ROBOTICS

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

Document ID: 3HAC037731-001

Revision: AA

Original instructions.

Table of contents

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.

Product manual scope

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

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.

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Chapter	Contents
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.
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
Product manual, spare parts - IRBP /D2009	*3HAC038416-001*
Product specification - IRBP /D2009	*3HAC038208-001*
Circuit diagrams - IRBP D/2009	*Circuit diagrams on page 341*
Safety manual for robot - Manipulator and IRC5 or OmniCore controller [i]	*3HAC031045-001*
Product manual - IRC5 IRC5 with main computer DSQC 639.	*3HAC021313-001*
Product manual - IRC5 IRC5 with main computer DSQC1000.	*3HAC047136-001*
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Operating manual - Calibration Pendulum	*3HAC16578-1*
Application manual - Additional axes and standalone controller	*3HAC051016-001*
Technical reference manual - Lubrication in gearboxes	*3HAC042927-001*
Technical reference manual - System parameters	*3HAC050948-001*
Operating manual - RobotStudio	*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: • *Securing the manipulator IRBP L using fixture laser on page 96* • *Example of fixture laser aligning on page 97*

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Revision	Description
B	This revision includes the following additions and/or changes: • Added *Define base frame on page 325*. • Forces on foundation added for IRBP 5000L, see *Forces on foundation on page 84*. • Updated information about load identification, see *Identification of load data for positioners IRBP on page 310*, and *Define payload for a mechanical unit on page 320*. • Updated information about signal names, see *Configuration on page 153*.
C	This revision includes the following additions and/or changes: • Specified type of the lubricating oil and corrected its article number, see *Current collector on page 193* and *Required equipment on page 193*. • Some general tightening torques have been changed/added, see updated values in *Screw joints on page 89*. • Information about the earth connector added. • Added information about batteries. • Added *Adjusting the bearing units for IRBP L-300, L-600, L-1000 och L-2000 on page 98*.
D	This revision includes the following additions and/or changes: • Information about the type and amount of oil has been removed from the manual and can now be found in the *Technical reference manual - Lubrication in gearboxes*, see *References on page 10*. • Added information about the amount of grease for the current collector, see *Lubricating the current collector on page 193*. • Corrected forces in *Forces on foundation on page 84*. • Added note about other variants in *Orienting and securing the manipulator on page 95*. • A new SMB unit and battery is introduced, with longer battery lifetime.
E	This revision includes the following additions and/or changes: • Instruction for replacement of SMB board added, see *Replacing SMB board on page 253*. • Service Information System, SIS, is not available for IRBP positioners.
F	This revision includes the following additions and/or changes: • Article number changed for grease in Lubricating current collector, see *Required equipment on page 193*. • Added information for tool and speed data, see *Tool and speed data on page 308*. • Minor corrections.
G	This revision includes the following additions and/or changes: • The calibration procedure for the interchange unit is updated, see *Calibration of the station interchange unit for positioner IRBP on page 295*. • 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 144*. • CAUTION added warning that motors *valid from* serial number SEROP POF-110001- & CNAUS POF-510001-, not are compatible with motors *valid up to* 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.

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Revision	Description
H	This revision includes the following additions and/or changes: • 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 236*.
J	Published in release R16.2. This revision includes the following additions and/or changes: • Added safety section for emergency release of the robot arm. • Added two additional torque wrenches in standard toolkit.
K	Published in release R17.1. This revision includes the following additions and/or changes: • The *Operating manual - IRBP/D2009* (*3HAC038435-001*) is phased out and replaced by this manual. The section *Operation* is therefore added to this manual. • Updated example of equipment, see *Example of fixture laser aligning on page 97*. • Minor corrections. • Added explanation of force.
L	Published in release R17.2. This revision includes the following additions and/or changes: • Added section *Retrofit an interface to the IRC5 controller on page 124*. • Caution about removing metal residues added in sections about SMB boards. • Updated list of applicable standards. • Added information regarding removal/refitting of plates and protection plugs for access to lifting eye holes on the IRBP R frame.
M	Published in release R18.1. This revision includes the following additions and/or changes: • Added section, Cut the paint or surface on the robot before replacing parts. • Safety restructured. • Information about myABB Business Portal added.
N	Published in release R18.2. This revision includes the following additions and/or changes: • Updated calibration procedure for base frame, see *Calibrating the multi-arc system on page 297*. • Added dimensional drawing of tailstock, see *Dimensions of the tail-stock*. • Information about my ABB business portal added, see *Type and amount of oil in gearboxes on page 196*. • Corrected lifting weights for IRBP B, see *Lifting the IRBP on page 77*
P	Published in release R18.2. This revision includes the following additions and/or changes: • Updated references.
Q	Published in release 19B. The following updates are made in this revision: • New touch up color Graphite White available. See *Cut the paint or surface on the robot before replacing parts on page 206*. • Added description of connection flange on the IRBPs. See *Electrical assembly IRBP on page 118*. • Added information regarding problems with vibration during loading if not in calibration position. See *Loading the workpiece on page 276*. • Updated the gearbox denominations to MTD (was MTC).

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Revision	Description
R	Published in release 19C. The following updates are made in this revision: • Added information regarding jumper cables for the operator panel, see *External control units on page 62*.
S	Published in release 19D. The following updates are made in this revision: • Added information about load data identification for IRBP C, see *Identification of load data for positioners IRBP on page 310*.
T	Published in release 20A. The following updates are made in this revision: • Clarified information about pre-reset button in complete chapter *Operation on page 273*. • Clarified and added information in mounting instructions for rotating sealings, see *Mounting instructions for sealings on page 202*.
U	Published in release 20D. The following updates are made in this revision: • Added information about mechanical stops.
V	Published in release 21A. The following updates are made in this revision: • Updated laser alignment information. • Added clarification that SafeBall is not connected to safety mechanisms in the controller.
W	Published in release 21B. The following updates are made in this revision: • New illustration for Synchronization mark MID station foot in *Calibration marks on page 288*.
X	Published in release 21C The following updates are done in this revision: • Standard ANSI/UL borttagen ifrån manualen. See *Region specific standards*.
Y	Published in release 21D The following updates are done in this revision: • Text regarding adjusting IRBP L-5000 added to document, see *Adjusting the bearing units for IRBP L-5000*.
Z	Published in release 22D The following updates are done in this revision: • Added information about brake release buttons, see *IRBP Positioner overview on page 43*.
AA	Published in release 23C The following updates are done in this revision: • Added information about the new rotary unit MTE.

Product documentation

Categories for user documentation from ABB Robotics

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

Tip

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

Product manuals

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

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

Technical reference manuals

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

Application manuals

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

An application manual generally contains information about:

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

Continues on next page

- Examples of how to use the application.

Operating manuals

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

How to read the product manual

Reading the procedures

The procedures contain 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 *rear attachment screws, gearbox.*	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 *sealing, axis 2* 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.

1 Safety

1.1 Safety information

1.1.1 Limitation of liability

Limitation of liability

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

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

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

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

Spare parts and equipment

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

1.1.2 Requirements on personnel

General

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

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

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

Personal protective equipment

Use personal protective equipment, as stated in the instructions.

1.2 Safety signals and symbols

1.2.1 Safety signals in the manual

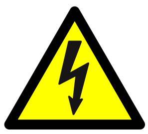
Introduction to safety signals

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

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

Hazard levels

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

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

Continues on next page

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

1.2.2 Safety symbols on manipulator labels

Introduction to symbols

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

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

Note

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

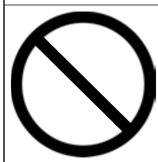
Types of symbols

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

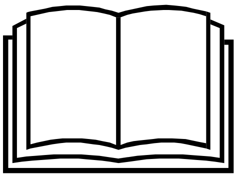
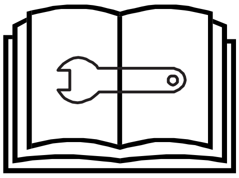
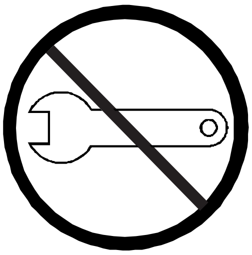
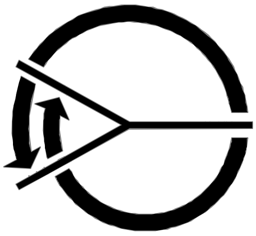
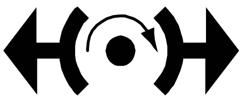
The safety labels are language independent, they only use graphics. See *Symbols on safety labels on page 21*.

The information labels can contain information in text.

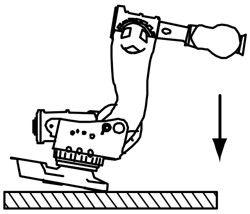
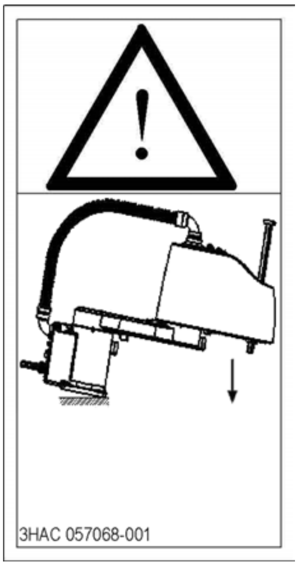
Symbols on safety labels

Symbol	Description
 xx0900000812	**Warning!** Warns that an accident *may* occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
 xx0900000811	**Caution!** Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment where there is a risk of damaging the product or causing a breakdown.
 xx0900000839	**Prohibition** Used in combinations with other symbols.

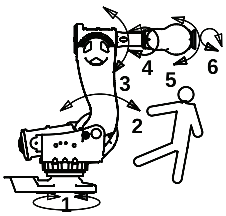
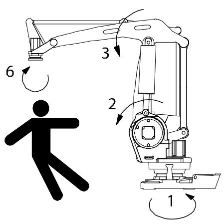
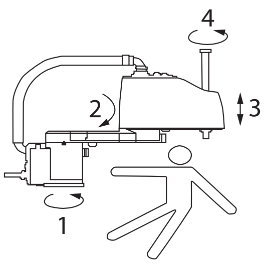
Continues on next page

Symbol	Description
 xx0900000813	**See user documentation** Read user documentation for details. Which manual to read is defined by the symbol: • No text: *Product manual*. • EPS: *Application manual - Electronic Position Switches*.
 xx0900000816	**Before disassembly, see product manual**
 xx0900000815	**Do not disassemble** Disassembling this part can cause injury.
 xx0900000814	**Extended rotation** This axis has extended rotation (working area) compared to standard.
 xx0900000808	**Brake release** Pressing this button will release the brakes. This means that the robot arm can fall down.

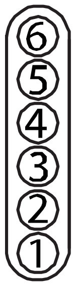
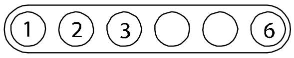
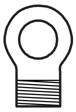
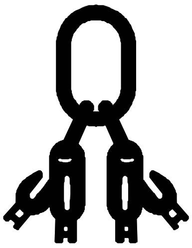
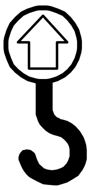
Continues on next page

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

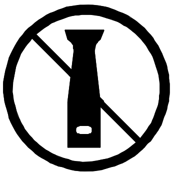
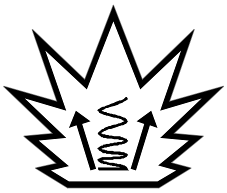
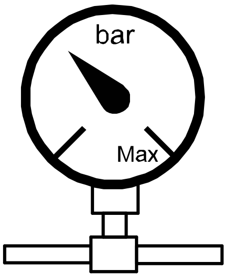
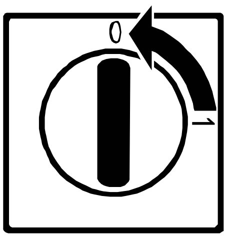
Continues on next page

Symbol	Description
 xx0900000818  xx1300001087	**Heat** Risk of heat that can cause burns. (Both signs are used)
 xx0900000819  xx1000001141  xx1500002616	**Moving robot** The robot can move unexpectedly.

Continues on next page

Symbol	Description
 xx0900000820  xx1000001140	**Brake release buttons**
 xx0900000821	**Lifting bolt**
 xx1000001242	**Adjustable 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**

Continues on next page

Symbol	Description
 xx1000001144	**No mechanical stop**
 xx0900000825	**Stored energy** Warns that this part contains stored energy. Used in combination with *Do not disassemble* symbol.
 xx0900000826	**Pressure** Warns that this part is pressurized. Usually contains additional text with the pressure level.
 xx0900000827	**Shut off with handle** Use the power switch on the controller.
 xx1400002648	**Do not step** Warns that stepping on these parts can cause damage to the parts.

1.3 Robot stopping functions

Protective stop and emergency stop

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

For more information see:

- *Product manual - IRC5*

1.4 Safety during installation and commissioning

National or regional regulations

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

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

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

Layout

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

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

If the manipulator is delivered with mechanical stops, these can be used for reducing the working space.

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

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

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

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

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

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

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

Allergenic material

See *Environmental information on page 328* for specification of allergenic materials in the product, if any.

Securing the robot to the foundation

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

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

Continues on next page

Electrical safety

Incoming mains must be installed to fulfill national regulations.

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

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

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

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

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

Safety devices

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

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

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

Other hazards

A robot may perform unexpected limited movement.

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

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

- Water
- Compressed air
- Hydraulics

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

Continues on next page

Pneumatic or hydraulic related hazards

Note

The pressure in the complete pneumatic or hydraulic systems must be released before service and maintenance.

All components in the robot system that remain pressurized after switching off the power to the robot must be marked with clearly visible drain facilities and a warning sign that indicates the hazard of stored energy.

Loss of pressure in the robot system may cause parts or objects 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.

All pipes, hoses, and connections have to be inspected regularly for leaks and damage. Damage must be repaired immediately.

Safety measures for arc welding

The following points should be observed:

- Consider the welding robot equipment as a single unit.
- 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.
- Connect the supplied 6 mm^2 earth conductor between the controller and the positioner. The connection points are prepared with M8 bolts. See the product manual for the robot controller.
- The welding circuit must not be broken during the welding process.

WARNING

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

Personal protective equipment

Use personal protective equipment, based on the risk assessment for the robot system.

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.

Welding fumes and any gases formed or used when welding can be dangerous to inhale.

Continues on next page

Light barriers for positioners

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 *start button (operator ready button)* on the operator panel within 10 seconds.

Verify the safety functions

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

1.5 Safety during operation

Automatic operation

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

Unexpected movement of robot arm

WARNING

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

A robot may perform unexpected limited movement.

WARNING

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

1.6 Safety during maintenance and repair

1.6.1 Safety during maintenance and repair

General

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

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

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

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

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

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

Hot surfaces

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

Allergic reaction

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

Gearbox lubricants (oil or grease)

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

Note

Take special care when handling hot lubricants.

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

Continues on next page

Warning	Description	Elimination/Action
Allergic reaction	When working with lubricants there is a risk of an allergic reaction.	Make sure that protective gear like goggles and gloves are always worn.
Possible pressure build-up in gearbox	When opening the oil or grease plug, there may be pressure present in the gearbox, causing lubricant to spray from the opening.	Open the plug carefully and keep away from the opening. Do not overfill the gearbox when filling.
Do not overfill	Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely.	Make sure not to overfill the gearbox when filling it with oil or grease. After filling, verify that the level is correct.
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 for the product.
Oil residues	Oil residues might be present in a drained gearbox and spilled when separating a motor and gearbox during repair.	Make sure that protective gear like goggles/protective visor, gloves and arm protection are always worn during this activity. Put oil absorbent cloth or paper at appropriate locations to catch any oil residues.
Heat up the oil	Warm oil drains quicker than cold oil.	Run the robot before changing the gearbox oil, if possible.
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.

Continues on next page

Warning	Description	Elimination/Action
Contaminated oil in gearboxes	For lifetime reasons always drain as much oil as possible from the gearbox. The magnetic oil plugs will gather residual metal chips.	

Hazards related to batteries

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

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

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

Operating temperatures are listed in *Operating conditions on page 76*.

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

Unexpected movement of robot arm

WARNING

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

A robot may perform unexpected limited movement.

WARNING

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

Related information

See also the safety information related to installation and operation.

1.6.2 Brake testing

When to test

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

How to test

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

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

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

Note

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

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

1.7 Safety during troubleshooting

General

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

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

DANGER

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

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

WARNING

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

A robot may perform unexpected limited movement.

WARNING

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

Related information

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

1.8 Safety during decommissioning

General

See section *Decommissioning on page 327*.

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

Unexpected movement of robot arm

WARNING

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

A robot may perform unexpected limited movement.

WARNING

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

2 System description

2.1 System overview

2.1.1 IRBP types and variants

How to know which of the types is described, in the manual

Throughout the manual the positioners are described as "Type A" and "Type B". Type A positioners use MID interchange units and MTD rotary units. Type B positioners use combination of MID, MTD and MTE units.

Interchangeable parts

MTD and MTE gearboxes despite having same interfaces are not interchangeable.

Notable changes connected to the Type B Rotary unit

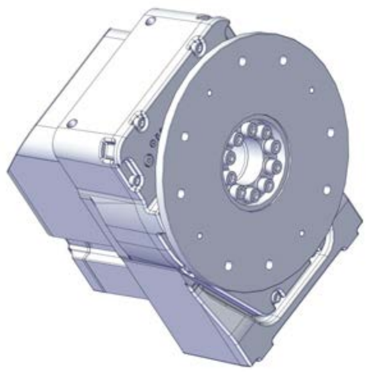
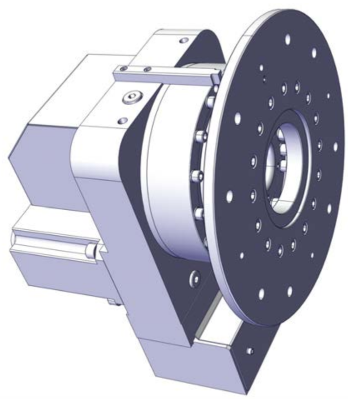
MTE 500/750 rotary unit uses a compact gearbox. MTD 500/750 rotary unit is a spur-gear solution. The MTE 500/750 has zero castings. The MTE 500/750 has a circular gearbox.

Identifying the Rotary unit

Visually

The mechanical structure of the gearbox differs depending on which model. The MTE 500/750 Supplier B gearbox is a compact gearbox. The Supplier A is a spur-gear solution. The MTE 500/750 has zero castings. The MTE 500/750 has a circular gearbox.

Use the images to identify which type of gearbox is installed on the positioner.

Type A gearbox	Type B gearbox
 xx2300001473	 xx2300001198

By WebConfig

The article numbers specified are found in WebConfig.

Gearbox Variant	Article number
MTE 500/750	3HAC088944-001

Continues on next page

By robot backup

Positioner type can be seen in system.xml file in the backup.

```
  <AdditionalOption>
    <Name>Positioner</Name>
    <Option descr="Calibration for Indexing positioners">
    </Option>
    <Option descr="IRBP B250 D1000 Type A">
    </Option>
  </AdditionalOption>
</SystemProperties>
```

xx2300001474

2.1.2 IRBP functions

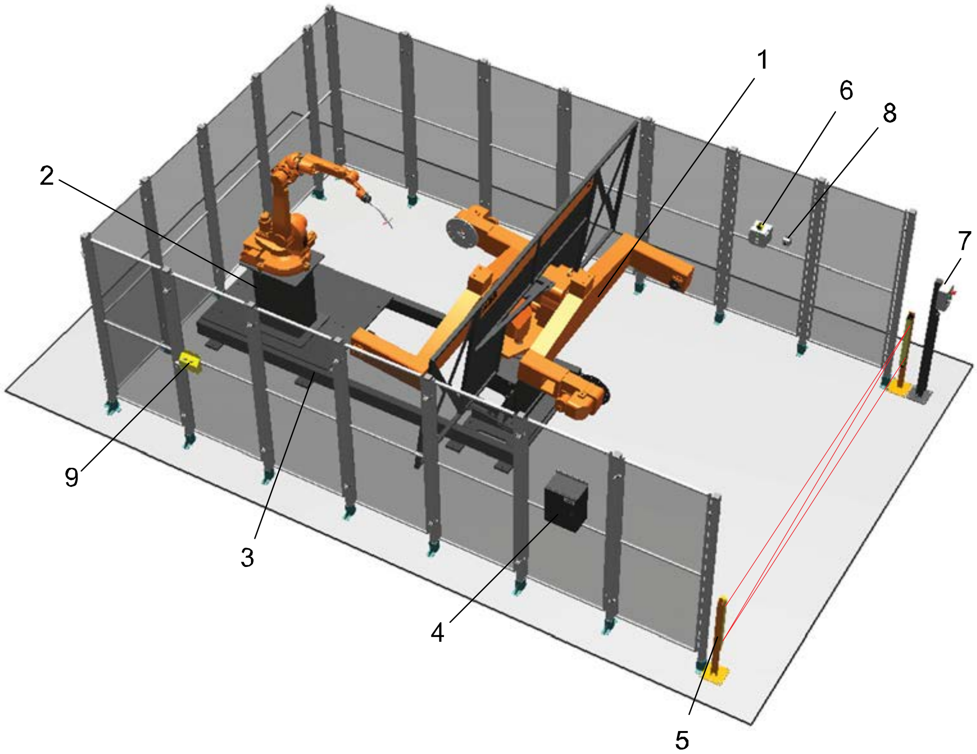
IRBP function package

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
8	Manual jog
9	Service door with gate switch

Continues on next page

10	Controller

2.2 IRBP positioner

2.2.1 IRBP 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.

Movement without drive power

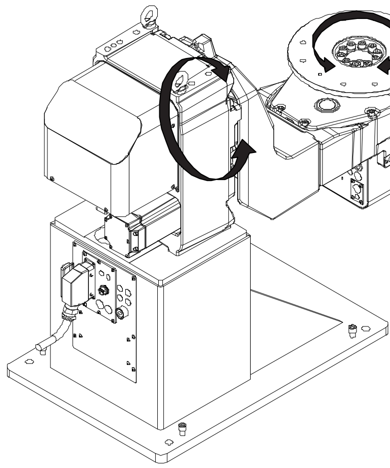
There are no brake release buttons on the positioners to use in an emergency situation. Due to positioner kinematics and payload, releasing the brake can cause additional hazards. This needs to be considered while doing a risk assessment of the complete installation. If a brake release function is needed, then this shall be solved by the integrator.

In order to rescue a trapped person, a suitable device should be used to overcome motor brake force such as a crane, a forklift, a jack, etc.

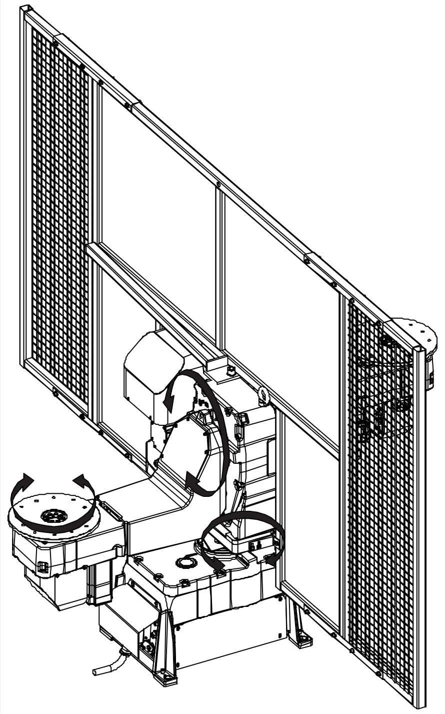
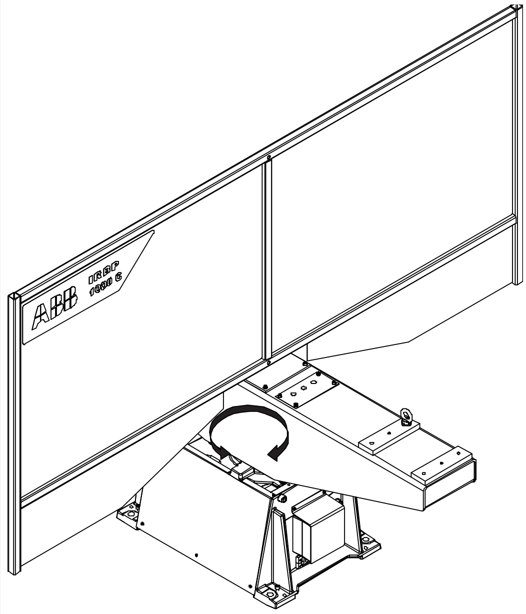
Axis limiting

There are no adjustable mechanical stops on the IRBP. This needs to be considered while doing a risk assessment of the complete installation.

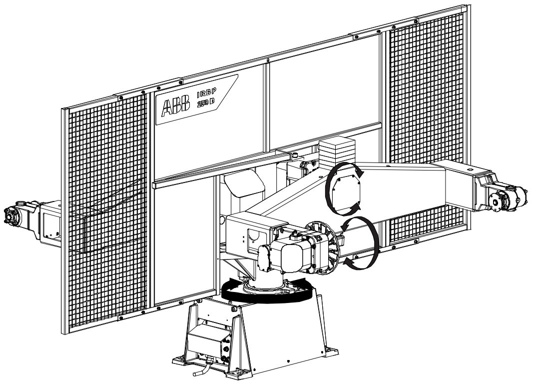
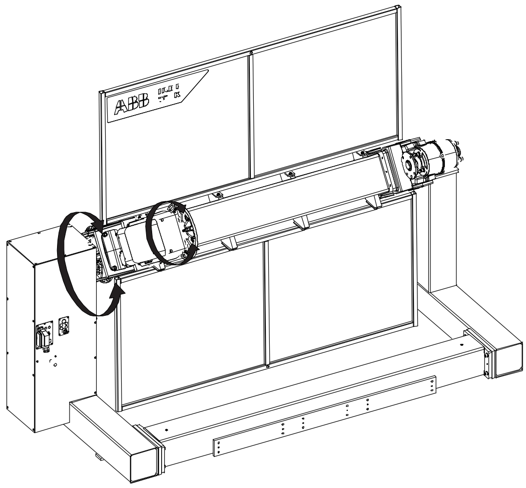
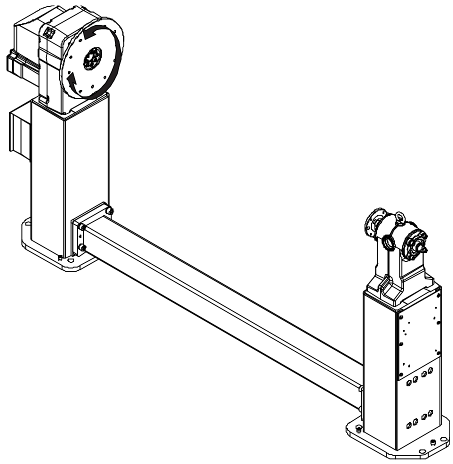
Positioner models

IRBP	Illustration
IRBP A: • 250 • 500 • 750	 xx0900000830

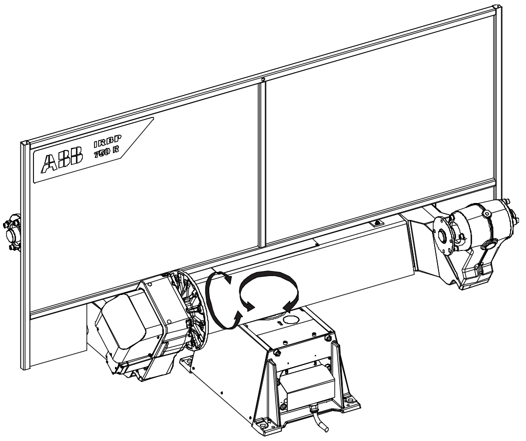
Continues on next page

IRBP	Illustration
IRBP B: • 250 • 500 • 750	 xx0900000840
IRBP C: • 500 • 1000	 xx0900000846

Continues on next page

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

IRBP	Illustration
IRBP R: • 300 • 600 • 1000	 xx0900000838

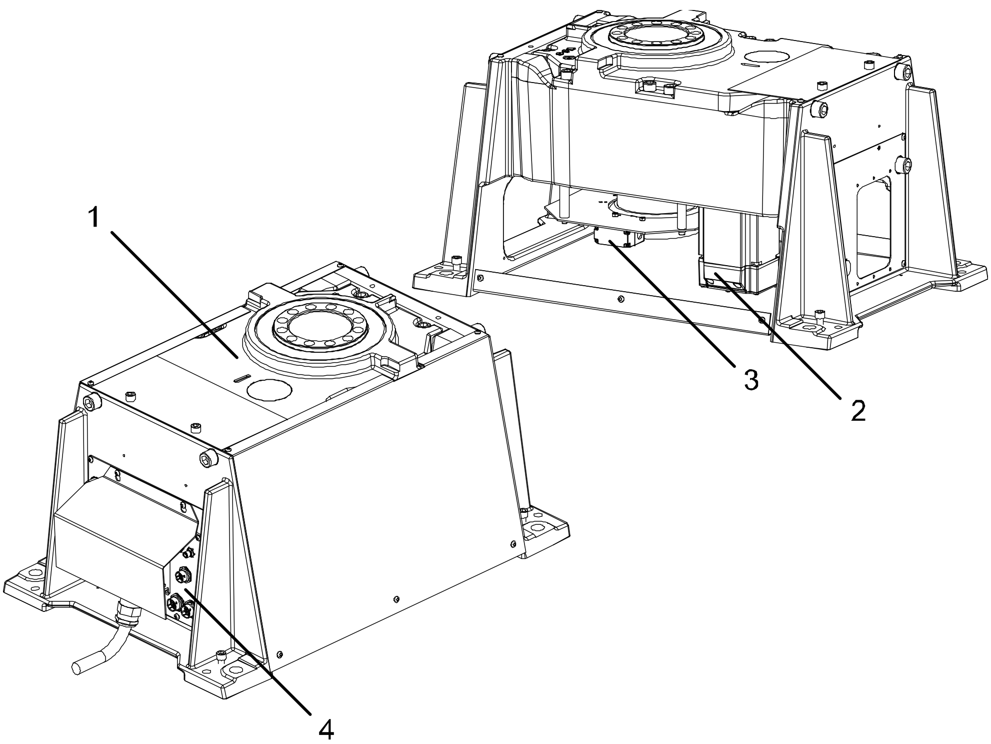
2.2.2 Station interchange unit MID

Station interchange unit componets

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:

