001 xx1500002402	
  xx0900000817	Crush Risk of crush injuries.
 xx0900000818	Heat Risk of heat that can cause burns.

Continues on next page

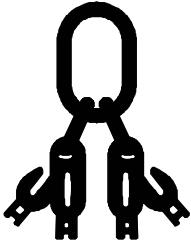
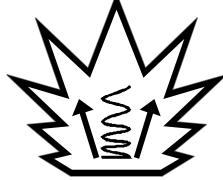
Symbol	Description
 xx0900000819	Moving robot The robot can move unexpectedly.
 xx1000001141	
 xx1500002616	
 xx0900000820 xx1000001140	Brake release buttons
 xx0900000821	Lifting bolt

Continues on next page

1 Safety

1.3.2 Safety symbols on product labels

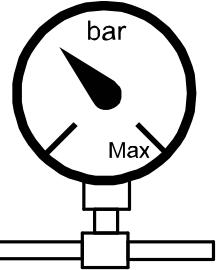
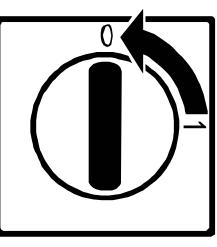
Continued

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

Continues on next page

1.3.2 Safety symbols on product labels

Continued

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

1 Safety

1.4.1 DANGER - Moving robots are potentially lethal!

1.4 Safety related instructions

1.4.1 DANGER - Moving robots are potentially lethal!

Description

Any moving robot is a potentially lethal machine.

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

Elimination

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

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

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

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

Elimination

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

**DANGER**

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

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

Collision risks**CAUTION**

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

1 Safety

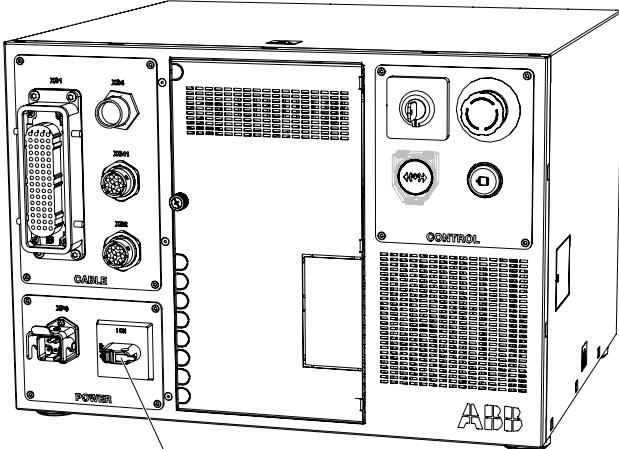
1.4.3 DANGER - Make sure that the main power has been switched off!

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

Description

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

Elimination, IRC5 Compact Controller

Action	Note/illustration
1 Switch off the main power switch on the controller cabinet.	<p>Note that the position of the main switch can vary depending on the year model.</p>  <p>xx0900000313</p> <p>A: Main power switch</p>
2 Disconnect the input power cable from the wall socket.	

1.4.4 WARNING - The unit is sensitive to ESD!

Description

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

Elimination

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

Continues on next page

1 Safety

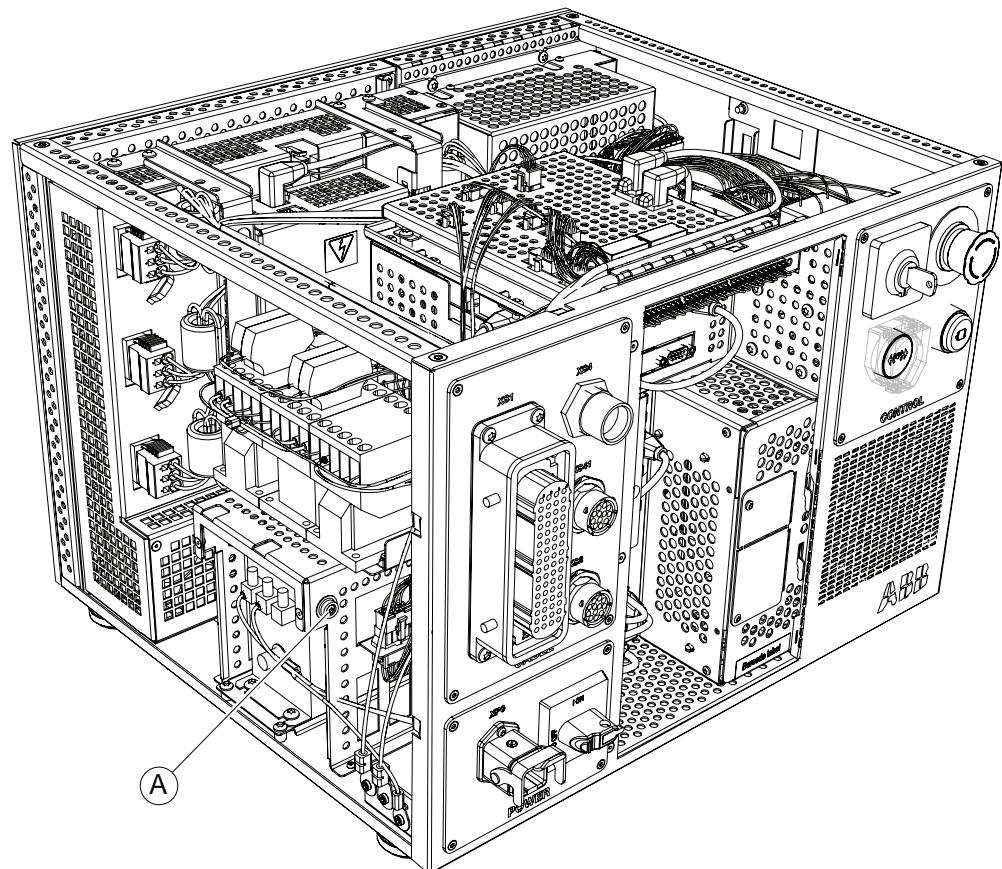
1.4.4 WARNING - The unit is sensitive to ESD!

Continued

Location of wrist strap button

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

IRC5 Compact Controller



xx1400001622

A	Wrist strap button
---	--------------------

1.4.5 WARNING - Safety risks during handling of batteries

Description

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

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



Note

Appropriate disposal regulations must be observed.

Elimination

	Action	Note
1	Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion.	Operating temperatures are listed in Pre-installation procedure on page 54 .
2	Use safety glasses when handling the batteries.	
3	In the event of leakage, wear gloves and chemical apron.	
4	In the event of fire, use self-contained breathing apparatus.	

1 Safety

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

Description

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



Note

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



Note

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



Note

Appropriate disposal regulations must be observed.



Note

Take special care when handling hot lubricants.

Warnings and elimination

Warning	Description	Elimination/Action
 xx0100000002 Hot oil or grease	Changing and draining gearbox oil or grease may require handling hot lubricant heated up to 90 °C.	Make sure that protective gear like goggles and gloves are always worn during this activity.
 xx0100000002 Allergic reaction	When working with gearbox lubricant there is a risk of an allergic reaction.	Make sure that protective gear like goggles and gloves are always worn.
 xx0100000002 Possible pressure build-up in gearbox	When opening the oil or grease plug, there may be pressure present in the gearbox, causing lubricant to spray from the opening.	Open the plug carefully and keep away from the opening. Do not overfill the gearbox when filling.

Continues on next page

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

Continued

Warning	Description	Elimination/Action
 xx0100000002 Do not overfill	<p>Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may:</p> <ul style="list-style-type: none"> • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely. 	<p>Make sure not to overfill the gearbox when filling it with oil or grease!</p> <p>After filling, verify that the level is correct.</p>
 xx0100000004 Specified amount depends on drained volume	<p>The specified amount of oil or grease is based on the total volume of the gearbox. When changing the lubricant, the amount refilled may differ from the specified amount, depending on how much has previously been drained from the gearbox.</p>	<p>After filling, verify that the level is correct.</p>
 xx0100000003 Contaminated oil in gear boxes	<p>When draining the oil make sure that as much oil as possible is drained from the gearbox. The reason for this is to drain as much oil sludge and metal chips as possible from the gearbox. The magnetic oil plugs will take care of any remaining metal chips.</p>	

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2 Installation and commissioning

2.1 Introduction

General

This chapter contains assembly instructions and information for installing the IRB 910SC at the working site.

More detailed technical data can be found in the *Product specification* for the IRB 910SC, such as:

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

Safety information

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

There are general safety aspects that must be read through, as well as more specific safety information that describes the danger and safety risks when performing the procedures. Read the chapter [Safety on page 15](#) before performing any installation work.



Note

If the IRB 910SC is connected to power, always make sure that the robot is connected to *protective earth* before starting any installation work!

For more information see:

- *Product manual - IRC5*
- *Product manual - IRC5 Compact*

2 Installation and commissioning

2.2.1 Pre-installation procedure

2.2 Unpacking

2.2.1 Pre-installation procedure

Introduction

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

Prerequisites for installation personnel

Installation personnel working with an ABB product must:

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

Checking the pre-requisites for installation

	Action
1	Make a visual inspection of the packaging and make sure that nothing is damaged.
2	Remove the packaging.
3	Check for any visible transport damage.  Note Stop unpacking and contact ABB if transport damages are found.
4	Clean the unit with a lint-free cloth, if necessary.
5	Make sure that the lifting accessory used is suitable to handle the weight of the robot as specified in: Weight, robot on page 55
6	If the robot is not installed directly, it must be stored as described in: Storage conditions, robot on page 56
7	Make sure that the expected operating environment of the robot conforms to the specifications as described in: Operating conditions, robot on page 56
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 55• Protection classes, robot on page 56• Requirements, foundation on page 56
9	Before moving the robot, please observe the stability of the robot: Risk of tipping/stability on page 61
10	When these prerequisites are met, the robot can be taken to its installation site as described in section: On-site installation on page 63
11	Install required equipment, if any.

Continues on next page

Weight, robot

The table shows the weight of the robot.

Robot model	Weight
IRB 910SC	IRB 910SC-3/0.45: 24.5 kg IRB 910SC-3/0.55: 25 kg IRB 910SC-3/0.65: 25.5 kg

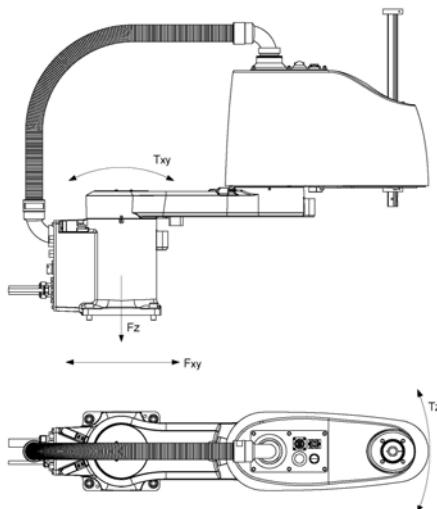


Note

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

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.



xx1500002522

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

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



Note

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

Continues on next page

2 Installation and commissioning

2.2.1 Pre-installation procedure

Continued

Floor mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±651 N	±945 N
Force z	255±392 N	255±441 N
Torque xy	±260 Nm	±418 Nm
Torque z	±121 Nm	±238 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.
Maximum tilt	0°	
Minimum resonance frequency	22 Hz	

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

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

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	5°C ⁱ
Maximum ambient temperature	45°C
Maximum ambient humidity	95% at constant temperature

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

Protection classes, robot

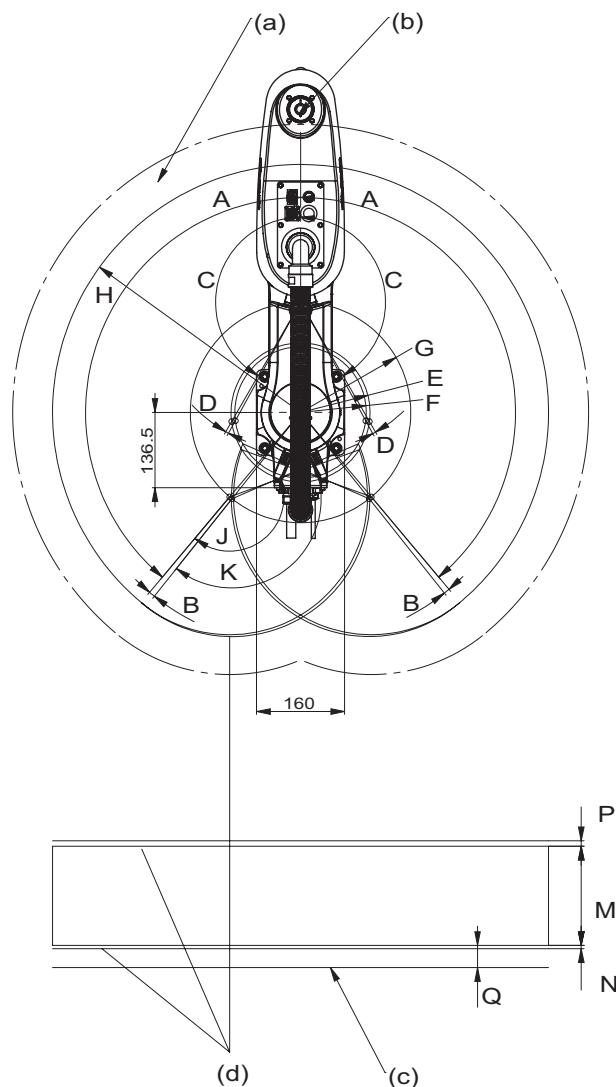
The table shows the available protection types of the robot, with the corresponding protection class.

Protection type	Protection class
Manipulator, protection type Standard	IP20

2.2.2 Working range

Illustration, working range and turning radius IRB 910SC-3/0.45

This illustration shows the unrestricted working range and turning radius of IRB 910SC-3/0.45.



xx1500002474

a	Maximum space	F	119 mm
b	Center joint of axis 3	G	200 mm
c	Base mounting face	H	450 mm
d	Area limited by mechanical stop	J	150°
A	140°	K	151.2°
B	1.5°	M	180 mm
C	150°	N	5 mm

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2 Installation and commissioning

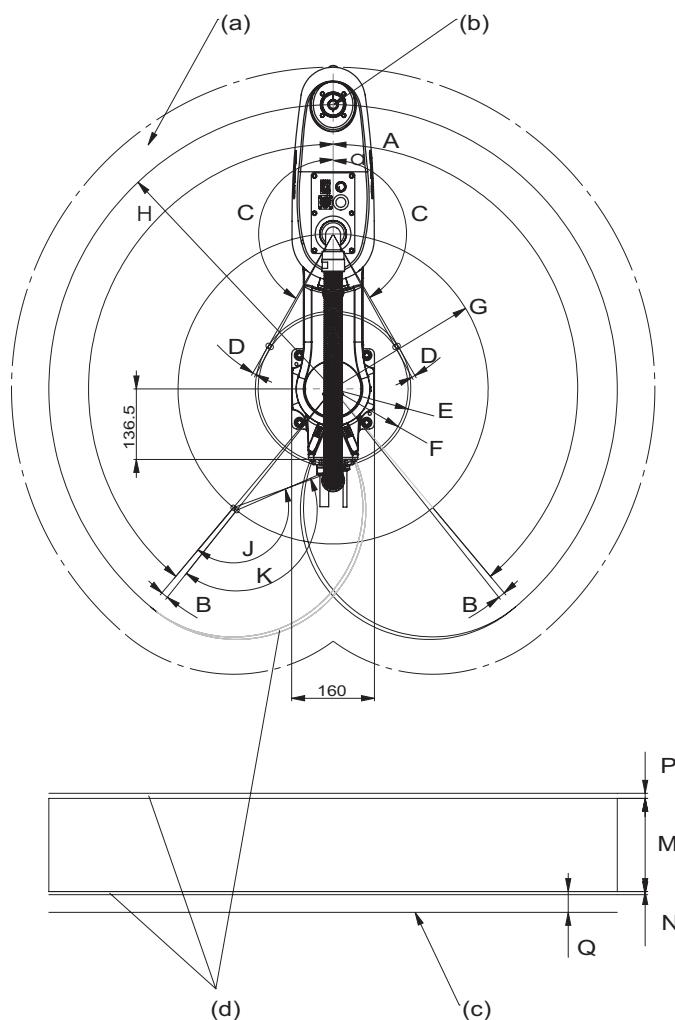
2.2.2 Working range

Continued

D	1.2°	P	2 mm
E	126 mm	Q	40.2 mm

Illustration, working range and turning radius IRB 910SC-3/0.55

This illustration shows the unrestricted working range and turning radius of IRB 910SC-3/0.55.



xx1500002475

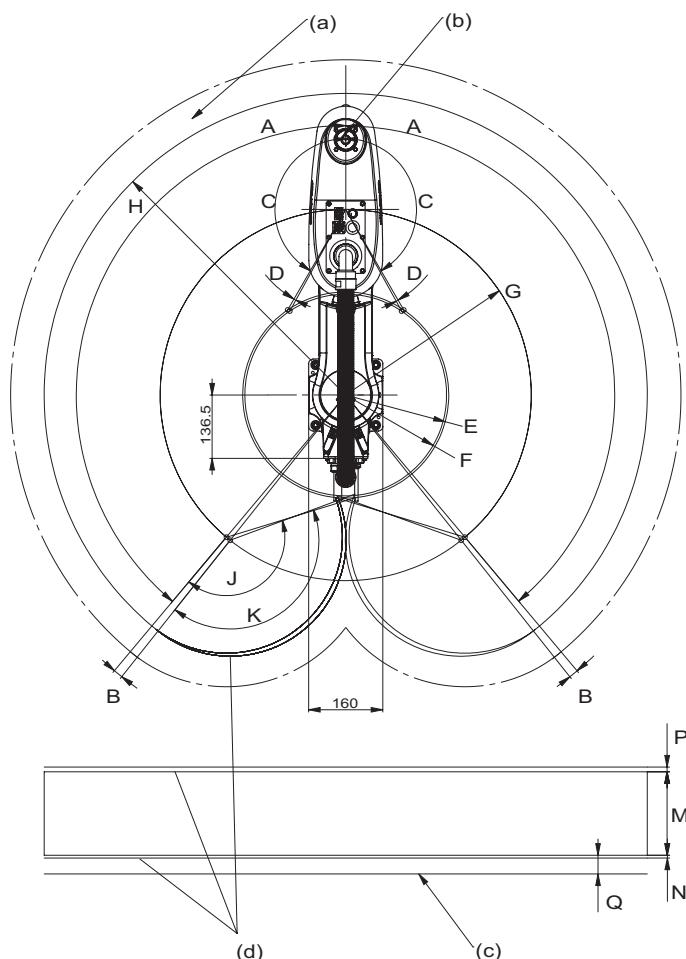
a	Maximum space	F	145 mm
b	Center joint of axis 3	G	300 mm
c	Base mounting face	H	550 mm
d	Area limited by mechanical stop	J	150°
A	140°	K	151.2°
B	1.5°	M	180 mm
C	150°	N	5 mm
D	1.2°	P	2 mm

Continues on next page

E	150 mm	Q	40.2 mm
---	--------	---	---------

Illustration, working range and turning radius IRB 910SC-3/0.65

This illustration shows the unrestricted working range and turning radius of IRB 910SC-3/0.65.



xx1500002476

a	Maximum space	F	217 mm
b	Center joint of axis 3	G	400 mm
c	Base mounting face	H	650 mm
d	Area limited by mechanical stop	J	150°
A	140°	K	151.2°
B	1.5°	M	180 mm
C	150°	N	5 mm
D	1.2°	P	2 mm
E	222 mm	Q	40.2 mm

Continues on next page

2 Installation and commissioning

2.2.2 Working range

Continued

Working range

Axis	Type of motion	Working range
Axis 1	Rotation motion	-140° to +140°
Axis 2	Rotation motion	-150° to +150° ⁱ
Axis 3	Linear motion	-180 mm to 0 mm
Axis 4	Rotation motion	Default: -400° to +400° Maximum revolutions: -864 to +864 ⁱⁱ

- i The axis 2 can be restricted to a smaller working range by fitting one more axis-2 mechanical stop block to the upper arm. For how to fit the block, see [Replacing the axis-2 mechanical stop block on page 271](#).
- ii The additional mechanical stop block and related screws are provided in accessory package.
- ii The default working range for axis 4 can be extended by changing parameter values in the software. Option 610-1 Independent axis can be used for resetting the revolution counter after the axis has been rotated (no need for "rewinding" the axis).

2.2.3 Risk of tipping/stability

Risk of tipping

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

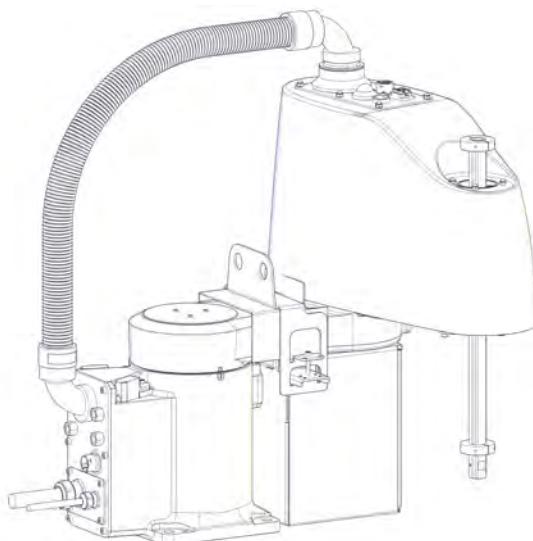
The shipping position is the most stable position.

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

Shipping and transportation position

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

IRB 910SC-3/0.45



xx1500002487

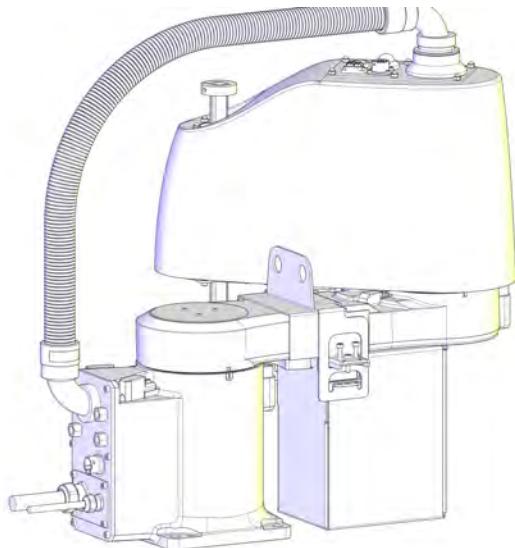
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2 Installation and commissioning

2.2.3 Risk of tipping/stability

Continued

IRB 910SC-3/0.55 and IRB 910SC-3/0.65



xx1500002492



WARNING

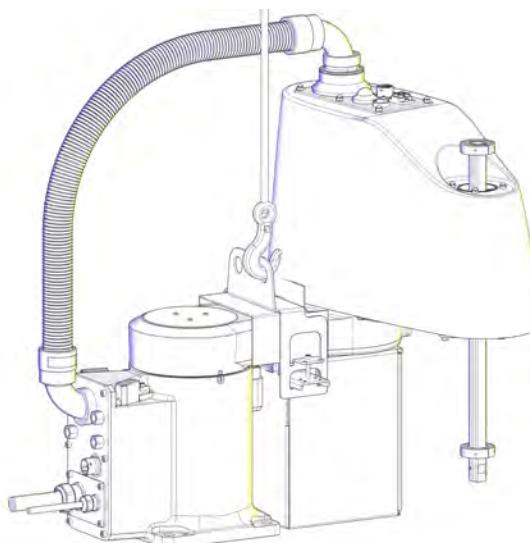
The robot is likely to be mechanically unstable if not secured to the foundation.

2.3 On-site installation

2.3.1 Lifting robot with lifting accessories

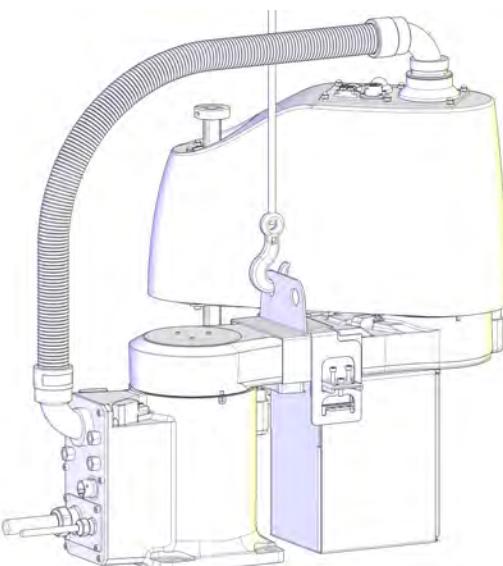
Introduction

IRB 910SC-3/0.45



xx1500002472

IRB 910SC-3/0.55 and IRB 910SC-3/0.65



xx1500002473

Required equipment

Equipment	Article number	Note
Overhead crane	-	

Continues on next page

2 Installation and commissioning

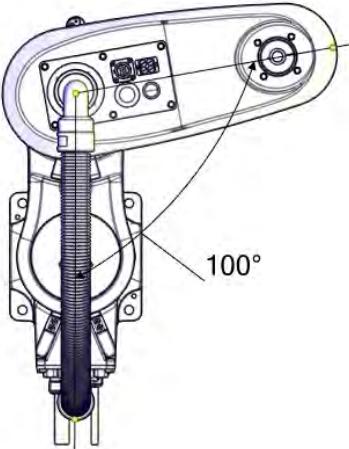
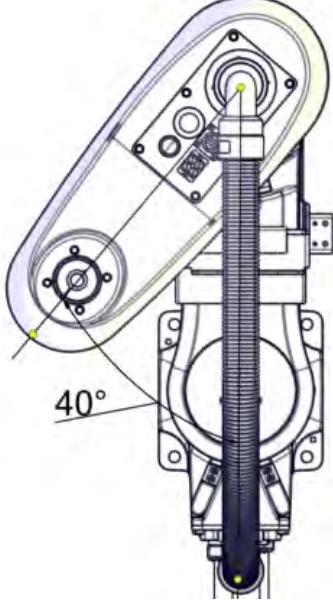
2.3.1 Lifting robot with lifting accessories

Continued

Equipment	Article number	Note
Lifting chain	-	> 50 kg (capacity of lifting chain)
Hook	-	
Lifting accessory, robot	-	Includes lifting accessories and screws.

Lifting the robot

Use this procedure to lift the robot.

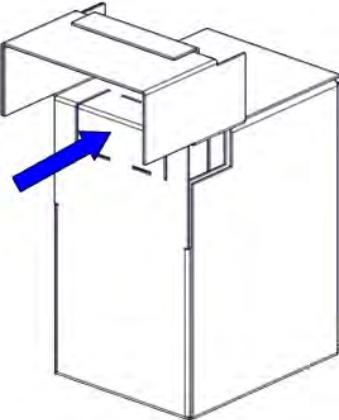
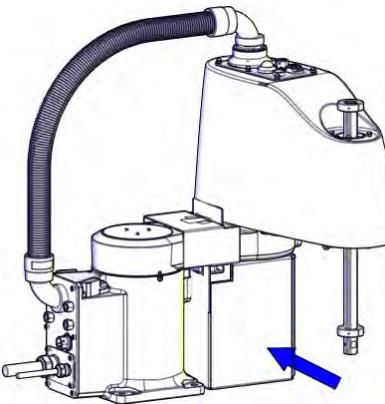
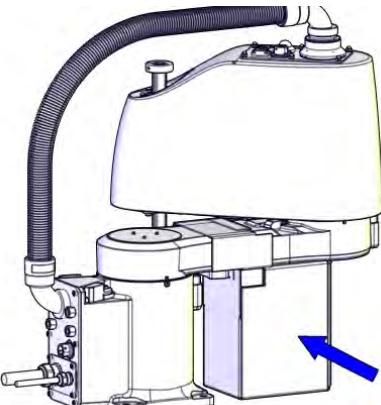
	Action	Note
1	<p>Move the robot to the appropriate lifting position.</p> <p>WARNING</p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p>	<p>Valid for IRB 910SC-3/0.45</p>  <p>xx1500002483</p> <p>Valid for IRB 910SC-3/0.55 and IRB 910SC-3/0.65</p>  <p>xx1500002488</p>

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2 Installation and commissioning

2.3.1 Lifting robot with lifting accessories

Continued

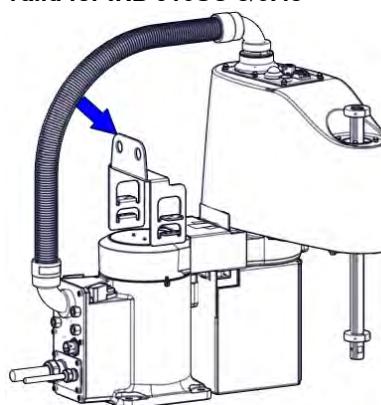
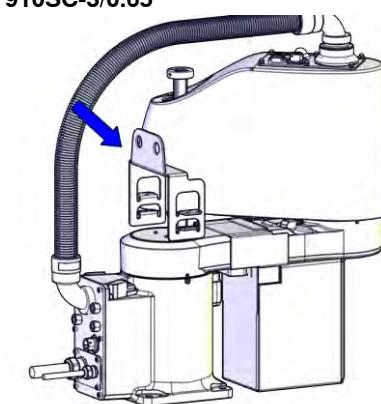
	Action	Note
2	<p>Fold the lifting paper box to the required shape and put it to the proper position under the lower arm.</p>  <p>xx1500002493</p> <p>Note</p> <p>For the IRB 910SC-3/0.45, fold the part pointing out in the figure along the folding mark so that a space will be left for the axis-1 mechanical stop block.</p>	<p>Valid for IRB 910SC-3/0.45</p>  <p>xx1500002484</p> <p>Valid for IRB 910SC-3/0.55 and IRB 910SC-3/0.65</p>  <p>xx1500002489</p>

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2 Installation and commissioning

2.3.1 Lifting robot with lifting accessories

Continued

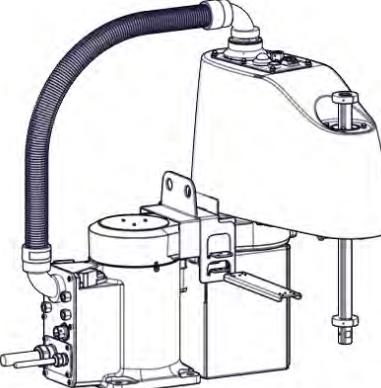
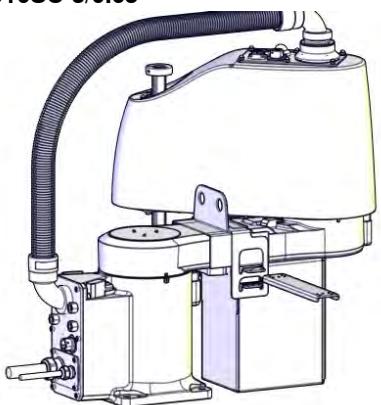
Action	Note
3 Fit the lifting bracket.	<p>Valid for IRB 910SC-3/0.45</p>  <p>xx1500002485</p> <p>Valid for IRB 910SC-3/0.55 and IRB 910SC-3/0.65</p>  <p>xx1500002490</p>

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2 Installation and commissioning

2.3.1 Lifting robot with lifting accessories

Continued

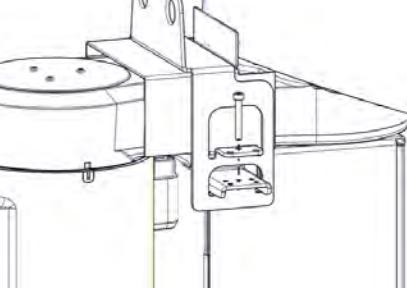
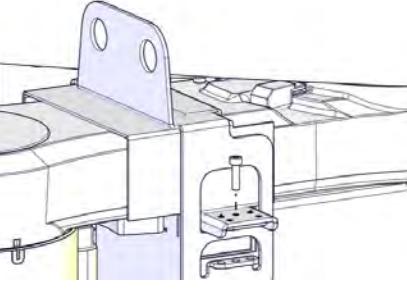
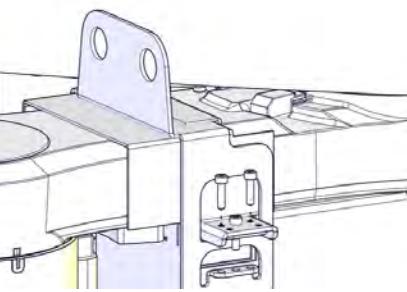
Action	Note
4 Insert the metal plate through the bracket and the paper box.  Note IRB 910SC-3/0.45: Use lower lug on the bracket. IRB 910SC-3/0.55 and IRB 910SC-3/0.65: Use upper lug on the bracket.	Valid for IRB 910SC-3/0.45  xx1500002771 Valid for IRB 910SC-3/0.55 and IRB 910SC-3/0.65  xx1500002772

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2 Installation and commissioning

2.3.1 Lifting robot with lifting accessories

Continued

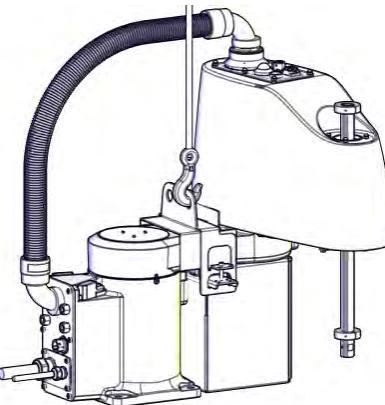
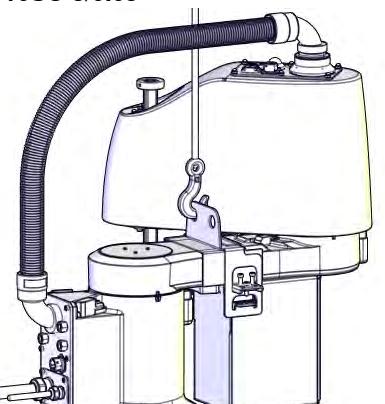
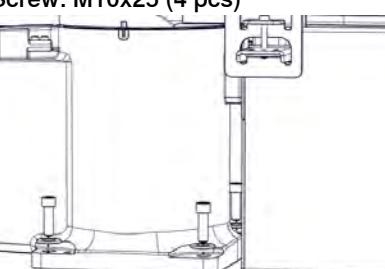
Action	Note
5 Secure the metal plate with screw(s). IRB 910SC-3/0.45: One screw at each side. IRB 910SC-3/0.55 and IRB 910SC-3/0.65: One screw at one side only.	Valid for IRB 910SC-3/0.45  xx1500002486 Screw: M4x30 (2 pcs) Tightening torque: 0.3-0.4 Nm Valid for IRB 910SC-3/0.55 and IRB 910SC-3/0.65  xx1500003067 Screw: M4x12 (1 pcs) Tightening torque: 0.2-0.3 Nm
6 For IRB 910SC-3/0.55 and IRB 910SC-3/0.65 Fasten two screws at each side to clamp the metal plate and the bracket.	Screw: M4x12 (4 pcs) Tightening torque: 0.2-0.3 Nm  xx1500002491
7  CAUTION The IRB 910SC robot weighs 25.5 kg at a maximum. All lifting accessories used must be sized accordingly!	
8  WARNING Personnel must not, under any circumstances, be present under the suspended load!	

Continues on next page

2 Installation and commissioning

2.3.1 Lifting robot with lifting accessories

Continued

Action	Note
9 Attach the lifting chain to the robot.	<p>Lifting capacity for the lifting chain is specified in Required equipment on page 63.</p> <p>Valid for IRB 910SC-3/0.45</p>  <p>xx1500002495</p>
	<p>Valid for IRB 910SC-3/0.55 and IRB 910SC-3/0.65</p>  <p>xx1500002494</p>
10 Carefully stretch the chain by lifting the crane slowly. This prevents the robot from falling down when it is unfastened or the support is removed. Do not overstretch the chain if the robot is fastened because there is a risk of the robot being damaged.	
11 Remove the robot attachment screws (if the robot is fastened).	<p>Screw: M10x25 (4 pcs)</p>  <p>xx1500002773</p>

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2 Installation and commissioning

2.3.1 Lifting robot with lifting accessories

Continued

	Action	Note
12	Raise the overhead crane to lift the robot.	

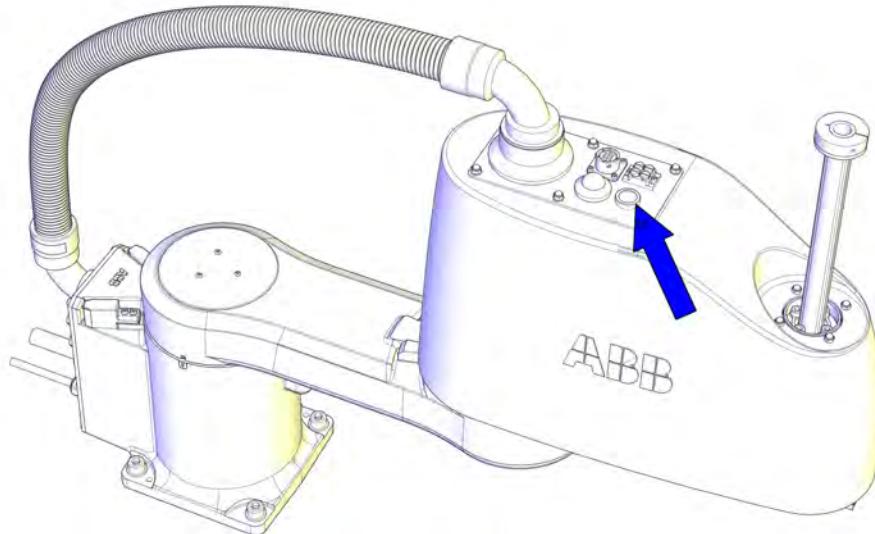
2.3.2 Manually releasing the brakes

Introduction to manually releasing the brakes

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

Location of brake release unit

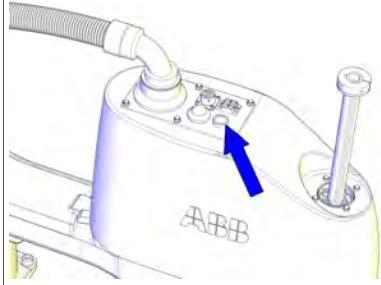
The internal brake release unit is located as shown in the figure.



xx1500002173

Releasing the brakes

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

	Action	Note
1	The internal brake release unit is equipped with a button for controlling the axes brakes. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to the section Supplying power to connector R1.MP on page 72 .	 xx1500002774

Continues on next page

2 Installation and commissioning

2.3.2 Manually releasing the brakes

Continued

Action	Note
<p>2</p> <p> DANGER</p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!</p> <p>Make sure the payload is disassembled or tooling is properly supported; otherwise, fast downward movements of axis 3 may cause severe hits.</p>	
<p>3</p> <p>Release the holding brake on all robot axes by pressing the button on the internal brake release unit.</p> <p>The brake will function again as soon as the button is released.</p>	

Supplying power to connector R1.MP

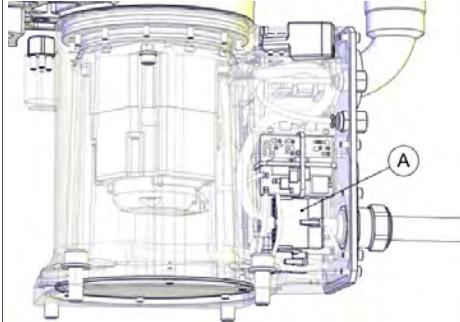
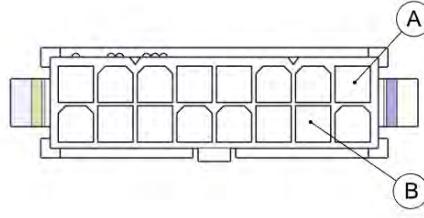
If the robot is not connected to the controller, power must be supplied to connector R1.MP on the robot in order to enable the brake release buttons.

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

Continues on next page

2.3.2 Manually releasing the brakes

Continued

Action	Note						
<p>2 Supply +24V on pin 15 and 0V on pin 8.</p> <p> Note</p> <p>Do not interchange the 24V and 0V pins. If they are mixed up, damage can be caused to the brake release unit and to the system board.</p>	 <p>xx1500002477</p> <table border="1"> <tr> <td>A</td> <td>R1.MP</td> </tr> </table>  <p>xx1500002478</p> <table border="1"> <tr> <td>A</td> <td>0V (8)</td> </tr> <tr> <td>B</td> <td>+24V (15)</td> </tr> </table>	A	R1.MP	A	0V (8)	B	+24V (15)
A	R1.MP						
A	0V (8)						
B	+24V (15)						

2 Installation and commissioning

2.3.3 Orienting and securing the robot

2.3.3 Orienting and securing the robot

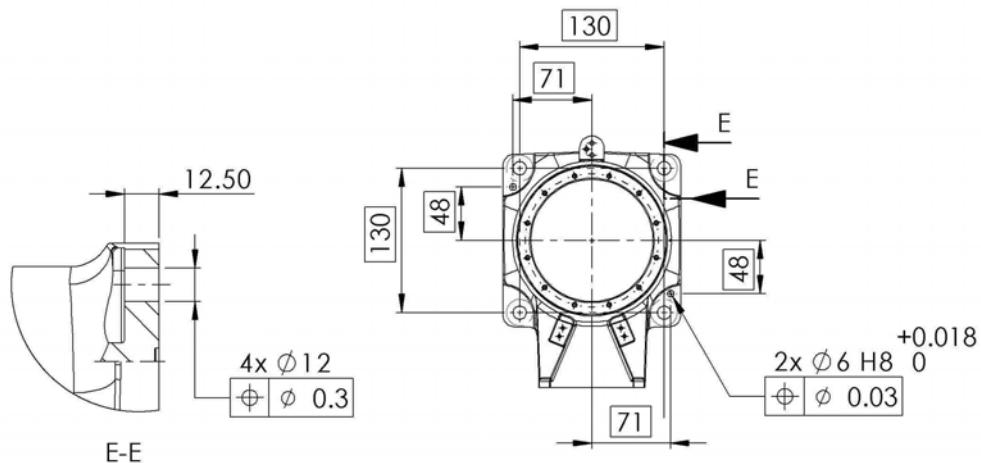
Introduction

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

- [Loads on foundation, robot on page 55](#)
- [Requirements, foundation on page 56.](#)

Hole configuration, base

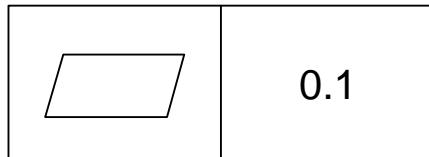
The illustration shows the hole configuration used when securing the robot.



xx1500002521

Specification, attachment screws and pins

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

Suitable screws	M10x25
Quantity	4 pcs
Quality	8.8
Suitable washer	20x10.5x2
Guide pins	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
Tightening torque	45 Nm
Level surface requirements	 0.1
	xx1500000627

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Orienting and securing the robot

Use this procedure to orient and secure the robot.

	Action	Information
1	Make sure the installation site for the robot conforms to the specifications in section: <ul style="list-style-type: none">• Pre-installation procedure on page 54.	
2	Prepare the installation site with attachment holes.	The hole configuration of the base is shown in the figure in Hole configuration, base on page 74.
3	 CAUTION The IRB 910SC robot weighs 25.5 kg at a maximum. All lifting accessories used must be sized accordingly!	
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 to its installation site.	See Lifting robot with lifting accessories on page 63.
6	Fit two pins to the holes in the base.	2 pcs, D6x20, ISO 2338 - 6m6x20 - 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: M10x25, quality: 8.8
9	Tighten the bolts in a criss-cross pattern to ensure that the base is not distorted.	Tightening torque: 45 Nm

Securing robot on a mounting plate

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

Screw joints must be able to withstand the stress loads defined in section [Loads on foundation, robot on page 55.](#)

2 Installation and commissioning

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

General

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



CAUTION

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

References

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

- *Operating manual - IRC5 with FlexPendant*

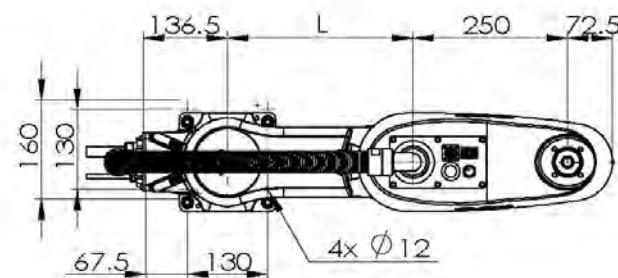
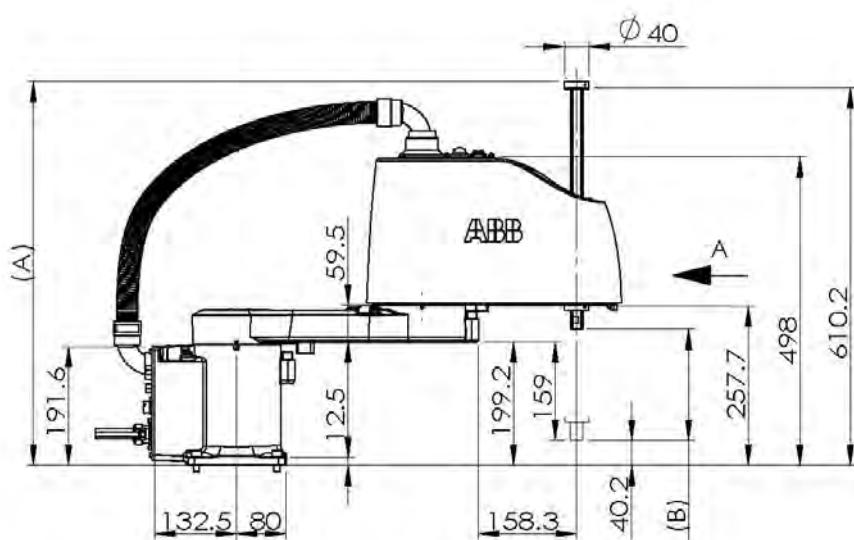
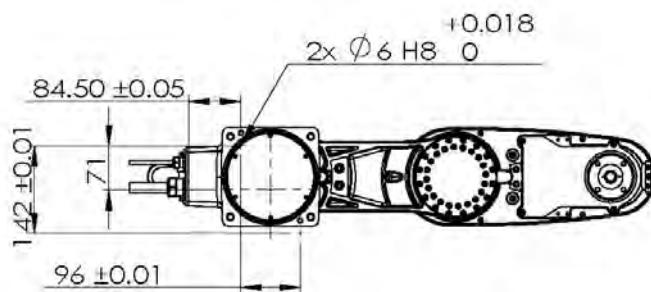
Stopping time and braking distances

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

2.3.5 Fitting equipment on the robot (robot dimensions)

Robot dimensions

The figure shows the dimension of the robot.



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2 Installation and commissioning

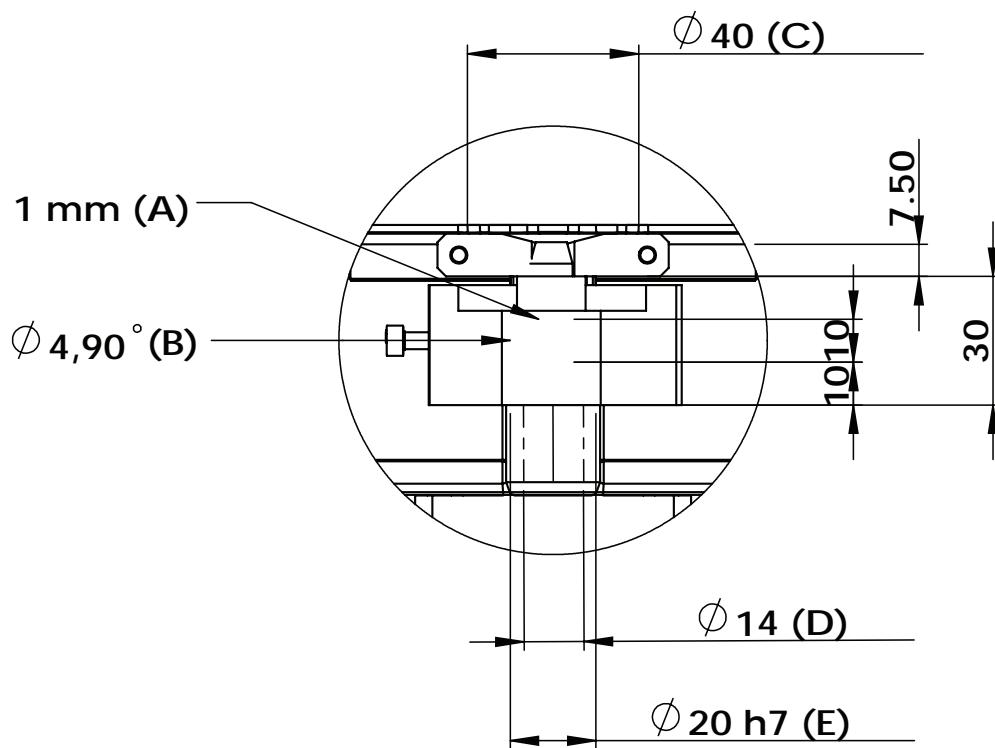
2.3.5 Fitting equipment on the robot (robot dimensions)

Continued

Item	Description	Variant		
		IRB 910SC-3/0.45	IRB 910SC-3/0.55	IRB 910SC-3/0.65
L	Length of lower arm	200 mm	300 mm	400 mm
A	Maximum height	620 mm	620 mm	620 mm
B	Z stroke	180 mm	180 mm	180 mm

Fitting of end effector to the ball screw spline shaft

An end effector can be attached to the lower end of the shaft of the ball screw spline unit. The dimensions for fitting the end effector is shown in the following figure.



xx1500002523

A	Flat cut
B	Conical hole
C	Stop block diameter
D	Through hole
E	Shaft diameter

2.4 Restricting the working range

2.4.1 Axes with restricted working range

General

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

The working range of the following axes may be restricted:

- Axis 1, hardware (mechanical stop)
- Axis 2, hardware (mechanical stop)
- Axes 3 and 4, hardware (stop block)

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



Note

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

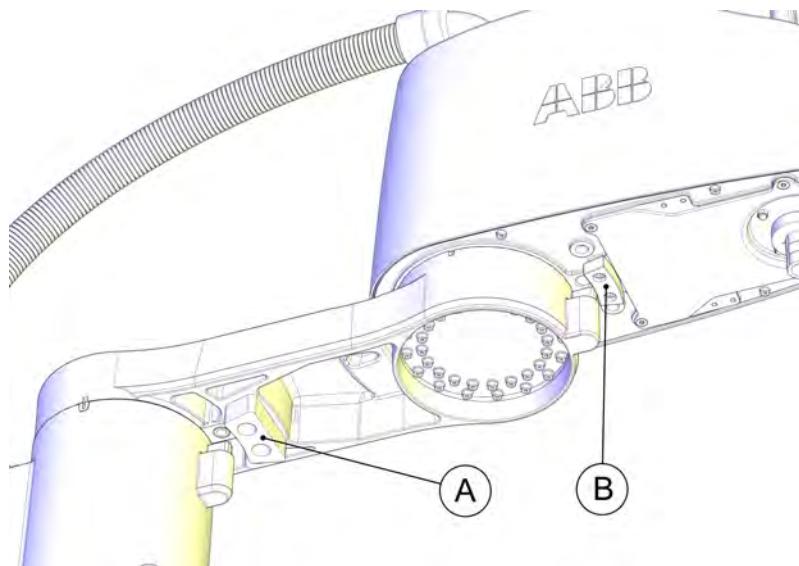
2 Installation and commissioning

2.4.2 Mechanically restricting the working range

2.4.2 Mechanically restricting the working range

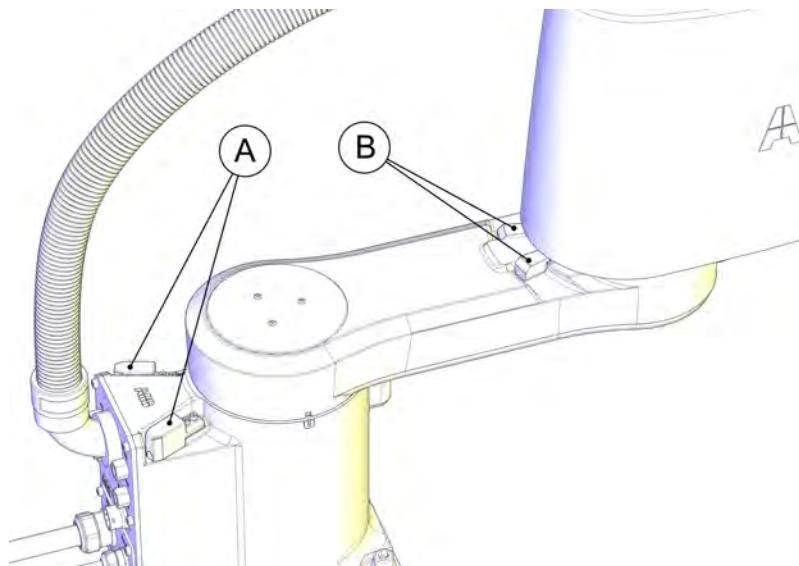
Location of mechanical stops

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



xx1500002811

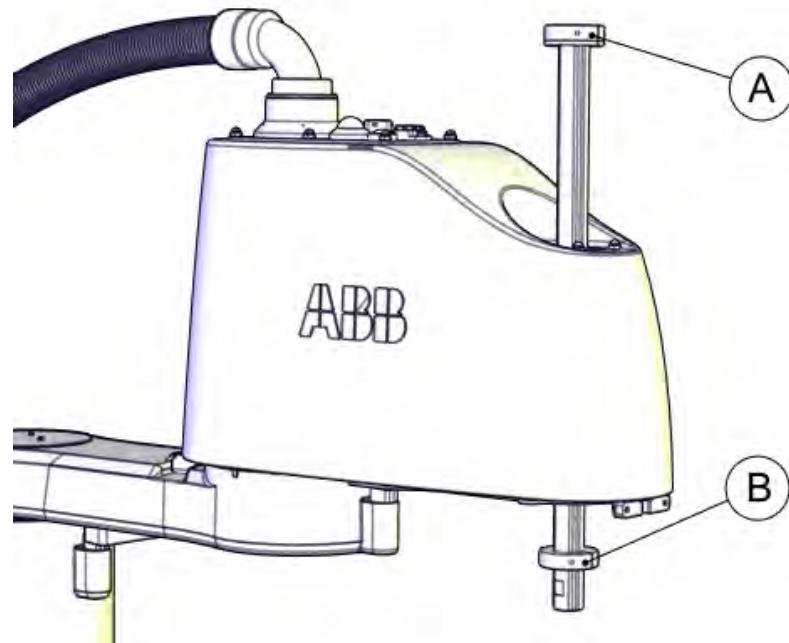
A	Mechanical stop block, axis 1 (lower arm)
B	Mechanical stop block, axis 2 (upper arm)



xx1500002814

A	Mechanical stop rubbers, axis 1 (base)
B	Mechanical stop rubbers, axis 2 (lower arm)

Continues on next page



xx1500002813

A	Upper stop block, axes 3 and 4 (upper arm)
B	Lower stop block, axes 3 and 4 (upper arm)

2 Installation and commissioning

2.5.1 Robot cabling and connection points

2.5 Electrical connections

2.5.1 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.

IRB 910SC works with IRC5 Compact controller only.

Main cable categories

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

Cable category	Description
Robot cables	Handles power supply to and control of the robot's motors as well as feedback from the encoder interface board. Specified in the table Robot cables on page 82 .
Customer cables (option)	Handles communication with equipment fitted on the robot by the customer (low voltage signals). The customer cables also handle Ethernet communication. See Product manual - IRC5 Compact .

Robot cables

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

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

Robot cable, power

Power cable length	Article number
3 m	3HAC057784-001
7 m	3HAC057785-001
15 m	3HAC057786-001

Robot cable, signals

Signal cable length	Article number
3 m	3HAC057787-001
7 m	3HAC057788-001
15 m	3HAC057789-001

Continues on next page

2 Installation and commissioning

2.5.1 Robot cabling and connection points

Continued

Customer cables - CP/CS cable (option)

CP/CS cable length	Article number
3 m (IRC5C)	3HAC049186-001
7 m (IRC5C)	3HAC049186-004
15 m (IRC5C)	3HAC049186-005

2 Installation and commissioning

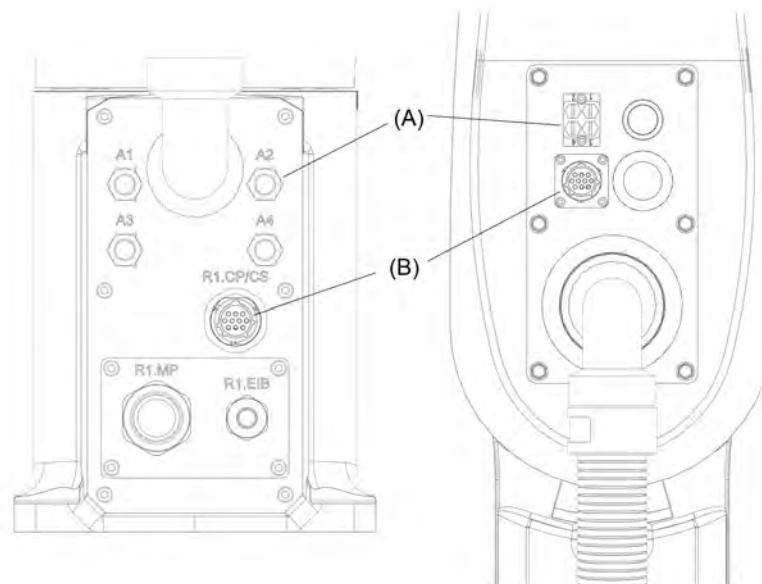
2.5.2 Customer connections

2.5.2 Customer connections

Introduction to customer connections

The cables for customer connection are integrated in the robot and the connectors are placed at the upper arm and base. There is one UTOW01210SH05 connector (R4.CP/CS) at the upper arm. Corresponding connector UTOW71210PH06 (R1.CP/CS) is 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 upper arm.



xx1500002751

Position	Connection	Description	Number	Value
A	Air	Max. 5 bar	4	Inner hose diameter 4 mm
B	(R1)R4.CP/CS	Customer power/signal	10	49 V, 500 mA

3 Maintenance

3.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 910SC.

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 15](#) before performing any service work!



Note

If the IRB 910SC is connected to power, always make sure that the IRB 910SC is connected to protective earth before starting any maintenance work!

For more information see:

- *Product manual - IRC5 Compact*

3 Maintenance

3.2.1 Specification of maintenance intervals

3.2 Maintenance schedule

3.2.1 Specification of maintenance intervals

Introduction

The intervals are specified in different ways depending on the type of maintenance activity to be carried out and the working conditions of the IRB 910SC:

- 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 M2004 is further described in the *Operating manual - Service Information System*.

3.2.2 Maintenance schedule

Scheduled and non-predictable maintenance

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

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

Life of each component

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

Activities and intervals, standard equipment

The table below specifies the required maintenance activities and intervals:

Maintenance activities	Regularly ⁱ	Every 100 km	Every 12 months	Every 20,000 hours ⁱⁱ	Reference
Cleaning activities					
Cleaning the robot	x				Cleaning the IRB 910SC on page 121
Inspection activities					
Inspecting the robot	x				Check for abnormal wear or contamination.
Inspecting the robot cabling ⁱⁱⁱ	x ^{iv}				Inspecting the cabling on page 89
Inspecting the information labels			x		Inspecting the information labels on page 90
Inspecting the ball screw spline unit	x ^v				Inspecting the ball screw spline unit on page 93
Inspecting the axis-1 and axis-2 mechanical stops	x ^{vi}				Inspecting axis-1 and axis-2 mechanical stops on page 96
Inspecting the timing belts			x		Inspecting the timing belts on page 99
Replacement/changing activities					
Replacing the battery pack ^{vii}					Replacing the battery pack on page 107
Lubrication activities					
Lubricating the ball screw spline unit		x			Lubricating the ball screw spline unit on page 118
Overhaul					

Continues on next page

3 Maintenance

3.2.2 Maintenance schedule

Continued

Maintenance activities	Regularly ⁱ	Every 100 km	Every 12 months	Every 20,000 hours ⁱⁱ	Reference
Overhaul of complete robot			x		

- i "Regularly" implies that the activity is to be performed regularly, but the actual interval may not be specified by the robot manufacturer. The interval depends on the operation cycle of the robot, its working environment and movement pattern. Generally, the more contaminated environment, the shorter intervals. The more demanding movement pattern (sharper bending cable harness), the shorter intervals.
- ii Operating hours counted by the DTC = Duty time counter.
- iii The robot cabling comprises the cabling between the robot and controller cabinet.
- iv Replace when damage or cracks is detected or life limit is approaching.
- v Inspect immediately if the stop blocks are hit.
- vi Inspect immediately if the mechanical stop is hit.
- vii The battery low alert (38213 **Battery charge low**) is displayed when remaining backup capacity (robot powered off) is less than 2 months. Typical life of a new battery is 36 months if the robot is powered off 2 days/week, or 18 months if the robot is powered off 16 hours/day. The life can be extended (approximately 3 times) for longer production breaks by a battery shutdown service routine. See *Operating manual - IRC5 with FlexPendant*.

See the replacement instruction for more details.

3.3 Inspection activities

3.3.1 Inspecting the cabling

Location of robot cabling

The robot cabling comprises the cabling between the robot and controller cabinet as well as the externally visible cabling from the base to the upper arm.

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 externally visible cabling from the base to the upper arm Look for abrasions, cuts or crush damages.	
3	Replace the cabling if wear or damage is detected.	See Replacing the main cable package on page 127 .

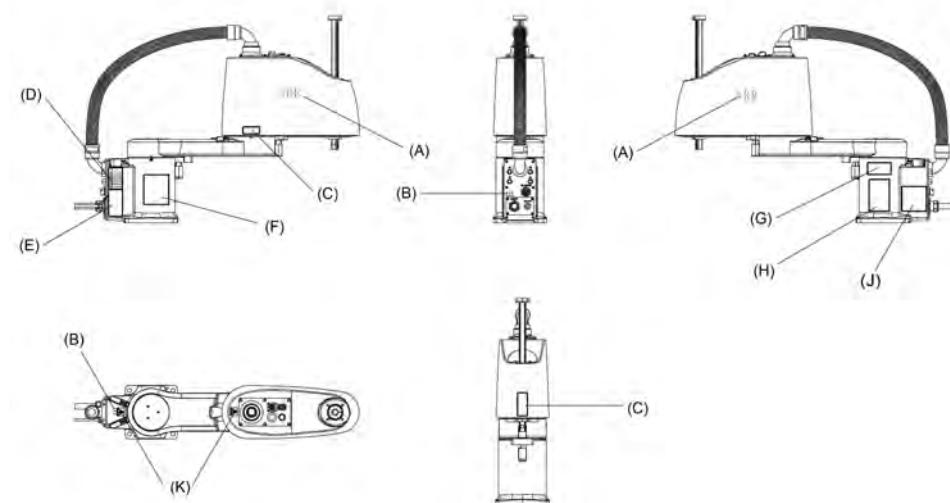
3 Maintenance

3.3.2 Inspecting the information labels

3.3.2 Inspecting the information labels

Location of labels

This figure shows the location of the information labels to be inspected. The symbols are described in section [Safety symbols on product labels on page 38](#).



xx1500002258

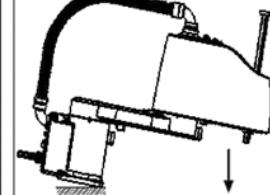
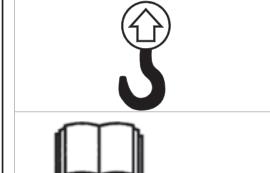
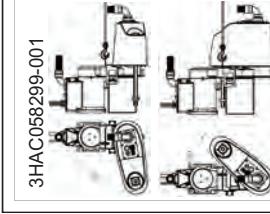
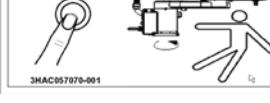
Pos	Description	Illustration
A	ABB logo, large size	
B	ABB logo, small size	
C	Synchronization mark for axis 2	 xx1500002671
	Synchronization mark for axis 3 and 4	 xx1500002672

Continues on next page

3 Maintenance

3.3.2 Inspecting the information labels

Continued

D	Calibration label	
E	Warning label Tip risk when loosening bolts	  <p>3HAC 057068-001</p> <p>xx1500002402</p>
F	Rating label	
G	UL label	
H	Instruction label Lifting of robot	  <p>IRB910SC-3/0.55 IRB910SC-3/0.45 IRB910SC-3/0.65</p>  <p>3HAC058299-001</p> <p>xx1600000282</p>
J	Instruction label Brake release Moving robot Brake release buttons	  <p>3HAC057070-001</p> <p>xx1500002403</p>
K	Warning label Flash	 <p>xx1300001091</p>

Continues on next page

3 Maintenance

3.3.2 Inspecting the information labels

Continued

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
ABB logo, small size	3HAC0453-6	
ABB logo, large size	3HAC0453-2	
Warning label	3HAC057068-001	Risk of tipping
Warning sign	3HAC1589-1	Electrical shock
Rating label	3HAB9549-1	
UL label	3HAC037252-001	
Lifting label	3HAC058299-001	
Instruction label	3HAC057070-001	Break release, moving robot
Calibration label	3HAC13488-1	
Calibration mark (axis 2)	3HAC057089-001	
Calibration mark (axis 3 and axis 4)	3HAC057090-001	

Required tools and equipment

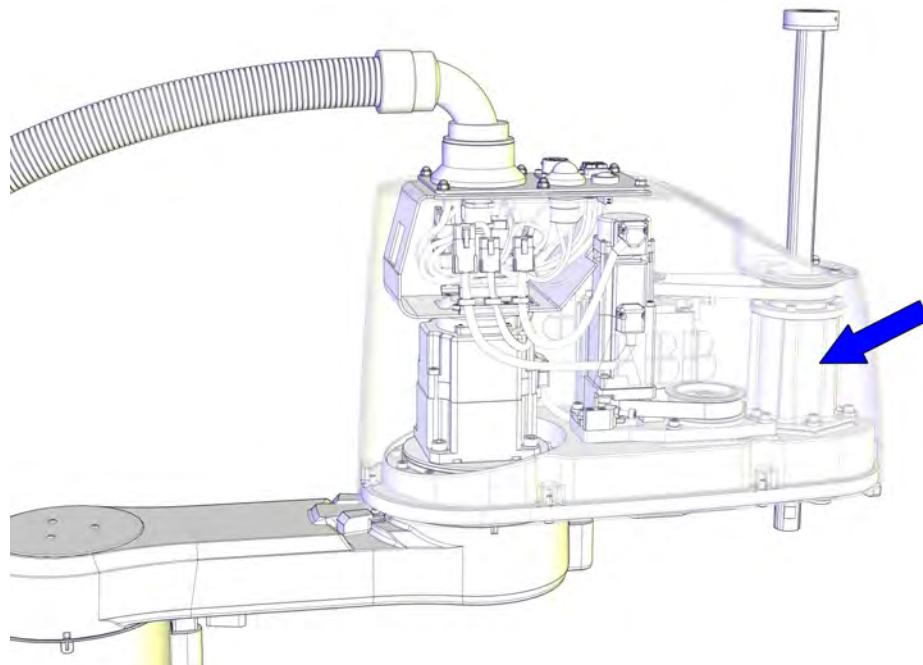
Visual inspection, no tools are required.

