



Product manual

IRBP /D2009

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Product manual

**IRBP A
IRBP B
IRBP C
IRBP D
IRBP K
IRBP R
IRBP L**

IRC5

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Overview of this manual

About this manual

This manual contains instructions for:

- mechanical and electrical installation of the manipulator system
- maintenance of the manipulator system
- mechanical and electrical repair of the manipulator system.

It also contains reference information for all procedures described in the manual.

Usage

This manual should be used during:

- installation, from lifting the manipulator to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- operation
- 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 technician working with an ABB manipulator 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	Safety information that must be read through before performing any installation or service work on the manipulator. Contains general safety aspects as well as more specific information on how to avoid personal injuries and damage to the product.
System description	Useful information when performing installation.
Installation and commissioning	Required information about lifting and installation of the manipulator.
Maintenance	Step-by-step procedures that describe how to perform the maintenance of manipulator. 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 manipulator. Based on available spare parts.
Operation	Step-by-step procedures for starting and stopping programs.

Continues on next page

Overview of this manual

Continued

Chapter	Contents
Calibration information	Procedures that do not require specific calibration equipment. General information about calibration.
Decommissioning	Environmental information about the manipulator and its components.
Reference information	Useful information when performing installation, maintenance or repair work. Includes lists of necessary tools, additional documents, safety standards etc.

References

Reference	Document ID
<i>Product manual, spare parts - IRBP /D2009</i>	3HAC038416-001
<i>Product specification - IRBP /D2009</i>	3HAC038208-001
Circuit diagrams - IRBP D/2009	<i>Circuit diagrams on page 315</i>
<i>Operating manual - General safety information</i> ⁱ	3HAC031045-001
<i>Product manual - IRC5</i> IRC5 with main computer DSQC 639.	3HAC021313-001
<i>Product manual - IRC5</i> IRC5 with main computer DSQC1000.	3HAC047136-001
<i>Operating manual - IRC5 with FlexPendant</i>	3HAC050941-001
<i>Operating manual - Calibration Pendulum</i>	3HAC16578-1
<i>Application manual - Additional axes and stand alone controller</i>	3HAC051016-001
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001
<i>Technical reference manual - System parameters</i>	3HAC050948-001
<i>Operating manual - RobotStudio</i>	3HAC032104-001

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

Revisions

Revision	Description
-	First edition
A	The following new sections added: <ul style="list-style-type: none">• <i>Securing the manipulator IRBP L using fixture laser on page 116</i>• <i>Example of fixture laser aligning on page 117</i>
B	This revision includes the following additions and/or changes: <ul style="list-style-type: none">• Added <i>Define base frame on page 306</i>.• Forces on foundation added for IRBP 5000L, see <i>Forces on foundation on page 105</i>.• Updated information about load identification, see <i>Identification of load data for positioners IRBP on page 291</i>, and <i>Define payload for a mechanical unit on page 301</i>.• Updated information about signal names, see <i>Configuration on page 161</i>.

Continues on next page

Revision	Description
C	<p>This revision includes the following additions and/or changes:</p> <ul style="list-style-type: none"> • Specified type of the lubricating oil and corrected its article number, see Current collector on page 194 and Required equipment on page 194. • Some general tightening torques have been changed/added, see updated values in Screw joints on page 110. • Information about the earth connector added to sections Risk of electric shock on page 59, Electrical connectors on page 130, and Electrical assembly IRBP on page 133. • Added WARNING - Safety risks during handling of batteries on page 50. • Added Adjustment of bearing units for IRBP L on page 117.
D	<p>This revision includes the following additions and/or changes:</p> <ul style="list-style-type: none"> • Information about the type and amount of oil has been removed from the manual and can now be found in the <i>Technical reference manual - Lubrication in gearboxes</i>, see References on page 10. • Added information about the amount of grease for the current collector, see Lubricating the current collector on page 194. • Corrected forces in Forces on foundation on page 105. • Added note about other variants in Orienting and securing the manipulator on page 115. • A new SMB unit and battery is introduced, with longer battery lifetime.
E	<p>This revision includes the following additions and/or changes:</p> <ul style="list-style-type: none"> • Instruction for replacement of SMB board added, see Replacing SMB board on page 238. • Service Information System, SIS, is not available for IRBP positioners.
F	<p>This revision includes the following additions and/or changes:</p> <ul style="list-style-type: none"> • Article number changed for grease in Lubricating current collector, see Required equipment on page 194. • Added information for tool and speed data, see Tool and speed data on page 289. • Minor corrections.
G	<p>This revision includes the following additions and/or changes:</p> <ul style="list-style-type: none"> • The calibration procedure for the interchange unit is updated, see Calibration of the station interchange unit for positioner IRBP on page 282. • Added that lifting eyes (standard as well as with swivel) no longer is delivered with the IRBP. Information updated throughout the manual. • Updated the software installation chapter, see Software installation on page 153. • CAUTION added warning that motors <i>valid from</i> serial number SEROP POF-110001- & CNAUS POF-510001-, not are compatible with motors <i>valid up to</i> serial numbers SEROP -POF-110000 & CNAUS -POF-510000. • Minor corrections. • Changed designations for IRBP R. 250 to 300, 500 to 600 and 750 to 1000.
H	<p>This revision includes the following additions and/or changes:</p> <ul style="list-style-type: none"> • Updated lifting figures. • Changed designations for IRBPs in Forces and Lifting frame parts (D, K, L, C, R.250 to 300, 500 to 600 and 750 to 1000). • Note regarding recess on motor flange and plain washer for mounting of insulating washer added to Replacing motors on page 225.

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Overview of this manual

Continued

Revision	Description
J	Published in release R16.2. This revision includes the following additions and/or changes: <ul style="list-style-type: none">Added safety section Emergency release of the robot arm on page 33.Added two additional torque wrenches in standard toolkit.
K	Published in release R17.1. This revision includes the following additions and/or changes: <ul style="list-style-type: none">The <i>Operating manual - IRBP/D2009 (3HAC038435-001)</i> is phased out and replaced by this manual. The section <i>Operation</i> is therefore added to this manual.Updated example of equipment, see Example of fixture laser aligning on page 117.Minor corrections.Added explanation of force.

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 references to figures, tools, material, and so on. The references are read as described below.

References to figures

The procedures often include references to components or attachment points located on the manipulator/controller. The components or attachment points are marked with *italic text* in the procedures and completed with a reference to the figure where the current component or attachment point is shown.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced figure.

The table below shows an example of a reference to a figure from a step in a procedure.

	Action	Note/Illustration
8.	Remove the <i>rear attachment screws, gearbox</i> .	Shown in the figure Location of gearbox on page xx .

References to required equipment

The procedures often include references to equipment (spare parts, tools, etc.) required for the different actions in the procedure. The equipment is marked with *italic text* in the procedures and completed with a reference to the section where the equipment is listed with further information, that is article number and dimensions.

The designation in the procedure for the component or attachment point corresponds to the designation in the referenced list.

The table below shows an example of a reference to a list of required equipment from a step in a procedure.

	Action	Note/Illustration
3.	Fit a new <i>sealing, axis 2</i> to the gearbox.	Art. no. is specified in Required equipment on page xx .

Safety information

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

Read more in the chapter [Safety on page 17](#).

Illustrations

The robot 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 robot models, can be illustrated with illustrations that show a different robot model than the one that is described in the current manual.

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1 Safety

1.1 Introduction to safety information

Overview

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

- General safety aspects, important to attend to before performing any service work on the robot. These are applicable for all service work and are found in [General safety information on page 18](#).
- Safety signals and symbols shown in the manual and on the robot, warning for different types of dangers, are found in [Safety signals and symbols on page 38](#).
- 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 46](#).

1 Safety

1.2.1 Introduction to general safety information

1.2 General safety information

1.2.1 Introduction to general safety information

Definitions

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

Sections

The general safety information is divided into the following sections.

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

1.2.2 Safety in the manipulator system

Validity and responsibility

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

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

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

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

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

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

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

Connection of external safety devices

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

Limitation of liability

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

Related information

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

Continues on next page

1 Safety

1.2.2 Safety in the manipulator system

Continued

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

1.2.3 Protective stop and emergency stop

Overview

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

1 Safety

1.2.4.1 Safety risks during installation and service work on robots

1.2.4 Safety risks

1.2.4.1 Safety risks during installation and service work on robots

Overview

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

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

General risks during installation and service

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

Spare parts and special equipment

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

Personal protective equipment

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

Nation/region specific regulations

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

Non-voltage related risks

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

Continues on next page

1.2.4.1 Safety risks during installation and service work on robots

Continued

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

To be observed by the supplier of the complete system

When integrating the robot with external devices and machines:

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

Complete robot

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

Continues on next page

1 Safety

1.2.4.1 Safety risks during installation and service work on robots

Continued

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

Cabling

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

Gearboxes and motors

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

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* in the product manual for the robot.

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

Increased injury

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



DANGER

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

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

1 Safety

1.2.5.4 Brake testing

1.2.5.4 Brake testing

When to test

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

How to test

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

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

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

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



Note

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

1 Safety

1.2.5.6 Safe use of the jogging device

1.2.5.6 Safe use of the jogging device

Three-position enabling device

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

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



Note

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

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

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

Hold-to-run function

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

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

1.2.5.7 Work inside the working range of the robot



WARNING

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

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



WARNING

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

1 Safety

1.3.1 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

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 40](#).

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

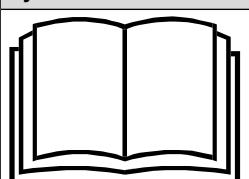
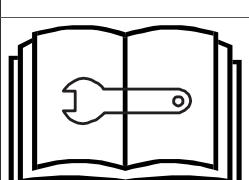
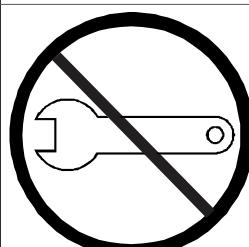
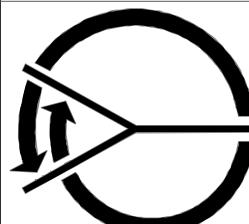
Symbols on safety labels

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.

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1.3.2 Safety symbols on product labels

Continued

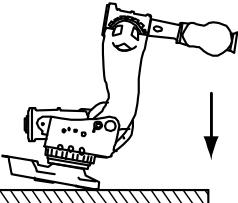
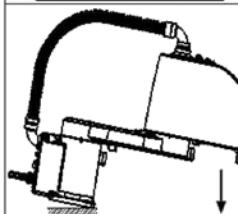
Symbol	Description
 xx0900000813	See user documentation Read user documentation for details. Which manual to read is defined by the symbol: <ul style="list-style-type: none"> • No text: <i>Product manual</i>. • EPS: <i>Application manual - Electronic Position Switches</i>.
 xx0900000816	Before disassemble,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

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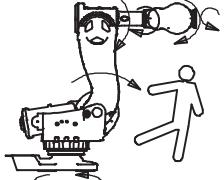
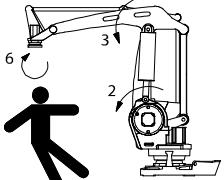
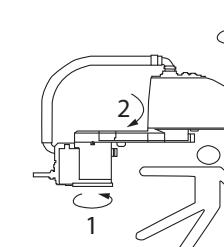
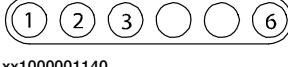
1 Safety

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.

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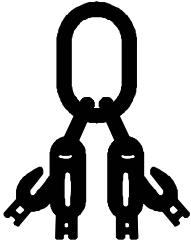
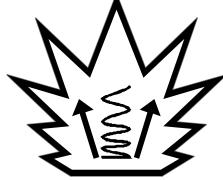
Symbol	Description
 xx0900000819	Moving robot The robot can move unexpectedly.
 xx1000001141	
 xx1500002616	
 xx0900000820	Brake release buttons
 xx1000001140	
 xx0900000821	Lifting bolt

Continues on next page

1 Safety

1.3.2 Safety symbols on product labels

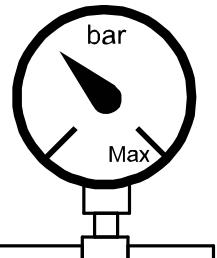
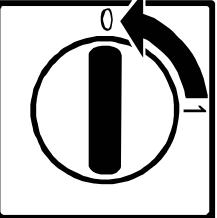
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Symbol	Description
 xx1000001242	Chain sling with shortener
 xx0900000822	Lifting of robot
 xx0900000823	Oil Can be used in combination with prohibition if oil is not allowed.
 xx0900000824	Mechanical stop
 xx1000001144	No mechanical stop
 xx0900000825	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 Single Cabinet Controller

	Action	Note/illustration
1		

Elimination, IRC5 Dual Cabinet Controller

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

1.4.4 WARNING - The unit is sensitive to ESD!

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.

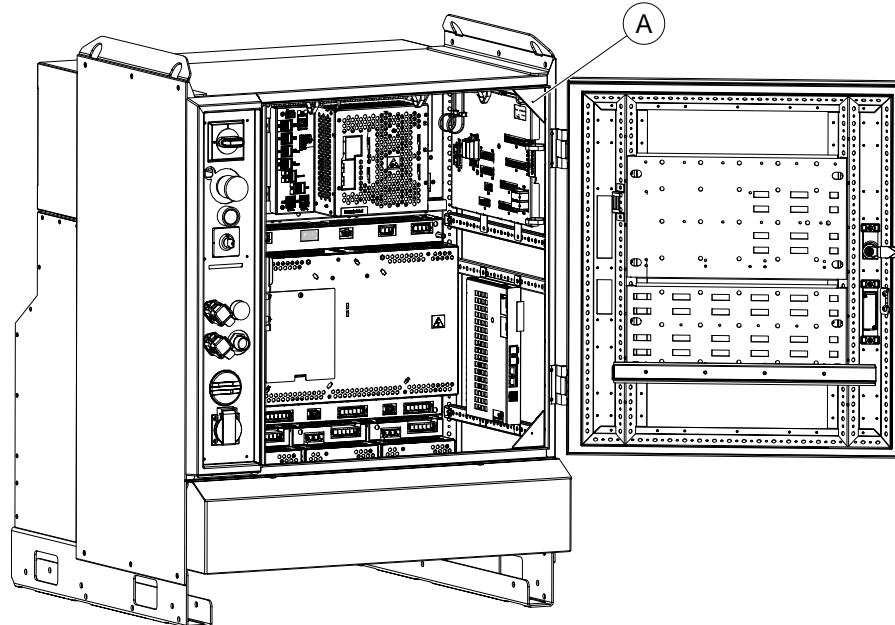
Elimination

	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.

Location of wrist strap button

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

IRC5



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

1 Safety

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, IRBP on page 97 .
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.	

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

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 Safety

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

Continued

Warning	Description	Elimination/Action
 xx010000002 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>
 xx010000002 Do not mix types of oil	Mixing types of oil may cause severe damage to the gearbox.	When filling gearbox oil, do not mix different types of oil unless specified in the instructions. Always use the type of oil specified by the manufacturer!
 xx0100000098 Heat up the oil	Warm oil drains quicker than cold oil.	When changing gearbox oil, first run the robot for a time to heat up the oil.
 xx0100000004 Specified amount depends on drained volume	The specified amount of oil or grease is based on the total volume of the gearbox. When changing the lubricant, the amount refilled may differ from the specified amount, depending on how much has previously been drained from the gearbox.	After filling, verify that the level is correct.
 xx0100000003 Contaminated oil in gear boxes	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.	

1.5 Arc welding related safety

1.5.1 Special safety instructions

Welding robot system

The following points should be observed in all work in or around the welding robot system:

- Consider the welding robot equipment as a single unit.
- The welding robot system consists of many different parts, which in addition to the robot, also includes positioners and other peripheral equipment.
- The entire system communicates via electrical signals and can therefore bring about movements in completely different components to those directly affected.

Workplace

The following points should be observed in all work in or around the workplace:

- Make sure that the workplace is in order before the system is put into operation. If malfunctions are discovered on or in the system, these must be rectified before starting.
- Consult trained personnel or the system manager if your own knowledge is insufficient to implement the measures.

Before operation

The following points should be observed before putting the welding robot system into operation:

- All guards and all safety equipment must be fitted before the robot system is started.
- The safety equipment must not be disengaged, bypassed or in any other way modified so that it does not provide the intended protection.
- Test running with the operating mode selector (key switch) in the 100% position should only be carried out by qualified personnel who are aware of the risks this involves.

During operation

The following points should be observed when the welding robot system is in operation:

- Do not remain within the risk zone (the robot and positioner working area) when the system is operational. If it is absolutely essential that you remain within the risk zone in order to carry out the work, the following must be observed.
 - Never work alone in the risk zone when the system is in operation. One person should stand outside the risk zone to stop the equipment if a hazard arises while work is being carried out inside the risk zone.
 - Exercise extreme care when operating the robot/positioner. Always remember that these can perform unexpected movements when executing a program.

Continues on next page

1 Safety

1.5.1 Special safety instructions

Continued

Even when the robot system seems to perform the same movement pattern over and over again for an extended period, the pattern can suddenly change.

- Be aware that weld splatter represents a fire and burn risk

During maintenance work

The following points should be observed before beginning maintenance work:

- Bring the jogging device for the robot system with you when entering the risk zone so that no one else can start the robot system.
- Make sure to release the three-position enabling device when the robot or positioner does not need to be operated.
- The robot system will be in standby mode with the motors shut off. The operating mode selector (key switch) on the control cabinet's control panel will be in the "Manual reduced speed <250 mm/s" position, and the three-position enabling device must then be used to operate the robot system. In this mode the robot and positioner movements are limited to a speed of no more than 250 mm/s.

1.5.2 Protective equipment

General

Do not wear loose-fitting garments or belts, bracelets, etc., that can become entangled in the robot or positioner. Always use the prescribed personal protective equipment.

Personal protective equipment

Personnel should have the following protective equipment:

Equipment	Description
Safety goggles	Protect the eyes against loose particles, sharp edges and sharp components.
Welding helmet with welding glass	Protect the eyes and skin against radiation and burn injuries.
Dry and undamaged gloves	Protect against radiation and burn injuries, as well as electric shocks.
Dry and undamaged protective clothing	Protect against radiation and burn injuries, as well as electric shocks.
Shoes with insulated soles	Protect against radiation and burn injuries, as well as electric shocks.
Ear protection	Protects hearing when using certain welding settings.
Protective screens and curtains	Protect other persons located in the vicinity of the station.

1 Safety

1.5.3 Light barriers

1.5.3 Light barriers

Light barriers function

The light barriers in the robot system are used to stop the robot and positioner if anyone enters the risk zone where moving parts are activated. The light barriers can, where appropriate, be replaced by hatches, sliding doors or gates.

Pre reset

A pre-reset button is located inside the service area. It is used in connection with resetting the safety circuits for the light barriers. The pre-reset prevents unintentional starting when the operator is inside the service area.

	Action
1	Press the pre-reset button (this permits a pre-reset of the safety circuits for the light barriers of 10 seconds).
2	Press and hold the <i>start button (operator ready button)</i> on the operator panel within 10 seconds.

1.5.4 Risk of fire

**WARNING**

There is a risk of fire in connection with welding.

Safety measures

The following points should be observed:

- Observe local fire regulations for welding.
- Clean the area around the workplace regularly and ensure that the area is free of combustible material.
- Check that all connections in the welding current circuit are properly tightened. Poor contact can result in inferior welding results and a risk of fire.
- Check that the cables are correctly dimensioned. Cables that are underdimensioned can constitute a fire risk due to overheating.

Fire extinguishing

Use carbon dioxide (CO₂) if the equipment catches fire.

1 Safety

1.5.5 Risk of explosion

1.5.5 Risk of explosion

Gas cylinders

There is a great risk of the gas cylinders exploding in the event of a fire. Observe local safety instructions with regard to the handling and storing of gas cylinders.

1.5.6 Risk of electric shock



WARNING

The welding wire is live during the welding process even before the arc is ignited.

Safety measures

The following points should be observed:

- Do not mix up the phase and grounding conductors when connecting the equipment to the main supply.
- The workpiece, fixtures and positioner are usually in direct contact with the welding circuit, and should therefore be regarded as live.
- Do not touch live parts of the equipment with your bare hands or with damp gloves.
- Equip the operator station with an insulating mat.
- Connect the supplied 6 mm² earth conductor between the controller and the positioner. The connection points are prepared with M8 bolts. See *Product manual - IRC5*.
- The welding circuit must not be broken during the welding process.

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2 System description

2.1 System overview

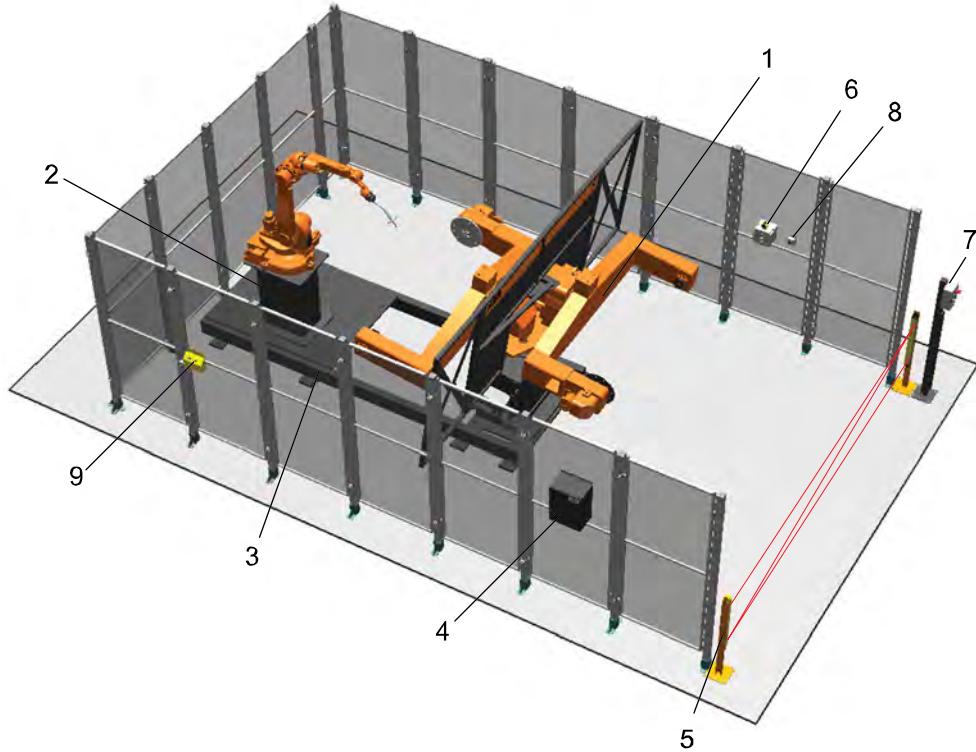
IRBP function package

The IRBP function package consists of the following units:

- Positioner(s) with one or two operator stations
- Robot(s) with process equipment for e.g. arc welding
- Control cabinet IRC5
- Operator panel(s)
- Personal safety system

Example of single robot system

Example of an IRBP D manipulator system:



xx0900000807

1	Positioner
2	Robot with pedestal
3	Floor mounting base
4	Safety module
5	Light beam
6	Pre-reset
7	Operator panel

Continues on next page

2 System description

2.1 System overview

Continued

8	Manual jog
9	Service door with gate switch
10	Controller

2.2 IRBP positioner

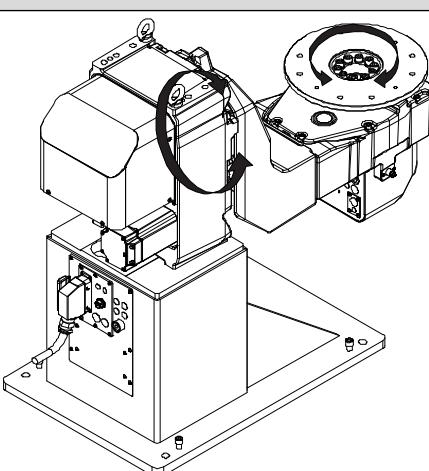
2.2.1 IRB Positioner overview

Positioner

A positioner is used to position work pieces optimally for welding joints and robots. The IRBP positioner is equipped with maintenance-free AC motors with electro-magnetic brakes.

The letter in the positioner name indicates the positioner type and the number indicates its maximum handling capacity in Kg.

Positioner models

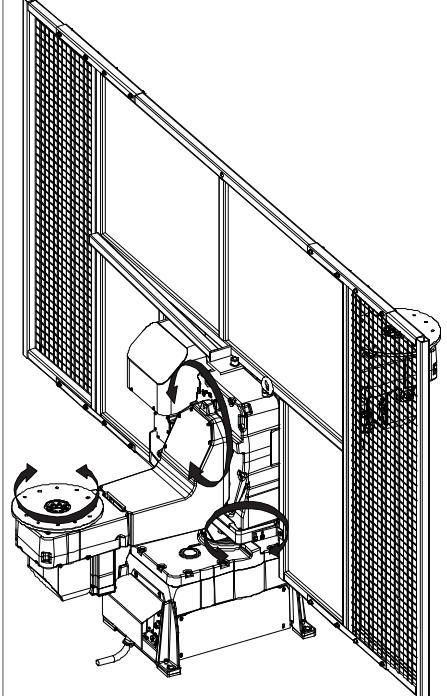
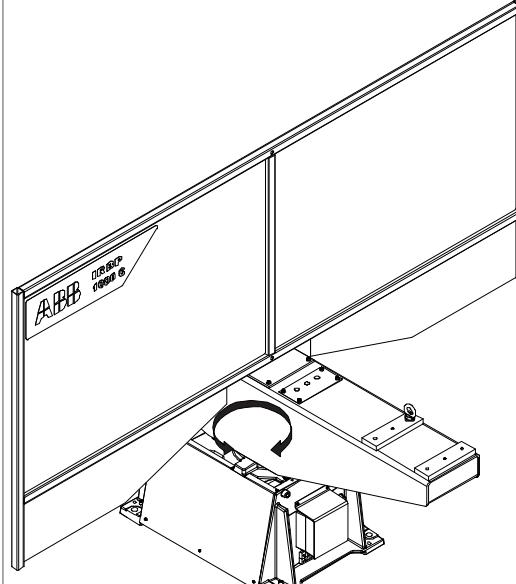
IRBP	Illustration
IRBP A: <ul style="list-style-type: none">• 250• 500• 750	

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2 System description

2.2.1 IRB Positioner overview

Continued

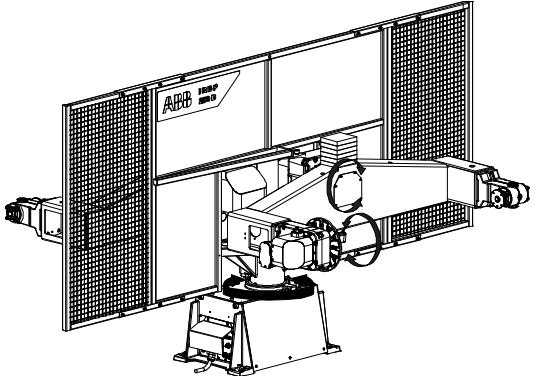
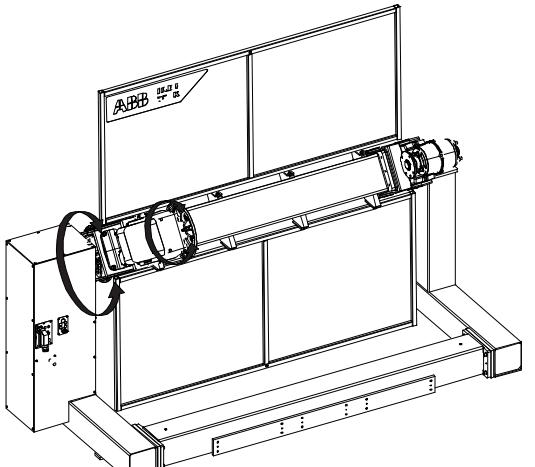
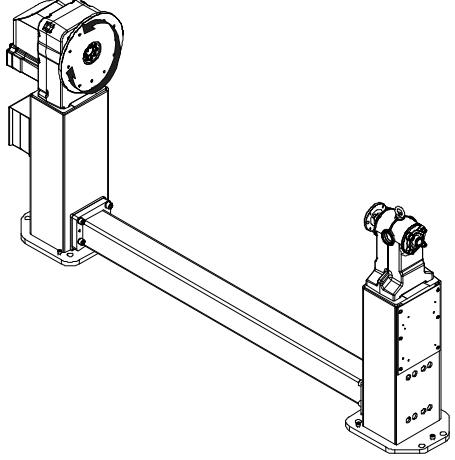
IRBP	Illustration
IRBP B: <ul style="list-style-type: none">• 250• 500• 750	 xx0900000840
IRBP C: <ul style="list-style-type: none">• 500• 1000	 xx0900000846

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2 System description

2.2.1 IRB Positioner overview

Continued

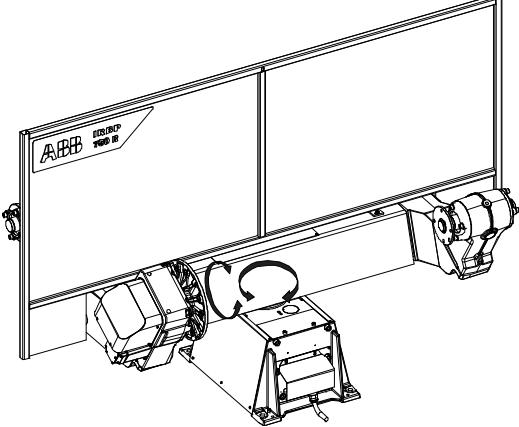
IRBP	Illustration
IRBP D: • 300 • 600	 xx0900000837
IRBP K: • 300 • 600 • 1000	 xx0900000832
IRBP L: • 300 • 600 • 1000 • 2000 • 5000	 xx0900000845

Continues on next page

2 System description

2.2.1 IRB Positioner overview

Continued

IRBP	Illustration
<p>IRBP R:</p> <ul style="list-style-type: none">• 300• 600• 1000	 <p>xx0900000838</p>

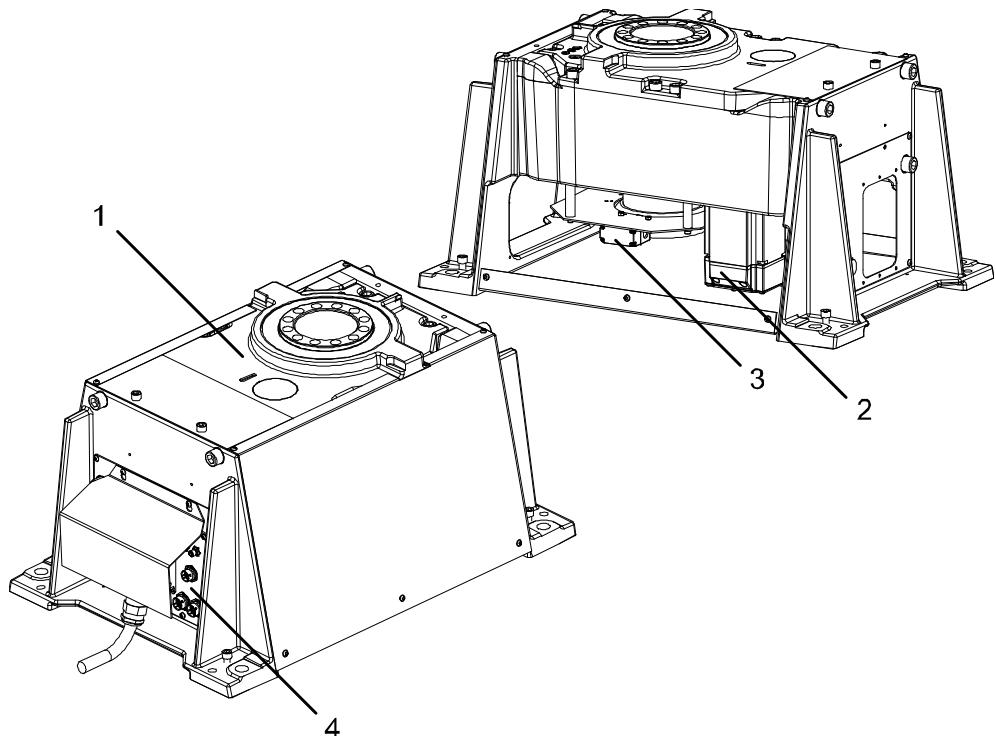
2.2.2 Station interchange unit MID

Station interchange unit components

The station interchange unit MID is a modular unit specifically developed for robot applications and is intended for indexed movement.

Station interchange unit MID 2.1

The station interchange unit for two stations consists of the following:



xx0900000834

1	Gear drive
2	AC servo motor with integrated resolver and brake
3	Limit switch with limit position disc
4	Connection panel

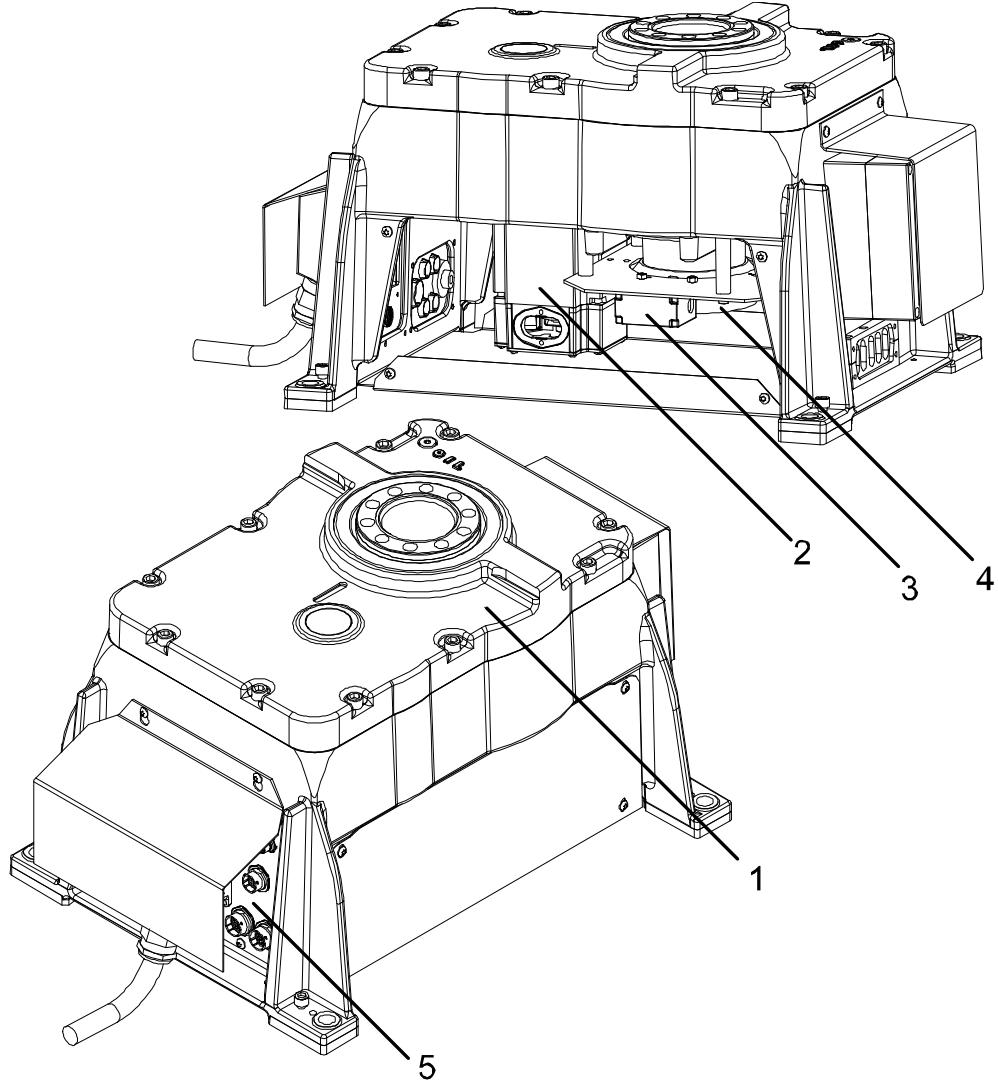
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2 System description

2.2.2 Station interchange unit MID

Continued

Station interchange unit MID 1.1



xx0900000841

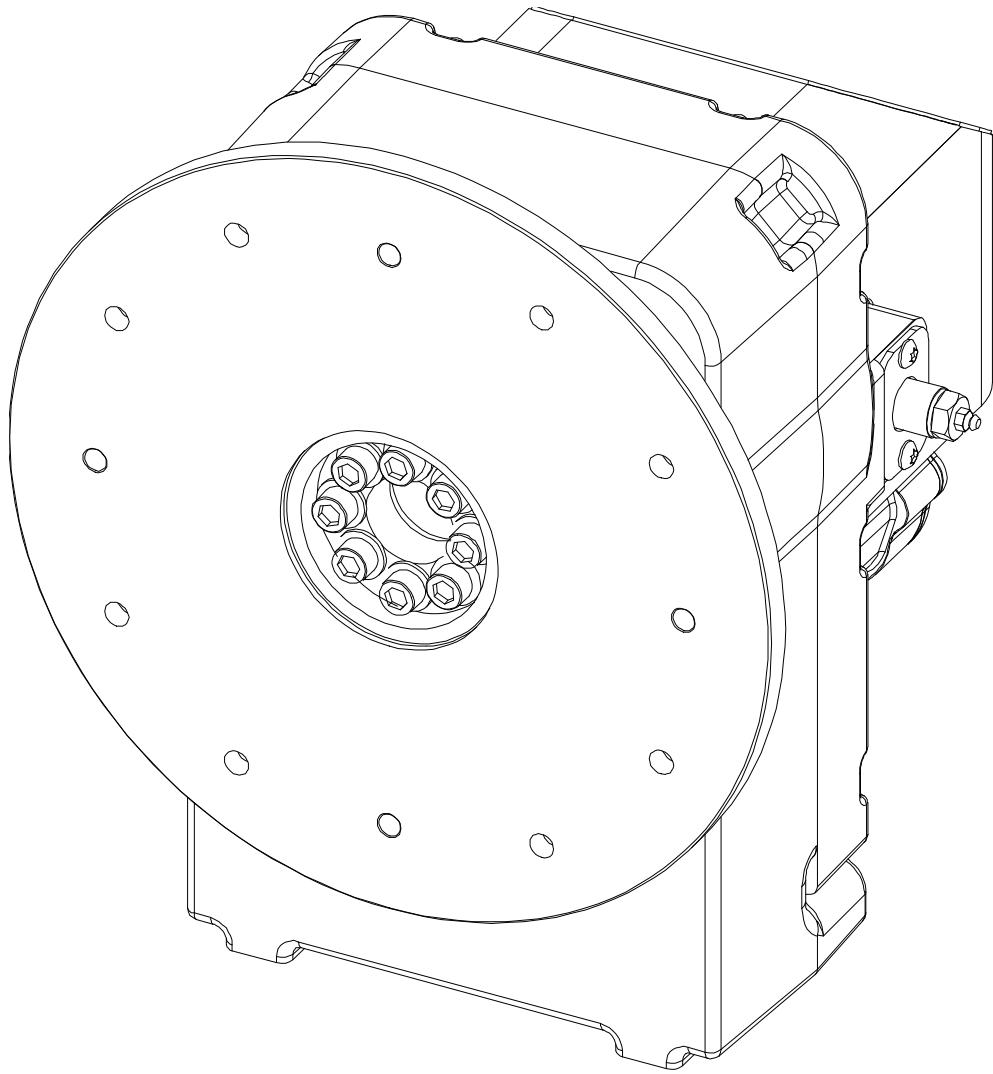
1	Gear drive
2	AC servo motor with integrated resolver and brake
3	Limit switch
4	Limit position disc
5	Connection panel

2.2.3 Rotary units

Rotary unit components

The rotary unit MTD is a modular unit, developed specifically for robot applications and is intended for positioning the workpiece.

MTD units



xx0900000843

MTD 250
MTD 500/750
MTD 2000
MTD 5000

Continues on next page

2 System description

2.2.3 Rotary units

Continued

MTD components

The rotary unit consists of the following components.

Gearbox

The gearbox is a precision gear drive specifically developed to withstand the high demands placed on robot applications, among others, rigidity and torsional strength, speed and accuracy. The gearbox is virtually free of play and never needs to be adjusted; conforming to requirements during its entire life. The gearbox is maintenance free and the lubricant is sufficient for the gearbox's entire life, equivalent to 40000 hours of operation.

Current collector

The function of the current collector is to transfer the weld current through the rotary unit. This takes place through a spring-loaded contact bar against the shaft. The contact bar needs to be lubricated after approximately 400 hours of operation. This should be done using a special grease, article number 501 869-001.

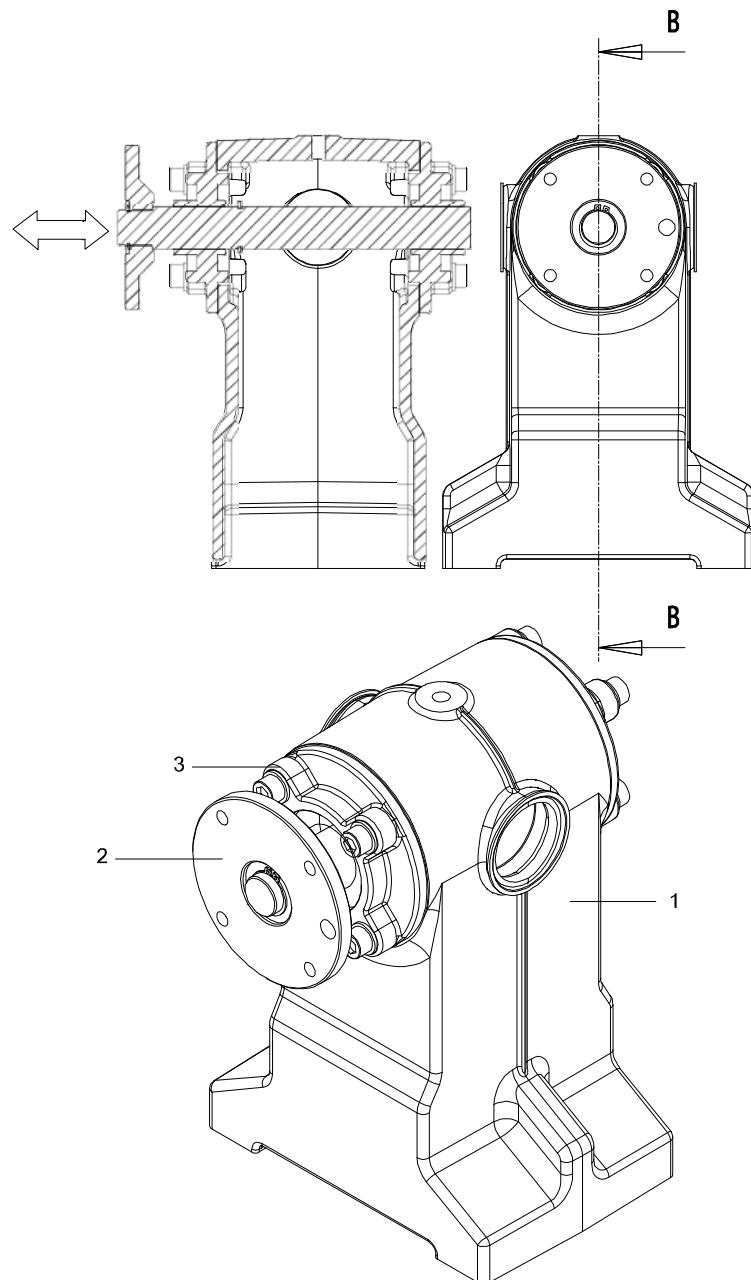
AC servo motor

The AC-servo motor is a permanent magnetized 3-phase AC motor and runs smoothly throughout the entire speed range. The motor is equipped with high-grade permanent magnets that are marginally affected by the temperature. The motor has a resolver for motor feedback and position indication. The motor is equipped with a brake for locking into a position when the rotary unit is not actuated and to provide braking with an emergency or operating stop. **This brake is not an operating brake.** This means that with normal operations the FlexPendant or the operator's panel are to be used to stop. The motor is grounded and electrically insulated from other parts in order to prevent the weld current from being conducted through the motor's protective conductor in the event of a malfunction. The motor is maintenance free.

2.2.4 Support collar

Components

The support collar allows axial movement during rotation.



xx0900000844

1	Support collar
2	Shaft with the mounting flange
3	Flange bearing with spherical bearing position.

2 System description

2.3.1 IRC5 controller

2.3 Control system

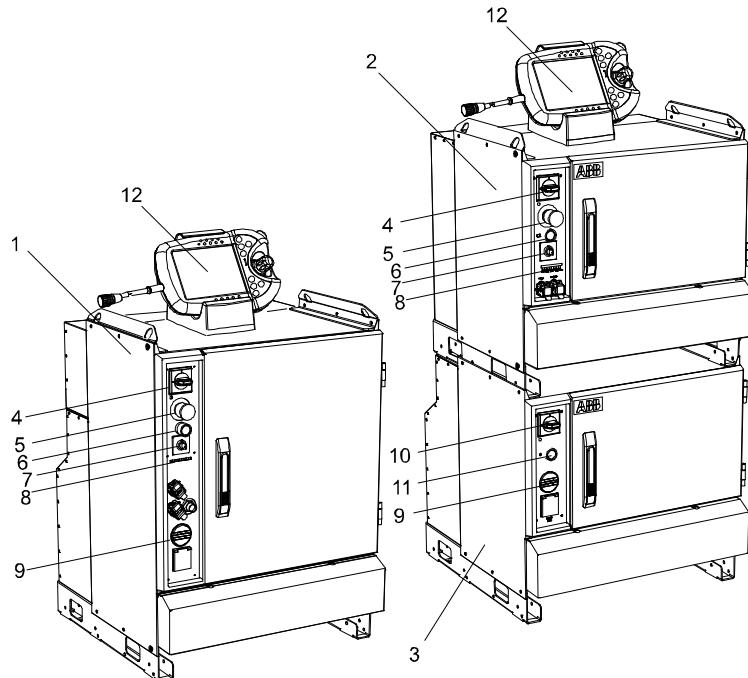
2.3.1 IRC5 controller

Single Cabinet Controller/Dual Cabinet Controller

The Single Cabinet Controller/Dual Cabinet Controller (Drive Module DM1) contains control equipment (axis selector unit) for IRBP positioners. It is installed on a pivot frame in the Single Cabinet Controller/Dual Cabinet Controller (Drive module). In the Dual Controller, the Drive Module (DM1) and Control Module (CM) are jointly connected to incoming power supply. Other drive modules (DM2–DM4) have separate incoming power sources.

Continues on next page

Control system with control panel at front



xx0900000853

1	SC (Single Cabinet)
2	CM (Dual Cabinet Control Module)
3	DM (Dual Cabinet Drive Module)
4	CM (Main power switch on Control Module or Single Cabinet)
5	Emergency stop on (Control Module or Single Cabinet)
6	MOTORS ON button on (Control Module or Single Cabinet)
7	Operating mode selector on (Control Module or Single Cabinet)
8	Diode panel that shows status of safety loops (option) on (Control Module or Single Cabinet)
9	Running time meter on (Drive Module or Single Cabinet)
10	Main power switch (Circuit Breaker) on Drive Module)
11	Stand by lamp indicates that electronic supply is switched on by the Control Module mains switch.
12	Flex Pendant

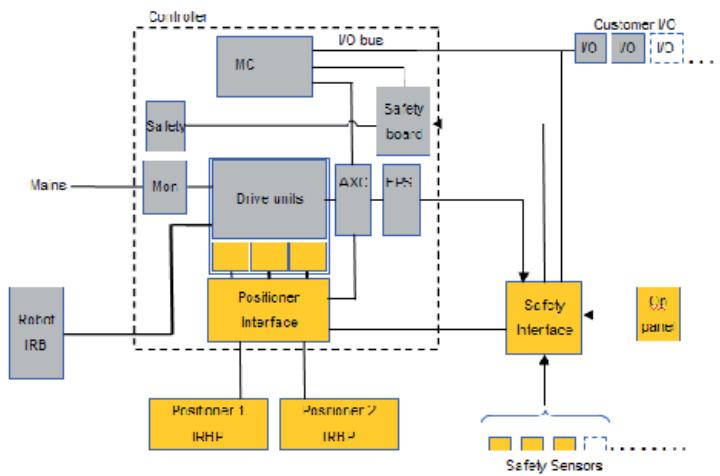
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2 System description

2.3.1 IRC5 controller

Continued

Block overview



xx1000000227

2.4 Operator panel

2.4.1 What is a FlexPendant?

Introduction to the FlexPendant

The FlexPendant is a hand held operator unit used to perform many of the tasks involved when operating a robot system: running programs, jogging the manipulator, modifying robot programs, and so on.

The FlexPendant is designed for continuous operation in harsh industrial environment. Its touch screen is easy to clean and resistant to water, oil and accidental welding splashes.

Complete computer and part of IRC5

The FlexPendant consists of both hardware and software and is a complete computer in itself. It is a part of IRC5, connected to the controller by an integrated cable and connector. The hot plug button option, however, makes it possible to disconnect the FlexPendant in automatic mode and continue running without it.

Continues on next page

2 System description

2.4.1 What is a FlexPendant?

Continued

Main parts

These are the main parts of the FlexPendant.



xx1400001636

A	Connector
B	Touch screen
C	Emergency stop button
D	Joystick
E	USB port
F	Three-position enabling device
G	Stylus pen
H	Reset button

Joystick

Use the joystick to move the manipulator. This is called jogging the robot. There are several settings for how the joystick will move the manipulator.

Continues on next page

USB port

Connect a USB memory to the USB port to read or save files. The USB memory is displayed as drive */USB:Removable* in dialogs and FlexPendant Explorer.



Note

Close the protective cap on the USB port when not used.

Stylus pen

The stylus pen included with the FlexPendant is located on the back. Pull the small handle to release the pen.

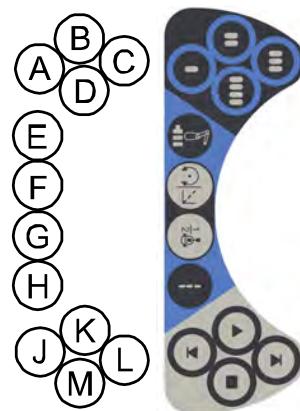
Use the stylus pen to tap on the touch screen when using the FlexPendant. Do not use screw drivers or other sharp objects.

Reset button

The reset button resets the FlexPendant, not the system on the controller.

Hard buttons

There are dedicated hardware buttons on the FlexPendant. You can assign your own functions to four of the buttons.



xx0900000023

A - D	Programmable keys, 1 - 4. How to define their respective function is detailed in section Programmable keys, in <i>Operating manual - IRC5 with FlexPendant</i> .
E	Select mechanical unit.
F	Toggle motion mode, reorient or linear.
G	Toggle motion mode, axis 1-3 or axis 4-6.
H	Toggle increments.
J	Step BACKWARD button. Executes one instruction backward as button is pressed.
K	START button. Starts program execution.
L	Step FORWARD button. Executes one instruction forward as button is pressed.
M	STOP button. Stops program execution.

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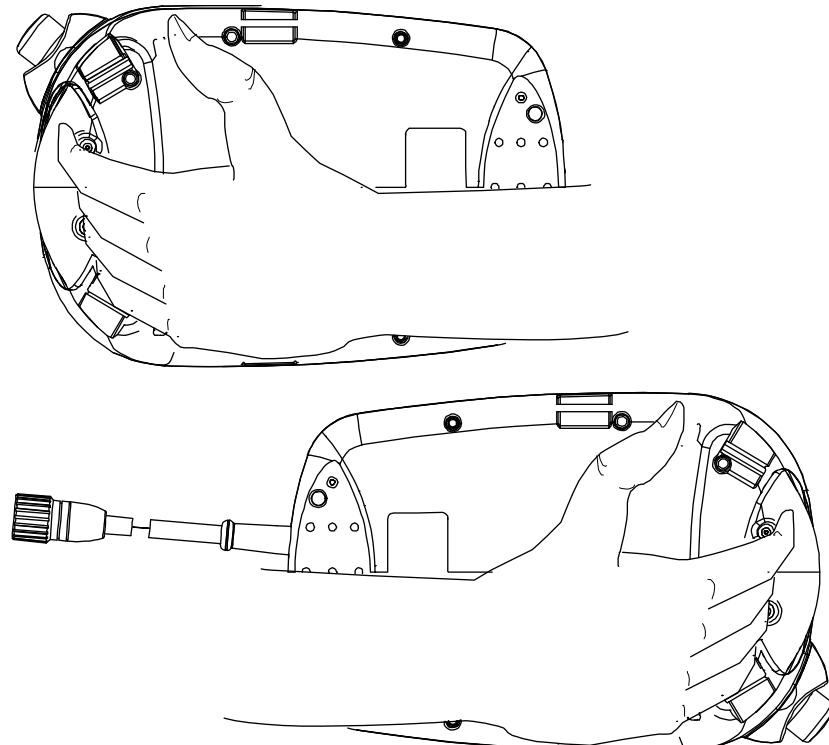
2 System description

2.4.1 What is a FlexPendant?

Continued

How to hold the FlexPendant

The FlexPendant is typically operated while being held in the hand. A right-handed person uses his left hand to support the device while the other hand performs operations on the touch screen. A left-hander, however, can easily rotate the display through 180 degrees and use his right hand to support the device. For more information about adapting the FlexPendant to left-handness, see *Operating manual - IRC5 with FlexPendant*.

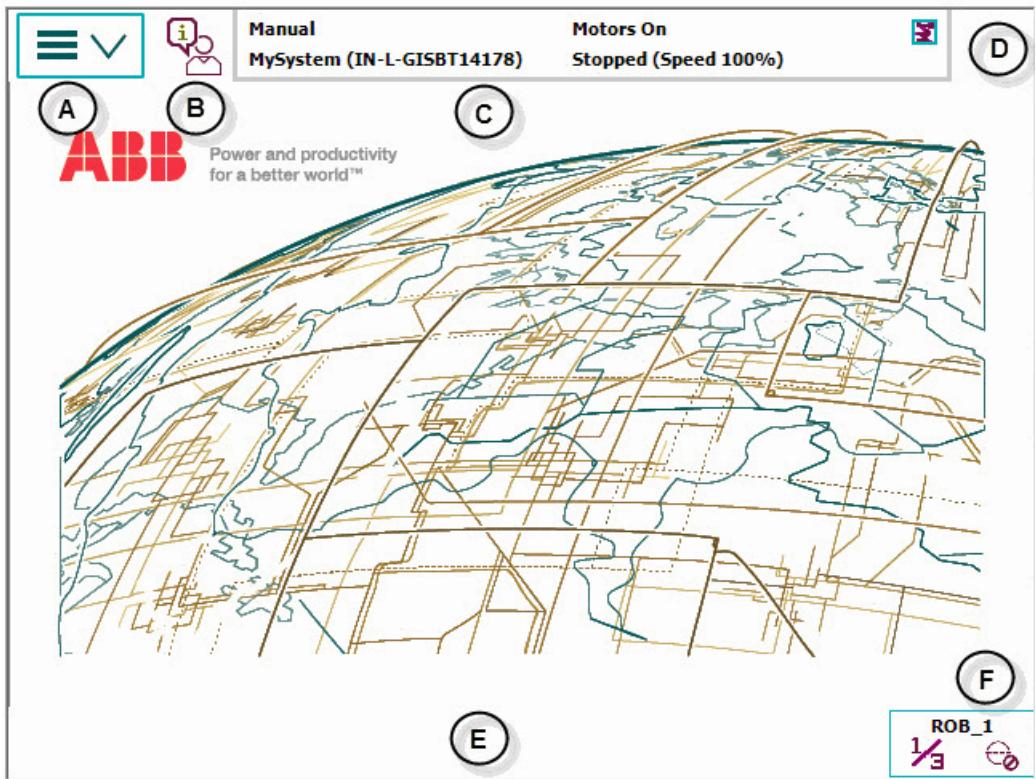


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Touch screen elements

The illustration shows important elements of the FlexPendant touch screen.



xx1400001446

A	ABB menu
B	Operator window
C	Status bar
D	Close button
E	Task bar
F	Quickset menu

ABB menu

The following items can be selected from the ABB menu:

- HotEdit
- Inputs and Outputs
- Jogging
- Production Window
- Program Editor
- Program Data
- Backup and Restore
- Calibration
- Control Panel
- Event Log

Continues on next page

2 System description

2.4.1 What is a FlexPendant?

Continued

- **FlexPendant Explorer**
- **System Info**
- etc.

This is further described in section *The ABB Menu in Operating manual - IRC5 with FlexPendant*.

Operator window

The operator window displays messages from robot programs. This usually happens when the program needs some kind of operator response in order to continue. This is described in section *Operator window in Operating manual - IRC5 with FlexPendant*.

Status bar

The status bar displays important information about system status, such as operating mode, motors on/off, program state and so on. This is described in section *Status bar in Operating manual - IRC5 with FlexPendant*.

Close button

Tapping the close button closes the presently active view or application.

Task bar

You can open several views from the ABB menu, but only work with one at a time. The task bar displays all open views and is used to switch between these.

Quickset menu

The quickset menu provides settings for jogging and program execution. This is described in section *The Quickset menu in Operating manual - IRC5 with FlexPendant*.

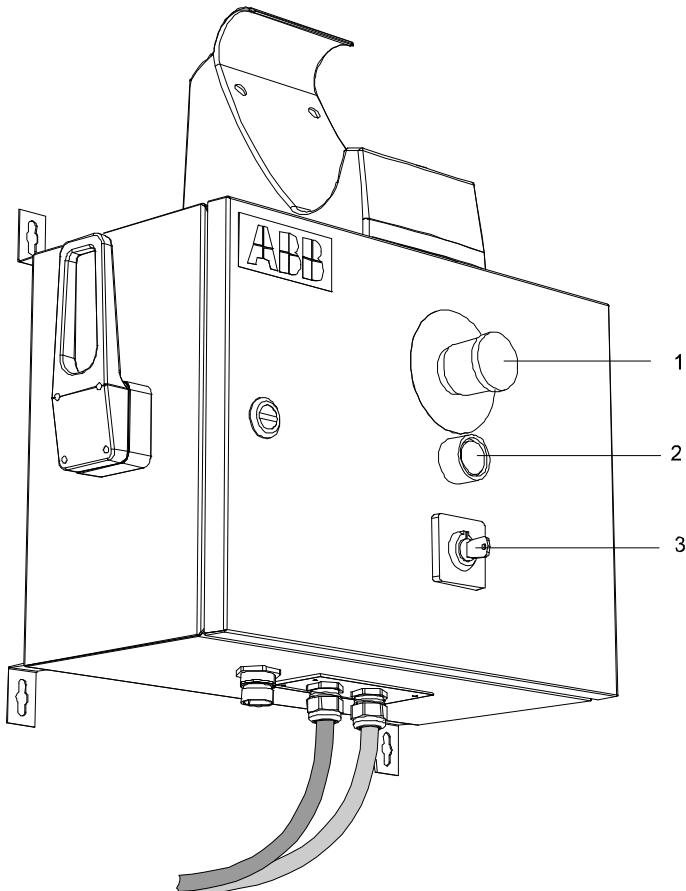
Operated in twenty languages

As the name suggests, the FlexPendant is designed with flexibility and adaptation to end-users' specific needs in mind. Currently, it can be operated in twenty different languages, including Asian character-based languages such as Chinese and Japanese.

Switching from one of the installed languages to another is easy. For more information about changing language, see *Operating manual - IRC5 with FlexPendant*.

2.4.2 External control units

External control panel



xx0900000860

1	Emergency stop
2	Motors On button
3	Operating mode selector

Continues on next page

2 System description

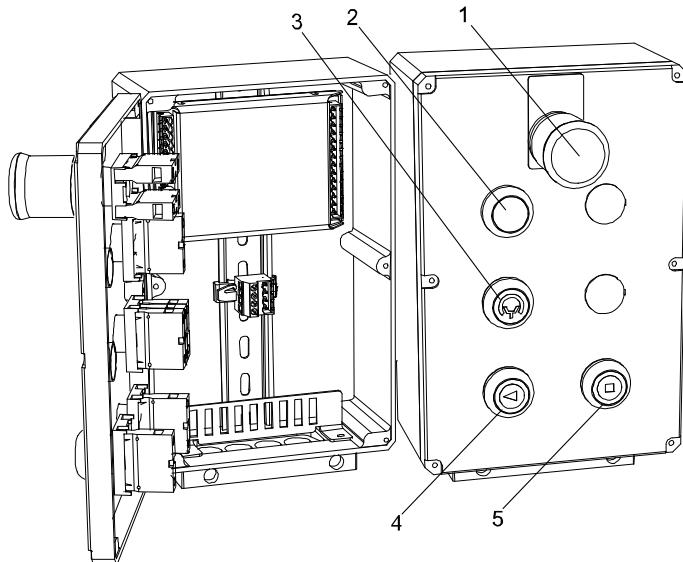
2.4.2 External control units

Continued

Operator panel

Single working area

This variant applies to stations with one working area for the operator.



xx0900000863

1	Emergency stop
2	Entry permitted indication
3	Start process, reset (toggle function)
4	Program start
5	Program stop

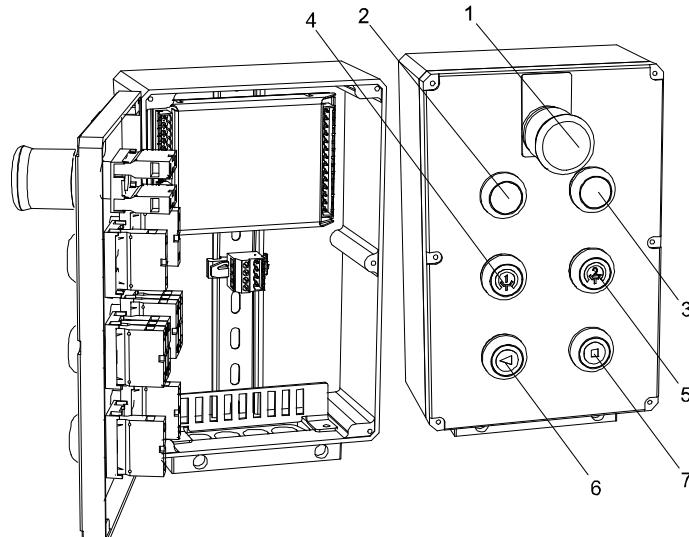
Description of buttons

Emergency stop	Pressing the emergency stop button immediately stops the entire welding robot system. The emergency stop button is connected in series with other emergency stop buttons in the system.
Entry permitted indication	When green, the lamp indicates that the station is ready for loading the next workpiece. Entry into the monitored area is permitted.
Start process	Press the button after loading the workpiece in station 1. The indication lamp in the button comes on and: 1 Gives the ready signal to the robot system that loading of the workpiece in the station is complete. 2 Resets the personal safety protection around the station's working area. 3 Starts the process. Press the button once again; the status lamp goes out: 1 Cancel button for operator ready. Stops the process.
Program start	Starts execution of the robot program. Enables welding restart.
Program stop	Stops execution of the robot program.