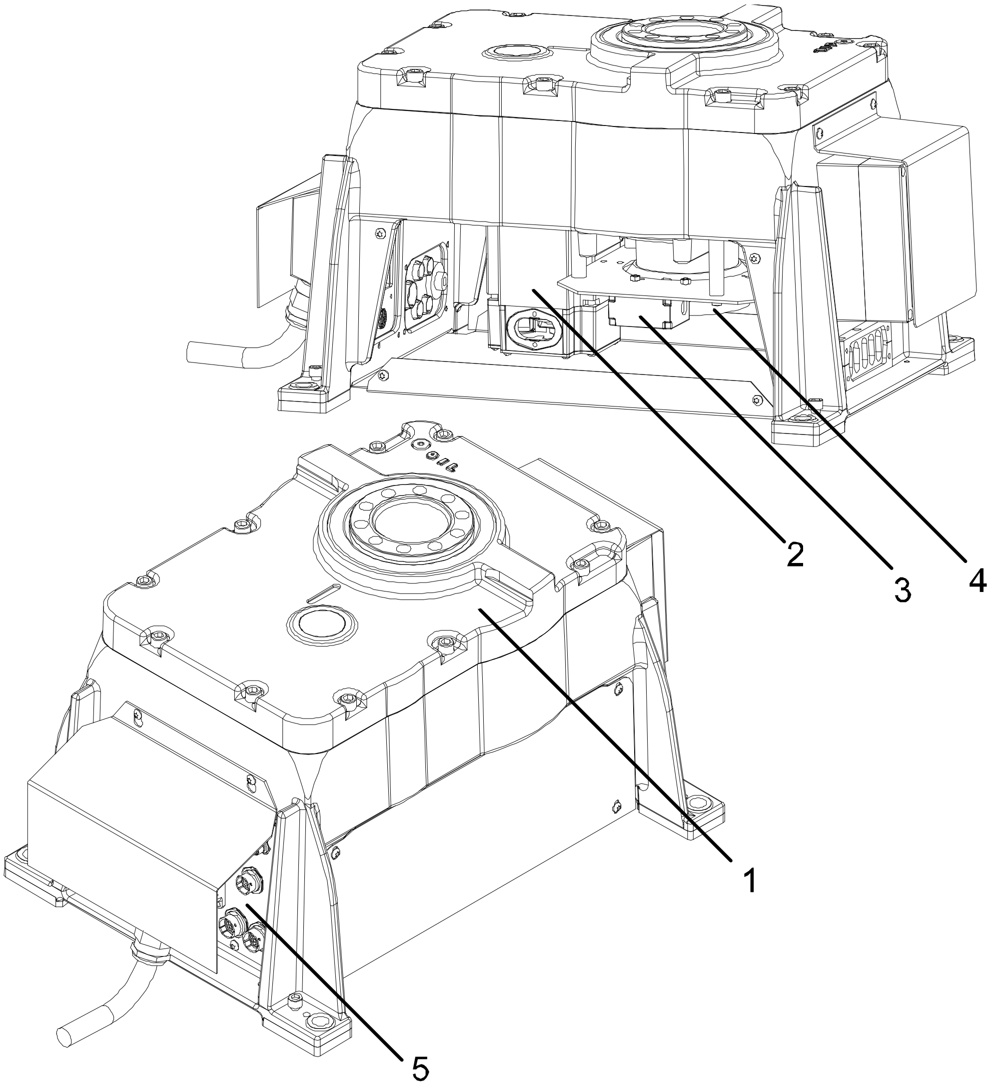


xx0900000834

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

Continues on next page

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

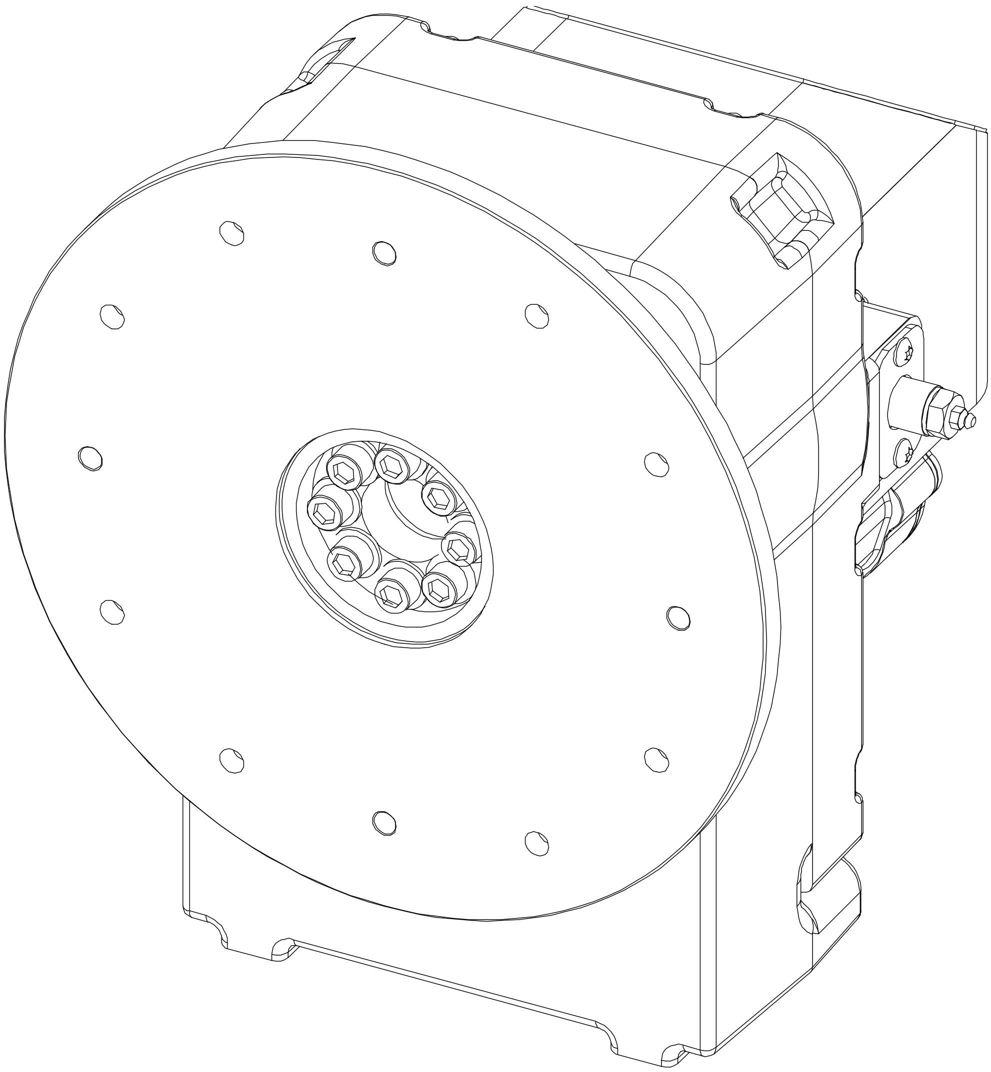
2.2.3 Rotary units

Rotary unit components

Overview

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

MTD units

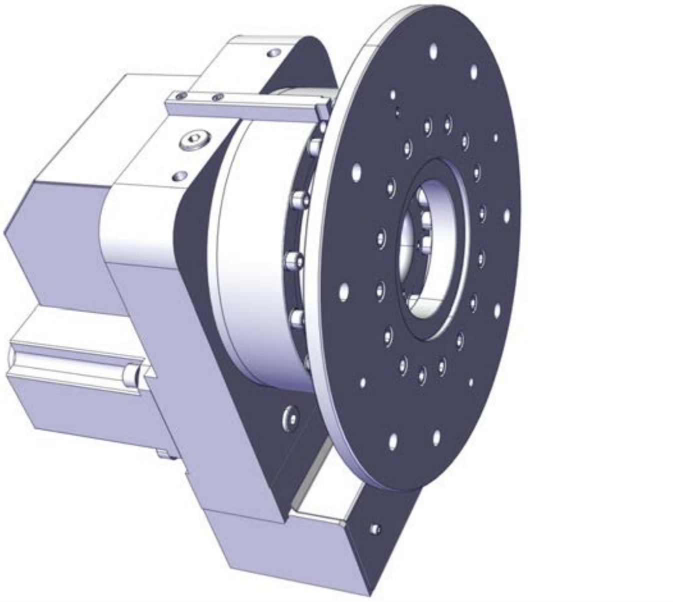


xx0900000843

MTD 250
MTD 500/750
MTD 2000
MTD 5000

Continues on next page

MTE units



xx2300001198

MTE 500/750

Components

The rotary unit consists of the following components.

Gearbox MTD

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.

Gearbox MTE

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 lubricant should be checked after 20,000 hours of operation. If the oil test is approved, the gearbox can be operated for a further 20,000 operating hours without maintenance.

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.

Continues on next page

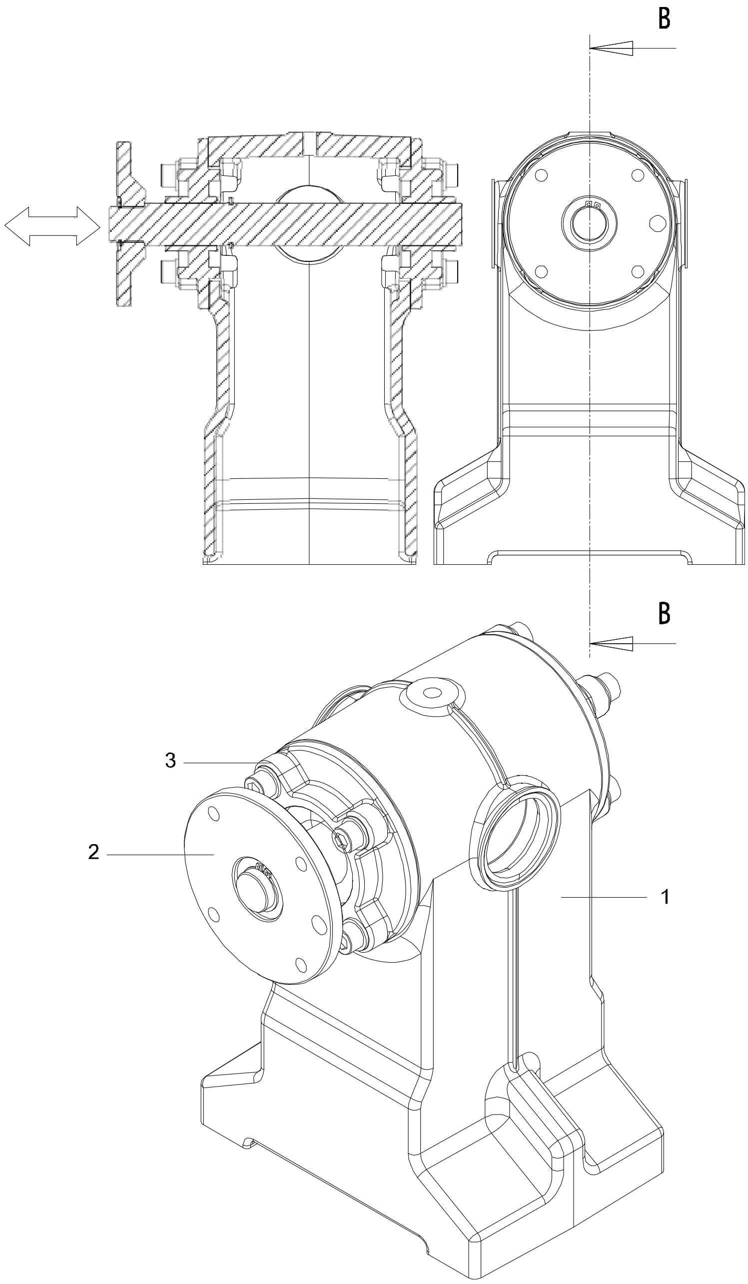
AC servo motor

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.

2.3 Control system

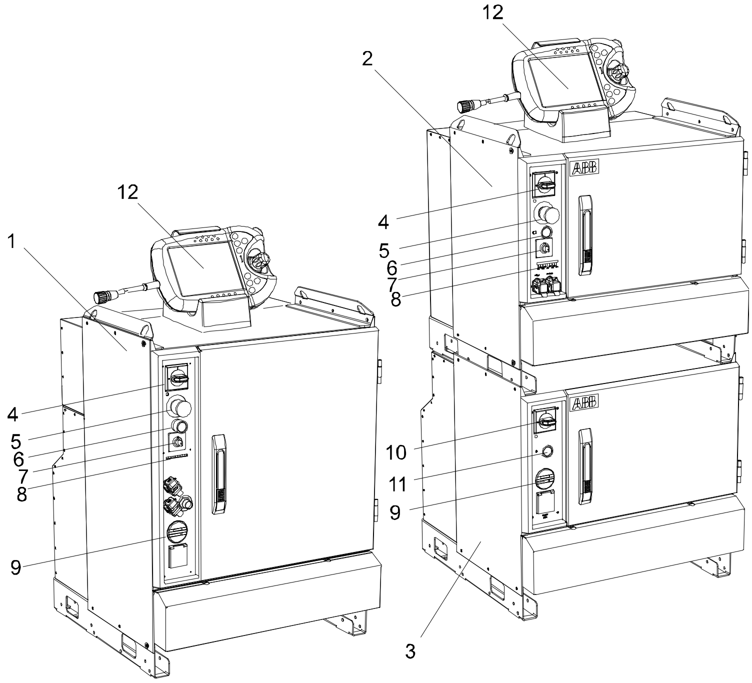
2.3.1 IRC5 controller

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

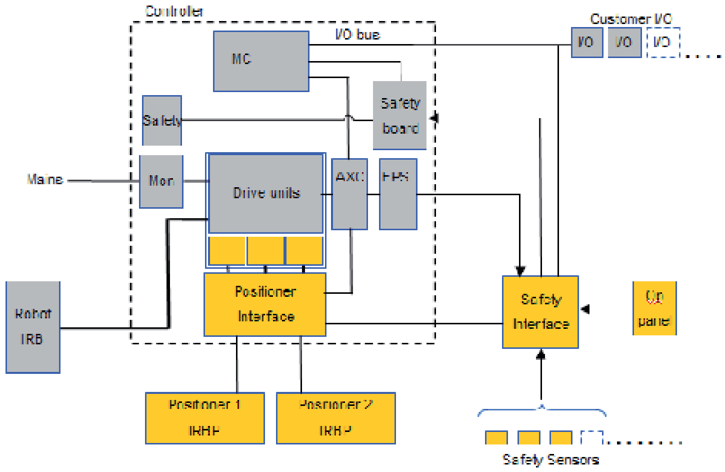


xx0900000853

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

Continues on next page

Block overview



xx1000000227

2.4 Operator panel

2.4.1 The FlexPendant

Introduction to the FlexPendant

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

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

The FlexPendant consists of both hardware and software and is a complete computer in itself. It is connected to the robot controller by an integrated cable and connector.

The hot plug button option makes it possible to disconnect the FlexPendant in automatic mode and continue running without it.

The FlexPendant is available in different versions, as the hardware has been updated over the years. The exact appearance on the graphics might therefore differ slightly from reality.

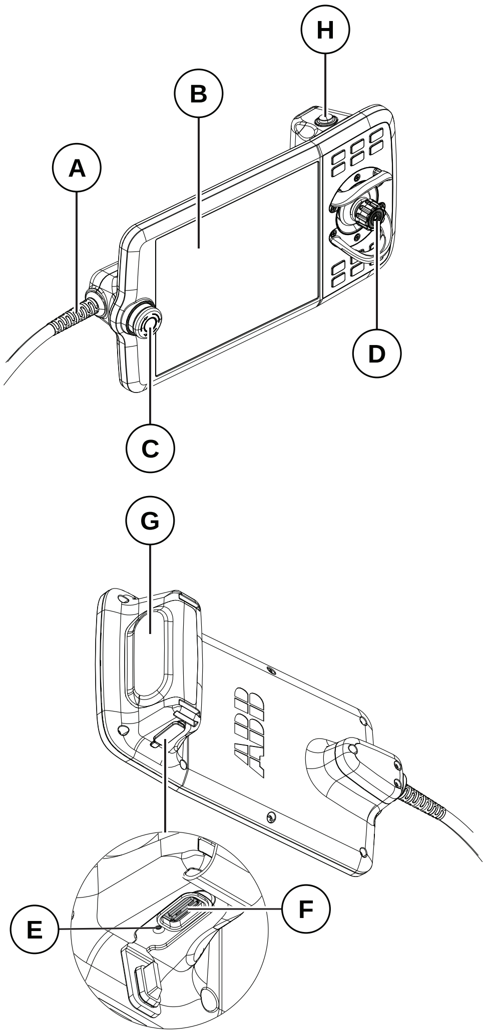
Note

If protective gloves are used, these must be compatible with touchscreens when using the FlexPendant.

Continues on next page

Main parts

These are the main parts of the FlexPendant.

FlexPendant with emergency stop button at the connector	FlexPendant with emergency stop button at the outer edge
 xx2200002054	 xx1400001636

A	Connector
B	Touchscreen
C	Emergency stop button
D	Joystick
E	Reset button
F	USB port
G	Three-position enabling device
H	Thumb button (Not available on all versions of FlexPendant.)
J	Stylus pen (Not available on all versions of FlexPendant.)

Continues on next page

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.

Reset button

If the FlexPendant freezes during operation, press the reset button to restart the FlexPendant.

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

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

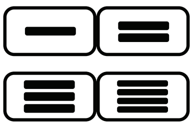
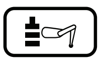
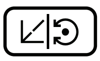
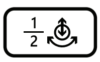
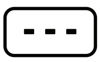
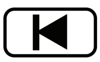
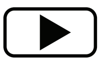
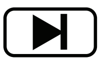
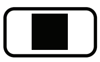
The stylus pen included with the FlexPendant is located on the back. Pull the small handle to release the pen.

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

(Not available on all versions of FlexPendant.)

Hard buttons

The following hard buttons are available on the FlexPendant.

Button	Description
	Programmable keys, 1 - 4.
	Select mechanical unit.
	Toggle motion mode, reorient or linear.
	Toggle motion mode, axis 1-3 or axis 4-6.
	Toggle increments.
	**Step BACKWARD** button. Executes one instruction backward as button is pressed.
	**START** button. Starts program execution.
	**Step FORWARD** button. Executes one instruction forward as button is pressed.
	**STOP** button. Stops program execution.

Continues on next page

Three-position enabling device

> **CAUTION**
>
> The person using the three-position enabling device is responsible to observe the safeguarded space for hazards due to robot motion and any other hazards related to the robot.

The three-position enabling device is located on the FlexPendant. When continuously held in center-enabled position, the three-position enabling device will permit robot motion and any hazards controlled by the robot. Release of or compression past the center-enabled position will stop the robot motion.

> **CAUTION**
>
> For safe use of the three-position enabling device, the following must be implemented:
>
> - The three-position enabling device must never be rendered inoperational in any way.
> - If there is a need to enter safeguarded space, always bring the FlexPendant. This is to enforce single point of control.

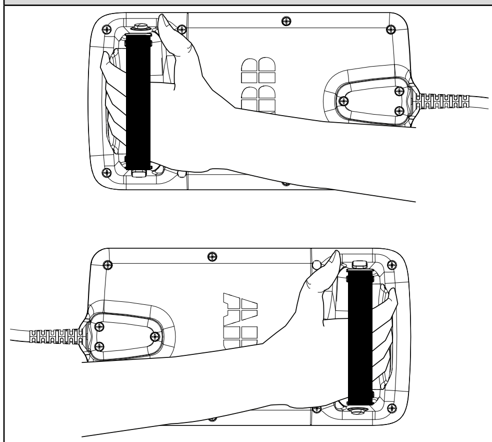
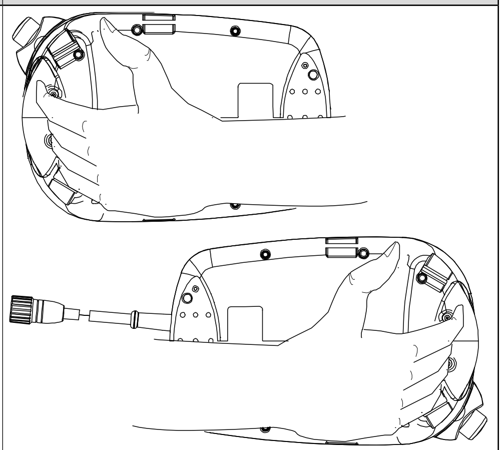
Thumb button

The thumb button is only available on the FlexPendant with emergency stop located at the connector.

The thumb button is used for hold-to-run.

How to hold the FlexPendant

FlexPendant is typically operated while being held in the hand. The right-handed users use their left-hand to support the FlexPendant while their right-hand performs the operations on the touch screen. However, the left-handed users can easily adapt FlexPendant for their use.

FlexPendant with emergency stop button at the connector	FlexPendant with emergency stop button at the outer edge
 xx1800000045	 en0400000913

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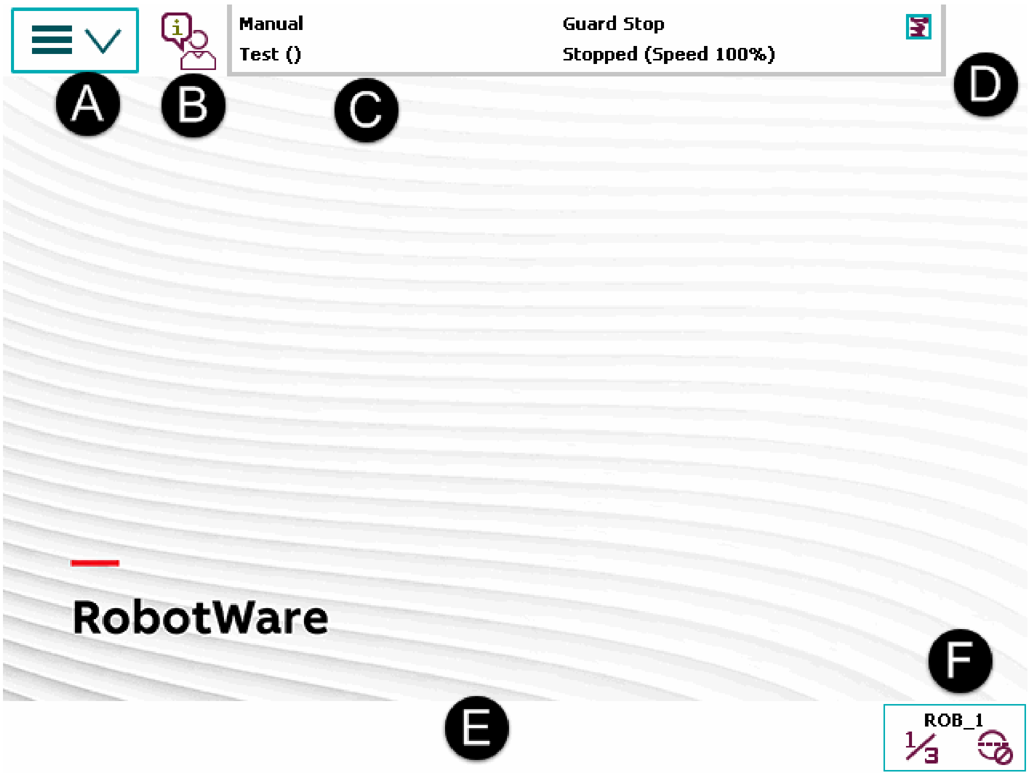
Touchscreen elements

The illustration shows important elements of the FlexPendant touchscreen.



xx1400001446

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

Main menu

The following items can be selected from the Main menu:

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

Continues on next page

- 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

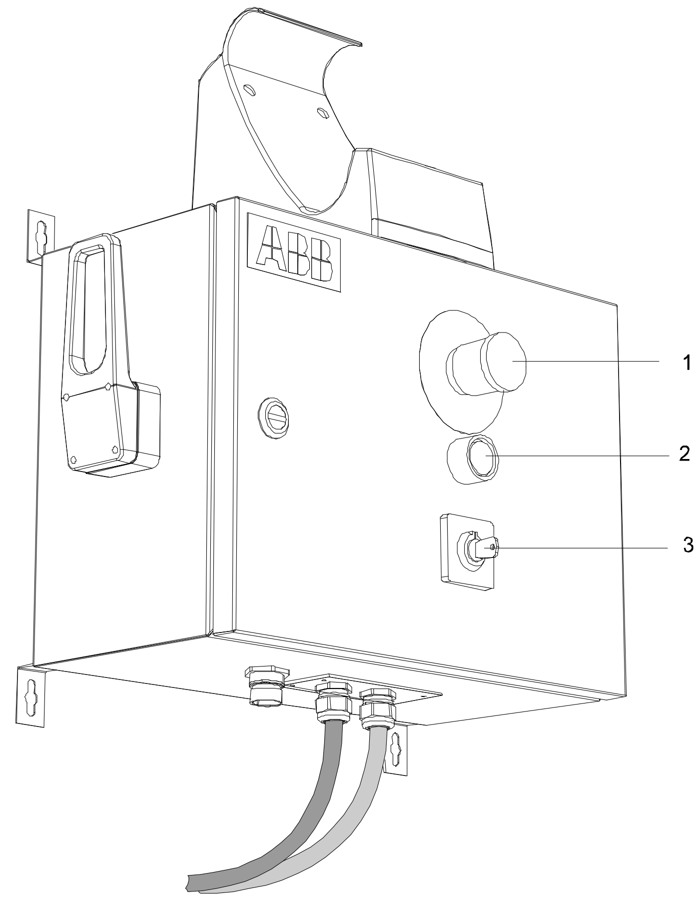
You can open several views from the Main menu, but only work with one at a time. The task bar displays all open views and is used to switch between these.

Quickset menu

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

2.4.2 External control units

External control panel



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1	Emergency stop
2	Motors On button
3	Operating mode selector

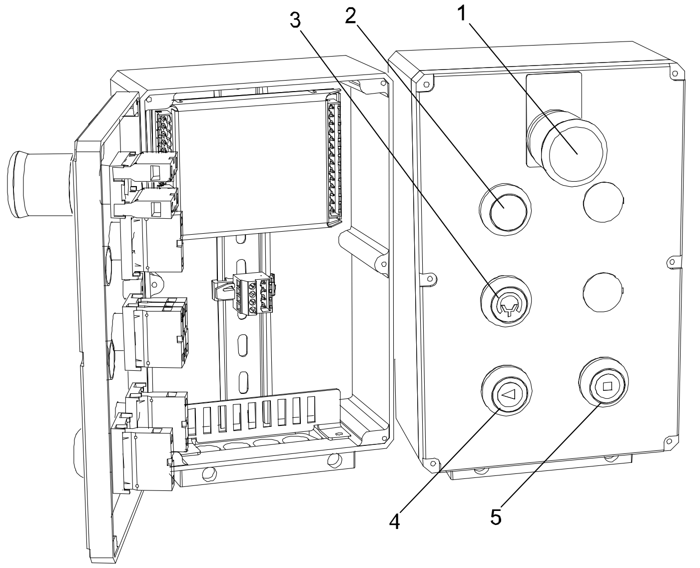
Continues on next page

Operator panel

There is one operator panel for a single working area, and one operator panel for two working areas. The functionality is the same but the two working area variant has one start button and status lamp per working area.

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

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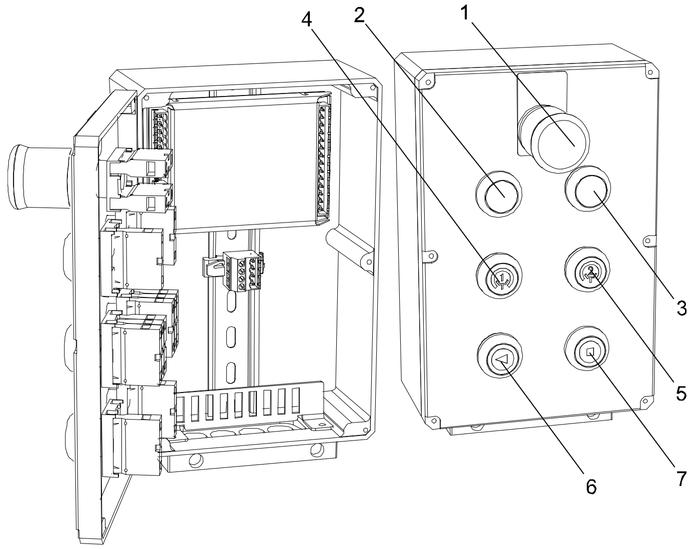
Two working areas

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



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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

Buttons on the operator panel

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 [i]	When green, the lamp indicates that the station is ready for loading the next workpiece. Entry into the monitored area is permitted.
Start process [ii]	Press the button after loading the workpiece in the station. The indication lamp in the button turns 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. Press the button a second time to start 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.

i The variant for two working areas has one indicator per station.
ii The variant for two working areas has one button per station.

Continues on next page

CAUTION

If using auto-hatch or other slow processes as safety barrier, then two jumpers should be added in the SIB harness. See the circuit diagram.

- TB3:2 to TB31:10
- TB31:11 to TB31:12

By adding jumpers, the operator only needs to press the start process button once to start the process.

Systems delivered before March 2019 have these two jumpers installed on delivery.

Manual Jog control panel

Manually adjustable load position (or Manual Jog) is a control panel fitted between the robot controller and the positioner.

Manual Jog can be used for:

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

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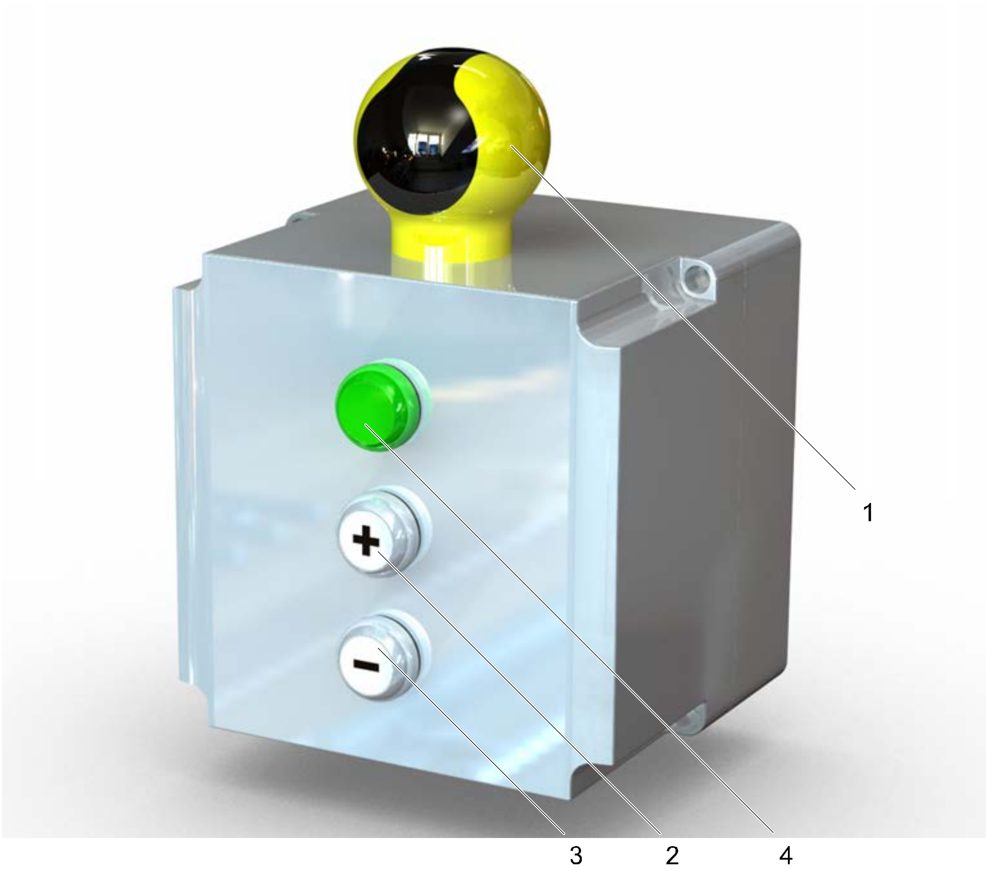


xx1000000251

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

When Manual Jog is fitted on the guard in the positioner's loading area, it is possible to rotate the positioner axis on the loading side to achieve ergonomically good positions for loading/unloading the process.