Inspecting, labels

Action	Note
1  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2 Inspect the labels, located as shown in the figures.	See the figures in Location of labels on page 90 .
3 Replace any missing or damaged labels.	

3.3.3 Inspecting the ball screw spline unit

Location of ball screw spline unit



xx1500002212

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Ball screw spline unit	3HAC056148-001	

Required tools and equipment

Equipment	Note
24 VDC power supply	Used to release the motor brakes.
Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.	

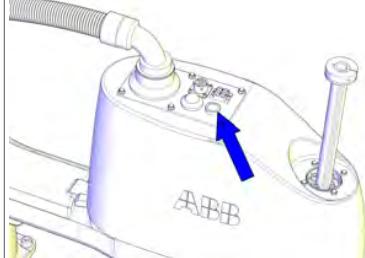
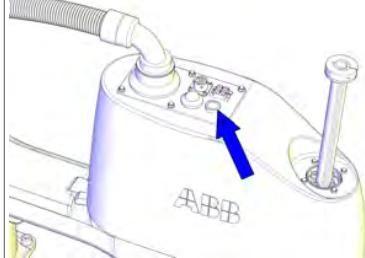
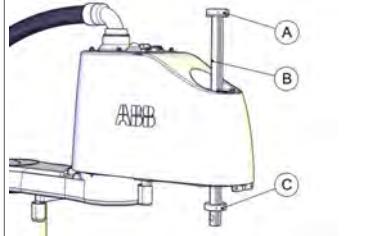
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3 Maintenance

3.3.3 Inspecting the ball screw spline unit

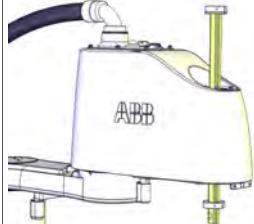
Continued

Inspecting, ball screw spline unit

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 the section <i>Supplying power to connector R1.MP on page 72</i> .							
2  DANGER When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure the payload is disassembled or tooling is properly supported; otherwise, fast downward movements of axis 3 may cause severe hits.							
3 Release the holding brake by pressing the button on the internal brake release unit.	 xx1500002774						
4 Move the upper arm to a position where the axis 3 can be moved in full stroke.							
5 Press the brake release button and move the shaft to its upper and lower limits manually.	 xx1500002774						
6 Visually inspect: <ul style="list-style-type: none">• the stop blocks on the ball screw spline unit• the shaft of the ball screw spline unit Look for abrasions, cuts or crush damages on the spline, and grease amount on the shaft.	 xx1500002778 <table border="1" data-bbox="1024 1852 1389 2010"> <tr> <td>A</td> <td>Upper stop block</td> </tr> <tr> <td>B</td> <td>Shaft</td> </tr> <tr> <td>C</td> <td>Lower stop block</td> </tr> </table>	A	Upper stop block	B	Shaft	C	Lower stop block
A	Upper stop block						
B	Shaft						
C	Lower stop block						

Continues on next page

3.3.3 Inspecting the ball screw spline unit *Continued*

Action	Note
7 Apply grease to the shaft if it is not enough.	See Lubricating the ball screw spline unit on page 118 .  xx1500002779
8 Replace the ball screw spline unit if wear or damage is detected.	See Replacing the ball screw spline unit on page 229 .

3 Maintenance

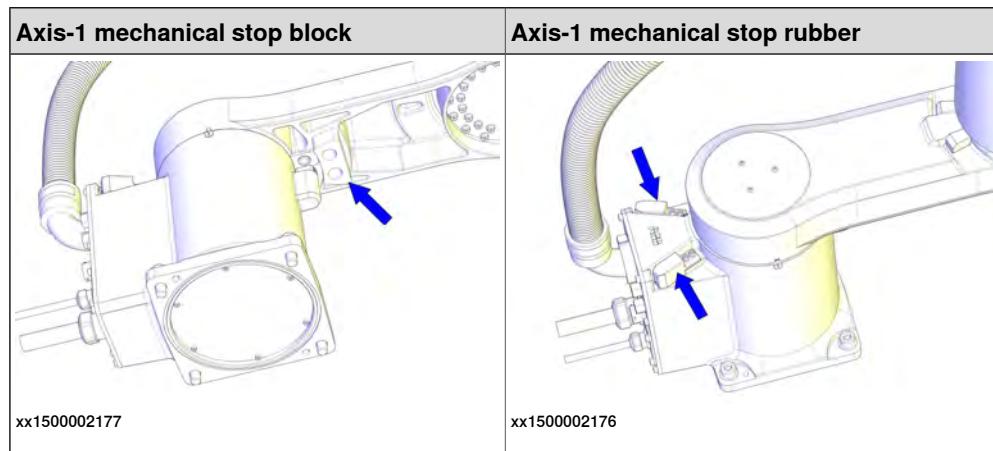
3.3.4 Inspecting axis-1 and axis-2 mechanical stops

3.3.4 Inspecting axis-1 and axis-2 mechanical stops

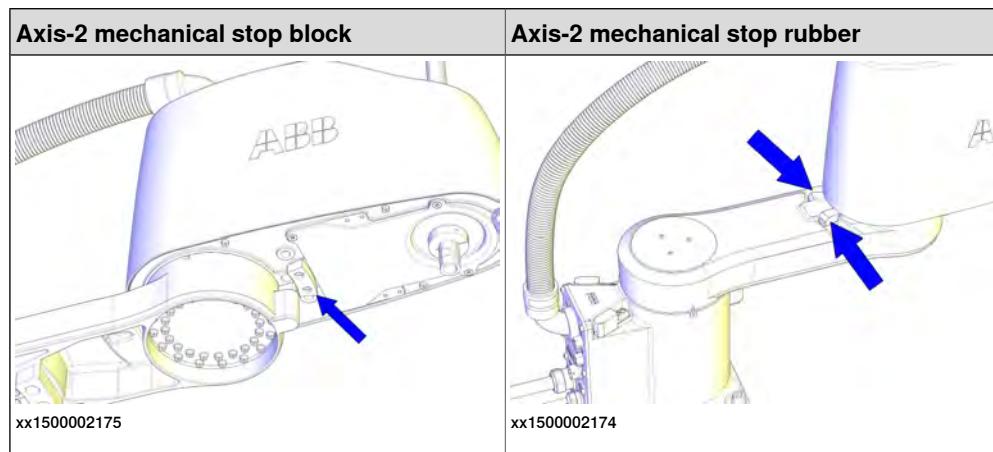
Location of axis-1 and axis-2 mechanical stops

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

Axis 1



Axis 2



Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Axis-1 mechanical stop rubber	3HAC056042-001	Replace if damaged.
Axis-1 mechanical stop block	3HAC055164-001	Replace if damaged.
Axis-2 mechanical stop rubber	3HAC056017-001	Replace if damaged.
Axis-2 mechanical stop block	3HAC055185-001	Replace if damaged.

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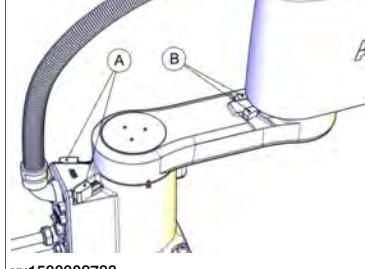
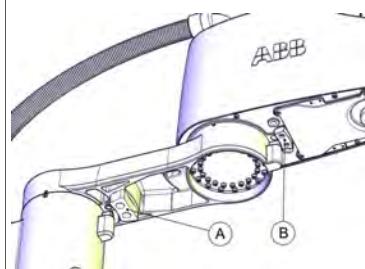
Required tools and equipment

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.

Inspecting, axis-1 and axis-2 mechanical stops

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

Action	Information								
<p>1</p>  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.									
<p>2</p> Inspect the mechanical stops.	 xx1500002783 <table border="1"> <tr> <td>A</td> <td>Axis-1 mechanical stop rubbers</td> </tr> <tr> <td>B</td> <td>Axis-2 mechanical stop rubbers</td> </tr> </table>  xx1500002784 <table border="1"> <tr> <td>A</td> <td>Axis-1 mechanical stop block</td> </tr> <tr> <td>B</td> <td>Axis-2 mechanical stop block</td> </tr> </table>	A	Axis-1 mechanical stop rubbers	B	Axis-2 mechanical stop rubbers	A	Axis-1 mechanical stop block	B	Axis-2 mechanical stop block
A	Axis-1 mechanical stop rubbers								
B	Axis-2 mechanical stop rubbers								
A	Axis-1 mechanical stop block								
B	Axis-2 mechanical stop block								

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3 Maintenance

3.3.4 Inspecting axis-1 and axis-2 mechanical stops

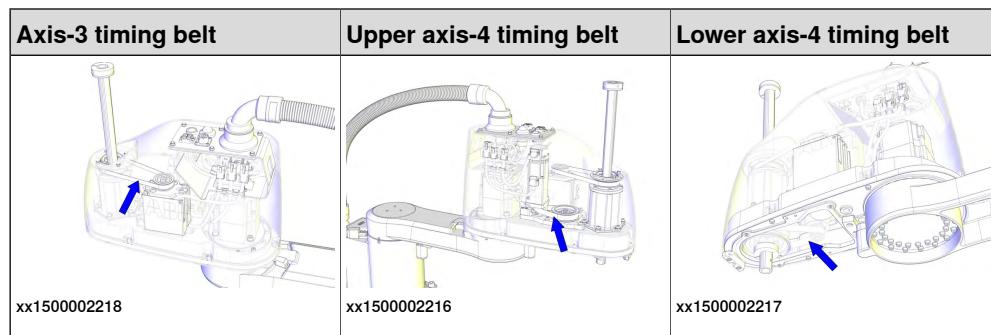
Continued

	Action	Information
3	<p>Replace if any 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>	

3.3.5 Inspecting the timing belts

Location of timing belts

The timing belts are located as shown in the figures.



Required tools and equipment

Equipment	Note
Standard toolkit	The content is defined in the section Standard toolkit on page 384 .
Acoustic tensiometer	Used for measuring the timing belt tension.
Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.	

Timing belt tension

The table describes the timing belt tension.

Axis	Timing belt tension
Axis 3	Recommended: 31 N Tension range of new belt: 28.5 N to 31.3 N Tension range of used belt ⁱ : 19.9 N to 22.8 N
Axis 4	Upper timing belt Recommended: 33 N Tension range of new belt: 30.5 N to 33.6 N Tension range of used belt ⁱ : 21.4 N to 24.4 N Lower timing belt Recommended: 91 N Tension range of new belt: 83.1 N to 91.4 N Tension range of used belt ⁱ : 58.1 N to 66.5 N

ⁱ Used belt is the one having been installed and used for more than 24 hours.

Continues on next page

3 Maintenance

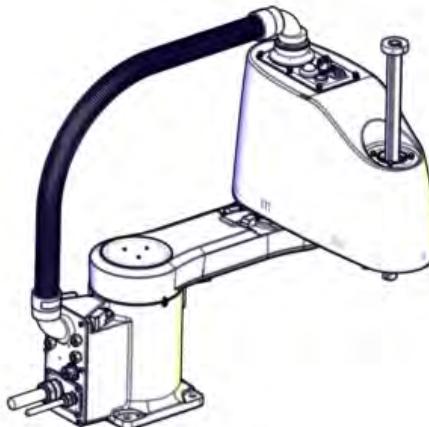
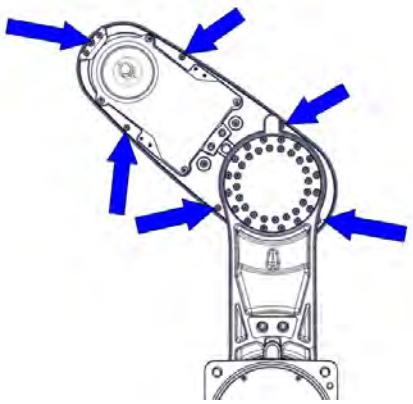
3.3.5 Inspecting the timing belts

Continued

Inspecting timing belts

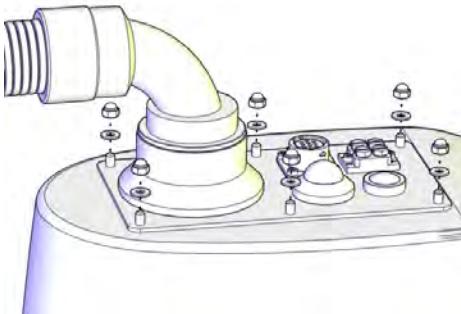
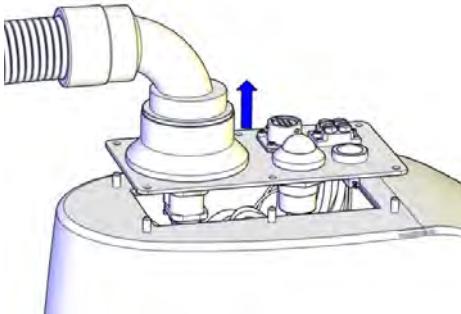
Use this procedure to inspect timing belts.

Preparations before inspecting timing belts

Action	Note
1 Jog axis 2 to access the cover screws.	 xx1500002520  xx1500002782
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

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Removing the main cable package from the upper arm

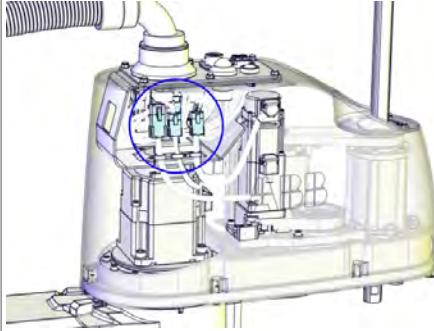
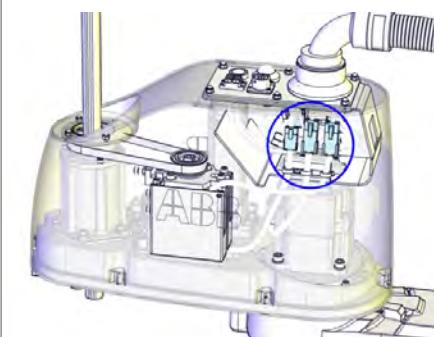
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the dome nuts and washers.	 xx1500002182
3	CARE Carefully open the user interface plate and pull out the cable package.  CAUTION The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183

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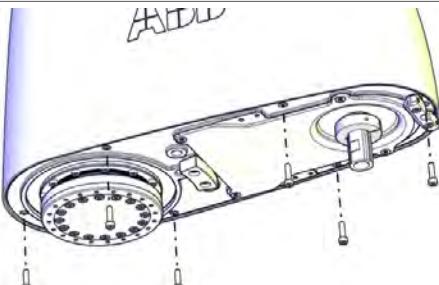
3 Maintenance

3.3.5 Inspecting the timing belts

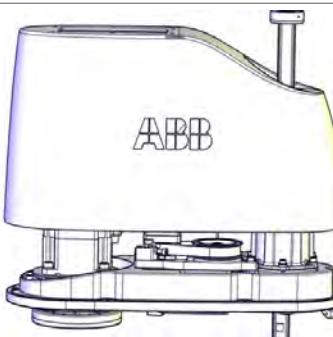
Continued

Action	Note
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 <p> Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 

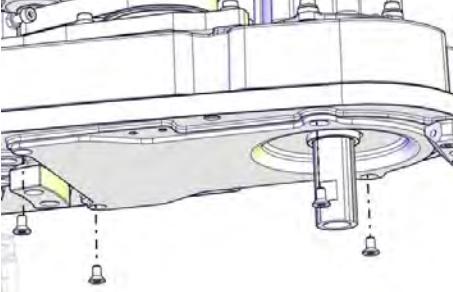
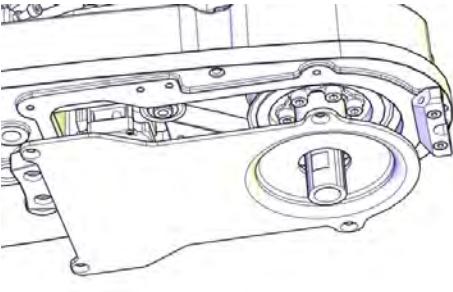
Removing the upper cover

Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2  WARNING</p> <p>Risk of tipping. Make sure the robot is well secured and that the upper arm is supported during the removal work.</p>	
<p>3 Remove the screws.</p>	

Continues on next page

Action	Note
4  WARNING The cover may be damaged due to improper shift. Keep the cover in position while removing the screws.	
5 Lift out the upper cover carefully.	 xx1500002221

Removing the lower cover

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the screws.	 xx1500002785
3 Remove the cover.  Tip If only working with lower axis-4 timing belt, no need to remove the stop block of ball screw spline unit before removing the lower cover.	 xx1500002225

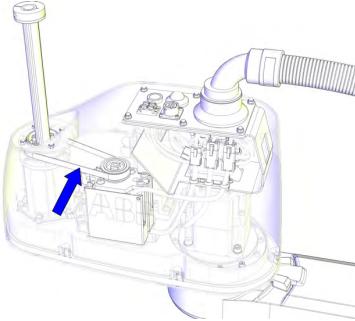
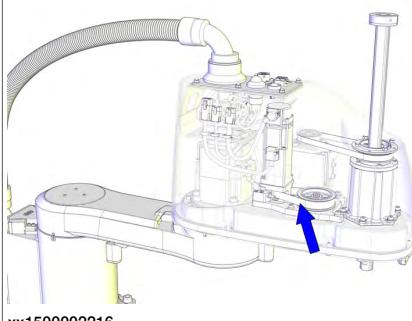
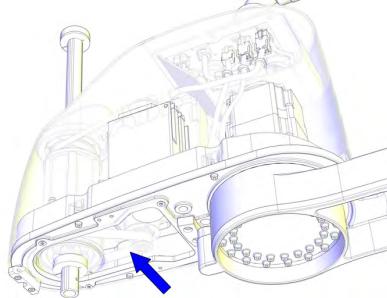
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3 Maintenance

3.3.5 Inspecting the timing belts

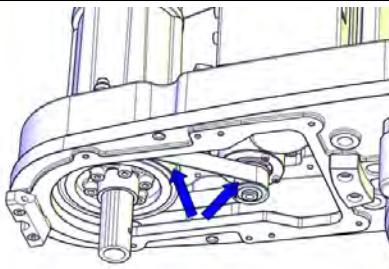
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Inspecting timing belts

	Action	Information
1	Check the timing belts for damage or wear.	 xx1500002218  xx1500002216  xx1500002217

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3.3.5 Inspecting the timing belts
Continued

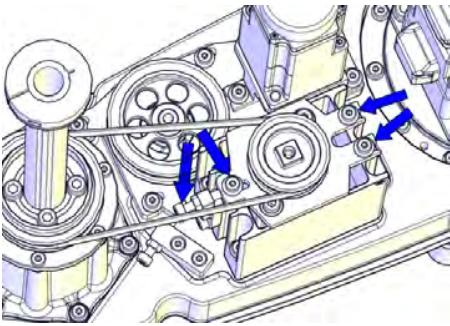
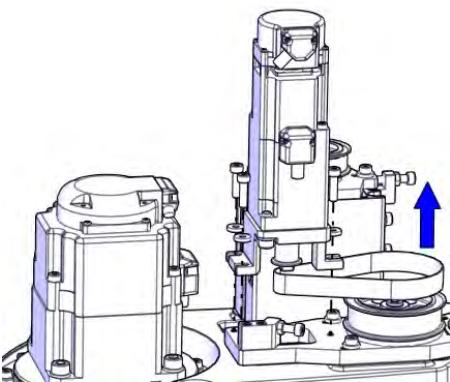
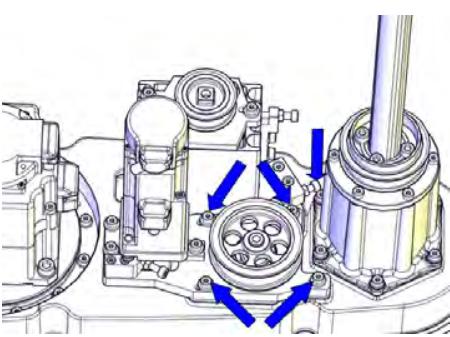
Action	Information
2 Check the timing belt pulleys for damage.	 xx1500002780
3 If any damage or wear is detected, the part must be replaced!	
4 Check each belt for tension.	Timing belt tensions are specified in Timing belt tension on page 99 .

Continues on next page

3 Maintenance

3.3.5 Inspecting the timing belts

Continued

Action	Information
5	<p>If the belt tension is not correct, adjust screws while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved!</p>  xx1500002229  xx1500002233  xx1500002231

3.4 Replacement/changing activities

3.4.1 Replacing the battery pack

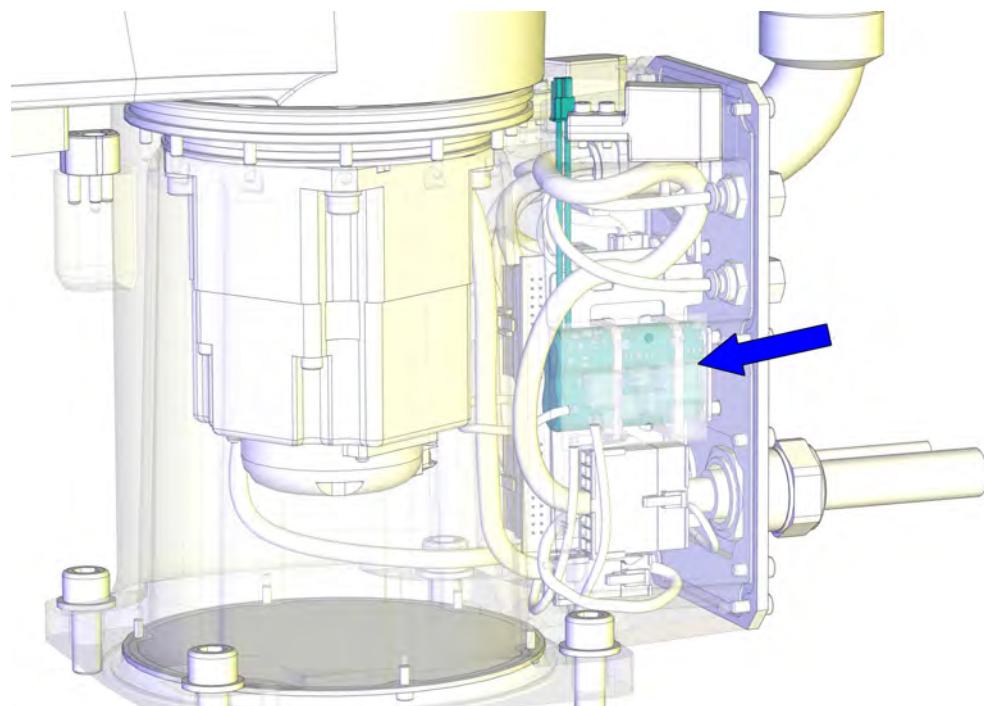


Note

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

Location of the battery pack

The battery pack is located as shown in the figure.



xx1500002180

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

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3 Maintenance

3.4.1 Replacing the battery pack

Continued

Spare part	Article number	Note
Battery pack	3HAC051036-001	Battery includes protection circuits. Only replace with a specified spare part or an ABB-approved equivalent.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

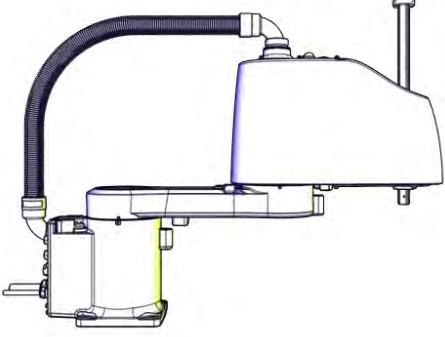
Required consumables

Consumable	Article number	Note
Cable ties	-	

Removing the battery pack

Use these procedures to remove the battery pack.

Preparations before removing the battery pack

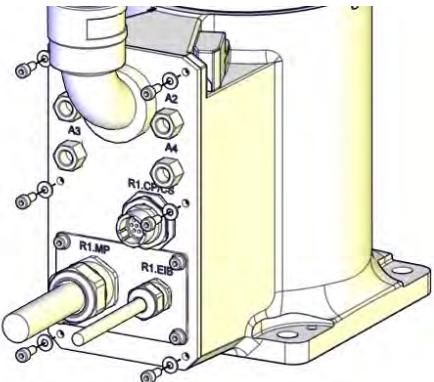
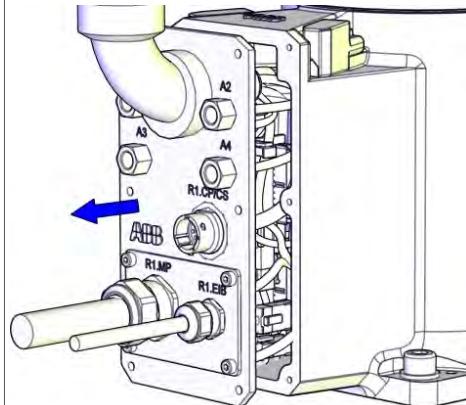
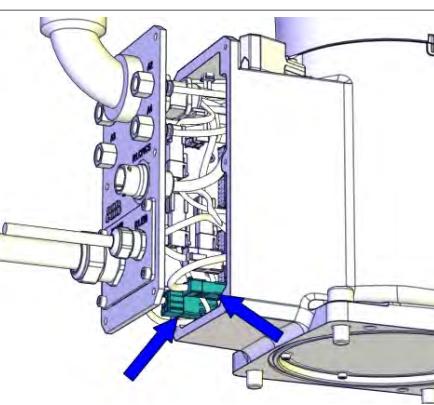
Action	Note
1 Jog all axes to zero position.	 xx1500002227
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

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3.4.1 Replacing the battery pack

Continued

Removing the main cable package from 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 screws and washers.	 xx1500002186
3	Carefully open the base cover and pull out the cable package.  CAUTION The cover cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002187
4	Disconnect the connectors: <ul style="list-style-type: none"> • R2.MP1 • R2.ME1  Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002188

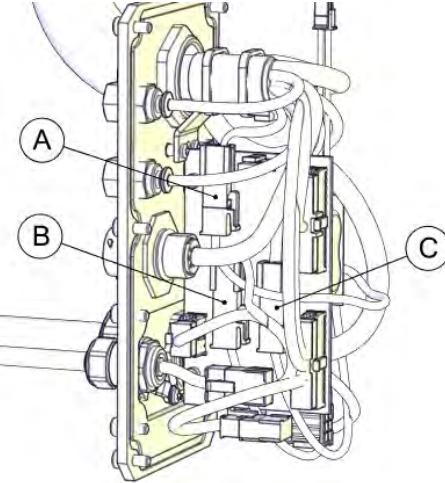
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3 Maintenance

3.4.1 Replacing the battery pack

Continued

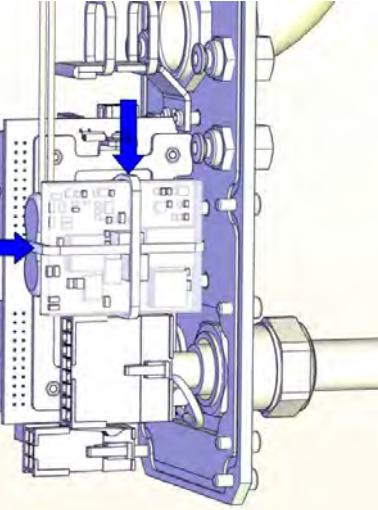
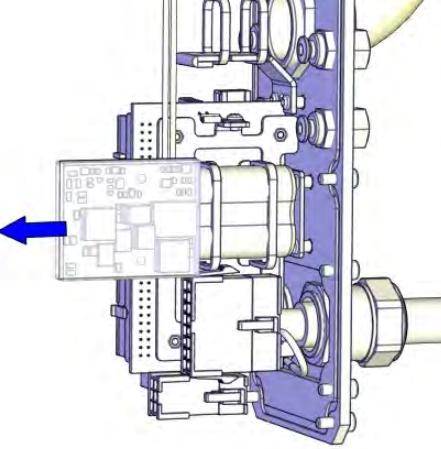
Removing the PCB board

Action	Note						
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.							
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47							
3 Disconnect the connectors: <ul style="list-style-type: none">• R1.BK1-2• R1.DBP• R2.BK1-2  Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002190 <table border="1"><tr><td>A</td><td>R1.BK1-2</td></tr><tr><td>B</td><td>R1.DBP</td></tr><tr><td>C</td><td>R2.BK1-2</td></tr></table>	A	R1.BK1-2	B	R1.DBP	C	R2.BK1-2
A	R1.BK1-2						
B	R1.DBP						
C	R2.BK1-2						

Continues on next page

3.4.1 Replacing the battery pack

Continued

Action	Note
4 Cut the cable ties.	 xx1500002752
5 Remove the PCB board carefully.	 xx1500002191

Disconnecting the battery cable

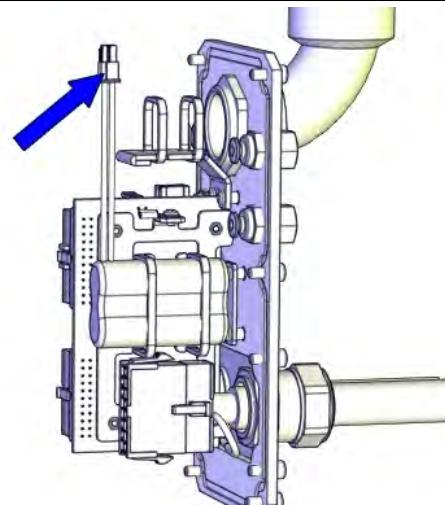
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

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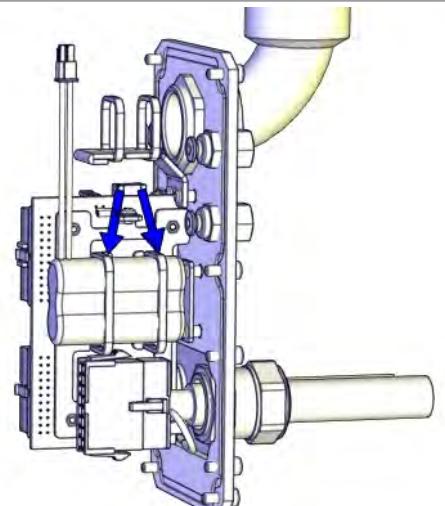
3 Maintenance

3.4.1 Replacing the battery pack

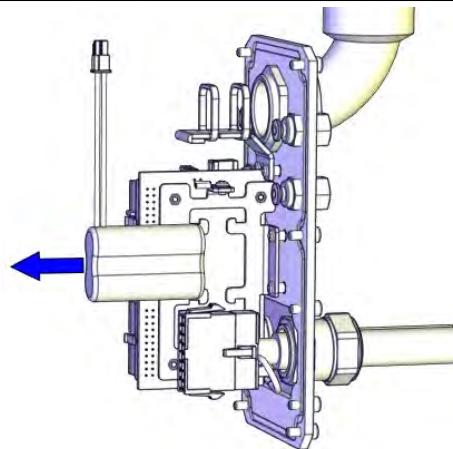
Continued

Action	Note
3 Disconnect the battery cable.	 xx1500002192

Removing the battery pack

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
3 Cut the cable ties.	 xx1500002193

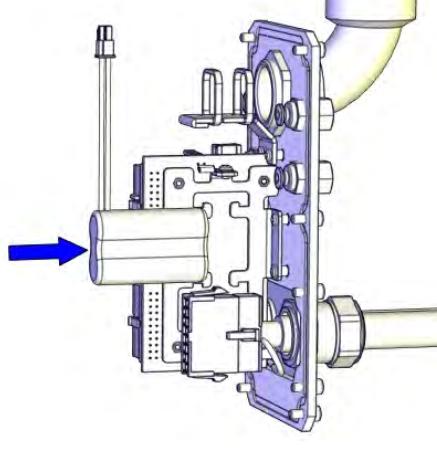
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Action	Note
<p>4 Remove the battery.</p> <p>Note</p> <p>Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.</p>	 xx1500002194

Refitting the battery pack

Use these procedures to refit the battery pack.

Refitting the battery pack

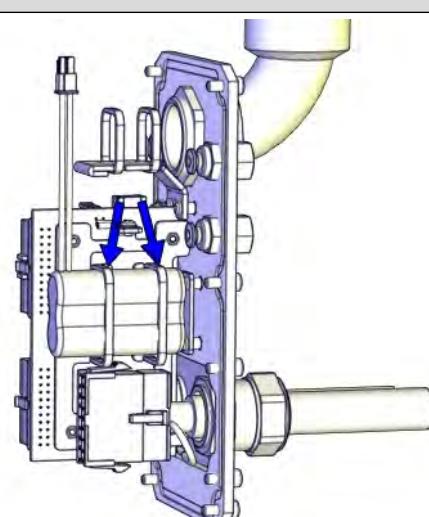
Action	Note
<p>1  ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47</p>	
<p>2 Fit the battery.</p> <p>Note</p> <p>Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.</p>	 xx1500002206

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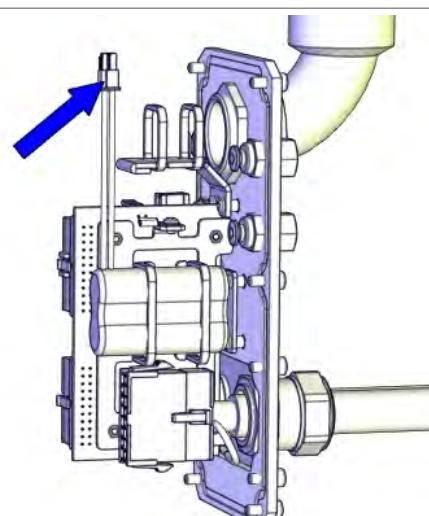
3 Maintenance

3.4.1 Replacing the battery pack

Continued

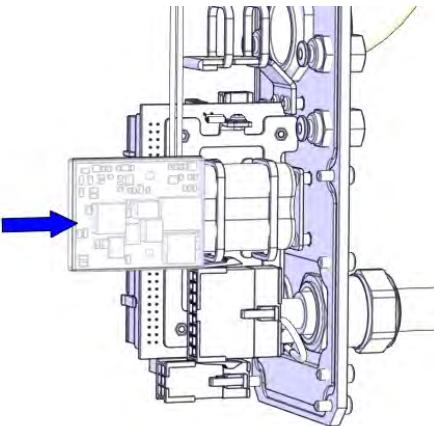
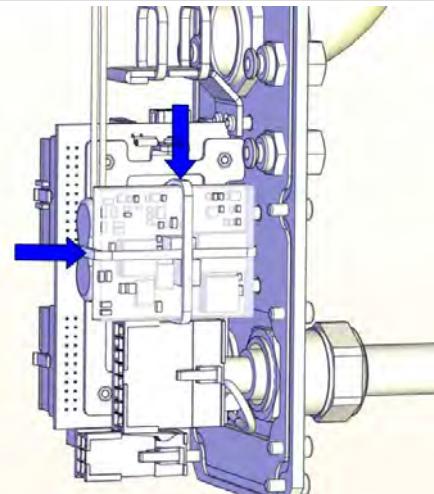
Action	Note
3 Secure the battery with cable ties.	 xx1500002193

Connecting the battery cable

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
2 Connect the battery cable.	 xx1500002192

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Refitting the PCB board

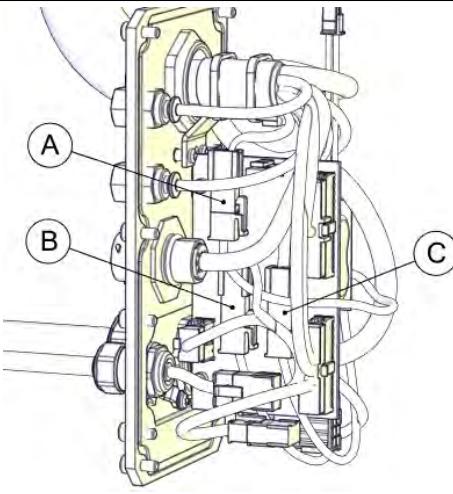
	Action	Note
1	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
2	 Note The PCB board is protected by shrink hose. Replace the hose if damaged.	PCB board: 3HAC057687-001  xx1500002205
3	Secure the PCB board with cable ties. Do not tighten the ties too tight.	 xx1500002752

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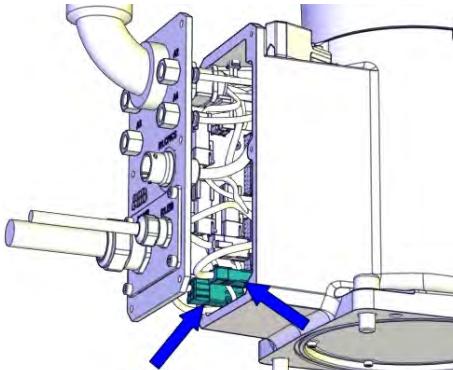
3 Maintenance

3.4.1 Replacing the battery pack

Continued

Action	Note						
<p>4 Reconnect the connectors.</p> <ul style="list-style-type: none"> • R1.BK1-2 • R1.DBP • R2.BK1-2 <p>CAUTION</p> <p>Make sure not to mix the connectors. See the labels on the connectors for correct connection.</p>	 <p>xx1500002190</p> <table border="1"> <tr> <td>A</td> <td>R1.BK1-2</td> </tr> <tr> <td>B</td> <td>R1.DBP</td> </tr> <tr> <td>C</td> <td>R2.BK1-2</td> </tr> </table>	A	R1.BK1-2	B	R1.DBP	C	R2.BK1-2
A	R1.BK1-2						
B	R1.DBP						
C	R2.BK1-2						
5 Secure the cables with cable ties if needed.							

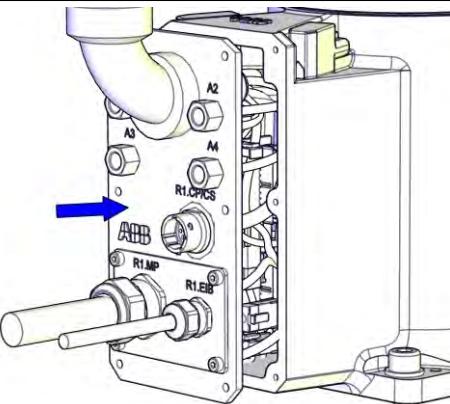
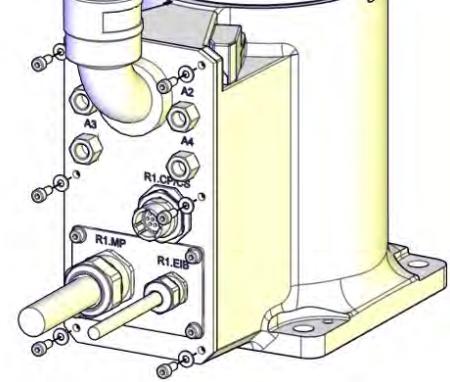
Refitting the main cable to the base

Action	Note
1 Secure the main cable package with cable ties if needed.	
2 Reconnect the connectors.	 <p>xx1500002188</p>

Continues on next page

3.4.1 Replacing the battery pack

Continued

	Action	Note
3	Push the main cable package into place.	 xx1500002204
4	Refit the base cover with screws and washers.	 xx1500002186 <p>Screws: M4x10 (6 pcs) Tightening torque: 2 Nm</p>

Concluding procedure

	Action	Note
1	Update the revolution counters.	See Updating revolution counters on page 350 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

3 Maintenance

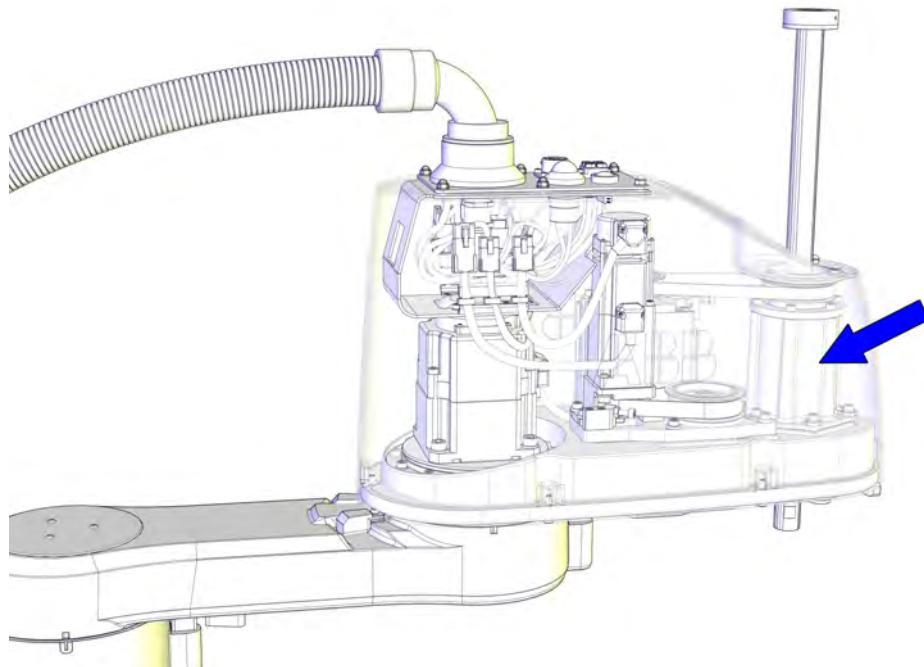
3.5.1 Lubricating the ball screw spline unit

3.5 Lubrication activities

3.5.1 Lubricating the ball screw spline unit

Location of the ball screw spline unit

The ball screw spline unit is located as shown in the figure.



xx1500002212

Required tools and equipment

Equipment	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.

Required consumables

Consumable	Article number	Note
Grease	-	THK AFA Used for lubricating the ball screw spline shaft.

Lubricating the ball screw spline unit



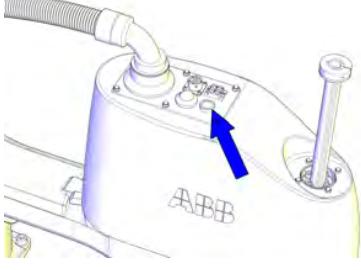
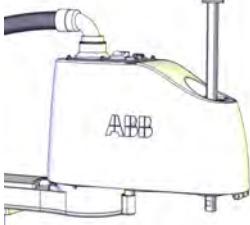
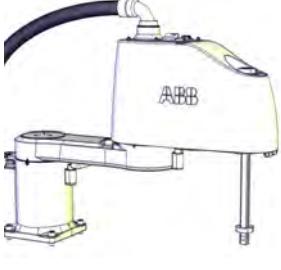
Note

Cover the end effector and peripheral equipment in case the grease drips, before lubricating the ball screw spline unit.

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3.5.1 Lubricating the ball screw spline unit

Continued

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 the section <i>Supplying power to connector R1.MP on page 72</i> .	
2  DANGER When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure the payload is disassembled or tooling is properly supported; otherwise, fast downward movements of axis 3 may cause severe hits.	
3 Release the holding brake by pressing the button on the internal brake release unit.	 xx1500002774
4 Move the upper arm to a position where the axis 3 can be moved in full stroke.	
5 Move the shaft manually to its upper limit while pressing the brake release button.	 xx1500002790
6 Wipe off old grease from the shaft.	
7 Apply new grease and fill the grooves. Wipe off excessive grease.	
8 Move the shaft manually to its lower limit while pressing the brake release button.	 xx1500002791
9 Wipe off old grease from the shaft.	
10 Apply new grease and fill the grooves. Wipe off excessive grease.	

Continues on next page

3 Maintenance

3.5.1 Lubricating the ball screw spline unit

Continued

	Action	Note
11	Move the shaft up and down several times while pressing the brake release button to smooth out the grease on the shaft. Wipe off excessive grease.	

3.6 Cleaning activities

3.6.1 Cleaning the IRB 910SC



WARNING

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

General

To secure high uptime it is important that the IRB 910SC is cleaned regularly. The frequency of cleaning depends on the environment in which the manipulator works.

Different cleaning methods are allowed depending on the type of protection of the IRB 910SC.



Note

Always verify the protection type of the robot before cleaning.

Dos and don'ts!

This section specifies some special considerations when cleaning the robot.

Always!

- Always use cleaning equipment as specified! Any other cleaning equipment may shorten the life of the robot.
- Always check that all protective covers are fitted to the robot before cleaning!

Never!

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

Cleaning methods

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

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water or steam
Standard IP20	Yes	Yes. With light cleaning detergent.	No	No

Continues on next page

3 Maintenance

3.6.1 Cleaning the IRB 910SC

Continued

Cables

Movable cables need to be able to move freely:

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

4 Repair

4.1 Introduction

Structure of this chapter

This chapter describes all repair activities recommended for the IRB 910SC and any external unit.

It is made up of separate procedures, each describing a specific repair activity. Each procedure contains all the information required to perform the activity, for example spare parts numbers, required special tools, and materials.



WARNING

Repair activities not described in this chapter must only be carried out by ABB. Otherwise damage to the mechanics and electronics may occur.

Required equipment

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

The details of equipment are also available in different lists in the chapter [Reference information on page 375](#).

Safety information

There are general safety information and specific safety information. The specific safety information describes the danger and safety risks while performing specific steps in a procedure. Make sure to read through the chapter [Safety on page 15](#) before commencing any service work.



Note

If the IRB 910SC is connected to power, always make sure that the IRB 910SC is connected to earth before starting any repair work.

For more information see:

- *Product manual - IRC5 Compact*

4 Repair

4.2.1 Replacing parts on the robot

4.2 General procedures

4.2.1 Replacing parts on the robot

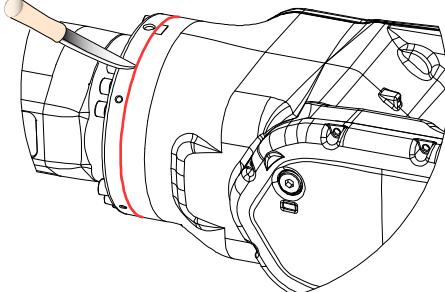
General

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

Required equipment

Equipment	Spare parts	Note
Cleaning agent		Ethanol
Knife		
Lint free cloth		

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.	 xx0900000121
2	Carefully grind the paint edge that is left on the structure to a smooth surface.	

4.2.2 Mounting instructions for seals

General

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

Equipment

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

Rotating seals

The procedure below describes how to fit rotating seals.



CAUTION

Please observe the following before commencing any assembly of seals:

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

	Action	Note
1	Check the seal to ensure that: <ul style="list-style-type: none"> • The seal is of the correct type (provided with cutting edge). • There is no damage to the sealing edge (feel with a fingernail). 	
2	Inspect the sealing surface before mounting. If scratches or damage are found, the seal must be replaced since it may result in future leakage.	
3	Lubricate the seal with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the seal.) Fill 2/3 of the space between the dust tongue and sealing lip with grease. The rubber coated external diameter must also be greased, unless otherwise specified.	Article number is specified in Equipment on page 125 .
4	Mount the seal correctly with a mounting tool. Never hammer directly on the seal as this may result in leakage.	

Continues on next page

4 Repair

4.2.2 Mounting instructions for seals

Continued

Flange seals and static seals

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

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

O-rings

The following procedure describes how to fit o-rings.

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

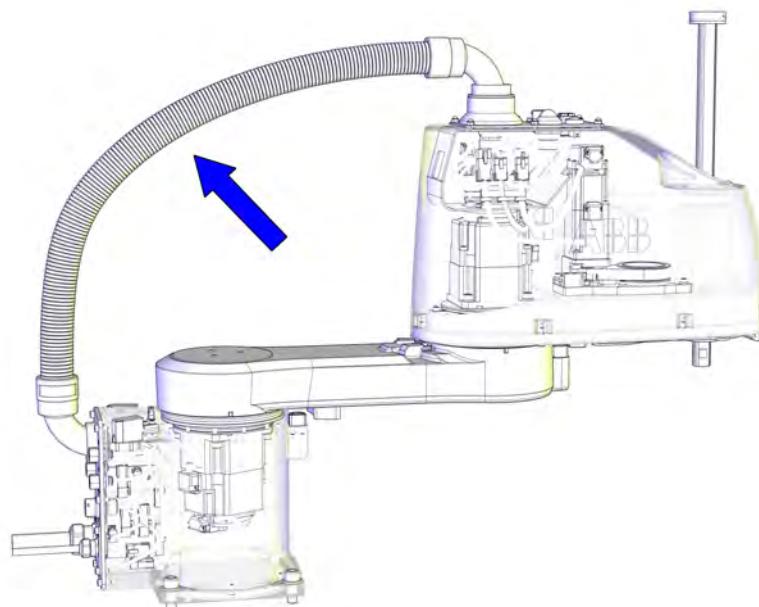
4.3.1 Replacing the main cable package

4.3 Cable harness

4.3.1 Replacing the main cable package

Location of the main cable package

The main cable package is located as shown in the figure.



xx1500002172

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Main cable, 450 mm	3HAC056165-001	
Main cable, 550 mm	3HAC056080-001	
Main cable, 650 mm	3HAC056166-001	
EIB connection cable	3HAC056703-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

Continues on next page

4 Repair

4.3.1 Replacing the main cable package

Continued

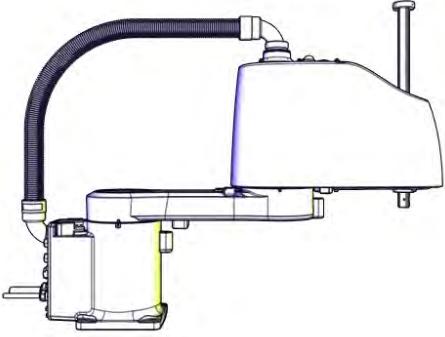
Required consumables

Consumable	Article number	Note
Shrink hose	-	Used for protecting the PCB board.
Cable ties	-	

Removing the main cable package

Use these procedures to remove the main cable package.

Preparations before removing the main cable package

	Action	Note
1	Jog all axes to zero position.	 xx1500002227
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

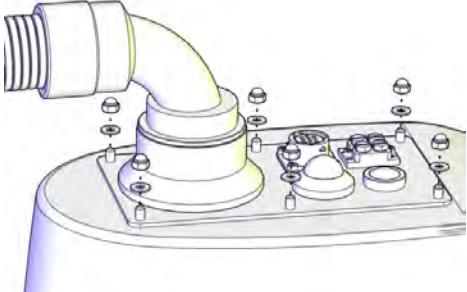
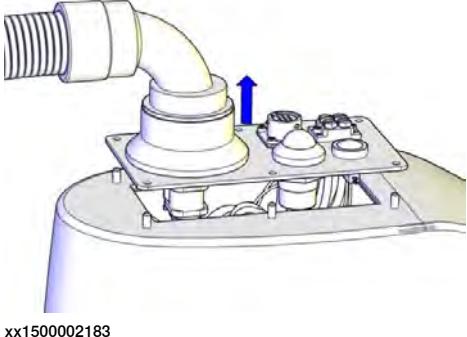
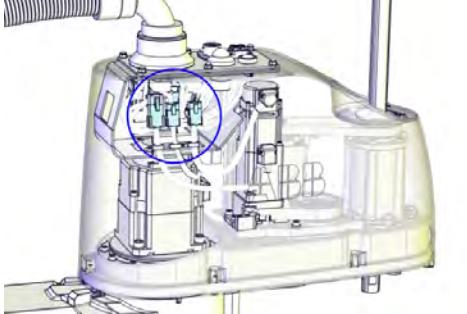
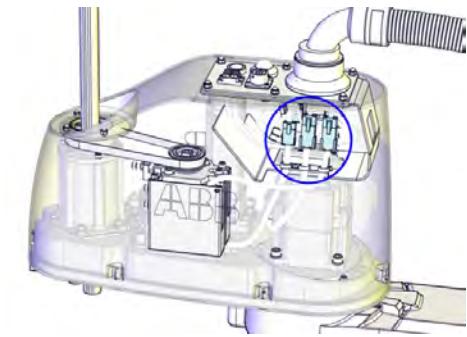
Removing the main cable package from the upper arm

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

Continues on next page

4.3.1 Replacing the main cable package

Continued

Action	Note
2 Remove the dome nuts and washers.	 xx1500002182
3 Carefully open the user interface plate and pull out the cable package.  CAUTION The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183
4 Disconnect the connectors: <ul style="list-style-type: none">• R2.MP2• R2.MP3• R2.MP4• R2.ME2• R2.ME3• R2.ME4  Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002184  xx1500002185

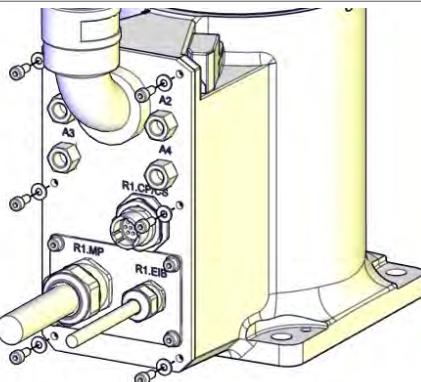
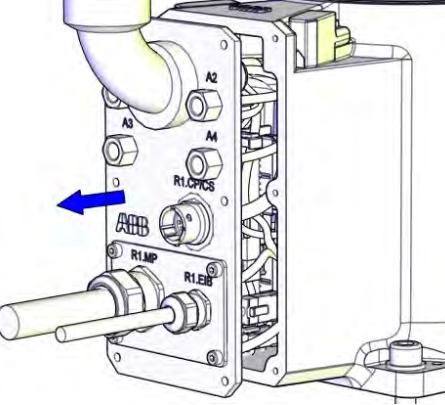
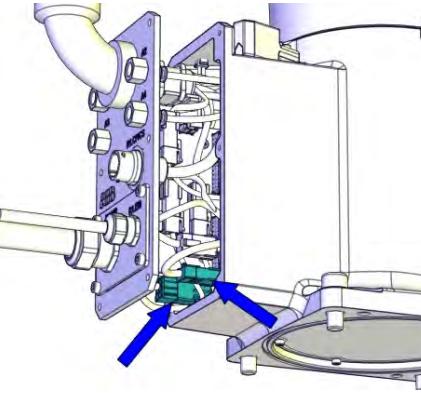
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4 Repair

4.3.1 Replacing the main cable package

Continued

Removing the main cable package from the base

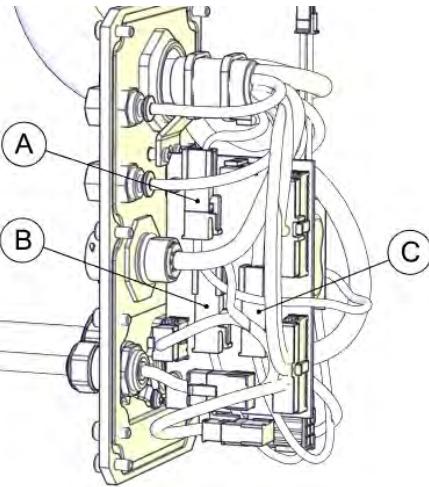
Action	Note
<p>1</p>  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
<p>2</p> Remove the screws and washers.	 xx1500002186
<p>3</p> Carefully open the base cover and pull out the cable package.  CAUTION The cover cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002187
<p>4</p> Disconnect the connectors: <ul style="list-style-type: none"> • R2.MP1 • R2.ME1  Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002188

Continues on next page

4.3.1 Replacing the main cable package

Continued

Removing the PCB board

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
3	Disconnect the connectors: <ul style="list-style-type: none"> • R1.BK1-2 • R1.DBP • R2.BK1-2  Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002190

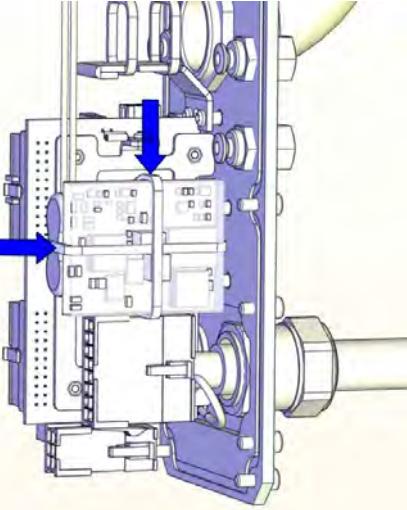
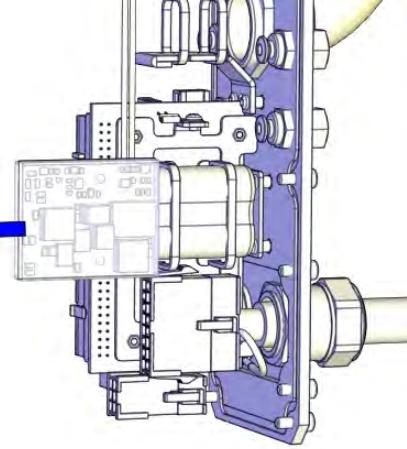
A	R1.BK1-2
B	R1.DBP
C	R2.BK1-2

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4 Repair

4.3.1 Replacing the main cable package

Continued

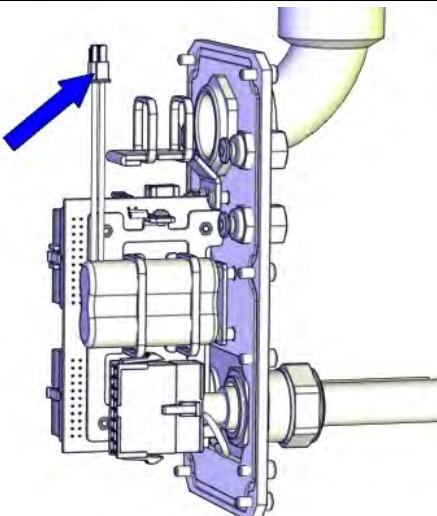
Action	Note
4 Cut the cable ties.	 xx1500002752
5 Remove the PCB board carefully.	 xx1500002191

Disconnecting the battery cable

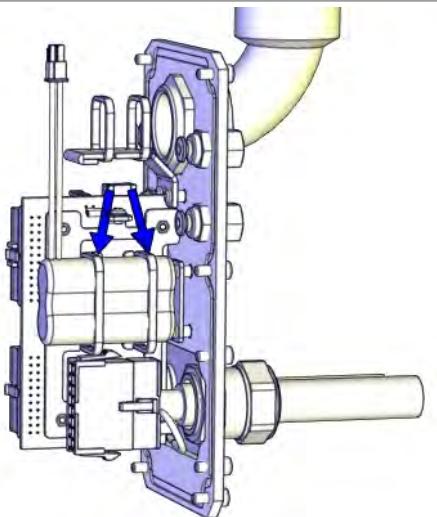
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

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4.3.1 Replacing the main cable package
Continued

Action	Note
3 Disconnect the battery cable.	 xx1500002192

Removing the battery pack

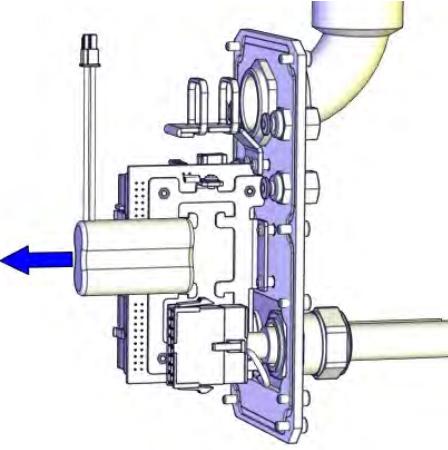
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
3 Cut the cable ties.	 xx1500002193

Continues on next page

4 Repair

4.3.1 Replacing the main cable package

Continued

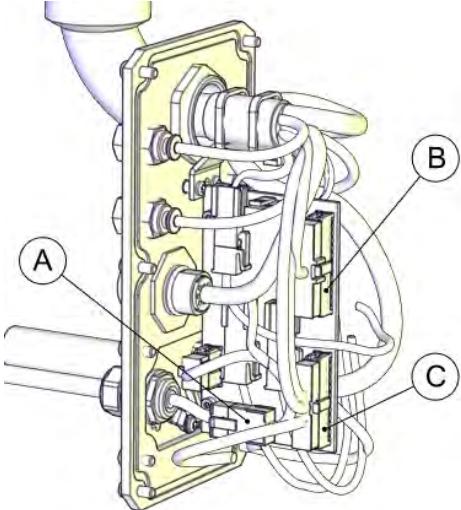
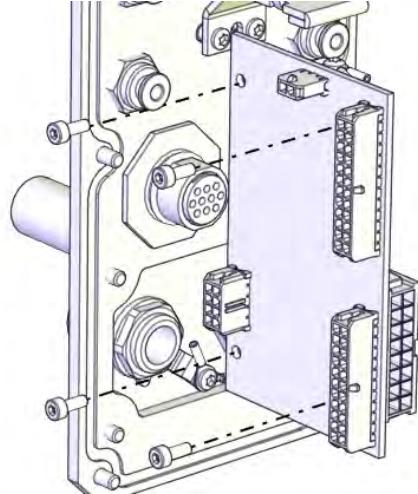
Action	Note
4 Remove the battery.  Note Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.	 xx1500002194

Removing the EIB unit

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>WARNING - The unit is sensitive to ESD! on page 47</i>	

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4.3.1 Replacing the main cable package
Continued

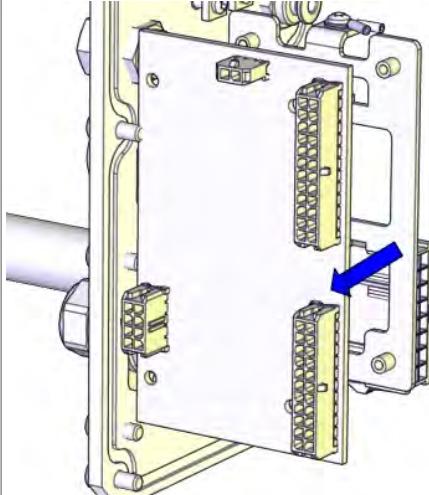
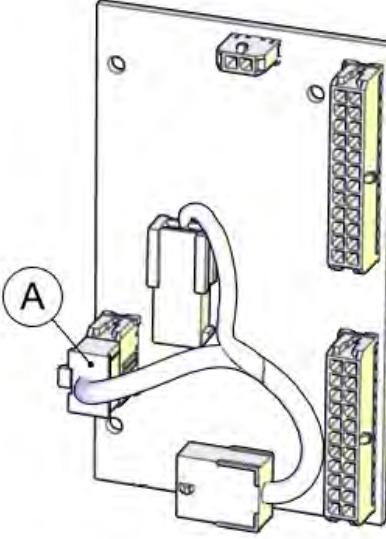
Action	Note						
3 Disconnect the connectors: <ul style="list-style-type: none"> • R1.EIB • R1.ME4 • R1.ME1-3 	 <p>xx1500002195</p> <table border="1"> <tr> <td>A</td> <td>R1.EIB</td> </tr> <tr> <td>B</td> <td>R1.ME4</td> </tr> <tr> <td>C</td> <td>R1.ME1-3</td> </tr> </table>	A	R1.EIB	B	R1.ME4	C	R1.ME1-3
A	R1.EIB						
B	R1.ME4						
C	R1.ME1-3						
4 Remove the screws.	 <p>xx1500002792</p>						

Continues on next page

4 Repair

4.3.1 Replacing the main cable package

Continued

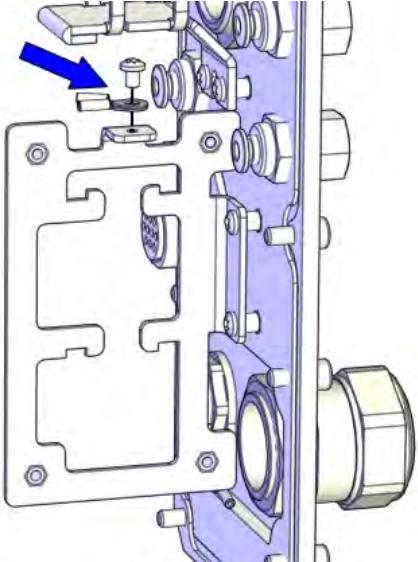
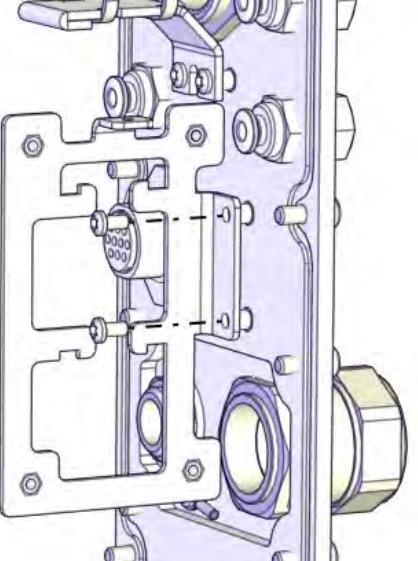
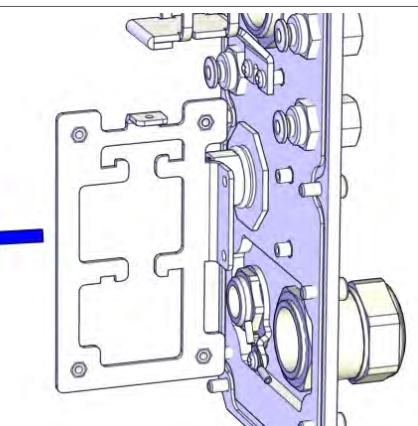
Action	Note
5 Remove the EIB unit.	 xx1500002196
6 Disconnect the connector to remove the EIB connection cable. <ul style="list-style-type: none"> • R2.EIB 	 xx1500002197 <div style="border: 1px solid black; padding: 2px; display: inline-block;"> A R2.EIB </div>

Removing the EIB mounting plate

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

Continues on next page

4.3.1 Replacing the main cable package
Continued

Action	Note
2 Disconnect the earth cable by removing the screw.	 xx1500002794
3 Remove the screws.	 xx1500002795
4 Remove the EIB mounting plate.	 xx1500002198

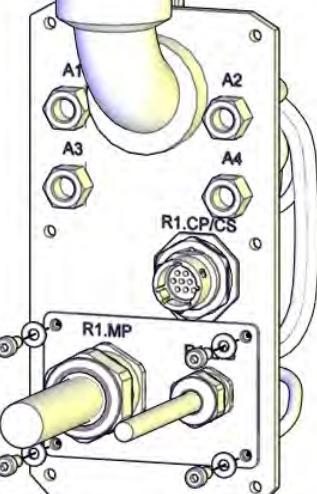
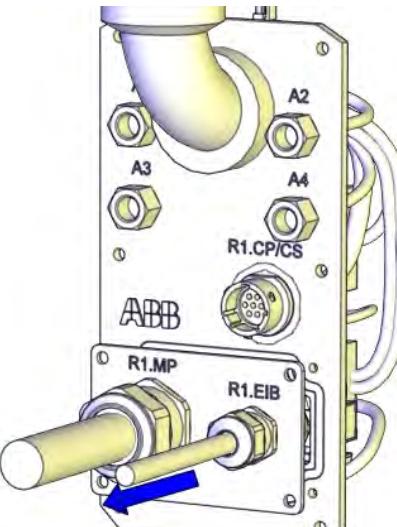
Continues on next page

4 Repair

4.3.1 Replacing the main cable package

Continued

Removing the floor cables

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 washers.	 xx1500002199
3 Pull out the floor cables.	 xx1500002200

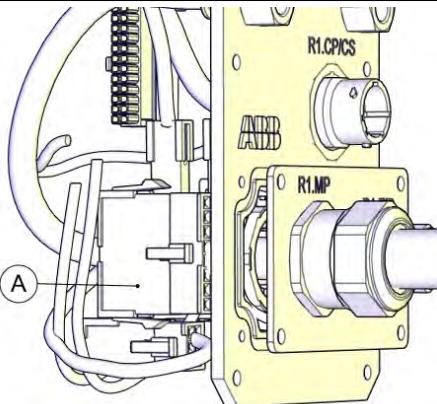
Disconnecting the floor cable connector

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

Continues on next page

4.3.1 Replacing the main cable package

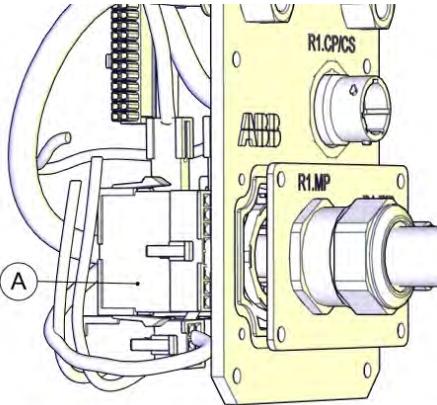
Continued

Action	Note		
2 Disconnect the connector: • R1.MP	 <p>xx1500002201</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A</td> <td>R1.MP</td> </tr> </table>	A	R1.MP
A	R1.MP		

Refitting the main cable package

Use these procedures to refit the main cable package.