Continues on next page

Two working areas

This variant applies to stations with two working areas for the operator.



xx0900000864

1	Emergency stop
2	Entry permitted indication station 1
3	Entry permitted indication station 2
4	Start process, reset (toggle function), station 1
5	Start process, reset (toggle function), station 2
6	Program start
7	Program stop

Description of buttons

Emergency stop	Pressing the emergency stop button immediately stops the entire welding robot system. The emergency stop button is connected in series with other emergency stop buttons in the system.
Entry permitted indication, station 1/station 2	When green, the lamp indicates that station 1/station 2 is ready for loading the next workpiece. Entry into the monitored area is permitted.
Start process, station 1/station 2	Press the button after loading the workpiece in station 1/station 2. 1 Gives the ready signal to the robot system that loading of the workpiece in the station is complete. 2 Resets the personal safety protection around the station's working area. 3 Starts the process. Press the button once again; the status lamp goes out: 1 Cancel button for operator ready. Stops the process.
Program start	Starts execution of the robot program. Enables welding restart.
Program stop	Stops execution of the robot program.

Continues on next page

2 System description

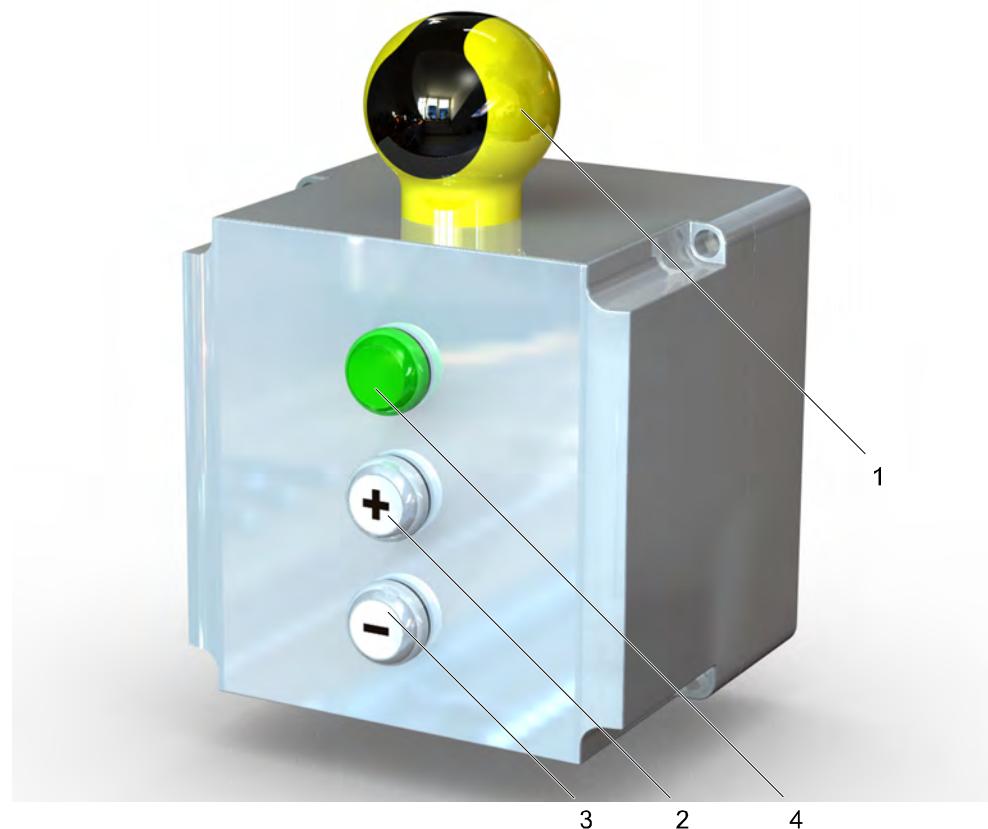
2.4.2 External control units

Continued

Manual jog control panel

The control panel is available in a configuration that can be used for:

- Positioner IRBP K/R
- Positioner 2 x IRBP L



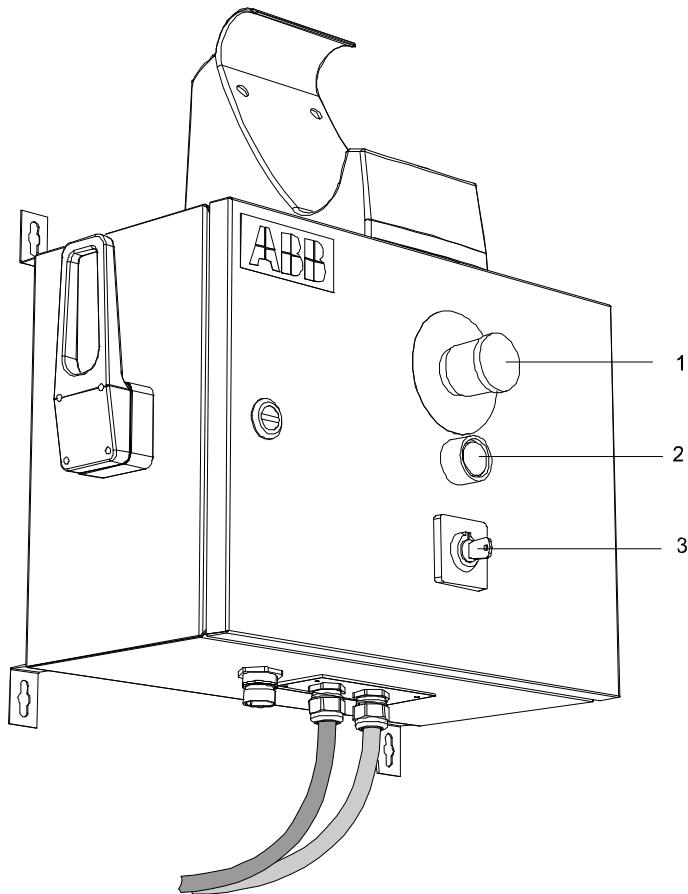
xx1000000251

1	SafeBall, activation
2	Indicates positive direction of travel
3	Indicates negative direction of travel
4	Indication lamp

For more information, see the product manual for manual jog.

Continues on next page

2.4.2.1 External control panel



xx0900000860

1	Emergency stop
2	Motors On button
3	Operating mode selector

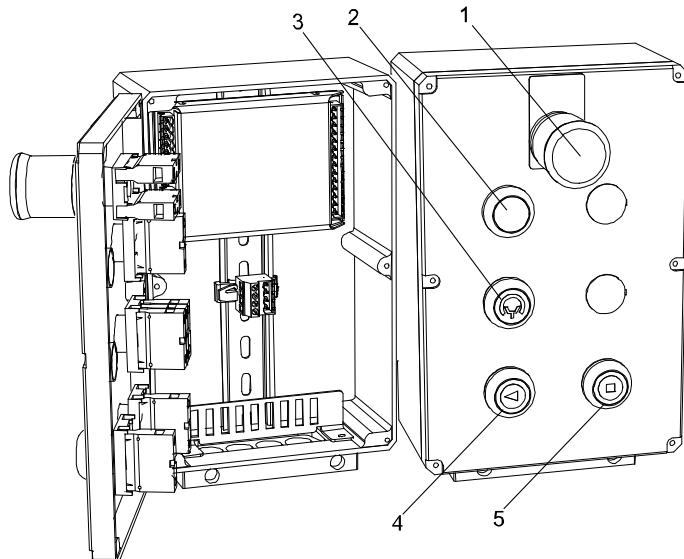
2 System description

2.4.2.2 Operator panel

2.4.2.2 Operator panel

Single working area

This variant applies to stations with one working area for the operator.



xx0900000863

1	Emergency stop
2	Entry permitted indication
3	Start process, reset (toggle function)
4	Program start
5	Program stop

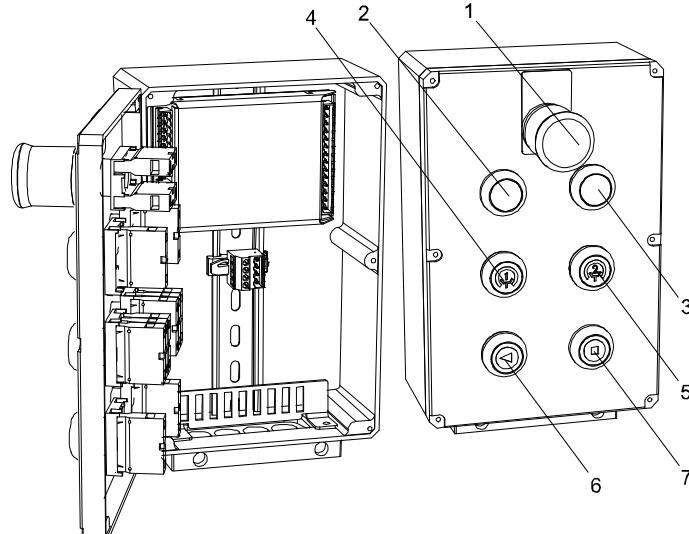
Description of buttons

Emergency stop	Pressing the emergency stop button immediately stops the entire welding robot system. The emergency stop button is connected in series with other emergency stop buttons in the system.
Entry permitted indication	When green, the lamp indicates that the station is ready for loading the next workpiece. Entry into the monitored area is permitted.
Start process	Press the button after loading the workpiece in station 1. The indication lamp in the button comes on and: 1 Gives the ready signal to the robot system that loading of the workpiece in the station is complete. 2 Resets the personal safety protection around the station's working area. 3 Starts the process. Press the button once again; the status lamp goes out: 1 Cancel button for operator ready. Stops the process.
Program start	Starts execution of the robot program. Enables welding restart.
Program stop	Stops execution of the robot program.

Continues on next page

Two working areas

This variant applies to stations with two working areas for the operator.



xx0900000864

1	Emergency stop
2	Entry permitted indication station 1
3	Entry permitted indication station 2
4	Start process, reset (toggle function), station 1
5	Start process, reset (toggle function), station 2
6	Program start
7	Program stop

Description of buttons

Emergency stop	Pressing the emergency stop button immediately stops the entire welding robot system. The emergency stop button is connected in series with other emergency stop buttons in the system.
Entry permitted indication, station 1/station 2	When green, the lamp indicates that station 1/station 2 is ready for loading the next workpiece. Entry into the monitored area is permitted.
Start process, station 1/station 2	<p>Press the button after loading the workpiece in station 1/station 2.</p> <ol style="list-style-type: none"> 1 Gives the ready signal to the robot system that loading of the workpiece in the station is complete. 2 Resets the personal safety protection around the station's working area. 3 Starts the process. <p>Press the button once again; the status lamp goes out:</p> <ol style="list-style-type: none"> 1 Cancel button for operator ready. Stops the process.
Program start	Starts execution of the robot program. Enables welding restart.
Program stop	Stops execution of the robot program.

2 System description

2.4.2.3 Manual jog control panel

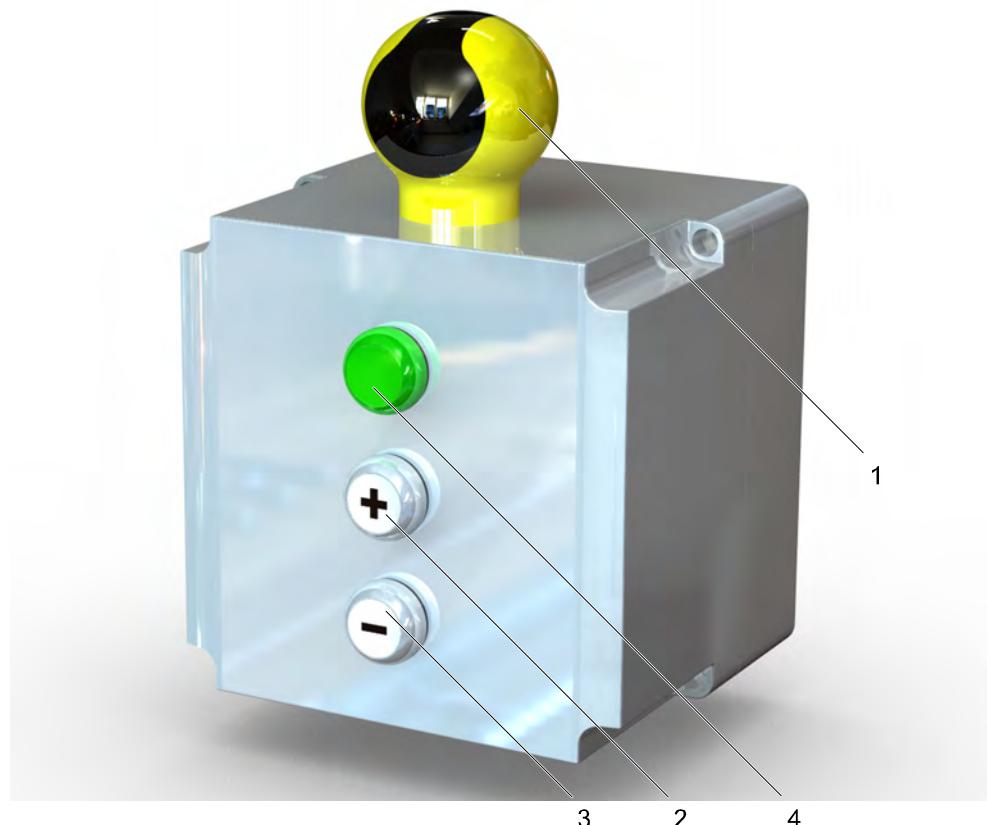
2.4.2.3 Manual jog control panel

Usage

The control panel is available in a configuration that can be used for:

- Positioner IRBP K/R
- Positioner 2 x IRBP L

Overview illustration



xx1000000251

1	SafeBall, activation
2	Button for rotation of axis in positive direction (+)
3	Button for rotation of axis in negative direction (-)
4	Indication lamp

Jogging the positioner

	Action	Note
1	Press SafeBall to permit activation and keep it pressed during the whole operation.	
2	Press (+) or (-) for the desired direction and keep it pressed for as long as the positioner shall move.	
3	Release the button for rotation, (+) or (-).	

Continues on next page

	Action	Note
4	Wait until the green indication lamp has turned off.	
5	Release the SafeBall.	



Note

If the SafeBall is released before the indication lamp is turned off, the manual jog program task gets stuck. To recover, it is necessary to go into the manual jog program task on the FlexPendant and move the pointer to top of the task.

2 System description

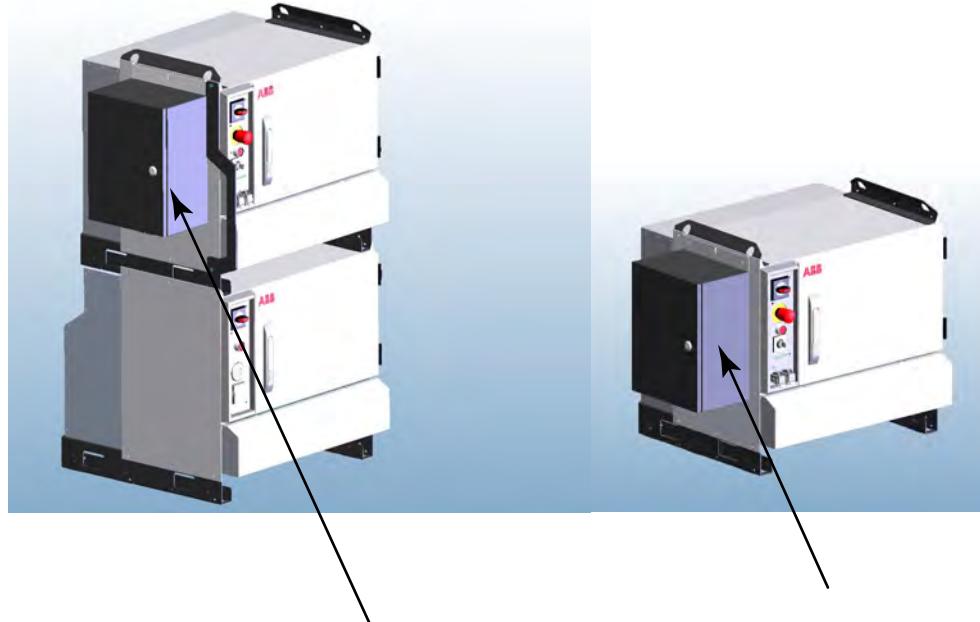
2.5.1 Location of safety equipment

2.5 Safety equipment (options)

2.5.1 Location of safety equipment

Safety control equipment

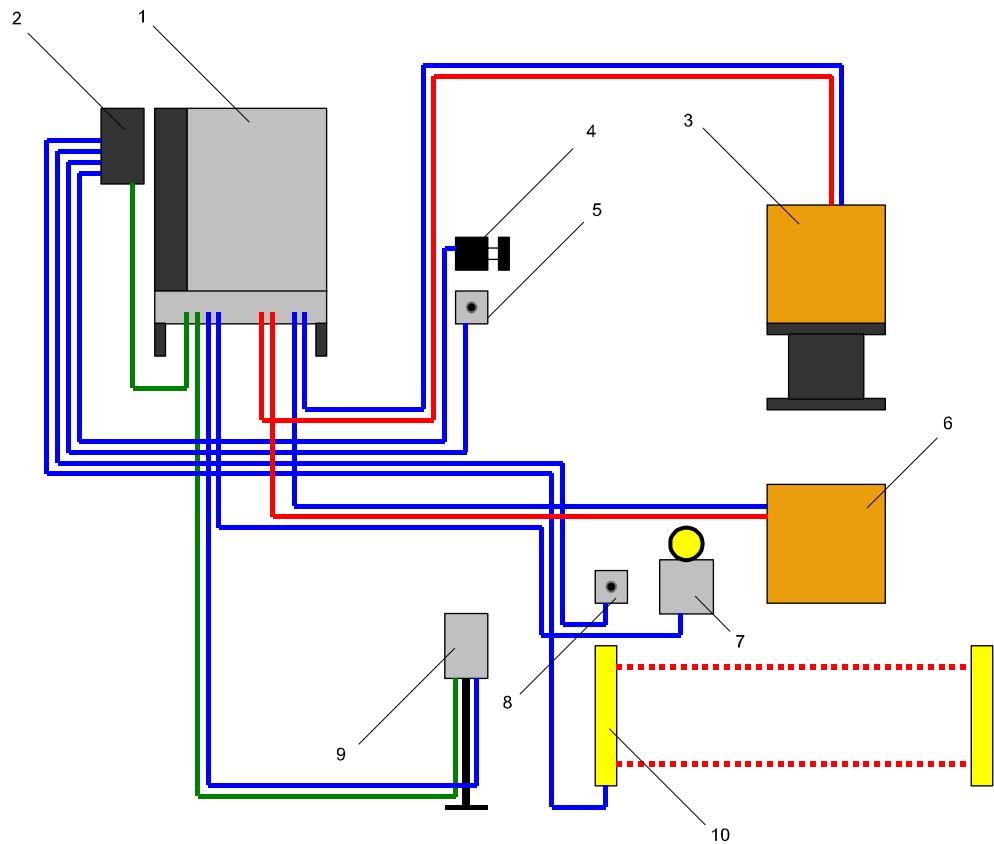
Safety control equipment is located on the sidewall of the cabinet. The control equipment may also be located on the guard or on a stationary building wall.



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Continues on next page

Safety block diagram



xx0900000896

1	Controller
2	Safety control equipment
3	IRB
4	Gate switch
5	Gate reset
6	IRBP
7	Manual jog panel
8	Pre-reset
9	Operating panel
10	Light barrier

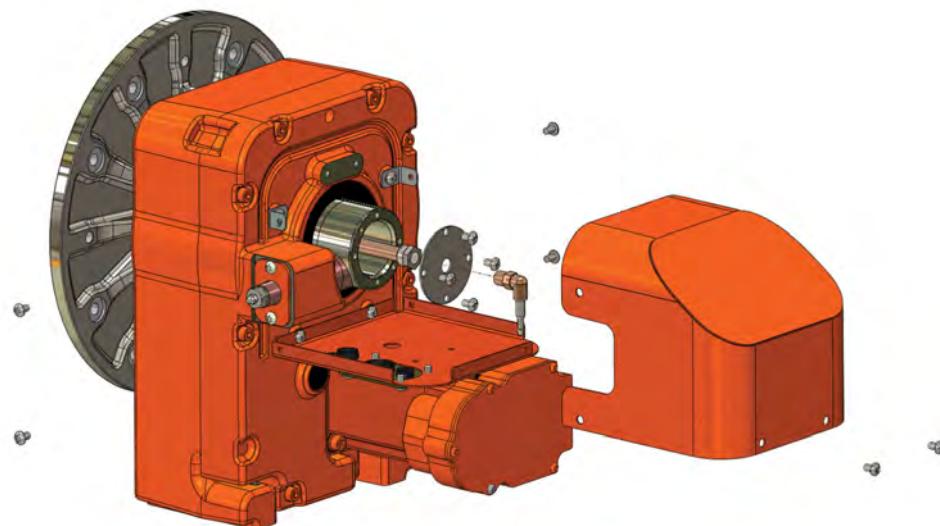
2 System description

2.6.1 Optional swivels

2.6 Customer options

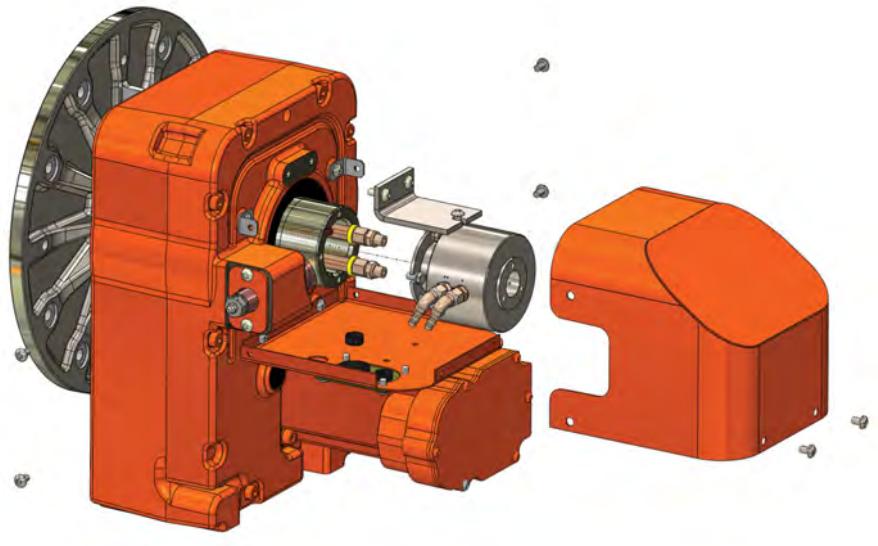
2.6.1 Optional swivels

Air swivel, 1 channel



xx1000000177

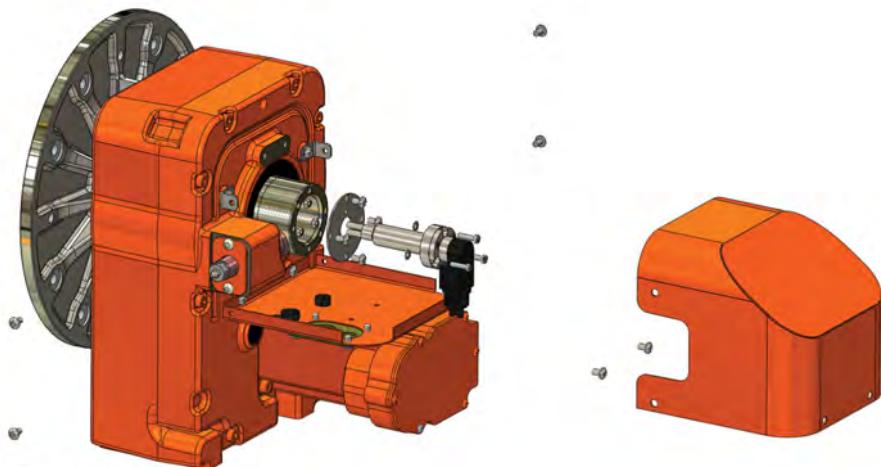
Air swivel, 2 channel



xx1000000179

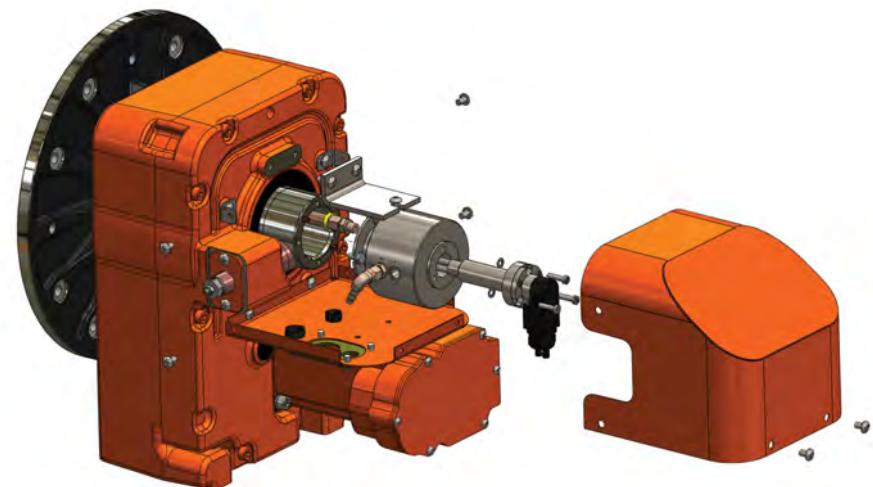
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Electrical swivel



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Air swivel, 1 channel and 1 electrical channel



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3 Installation and commissioning

3.1 Introduction

General

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

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

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

Safety information

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

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



Note

If the IRBP 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*

3 Installation and commissioning

3.2 Installation and set-up

3.2 Installation and set-up



WARNING

This work must only be carried out by persons trained in the complete installation, who are aware of the particular risks associated with its different parts.



CAUTION

Caution must be observed. All work carried out on the system shall be done professionally and conform to the applicable safety regulations.

Transport and unpacking



WARNING

The safety instructions and other instructions should be studied carefully before initiating transport and unpacking of the safety equipment. These can be found under a separate tab in the System Manual.

Unpacking

- Check that the equipment is not damaged in any way.
- Report any visible transport damage immediately.

Lifting instructions

Lifting of the safety equipment must only:

- be carried out using equipment that corresponds with the applicable lifting standards.
- be carried out by authorized personnel.



Note

Lifting eyes (standard as well as with swivel) are not delivered with the IRBP. Use lifting eyes and/or swiveled lifting eyes in the proper positions as described in the lifting instructions for each IRBP. Always use lifting eyes with the correct lifting capacity according to the part being lifted.



WARNING

Do not walk under a suspended load!

3.3 Unpacking and handling

3.3.1 Pre-installation procedure, IRBP

General

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

Checking the pre-requisites for installation

The checklist below details what must be observed before proceeding with the actual installation of the IRBP system:

	Action
1	Make sure only qualified installation personnel conforming to all national and local codes are allowed to perform the installation.
2	Visually inspect the robot to make sure it is not damaged.
3	Make sure the lifting accessory used is suitable to handle the weight of the system units.
4	If the IRBP system is not installed directly, it must be stored.
5	Before taking the IRBP system to its installation site, make sure the foundation conforms to the requirements.
6	Before moving the IRBP system, please observe and read the sections regarding lifting of the IRBP system.
7	When these prerequisites are met, the IRBP system may be taken to its installation site:

Requirements, foundation

The positioner requires a good foundation and/or a concrete floor with strength according to standard C20/25 or better according to ENV 206. If necessary, use shims under the foundation of the positioner to avoid alignment problem. The bolts can be either anchor or chemical type. For more detailed information regarding installation please see section [Forces on foundation on page 105](#).

Storage conditions

The table below shows the allowed storage conditions for the robot:

Parameter	Value
Min. ambient temperature	-25° C
Max. ambient temperature	+55° C
Max. ambient temperature (less than 24 h)	+70° C
Max. ambient humidity	Max. 95% at constant temperature

Continues on next page

3 Installation and commissioning

3.3.1 Pre-installation procedure, IRBP

Continued

Operating conditions

The table below shows the allowed operating conditions for the robot:

Parameter	Value
Min. ambient temperature	+5° C 0° C ¹⁾
Max. ambient temperature	+50° C ¹⁾
Max. ambient humidity	Max. 95% at constant temperature

¹⁾At cold start (0° C - 5° C), see note in the product specification on how to warm up the robot.

Protection classes

The table below shows the protection class of the manipulators:

Equipment	Protection class
Manipulator IRBP A	IP 42
Manipulator IRBP B	IP 42
Manipulator IRBP C	IP 42
Manipulator IRBP D	IP 42
Manipulator IRBP L	IP 65
Manipulator IRBP K	IP 42
Manipulator IRBP R	IP 42

3.3.2 Lifting the IRBP

Actions before lifting

Refer section [Lifting instructions on page 317](#) before lifting the manipulator.



Note

Lifting eyes (standard as well as with swivel) are not delivered with the IRBP. Use lifting eyes and/or lifting eyes with swivel in the proper positions as described in the lifting instructions for each IRBP. Always use lifting eyes with the correct lifting capacity according to the part being lifted.



WARNING

Always lift the manipulator in a safe manner, using lifting tools according to the specified lifting weight in section [Lifting weight](#).



WARNING

Do not walk under a suspended load!



WARNING

In order to prevent damage, only use the pre-mounted lifting eyes.

Lifting weight

The table below shows the minimum and maximum weights of the different IRBP models, for exact weight see the silver tags on the manipulator:

Weight IRBP

IRBP model	Handling weight/Kg	Weight min.	Weight max
IRBP A	250		470
	500		870
	750		870
IRBP B	250		470
	500		870
	750		870
IRBP C	500		380
	1000		660
IRBP D	300	1520	1560
	600	2870	2960

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3 Installation and commissioning

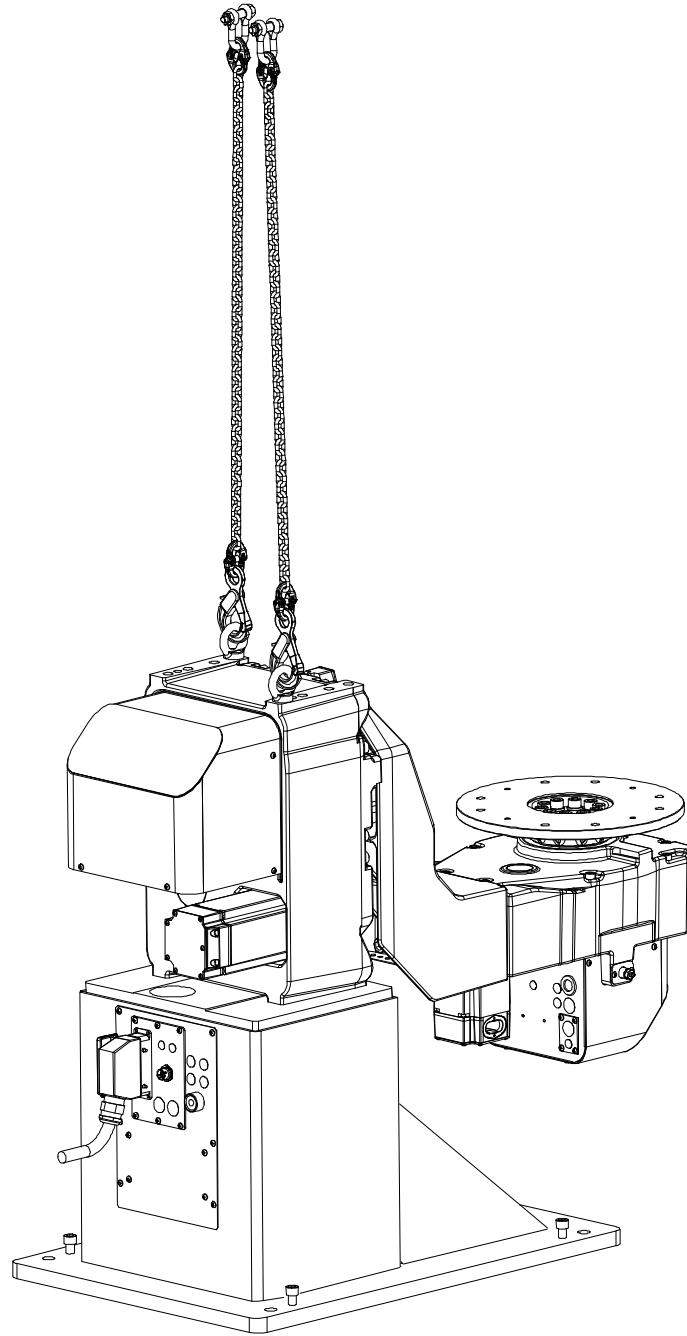
3.3.2 Lifting the IRBP

Continued

IRBP model	Handling weight/Kg	Weight min.	Weight max
IRBP L	300	250	300
	600	465	515
	1000	465	515
	2000	700	740
	5000		
IRBP K	300	1090	1515
	600	1980	2570
	1000	1980	2570
IRBP R	300	620	645
	600	1285	1380
	1000	1285	1380

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Lifting IRBP A



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3 Installation and commissioning

3.3.2 Lifting the IRBP

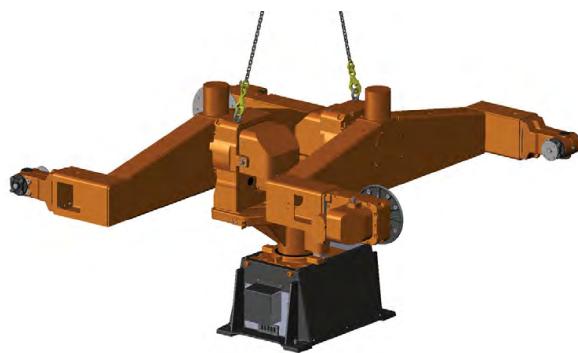
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Lifting IRBP B



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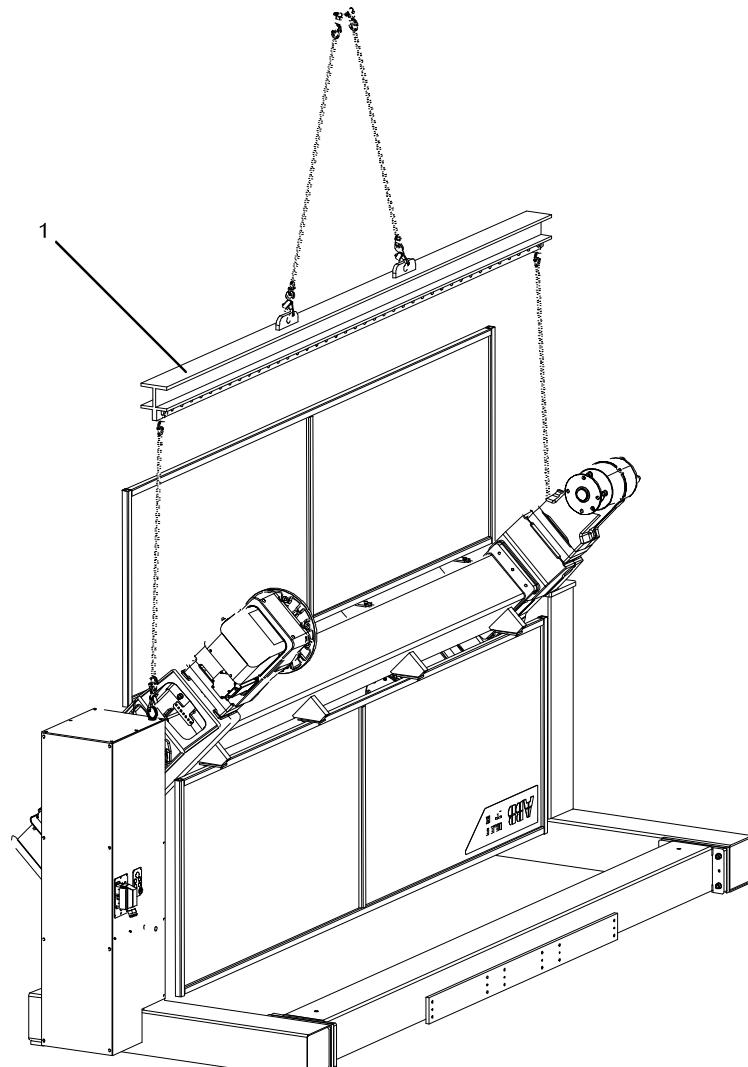
Lifting IRBP D



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Lifting IRBP R, K



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1	Lifting beam 4000 mm
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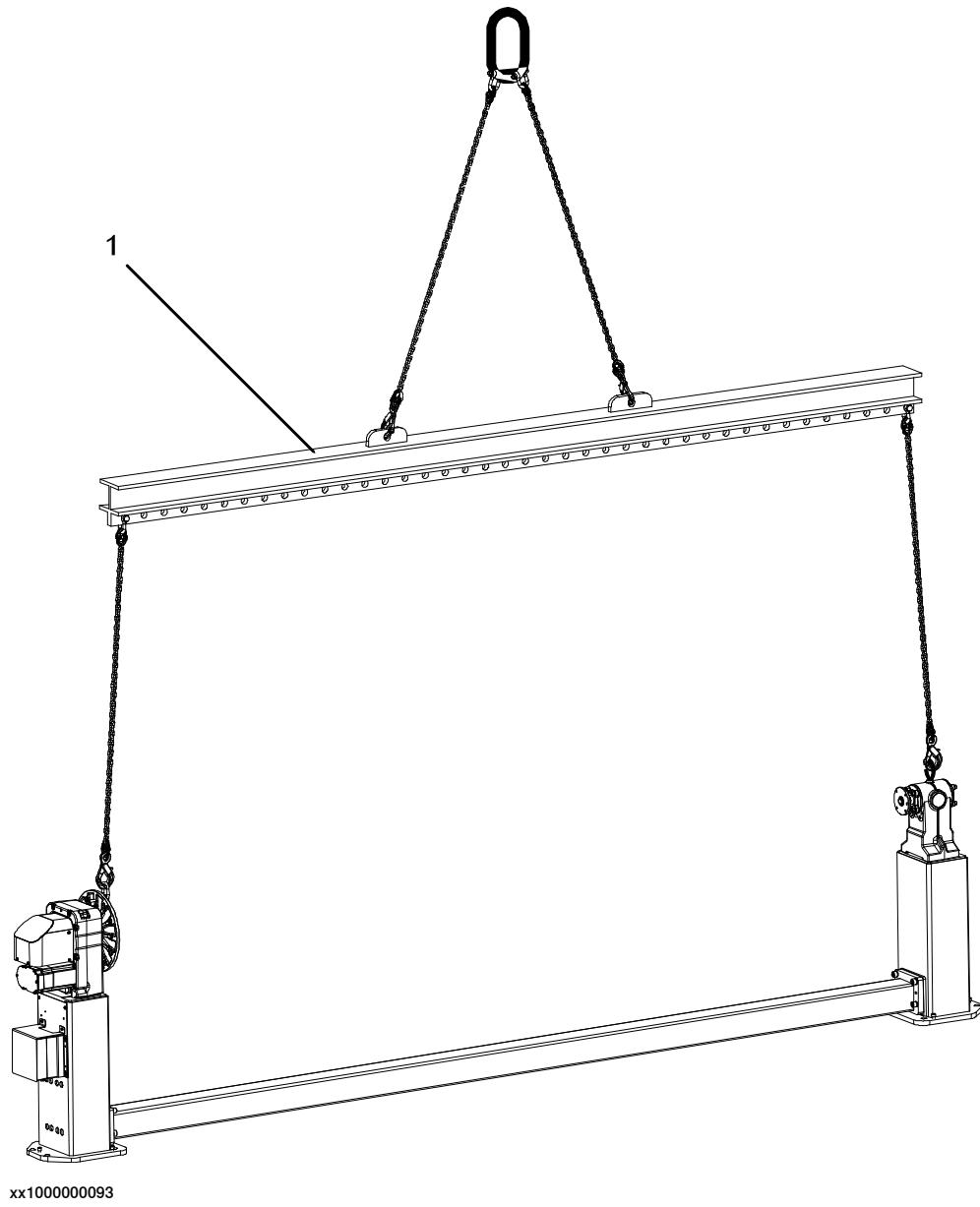
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3 Installation and commissioning

3.3.2 Lifting the IRBP

Continued

Lifting IRBP L



3.3.3 Forces on foundation

Robustness

The foundation must withstand the static loads caused by the weight of the equipment, and the dynamic loads generated by the movement of the manipulator.

Incline

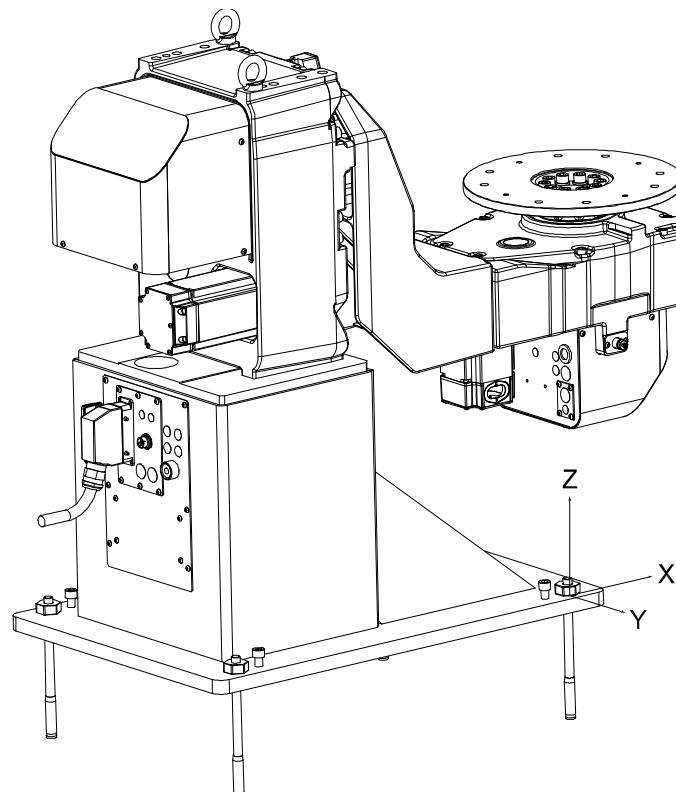
The foundation must be designed, so that the manipulator can be mounted without the incline exceeding 0.5 mm/m.

Maximum floor loads

When a floor mounting base (FMB) is used, then the floor load is the combined load from both the positioner and the robot. The forces are the sum of the maximum component for each direction.

Maximum floor loads in relation to the base coordinate system and indicated per each screw of the base on the positioner, see figure below.

Forces IRBP A



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Rotation unit	Endurance load in operation (N)		Max load at emergency stop (N)		Screw dimension
	Fxy	Fz	Fxy	Fz	
A-250	800	6300	1930	11500	M16
A-500	3300	12900	6700	23200	M20

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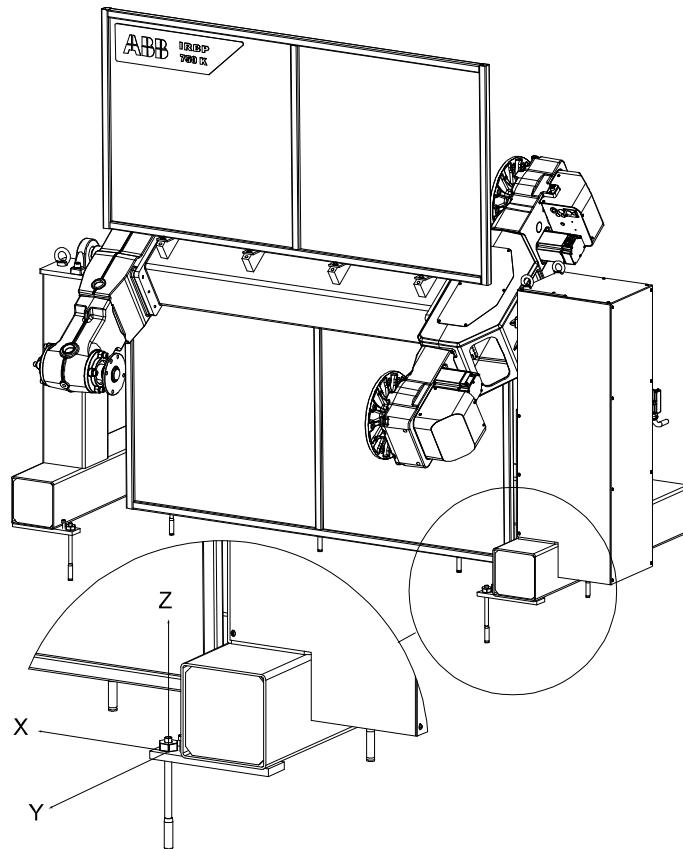
3 Installation and commissioning

3.3.3 Forces on foundation

Continued

Rotation unit	Endurance load in operation (N)		Max load at emergency stop (N)		Screw dimension
	Fxy	Fz	Fxy	Fz	
A-750	4400	17200	9000	31000	M20

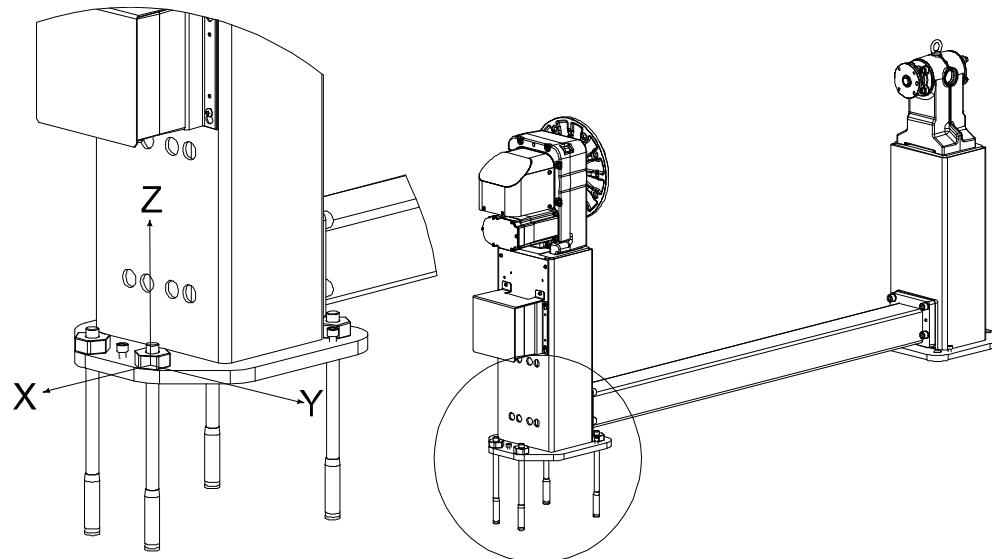
Forces IRBP K



Rotation unit	Endurance load in operation (N)		Max load at emergency stop (N)		Screw dimension
	Fxy	Fz	Fxy	Fz	
K-300	1000	3100	1500	5000	M20
K-600	2000	7000	2000	10200	M20
K-1000	2000	7000	2000	10200	M20

Continues on next page

Forces IRBP L



xx0900000909

Rotation unit	Endurance load in opera- tion (N)		Max load at emergency stop (N)		Screw dimen- sion
	F _{xy}	F _z	F _{xy}	F _z	
L-300	500	5200	1800	8900	M20
L-600	1200	12000	2200	18800	M20
L-1000	1200	12000	2200	18800	M20
L-2000	1700	25700	3700	36700	M20
L-5000	3000	35000	9000	44500	M20

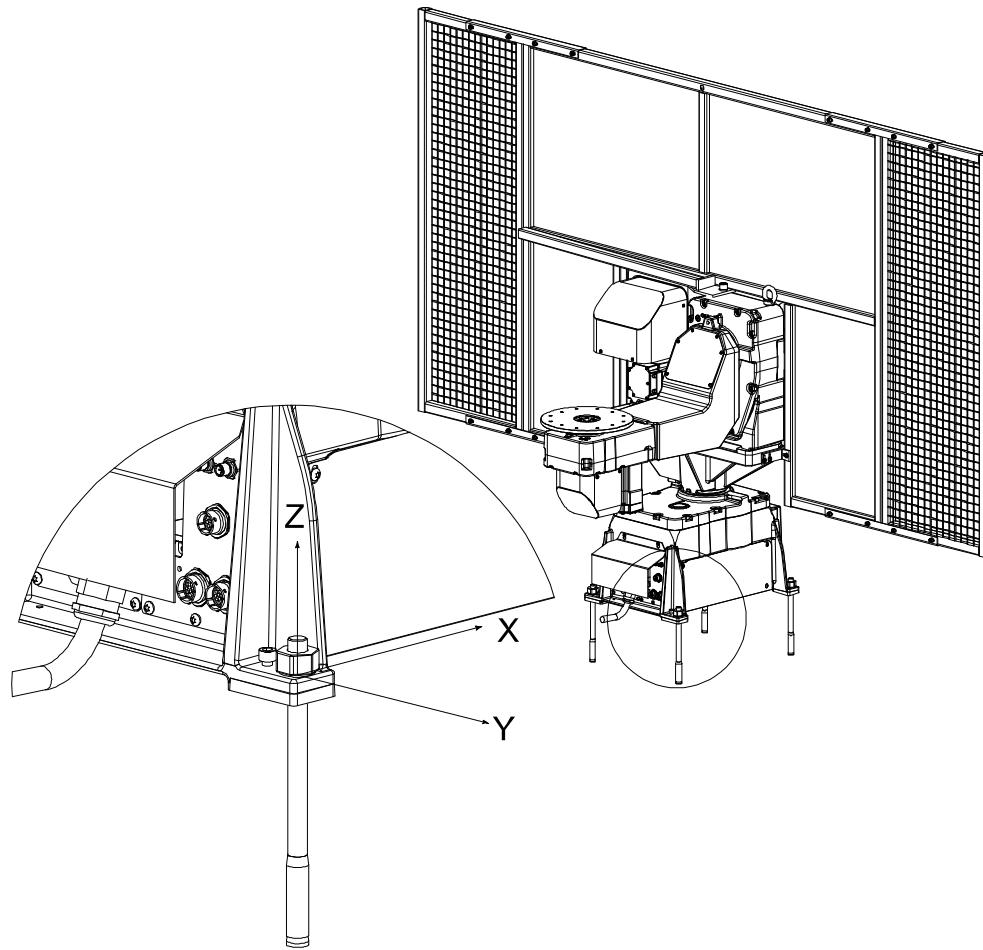
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3 Installation and commissioning

3.3.3 Forces on foundation

Continued

Forces IRBP B/C/D/R



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Rotation unit	Endurance load in operation (N)		Max load at emergency stop (N)		Screw dimension
	Fxy	Fz	Fxy	Fz	
B-250	2000	8300	3600	12400	M16
B-500	5000	20600	9000	30900	M20
B-750	5000	20600	9000	30900	M20
C-500	1500	6000	3000	8000	M16
C-1000	2700	15000	6400	22300	M20
D-300	2500	10300	4500	15500	M20
D-600	5000	20600	9000	30900	M20
R-300	1380	5400	3000	7800	M16
R-600	2700	15000	6400	22300	M20
R-1000	2700	15000	6400	22300	M20

3.3.4 Recommendations for attachment bolts and screws

Attachment bolts

Chemical anchor bolts or expansion-shell bolts are recommended for securing the manipulator to the floor. However, the attachment bolts are not supplied since they must be selected based on the material or the foundation.

Choose attachment bolts so that they are suitable for and fit inside the holes in the foundation. Choose attachment bolts that can handle the dynamic loads.

The bolts must be able to bear the combined dynamic loads that can occur when the manipulator is stopped with the emergency brake.

Instructions for tightening screw joints

Recommended screws for securing the manipulator to the base	Note
Steel structure	See section Screw joints on page 110
Concrete floor	See section Screw joints on page 110



Note

Expansion shell anchor bolts with a notch or chemical anchor are recommended for the IRBP.



CAUTION

It is of the utmost importance that all screw joints be tightened with the correct torque.

Application

The following tightening torques are to be used for all screw joints in metallic materials unless otherwise specified in the text. See section [Screw joints on page 110](#). These instructions do not apply to screw joints composed of soft or brittle materials. For screws with a higher property class than 8.8, the data for 8.8 must be used unless otherwise specified.

3 Installation and commissioning

3.3.5 Screw joints

3.3.5 Screw joints

General

This section describes how to tighten the various types of screw joints on the IRBP.

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.
- Always *tighten the joint by hand*, and never use pneumatic tools.

Continues on next page

- Use the *correct tightening technique*, that is *do not jerk*. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is 10%!

Oil-lubricated screws with slotted or cross-recess head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws with slotted or cross-recess head screws*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Oil-lubricated screws with allen head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws with allen head screws*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Dimension	Tightening torque (Nm) Class 8.8, oil-lubricated	Tightening torque (Nm) Class 10.9, oil-lubricated	Tightening torque (Nm) Class 12.9, oil-lubricated
M5	6	-	-
M6	10	-	-
M8	24	34	40
M10	47	67	80
M12	82	115	140
M16	200	290	340
M20	400	560	670
M24	680	960	1150

Lubricated screws (Molykote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for *screws lubricated with Molykote 1000, Gleitmo 603 or equivalent with allen head screws*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

Dimension	Tightening torque (Nm) Class 10.9, lubricated ⁱ	Tightening torque (Nm) Class 12.9, lubricated ⁱ
M8	28	35
M10	55	70
M12	96	120
M16	235	280
M20	460	550
M24	790	950

ⁱ Lubricated with Molykote 1000, Gleitmo 603 or equivalent

Continues on next page

3 Installation and commissioning

3.3.5 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!

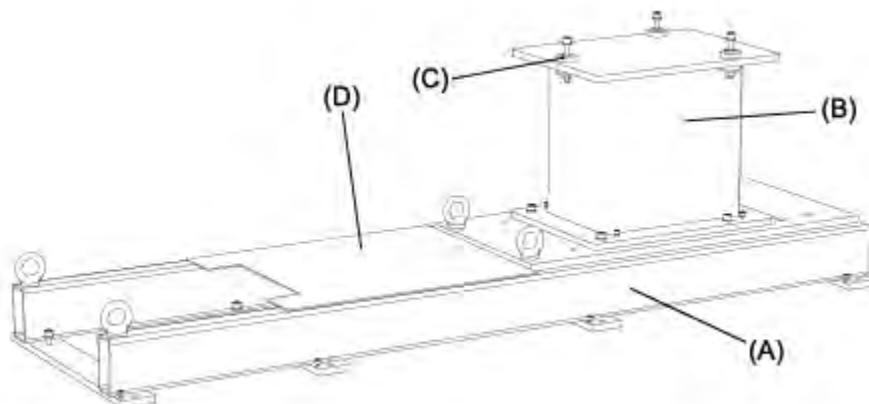
Dimension	Tightening torque Nm - Nominal	Tightening torque Nm - Min.	Tightening torque Nm - Max.
1/8	12	8	15
1/4	15	10	20
3/8	20	15	25
1/2	40	30	50
3/4	70	55	90

3.4 On-site installation

3.4.1 Securing the robot stand (optional)

Robot stand parts

The robot stand consists of the following parts:



xx1000000225

A	Floor mount base,
B	Robot pedestal,
C	Insulation
D	Cover plate



Note

The pedestal can be placed in different hole groups on the stand. Exercise care to ensure the robot and positioner do not collide during station switching. Recommended spacing, see the chapter for respective positioner.

Continues on next page

3 Installation and commissioning

3.4.1 Securing the robot stand (optional)

Continued

Prerequisites

The positioner requires a good foundation and/or a concrete floor with strength according to standard C20/25 or better according to ENV 206. If necessary, use shims under the foundation of the positioner to avoid alignment problem. The bolts can be either anchor or chemical type. For more information see section [**Forces on foundation on page 105**](#)

Procedure

Use this procedure to secure the robot stand.

	Action	Note
1	Position the robot stand at the intended work site.	See instructions in <i>Orienting and securing the manipulator on page 115</i> .

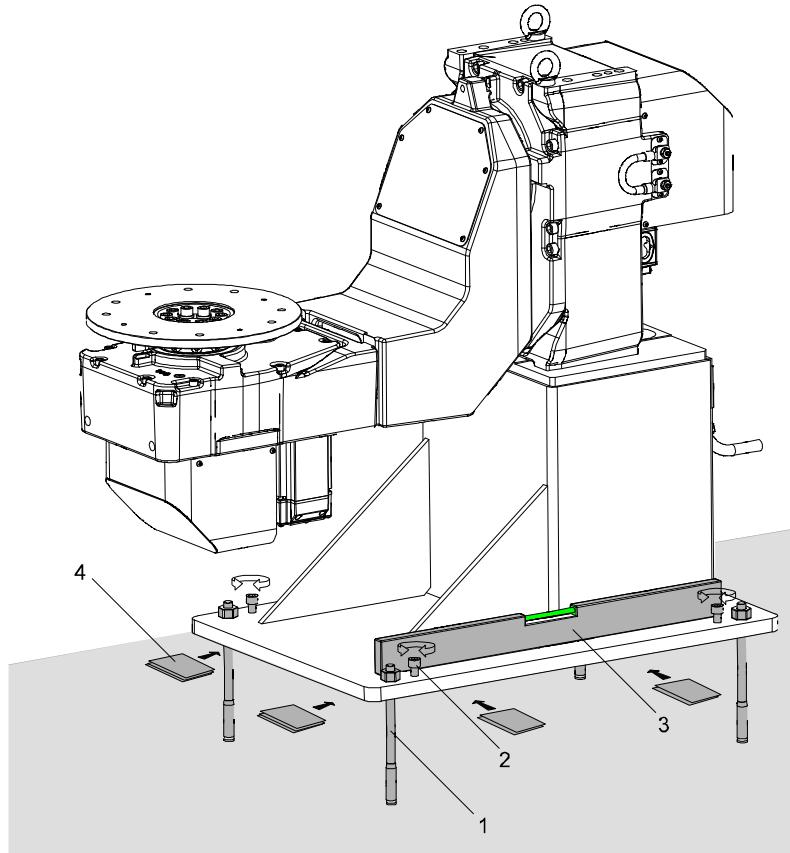
3.4.2 Orienting and securing the manipulator

Illustration, positioning the manipulator



Note

The illustration shows IRBP A, but the principle for orienting and securing the positioner is the same for all variants.



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1	Screws for fastening (floor bolts)
2	Adjusting screws
3	Leveling meter
4	Shim

Securing the manipulator IRBP

Use this procedure to secure the manipulator.

	Action	Note
1	Position the IRBP at the intended work site.	
2	Drill all holes according to the screw manufactures recommendation for the specific foundation. Facts and drilling recommendations are found in section <i>Recommendations for attachment bolts and screws on page 109</i>	

Continues on next page

3 Installation and commissioning

3.4.2 Orienting and securing the manipulator

Continued

Action	Note
3 Adjust the foot to level using a level meter and the level screws.	
4 Insert shims to fill the gap between the foot and the floor.  CAUTION Always loosen the adjusting screws before tightening the floor bolts.	
5 Tighten all the floor bolts.	Tightening torque according to screw manufactures.

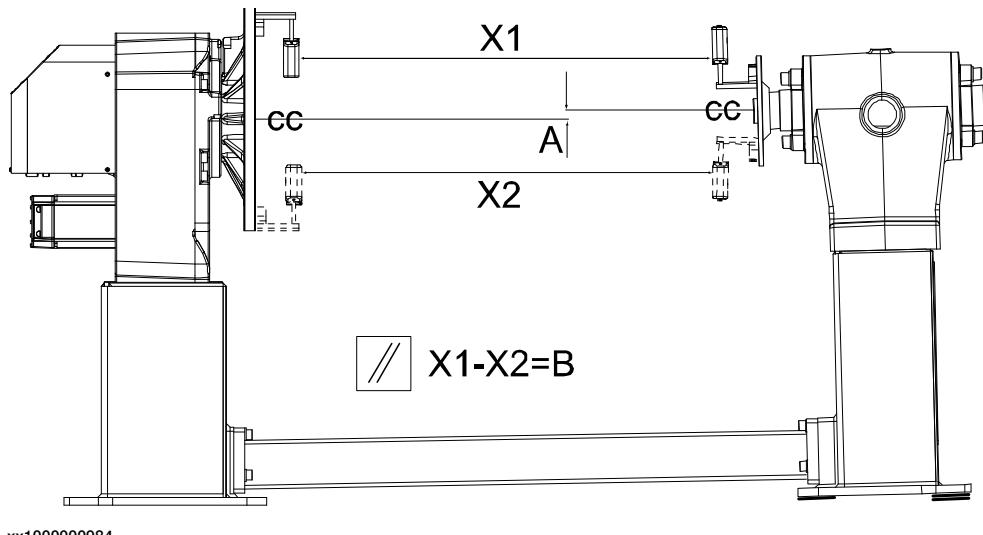
Securing the manipulator IRBP L using fixture laser

Use this procedure to secure the IRBP L using a fixture laser.

Action	Note
1 Position the IRBP L at the intended work site.	
2 Drill all holes according to the screw manufactures recommendation for the specific foundation. Facts and drilling recommendations are found in section <i>Recommendations for attachment bolts and screws on page 109</i>	
3 Adjust the level screws in the foot to level using a fixture laser.	Recommended data in the table below.
4 Insert shims to fill the gap between the foot and the floor.  CAUTION Always loosen the adjusting screws before tightening the floor bolts.	
5 Tighten all the floor bolts.	Tightening torque according to screw manufactures.
6 Check the reading on the laser after tightening the floor bolts.	See recommendations for bearing units, <i>Adjustment of bearing units for IRBP L on page 117</i> .

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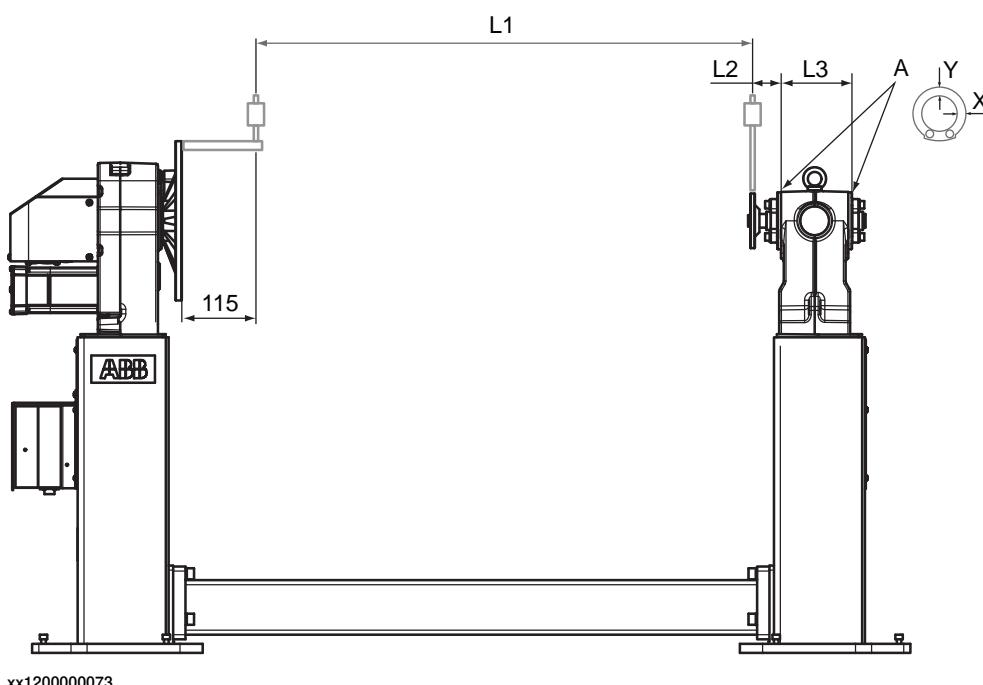
Example of fixture laser aligning



The fixture laser alignment can be done using Fixturelaser NXA Pro (www.fixture-laser.com).