CAUTION

The Manual Jog must be placed at a distance from the positioner axis so that any unsecured fixtures or object parts cannot fall and injure the operator.

CAUTION

The SafeBall mechanism is not connected to any internal safety mechanisms in the controller. There is no state supervision for activation of positioners included in this option.

Continues on next page

Using Manual Jog in operation

	Action	Note
1	Set the robot to motors on operating mode and deactivate the positioner from the control system.	
2	Press and hold the SafeBall during the whole operation.	
3	Press and hold the buttons for the desired direction until the positioner has reached the desired position.	
4	Release the button for rotation.	
5	Wait until the green indication lamp has turned off.	
6	Release the SafeBall.	

Note

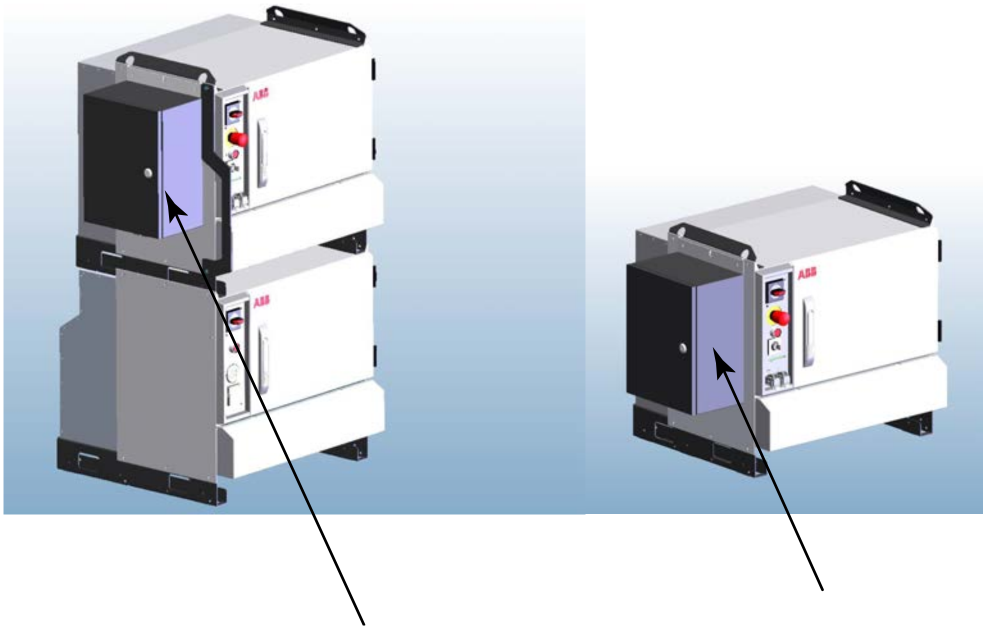
If the SafeBall is released before the indication lamp is turned off, the Manual Jog program task gets stuck. To recover, go into the Manual Jog program task on the FlexPendant and move the program pointer to the start of the task.

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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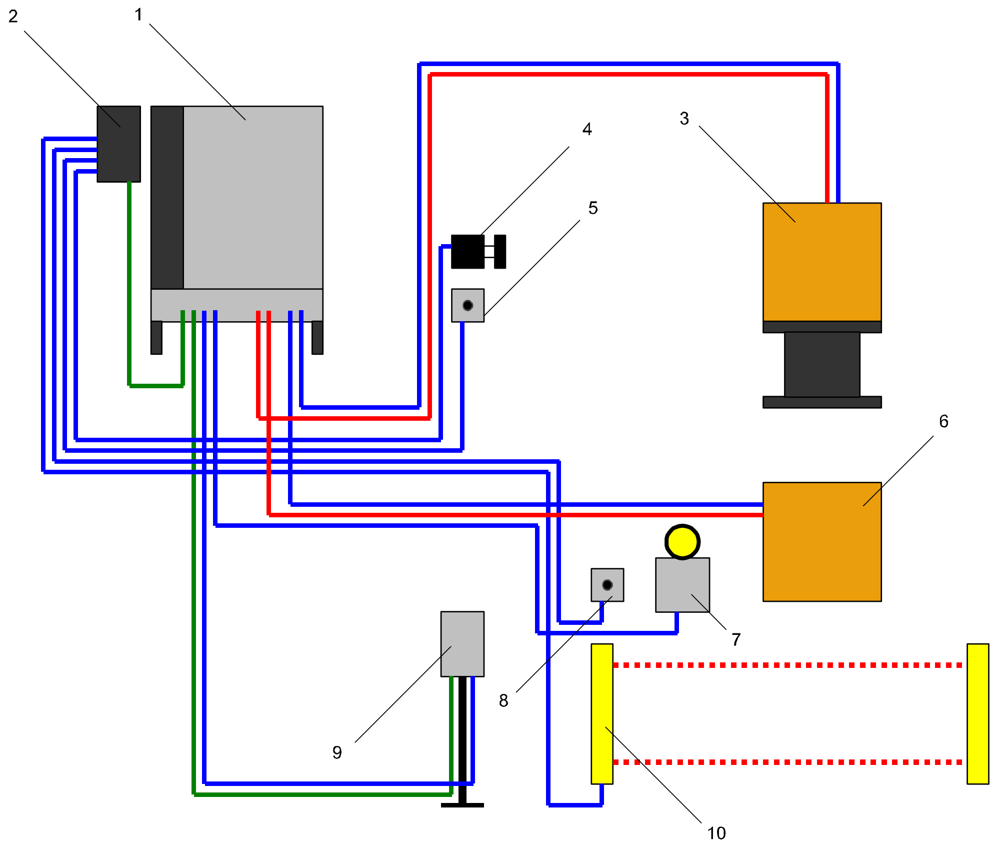
Safety block diagram



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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

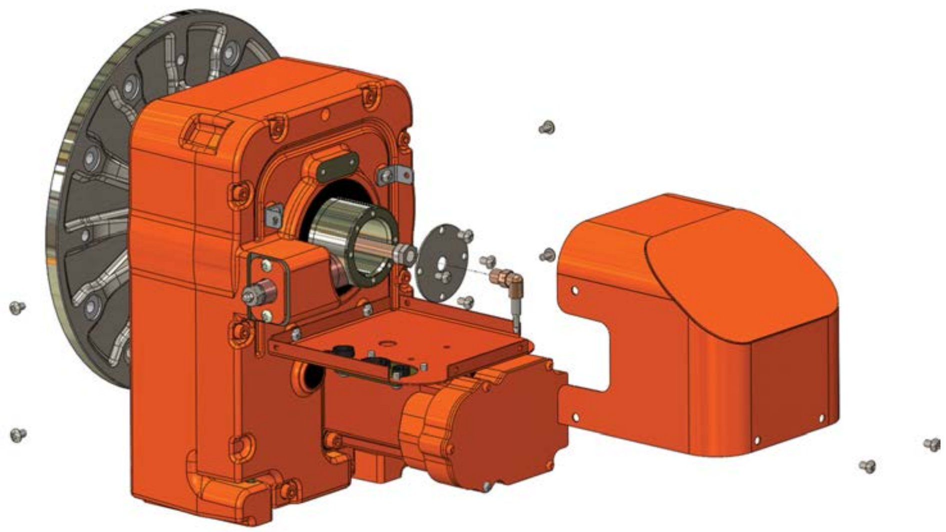
2.6 Customer options

2.6.1 Optional swivels

Overview

The following options are not available with the Rotary Unit MTE.

Air swivel, 1 channel



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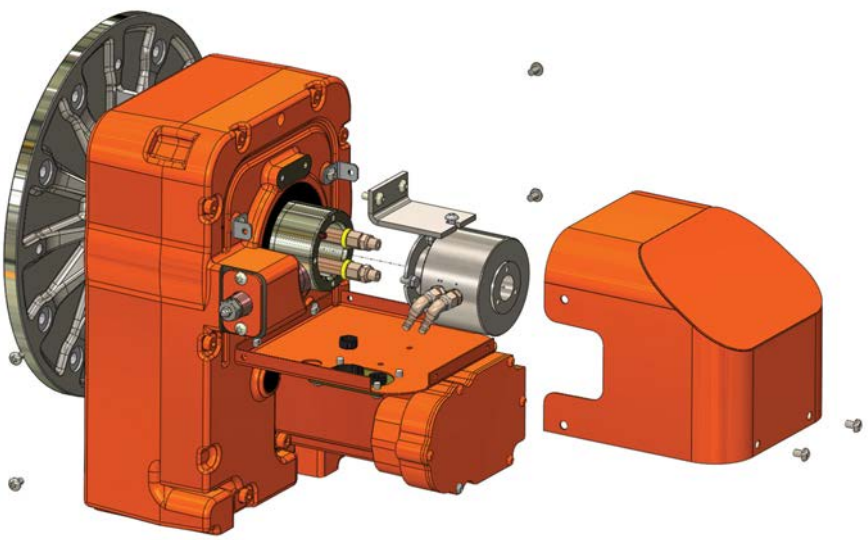
Air swivel, 2 channel



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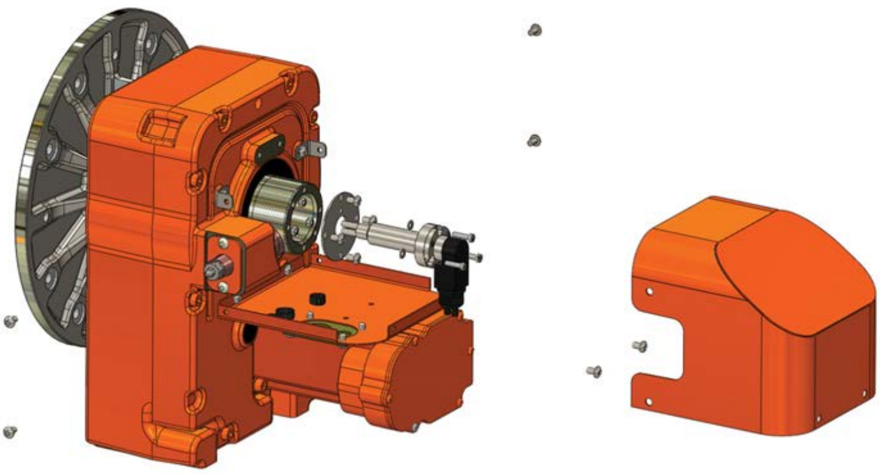
Electrical swivel



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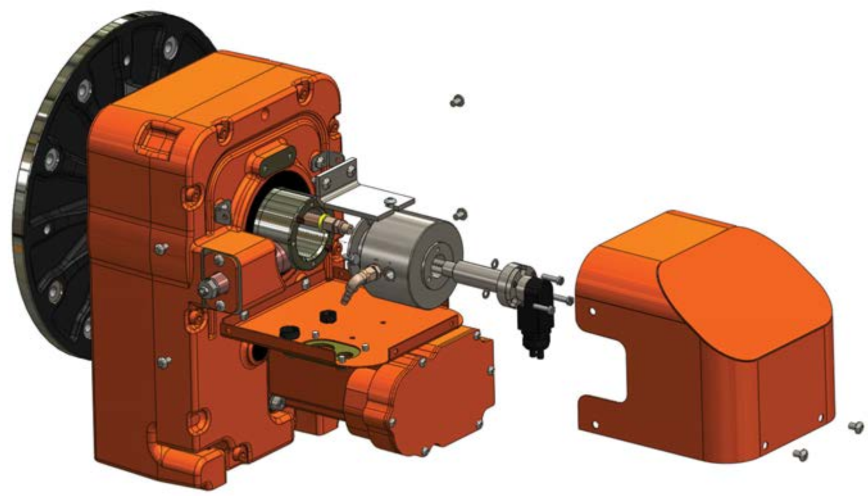
Air swivel, 1 channel and 1 electrical channel



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3 Installation and commissioning

3.1 Introduction to installation and commissioning

General

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

See also the product manual for the robot controller.

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

Safety information

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

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

Note

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

For more information see:

- *Product manual - IRC5*

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

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 84*.

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

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 343* 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, kg
IRBP A	250		470
	500		870
	750		870
IRBP B	250		915
	500		1,750
	750		1,750
IRBP C	500		380
	1000		660
IRBP D	300	1520	1,560
	600	2870	2,960

Continues on next page

IRBP model	Handling weight/kg	Weight min.	Weight max, kg
IRBP L	300	250	300
	600	465	515
	1000	465	515
	2000	700	740
	5000		
IRBP K	300	1090	1,515
	600	1980	2,570
	1000	1980	2,570
IRBP R	300	620	645
	600	1285	1,380
	1000	1285	1,380

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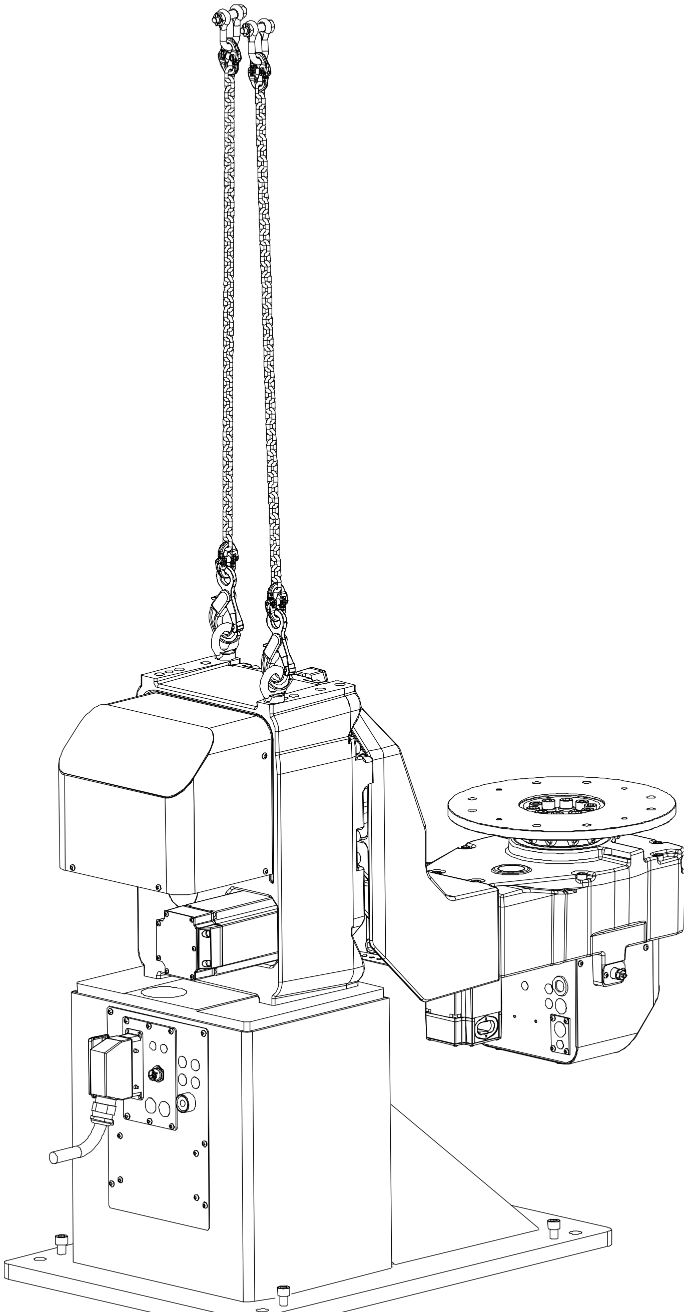
Lifting IRBP A



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Lifting IRBP B

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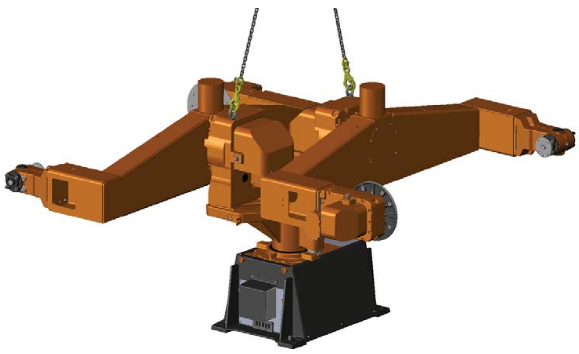
Lifting IRBP D



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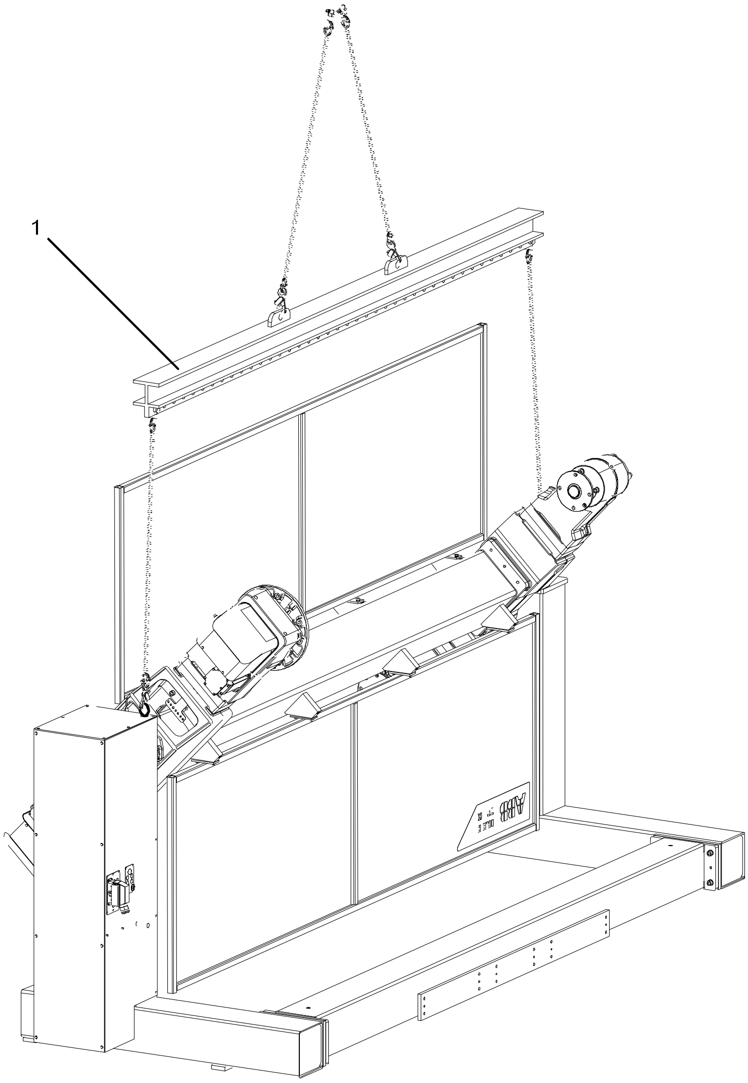
Lifting IRBP R, K



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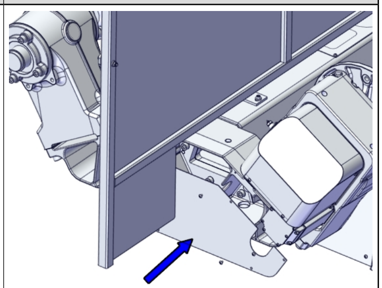
1	Lifting beam 4000 mm

Fitting the lifting eyes on IRBP R

	Action	Note
1	Remove the plates to get access to the lifting eye holes in the frame.	 xx1700001322

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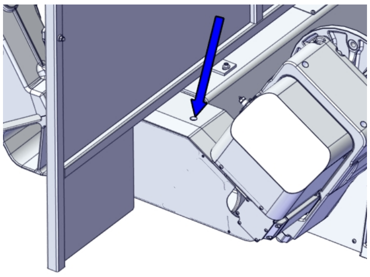
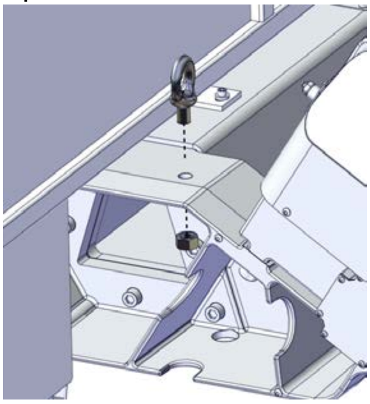
	Action	Note
2	Remove the protection plugs from the lifting eye holes. **Note** Save the plugs for refit after installation.	 xx1700001324
3	Attach the lifting eyes.	2 pcs  xx1700001323

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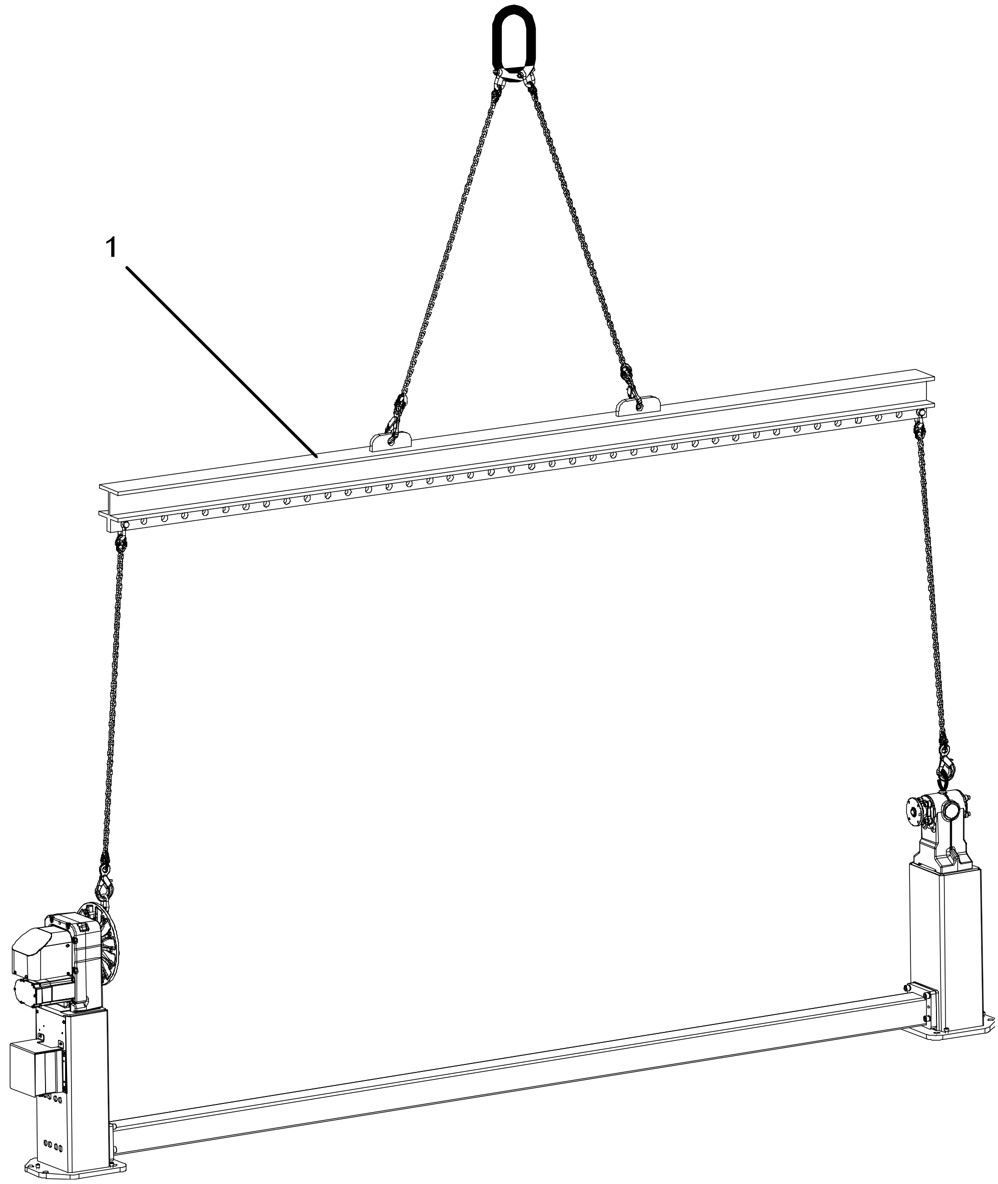
Lifting IRBP L



xx1000000093

1	Lifting beam 4000 mm

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

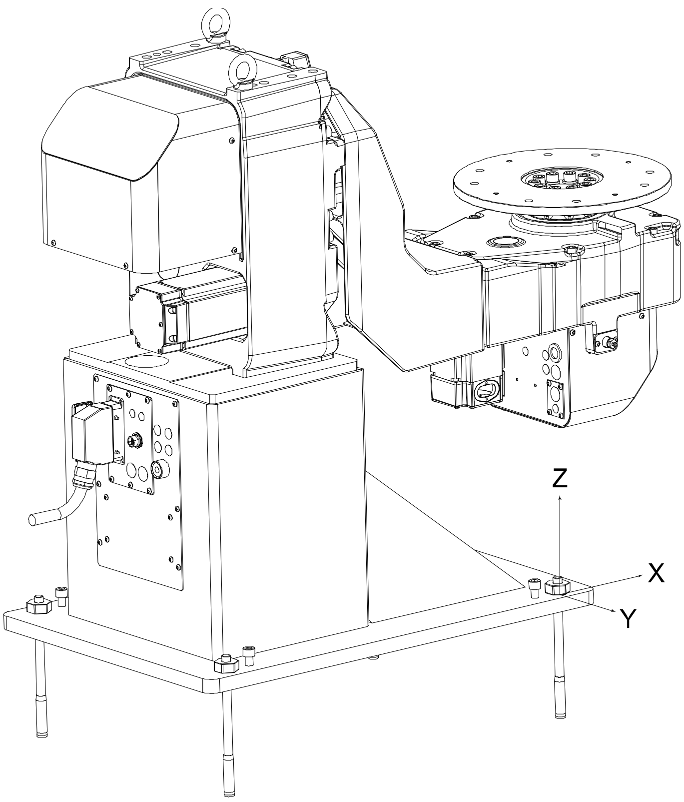
The foundation must be designed, so that the manipulator can be mounted without the incline exceeding 0.5 mm/m.

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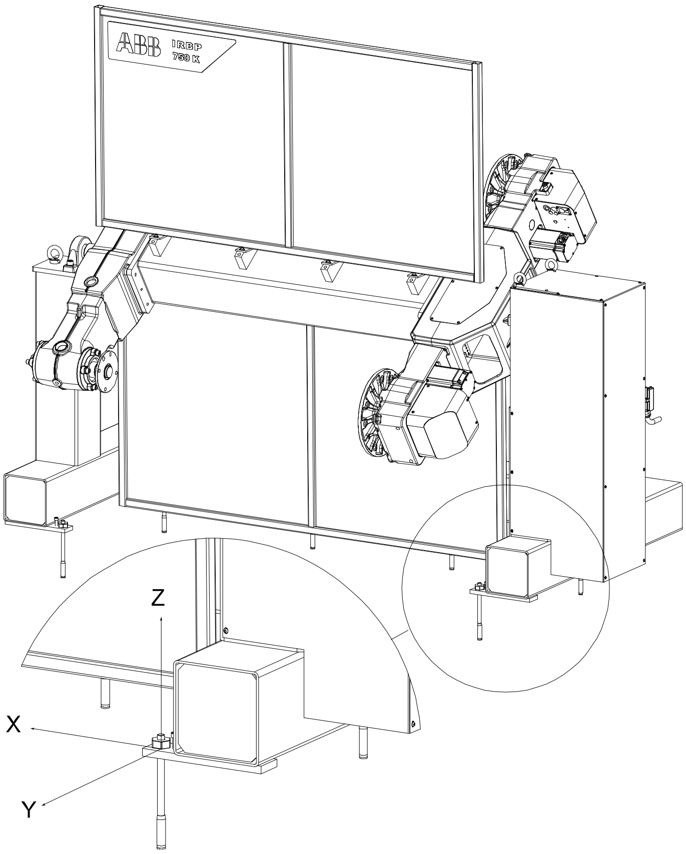
Rotation unit	Endurance load in operation (N)		Max load at emergency stop (N)		Screw dimension
	Fxy	Fz	Fxy	Fz	
A-250	800	6300	1930	11500	M16
A-500	3300	12900	6700	23200	M20

Continues on next page

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



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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

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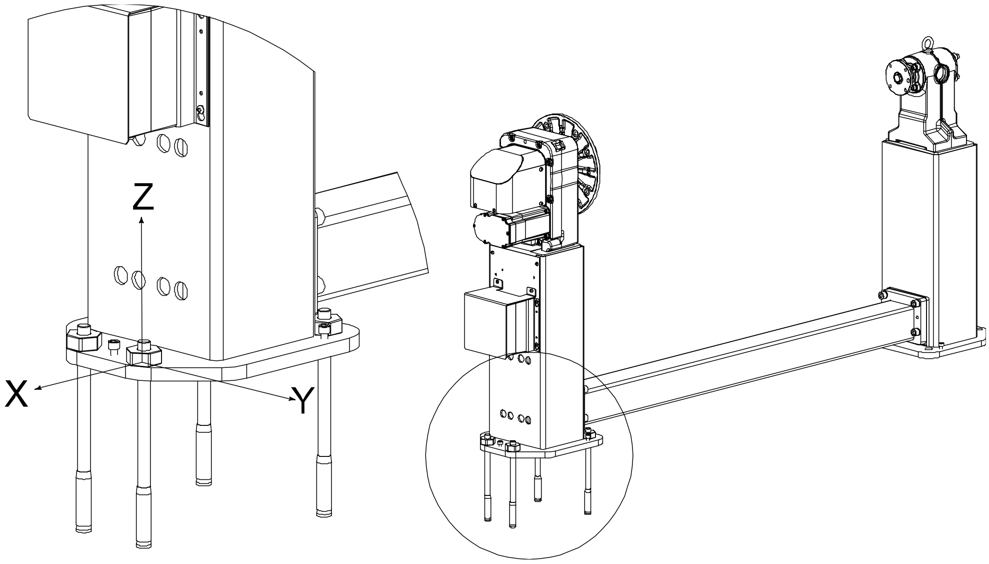
Forces IRBP L



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Rotation unit	Endurance load in operation (N)		Max load at emergency stop (N)		Screw dimension
	Fxy	Fz	Fxy	Fz	
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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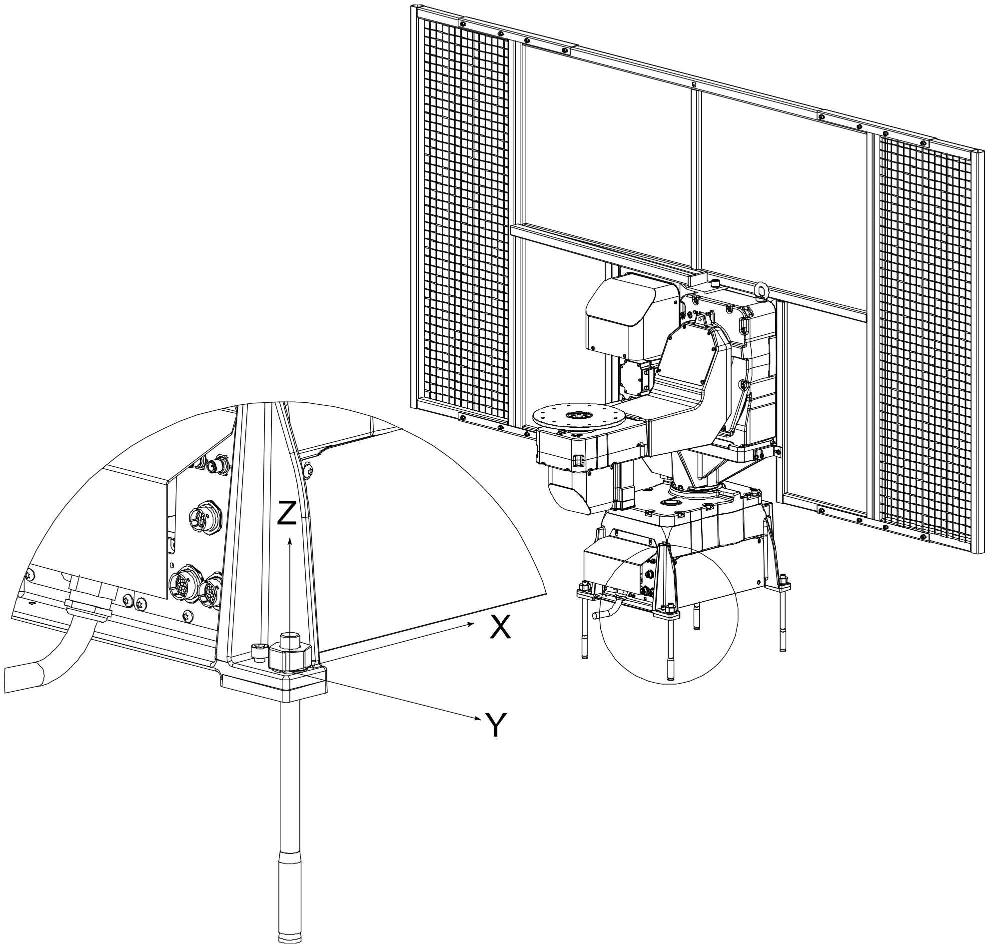
Forces IRBP B/C/D/R



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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 89*
Concrete floor	See section *Screw joints on page 89*

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 89*. 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.