Reconnecting the floor cable connector

Action	Note		
1 Reconnect the connector. • R1.MP	 <p>xx1500002201</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A</td> <td>R1.MP</td> </tr> </table>	A	R1.MP
A	R1.MP		

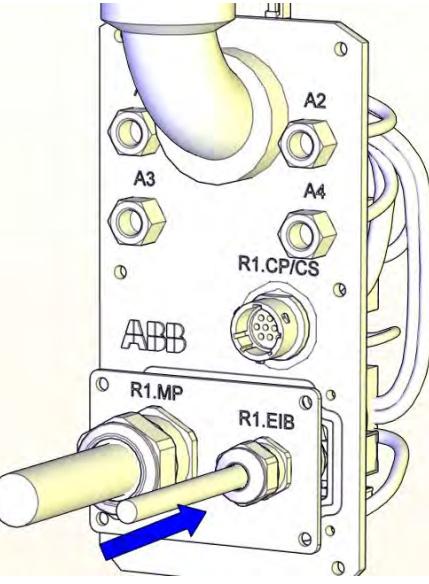
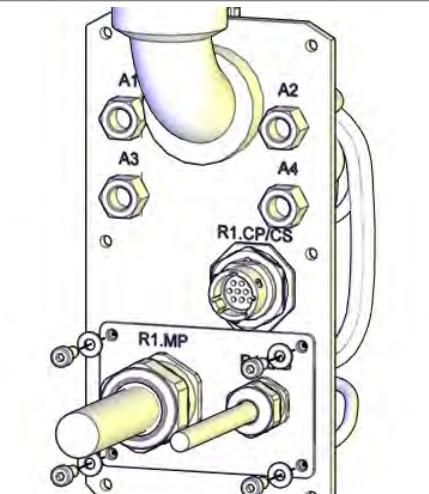
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4 Repair

4.3.1 Replacing the main cable package

Continued

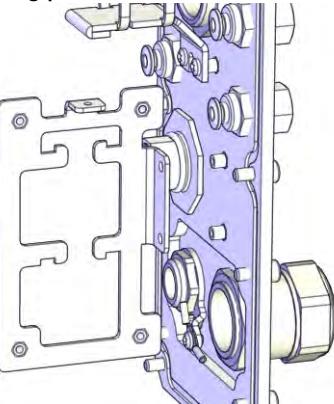
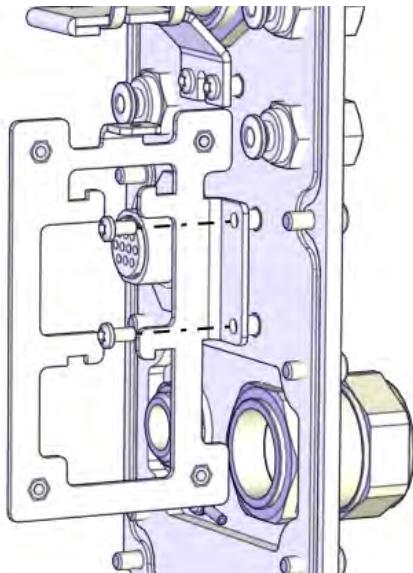
Refitting the floor cables

Action	Note
1 Push the floor cables into place.	 xx1500002208
2 Secure with screws and washers.	 xx1500002199 Screw: M4x10 (4 pcs) Tightening torque: 2 Nm

Continues on next page

4.3.1 Replacing the main cable package
Continued

Refitting the EIB mounting plate

	Action	Note
1	Refit the EIB mounting plate.	<p>EIB mounting plate: 3HAC055165-001</p>  <p>xx1500002796</p>
2	Secure with screws.	 <p>xx1500002795</p> <p>Screw: M3x6 (2 pcs) Tightening torque: 1.5 Nm</p>

Continues on next page

4 Repair

4.3.1 Replacing the main cable package

Continued

Action	Note
3 Connect the earth cable with the screw.	 xx1500002794 Screw: M3x4 (1 pcs) Tightening torque: 0.3 Nm

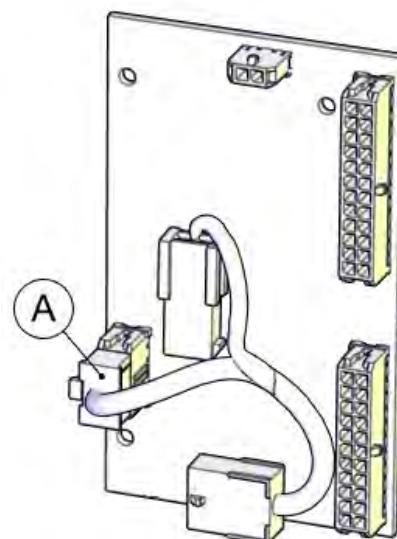
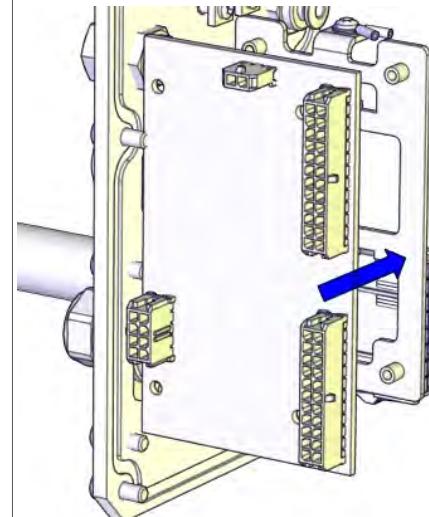
Refitting the EIB unit

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

Continues on next page

4.3.1 Replacing the main cable package

Continued

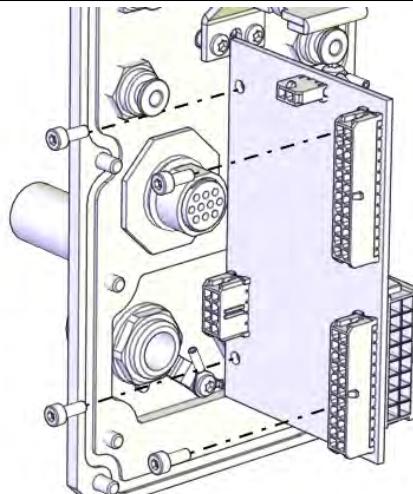
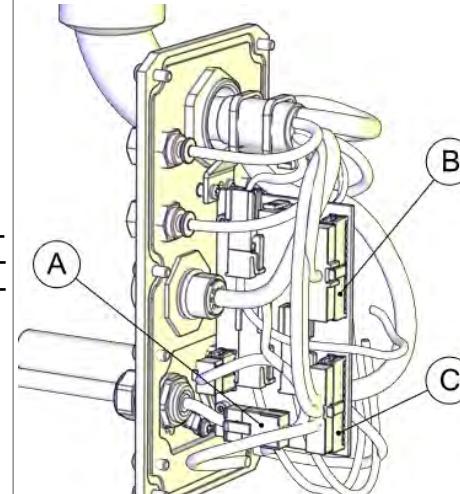
Action	Note		
<p>2 Reconnect the connector to refit the EIB connection cable.</p> <ul style="list-style-type: none"> • R2.EIB <p>CAUTION</p> <p>The EIB connection cable has one connector at one end and two connectors at the other end.</p> <p>Make sure not to mix the connectors. See the labels on the connectors for correct connection.</p>	<p>EIB connection cable: 3HAC056703-001</p>  <p>xx1500002197</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A</td> <td>R2.EIB</td> </tr> </table>	A	R2.EIB
A	R2.EIB		
3 Refit the EIB unit.	 <p>xx1500002793</p>		

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4 Repair

4.3.1 Replacing the main cable package

Continued

Action	Note						
4 Secure with screws.	 xx1500002792 <p>Screw: M3x8 (4 pcs) Tightening torque: 0.3 Nm</p>						
5 Reconnect the connectors. <ul style="list-style-type: none"> • R1.EIB • R1.ME4 • R1.ME1-3 <p>CAUTION Make sure not to mix the connectors; otherwise, axes may be damaged. See the labels on the connectors for correct connection.</p>	 xx1500002195 <table border="1"> <tr> <td>A</td> <td>R1.EIB</td> </tr> <tr> <td>B</td> <td>R1.ME4</td> </tr> <tr> <td>C</td> <td>R1.ME1-3</td> </tr> </table>	A	R1.EIB	B	R1.ME4	C	R1.ME1-3
A	R1.EIB						
B	R1.ME4						
C	R1.ME1-3						

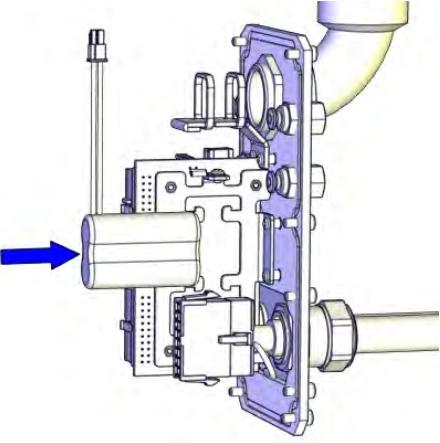
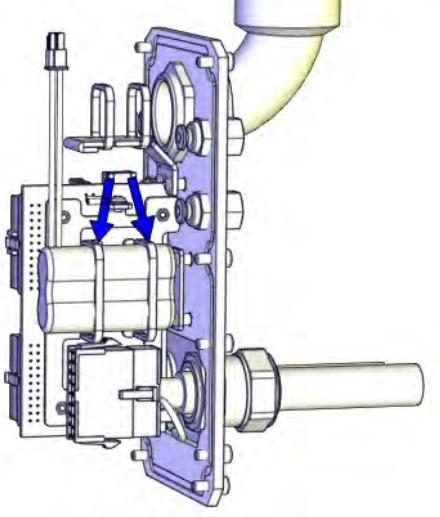
Refitting the battery pack

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

Continues on next page

4.3.1 Replacing the main cable package

Continued

Action	Note
2 Fit the battery.	 Note Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.  xx1500002206
3 Secure the battery with cable ties.	 xx1500002193

Connecting the battery cable

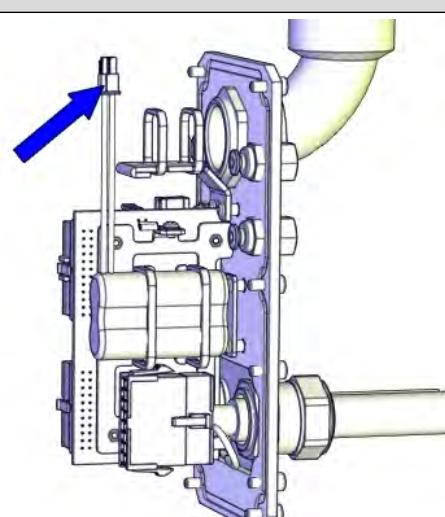
Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

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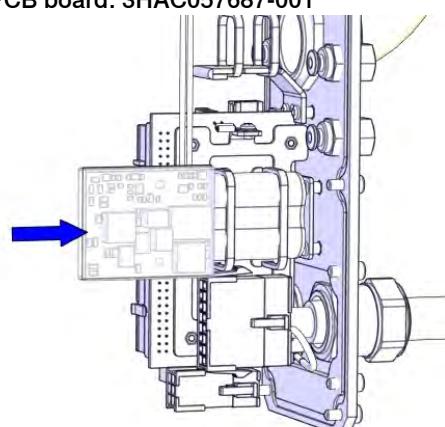
4 Repair

4.3.1 Replacing the main cable package

Continued

Action	Note
2 Connect the battery cable.	 xx1500002192

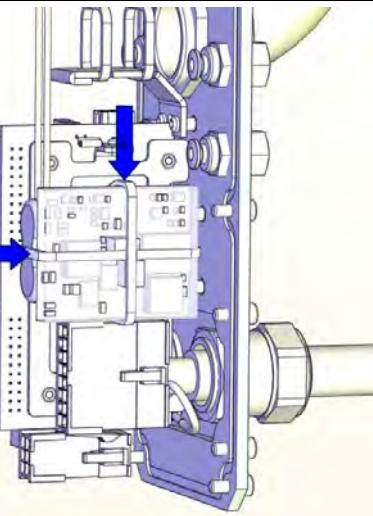
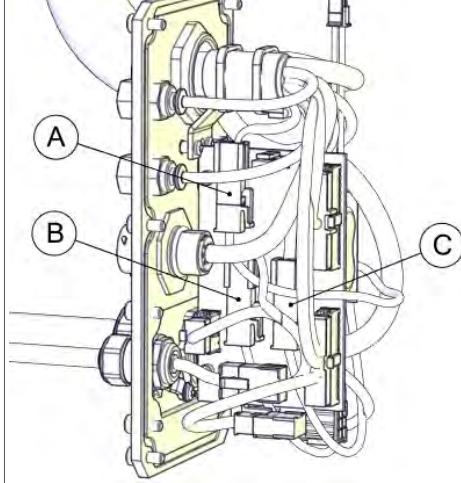
Refitting the PCB board

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
2 Refit the PCB board.  Note The PCB board is protected by shrink hose. Replace the hose if damaged.	PCB board: 3HAC057687-001  xx1500002205

Continues on next page

4.3.1 Replacing the main cable package

Continued

Action	Note						
3 Secure the PCB board with cable ties. Do not tighten the ties too tight.	 xx1500002752						
4 Reconnect the connectors. <ul style="list-style-type: none"> • R1.BK1-2 • R1.DBP • R2.BK1-2 <p>CAUTION Make sure not to mix the connectors. See the labels on the connectors for correct connection.</p>	 xx1500002190 <table border="1" data-bbox="960 1414 1429 1560"> <tr> <td>A</td> <td>R1.BK1-2</td> </tr> <tr> <td>B</td> <td>R1.DBP</td> </tr> <tr> <td>C</td> <td>R2.BK1-2</td> </tr> </table>	A	R1.BK1-2	B	R1.DBP	C	R2.BK1-2
A	R1.BK1-2						
B	R1.DBP						
C	R2.BK1-2						
5 Secure the cables with cable ties if needed.							

Refitting the main cable to the base

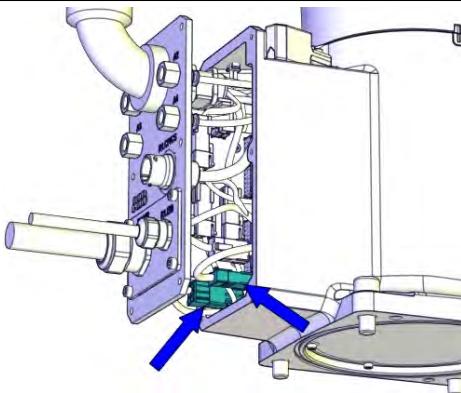
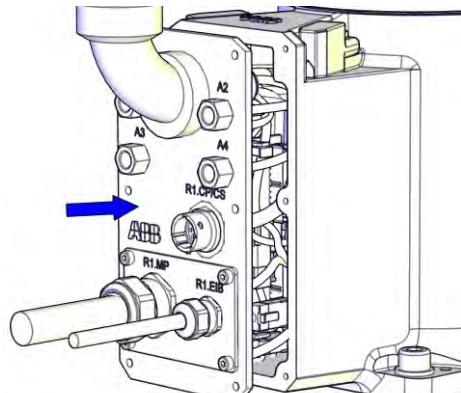
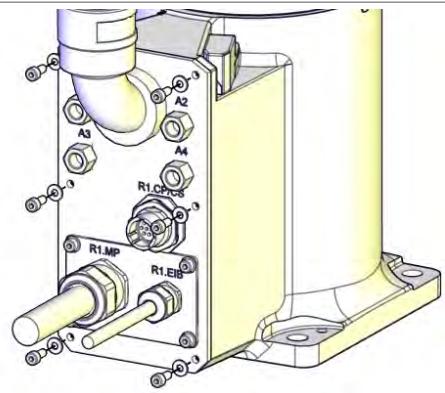
Action	Note
1 Secure the main cable package with cable ties if needed.	

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4 Repair

4.3.1 Replacing the main cable package

Continued

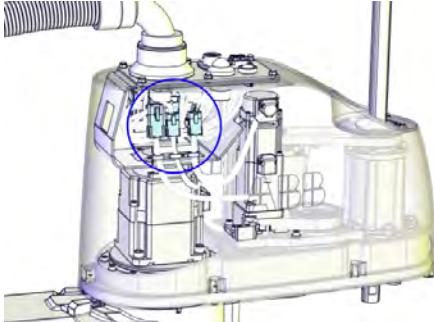
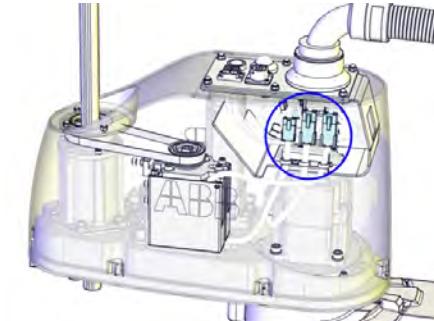
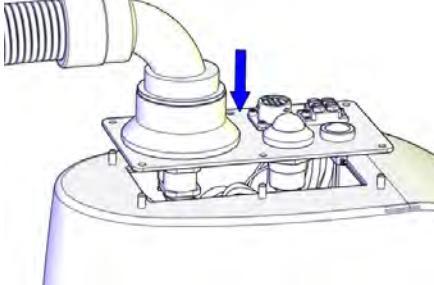
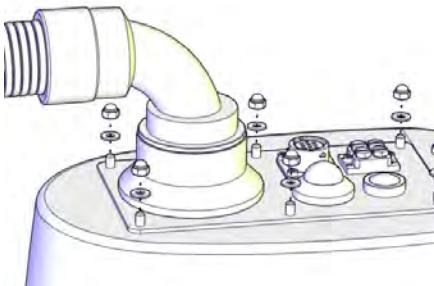
Action	Note
2 Reconnect the connectors. • R2.MP1 • R2.ME1	 xx1500002188
3 Push the main cable package into place.	 xx1500002204
4 Refit the base cover with screws and washers.	 xx1500002186 Screws: M4x10 (6 pcs) Tightening torque: 2 Nm

Refitting the main cable to the upper arm

Action	Note
1 Secure the main cable package with cable ties if needed.	

Continues on next page

4.3.1 Replacing the main cable package
Continued

Action	Note
2 Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 	 xx1500002184  xx1500002185
3 Push the main cable package into place.	 xx1500002207
4 Refit the user interface plate.	 xx1500002182 <p>Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs</p>

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4 Repair

4.3.1 Replacing the main cable package

Continued

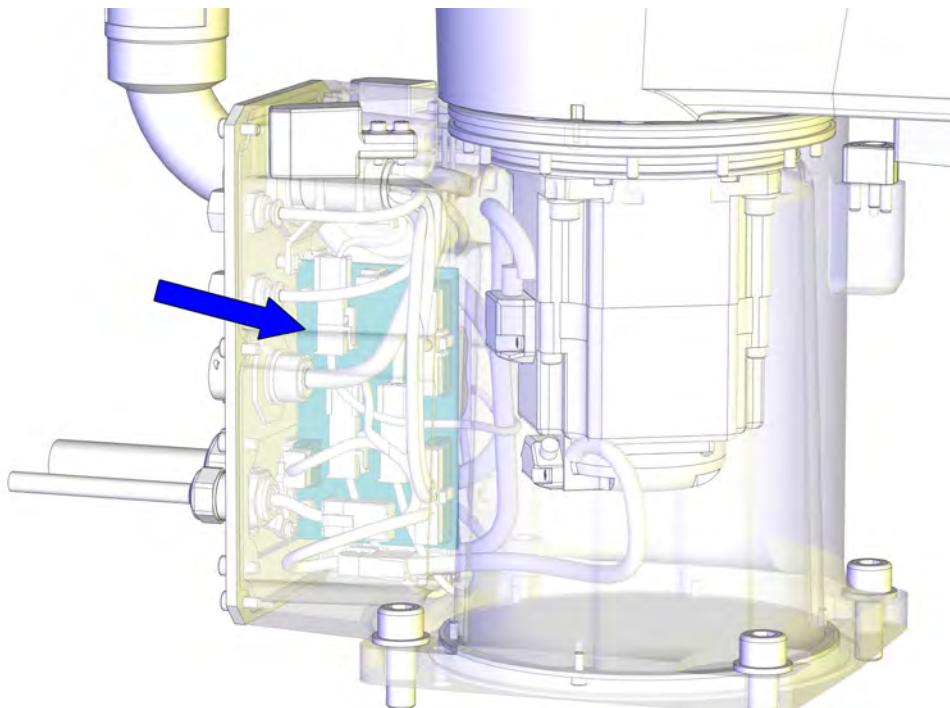
Concluding procedure

Action	Note
1 Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4.3.2 Replacing the EIB unit

Location of the EIB unit

The EIB unit is located as shown in the figure.



xx1500002178

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
EIB unit	3HAC045759-001	
EIB connection cable	3HAC056703-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

Required consumables

Consumable	Article number	Note
Cable ties	-	

Continues on next page

4 Repair

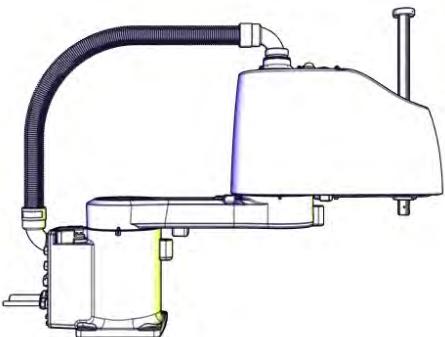
4.3.2 Replacing the EIB unit

Continued

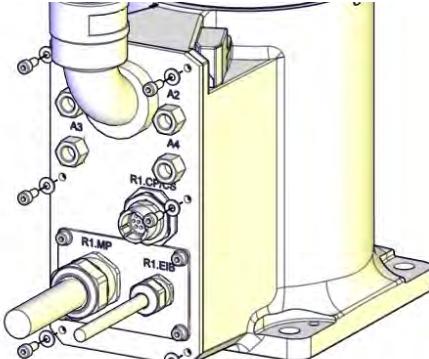
Removing the EIB unit

Use these procedures to remove the EIB unit.

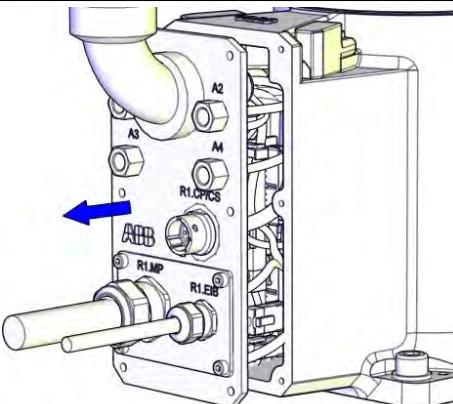
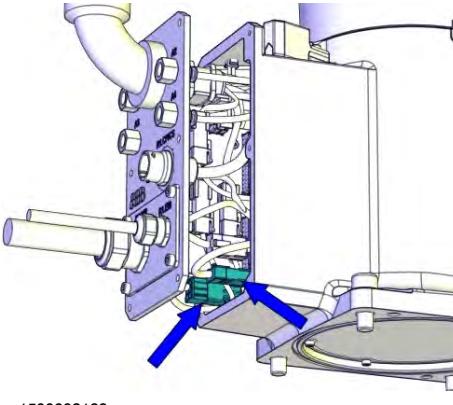
Preparations before removing the EIB unit

Action	Note
1 Jog all axes to zero position.	 xx1500002227
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

Removing the main cable package from 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 screws and washers.	 xx1500002186

Continues on next page

Action	Note
<p>3 Carefully open the base cover and pull out the cable package.</p> <p>CAUTION The cover cannot be removed completely until the connectors are disconnected, as shown in the following step.</p>	 <p>xx1500002187</p>
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> R2.MP1 R2.ME1 <p>Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1500002188</p>

Disconnecting the battery cable

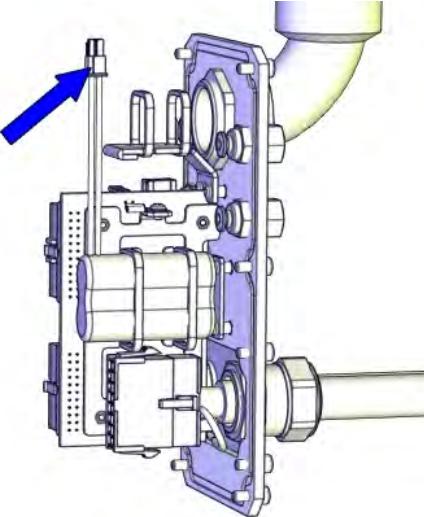
Action	Note
<p>1</p> <p>DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2</p> <p>ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47</p>	

Continues on next page

4 Repair

4.3.2 Replacing the EIB unit

Continued

Action	Note
3 Disconnect the battery cable.	 xx1500002192

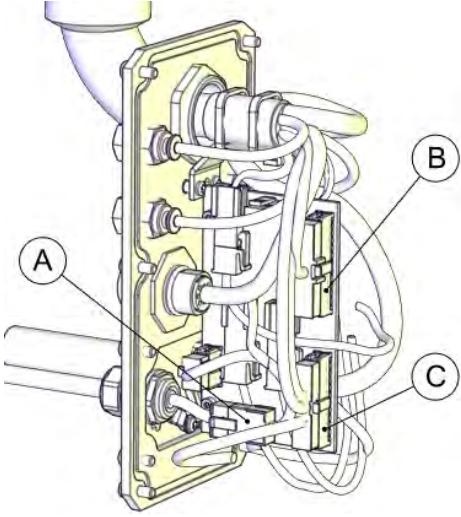
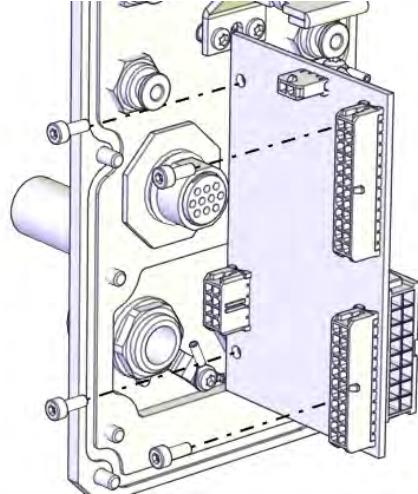
Removing the EIB unit

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>WARNING - The unit is sensitive to ESD! on page 47</i>	

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4.3.2 Replacing the EIB unit

Continued

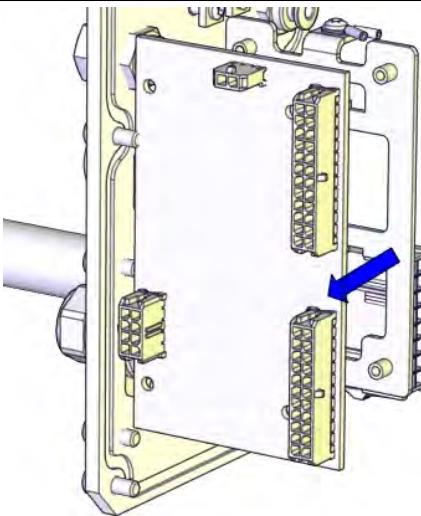
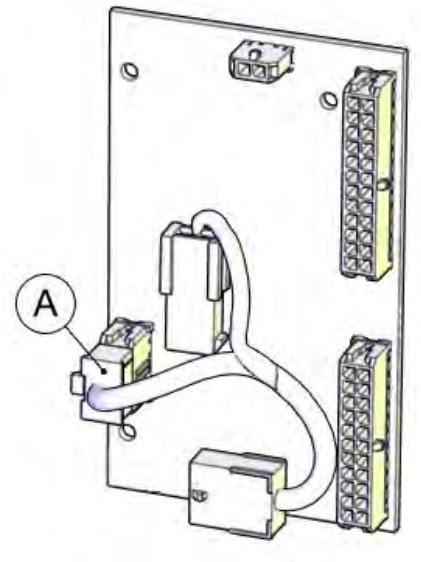
Action	Note						
3 Disconnect the connectors: • R1.EIB • R1.ME4 • R1.ME1-3	 <p>xx1500002195</p> <table border="1"> <tr> <td>A</td> <td>R1.EIB</td> </tr> <tr> <td>B</td> <td>R1.ME4</td> </tr> <tr> <td>C</td> <td>R1.ME1-3</td> </tr> </table>	A	R1.EIB	B	R1.ME4	C	R1.ME1-3
A	R1.EIB						
B	R1.ME4						
C	R1.ME1-3						
4 Remove the screws.	 <p>xx1500002792</p>						

Continues on next page

4 Repair

4.3.2 Replacing the EIB unit

Continued

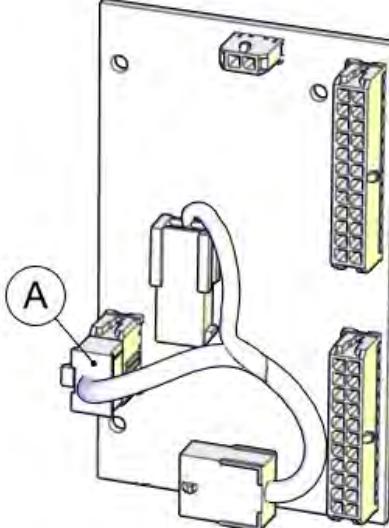
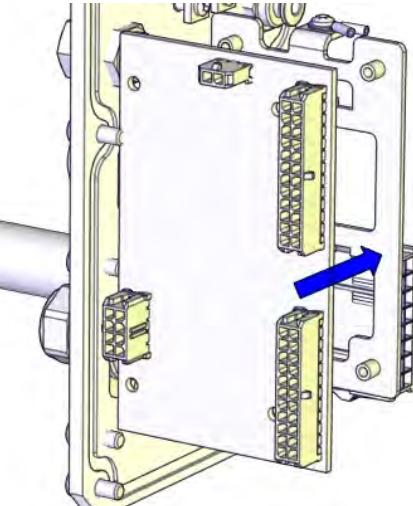
Action	Note		
5 Remove the EIB unit.	 xx1500002196		
6 Disconnect the connector to remove the EIB connection cable. • R2.EIB	 xx1500002197 <table border="1"><tr><td>A</td><td>R2.EIB</td></tr></table>	A	R2.EIB
A	R2.EIB		

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Refitting the EIB unit

Use these procedures to refit the EIB unit.

Refitting the EIB unit

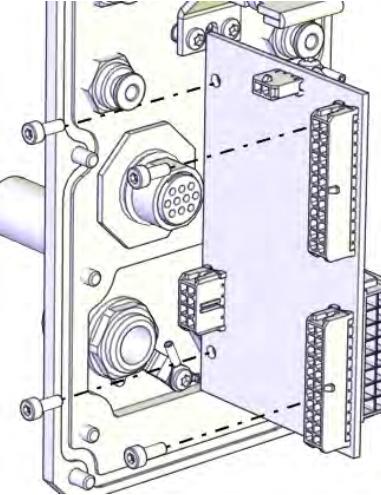
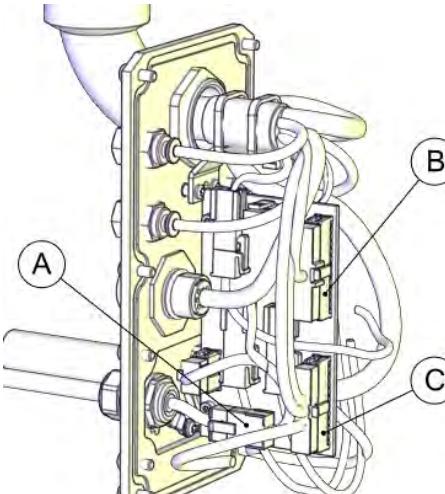
	Action	Note		
1	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47			
2	Reconnect the connector to refit the EIB connection cable. <ul style="list-style-type: none"> • R2.EIB  CAUTION The EIB connection cable has one connector at one end and two connectors at the other end. Make sure not to mix the connectors. See the labels on the connectors for correct connection.	EIB connection cable: 3HAC056703-001  xx1500002197 <table border="1" data-bbox="976 1381 1421 1426"> <tr> <td>A</td> <td>R2.EIB</td> </tr> </table>	A	R2.EIB
A	R2.EIB			
3	Refit the EIB unit.	 xx1500002793		

Continues on next page

4 Repair

4.3.2 Replacing the EIB unit

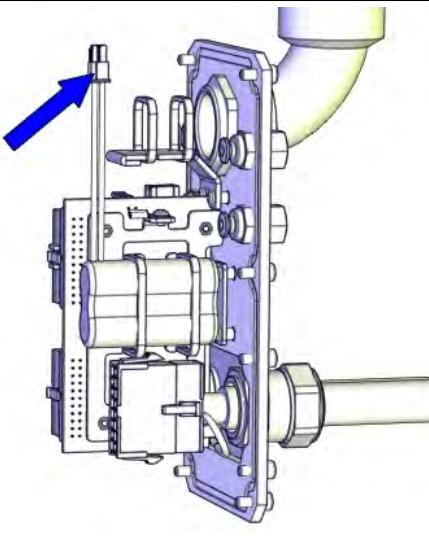
Continued

Action	Note						
4 Secure with screws.	 <p>xx1500002792</p> <p>Screw: M3x8 (4 pcs) Tightening torque: 0.3 Nm</p>						
5 Reconnect the connectors. <ul style="list-style-type: none"> • R1.EIB • R1.ME4 • R1.ME1-3 <p>CAUTION Make sure not to mix the connectors; otherwise, axes may be damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1500002195</p> <table border="1"> <tr> <td>A</td> <td>R1.EIB</td> </tr> <tr> <td>B</td> <td>R1.ME4</td> </tr> <tr> <td>C</td> <td>R1.ME1-3</td> </tr> </table>	A	R1.EIB	B	R1.ME4	C	R1.ME1-3
A	R1.EIB						
B	R1.ME4						
C	R1.ME1-3						

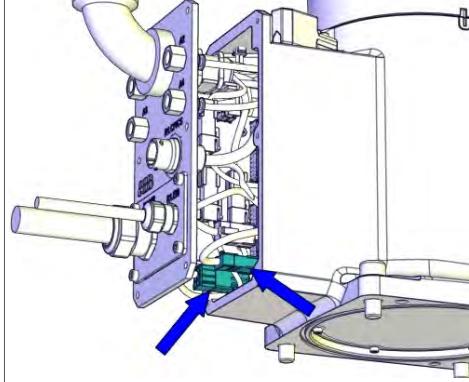
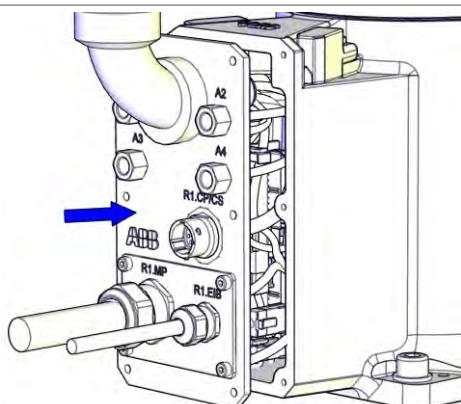
Connecting the battery cable

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

Continues on next page

Action	Note
2 Connect the battery cable.	 xx1500002192

Refitting the main cable to the base

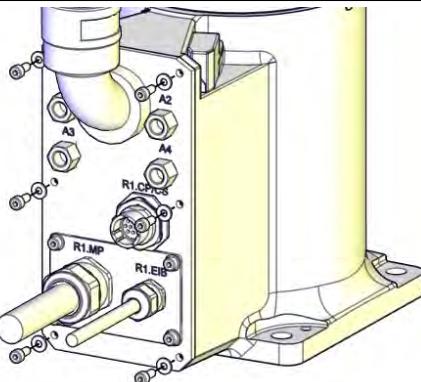
Action	Note
1 Secure the main cable package with cable ties if needed.	
2 Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP1 • R2.ME1 	 xx1500002188
3 Push the main cable package into place.	 xx1500002204

Continues on next page

4 Repair

4.3.2 Replacing the EIB unit

Continued

Action	Note
4 Refit the base cover with screws and washers.	 xx1500002186 Screws: M4x10 (6 pcs) Tightening torque: 2 Nm

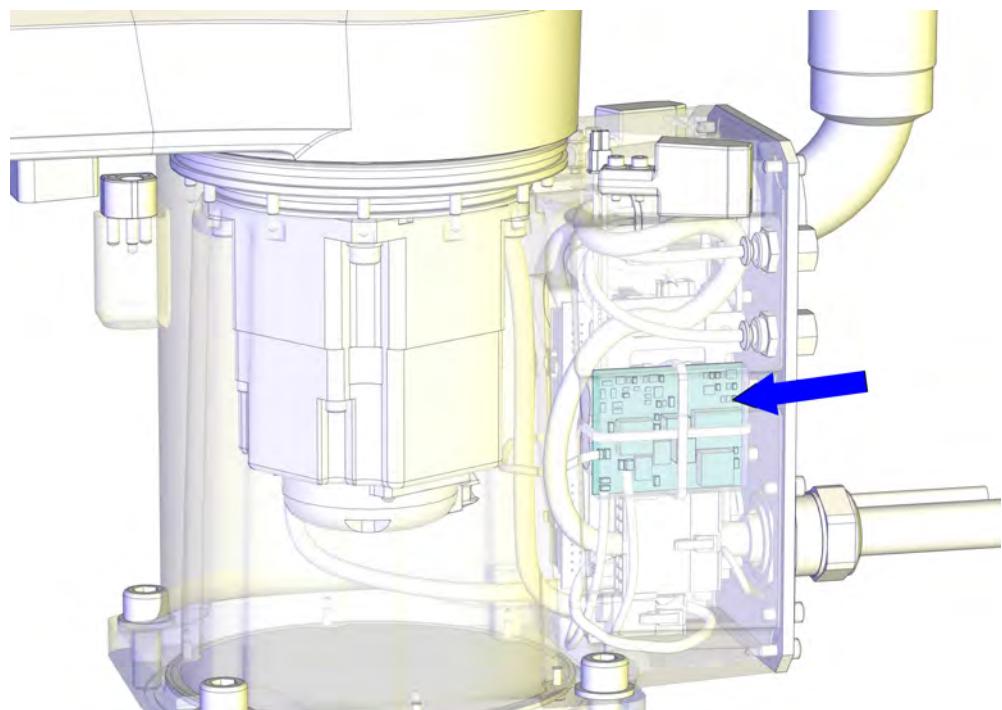
Concluding procedure

Action	Note
1 Update the revolution counters.	See Updating revolution counters on page 350 .
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4.3.3 Replacing the PCB board

Location of the PCB board

The PCB board is located as shown in the figure.



xx1500002179

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
PCB board	3HAC057687-001	

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

Required consumables

Consumable	Article number	Note
Shrink hose	-	Used for protecting the PCB board.
Cable ties	-	

Continues on next page

4 Repair

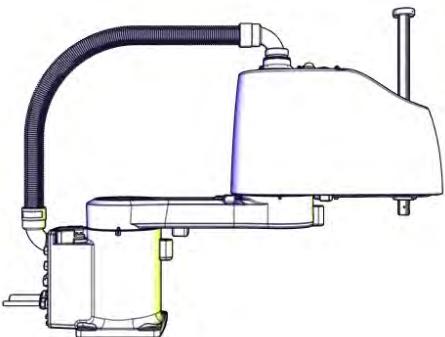
4.3.3 Replacing the PCB board

Continued

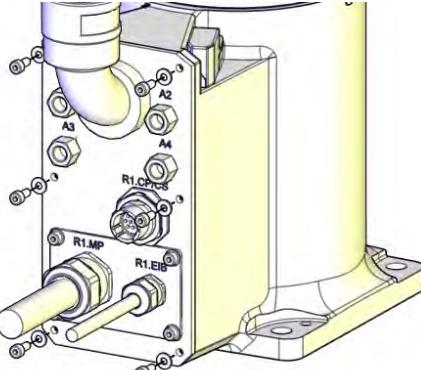
Removing the PCB board

Use these procedures to remove the PCB board.

Preparations before removing the PCB board

Action	Note
1 Jog all axes to zero position.	 xx1500002227
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

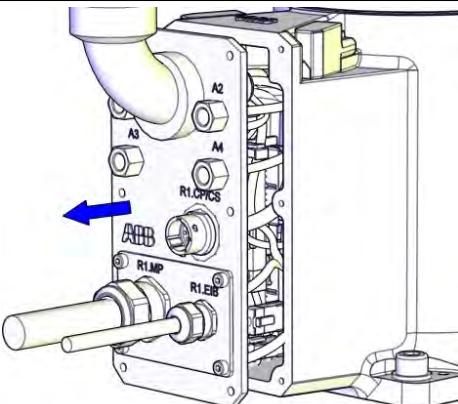
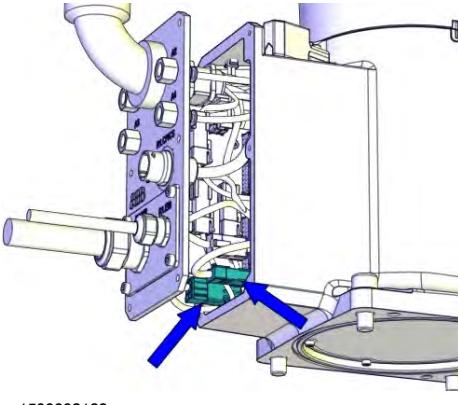
Removing the main cable package from the base

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the screws and washers.	 xx1500002186

Continues on next page

4.3.3 Replacing the PCB board

Continued

Action	Note
<p>3 Carefully open the base cover and pull out the cable package.</p> <p>CAUTION The cover cannot be removed completely until the connectors are disconnected, as shown in the following step.</p>	 <p>xx1500002187</p>
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> R2.MP1 R2.ME1 <p>Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1500002188</p>

Removing the PCB board

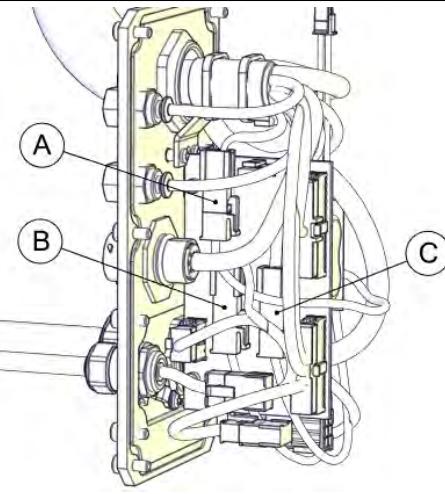
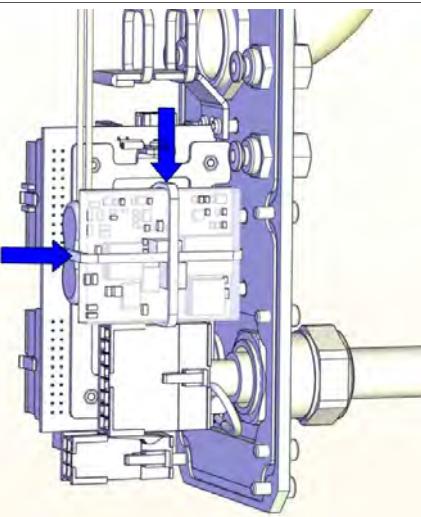
Action	Note
<p>1 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47</p>	

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4 Repair

4.3.3 Replacing the PCB board

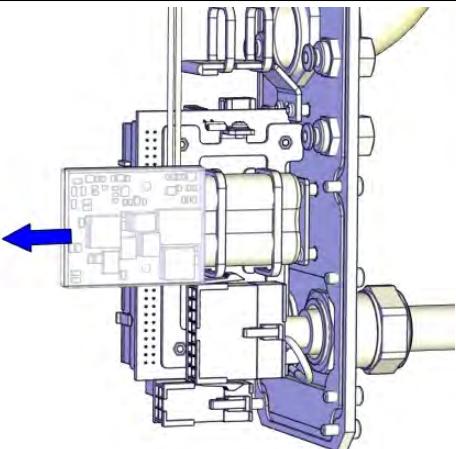
Continued

Action	Note						
3 Disconnect the connectors: <ul style="list-style-type: none">• R1.BK1-2• R1.DBP• R2.BK1-2 <p> Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1500002190</p> <table border="1"><tr><td>A</td><td>R1.BK1-2</td></tr><tr><td>B</td><td>R1.DBP</td></tr><tr><td>C</td><td>R2.BK1-2</td></tr></table>	A	R1.BK1-2	B	R1.DBP	C	R2.BK1-2
A	R1.BK1-2						
B	R1.DBP						
C	R2.BK1-2						
4 Cut the cable ties.	 <p>xx1500002752</p>						

Continues on next page

4.3.3 Replacing the PCB board

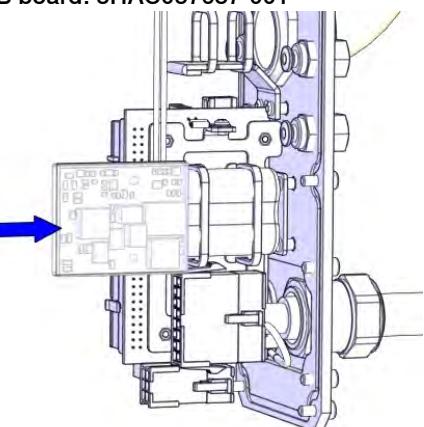
Continued

Action	Note
5 Remove the PCB board carefully.	 xx1500002191

Refitting the PCB board

Use these procedures to refit the PCB board.

Refitting the PCB board

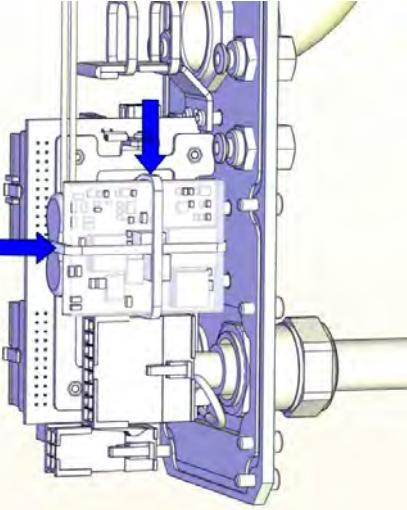
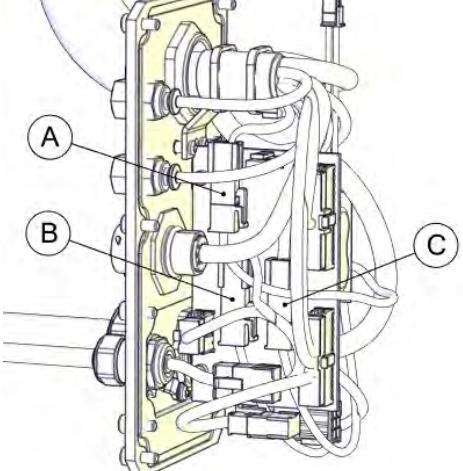
Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
2 Refit the PCB board.  Note The PCB board is protected by shrink hose. Replace the hose if damaged.	PCB board: 3HAC057687-001  xx1500002205

Continues on next page

4 Repair

4.3.3 Replacing the PCB board

Continued

Action	Note						
3 Secure the PCB board with cable ties. Do not tighten the ties too tight.	 xx1500002752						
4 Reconnect the connectors. <ul style="list-style-type: none"> • R1.BK1-2 • R1.DBP • R2.BK1-2 <p>CAUTION Make sure not to mix the connectors. See the labels on the connectors for correct connection.</p>	 xx1500002190 <table border="1" data-bbox="936 1414 1399 1560"> <tr> <td>A</td> <td>R1.BK1-2</td> </tr> <tr> <td>B</td> <td>R1.DBP</td> </tr> <tr> <td>C</td> <td>R2.BK1-2</td> </tr> </table>	A	R1.BK1-2	B	R1.DBP	C	R2.BK1-2
A	R1.BK1-2						
B	R1.DBP						
C	R2.BK1-2						
5 Secure the cables with cable ties if needed.							

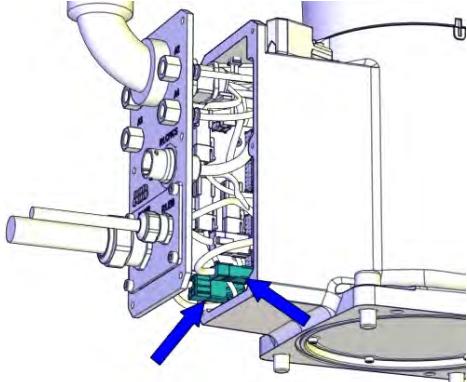
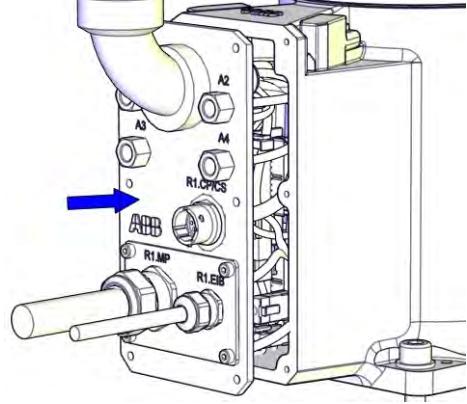
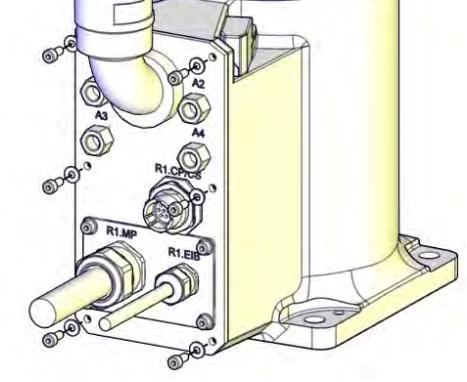
Refitting the main cable to the base

Action	Note
1 Secure the main cable package with cable ties if needed.	

Continues on next page

4.3.3 Replacing the PCB board

Continued

Action	Note
2 Reconnect the connectors. • R2.MP1 • R2.ME1	 xx1500002188
3 Push the main cable package into place.	 xx1500002204
4 Refit the base cover with screws and washers.	 xx1500002186 Screws: M4x10 (6 pcs) Tightening torque: 2 Nm

Concluding procedure

Action	Note
1 Update the revolution counters.	See Updating revolution counters on page 350 .

Continues on next page

4 Repair

4.3.3 Replacing the PCB board

Continued

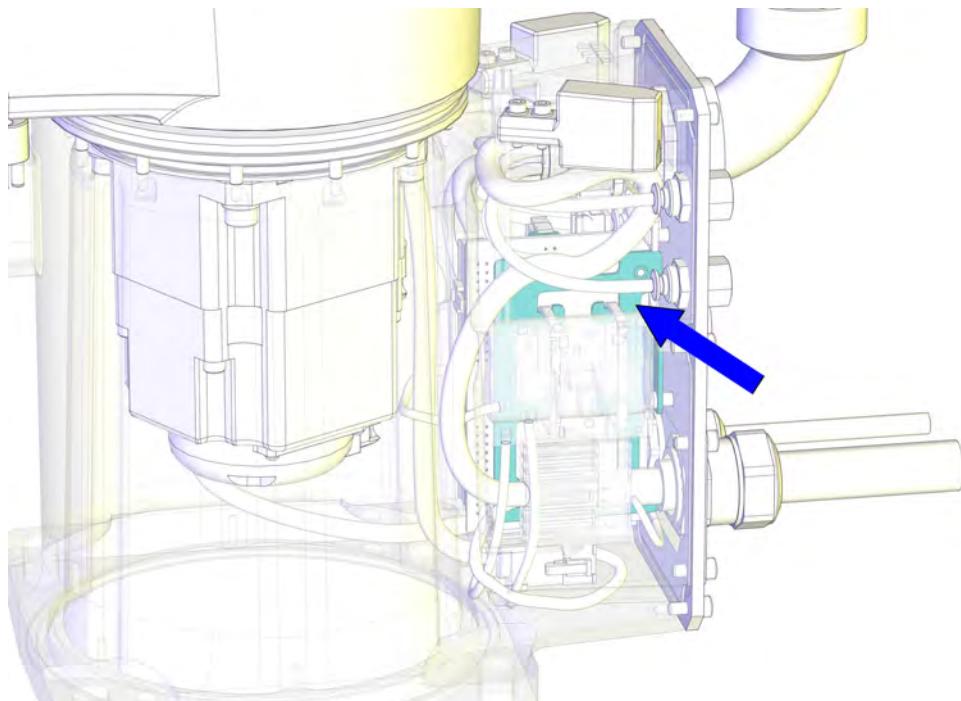
Action	Note
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45.	

4.3.4 Replacing the EIB mounting plate

4.3.4 Replacing the EIB mounting plate

Location of the EIB mounting plate

The EIB mounting plate is located as shown in the figure.



xx1500002517

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
EIB mounting plate	3HAC055165-001	
EIB connection cable	3HAC056703-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

Required consumables

Consumable	Article number	Note
Cable ties	-	

Continues on next page

4 Repair

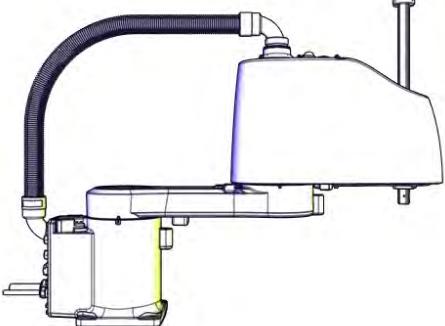
4.3.4 Replacing the EIB mounting plate

Continued

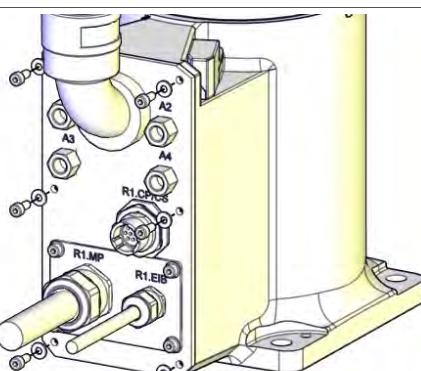
Removing the EIB mounting plate

Use these procedures to remove the EIB mounting plate.

Preparations before removing the EIB mounting plate

Action	Note
1 Jog all axes to zero position.	 xx1500002227
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

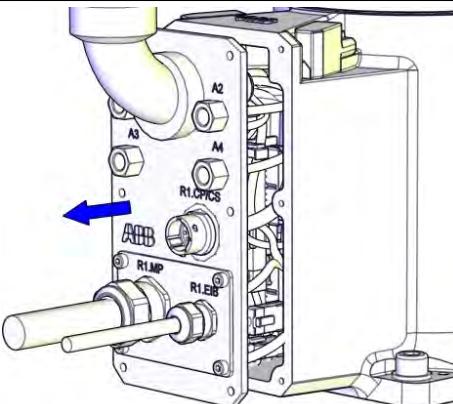
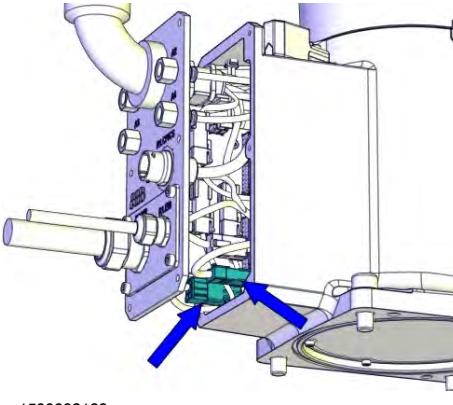
Removing the main cable package from the base

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the screws and washers.	 xx1500002186

Continues on next page

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note
<p>3 Carefully open the base cover and pull out the cable package.</p> <p>CAUTION The cover cannot be removed completely until the connectors are disconnected, as shown in the following step.</p>	 xx1500002187
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> R2.MP1 R2.ME1 <p>Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 xx1500002188

Removing the PCB board

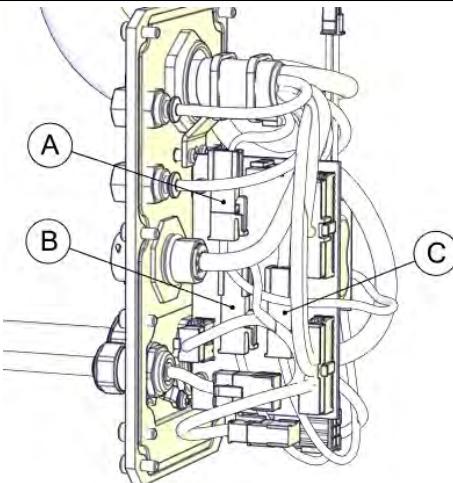
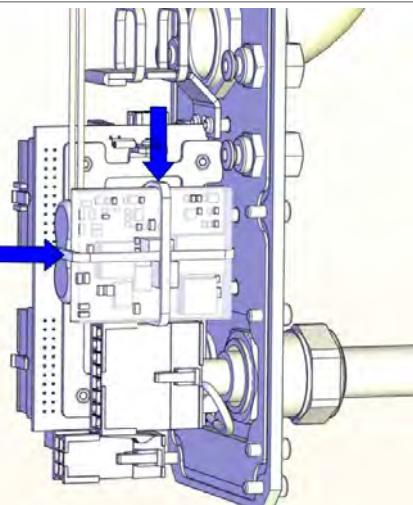
Action	Note
<p>1 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47</p>	

Continues on next page

4 Repair

4.3.4 Replacing the EIB mounting plate

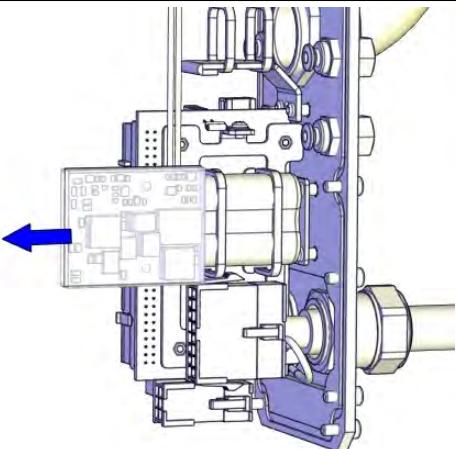
Continued

Action	Note						
<p>3 Disconnect the connectors:</p> <ul style="list-style-type: none"> • R1.BK1-2 • R1.DBP • R2.BK1-2 <p>Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1500002190</p> <table border="1"> <tr> <td>A</td> <td>R1.BK1-2</td> </tr> <tr> <td>B</td> <td>R1.DBP</td> </tr> <tr> <td>C</td> <td>R2.BK1-2</td> </tr> </table>	A	R1.BK1-2	B	R1.DBP	C	R2.BK1-2
A	R1.BK1-2						
B	R1.DBP						
C	R2.BK1-2						
4 Cut the cable ties.	 <p>xx1500002752</p>						

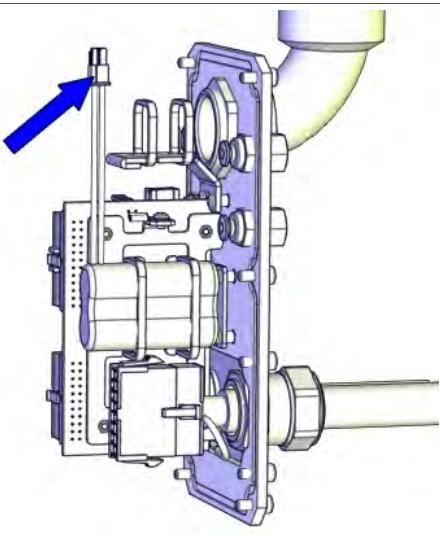
Continues on next page

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note
5 Remove the PCB board carefully.	 xx1500002191

Disconnecting the battery cable

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
3 Disconnect the battery cable.	 xx1500002192

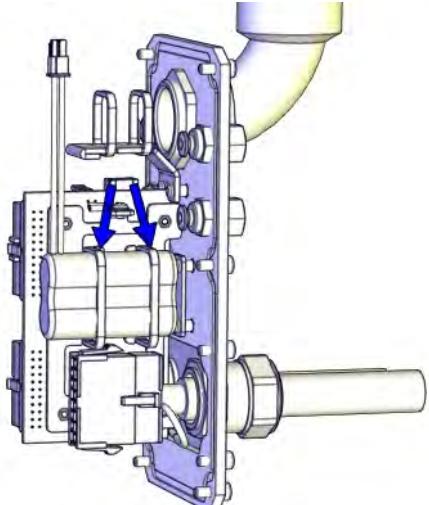
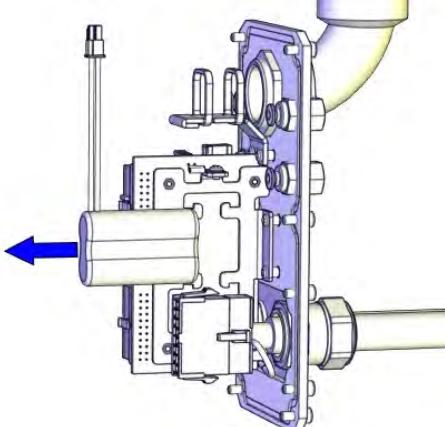
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4 Repair

4.3.4 Replacing the EIB mounting plate

Continued

Removing the battery pack

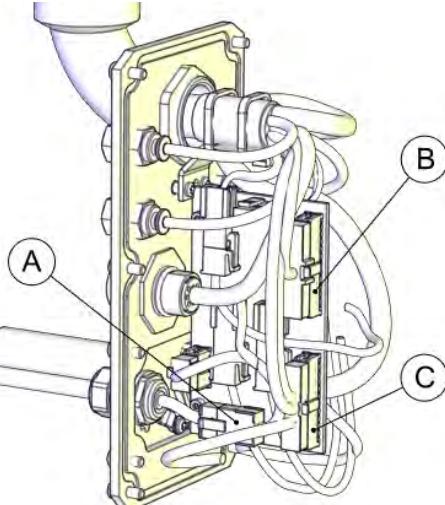
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
3	Cut the cable ties.	 xx1500002193
4	Remove the battery.  Note Battery includes protection circuits. Only replace with a specified spare part or with an ABB-approved equivalent.	 xx1500002194

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4.3.4 Replacing the EIB mounting plate

Continued

Removing the EIB unit

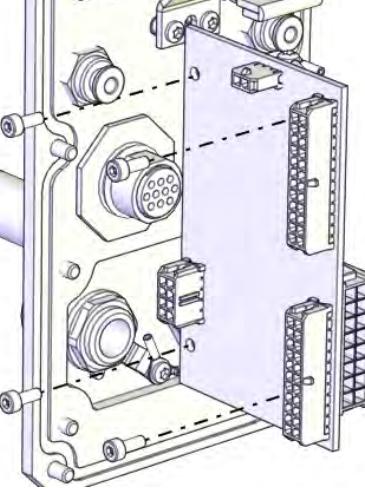
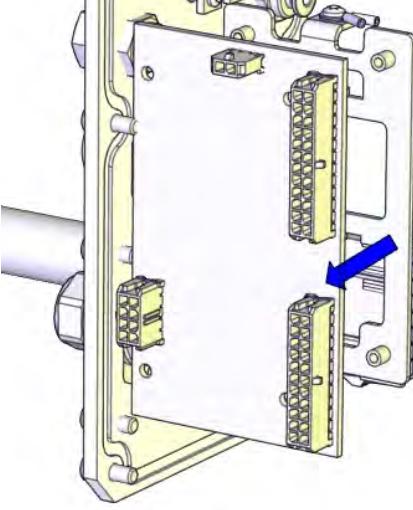
Action	Note						
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.							
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>WARNING - The unit is sensitive to ESD! on page 47</i>							
3 Disconnect the connectors: <ul style="list-style-type: none"> • R1.EIB • R1.ME4 • R1.ME1-3 	 xx1500002195 <table border="1" data-bbox="976 1358 1421 1504"> <tr> <td>A</td> <td>R1.EIB</td> </tr> <tr> <td>B</td> <td>R1.ME4</td> </tr> <tr> <td>C</td> <td>R1.ME1-3</td> </tr> </table>	A	R1.EIB	B	R1.ME4	C	R1.ME1-3
A	R1.EIB						
B	R1.ME4						
C	R1.ME1-3						

Continues on next page

4 Repair

4.3.4 Replacing the EIB mounting plate

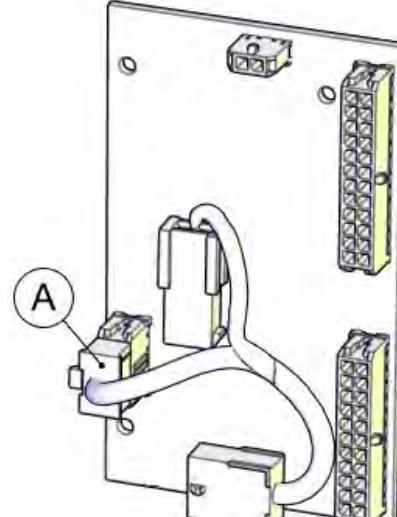
Continued

	Action	Note
4	Remove the screws.	 xx1500002792
5	Remove the EIB unit.	 xx1500002196

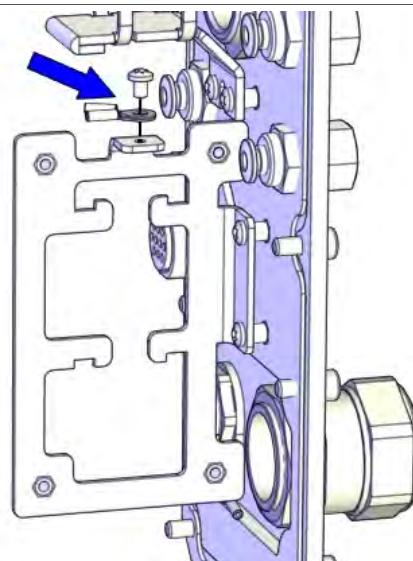
Continues on next page

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note		
<p>6 Disconnect the connector to remove the EIB connection cable.</p> <ul style="list-style-type: none"> • R2.EIB 	 <p>xx1500002197</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A</td> <td>R2.EIB</td> </tr> </table>	A	R2.EIB
A	R2.EIB		

Removing the EIB mounting plate

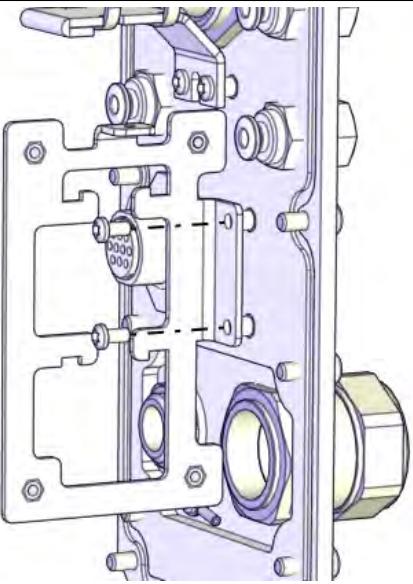
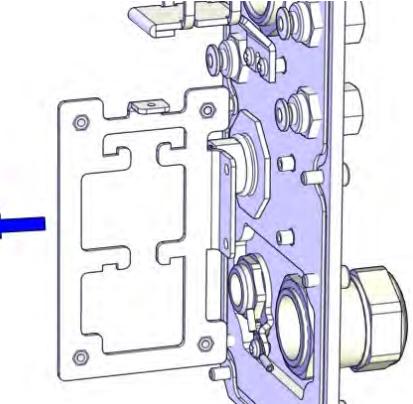
Action	Note
<p>1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2 Disconnect the earth cable by removing the screw.</p>	 <p>xx1500002794</p>

Continues on next page

4 Repair

4.3.4 Replacing the EIB mounting plate

Continued

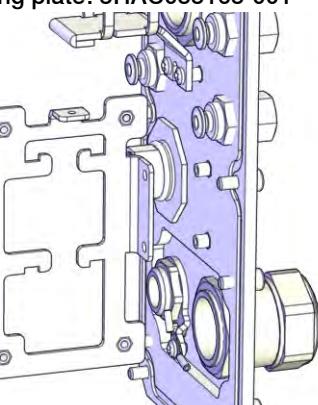
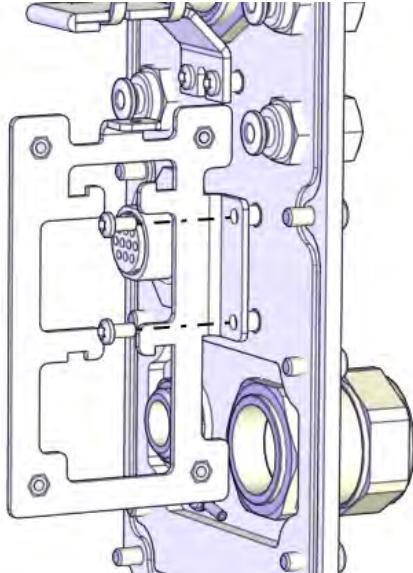
Action	Note
3 Remove the screws.	 xx1500002795
4 Remove the EIB mounting plate.	 xx1500002198

Continues on next page

Refitting the EIB mounting plate

Use these procedures to refit the EIB mounting plate.