Adjustment of bearing units for IRBP L

After securing the positioner to the foundation the bearing units may need adjustments.



Required equipment

Equipment	Art. no.
Adjustment tool, MTD 250	3HAC036527-001

Continues on next page

3 Installation and commissioning

3.4.2 Orienting and securing the manipulator

Continued

Equipment	Art. no.
Adjustment tool, MTD 750	3HAC036532-001
Adjustment tool, MTD 2000	3HAC037846-001

Deviations

IRBP	L1 [mm]	L2 [mm]	L3 [mm]	Position deviation [mm]			Parallel deviation [mm/100mm]		
				Pre- ferred (X,Y)	Accept- able (X,Y)	Not OK (X,Y)	Pre- ferred (X,Y)	Accept- able (X,Y)	Not OK (X,Y)
L-300 L=1250	1150	46.5	160	0-0.22	0.23-0.44	>0.44	0-0.04	0.05-0.08	>0.08
L-300 L=1600	1500	46.5	160	0-0.28	0.29-0.56	>0.56	0-0.04	0.05-0.08	>0.08
L-300 L=2000	1900	46.5	160	0-0.35	0.36-0.70	>0.70	0-0.04	0.05-0.08	>0.08
L-300 L=2500	2400	46.5	160	0-0.44	0.45-0.88	>0.88	0-0.04	0.05-0.08	>0.08
L-300 L=3150	3050	46.5	160	0-0.55	0.56-1.10	>1.10	0-0.04	0.05-0.08	>0.08
L-300 L=4000	3900	46.5	160	0-0.70	0.71-1.40	>1.40	0-0.04	0.05-0.08	>0.08
L-600/1000 L=1250	1160	83	266	0-0.22	0.23-0.44	>0.44	0-0.04	0.05-0.08	>0.08
L-600/1000 L=1600	1510	83	266	0-0.28	0.29-0.56	>0.56	0-0.04	0.05-0.08	>0.08
L-600/1000 L=2000	1910	83	266	0-0.35	0.36-0.70	>0.70	0-0.04	0.05-0.08	>0.08
L-600/1000 L=2500	2410	83	266	0-0.44	0.45-0.88	>0.88	0-0.04	0.05-0.08	>0.08
L-600/1000 L=3150	3060	83	266	0-0.55	0.56-1.10	>1.10	0-0.04	0.05-0.08	>0.08
L-600/1000 L=4000	3910	83	266	0-0.70	0.71-1.40	>1.40	0-0.04	0.05-0.08	>0.08
L-2000 L=1250	1160	98	366	0-0.22	0.23-0.44	>0.44	0-0.04	0.05-0.08	>0.08
L-2000 L=1600	1510	98	366	0-0.28	0.29-0.56	>0.56	0-0.04	0.05-0.08	>0.08
L-2000 L=2000	1910	98	366	0-0.35	0.36-0.70	>0.70	0-0.04	0.05-0.08	>0.08
L-2000 L=2500	2410	98	366	0-0.44	0.45-0.88	>0.88	0-0.04	0.05-0.08	>0.08
L-2000 L=3150	3060	98	366	0-0.55	0.56-1.10	>1.10	0-0.04	0.05-0.08	>0.08
L-2000 L=4000	3910	98	366	0-0.70	0.71-1.40	>1.40	0-0.04	0.05-0.08	>0.08

3.4.3 Securing the controller



CAUTION

Safety instructions and other instructions need to be read carefully before moving and unpacking the control equipment. See installation description in *Product manual - IRC5*.

These can be found under separate tabs in the system manual. These tasks may only be carried out by persons trained for the entire installation and who are aware of the special risks involved with these various components.

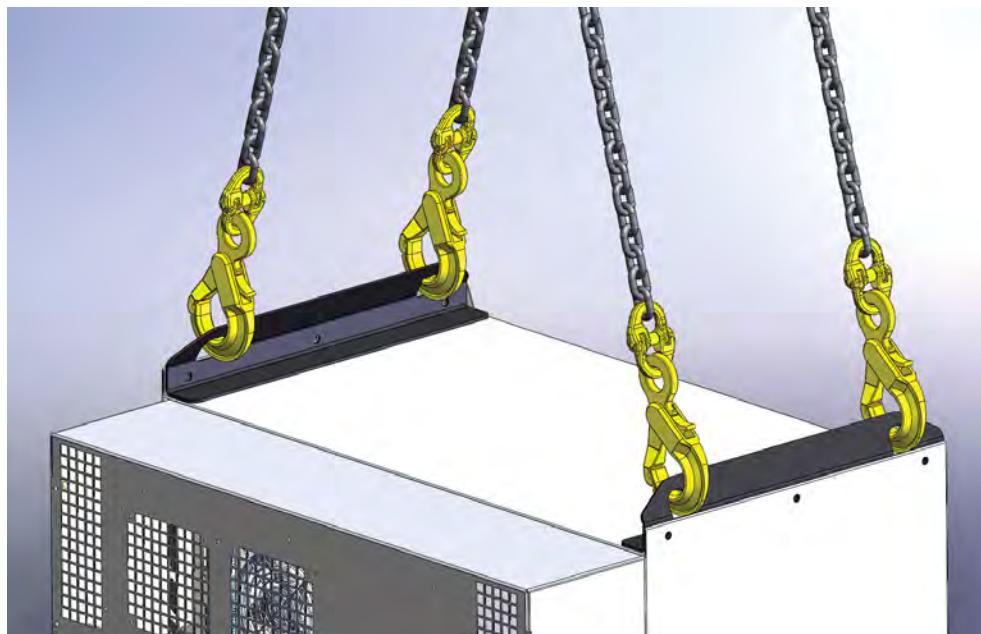


WARNING

Do not walk under a suspended load!

Lifting instructions

The control cabinet is fitted with lifting eyes to facilitate lifting. Control equipment may only be lifted by authorized personnel, using equipment that complies with applicable lifting standards.



xx0900000915

Space requirements

See installation description in *Product manual - IRC5*.

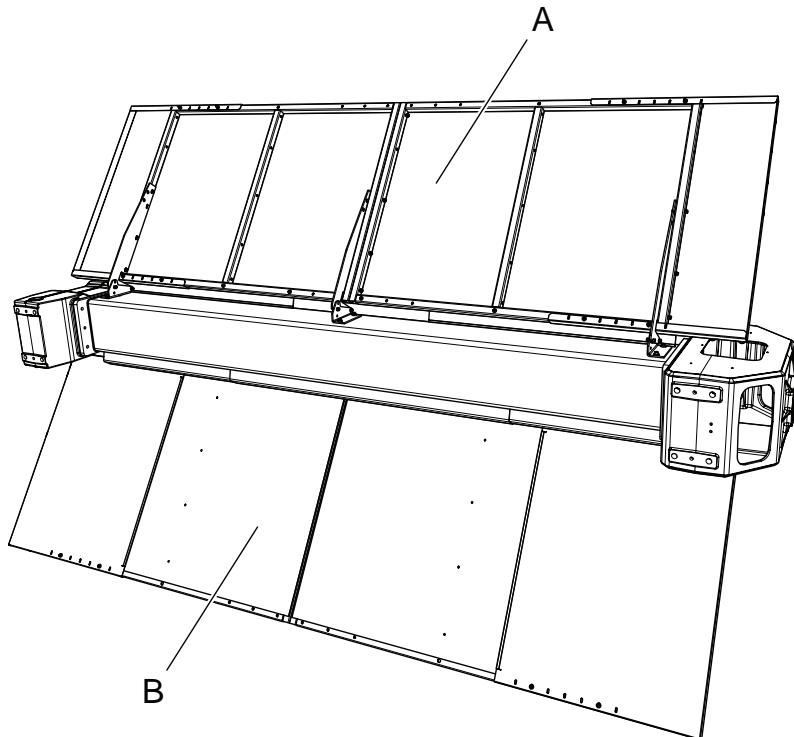
3 Installation and commissioning

3.4.4 Mounting of secondary shield on IRBP-K

3.4.4 Mounting of secondary shield on IRBP-K

Location of the shield

The secondary shield is located as shown in the figure.



xx1700000439

A	Secondary shield
B	Primary shield

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard tools IRBP on page 314 .

Mounting the shield



Note

It's important to check tightening torque on all pre-mounted fixings.

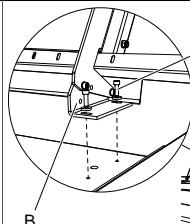
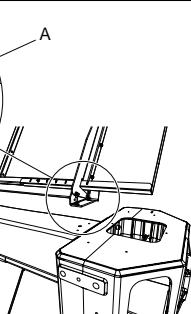
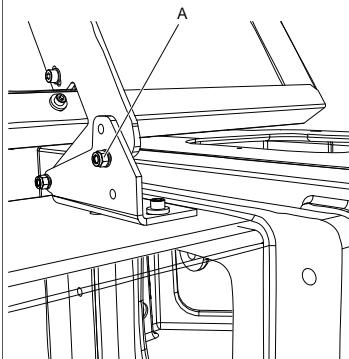
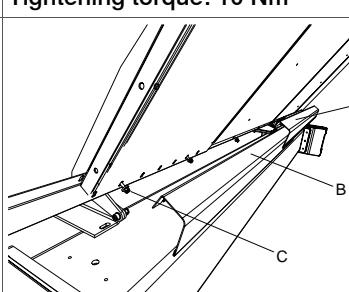
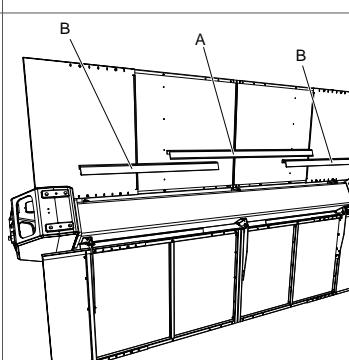
	Action	Note
1	Attach a lifting device to the shield and align it to the beam.	

Continues on next page

3 Installation and commissioning

3.4.4 Mounting of secondary shield on IRBP-K

Continued

Action	Note
2 Fit the six screws with washers (A) through the pre-mounted bracket (B).	  xx1700000440 <p>Screw: M8x25 (6 pcs) Washer: 8.4x21x4 (6 pcs)</p>
3 Tighten the screws.	Tightening torque: 25 Nm
4 Tighten the screws (A) with nuts (6 pcs) on the pre-mounted shield brackets.	 xx1700000447 <p>Tightening torque: 10 Nm</p>
5 Loosen the locking nut with washer (C) from the screws in the back of the shields and push the washer towards the nut creating a space of 5-8 mm between the shield and washer.	 xx1700000441
6 Push down the two inner covers (B) first, and then the outer cover (A) between the shield and the washer (C).	 xx1700000446
7 Tighten the locknuts.	

3 Installation and commissioning

3.5.1 Safe positioning of the control equipment

3.5 Safety options positioning

3.5.1 Safe positioning of the control equipment



CAUTION

Regulations applicable for machine safety must be observed during installation and use. Consult with the relevant local authorities about technical safety issues, if necessary.



CAUTION

Any connected entry protection must be designed to comply with category 4 in accordance with EN 954-1.

Safety instructions

In general, the following conditions must be satisfied:

Light barriers need to be installed so that the risk zone cannot be crossed from behind. If this cannot be guaranteed, further safety devices must be installed.
During all phases of the work it must be possible to check control of the machine electrically, so that a dangerous machine movement can be averted immediately.
The safety distance between the risk zone and the light field need to be sufficient to ensure that a dangerous machine movement is interrupted, before a person can reach the risk zone.
Mechanical and electrical installations need to be carried out by trained and qualified personnel.
Installation and commissioning of the equipment need to be carried out by trained and qualified personnel.
Repairs, especially those concerning optics and circuit cards, must only be carried out by the manufacturer or by persons appointed by the manufacturer.
Interference or modifications to safety equipment are not permitted.

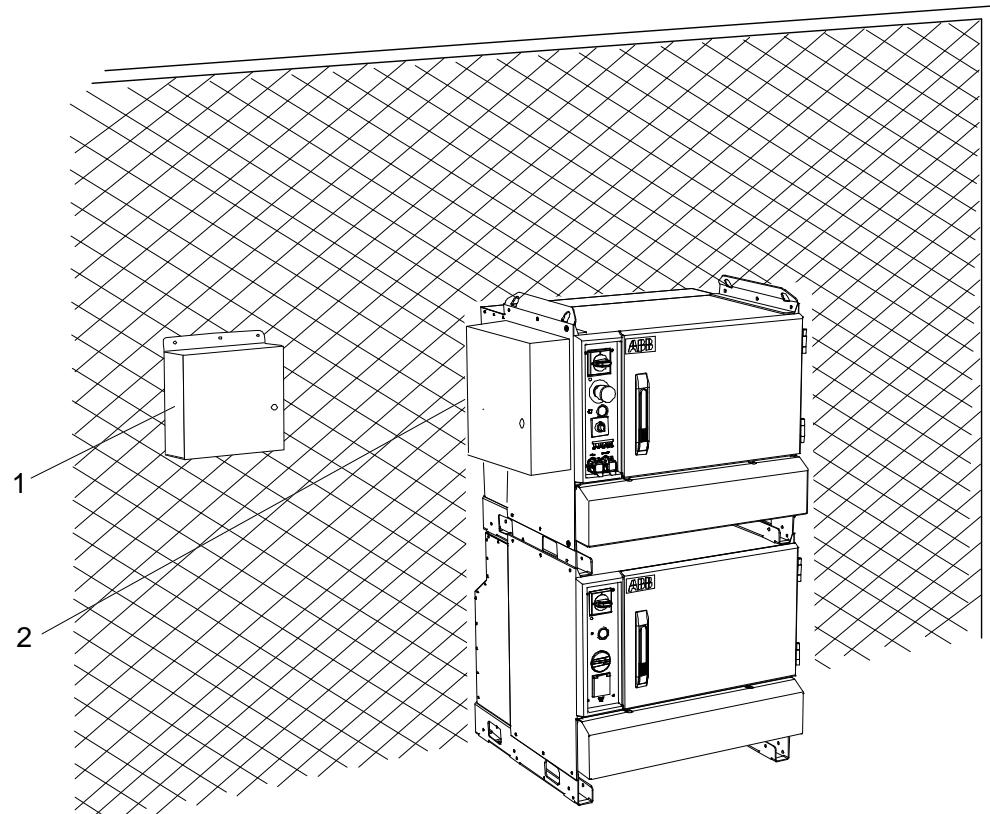
Continues on next page

3 Installation and commissioning

3.5.1 Safe positioning of the control equipment

Continued

Positioned on SC/DC or on Fence



xx0900000916

1	Control equipment for safety placed on fence
2	Control equipment for safety placed on SC/DC

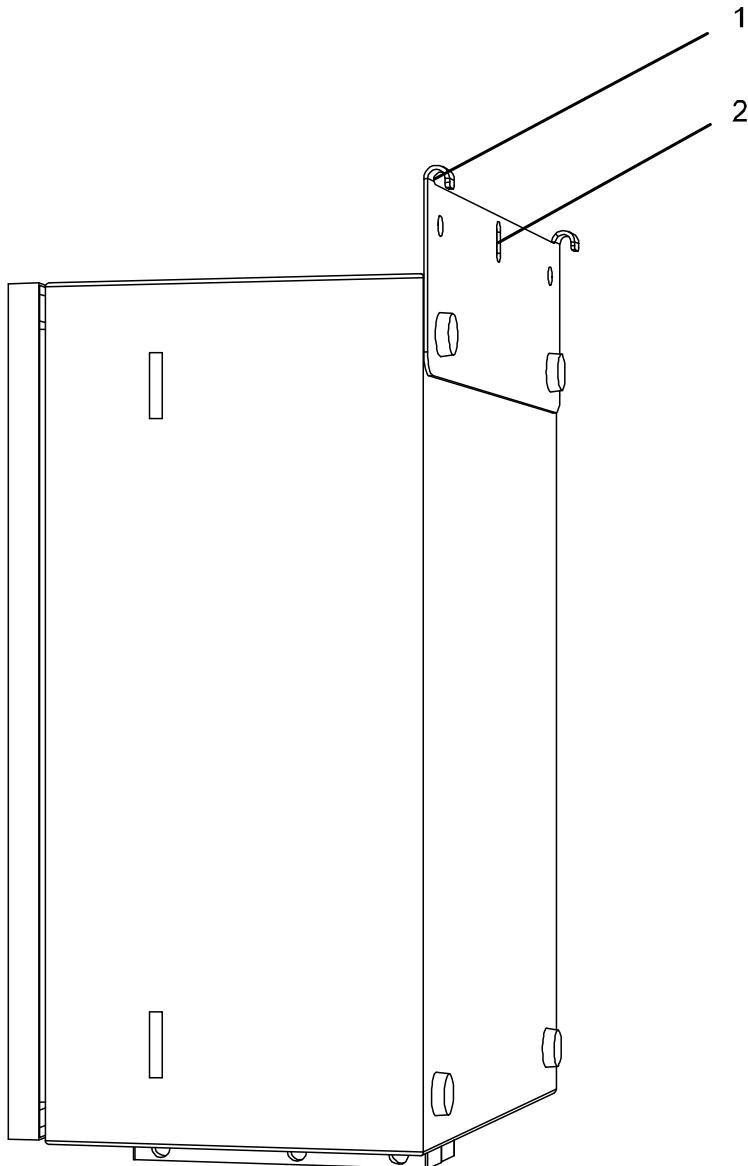
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3 Installation and commissioning

3.5.1 Safe positioning of the control equipment

Continued

Control equipment fastening

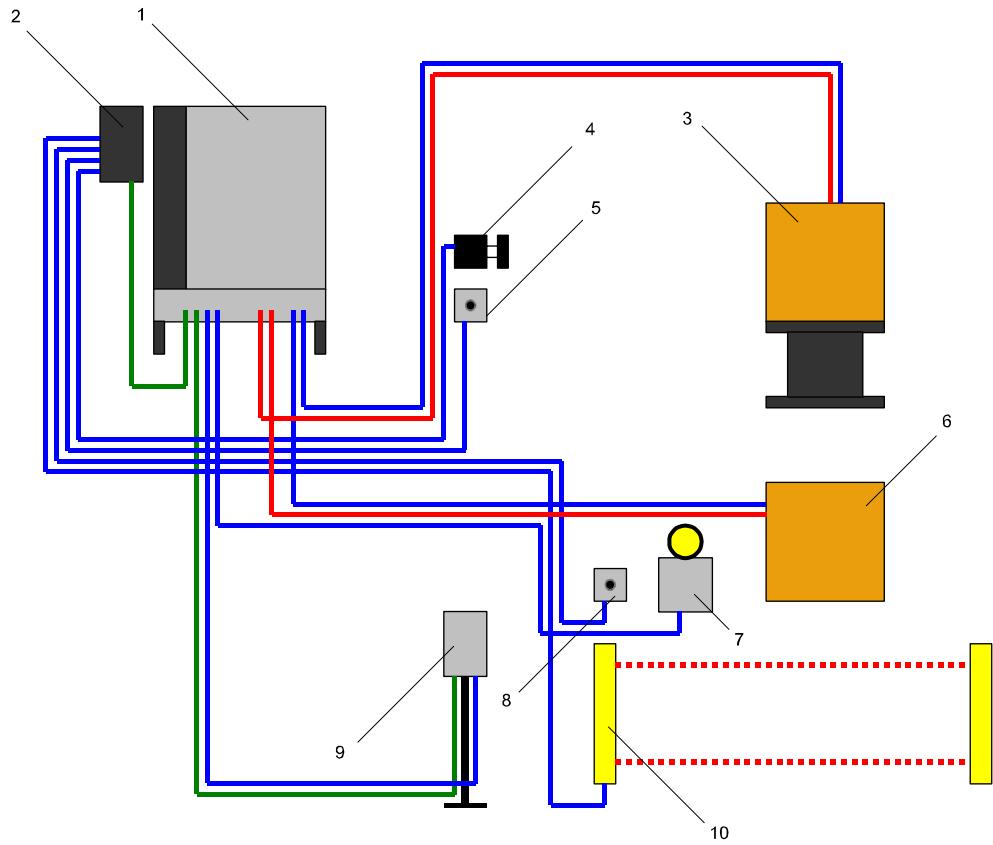


xx0900000923

1	Bracket
2	Hole for M8

Continues on next page

Safety block diagram



xx0900000896

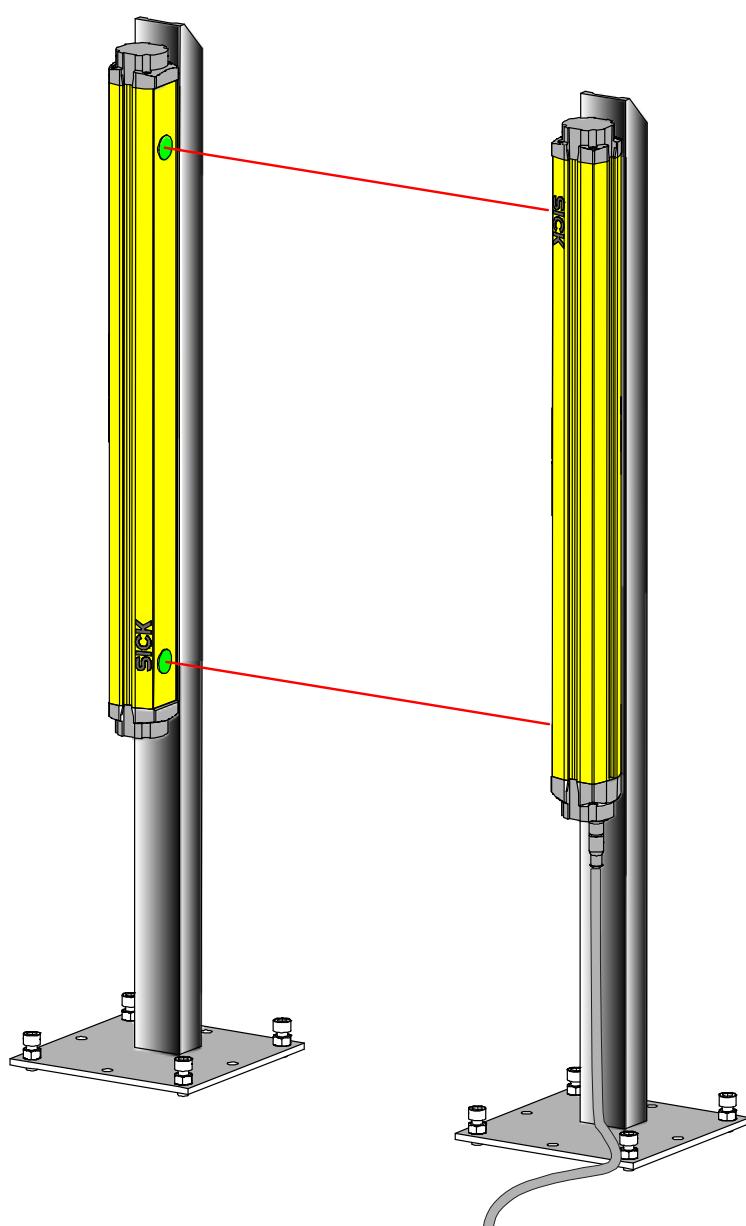
1	Controller
2	Safety control equipment
3	IRB
4	Gate switch
5	Gate reset
6	IRBP
7	Manual jog panel
8	Pre-reset
9	Operating panel
10	Light barrier

3 Installation and commissioning

3.5.2 Positioning of light barrier

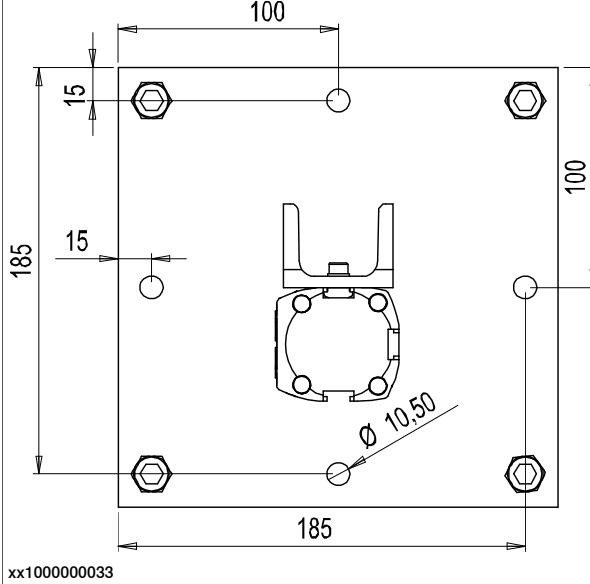
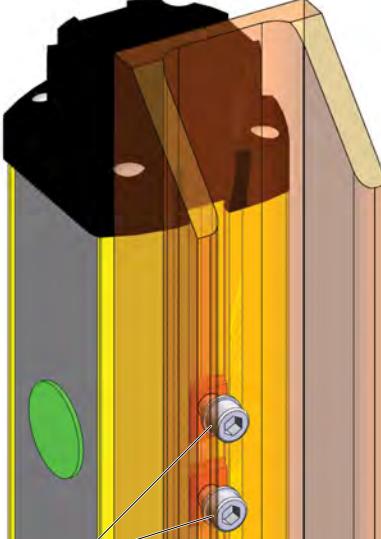
Position

The light barriers in the robot system are used to stop the robot and manipulator if someone enters the risk zone where moving parts are activated. Light barriers are an optoelectronics protective device intended to secure dangerous areas.



xx0900000989

Continues on next page

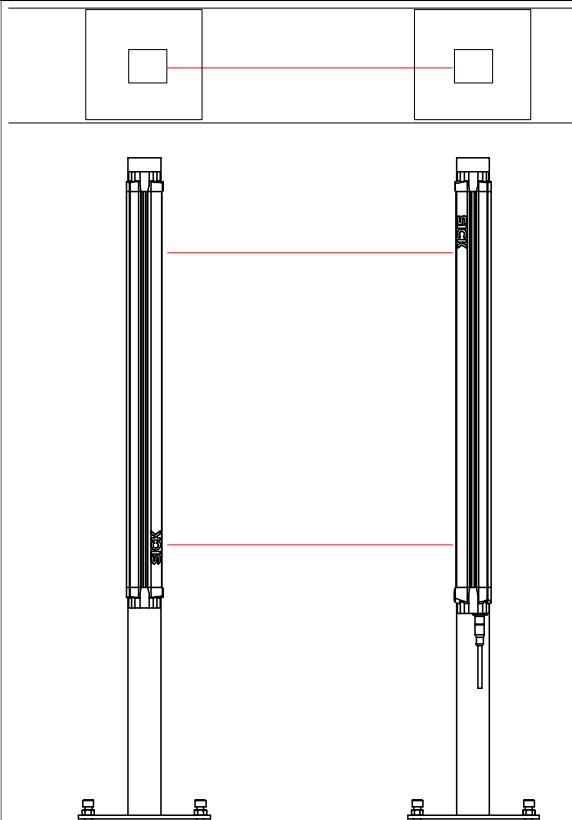
Action	Information
1 Mount the light barriers parallel, using a ruler. If the distance is to long for a ruler activate the transmitter's LED:s to correct the light beams parallel.	 xx1000000033
2 Adjust to the optimal horizontal position using the set screws (1) if necessary.	 xx1000000036

Continues on next page

3 Installation and commissioning

3.5.2 Positioning of light barrier

Continued

Action	Information
3 Check that the receiver unit is correctly adjusted.	 xx1000000034

3.5.3 Positioning of gate switch

General

The protective barrier that surrounds the robot system can be supplemented with one or more service gates to increase accessibility to the robot's working area, for example, during programming. Such a gate should be fitted with a forced make and break safety switch (interlock contact).

Positioning



xx0900000925

1	Safety switch
2	Safety lock

	Action	Information
1	Mount the safety switch and the safety lock in a suitable position.	
2	Mount the cable using straps.	
3	Attache the cable according to section <i>Connections safety equipment on page 139</i>	

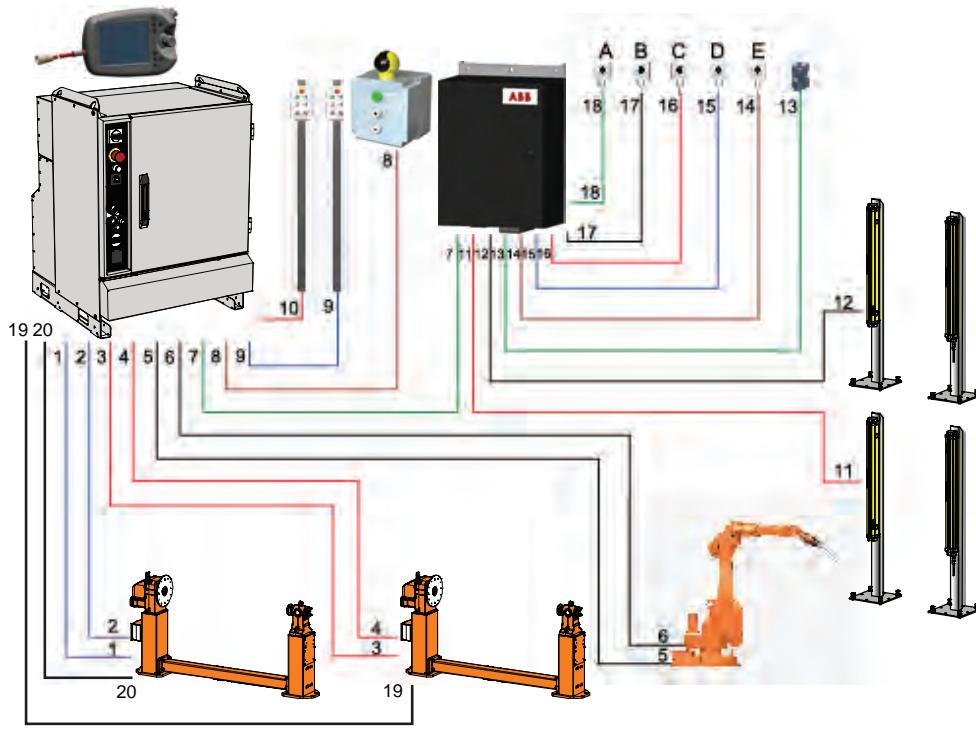
3 Installation and commissioning

3.6.1 Electrical connectors

3.6 Electrical connections

3.6.1 Electrical connectors

IRBP A/L



xx1000000224

A	Pre-reset STN1
B	Pre-reset STN2
C	Activation unit STN1
D	Activation unit STN2
E	Gate reset

External cables IRBP A/L

Cables shown in figure IRBP A/L

Pos	Connector	Length (m)
1	Cable signal IRBP STN1	7/10/15
2	Cable motor IRBP STN1	7/10/15
3	Cable signal IRBP STN2	7/10/15
4	Cable motor IRBP STN2	7/10/15
5	Cable signal robot IRB	7/10/15
6	Cable motor robot IRB	7/10/15
7	CAN bus + cable safety signals + cable position switches	2.5
8	Cable control panel manual jog	15

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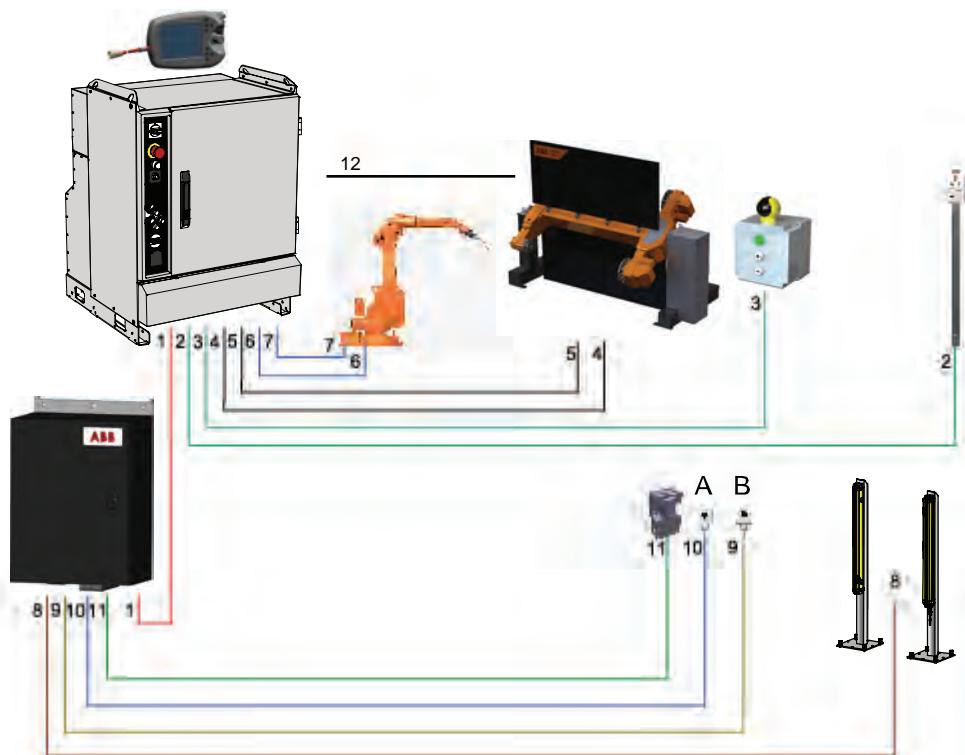
3 Installation and commissioning

3.6.1 Electrical connectors

Continued

Pos	Connector	Length (m)
9	Cable CAN bus + cable operator panel STN1	15
10	Cable CAN bus + cable operator panel STN2	15
11	Cable light beam STN1	15
12	Cable light beam STN2	15
13	Cable gate switch	7
14	Cable external reset push button, gate switch	15
15	Cable activation unit "Programming from operator area" STN1	7
16	Cable activation unit "Programming from operator area" STN2	7
17	Cable pre-reset STN1	7
18	Cable pre-reset STN2	7
19	Cable protective earth	7/10/15
20	Cable protective earth	7/10/15

IRBP B/C/D/K/R



xx1000000226

A	Gate reset
B	Pre-reset

Continues on next page

3 Installation and commissioning

3.6.1 Electrical connectors

Continued

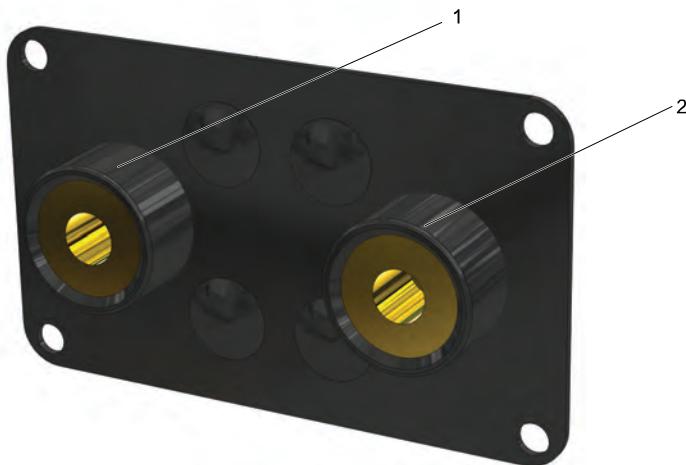
External cables IRBP B/C/D/K/R

Cables shown in figure IRBP B/C/D/K/R

Pos	Connector	Length (m)
1	CAN bus + cable safety signals + cable position switches	2.5
2	Cable CAN bus + cable operator panel	15
3	Cable control panel manual jog	15
4	Cable signal IRBP	7/10/15
5	Cable motor IRBP	7/10/15
6	Cable signal robot IRB	7/10/15
7	Cable motor robot IRB	7/10/15
8	Cable light beam	15
9	Cable pre-reset	7
10	Cable external reset push button, gate switch	15
11	Cable gate switch	7
12	Cable protective earth	7/10/15

3.6.2 Electrical assembly IRBP

Connections



xx0900000990

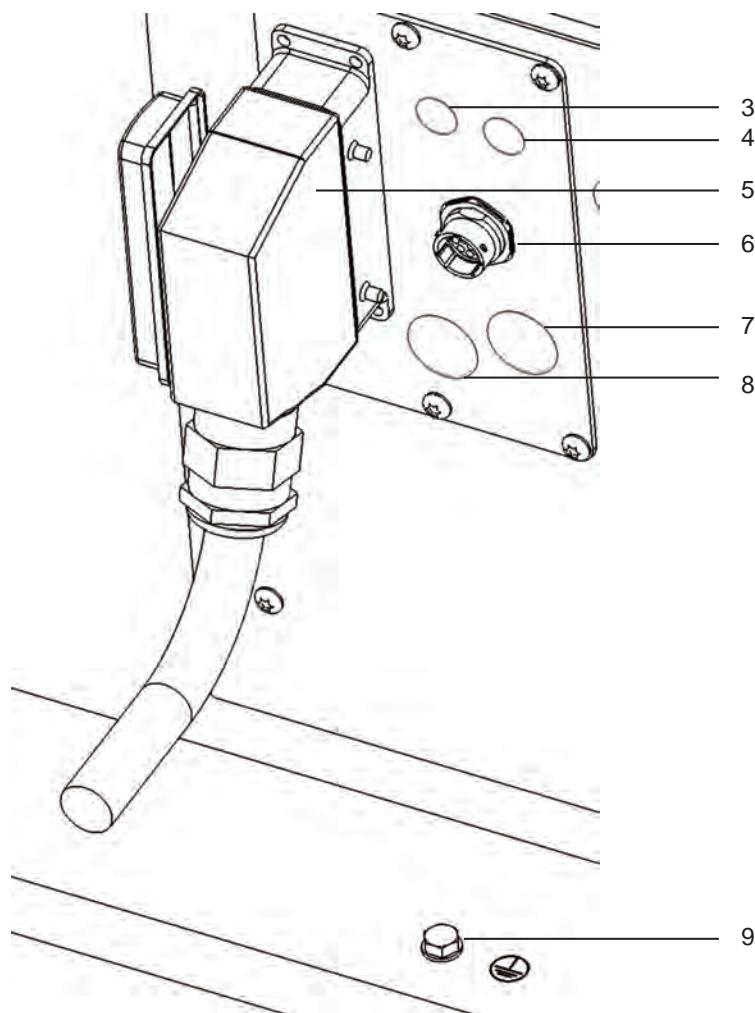
1	Current Collector Connection 1
2	Current Collector Connection 2

Continues on next page

3 Installation and commissioning

3.6.2 Electrical assembly IRBP

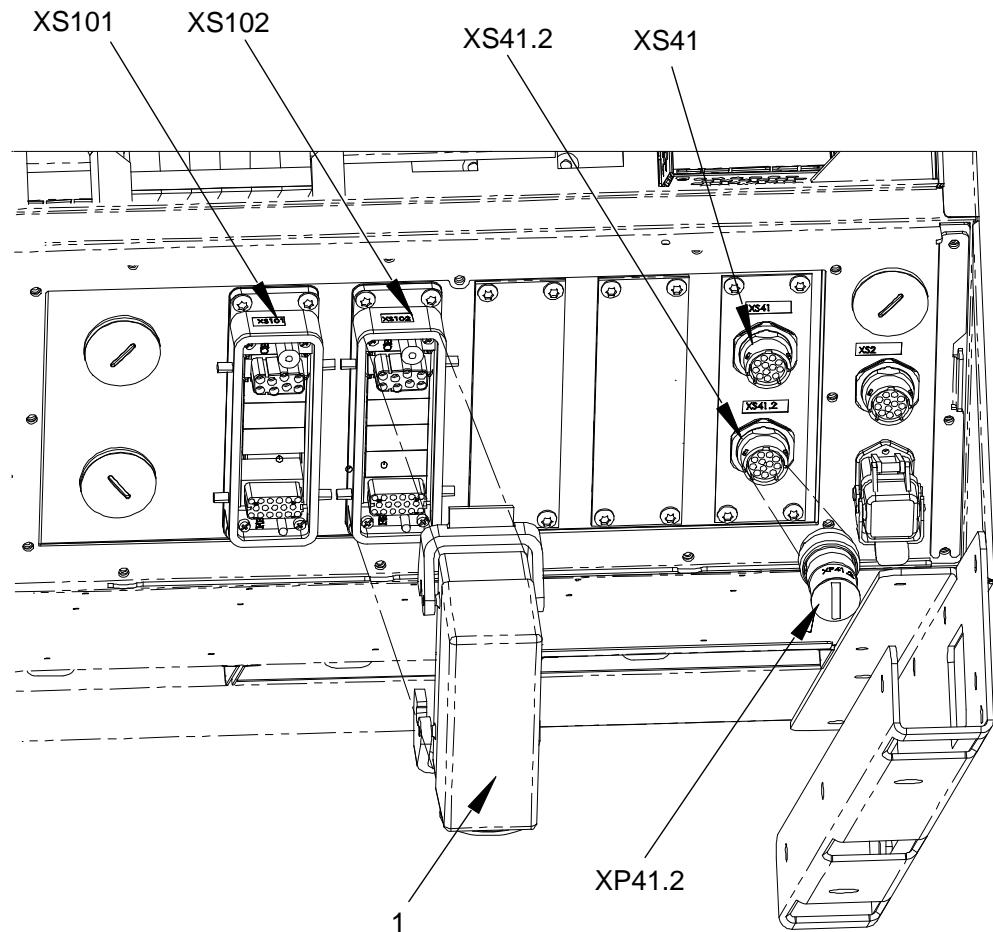
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3	CP1.Customer Power 1
4	CP2.Customer Power 2
5	R1.SMB.Resolversignals.
6	CS1.Customer Signals 1.
7	CS2.Customer Signals 2.
8	XS50/XP50.Motor Power
9	Earth connection point

3.6.3 Connections for SC/DC (DM)

Outputs for positioner A, L



xx0900001006

1	Cover hood if only using one IRBP
XP41.2	Jumper connector if only using one IRBP
XS101	Motor Power IRBP 1
XS102	Motor Power IRBP 2
XS41	Resolver signals IRBP 1
XS41.2	Resolver signals IRBP 2

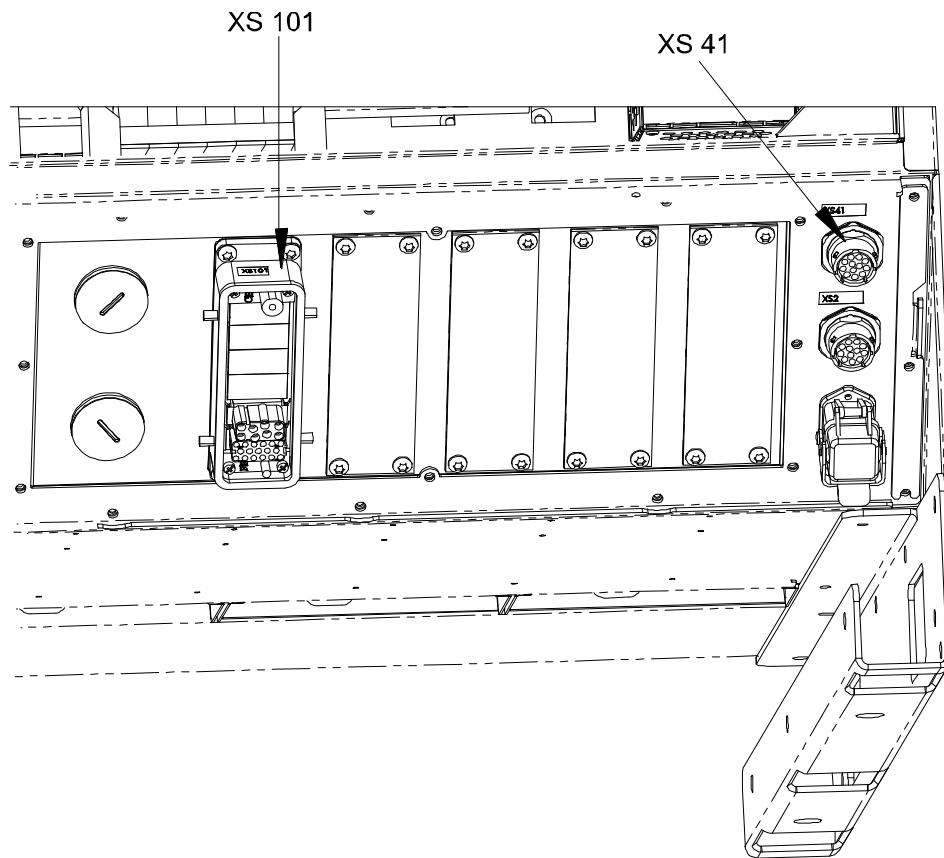
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3 Installation and commissioning

3.6.3 Connections for SC/DC (DM)

Continued

Outputs for positioner C, K, R, B, D



xx0900001005

XS 101	Motor Power
XS 41	Resolver Signals

3.6.4 Open and close the pivot frame

Overview

In order to access the components behind the axis selector unit, the pivot frame must be opened.



DANGER

Before beginning any work on the IRC5 control/drive modules, please see the safety information in section DANGER – Ensure that the main power switch is turned off.



WARNING

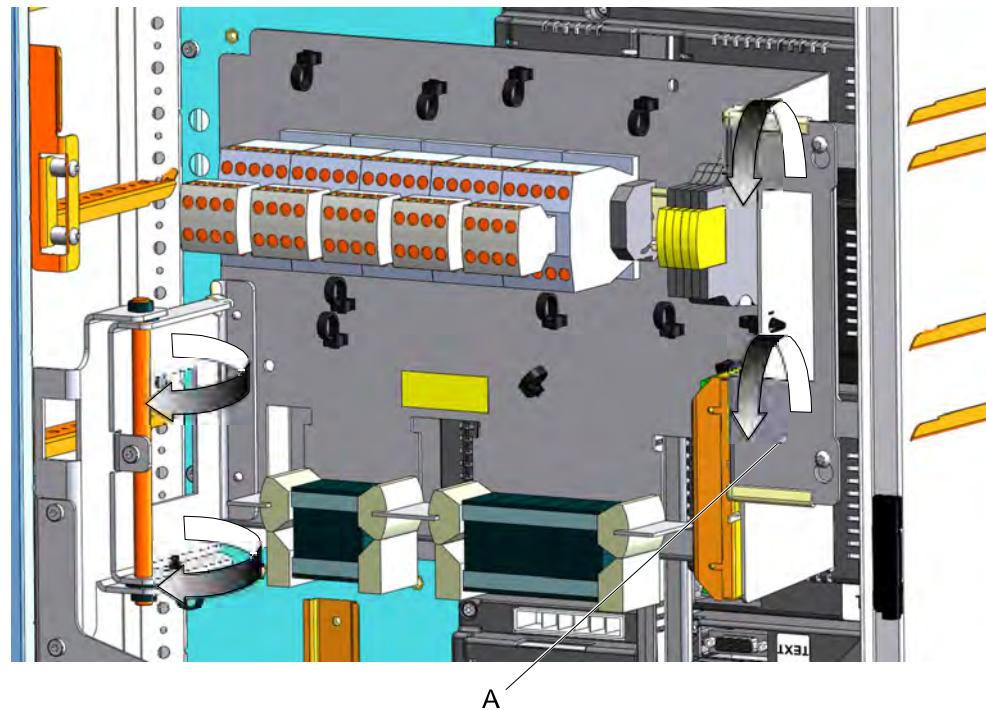
The unit is sensitive to ESD; before beginning any task involving the unit, please see the safety information in section WARNING The unit is sensitive to ESD.



Note

Note that the wiring to the pivot frame must be detached before the pivot frame is opened.

Opening pivot frame



xx0900001051

	Action	Information
1	Open Single Cabinet Controller/Dual Cabinet Controller (Drive module)	

Continues on next page

3 Installation and commissioning

3.6.4 Open and close the pivot frame

Continued

	Action	Information
2	Disconnect the cables on the axis selector unit.	
3	Lift (A) to open the pivot frame with the axis selector plate.	
4	Pull out the pivot frame so that it is fully extended;	

Close pivot frame

	Action	Information
1	Secure the pivot frame with the axis selector plate by tightening the two locking screws (pos. A).	
2	Fit the cables on the axis selector unit.	

3.7 Safety installations

3.7.1 Connections safety equipment

Connections in SC/DC (DM)

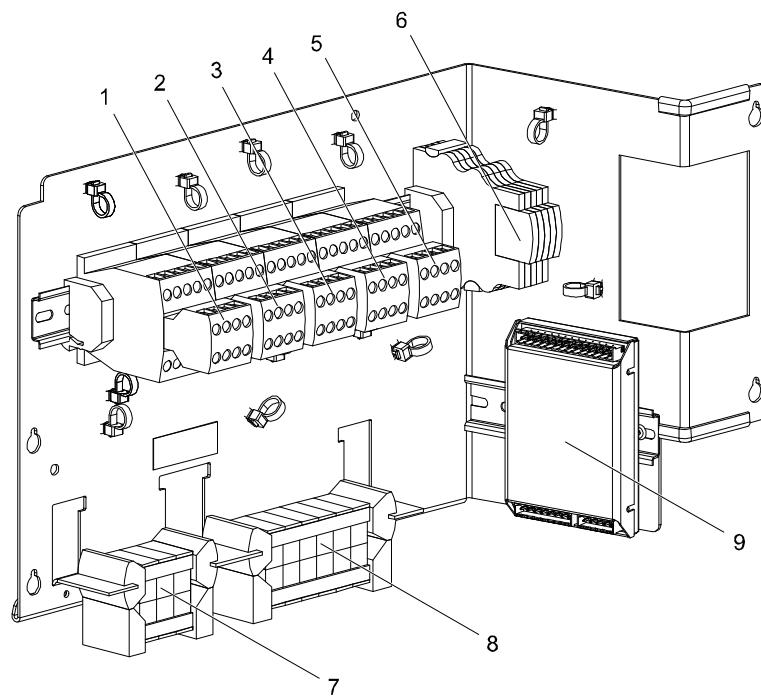
The tables below show the configuration for the specific IRBP, (x) = not used.

The safety unit has the following tasks:

- To monitor the station interchange unit
- To monitor the working areas
- To receive and evaluate information from the different sensors
- To send information to the robot system

There are three variants of the safety unit, depending on the manipulator selected.

Axis selector in SC/DC (DM)



xx0900001011

1	Motor contactor with auxiliary contact block for positioner axes 1, (K1)
2	Motor contactor with auxiliary contact block for positioner axes 2, (K2)
3	Motor contactor with auxiliary contact block for positioner axes 3, (K3)
4	Motor contactor with auxiliary contact block for positioner axes 4, (K4)
5	Motor contactor with auxiliary contact block for positioner axes 5, (K5)
6	Auxiliary relays for breaker activation, (K11-K15)
7	Connector Drive unit, (A11.X2)
8	Connector Connection: A11.X1.A-D Positioner Motor Power and A11.X1.F Positioner Brake signals
9	Digital I/O unit, (A111)

Continues on next page

3 Installation and commissioning

3.7.1 Connections safety equipment

Continued

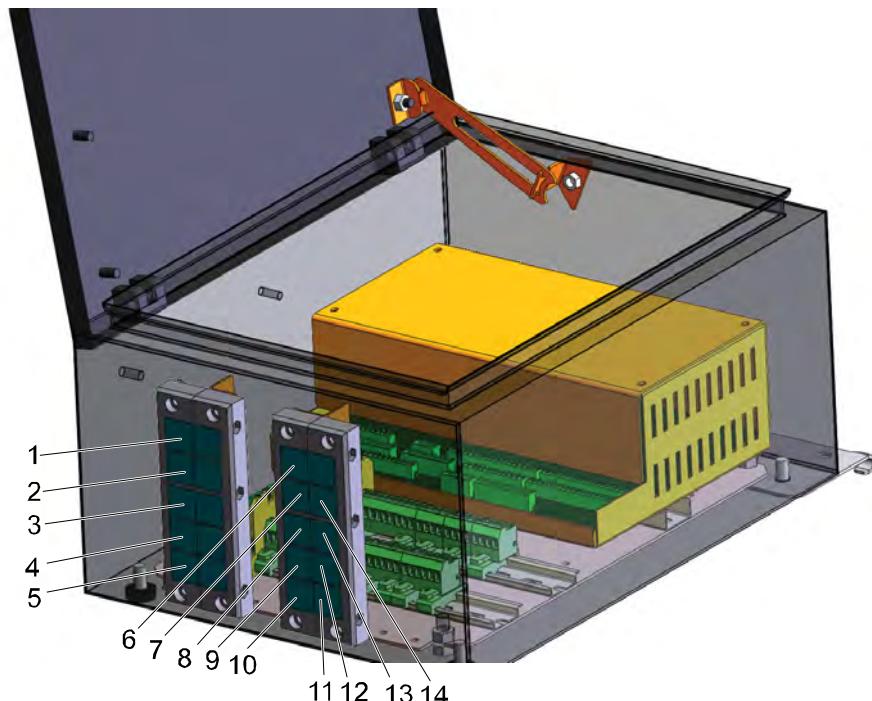
Pos	IRBP A pcs	IRBP B pcs	IRBP C pcs	IRBP D pcs	IRBP K pcs	IRBP R pcs	IRBP L pcs
1	1	1	0	1	1	1	1
2	1	1	0	1	1	1	1
3	1	1	0	1	0	0	0
4	1	1	1	1	1	1	0
5	0	1	0	1	0	0	0
6	4	5	1	5	3	3	2
7	1						
8	1						
9	1						

Continues on next page

Connections in safety unit SIB

The external safety components are connected to the terminals fitted inside the control equipment. The cable glands and connections are shown in the following graphic.

Cable gland A/L



xx0900001013

1	Button for activation unit, station 2, (A13.X7.2)
2	Light barrier station 2, (A13.X3.2)
3	Button for pre-reset, station 2, (A13.X4.2)
4	Position indication for robot/travel track, (A13.X5)
5	Home position/transport position indication, (A13.X6)
6	Button for pre-reset, station 1, (A13.X4)
7	Gate switch, (A13.X2.1)
8	Button for gate reset, (A13.X2.2)
9	Gate switch, (A13.X2.1)
10	Button for gate reset, (A13.X2.2)
11	CAN IN, (A131.TB6)
12	Positioner signals, (A131.TB2)
13	Safety signals, (A13.X8)
14	CAN OUT, (A13.A35.J1)

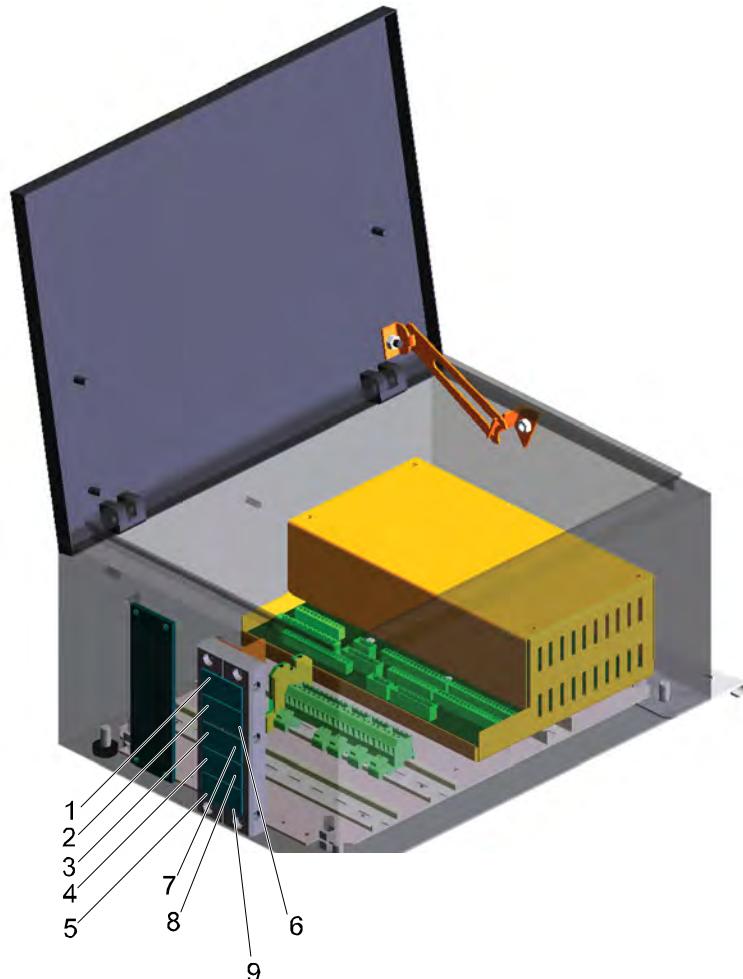
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3 Installation and commissioning

3.7.1 Connections safety equipment

Continued

Cable gland B/C/D/K/R



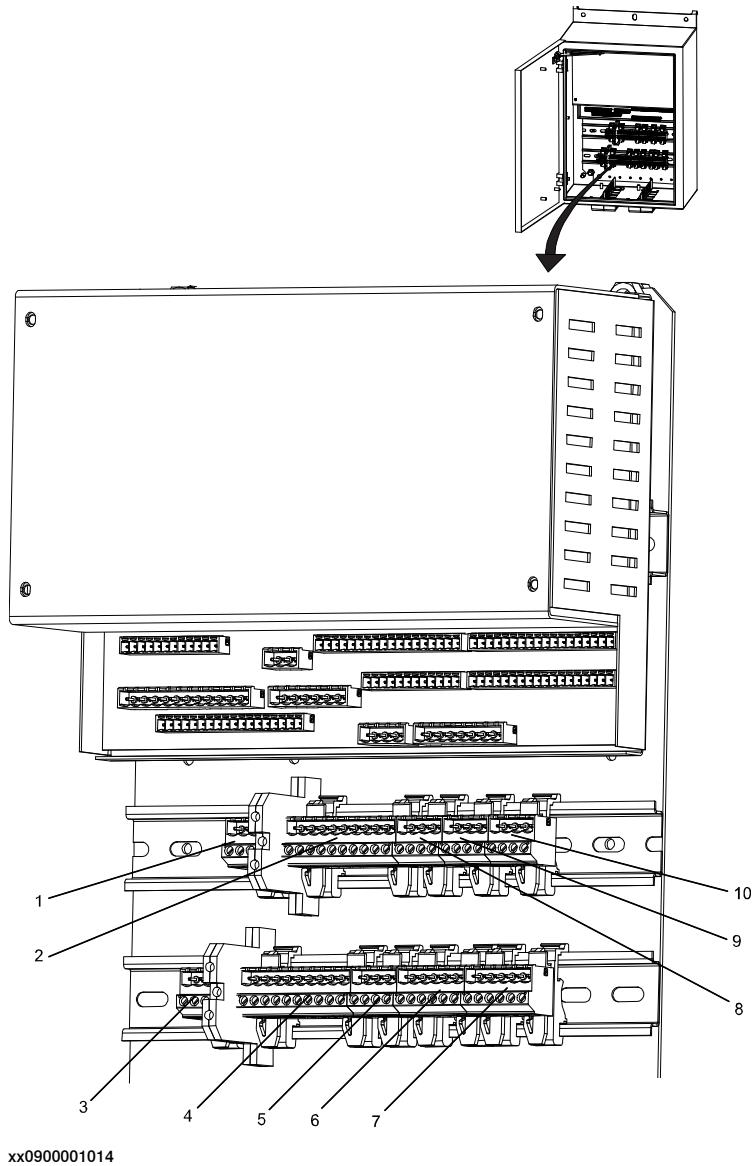
xx1000000114

1	Light barrier 1, (A13.X3)
2	Button for pre-reset, station 1, (A13.X4)
3	Gate switch, (A13.X2.1)
4	Button for gate reset, (A13.X2.2)
5	Supervision of contactors in drive module, (A131.TB2)
6	CAN OUT, (A13.A35.J1)
7	Safety signals, (A13.X8)
8	Positioners safety signals
9	CAN IN, (A131.TB6)

Continues on next page

Cable connections A, L

Between the control system and the included safety equipment, there is modularly designed, safety control equipment. The safety control equipment can be installed beside an SC/DC or on the guard. The figure shows the connection of included safety components at the terminal block in the safety control equipment.



1	Light barrier 1
2	Button for pre-reset, station 1
3	Light barrier 2
4	Button for pre-reset, station 2
5	Home position/transport position indication
6	Button for activation unit, station 1
7	Button for activation unit, station 2
8	Gate switch

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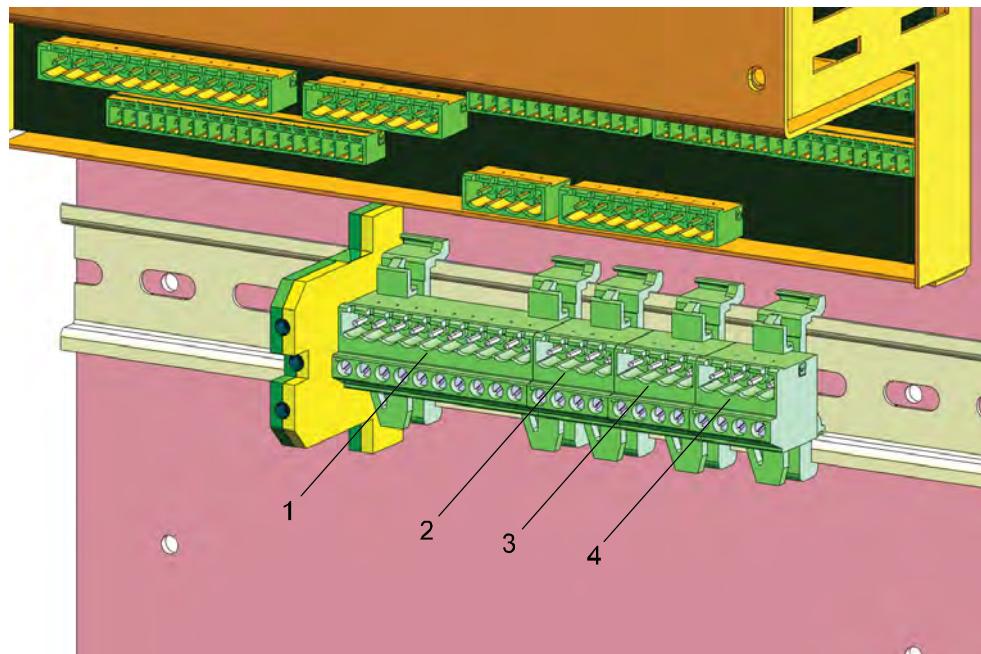
3 Installation and commissioning

3.7.1 Connections safety equipment

Continued

9	Button for gate reset
10	Position indication for robot/travel track

Cable connections B, C, D, K, R



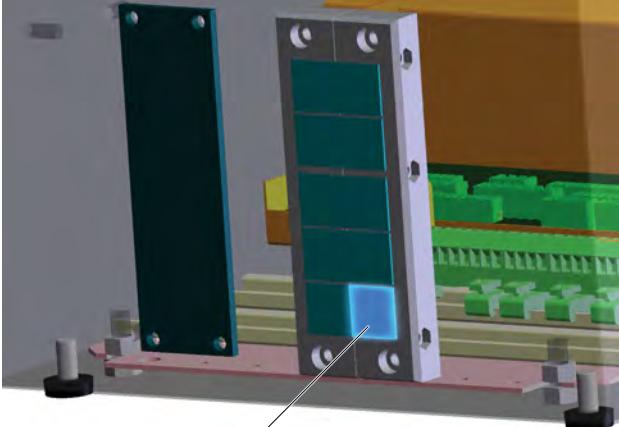
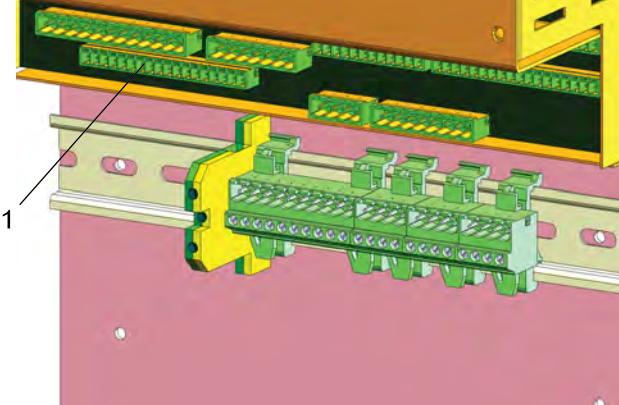
xx0900001015

1	Light barrier 1, (A13.X3)
2	Push-button for pre reset station 1, (A13.X4)
3	Gate switch, (A13.X2.1)
4	Push-button for resetting gate, (A13.X2.2)

3.7.2 Connection of cable for manipulator signals

Connections

Connect the cable (monitoring of contactors in axis selector) between a terminal in the control equipment for safety and a terminal in the SC or DC drive module.