3.3.5 Screw joints

General

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

The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.

UNBRAKO screws

UNBRAKO is a special type of screw recommended by ABB for certain screw joints. It features special surface treatment (Gleitmo as described below) and is extremely resistant to fatigue.

Whenever used, this is specified in the instructions, and in such cases, *no other type of replacement screw* is allowed. Using other types of screws will void any warranty and may potentially cause serious damage or injury.

Gleitmo treated screws

Gleitmo is a special surface treatment to reduce the friction when tightening the screw joint. It is recommended by ABB for M6-M20 screw joints. Screws treated with Gleitmo may be reused 3-4 times before the coating disappears. After this the screw must be discarded and replaced with a new one.

When handling screws treated with Gleitmo, protective gloves of **nitrile rubber** type should be used.

Generally, screws are lubricated with *Gleitmo 603* mixed with *Geomet 500* or *Geomet 702* in proportion 1:3. *Geomet* thickness varies according to screw dimensions, refer to the following.

Dimension	Lubricant	Geomet thickness
M6-M20 (any length except M20x60)	*Gleitmo 603* + *Geomet 500*	3-5 μm
M6-M20 (any length except M20x60)	*Gleitmo 603* + *Geomet 720*	3-5 μm
M20x60	*Gleitmo 603* + *Geomet 500*	8-12 μm
M20x60	*Gleitmo 603* + *Geomet 720*	6-10 μm

Screws lubricated in other ways

Screws lubricated with Molykote 1000 or Molykote P1900 should *only* be used when specified in the repair, maintenance or installation procedure descriptions.

In such cases, proceed as follows:

1. Apply lubricant to the screw thread.
2. Apply lubricant between the plain washer and screw head.
3. Screw dimensions of M8 or larger must be tightened with a torque wrench. Screw dimensions of M6 or smaller may be tightened without a torque wrench *if* this is done by trained and qualified personnel.

Continues on next page

Lubricant	Article number
Molykote 1000 (molybdenum disulphide grease)	3HAC042472-001
Molykote P1900 (molybdenum disulphide grease)	3HAC070875-001

Tightening torque

Before tightening any screw, note the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard torques** are specified in the following tables. Any **special torques** are specified in the repair, maintenance or installation procedure descriptions. **Any special torque specified overrides the standard torque!**
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- Always *tighten the joint by hand,* and never use pneumatic tools.
- Use the *correct tightening technique*, that is *do not* jerk. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is **10%**!

Tightening torque for oil-lubricated screws with slotted or cross-recess head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws* with *slotted or cross-recess head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Tightening torque for oil-lubricated screws with allen head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws* with *allen head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

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

Continues on next page

Dimension	Tightening torque (Nm) Class 8.8, oil-lubricated	Tightening torque (Nm) Class 10.9, oil-lubricated	Tightening torque (Nm) Class 12.9, oil-lubricated
M24	680	960	1150

Tightening torque for lubricated screws (Molykote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for *screws lubricated with Molycote 1000, Gleitmo 603 or equivalent* with *allen head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Dimension	Tightening torque (Nm) Class 10.9, lubricated [i]	Tightening torque (Nm) Class 12.9, lubricated [i]
M5		8
M6		14
M8	28	35
M10	55	70
M12	96	120
M16	235	300
M20	460	550
M24	790	950

[i] Lubricated with Molycote 1000, Gleitmo 603 or equivalent

3.3.6 The unit is sensitive to ESD

Description

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

Safe handling

Use one of the following alternatives:

- Use a wrist strap.

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

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

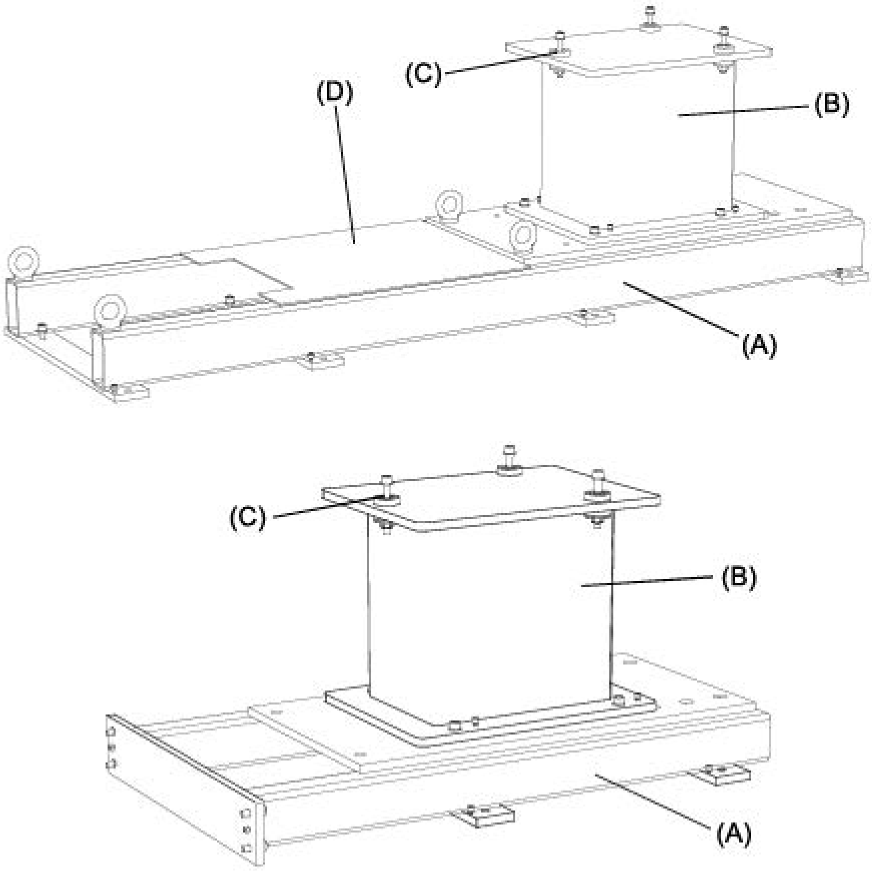
  The mat should provide a controlled discharge of static voltages and must be grounded.

3.4 On-site installation

3.4.1 Securing the robot stand (optional)

Robot stand parts

The robot stand consists of the following parts:



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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

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 84*

Securing the robot stand

Use this procedure to secure the robot stand.

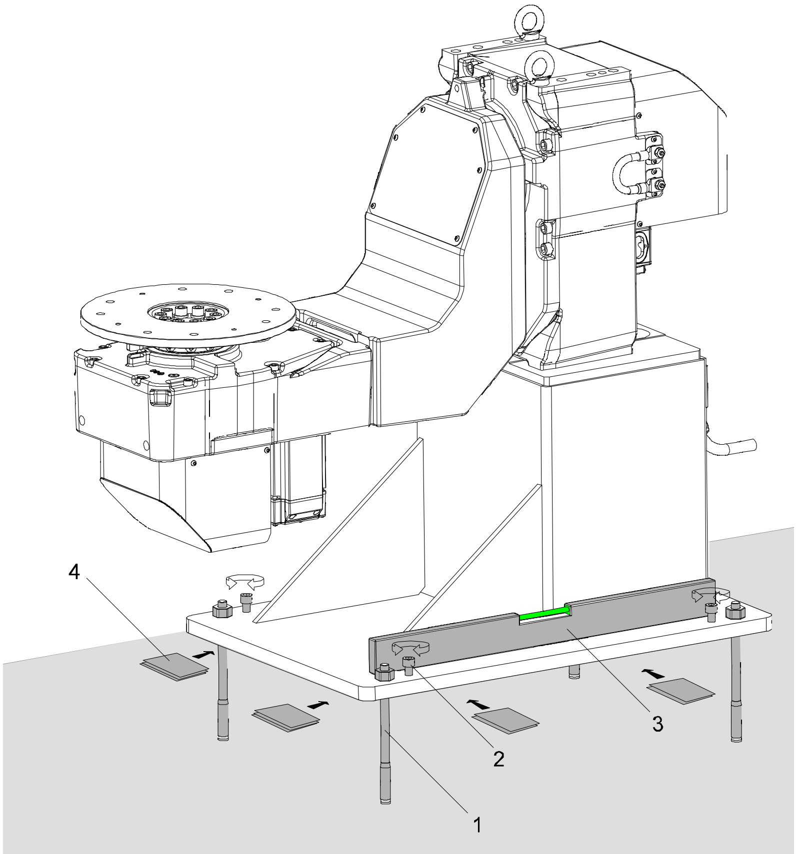
	Action	Note
1	Position the robot stand at the intended work site.	See instructions in *Orienting and securing the manipulator on page 95*.

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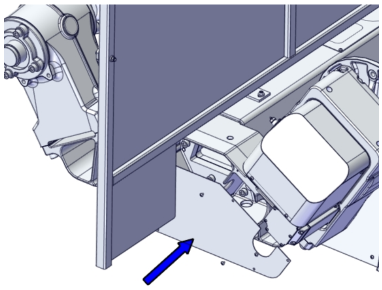
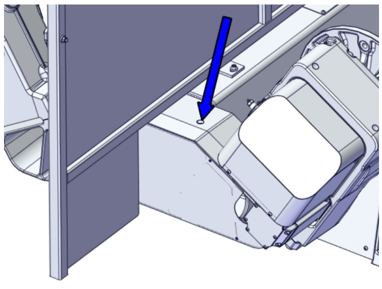
1	Screws for fastening (floor bolts)
2	Adjusting screws
3	Machine level meter
4	Shim

Securing the manipulator IRBP

Use this procedure to secure the manipulator.

	Action	Note
1	Position the IRBP at the intended work site.	

Continues on next page

	Action	Note
2	Drill all holes according to the screw manufactures recommendation for the specific foundation. Facts and drilling recommendations are found in section *Recommendations for attachment bolts and screws on page 88*	
3	Adjust the foot to level using a machine level meter and the level screws.	
4	Insert shims to fill the gap between the pedestal foot and the floor. **CAUTION** Always loosen the adjusting screws before tightening the floor bolts.	**Note** Never use any shims between gear unit and the pedestal.
5	Tighten all the floor bolts.	Tightening torque according to screw manufactures.
6	Remove all lifting accessories used.	
7	**Valid for IRBP R** Refit the plates at the frame ends.	 xx1700001322
8	**Valid for IRBP R** Refit the protection plugs to the lifting eye holes.	 xx1700001324

Securing the manipulator IRBP L using fixture laser

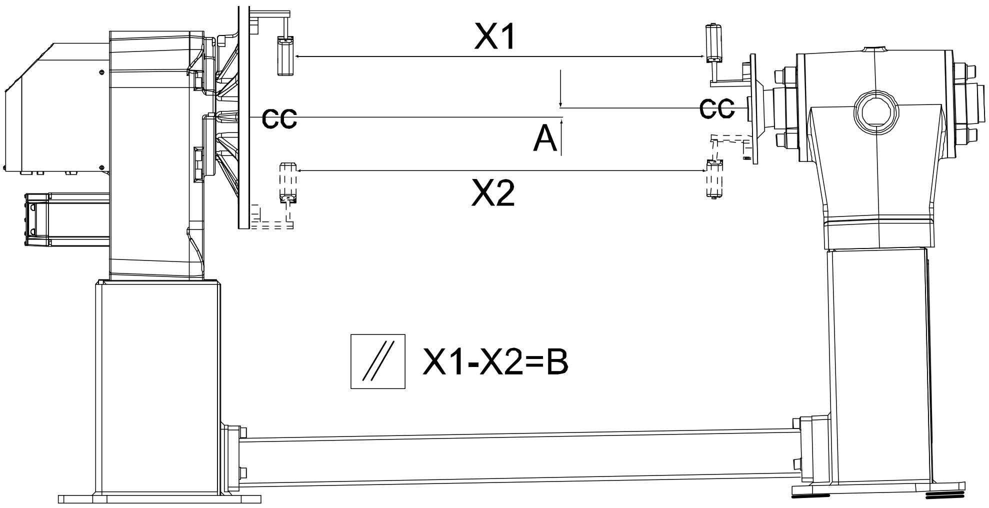
Use this procedure to secure the IRBP L using a fixture laser.

	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 *Recommendations for attachment bolts and screws on page 88*	
3	Adjust the level screws in the foot to level using a fixture laser.	Recommended data in the table below.

Continues on next page

	Action	Note
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, *Adjusting the bearing units for IRBP L-300, L-600, L-1000 och L-2000 on page 98*.

Example of fixture laser aligning

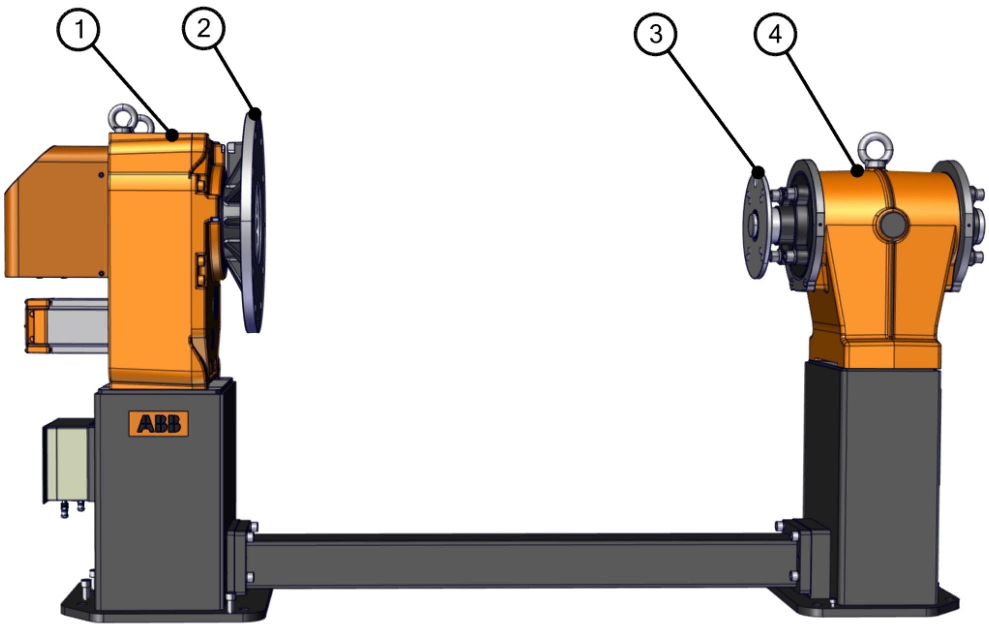


xx1000000984

The figure shows an example of aligning the bearing units using laser sensors for example, NXA by Fixturlaser or TKSA41 from SKF, turning disc adapters and adjustment tool. For more information, see *Adjusting the bearing units for IRBP L-300, L-600, L-1000 och L-2000 on page 98*

Adjusting the bearing units for IRBP L-300, L-600, L-1000 och L-2000

After securing the positioner to the foundation the bearing units may need adjustments. This is an example on how to use the adjustment tool when adjusting the bearing units on the IRBP L positioner. The adjustment tool can be ordered from ABB as a spare part. Other equipment mentioned in this example, for example laser sensors and turning disc adapter, is to be considered generic and therefore not available as spare parts delivered by ABB.



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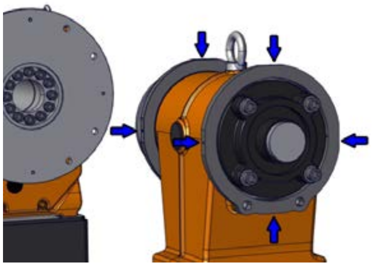
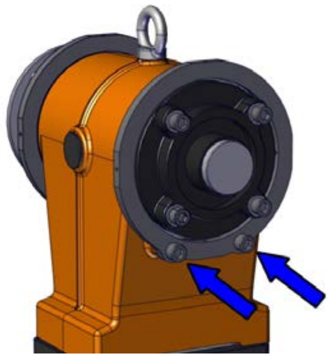
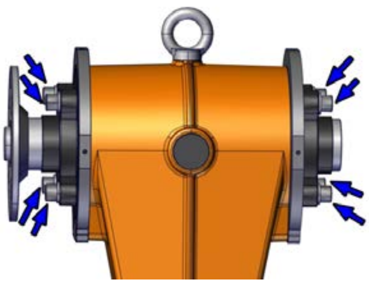
1	Gearbox
2	Rotary disc
3	Bearing disc
4	Bearing house

Required equipment

Equipment	Article number
Adjustment tool, MTD 250	3HAC036527-001
Adjustment tool, MTD 750	3HAC036532-001
Adjustment tool, MTD 2000	3HAC037846-001

Continues on next page

Fitting the adjustment tools and the laser sensor on to the bearing house

	Action	Note
1	Fit the adjustment tool on both sides of the bear-ing house using the set screws.	 xx1700001363
2	Fasten the adjustment tools using the adjustment screws.	 xx1700001364
3	Loosen the bearing screws from both sides of the bearing house.	 xx1700001365

Measuring the positioner

	Action	Note
1	Fit the laser sensor on to the gearbox turning plate, and tailstock turning flange.	**Note** The fitting of the laser sensors varies depending on the equipment used.
2	Start the laser sensors.	
3	Attach the motor cable to the gearbox.	

Continues on next page

	Action	Note
4	Rotate the bearing disc to -90 degrees (9 o'clock).	**Note** Adjust the position of the disc during the measuring process by rotating the set screws attached to the adjustment tool if needed. It is possible to adjust up to 2.5 mm.
5	Rotate the rotary disc to -90 degrees (9 o'clock).	
6	Measure the laser position as position 1.	
7	Rotate the bearing disc to +90 degrees (3 o'clock).	
8	Rotate the rotary disc to +90 degrees (3 o'clock).	
9	Measure the laser position as position 2.	
10	Rotate the bearing disc to 0 degrees (12 o'clock).	
11	Rotate the rotary disc to 0 degrees (12 o'clock).	
12	Measure the laser position as position 3.	
13	Calibrate the positioner.	

Calibrating the positioner

	Action	Note
1	Measure the IRBP L.	
2	Rotate the bearing disc to 0 degrees (12 o'clock).	
3	Rotate the rotary disc to 0 degrees (12 o'clock).	
4	Adjust the laser value by rotating the vertically aligned set screws.	
5	Rotate the bearing disc to -90 degrees (9 o'clock).	
6	Rotate the rotary disc to -90 degrees (9 o'clock).	
7	Adjust the laser value by rotating the horizontally aligned set screws.	
8	Repeat the measurement process to make sure that the calibration is correct. **Note** If the values from the laser reading is not within the allowed deviation during calibration, then recalibrate and measure again. If the problem remain, please contact ABB.	For more information about the allowed deviations, see *Deviations on page 101*.
9	Remove any equipment fitted on the IRBP L positioner.	
10	Fasten the bearing screws to the bearing house using the correct torque.	For more information about the correct torque, see *Screw joints on page 89*

Continues on next page

Deviations

IRBP	L1 [mm]	L2 [mm]	L3 [mm]	Position deviation [mm]			Parallel deviation [mm/100mm]		
				Preferred (X,Y)	Acceptable (X,Y)	Not OK (X,Y)	Preferred (X,Y)	Acceptable (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

Adjusting the bearing units for IRBP L-5000

The L5000 differs from the smaller L models in that sense that the support bearing side is not attached to the rotary unit with a distance beam.

Since the length between Rotary disc and Bearing disc is unknown, no fixed values can be provided. The figures in the table could be used as a guidance, see *Deviations*.

Laser adjustment on turning disk can be used. Adjustment is done by using shims between the floor and the bottom of the tailstock foot.

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*.

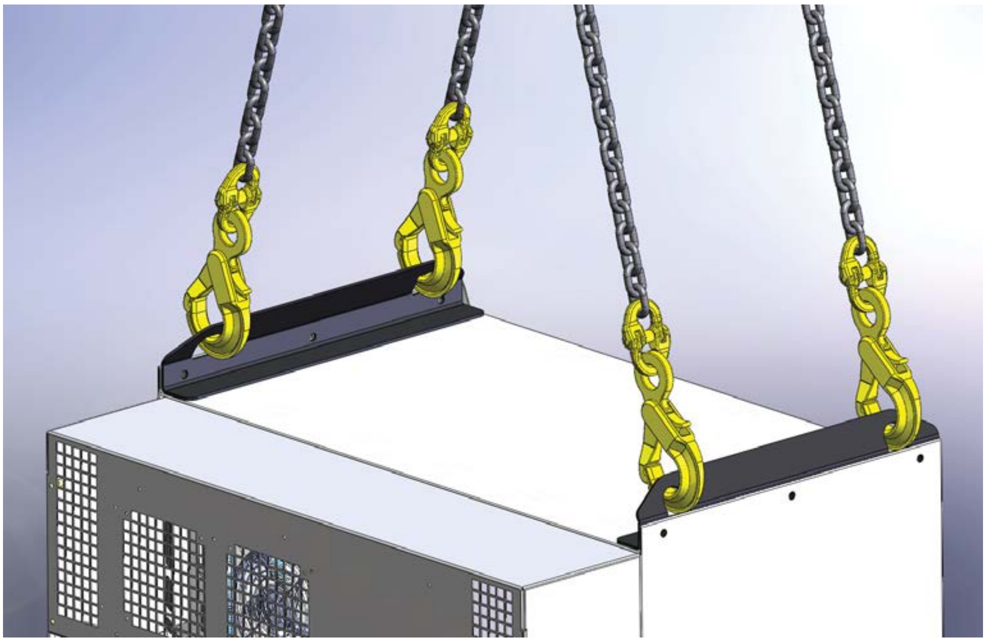
These can be found under separate tabs in the system manual. These tasks may only be carried out by persons trained for the entire installation and who are aware of the special risks involved with these various components.

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.



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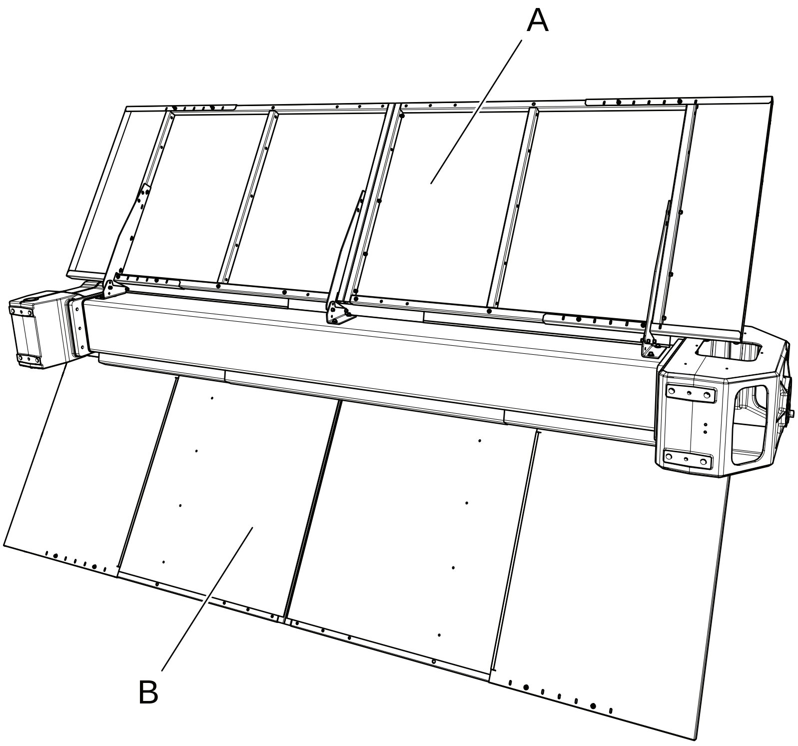
Space requirements

See installation description in *Product manual - IRC5*.

3.4.4 Mounting of secondary shield on IRBP-K

Location of the shield

The secondary shield is located as shown in the figure.



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A	Secondary shield
B	Primary shield

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 339*.

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.	

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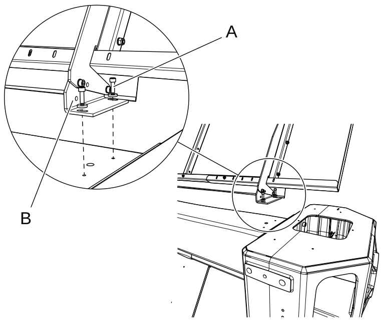
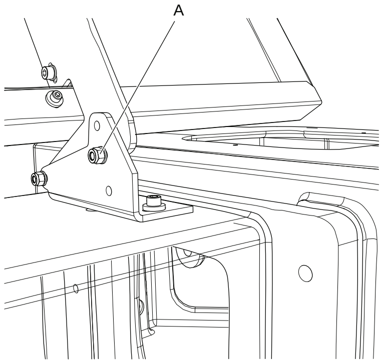
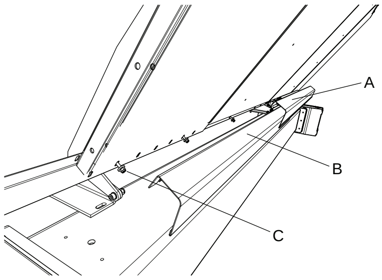
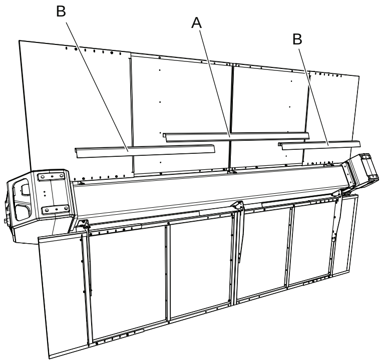
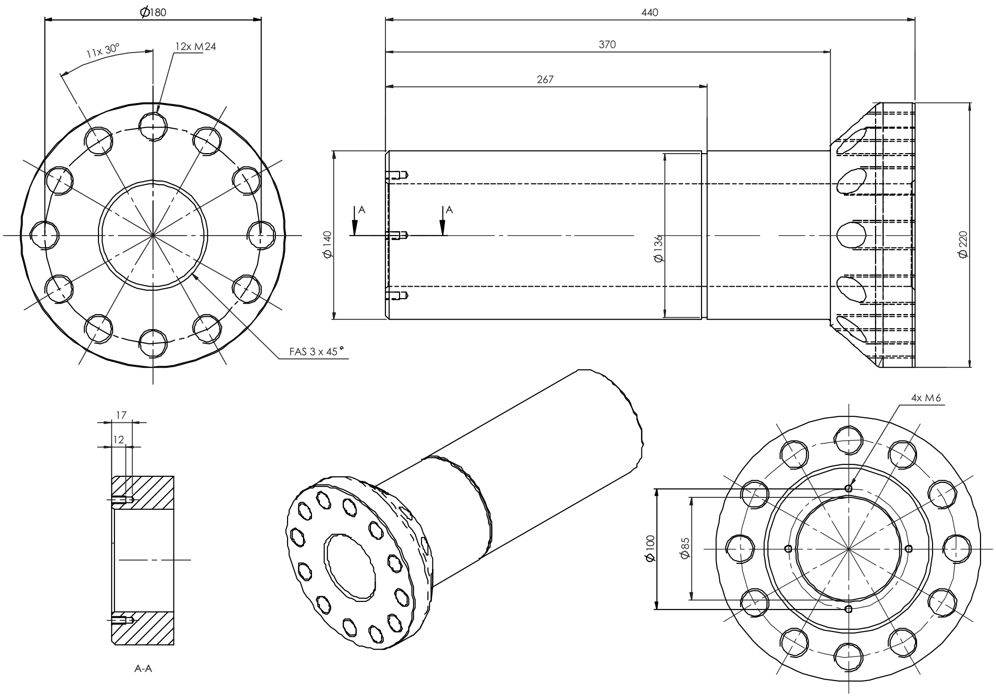
	Action	Note
2	Fit the six screws with washers (A) through the pre-mounted bracket (B).	 xx1700000440 Screw: M8x25 (6 pcs) Washer: 8.4x21x4 (6 pcs)
3	Tighten the screws.	Tightening torque: 25 Nm
4	Tighten the screws (A) with nuts (6 pcs) on the pre-mounted shield brackets.	 xx1700000447 Tightening torque: 10 Nm
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.	

3.4.5 Dimensions of the tailstock IRBP L-5000

Tailstock dimensions

The tailstock on the IRBP L-5000 has a centered hole to be able to, for example, pull cable harness through.



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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.