Refitting the EIB mounting plate

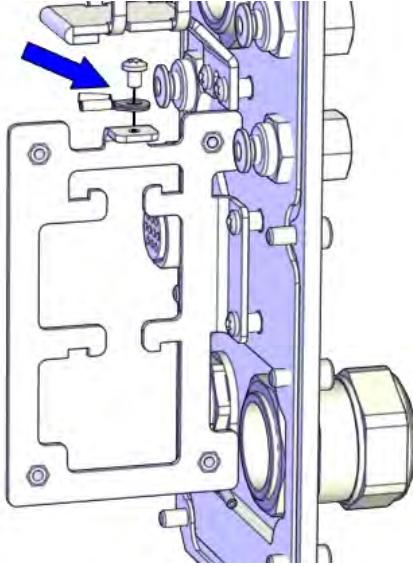
	Action	Note
1	Refit the EIB mounting plate.	 EIB mounting plate: 3HAC055165-001 xx1500002796
2	Secure with screws.	 xx1500002795 Screw: M3x6 (2 pcs) Tightening torque: 1.5 Nm

Continues on next page

4 Repair

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note
3 Connect the earth cable with the screw.	 xx1500002794 Screw: M3x4 (1 pcs) Tightening torque: 0.3 Nm

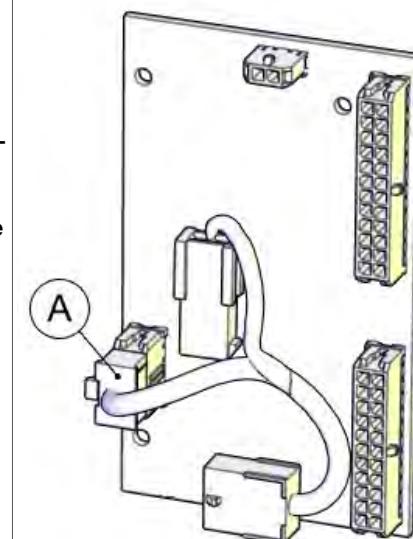
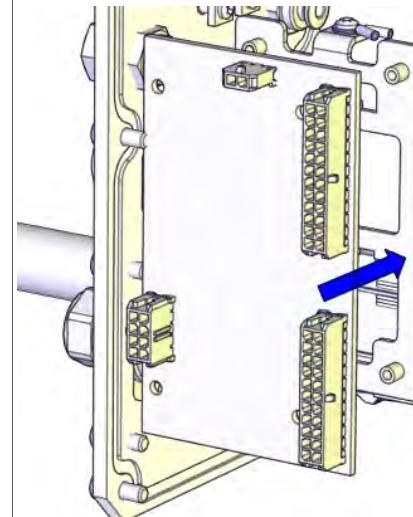
Refitting the EIB unit

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

Continues on next page

4.3.4 Replacing the EIB mounting plate

Continued

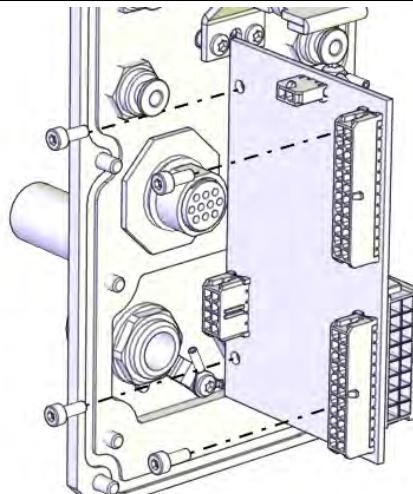
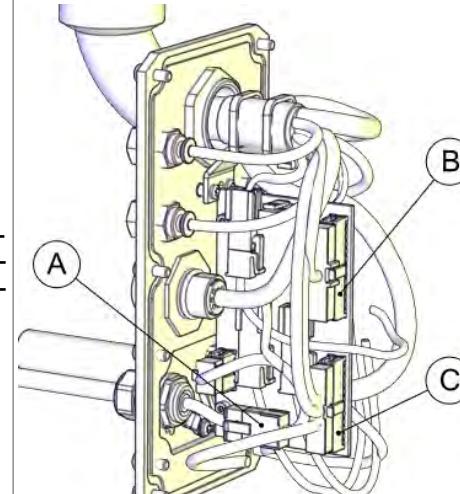
Action	Note		
<p>2 Reconnect the connector to refit the EIB connection cable.</p> <ul style="list-style-type: none"> • R2.EIB <p>CAUTION</p> <p>The EIB connection cable has one connector at one end and two connectors at the other end.</p> <p>Make sure not to mix the connectors. See the labels on the connectors for correct connection.</p>	<p>EIB connection cable: 3HAC056703-001</p>  <p>xx1500002197</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A</td> <td>R2.EIB</td> </tr> </table>	A	R2.EIB
A	R2.EIB		
3 Refit the EIB unit.	 <p>xx1500002793</p>		

Continues on next page

4 Repair

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note						
4 Secure with screws.	 xx1500002792 <p>Screw: M3x8 (4 pcs) Tightening torque: 0.3 Nm</p>						
5 Reconnect the connectors. <ul style="list-style-type: none"> • R1.EIB • R1.ME4 • R1.ME1-3 <p>CAUTION Make sure not to mix the connectors; otherwise, axes may be damaged. See the labels on the connectors for correct connection.</p>	 xx1500002195 <table border="1"> <tr> <td>A</td> <td>R1.EIB</td> </tr> <tr> <td>B</td> <td>R1.ME4</td> </tr> <tr> <td>C</td> <td>R1.ME1-3</td> </tr> </table>	A	R1.EIB	B	R1.ME4	C	R1.ME1-3
A	R1.EIB						
B	R1.ME4						
C	R1.ME1-3						

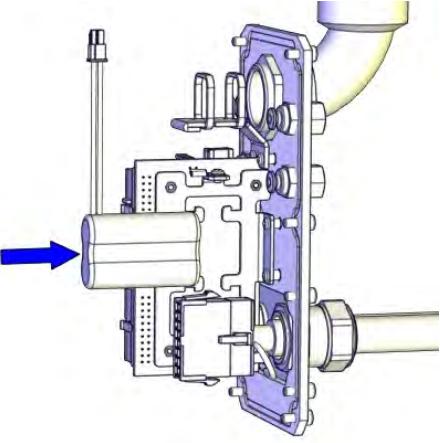
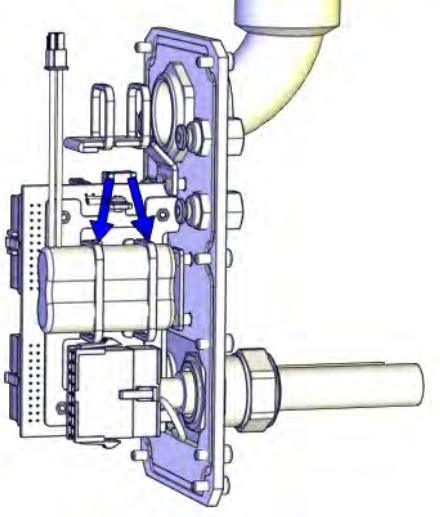
Refitting the battery pack

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

Continues on next page

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note
2 Fit the battery.	<p> Note</p> <p>Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.</p>  <p>xx1500002206</p>
3 Secure the battery with cable ties.	 <p>xx1500002193</p>

Connecting the battery cable

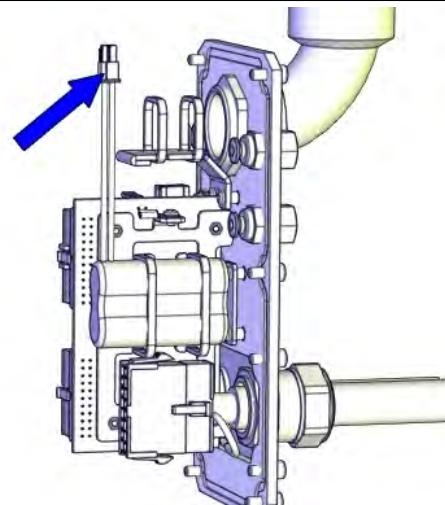
Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	

Continues on next page

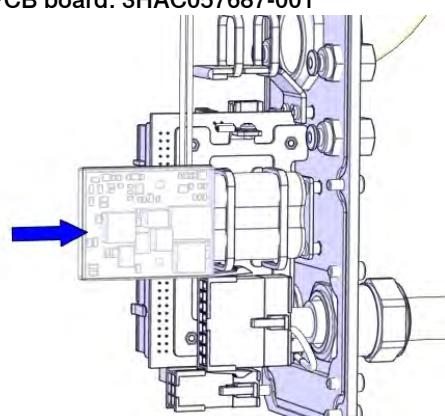
4 Repair

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note
2 Connect the battery cable.	 xx1500002192

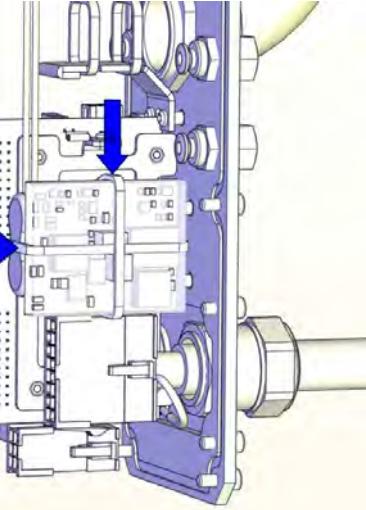
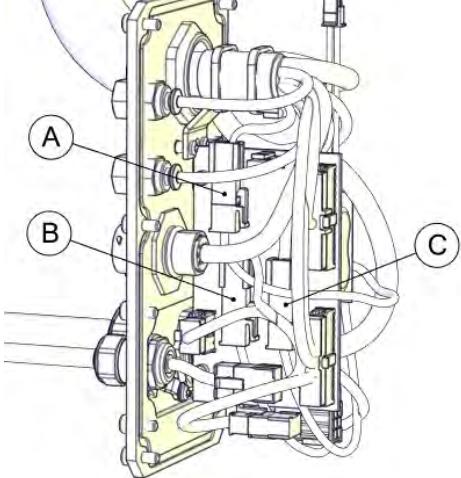
Refitting the PCB board

Action	Note
1  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 47	
2 Refit the PCB board.  Note The PCB board is protected by shrink hose. Replace the hose if damaged.	PCB board: 3HAC057687-001  xx1500002205

Continues on next page

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note						
3 Secure the PCB board with cable ties. Do not tighten the ties too tight.	 xx1500002752						
4 Reconnect the connectors. <ul style="list-style-type: none"> • R1.BK1-2 • R1.DBP • R2.BK1-2 <p>CAUTION Make sure not to mix the connectors. See the labels on the connectors for correct connection.</p>	 xx1500002190 <table border="1" data-bbox="965 1414 1432 1560"> <tr> <td>A</td> <td>R1.BK1-2</td> </tr> <tr> <td>B</td> <td>R1.DBP</td> </tr> <tr> <td>C</td> <td>R2.BK1-2</td> </tr> </table>	A	R1.BK1-2	B	R1.DBP	C	R2.BK1-2
A	R1.BK1-2						
B	R1.DBP						
C	R2.BK1-2						
5 Secure the cables with cable ties if needed.							

Refitting the main cable to the base

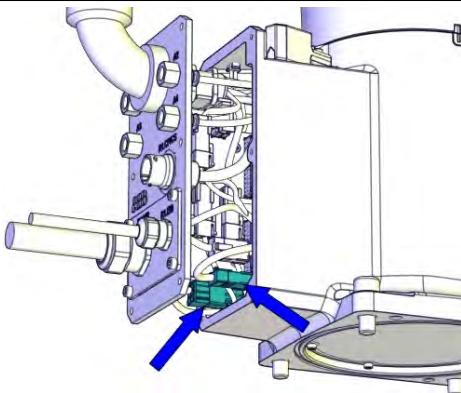
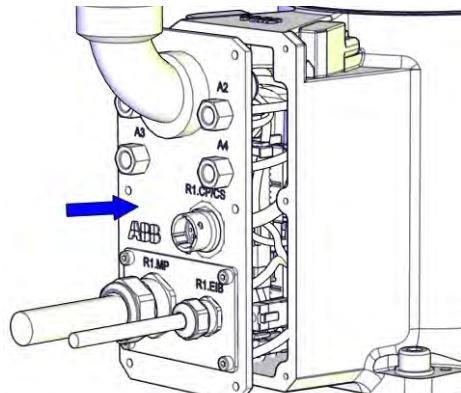
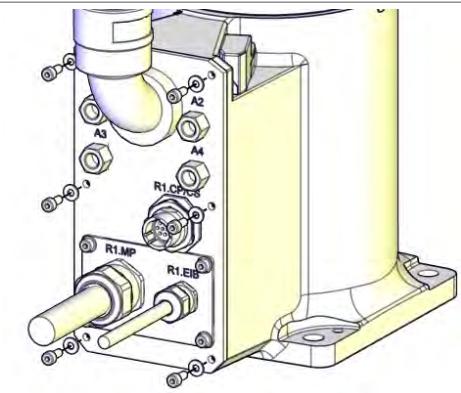
Action	Note
1 Secure the main cable package with cable ties if needed.	

Continues on next page

4 Repair

4.3.4 Replacing the EIB mounting plate

Continued

Action	Note
2 Reconnect the connectors. • R2.MP1 • R2.ME1	 xx1500002188
3 Push the main cable package into place.	 xx1500002204
4 Refit the base cover with screws and washers.	 xx1500002186 Screws: M4x10 (6 pcs) Tightening torque: 2 Nm

Concluding procedure

Action	Note
1 Update the revolution counters.	See Updating revolution counters on page 350 .

Continues on next page

4.3.4 Replacing the EIB mounting plate

Continued

	Action	Note
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45.	

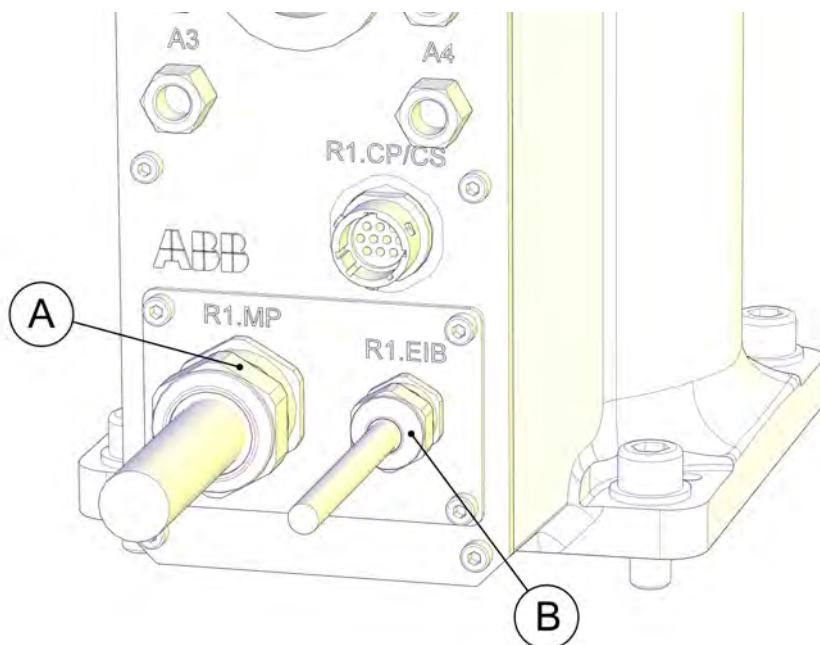
4 Repair

4.3.5 Replacing the floor cables

4.3.5 Replacing the floor cables

Location of the floor cables

The floor cables are located as shown in the figure.



xx1500002181

A	Power floor cable
B	Signal floor cable

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Power floor cable, 3 m	3HAC057784-001	
Power floor cable, 7 m	3HAC057785-001	
Power floor cable, 15 m	3HAC057786-001	
Signal floor cable, 3 m	3HAC057787-001	
Signal floor cable, 7 m	3HAC057788-001	
Signal floor cable, 15 m	3HAC057789-001	

Continues on next page

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

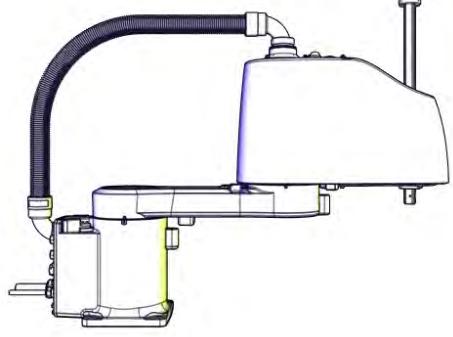
Required consumables

Consumable	Article number	Note
Cable ties	-	

Removing the floor cables

Use these procedures to remove the floor cables.

Preparations before removing the floor cables

	Action	Note
1	Jog all axes to zero position.	 xx1500002227
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

Removing the floor cables

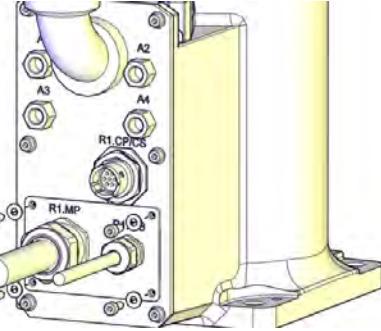
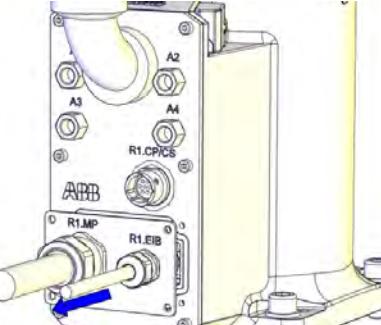
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4 Repair

4.3.5 Replacing the floor cables

Continued

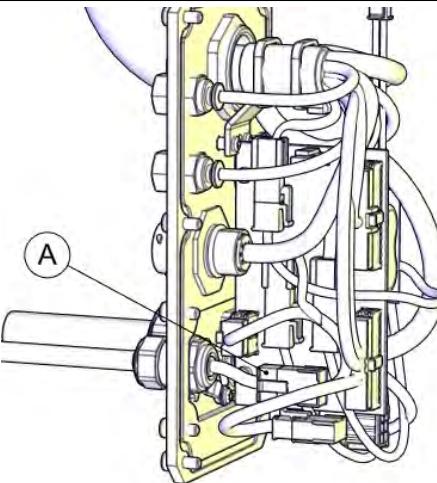
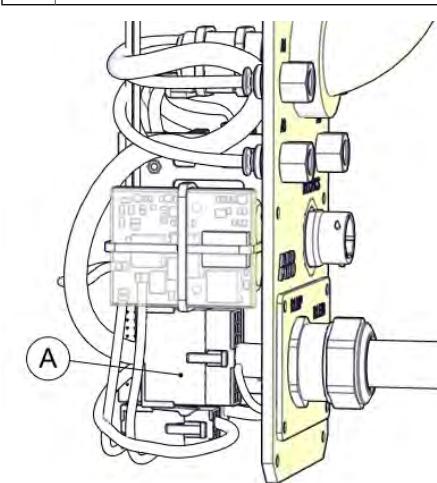
Action	Note
2 Remove the screws and washers.	 xx1500003003
3 Pull out the floor cables.	 xx1500003004

Disconnecting the floor cable connectors

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

Continues on next page

4.3.5 Replacing the floor cables
Continued

Action	Note				
<p>2 Disconnect the connectors.</p> <ul style="list-style-type: none"> • R1.EIB • R1.MP 	 <p>xx1500002202</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A</td> <td>R1.EIB</td> </tr> </table>  <p>xx1500002203</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A</td> <td>R1.MP</td> </tr> </table>	A	R1.EIB	A	R1.MP
A	R1.EIB				
A	R1.MP				

Separating the signal floor cable

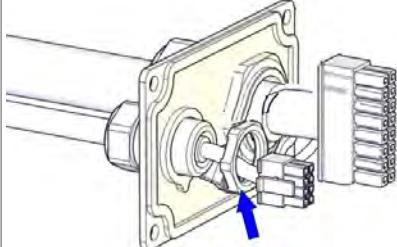
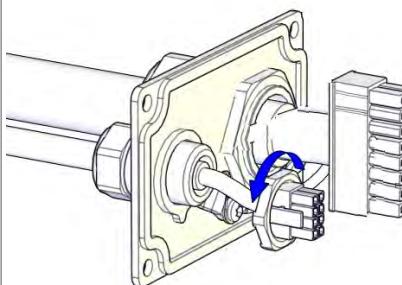
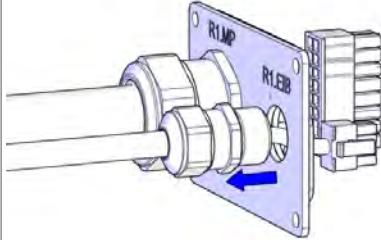
Action	Note
<p>1</p> <p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

Continues on next page

4 Repair

4.3.5 Replacing the floor cables

Continued

Action	Note
2 Screw off the hexagonal lock nut.	 xx1500003006
3 Turn the lock nut gently against the connector to pull out the connector.	 xx1500003007
4 Remove the signal floor cable.	 xx1500003008

Refitting the floor cables

Use these procedures to refit the floor cables.

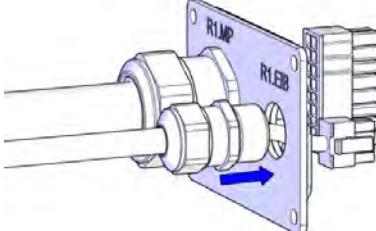
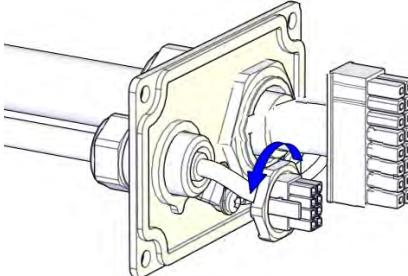
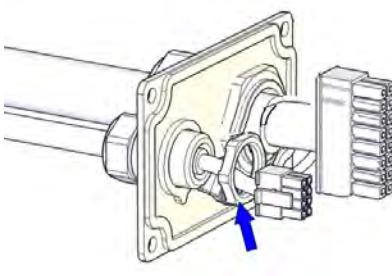
Assembling the signal floor cable

Action	Note
1 Check the power floor cable. Replace if damaged.	

Continues on next page

4.3.5 Replacing the floor cables

Continued

Action	Note
2 Insert the signal floor cable.	 xx1500003009
3 Turn the hexagonal lock nut gently against the connector to enable the connector to move through the lock nut.	 xx1500003007 Lock nut: M16
4 Secure the signal floor cable with the lock nut.	 xx1500003006 Tightening torque: 20 Nm

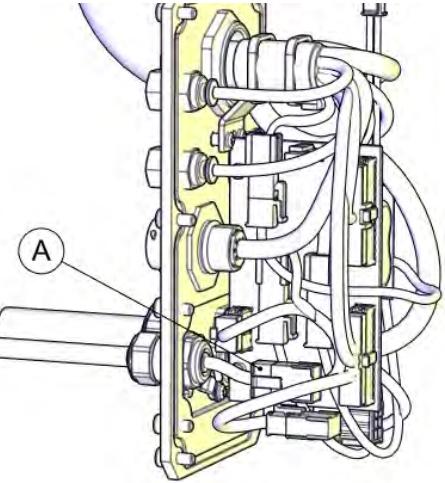
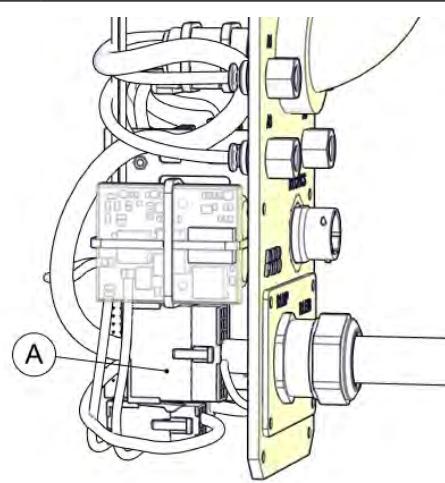
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4 Repair

4.3.5 Replacing the floor cables

Continued

Reconnecting the floor cable connectors

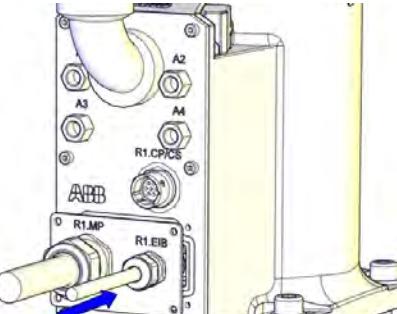
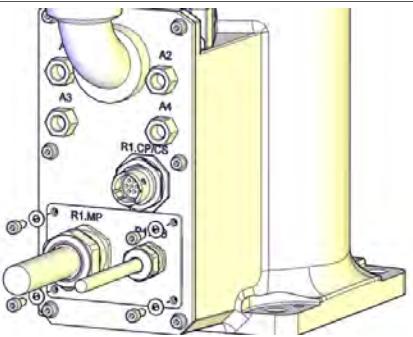
Action	Note				
1 Reconnect the connectors. • R1.EIB • R1.MP	 <p>xx1500002202</p> <table border="1"><tr><td>A</td><td>R1.EIB</td></tr></table>  <p>xx1500002203</p> <table border="1"><tr><td>A</td><td>R1.MP</td></tr></table>	A	R1.EIB	A	R1.MP
A	R1.EIB				
A	R1.MP				

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4.3.5 Replacing the floor cables

Continued

Refitting the floor cables

	Action	Note
1	Push the floor cables into place.	 xx1500003005
2	Secure with screws and washers.	 xx1500003003 Screw: M4x10 (4 pcs) Tightening torque: 2 Nm

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4 Repair

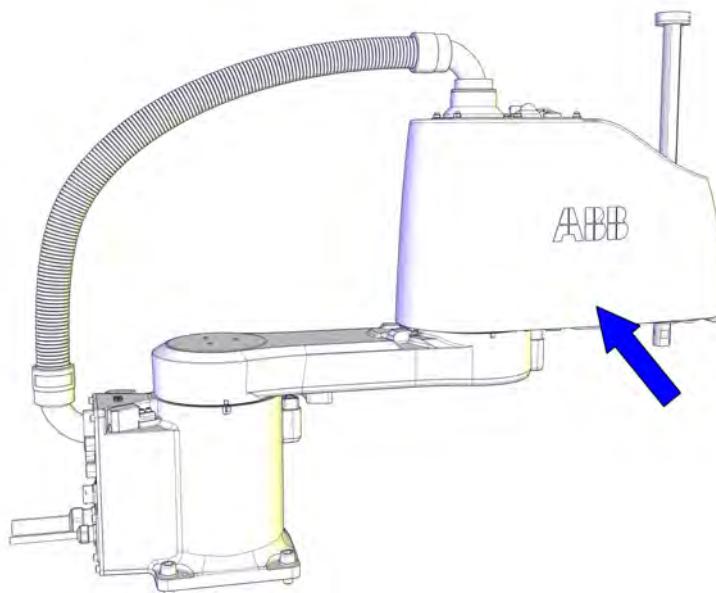
4.4.1 Replacing the upper arm

4.4 Upper arm

4.4.1 Replacing the upper arm

Location of the upper arm

The upper arm is located as shown in the figure.



xx1500002209

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Upper arm body	3HAC057711-001	
Upper cover unit	3HAC057615-001	Includes upper cover and cover flange.
Lower cover	3HAC060106-001	Replace if damaged.
Plate for upper arm cable harness	3HAC056086-001	Replace if damaged.
Axis-4 housing with idler	3HAC056121-001	Replace if damaged.
Axis-3 drive unit housing	3HAC055184-001	Replace if damaged.
Adjusting block for axis-3 timing belt	3HAC056650-001	Replace if damaged.
Adjusting block for upper axis-4 timing belt	3HAC056651-001	Replace if damaged.

Continues on next page

4.4.1 Replacing the upper arm

Continued

Spare part	Article number	Note
Adjusting block for lower axis-4 timing belt	3HAC056652-001	Replace if damaged.
Plain washer	3HAC056937-001	Replace if damaged.
Axis-2 mechanical stop block	3HAC055185-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	The content is defined in the section Standard toolkit on page 384 .
Acoustic tensiometer	-	Used for measuring the timing belt tension.

Required consumables

Consumable	Article number	Note
Grease	-	THK AFA Used for lubricating the ball screw spline shaft.
Cable ties	-	

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4 Repair

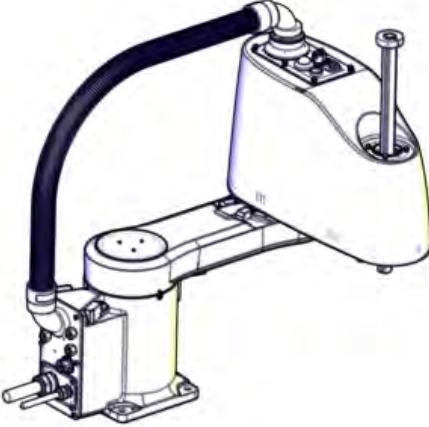
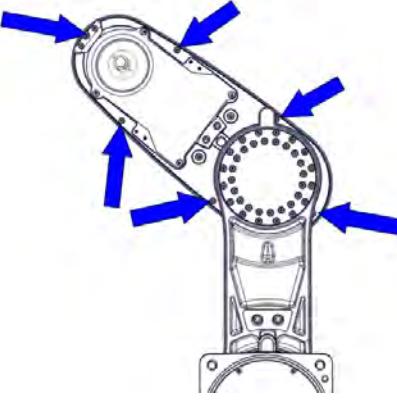
4.4.1 Replacing the upper arm

Continued

Removing the upper arm

Use these procedures to remove the upper arm from the lower arm.

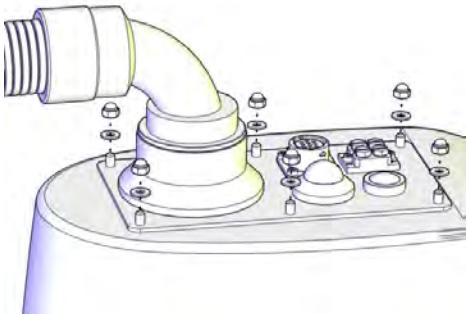
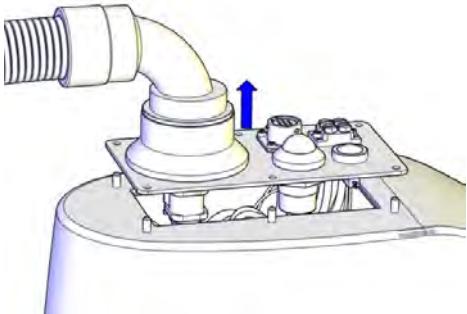
Preparations before removing the upper arm

Action	Note
1 Jog axis 2 to access the cover screws.	 xx1500002520  xx1500002782
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

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4.4.1 Replacing the upper arm
Continued

Removing the main cable package from the upper arm

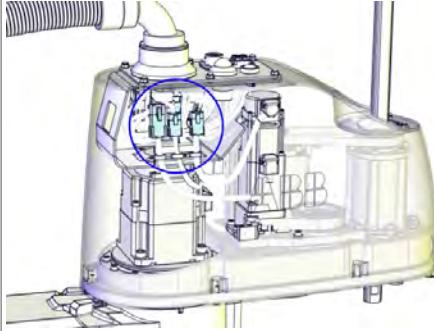
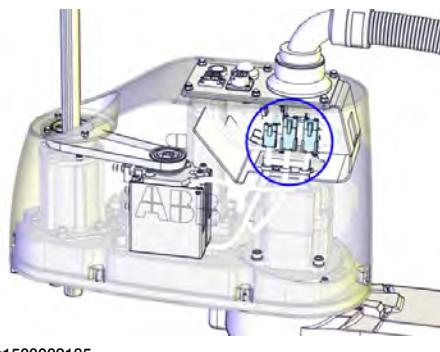
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the dome nuts and washers.	 xx1500002182
3	Carefully open the user interface plate and pull out the cable package.  CAUTION The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183

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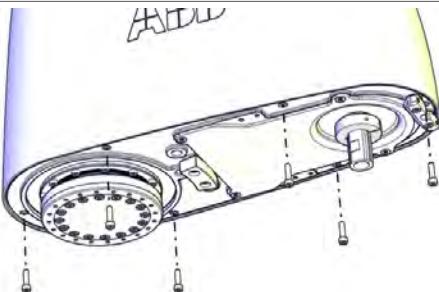
4 Repair

4.4.1 Replacing the upper arm

Continued

Action	Note
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 <p> Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 xx1500002184  xx1500002185

Removing the upper cover

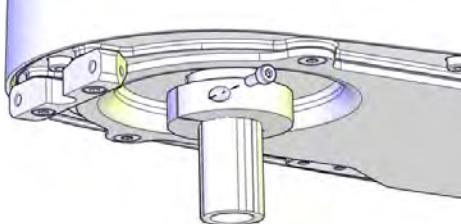
Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2  WARNING</p> <p>Risk of tipping. Make sure the robot is well secured and that the upper arm is supported during the removal work.</p>	
<p>3 Remove the screws.</p>	 xx1500002220

Continues on next page

4.4.1 Replacing the upper arm
Continued

Action	Note
4  WARNING The cover may be damaged due to improper shift. Keep the cover in position while removing the screws.	
5 Lift out the upper cover carefully.	 xx1500002221

Removing the lower stop block

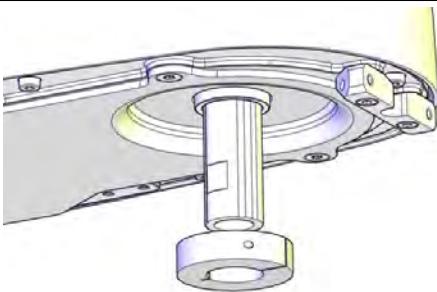
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the lower stop block of ball screw spline unit to replace: <ul style="list-style-type: none"> • lower cover of the upper arm • ball screw spine unit • upper arm body 	
3 Remove the screws.	 xx1500002222

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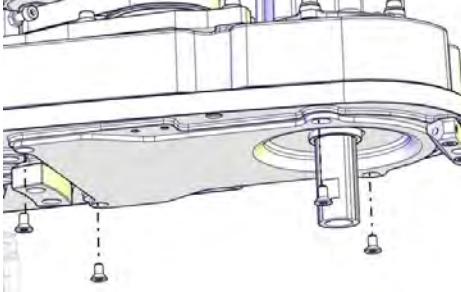
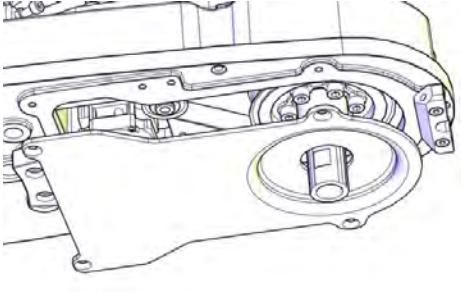
4 Repair

4.4.1 Replacing the upper arm

Continued

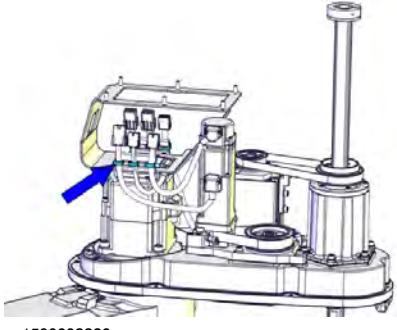
Action	Note
4 Remove the stop block.	 xx1500002223

Removing the lower cover

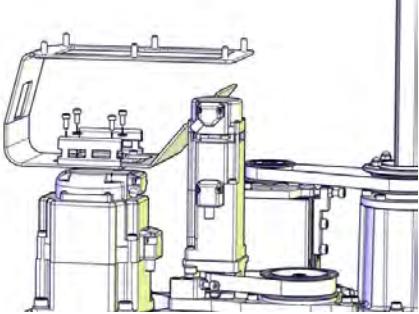
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the screws.	 xx1500002785
3 Remove the cover.  Tip If only working with lower axis-4 timing belt, no need to remove the stop block of ball screw spline unit before removing the lower cover.	 xx1500002225

Continues on next page

Removing the drive unit cables

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Cut the cable ties. Be careful not to damage the cabling.  Tip Take photos of the cable position before removing them, to have as a reference when refitting.	 xx1500002226

Removing the cable harness plate

	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 washers.	
3	Remove the cable harness plate.	 xx1500002228

Removing the axis-3 timing belt

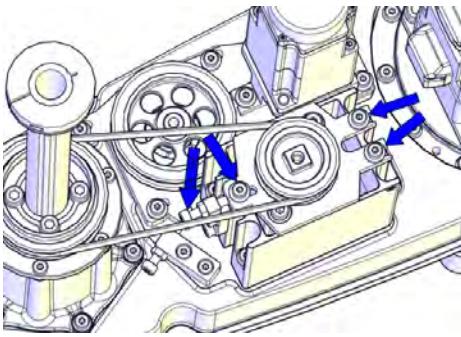
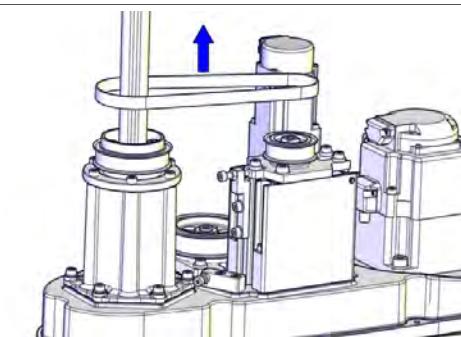
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

4.4.1 Replacing the upper arm

Continued

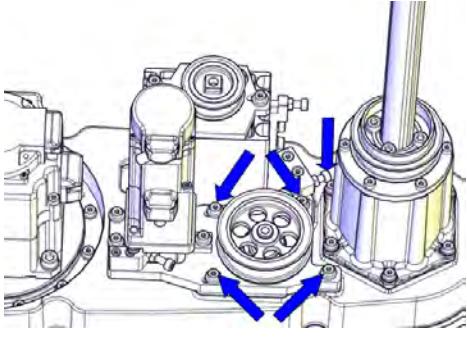
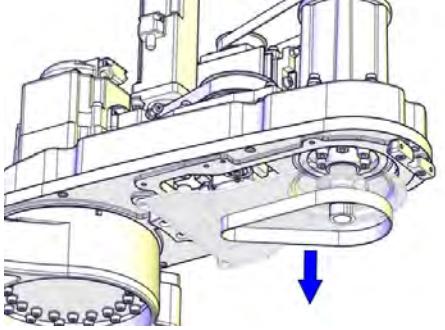
Action	Note
2  WARNING Risk of tipping. Make sure the gravity center is well supported.	
3 Loosen the screws and move the axis-3 drive unit upwards to slacken the timing belt.	 xx1500002229
4 Remove the timing belt.	 xx1500002230

Removing the lower axis-4 timing belt

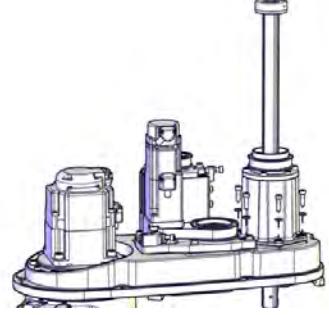
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING Risk of tipping. Make sure the gravity center is well supported.	

Continues on next page

4.4.1 Replacing the upper arm
Continued

Action	Note
3 Loosen the screws and move the axis-4 housing sideways to slacken the lower axis-4 timing belt.	 xx1500002231
4 Remove the timing belt.	 xx1500002232

Removing the ball screw spline

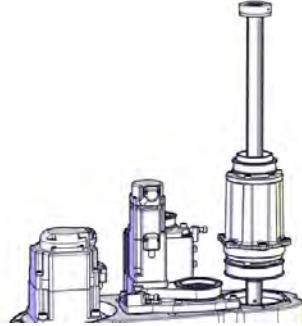
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the screws.	 xx1500002788

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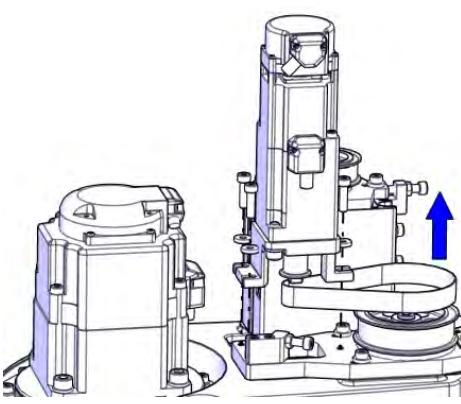
4 Repair

4.4.1 Replacing the upper arm

Continued

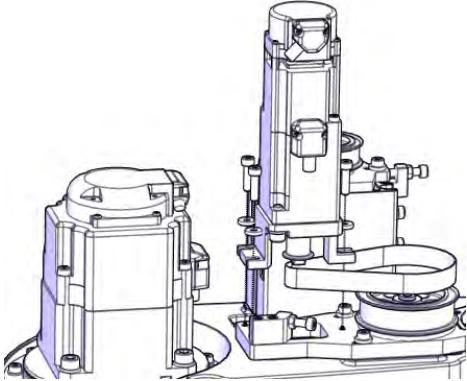
Action	Note
3 Remove the ball screw spline unit.	 xx1500002787

Removing the axis-4 drive unit and upper timing belt

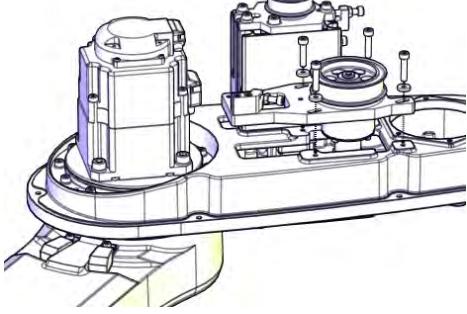
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING Risk of tipping. Make sure the gravity center is well supported.	
3 Loosen the screws and move the axis-4 drive unit upwards to slacken the upper axis-4 timing belt.	 xx1500002233

Continues on next page

4.4.1 Replacing the upper arm
Continued

Action	Note
4 Remove the drive unit and timing belt.	 xx1500002234

Removing the axis-4 housing with idler

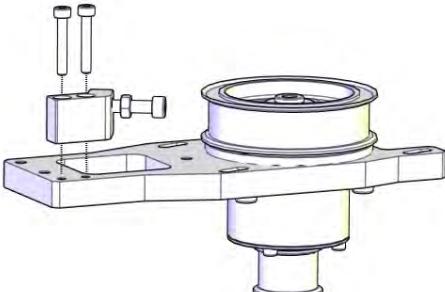
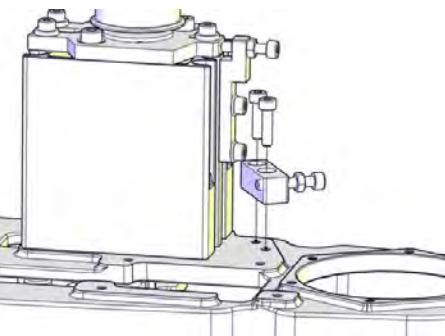
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING There is a risk of tipping during the removal. Make sure the gravity center is well supported.	
3 Remove the axis-4 housing with idler.	 xx1500002235

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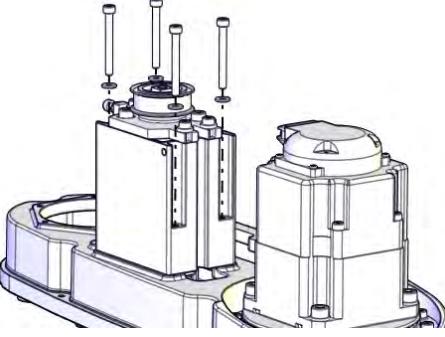
4 Repair

4.4.1 Replacing the upper arm

Continued

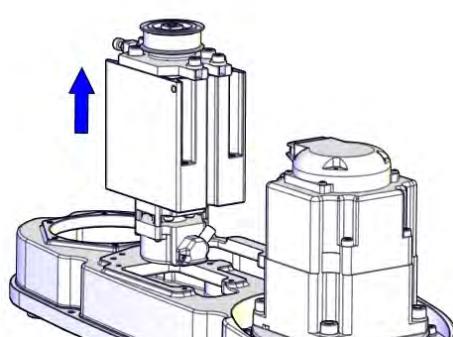
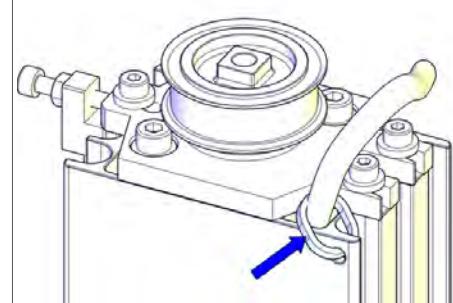
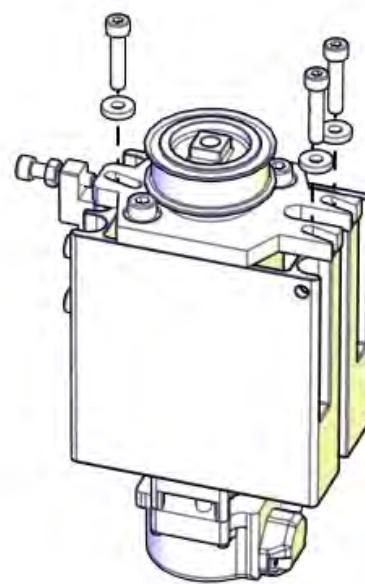
Action	Note
4 Remove the adjusting blocks.	 xx1500002236  xx1500002237

Removing the axis-3 housing and axis-3 drive unit

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING Risk of tipping. Make sure the gravity center is well supported.	
3 Remove the screws and washers.	 xx1500002810

Continues on next page

4.4.1 Replacing the upper arm
Continued

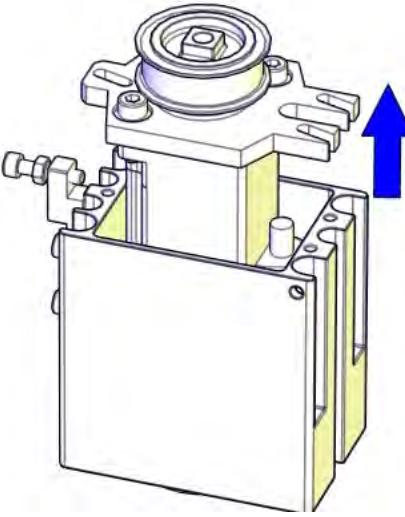
Action	Note
4 Lift out the axis-3 housing and drive unit.	 xx1500002238
5 Cut the cable tie. Be careful not to damage the cabling.	 xx1500002815
6 Remove the screws.	<p>WARNING</p> <p>Do not remove the other screws. They hold the gearbox together. Removing them can damage the gearbox severely.</p>  xx1500002797

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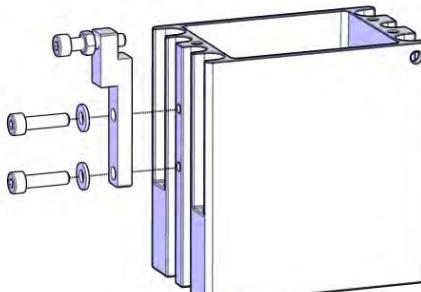
4 Repair

4.4.1 Replacing the upper arm

Continued

Action	Note
7 Lift out the axis-3 drive unit carefully.	 xx1500002239

Removing the axis-3 timing belt adjusting block

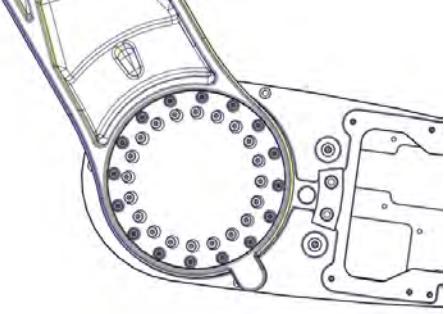
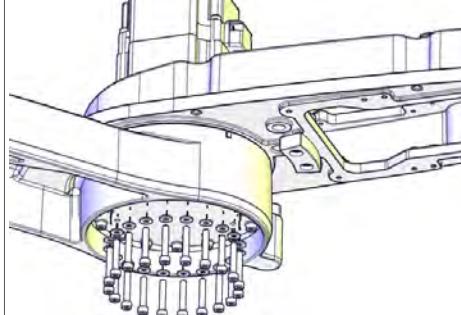
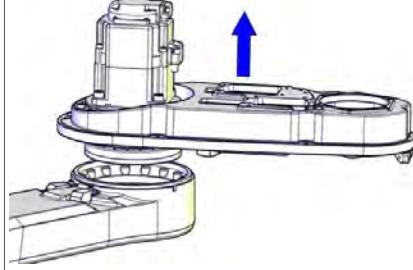
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the adjusting block.	 xx1500002240

Removing the upper arm body

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

Continues on next page

4.4.1 Replacing the upper arm
Continued

Action	Note
<p>2</p>  WARNING The upper arm body with the axis-2 drive unit weighs 7 kg. Make sure the weight of the upper arm body is properly supported, or it may drop when it is released from the lower arm.	
<p>3</p> Remove the screws and washers.  WARNING Keep the twelve screws in the outer circle fitted. They hold the axis-2 motor flange on the lower arm.  xx1500002242	 xx1500002241
<p>4</p> Remove the upper arm body and lay it aside on a workbench.	 xx1500002799

Removing the axis-2 drive unit

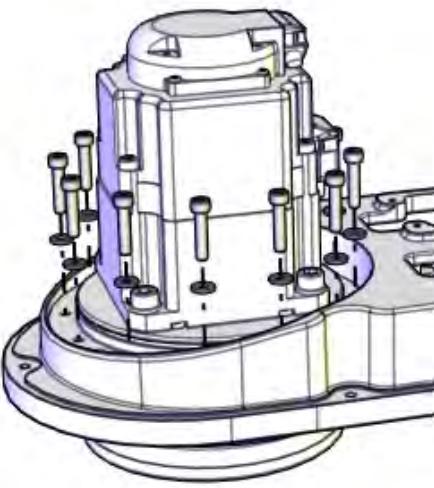
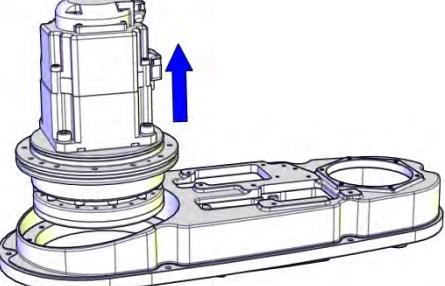
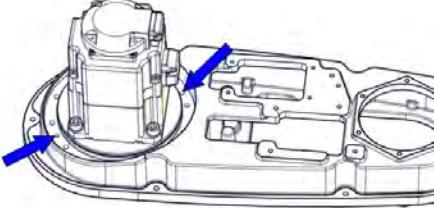
Action	Note
<p>1</p>  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

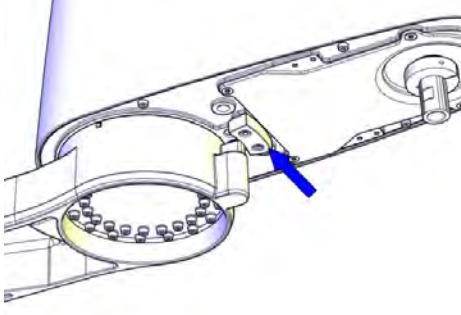
4.4.1 Replacing the upper arm

Continued

Action	Note
2	 WARNING There is a risk of tipping during the removal. Make sure the gravity center is well supported.
3	 WARNING Remove the screws. Do not remove the other screws. They hold the gearbox together. Removing them can damage the gearbox severely.
	 xx1500002800
4	Lift out the drive unit.
	 xx1500002243
5	 Tip If the drive unit is hard to remove, insert two M3 screws and press out the drive unit.
	 xx1500002244

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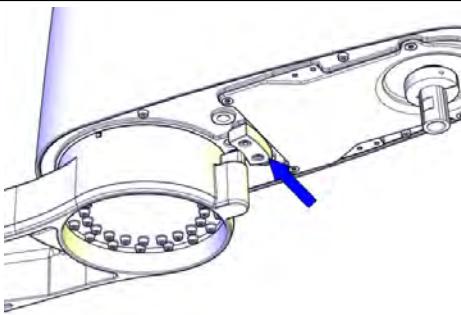
Removing the axis-2 mechanical stop block

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the axis-2 mechanical stop block.	 xx1500003062 See Replacing the axis-2 mechanical stop on page 270 .

Refitting the upper arm

Use these procedures to refit the upper arm.

Refitting axis-2 mechanical stop block

	Action	Note
1	Refit the axis-2 mechanical stop block with screws.	 xx1500003062 See Replacing the axis-2 mechanical stop on page 270 .

Refitting the axis-2 drive unit

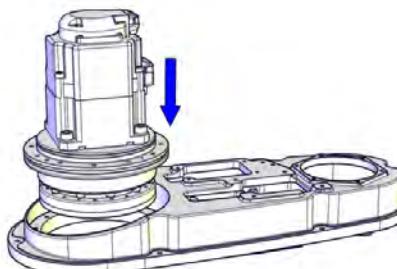
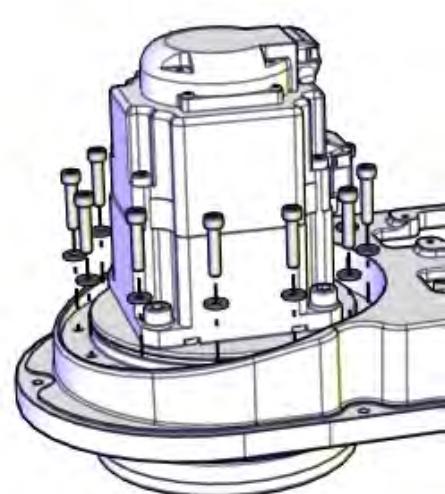
	Action	Note
1	Make sure that: <ul style="list-style-type: none"> • all assembly surfaces are clean and undamaged. • the drive unit is clean and undamaged. 	

Continues on next page

4 Repair

4.4.1 Replacing the upper arm

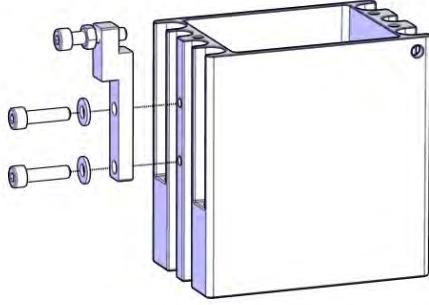
Continued

Action	Note
2 Refit the drive unit.  CAUTION Do not mix axis-1 and axis-2 drive units. Always check the mark or label on the drive units before refitting.  Note Make sure to refit the drive unit with the motor connectors pointing to the ball screw spline unit location.	Axis-2 drive unit: 3HAC056153-001  xx1500003068
3 Secure with screws and washers.	  xx1500002800 Screw: M4x25 (12 pcs) Tightening torque: 4.5 Nm Washer: 4.3x9x1 (12 pcs)

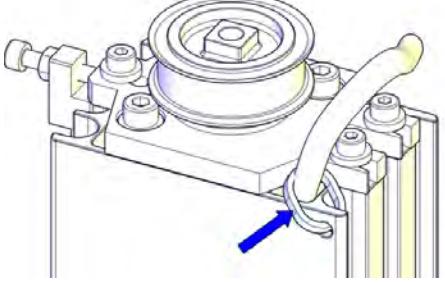
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4.4.1 Replacing the upper arm
Continued

Refitting the axis-3 timing belt adjusting block

Action	Note
1 Refit the adjusting block.	<p>Adjusting block: 3HAC056651-001</p>  <p>xx1500002240</p> <p>Screw: M4x16 (2 pcs)</p> <p>Tightening torque: 4.5 Nm</p>

Refitting the axis-3 housing and axis-3 drive unit

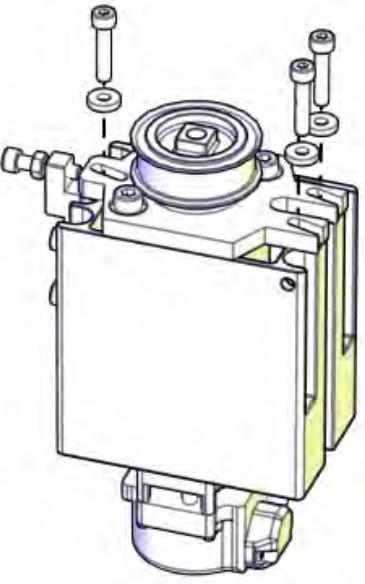
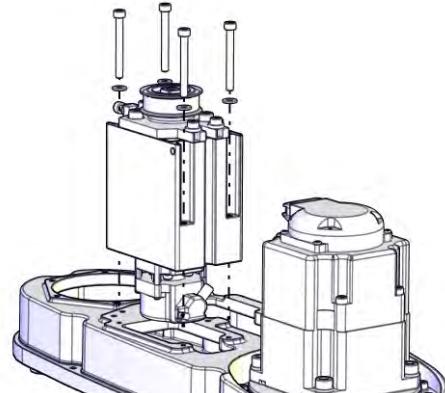
Action	Note
1 Refit the drive unit with one cabling coming out from the upside and the other coming out from the downside.	<p>Axis-3 drive unit: 3HAC056111-001</p> <p>Axis-3 drive unit housing: 3HAC055184-001</p> <p> Note</p> <p>Make sure to refit the drive unit correctly oriented with the lugs of the drive unit bracket as a reference.</p>
2 Secure the upper cabling with a cable tie. Do not tighten the tie too tight.	 <p>xx1500002815</p>

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4 Repair

4.4.1 Replacing the upper arm

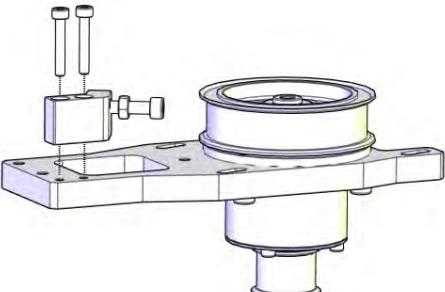
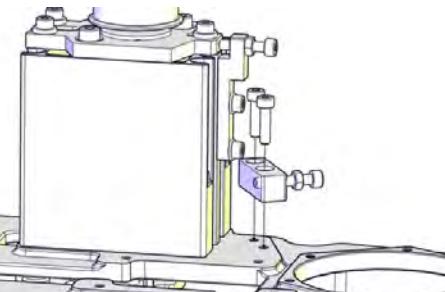
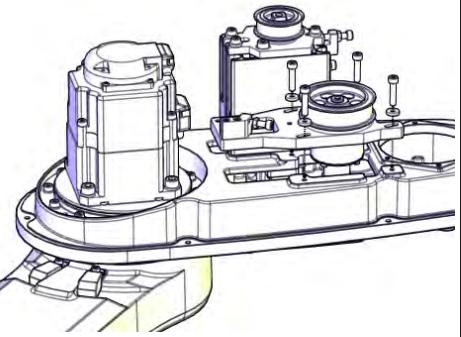
Continued

Action	Note
3 Refit drive unit screws and washers just enough to still be able to move the drive unit.	 xx1500002797 Screw: M4x20 (3 pcs) Tightening torque: 4.5 Nm Washer: (3HAC056937-001, 3 pcs)  Note Only use specified washers, never replace them with other washers.
4 Refit the housing with drive unit.	 xx1500002798 Screw: M4x40 (4 pcs) Tightening torque: 3.5 Nm Washer: M4 (4 pcs)

Continues on next page

4.4.1 Replacing the upper arm
Continued

Refitting the axis-4 housing with idler

	Action	Note
1	<p>Refit the adjusting blocks.</p>	<p>Adjusting block for upper timing belt: 3HAC056651-001</p>  <p>xx1500002236</p> <p>Screw: M3x20 (2 pcs)</p> <p>Adjusting block for lower timing belt: 3HAC056652-001</p>  <p>xx1500002237</p> <p>Screw: M4x16 (2 pcs)</p> <p>Tightening torque: 4.5 Nm</p>
2	<p>Refit the housing with idler and fasten the screws and washers just enough to still be able to move the housing sideways.</p>	 <p>xx1500002235</p> <p>Screw: M4x20 (4 pcs)</p> <p>Washer (3HAC056937-001, 4 pcs)</p> <p> Note</p> <p>Only use specified washers, never replace them with other washers.</p>

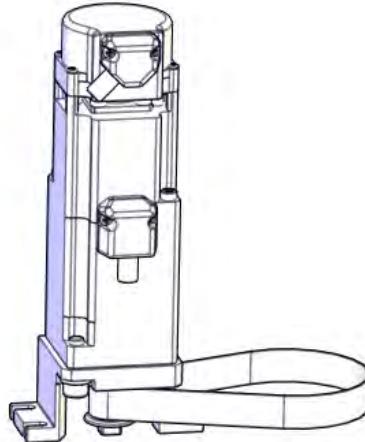
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4 Repair

4.4.1 Replacing the upper arm

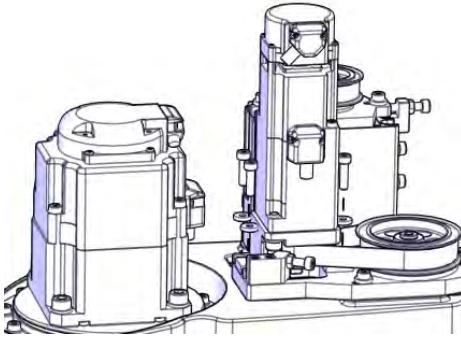
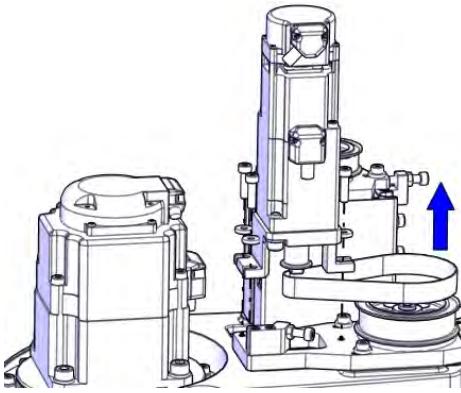
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Refitting the axis-4 drive unit and upper timing belt

Action	Note
1 Make sure that: <ul style="list-style-type: none">• all assembly surfaces are clean and undamaged.• the drive unit is clean and undamaged.	
2 Place the timing belt.	Axis-4 drive unit: 3HAC056112-001 Upper axis-4 timing belt: 3HAC055206-001
3 Refit the drive unit and timing belt.  Note Make sure to refit the drive unit with motor connectors pointing against axis-3 drive unit.	 xx1500002801

Continues on next page

4.4.1 Replacing the upper arm
Continued

Action	Note
4 Refit screws and washers just enough to still be able to move the drive unit upwards.	 <p>Screw: M4x16 (3 pcs) Washer (3HAC056937-001, 3 pcs)</p> <p>Note</p> <p>Only use specified washers, never replace them with other washers.</p>
5 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 <p>Belt tension: F = 33 N (Recommended) Belt tension range: 21.4 N to 24.4 N (for used timing belt, which has been installed and used for more than 24 hours) 30.5 N to 33.6 N (for new timing belt)</p>

Refitting the ball screw spline unit

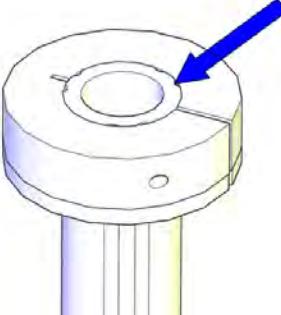
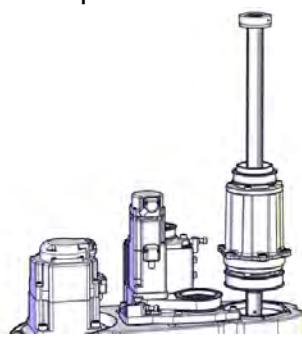
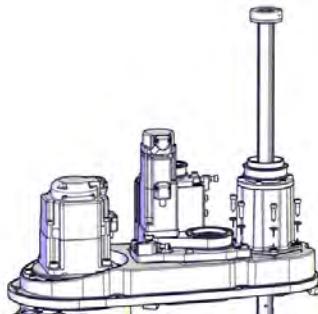
Action	Note
1 Make sure that: <ul style="list-style-type: none"> • all assembly surfaces are clean and undamaged. • the ball screw spline unit is well-lubricated and undamaged. 	See Lubricating the ball screw spline unit on page 118 .
2 If a new ball screw spline unit is used, remove the lower stop block to enable fitting of the lower cover.	See "Removing the lower stop block" in Removing the ball screw spline unit on page 230 .