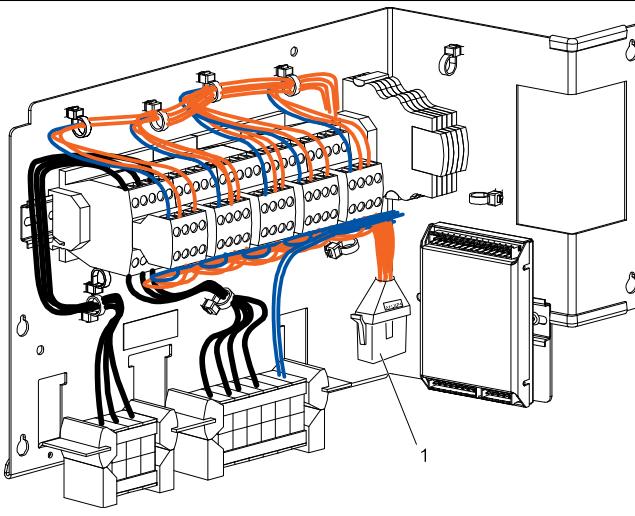
	Action	Illustration
1	Use the cable gland in the separable panel for the control equipment for safety (POSITIONER SIGNALS) (1).	 xx0900001025
2	Connect the cable to connection A131.TB2 (1) in the control equipment.	 xx0900001022
3	Make the cable gland in the separable panel on the SC or DC drive module (POSITIONER SIGNALS) (1).	 xx0900001026

Continues on next page

3 Installation and commissioning

3.7.2 Connection of cable for manipulator signals

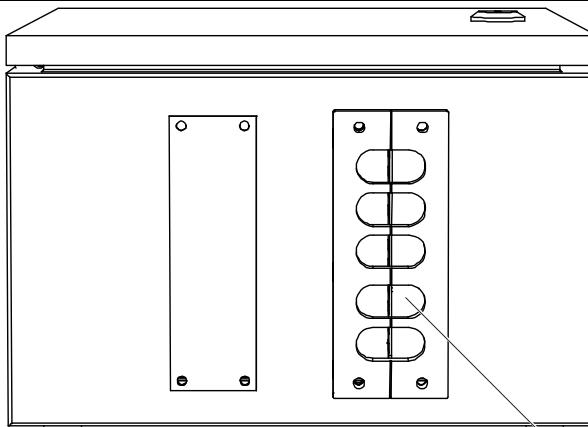
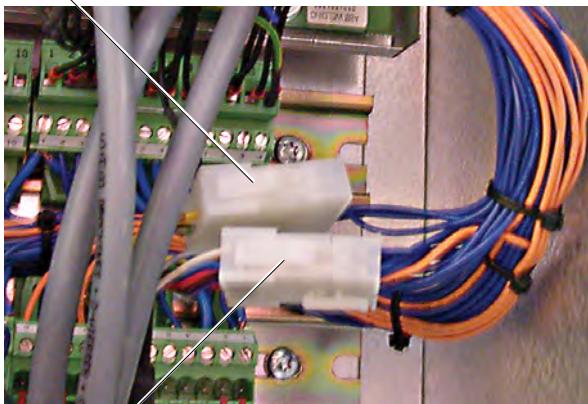
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Action	Illustration
4 Connect the cable to connector A11.X3 or A11.X4 in SCC/DCC (1).	 <p>xx0900001032</p>

3.7.3 Connection of cable for safety signals

Safety signals

Connect the cable to the terminal in the control equipment for safety and the terminal in the SCC or DCC control module.

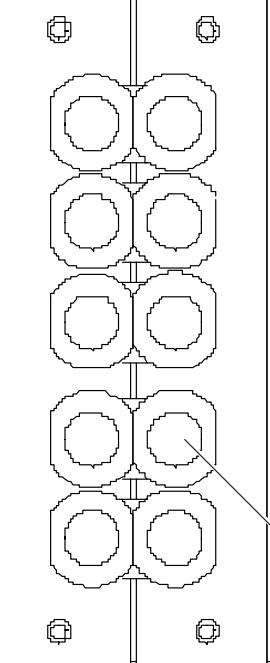
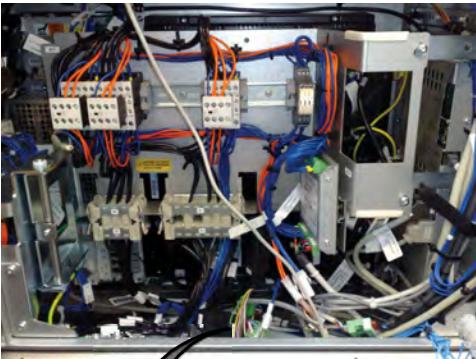
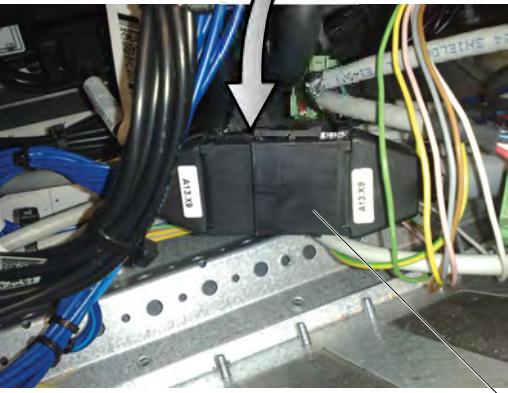
Action	Illustration
1 Add a cable gland to the separable panel for the control equipment for safety (SAFETY SIGNALS) (1).	 xx0900001035
2 Connect the cable to connector A13.X8 in the control equipment for safety (2).	 xx0900001036

Continues on next page

3 Installation and commissioning

3.7.3 Connection of cable for safety signals

Continued

Action	Illustration
3 Add a cable gland to the separable panel on the SCC or DCC control module (SAFETY SIGNALS) (3).	 xx0900001037
4 Connect the cable to connector A13.X9 in SCC/DCC	  xx0900001039

3.7.4 Drive system

General

The IRC5 Single Cabinet Controller contains one Main Drive Unit. The robot system may also be equipped with up to three additional Drive Modules, and in some cases an Additional Rectifier Unit. The units are described in the Product manual - IRC5.

Drive system (small manipulators)

Drive system (small manipulators) consists of the following:

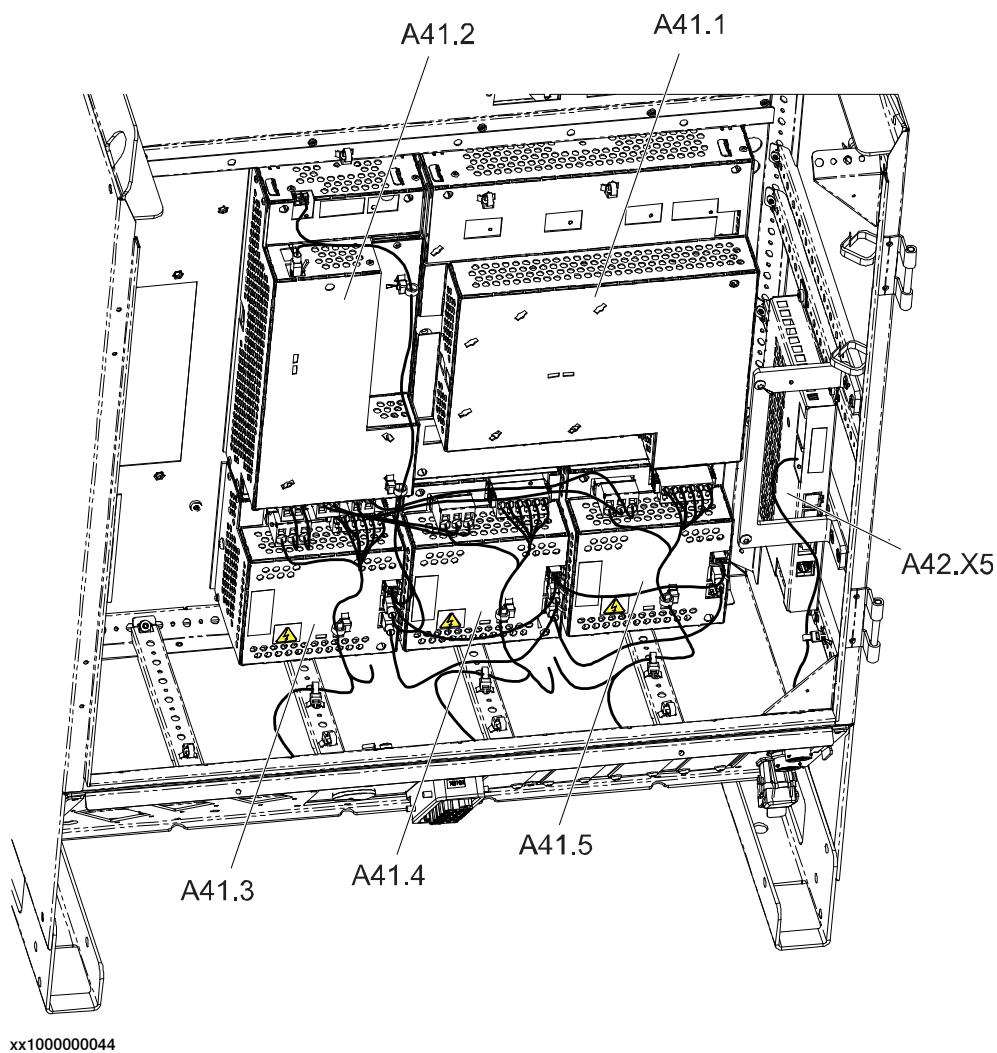
- Axis computer
- Main Drive Unit
- Rectifier
- Drive unit for positioner
- Cables and contactors for connecting rotary unit.

Continues on next page

3 Installation and commissioning

3.7.4 Drive system

Continued



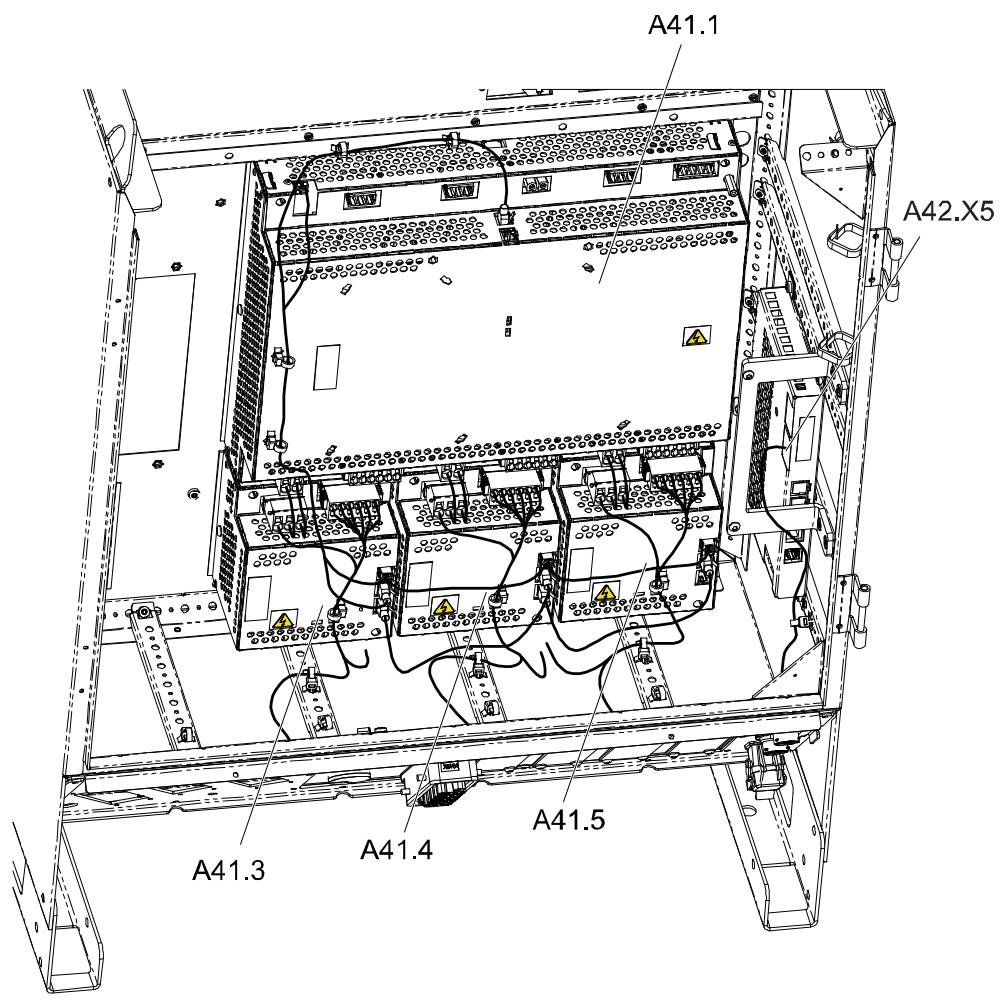
A41.2	Additional Rectifier Unit
A41.1	Main Drive Unit
A42.X5	Axis computer
A41.3	Additional Drive Unit (ADU) for positioner
A41.4	Additional Drive Unit (ADU) for positioner
A41.5	Additional Drive Unit (ADU) for positioner

Drive system (large manipulators)

Drive system (large manipulators) consists of the following:

- Axis computer
- Main Drive Unit (Rectifier included)
- Drive unit for positioner
- Cables and contactors for connecting rotary unit.

Continues on next page



xx1000000045

A41.1	Main Drive Unit (MDU)
A42.X5	Axis computer
A41.3	Additional Drive Unit (ADU) for positioner
A41.4	Additional Drive Unit (ADU) for positioner
A41.5	Additional Drive Unit (ADU) for positioner

3 Installation and commissioning

3.7.5 Axis computer

3.7.5 Axis computer

General

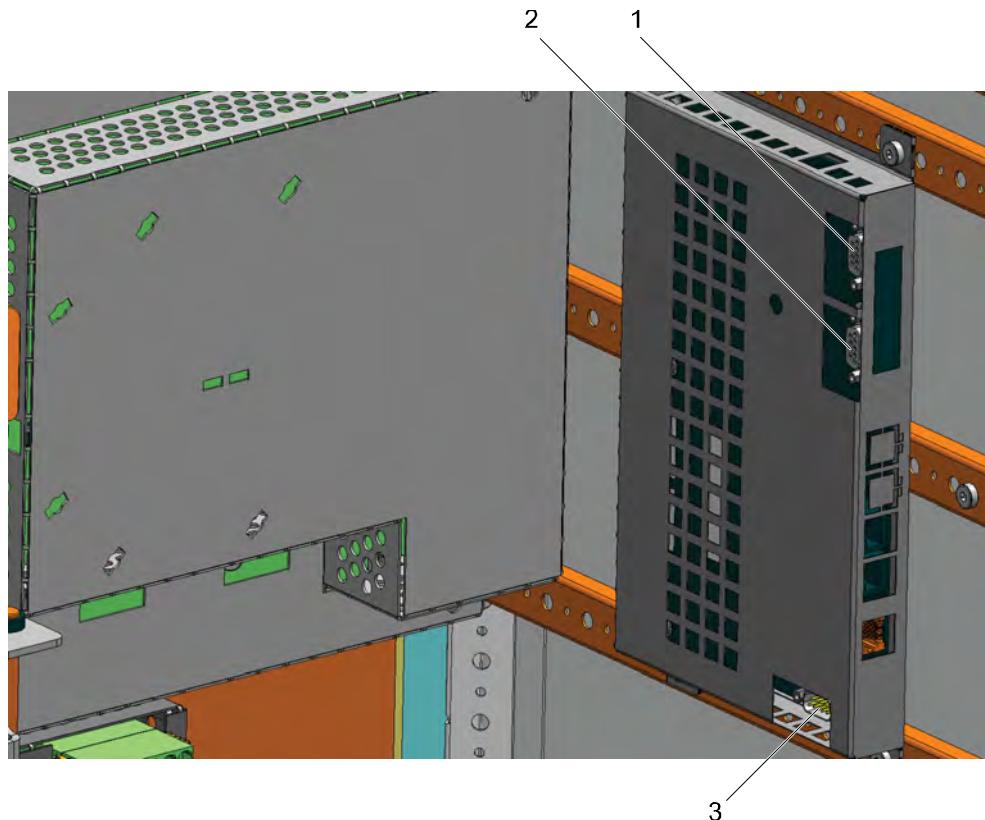
The following figure shows the axis computer with connections.

The axis computer has two measurement systems. Each measurement system can handle up to seven axes. Two serial measurement boards can be connected to the measurement system for a total of fourteen axes.

The measurement system for positioners consists of the following:

- Axis computer
- Communications cable (MS2)
- Serial measurement board, located in the external distribution box
- Resolver connection cable

Connections



xx1000000046

1	A42.X4 Measurement Link 1
2	A42.X5 Measurement Link 2
3	A42.X9 Console port

3.8 Software installation

3.8.1 Starting the system for the first time

General

An IRBP function package delivered by ABB has a customized configuration installed at delivery. The system is preconfigured and will start up with the options and settings that were ordered.

In some cases it might be necessary to reload the software, for example when the RobotWare software needs to be upgraded, or when the configuration needs to be changed, see [*Upgrading the software on page 154*](#).

3 Installation and commissioning

3.8.2 Upgrading the software

3.8.2 Upgrading the software

Introduction

The PC application RobotStudio is used for creating and downloading systems to the controller.

The procedure how to create and download a system is different depending on if the controller is installed with RobotWare 5 or RobotWare 6. RobotStudio version 6 or later supports both procedures.



Note

In RobotStudio, use System Builder to create and modify systems based on RobotWare 5. Use Installation Manager to create and modify systems with RobotWare 6 and later.

For more information, see *Operating manual - RobotStudio*.

Delivered system software

The following software is supplied for the positioner system:

- DVD with the positioner system configuration, mediapool, which may also contains some arc welding configuration.
- *RobotWare and RobotStudio*



Note

The DVD that contain the system configuration must not be modified in anyway. This can result in the deactivation of safety functions such as reduced speed.

Before modifying the system

Before modifying the system it is recommended to take a backup of the system and put all axes of the robot and any external axes are in their zero positions.

Creating a system for RobotWare 5

In RobotWare 5, the positioner is loaded as an additional option to the system. Before creating the system, the positioner option disk must be installed to the RobotStudio mediapool. The license file for the positioner is included in the option disk.

Use this procedure to create and download the system.

Action	
1	<p>On the positioner system configuration DVD, unzip the file <system serial number>.zip into the RobotStudio mediapool: ...\\ABB Industrial IT\\Robotics IT\\MediaPool\\</p> <p> Note</p> <p>The folder can also be unzipped elsewhere, but will then need to be located manually in the System Builder wizard.</p>

Continues on next page

Action
2 Verify that the folder is created: ...\\ABB Industrial IT\\Robotics IT\\MediaPool\\3HEA-<system serial number>
3 Create a new system using the System Builder in RobotStudio.  Note All license files, *.kxt, for the controller, drive modules, and positioner are included in the mediapool folder.
4 In the Add Additional Options window, click Enter key and browse to the installed positioner option disk.
5 Select, open, and add the license file for the positioner.
6 Complete the System Builder wizard.
7 Download the system and restart the controller.
8 Load the necessary system parameters, system modules, and program modules from the backup and restart the controller.
9 Update the revolution counters, see Updating revolution counters on page 277 .

For more detailed instructions on using the System Builder, see *Operating manual - RobotStudio*.

Creating a system for RobotWare 6

In RobotWare 6, the positioner is loaded as an Add-In. The positioner Add-In is included in the RobotWare package and does not require a license. The settings for the positioner can be imported using a settings file.

Use this procedure to create and download the system.

Action
1 Create a new system using the Installation Manager in RobotStudio.
2 In the Products tab, click Add and select the <i>RobotWare</i> and <i>Positioner</i> product manifests.
3 In the Licenses tab, add the license for RobotWare. The positioner does not require a license.
4 In the Options tab, click the Add settings button and add the settings file, *.rsf, for the positioner.  Note The settings for the positioner can also be selected manually in the Drive Modules pane.
5 Complete the Installation Manager wizard.
6 Download the system and restart the controller.
7 Load the necessary system parameters, system modules, and program modules from the backup and restart the controller.
8 Update the revolution counters, see Updating revolution counters on page 277 .

For more detailed instructions on using the Installation Manager, see *Operating manual - RobotStudio*.

3 Installation and commissioning

3.9.1 Installing fixtures

3.9 Installing fixtures and testing with corresponding workpieces

3.9.1 Installing fixtures

Introduction

If there is a difference between the loads on each side of the positioner IRBPK, then special care must be taken when installing fixtures or workpieces.



Note

The values for *Max load difference between sides 1 and 2* are listed in the technical data in *Product specification - IRBP /D2009*.

Load difference sides 1 and 2 does not exceed specified maximum value

If the positioner is in a horizontal position or not at the end of the working range when installing fixtures, make sure that the value of *Max load difference sides 1 and 2* is not exceeded.

Fixtures can be installed in any positioner position.

Load difference sides 1 and 2 exceeds specified maximum value

If the weight of the fixture exceeds the value of *Max load difference sides 1 and 2*, run the positioner to the working range end when positioner side 2 is oriented towards the operator side (positioner side 1 is toward the welding robot). Then the positioner cannot move further downwards when the first fixture is installed.

- 1 Install the fixture on positioner side 2.
- 2 Install the fixture on positioner side 1.



WARNING

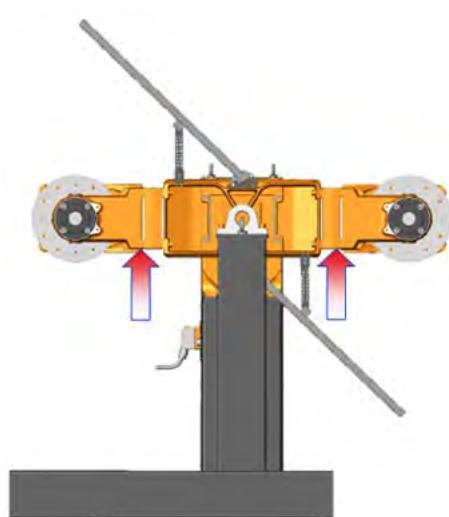
Do not move the positioner before both fixtures are installed.



Note

If the fixtures must be installed in another position then the positioner must be supported on the surfaces shown with arrows in the graphic below.

Continues on next page



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Brake testing

After installing fixtures, always test the brakes, see [Brake testing on page 34](#).

3 Installation and commissioning

3.9.2 Removing or changing fixtures

3.9.2 Removing or changing fixtures

Introduction

If there is a difference between the loads on each side of the positioner IRBPK, then special care must be taken when removing or changing fixtures or workpieces.



Note

The values for *Max load difference between sides 1 and 2* are listed in the technical data in *Product specification - IRBP /D2009*.

Load difference sides 1 and 2 does not exceed specified maximum value

If the positioner is in a horizontal position or not at the end of the working range when removing or changing fixtures, make sure that the value of *Max load difference sides 1 and 2* is not exceeded.

Fixtures can be installed in any positioner position.

Load difference sides 1 and 2 exceeds specified maximum value

If the weight of the fixture exceeds the value of *Max load difference sides 1 and 2*, run the positioner to the working range end when positioner side 2 is oriented towards the operator side (positioner side 1 is toward the welding robot). Then the positioner cannot move further downwards when the first fixture is removed.

- 1 Remove the fixture on positioner side 1.
- 2 Remove the fixture on positioner side 2.
- 3 If changing fixtures, then install the new fixture on side 2 and finally the new fixture on side 1.



WARNING

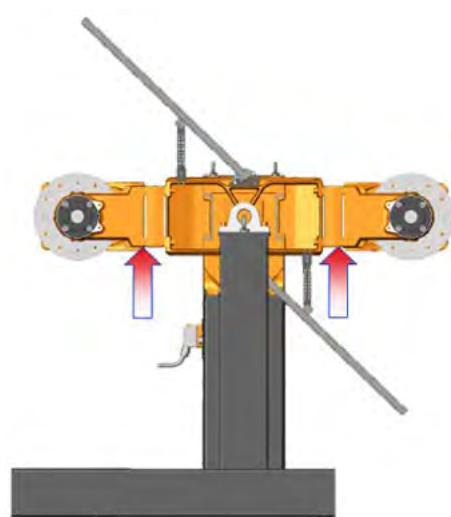
Do not move the positioner before both fixtures are removed or replaced by new fixtures!



Note

If the fixtures must be installed in another position then the positioner must be supported on the surfaces shown with arrows in the graphic below.

Continues on next page



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Brake testing

After installing fixtures, always test the brakes, see [Brake testing on page 34](#).

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4 Configuration

4.1 Positioner Interface IRBP A

General

This section describes the I/O configuration for positioner IRBP A.

I/O board Configuration for positioner

Address	Name	Type	Digital/Input	Digital/Output	Analog/Input	Analog/Output	Relay/Output
-	B_POS_SIM	Simulated digital I/O					
Internal bus	DRIVO_1 ¹	Digital I/O	7	12	-	-	-

- 1) The number relates to the drive module where the I/O board is located, the example shows DM1.

Simulated outputs for B_POS_SIM

Simulated outputs

UnitMap	Name	Description
0	soACT_STN1	Activate mechanical unit 1
1	soACT_STN2	Activate mechanical unit 2

Simulated inputs

UnitMap	Name	Description
0	siSTN1_ACT	Mechanical unit 1 activated
1	siSTN2_ACT	Mechanical unit 2 activated

I/O-Signals configuration for DRIVO_1

Digital outputs TB4

Output	UnitMap	Name	Description	Connected to unit
1	0	doACT_K1	Activate mechanical unit 1	Positioner
2	1	doACT_K2	Activate mechanical unit 2	Positioner
3	2	doACT_K3	Activate mechanical unit 3	Positioner
4	3	doACT_K4	Activate mechanical unit 4	Positioner
5	4			
6	5	doACT_K11	Activate release break 1	Positioner
7	6	doACT_K12	Activate release break 2	Positioner
8	7	doACT_K13	Activate release break 3	Positioner
9	8	doACT_K14	Activate release break 4	Positioner

Continues on next page

4 Configuration

4.1 Positioner Interface IRBP A

Continued

Output	UnitMap	Name	Description	Connected to unit
10	9			
11	10			
12	11			
13		0 V Output		
14		24 V Output 1-12		

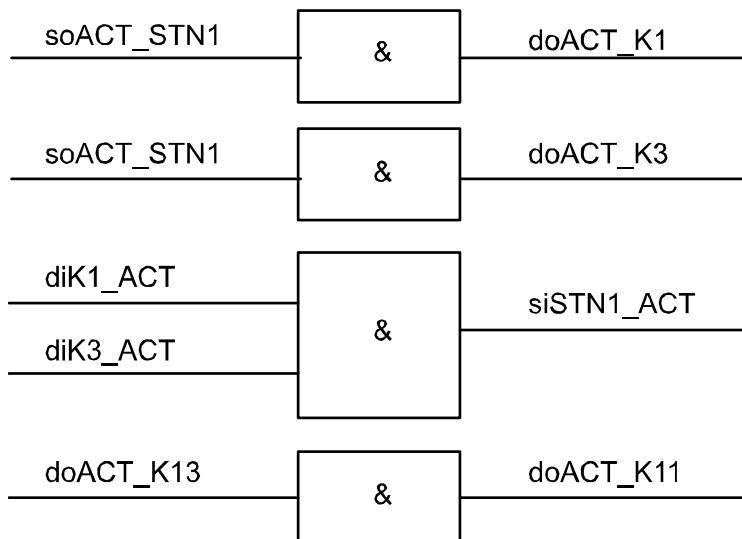
Digital inputs TB3

Input	UnitMap	Name	Description	Connected to unit
1	0	diK1_ACT	Mechanical unit 1 activated	Positioner
2	1	diK2_ACT	Mechanical unit 2 activated	Positioner
3	2	diK3_ACT	Mechanical unit 3 activated	Positioner
4	3	diK4_ACT	Mechanical unit 4 activated	Positioner
5	4			
6	5			
7	6			
8		0 V input 1-7		

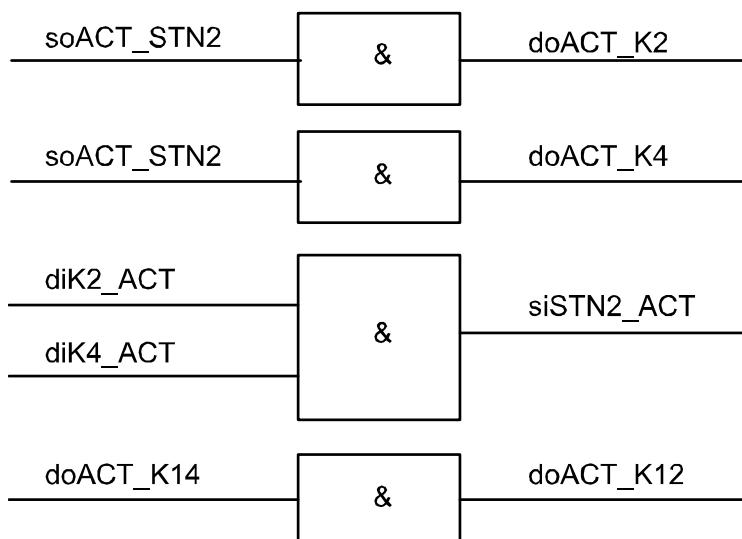
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Configuration cross-connections

STN1.



STN2.



xx1000000130

4 Configuration

4.2 Positioner Interface IRBP B/D

4.2 Positioner Interface IRBP B/D

General

This section describes the I/O configuration for positioner IRBP B/D.

I/O board Configuration for positioner

Address	Name	Type	Digital/Input	Digital/Output	Analog/In-	Analog/Out-	Relay/Out-
-	B_POS_SIM	Simulated digital I/O					
Internal bus	DRIVO_1 ¹	Digital I/O	7	12	-	-	-

- 1) The number relates to the drive module where the I/O board is located, the example shows DM1.

Simulated outputs for B_POS_SIM

Simulated outputs

UnitMap	Name	Description
0	soACT_STN1	Activate mechanical unit 1
1	soACT_STN2	Activate mechanical unit 2
2	soACT_INTCH	Activate mechanical unit 3

Simulated inputs

UnitMap	Name	Description
0	siSTN1_ACT	Mechanical unit 1 activated
1	siSTN2_ACT	Mechanical unit 2 activated
2	si_INTCH_ACT	Mechanical unit 3 activated

I/O-Signals configuration for DRIVO_1

Digital outputs TB4

Output	UnitMap	Name	Description	Connected to unit
1	0	doACT_K1	Activate mechanical unit 1	Positioner
2	1	doACT_K2	Activate mechanical unit 2	Positioner
3	2	doACT_K3	Activate mechanical unit 3	Positioner
4	3	doACT_K4	Activate mechanical unit 4	Positioner
5	4	doACT_K5	Activate mechanical unit 5	Positioner
6	5	doACT_K11	Activate release break 1	Positioner
7	6	doACT_K12	Activate release break 2	Positioner
8	7	doACT_K13	Activate release break 3	Positioner
9	8	doACT_K14	Activate release break 4	Positioner

Continues on next page

Output	UnitMap	Name	Description	Connected to unit
10	9	doACT_K15	Activate release break 5	Positioner
11	10			
12	11			
13		0 V Output		
14		24 V Output 1-12		

Digital inputs TB3

Input	UnitMap	Name	Description	Connected to unit
1	0	diK1_ACT	Mechanical unit 1 activated	Positioner
2	1	diK2_ACT	Mechanical unit 2 activated	Positioner
3	2	diK3_ACT	Mechanical unit 3 activated	Positioner
4	3	diK4_ACT	Mechanical unit 4 activated	Positioner
5	4	diK5_ACT	Mechanical unit 5 activated	Positioner
6	5			
7	6			
8		0 V input 1-7		

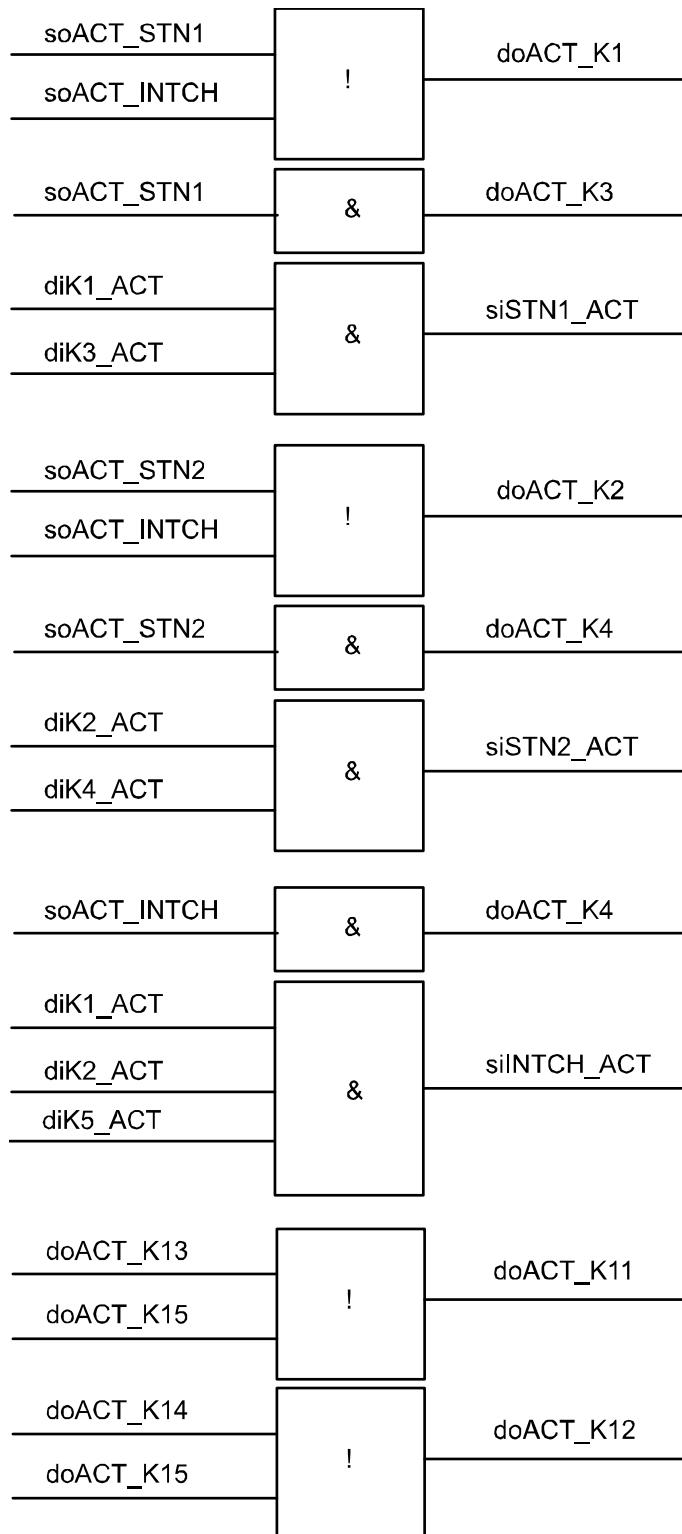
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4 Configuration

4.2 Positioner Interface IRBP B/D

Continued

Configuration cross-connections



xx1000000131

4.3 Positioner Interface IRBP C

General

This section describes the I/O configuration for positioner IRBP C

I/O board Configuration for positioner

Address	Name	Type	Digital/Input	Digital/Output	Analog/Input	Analog/Output	Relay/Output
-	B_POS_SIM	Simulated digital I/O					
Internal bus	DRIVO_1 ¹	Digital I/O	7	12	-	-	-

- 1) The number relates to the drive module where the I/O board is located, the example shows DM1.

Simulated outputs for B_POS_SIM

Simulated outputs

UnitMap	Name	Description
0	soACT_INTCH	Activate mechanical unit 1

Simulated inputs

UnitMap	Name	Description
0	siINTCH_ACT	Mechanical unit 1 activated

I/O-Signals configuration for DRIVO_1

Digital outputs TB4

Output	UnitMap	Name	Description	Connected to unit
1	0			
2	1			
3	2			
4	3			
5	4	doACT_K5	Activate mechanical unit 1	Positioner
6	5			
7	6			
8	7			
9	8			
10	9	doACT_K15	Activate release break 1	Positioner
11	10			
12	11			
13		0 V Output		

Continues on next page

4 Configuration

4.3 Positioner Interface IRBP C

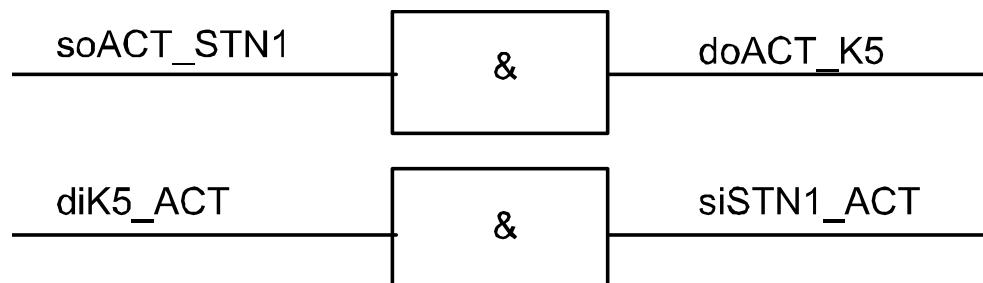
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Output	UnitMap	Name	Description	Connected to unit
14		24 V Output 1-12		

Digital inputs TB3

Input	UnitMap	Name	Description	Connected to unit
1	0			
2	1			
3	2			
4	3			
5	4	diK5_ACT	Mechanical unit 1 activated	Positioner
6	5	diLS_1_INPOS	Limit switch station 1	Station interchange unit
7	6	diLS_2_INPOS	Limit switch station 2	Station interchange unit
8		0 V input 1-7		

Configuration cross-connections



xx1000000134

4.4 Positioner Interface IRBP K/R

General

This section describes the I/O configuration for positioner IRBP K/R.

I/O board Configuration for positioner

Address	Name	Type	Digital/Input	Digital/Output	Analog/Input	Analog/Output	Relay/Output
-	B_POS_SIM	Simulated digital I/O					
Internal bus	DRIVO_1 ¹	Digital I/O	7	12	-	-	-

- 1) The number relates to the drive module where the I/O board is located, the example shows DM1.

Simulated outputs for B_POS_SIM

Simulated outputs

UnitMap	Name	Description
0	soACT_STN1	Activate mechanical unit 1
1	soACT_STN2	Activate mechanical unit 2
2	soACT_INTCH	Activate mechanical unit 3

Simulated inputs

UnitMap	Name	Description
0	siSTN1_ACT	Mechanical unit 1 activated
1	siSTN2_ACT	Mechanical unit 2 activated
2	siINTCH_ACT	Mechanical unit 3 activated

I/O-Signals configuration for DRIVO_1

Digital outputs TB4

Output	UnitMap	Name	Description	Connected to unit
1	0	doACT_K1	Activate mechanical unit 1	Positioner
2	1	doACT_K2	Activate mechanical unit 2	Positioner
3	2			
4	3			
5	4	doACT_K5	Activate mechanical unit 3	Positioner
6	5	doACT_K11	Activate release break 1	Positioner
7	6	doACT_K12	Activate release break 2	Positioner
8	7			
9	8			

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4 Configuration

4.4 Positioner Interface IRBP K/R

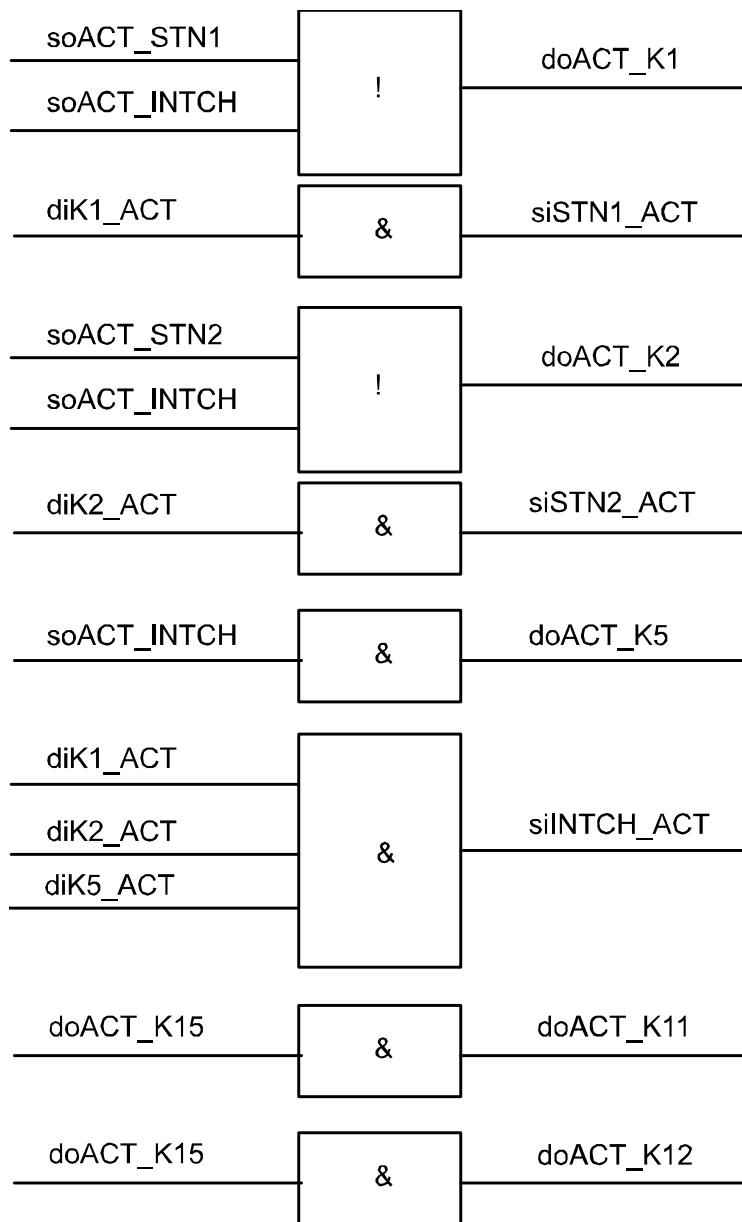
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Output	UnitMap	Name	Description	Connected to unit
10	9	doACT_K15	Activate release break 3	Positioner
11	10			
12	11			
13		0 V Output		
14		24 V Output 1-12		

Digital inputs TB3

Input	UnitMap	Name	Description	Connected to unit
1	0	diK1_ACT	Mechanical unit 1 activated	Positioner
2	1	diK2_ACT	Mechanical unit 2 activated	Positioner
3	2			
4	3			
5	4	diK5_ACT	Mechanical unit 3 activated	Positioner
6	5	diLS_1_INPOS	Limit switch station 1	Station interchange unit
7	6	diLS_2_INPOS	Limit switch station 2	Station interchange unit
8		0 V input 1-7		

Continues on next page

Configuration cross-connections

xx1000000135

4 Configuration

4.5 Positioner Interface IRBP L

4.5 Positioner Interface IRBP L

General

This section describes the I/O configuration for positioner IRBP L.

I/O board Configuration for positioner

Address	Name	Type	Digital/Input	Digital/Output	Analog/In-	Analog/Out-	Re-	lay/Out-
-	B_POS_SIM	Simulated digital I/O						
Internal bus	DRIVO_1 ¹	Digital I/O	7	12	-	-	-	-

- 1) The number relates to the drive module where the I/O board is located, the example shows DM1.

Simulated outputs for B_POS_SIM

Simulated outputs

UnitMap	Name	Description
0	soACT_STN1	Activate mechanical unit 1
1	soACT_STN2	Activate mechanical unit 2

Simulated inputs

UnitMap	Name	Description
0	siSTN1_ACT	Mechanical unit 1 activated
1	siSTN2_ACT	Mechanical unit 2 activated

I/O-Signals configuration for DRIVO_1

Digital outputs TB4

Output	UnitMap	Name	Description	Connected to unit
1	0	doACT_K1	Activate mechanical unit 1	Positioner
2	1	doACT_K2	Activate mechanical unit 2	Positioner
3	2			
4	3			
5	4			
6	5	doACT_K11	Activate release break 1	Positioner
7	6	doACT_K12	Activate release break 2	Positioner
8	7			
9	8			
10	9			
11	10			

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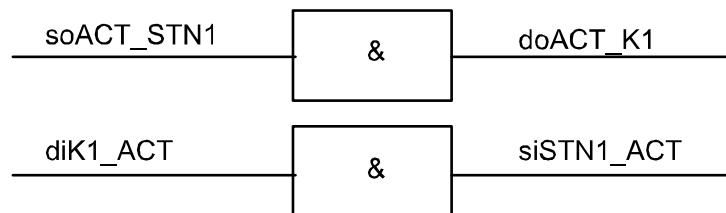
Output	UnitMap	Name	Description	Connected to unit
12	11			
13		0 V Output		
14		24 V Output 1-12		

Digital inputs TB3

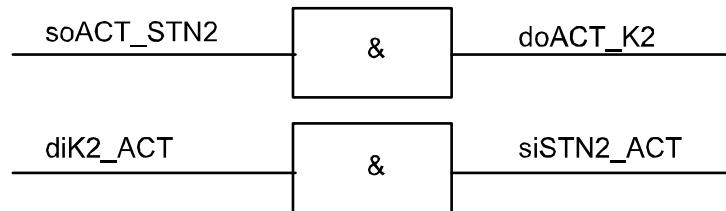
Input	UnitMap	Name	Description	Connected to unit
1	0	diK1_ACT	Mechanical unit 1 activated	Positioner
2	1	diK2_ACT	Mechanical unit 2 activated	Positioner
3	2			
4	3			
5	4			
6	5			
7	6			
8		0 V input 1-7		

Configuration cross-connections

STN1



STN2



xx1000000136

4 Configuration

4.6 Operator panel IRBP

4.6 Operator panel IRBP

General

This chapter describes the I/O configurations for operator panels delivered by ABB.

I/O board configuration

Address	Name	Type	Digital/In-put	Digital/Out-put	Analog/In-put	Ana-log/Output
-	B_OP_SIM	Simulated digit-al I/O				
21	B_OP_21	Digital I/O	12	7	-	-
22	B_OP_22	Digital I/O	12	7	-	-

System functions

Inputs

Signal name	Action
diPROG_START	Start
diPROG_STOP	Stop

Outputs

Signal name	Status
doCYCLE	CycleOn
doMON	MotorOn
doAUTO	AutoOn

I/O signals configuration for B_OP_SIM

Digital outputs

UnitMap	Name	Description
10	doCYCLE	CycleOn
11	doAUTO	MotorOn
12	doMON	AutoOn

I/O signals configuration for B_OP_21, B_OP_22

Digital outputs

Output	UnitMap	Name	Description
1	0	doPROC1	Operator ready activated on work area 1
2	1	doPROC2	Operator ready activated on work area 2
3	2	doPERM_ENTR1	Permit operator ready on work area 1
4	3	doPERM_ENTR2	Permit operator ready on work area 2

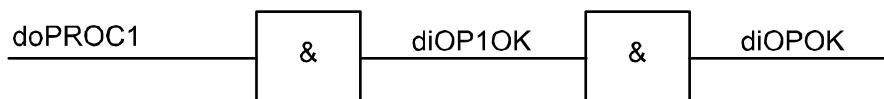
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Digital inputs

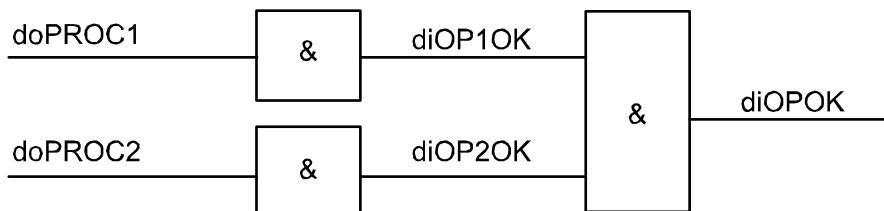
Input	UnitMap	Name	Description
1	0	diPROC1	Operator ready OK on work area 1
2	1	diPROC2	Operator ready OK on work area 2
3	2	diPROG_START	Program start
3	2	diPROG_START2	Program start (only used when two operator panels are used)
4	3	diPROG_STOP	Program stop
4	3	diPROG_STOP2	Program stop (only used when two operator panels are used)

Configuring cross connections

1 OP



2 OP



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4 Configuration

4.7 Safety interface SIB V for positioner A/L

General

This chapter describes the different I/O configurations for standard equipment for safety supervision SIB V, delivered by ABB.

I/O board Configuration SIB V

Address	Name	Board type	Digital inputs	Digital outputs
8	SIB_V_B1	Safety Interface Board Type 1	56	-
9*	SIB_V_B1	Safety Interface Board Type 1	56	-
8	SIB_V_B2	Safety Interface Board Type 2	56	-
9*	SIB_V_B2	Safety Interface Board Type 2	56	-
8	SIB_V_B3	Safety Interface Board Type 3	56	-
9*	SIB_V_B3	Safety Interface Board Type 3	56	-

*) Used as board No 2 in multi-station applications or combinations between different types of positioners. Example: Robot welding station with one positioner type IRBP 250K and one positioner type IRBP 250L.

I/O-signal configuration for SIB_V_B3

Digital inputs

Unit-Map	Connection	Name	Description	Connected to unit
0	TB1:8	diASTOP_CHA	Run chain AS1-	Panel board/safety switch service door
1	TB1:4	diASTOP_CHB	Run chain AS2+	Panel board/safety switch service door
2	TB31:2,TB31:15	diRL1	Channel 1 active	Entrance protection area 1
3	TB31:1,TB31:16	diRL2	Channel 2 active	Entrance protection area 2
4	TB31:9	diRL3	Reset/control of function safety circuits	Entrance protection area 1
5	TB33:14	diRL11	Channel 1 active	Station indication switch robot in area 2
6	TB33:15	diRL12	Channel 2 active	Station indication switch robot in area 2
7		diRL15	Reset/control of function safety circuits	Safety relays robot in area 2
9	TB33:12	diRL9	Channel 1 active	Station indication switch robot in area 1

Continues on next page

Unit-Map	Connection	Name	Description	Connected to unit
10	TB33:13	diRL10	Channel 2 active	Station indication switch robot in area 2
11		diRL14	Reset/control of function safety circuits	Safety relays robot in area 1
12	TB4:4	diRL4	Activate entrance protection area 1	Op-panel
13	TB4:1	diRL5	Activate entrance protection area 2	Op-panel
14	TB32:9	diRL6	Reset/control of function safety circuits	Entrance protection area 2
16	TB32:1,TB32:16	diRL7	Channel 1 active	Entrance protection area 2
17	TB32:2,TB32:15	diRL8	Channel 2 active	Entrance protection area 2
18	TB2:4, TB34:5	diG-STOP_CHA_1	Run chain GS2+ area 1	Panel board
19	TB1:1, TB34:3	diG-STOP_CHA_2	Run chain GS2+ area 2	Panel board
20	TB2:8, TB34:11	diG-STOP_CHB_1	Run chain GS1- area 1	Panel board
21	TB1:5, TB34:9	diG-STOP_CHB_2	Run chain GS1- area 2	Panel board
24	TB111:10, TB33:2	diRL201	Channel 1 active	Safety switch service door
25	TB111:8, TB33:4	diRL202	Channel 2 active	Safety switch service door
26	TB111:11, TB33:5	diRL203	Reset/control of function safety circuits	Safety switch service door
27	TB111:13, TB33:6	diRL204	Activate safety circuits service door	Push button service door
32	TB112:10, TB33:8	diRL401	Channel 1 active	Home position switch
33	TB112:8,TB3 3:9	diRL402	Channel 2 active	Home position switch
34	TB112:11*), TB112:12*)	diRL403	Reset/control of function safety circuits	Home position switch

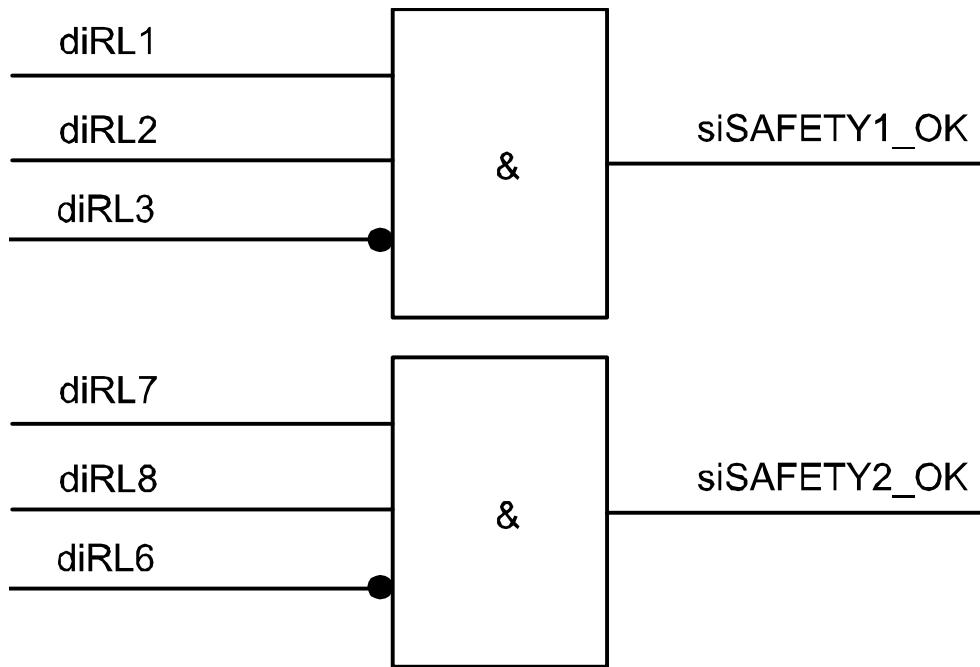
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4 Configuration

4.7 Safety interface SIB V for positioner A/L

Continued

Configuration cross- connections



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4.8 Safety interface SIB V for positioner B/C/D/K/R

General

This chapter describes the different I/O configurations for standard equipment for safety supervision SIB V, delivered by ABB Technologies AB.

I/O board Configuration SIB V

Address	Name	Board type	Digital inputs	Digital outputs
8	SIB_V_B1	Safety Interface Board Type 1	56	-
9*	SIB_V_B1	Safety Interface Board Type 1	56	-
8	SIB_V_B2	Safety Interface Board Type 2	56	-
9*	SIB_V_B2	Safety Interface Board Type 2	56	-
8	SIB_V_B3	Safety Interface Board Type 3	56	-
9*	SIB_V_B3	Safety Interface Board Type 3	56	-

*) Used as board No 2 in multi-station applications or combinations between different types of positioners. Example: Robot welding station with one positioner type IRBP 250K and one positioner type IRBP 250L.

I/O-signal configuration for SIB_V_B1

Digital inputs

Unit-Map	Connec-tion	Name	Description	Connected to unit
0	TB1:8	diASTOP_CHA	Run chain AS1-	Panel board/safety switch service door
1	TB1:4	diASTOP_CHB	Run chain AS2+	Panel board/safety switch service door
2	TB31:9, TB31:17	diRL1	Channel 1 active	Entrance protection area 1
3	TB31:8, TB31:18	diRL2	Channel 2 active	Entrance protection area 1
4	TB1:16	diRL3	Reset/control of function safety circuits	Entrance protection area 1
5	TB4:4	diRL4	Activate entrance protection area 1	Op-panel
6	TB2:9	diRL13	Indication station 1 at robot	Station interchange
7	TB2:10	diRL133	Indication station 1 at robot (inverted signal)	Station interchange
9	TB2:11	diRL141	Indication station 2 at robot	Station interchange
10	TB2:12	diRL143	Indication station 2 at robot (inverted signal)	Station interchange
16	TB1:1	diGSTOP_CHA	Run chain GS2+	Panel board
17	TB1:5	diGSTOP_CHB	Run chain GS2-	Panel board

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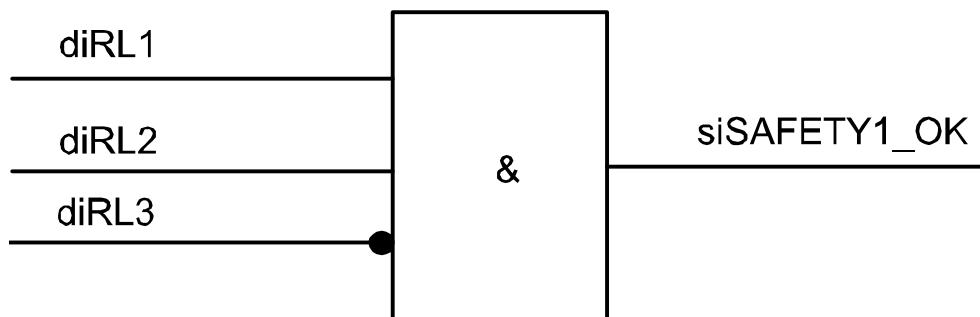
4 Configuration

4.8 Safety interface SIB V for positioner B/C/D/K/R

Continued

Unit-Map	Connec-tion	Name	Description	Connected to unit
24	TB111:10, TB31:2	diRL201	Channel 1 active	Safety switch service door
25	TB111:8, TB31:4	diRL202	Channel 2 active	Safety switch service door
26	TB111:11,TB31:5	diRL203	Reset/control of func-tion safety circuits	Safety switch service door
27	TB111:13, TB31:6	diRL204	Activate safety circuits service door	Push button service door

Configuration cross- connections



xx1000000138

5 Maintenance

5.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRBP.

It is based on the maintenance schedule found at the beginning of the chapter.

The schedule contains information about required maintenance activities including intervals, and refers to procedures for the activities.

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

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

Safety information

Observe all safety information before conducting any service work!

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



Note

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

For more information see:

- *Product manual - IRC5*

5 Maintenance

5.2 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 IRBP:

- 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.

5.3 Maintenance schedule and expected component life

5.3.1 Maintenance schedule

General

This chapter details all maintenance activities recommended for the IRBP. It is based on the maintenance schedule located 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 information required to perform the activity, e.g. required tools and materials. The procedures are gathered in different sections and divided according to the maintenance activity.

Safety information

Before performing any service work, 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 risks during installation and service work on robots on page 22* before performing any service work.

Activities and intervals, standard equipment

The sections referred to in the table can be found in the different chapters for every maintenance activity. The table below specifies the required maintenance activities and intervals:

Maintenance activity	Equipment	Interval
Inspection	Positioner harness	Running
Inspection	Current collector	Running
Inspection	Interchange gearbox, oil leak	Running
Clean	Positioner	Running
Lubrication	Current collector	400h
Lubrication	Gearbox, oil	40,000h
Replacement	Battery pack, measurement system with 2-pole battery contact, e.g. DSQC633A	Battery low alert ⁱ
Replacement	Battery pack, measurement system of type RMU101 or RMU102 (3-pole battery contact)	36 months or battery low alert ⁱⁱ

ⁱ The battery low alert (38213 **Battery charge low**) is displayed when remaining backup capacity (robot powered off) is less than 2 months. The typical lifetime 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 h/day. The lifetime can be extended with a battery shutdown service routine. See *Operating manual - IRC5 with FlexPendant* for instructions.

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

See the replacement instruction for more details.