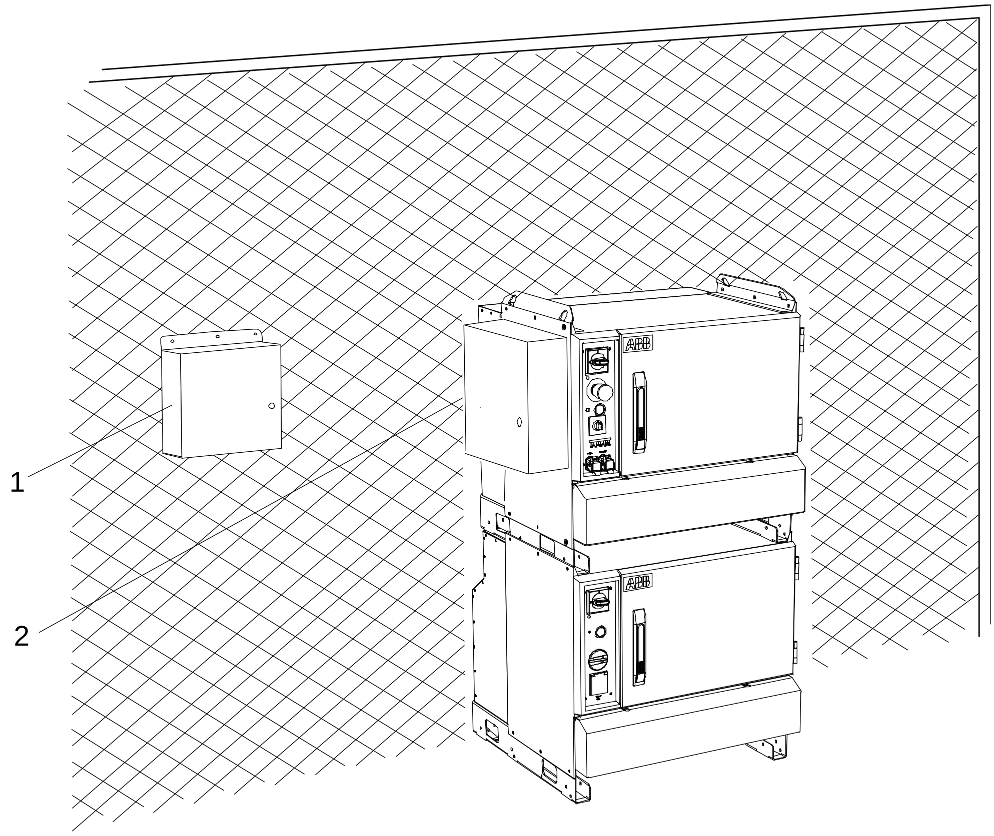
Safety instructions

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

Positioned on SC/DC or on Fence



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

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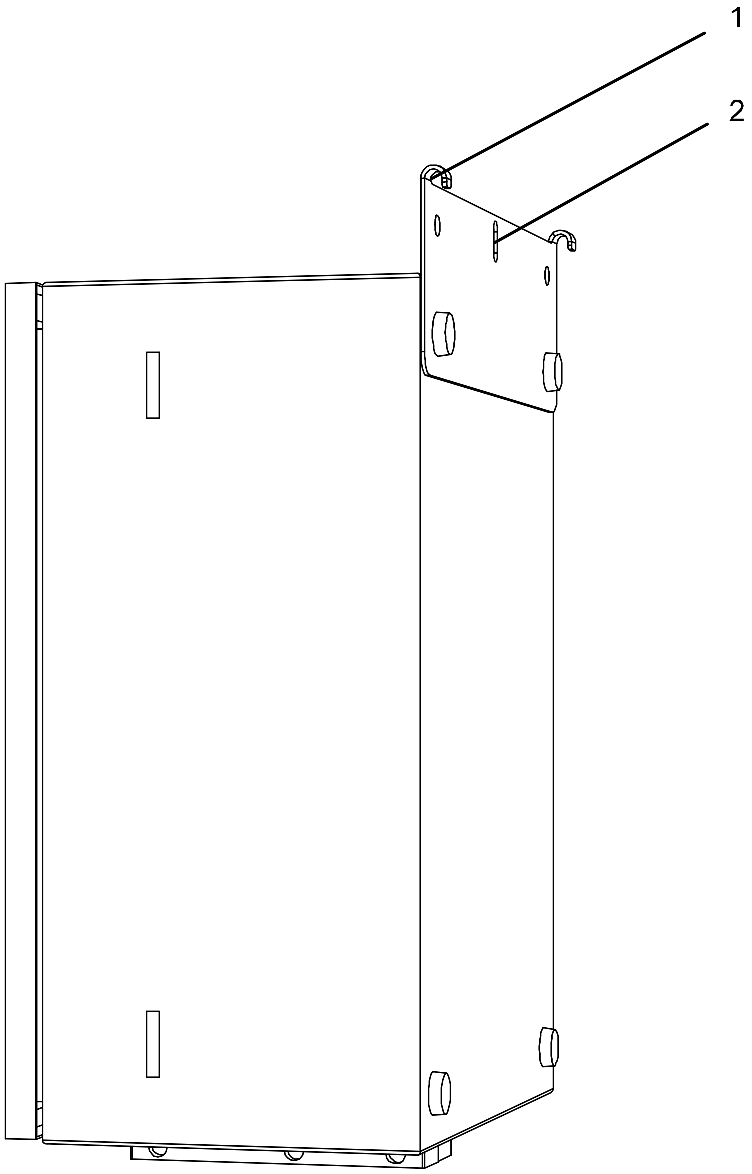
Control equipment fastening



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1	Bracket
2	Hole for M8

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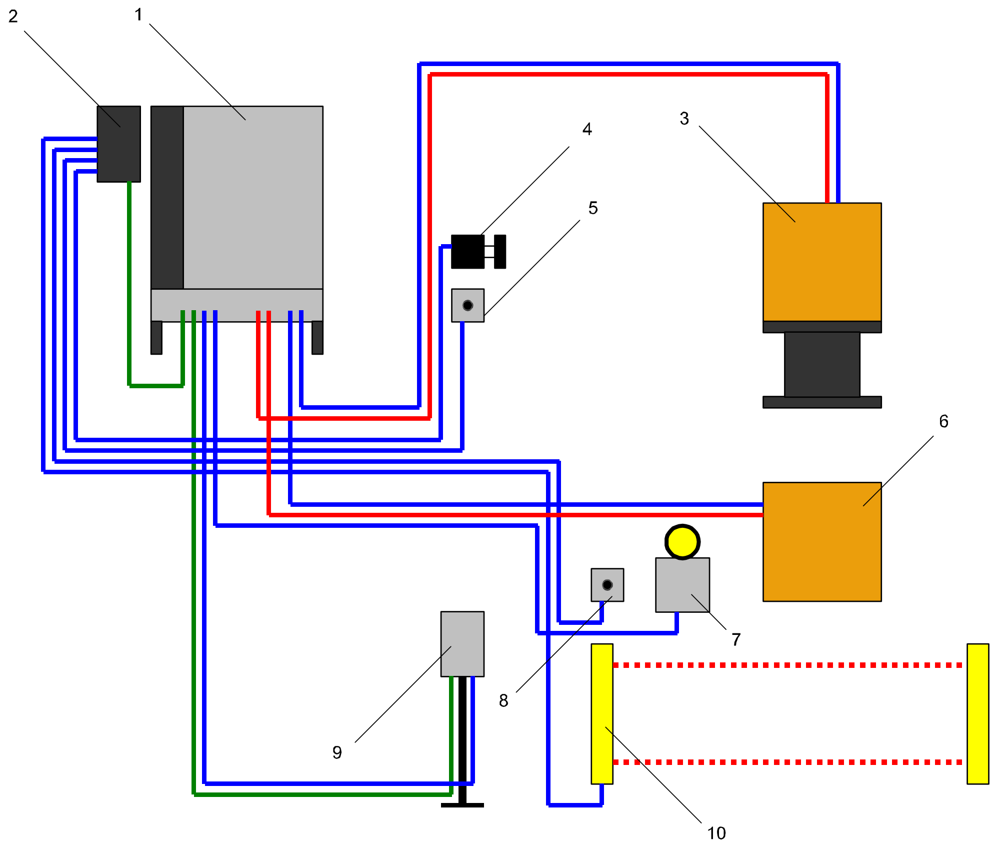
Safety block diagram



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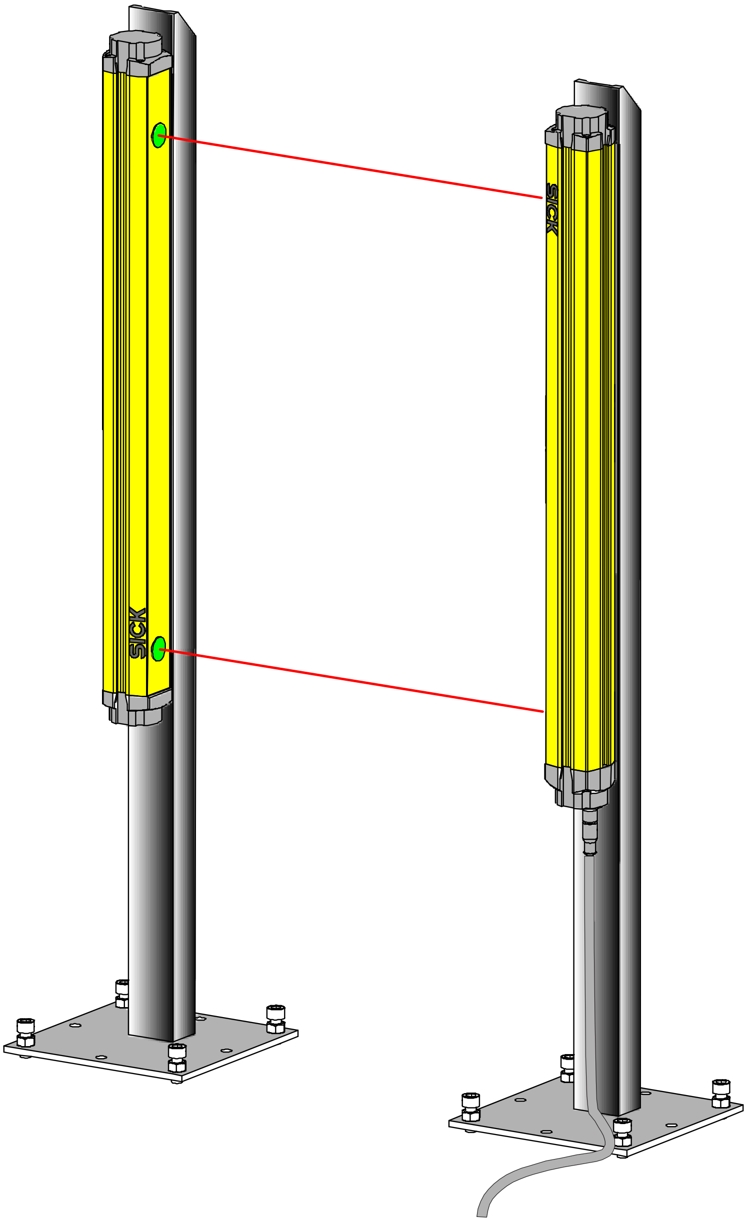
1	Controller
2	Safety control equipment
3	IRB
4	Gate switch
5	Gate reset
6	IRBP
7	Manual jog panel
8	Pre-reset
9	Operating panel
10	Light barrier

3.5.2 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.



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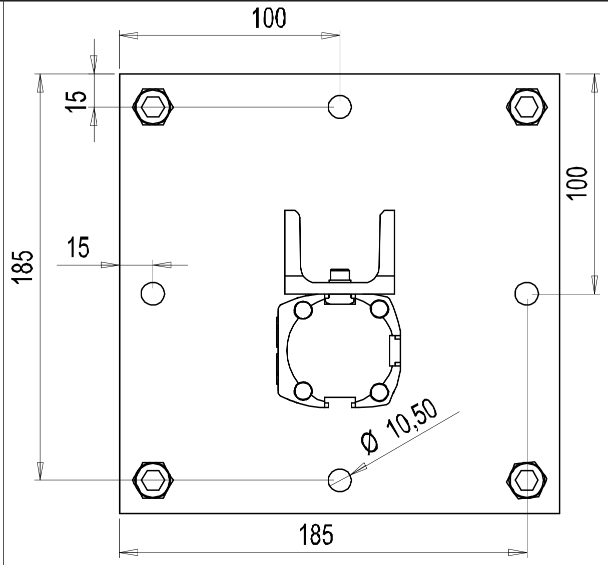
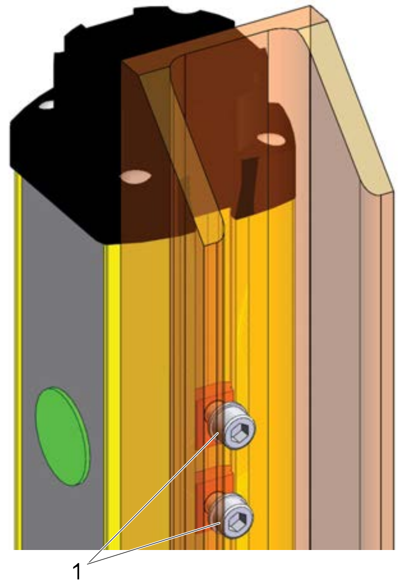
	Action	Information
1	Mount the light barriers parallel, using a ruler. If the distance is to long for a ruler activate the transmitter's LED:s to correct the light beams parallel.	 xx1000000033
2	Adjust to the optimal horizontal position using the set screws (1) if necessary.	 xx1000000036

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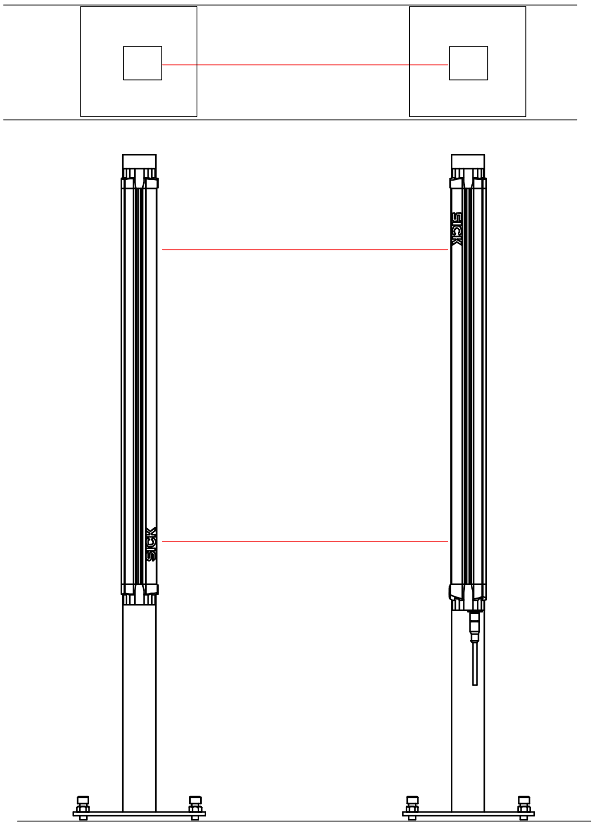
	Action	Information
3	Check that the receiver unit is correctly adjusted.	 xx1000000034

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 *Connections safety equipment on page 130*	

3.6 Electrical connections

Introduction

Connect the robot and controller to each other after securing them to the foundation. The lists below specify which cables to use for each respective application.

DANGER

Turn off the main power before connecting any cables.

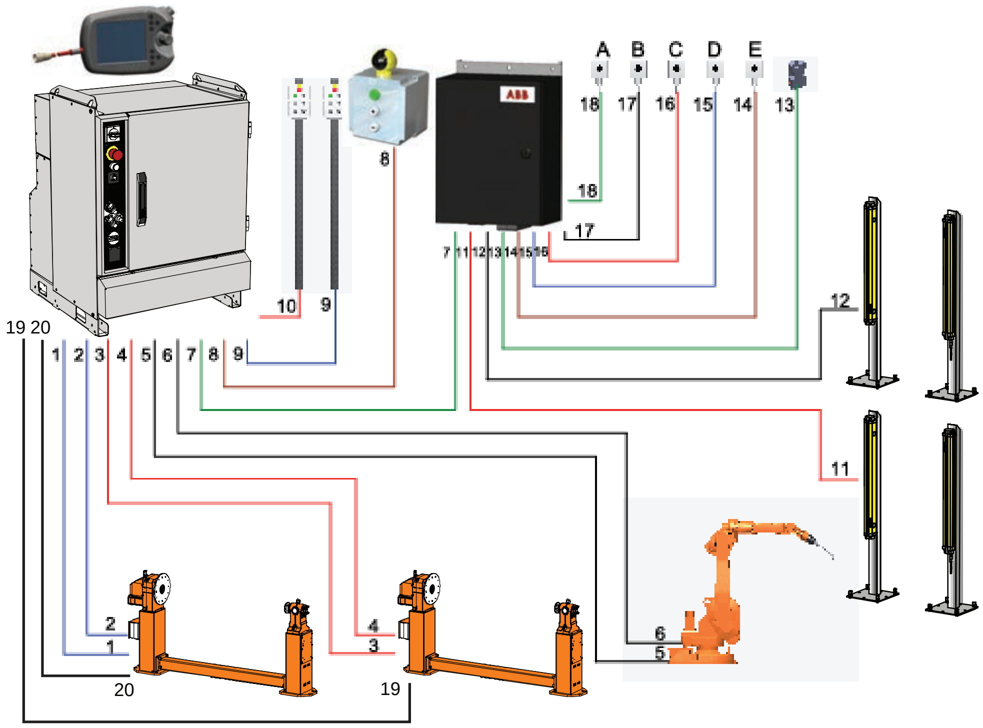
CAUTION

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

Continues on next page

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

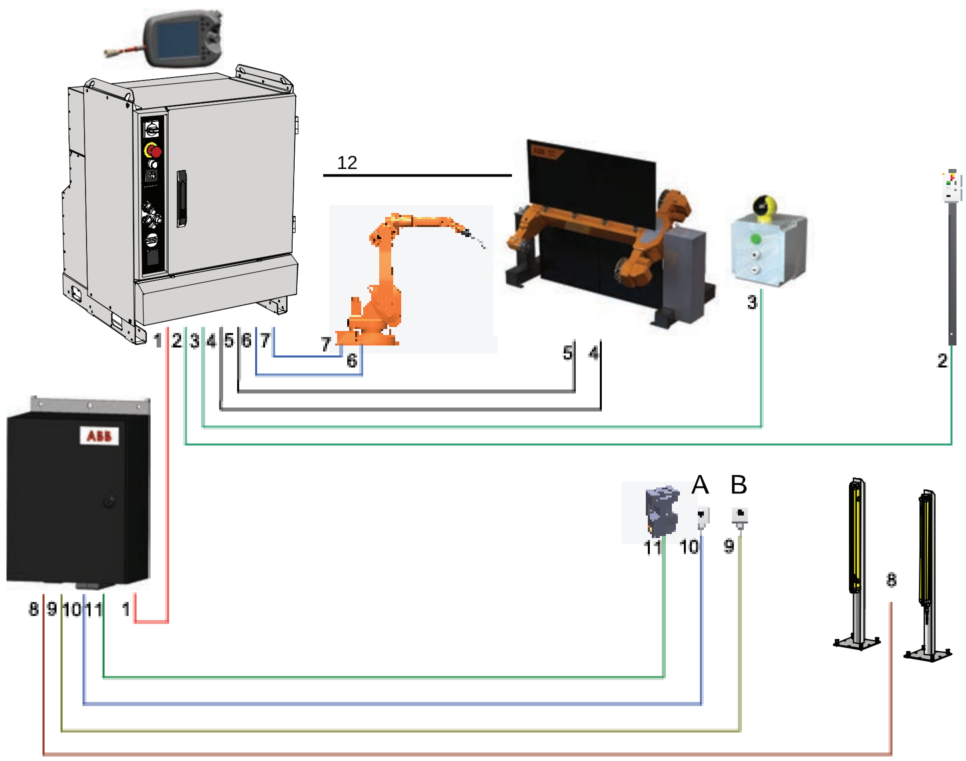
Cables shown in figure IRBP A/L

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
9	Cable CAN bus + cable operator panel STN1	15
10	Cable CAN bus + cable operator panel STN2	15

Continues on next page

Pos	Connector	Length (m)
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	

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

Continues on next page

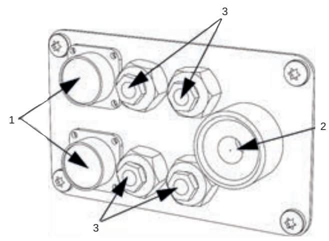
Pos	Connector	Length (m)
2	Cable CAN bus + cable operator panel	15
3	Cable control panel manual jog	15
4	Cable signal IRBP	7/10/15
5	Cable motor IRBP	7/10/15
6	Cable signal robot IRB	7/10/15
7	Cable motor robot IRB	7/10/15
8	Cable light beam	15
9	Cable pre-reset	7
10	Cable external reset push button,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

3.6.2 Electrical assembly IRBP

Connections

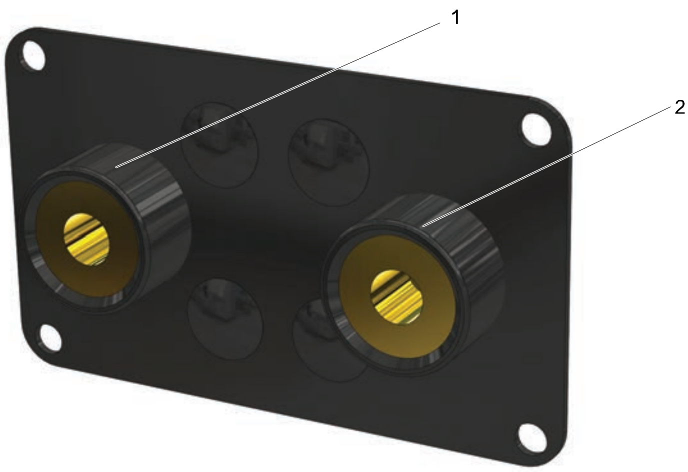
Positioner types A/B/C/D/K/R

Connection of the signals/media is made through the connection flanges.

<table>
<tr><th></th><th>Action</th><th>Note</th></tr>
<tr><td>1</td><td>Connect the electrical signals (1).
Suitable plugs are supplied for fitting on the incoming cables. See Circuit diagram.</td><td rowspan="4">

xx1800003051
<table><tr><td>1</td><td>Electrical signals</td></tr><tr><td>2</td><td>Ground connection, weld negative</td></tr><tr><td>3</td><td>Air connection (4 pcs)</td></tr></table></td></tr>
<tr><td>2</td><td>Connect the ground connection (weld negative, (2)). The positioner chassis is to be separated from the system ground; eg cable screen.</td></tr>
<tr><td>3</td><td>Connect the air (3) to the connections.</td></tr>
<tr><td>4</td><td>On the rotary unit, there is a free cable/hose for connection to the fixture.</td></tr>
</table>

Current collectors

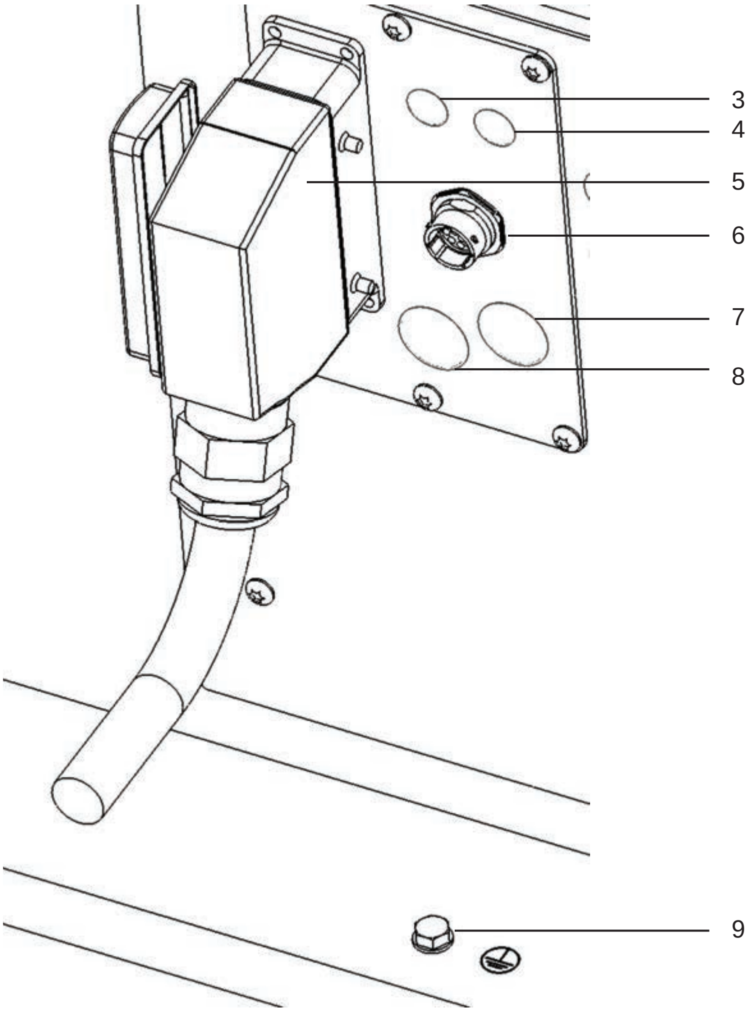


xx0900000990

1	Current collector connection 1
2	Current collector connection 2

Continues on next page

Customer connections

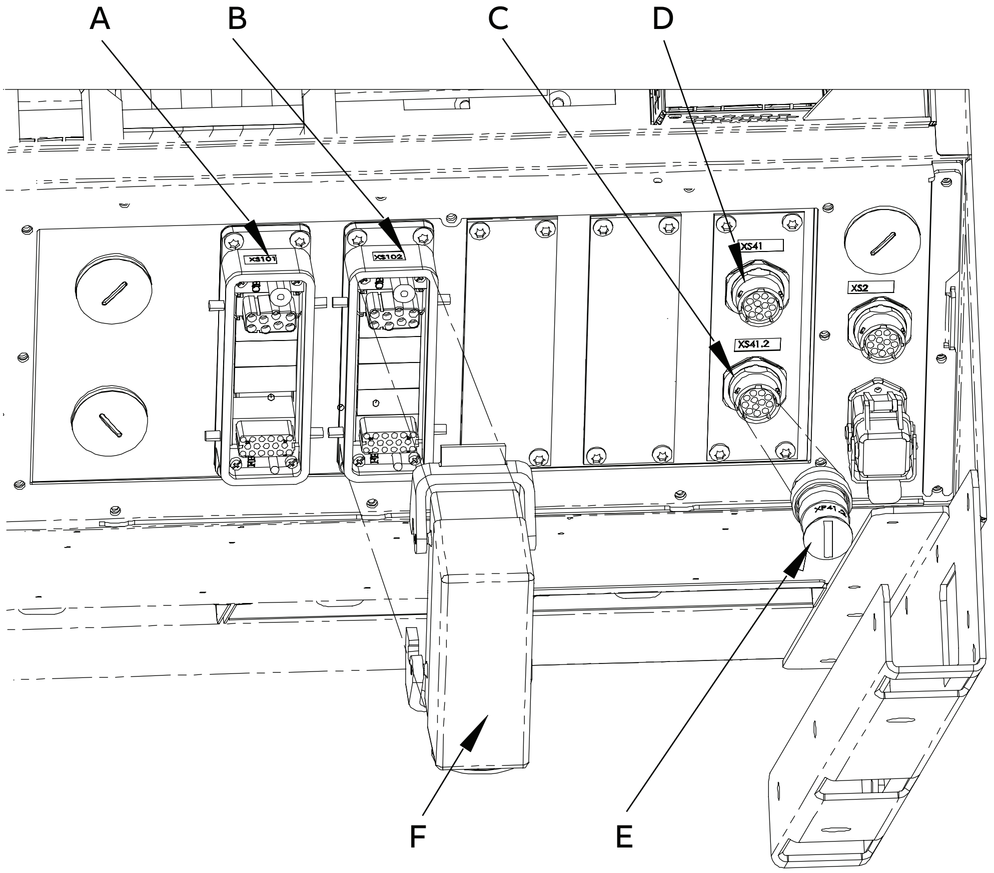


xx1200000067

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

A	XS101	Motor power IRBP 1
B	XS102	Motor power IRBP 2
C	XS41.2	Resolver signals IRBP 2
D	XS41	Resolver signals IRBP 1
E	XP41.2	Jumper connector if only using one IRBP
F		Cover hood if only using one IRBP

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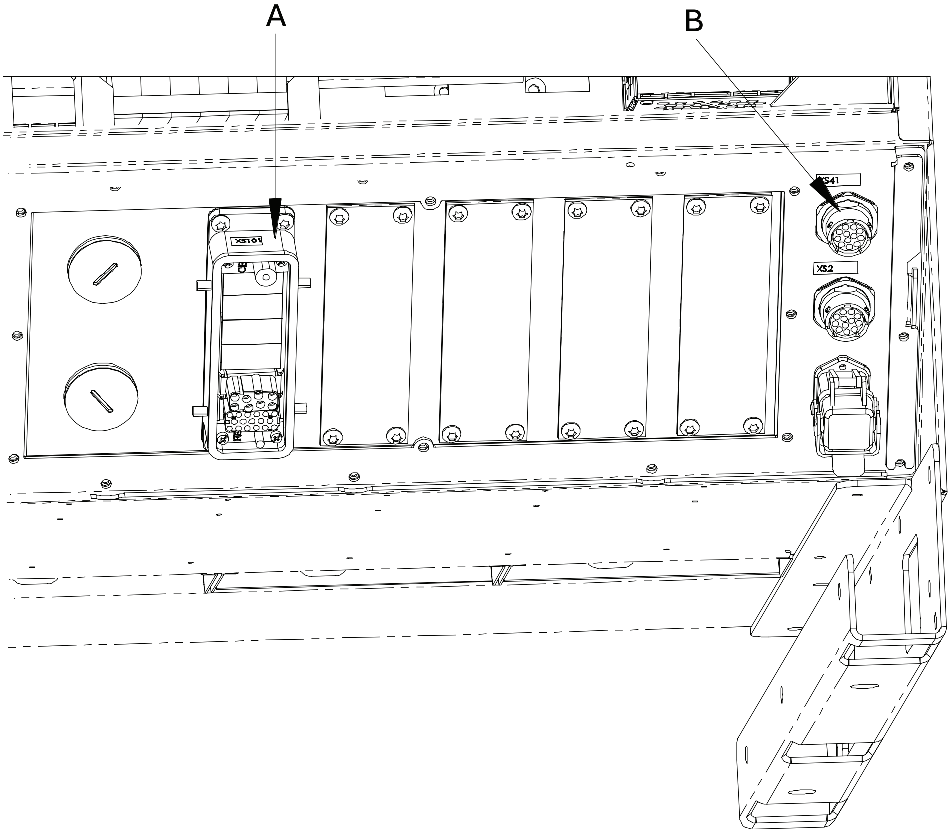
Outputs for positioner C, K, R, B, D



xx0900001005

A	XS 101	Motor power
B	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 doing any work inside the cabinet, disconnect the mains power. For more information, see *Electrical safety on page 29*.

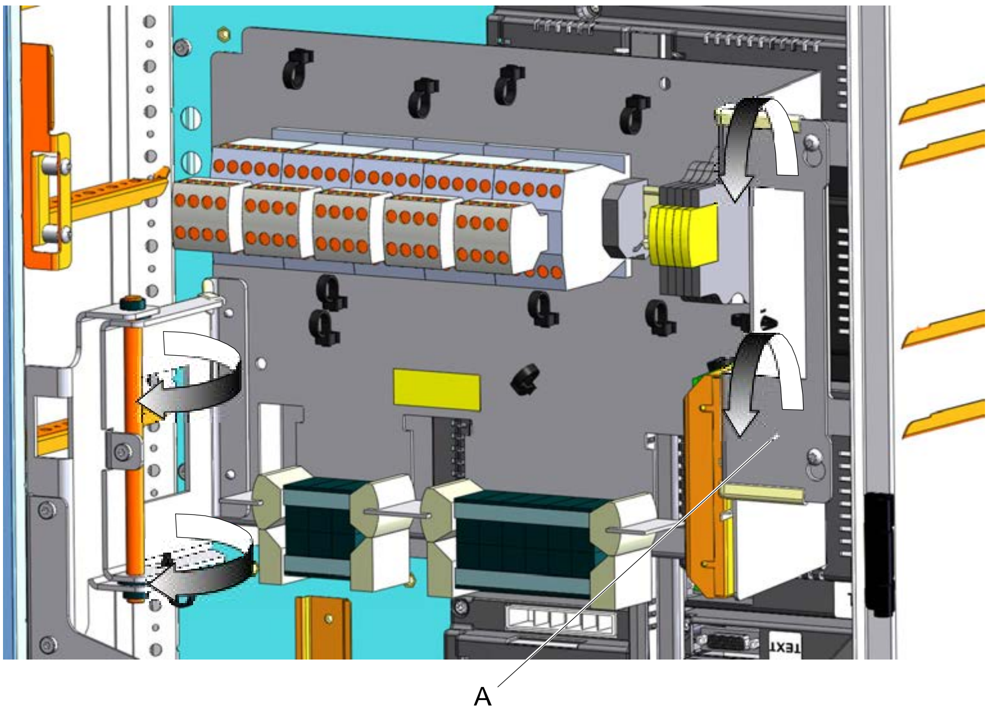
WARNING

The unit is sensitive to ESD. Before handling the unit, see *The unit is sensitive to ESD on page 92*.