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4 Repair

4.4.1 Replacing the upper arm

Continued

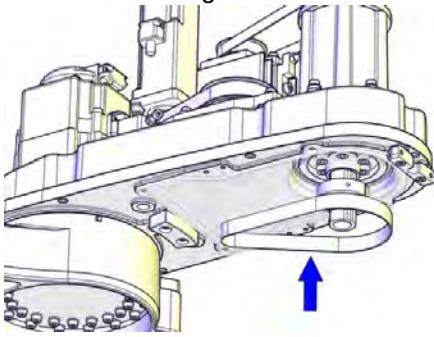
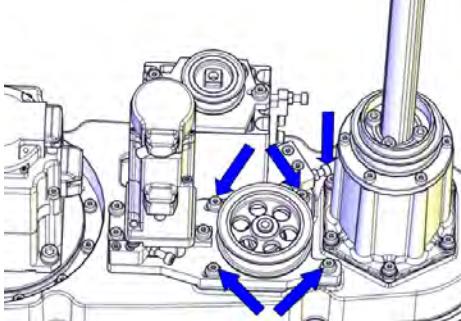
Action	Note
3 Check the upper stop block of the ball screw spline unit. Replace if damaged. Make sure the upper surfaces of the shaft and stop block are at the same level.	Upper axis-3 and axis-4 mechanical stop block: 3HAC061259-001  xx1600002115
4 Refit the ball screw spline unit.	Ball screw spline unit: 3HAC056148-001  xx1500002787
5 Secure with screws and washers.	 xx1500002788 Screw: M4x16 (6 pcs) Tightening torque: 4.5 Nm Washer: M4 (6 pcs)

Refitting the lower axis-4 timing belt

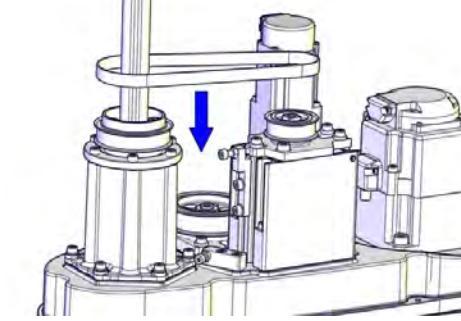
Action	Note
1 Make sure that: <ul style="list-style-type: none">• all assembly surfaces are clean and undamaged.• the drive unit is clean and undamaged.	

Continues on next page

4.4.1 Replacing the upper arm Continued

Action	Note
2 Refit lower axis-4 timing belt. Ensure that the belt runs correctly in the grooves.	<p>Lower axis-4 timing belt: 3HAC055201-001</p>  <p>xx1500002786</p>
3 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 <p>xx1500002231</p> <p>Belt tension: $F = 91 \text{ N}$ (Recommended) Belt tension range: 58.1 N to 66.5 N (for used timing belt, which has been installed and used for more than 24 hours) 83.1 N to 91.4 N (for new timing belt)</p>

Refitting the axis-3 timing belt

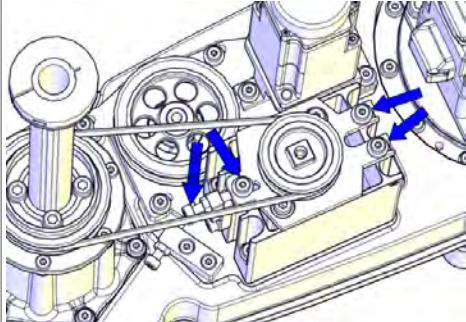
Action	Note
1 Make sure that: <ul style="list-style-type: none"> • all assembly surfaces are clean and undamaged. • the drive unit is clean and undamaged. 	
2 Refit axis-3 timing belt. Ensure that the belt runs correctly in the grooves.	<p>Axis-3 timing belt: 3HAC055209-001</p>  <p>xx1500002789</p>

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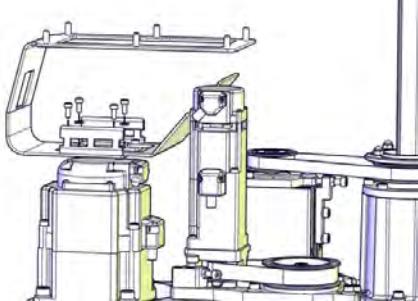
4 Repair

4.4.1 Replacing the upper arm

Continued

Action	Note
3 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 xx1500002229 Belt tension: $F = 31 \text{ N}$ (Recommended) Belt tension range: 19.9 N to 22.8 N (for used timing belt, which has been installed and used for more than 24 hours) 28.5 N to 31.3 N (for new timing belt)

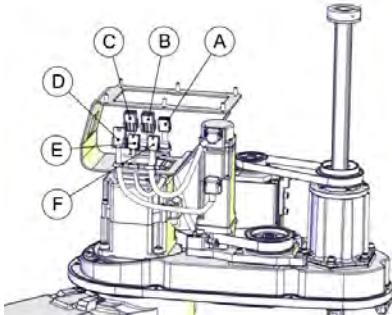
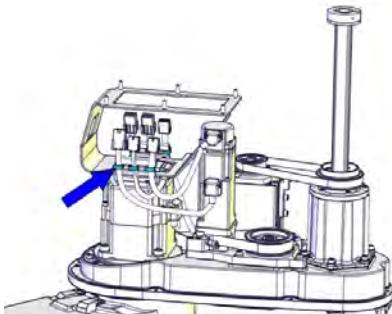
Refitting the cable harness plate

Action	Note
1 Refit the cable harness plate. 2 Secure with screws and washers.	 xx1500002228 Screw: M3x8 (4 pcs) Tightening torque: 1.5 Nm Washer: M3 (4 pcs)

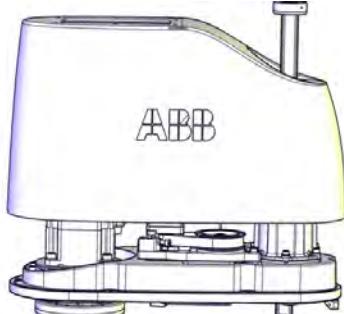
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4.4.1 Replacing the upper arm
Continued

Securing the drive unit cables

Action	Note												
1 Put the drive unit cables in place.	 <p>xx1500003063</p> <table border="1"> <tr> <td>A</td> <td>R2.ME3</td> </tr> <tr> <td>B</td> <td>R2.MP2</td> </tr> <tr> <td>C</td> <td>R2.MP3</td> </tr> <tr> <td>D</td> <td>R2.MP4</td> </tr> <tr> <td>E</td> <td>R2.ME2</td> </tr> <tr> <td>F</td> <td>R2. ME4</td> </tr> </table>	A	R2.ME3	B	R2.MP2	C	R2.MP3	D	R2.MP4	E	R2.ME2	F	R2. ME4
A	R2.ME3												
B	R2.MP2												
C	R2.MP3												
D	R2.MP4												
E	R2.ME2												
F	R2. ME4												
2 Secure the cables with cable ties. Do not tighten the ties too tight.	 <p>xx1500002226</p>												

Refitting the upper cover

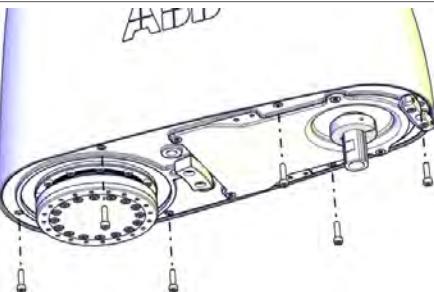
Action	Note
1 Carefully put down the upper cover, avoiding any collision to the ball screw spline unit and drive units.	<p>Upper cover unit: 3HAC057615-001</p>  <p>xx1500002221</p>

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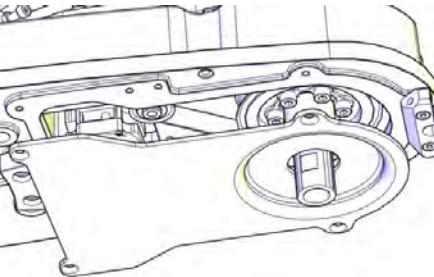
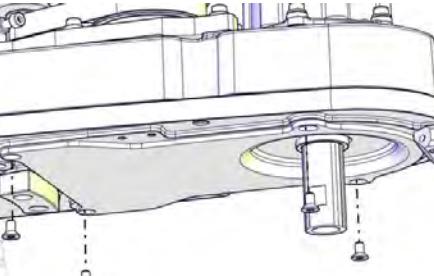
4 Repair

4.4.1 Replacing the upper arm

Continued

Action	Note
2  Tip Some of the screws are accessed from below. Make sure that the robot is properly fastened and hang out the upper arm from the workbench to access them.	
3 Refit the cover.	 xx1500002220 Screw: M4x16 (6 pcs) Tightening torque: 2 Nm

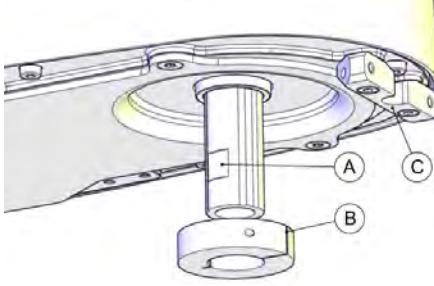
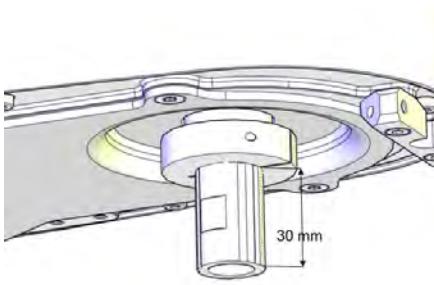
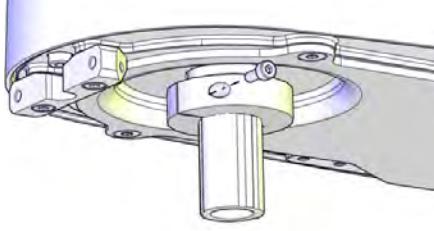
Refitting the lower cover

Action	Note
1 Refit the cover.	Lower cover: 3HAC060106-001  xx1500002225
2 Secure with screws.	 xx1500002785 Screw: M4x8 (4 pcs) Tightening torque: 2 Nm

Continues on next page

4.4.1 Replacing the upper arm Continued

Refitting the lower stop block

	Action	Note						
1	Check the lower stop block of the ball screw spline unit. Replace if damaged.	Lower axis-3 and axis-4 mechanical stop block: 3HAC055208-001						
2	Refit the lower stop block. Make the notch point to the calibration block and 90° away from the flat mark on the shaft. Make sure the distance between the lower surfaces of stop block and shaft is 30 mm.	 <p>xx1500002908</p> <table border="1"> <tr> <td>A</td><td>Flat mark on the shaft</td></tr> <tr> <td>B</td><td>Notch</td></tr> <tr> <td>C</td><td>Calibration block</td></tr> </table>  <p>xx1500002224</p>	A	Flat mark on the shaft	B	Notch	C	Calibration block
A	Flat mark on the shaft							
B	Notch							
C	Calibration block							
3	Secure with the screw.	 <p>xx1500002222</p> <p>Screw: M5x8 (1 pcs) Tightening torque: 10 Nm</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>						

Continues on next page

4 Repair

4.4.1 Replacing the upper arm

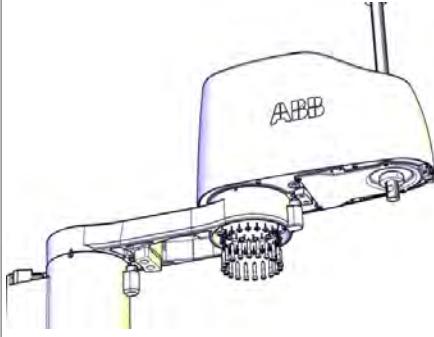
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Refitting the upper arm



Note

Two persons working together are required to perform this procedure.

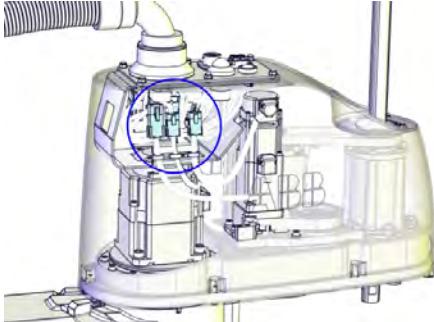
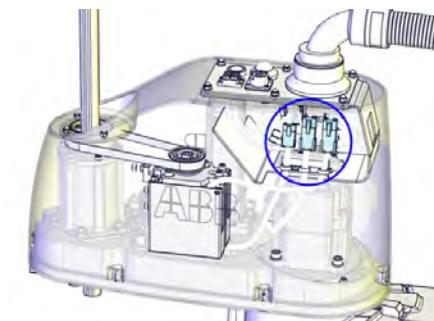
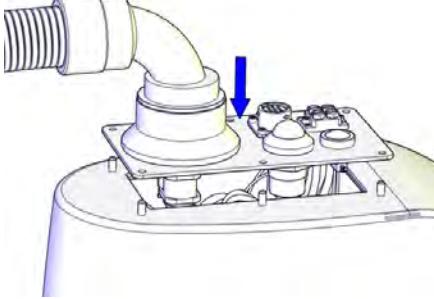
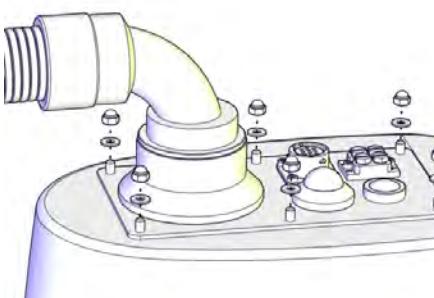
	Action	Note
1	 Note Two persons working together are required to perform this step. Person 1: Hold the upper arm. Person 2: Refit the screws that fasten the upper arm to the lower arm.	
2	Make sure the lower arm is secured. Lower the upper arm down onto the right place of the lower arm.	
3	Refit the upper arm screws and washers.	 xx1500002256 Screw: M4x20 (16 pcs) Tightening torque: 4.5 Nm Washer: 4.3x9x1.3 (16 pcs)

Refitting the main cable to the upper arm

	Action	Note
1	Secure the main cable package with cable ties if needed.	

Continues on next page

4.4.1 Replacing the upper arm
Continued

Action	Note
2 Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 	 xx1500002184  xx1500002185
3 Push the main cable package into place.	 xx1500002207
4 Refit the user interface plate.	 xx1500002182 Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs

Continues on next page

4 Repair

4.4.1 Replacing the upper arm

Continued

Concluding procedure

Action	Note
1 Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4.4.2 Replacing the ball screw spline unit

General

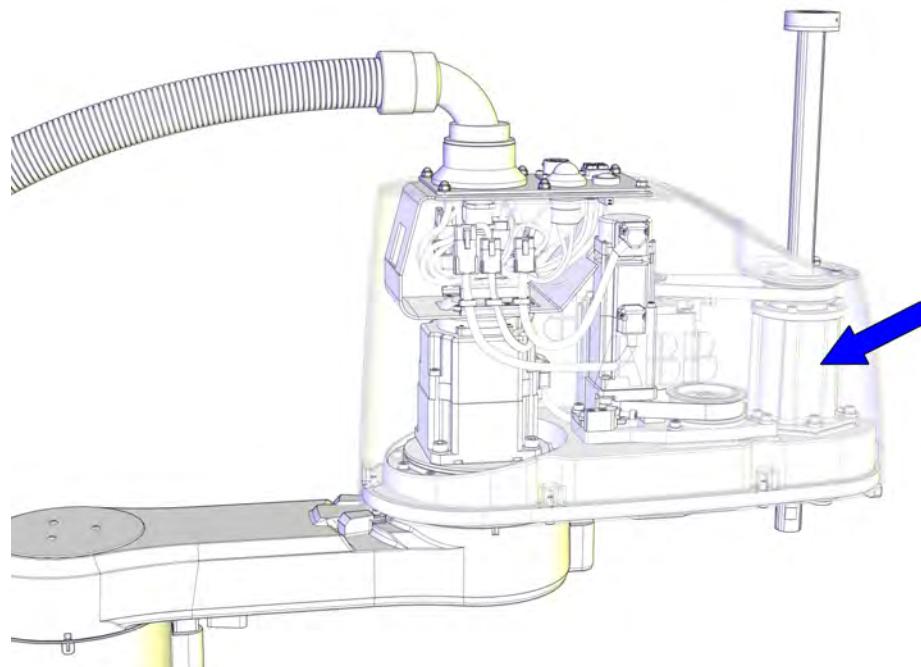


Note

If a collision with the stop blocks on the ball screw spline unit occur, check and retighten all screws before replacement work. Replace damaged or cracked screws.

Location of the ball screw spline unit

The ball screw spline unit is located as shown in the figure.



xx1500002212

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Ball screw spline unit	3HAC056148-001	

Continues on next page

4 Repair

4.4.2 Replacing the ball screw spline unit

Continued

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	The content is defined in the section Standard toolkit on page 384 .
Acoustic tensiometer	-	Used for measuring the timing belt tension.

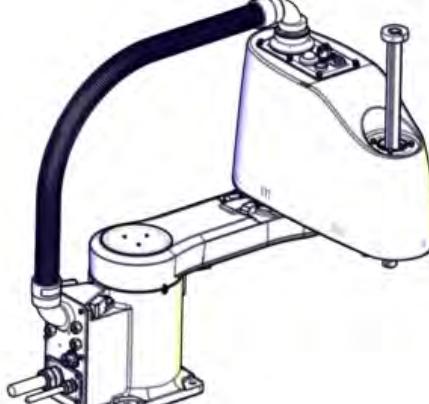
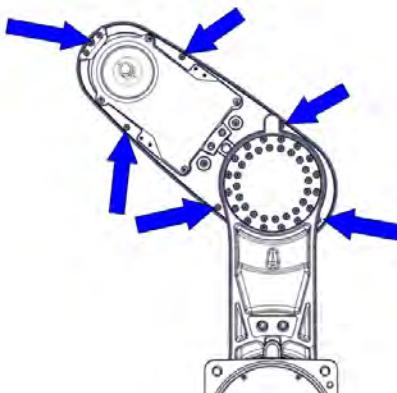
Required consumables

Consumable	Article number	Note
Grease	-	THK AFA Used for lubricating the ball screw spline shaft.
Cable ties	-	

Removing the ball screw spline unit

Use these procedures to remove the ball screw spline unit.

Preparations before removing the ball screw spline unit

Action	Note
1 Jog axis 2 to access the cover screws.	 xx1500002520  xx1500002782

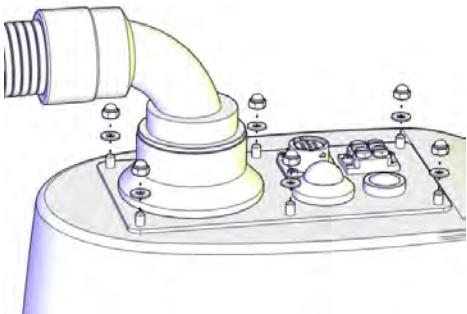
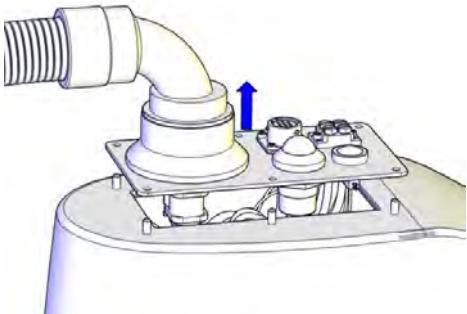
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4.4.2 Replacing the ball screw spline unit

Continued

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

Removing the main cable package from the upper arm

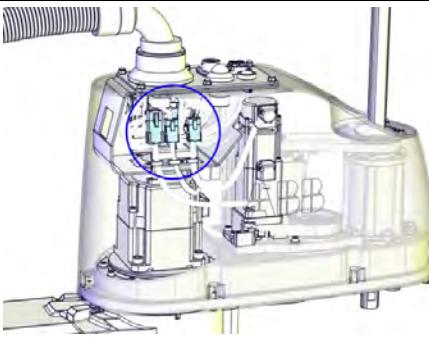
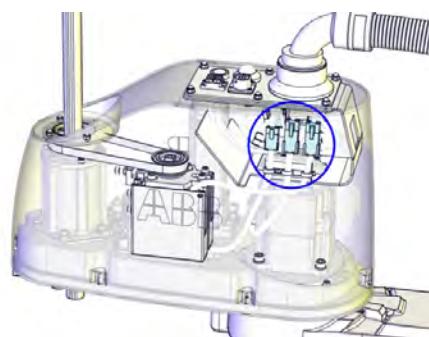
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the dome nuts and washers.	 xx1500002182
3	CAUTION Carefully open the user interface plate and pull out the cable package.  The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183

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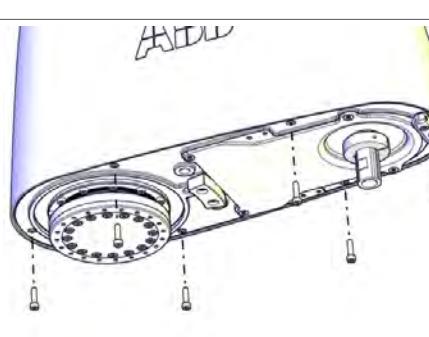
4 Repair

4.4.2 Replacing the ball screw spline unit

Continued

Action	Note
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 <p> Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 

Removing the upper cover

Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2  WARNING</p> <p>Risk of tipping. Make sure the robot is well secured and that the upper arm is supported during the removal work.</p>	
<p>3 Remove the screws.</p>	

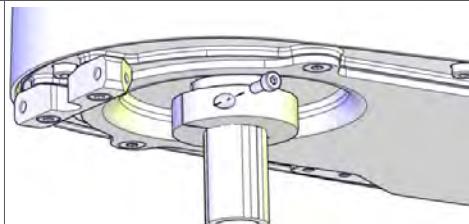
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4.4.2 Replacing the ball screw spline unit

Continued

Action	Note
4  WARNING The cover may be damaged due to improper shift. Keep the cover in position while removing the screws.	
5 Lift out the upper cover carefully.	 xx1500002221

Removing the lower stop block

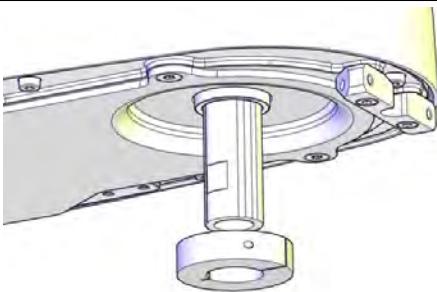
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the lower stop block of ball screw spline unit to replace: <ul style="list-style-type: none"> • lower cover of the upper arm • ball screw spine unit • upper arm body 	
3 Remove the screws.	 xx1500002222

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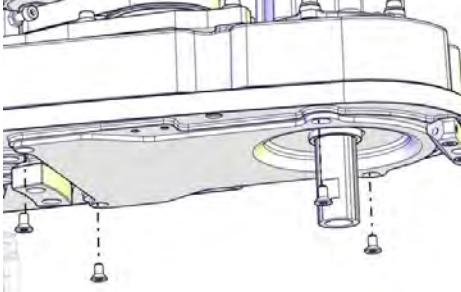
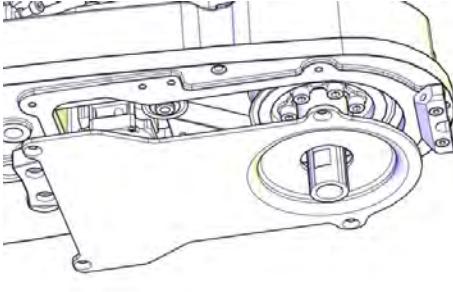
4 Repair

4.4.2 Replacing the ball screw spline unit

Continued

Action	Note
4 Remove the stop block.	 xx1500002223

Removing the lower cover

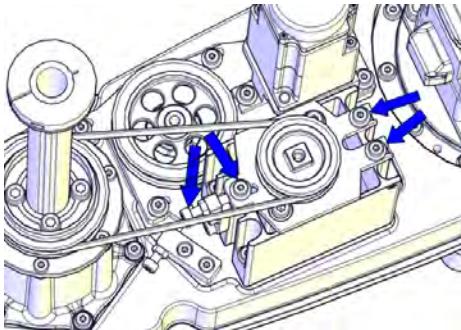
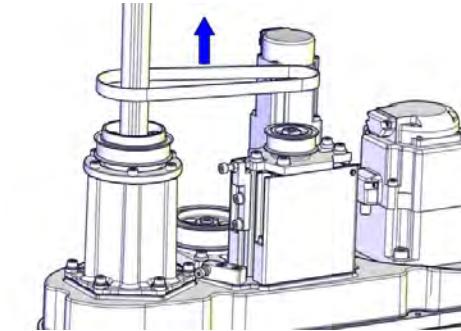
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the screws.	 xx1500002785
3 Remove the cover.  Tip If only working with lower axis-4 timing belt, no need to remove the stop block of ball screw spline unit before removing the lower cover.	 xx1500002225

Continues on next page

4.4.2 Replacing the ball screw spline unit

Continued

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	 WARNING Risk of tipping. Make sure the gravity center is well supported.	
3	Loosen the screws and move the axis-3 drive unit upwards to slacken the timing belt.	 xx1500002229
4	Remove the timing belt.	 xx1500002230

Removing the lower axis-4 timing belt

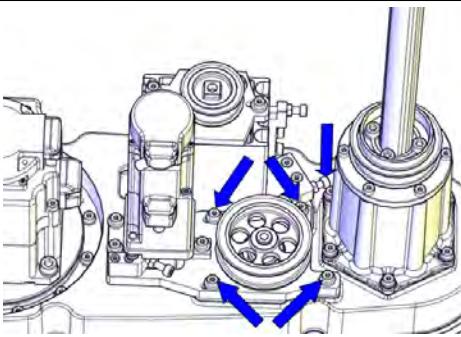
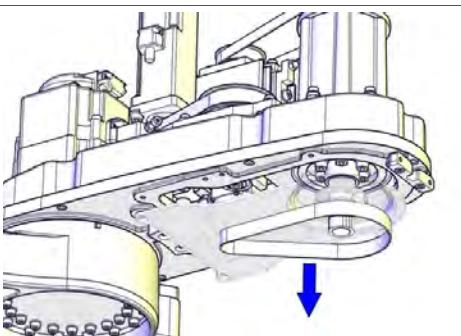
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 WARNING Risk of tipping. Make sure the gravity center is well supported.	

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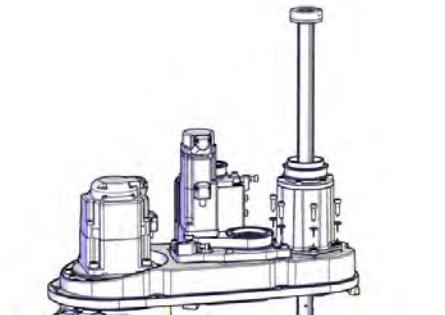
4 Repair

4.4.2 Replacing the ball screw spline unit

Continued

Action	Note
3 Loosen the screws and move the axis-4 housing sideways to slacken the lower axis-4 timing belt.	 xx1500002231
4 Remove the timing belt.	 xx1500002232

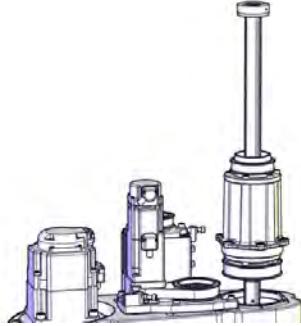
Removing the ball screw spline

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the screws.	 xx1500002788

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4.4.2 Replacing the ball screw spline unit

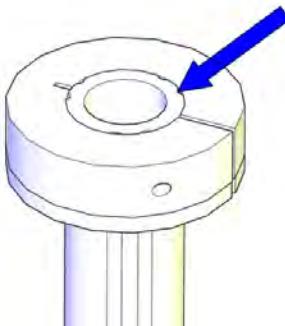
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Action	Note
3 Remove the ball screw spline unit.	 xx1500002787

Refitting the ball screw spline unit

Use these procedures to refit the ball screw spline unit.

Refitting the ball screw spline unit

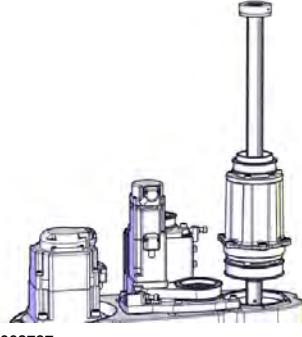
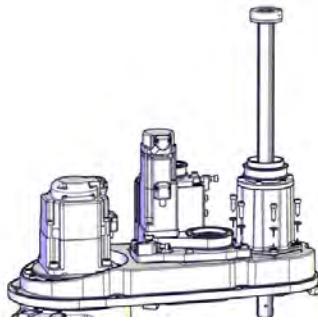
Action	Note
1 Make sure that: <ul style="list-style-type: none"> all assembly surfaces are clean and undamaged. the ball screw spline unit is well-lubricated and undamaged. 	See Lubricating the ball screw spline unit on page 118 .
2 If a new ball screw spline unit is used, remove the lower stop block to enable fitting of the lower cover.	See "Removing the lower stop block" in Removing the ball screw spline unit on page 230 .
3 Check the upper stop block of the ball screw spline unit. Replace if damaged. Make sure the upper surfaces of the shaft and stop block are at the same level.	Upper axis-3 and axis-4 mechanical stop block: 3HAC061259-001  xx1600002115

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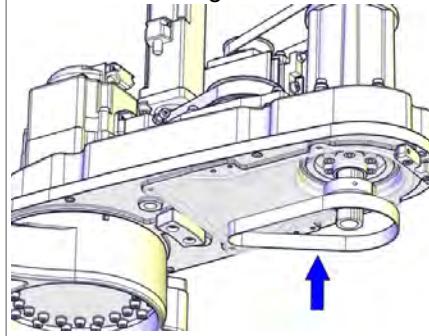
4 Repair

4.4.2 Replacing the ball screw spline unit

Continued

Action	Note
4 Refit the ball screw spline unit.	<p>Ball screw spline unit: 3HAC056148-001</p>  <p>xx1500002787</p>
5 Secure with screws and washers.	 <p>xx1500002788</p> <p>Screw: M4x16 (6 pcs) Tightening torque: 4.5 Nm Washer: M4 (6 pcs)</p>

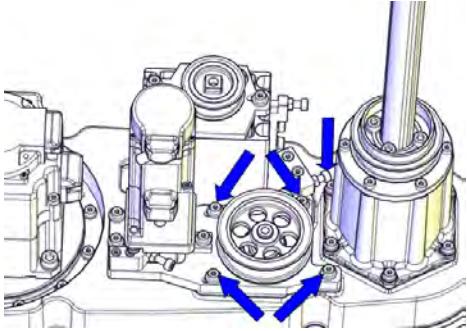
Refitting the lower axis-4 timing belt

Action	Note
1 Make sure that: <ul style="list-style-type: none"> all assembly surfaces are clean and undamaged. the drive unit is clean and undamaged. 	
2 Refit lower axis-4 timing belt. Ensure that the belt runs correctly in the grooves.	<p>Lower axis-4 timing belt: 3HAC055201-001</p>  <p>xx1500002786</p>

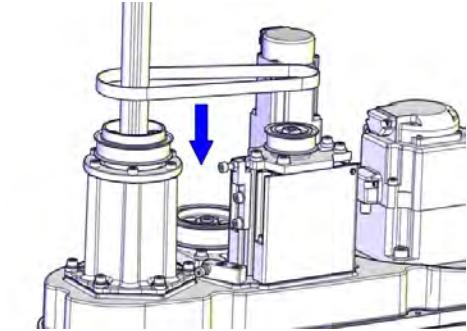
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4.4.2 Replacing the ball screw spline unit

Continued

Action	Note
3 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 <p>xx1500002231</p> <p>Belt tension: $F = 91 \text{ N}$ (Recommended) Belt tension range: 58.1 N to 66.5 N (for used timing belt, which has been installed and used for more than 24 hours) 83.1 N to 91.4 N (for new timing belt)</p>

Refitting the axis-3 timing belt

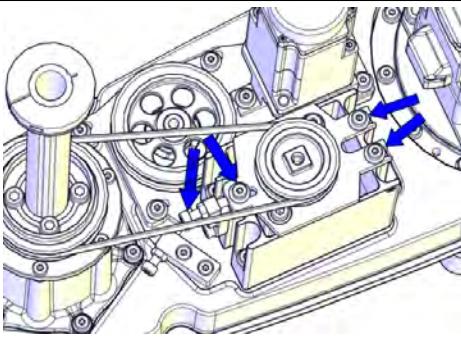
Action	Note
1 Make sure that: <ul style="list-style-type: none"> all assembly surfaces are clean and undamaged. the drive unit is clean and undamaged. 	
2 Refit axis-3 timing belt. Ensure that the belt runs correctly in the grooves.	Axis-3 timing belt: 3HAC055209-001  <p>xx1500002789</p>

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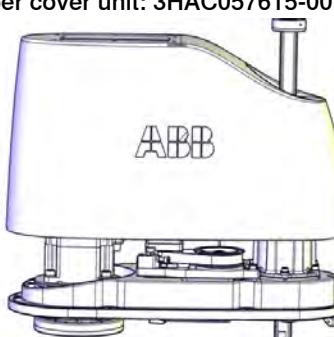
4 Repair

4.4.2 Replacing the ball screw spline unit

Continued

Action	Note
3 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 xx1500002229 Belt tension: $F = 31 \text{ N}$ (Recommended) Belt tension range: 19.9 N to 22.8 N (for used timing belt, which has been installed and used for more than 24 hours) 28.5 N to 31.3 N (for new timing belt)

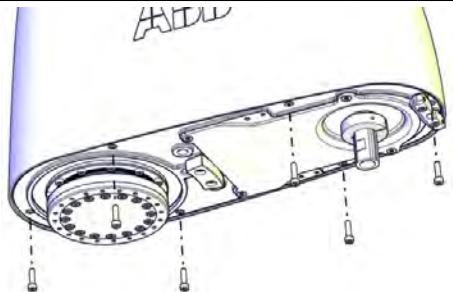
Refitting the upper cover

Action	Note
1 Carefully put down the upper cover, avoiding any collision to the ball screw spline unit and drive units.	Upper cover unit: 3HAC057615-001  xx1500002221
2  Tip Some of the screws are accessed from below. Make sure that the robot is properly fastened and hang out the upper arm from the workbench to access them.	

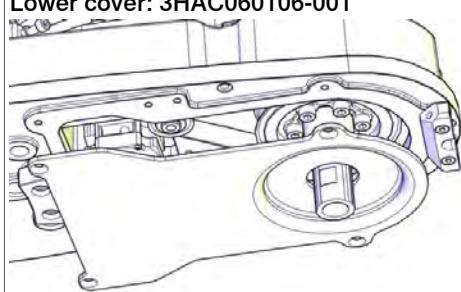
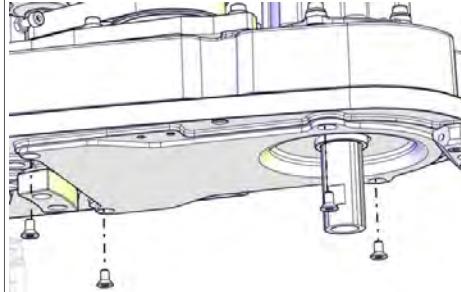
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4.4.2 Replacing the ball screw spline unit

Continued

Action	Note
3 Refit the cover.	 xx1500002220 Screw: M4x16 (6 pcs) Tightening torque: 2 Nm

Refitting the lower cover

Action	Note
1 Refit the cover.	 Lower cover: 3HAC060106-001 xx1500002225
2 Secure with screws.	 xx1500002785 Screw: M4x8 (4 pcs) Tightening torque: 2 Nm

Refitting the lower stop block

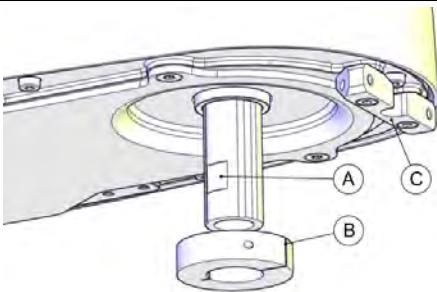
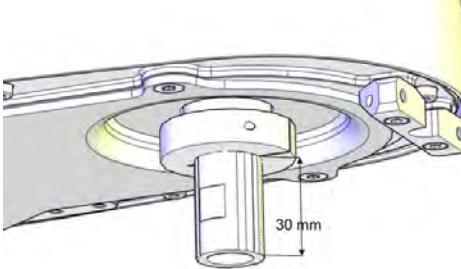
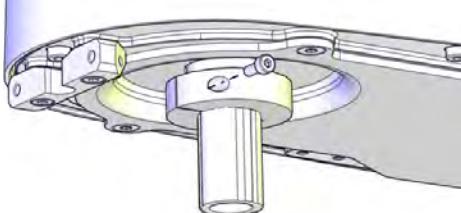
Action	Note
1 Check the lower stop block of the ball screw spline unit. Replace if damaged.	Lower axis-3 and axis-4 mechanical stop block: 3HAC055208-001

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4 Repair

4.4.2 Replacing the ball screw spline unit

Continued

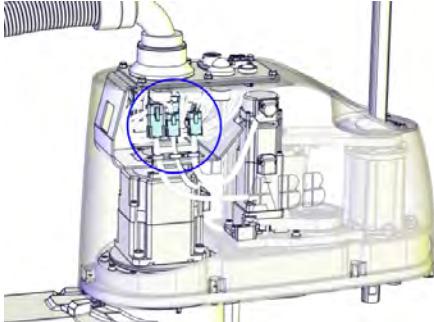
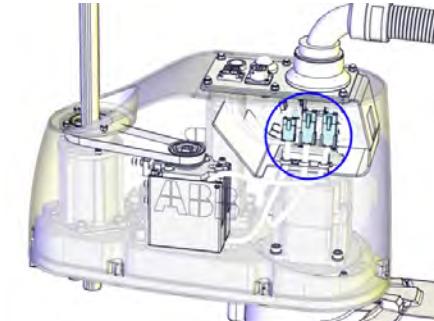
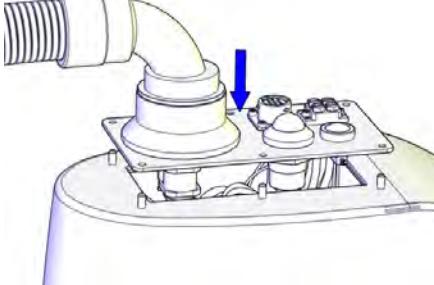
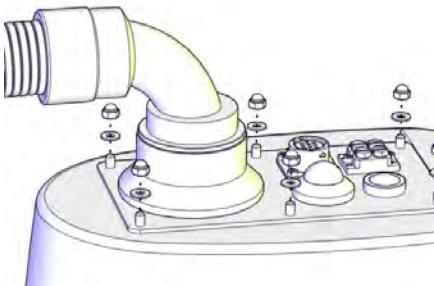
Action	Note						
<p>2 Refit the lower stop block.</p> <p>Make the notch point to the calibration block and 90° away from the flat mark on the shaft.</p> <p>Make sure the distance between the lower surfaces of stop block and shaft is 30 mm.</p>	 <p>xx1500002908</p> <table border="1"> <tr> <td>A</td> <td>Flat mark on the shaft</td> </tr> <tr> <td>B</td> <td>Notch</td> </tr> <tr> <td>C</td> <td>Calibration block</td> </tr> </table>  <p>xx1500002224</p>	A	Flat mark on the shaft	B	Notch	C	Calibration block
A	Flat mark on the shaft						
B	Notch						
C	Calibration block						
<p>3 Secure with the screw.</p>	 <p>xx1500002222</p> <p>Screw: M5x8 (1 pcs) Tightening torque: 10 Nm</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>						

Refitting the main cable to the upper arm

Action	Note
1 Secure the main cable package with cable ties if needed.	

Continues on next page

4.4.2 Replacing the ball screw spline unit *Continued*

Action	Note
2 Reconnect the connectors. • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4	 xx1500002184  xx1500002185
3 Push the main cable package into place.	 xx1500002207
4 Refit the user interface plate.	 xx1500002182 Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs

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4 Repair

4.4.2 Replacing the ball screw spline unit

Continued

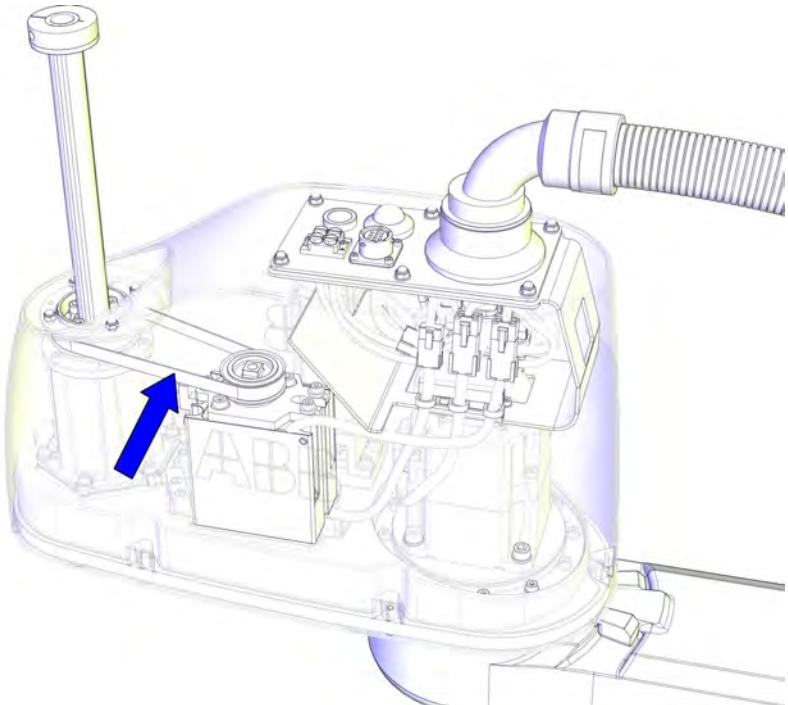
Concluding procedure

Action	Note
1 Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4.4.3 Replacing the axis-3 timing belt

Location of the axis-3 timing belt

The axis-3 timing belt is located as shown in the figure.



xx1500002218

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Axis-3 timing belt	3HAC055209-001	
Upper cover unit	3HAC057615-001	Includes upper cover and cover flange.

Required tools and equipment



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Equipment	Article number	Note
Standard toolkit	-	The content is defined in the section Standard toolkit on page 384 .

Continues on next page

4 Repair

4.4.3 Replacing the axis-3 timing belt

Continued

Equipment	Article number	Note
Acoustic tensiometer	-	Used for measuring the timing belt tension.

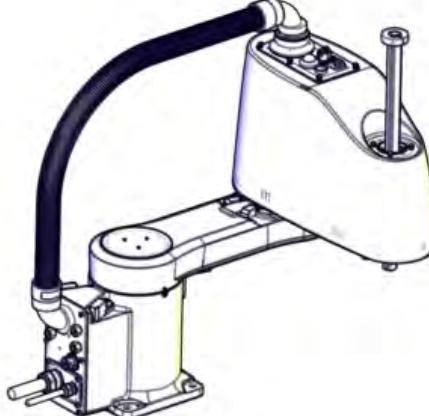
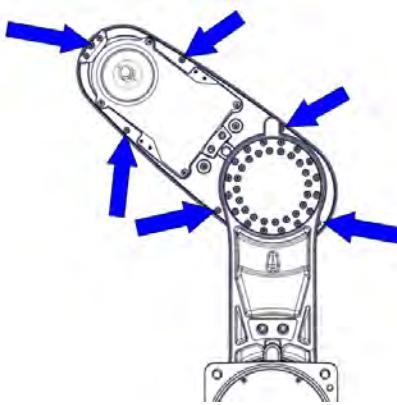
Required consumables

Consumable	Article number	Note
Cable ties	-	

Removing the axis-3 timing belt

Use these procedures to remove the axis-3 timing belt.

Preparations before removing the axis-3 timing belt

Action	Note
1 Jog axis 2 to access the cover screws.	 xx1500002520  xx1500002782

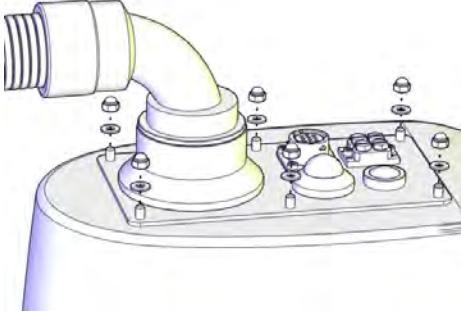
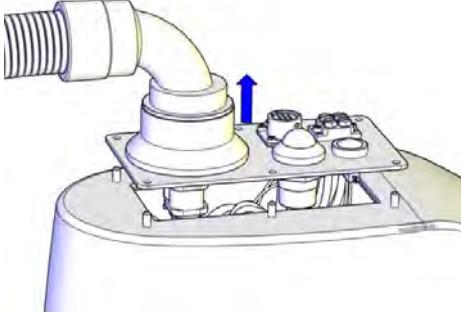
Continues on next page

4.4.3 Replacing the axis-3 timing belt

Continued

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

Removing the main cable package from the upper arm

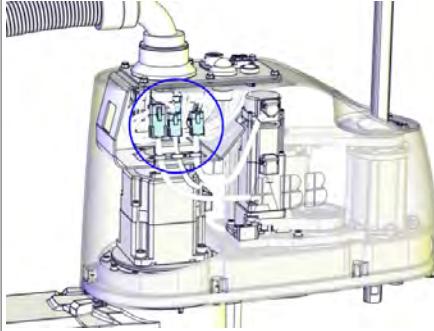
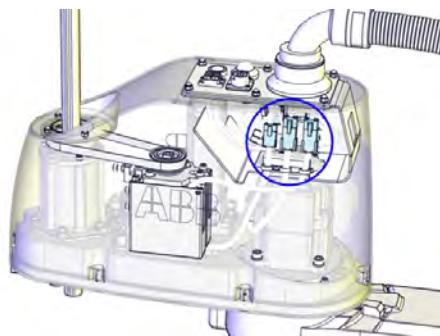
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the dome nuts and washers.	 xx1500002182
3	CAUTION Carefully open the user interface plate and pull out the cable package.  The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183

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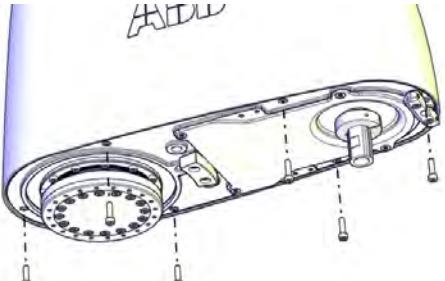
4 Repair

4.4.3 Replacing the axis-3 timing belt

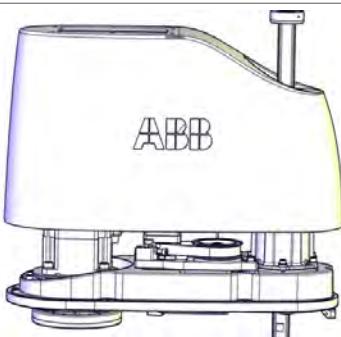
Continued

Action	Note
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 <p> Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 xx1500002184  xx1500002185

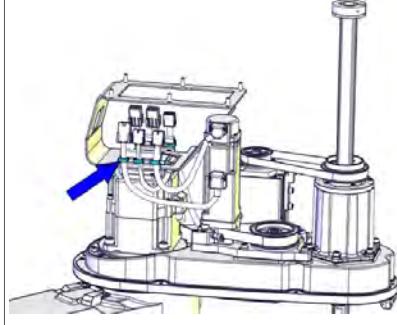
Removing the upper cover

Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2  WARNING</p> <p>Risk of tipping. Make sure the robot is well secured and that the upper arm is supported during the removal work.</p>	
<p>3 Remove the screws.</p>	 xx1500002220

Continues on next page

Action	Note
4  WARNING The cover may be damaged due to improper shift. Keep the cover in position while removing the screws.	
5 Lift out the upper cover carefully.	 xx1500002221

Removing the drive unit cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Cut the cable ties. Be careful not to damage the cabling.  Tip Take photos of the cable position before removing them, to have as a reference when refitting.	 xx1500002226

Removing the axis-3 timing belt

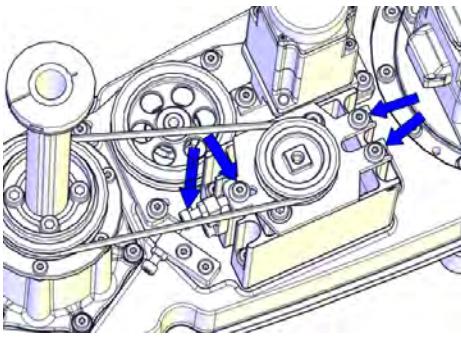
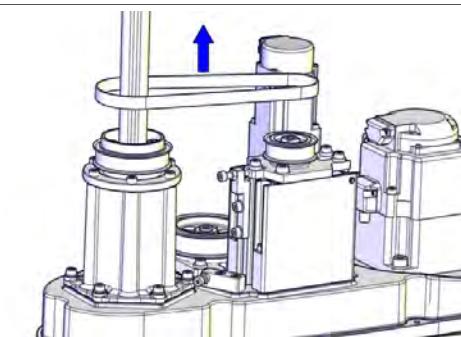
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4 Repair

4.4.3 Replacing the axis-3 timing belt

Continued

	Action	Note
2	 WARNING Risk of tipping. Make sure the gravity center is well supported.	
3	Loosen the screws and move the axis-3 drive unit upwards to slacken the timing belt.	 xx1500002229
4	Remove the timing belt.	 xx1500002230

Refitting the axis-3 timing belt

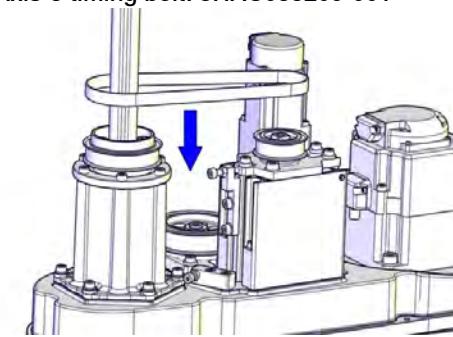
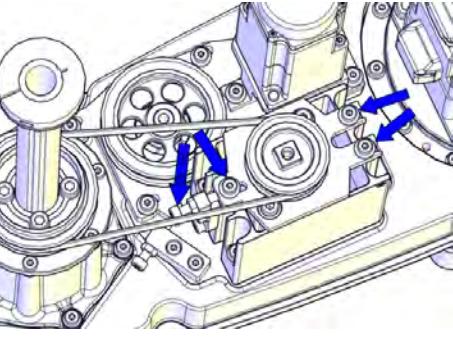
Use these procedures to refit the axis-3 timing belt.

Refitting the axis-3 timing belt

	Action	Note
1	Make sure that: <ul style="list-style-type: none">all assembly surfaces are clean and undamaged.the drive unit is clean and undamaged.	

Continues on next page

4.4.3 Replacing the axis-3 timing belt
Continued

Action	Note
2 Refit axis-3 timing belt. Ensure that the belt runs correctly in the grooves.	<p>Axis-3 timing belt: 3HAC055209-001</p>  <p>xx1500002789</p>
3 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 <p>xx1500002229</p> <p>Belt tension: $F = 31 \text{ N}$ (Recommended) Belt tension range: 19.9 N to 22.8 N (for used timing belt, which has been installed and used for more than 24 hours) 28.5 N to 31.3 N (for new timing belt)</p>

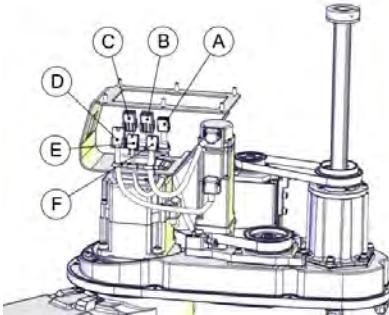
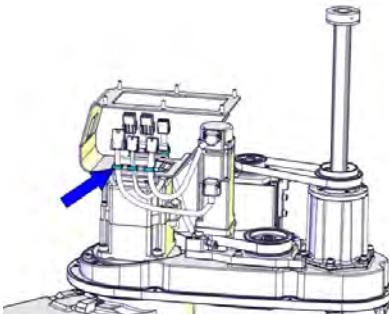
Continues on next page

4 Repair

4.4.3 Replacing the axis-3 timing belt

Continued

Securing the drive unit cables

	Action	Note												
1	Put the drive unit cables in place.	 xx1500003063 <table border="1"><tr><td>A</td><td>R2.ME3</td></tr><tr><td>B</td><td>R2.MP2</td></tr><tr><td>C</td><td>R2.MP3</td></tr><tr><td>D</td><td>R2.MP4</td></tr><tr><td>E</td><td>R2.ME2</td></tr><tr><td>F</td><td>R2. ME4</td></tr></table>	A	R2.ME3	B	R2.MP2	C	R2.MP3	D	R2.MP4	E	R2.ME2	F	R2. ME4
A	R2.ME3													
B	R2.MP2													
C	R2.MP3													
D	R2.MP4													
E	R2.ME2													
F	R2. ME4													
2	Secure the cables with cable ties. Do not tighten the ties too tight.	 xx1500002226												

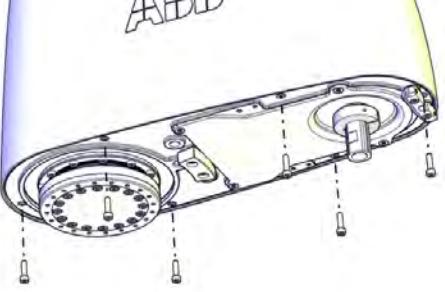
Refitting the upper cover

	Action	Note
1	Carefully put down the upper cover, avoiding any collision to the ball screw spline unit and drive units.	Upper cover unit: 3HAC057615-001  xx1500002221

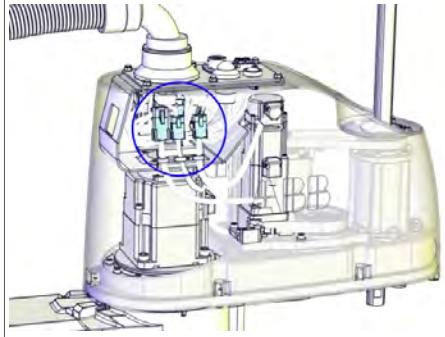
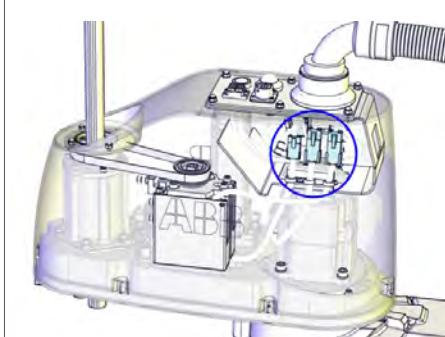
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4.4.3 Replacing the axis-3 timing belt

Continued

Action	Note
2  Tip Some of the screws are accessed from below. Make sure that the robot is properly fastened and hang out the upper arm from the workbench to access them.	
3 Refit the cover.	 xx1500002220 Screw: M4x16 (6 pcs) Tightening torque: 2 Nm

Refitting the main cable to the upper arm

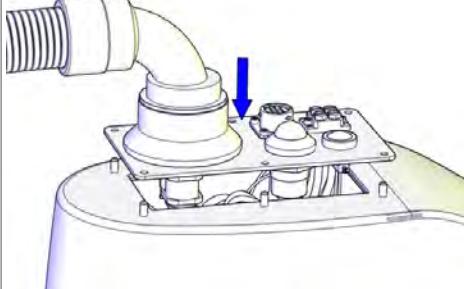
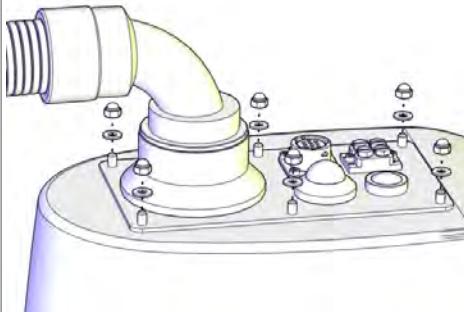
Action	Note
1 Secure the main cable package with cable ties if needed.	
2 Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 	 xx1500002184  xx1500002185

Continues on next page

4 Repair

4.4.3 Replacing the axis-3 timing belt

Continued

Action	Note
3 Push the main cable package into place.	 xx1500002207
4 Refit the user interface plate.	 xx1500002182 <p>Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs</p>

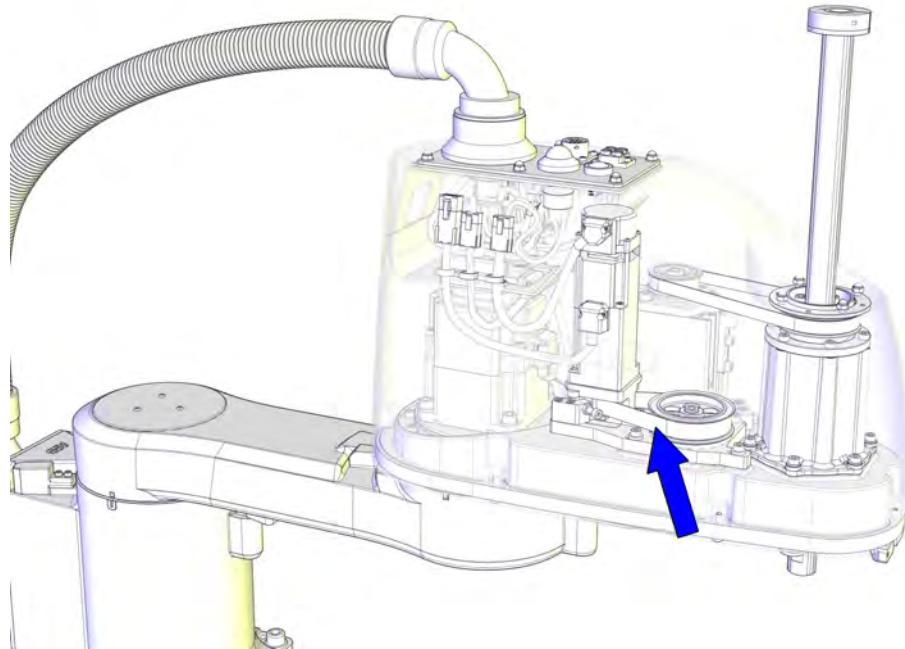
Concluding procedure

Action	Note
1 Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

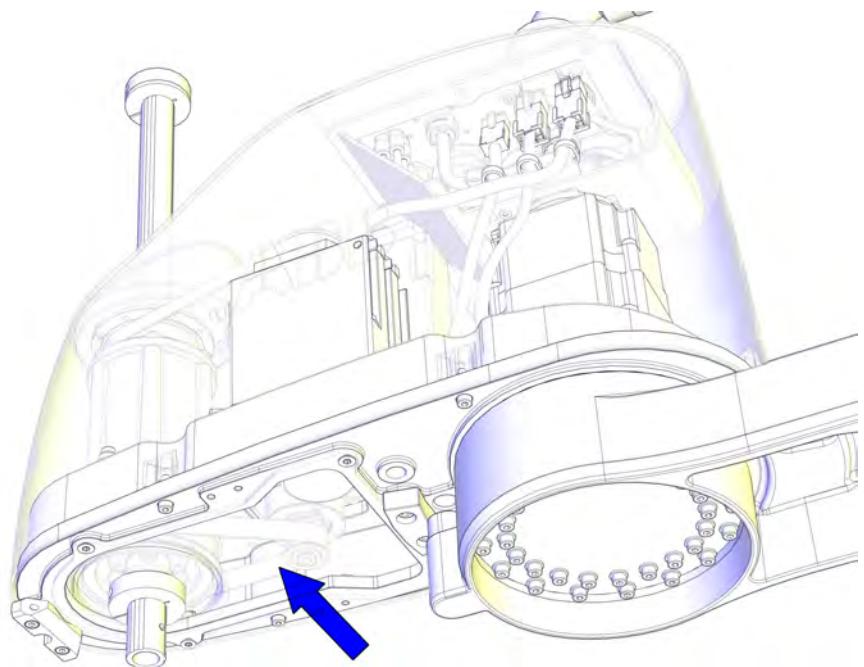
4.4.4 Replacing the axis-4 timing belts

Location of the axis-4 timing belts

The axis-4 timing belts are located as shown in the figures.



xx1500002216



xx1500002217

Continues on next page

4 Repair

4.4.4 Replacing the axis-4 timing belts

Continued

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Upper axis-4 timing belt	3HAC055206-001	
Lower axis-4 timing belt	3HAC055201-001	
Upper cover unit	3HAC057615-001	Includes upper cover and cover flange.
Plain washer	3HAC056937-001	Replace if damaged.

Required tools and equipment



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Equipment	Article number	Note
Standard toolkit	-	The content is defined in the section Standard toolkit on page 384 .
Acoustic tensiometer	-	Used for measuring the timing belt tension.