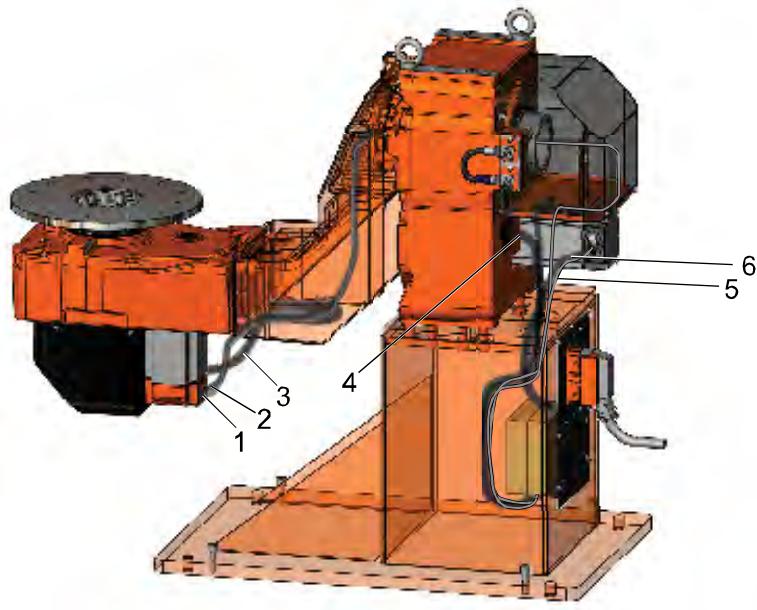
5 Maintenance

5.4.1 Inspection, cables

5.4 Inspection activities

5.4.1 Inspection, cables

Location

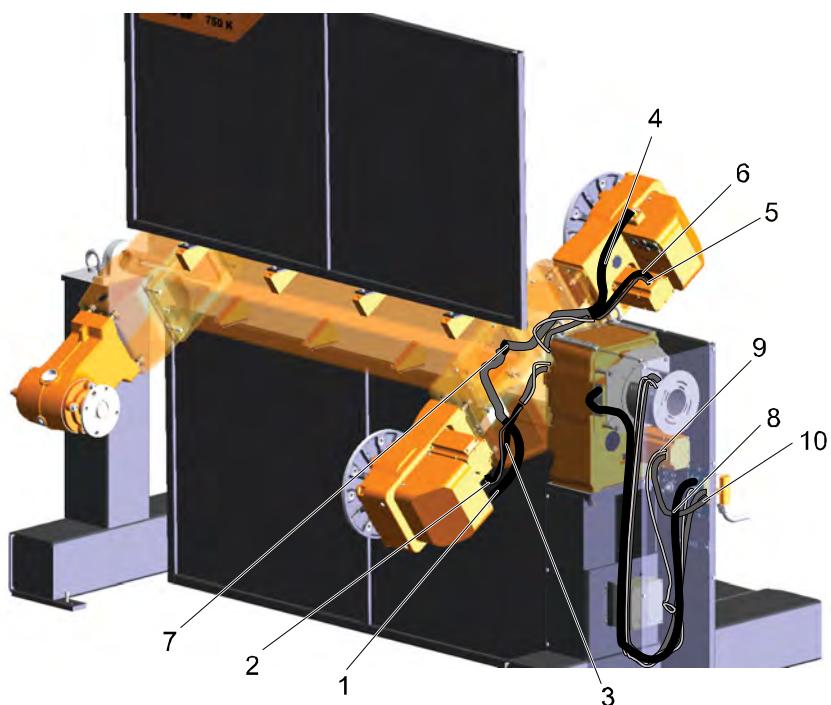


xx0900001055

1	Motor power axis 2
2	SMB 2 signals axis 2
3	Current collector rotary unit 2
4	Current collector rotary unit 1
5	Motor power axis 1
6	SMB 1 signals axis 1

Continues on next page

5.4.1 Inspection, cables *Continued*



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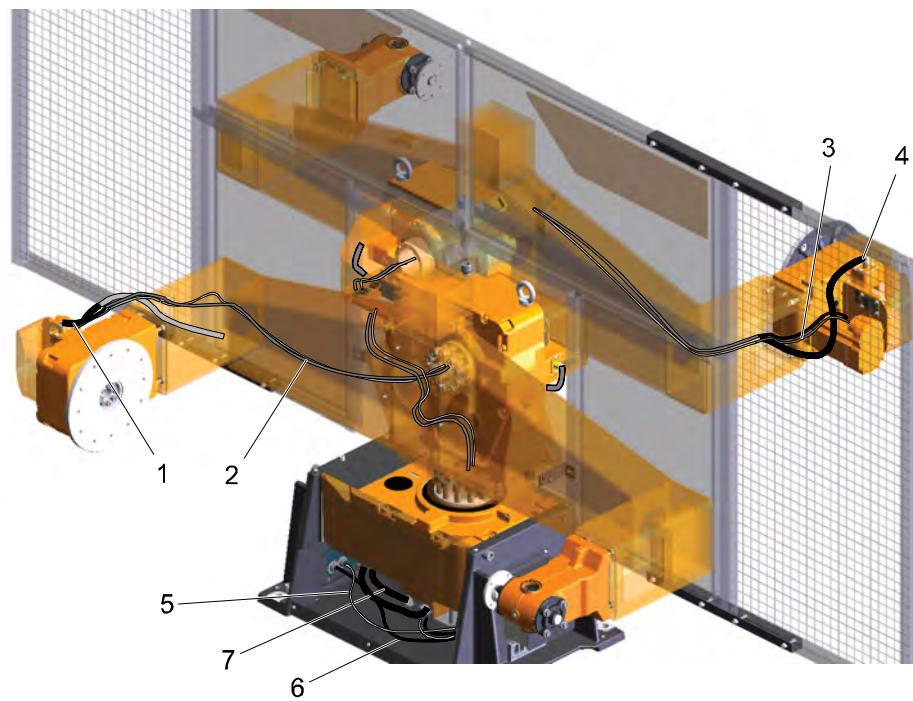
1	Current collector rotary unit 3
2	SMB signals axis 3
3	Motor power axis 3
4	Current collector rotary unit 2
5	SMB signals axis 2
6	Motor power axis 2
7	Current collector connection point
8	Current collector rotary unit 1
9	SMB signals axis 1
10	Motor power axis 1

Continues on next page

5 Maintenance

5.4.1 Inspection, cables

Continued

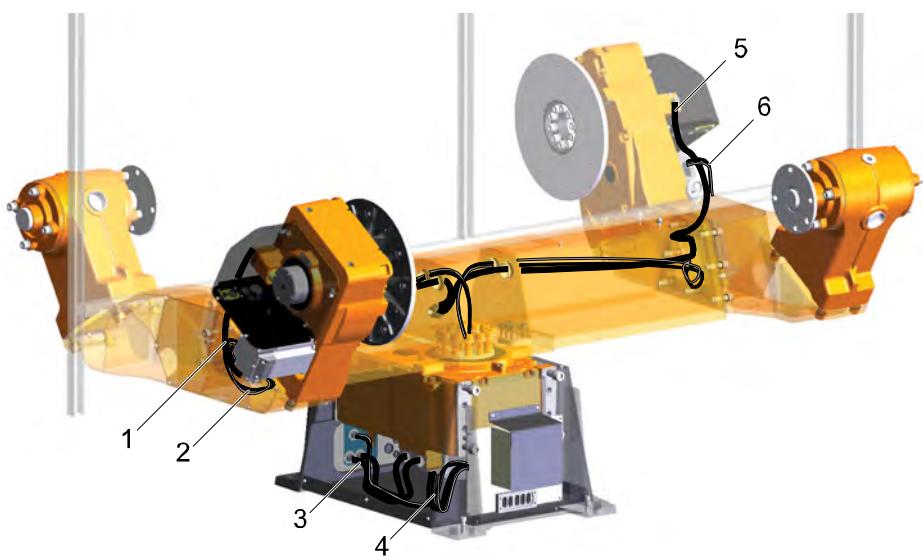


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1	Current collector rotary unit 4
2	SMB signals axis 4/ Motor power axis 4
3	SMB signals axis 5/ Motor power axis 5
4	Current collector rotary unit 5
5	SMB signals axis 1
6	Motor power axis 1
7	Current collector rotary unit 1

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5.4.1 Inspection, cables *Continued*



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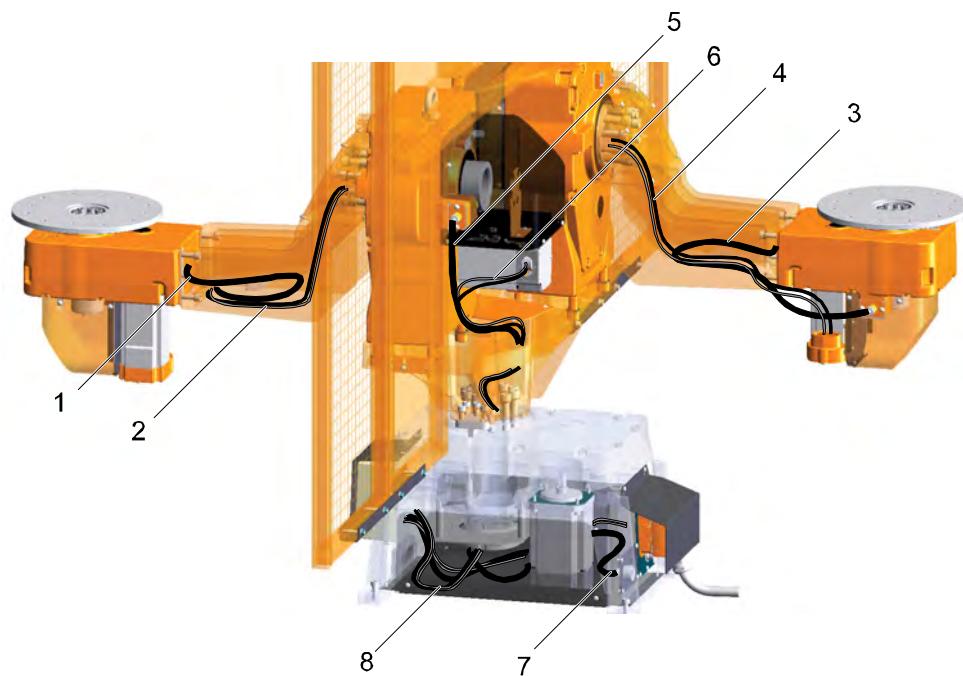
1	Current collector rotary unit 3
2	SMB signals axis 3/ Motor power axis 3
3	Current collector rotary unit 1
4	SMB signals axis 1/ Motor power axis 1
5	Current collector rotary unit 2
6	SMB signals axis 2/ Motor power axis 2

Continues on next page

5 Maintenance

5.4.1 Inspection, cables

Continued



xx1000000011

1	Current collector rotary unit 4
2	SMB signals axis 4/ Motor power axis 4
3	Current collector rotary unit 5
4	SMB signals axis 5/ Motor power axis 5
5	SMB signals axis 2/ Motor power axis 2
6	Current collector rotary unit 2
7	Current collector rotary unit 1
8	SMB signals axis 1/ Motor power axis 1

Inspection procedure



WARNING

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

	Action	Note
1	Make an overall visual inspection of the cable harness, in order to detect wear and damage.	
2	Replace the cable harness if wear, cracks or damage is detected.	

5.4.2 Inspection, current collector



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

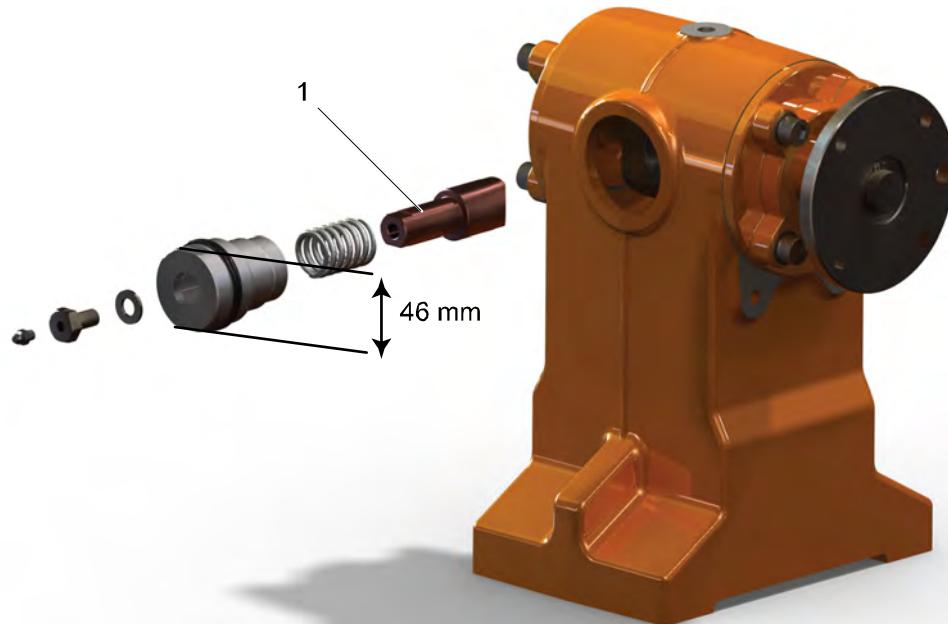
Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)

General

The function of the current collector is to transfer the weld current through the rotary unit or through the support collar. The contact bar needs to be checked for damage caused by sparking during welding start after approximately 1000 hours of operation.

Inspection procedure



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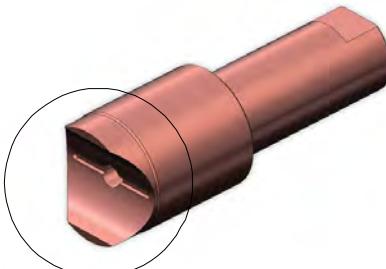
1	Current Collector	
	Action	Information
1	Remove the Current Collector cable.	
2	Remove the Current Collector.	Open key 46 mm

Continues on next page

5 Maintenance

5.4.2 Inspection, current collector

Continued

	Action	Information
3	Check the collector surface for damage.	 xx1000000113
4	For assemble see <i>Replacing support collar axis on page 234</i> .	

5.4.3 Inspection, gearbox oil leak



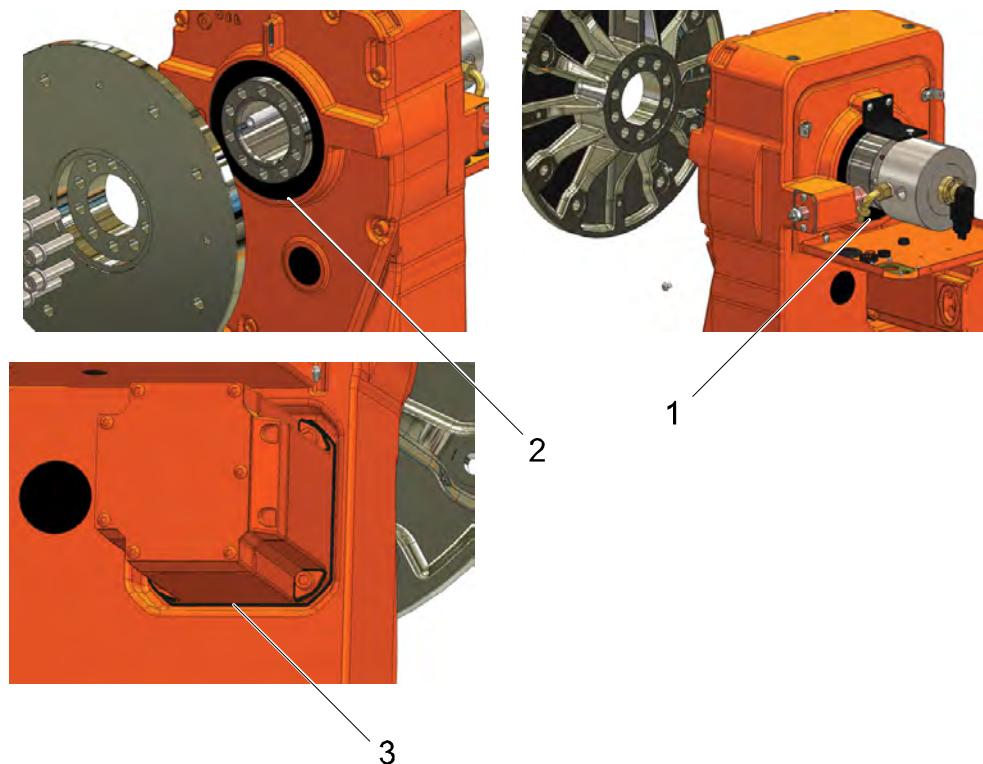
DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)

Location



xx1000000250

1	Axis sealing
2	Axis sealing
3	Motor sealing

Inspection procedure

	Action	Information
1	Check all sealing areas for oil leak.	

5 Maintenance

5.5.1 Cleaning the IRBP



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 IRBP 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 IRBP.



Note

Always verify the protection type of the robot before cleaning.

Oil spills

Oil spills from gearboxes

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

- 1 Inspect that the oil level in the suspected gearbox is according to the recommendations, see [Inspection activities on page 184](#).
- 2 Write down the oil level.
- 3 Inspect the oil level again after, for example, 6 months.
- 4 If the oil level is decreased then replace the gearbox.

Oil spills discolors painted surfaces

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



Note

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

Dos and don'ts!

This section specifies some special considerations when cleaning the robot.

Always!

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

Continues on next page

Never!

- Never use compressed air to clean the robot!
- Never use solvents that are not approved by ABB to clean the robot!
- Never remove any covers or other protective devices before cleaning the robot!

Cleaning methods

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

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

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.

Mechanical stops

Regularly clean the contact surface of the mechanical stops.

5 Maintenance

5.6.1 Lubricating the current collector



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

- [*Safety risks related to pneumatic/hydraulic systems on page 27*](#)
- [*Risks associated with live electric parts on page 29*](#)
- [*Safety risks during installation and service work on robots on page 22*](#)

Current collector

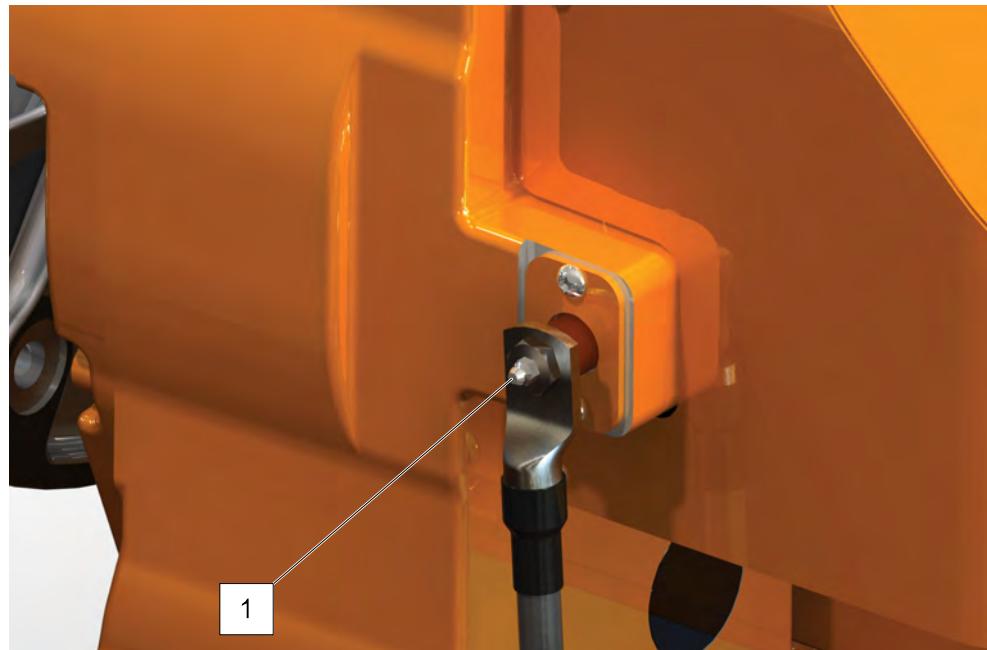
The function of the current collector is to transfer the weld current through the rotary unit. This takes place through a spring-loaded contact bar against the shaft. The contact bar needs to be lubricated approximately after 400 hours of operation. This should be done using a special grease, P34 from Nies, article number: 0501869-001.

Required equipment

Equipment	Note
Grease	Grease type: P34 from Nies. Article number: 0501869002.
Standard tools	<i>Standard tools IRBP on page 314</i>
Grease gun	

Continues on next page

Lubricate



xx1000000024

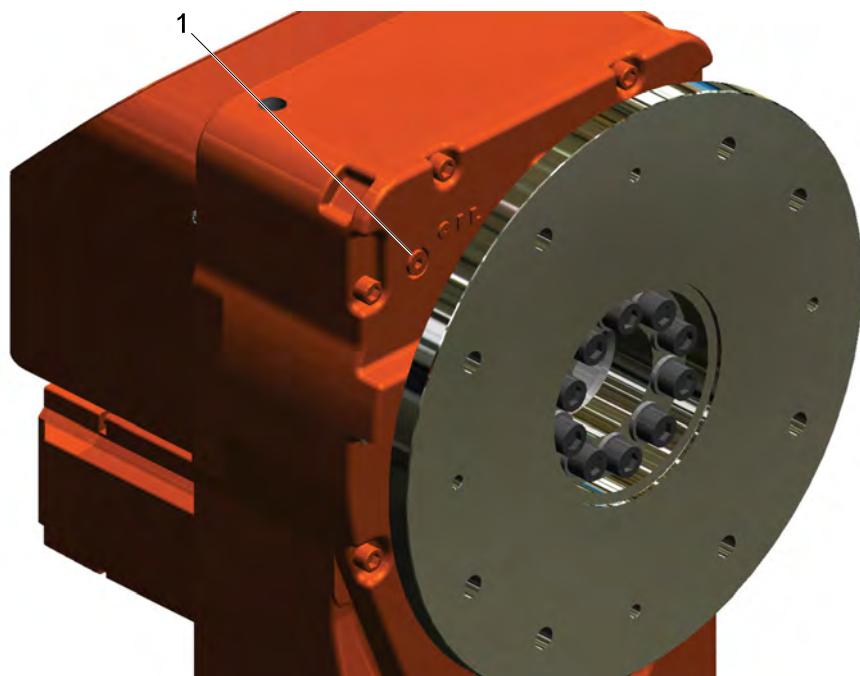
1	Lubrication nipple	
	Action	Information
1	Lubricate the current collector using a grease gun.	 Note Amount of grease: 12 ml.

5 Maintenance

5.6.2 Oil in gearboxes

5.6.2 Oil in gearboxes

Location of oil plugs MTD/MID



xx1000000083

1	Oil plug
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Oil in gearbox

The oil in the gearbox does not need to be changed during the lifetime of the gearbox.

Type and amount of oil in gearboxes

Information about the *type of lubrication*, *article number* as well as the *amount* in the specific gearbox can be found in *Technical reference manual - Lubrication in gearboxes*. Document number is presented in [References on page 10](#). In order to always get the latest information of updates about lubrication in gearboxes, always check on ABB Library for the latest revision of the manual. A new revision will be published on ABB Library immediatly after any updates.

Before starting any inspection, maintenance, or changing activities of lubrication, **always** check ABB Library for the latest revision of this manual. The revision of the manual published on the Documentation DVD (released twice a year) will only contain the latest updates when the Documentation DVD is released. Any updates of the manual in between these releases will be published on ABB Library. Therefore the manual published on the documentation DVD may not contain the latest updates about lubrication. If ABB Library cannot be reached, contact the local ABB Service organisation for more information.

5.7 Replacement and changing activities

5.7.1 Replacing SMB battery



Note

The battery low alert (38213 **Battery charge low**) is displayed when the battery needs to be replaced. The recommendation to avoid an unsynchronized robot is to keep the power to the controller turned on until the battery is to be replaced. For an SMB board with 3-pole battery contact (RMU101 3HAC044168-001 or RMU102 3HAC043904-001), the lifetime of a new battery is typically 36 months. For an SMB board with 2-pole battery contact, the typical lifetime 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 h/day. The lifetime can be extended for longer production breaks with a battery shutdown service routine. See *Operating manual - IRC5 with FlexPendant* for instructions.



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)
- [WARNING - Safety risks during handling of batteries on page 50](#)



Note

This action demands an update of the revolution counters.

Required equipment



Note

There are two variants of SMB units and batteries. One with 2-pole battery contact and one with 3-pole battery contact. The variant with the 3-pole battery contact has longer lifetime for the battery.

It is important that the SMB unit uses the correct battery. Make sure to order the correct spare parts. Do not replace the battery contact!

Equipment	Note
Standard tools	Standard tools IRBP on page 314
Cable strap (outdoors)	4.8 x 290, 2 pcs

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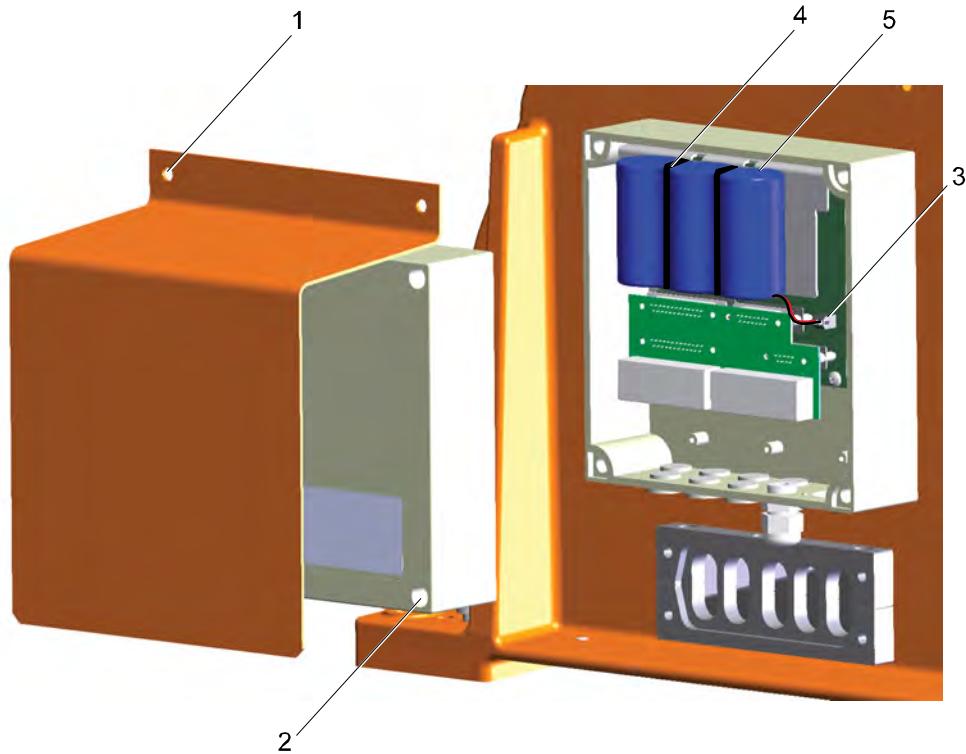
5 Maintenance

5.7.1 Replacing SMB battery

Continued

Equipment	Note
SMB battery	See <i>Product manual, spare parts - IRBP /D2009</i>

Replacement battery



xx1000000025

1	Torx screw M6 x 10
2	Cover
3	SMB battery contact
4	Cable strap
5	SMB battery

Action	Information
1 Remove the cover.	
2 Locate the SMB backup battery packs (5).	
3 Cut off the cable strap (4) holding the battery.	
4 Disconnect the connection cable (3) in figure and remove the battery.	
5 Fit the new battery in the reverse order.	Use 2 cable straps.
6 Mount the cover.	

6 Repair

6.1 General procedures

6.1.1 Introduction

Structure of this chapter

This chapter describes all repair activities recommended for the IRBP 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 309](#).

Safety information

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



Note

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

For more information see:

- *Product manual - IRC5*

6 Repair

6.1.2 Mounting instructions for bearings

General

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

Equipment

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

Assembly of all bearings

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

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

Assembly of tapered bearings

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

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

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

Greasing of bearings

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

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

Continues on next page

6.1.2 Mounting instructions for bearings

Continued

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

Grease the different types of bearings as following description:

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

6 Repair

6.1.3 Mounting instructions for seals

6.1.3 Mounting instructions for seals

General

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

Equipment

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

Rotating seals

The procedure below describes how to fit rotating seals.



CAUTION

Please observe the following before commencing any assembly of seals:

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

Action	Note
1 Check the seal to ensure that: <ul style="list-style-type: none">• The seal is of the correct type (provided with cutting edge).• There is no damage to the sealing edge (feel with a fingernail).	
2 Inspect the sealing surface before mounting. If scratches or damage are found, the seal must be replaced since it may result in future leakage.	
3 Lubricate the seal with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the seal.) Fill 2/3 of the space between the dust tongue and sealing lip with grease. The rubber coated external diameter must also be greased, unless otherwise specified.	Article number is specified in Equipment on page 202 .
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

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.	

6 Repair

6.2.1 Replacing frame parts

6.2 Frame parts

6.2.1 Replacing frame parts

General

The following procedures in this section details how to remove the gearbox axes 1-3.

- [*Demount station frame on page 206*](#)
- [*Refit station frame on page 207*](#)
- [*Demount station frame on page 206*](#)
- [*Demount frame and covers on page 210*](#)
- [*Refit the frame and covers on page 212*](#)
- [*Demount MTD turning disc on page 213*](#)
- [*Refit the MTD turning disc on page 213*](#)



DANGER

Turn off all electrical power, hydraulic, and pneumatic pressure supplies to the manipulator before comming the repair work.

Also read the safety sections:

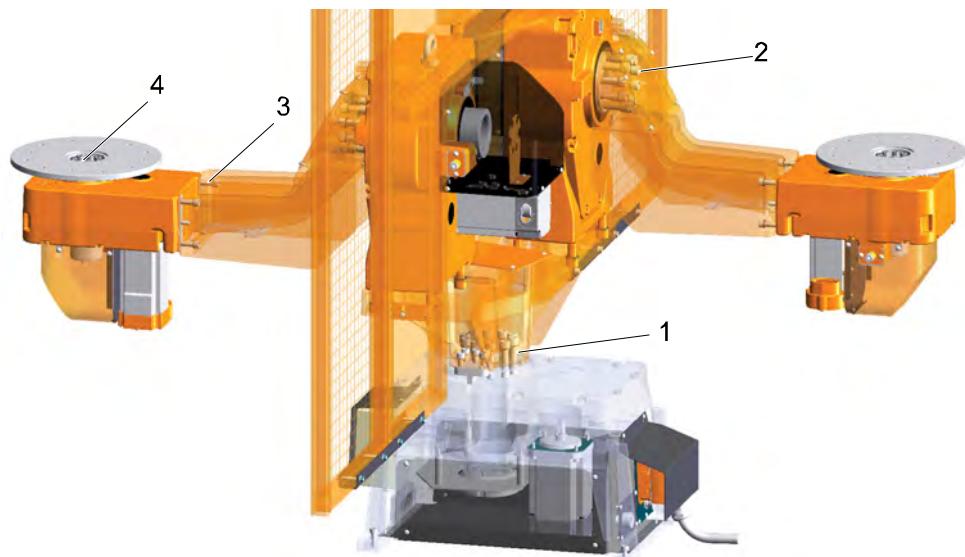
- [*Safety risks related to pneumatic/hydraulic systems on page 27*](#)
- [*Replacing frame parts on page 204*](#)
- [*Safety risks during installation and service work on robots on page 22*](#)

Required equipment

Equipment	Note
Standard tools	For more information, see <i>Standard tools IRBP on page 314</i> .

Continues on next page

Frame parts



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1	Base frame screws
2	Station frame screws
3	Rotary units screws
4	Turning disc screws

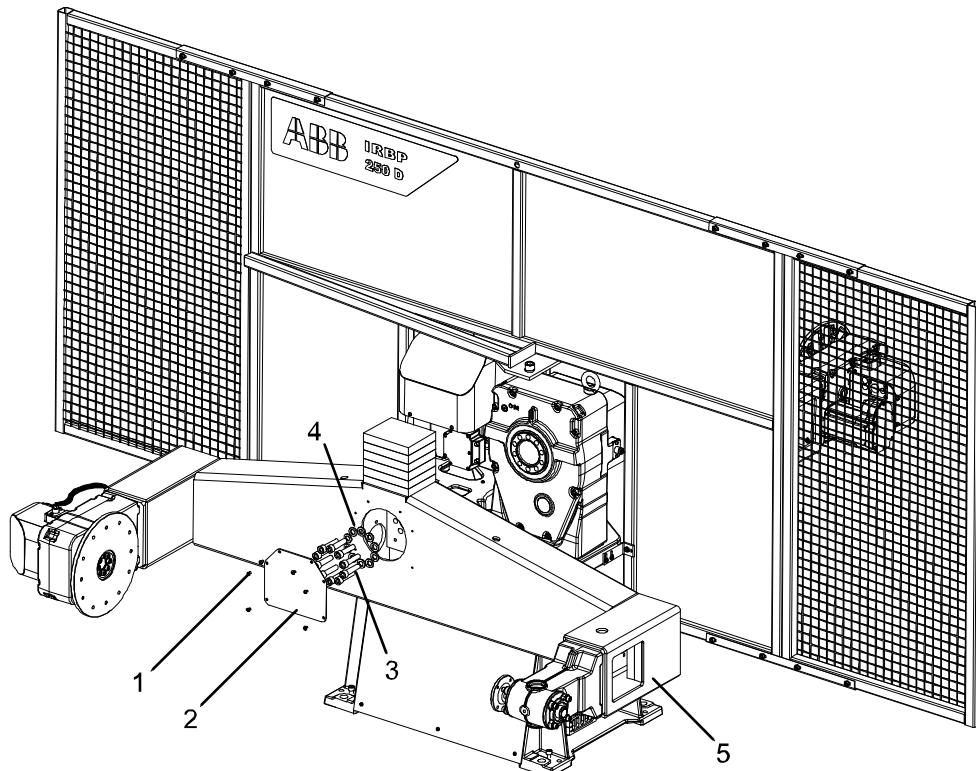
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6 Repair

6.2.1 Replacing frame parts

Continued

Demount station frame



xx1000000015

1	Screw
2	Cover plate
3	Attachment screws M16x70 12.9 Gleitmo
4	Washers
5	Station frame

	Action	Note
1	Loosen the screws (1) and remove the cover plate (2).	
2	Loosen the attachment screws.	
3	Lift the station frame.	Described in section Lifting frame parts on page 214 .

Screw joints MTD axis

MTD/MID	Axis	Screw dim. 12.9 UNB	Screw dim. 12.9	Tightening torque (Nm)
MTD 250	Turning axis	10x40		70
MTD 500	Turning axis	16x70		300
MTD 750	Turning axis	16x70		300
MTD 2000	Turning axis	20x90		550
MTD 5000	Turning axis	24x110		950

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6.2.1 Replacing frame parts
Continued

MTD/MID	Axis	Screw dim. 12.9 UNB	Screw dim. 12.9	Tightening torque (Nm)
MID 2.1	Foot - Frame		20x90	550
Support collar MTD 250	Spherical bearing		10x40	70
Support collar MTD 750	Spherical bearing		16x70	300
Support collar MTD 2000	Spherical bearing		20x90	550

Refit station frame

	Action	Note
1	Clean the contact surface	
2	Lift the station frame.	Described in section <i>Lifting frame parts on page 214</i> .
3	Mount the attachment screws	Tightening torque according to table in Screw joints MTD axis.

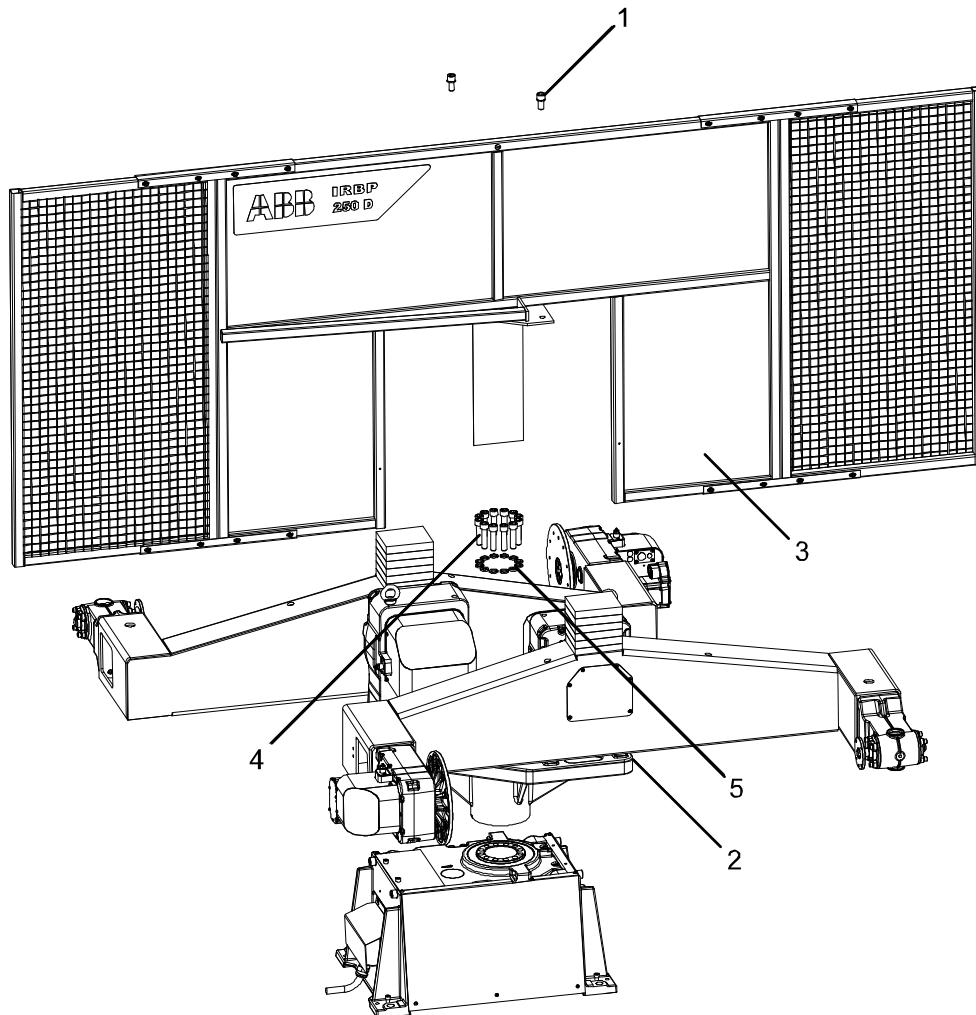
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6 Repair

6.2.1 Replacing frame parts

Continued

Demount base frame



xx1000000014

1	Screws
2	Base frame
3	Station shield
4	Attachment screws M20x90 Steel 12.9
5	Washers

	Action	Note
1	Remove the screws holding the station shield.	

Continues on next page

Action	Note
2 Remove the cover on the base frame	 xx1000000115
3 Remove the attachment screws	
4 Lift the base frame.	Described in section Lifting frame parts on page 214 .

Refit base frame

Action	Note
1 Clean the contact surface.	
2 Lift the station frame.	Described in section Lifting frame parts on page 214 .
3 Mount the attachment screws.	Tightening torque according to table in Screw joints MTD axis.

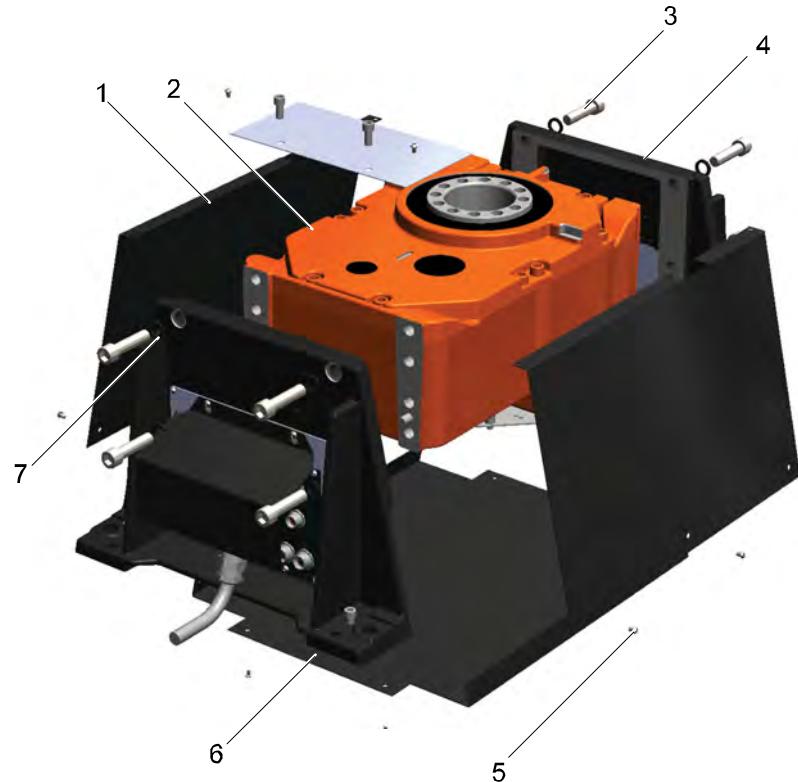
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6 Repair

6.2.1 Replacing frame parts

Continued

Demount frame and covers



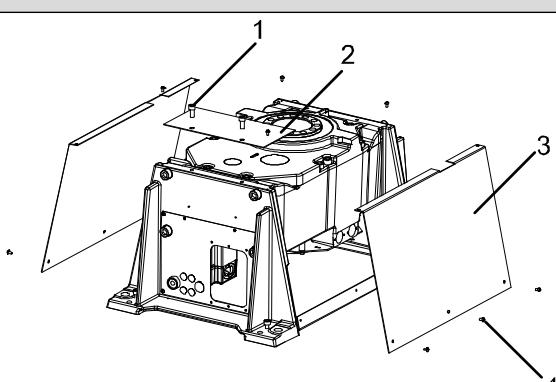
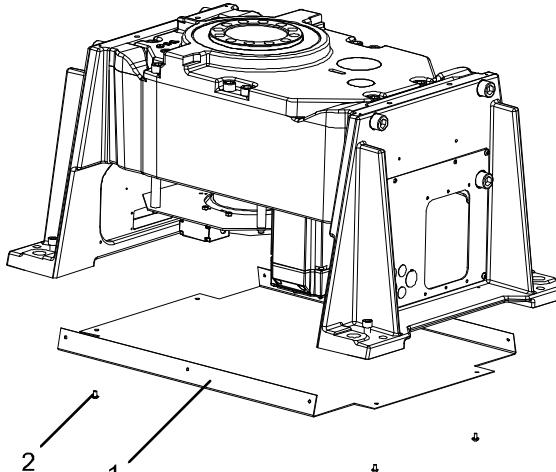
xx1000000020

1	Side cover
2	Rotary Unit
3	Attachment screw M20x90 Steel 12.9
4	Frame
5	Screw M6x10
6	Bottom plate
7	Washer 21x31/ 4 mm

Continues on next page

6.2.1 Replacing frame parts

Continued

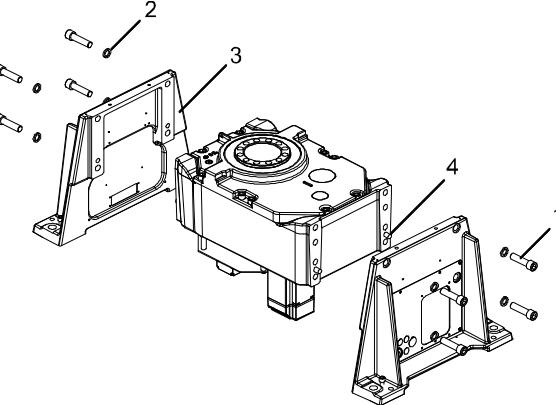
Action	Note
<p>1 Unscrew (4) and remove the side covers (3).</p> <p>2 Unscrew (1) and remove the cover plate (2).</p>	 <p>xx100000006</p> <p>1 Screw 2 Cover plate 3 Side cover 4 Screw M6x10</p>
2 Unscrew (2) and remove the bottom plate (1).	 <p>xx100000007</p> <p>1 Bottom plate 2 Screw M6x10</p>
3 Remove the electrical connection.	

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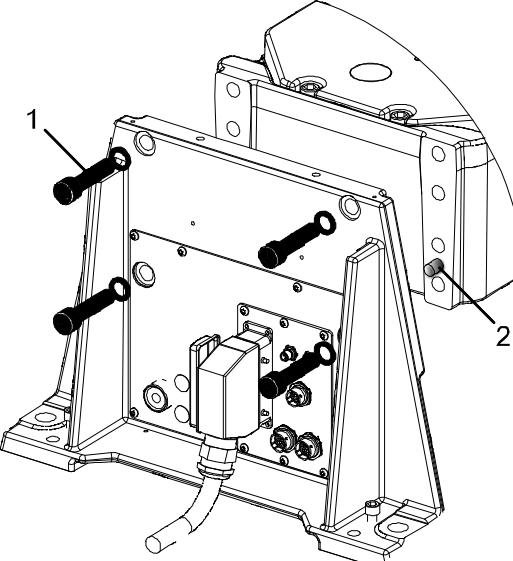
6 Repair

6.2.1 Replacing frame parts

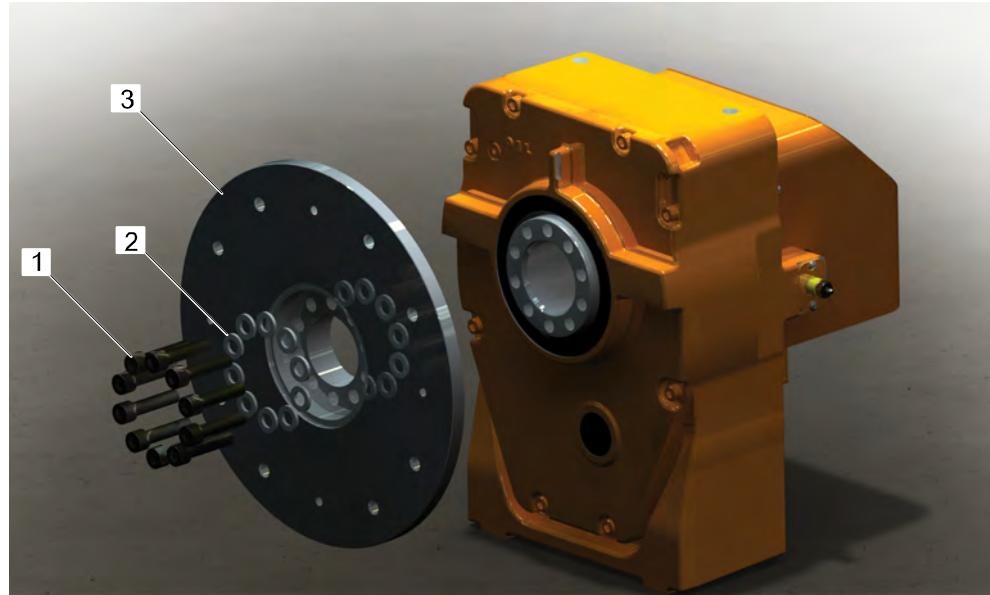
Continued

Action	Note
4 Unscrew (1) and loose the washers (2) and remove the two frames (3).	 xx1000000008 <ul style="list-style-type: none"> 1 Attachment screw M20x90 Steel 12.9 2 Washers 3 Frame 4 Guide pin

Refit the frame and covers

Actions	Note
1 Mount the frames using the attachment screws M20x90. <ul style="list-style-type: none"> • Tightening torque is 550 Nm <p>Note</p> <p>Use Molykote-lubricant for the screw joints.</p>	 xx1000000077 <ul style="list-style-type: none"> 1 Attachment screw M20x90 Steel 12.9 2 Guide pin
2 Mount all electrical connections.	
3 Mount the bottom plate.	
4 Mount the side plates and cover.	

Continues on next page

Demount MTD turning disc

xx1000000023

1	Attachment screws	
2	Washers	
3	Turning disc	
Action		Note
1	Remove the screws by holding the turning disc.	

Refit the MTD turning disc

	Action	Note
1	Refit the screws by holding the turning disc.	Tightening torque according to the table in Screw joints MTD axis.

6 Repair

6.2.2 Lifting frame parts

6.2.2 Lifting frame parts

General

This section describes about the lifting of frame parts.

For information about the lifting of manipulator, see the section [Lifting the IRBP on page 99](#). For information about replacing rotary units see the section [Replacing rotary unit on page 232](#).



Note

Lifting eyes (standard as well as with swivel) are not delivered with the IRBP. Use lifting eyes and/or lifting eyes with swivel in the proper positions as described in the lifting instructions for each IRBP. Always use lifting eyes with the correct lifting capacity according to the part being lifted.



WARNING

Do not work or walk under a suspended load!



WARNING

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



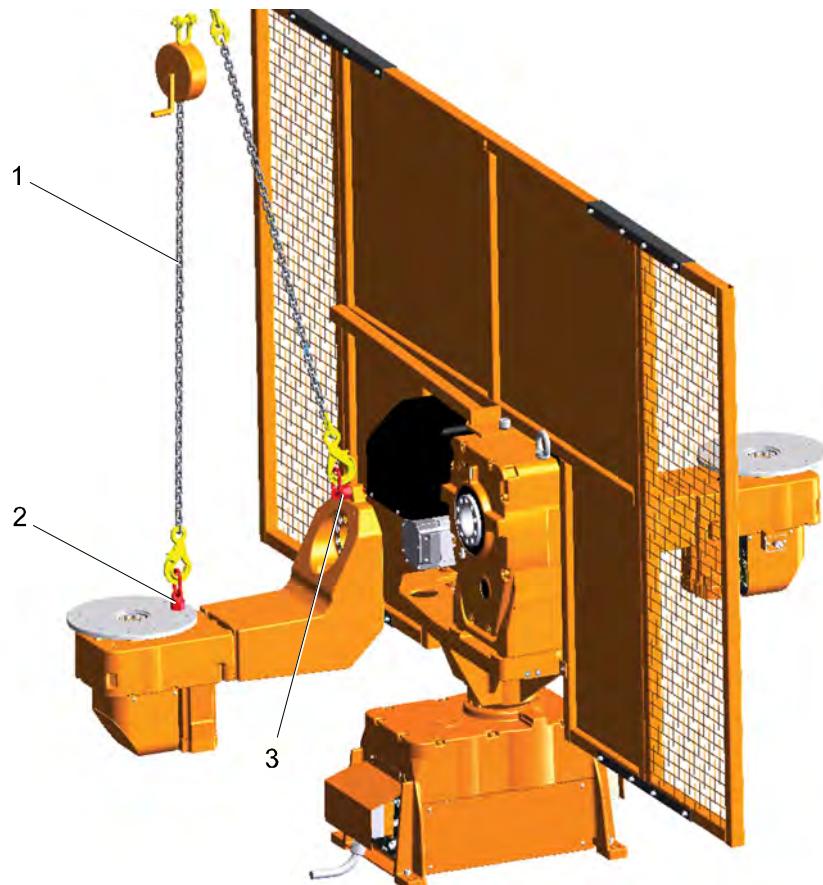
WARNING

Always lift the manipulator in a safe manner, using lifting tools according to the specified lifting weight in section *Lifting weight*.

Required equipment

Equipment	Note
Standard tools	See section Standard tools IRBP on page 314 .
Lifting accessories	Suitable for the specified lifting weight.
Lifting eyes	Suitable for the specified lifting weight.
Lifting eyes, swivel	Suitable for the specified lifting weight.
Winch min. 500 kg	

Continues on next page

Lifting A, B station arm

xx1000000078

1	Winch min. 500 Kg
2	Lifting eye, swivel
3	Lifting eye, swivel 14 mm

Frame parts	Lifting weight
250 A/B	117 kg
500/750A, dist. =1000	250 kg
500/750 A/B	270 kg

	Action	Note
1	Attach the lifting eyes with swivel, as shown in the figure.	
2	Stretch the lifting chains.	
3	Remove the attachment screws.	
4	Lift the gearbox and the frame.	

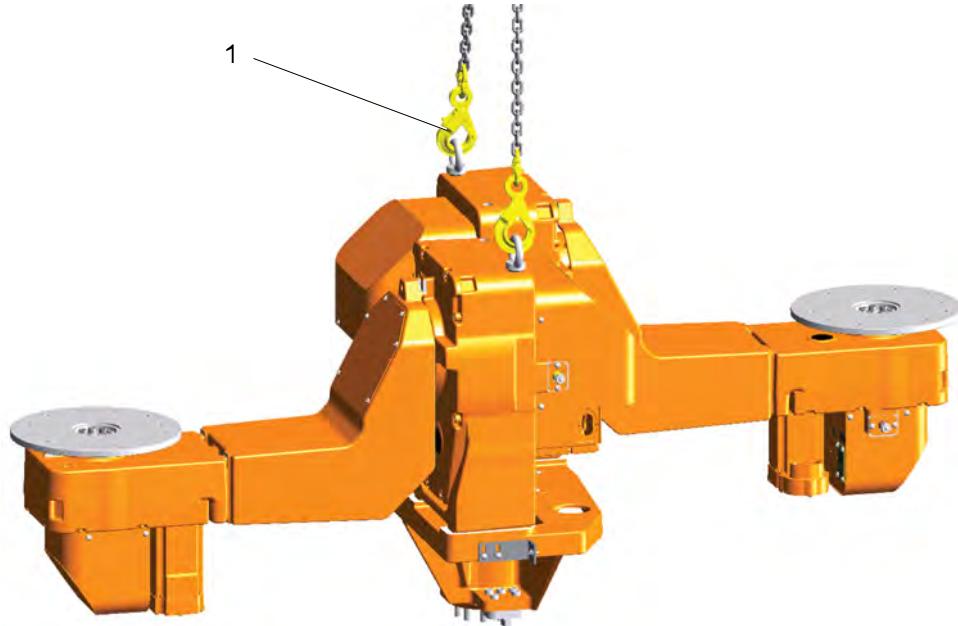
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6 Repair

6.2.2 Lifting frame parts

Continued

Lifting A, B station frame



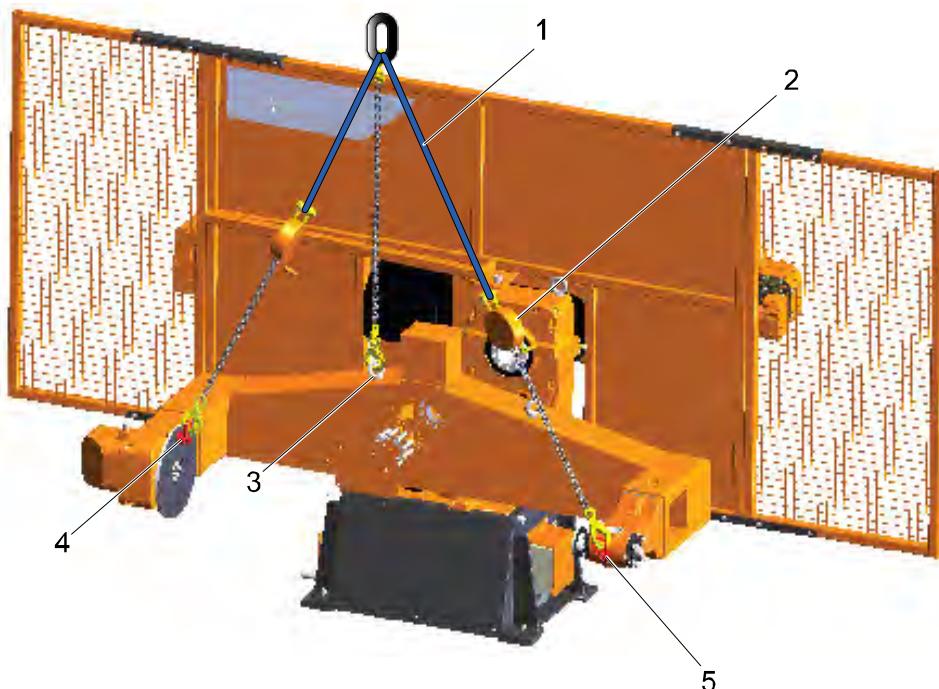
xx1000000125

1	Lifting eye (2 pcs)
Frame parts	Lifting weight
250B	640 kg
500/750B	1,250 kg

	Action	Note
1	Attach the lifting eyes as shown in the figure.	
2	Stretch the lifting chains	
3	Remove the attachment screws	
4	Lift the gearbox and the frame	

Continues on next page

Lifting D station frame



xx1000000079

1	Lifting sling
2	Winch min.500 Kg
3	Lifting eye 24 mm
4	Lifting eye, swivel
5	Lifting eye, swivel

Frame parts	Lifting weight
300D, L=1250	290 kg
300D, L=1600	310 kg
600D, Dist. =1000, L=1600	782 kg
600D, Dist. =1000, L=2000	817 kg
600D, Dist. =1200, L=1600	808 kg
600D, Dist. =1200, L=2000	843 kg

	Action	Note
1	Attach the lifting eyes, standard and with swivel in the proper positions, as shown in the figure.	
2	Stretch the lifting chains	
3	Remove the attachment screws	
4	Lift the gearbox and the frame	

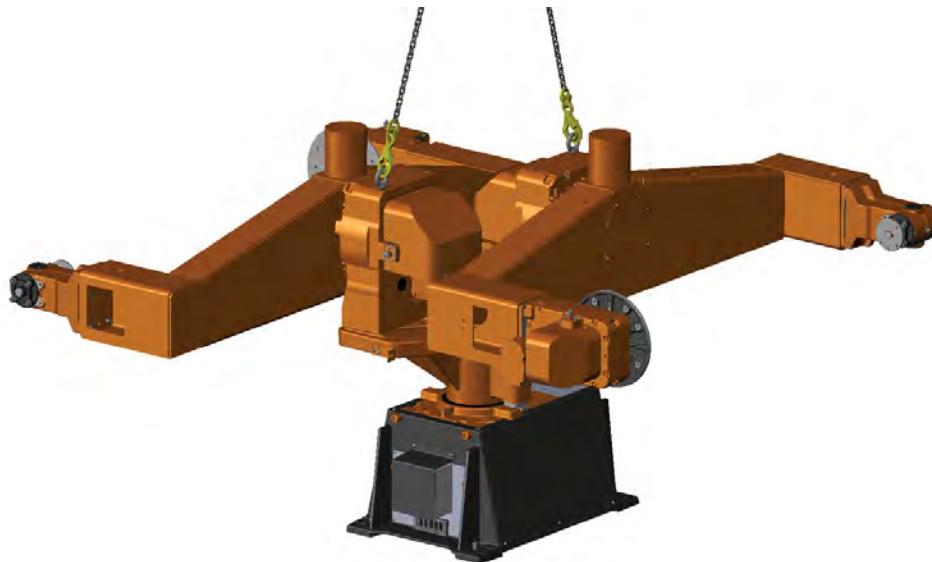
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6 Repair

6.2.2 Lifting frame parts

Continued

Lifting D stations



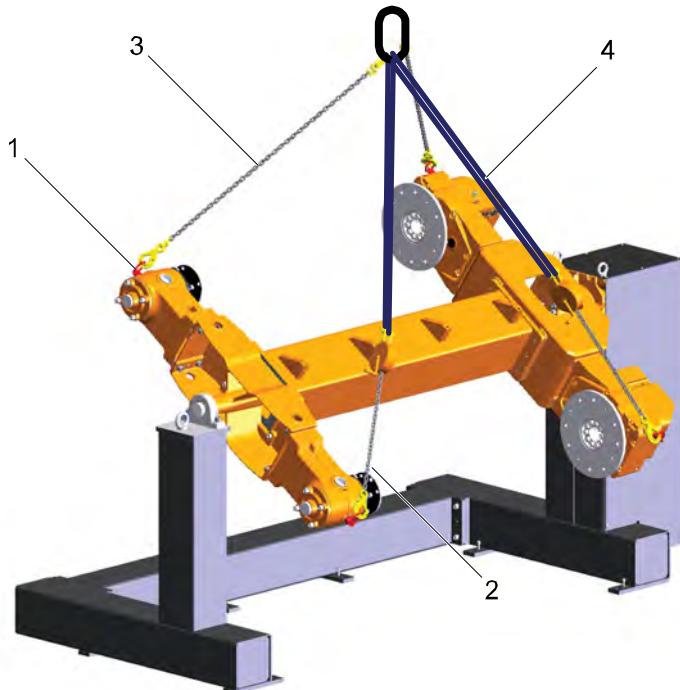
xx1000000090

Frame parts	Lifting weight
300D, L=1250	1,010 kg
300D, L=1600	1,050 kg
600D, Dist. =1000, L=1600	2,300 kg
600D, Dist. =1000, L=2000	2,370 kg
600D, Dist. =1200, L=1600	2,360 kg
600D, Dist. =1200, L=2000	2,430 kg

	Action	Note
1	Attach the lifting eyes as shown in the figure.	
2	Stretch the lifting chains	
3	Remove the attachment screws	
4	Lift the gearbox and the frame	

Continues on next page

Lifting K stations



xx1000000080

1	Lifting eyes, swivel (4 pcs)
2	Winch min.500 Kg
3	Lifting chain
4	Lifting sling

Frame parts	Lifting weight
250K, D=1000, L=1600	454 kg
250K, D=1000, L=4000	606 kg
250K, D=1200, L=1600	500 kg
250K, D=1200, L=4000	652 kg
500/750K, D=1200, L=1600	975 kg
500/750K, D=1200, L=4000	1,188 kg
500/750K, D=1400, L=1600	1,036 kg
500/750K, D=1400, L=4000	1,248 kg

	Action	Note
1	Attach the lifting eyes as shown in the figure.	
2	Stretch the lifting chains	
3	Remove the attachment screws	
4	Lift the gearbox and the frame	

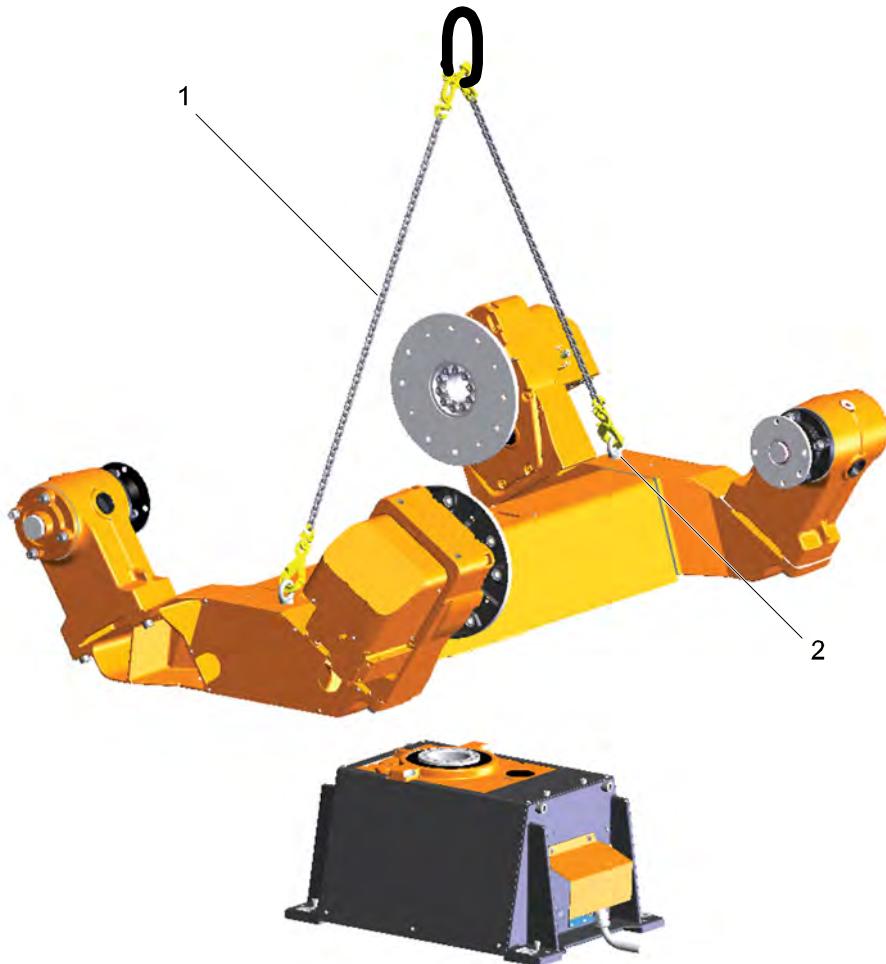
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6 Repair

6.2.2 Lifting frame parts

Continued

Lifting R stations



xx1000000081

1	Lifting chain
2	Lifting eye 24 mm (2 pcs)

Frame parts	Lifting weight
300R, L=1250	376 kg
300R, L=1600	394 kg
600/1000R, D=1000, L=1600	828 kg
600/1000R, D=1000, L=2000	853 kg
600/1000R, D=1200, L=1600	884 kg
600/1000R, D=1200, L=2000	909 kg

	Action	Note
1	Attach the lifting eyes as shown in the figure.	
2	Stretch the lifting chains	
3	Remove the attachment screws	
4	Lift the gearbox and the frame	

Continues on next page

Lifting rotary units

xx1000000116

Frame parts	Lifting weight
MTD 5000	770 kg
MTD 2000	340 kg
MTD 750	180 kg
MTD 500	180 kg
MTD 250	70 kg
MID 1.1	180 kg
MID 1.2	165 kg
MID 2.1	370 kg
MID 2.2	285 kg

	Action	Note
1	Attach the lifting eyes as shown in the figure.	
2	Stretch the lifting chains	
3	Remove the attachment screws	
4	Lift the gearbox	

6 Repair

6.3.1 Replacing stop lugs

6.3 Lower frame and base

6.3.1 Replacing stop lugs

General

The function of the stop lug is to allow the positioner after station interchange to be positioned in an accurate position.