Note

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

Opening the pivot frame



xx0900001051

	Action	Information
1	Open the controller cabinet.	
2	Disconnect the cables on the axis selector unit.	

Continues on next page

	Action	Information
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.	

Closing the 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.	

3.6.5 Retrofit an interface to the IRC5 controller

Introduction

The below procedure describes how to retrofit a positioner interface to an IRC5 controller with drive system 09.

Prerequisites

- An IRC5 Single controller drive system 09 with additional drive units.

  The option *Prepared for IRBP (922-1)* is strongly recommended.

  Note

  If the standalone controller was ordered without the option *Prepared for IRBP*, then one mounting rail is missing. One extra rail is delivered with the positioner interface and it is necessary to remove the axis computer and the main drive module to attach the rail.

- The "backbone" harness, *3HAC049197-001 Ext.Axis Brake Harness*, must be installed in the controller.

  Since 2015 all systems with any additional axis are delivered with this new harness. If it is missing the system has to be upgraded before installing the retrofit option.

Part list

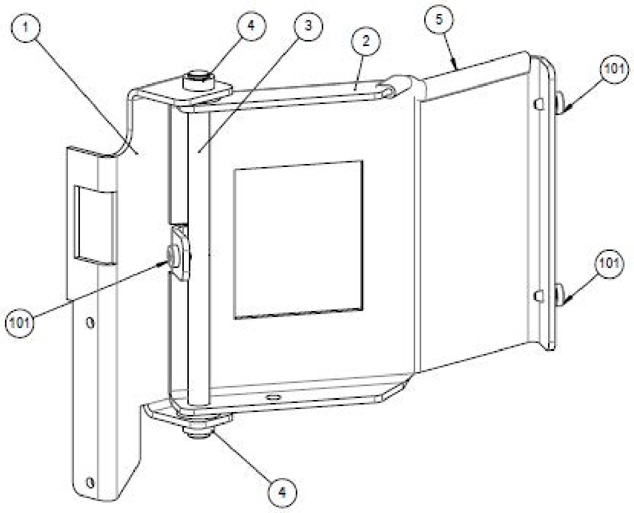
Equipment	Article number	Note
Positioner interface A Drive system 09 Positioner interface B/D Drive system 09 Positioner interface C Drive system 09 Positioner interface K/R Drive system 09 Positioner interface L Drive system 09 Positioner interface 5000L Drive system 09	3HAC057115-004 3HAC057115-005 3HAC057115-009 3HAC057115-008 3HAC057115-006 3HAC057115-007	Standard set for upgrade
Positioner upgrade material set	3HAC058311-001	

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section *Standard toolkit on page 339*.

Continues on next page

Assemble the hinge



xx1600000454

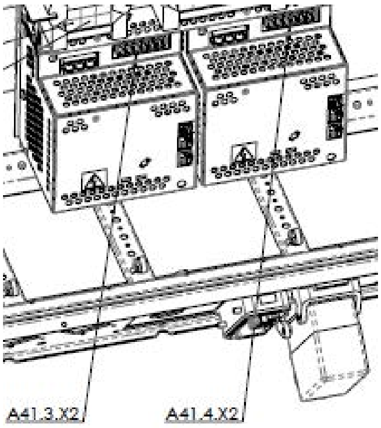
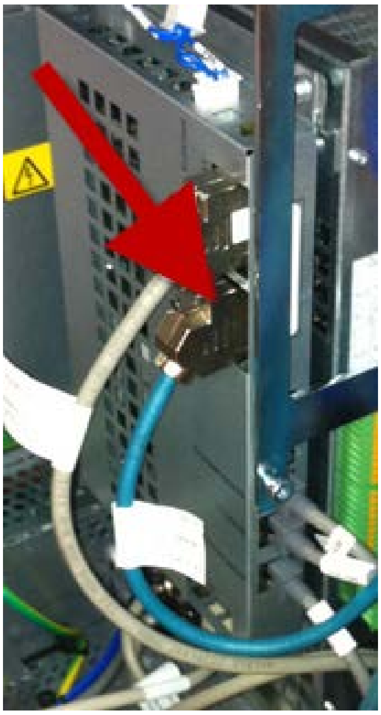
1	Bracket
2	Arm
3	Shaft
4	Plastic bushing
5	Profile
101	Fastite screw

	Action	Note
1	Assemble the plastic bushings in the bracket. **Note** Assemble the bushings from the inside.	 xx1600000455
2	Fit the arm and mount the shaft through the bushings. The bushings are often tight so it is recommended to carefully use a plastic hammer.	
3	Lock the shaft with a screw.	

Continues on next page

	Action	Note
4	Assemble two screws in the rear end of the arm. Do not tighten the screws completely, make sure to leave about 2 mm free space.	

Assemble the interface

	Action	Note
1	Attach the harness drive unit to the additional drive units. **Note** 1, 2 or 3 drive units depending on the type of the positioner.	 xx1600000456
2	Attach the SMB2 cable to the X5 connector on the axis computer.	 xx1600000457

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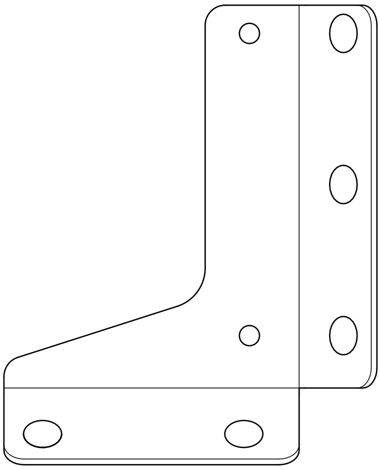
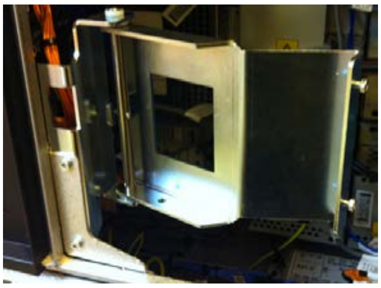
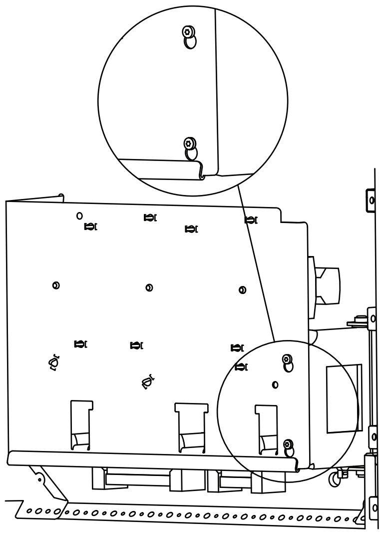
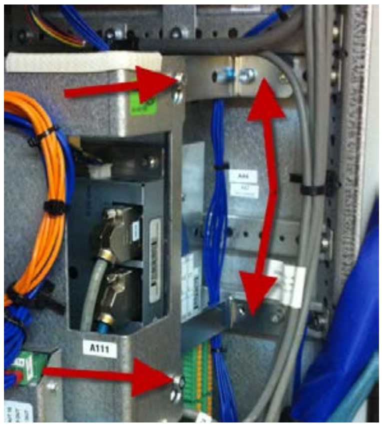
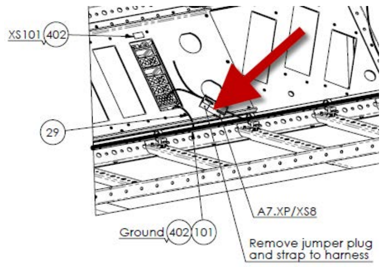
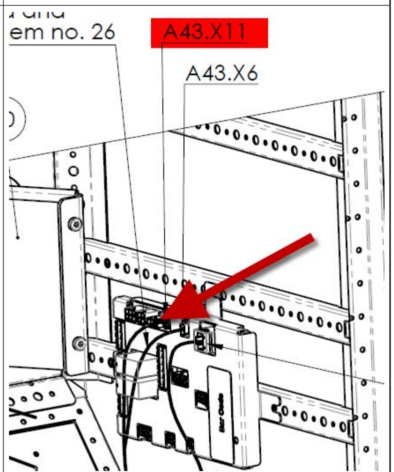
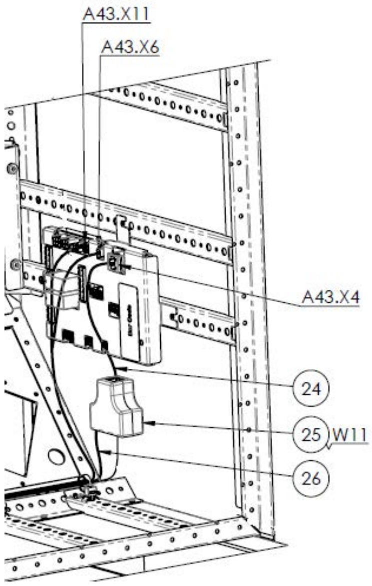
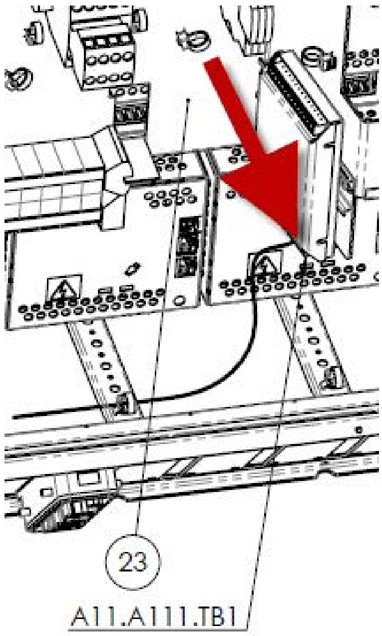
	Action	Note
3	Assemble the attachment plate in the cabinet front left corner.	 xx1700001273
4	Attach the hinge to the attachment plate.	 xx1600000460
5	Attach the axis selector to the hinge.	 xx1700001274

Continues on next page

	Action	Note
6	Fit two screws on the lock bracket and attach it to the mounting rails with four screws. **Note** If the standalone controller was ordered without the option *Prepared for IRBP*, then one mounting rail is missing. One extra rail is delivered with the positioner interface and it is necessary to remove the axis computer and the main drive module to attach the rail.	 xx1600000461
7	Locate the connector A7.XS8 in the signal harness from XS101 and connect it to the existing harness in the bottom of the cabinet.	 xx1600000462
8	Locate the connector A43.XS11 in the signal harness from XS101 and connect it to the contactor board at the left side of the cabinet.	 xx1600000463

Continues on next page

	Action	Note
9	Locate the patch cable (item 24), the 3-way connector W11 (item 25), and the I/O cable (item 26). • Remove the existing cable from A43.X4 and connect it to X2 on W11. • Connect the cable item 24 to A43.X4 and W11. • Remove the existing cable from A43.X6 and connect it to A43.X6.1, included in item 26. • Connect A43.X6 on the cable item 26 to the connector board A43.X6. • Connect the W11.X3 connector on cable item 26 to X3 on the W11 connector.	 xx1600000464 • Item 24: *Cable Patch (3HEA802215-001)* • Item 25: *3-way RJ45 8P/8C shielded MPK402 (3HEA802183-001)* • Item 26: *Cable I/O RS485 (3HEA802201-001)*
10	Attach the connectors X1, X2 and A111.TB1 to the axis selector.	
11	Attach the ground cable from the axis selector to the chassis.	 xx1600000465

3.7 Safety installations

3.7.1 Connections safety equipment

Connections in SC/DC (DM)

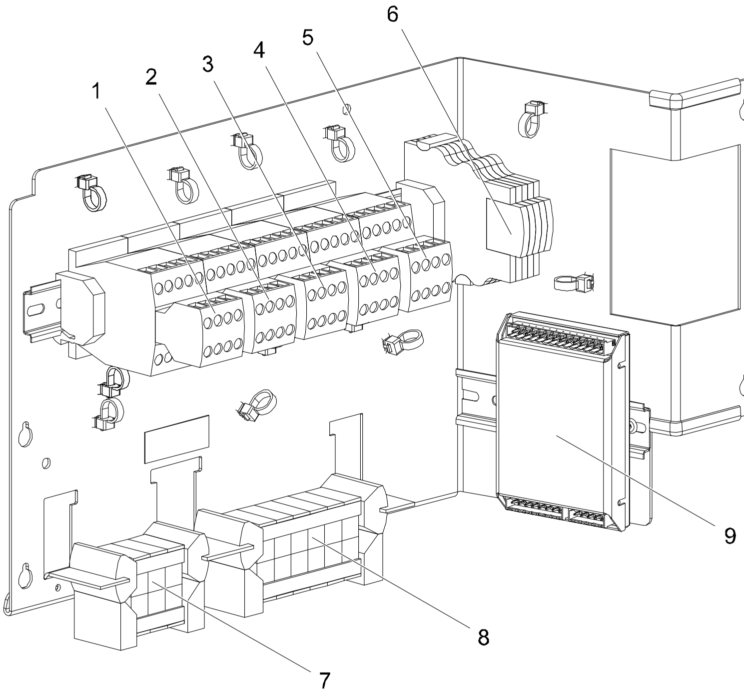
The tables below show the configuration for the specific IRBP, (x) = not used.

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

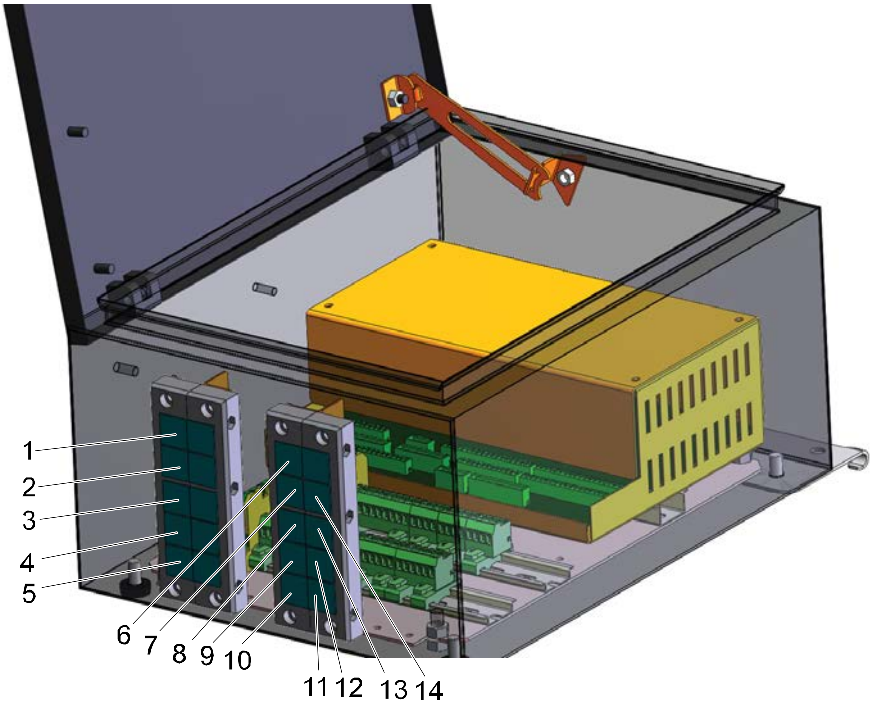
Pos	IRBP A pcs	IRBP B pcs	IRBP C pcs	IRBP D pcs	IRBP K pcs	IRBP R pcs	IRBP L pcs
1	1	1	0	1	1	1	1
2	1	1	0	1	1	1	1
3	1	1	0	1	0	0	0
4	1	1	1	1	1	1	0
5	0	1	0	1	0	0	0
6	4	5	1	5	3	3	2
7	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1

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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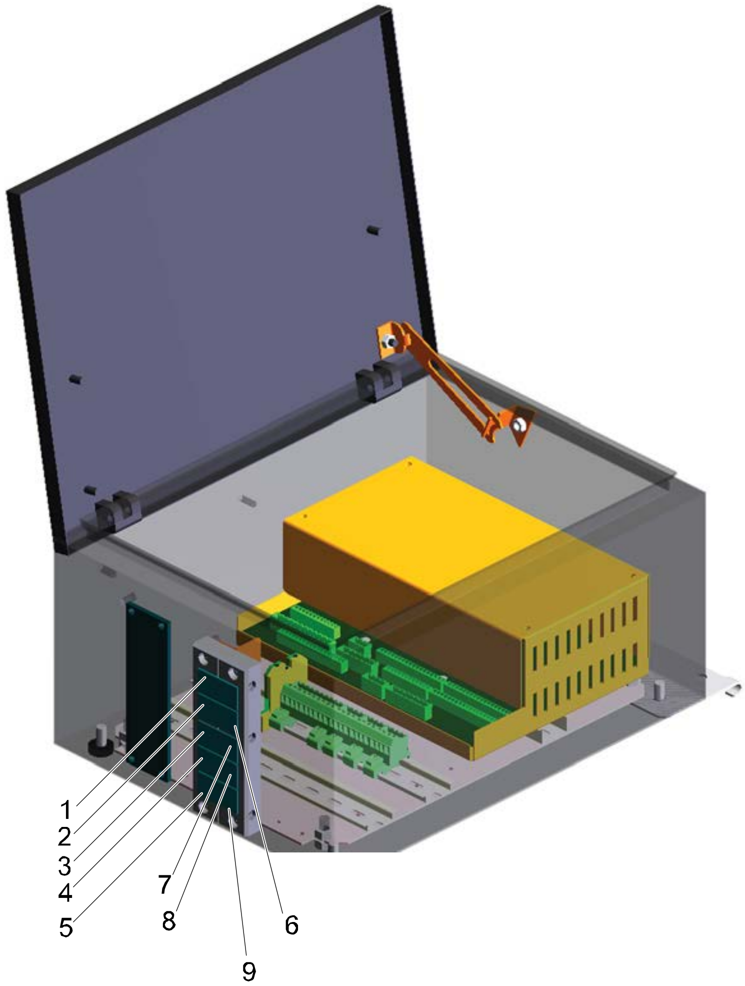
Cable gland B/C/D/K/R



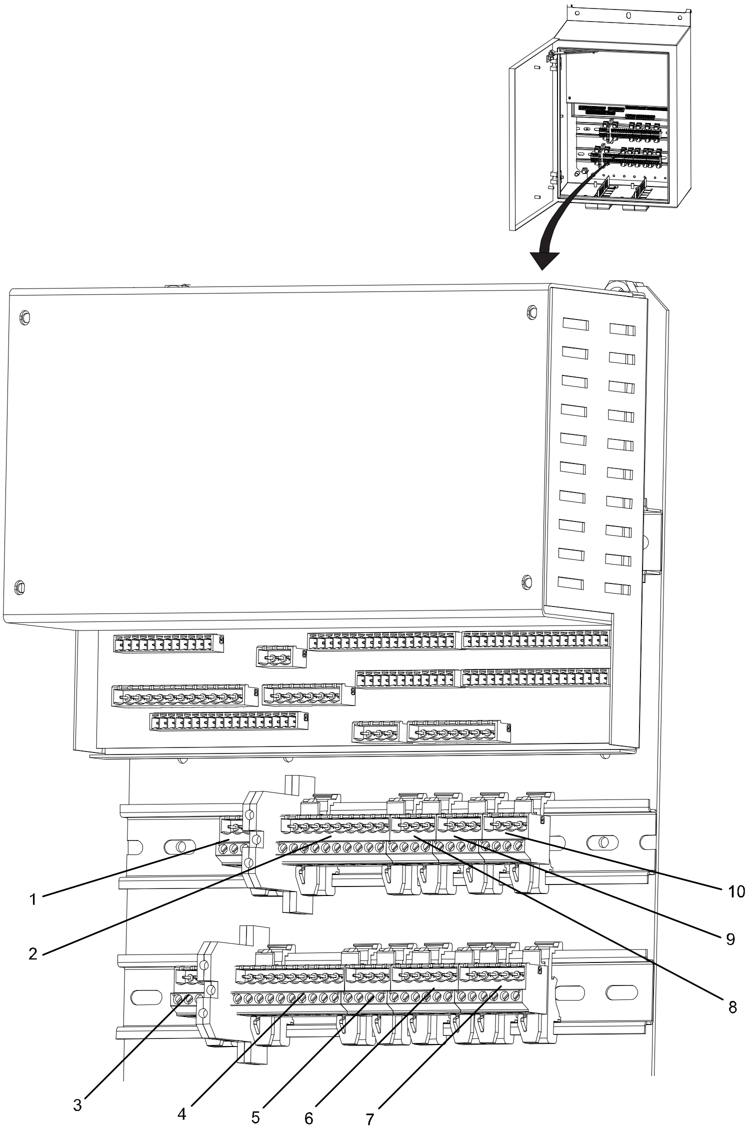
xx1000000114

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.



xx0900001014

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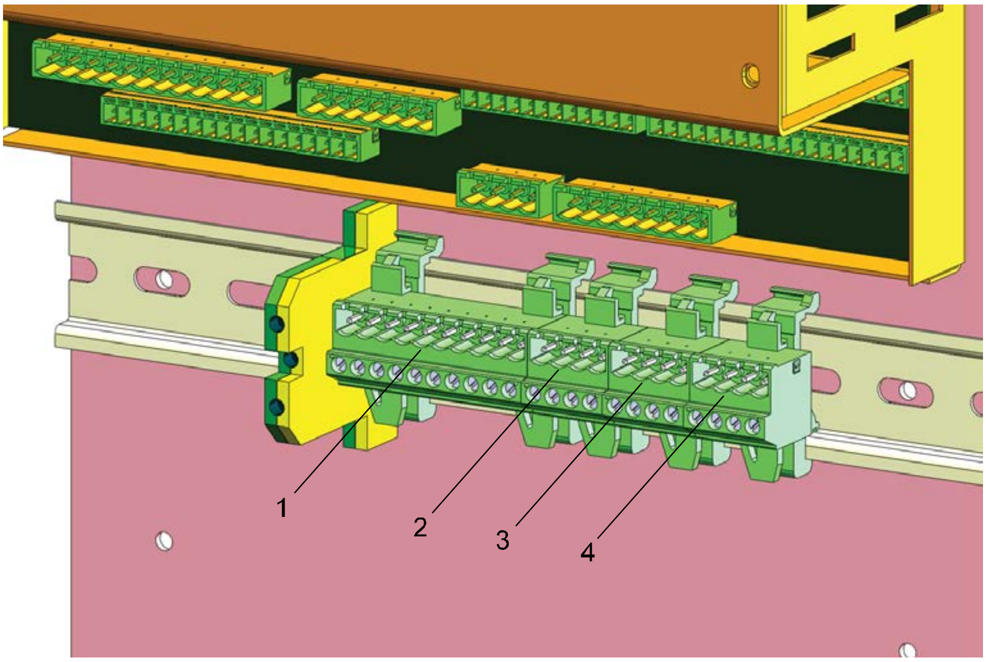
9	Button for gate reset
10	Position indication for robot/travel track

Cable connections B, C, D, K, R



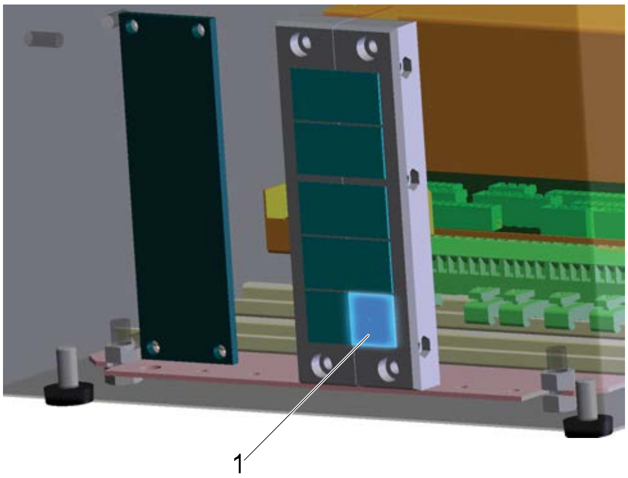
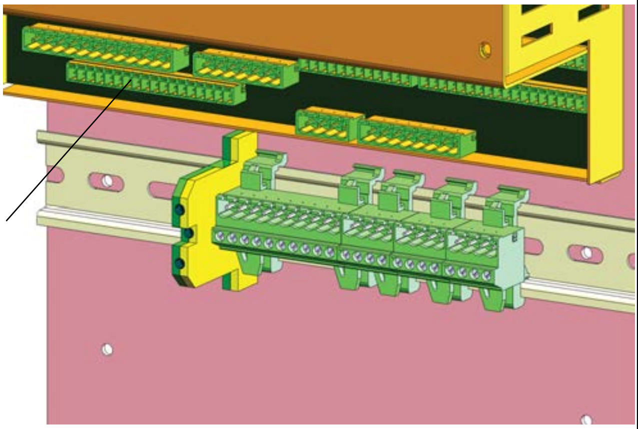
xx0900001015

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

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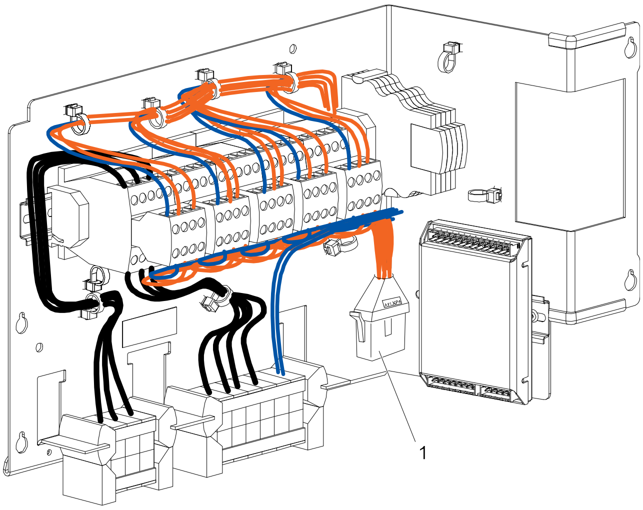
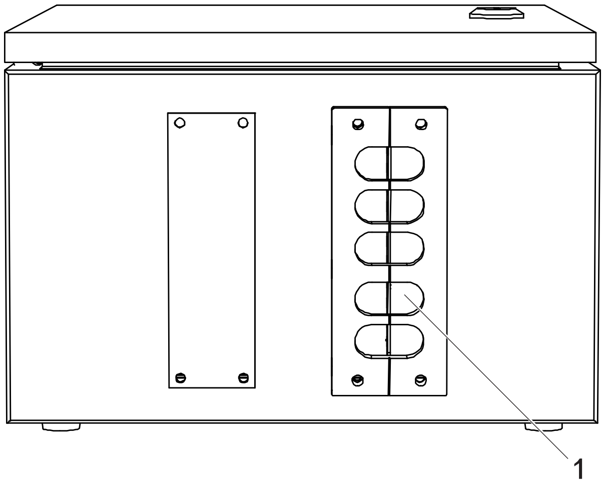
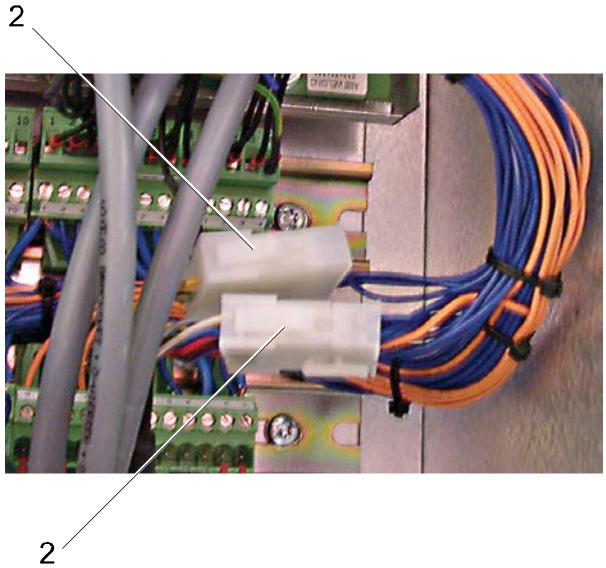
	Action	Illustration
4	Connect the cable to connector A11.X3 or A11.X4 in SCC/DCC (1).	 xx0900001032

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

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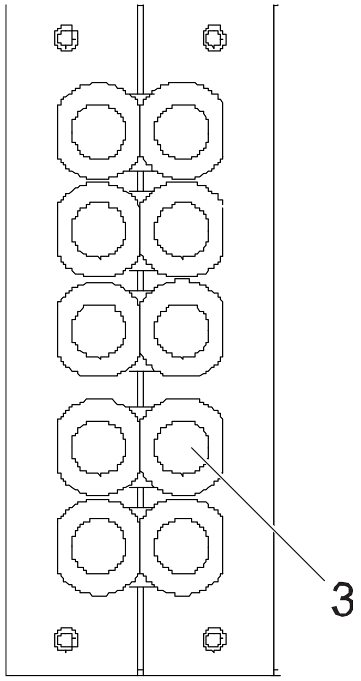
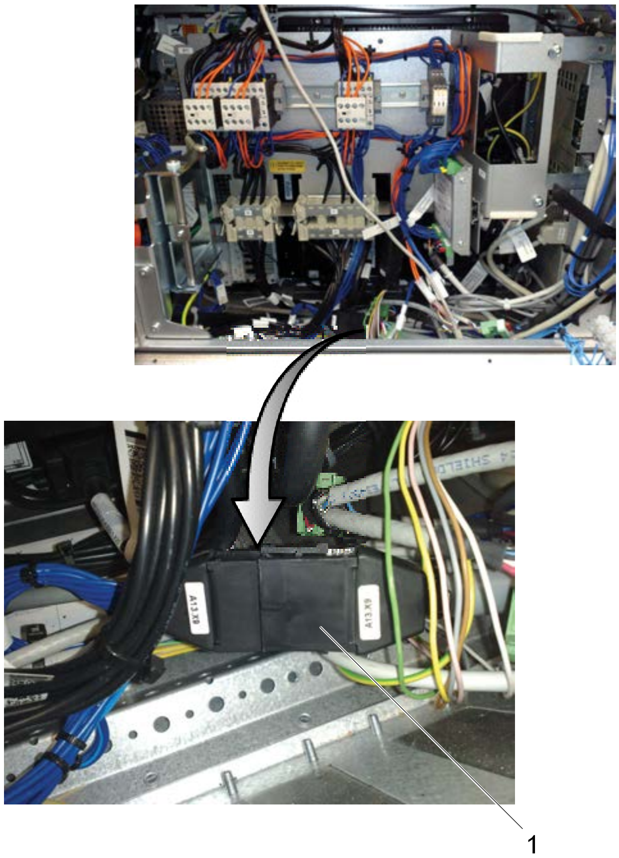
	Action	Illustration
3	Add a cable gland to the separable panel on the SCC or DCC control module (SAFETY SIGNALS) (3).	 xx0900001037
4	Connect the cable to connector A13.X9 in SCC/DCC	 xx0900001039

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.