Required consumables

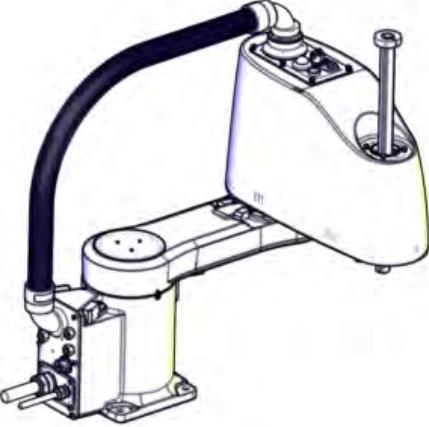
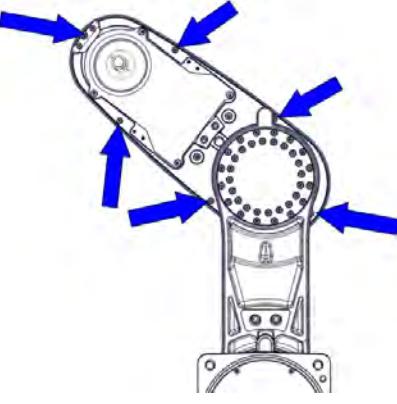
Consumable	Article number	Note
Cable ties	-	

Continues on next page

Removing the axis-4 timing belts

Use these procedures to remove the axis-4 timing belts.

Preparations before removing the axis-4 timing belts

	Action	Note
1	Jog axis 2 to access the cover screws.	 xx1500002520  xx1500002782
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

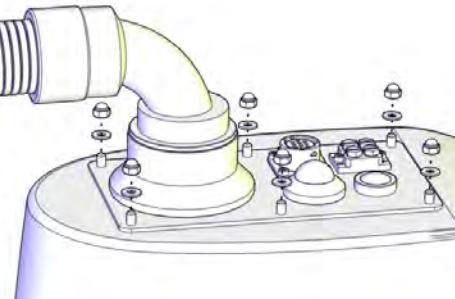
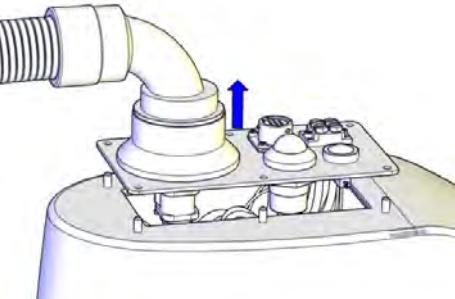
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4 Repair

4.4.4 Replacing the axis-4 timing belts

Continued

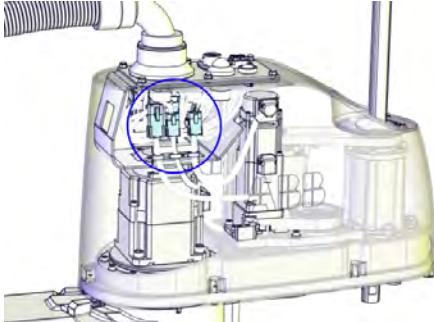
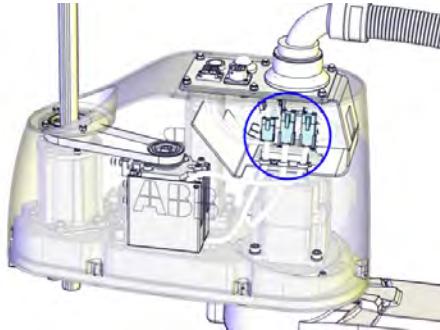
Removing the main cable package from the upper arm

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the dome nuts and washers.	 xx1500002182
3 Carefully open the user interface plate and pull out the cable package.  CAUTION The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183

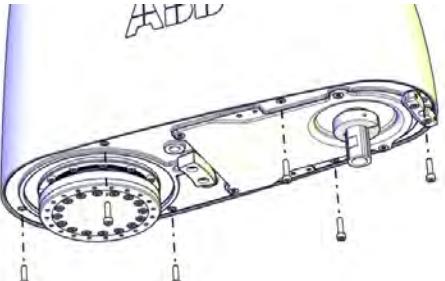
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4.4.4 Replacing the axis-4 timing belts

Continued

Action	Note
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 <p> Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 xx1500002184  xx1500002185

Removing the upper cover

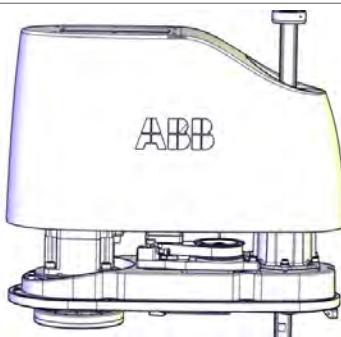
Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2  WARNING</p> <p>Risk of tipping. Make sure the robot is well secured and that the upper arm is supported during the removal work.</p>	
3 Remove the screws.	 xx1500002220

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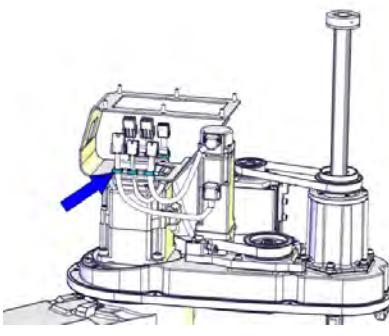
4 Repair

4.4.4 Replacing the axis-4 timing belts

Continued

Action	Note
4  WARNING The cover may be damaged due to improper shift. Keep the cover in position while removing the screws.	
5 Lift out the upper cover carefully.	 xx1500002221

Removing the drive unit cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Cut the cable ties. Be careful not to damage the cabling.  Tip Take photos of the cable position before removing them, to have as a reference when refitting.	 xx1500002226

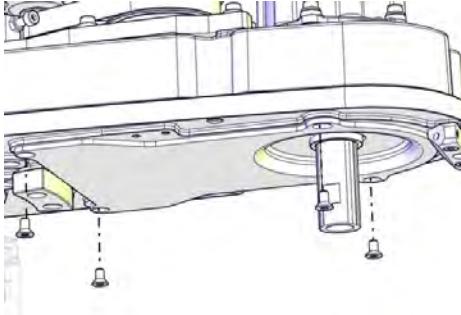
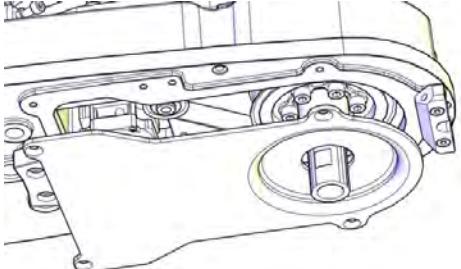
Removing the lower cover

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

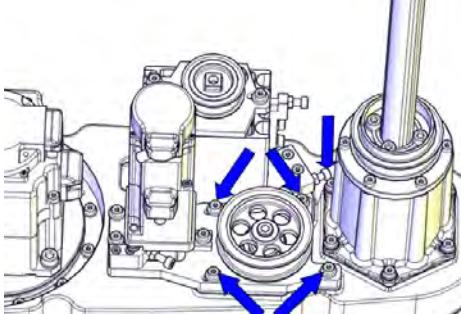
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4.4.4 Replacing the axis-4 timing belts

Continued

Action	Note
2 Remove the screws.	 xx1500002785
3 Remove the cover.  Tip If only working with lower axis-4 timing belt, no need to remove the stop block of ball screw spline unit before removing the lower cover.	 xx1500002225

Removing the lower axis-4 timing belt

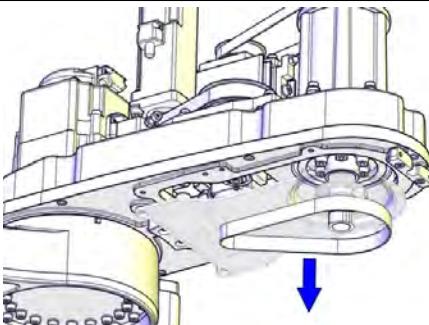
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING Risk of tipping. Make sure the gravity center is well supported.	
3 Loosen the screws and move the axis-4 housing sideways to slacken the lower axis-4 timing belt.	 xx1500002231

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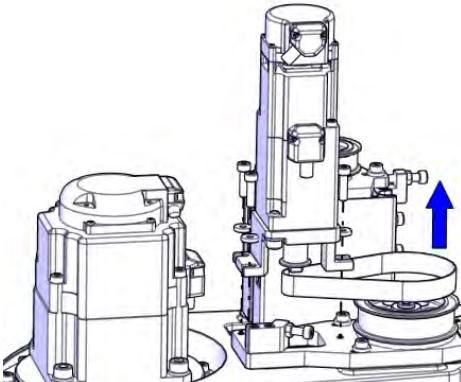
4 Repair

4.4.4 Replacing the axis-4 timing belts

Continued

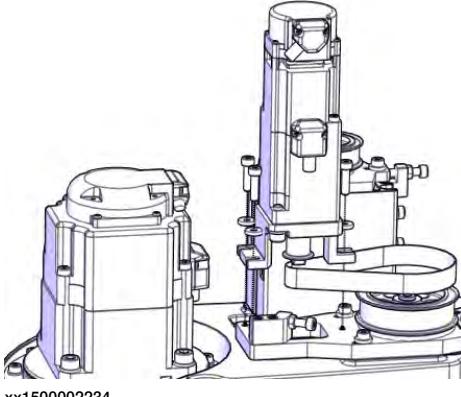
Action	Note
4 Remove the timing belt.	 xx1500002232

Removing the axis-4 drive unit and upper timing belt

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING Risk of tipping. Make sure the gravity center is well supported.	
3 Loosen the screws and move the axis-4 drive unit upwards to slacken the upper axis-4 timing belt.	 xx1500002233

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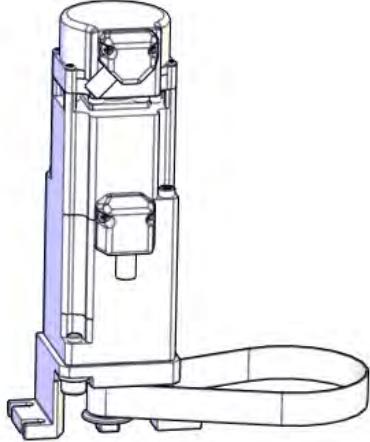
4.4.4 Replacing the axis-4 timing belts
Continued

Action	Note
4 Remove the drive unit and timing belt.	

Refitting the axis-4 timing belts

Use these procedures to refit the axis-4 timing belts.

Refitting the axis-4 drive unit and upper timing belt

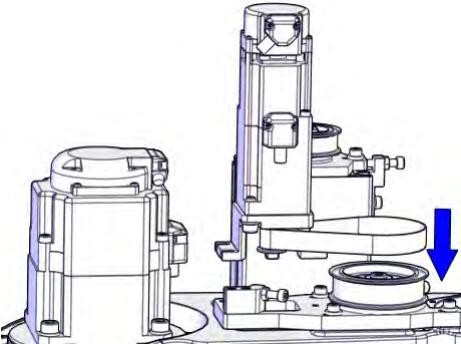
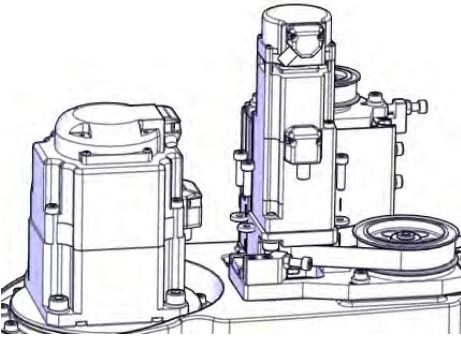
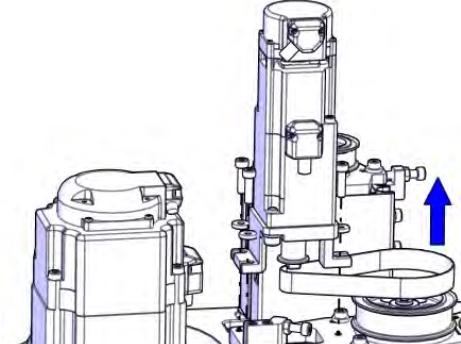
Action	Note
1 Make sure that: <ul style="list-style-type: none"> • all assembly surfaces are clean and undamaged. • the drive unit is clean and undamaged. 	
2 Place the timing belt.	Axis-4 drive unit: 3HAC056112-001 Upper axis-4 timing belt: 3HAC055206-001 

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4 Repair

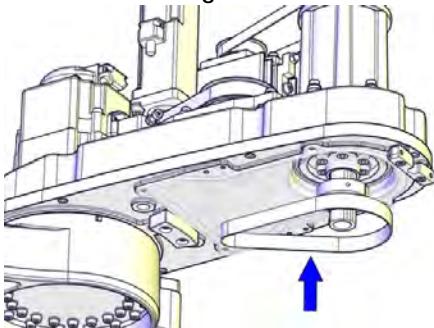
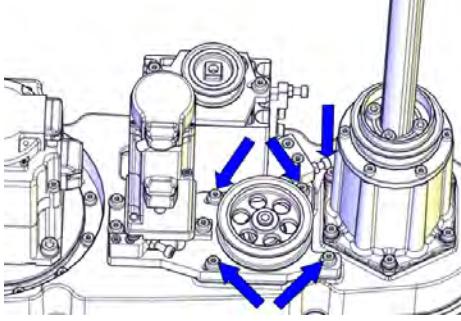
4.4.4 Replacing the axis-4 timing belts

Continued

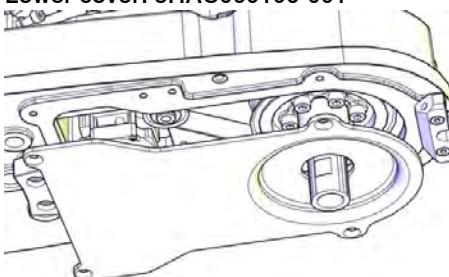
Action	Note
3 Refit the drive unit and timing belt.	 Note Make sure to refit the drive unit with motor connectors pointing against axis-3 drive unit.  xx1500002802
4 Refit screws and washers just enough to still be able to move the drive unit upwards.	 xx1500002803 Screw: M4x16 (3 pcs) Washer (3HAC056937-001, 3 pcs)  Note Only use specified washers, never replace them with other washers.
5 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 xx1500002233 Belt tension: F = 33 N (Recommended) Belt tension range: 21.4 N to 24.4 N (for used timing belt, which has been installed and used for more than 24 hours) 30.5 N to 33.6 N (for new timing belt)

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Refitting the lower axis-4 timing belt

	Action	Note
1	Make sure that: <ul style="list-style-type: none"> • all assembly surfaces are clean and undamaged. • the drive unit is clean and undamaged. 	
2	Refit lower axis-4 timing belt. Ensure that the belt runs correctly in the grooves.	Lower axis-4 timing belt: 3HAC055201-001  xx1500002786
3	Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 xx1500002231 Belt tension: $F = 91 \text{ N}$ (Recommended) Belt tension range: 58.1 N to 66.5 N (for used timing belt, which has been installed and used for more than 24 hours) 83.1 N to 91.4 N (for new timing belt)

Refitting the lower cover

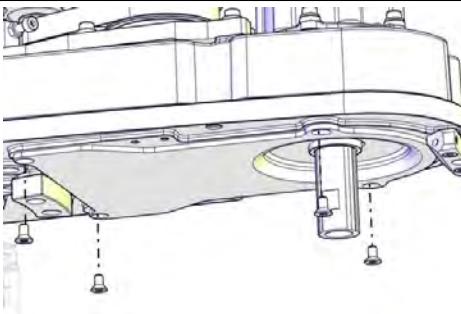
	Action	Note
1	Refit the cover.	Lower cover: 3HAC060106-001  xx1500002225

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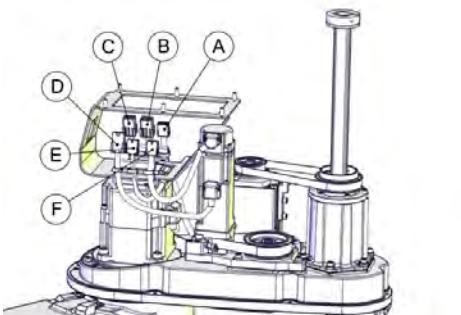
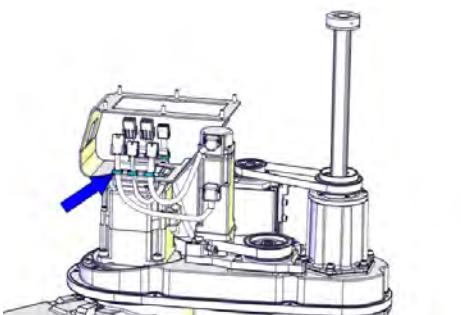
4 Repair

4.4.4 Replacing the axis-4 timing belts

Continued

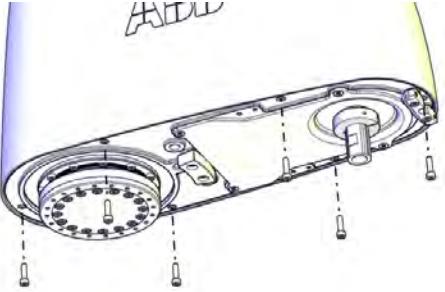
Action	Note
2 Secure with screws.	 xx1500002785 Screw: M4x8 (4 pcs) Tightening torque: 2 Nm

Securing the drive unit cables

Action	Note												
1 Put the drive unit cables in place.	 xx1500003063 <table border="1" data-bbox="936 1235 1397 1516"> <tr><td>A</td><td>R2.ME3</td></tr> <tr><td>B</td><td>R2.MP2</td></tr> <tr><td>C</td><td>R2.MP3</td></tr> <tr><td>D</td><td>R2.MP4</td></tr> <tr><td>E</td><td>R2.ME2</td></tr> <tr><td>F</td><td>R2. ME4</td></tr> </table>	A	R2.ME3	B	R2.MP2	C	R2.MP3	D	R2.MP4	E	R2.ME2	F	R2. ME4
A	R2.ME3												
B	R2.MP2												
C	R2.MP3												
D	R2.MP4												
E	R2.ME2												
F	R2. ME4												
2 Secure the cables with cable ties. Do not tighten the ties too tight.	 xx1500002226												

Continues on next page

Refitting the upper cover

	Action	Note
1	Carefully put down the upper cover, avoiding any collision to the ball screw spline unit and drive units.	Upper cover unit: 3HAC057615-001  xx1500002221
2	 Tip Some of the screws are accessed from below. Make sure that the robot is properly fastened and hang out the upper arm from the workbench to access them.	
3	Refit the cover.	 xx1500002220 Screw: M4x16 (6 pcs) Tightening torque: 2 Nm

Refitting the main cable to the upper arm

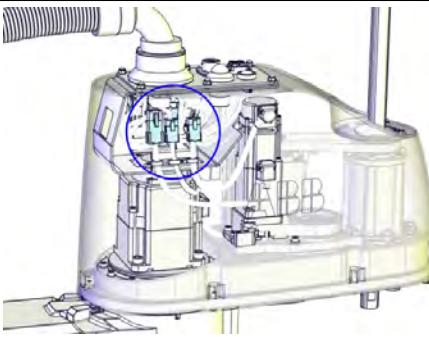
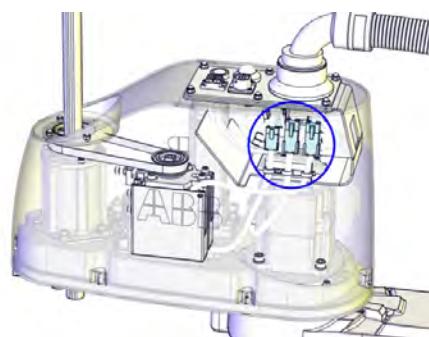
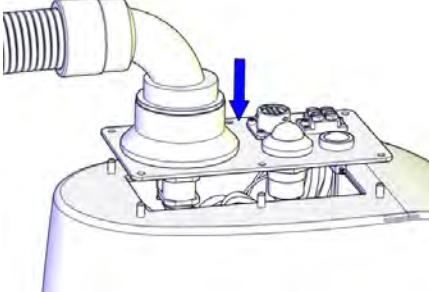
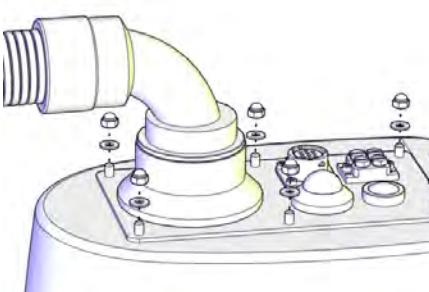
	Action	Note
1	Secure the main cable package with cable ties if needed.	

Continues on next page

4 Repair

4.4.4 Replacing the axis-4 timing belts

Continued

Action	Note
2 Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 	 xx1500002184  xx1500002185
3 Push the main cable package into place.	 xx1500002207
4 Refit the user interface plate.	 xx1500002182 <p>Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs</p>

Continues on next page

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4 Repair

4.4.5 Replacing the axis-2 mechanical stop

4.4.5 Replacing the axis-2 mechanical stop

General

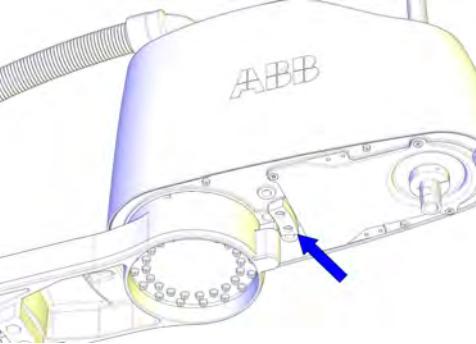
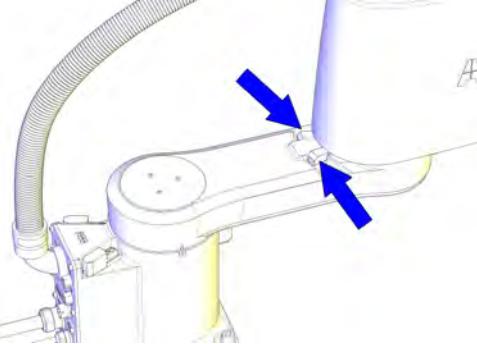


Note

If a collision with the mechanical stops occur, check and retighten all screws before any installation or service work. Replace damaged or cracked screws.

Location of the axis-2 mechanical stop

The axis-2 mechanical stop is located as shown in the figure.

Axis-2 mechanical stop block	Axis-2 mechanical stop rubber
 xx1500002175	 xx1500002174
3HAC055185-001	3HAC056017-001

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Axis-2 mechanical stop rubber	3HAC056017-001	Replace if damaged.
Axis-2 mechanical stop block	3HAC055185-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

Required consumables

Consumable	Article number	Note
Locking liquid	3HAB7116-1	Loctite 243

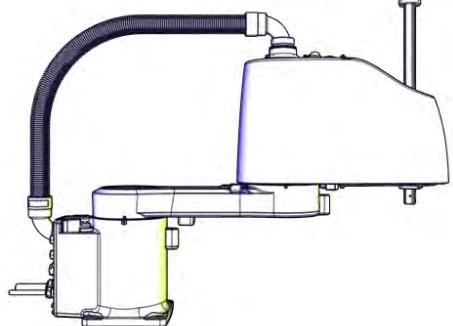
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4.4.5 Replacing the axis-2 mechanical stop

*Continued***Replacing the axis-2 mechanical stop**

Use these procedures to replace the axis-2 mechanical stop.

Preparations before replacing the axis-2 mechanical stop

Action	Note
1 Jog all axes to zero position.	 xx1500002227
2  DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

Replacing the axis-2 mechanical stop block

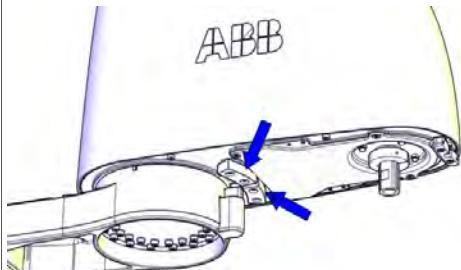
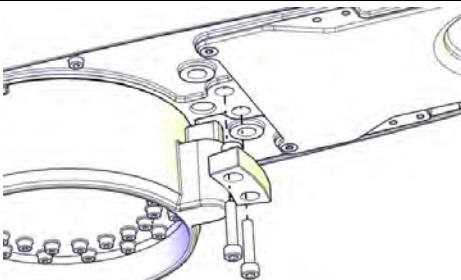
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4 Repair

4.4.5 Replacing the axis-2 mechanical stop

Continued

Action	Note
<p>2 Remove the block by removing the screws.</p> <p>3 Refit and secure the new mechanical stop block.</p> <p> Tip</p> <p>One more mechanical stop block can be fitted to restrict the working range of axis 2, as shown in the following figure. The block and related screws are provided in accessory package.</p>  <p>xx1500003065</p>	 <p>xx1500002245</p> <p>Screw: M5x15 (2 pcs) Tightening torque: 5 Nm</p>

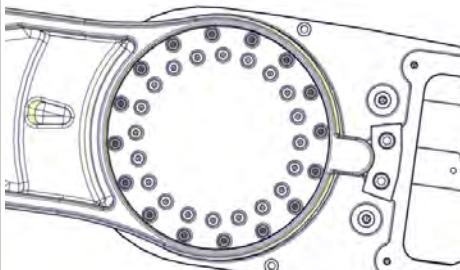
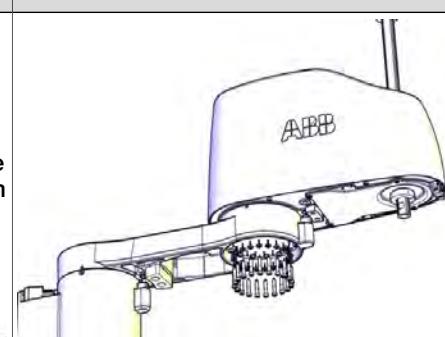
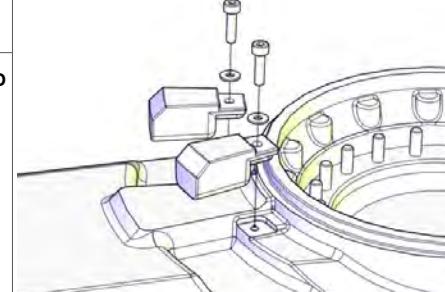
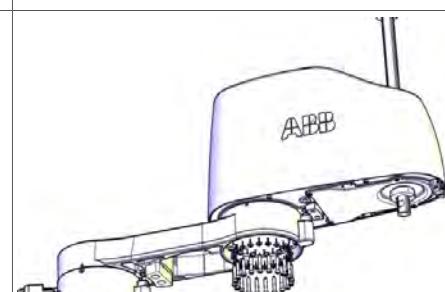
Replacing the axis-2 mechanical stop rubbers

Note	
Two persons working together are required to perform this procedure.	
Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2  WARNING</p> <p>The upper arm weights 13.2 kg. It may drop by the force of gravity when it is released from the lower arm. Make sure the weight of the upper arm body is properly supported.</p>	
<p>3  Note</p> <p>Two persons working together are required to perform this step. Person 1: Hold the upper arm. Person 2: Remove the screws that fasten the upper arm to the lower arm.</p>	

Continues on next page

4.4.5 Replacing the axis-2 mechanical stop

Continued

Action	Note
4 Remove the screws and washers.	<p>WARNING Keep the twelve screws in the outer circle fitted. They hold the axis-2 motor flange on the lower arm.</p>  <p>xx1500002257</p>  <p>xx1500002256</p>
5 Remove the upper arm and lay it on a workbench.	
6 Remove the rubbers by removing the screws.	
7 Refit and secure the new mechanical stop rubbers with screws. Lock screws with locking liquid (Loctite 243).	 <p>xx1500002246</p> <p>Screw: M3x6 (2 pcs) Tightening torque: 0.3 Nm</p>
8 Make sure the lower arm is secured. Lower the upper arm down onto the right place of the lower arm.	
9 Refit the upper arm screws and washers.	 <p>xx1500002256</p> <p>Screw: M4x20 (16 pcs) Tightening torque: 4.5 Nm</p>

Continues on next page

4 Repair

4.4.5 Replacing the axis-2 mechanical stop

Continued

Action	Note
10  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45.	

Concluding procedure

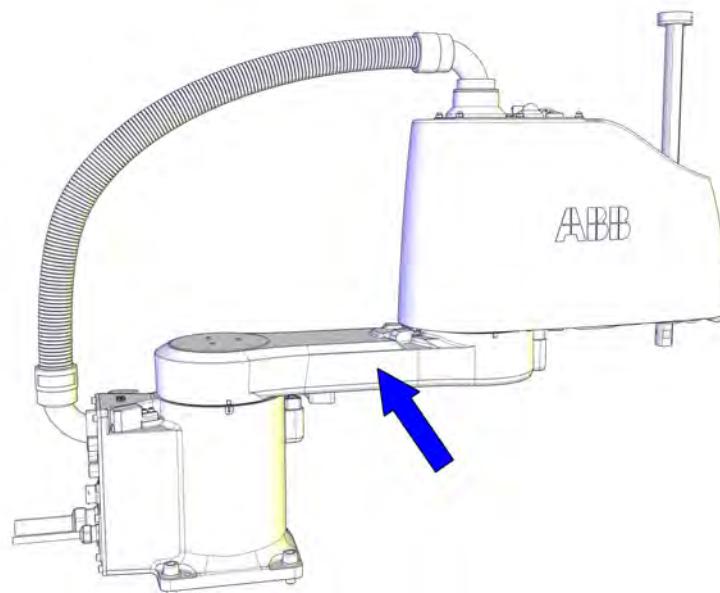
Action	Note
1 Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45.	

4.5 Lower arm and base

4.5.1 Replacing the lower arm

Location of the lower arm

The lower arm is located as shown in the figure.



xx1500002210

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Lower arm, 450 mm	3HAC057609-001	Used for IRB 910SC-3/0.45
Lower arm, 550 mm	3HAC057612-001	Used for IRB 910SC-3/0.55
Lower arm, 650 mm	3HAC057613-001	Used for IRB 910SC-3/0.65
Lower arm cover	3HAC056065-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

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4 Repair

4.5.1 Replacing the lower arm

Continued

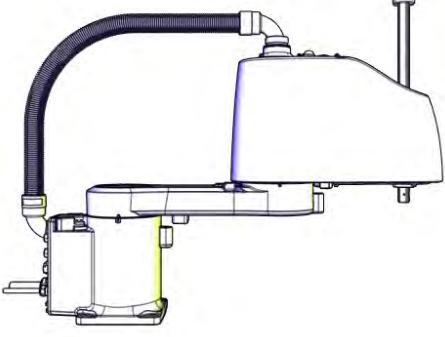
Required consumables

Consumable	Article number	Note
Cable ties	-	

Removing the lower arm

Use these procedures to remove the lower arm.

Preparations before removing the lower arm

	Action	Note
1	Jog all axes to zero position.	 xx1500002227
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

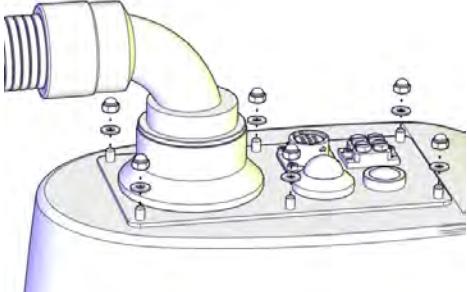
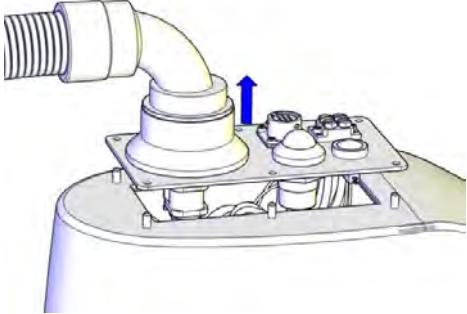
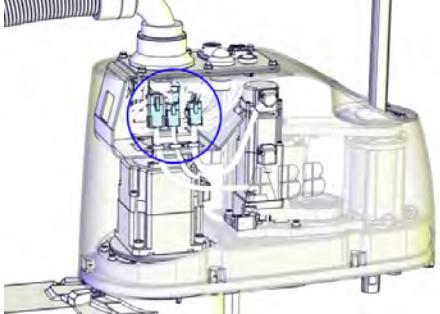
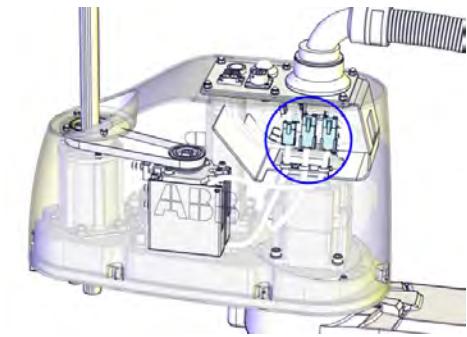
Removing the main cable package from the upper arm

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

Continues on next page

4.5.1 Replacing the lower arm

Continued

Action	Note
2 Remove the dome nuts and washers.	 xx1500002182
3 Carefully open the user interface plate and pull out the cable package.  CAUTION The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183
4 Disconnect the connectors: <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4  Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002184  xx1500002185

Removing the upper arm



Note

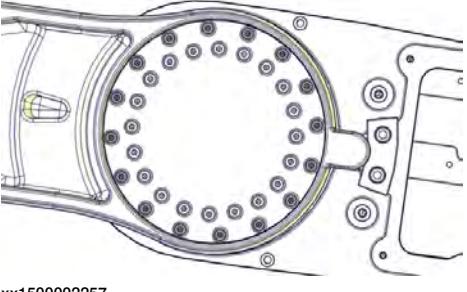
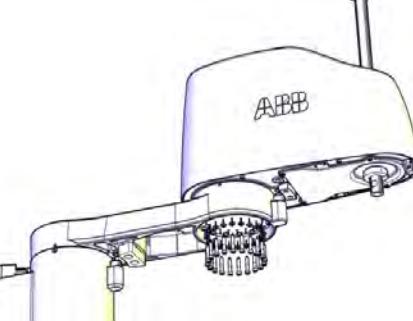
Two persons working together are required to perform this procedure.

Continues on next page

4 Repair

4.5.1 Replacing the lower arm

Continued

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING The upper arm weights 13.2 kg. It may drop by the force of gravity when it is released from the lower arm. Make sure the weight of the upper arm body is properly supported.	
3  Note Two persons working together are required to perform this step. Person 1: Hold the upper arm. Person 2: Remove the screws that fasten the upper arm to the lower arm.	
4 Remove the screws and washers.  WARNING Keep the twelve screws in the outer circle fitted. They hold the axis-2 motor flange on the lower arm.  xx1500002257	 xx1500002256
5 Remove the upper arm and lay it aside on a workbench.	

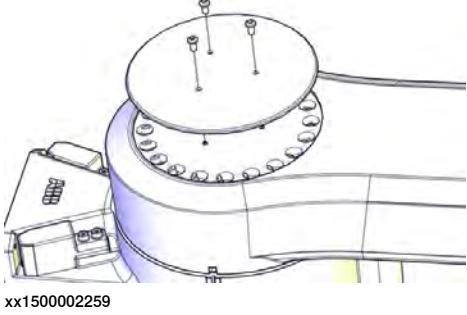
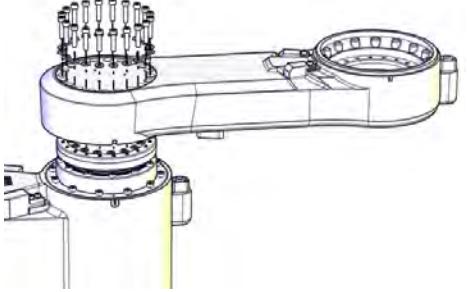
Removing the lower arm

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

Continues on next page

4.5.1 Replacing the lower arm

Continued

Action	Note
2 Remove the cover. Tip If the cover is hard to remove, fit a screw to its attachment hole to help press out the cover.	
3  WARNING The lower arm weighs 3.2 kg. It may drop when it is released from the base. Make sure the weight of the lower arm is properly supported.	
4 Remove the screws and washers.	
5 Lay the lower arm aside on a workbench.	

Continues on next page

4 Repair

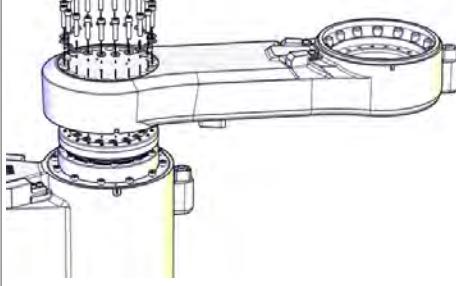
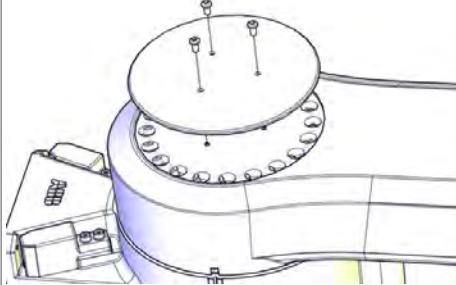
4.5.1 Replacing the lower arm

Continued

Refitting the lower arm

Use these procedures to refit the lower arm.

Refitting the lower arm

	Action	Note
1	Refit the lower arm and tighten screws.	<p>Lower arm, 450 mm: 3HAC057609-001 (For IRB 910SC-3/0.45) Lower arm, 550 mm: 3HAC057612-001 (For IRB 910SC-3/0.65) Lower arm, 650 mm: 3HAC057613-001 (For IRB 910SC-3/0.65)</p>  <p>xx1500002260</p> <p>Screw: M4x20 (16 pcs) Tightening torque: 4.2 Nm Washer: 4.3x9x1.3 (16 pcs)</p>
2	Refit the cover.	<p>Lower arm cover: 3HAC056065-001</p>  <p>xx1500002259</p> <p>Screw: M3x6 (3 pcs) Tightening torque: 1 Nm</p>

Refitting the upper arm

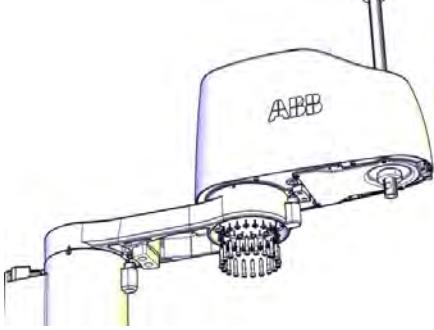


Note

Two persons working together are required to perform this procedure.

Continues on next page

4.5.1 Replacing the lower arm
Continued

Action	Note
1  Note Two persons working together are required to perform this step. Person 1: Hold the upper arm. Person 2: Refit the screws that fasten the upper arm to the lower arm.	
2 Make sure the lower arm is secured. Lower the upper arm down onto the right place of the lower arm.	
3 Refit the upper arm screws and washers.	 xx1500002256 Screw: M4x20 (16 pcs) Tightening torque: 4.5 Nm Washer: 4.3x9x1.3 (16 pcs)

Refitting the main cable to the upper arm

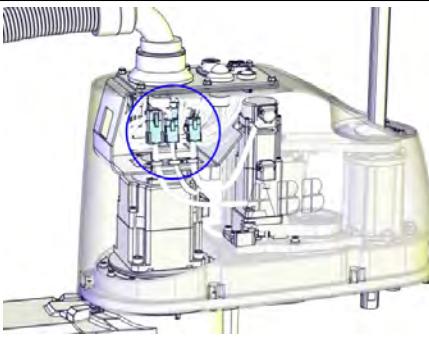
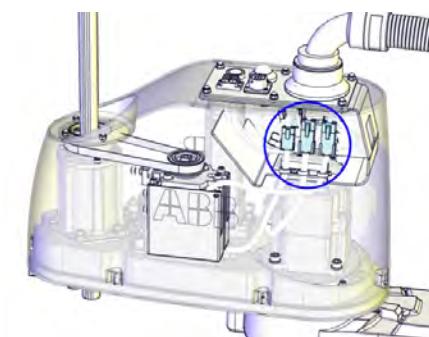
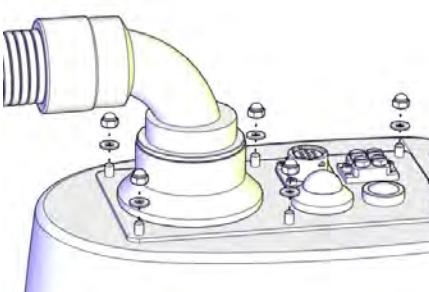
Action	Note
1 Secure the main cable package with cable ties if needed.	

Continues on next page

4 Repair

4.5.1 Replacing the lower arm

Continued

Action	Note
2 Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 	 xx1500002184
3 Push the main cable package into place.	 xx1500002207
4 Refit the user interface plate.	 xx1500002182 <p>Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs</p>

Continues on next page

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

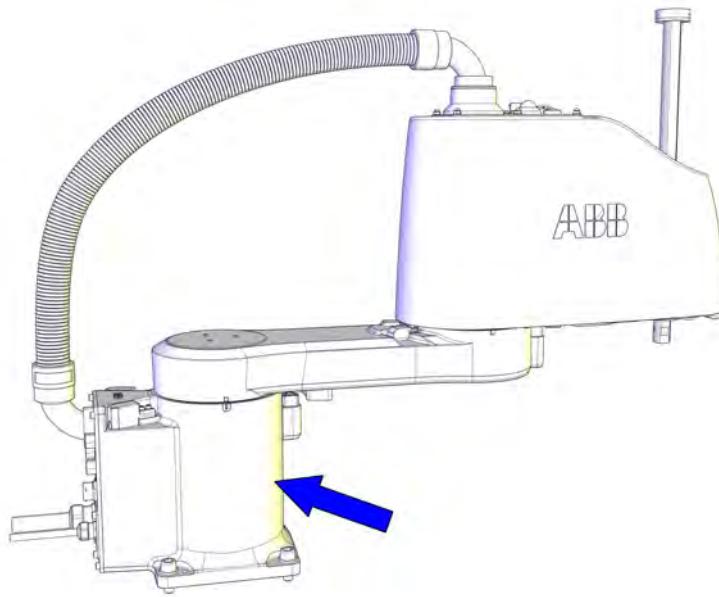
4 Repair

4.5.2 Replacing the base

4.5.2 Replacing the base

Location of the base

The base is located as shown in the figure.



xx1500002211

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Base	3HAC057614-001	
Base bottom cover	3HAC055216-001	Replace if damaged.
Lower arm cover	3HAC056065-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

Required consumables

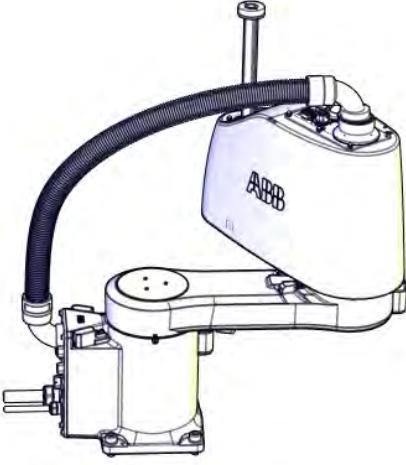
Consumable	Article number	Note
Cable ties	-	

Continues on next page

Removing the cabling from the base

Use these procedures to remove the cabling from the base.

Preparations before replacing the base

	Action	Note
1	Jog axis 2 to easily support the arm system weight.	
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

Removing the main cable package from the base

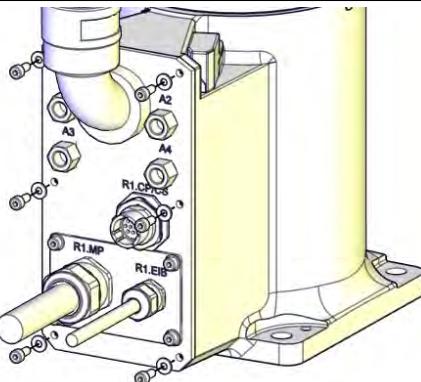
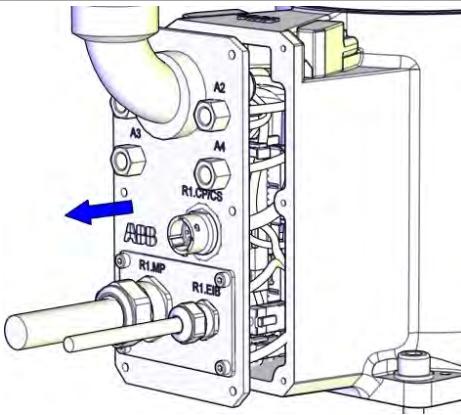
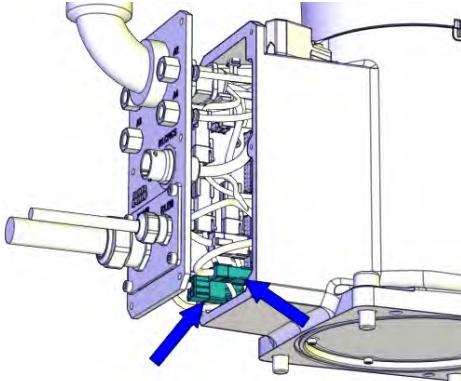
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4 Repair

4.5.2 Replacing the base

Continued

Action	Note
2 Remove the screws and washers.	 xx1500002186
3 Carefully open the base cover and pull out the cable package.  CAUTION The cover cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002187
4 Disconnect the connectors: <ul style="list-style-type: none">• R2.MP1• R2.ME1  Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002188

Replacing the base

Use these procedures to replace the base.

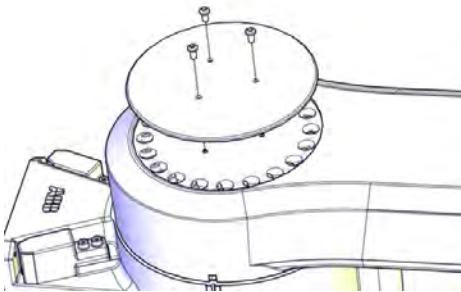
Removing the arm system



Note

Two persons working together are required to perform this procedure.

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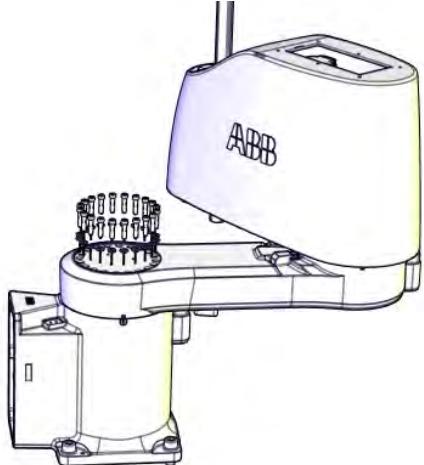
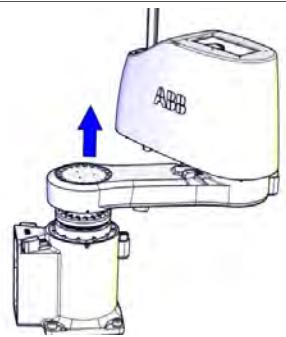
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	 Tip If the cover is hard to remove, fit a screw to its attachment hole to help press out the cover.	 xx1500002259
3	 WARNING The arm system weights 16.4 kg. The arm system may drop when released from the base. Make sure the weight of the arm system is properly supported.	
4	 Note Two persons working together are required to perform this step. Person 1: Hold the arm system. Person 2: Remove the screws that fasten the arm system to the base.	
5	 CAUTION Handle the main cable package with care. Minimum bending radius is approximately 10 times of the cable diameter.	

Continues on next page

4 Repair

4.5.2 Replacing the base

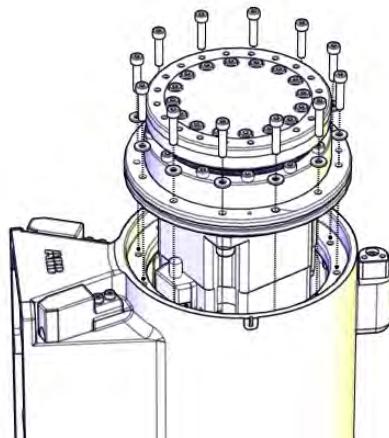
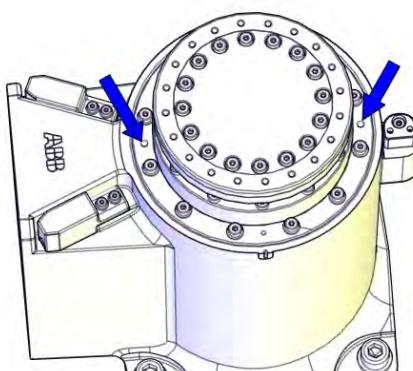
Continued

	Action	Note
6	Remove the screws and washers.	 xx1500002805
7	Remove the arm system and lay it aside on a workbench.	 xx1500002261

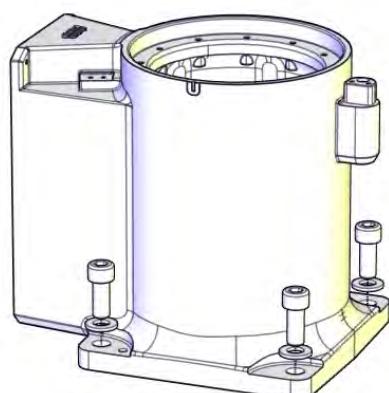
Removing the axis-1 drive unit

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

Continues on next page

Action	Note
<p>2 Remove the screws and washers.</p> <p>WARNING Do not remove the inner circle screws. They are holding the gearbox together and removing them may damage the gearbox severely.</p>	 xx1500002262
<p>3 Pull the drive unit out carefully while pulling the motor cables out of the base rear.</p> <p>Tip If the drive unit is hard to remove, insert two M3 screws and press out the drive unit.</p>  xx1500002263	

Removing the base

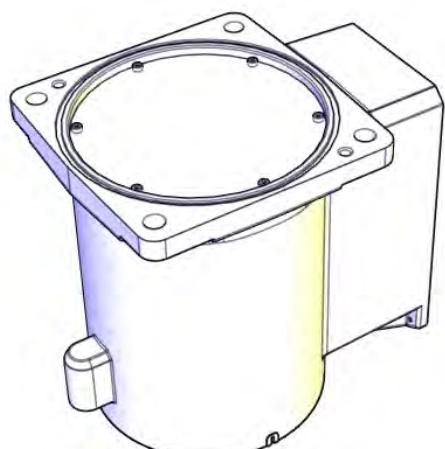
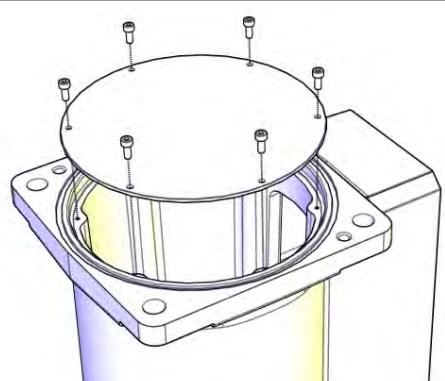
Action	Note
<p>1</p> <p>DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2 Remove the attachment screws and washers.</p>	 xx1500002264

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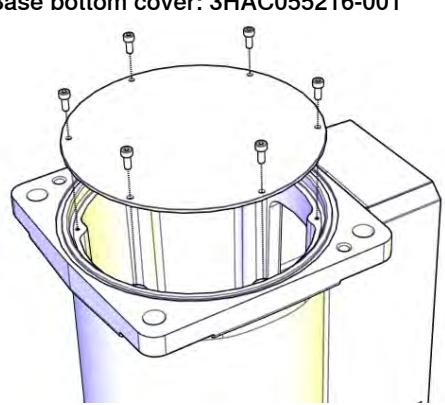
4 Repair

4.5.2 Replacing the base

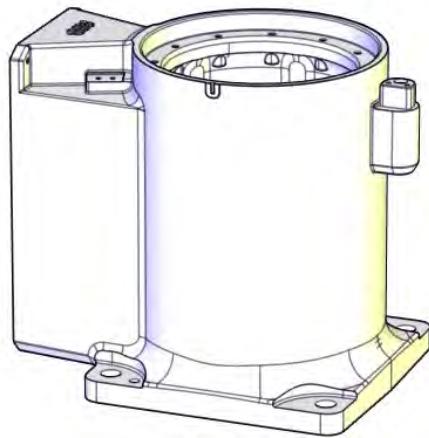
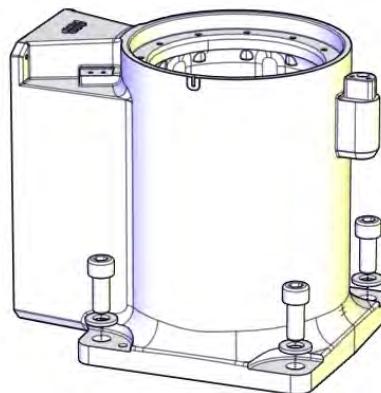
Continued

Action	Note
3 Put the base on its side.	 xx1500002806
4 Remove the bottom cover.	 xx1500002265

Refitting the base

Action	Note
1 Refit the bottom cover.	<p>Base bottom cover: 3HAC055216-001</p>  xx1500002265 <p>Screw: M3x8 (6 pcs) Tightening torque: 2 Nm</p>

Continues on next page

Action	Note
2 Put the base in a raised position.	
3 Fasten the attachment screws and washers.	 <p>Attachment screws: M10x25 (4 pcs), quality: 8.8. Washers: 20x10.5x2. Pin: 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1. Tightening Torque: 45 Nm.</p>

Refitting the axis-1 drive unit

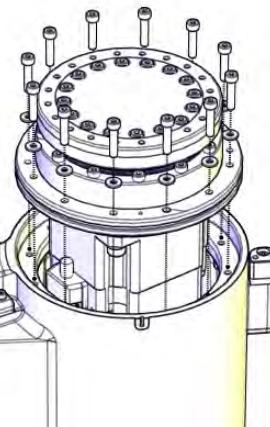
Action	Note
1 Make sure that: <ul style="list-style-type: none"> • all assembly surfaces are clean and undamaged. • the drive unit is clean and undamaged. 	

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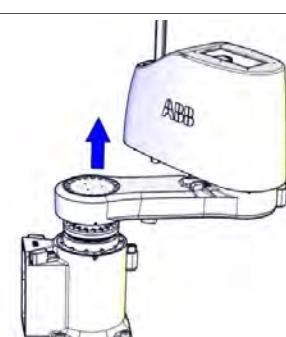
4 Repair

4.5.2 Replacing the base

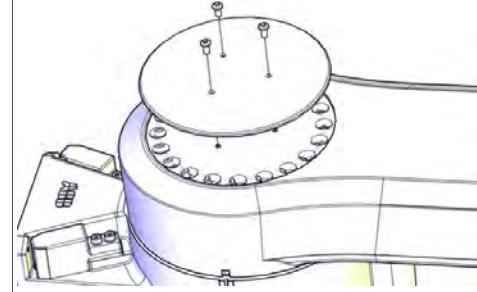
Continued

Action	Note
<p>2 Carefully insert the complete drive unit while pulling the motor cables out of the base rear.</p> <p> CAUTION</p> <p>Do not mix axis-1 and axis-2 drive units. Always check the mark or label on the drive units before refitting.</p>	Axis-1 drive unit: 3HAC055900-001  xx1500002262 Screw: M4x20 (12 pcs) Tightening torque: 4.5 Nm Washer: 4.3x9x1 (12 pcs)
3 Refit the screws and washers.	

Refitting the arm system

Action	Note
<p>1  Note</p> <p>Two persons working together are required to perform this step.</p> <p>Person 1: Hold the arm system.</p> <p>Person 2: Refit the screws that fasten the arm system to the base.</p>	
<p>2 Refit the whole arm system.</p> <p> WARNING</p> <p>The arm system weights 16.4 kg. Support the gravity center properly.</p>	 xx1500002261 Screw: M4x20 (16 pcs) Tightening torque: 4.2 Nm Washer: 4.3x9x1.3 (16 pcs)

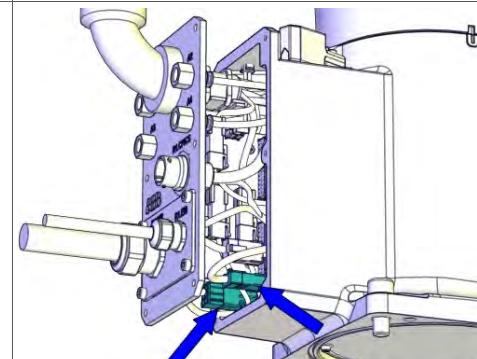
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	Action	Note
3	 CAUTION Handle the main cable package with care. Minimum bending radius is approximately 10x the cable diameter.	
4	Refit the cover.	Lower arm cover: 3HAC056065-001  xx1500002259 Screw: M3x6 (3 pcs) Tightening torque: 1 Nm

Refitting the cabling to the base

Use these procedures to refit the cabling to the base.

Refitting the main cable to the base

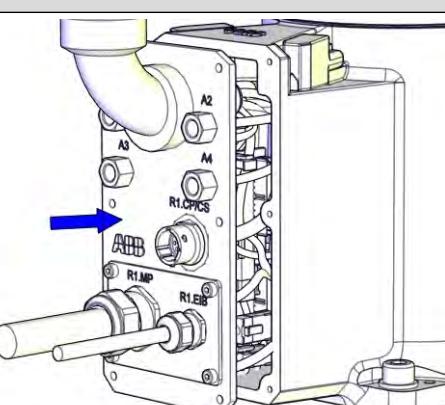
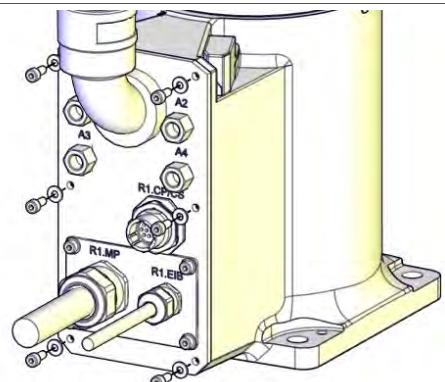
	Action	Note
1	Secure the main cable package with cable ties if needed.	
2	Reconnect the connectors. • R2.MP1 • R2.ME1	 xx1500002188

Continues on next page

4 Repair

4.5.2 Replacing the base

Continued

Action	Note
3 Push the main cable package into place.	 xx1500002204
4 Refit the base cover with screws and washers.	 xx1500002186 <p>Screws: M4x10 (6 pcs) Tightening torque: 2 Nm</p>

Concluding procedure

Action	Note
1 Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4.5.3 Replacing the axis-1 mechanical stop

General

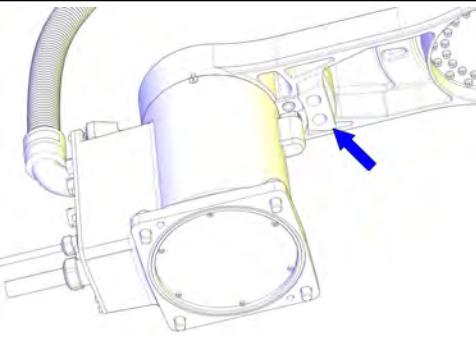
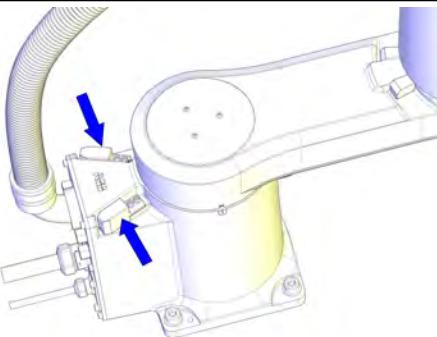


Note

If a collision with the mechanical stops occur, check and retighten all screws before any installation or service work. Replace damaged or cracked screws.

Location of the axis-1 mechanical stop

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

Axis-1 mechanical stop block	Axis-1 mechanical stop rubber
 xx1500002177 3HAC055164-001	 xx1500002176 3HAC056042-001

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Axis-1 mechanical stop rubber	3HAC056042-001	Replace if damaged.
Axis-1 mechanical stop block	3HAC055164-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

Required consumables

Consumable	Article number	Note
Locking liquid	3HAB7116-1	Loctite 243

Continues on next page

4 Repair

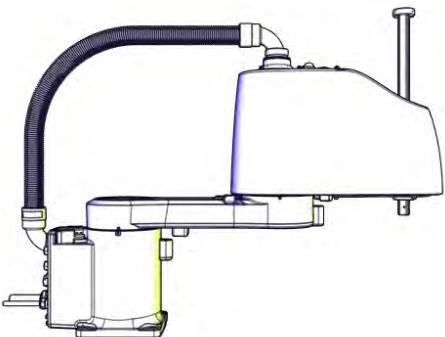
4.5.3 Replacing the axis-1 mechanical stop

Continued

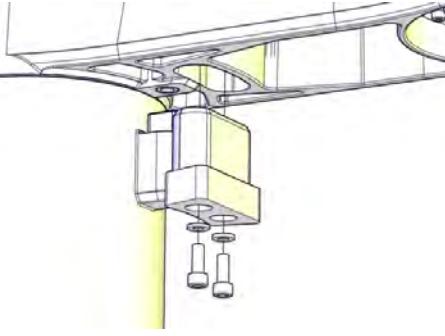
Replacing the axis-1 mechanical stop

Use these procedures to replace the axis-1 mechanical stop.

Preparations before replacing the axis-1 mechanical stop

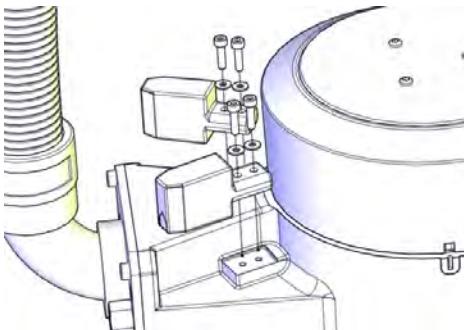
Action	Note
1 Jog all axes to zero position.	 xx1500002227
2  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

Replacing the axis-1 mechanical stop block

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the block by removing the screws and washers.	 xx1500002247
3 Refit and secure the new mechanical stop block.	Screw: 9ADA183-24 (M6x16, 2 pcs) Tightening torque: 6 Nm Washer: 9ADA312-6 (M6, 2 pcs)

Continues on next page

Replacing the axis-1 mechanical stop rubbers

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the rubbers by removing the screws.	 xx1500002255
3	Refit and secure the new mechanical stop rubbers with screws. Lock screws with locking liquid (Loctite 243).	Screw: M3x12 (4 pcs) Tightening torque: 0.3 Nm
4	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4 Repair

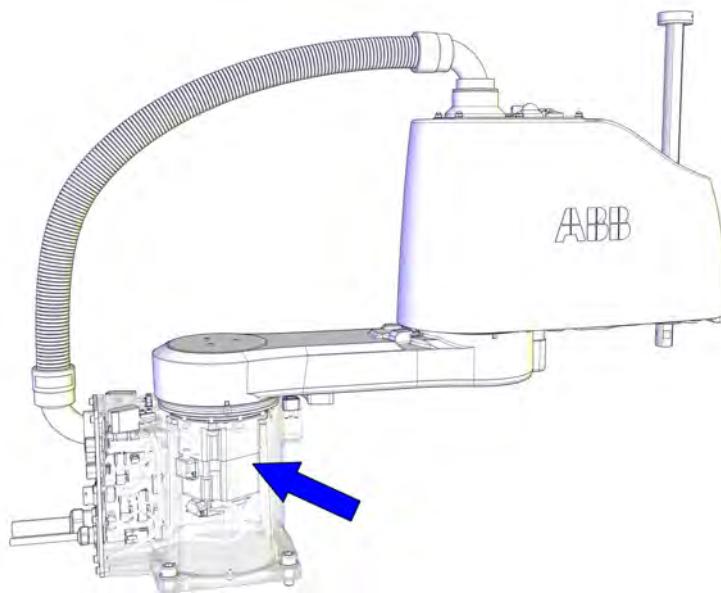
4.6.1 Replacing the axis-1 drive unit

4.6 Drive units

4.6.1 Replacing the axis-1 drive unit

Location of the axis-1 drive unit

The axis-1 drive unit is located as shown in the figure.



xx1500002213

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Axis-1 drive unit	3HAC055900-001	Includes axis-1 gearbox, motor and motor adapter.
Lower arm cover	3HAC056065-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

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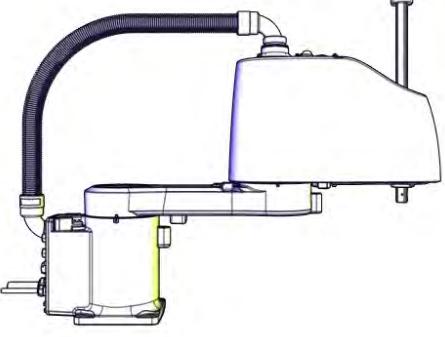
Required consumables

Consumable	Article number	Note
Cable ties	-	

Removing the axis-1 drive unit

Use these procedures to remove the axis-1 drive unit.

Preparations before removing the axis-1 drive unit

	Action	Note
1	Jog all axes to zero position.	 xx1500002227
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

Removing the main cable package from the base

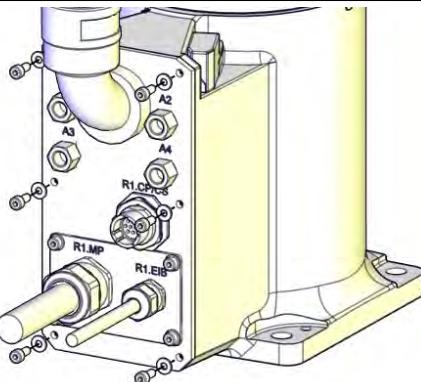
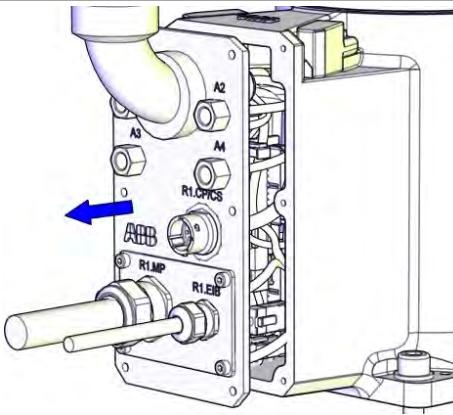
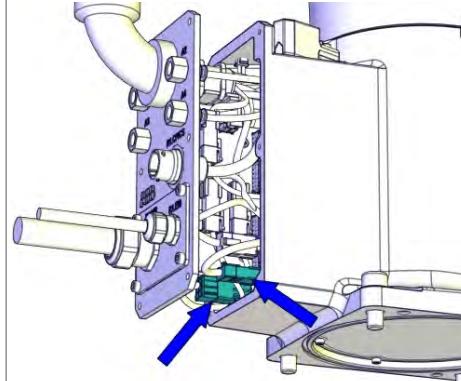
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4 Repair

4.6.1 Replacing the axis-1 drive unit

Continued

Action	Note
2 Remove the screws and washers.	 xx1500002186
3 Carefully open the base cover and pull out the cable package. CAUTION The cover cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002187
4 Disconnect the connectors: <ul style="list-style-type: none"> • R2.MP1 • R2.ME1 Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002188

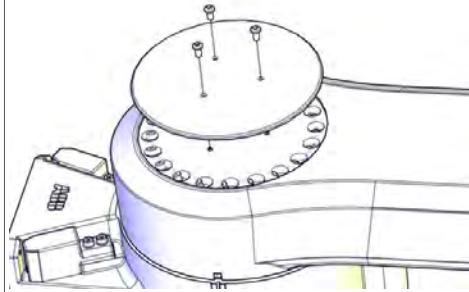
Removing the arm system



Note

Two persons working together are required to perform this procedure.