Replace the station stop lug immediately if it is damaged.



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

- [*Safety risks related to pneumatic/hydraulic systems on page 27*](#)
- [*Risks associated with live electric parts on page 29*](#)
- [*Safety risks during installation and service work on robots on page 22*](#)



Note

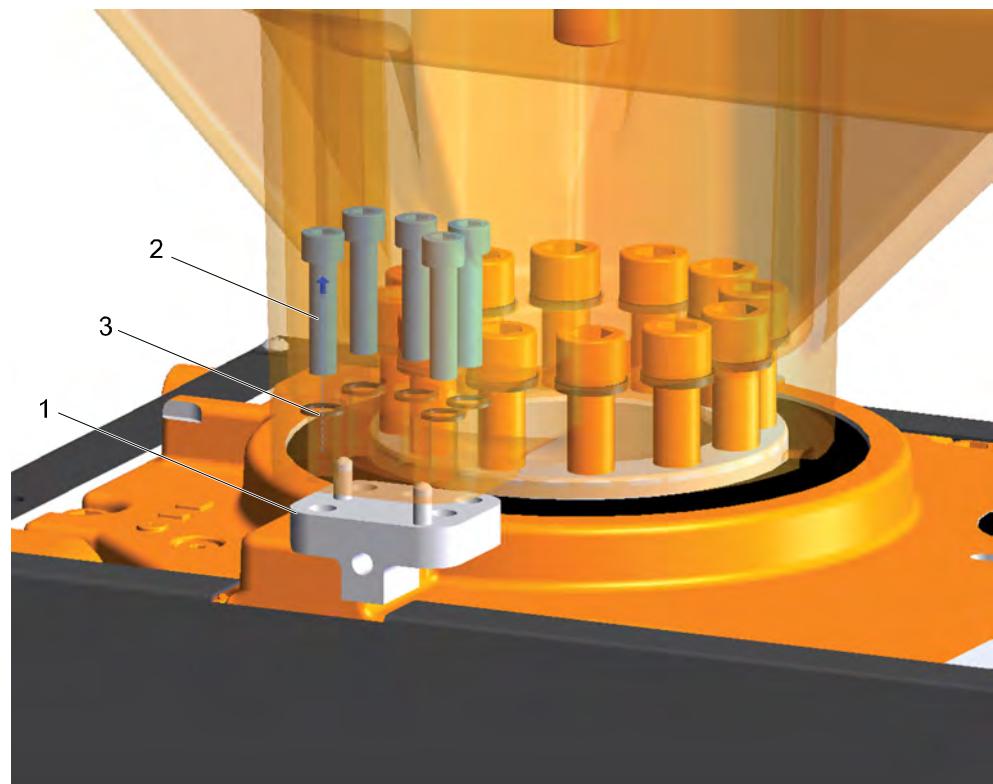
Keep the contact surfaces clean.

Required equipment

Equipment	Note
Standard tools	For more information, see <i>Standard tools IRBP on page 314</i> .
Stop lug	See <i>Product manual, spare parts - IRBP /D2009</i>

Continues on next page

Remove stop lug



xx1000000082

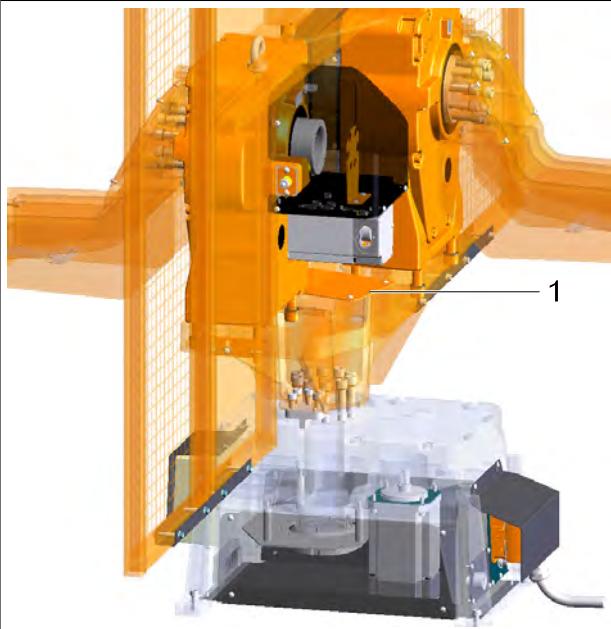
1	Stop lug
2	Attachment screw M12 x 50/12.9
3	Washer

Continues on next page

6 Repair

6.3.1 Replacing stop lugs

Continued

Action	Note
1 Remove the cover (1).	 xx1000000298 1 Cover
2 Remove the attachment screws.	Use standard tools
3 Remove the stop lug.	

Refit stop lug

Action	Note
1 Mount the stop lug.  Note Always use the two locking pins	
2 Mount the attachment screws.	Use standard tools, Tightening torque 140 Nm.
3 Mount the cover (1)	Standard tightening torque see Tightening torque on page 110 .

6.4 Motors

6.4.1 Replacing motors

General

The procedure below details how to remove and refit motors, and how to isolation check the motor.



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)



CAUTION

Galvanic contact between the gearbox and the motor can seriously damage the motor, see section [Checking insulation on page 231](#).

Required equipment

Equipment	Note
Standard tools	For more information, see Standard tools IRBP on page 314 .
Spareparts	Product Manual Sparepart IRBP /D2009

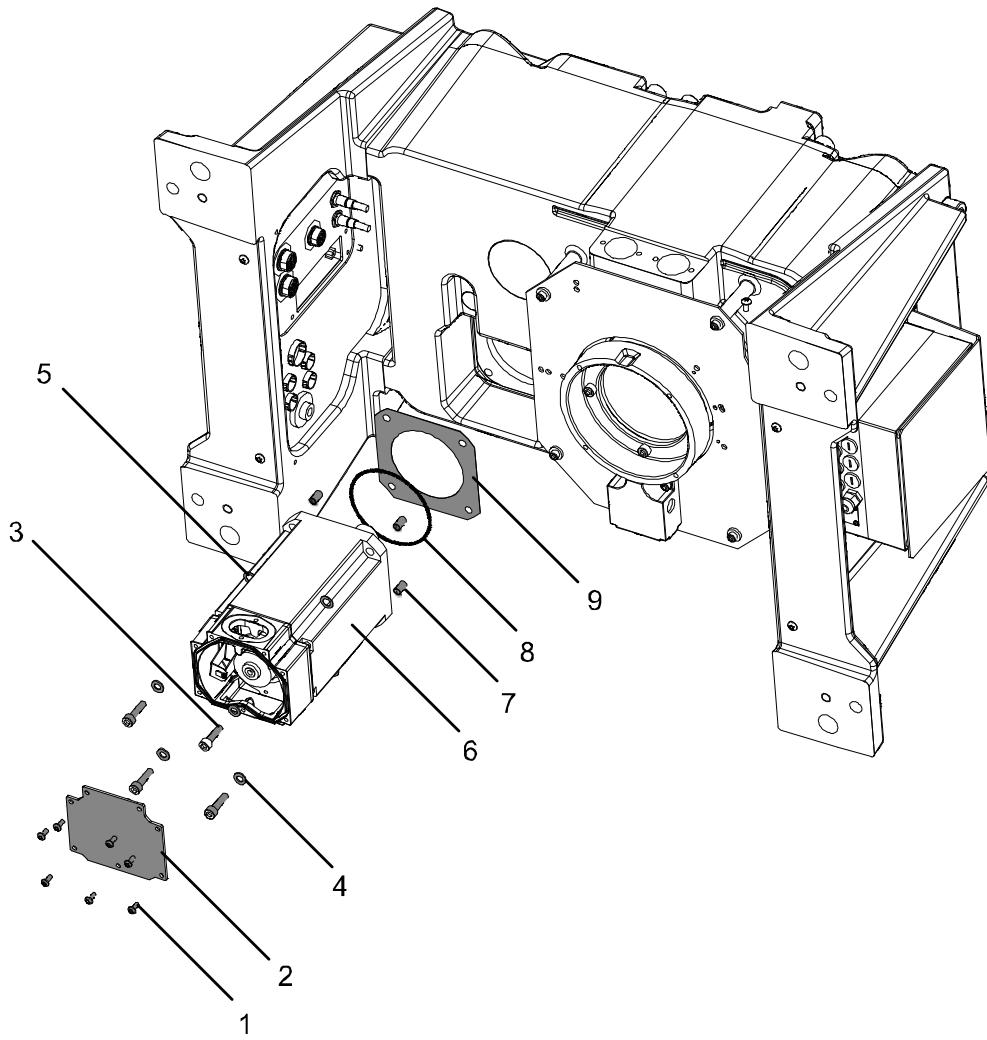
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6 Repair

6.4.1 Replacing motors

Continued

Remove motor rotary units axis 1



xx1000000017

1	Screws
2	Cover plate
3	Attachment screws
4	Plain washers
5	Insulating washer
6	Motor
7	Insulating tube
8	O-ring
9	Insulating material

Continues on next page

Action	Note
<p>1  DANGER Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator. Also read the safety sections: • <i>Safety risks related to pneumatic/hydraulic systems on page 27</i> • <i>Risks associated with live electric parts on page 29</i> • <i>Safety risks during installation and service work on robots on page 22</i></p>	
2 Remove all the covers on the manipulator foot. Not required on rotary units for axis two or three.	Detailed in the section <i>Replacing frame parts on page 204</i> .
3 Remove the cover plate on top of the motor by unscrewing the attachment screws (1-2).	
4 Remove the cable gland cover at the cable exit by unscrewing its the attachment screws.	
5 Disconnect all connectors.	
6 Remove the motor by unscrewing the attachment screws and plain washers (3-4).	
7 Remove the o-ring (8).	
8 Remove the insulating material and insulating tubes (5, 7, 9).	

Refit motor rotary units axis 1**CAUTION**

Do not mix motors valid from serial number SEROP POF-110001- & CNAUS POF-510001-, with motors valid up to serial numbers SEROP -POF 110000 & CNAUS -POF 510000. They are not compatible.

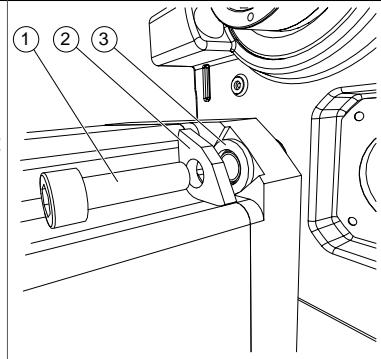
Action	Note
1 Refit the insulating material and insulating tubes (7-9).	
2 Refit the o-ring (8) on the motor.	Replace the o-ring if necessary. See superport in the spare parts manual.

Continues on next page

6 Repair

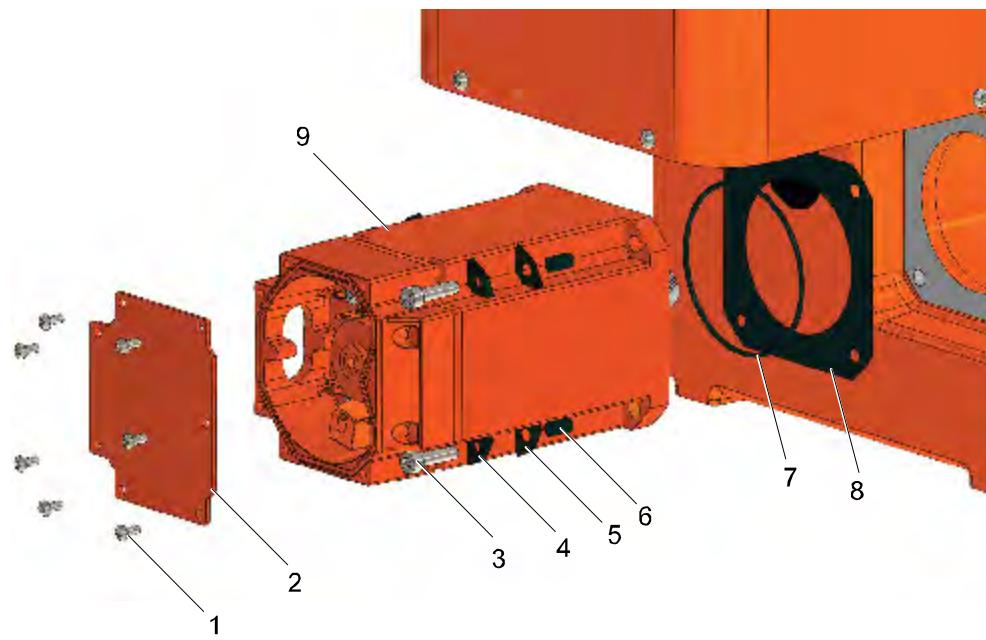
6.4.1 Replacing motors

Continued

Action	Note
3 Refit the insulating washer (5).  Note If countersunk holes in motor flange. Make sure that the plane washer is mounted before the insulating washer to fill out the recess.	 xx1500002519 1 Attachment screw 2 Insulating washer 3 Plane washer
4 Refit the motor using the attachment screws and plain washers (3-4).	Use standard torque, see section Tightening torque on page 110
5 Connect all connectors.	
6 Refit the cable gland cover at the cable exit.	
7 Refit the cover plate (2).	
8 Refit all the covers on the manipulator foot. Only axis one.	Detailed in the section Replacing frame parts on page 204 .

Continues on next page

Remove motor rotary units axis 2-3



xx1000000206

1	Torx screw M5x12
2	Cover plate
3	Hex socket head cap screw M8x30
4	Washer
5	Insulating material
6	Insulating tube
7	O-ring
8	Insulating material
9	Motor

	Action	Note
1	<p> DANGER</p> <p>Turn off all electrical power, hydraulic and pneumatic pressure supplies to the manipulator!</p> <p>Also read the safety sections:</p> <ul style="list-style-type: none"> • Safety risks related to pneumatic/hydraulic systems on page 27 • Replacing motors on page 225 • Safety risks during installation and service work on robots on page 22 	
2	Remove the cover plate (2) on top of the motor by unscrewing the attachment screws (1).	
3	Remove the cable gland cover at the cable exit by unscrewing its the attachment screws.	
4	Disconnect all connectors.	

Continues on next page

6 Repair

6.4.1 Replacing motors

Continued

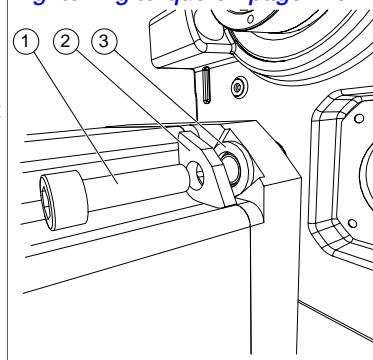
Action	Note
5 Remove the motor by unscrewing the attachment screws and washers (3-4).	
6 Remove the motor (9).	
7 Remove the o-ring (7).	
8 Remove the insulating material and insulating tubes (5, 6, 8).	

Refit motor rotary units axis 2-3



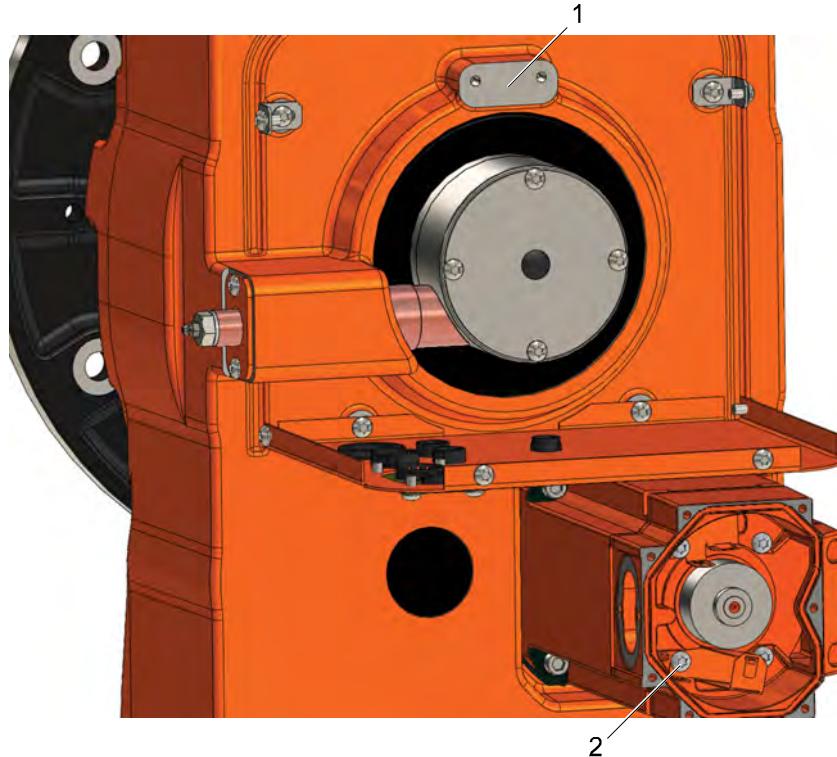
CAUTION

Do not mix motors *valid from* serial number SEROP POF-110001- & CNAUS POF-510001-, with motors *valid up to* serial numbers SEROP -POF 110000 & CNAUS -POF 510000. They are not compatible.

Action	Note
1 Refit the insulating material and insulating tubes (5, 6, 8).	
2 Refit the o-ring (7) on the motor.	
3 Refit the motor using the attachment screws and plain washers (4-5).  Note If countersunk holes in motor flange. Make sure that the plane washer is mounted before the insulating washer to fill out the recess.	Use standard torque, see section Tightening torque on page 110 .  xx1500002519 1 Attachment screw 2 Insulating washer 3 Plane washer
4 Connect all connectors.	
5 Refit the cable gland cover at the cable exit.	
6 Refit the cover plate (2).	

6.4.2 Checking insulation

Measuring points



xx1000000209

1	Gearbox body (clean surface)
2	Ground point in the AC motor.



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)

Insulation resistance tests

Insulation resistance greater than 2.5 MΩ at 500 V DC between the output shaft (Gearbox body) and the ground point in the AC motor.

Voltage tests

1 kVAC 50/60 Hz - 1 sec. between the output shaft (gearbox body) and the ground point in the AC motor. The test voltage is to be supplied from a transformer with a minimum rating of 500 VA.

6 Repair

6.5.1 Replacing rotary unit

6.5 Rotary units

6.5.1 Replacing rotary unit

General

The gearbox is a precision gear drive specifically developed to withstand the high demands placed on robot applications, among others, rigidity and torsional strength, speed and accuracy. The gearbox is virtually free of play and never needs to be adjusted; conforming to requirements during its entire life. The gearbox is maintenance free and the lubricant is sufficient for the gearbox's entire life, equivalent to 40,000 hours of operation. For lifting instructions, see section [Lifting rotary units on page 221](#)



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)



WARNING

Always lift the manipulator in a safe manner, using lifting tools according to the specified lifting weight in section [Lifting weight](#).

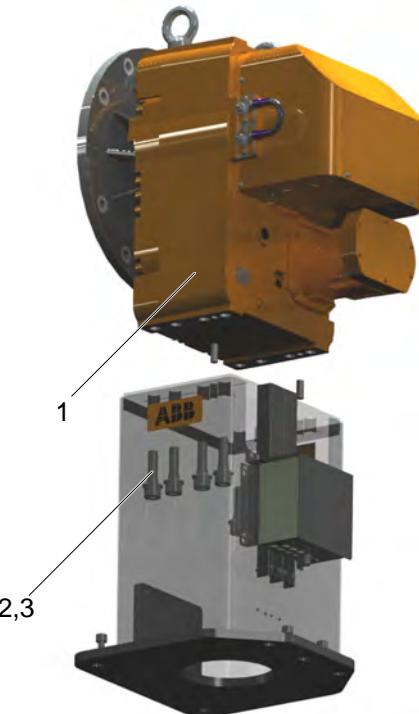
Required equipment

Equipment	Note
Standard tools	For more information, see Standard tools IRBP on page 314 .

Screw joints

MTD/MID	Screw quality	Screw dim.	Qty.	Tightening torque (Nm)
MTD 250	12.9	M12	4	140
MTD 500	12.9	M20	4	550
MTD 750	12.9	M20	4	550
MTD 2000	12.9	M20	8	550
MTD 5000	12.9	M24	12	1150

Continues on next page

Remove rotary unit

xx1000000013

1	Rotary unit
2	Attachment screws
3	Washers

	Action	Information
1	Remove the cable harness from the motor, spring.	
2	Attach the lifting accessories.	
3	Remove the attachment screws.	Use standard tools
4	Lift the rotary unit according to section <i>Lifting rotary units on page 221</i> .	

Refit rotary unit

	Action	Information
1	Lift the rotary unit according to section <i>Lifting rotary units on page 221</i> .	
2	Refit the attachment screws and washers.	Use standard tools, For Tightening torque see table <i>Screw joints on page 232</i>
3	Assemble the cable harness.	

6 Repair

6.6.1 Replacing support collar axis

6.6 Support collar

6.6.1 Replacing support collar axis

General



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

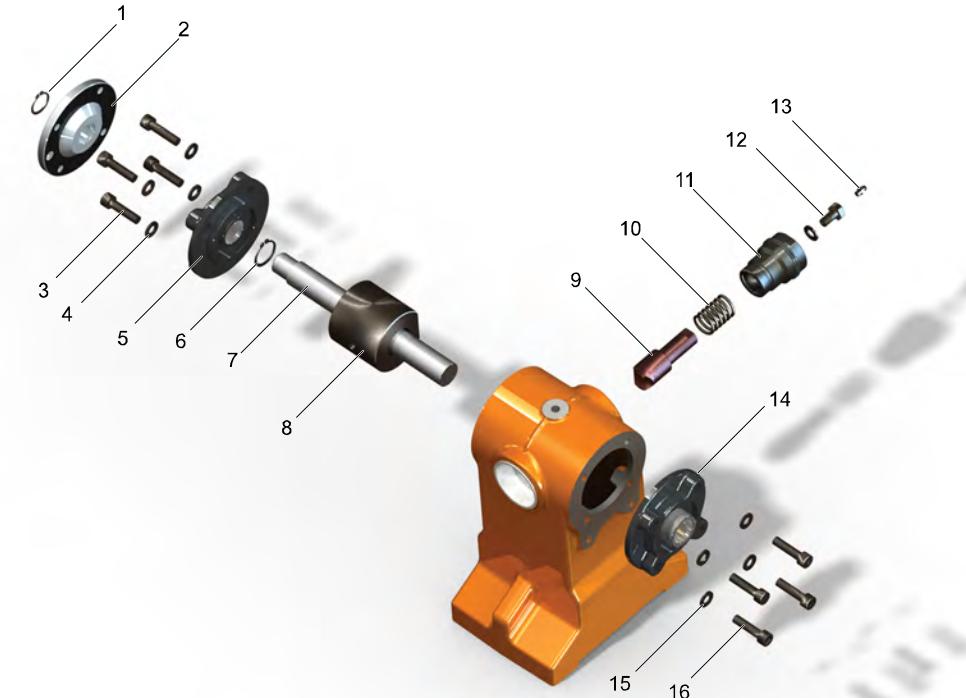
Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)

Required equipment

Equipment	Note
Standard tools	Standard tools IRBP on page 314
Spare parts	Product manual, spare parts - IRBP /D2009

Replacing support collar



xx1000000028

	Action	Note
1	Remove screw (12) to loosen the current collector cable.	Standard tools.

Continues on next page

Action	Note
2 Remove the spring housing with the current collector and spring.(9, 10, 11).	Standard tools, open key 46mm.
3 Remove the attachment screws with washers (15,16).	
4 Loosen the flange bearing locking screw.	
5 Remove the back flange bearing(14).	
6 Remove the bearing housing (8) from the axis.	
7 Loosen the flange bearing locking screw.	
8 Remove the axis with the turning disk and the front bearing housing (1, 2, 5, 6, 7) from the collar house.	

Refitting support collar

Action	Note
1 Mount the axis with the turning disk and the front bearing housing (1, 2, 5, 6, 7) in to the collar house.	
2 Refit the attachment screws with washers (3,4).	Use standard torque, see Tightening torque on page 110
3 Refit the bearing housing (8) to the axis.	
4 Refit the back flange bearing(14).	
5 Refit the attachment screws with washers (15,16).	Use standard torque, see Tightening torque on page 110
6 Tightening the flange bearing locking screw.	Use standard torque, see Tightening torque on page 110
7 Remove the spring housing with the current collector and spring.(9, 10, 11).	Standard tools, open key 46mm.
8 Refit the screw (12) and attach the current collector cable.	
9 Lubricate the current collector.	See Lubricating the current collector on page 194

6 Repair

6.7.1 Replacing current collector

6.7 Electrical

6.7.1 Replacing current collector

General



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

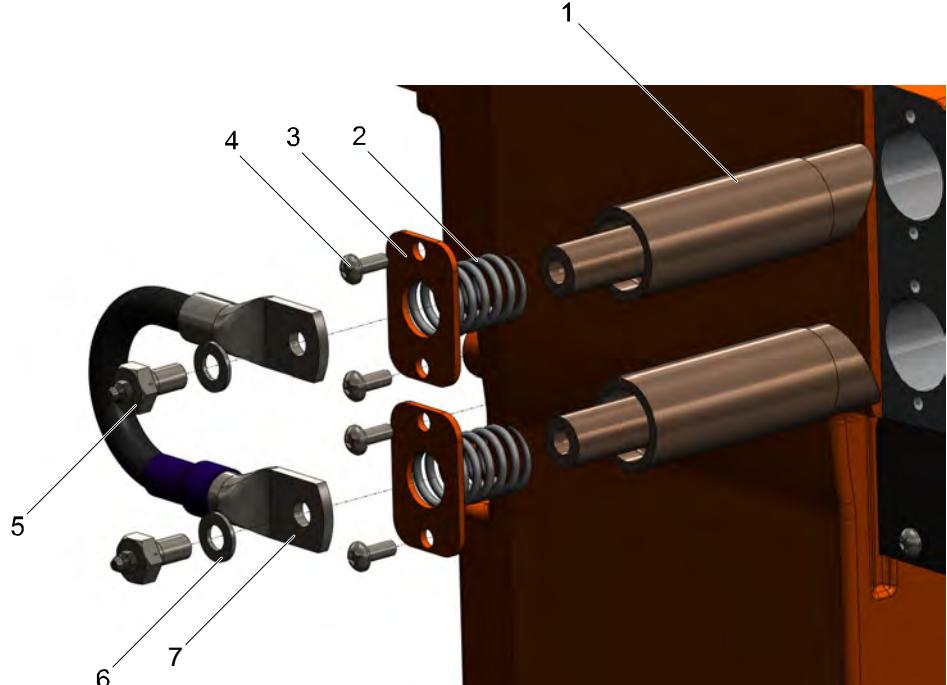
Also read the safety sections:

- [*Safety risks related to pneumatic/hydraulic systems on page 27*](#)
- [*Risks associated with live electric parts on page 29*](#)
- [*Safety risks during installation and service work on robots on page 22*](#)

Required equipment

Equipment	Note
Standard tools	See section <i>Standard tools IRBP on page 314.</i>
Current collector	See Product Manual Spareparts IRBP / D2009

Continues on next page

Replacing current collector

xx1000000016

1	Current collector
2	Spring
3	Spring support
4	Screw
5	Lubrication nipple
6	Washer
7	Current collector cable

	Action	Note
1	Remove the lubrication nipple and the current collector cable.	
2	Remove the screws holding the spring support.	
3	Remove the spring and the current collector.	

Assemble current collector

	Action	Note
1	Assemble the new current collector.	
2	Assemble the spring and the spring support using the screws.	
3	Assemble the lubrication nipple and the current collector cable.	Lubricate the current collector, see section Lubricating the current collector on page 194 .

6 Repair

6.7.2 Replacing SMB board

6.7.2 Replacing SMB board



WARNING

See safety instructions for batteries, [WARNING - Safety risks during handling of batteries on page 50](#).

Required equipment



Note

There are different variants of SMB units and batteries. The variant with the 3-pole battery contact has longer lifetime for the battery.

It is important that the SMB unit uses the correct battery. Make sure to order the correct spare parts. Do not replace the battery contact!

Equipment	Note
SMB board	See Spare parts on page 331 .

Removing the SMB board

Use this procedure to remove the SMB board in the SMB box.

	Action	Information
1	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2	 xx0200000023 WARNING 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 49	
3	Open the cover on the SMB box.	
4	Disconnect the cables.	
5	Remove the screws holding the plate.	
6	Pull out the plate.	
7	Loosen the three screws holding the SMB board.	
8	Pull out the SMB board.	

Continues on next page

	Action	Information
9	Dispose of the old SMB board.	See <i>Environmental information on page 307</i> .

Refitting the SMB board

Use this procedure to refit the SMB board in the SMB box.

	Action	Information
1	Place the new SMB board on the mounting plate.	
2	Refit and fasten the three screws fully.	
3	Refit the plate and fasten the screws fully.	Cross tighten the screws to make sure the sealing is tight.
4	Connect the cables and close the cover.	
5	Update the revolution counters.	See <i>Calibration information on page 273</i> .

6 Repair

6.7.3 Station changing indication

General



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

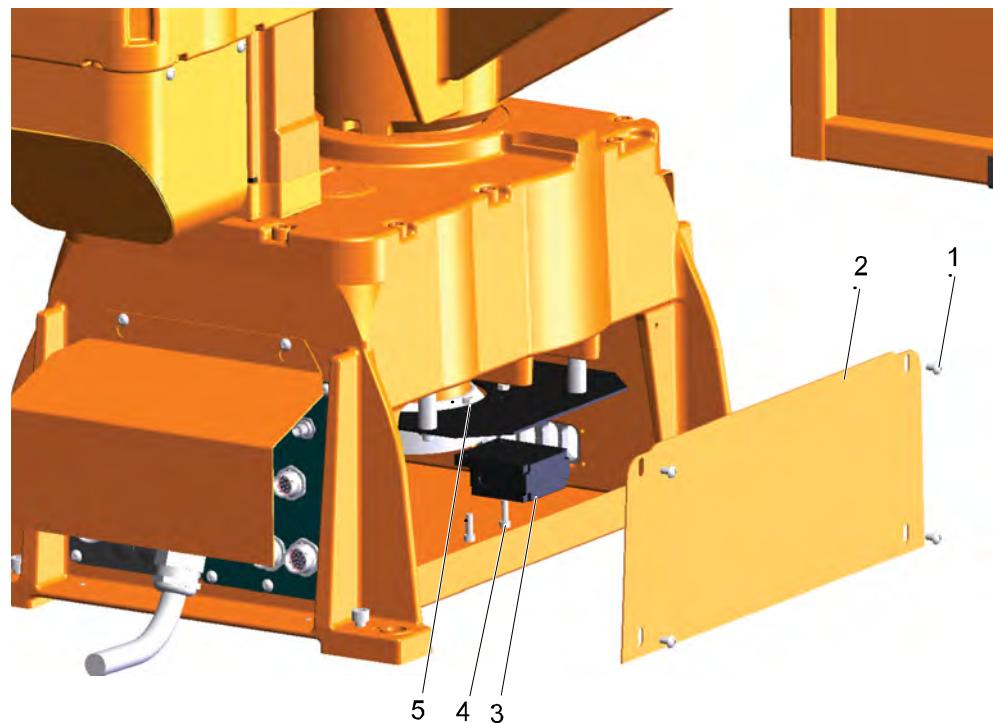
- *Safety risks related to pneumatic/hydraulic systems on page 27*
- *Risks associated with live electric parts on page 29*
- *Safety risks during installation and service work on robots on page 22*

Required equipment

Equipment	Note
Standard tools	This is detailed in section <i>Standard tools IRBP on page 314</i> .
Spareparts in	Product Manual Spareparts IRBP / D2009

Continues on next page

Change breaker



xx1000000026

1	Screw
2	Side cover
3	Station changing indication
4	Screw
5	Nut

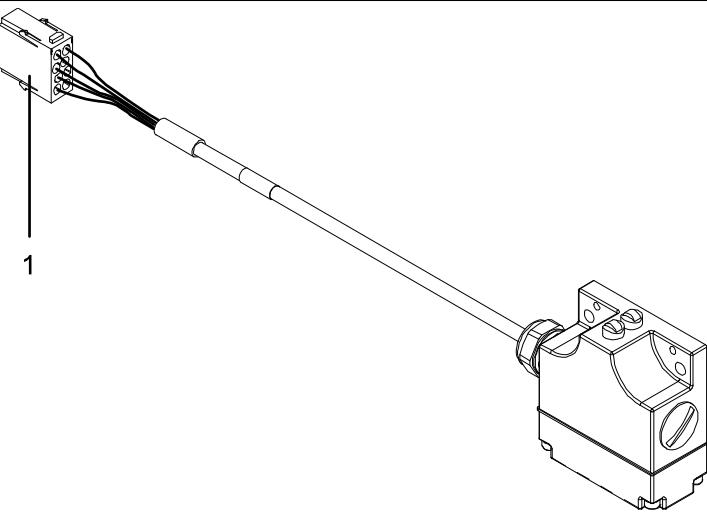
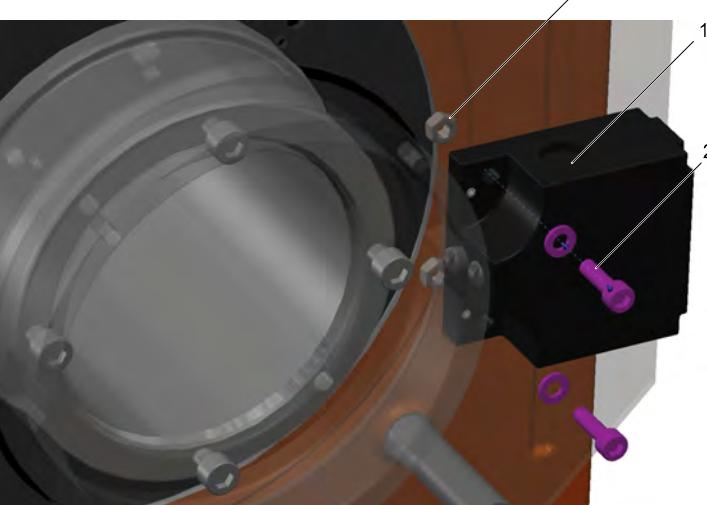
	Action	Information
1	 WARNING Turn off all electrical power supplies to the manipulator before entering its work space.	
2	Remove the side cover.	Use standard tools

Continues on next page

6 Repair

6.7.3 Station changing indication

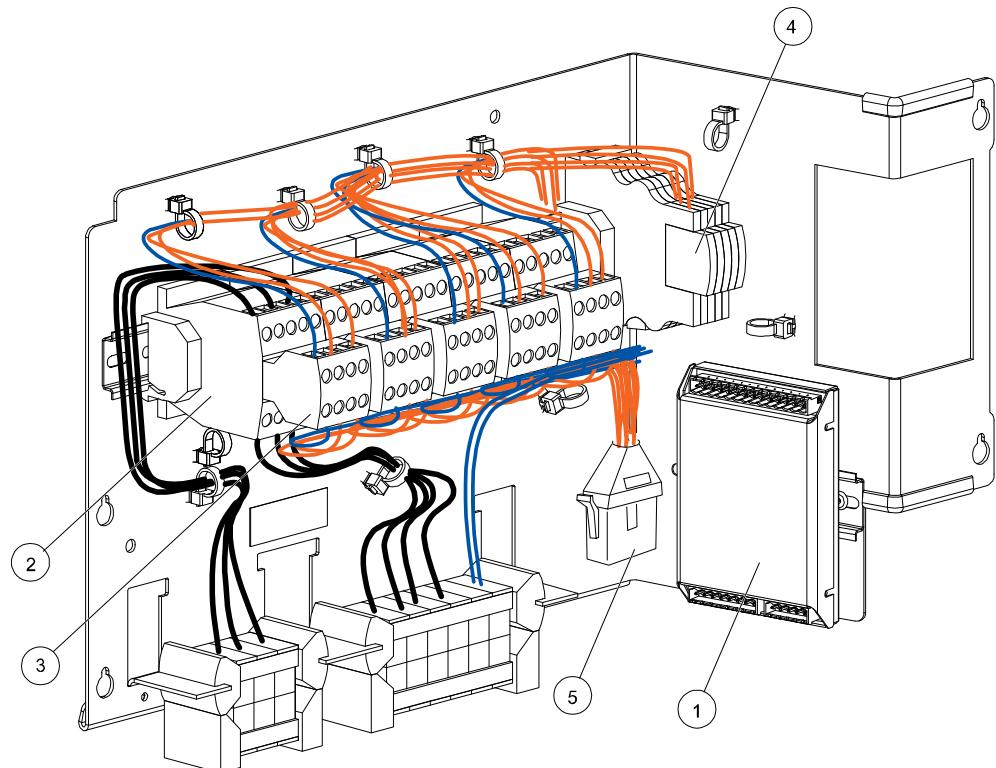
Continued

	Action	Information
3	Loosen the cable connection (1) on the station sync cable.	 xx1000000299
4	Remove the station breaker.	 xx1000000075 <ul style="list-style-type: none">1 Station indication2 Screw3 Nut

6.8 Controller

6.8.1 Overview of the controller

Location of parts



1	Drive module
2	Contactor
3	Auxiliary contact
4	Relay

6 Repair

6.8.2 Replacing drive module I/O

6.8.2 Replacing drive module I/O

Overview



CAUTION

Read the section [WARNING - The unit is sensitive to ESD! on page 49](#)



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

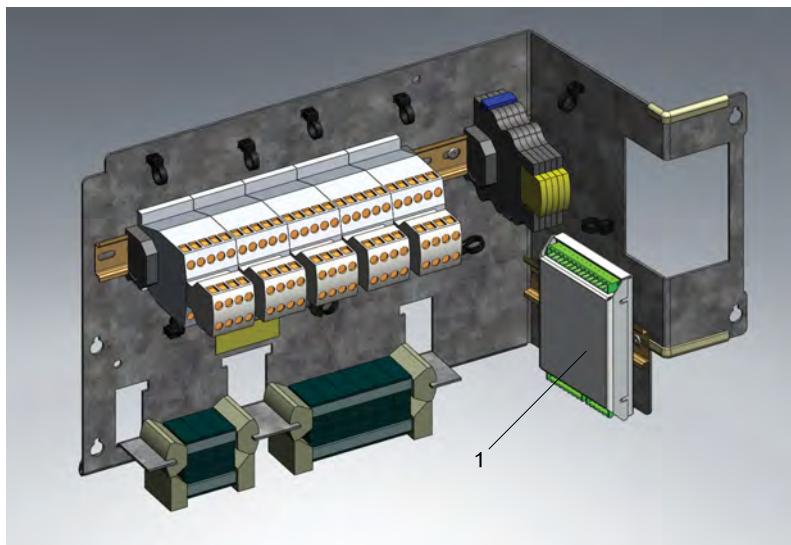
Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)

Required equipment

Equipment	Note
Spare parts	<i>Product manual, spare parts - IRBP /D2009</i>
Standard tools	See Contents, standard toolkit, IRC5 on page 313 .

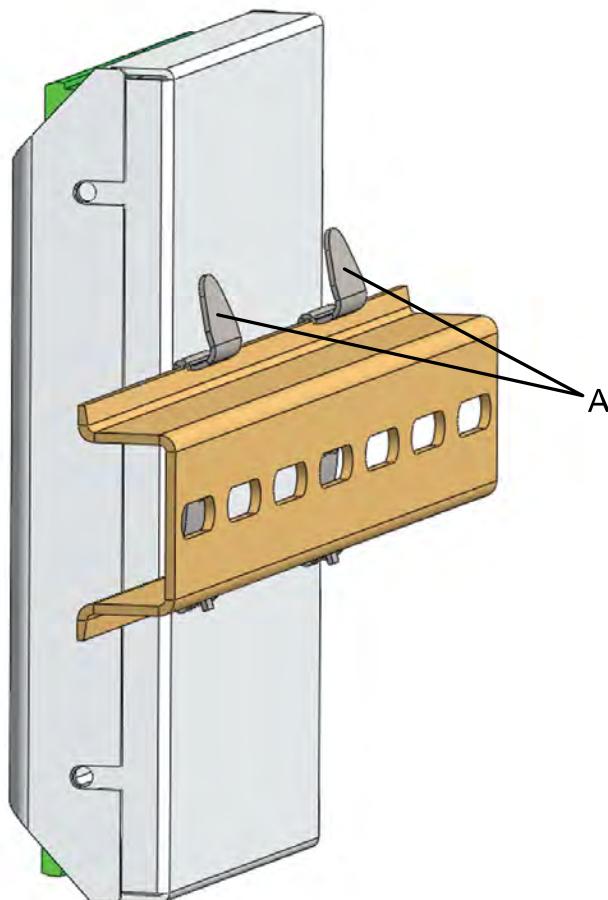
Drive module



xx1000000231

1	Drive module I/O
---	------------------

Continues on next page

Replacing drive module

xx1000000232

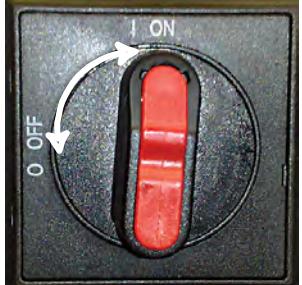
A	Mounting foot upper end	
	Action	Note
1	 DANGER Danger of electrical shock or burn. High voltages inside controller cabinet. The robot and other equipment in the cell are also supplied with high voltages.	

Continues on next page

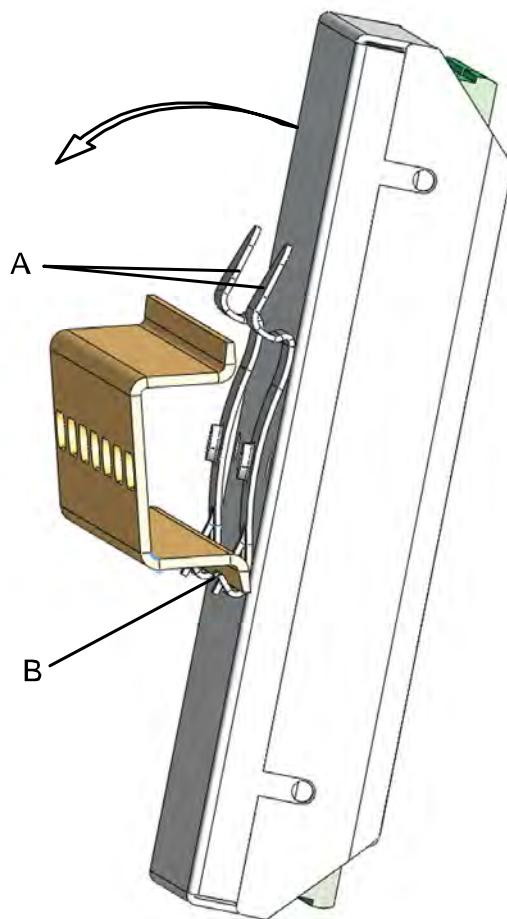
6 Repair

6.8.2 Replacing drive module I/O

Continued

Action	Note
2 Turn the main power switch to <i>OFF</i> .	 xx1000000212
3 Remove the cable harness from the drive module.	
4 Press the two mounting foots upper ends (A).	
5 Remove the drive module.	

Refitting the drive module



xx1000000233

A	Mounting foot upper end
B	Mounting foot lower end

Continues on next page

Action	Note
1 Hook on the mounting foot lower end (B) on to the mounting rail.	
2 Press the two mounting foots upper ends (A).	
3 Press the drive module on to the mounting rail.	
4 Mount the cable harness to the drive module.	

6 Repair

6.8.3 Replacing contactor

6.8.3 Replacing contactor

Overview



CAUTION

Read the section [WARNING - The unit is sensitive to ESD! on page 49](#)



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

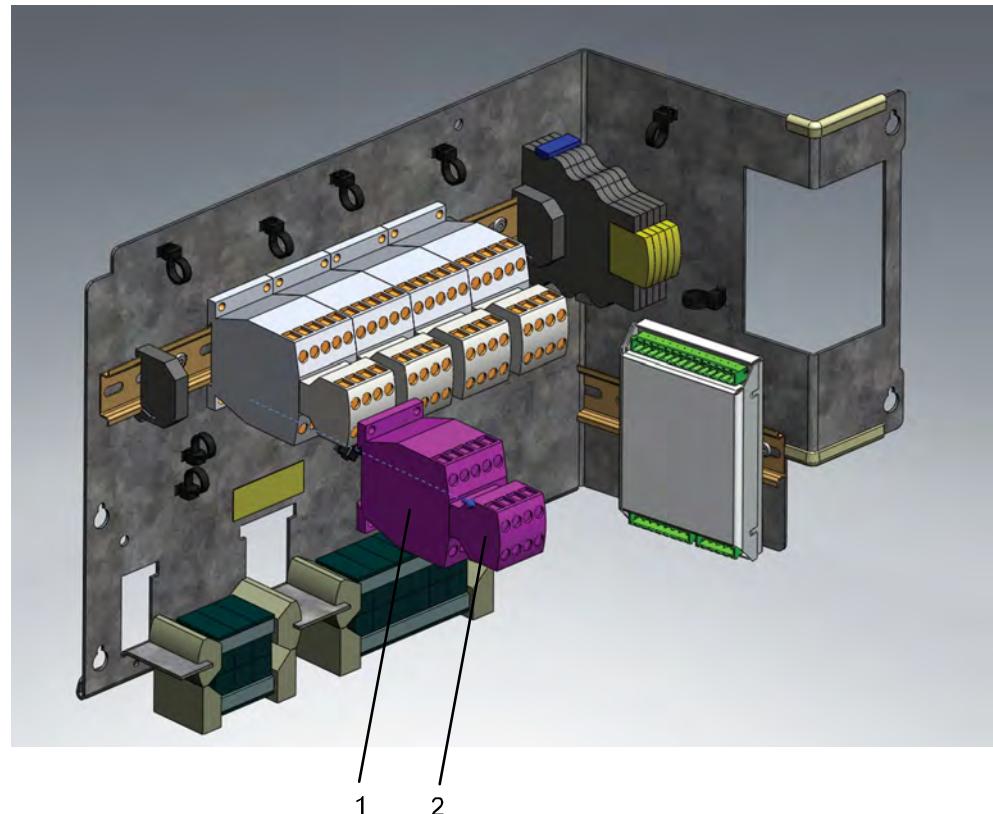
- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)

Required equipment

Equipment	Note
Standard tools	See Contents, standard toolkit, IRC5 on page 313 .
Spare parts	<i>Product manual, spare parts - IRBP /D2009</i>

Continues on next page

Location of contactors



xx1000000234

1	Contactor
2	Auxiliary contact

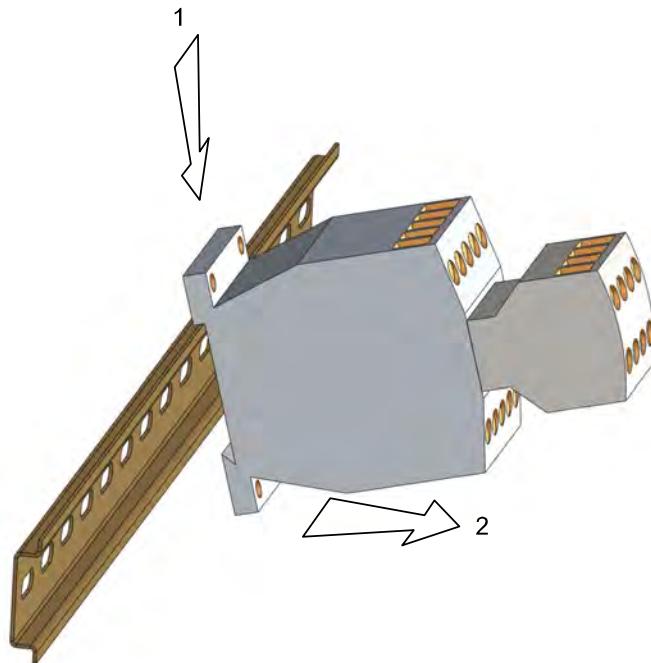
Continues on next page

6 Repair

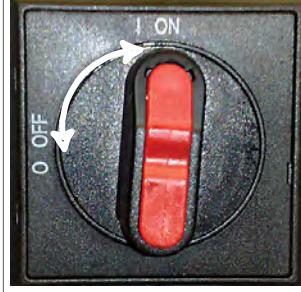
6.8.3 Replacing contactor

Continued

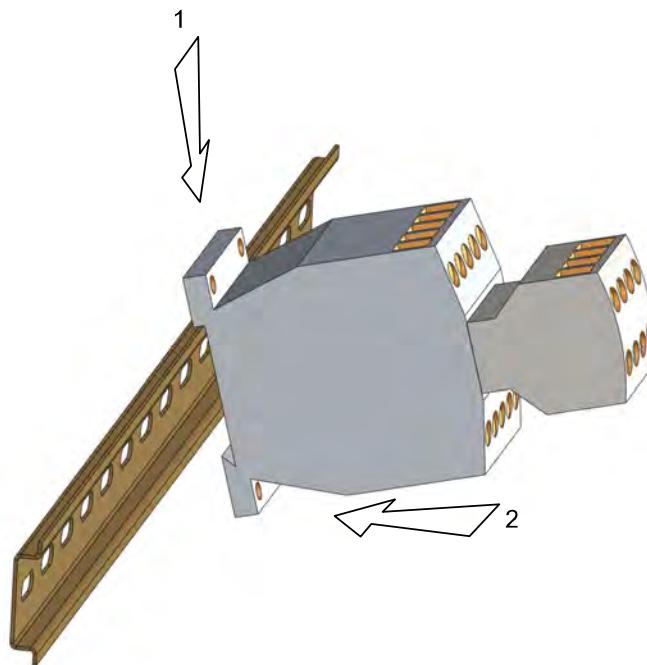
Removal



xx1000000237

	Action	Information
1	 DANGER Danger of electrical shock or burn. High voltages inside controller cabinet. The robot and other equipment in the cell are also supplied with high voltages.	
2	Turn the main power switch to <i>OFF</i> .	 xx1000000212
3	Remove the cable harness from the auxiliary contact and the contactor	
4	Press the contactor down.	
5	Remove the contactor.	

Continues on next page

Refitting

xx1000000236

	Action	Information
1	Press the contactor down.	
2	Press in the contactor.	
3	Refit the cable harness to the auxiliary contact and the contactor.	

6 Repair

6.8.4 Replacing auxiliary contact



CAUTION

Read the section [WARNING - The unit is sensitive to ESD! on page 49](#)



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

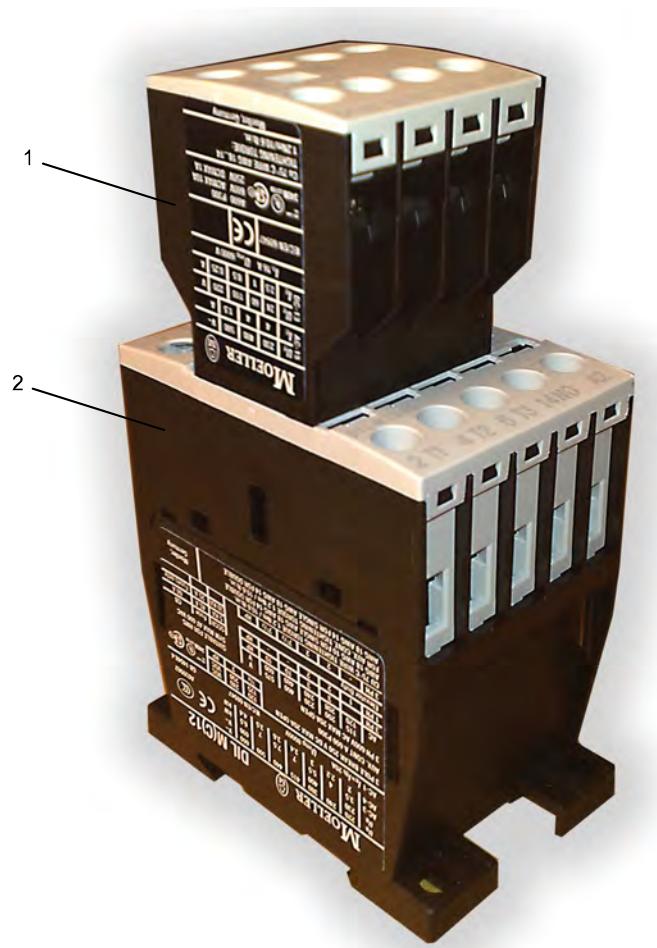
Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)

Required equipment

Equipment	Note
Standard tools	See Contents, standard toolkit, IRC5 on page 313 .
Auxiliary contact	<i>Product manual, spare parts - IRBP /D2009</i>

Continues on next page

Location

xx1000000241

1	Auxiliary contact
2	Contactor

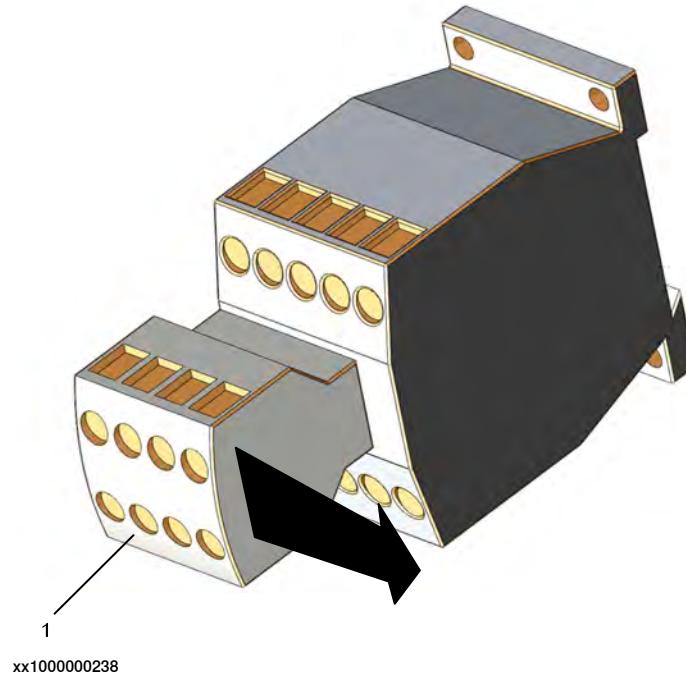
Continues on next page

6 Repair

6.8.4 Replacing auxiliary contact

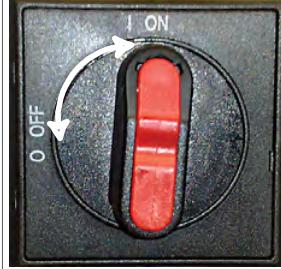
Continued

Removal



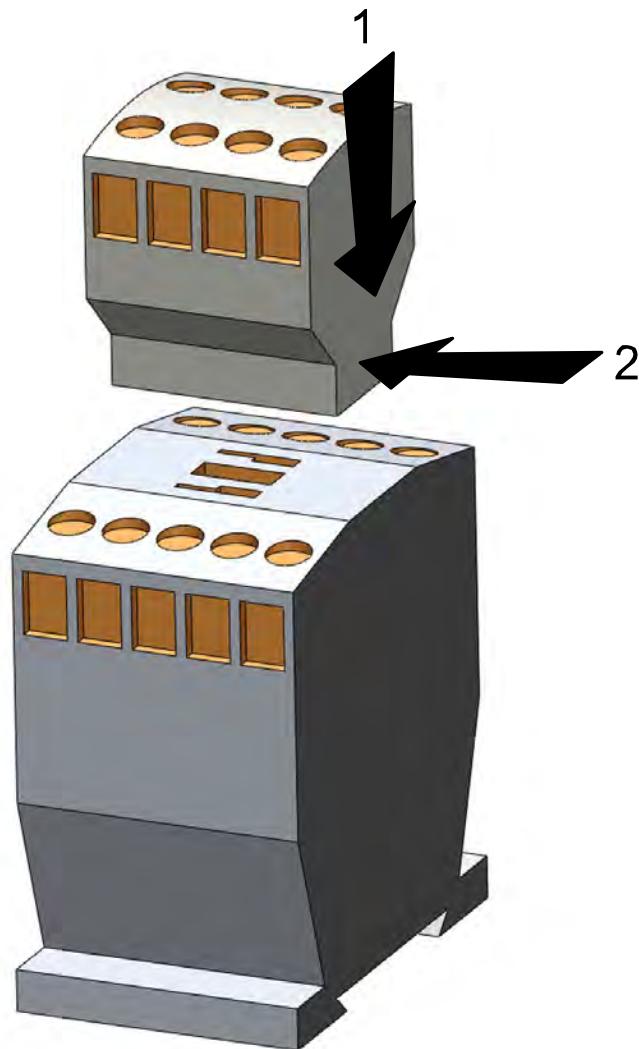
xx1000000238

1	Auxiliary contact
---	-------------------

Action	Information
1  DANGER Danger of electrical shock or burn. High voltages inside controller cabinet. The robot and other equipment in the cell are also supplied with high voltages.	
2 Turn the main power switch to <i>OFF</i> .	 xx1000000212
3 Remove the cable harness from the auxiliary contact.	
4 Push the auxiliary contact towards the center of the contactor.	
5 Remove the auxiliary contact.	

Continues on next page

Refitting



xx1000000239

	Action	Note
1	Fit the attachment legs on the auxiliary contact into the locking rail in the contactor.	
2	Push the auxiliary contact to the locked position.	

6 Repair

6.8.5 Replacing auxiliary relays for breaker

6.8.5 Replacing auxiliary relays for breaker

Overview



CAUTION

Read the section [WARNING - The unit is sensitive to ESD! on page 49](#)



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

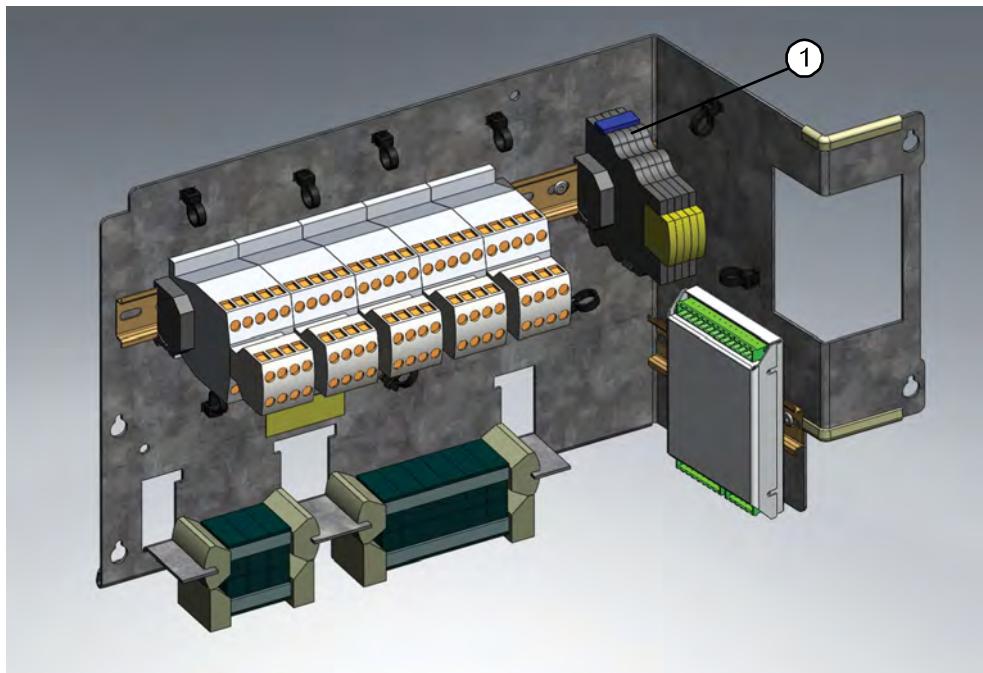
Also read the safety sections:

- [Safety risks related to pneumatic/hydraulic systems on page 27](#)
- [Risks associated with live electric parts on page 29](#)
- [Safety risks during installation and service work on robots on page 22](#)

Prerequisites

Equipment	Note
Standard tools	See Standard tools IRBP on page 314
Auxiliary relay	<i>Product manual, spare parts - IRBP /D2009</i>

Location

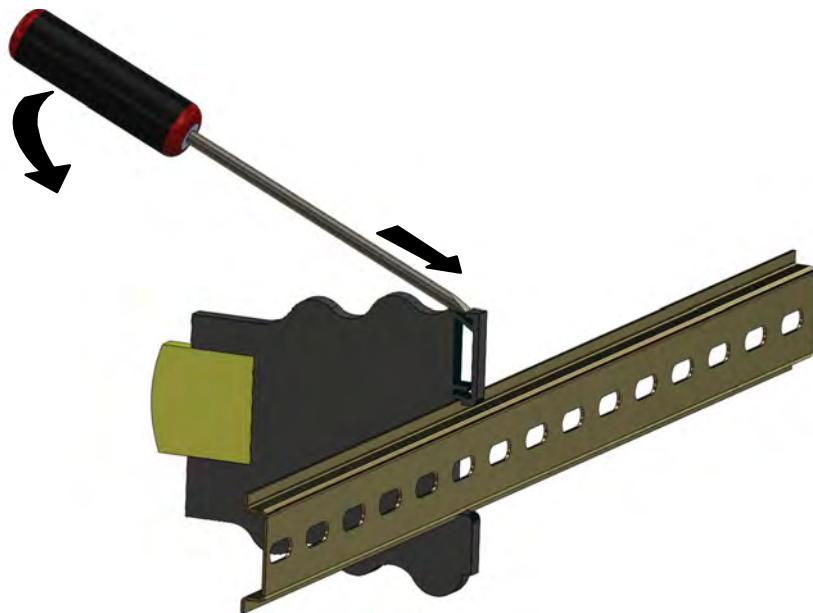


xx1000000243

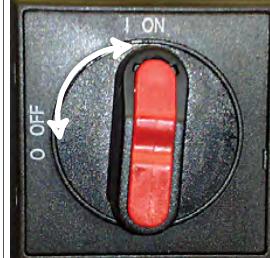
1

Auxiliary relay

Continues on next page

Replacing

xx1000000242

	Action	Information
1	 DANGER Danger of electrical shock or burn. High voltages inside controller cabinet. The robot and other equipment in the cell are also supplied with high voltages.	
2	Turn the main power switch to <i>OFF</i> .	 xx1000000212
3	Remove the cable harness from the auxiliary relay.	
4	Remove the auxiliary relay using a screw driver.	