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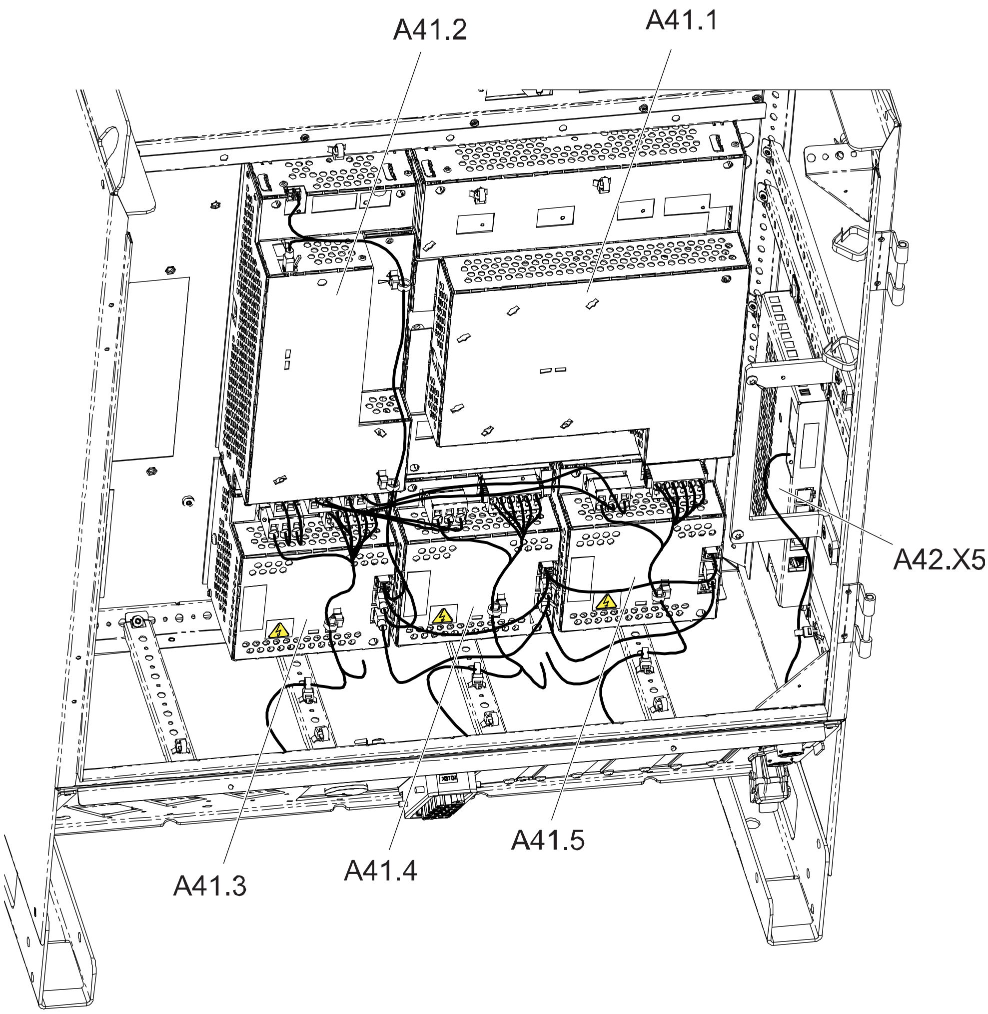

xx1000000044

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.

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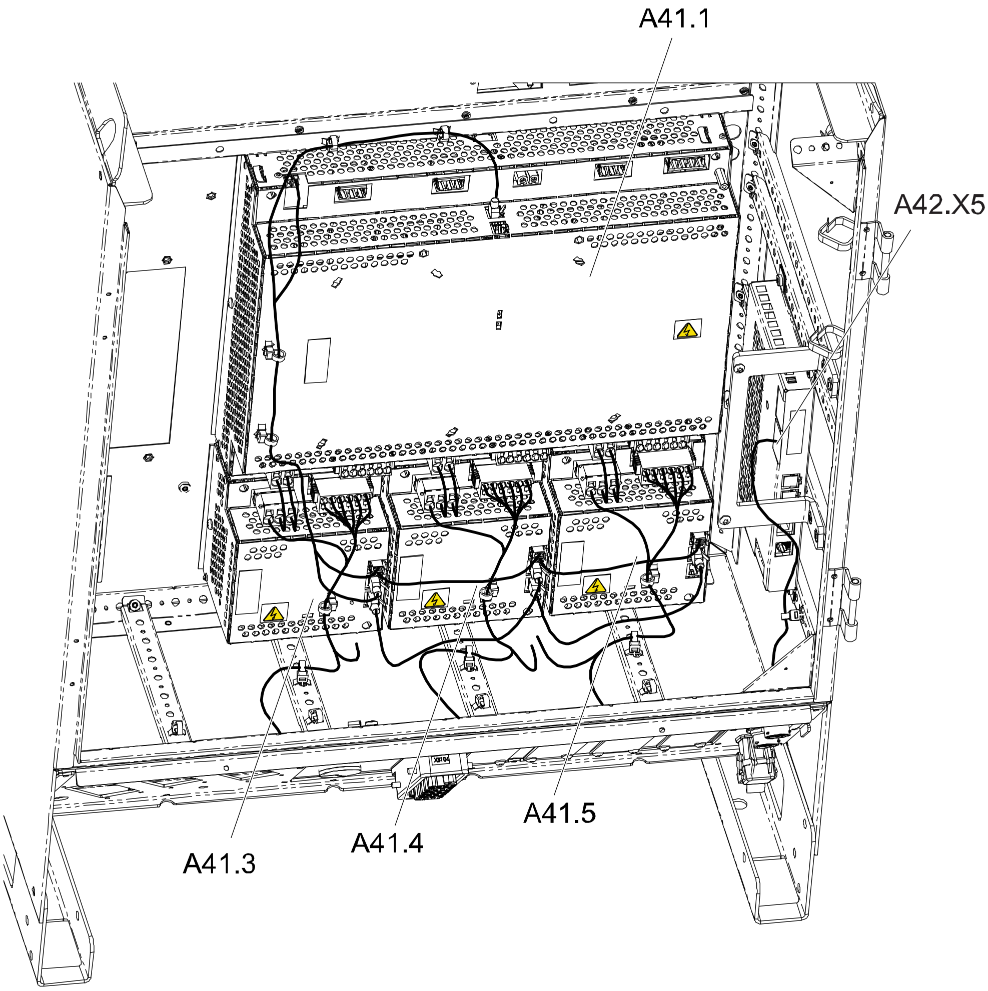


xx1000000045

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

3.7.5 Axis computer

General

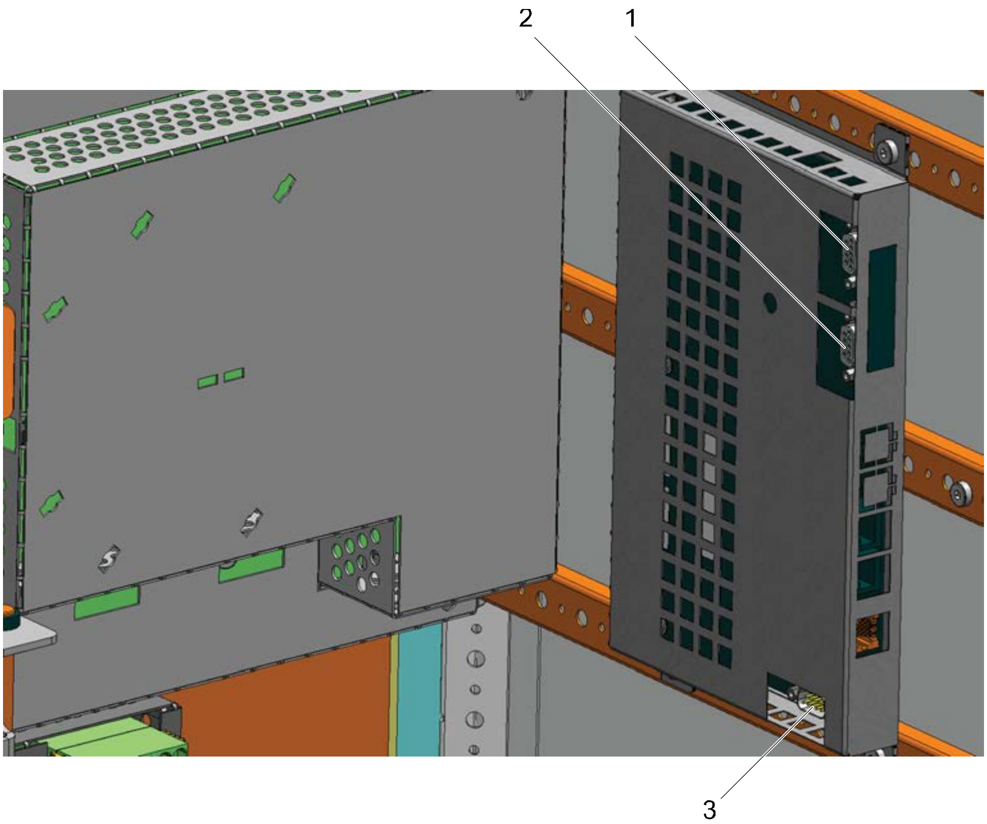
The following figure shows the axis computer with connections.

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



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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 145*.

Note

TYPE B Positioners is supported from RW 6.15.05

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*.

The positioner is delivered with a DVD that contain the system configuration and mediapool. It can also contain some arc welding configuration.

Note

The DVD that contain the system configuration must not be modified in any way. This can result in 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	On the positioner system configuration DVD, unzip the file *<system serial number>.zip* into the RobotStudio mediapool: *...\ABB Industrial IT\Robotics IT\MediaPool* **Note** The folder can also be unzipped elsewhere, but will then need to be located manually in the System Builder wizard.
2	Verify that the folder is created: *...\ABB Industrial IT\Robotics IT\MediaPool\\3HEA-<system serial number>*

Continues on next page

	Action
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 IRC5 robots on page 290*.

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 *RobotWare* and *Positioner* product manifests.
3	In the **Licenses** tab, add the license for RobotWare. The positioner does not require a license.
	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.
4	Complete the Installation Manager wizard.
5	Download the system and restart the controller.
6	Load the necessary system parameters, system modules, and program modules from the backup and restart the controller.
7	Update the revolution counters, see *Updating revolution counters on IRC5 robots on page 290*.

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

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.

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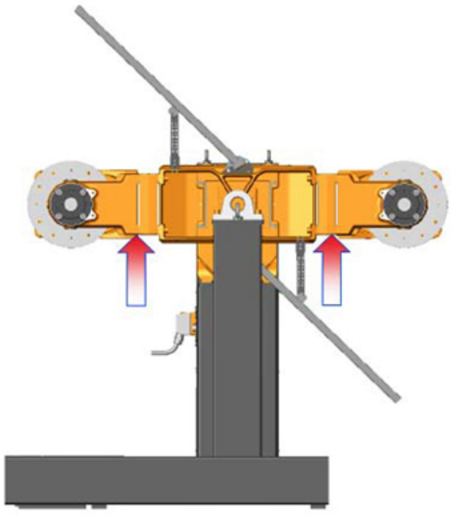

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Brake testing

After installing fixtures, always test the brakes, see *Brake testing on page 36*.

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.

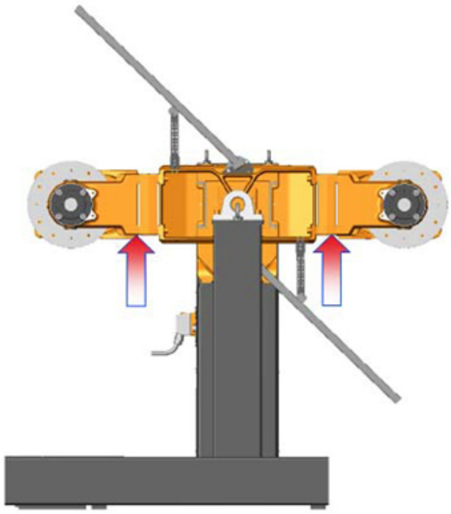
WARNING

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 36*.

3.10 Test run after installation, maintenance, or repair

Safe handling

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

DANGER

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

	Action
1	Remove all tools and foreign objects from the positioner and its working area.
2	Verify that the positioner is properly secured to its position by all screws, before it is powered up.
3	Verify that any safety equipment installed to secure the position or restrict the positioner motion during service activity is removed.
4	Verify that the fixture and work piece are well secured, if applicable.
5	Verify that all safety equipment is installed, as designed for the application.
6	Verify that the brake release tool is in its intended place.
7	Verify that no personnel are inside the safeguarded space before initiating motion. **Note** A positioner may perform unexpected limited movement.
8	The manual mode of operation shall be performed with all persons outside the safeguarded space.
9	Power on/off or rebooting the robot controller shall be performed with all persons outside the safeguarded space.
10	If maintenance or repair has been done, verify the function of the part that was maintained.
11	Always verify the results after calibrating any positioner axis, to verify that all calibration positions are correct.
12	Verify the application in the operating mode manual reduced speed.
13	When programming the movements of the positioner,always identify potential collision risks before initiating motion

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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

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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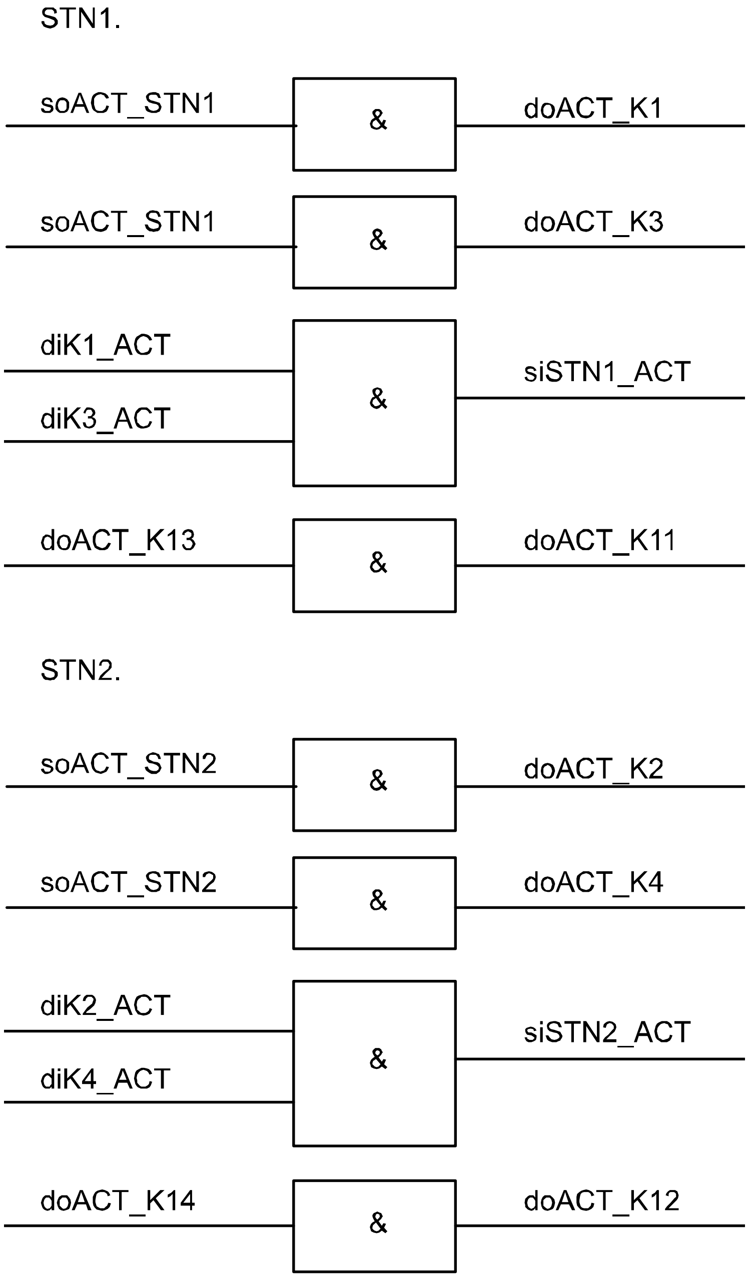
Configuration cross-connections



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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/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	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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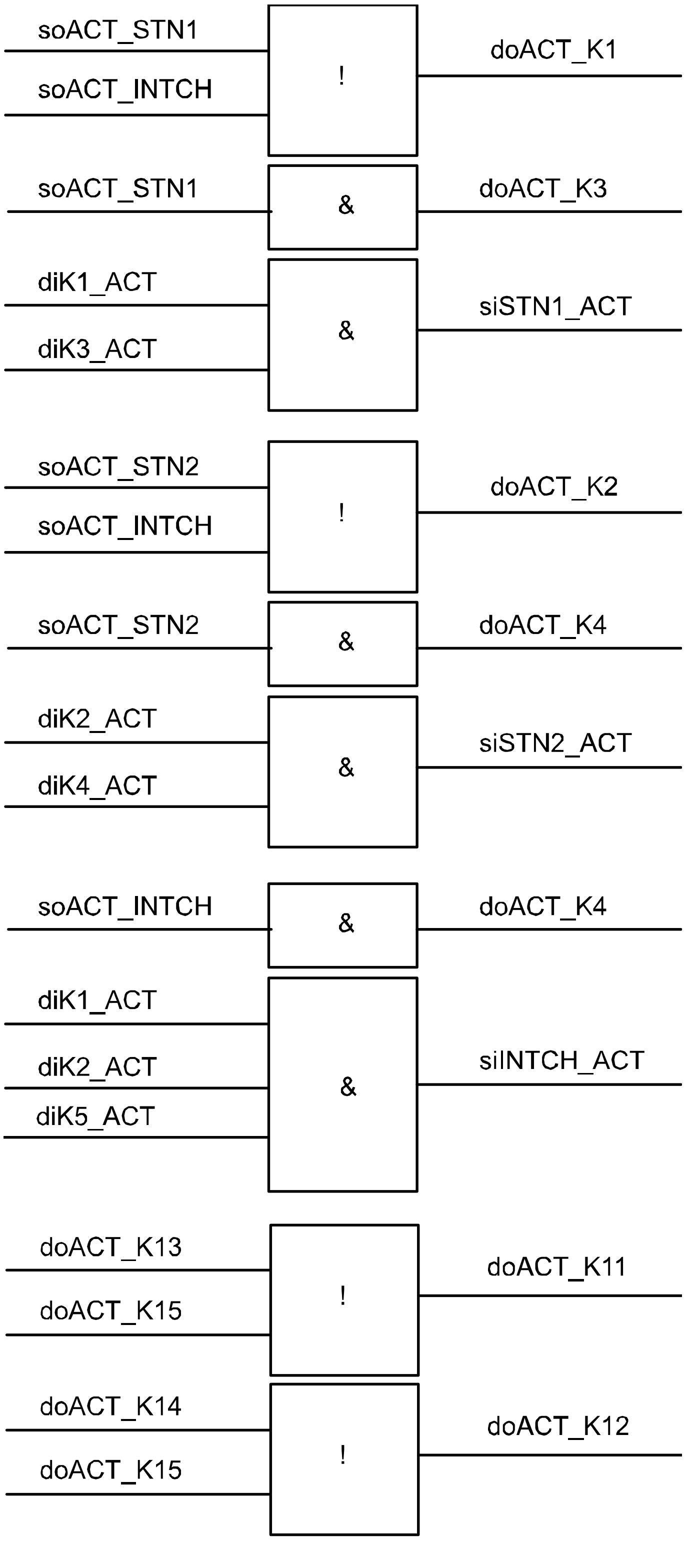
Configuration cross-connections



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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		

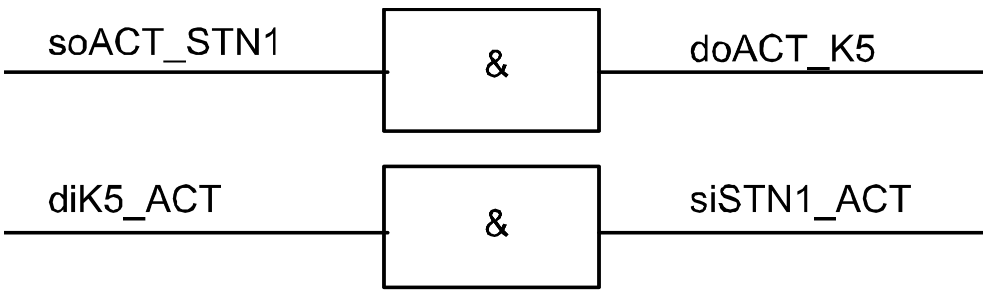
Continues on next page

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 activ-ated	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



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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			

Continues on next page

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		

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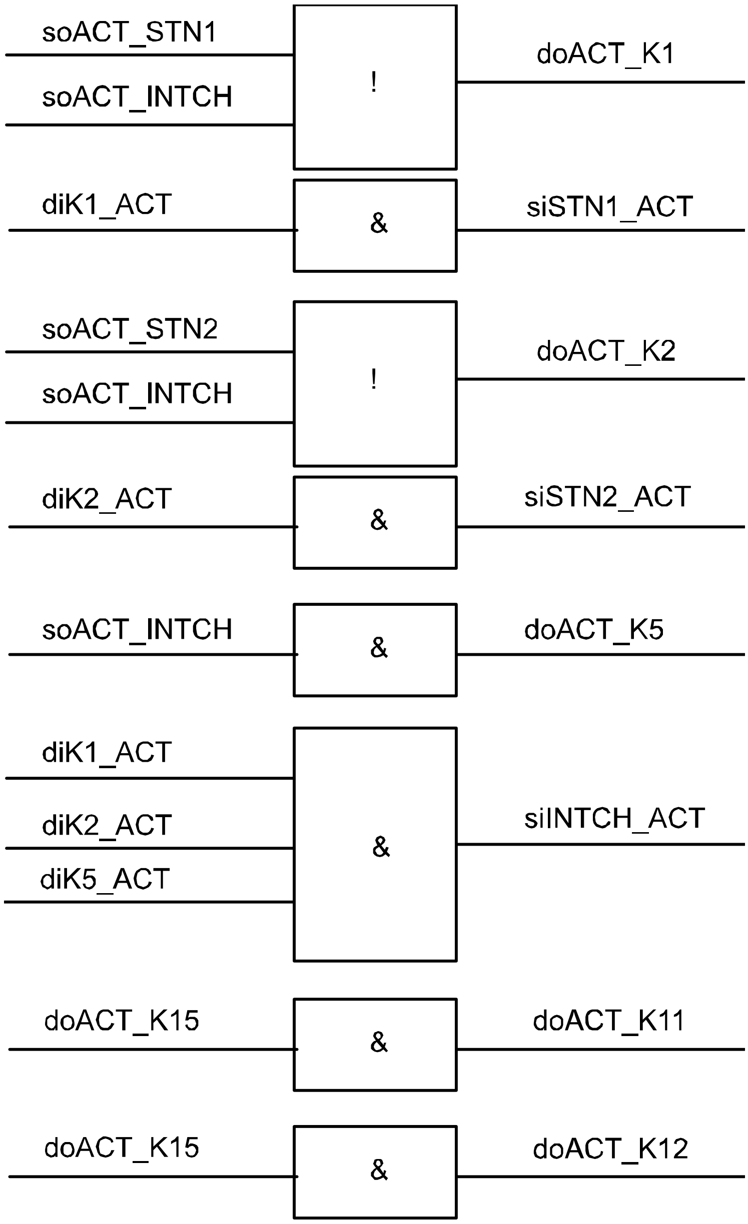
Configuration cross-connections



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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/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			
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			

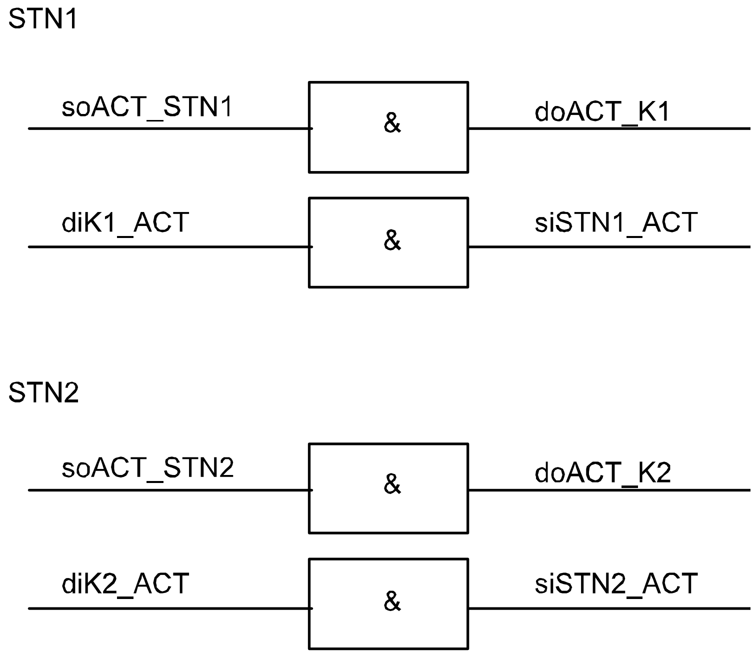
Continues on next page

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



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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/Input	Digital/Output	Analog/Input	Analog/Output
-	B_OP_SIM	Simulated digital 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

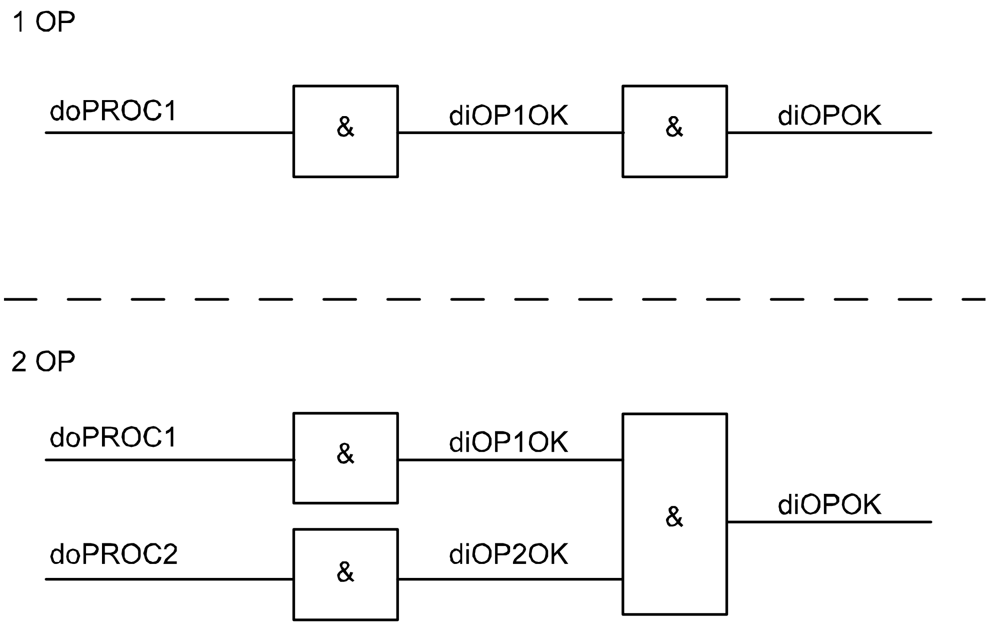
Output	UnitMap	Name	Description
1	0	doPROC1	Operator ready activated on work area 1
2	1	doPROC2	Operator ready activated on work area 2
3	2	doPERM_ENTR1	Permit operator ready on work area 1
4	3	doPERM_ENTR2	Permit operator ready on work area 2

Continues on next page

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



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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 signals 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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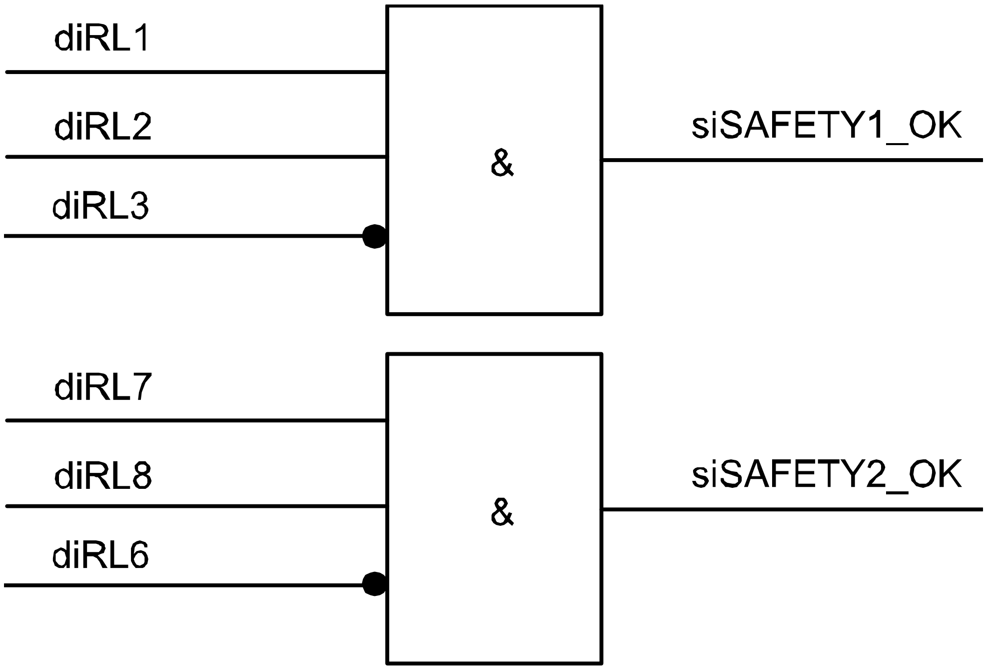
Configuration cross-connections



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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.

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 signals configuration for SIB_V_B1

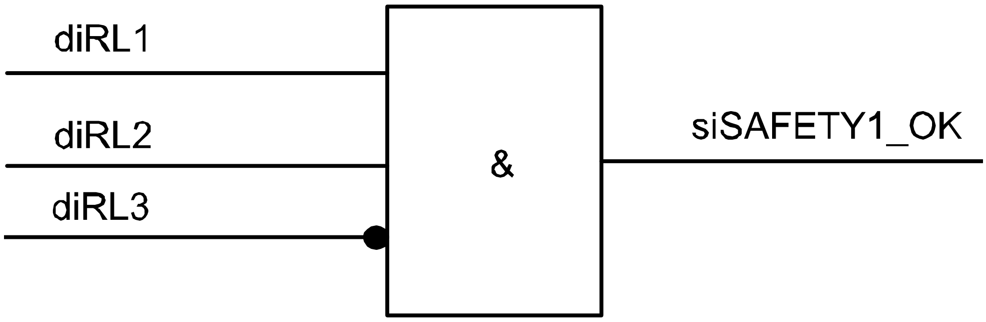
Digital inputs

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	TB31:9, 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

Continues on next page

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



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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.