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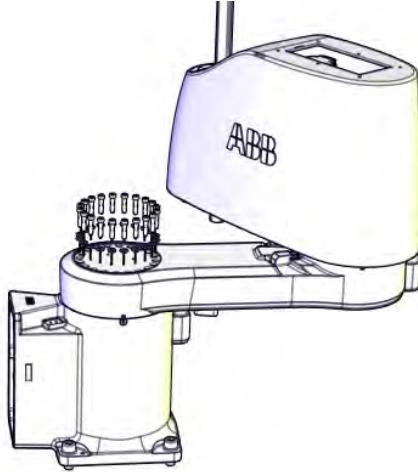
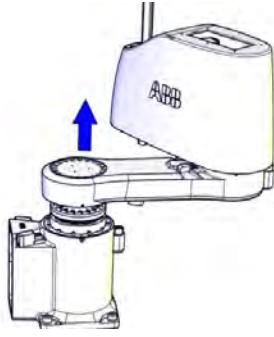
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	 Tip If the cover is hard to remove, fit a screw to its attachment hole to help press out the cover.	 xx1500002259
3	 WARNING The arm system weights 16.4 kg. The arm system may drop when released from the base. Make sure the weight of the arm system is properly supported.	
4	 Note Two persons working together are required to perform this step. Person 1: Hold the arm system. Person 2: Remove the screws that fasten the arm system to the base.	
5	 CAUTION Handle the main cable package with care. Minimum bending radius is approximately 10 times of the cable diameter.	

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4 Repair

4.6.1 Replacing the axis-1 drive unit

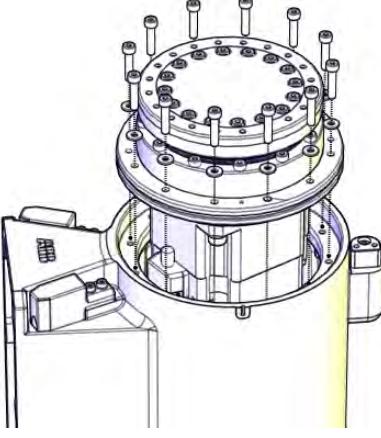
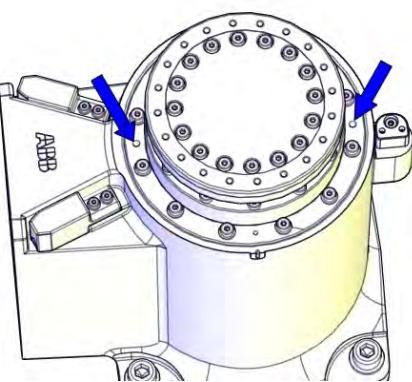
Continued

Action	Note
6 Remove the screws and washers.	 xx1500002805
7 Remove the arm system and lay it aside on a workbench.	 xx1500002261

Removing the axis-1 drive unit

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

Continues on next page

Action	Note
<p>2 Remove the screws and washers.</p> <p>WARNING Do not remove the inner circle screws. They are holding the gearbox together and removing them may damage the gearbox severely.</p>	 xx1500002262
<p>3 Pull the drive unit out carefully while pulling the motor cables out of the base rear.</p> <p>Tip If the drive unit is hard to remove, insert two M3 screws and press out the drive unit.</p>  xx1500002263	

Refitting the axis-1 drive unit

Use these procedures to refit the axis-1 drive unit.

Refitting the axis-1 drive unit

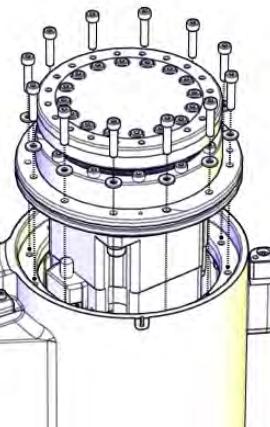
Action	Note
<p>1 Make sure that:</p> <ul style="list-style-type: none"> all assembly surfaces are clean and undamaged. the drive unit is clean and undamaged. 	

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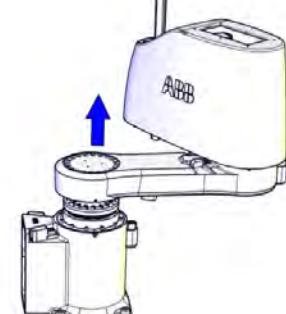
4 Repair

4.6.1 Replacing the axis-1 drive unit

Continued

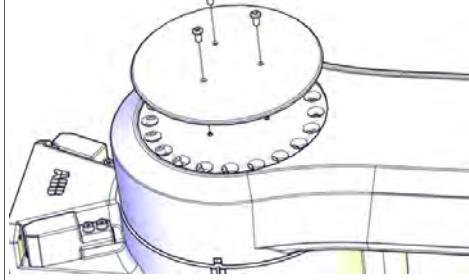
Action	Note
<p>2 Carefully insert the complete drive unit while pulling the motor cables out of the base rear.</p> <p> CAUTION</p> <p>Do not mix axis-1 and axis-2 drive units. Always check the mark or label on the drive units before refitting.</p>	Axis-1 drive unit: 3HAC055900-001  xx1500002262 Screw: M4x20 (12 pcs) Tightening torque: 4.5 Nm Washer: 4.3x9x1 (12 pcs)
3 Refit the screws and washers.	

Refitting the arm system

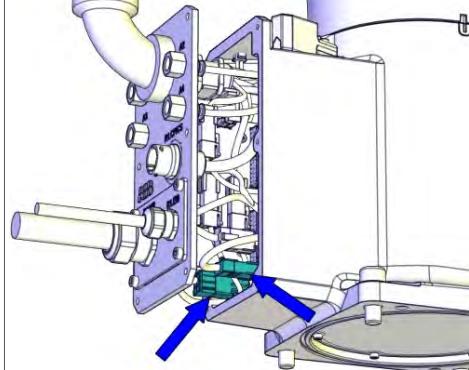
Action	Note
<p>1  Note</p> <p>Two persons working together are required to perform this step.</p> <p>Person 1: Hold the arm system.</p> <p>Person 2: Refit the screws that fasten the arm system to the base.</p>	
<p>2 Refit the whole arm system.</p> <p> WARNING</p> <p>The arm system weights 16.4 kg. Support the gravity center properly.</p>	 xx1500002261 Screw: M4x20 (16 pcs) Tightening torque: 4.2 Nm Washer: 4.3x9x1.3 (16 pcs)

Continues on next page

4.6.1 Replacing the axis-1 drive unit
Continued

Action	Note
<p>3</p>  CAUTION Handle the main cable package with care. Minimum bending radius is approximately 10x the cable diameter.	
<p>4</p> Refit the cover.	Lower arm cover: 3HAC056065-001  xx1500002259 Screw: M3x6 (3 pcs) Tightening torque: 1 Nm

Refitting the main cable to the base

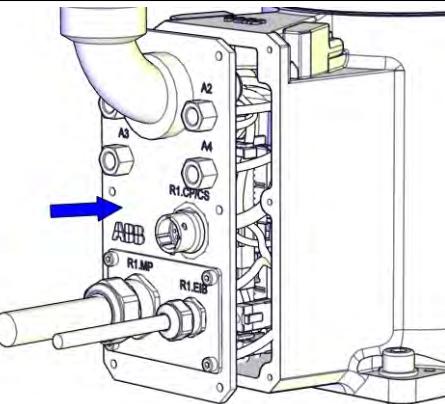
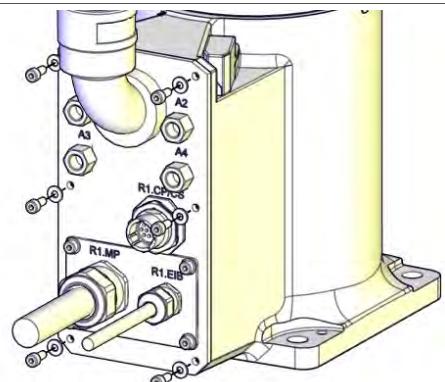
Action	Note
<p>1</p> Secure the main cable package with cable ties if needed.	
<p>2</p> Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP1 • R2.ME1 	 xx1500002188

Continues on next page

4 Repair

4.6.1 Replacing the axis-1 drive unit

Continued

Action	Note
3 Push the main cable package into place.	 xx1500002204
4 Refit the base cover with screws and washers.	 xx1500002186 <p>Screws: M4x10 (6 pcs) Tightening torque: 2 Nm</p>

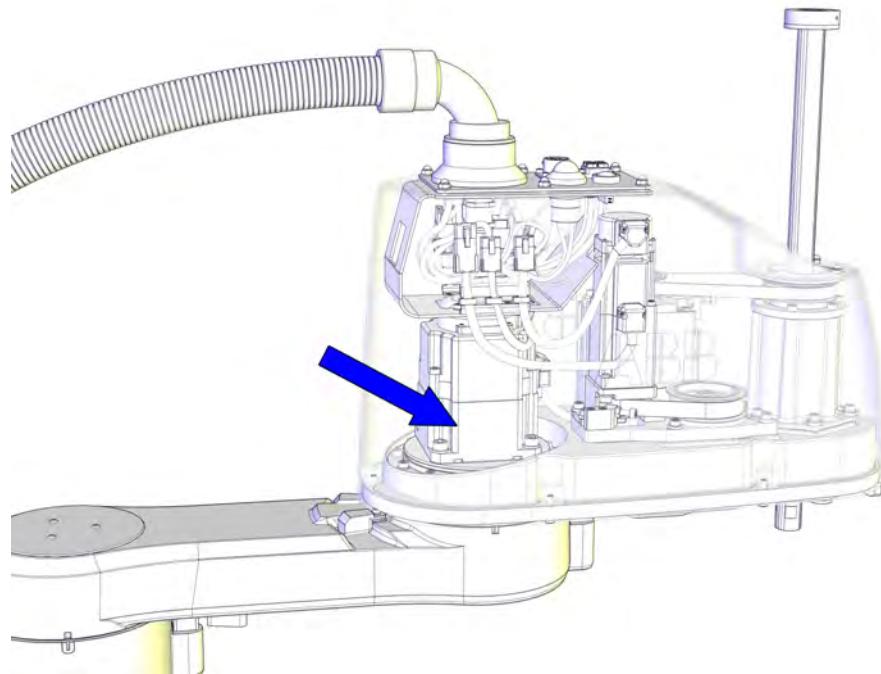
Concluding procedure

Action	Note
1 Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

4.6.2 Replacing the axis-2 drive unit

Location of the axis-2 drive unit

The axis-2 drive unit is located as shown in the figure.



xx1500002214

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Axis-2 drive unit	3HAC056153-001	Includes axis-2 gearbox, motor and motor adapter.
Upper cover unit	3HAC057615-001	Includes upper cover and cover flange.
Plate for upper arm cable harness	3HAC056086-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 384 .

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4 Repair

4.6.2 Replacing the axis-2 drive unit

Continued

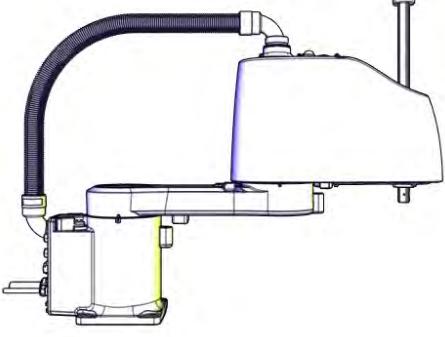
Required consumables

Consumable	Article number	Note
Cable ties	-	

Removing the axis-2 drive unit

Use these procedures to remove the axis-2 drive unit.

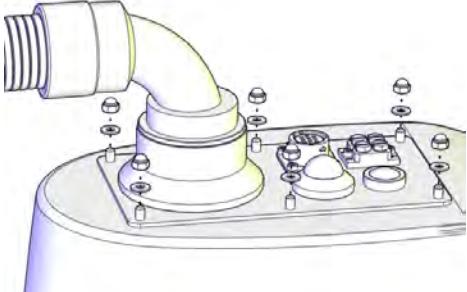
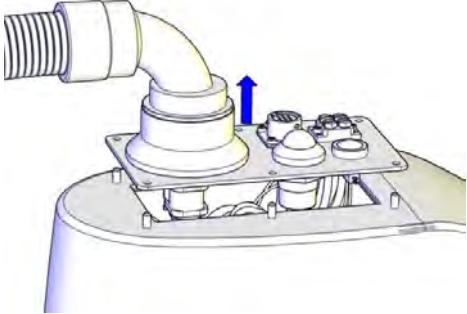
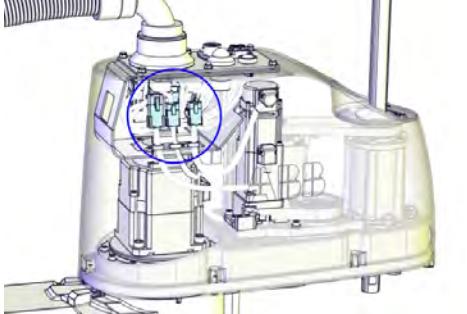
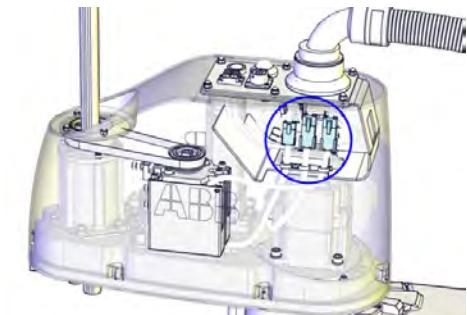
Preparations before removing the axis-2 drive unit

	Action	Note
1	Jog all axes to zero position.	 xx1500002227
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

Removing the main cable package from the upper 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 dome nuts and washers.	 xx1500002182
3 Carefully open the user interface plate and pull out the cable package.  CAUTION The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183
4 Disconnect the connectors: <ul style="list-style-type: none">• R2.MP2• R2.MP3• R2.MP4• R2.ME2• R2.ME3• R2.ME4  Tip Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1500002184  xx1500002185

Removing the upper arm**Note**

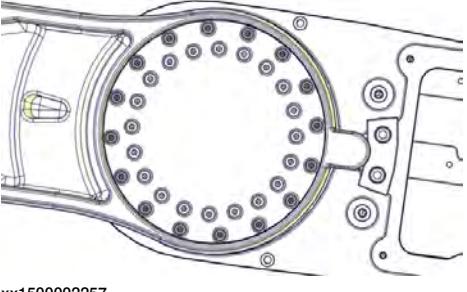
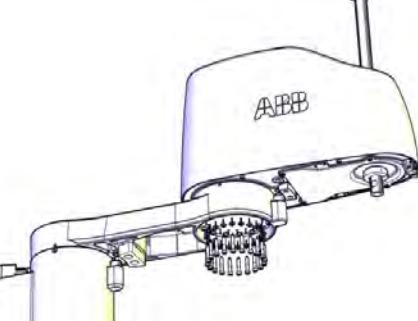
Two persons working together are required to perform this procedure.

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4 Repair

4.6.2 Replacing the axis-2 drive unit

Continued

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING The upper arm weights 13.2 kg. It may drop by the force of gravity when it is released from the lower arm. Make sure the weight of the upper arm body is properly supported.	
3  Note Two persons working together are required to perform this step. Person 1: Hold the upper arm. Person 2: Remove the screws that fasten the upper arm to the lower arm.	
4 Remove the screws and washers.  WARNING Keep the twelve screws in the outer circle fitted. They hold the axis-2 motor flange on the lower arm.  xx1500002257	 xx1500002256
5 Remove the upper arm and lay it aside on a workbench.	

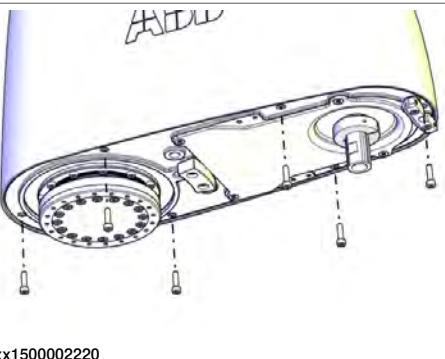
Removing the upper cover

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

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4.6.2 Replacing the axis-2 drive unit

Continued

Action	Note
2  WARNING Risk of tipping. Make sure the robot is well secured and that the upper arm is supported during the removal work.	
3 Remove the screws.	
4  WARNING The cover may be damaged due to improper shift. Keep the cover in position while removing the screws.	
5 Lift out the upper cover carefully.	

Removing the drive unit cables

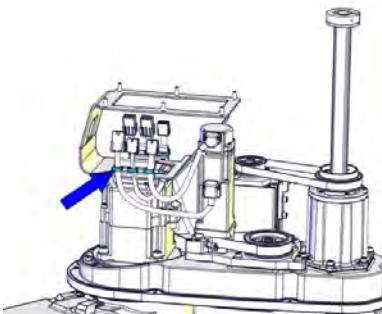
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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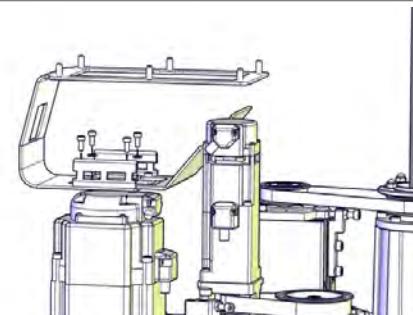
4 Repair

4.6.2 Replacing the axis-2 drive unit

Continued

Action	Note
<p>2 Cut the cable ties. Be careful not to damage the cabling.</p> <p>Tip Take photos of the cable position before removing them, to have as a reference when refitting.</p>	 xx1500002226

Removing the cable harness plate

Action	Note
<p>1 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2 Remove the screws and washers.	
3 Remove the cable harness plate.	 xx1500002228

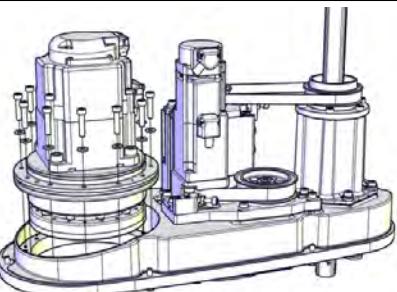
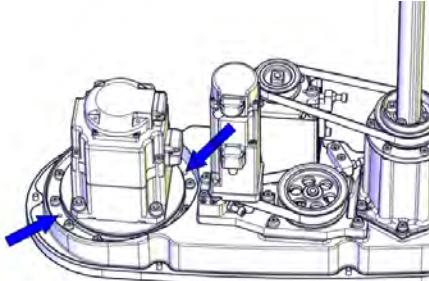
Removing the axis-2 drive unit

Action	Note
<p>1 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2 WARNING There is a risk of tipping during the removal. Make sure the gravity center is well supported.</p>	

Continues on next page

4.6.2 Replacing the axis-2 drive unit

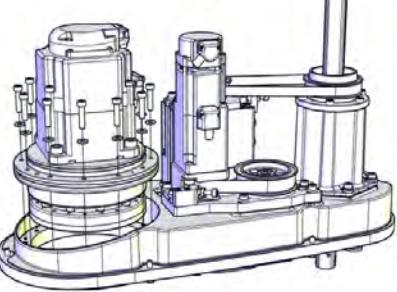
Continued

Action	Note
<p>3 Remove drive unit screws and washers.</p> <p>WARNING Pay attention to the screw positions and keep the others fitted. The other screws hold the gearbox together. Removing them can damage the gearbox severely.</p>	 xx1500002496
<p>4 Tip If the drive unit is hard to be removed, insert two M2 screws to the press out holes and press out the drive unit.</p>	 xx1500002498

Refitting the axis-2 drive unit

Use these procedures to refit the axis-2 drive unit.

Refitting the axis-2 drive unit

Action	Note
<p>1 Make sure that:</p> <ul style="list-style-type: none"> all assembly surfaces are clean and undamaged. the drive unit is clean and undamaged. 	
<p>2 Refit the axis-2 drive unit into the upper arm.</p> <p>CAUTION Do not mix axis-1 and axis-2 drive units. Always check the mark or label on the drive units before refitting.</p> <p>Note Make sure to refit the drive unit correctly oriented, that is, the motor connectors should point to the end where the ball screw spline unit is to be fitted.</p>	Axis-2 drive unit: 3HAC056153-001  xx1500002496
3 Refit the screws and washers.	Screw: M4x25 (12 pcs) Tightening torque: 4.5 Nm Washer: 4.3x9x1 (12 pcs)

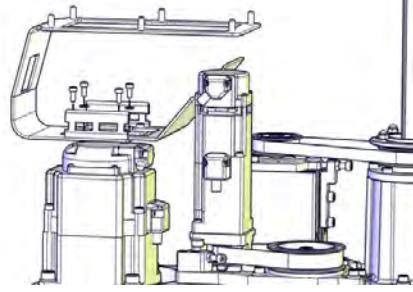
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4 Repair

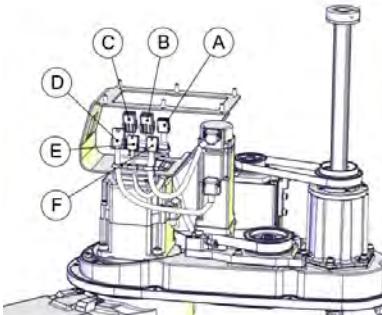
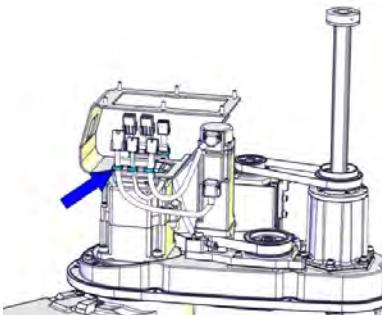
4.6.2 Replacing the axis-2 drive unit

Continued

Refitting the cable harness plate

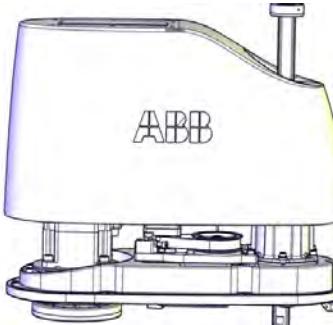
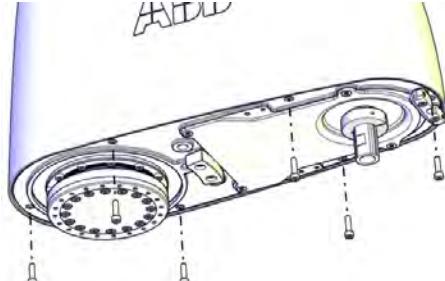
Action	Note
1 Refit the cable harness plate.	
2 Secure with screws and washers.	 <p>xx1500002228</p> <p>Screw: M3x8 (4 pcs) Tightening torque: 1.5 Nm Washer: M3 (4 pcs)</p>

Securing the drive unit cables

Action	Note												
1 Put the drive unit cables in place.	 <p>xx1500003063</p> <table border="1"><tr><td>A</td><td>R2.ME3</td></tr><tr><td>B</td><td>R2.MP2</td></tr><tr><td>C</td><td>R2.MP3</td></tr><tr><td>D</td><td>R2.MP4</td></tr><tr><td>E</td><td>R2.ME2</td></tr><tr><td>F</td><td>R2. ME4</td></tr></table>	A	R2.ME3	B	R2.MP2	C	R2.MP3	D	R2.MP4	E	R2.ME2	F	R2. ME4
A	R2.ME3												
B	R2.MP2												
C	R2.MP3												
D	R2.MP4												
E	R2.ME2												
F	R2. ME4												
2 Secure the cables with cable ties. Do not tighten the ties too tight.	 <p>xx1500002226</p>												

Continues on next page

Refitting the upper cover

	Action	Note
1	Carefully put down the upper cover, avoiding any collision to the ball screw spline unit and drive units.	Upper cover unit: 3HAC057615-001  xx1500002221
2	 Tip Some of the screws are accessed from below. Make sure that the robot is properly fastened and hang out the upper arm from the workbench to access them.	
3	Refit the cover.	 xx1500002220 Screw: M4x16 (6 pcs) Tightening torque: 2 Nm

Refitting the upper arm

**Note**

Two persons working together are required to perform this procedure.

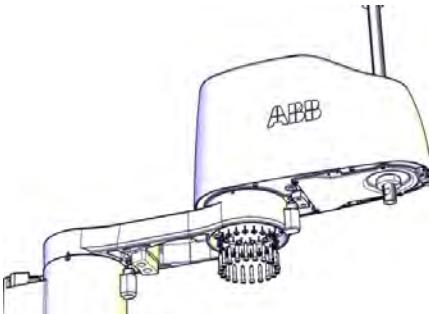
	Action	Note
1		Note Two persons working together are required to perform this step. Person 1: Hold the upper arm. Person 2: Refit the screws that fasten the upper arm to the lower arm.

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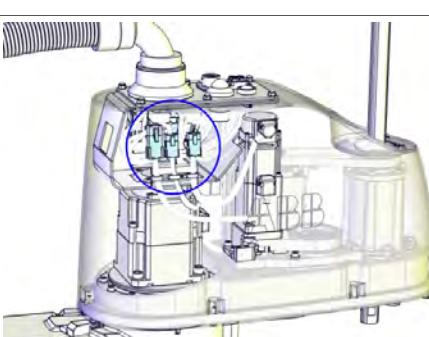
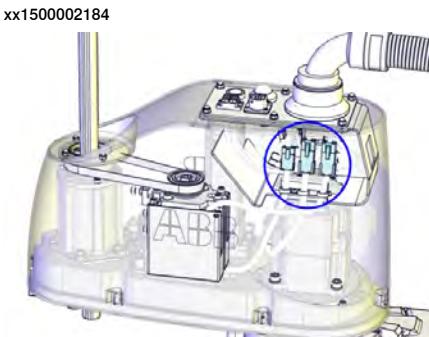
4 Repair

4.6.2 Replacing the axis-2 drive unit

Continued

Action	Note
2 Make sure the lower arm is secured. Lower the upper arm down onto the right place of the lower arm.	
3 Refit the upper arm screws and washers.	 <p>xx1500002256</p> <p>Screw: M4x20 (16 pcs) Tightening torque: 4.5 Nm Washer: 4.3x9x1.3 (16 pcs)</p>

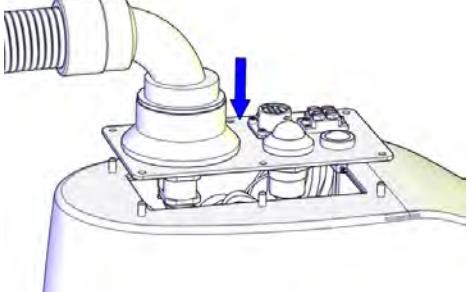
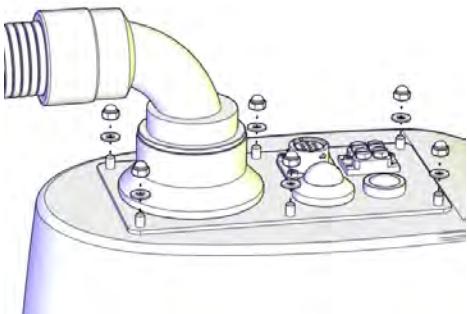
Refitting the main cable to the upper arm

Action	Note
1 Secure the main cable package with cable ties if needed.	
2 Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 	 <p>xx1500002184</p>  <p>xx1500002185</p>

Continues on next page

4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
3	Push the main cable package into place.	 xx1500002207
4	Refit the user interface plate.	 xx1500002182 Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

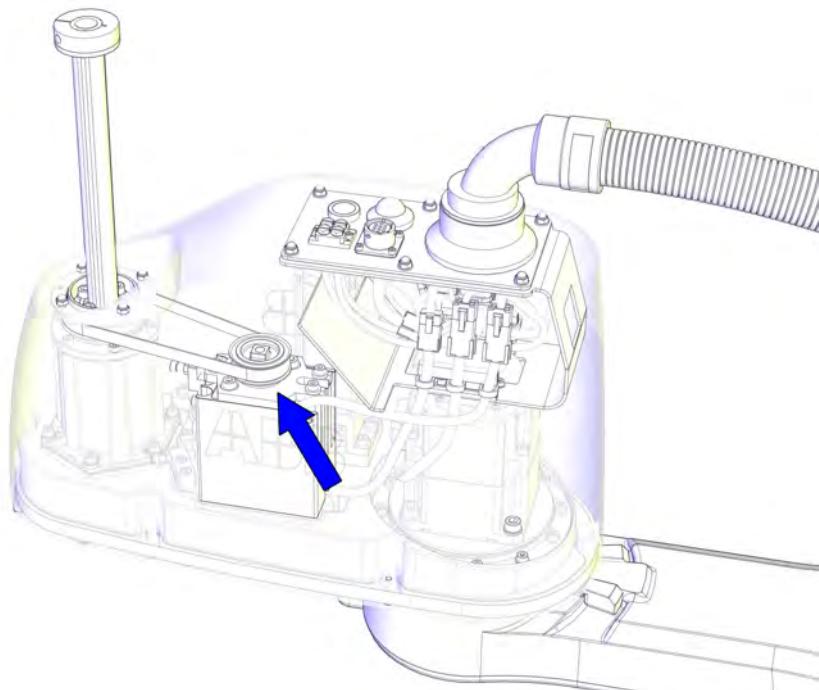
4 Repair

4.6.3 Replacing the axis-3 drive unit

4.6.3 Replacing the axis-3 drive unit

Location of the axis-3 drive unit

The axis-3 drive unit is located as shown in the figure.



xx1500002219

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Axis-3 drive unit	3HAC056111-001	Includes axis-3 gearbox, motor and motor adapter.
Upper cover unit	3HAC057615-001	Includes upper cover and cover flange.
Plain washer	3HAC056937-001	Replace if damaged.
Axis-3 drive unit housing	3HAC055184-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	The content is defined in the section Standard toolkit on page 384 .
Acoustic tensiometer	-	Used for measuring the timing belt tension.

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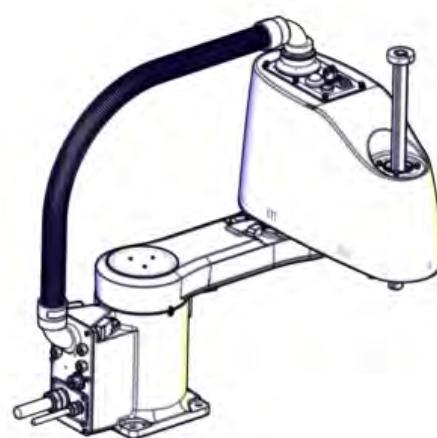
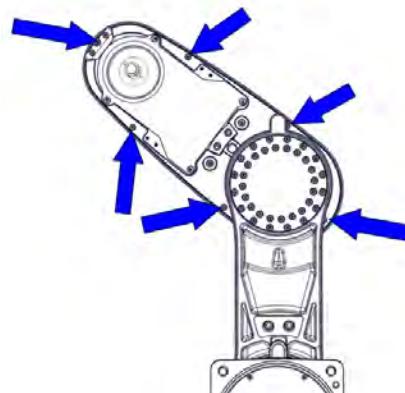
Required consumables

Consumable	Article number	Note
Cable ties	-	

Removing the axis-3 drive unit

Use these procedures to remove the axis-3 drive unit.

Preparations before removing the axis-3 drive unit

	Action	Note
1	Jog axis 2 to access the cover screws.	 xx1500002520  xx1500002782
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

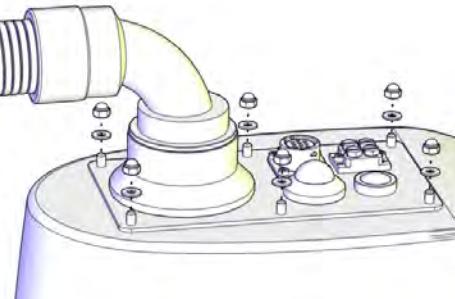
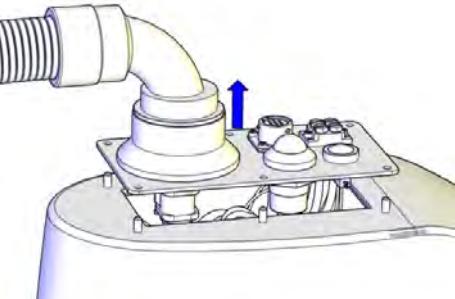
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4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

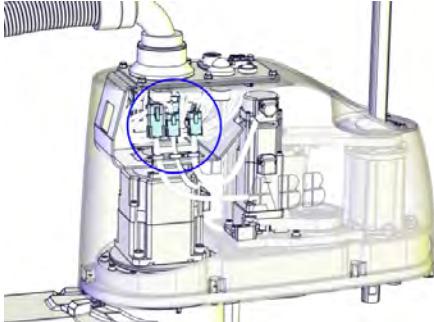
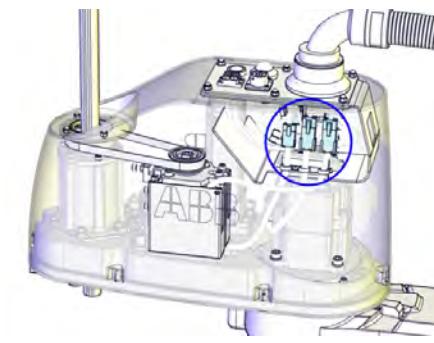
Removing the main cable package from the upper arm

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the dome nuts and washers.	 xx1500002182
3 Carefully open the user interface plate and pull out the cable package.  CAUTION The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183

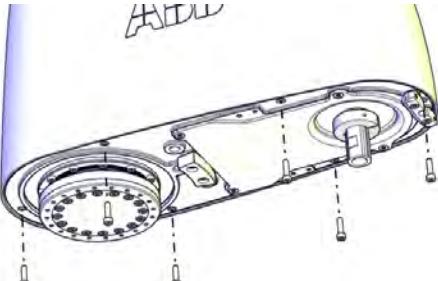
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4.6.3 Replacing the axis-3 drive unit

Continued

Action	Note
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 <p> Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 

Removing the upper cover

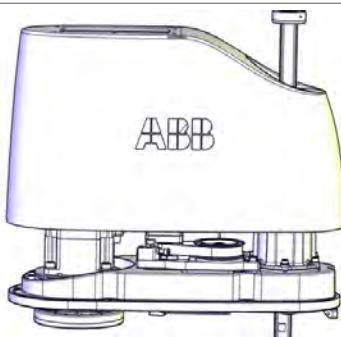
Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2  WARNING</p> <p>Risk of tipping. Make sure the robot is well secured and that the upper arm is supported during the removal work.</p>	
3 Remove the screws.	

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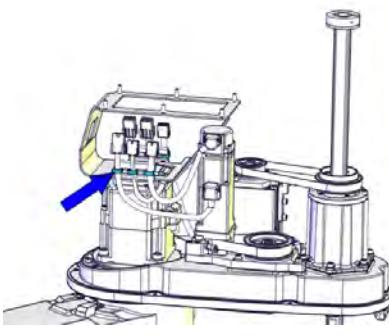
4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

Action	Note
4  WARNING The cover may be damaged due to improper shift. Keep the cover in position while removing the screws.	
5 Lift out the upper cover carefully.	 xx1500002221

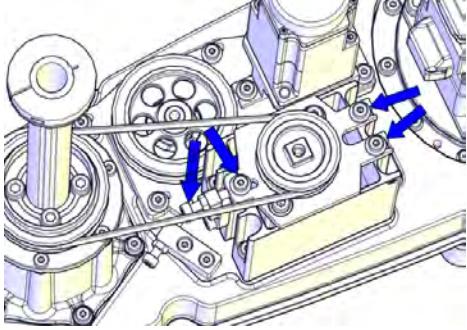
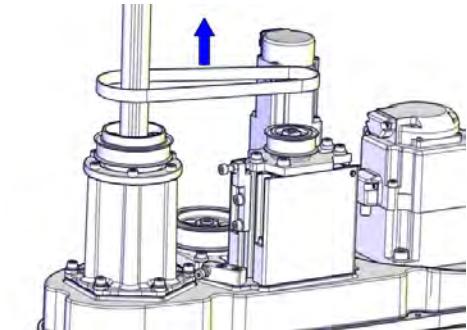
Removing the drive unit cables

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Cut the cable ties. Be careful not to damage the cabling.  Tip Take photos of the cable position before removing them, to have as a reference when refitting.	 xx1500002226

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  WARNING Risk of tipping. Make sure the gravity center is well supported.	
3 Loosen the screws and move the axis-3 drive unit upwards to slacken the timing belt.	 xx1500002229
4 Remove the timing belt.	 xx1500002230

Removing the axis-3 housing and axis-3 drive unit

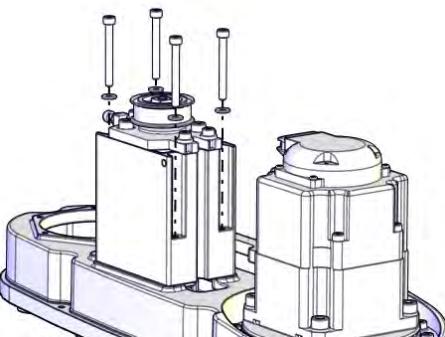
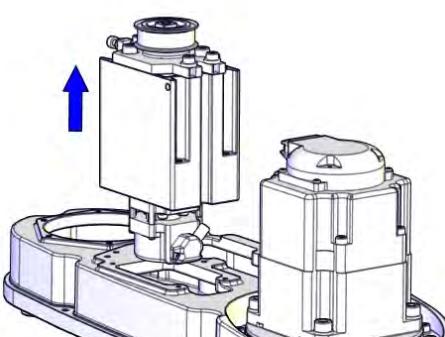
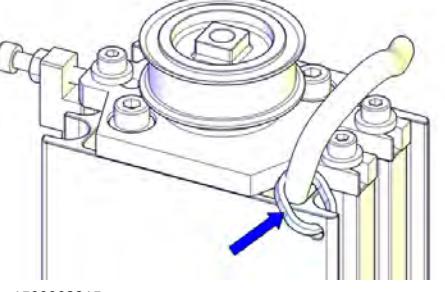
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING Risk of tipping. Make sure the gravity center is well supported.	

Continues on next page

4 Repair

4.6.3 Replacing the axis-3 drive unit

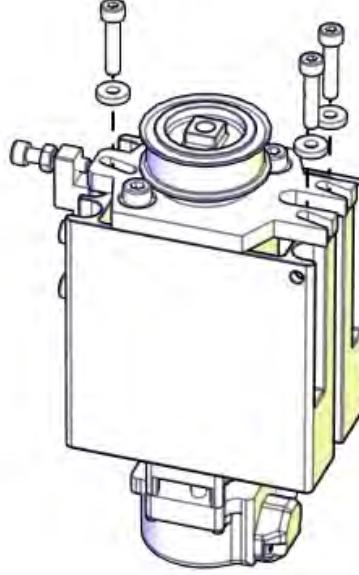
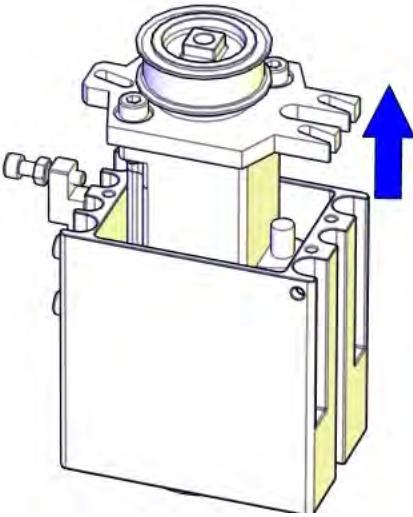
Continued

Action	Note
3 Remove the screws and washers.	 xx1500002810
4 Lift out the axis-3 housing and drive unit.	 xx1500002238
5 Cut the cable tie. Be careful not to damage the cabling.	 xx1500002815

Continues on next page

4.6.3 Replacing the axis-3 drive unit

Continued

Action	Note
6 Remove the screws. ! WARNING Do not remove the other screws. They hold the gearbox together. Removing them can damage the gearbox severely.	 xx1500002797
7 Lift out the axis-3 drive unit carefully.	 xx1500002239

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4 Repair

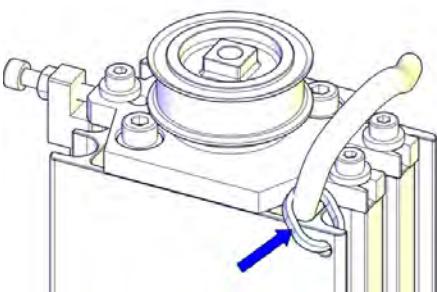
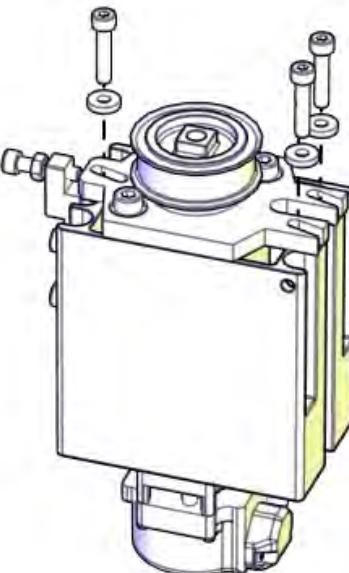
4.6.3 Replacing the axis-3 drive unit

Continued

Refitting the axis-3 drive unit

Use these procedures to refit the axis-3 drive unit.

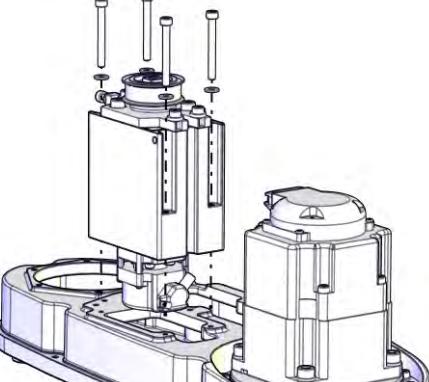
Refitting the axis-3 housing and axis-3 drive unit

Action	Note
<p>1 Refit the drive unit with one cabling coming out from the upside and the other coming out from the downside.</p> <p>Note</p> <p>Make sure to refit the drive unit correctly oriented with the lugs of the drive unit bracket as a reference.</p>	Axis-3 drive unit: 3HAC056111-001 Axis-3 drive unit housing: 3HAC055184-001
<p>2 Secure the upper cabling with a cable tie. Do not tighten the tie too tight.</p>	 xx1500002815
<p>3 Refit drive unit screws and washers just enough to still be able to move the drive unit.</p>	 xx1500002797 <p>Screw: M4x20 (3 pcs) Tightening torque: 4.5 Nm Washer (3HAC056937-001, 3 pcs)</p> <p>Note</p> <p>Only use specified washers, never replace them with other washers.</p>

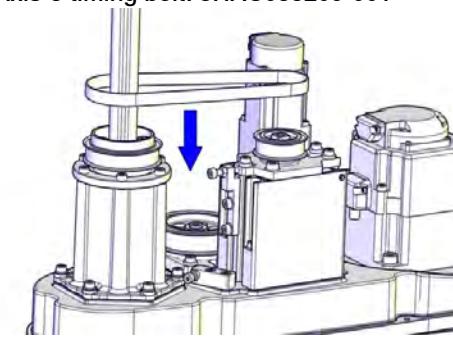
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4.6.3 Replacing the axis-3 drive unit

Continued

Action	Note
4 Refit the housing with drive unit.	 <p>xx1500002798</p> <p>Screw: M4x40 (4 pcs) Tightening torque: 3.5 Nm Washer: M4 (4 pcs)</p>

Refitting the axis-3 timing belt

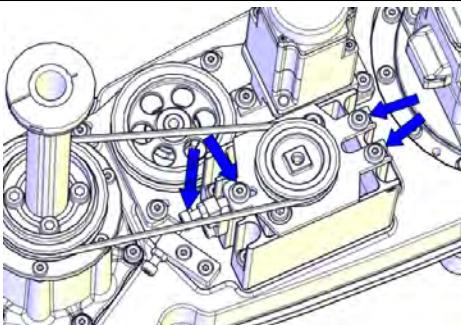
Action	Note
1 Make sure that: <ul style="list-style-type: none"> all assembly surfaces are clean and undamaged. the drive unit is clean and undamaged. 	
2 Refit axis-3 timing belt. Ensure that the belt runs correctly in the grooves.	Axis-3 timing belt: 3HAC055209-001  <p>xx1500002789</p>

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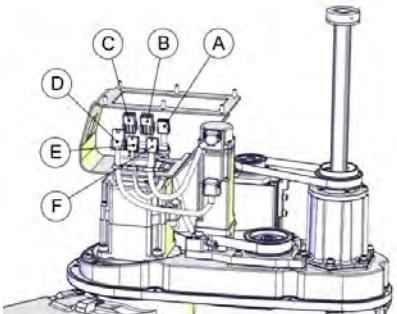
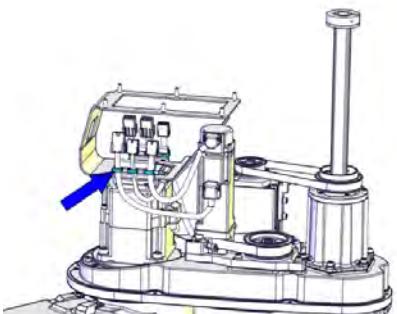
4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

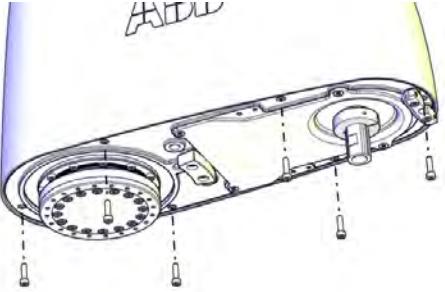
Action	Note
3 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 <p>xx1500002229</p> <p>Belt tension: $F = 31 \text{ N}$ (Recommended) Belt tension range: 19.9 N to 22.8 N (for used timing belt, which has been installed and used for more than 24 hours) 28.5 N to 31.3 N (for new timing belt)</p>

Securing the drive unit cables

Action	Note												
1 Put the drive unit cables in place.	 <p>xx1500003063</p> <table border="1"> <tr> <td>A</td> <td>R2.ME3</td> </tr> <tr> <td>B</td> <td>R2.MP2</td> </tr> <tr> <td>C</td> <td>R2.MP3</td> </tr> <tr> <td>D</td> <td>R2.MP4</td> </tr> <tr> <td>E</td> <td>R2.ME2</td> </tr> <tr> <td>F</td> <td>R2. ME4</td> </tr> </table>	A	R2.ME3	B	R2.MP2	C	R2.MP3	D	R2.MP4	E	R2.ME2	F	R2. ME4
A	R2.ME3												
B	R2.MP2												
C	R2.MP3												
D	R2.MP4												
E	R2.ME2												
F	R2. ME4												
2 Secure the cables with cable ties. Do not tighten the ties too tight.	 <p>xx1500002226</p>												

Continues on next page

Refitting the upper cover

	Action	Note
1	Carefully put down the upper cover, avoiding any collision to the ball screw spline unit and drive units.	Upper cover unit: 3HAC057615-001  xx1500002221
2	 Tip Some of the screws are accessed from below. Make sure that the robot is properly fastened and hang out the upper arm from the workbench to access them.	
3	Refit the cover.	 xx1500002220 Screw: M4x16 (6 pcs) Tightening torque: 2 Nm

Refitting the main cable to the upper arm

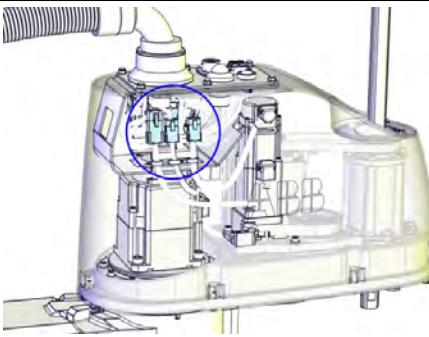
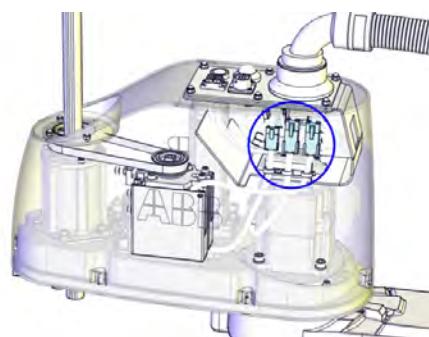
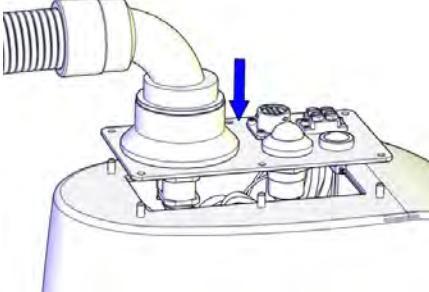
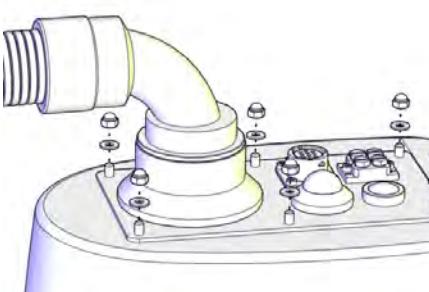
	Action	Note
1	Secure the main cable package with cable ties if needed.	

Continues on next page

4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

Action	Note
2 Reconnect the connectors. <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 	 xx1500002184  xx1500002185
3 Push the main cable package into place.	 xx1500002207
4 Refit the user interface plate.	 xx1500002182 <p>Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs</p>

Continues on next page

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

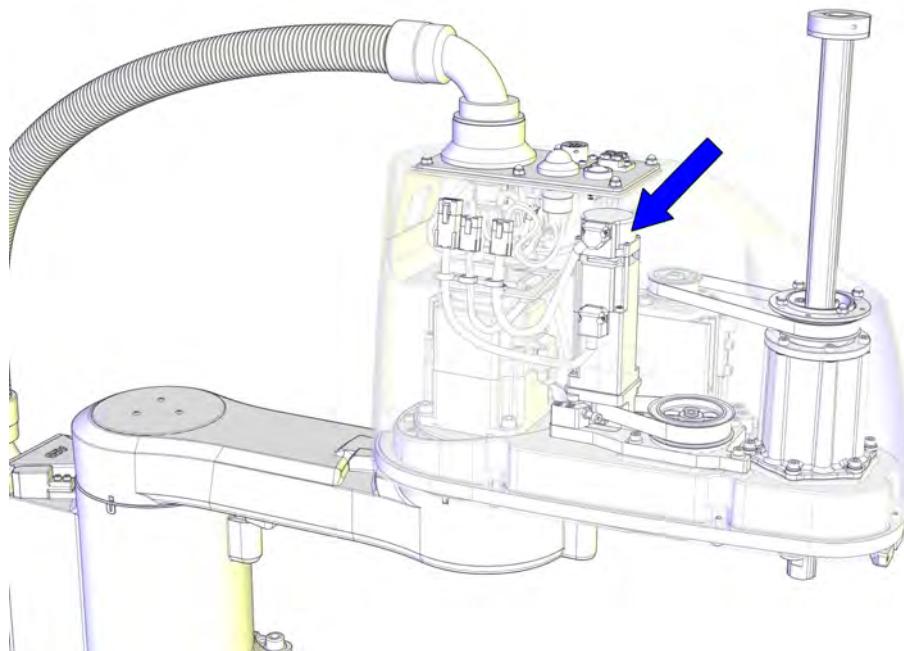
4 Repair

4.6.4 Replacing the axis-4 drive unit

4.6.4 Replacing the axis-4 drive unit

Location of the axis-4 drive unit

The axis-4 drive unit is 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 revision of *Product manual, spare parts - IRB 910SC* on ABB Library.

Spare part	Article number	Note
Axis-4 drive unit	3HAC056112-001	Includes axis-4 gearbox, motor and motor adapter.
Upper cover unit	3HAC057615-001	Includes upper cover and cover flange.
Plain washer	3HAC056937-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	The content is defined in the section Standard toolkit on page 384 .
Acoustic tensiometer	-	Used for measuring the timing belt tension.

Continues on next page

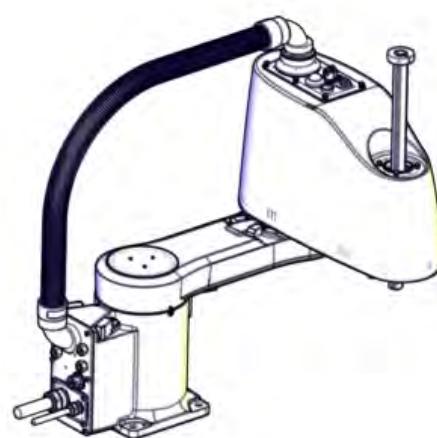
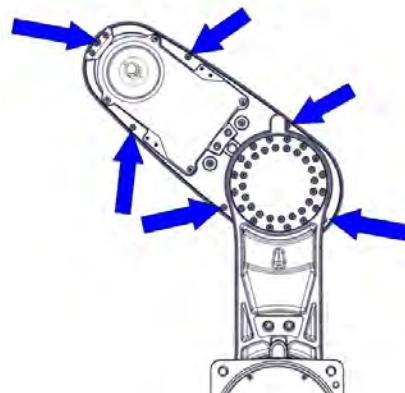
Required consumables

Consumable	Article number	Note
Cable ties	-	

Removing the axis-4 drive unit

Use these procedures to remove the axis-4 drive unit.

Preparations before removing the axis-4 drive unit

	Action	Note
1	Jog axis 2 to access the cover screws.	 xx1500002520  xx1500002782
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

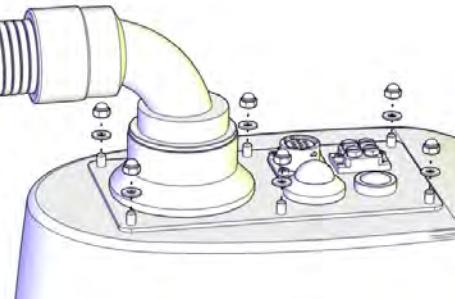
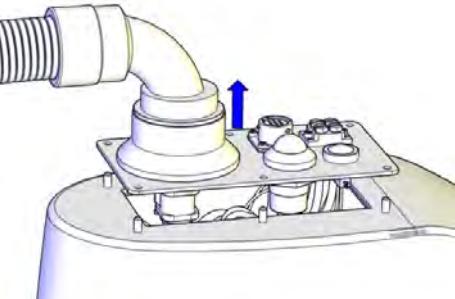
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4 Repair

4.6.4 Replacing the axis-4 drive unit

Continued

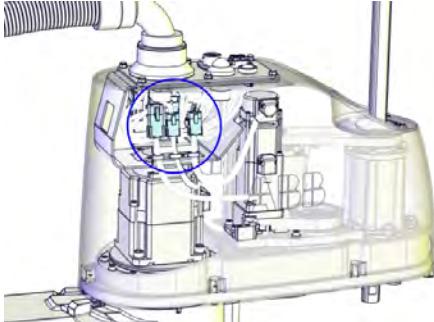
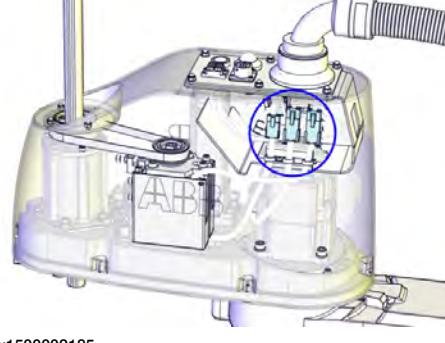
Removing the main cable package from the upper arm

Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Remove the dome nuts and washers.	 xx1500002182
3 Carefully open the user interface plate and pull out the cable package.  CAUTION The plate cannot be removed completely until the connectors are disconnected, as shown in the following step.	 xx1500002183

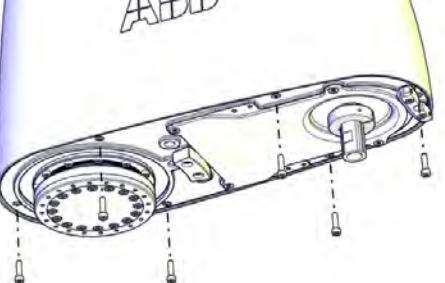
Continues on next page

4.6.4 Replacing the axis-4 drive unit

Continued

Action	Note
<p>4 Disconnect the connectors:</p> <ul style="list-style-type: none"> • R2.MP2 • R2.MP3 • R2.MP4 • R2.ME2 • R2.ME3 • R2.ME4 <p> Tip</p> <p>Take photos of the connectors and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 xx1500002184  xx1500002185

Removing the upper cover

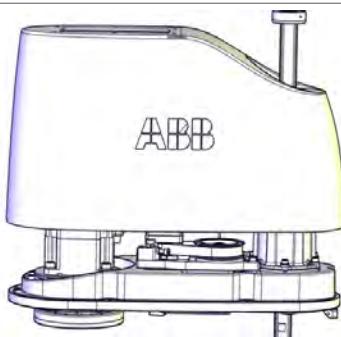
Action	Note
<p>1  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>2  WARNING</p> <p>Risk of tipping. Make sure the robot is well secured and that the upper arm is supported during the removal work.</p>	
3 Remove the screws.	 xx1500002220

Continues on next page

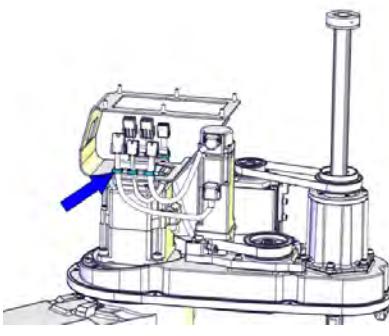
4 Repair

4.6.4 Replacing the axis-4 drive unit

Continued

Action	Note
4  WARNING The cover may be damaged due to improper shift. Keep the cover in position while removing the screws.	
5 Lift out the upper cover carefully.	 xx1500002221

Removing the drive unit cables

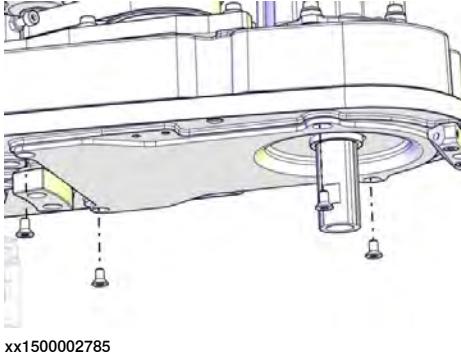
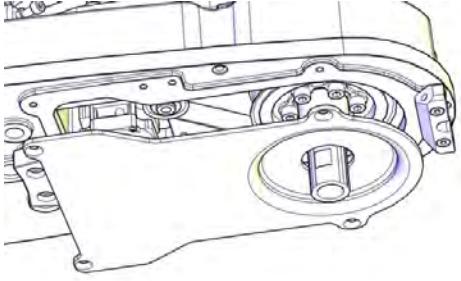
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2 Cut the cable ties. Be careful not to damage the cabling.  Tip Take photos of the cable position before removing them, to have as a reference when refitting.	 xx1500002226

Removing the lower cover

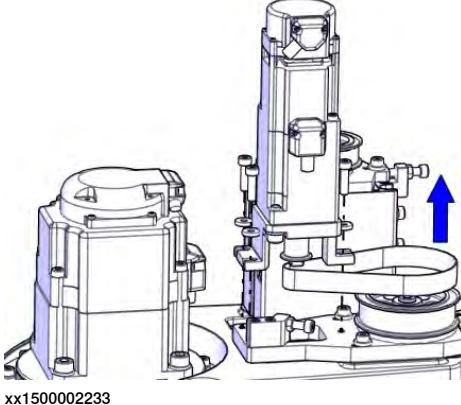
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

Continues on next page

4.6.4 Replacing the axis-4 drive unit Continued

Action	Note
2 Remove the screws.	 xx1500002785
3 Remove the cover.  Tip If only working with lower axis-4 timing belt, no need to remove the stop block of ball screw spline unit before removing the lower cover.	 xx1500002225

Removing the axis-4 drive unit and upper timing belt

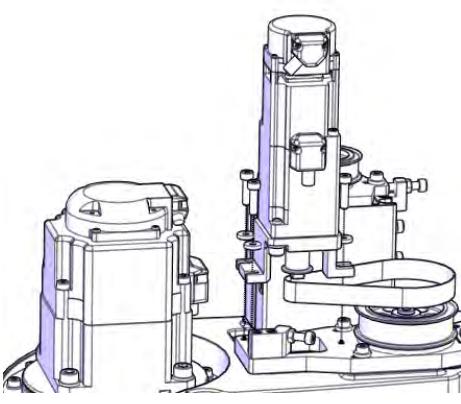
Action	Note
1  DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2  WARNING Risk of tipping. Make sure the gravity center is well supported.	
3 Loosen the screws and move the axis-4 drive unit upwards to slacken the upper axis-4 timing belt.	 xx1500002233

Continues on next page

4 Repair

4.6.4 Replacing the axis-4 drive unit

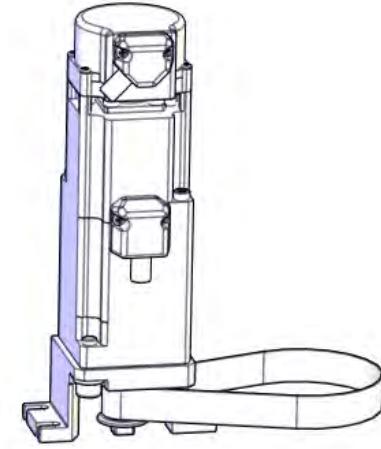
Continued

Action	Note
4 Remove the drive unit and timing belt.	 xx1500002234

Refitting the axis-4 drive unit

Use these procedures to refit the axis-4 drive unit.