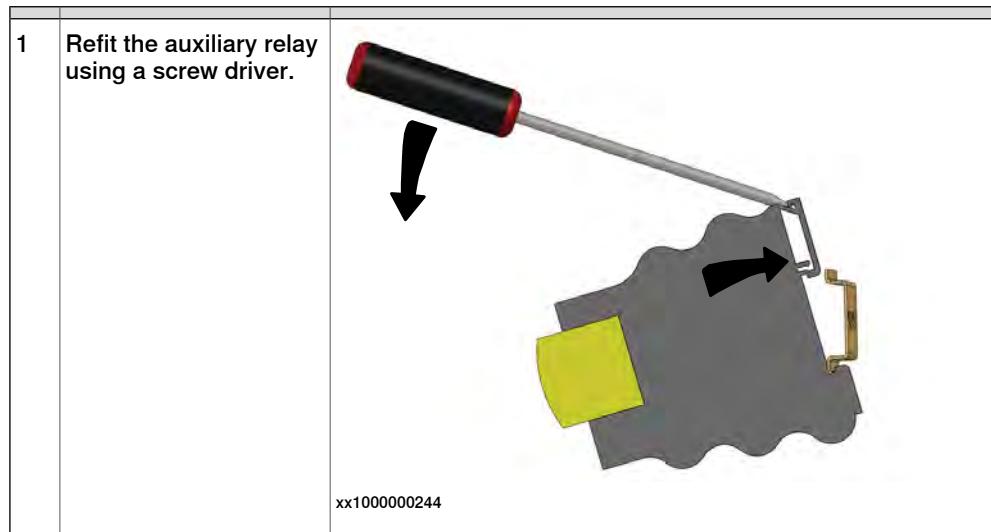
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6 Repair

6.8.5 Replacing auxiliary relays for breaker

Continued

Refitting



7 Operation

7.1 Start Up

7.1.1 Starting production

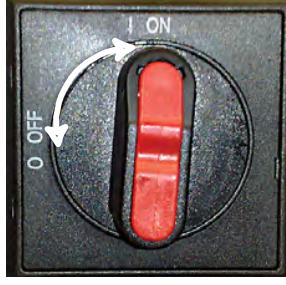
General



WARNING

Make sure that no one is inside the robot, positioner, and travel track working areas when the robot system starts.

Robot, positioner and travel track

	Action	Note
1	Check that none of the emergency stop buttons are actuated.	
2	Set the main power switch on the control module to position 1.	 xx1000000212
3	Check that: <ul style="list-style-type: none"> • The correct program has been loaded into the system. • The cursor is on the instruction where the program is to start. <i>Perform this in the programming window; see the operator's manual for the robot.</i>	

Resetting the light barriers during start-up

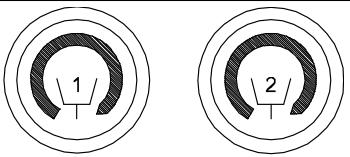
	Action	Note
1	Press the pre-reset button (optional); see section Operator panel on page 86 .	
2	Check that the service gate (optional) is closed.	
3	Press the service gate's reset button (optional).	

Continues on next page

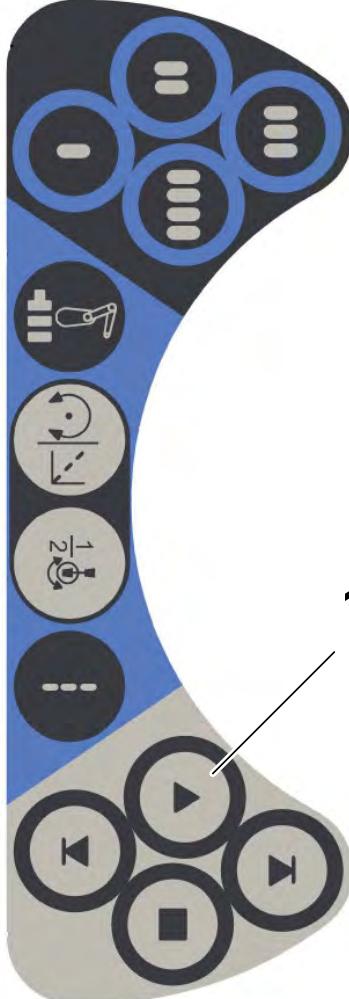
7 Operation

7.1.1 Starting production

Continued

Action	Note
<p>4 Press the Start Process button for one or two stations (see figure) for the light barriers on the operator panel to:</p> <ul style="list-style-type: none"> • Give the ready signal to the robot system that the loading of the work-piece in the station is complete. • Reset the personal safety protection around the working area of the station. • Start the process. <p> Note</p> <p>This must be performed within 10 seconds of pressing the pre-reset button; otherwise the light barriers will not reset.</p> <p>If the above does not work, start again from step 1.</p>	 xx1000000213
<p>5</p> <ol style="list-style-type: none"> 1 Turn the operating mode selector (pos. 1) on the control module's control panel to the AUTO position (pos. 2). 2 Tap OK when asked Is it OK to switch to automatic operation?. 3 Press the Motors On button on the control module's control panel (pos. 3). 	 xx1000000214 <ul style="list-style-type: none"> 1 Mode selector (100% optional) 2 Auto mode 3 Motors On button

Continues on next page

Action	Note
6 Press the Start button on the FlexPendant.	 xx1000000215 1 Start button
7 Press Program Start on the operator's panel to start the robot program.	See section Operator panel on page 86 .

7 Operation

7.1.2 Loading the workpiece

7.1.2 Loading the workpiece

Continuous operation

With continuous operation, the following process is repeated each time a workpiece is loaded.



CAUTION

Activating Start Process starts the robot and the positioner.

	Action	Information
1	Load the positioner or the stationary table.	
2	Make sure that the robot, positioner, and travel track working areas are clear before the system starts.	
3	Press the Pre-reset button (optional).	See section Operator panel on page 86 .
4	Press either the Start Process button or the button for the light barriers on the operator panel.	See section Operator panel on page 86 .
	 Note This must be performed within 10 seconds of pressing the pre-reset button; otherwise the light barriers will not reset.	

Two positioners or two work stations

If there are two positioners or two work stations on one positioner with station interchange, the loading of one of the positioners or one station side can be performed while the robot works on the other one. If the welding robot system includes two positioners, there is a time pre-reset button and a Start Process button for each positioner. Once the robot has completed the working cycle, it moves to a waiting position and checks if the Start Process has been pressed. If this has been done, the robot disengages the positioner or station side on the positioner that it has completed and activates the next positioner/station side.

One positioner with two station sides

There is a station interchange unit on any positioner with two station sides. When the robot system receives the ready signal from the operator station interchanges take place, so that the positioner changes station side in relation to the robot.

7.1.3 Stop during loading/unloading

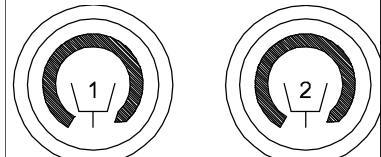
General

The station is equipped with external protection (light barriers) that monitors the operator area. The external protection interacts with the station indication function. See [Light barriers on page 56](#).

If the external protection is breached in a prohibited position, the entire station stops.

Procedure

The following must be observed in the event of a protective stop during the loading/unloading of the work station:

	Action	Information
1	Press the Pre-reset button (optional).	
2	Reset external personal protection  Note This must be performed within 10 seconds of pressing the pre-reset button; otherwise the light barriers will not reset.	
3	Leave the operator area of the station.	
4	Press the Start Process button on the operator panel.	 xx1000000213

Continues on next page

7 Operation

7.1.3 Stop during loading/unloading

Continued

Action	Information
5 Putting the system into operation: Turn the operating mode selector (1) on the control module's control panel to the AUTO position (2).  Note In the event of a warning about deactivating tasks/disabled tasks, respond with "Leave As Is".	 xx1000000214 <ul style="list-style-type: none">1 Operation mode (100% optional)2 Auto mode3 Motors on button
6 Press OK when asked Is it OK to switch to automatic operation? .	
7 Press the Motors On button on the control module's control panel (3).	

Continues on next page

Action	Information
8 Press the Start button on the FlexPendant.	 xx1000000215 1 Start button
9 Press Program Start on the operator panel to start the robot program. Do not go back to the original station side.	
10 Run the setting procedure to verify the positioner's station positions. See Drivers on page 291 .	

7 Operation

7.2.1 Program stop

7.2 Program stop and restart of program

7.2.1 Program stop

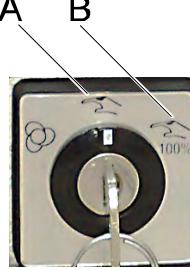
Programmed operation

Programmed operation can be stopped in various ways:

Stopping method	Button
Manually using the Stop button on the FlexPendant.	See What is a FlexPendant? on page 75.
Manually using the Stop button on the operator panel.	See External control units on page 81.
Automatically using a programmed stop in the robot program.	

Programmed operation in positions

Programmed operation in positions can be stopped in the following ways:

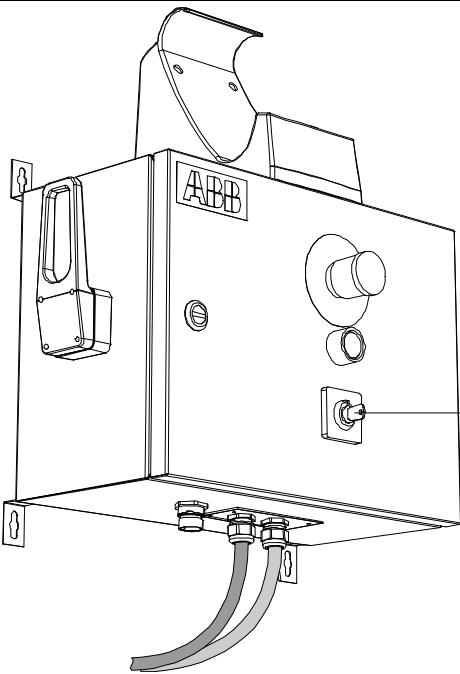
Stopping method	Mode
This should always be done using the Program Stop button before the continuous pressure switch on the FlexPendant is released. Otherwise, the system is stopped by AUTO stop, which is harder than the computer-controlled braking of movement.	A B  xx1000000219 Manual reduced speed <250mm/s Manual full speed 100% (not available in all markets)

Temporary stop

Temporary stops can be performed as follows:

Stopping method	Button
Press the Program Stop button on the FlexPendant.	See What is a FlexPendant? on page 75.
Press the Program Stop button on the operator panel.	See External control units on page 81.

Continues on next page

Stopping method	Button
Turn the operating mode selector on the control module's control panel. Result: Motors off.	 <p>xx1000000220</p> <p>1 mode selector</p>

Longer stops (more than 5 hours)

Longer stops can be performed as follows:

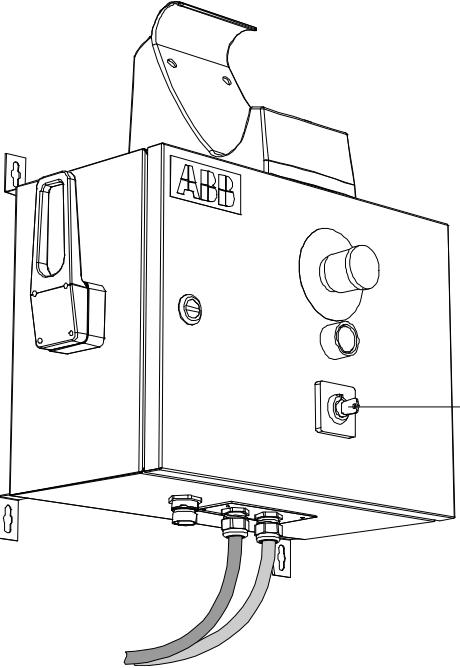
Stopping method	Button
Press the Program Stop button on the FlexPendant.	See What is a FlexPendant? on page 75 .
Press the Program Stop button on the operator panel.	See External control units on page 81 .

Continues on next page

7 Operation

7.2.1 Program stop

Continued

Stopping method	Button
Turn the operating mode selector on the control module's control panel. Result: Motors off.	 <p>A line drawing of a rectangular metal control panel. On the left side, there is a handle labeled 'A'. On the right side, there is a circular button and a square switch labeled '1 mode selector'. Below the panel, the code 'xx1000000220' is printed. A grey cable is shown connected to the bottom of the panel.</p>
Switch off the welding power source.	

7.2.2 Restarting the system

Introduction

In the event of a restart, the program continues from the program instruction where it was interrupted. For example, a program stop or a welding malfunction.



Note

If the program was interrupted during welding, the robot will perform a back up along the weld joint and start a new weld so that the already started weld joint is completed.

Resetting programmed operation

The following instructions enable program execution to be restarted.

For more information, see [Operator panel on page 86](#).

	Action	Note/Illustration
1	Rectify any malfunctions that caused the stop.	
2	Check that: <ul style="list-style-type: none"> • The service gate is closed • The robot, positioner, and travel track working areas are clear. 	
3	Press the service gate's Reset button (option).	See section Light barriers on page 56 .
4	Press the Pre-reset button.	
5	Press the Start Process button (for one or two stations) for the light barriers on the operator panel.	
	Note This step must be performed within 10 seconds of pressing the pre-reset button; otherwise the light barriers will not reset.	
6	Press the Motors On button on the control module's control panel.	
7	Press Program Start on the operator panel to start the robot program.	

7 Operation

7.2.3 Restarting after an emergency stop

7.2.3 Restarting after an emergency stop

Introduction

In the event of a restart, the program continues from the program instruction where it was interrupted. For example, a program stop or a welding malfunction.



Note

If the program was interrupted during welding, the robot will perform a back up along the weld joint and start a new weld so that the already started weld joint is completed.

Resetting programmed operation

The following instructions enable program execution to be restarted.

For more information, see [Operator panel on page 86](#).

	Action	Note/Illustration
1	Rectify any malfunctions that caused the stop.	
2	Check that: <ul style="list-style-type: none">• The service gate is closed• The robot, positioner and travel track working areas are clear.	
3	Press the service gate's Reset button (option).	See section Light barriers on page 56
4	Press the Pre-reset button.	
5	Press the Start Process button (for one or two stations) for the light barriers on the operator panel. Note This step must be performed within 10 seconds of pressing the pre-reset button; otherwise the light barriers will not reset.	
6	Press the Motors On button on the control module's control panel.	
7	Press Program Start on the operator panel to start the robot program.	

7.2.4 Measures in the event of disturbances in the operating sequence

7.2.4 Measures in the event of disturbances in the operating sequence

Operating sequence

Disturbances in the operating sequence entail risks other than those associated with normal operation, as such disturbances require manual actions.



WARNING

This work may only be carried out by persons trained in the use of the complete equipment and who are aware of the special risks that exist or may occur when undertaking such actions.



CAUTION

All work carried out on the system shall be performed in a professional manner and conform to applicable safety regulations.

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8 Calibration information

8.1 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 277](#). 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

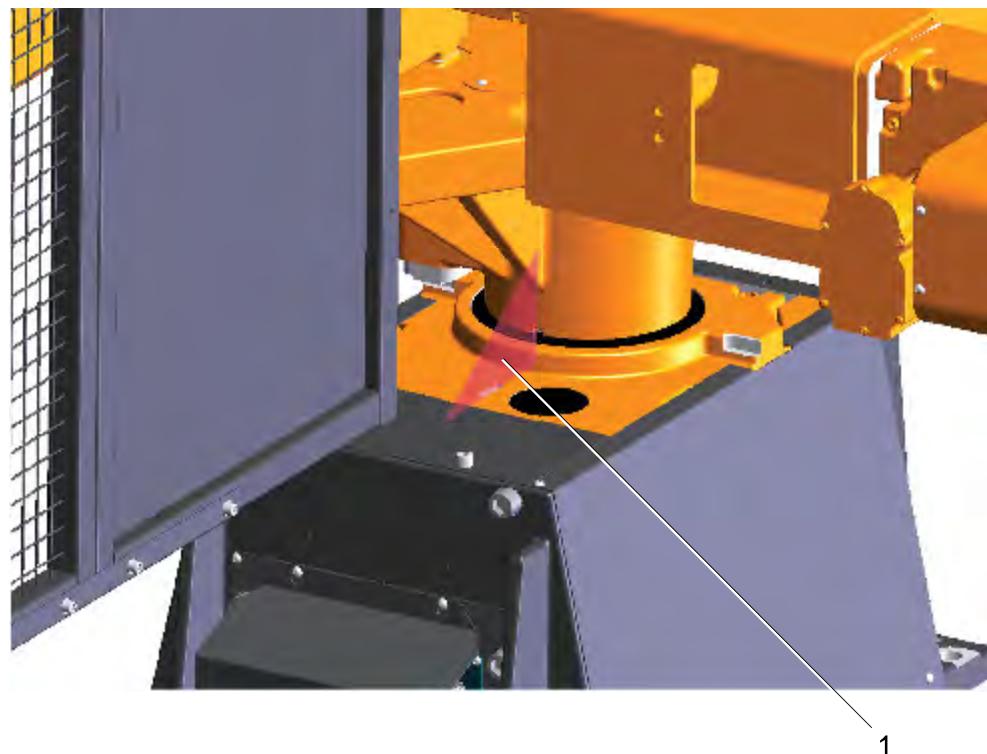
If the robot is rebuilt, for example, after a crash or when the reach ability of a robot is changed, it needs to be recalibrated for new resolver values.

8 Calibration information

8.2 Calibration marks

8.2 Calibration marks

Synchronization mark MID station foot

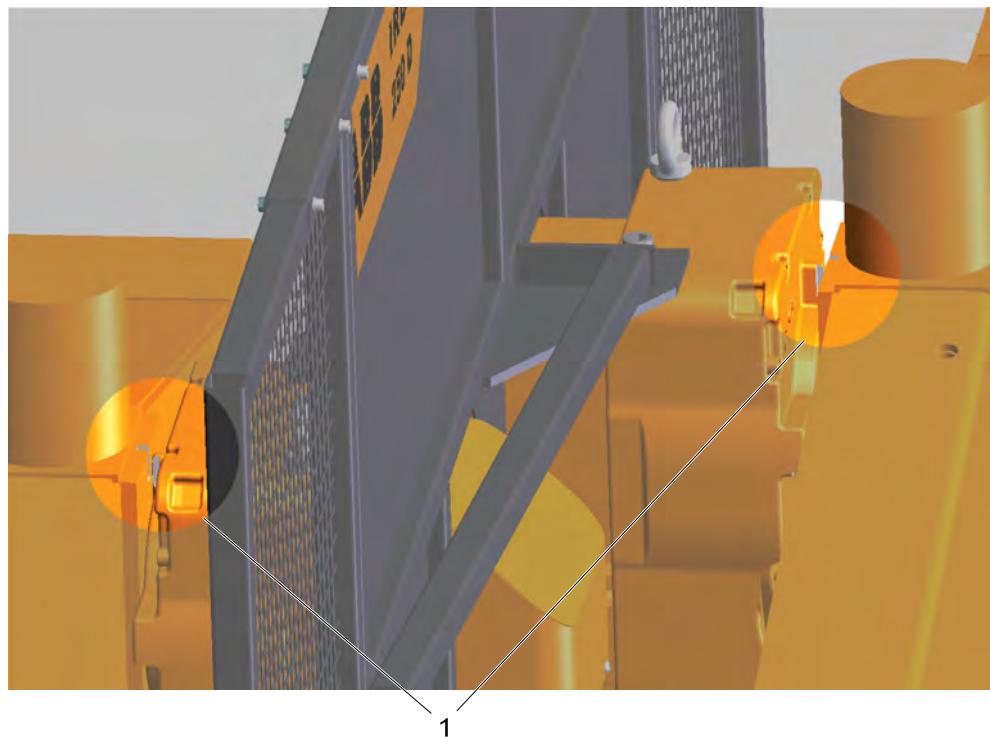


xx1000000121

1	Synchronization mark MID 2.1
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Continues on next page

Synchronization mark MTD station unit



xx1000000122

1	Synchronization mark MTD
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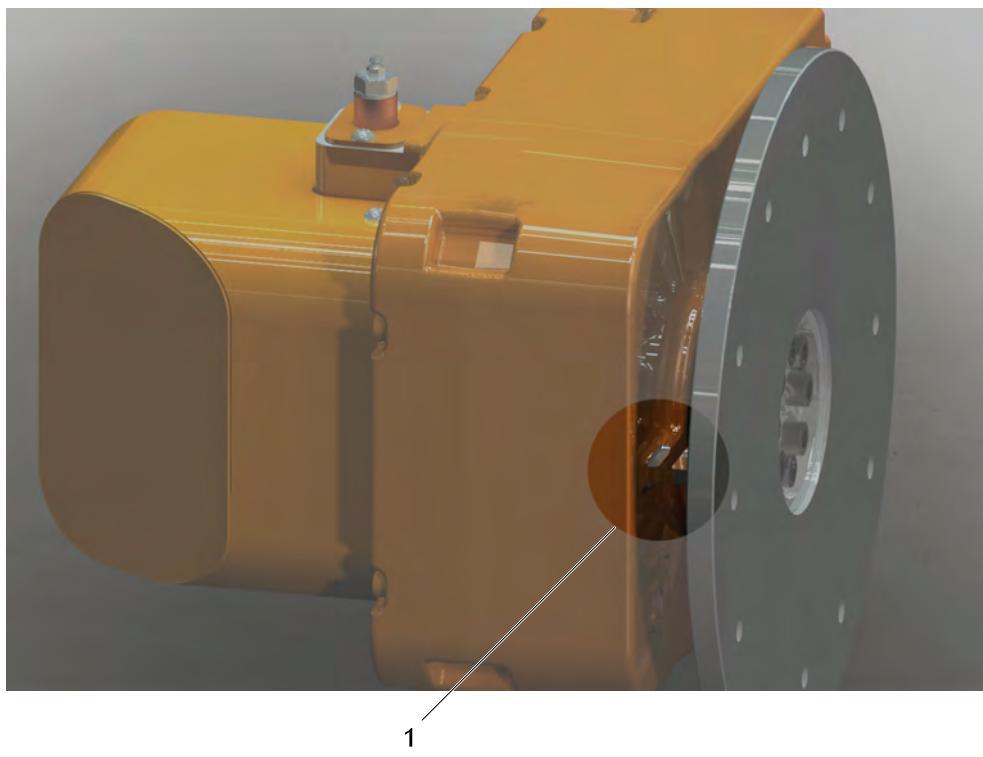
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8 Calibration information

8.2 Calibration marks

Continued

Synchronization mark MTD rotary unit



xx1000000117

1	Synchronization mark MTD
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8.3 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.

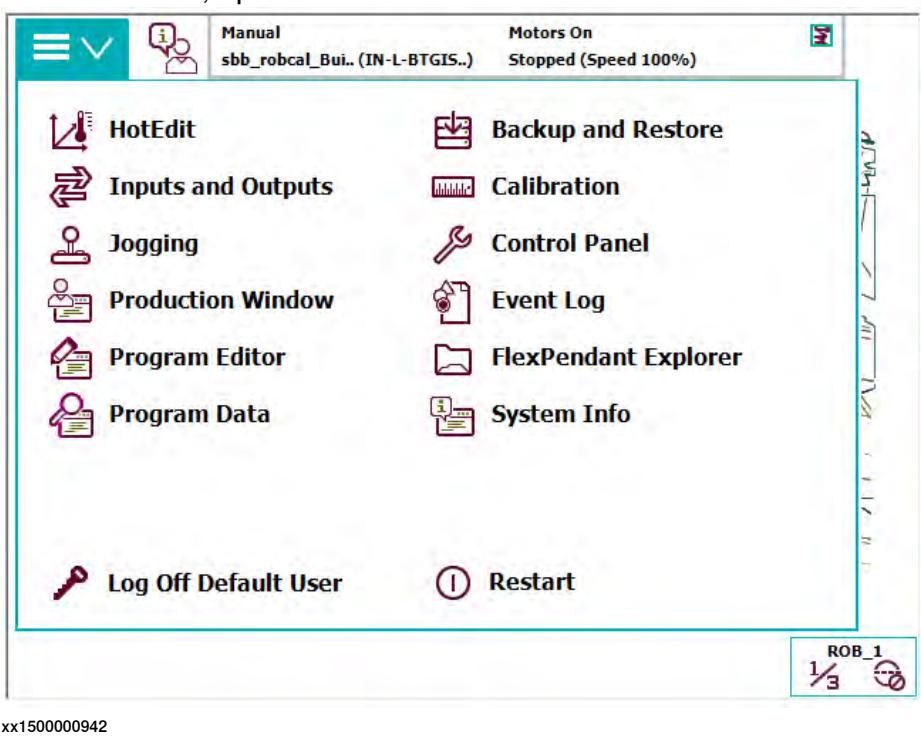
Step 1 - Manually running the manipulator to the synchronization position

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 Calibration marks on page 274 .
3 When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 277 .

Step 2 - Updating the revolution counter with the FlexPendant

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

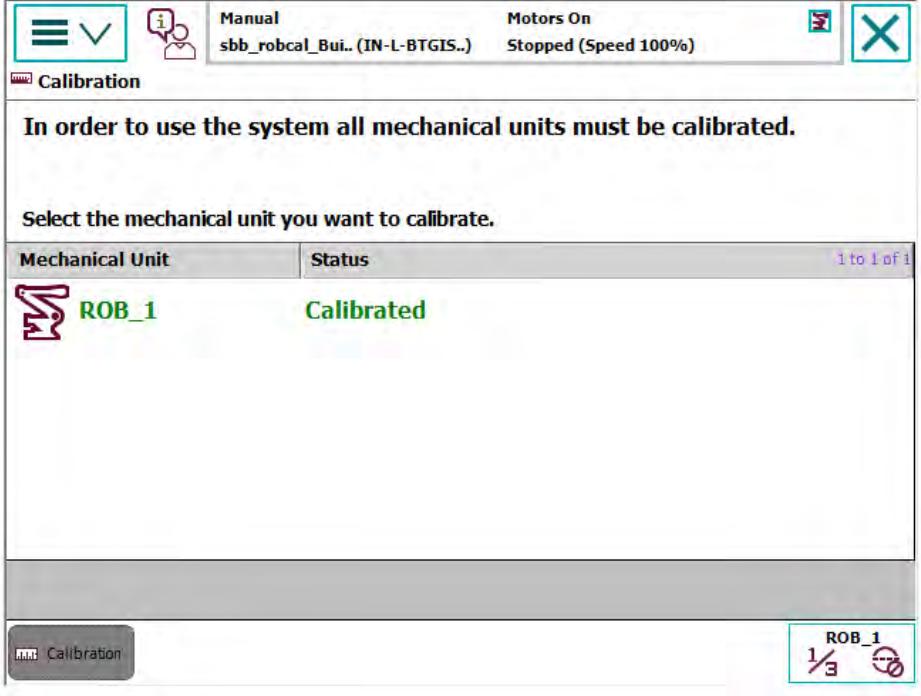
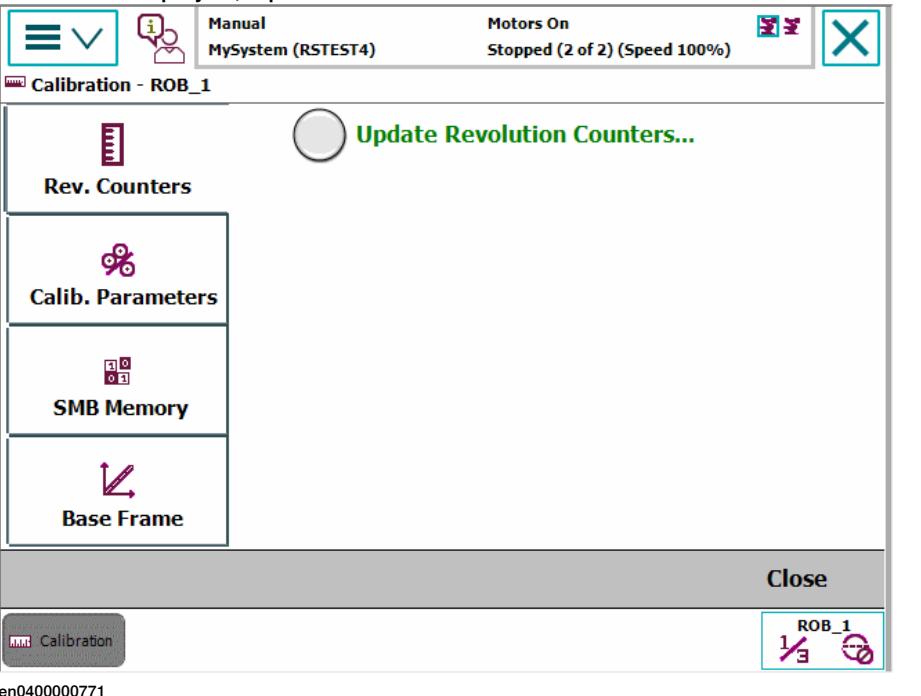
Action
1 On the ABB menu, tap Calibration.


Continues on next page

8 Calibration information

8.3 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....</p> <p>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none">• 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>

8 Calibration information

8.4 Manual setting of the calibration values

General

This chapter describes how to make manual settings for calibration values and recalibrate the axes. The measure is only necessary if the system has lost the calibration values (resolver values). The chapter describes the procedure for all robot and positioner axes where there are calibration values available.

Manual setting of the calibration values, procedure

	Action	Note
1	Tap ABB, to open the service window.	
2	Tap Calibration.	
3	Tap on the mechanical unit to be calibrated. When the unit concerned is not visible in the window, use the scroll bar arrows, in the lower part of the window.	
4	Tap Calibration Parameters.	
5	Tap Edit Motor Calibration.	
6	The system awaits a response: <ul style="list-style-type: none">• Tap Yes to proceed.	
7	Tap on the axis where the value is to be modified. <ul style="list-style-type: none">• Enter the new value with the help of the keypad.	
8	Confirm the value by tapping OK.	
9	The system awaits a response: <ul style="list-style-type: none">• Tap Yes to restart.	

8.5 Recalibrating the axes

General

This measure is necessary when the external axes lack calibration values or you wish to recalibrate the axes.

You should be aware that the programmed positions can change depending on whether the new calibrated position differs from the previous position. The chapter describes the procedure for the positioner, not for the robot. (Specialist know-how, which is not described here, and equipment are required to calibrate the robot's axes.) Calibration of the external axes is performed in different ways depending on the type of positioner in question.



Note

This procedure should not be used if calibration values already exist for the axis in question.

Positioners of the types A, L and MTC

	Action	Note
1	Move the positioner's axes (axis) to respective zero positions (synchronization marking). <ul style="list-style-type: none"> Be precise when adjusting the position of the axis so that it lies in the centre of the marking. The marking is made up of a machined groove or a machined notch on the gearbox respective faceplates. 	
2	Tap ABB , to open the service window.	
3	Tap Calibration .	
4	Tap on the mechanical unit to be calibrated. When the unit concerned is not visible in the window, use the scroll bar arrows, in the lower part of the window.	
5	Tap Calibration Parameters .	
6	Tap Fine Calibration .	
7	The system awaits a response: <ul style="list-style-type: none"> Tap Yes to proceed. 	
8	Select one or more axes, to be recalibrated.	
9	Tap Calibrate .	
10	The system awaits a response: <ul style="list-style-type: none"> Tap Calibrate, to confirm recalibration. 	
11	Tap Close .	

8 Calibration information

8.6 Calibration of the station interchange unit for positioner IRBP

General

Applies to IRBP positioners, types B, C, D, K or R, with mechanical stop. The position for the mechanical stop for side 1 and side 2 must be adjusted to attain the right torque. The program guides you through the adjustment.

Calibration procedure

	Action
1	Call and start the routine <i>CalibIntch1</i> from the Program Editor.
2	Tap OK to start the calibration.
3	Tap OK, then jog the robot to a position that is free from the positioners working area.
4	Start the routine again.
5	A warning is displayed that the station interchange will move to side 1.  CAUTION Make sure that you are at a safe distance. Tap OK to continue.
6	Wait while station side 1 is calibrated.
7	A warning is displayed that the station interchange will move to side 2.  CAUTION Make sure that you are at a safe distance. Tap OK to continue.
8	Wait while station side 2 is calibrated.
9	Station interchange calibration is finished. Measured values are displayed on the screen. Tap OK to finish.



Note

The calibration procedure can also be started from the **Setup** icon in *Production Manager*.

8.7 Multi-arc calibration

8.7.1 Introduction

General

Before the system could be used, the system has to be calibrated. The idea is to have tools with defined TCPs and move the TCPs together a number of times.

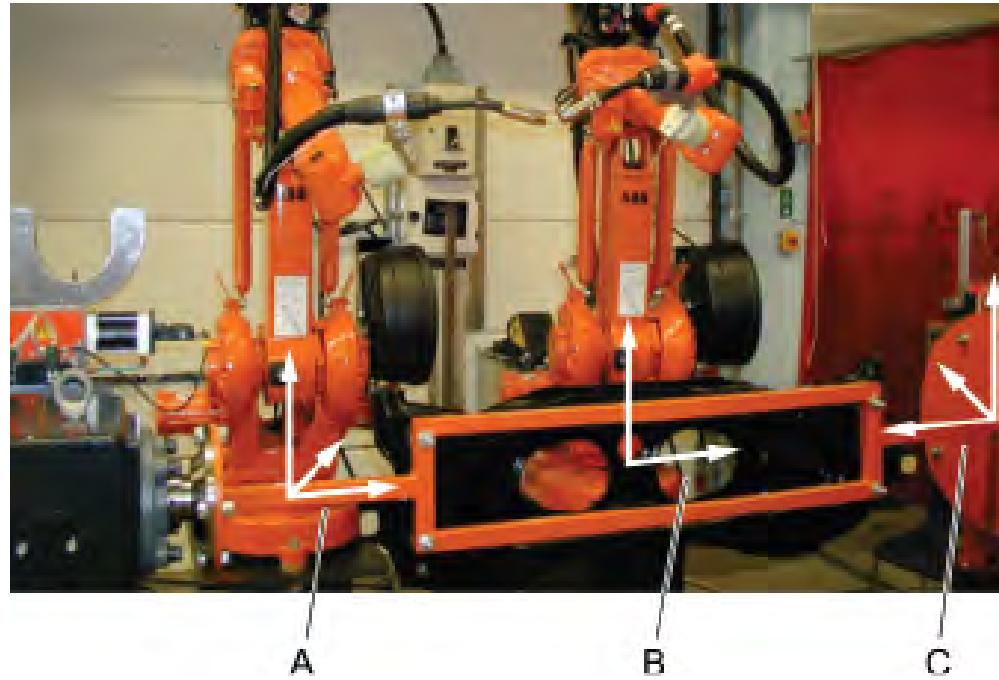
This method will move and rotate the base frame in relation to the world frame. Normally the base frame is centered and aligned with the world frame.



Note

Note that the base frame is fixed to the base of the robot.

Overview



xx1400000897

A	Base coordinate system for robot 2
B	Base and world coordinate system for robot 1
C	Base Frame for positioner

8 Calibration information

8.7.2 Calibrating the multi-arc system

8.7.2 Calibrating the multi-arc system

Tool calibration

Start to calibrate welding tool TCP using the BullsEye.

Action	Note
1 Change the mass in the tooldata from the negative value to the correct value for your tool, see figure.	

Calibrating the base frame of robot 1

Base frame calibration can be done with any robot, but only on one of the robots.

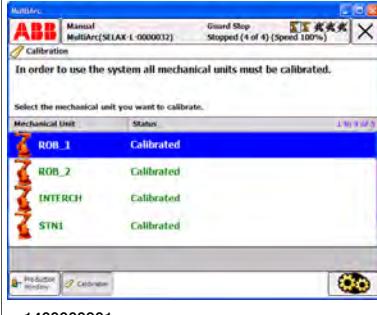
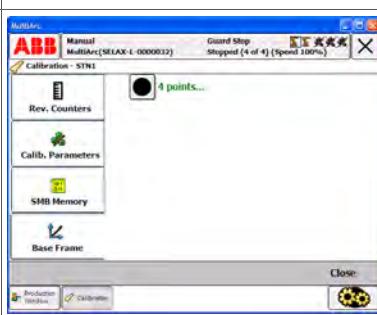
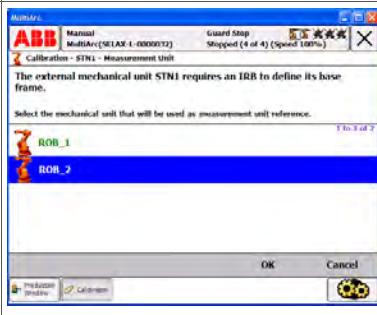
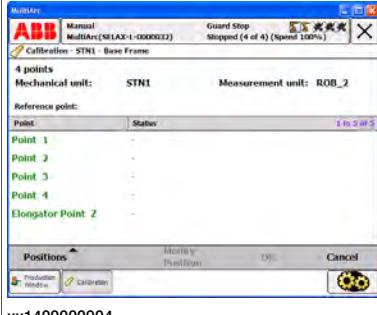
Action	Note
1 Rotate the positioner to 0 degree.	
2 Make a mark on the top off the disc.	This will be the X positive direction.
3 Jog the robots TCP to the mark.	 xx1400000899
4 On the FlexPendant, select Calibration.	 xx1400000900

Continues on next page

8 Calibration information

8.7.2 Calibrating the multi-arc system

Continued

Action	Note
5 Select Mechanical unit ROB_1.	 xx1400000901
6 Select Base Frame and then select 4 points.	 xx1400000902
7 Select the robot you will use to measure the manipulator base frame.	 xx1400000903
8 Rotate the positioner in positive direction 30 or 60 degrees between the points. Follow the movement with the robots TCP, and then modify point 1, 2 etc.	 xx1400000904

Continues on next page

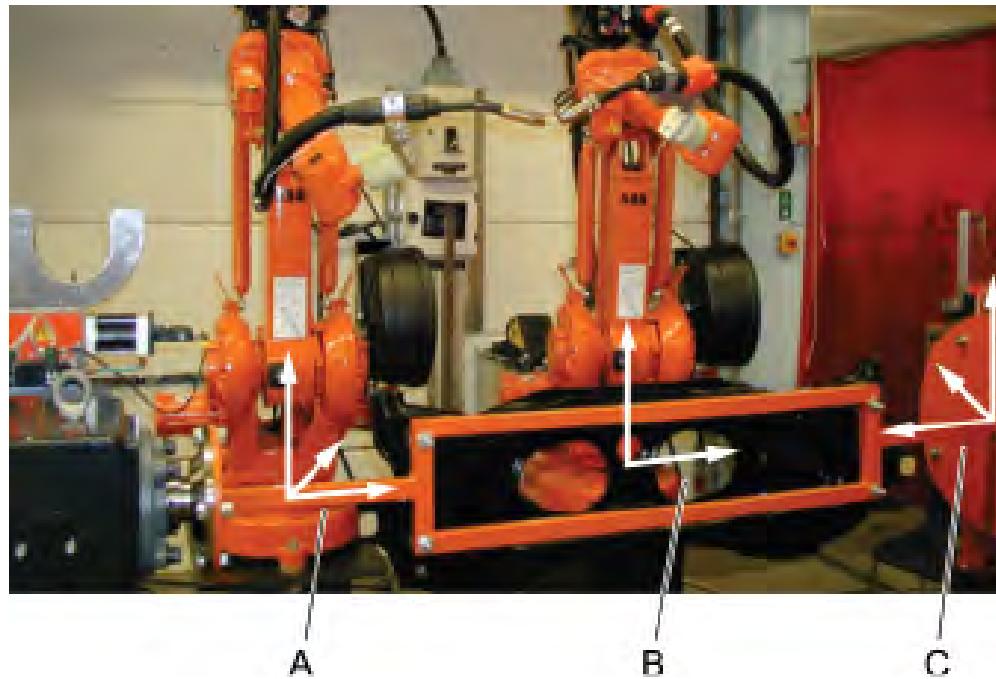
8 Calibration information

8.7.2 Calibrating the multi-arc system

Continued

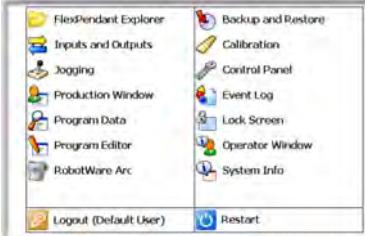
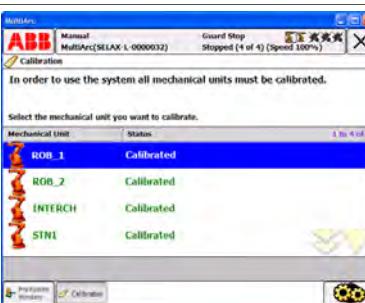
Calibrating the base coordinate for robot 2

Calibrate the robot 1 base coordinate system to the robot 2 world coordinate system.



xx1400000897

A	Base coordinate system for robot 2
B	Base and world coordinate system for robot 1
C	Base Frame for positioner

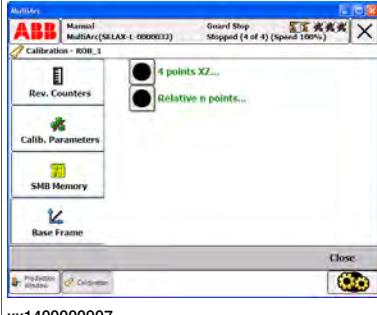
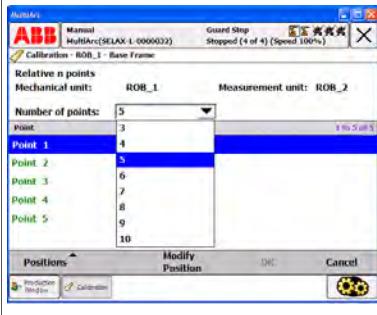
	Action	Note
1	On the FlexPendant, select Calibration.	 xx1400000905
2	Select robot 1 (ROB_1).	 xx1400000906

Continues on next page

8 Calibration information

8.7.2 Calibrating the multi-arc system

Continued

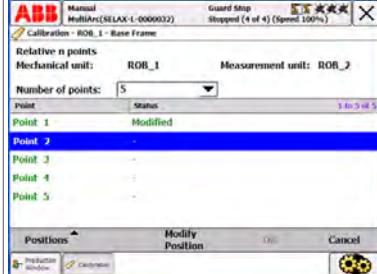
Action	Note
3 Select base frame and then Relative n points.	 xx1400000907
4 Select Number of points.	 xx1400000908
5 Point the TCPs of the robots towards each other.	 xx1400000909
6 Tap Modify position.	 xx1400000910
7 For each of the steps: Move the robots to a new position where they are far apart compared to the previous position.	
8 Tap Modify position.	

Continues on next page

8 Calibration information

8.7.2 Calibrating the multi-arc system

Continued

Action	Note
9	<p>When all positions are modified, tap OK.</p>  <p>xx1400000911</p>
10	<p>Create a work object according to <i>Operating manual - IRC5 with FlexPendant</i>, to confirm that the calibration is correct.</p>

8.8 Tool and speed data

Definition of the tool data (tload)

These are the movement related data that should be defined first. All movement is dependent on this definition.



Note

When using the option *Collision Detection*, it is very important to have the right tool load in the tool data.

The following data components are recommended for the tool.

robhold	true
tframe	5-point TCP&Z is normally used with weaving during MIG/MAG welding. Without weaving, the 4-point TCP is sufficient.
tload	Values for the supplied standard welding guns and guns with a swan neck.

Welding guns with swan neck

Welding gun type	Swan neck	Weight /kg	X mm	Y mm	Z mm
ESAB PSF 315R	22 degrees	3.3	-60	0	57
ESAB PSF 500R	22 degrees	3.3	-60	0	57
Dinse PKI 500	22 degrees	3.3	-35	0	90
Binzel WH 455	22 degrees	3.3	-35	0	55
Dinse PP Alu.	22 degrees	4.4	-20	0	120

The five standard welding gun types above are predefined with the right tload in the module `Tooldata.sys`.

- Always use one of these tools when using a standard welding gun.
- Duplicate and change the name of the tool data if you want to make your own tool.
- If you use a non-standard welding gun it is necessary to run the load identification service routine, see [Identification of load data for positioners IRBP on page 291](#).

Setup welding gun without BullsEye

The position of the robot and its movements are always related to its tool coordinate system, that is the TCP and tool orientation. To get the best performance, it is important to define the tool coordinate system as correctly as possible.

Continues on next page

8 Calibration information

8.8 Tool and speed data

Continued

Speed data for external axes

Use the following maximum speed data for IRBP.

IRBP positioner	
MTC 250	180 degree/s
MTC 750	150 degree/s
MTC 2000	90 degree/s
MTC 5000	39 degree/s
MIC 1.1	90 degree/s
MIC 1.2	90 degree/s
MIC 2.1	90 degree/s
MIC 2.2	90 degree/s

8.9 Drivers

8.9.1 Identification of load data for positioners IRBP

Introduction

Since the data of the different loads that can be mounted on the external positioner can be quite difficult to compute, there is a load identification service routine (*ManLoadIdentify*) that computes the necessary load data by moving the positioner. Here we will describe which parameters are identified with the load identification.

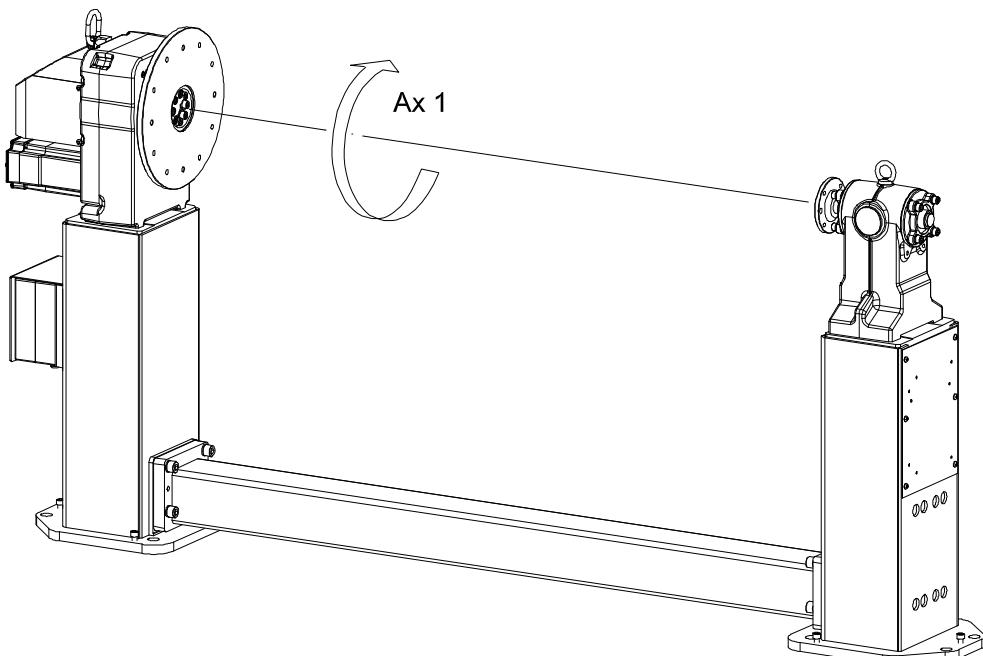


Note

If you run the load identification for the first time on a specific type of positioner, it is recommended that you first run the procedure in slow test mode to prevent any collisions.

Load identification for IRBP L

A simplified view of positioner IRBP L is shown in figure. Load identification can be performed in any position for this positioner.



xx1000000139

Parameters and movements



Note

The mass of the load must be known in advance. The mass data is entered when performing the load identification.

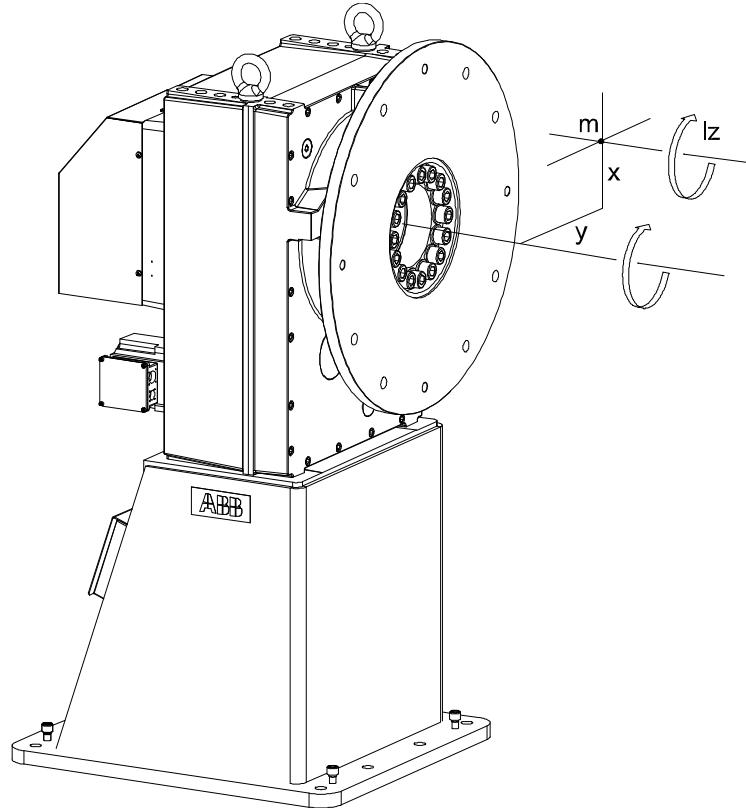
Continues on next page

8 Calibration information

8.9.1 Identification of load data for positioners IRBP

Continued

Parameters



xx1000000140

The parameters that are identified are the center of gravity in a plane perpendicular to the axis, and moments of inertia around the axis, see figure.

To perform the identification the positioner moves the load and computes the parameters.

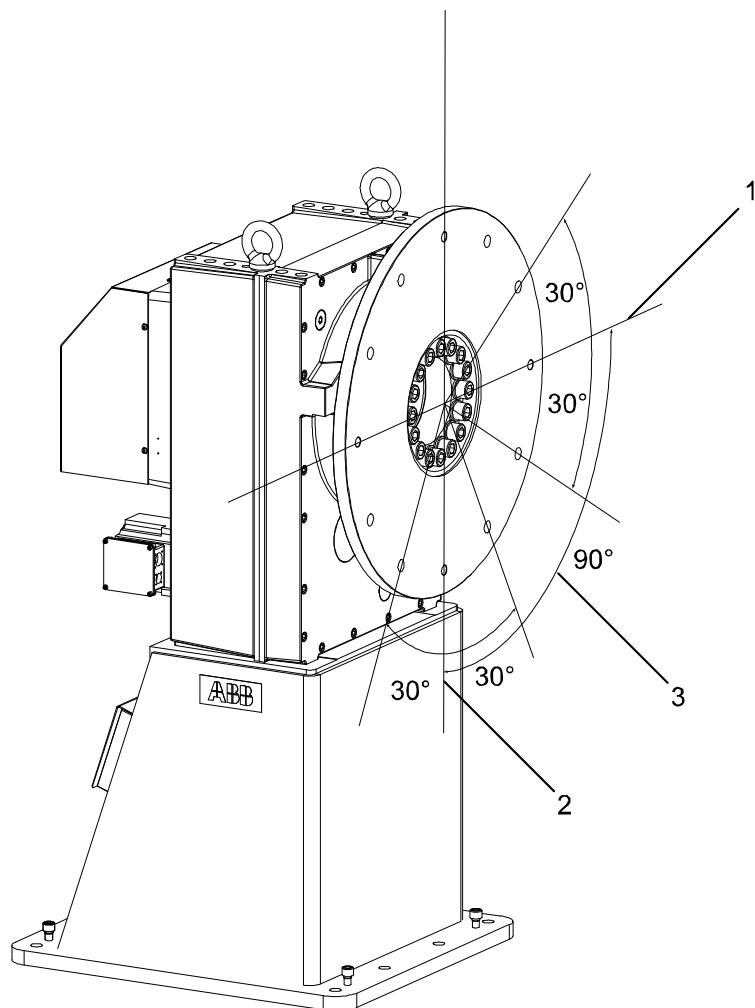
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8.9.1 Identification of load data for positioners IRBP

Continued

Movements

The movements for the axis are performed around two configuration points as described in the following figure. At each configuration, the maximum motion for the axis is approximately 30 degrees up and 30 degrees down. The optimum value for the configuration angle is 90 degrees.



xx1000000142

1	Configuration 2
2	Configuration 1 (start position)
3	Configuration angle

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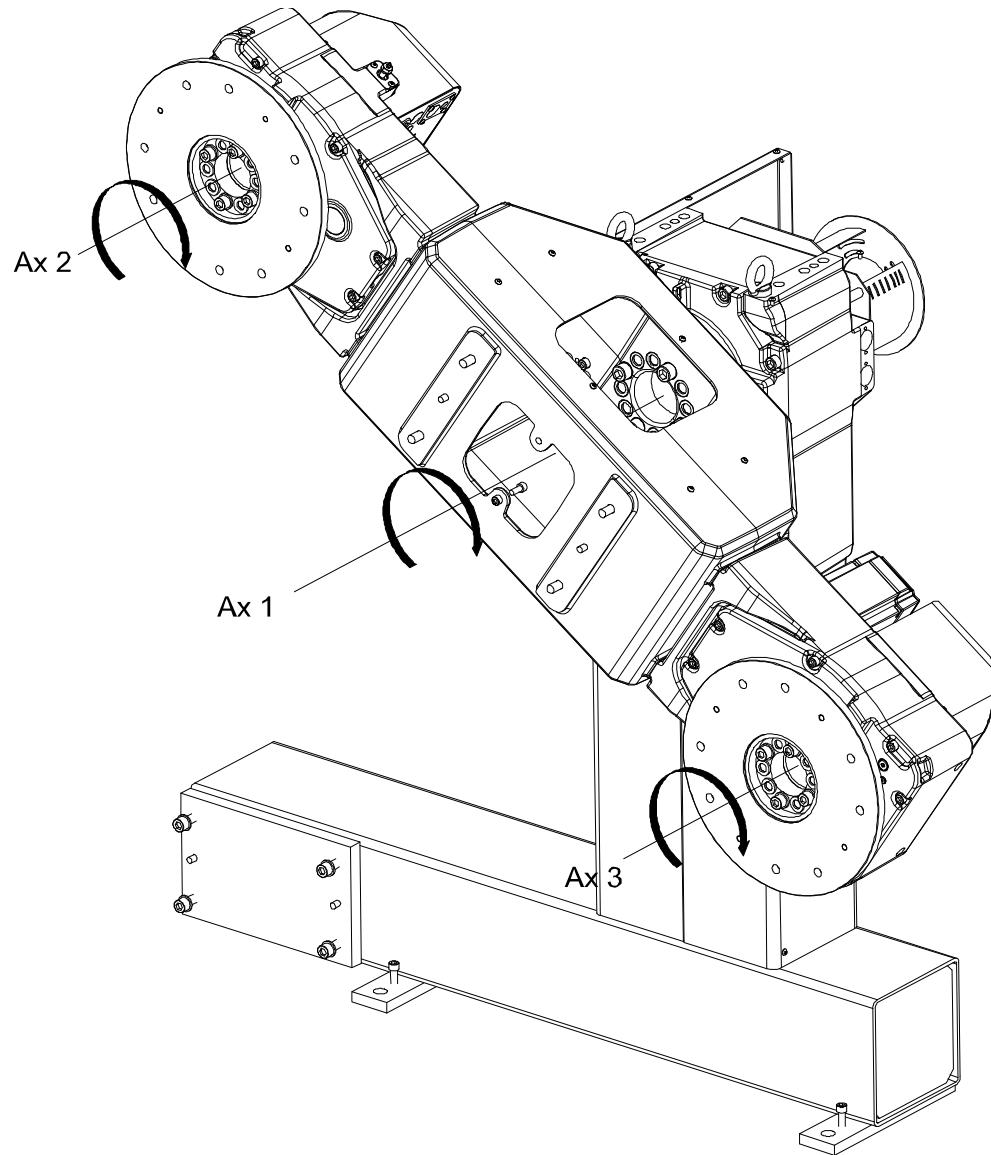
8 Calibration information

8.9.1 Identification of load data for positioners IRBP

Continued

Load identification for IRBP K

A simplified view of positioner IRBP K is shown in the following figure. Load identification is allowed on axes 2 and 3 for this positioner. Load identification can only be performed when axis 1 is in one of its end positions. This is checked by the load identification procedure.



xx1000000144

The identified parameters and movements for each axis are the same as for the IRBP L positioner. See [Parameters and movements on page 291](#).

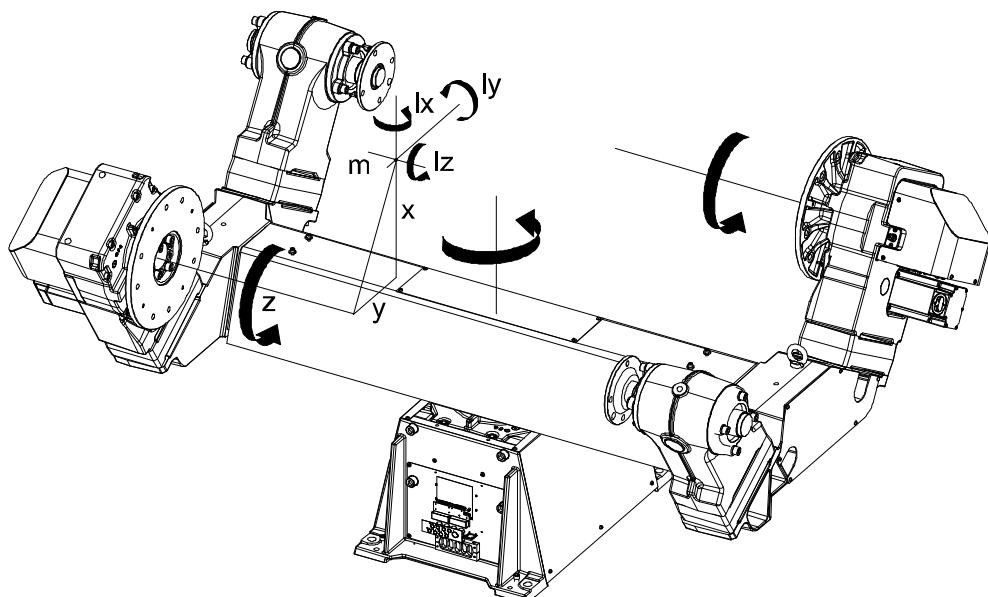
Continues on next page

8.9.1 Identification of load data for positioners IRBP

Continued

Load identification for IRBP R

A simplified view of the positioner IRBP R is shown in the following figure. The parameters identified are the center of gravity in a plane perpendicular to the axis, and three moments of inertia at the center of gravity. Note that both the mass of the load and the distance z to the center of gravity must be known in advance. These data are entered when performing the load identification.



xx1000000149

One part of the identification movements for one axis is the same as for the positioner IRBP L. To find the extra moment of inertia we also move the interchange axis with the load to two different positions. The movements for the interchange axis are the movements described in the figure in section [Parameters and movements on page 291](#), but only at one configuration point.



CAUTION

The identification on one axis will be correct only if there is no load mounted on the other axis.

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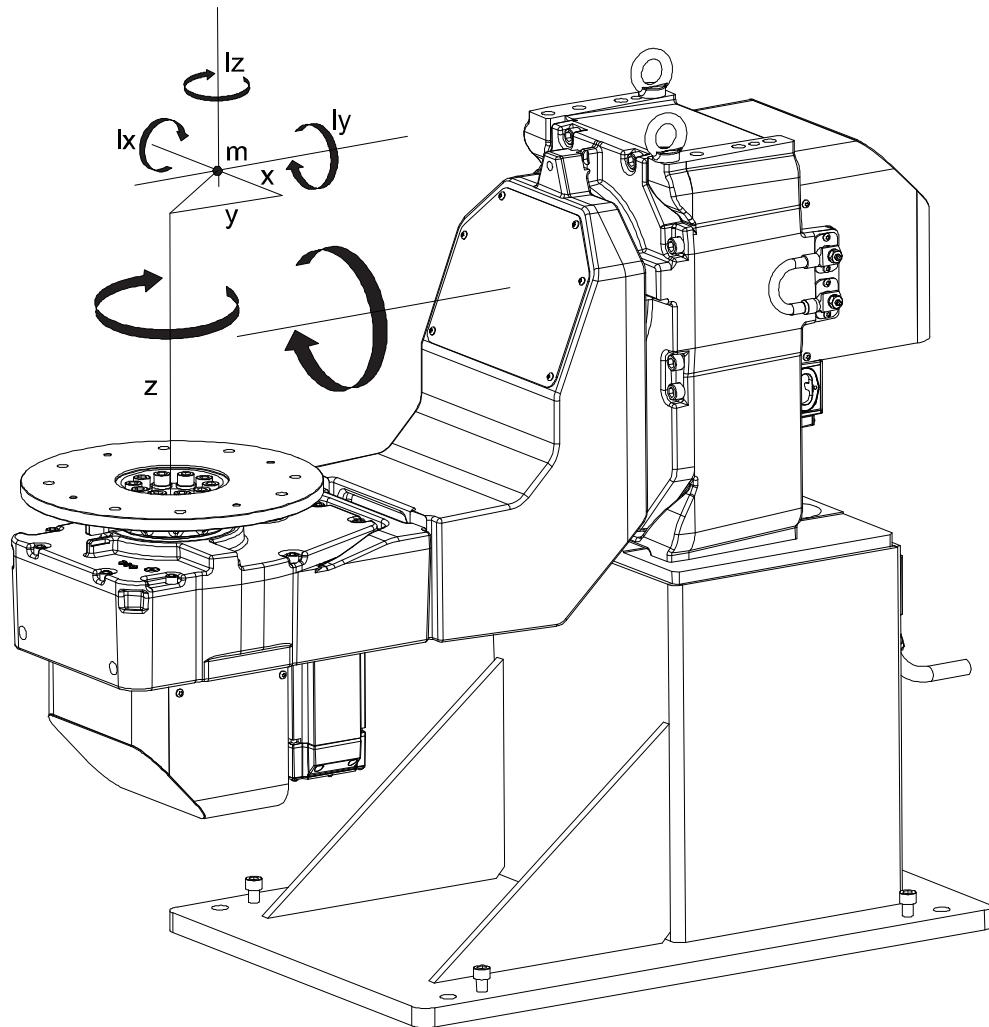
8 Calibration information

8.9.1 Identification of load data for positioners IRBP

Continued

Load identification for IRBP A/B/D

A simplified view of positioner IRBP A/B/D is shown in the following figure. When the identification is performed, the positioner must be positioned so that the z axis is horizontal. This is verified by the load identification procedure. If axis 1 is too far from this position the load identification procedure will suggest which angle it should be moved to.



xx1000000150

The parameters identified are the center of gravity and three moments of inertia at the center of gravity, see figure.

The mass of the load must be known in advance. The mass data is entered when performing the load identification.

The motion for each axis is, in principal, the same as for the positioner IRBP L, see figure in section [Parameters and movements on page 291](#). However, axis 1 only performs its movements around one configuration point.

8.9.2 Safe position

General

The safe position should be a position where the robot is free from the IRBP positioner working area. The first time that you start the program execution you will be asked to setup the safe position for the robots.