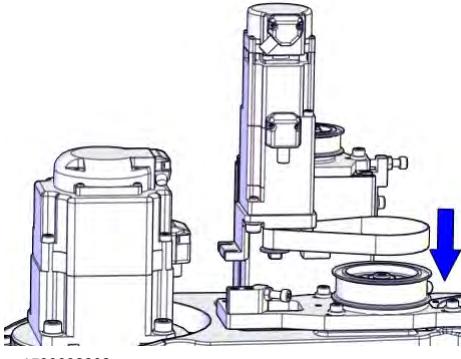
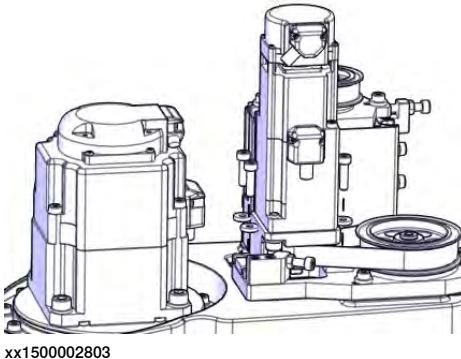
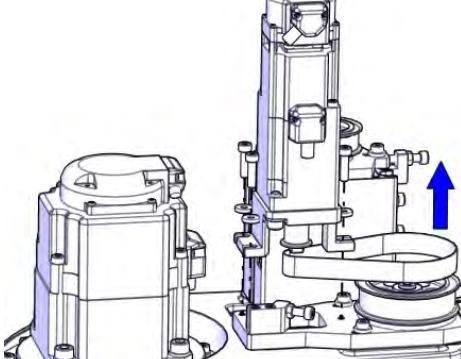
Refitting the axis-4 drive unit and upper timing belt

Action	Note
1 Make sure that: <ul style="list-style-type: none">• all assembly surfaces are clean and undamaged.• the drive unit is clean and undamaged.	
2 Place the timing belt.	Axis-4 drive unit: 3HAC056112-001 Upper axis-4 timing belt: 3HAC055206-001  xx1500002801

Continues on next page

4.6.4 Replacing the axis-4 drive unit

Continued

Action	Note
3 Refit the drive unit and timing belt.	<p>Note</p> <p>Make sure to refit the drive unit with motor connectors pointing against axis-3 drive unit.</p>  <p>xx1500002802</p>
4 Refit screws and washers just enough to still be able to move the drive unit upwards.	 <p>xx1500002803</p> <p>Screw: M4x16 (3 pcs) Washer (3HAC056937-001, 3 pcs)</p> <p>Note</p> <p>Only use specified washers, never replace them with other washers.</p>
5 Fasten the screws little by little while using an acoustic tensiometer to measure the belt tension until a proper belt tension is achieved.	 <p>xx1500002233</p> <p>Belt tension: F = 33 N (Recommended) Belt tension range: 21.4 N to 24.4 N (for used timing belt, which has been installed and used for more than 24 hours) 30.5 N to 33.6 N (for new timing belt)</p>

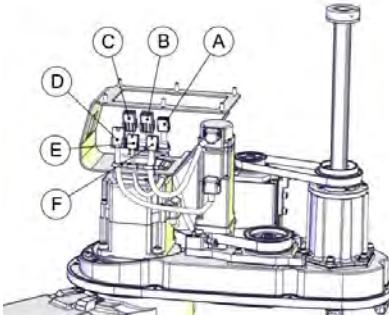
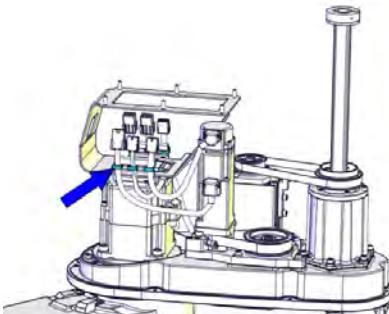
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4 Repair

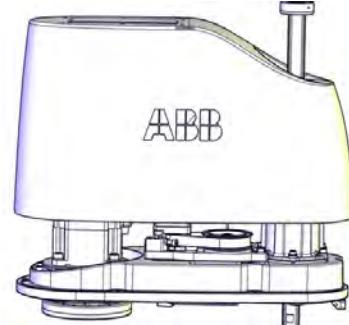
4.6.4 Replacing the axis-4 drive unit

Continued

Securing the drive unit cables

Action	Note												
1 Put the drive unit cables in place.	 <p>xx1500003063</p> <table border="1"> <tr> <td>A</td> <td>R2.ME3</td> </tr> <tr> <td>B</td> <td>R2.MP2</td> </tr> <tr> <td>C</td> <td>R2.MP3</td> </tr> <tr> <td>D</td> <td>R2.MP4</td> </tr> <tr> <td>E</td> <td>R2.ME2</td> </tr> <tr> <td>F</td> <td>R2. ME4</td> </tr> </table>	A	R2.ME3	B	R2.MP2	C	R2.MP3	D	R2.MP4	E	R2.ME2	F	R2. ME4
A	R2.ME3												
B	R2.MP2												
C	R2.MP3												
D	R2.MP4												
E	R2.ME2												
F	R2. ME4												
2 Secure the cables with cable ties. Do not tighten the ties too tight.	 <p>xx1500002226</p>												

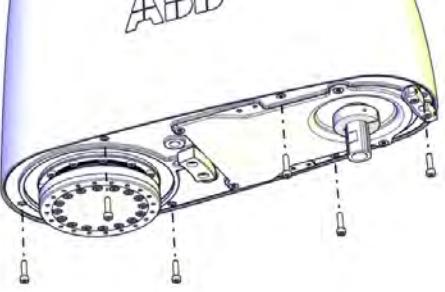
Refitting the upper cover

Action	Note
1 Carefully put down the upper cover, avoiding any collision to the ball screw spline unit and drive units.	<p>Upper cover unit: 3HAC057615-001</p>  <p>xx1500002221</p>

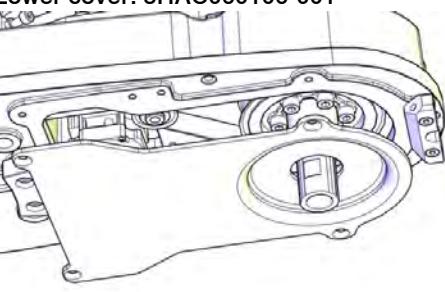
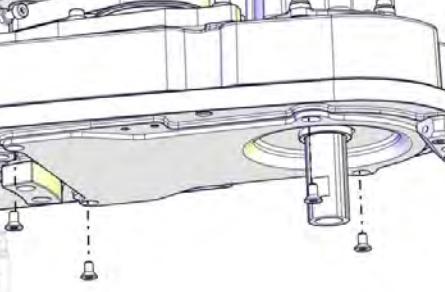
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4.6.4 Replacing the axis-4 drive unit

Continued

	Action	Note
2	 Tip Some of the screws are accessed from below. Make sure that the robot is properly fastened and hang out the upper arm from the workbench to access them.	
3	Refit the cover.	 xx1500002220 Screw: M4x16 (6 pcs) Tightening torque: 2 Nm

Refitting the lower cover

	Action	Note
1	Refit the cover.	Lower cover: 3HAC060106-001  xx1500002225
2	Secure with screws.	 xx1500002785 Screw: M4x8 (4 pcs) Tightening torque: 2 Nm

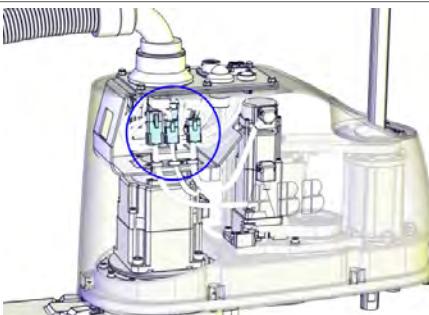
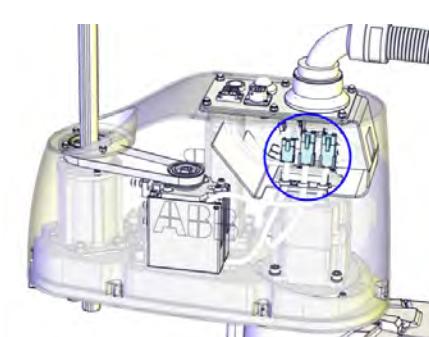
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4 Repair

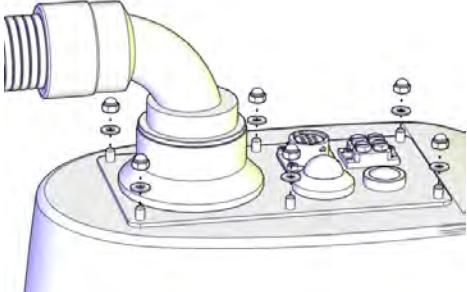
4.6.4 Replacing the axis-4 drive unit

Continued

Refitting the main cable to the upper arm

	Action	Note
1	Secure the main cable package with cable ties if needed.	
2	Reconnect the connectors. <ul style="list-style-type: none">• R2.MP2• R2.MP3• R2.MP4• R2.ME2• R2.ME3• R2.ME4	 xx1500002184
3	Push the main cable package into place.	 xx1500002185

Continues on next page

	Action	Note
4	Refit the user interface plate.	 xx1500002182 <p>Dome nut: M4 (6 pcs) Tightening torque: 2 Nm Washer, 6 pcs</p>

Concluding procedure

	Action	Note
1	Recalibrate the robot.	Calibration is detailed in section Calibration on page 345 .
2	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 45 .	

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5 Calibration

5.1 Introduction to calibration

5.1.1 Introduction and calibration terminology

Calibration information

This chapter includes general information about the recommended calibration methods and also the detailed procedures for updating the revolution counters, checking the calibration position etc.

Calibration terminology

Term	Definition
Calibration method	A collective term for several methods that might be available for calibrating the ABB robot. Each method contains calibration routines.
Synchronization position	Known position of the complete robot where the angle of each axis can be checked against visual synchronization marks.
Calibration position	Known position of the complete robot that is used for calibration of the robot.
Standard calibration	A generic term for all calibration methods that aim to move the robot to calibration position.
Fine calibration	A calibration routine that generates a new zero position of the robot.
Reference calibration	A calibration routine that generates a new zero position of the robot. This routine is more flexible compared to fine calibration and is used when tools and process equipment are installed. Requires that a reference is created before being used for recalibrating the robot.
Update revolution counter	A calibration routine to make a rough calibration of each manipulator axis.
Synchronization mark	Visual marks on the robot axes. When marks are aligned, the robot is in synchronization position.

5 Calibration

5.1.2 Calibration methods

5.1.2 Calibration methods

Overview

This section specifies the different types of calibration and the calibration methods that are supplied by ABB.

Types of calibration

Type of calibration	Description	Calibration method
Standard calibration	<p>The calibrated robot is positioned at calibration position.</p> <p>Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot.</p> <p>For robots with RobotWare 5.04 or older, the calibration data is delivered in a file, calib.cfg, supplied with the robot at delivery. The file identifies the correct resolver/motor position corresponding to the robot home position.</p>	Manual calibration

References

Article numbers for the calibration tools are listed in the section [Special tools on page 385](#).

5.1.3 When to calibrate

When to calibrate

The system must be calibrated if any of the following situations occur.

The resolver values are changed

If resolver values are changed, the robot must be recalibrated using the calibration methods supplied by ABB. Calibrate the robot carefully with standard calibration, according to information in this manual.

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 350](#). This will occur when:

- The battery is discharged
- A resolver error occurs
- The signal between a resolver and measurement board is interrupted
- A robot axis is moved with the control system disconnected

The revolution counters must also be updated after the robot and controller are connected at the first installation.

The robot is rebuilt

If the robot is rebuilt, for example, after a crash or when the reach ability of a robot is changed, it needs to be recalibrated for new resolver values.

5 Calibration

5.2.1 Synchronization marks and synchronization position for axes

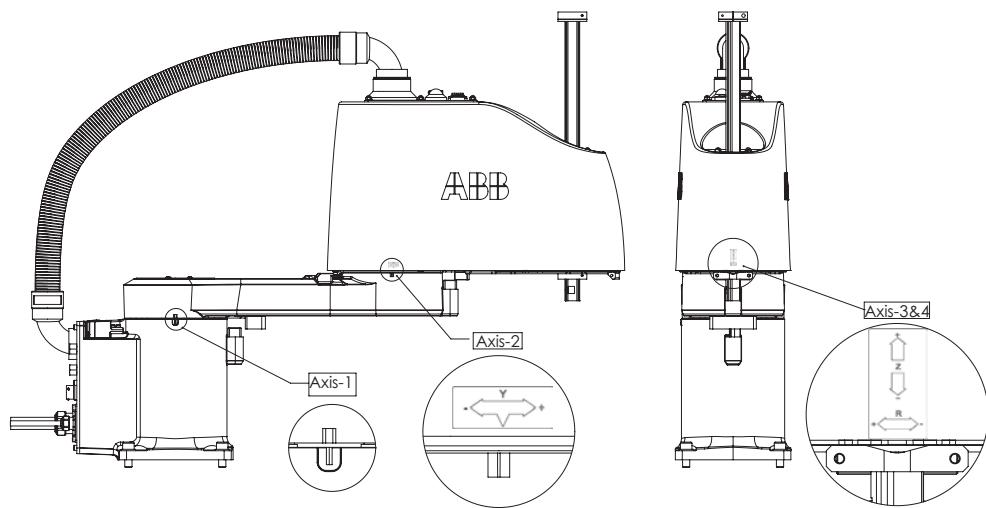
5.2 Synchronization marks and axis movement directions

5.2.1 Synchronization marks and synchronization position for axes

Introduction

This section shows the position of the synchronization marks and the synchronization position for each axis.

Synchronization marks, IRB 910SC



xx1500002634

5.2.2 Calibration movement directions for all axes

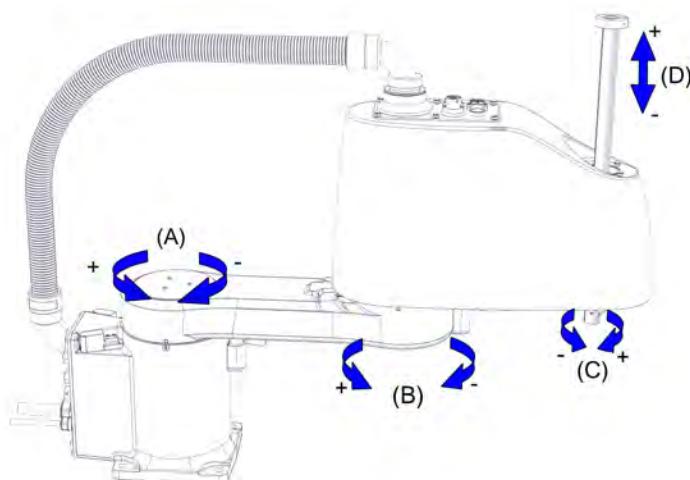
5.2.2 Calibration movement directions for all axes

Overview

When calibrating, the axis must consistently be run towards the calibration position in the same direction in order to avoid position errors caused by backlash in gears and so on. Positive directions are shown in the graphic below.

Calibration service routines will handle the calibration movements automatically and these might be different from the positive directions shown below.

Manual movement directions



xx1500002631

Position	Description	Position	Description
A	Axis 1	B	Axis 2
C	Axis 4	D	Axis 3

5 Calibration

5.3 Updating revolution counters

5.3 Updating revolution counters

Introduction

This section describes how to do a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

Step 1 - Manually running the manipulator to the synchronization position

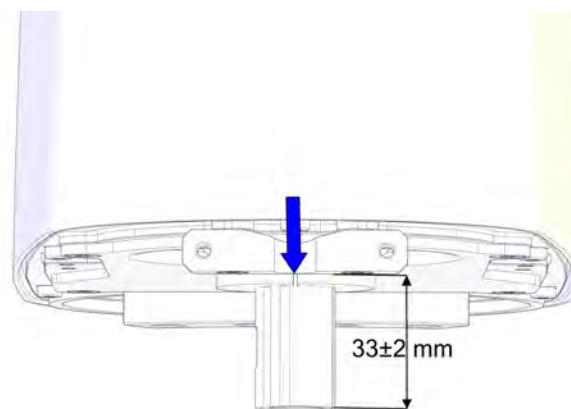
Use this procedure to manually run the manipulator to the synchronization position.

Action	Note
1 Select axis-by-axis motion mode.	
2 Jog the manipulator to align the synchronization marks.	See Synchronization marks and synchronization position for axes on page 348 .
3 When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 351 .

Correct calibration position of axes 3 and 4

When jogging the manipulator to synchronization position, it is extremely important to make sure that axes 3 and 4 are positioned correctly. Axis 4 can be calibrated at the wrong turn, resulting in an incorrect axis 3 calibration position and manipulator calibration.

Make sure the notch on the stop block points to the center of fixing calibration block, and the distance between lower surfaces of shaft and fixing calibration block is 33 mm.



xx1500002907

At delivery the manipulator is in the correct position, do NOT shift axis 3 or rotate axis 4 at power up before the revolution counters are updated.

If axis 4 is rotated one or more turns from its calibration position before updating the revolution counter, the correct calibration position will be lost due to non-integer gear ratio. This will further affect the calibration position of axis 3.

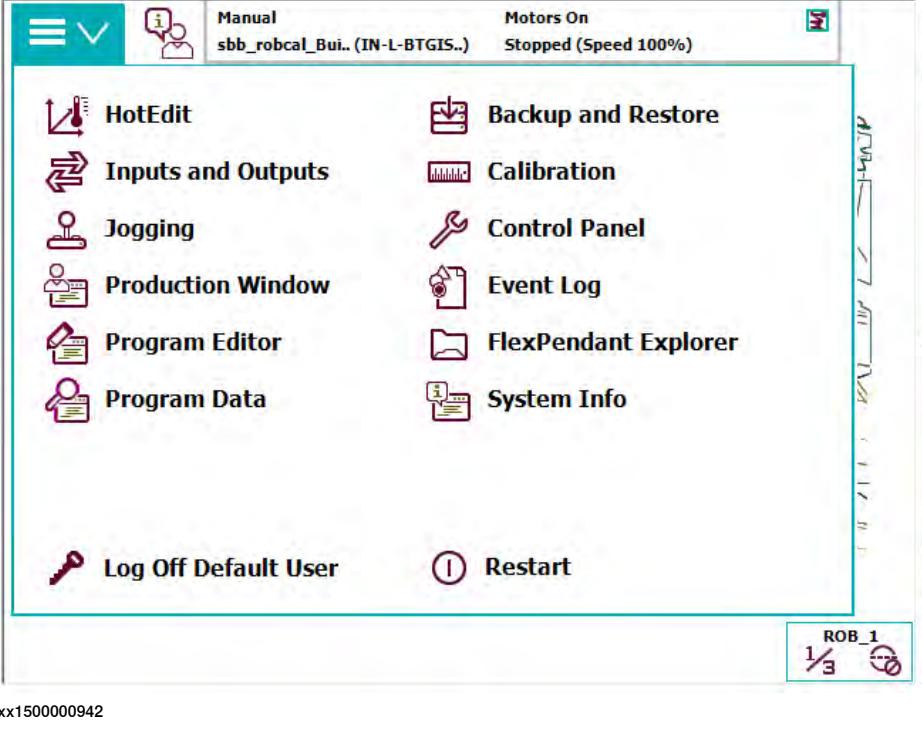
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Step 2 - Updating the revolution counter with the FlexPendant
**Note**

Revolution counters of axes 3 and 4 must be updated together.

Use this procedure to update the revolution counter with the FlexPendant (IRC5).

Action
1 On the ABB menu, tap Calibration.



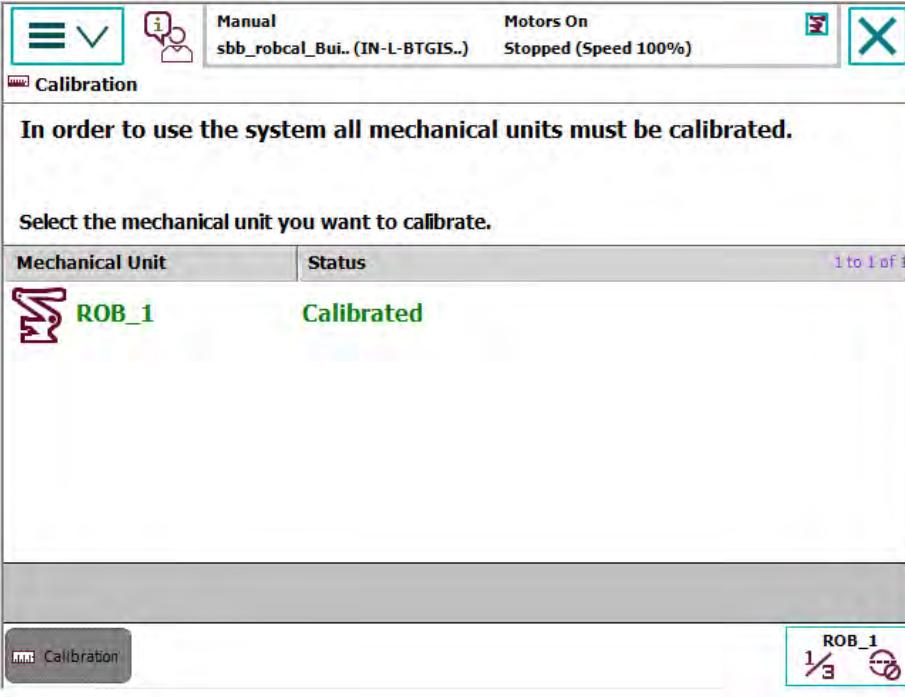
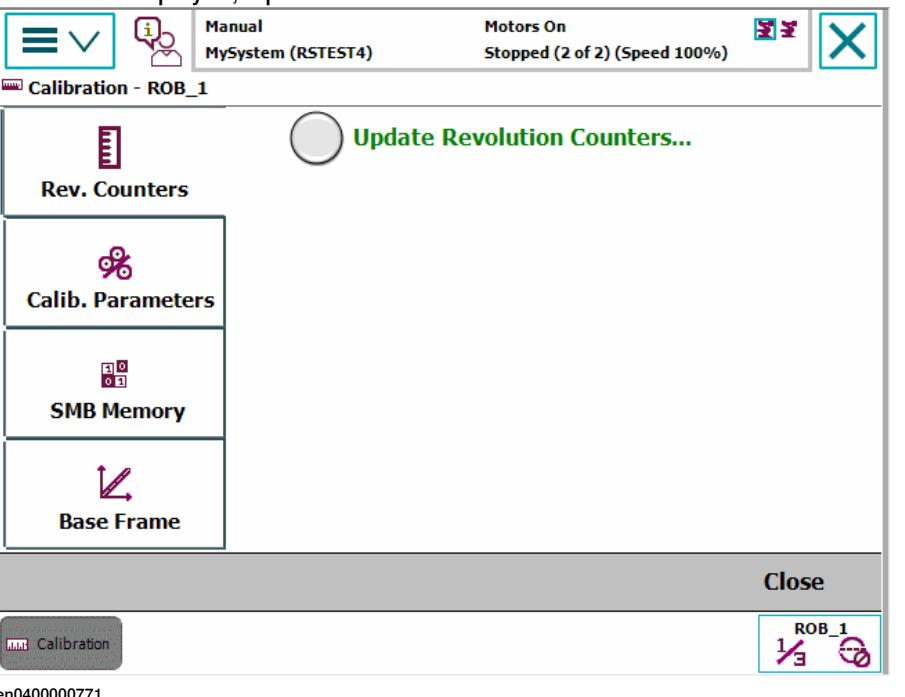
The image shows the ABB IRC5 FlexPendant software interface. At the top, there's a toolbar with icons for file operations, user profile, and system status (Manual mode, sbb_robcal_Bui.. (IN-L-BTGIS..), Motors On, Stopped (Speed 100%)). Below the toolbar is a main menu area with several options: HotEdit, Backup and Restore, Inputs and Outputs, Calibration, Jogging, Control Panel, Production Window, Event Log, Program Editor, FlexPendant Explorer, Program Data, System Info, Log Off Default User, and Restart. The 'Calibration' option is highlighted with a red box. At the bottom of the screen, there's a footer with the text 'xx1500000942' and a status bar on the right labeled 'ROB_1 1/3' with a power icon.

Continues on next page

5 Calibration

5.3 Updating revolution counters

Continued

	Action				
2	<p>All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.</p>  <p>In order to use the system all mechanical units must be calibrated.</p> <p>Select the mechanical unit you want to calibrate.</p> <table border="1"><thead><tr><th>Mechanical Unit</th><th>Status</th></tr></thead><tbody><tr><td>ROB_1</td><td>Calibrated</td></tr></tbody></table> <p>xx1500000943</p>	Mechanical Unit	Status	ROB_1	Calibrated
Mechanical Unit	Status				
ROB_1	Calibrated				
3	<p>A screen is displayed, tap Rev. Counters.</p>  <p>Rev. Counters</p> <p>Calib. Parameters</p> <p>SMB Memory</p> <p>Base Frame</p> <p>Update Revolution Counters...</p> <p>Close</p> <p>xx0400000771</p>				

Continues on next page

	Action
4	<p>Tap Update Revolution Counters.... A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none"> • Tap Yes to update the revolution counters. • Tap No to cancel updating the revolution counters. <p>Tapping Yes displays the axis selection window.</p>
5	<p>Select the axis to have its revolution counter updated by:</p> <ul style="list-style-type: none"> • Ticking in the box to the left • Tapping Select all to update all axes. <p>Then tap Update.</p>
6	<p>A dialog box is displayed, warning that the updating operation cannot be undone:</p> <ul style="list-style-type: none"> • Tap Update to proceed with updating the revolution counters. • Tap Cancel to cancel updating the revolution counters. <p>Tapping Update updates the selected revolution counters and removes the tick from the list of axes.</p>
7	<p> CAUTION</p> <p>If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury!</p> <p>Check the synchronization position very carefully after each update. See Checking the synchronization position on page 372.</p>

5 Calibration

5.4.1 Calibration position

5.4 Calibrating the robot

5.4.1 Calibration position

Calibration position

The position of the axis to be calibrated is illustrated in each calibration section respectively.

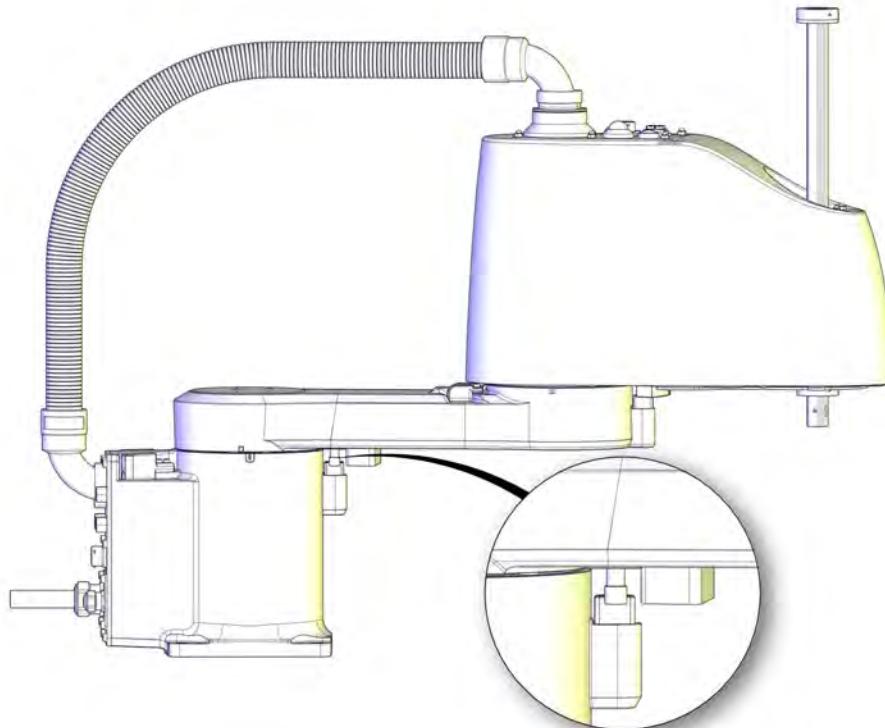
The table below specifies the exact axis positions in degrees.

Axis	IRB 910SC-3/0.45	IRB 910SC-3/0.55	IRB 910SC-3/0.65
1	-6.9199168°	-6.9199168°	-6.9199168°
2	-7.12701982°	-7.12701982°	-7.12701982°
3	0 mm	0 mm	0 mm
4	0°	0°	0°

5.4.2 Calibrating axis 1

Calibration position of axis 1

The figure shows axis 1 in calibration position, with calibration tools fitted.



xx1500002512

Required equipment

Calibration of axis 1 is done by moving the lower arm so that the moving calibration pin and calibration block touches each other gently.

The calibration block is already fitted to the robot.

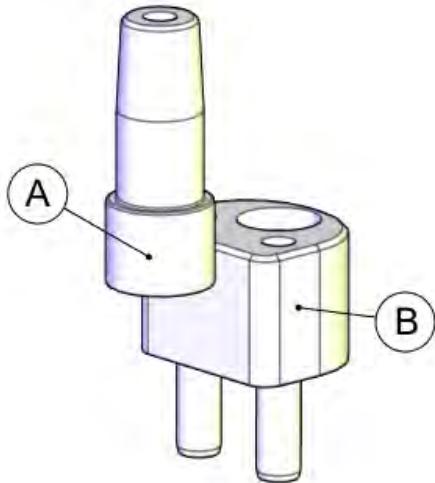
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5 Calibration

5.4.2 Calibrating axis 1

Continued

See figures below for reference, and follow the step-by-step procedure that follows.



xx1500002516

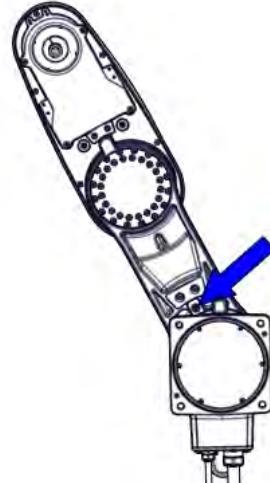
A	Moving calibration pin
B	Calibration block

Required consumables

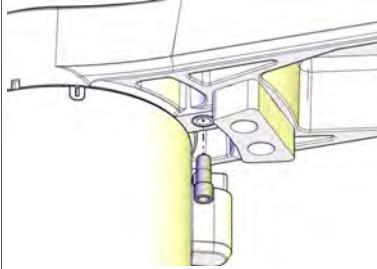
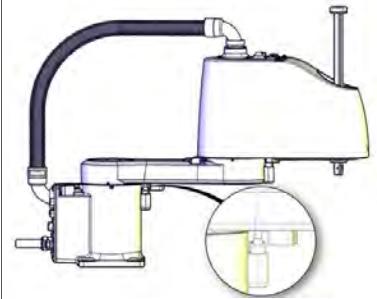
Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

Calibrating axis 1

Moving the robot to calibration position

	Action	Note
1	Jog axis 1 to a suitable position where the calibration pin can be fitted in to the press fit bushing.	 xx1500002808

Continues on next page

Action	Note
<p>2  DANGER Turn off all:<ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.</p>	
3 Fit the calibration pin to the press fit bushing.	 xx1500002509
4 Turn on the electric power to the robot.	
<p>5  DANGER When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure the payload is disassembled or tooling is properly supported; otherwise, fast downward movements of axis 3 may cause severe hits.</p>	
6 Release the brakes and manually rotate axis 1 until the calibration pin touches the calibration block gently. There should be no pressing force between them.	See Manually releasing the brakes on page 71 .  xx1500002508
<p>7  CAUTION Pay attention to robot pose in order to avoid arm collision.</p>	
8 Release the brake release button to activate the brakes.	

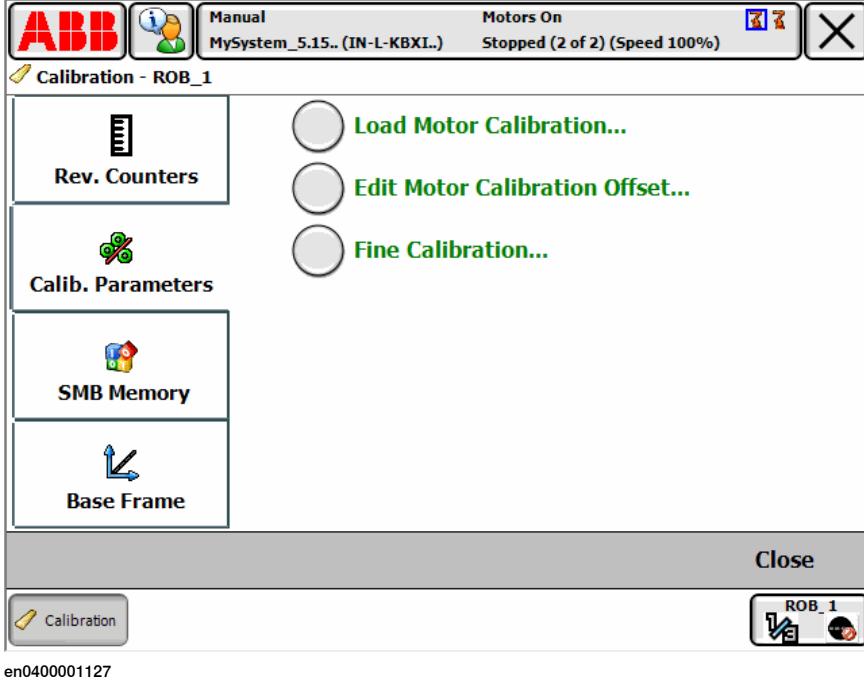
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5 Calibration

5.4.2 Calibrating axis 1

Continued

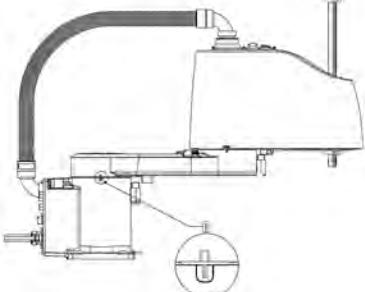
Performing the fine calibration procedure

Action	Note
1  WARNING Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2 Choose fine calibration from Calib menu. On the ABB menu, tap Calibration. All mechanical units connected to the system are shown along with their calibration status.	
3 Tap to select the mechanical unit and then tap Calib. Parameters. 	
4 Tap Fine Calibration.... A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none">• Tap Yes to proceed.• Tap No to cancel.	
5 Select the check-box for the current axis/axes to be calibrated.	

Continues on next page

	Action	Note
6	<p>Tap Calibrate.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> • Tap Calibrate to proceed. • Tap Cancel to cancel. <p>Tapping Calibrate results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p>	

Checking and finalizing the calibration

	Action	Note
1	 DANGER <p>Always remember to remove the calibration tools from the robot before jogging axes to zero position during calibration.</p>	
2	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	
3	Jog axis 1 to zero degree using the FlexPendant.	
4	<p>Check that the synchronization marks on axis 1 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure. 	 xx1500002514

After calibration

	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

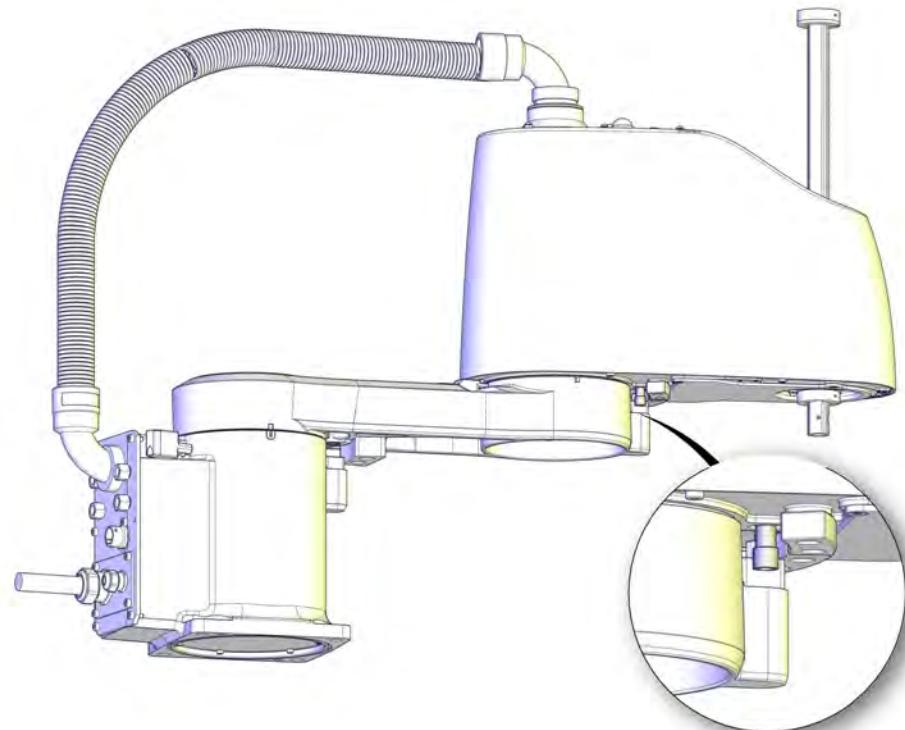
5 Calibration

5.4.3 Calibrating axis 2

5.4.3 Calibrating axis 2

Calibration position of axis 2

The figure shows axis 2 in calibration position.



xx1500002513

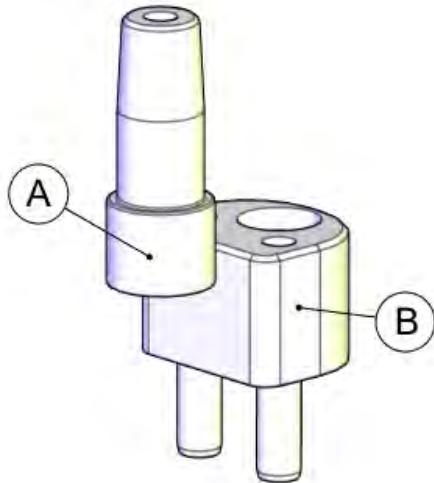
Required equipment

Calibration of axis 2 is done by moving the lower arm so that the moving calibration pin and calibration block touches each other gently.

The calibration block is already fitted to the robot.

Continues on next page

See figures below for reference, and follow the step-by-step procedure that follows.



xx1500002516

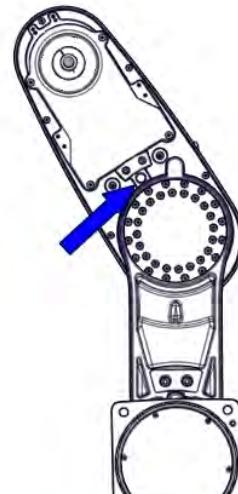
A	Moving calibration pin
B	Calibration block

Required consumables

Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

Calibrating axis 2

Moving the robot to calibration position

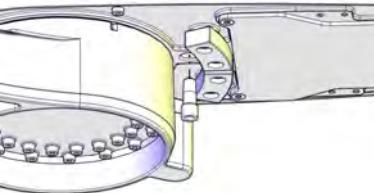
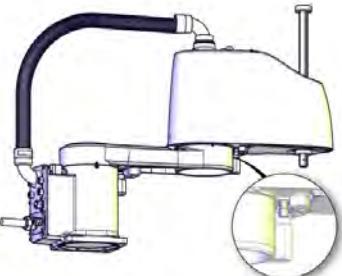
	Action	Note
1	Jog axis 2 to a suitable position where the calibration pin can be fitted to the press fit bushing.	 <p>xx1500002809</p>

Continues on next page

5 Calibration

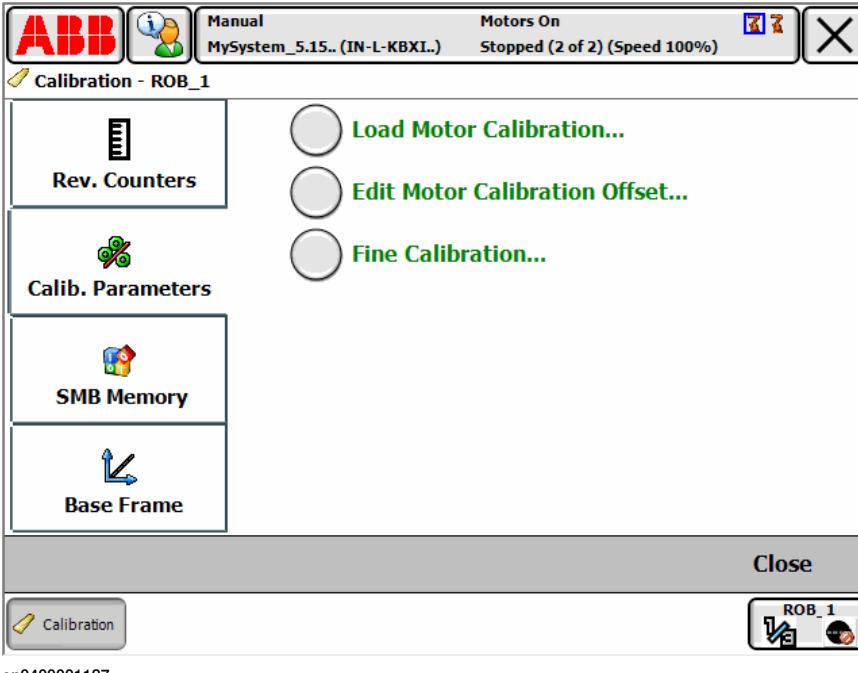
5.4.3 Calibrating axis 2

Continued

	Action	Note
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	Fit the calibration pin to the press fit bushing.	 xx1500002511
4	Turn on the electric power to the robot.	
5	 DANGER When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure the payload is disassembled or tooling is properly supported; otherwise, fast downward movements of axis 3 may cause severe hits.	
6	Release the brakes and manually rotate axis 2 until the calibration pin touches the calibration block gently. There should be no pressing force between them.	See Manually releasing the brakes on page 71 .  xx1500002510
7	 CAUTION Pay attention to robot pose in order to avoid arm collision.	
8	Release the brake release button to activate the brakes.	

Continues on next page

Performing the fine calibration procedure

Action	Note
1  WARNING Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2 Choose fine calibration from Calib menu. On the ABB menu, tap Calibration. All mechanical units connected to the system are shown along with their calibration status.	
3 Tap to select the mechanical unit and then tap Calib. Parameters. 	
4 Tap Fine Calibration.... A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none">• Tap Yes to proceed.• Tap No to cancel.	
5 Select the check-box for the current axis/axes to be calibrated.	

Continues on next page

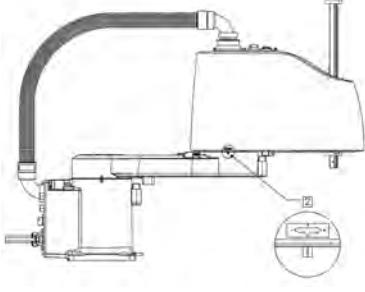
5 Calibration

5.4.3 Calibrating axis 2

Continued

Action	Note
<p>6 Tap Calibrate.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> • Tap Calibrate to proceed. • Tap Cancel to cancel. <p>Tapping Calibrate results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p>	

Checking and finalizing the calibration

Action	Note
<p>1  DANGER</p> <p>Always remember to remove the calibration tools from the robot before jogging axes to zero position during calibration.</p>	
<p>2 Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.</p>	
<p>3 Jog axis 2 to zero degree using the FlexPendant.</p>	
<p>4 Check that the synchronization marks on axis 2 are aligned with eachother.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure. 	 xx1500002515

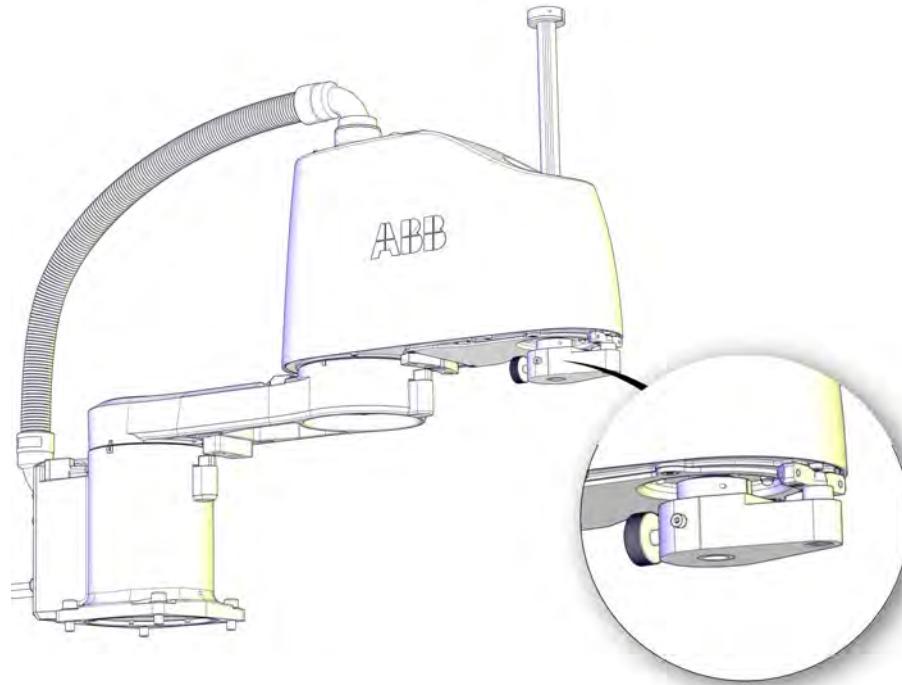
After calibration

Action	Note
<p>1 Write down the new system parameters on a new label and stick on top of the calibration label on the robot.</p>	

5.4.4 Calibrating axis 3 and axis 4

Calibration position of axis 3 and axis 4

The figure shows axis 3 and axis 4 in calibration position. The axes 3 and 4 are calibrated together.



xx1500002499

Required equipment

Axes 3 and 4 are calibrated together. The calibration is done by moving the ball screw spline unit so that the calibration pin on the moving calibration block and the fixing calibration block touch each other gently.

The fixing calibration block is already fitted to the robot.

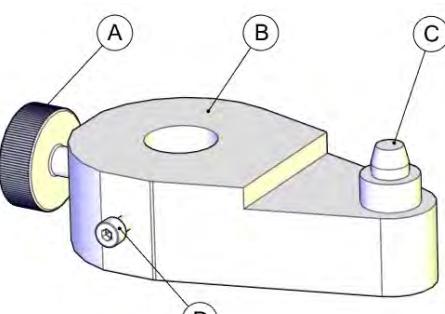
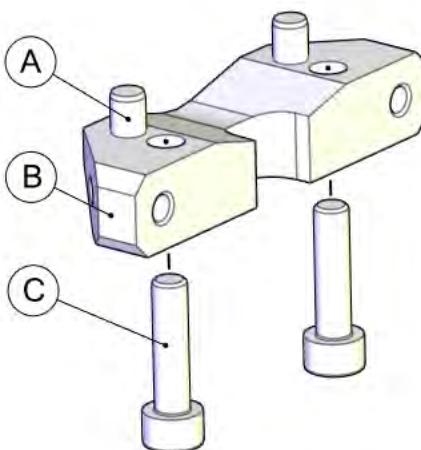
Continues on next page

5 Calibration

5.4.4 Calibrating axis 3 and axis 4

Continued

See figures below for reference, and follow the step-by-step procedure that follows the figures.

Moving calibration block (including calibration pin, knob and adjusting screw)	Fixing calibration block (including parallel pins and attachment screws)
 <p>xx1500002500</p> <p>A Knob B Moving calibration block C Calibration pin D Screw</p>	 <p>xx1500002501</p> <p>A Parallel pin B Fixing block C Screw</p>

Required consumables

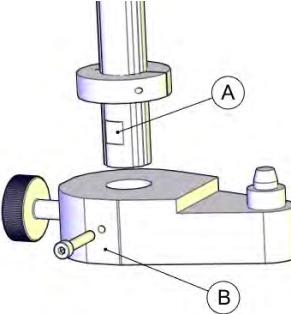
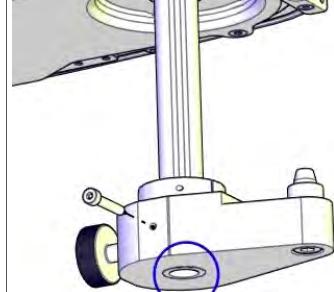
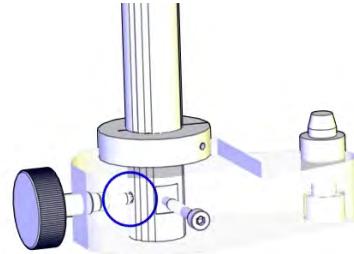
Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

Calibrating axis 3 and axis 4

Moving the robot to calibration position

	Action	Note
1	Jog axis 3 and axis 4 to find a suitable position where axis-3/4 calibration tools can be fitted.	 <p>xx1500002502</p>

Continues on next page

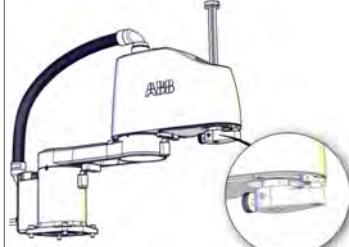
	Action	Note
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	Fit the moving calibration block with its flat part aligned with the shaft flat mark.	 xx1500002503 A Shaft flat mark B Block flat part
4	When the lower surfaces of the shaft and block are at the same level, tighten the screw slowly to a degree just enough to ensure the block not drop.	 xx1500002504
5	Turn the knob gently until its sphere head is properly inserted into the conical hole.	 xx1500002505
6	Tighten the screw to lock the block on the shaft.	
7	Turn on the electric power to the robot.	

Continues on next page

5 Calibration

5.4.4 Calibrating axis 3 and axis 4

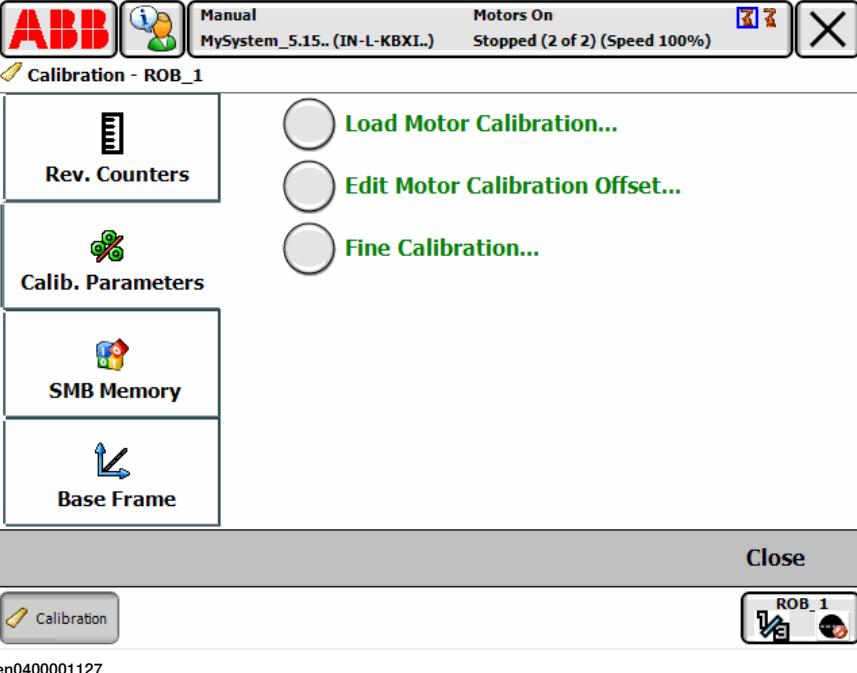
Continued

Action	Note
8  DANGER When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure the payload is disassembled or tooling is properly supported; otherwise, fast downward movements of axis 3 may cause severe hits.	
9 Release the brakes and manually move the ball screw spline up and down until: <ul style="list-style-type: none">• the calibration pin on the moving calibration block locates in the groove of the fixing calibration block and;• the contact surfaces of the calibration pin and fixing calibration block touches each other gently; there should be no pressing force between the surfaces. When doing this, pay attention to robot pose in order to avoid arm collision. When the axes are in position, release the brake release button to activate the brakes again.	How to release the brakes is detailed in Manually releasing the brakes on page 71 .  xx1500002506

Performing the fine calibration procedure

Action	Note
1  WARNING Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2 Choose fine calibration from Calib menu. On the ABB menu, tap Calibration. All mechanical units connected to the system are shown along with their calibration status.	

Continues on next page

Action	Note
3 Tap to select the mechanical unit and then tap Calib. Parameters .	
4 Tap Fine Calibration.... A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none">• Tap Yes to proceed.• Tap No to cancel.	
5 Select the check-box for the current axis/axes to be calibrated.	
6 Tap Calibrate . A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone: <ul style="list-style-type: none">• Tap Calibrate to proceed.• Tap Cancel to cancel. Tapping Calibrate results in briefly displaying a dialog box, announcing that the calibration process has started. The axis is calibrated and the system returns to the list of available mechanical units.	

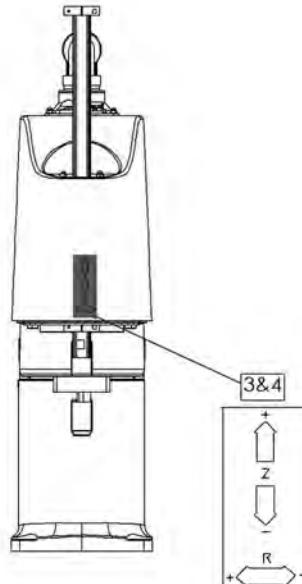
Continues on next page

5 Calibration

5.4.4 Calibrating axis 3 and axis 4

Continued

Checking and finalizing the calibration

Action	Note
1  DANGER Always remember to remove the calibration tools from the robot before jogging axes to zero position during calibration.	
2 Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	
3 Jog axes 3 and 4 to zero degree using the Flex-Pendant.	
4 Check that the synchronization marks on axes 3 and 4 are aligned with each other. Are they aligned within the tolerances? <ul style="list-style-type: none">• If yes, the calibration is verified OK.• If no, redo the fine calibration procedure.	 xx1500002507

After calibration

Action	Note
1 Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

5.5 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 372 .
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 348 .
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.	
4 Remove any calibration equipment from the robot.	

5 Calibration

5.6 Checking the synchronization position

5.6 Checking the synchronization position

Introduction

Check the synchronization position of the robot before beginning any programming of the robot system. This may be done:

- Using a **MoveAbsJ** instruction with argument zero on all axes.
- Using the **Jogging** window on the FlexPendant.

Using a **MoveAbsJ** instruction

Use this procedure to create a program that runs all the robot axes to their synchronization position.

Action	Note
1 On ABB menu tap Program editor .	
2 Create a new program.	
3 Use MoveAbsJ in the Motion&Proc menu.	
4 Create the following program: <pre>MoveAbsJ [[0,0,0,0,0,0], [9E9,9E9,9E9,9E9,9E9,9E9]] \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 348 and Updating revolution counters on page 350 .

Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

Action	Note
1 On the ABB menu, tap Jogging .	
2 Tap Motion mode to select group of axes to jog.	
3 Tap to select the axis to jog, axis 1, 2, or 3.	
4 Manually run the robots axes to a position where the axis position value read on the FlexPendant, is equal to zero.	
5 Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See Synchronization marks and synchronization position for axes on page 348 and Updating revolution counters on page 350 .

6 Decommissioning

6.1 Introduction

Introduction

This section contains information to consider when taking a product, robot or controller, out of operation.

It deals with how to handle potentially dangerous components and potentially hazardous materials.

General

All used grease/oils and dead batteries **must** be disposed of in accordance with the current legislation of the country in which the robot and the control unit are installed.

If the robot or the control unit is partially or completely disposed of, the various parts **must** be grouped together according to their nature (which is all iron together and all plastic together), and disposed of accordingly. These parts **must** also be disposed of in accordance with the current legislation of the country in which the robot and control unit are installed.

6 Decommissioning

6.2 Environmental information

6.2 Environmental information

Hazardous material

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly to prevent health or environmental hazards.

Material	Example application
Batteries, NiCad or Lithium	Battery pack
Steel	Drive units, ball screw spline unit, etc
Neodymium	Drive units
Plastic/rubber	Upper arm cover, mechanical stop rubbers
Oil, grease	Drive units, ball screw spline unit
Aluminium	Base, upper arm, lower arm, axis-3 housing, etc

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.

7 Reference information

7.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

7 Reference information

7.2 Applicable standards

7.2 Applicable standards



Note

The listed standards are valid at the time of the release of this document. Phased out or replaced standards are removed from the list when needed.

Standards, EN ISO

The product is designed in accordance with the requirements of:

Standard	Description
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13849-1	Safety of machinery, safety related parts of control systems - Part 1: General principles for design
EN ISO 13850	Safety of machinery - Emergency stop - Principles for design
EN ISO 10218-1	Robots for industrial environments - Safety requirements -Part 1 Robot
EN ISO 9787	Robots and robotic devices -- Coordinate systems and motion nomenclatures
EN ISO 9283	Manipulating industrial robots, performance criteria, and related test methods
EN ISO 14644-1 ⁱ	Classification of air cleanliness
EN ISO 13732-1	Ergonomics of the thermal environment - Part 1
EN IEC 61000-6-4 (option 129-1)	EMC, Generic emission
EN IEC 61000-6-2	EMC, Generic immunity
EN IEC 60974-1 ⁱⁱ	Arc welding equipment - Part 1: Welding power sources
EN IEC 60974-10 ⁱⁱ	Arc welding equipment - Part 10: EMC requirements
EN IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1 General requirements
IEC 60529	Degrees of protection provided by enclosures (IP code)

ⁱ Only robots with protection Clean Room.

ⁱⁱ Only valid for arc welding robots. Replaces EN IEC 61000-6-4 for arc welding robots.

European standards

Standard	Description
EN 614-1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN 574	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design

Continues on next page

Other standards

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-14	Industrial robots and robot Systems - General safety requirements

7 Reference information

7.3 Unit conversion

7.3 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	

7.4 Specification of screws

Screws, nuts and washers not handled as spare parts

The screws, nuts and washers listed have no special treatment and can be bought locally if lost or damaged.

Screw/Nut/Washer	Dimension, class and treatment
Hex socket head cap screw	M5x16 12.9 Steel Black Oxide
Hex socket head cap screw	M5x25 12.9 Steel Black Oxide
Hex socket head cap screw	M6x30 12.9 Steel Black Oxide
Hex socket head cap screw	M3x8 12.9 Steel Black Oxide
Hex socket head cap screw	M3x20 12.9 Steel Black Oxide
Hex socket head cap screw	M4x16 12.9 Steel Black Oxide
Hex socket head cap screw	M4x25 12.9 Steel Black Oxide
Hex socket head cap screw	M4x20 12.9 Steel Black Oxide
Hex socket head cap screw	M5x12 12.9 Steel Black Oxide
Hex socket head cap screw	M3x12 12.9 Steel Black Oxide
Hex socket head cap screw	M4x12 12.9 Steel Black Oxide
Hex socket head cap screw	M2.5x6 12.9 Steel Black Oxide
Hex socket head cap screw	M4x30 12.9 Steel Black Oxide
Hex socket head cap screw	M4x10 12.9 Steel Black Oxide
Hex socket head cap screw	M6x16 8.8 Steel Zinc electroplated and chromated, bluish
Torx pan head screw	M3x4 8.8 Steel Zinc eletroplated and chromated, bluish
Torx pan head screw	M3x6 8.8 Steel Zinc eletroplated and chromated, bluish
Hex socket counters. flat head screw	M4x8 8.8 Steel Zinc electroplated and chromated, bluish
Hex socket pan head thread rolling screw	M3x6 8.8 Stainless steel Zinc electroplated and chromated, bluish
Hexagon domed cap nut	M4 DIN1587 Stainless steel A2
Hexagon nut	M4 8 Steel Zinc electroplated and chromated, bluish
Plain washer	4.3x9x0.8 200HV Steel Zinc electroplated and chromated, bluish
Plain washer	6.4x12x1.6 200HV Steel Zinc electroplated and chromated, bluish
Plain washer	6.4x17x3 200HV Steel Zinc electroplated and chromated, bluish
Conical spring washer	3.2x7x0.6 420-510HV Spring steel acc.to DIN267 Teil26 Zinc plated mechanically and chromated, bluish
Conical spring washer	4.3x9x1 420-510HV Spring steel acc.to DIN267 Teil26 Zinc plated mechanically and chromated, bluish
Conical spring washer	5.3x11x1.2 420-510HV Spring steel acc.to DIN267 Teil26 Zinc plated mechanically and chromated, bluish

7 Reference information

7.5 Screw joints

7.5 Screw joints

General

This section describes how to tighten the various types of screw joints on the IRB 910SC.

The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.

UNBRAKO screws

UNBRAKO is a special type of screw recommended by ABB for certain screw joints. It features special surface treatment (Gleitmo as described below) and is extremely resistant to fatigue.

Whenever used, this is specified in the instructions, and in such cases, *no other type of replacement screw* is allowed. Using other types of screws will void any warranty and may potentially cause serious damage or injury.

Gleitmo treated screws

Gleitmo is a special surface treatment to reduce the friction when tightening the screw joint. Screws treated with Gleitmo may be reused 3-4 times before the coating disappears. After this the screw must be discarded and replaced with a new one.

When handling screws treated with Gleitmo, protective gloves of nitrile rubber type should be used.

Screws lubricated in other ways

Screws lubricated with Molycote 1000 should *only* be used when specified in the repair, maintenance or installation procedure descriptions.

In such cases, proceed as follows:

- 1 Apply lubricant to the screw thread.
- 2 Apply lubricant between the plain washer and screw head.
- 3 Screw dimensions of M8 or larger must be tightened with a torque wrench. Screw dimensions of M6 or smaller may be tightened without a torque wrench if this is done by trained and qualified personnel.

Lubricant	Article number
Molycote 1000 (molybdenum disulphide grease)	11712016-618

Tightening torque

Before tightening any screw, note the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard torques** are specified in the following tables. Any **special torques** are specified in the repair, maintenance or installation procedure descriptions. Any **special torque specified overrides the standard torque!**
- Use the *correct* tightening torque for each type of screw joint.
- Only use *correctly calibrated* torque keys.

Continues on next page

- Always *tighten the joint by hand*, and never use pneumatic tools.
- Use the *correct tightening technique*, that is *do not jerk*. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is 10%!

Oil-lubricated screws with slotted or cross-recess head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws with slotted or cross-recess head screws*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Oil-lubricated screws with allen head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws with allen head screws*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Dimension	Tightening torque (Nm) Class 8.8, oil-lubricated	Tightening torque (Nm) Class 10.9, oil-lubricated	Tightening torque (Nm) Class 12.9, oil-lubricated
M5	6	-	-
M6	10	-	-
M8	24	34	40
M10	47	67	80
M12	82	115	140
M16	200	290	340
M20	400	560	670
M24	680	960	1150

Lubricated screws (Molycote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for *screws lubricated with Molycote 1000, Gleitmo 603 or equivalent with allen head screws*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Dimension	Tightening torque (Nm) Class 10.9, lubricated ⁱ	Tightening torque (Nm) Class 12.9, lubricated ⁱ
M8	28	35
M10	55	70
M12	96	120
M16	235	280
M20	460	550
M24	790	950

ⁱ Lubricated with Molycote 1000, Gleitmo 603 or equivalent

Continues on next page

7 Reference information

7.5 Screw joints

Continued

Water and air connectors

The following table specifies the recommended standard tightening torque for *water and air connectors* when *one or both* connectors are made of *brass*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Dimension	Tightening torque Nm - Nominal	Tightening torque Nm - Min.	Tightening torque Nm - Max.
1/8	12	8	15
1/4	15	10	20
3/8	20	15	25
1/2	40	30	50
3/4	70	55	90

7.6 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
<p> CAUTION</p> <p>The robot weighs .</p> <p>IRB 910SC-3/0.45: 24.5 kg</p> <p>IRB 910SC-3/0.55: 25 kg</p> <p>IRB 910SC-3/0.65: 25.5 kg</p> <p>All lifting accessories used must be sized accordingly!</p>	

7 Reference information

7.7 Standard toolkit

7.7 Standard toolkit

General

All service (repairs, maintenance, and installation) procedures contains lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the following table.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

Contents, standard toolkit

Qty	Tool	Rem.
1	Socket head cap 2-17 mm	
1	Torque wrench 0.3-45 Nm	
1	Torque wrench 45 Nm	For securing robot to foundation.
1	Ratchet head for torque wrench 1/2	
1	Hex socket head cap no. 2.5 socket 1/2" bit L=110 mm	
1	Small screwdriver	
1	T-handle with ball head	
1	Small cutting plier	
1	Plastic mallet	

7.8 Special tools

General

All service instructions contain lists of tools required to perform the specified activity. The required tools are a sum of standard tools, defined in the section [Standard toolkit on page 384](#), and of special tools, listed directly in the instructions and also gathered in this section.

Special tools



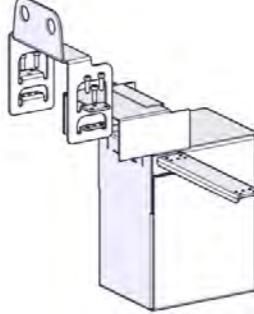
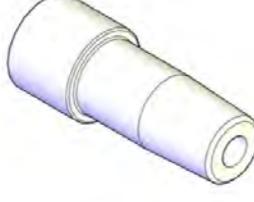
Note

If the replacing procedure is not listed in the table below, only standard tools are needed for the procedure.

Continues on next page

7 Reference information

7.8 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness spare parts	Base spare parts	Lower arm spare parts	Upper arm spare parts	Ball screw spline unit	Axis-1 motor	Axis-2 motor	Axis-3 motor	Axis-4 motor	Axis-3 timing belt	Axis-4 timing belts
Lifting accessories													
-	Lifting accessory, robot Includes lifting accessories and screws.	 xx1500002471											
-	Lifting chain, capacity > 50 kg. Hook												
Calibration toolkit													
3HAC057036-001	Moving calibration pin	 xx1500002518	1	1	1	1	1	1					
3HAC057137-001	Moving calibration block, axis3 and axis 4 Includes calibration pin, knob and adjusting screw.	 xx1500002682				1		1	1	1	1	1	
Other tools													
-	24 VDC power supply					1							
-	Acoustic tensiometer				1	1		1	1	1	1	1	1

Continues on next page

7.9 Lifting accessories and lifting instructions

General

Many repair and maintenance activities require different pieces of lifting accessories, which are specified in each procedure.

The use of each piece of lifting accessories is *not* detailed in the activity procedure, but in the instruction delivered with each piece of lifting accessories.

This implies that the instructions delivered with the lifting accessories should be stored for later reference.

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8 Spare parts

8.1 Spare part lists and illustrations

Location

Spare parts and exploded views are not included in the manual but delivered as a separate document on the documentation DVD.

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9 Circuit diagrams

9.1 Circuit diagrams

Overview

The circuit diagrams are not included in this manual, but delivered as separate documents on the documentation DVD. See the article numbers in the tables below.

Controllers

Product	Article numbers for circuit diagrams
Circuit diagram - IRC5	3HAC024480-011
Circuit diagram - IRC5 Compact	3HAC049406-003
Circuit diagram - IRC5 Panel Mounted Controller	3HAC026871-020
Circuit diagram - Euromap	3HAC024120-004
Circuit diagram - Spot welding cabinet	3HAC057185-001

Robots

Product	Article numbers for circuit diagrams
Circuit diagram - IRB 120	3HAC031408-003
Circuit diagram - IRB 140 type C	3HAC6816-3
Circuit diagram - IRB 260	3HAC025611-001
Circuit diagram - IRB 360	3HAC028647-009
Circuit diagram - IRB 460	3HAC036446-005
Circuit diagram - IRB 660	3HAC025691-001
Circuit diagram - IRB 760	3HAC025691-001
Circuit diagram - IRB 1200	3HAC046307-003
Circuit diagram - IRB 1410	3HAC2800-3
Circuit diagram - IRB 1600/1660	3HAC021351-003
Circuit diagram - IRB 1520	3HAC039498-007
Circuit diagram - IRB 2400	3HAC6670-3
Circuit diagram - IRB 2600	3HAC029570-007
Circuit diagram - IRB 4400/4450S	3HAC9821-1
Circuit diagram - IRB 4600	3HAC029038-003
Circuit diagram - IRB 6400RF	3HAC8935-1
Circuit diagram - IRB 6600 type A	3HAC13347-1 3HAC025744-001
Circuit diagram - IRB 6600 type B	3HAC13347-1 3HAC025744-001
Circuit diagram - IRB 6620	3HAC025090-001

Continues on next page

9 Circuit diagrams

9.1 Circuit diagrams

Continued

Product	Article numbers for circuit diagrams
<i>Circuit diagram - IRB 6620 / IRB 6620LX</i>	<i>3HAC025090-001</i>
<i>Circuit diagram - IRB 6640</i>	<i>3HAC025744-001</i>
<i>Circuit diagram - IRB 6650S</i>	<i>3HAC13347-1</i> <i>3HAC025744-001</i>
<i>Circuit diagram - IRB 6660</i>	<i>3HAC025744-001</i> <i>3HAC029940-001</i>
<i>Circuit diagram - IRB 6700</i>	<i>3HAC043446-005</i>
<i>Circuit diagram - IRB 7600</i>	<i>3HAC13347-1</i> <i>3HAC025744-001</i>
<i>Circuit diagram - IRB 14000</i>	<i>3HAC050778-003</i>
<i>Circuit diagram - IRB 910SC</i>	<i>3HAC056159-002</i>

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