Procedure

	Action	Note
1	Tap OK. First, the Robot Safe Position is teached. The driver requires this position to safely perform a station interchange.	
2	Move the robot to a safe position for the positioner's work area. Tap Start.	
3	To update the safe position or if you want to do it manually you can move PP to the procedure SetSafePos. Tap Debug and then Move PP to routine.	

8 Calibration information

8.9.3 Work positions

8.9.3 Work positions

Introduction

These positions speed up and simplify the process. Settings for load position, process position and service position for all included mechanical units. In order to define the working positions, a part must be activated on the station and refer to a data type *advPart*.

Load position

A load position is the position the positioner side/positioner is in after station interchange or that it can run to after a finished work program. Set the load position so that it is in a suitable position for the operator to load/remove the workpiece. The value is saved in data type *partadv* in the component *loadAngle*, which the pertinent part refers to in the component *advPart*.

Procedures

Action	Note
1 To change load position, the ABB menu must be opened. <ul style="list-style-type: none">• Tap Production Manager.	
2 Tap Setup	
3 Choose the station for which the load position will be changed. <ul style="list-style-type: none">• Tap GO	
4 If a part is not activated for the selected station, one must be activated for the station.	
5 Specify the desired load position in degrees.	

8.9.4 Process position

General

A process position is the position the positioner or positioner side is in after station interchange. Set the process position so that it is in a suitable position for the first position in the work program. The value is saved in data type *partadv* in the component *procAngle*, which the pertinent part refers to in the component *advPart*.

Procedures

	Action	Note
1	To change process position, the ABBmenu must be opened. <ul style="list-style-type: none">• Tap Production Manager.	
2	Tap Setup.	
3	Choose the station for which the process position will be changed. <ul style="list-style-type: none">• Tap GO.	
4	If a part is not activated for the selected station, one must be activated for the station. See section “Parts handling” section 5.1.2 on how to do this.	
5	Specify the desired process position in degrees.	

8 Calibration information

8.9.5 Service position

8.9.5 Service position

General

A service position is a position at which the operator or service technician can perform inspections or service to a workpiece or fixture. The value is saved in data type *partadv* in the component *serviceAngle*, which the pertinent part refers to in the component *advPart*.

Procedures

	Action	Note
1	To change service position, the ABB menu must be opened. <ul style="list-style-type: none">• Tap Production Manager.	
2	Tap Setup .	
3	Choose the station for which the service position will be changed. <ul style="list-style-type: none">• Tap GO.	
4	If a part is not activated for the selected station, one must be activated for the station. See section “Parts handling” section 5.1.2 on how to do this.	
5	Specify the desired service position in degrees.	

8.9.6 Define payload for a mechanical unit

Description of MechUnitLoad

The instruction **MechUnitLoad** is used to define a payload for an additional axis (external mechanical unit). The payload for the robot is defined with instruction **GripLoad**. When using the drivers **MechUnitLoad** is built in.

This instruction should be used for all mechanical units with dynamic model in servo to achieve the best motion performance.

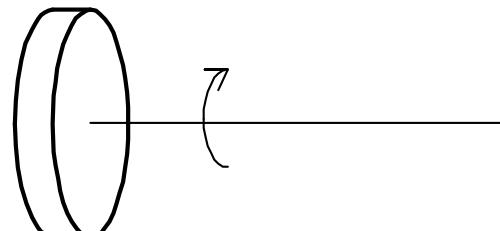
The **MechUnitLoad** instruction should always be executed after execution of the instruction **ActUnit**.

The axis closest to the payload should be selected in the **MechUnitLoad** instruction. While executing **ActUnit INTERCH one** **MechUnitLoad** should be executed for axis 2 and axis 3.

Examples

Basic examples of the instruction **MechUnitLoad** are illustrated below.

The following figure shows axis 1 on a mechanical unit named STN1 of type IRBP L.



xx0500002142

Example 1

```
ActUnit STN1;
MechUnitLoad STN1, 1, load0;
```

Activate mechanical unit STN1 and define the payload *load0* corresponding to no load (at all) mounted on axis 1.

Example 2

```
ActUnit STN1;
MechUnitLoad STN1, 1, fixture1;
```

Activate mechanical unit STN1 and define the payload *fixture1* corresponding to fixture *fixture1* mounted on axis 1.

Example 3

```
ActUnit STN1;
MechUnitLoad STN1, 1, workpiece1;
```

Activate mechanical unit STN1 and define the payload *workpiece1* corresponding to fixture and work piece named *workpiece1* mounted on axis 1.

Arguments

MechUnitLoad MechUnit AxisNo Load

Continues on next page

8 Calibration information

8.9.6 Define payload for a mechanical unit

Continued

MechUnit

Mechanical Unit

Data type: `mecunit`

The name of the mechanical unit

AxisNo

Axis Number

Data type: `num`

The axis number, within the mechanical unit, that holds the load.

Load

Data type: `loaddata`

The load data that describes the current payload to be defined.

Program execution

After execution of `MechUnitLoad`, when the robot and additional axes have come to a standstill, the specified load is defined for the specified mechanical unit and axis. This means that the payload is controlled and monitored by the control system.

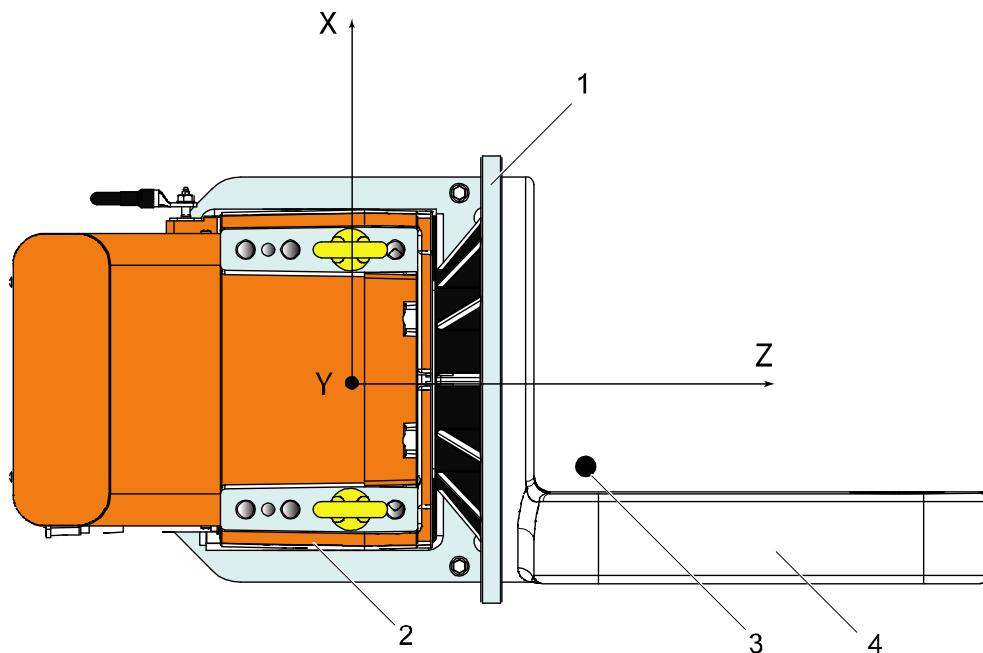
The default payload at cold start for a certain mechanical unit type, is the predefined maximal payload for this mechanical unit type.

When another payload is used the actual payload for the mechanical unit and axis should be redefined with this instruction. This should always be done after activation of the mechanical unit.

The defined payload will survive a power failure restart. The defined payload will also survive a restart of the program after manual activation of other mechanical units from the jogging window.

Continues on next page

The following graphic shows a payload mounted on the end-effector of a mechanical unit (end-effector coordinate system for the mechanical unit).



xx1000000153

1	Fixture
2	Mechanical unit
3	Center of gravity for the payload (fixture + work piece)
4	Work piece

Continues on next page

8 Calibration information

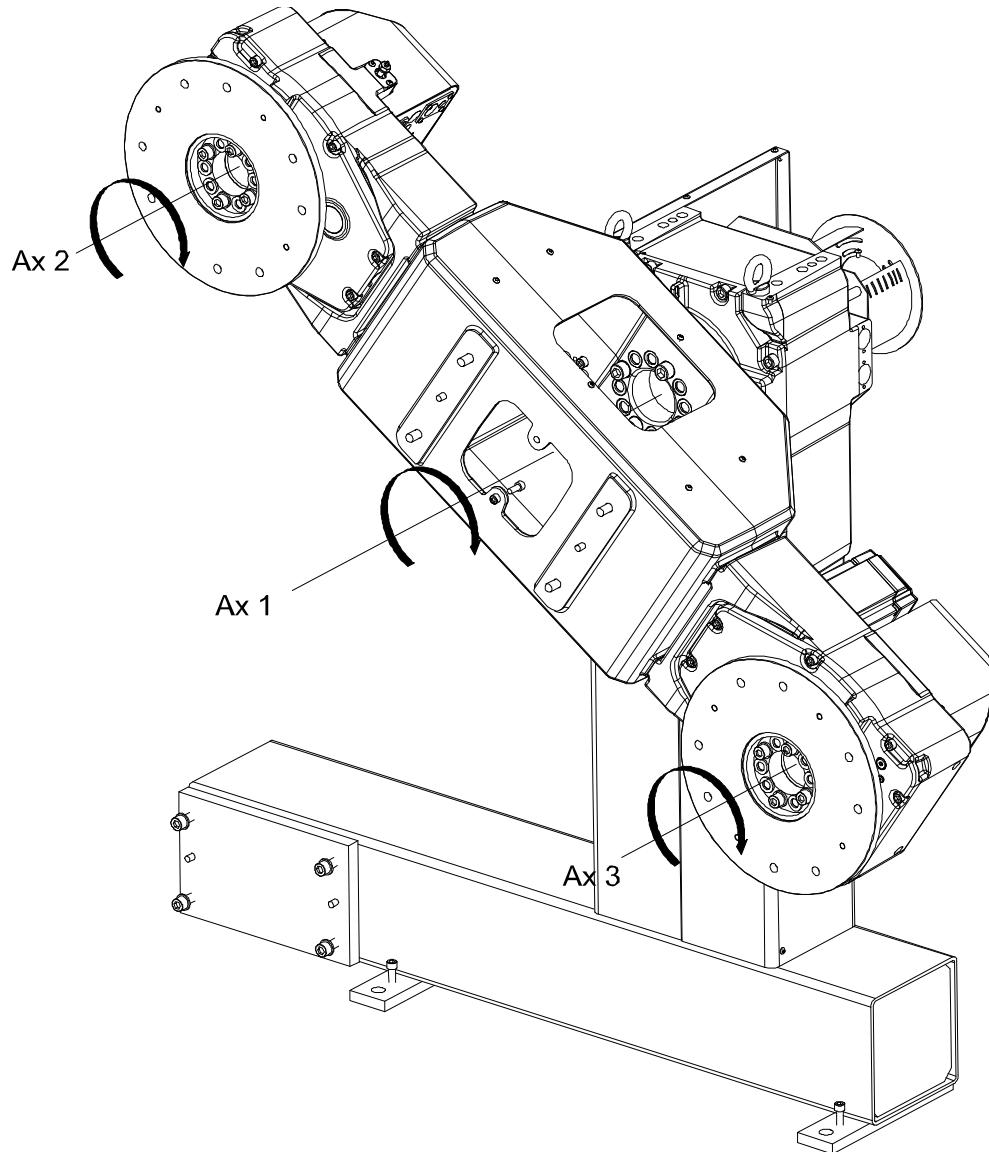
8.9.6 Define payload for a mechanical unit

Continued

More examples

More examples of how to use the instruction `MechUnitLoad` are illustrated below.

The following figure shows a mechanical unit named `INTERCH` of type IRBP K with three axes (1, 2, and 3).



xx1000000144

Example 1

```
MoveL homeside1, v1000, fine, gun1;  
....  
ActUnit INTERCH;
```

The whole mechanical unit `INTERCH` is activated.

Example 2

```
MechUnitLoad INTERCH, 2, workpiece1;  
Defines payload workpiece1 on the mechanical unit INTERCH axis 2.
```

Continues on next page

Example 3

```
MechUnitLoad INTERCH, 3, workpiece2;
```

Defines payload *workpiece2* on the mechanical unit *INTERCH* axis 3.

Example 4

```
MoveL homeside2, v1000, fine, gun1
```

The axes of the mechanical unit *INTERCH* move to the switch position *homeside2* with mounted payload on both axes 2 and 3.

Limitations

If this instruction is preceded by a move instruction, that move instruction must be programmed with a stop point (zonedata fine), not a fly-by point. Otherwise restart after power failure will not be possible.

MechUnitLoad cannot be executed in a RAPID routine connected to any of the following special system events: PowerOn, Stop, QStop, Restart or Step.

Syntax

```
MechUnitLoad  
[ MechUnit ':=' ] < variable (VAR) of mecunit> ','  
[ AxisNo ':=' ] <expression (IN) of num ','  
[ Load ':=' ] < persistent (PERS) of loaddata> ';
```

Related information

Information	Described in
Mechanical units	<i>Technical reference manual - RAPID Instructions, Functions and Data types</i> , data type <i>mecunit</i>
Definition of load data	<i>Technical reference manual - RAPID Instructions, Functions and Data types</i> , data type <i>loaddata</i>
Definition of payload for the robot	<i>Technical reference manual - RAPID Instructions, Functions and Data types</i> , instruction <i>GripLoad</i> and data type <i>tooldata</i>

8.9.7 Define base frame

General

To run coordinated axes, the base frame must be defined. See *Application manual - Additional axes and stand alone controller (Coordinated track motion)*.

9 Decommissioning

9.1 Environmental information

Hazardous material

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly to prevent health or environmental hazards.

Material	Example application
Batteries, NiCad or Lithium	Serial measurement board
Copper	Cables, motors
Cast iron/nodular iron	Gearboxes
Steel	Frame
Neodymium	Brakes, motors
Plastic/rubber	Cables, connectors, drive belts, and so on.
Oil, grease	Gearboxes

Oil and grease

Where possible, arrange for oil and grease to be recycled. Dispose of via an authorized person/contractor in accordance with local regulations. Do not dispose of oil and grease near lakes, ponds, ditches, down drains, or onto soil. Incineration must be carried out under controlled conditions in accordance with local regulations.

Also note that:

- Spills can form a film on water surfaces causing damage to organisms.
Oxygen transfer could also be impaired.
- Spillage can penetrate the soil causing ground water contamination.

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10 Reference information

10.1 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

10 Reference information

10.1 Applicable standards

Continued

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

10.2 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	

10 Reference information

10.3 Weight specifications

10.3 Weight specifications

Definition

In installation, repair, and maintenance procedures, weights of the components handled are sometimes specified. All components exceeding 22 kg (50 lbs) are highlighted in this way.

To avoid injury, ABB recommends the use of a lifting accessory when handling components with a weight exceeding 22 kg. A wide range of lifting accessories and devices are available for each manipulator model.

Example

Following is an example of a weight specification in a procedure:

	Action	Note
	 CAUTION The robot weighs xx kg. All lifting accessories used must be sized accordingly!	

10.4 Standard toolkit, IRC5

General

All service (repair, maintenance and installation) instructions contain lists of tools required to perform the specified activity. All special tools, that is, all tools that are not considered as standard tools as defined below, are listed in their instructions respectively.

This way, the tools required are the sum of the Standard Toolkit and any tools listed in the instructions.

Contents, standard toolkit, IRC5

Tool	Remark
Screw driver, Torx	Tx10
Screw driver, Torx	Tx20
Screw driver, Torx	Tx25
Ball tipped screw driver, Torx	Tx25
Screw driver, flat blade	4 mm
Screw driver, flat blade	8 mm
Screw driver, flat blade	12 mm
Screw driver	Phillips-1
Box spanner	8 mm

10 Reference information

10.5 Standard tools IRBP

10.5 Standard tools IRBP

General

All service (repairs, maintenance and installation) procedures contain 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 table below.

This way, the tools required are the sum of the Standard toolkit and any tools listed in the instructions.

Contents, standard toolkit

Qty	Tool	Rem.
1	Ring-open-end spanner 8-19 mm	
1	Socket head cap 5-17 mm	
1	Torx socket no: 20-60	
1	Box spanner set	
1	Torque wrench 75-400 Nm	
1	Torque wrench 500-1500 Nm	
1	Ratchet head for torque wrench 1/2	
2	Hexagon-headed screw M10x100	
1	Socket head cap no: 14, socket 40 mm bit L 100 mm	
1	Socket head cap no: 14, socket 40 mm bit L 20 mm	To be shortened to 12 mm
1	Socket head cap no: 6, socket 40 mm bit L 145 mm	
1	Socket head cap no: 6, socket 40 mm bit L 220 mm	

10.6 Circuit diagrams

Overview

The circuit diagrams are not included in this manual, but delivered as separate documents on the documentation DVD. See the article numbers in the tables below.

Controllers

Product	Article numbers for circuit diagrams
<i>Circuit diagram - IRC5</i>	3HAC024480-011
<i>Circuit diagram - IRC5 Compact</i>	3HAC049406-003
<i>Circuit diagram - IRC5 Panel Mounted Controller</i>	3HAC026871-020
<i>Circuit diagram - Euromap</i>	3HAC024120-004
<i>Circuit diagram - Spot welding cabinet</i>	3HAC057185-001

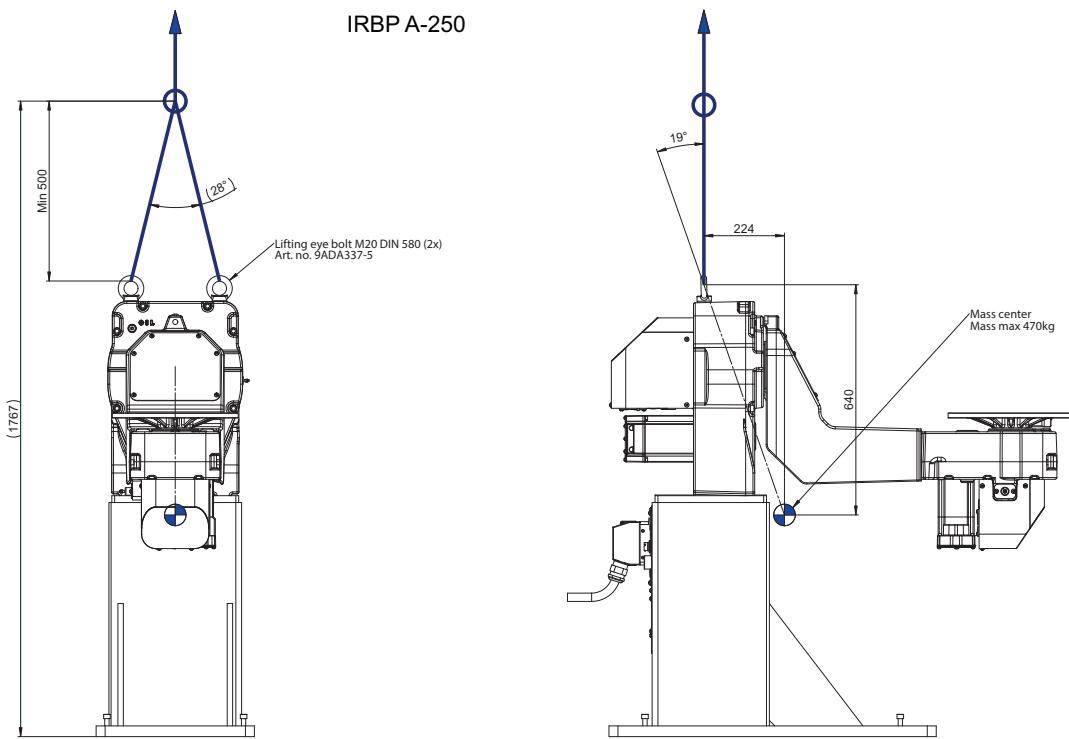
Positioners

Product	Article numbers for circuit diagrams
<i>Circuit diagram - Service diagram IRBP C</i>	3HAC035753-001
<i>Circuit diagram - Service diagram IRBP L</i>	3HAC035753-002
<i>Circuit diagram - Service diagram IRBP K/R</i>	3HAC035753-003
<i>Circuit diagram - Service diagram IRBP A</i>	3HAC035753-004
<i>Circuit diagram - Service diagram IRBP B/D</i>	3HAC035753-005
<i>Circuit diagram - Service diagram IRBP IF C</i>	3HAC035754-001
<i>Circuit diagram - Service diagram IRBP IF L</i>	3HAC035754-002
<i>Circuit diagram - Service diagram IRBP IF K/R</i>	3HAC035754-003
<i>Circuit diagram - Service diagram IRBP IF A</i>	3HAC035754-004
<i>Circuit diagram - Service diagram IRBP IF B/D</i>	3HAC035754-005
<i>Circuit diagram - Service diagram Safety Options A/L/S</i>	3HEA800730-001
<i>Circuit diagram - Service diagram Safety Interface A/L/S</i>	3HEA802301-001

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11 Lifting instructions

IRBP A-250



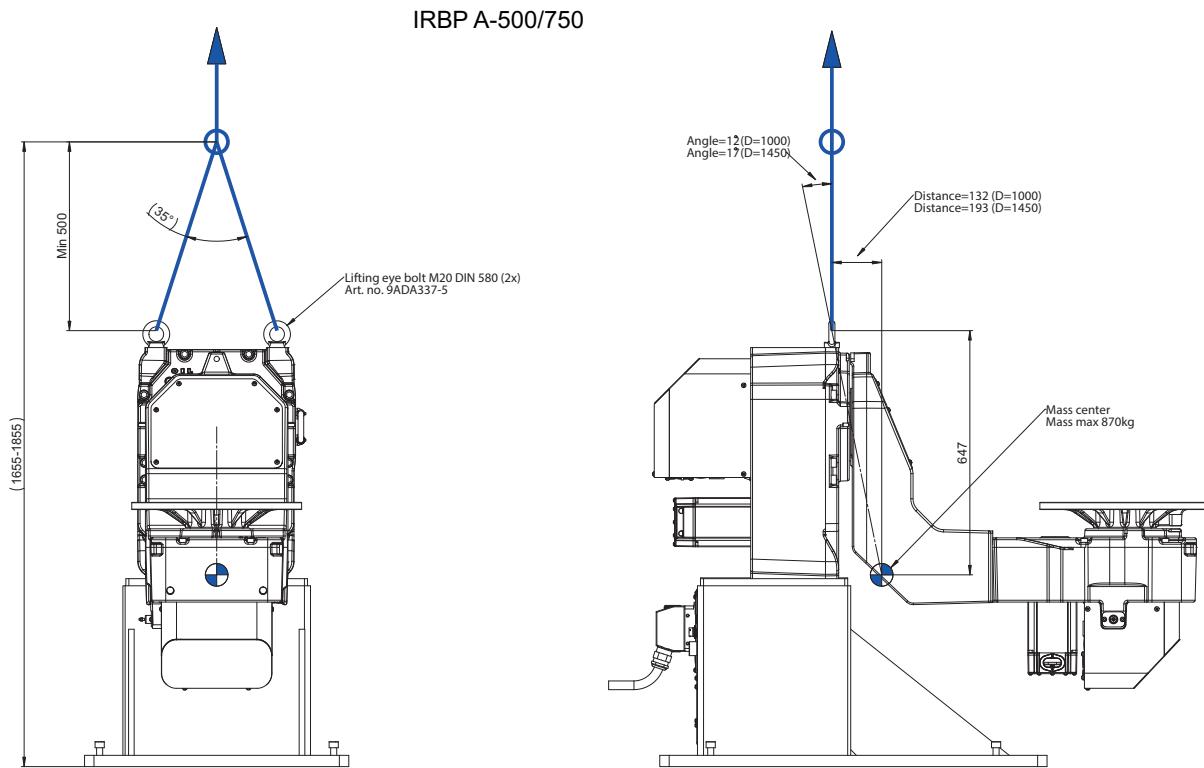
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11 Lifting instructions

Continued

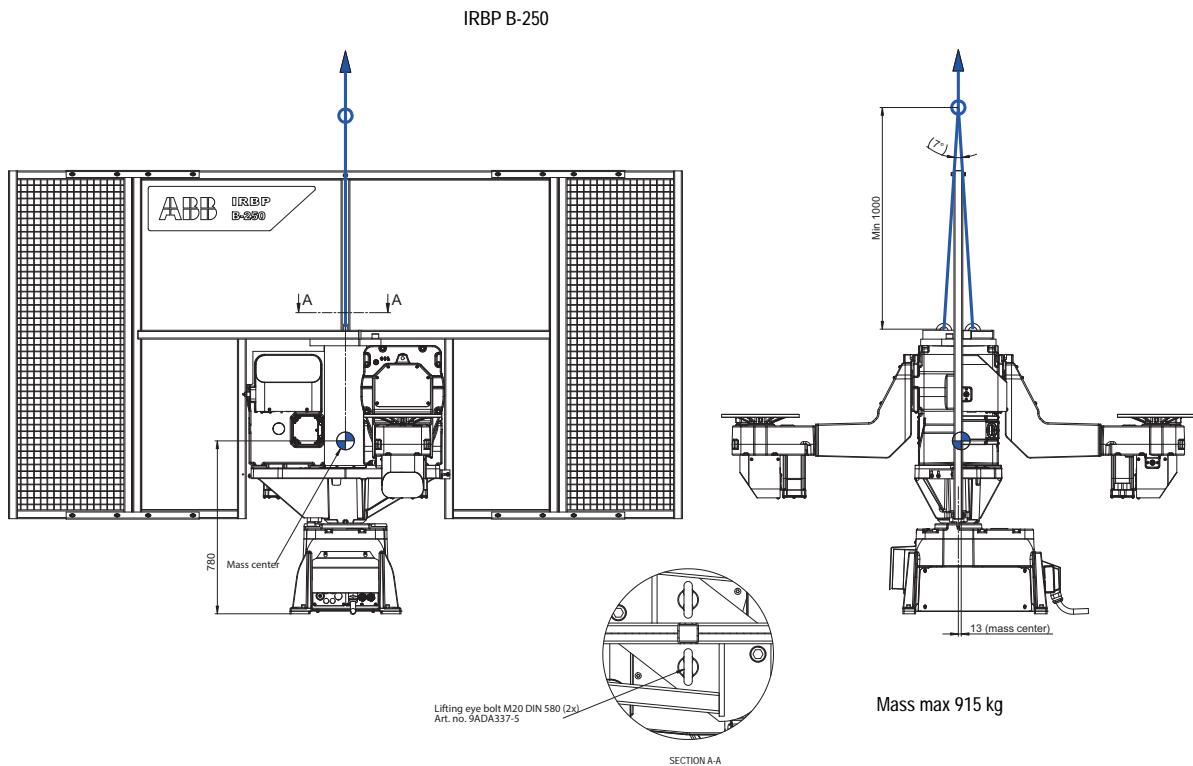
IRBP A-500/750



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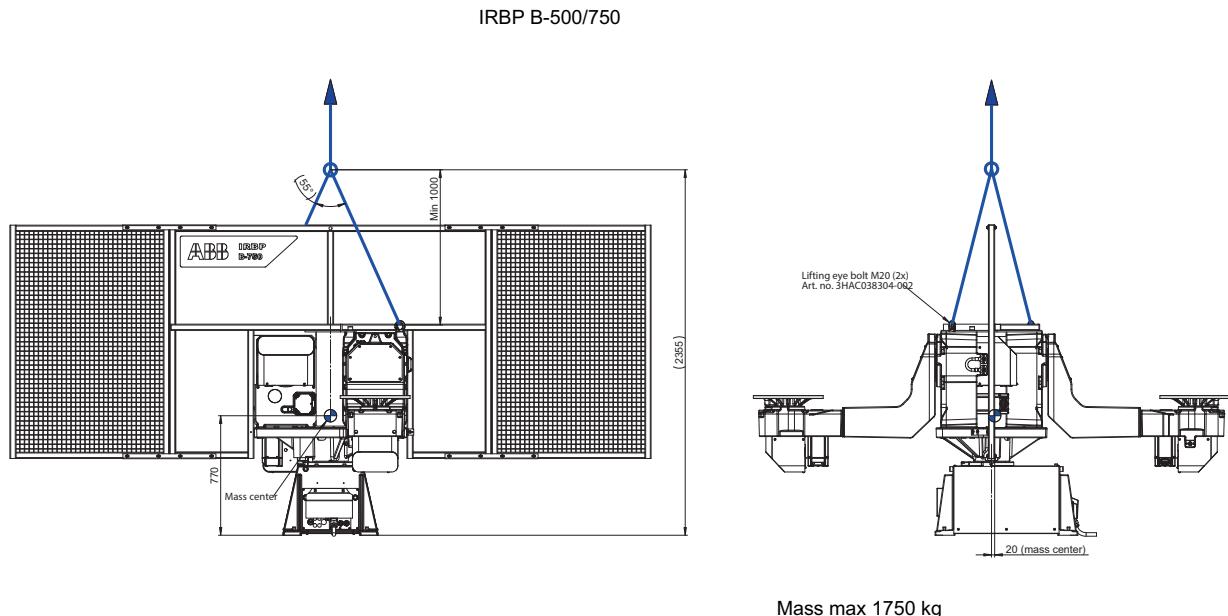
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IRBP B-250



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IRBP B-500/750



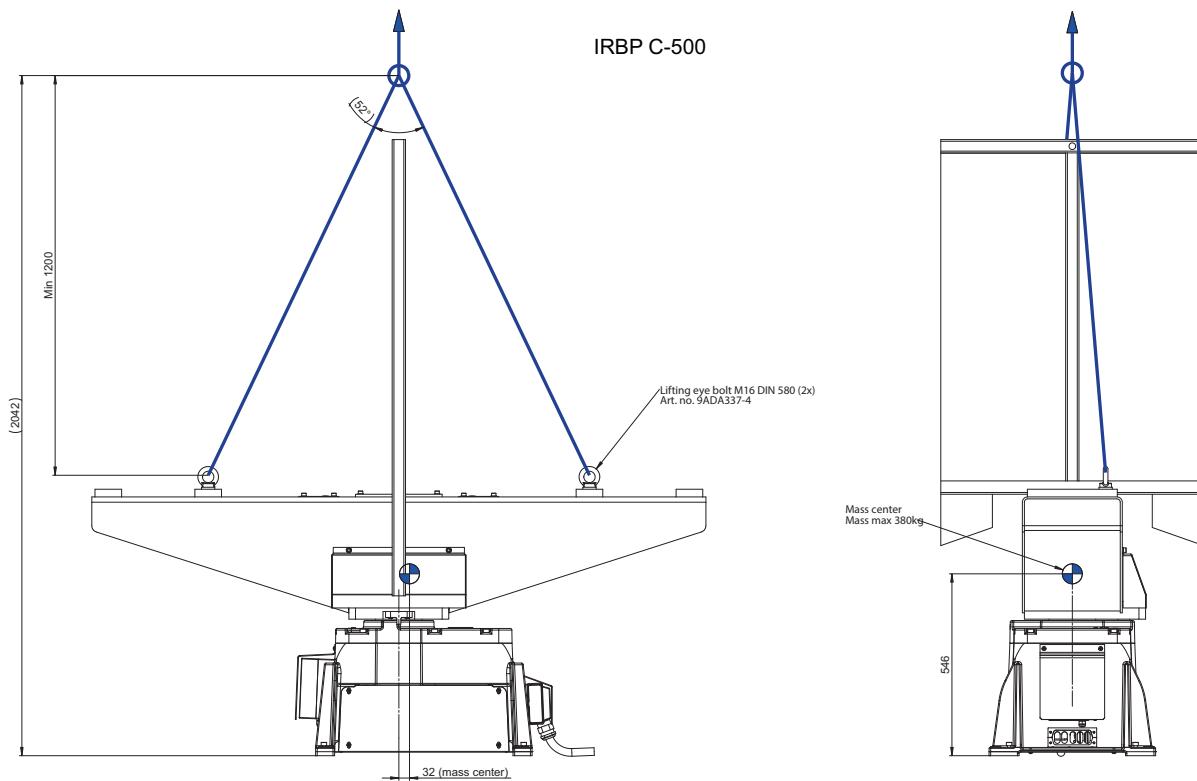
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11 Lifting instructions

Continued

IRBP C-500

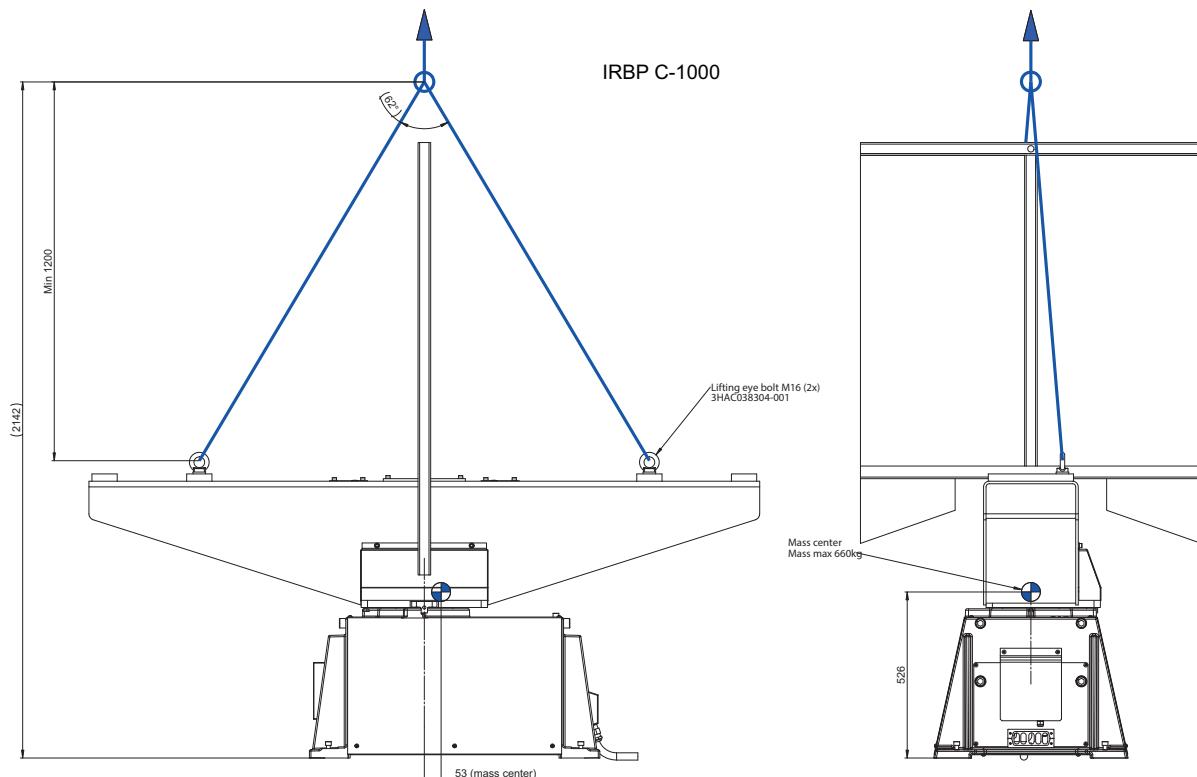


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Product manual - IRBP /D2009
3HAC037731-001 Revision: K

IRBP C-1000

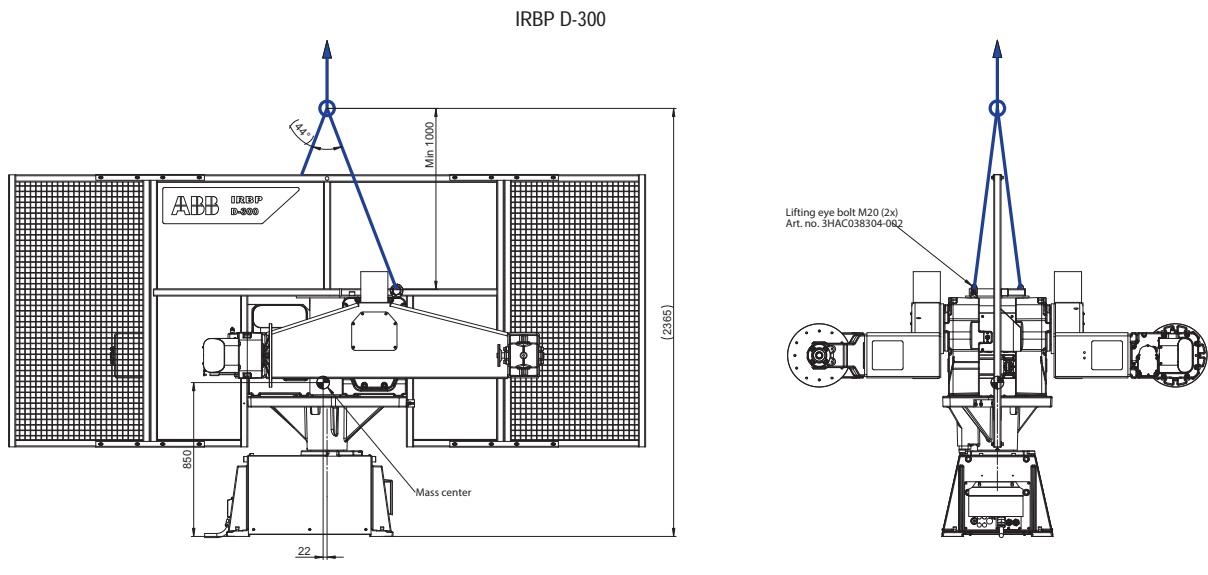
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11 Lifting instructions

Continued

IRBP D-300



Mass max 1560kg

xx1500002137

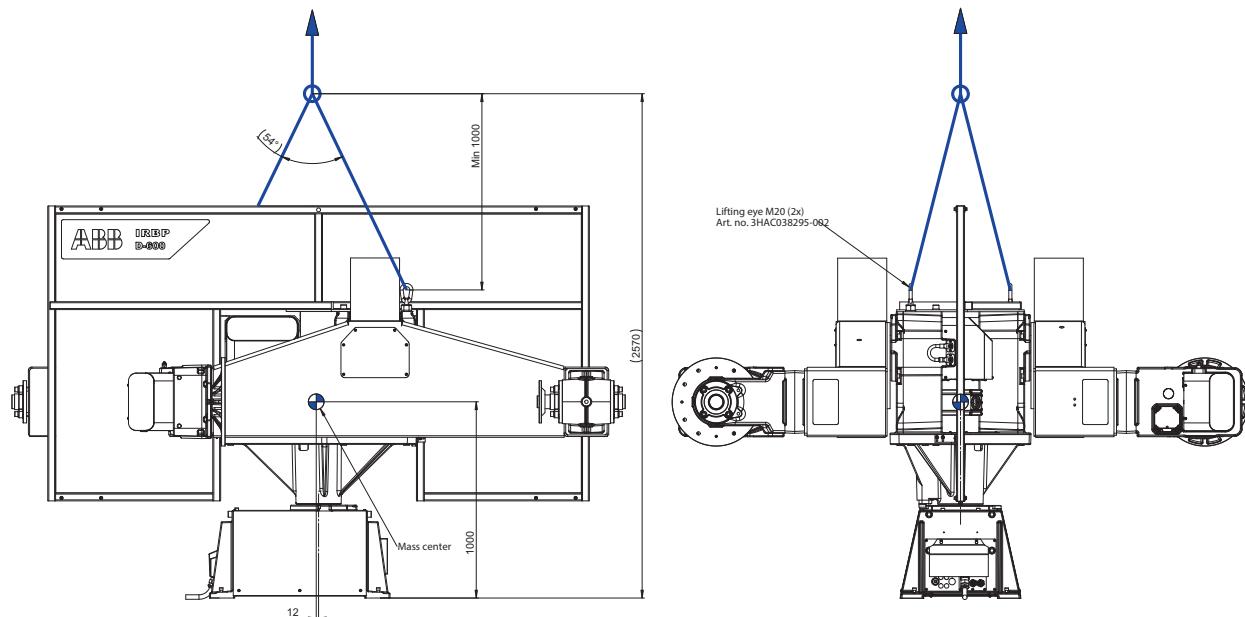
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Product manual - IRBP /D2009
3HAC037731-001 Revision: K

IRBP D-600

IRBP D-600



Mass max 2960kg

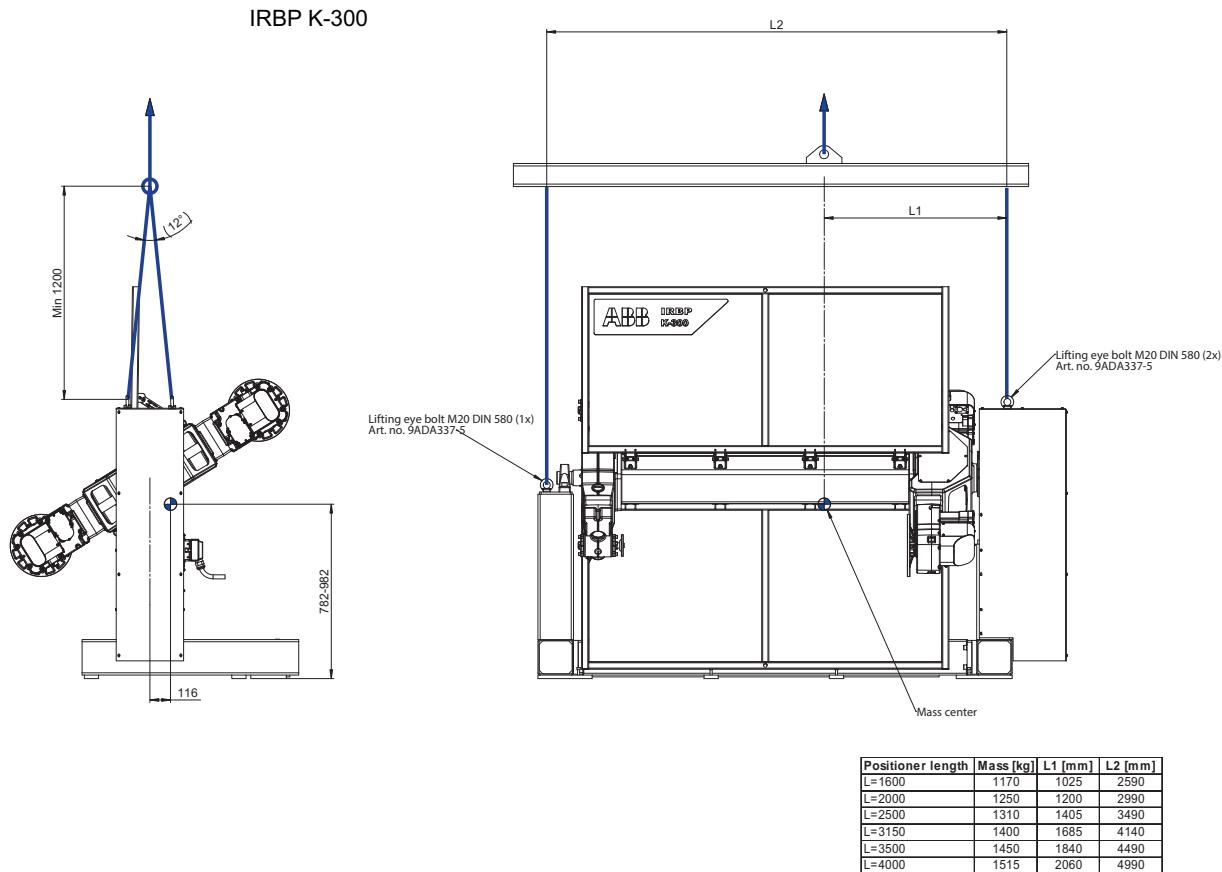
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11 Lifting instructions

Continued

IRBP K-300



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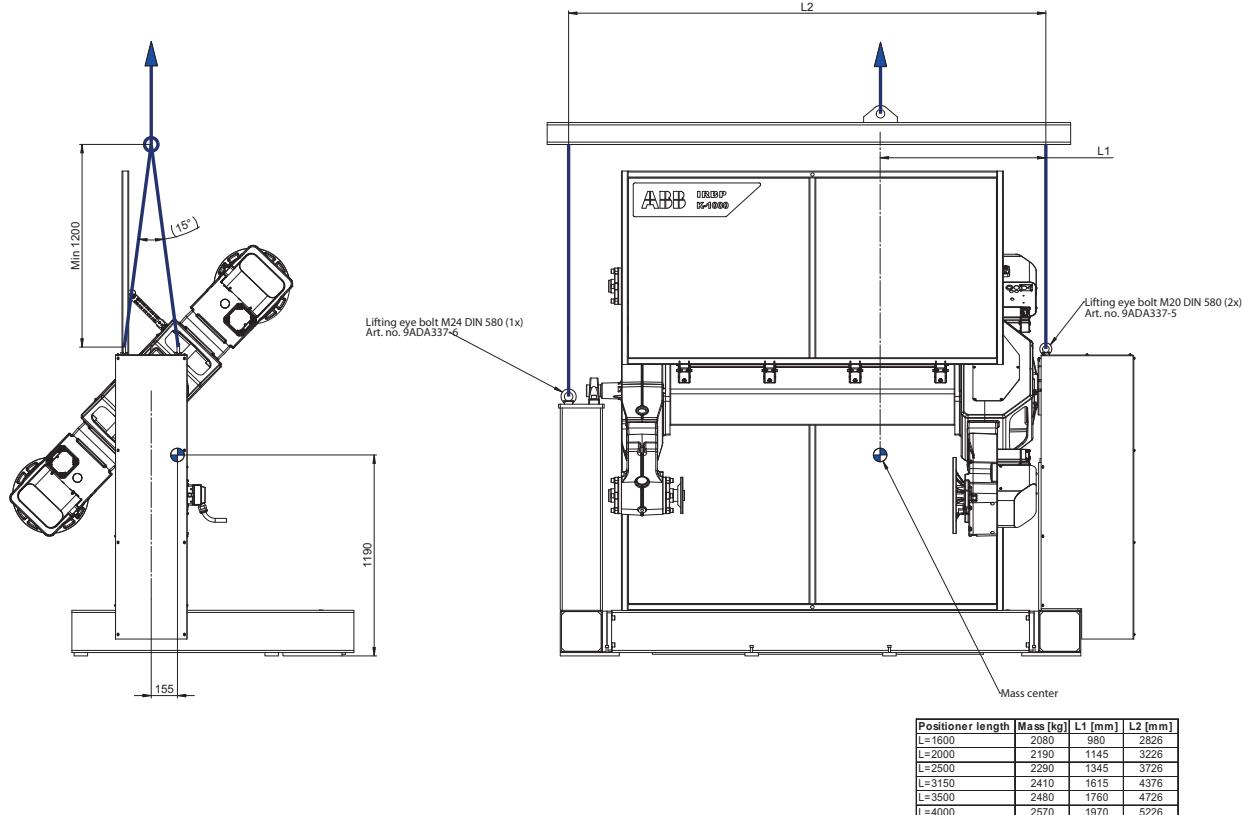
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Product manual - IRBP /D2009
3HAC037731-001 Revision: K

IRBP K-600/1000

IRBP K-600/1000



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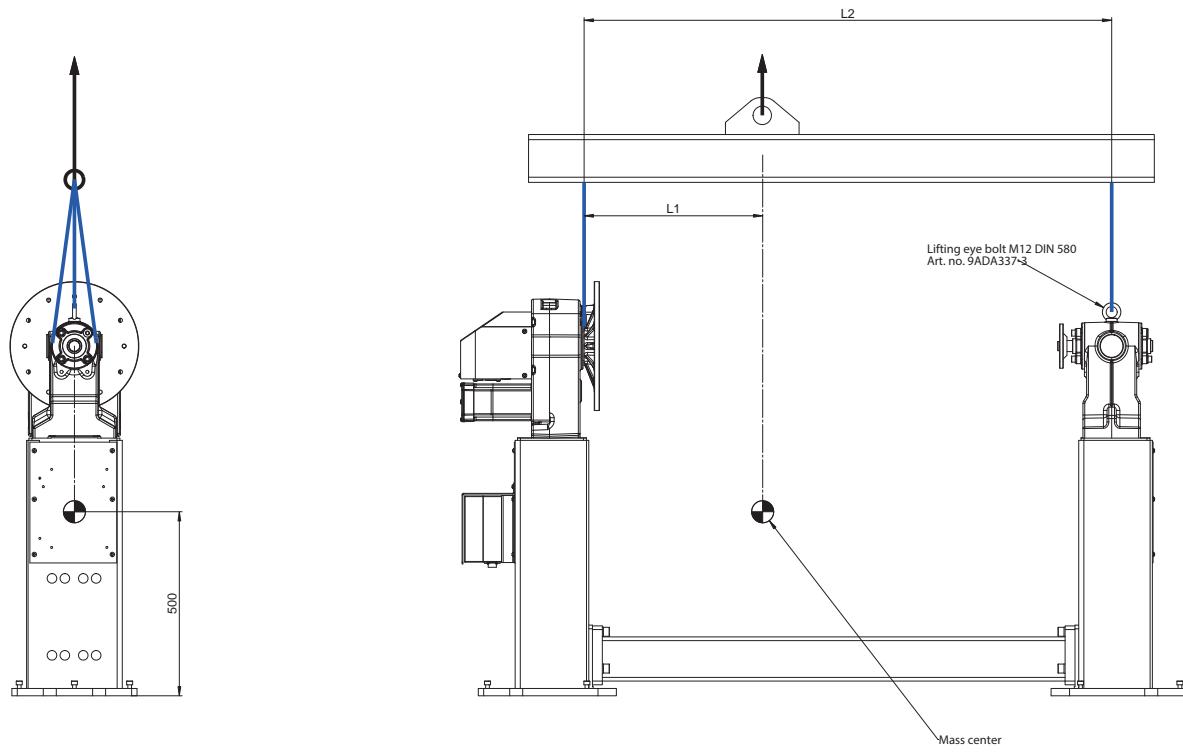
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11 Lifting instructions

Continued

IRBP L-300

IRBP L-300



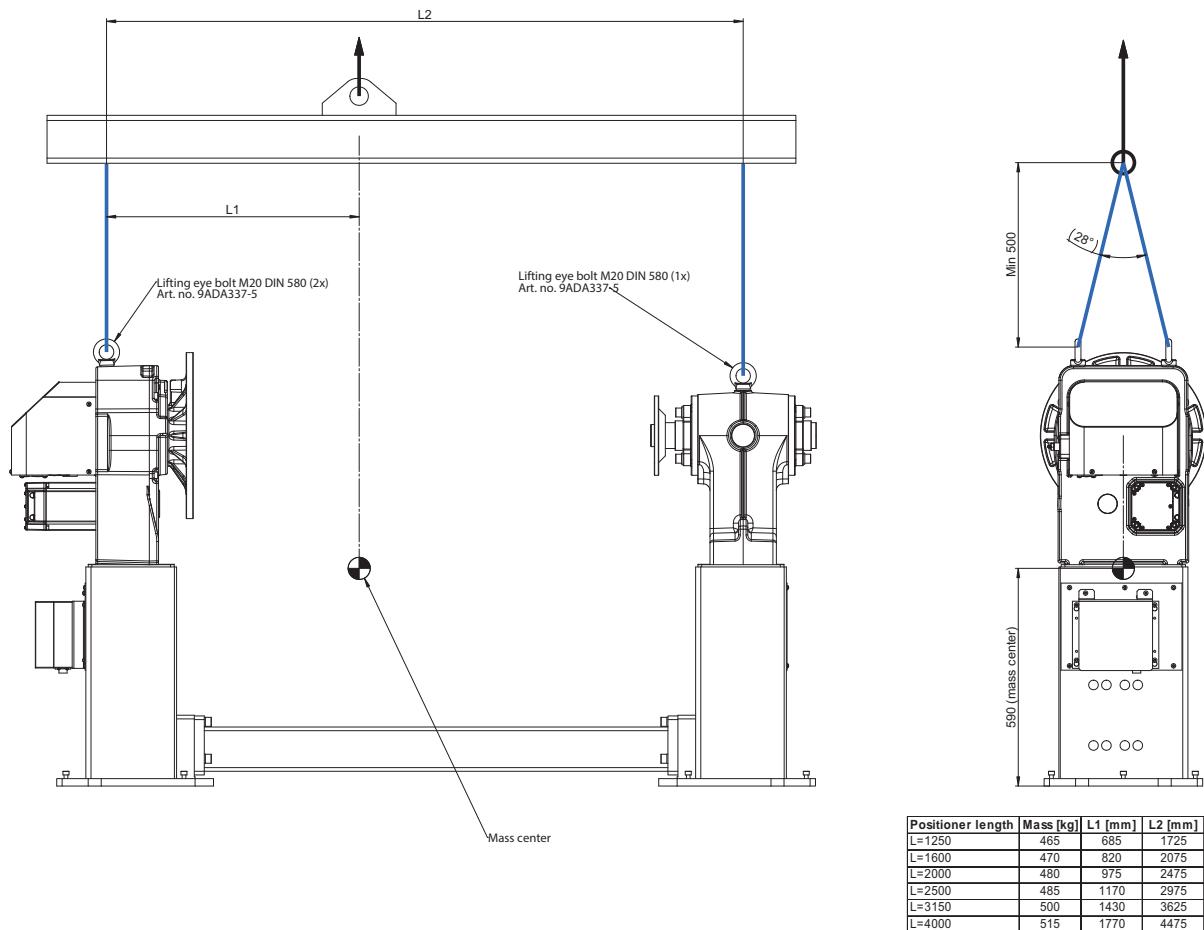
Positioner length	Mass [kg]	L1 [mm]	L2 [mm]
L=1250	250	485	1433
L=1600	255	625	1783
L=2000	260	785	2183
L=2500	270	985	2683
L=3150	280	1250	3333
L=4000	300	1610	4183

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IRBP L-600/1000

L-600/1000



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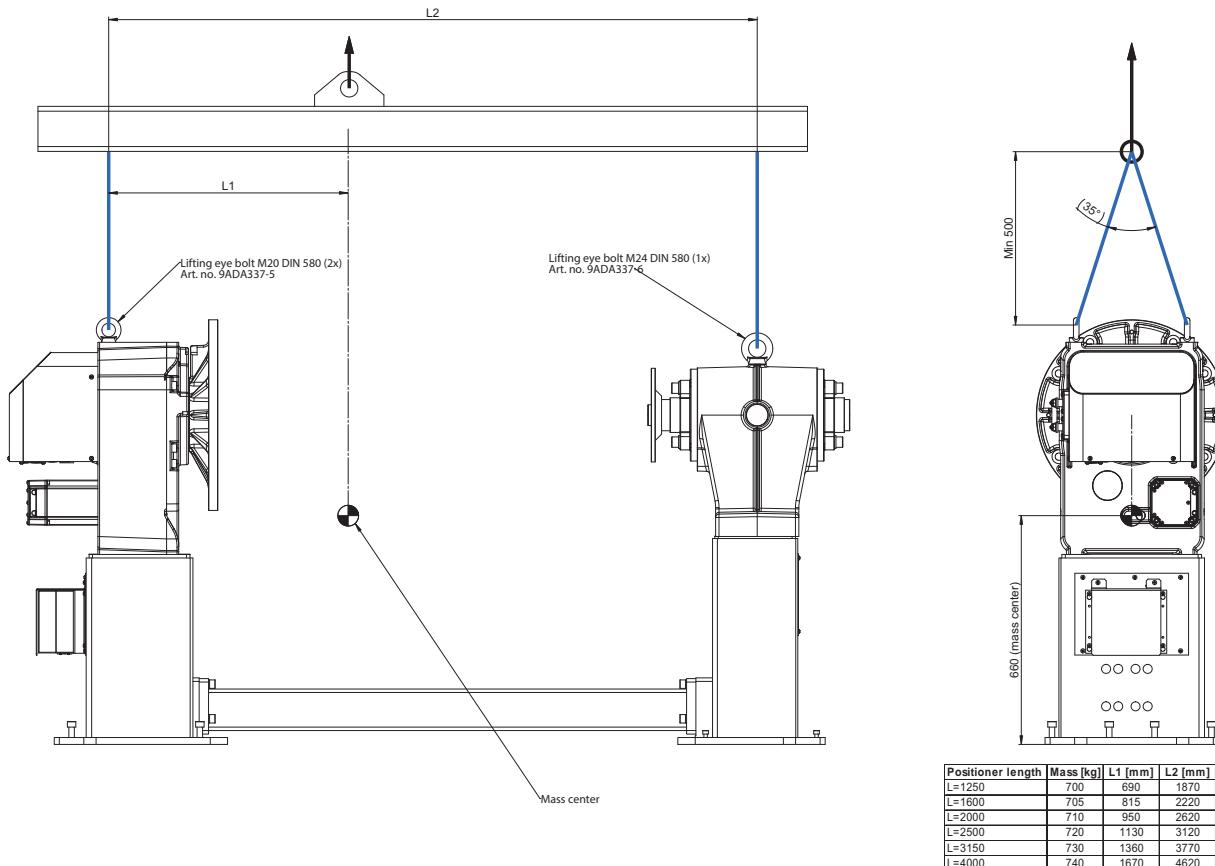
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11 Lifting instructions

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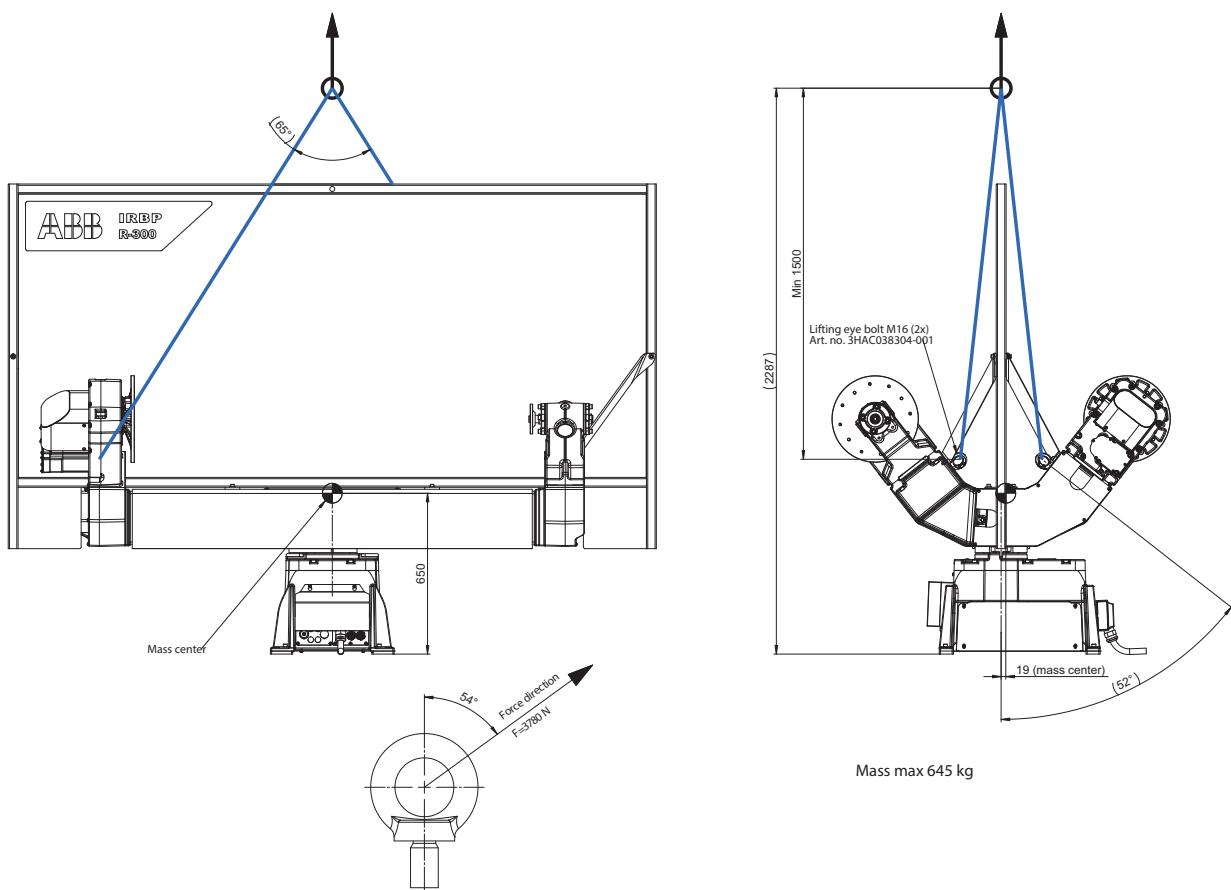
IRBP L-2000

IRBP L-2000



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IRBP R-300**IRBP R-300**

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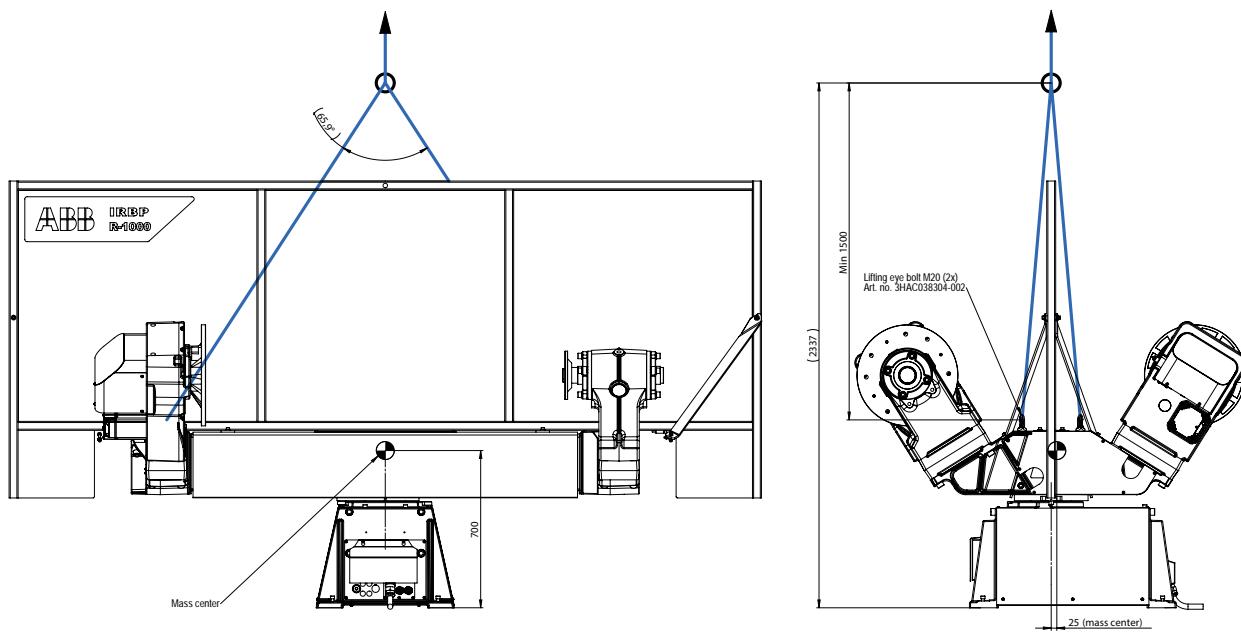
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11 Lifting instructions

Continued

IRBP R-600/1000

IRBP R-600/1000



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12 Spare parts

12.1 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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