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

Note

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

For more information see:

- *Product manual - IRC5*
- *Electrical connectors on page 115*.

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.

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

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.

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
Inspection	Rotary gearbox, oil leak	Running
Inspection	Gearbox, oil test **Note** This test is valid only for Rotary unit MTE.	20,000h [i]
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 [ii]
Replacement	Battery pack, measurement system of type RMU101 or RMU102 (3-pole battery contact)	36 months or battery low alert [iii]

i If the oil sample is approved after 20,000 hours, continue for another 20,000 hours. Change the oil if the oil sample is not approved.

ii 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.

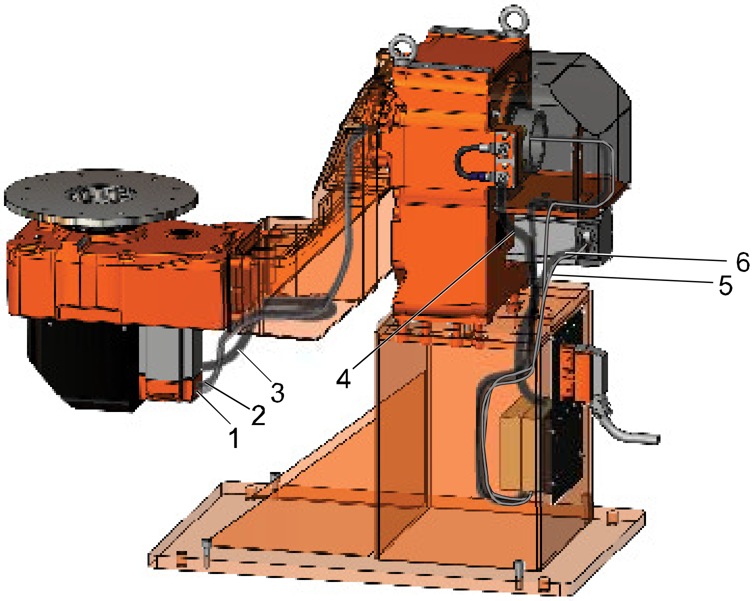
iii The battery low alert (38213 **Battery charge low**) is displayed when the battery needs to be replaced. The recommendation to avoid an unsynchronized robot is to keep the power to the controller turned on until the battery is to be replaced.

See the replacement instruction for more details.

5.4 Inspection activities

5.4.1 Inspection, cables

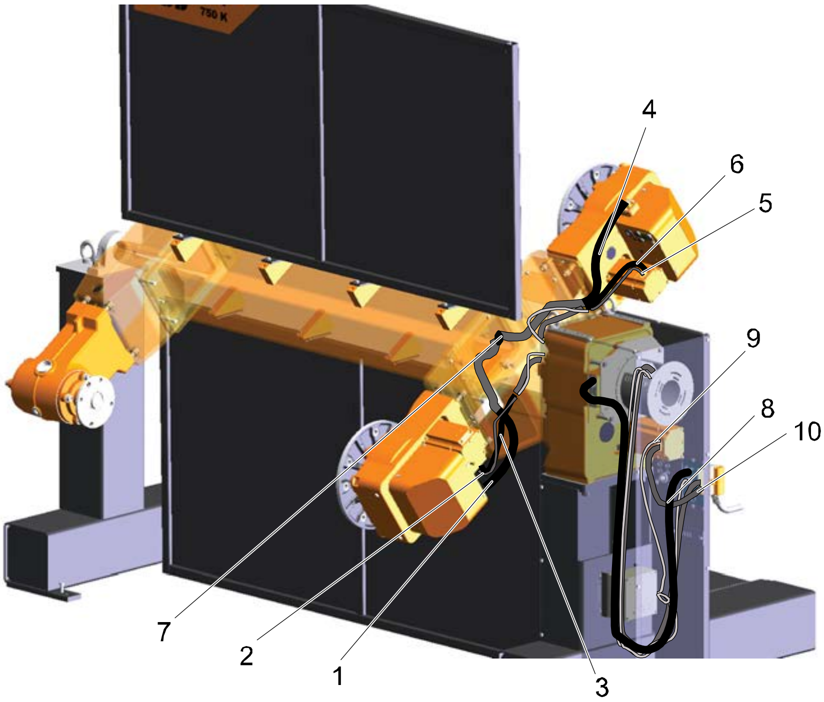
Location



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

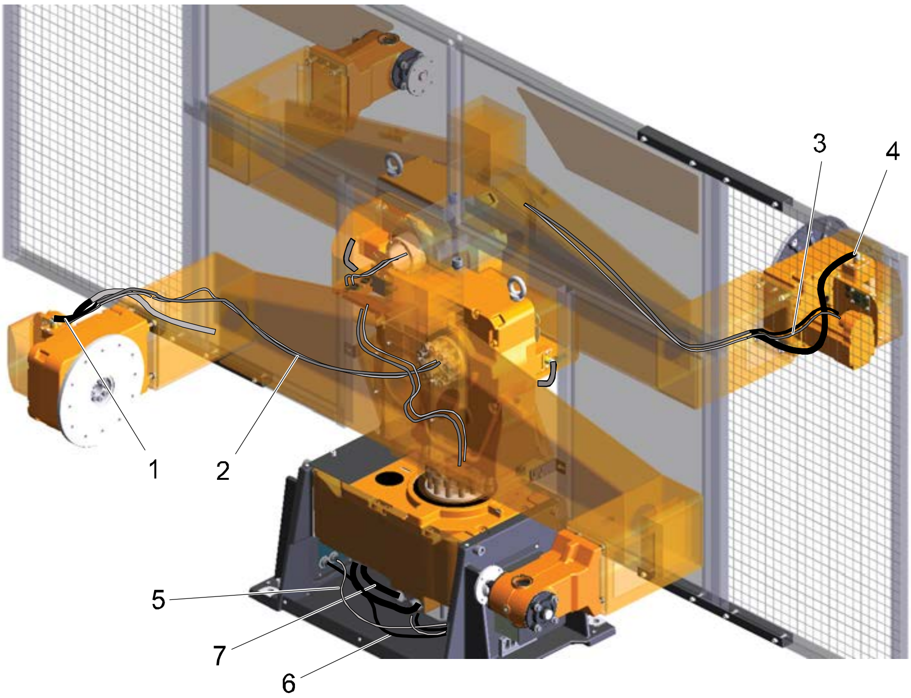
Continues on next page



xx0900001062

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

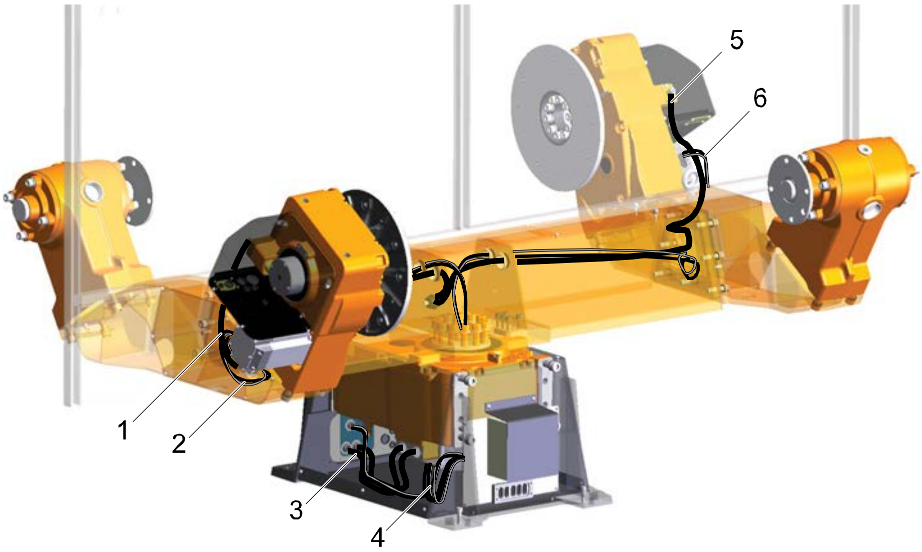
Continues on next page



xx0900001065

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

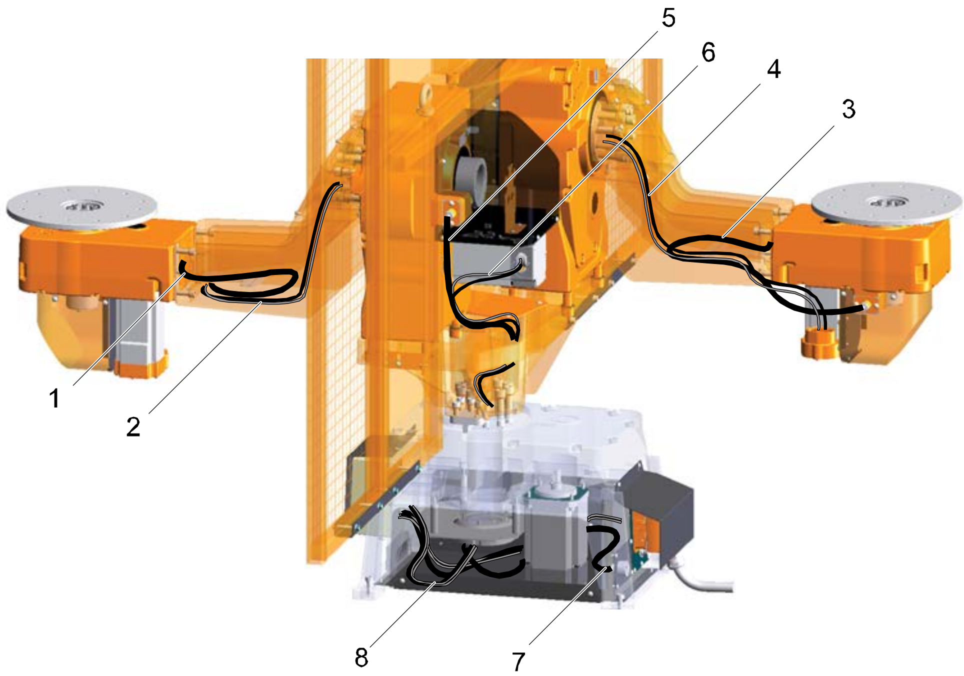
Continues on next page



xx1000000010

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



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	Current collector rotary unit 2
6	SMB signals axis 2/ Motor power axis 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 Inspecting, weld return path

General

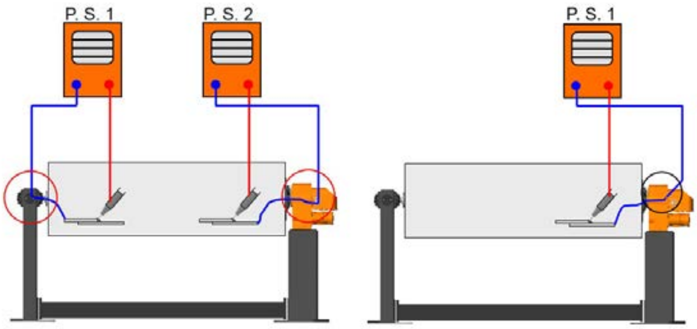
Make an overall visual inspection of weld return path all the way from welding fixture to welding power source. There must be proper contact between fixture and welding power source. Lack of above might lead to a situation when welding current can bypass normal path and pass though e.g. gearbox or support collar bearings reducing bearing or gearbox life time.

ELECTRICAL SHOCK

An inadequate contact between the current collector and the shaft may result in stray welding currents can pass through the earthing and lead to dangerous situations that can result in serious personal injury, damage to the control unit or other safety risks.

Location

Welding equipment connected to a positioner with one and a second current collector.



xx2300001345

Note

Current from one weld circuit is transferred through the current collector in the gearbox.

Two seperated weld circuits gives less risk for interference.

Required tools and equipment

Equipment	Article number	Note
Multimeter	-	-

Inspection procedure

	Action	Note
1	Check current collector.	See section *Inspection, support collar current collector on page 185*

Continues on next page

	Action	Note
2	Check weld return cable. Is intact, connection between cable and current collector is tight. Bayonet connector is tight at positioner foot and at welding power source side.	
3	Check weld return cable is intact.	
4	Check that the connection between cable and current collector is tight.	
5	Check that the bayonet connector is tight at positioner foot and at welding power source side.	

5.4.3 Inspection, rotary unit current collector

DANGER

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

See also *Safety on page 17*.

General

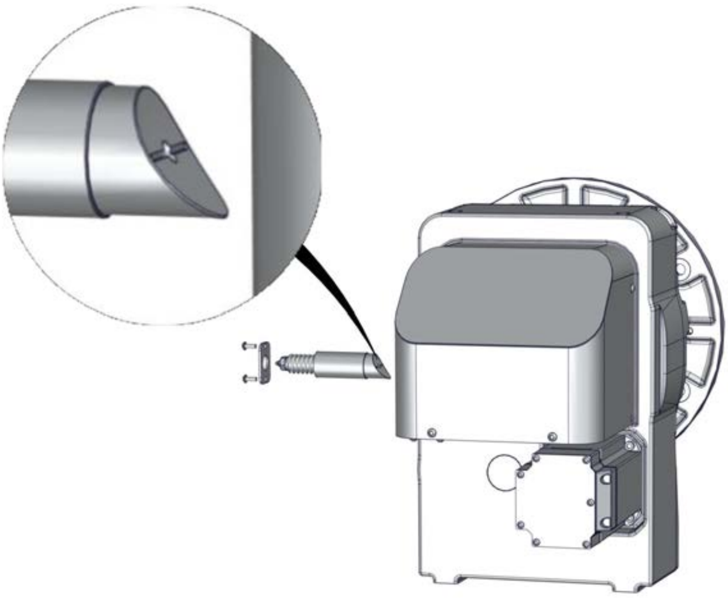
The function of the current collector is to transfer the weld current through the rotary unit. The contact bar needs to be check for damage caused by sparking during welding start after approximately 1000 hours of operation.

To ensure a good contact between the current collector and the shaft, the surface of the current collector must be thoroughly cleaned and lubricated according to *Lubricating the current collector on page 193*.

ELECTRICAL SHOCK

An inadequate contact between the current collector and the shaft may result in stray welding currents can pass through the earthing and lead to dangerous situations that can result in serious personal injury, damage to the control unit or other safety risks.

Location MTD



xx2300001343

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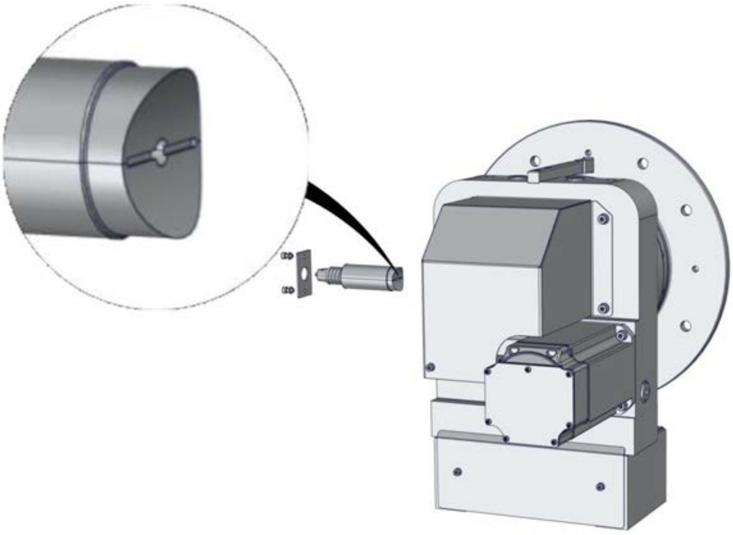
Location MTE



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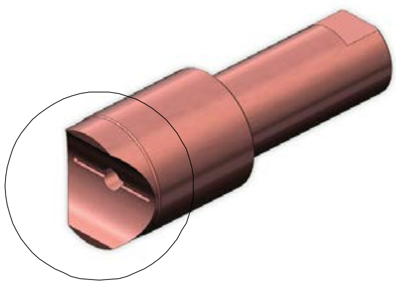
Inspection procedure

	Action	Info
1	Remove the Current Collector cable.	
2	Remove the Current Collector.	Open key 46 mm
3	Check the collector surface for damage.	 xx1000000113
4	For assemble see *Replacing support collar axis on page 249*.	

5.4.4 Inspection, support collar current collector

DANGER

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

See also *Safety on page 17*.

General

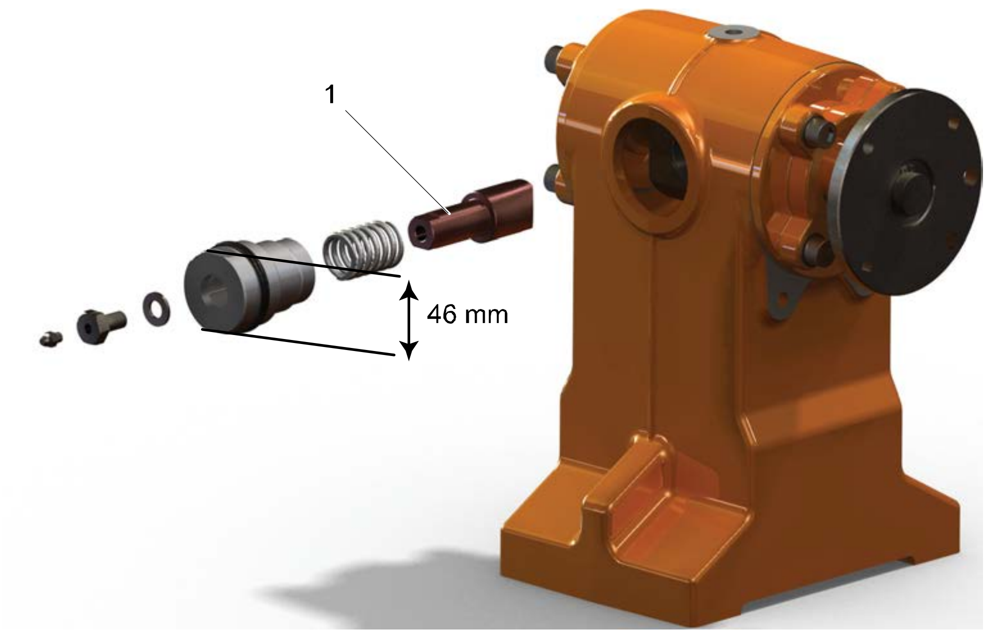
The function of the current collector is to transfer the weld current through the support collar. The contact bar needs to be check for damage caused by sparking during welding start after approximately 1000 hours of operation.

To ensure a good contact between the current collector and the shaft, the surface of the current collector must be thoroughly cleaned and lubricated according to *Lubricating the current collector on page 193*.

ELECTRICAL SHOCK

An inadequate contact between the current collector and the shaft may result in stray welding currents can pass through the earthing and lead to dangerous situations that can result in serious personal injury, damage to the control unit or other safety risks.

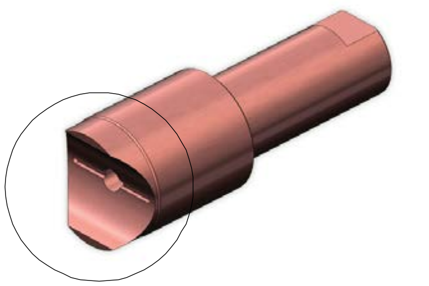
Inspection procedure



xx1000000043

1	Current Collector

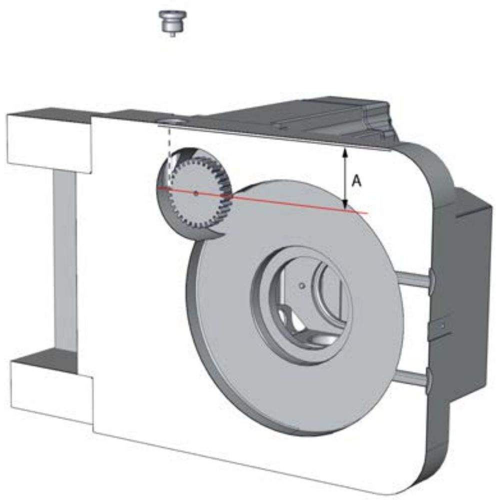
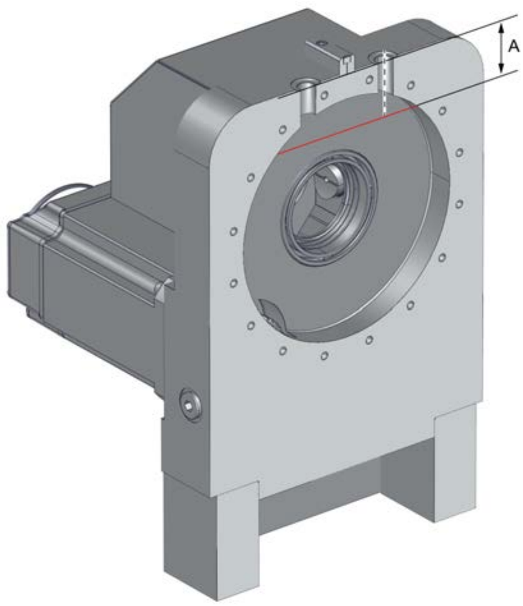
Continues on next page

	Action	Information
1	Remove the Current Collector cable.	
2	Remove the Current Collector.	Open key 46 mm
3	Check the collector surface for damage.	 xx1000000113
4	For assemble see *Replacing support collar axis on page 249*.	

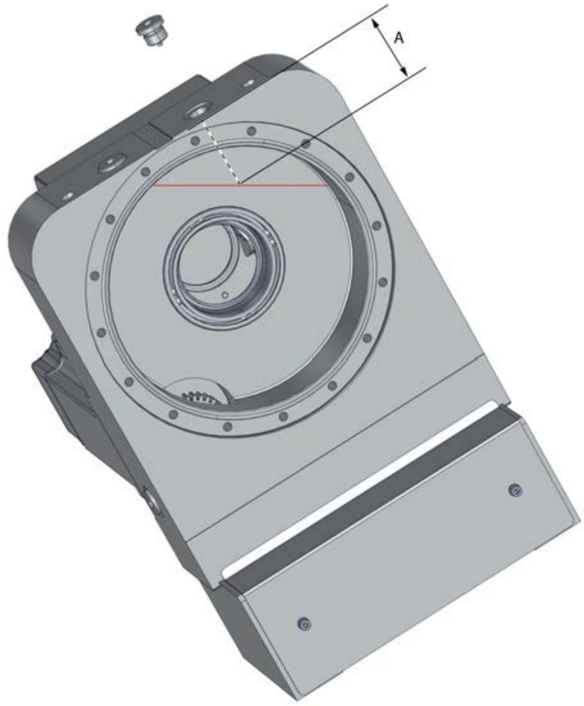
5.4.5 Inspecting the oil level in gearbox, MTE Rotary unit

Oil levels

This section provides oil levels for the different variants of positioners.

Action	Info
 xx2300001477	**IRBP-A-500/750** **IRBP-B-500/750** Rotate Arm to 90°, Oil level, Pos A: 46 ± 10 mm below the sealing surface of the oil plug.
 xx2300001338	**IRBP L-600/1000** Oil level, Pos A: 55 ± 10 mm below the sealing surface of the oil plug.

Continues on next page

Action	Info
xx2300001478	**IRBP R-600/1000** Oil level, Pos A: 67 ± 10 mm below the sealing surface of the oil plug. **IRBP K-600/1000 Diameter 1200 mm** Oil level, Pos A: 48 ± 10 mm below the sealing surface of the oil plug. **IRBP K-600/1000 Diameter 1400 mm** Oil level, Pos A: 62 ± 10 mm below the sealing surface of the oil plug.

Inspection procedure

	Action	Info
1	Measure the oil level from the sealing surface of the oil plug hole.	

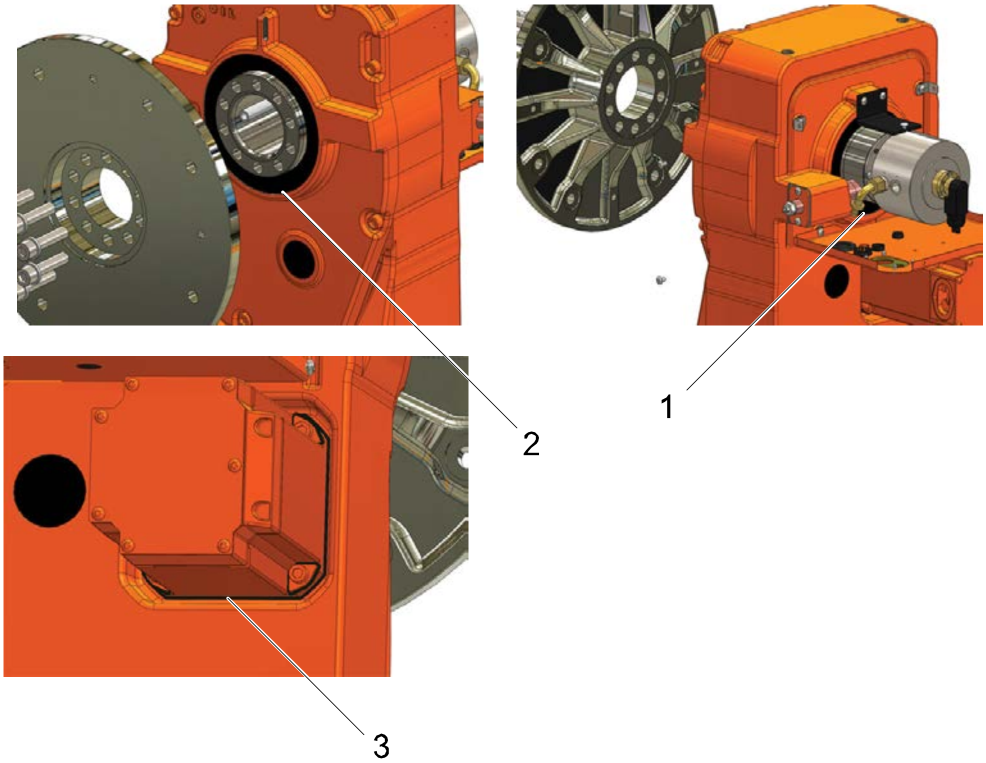
5.4.6 Inspection, gearbox oil leak

DANGER

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

See also *Safety on page 17*.

Location MTD

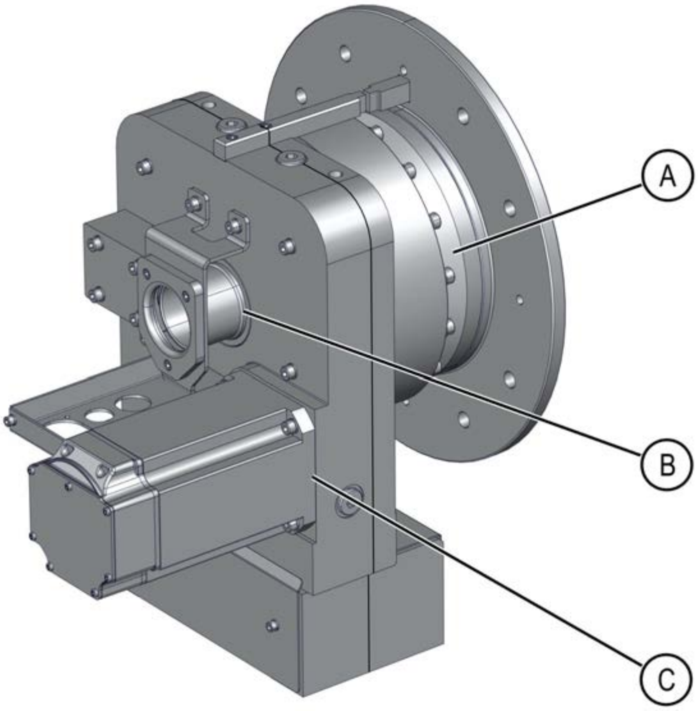


xx1000000250

1	Axis sealing
2	Axis sealing
3	Motor sealing

Continues on next page

Location MTE



xx2300001202

A	Area between gearbox and turning disk
B	Axis sealing
C	Area around the motor

Inspection procedure

	Action	Information
1	Check all sealing areas for oil leak.	

5.5 Cleaning activities

5.5.1 Cleaning the IRBP

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded 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 product 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 176*.
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.

Special cleaning considerations

This section specifies some special considerations when cleaning the robot.

- Always use cleaning equipment as specified. Any other cleaning equipment may shorten the life of the robot.
- Always check that all protective covers are fitted to the robot before cleaning.
- Do not use compressed air to clean the robot.
- Never use solvents that are not approved by ABB to clean the robot.
- Do not spray from a distance closer than 0.4 m.
- Do not remove any covers or other protective devices before cleaning the robot.

Continues on next page

Cleaning methods

The following table defines what cleaning methods are allowed 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 deter-gent.	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.

5.6 Lubrication activities

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.

See also *Safety on page 17*.

Current collector

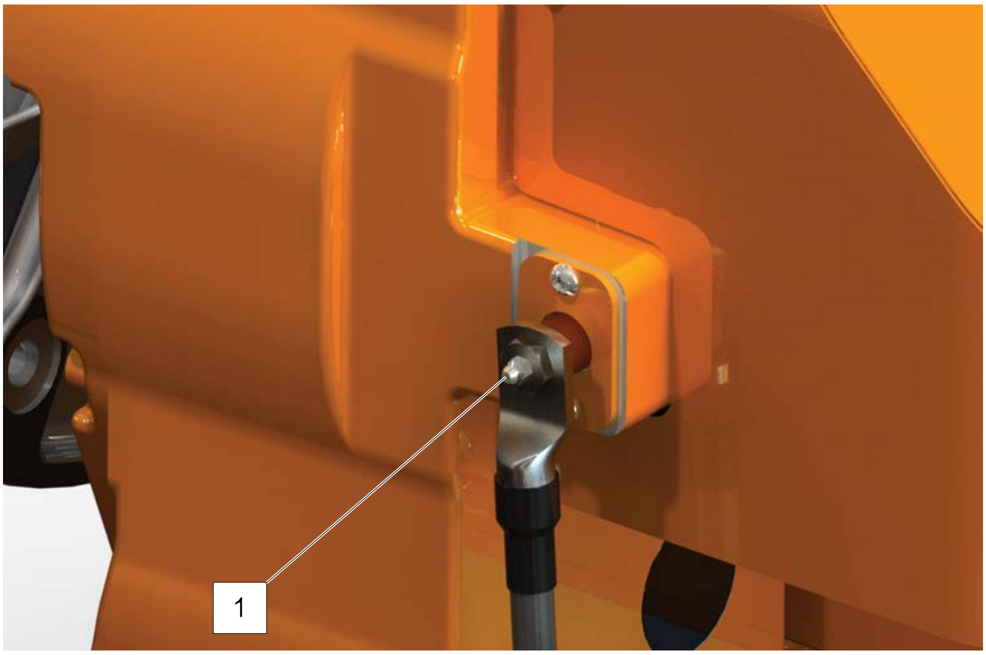
The function of the current collector is to transfer the weld current through the rotary unit. This takes place through a spring-loaded contact bar against the shaft. The contact bar needs to be lubricated approximately after 400 hours of operation. This should be done using a special grease, P34 from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

Required equipment

Equipment	Note
Grease	Grease type: P34 from Nies. Article number: 0501869002.
Standard tools	*Standard toolkit on page 339*
Grease gun	

Continues on next page

Lubricate



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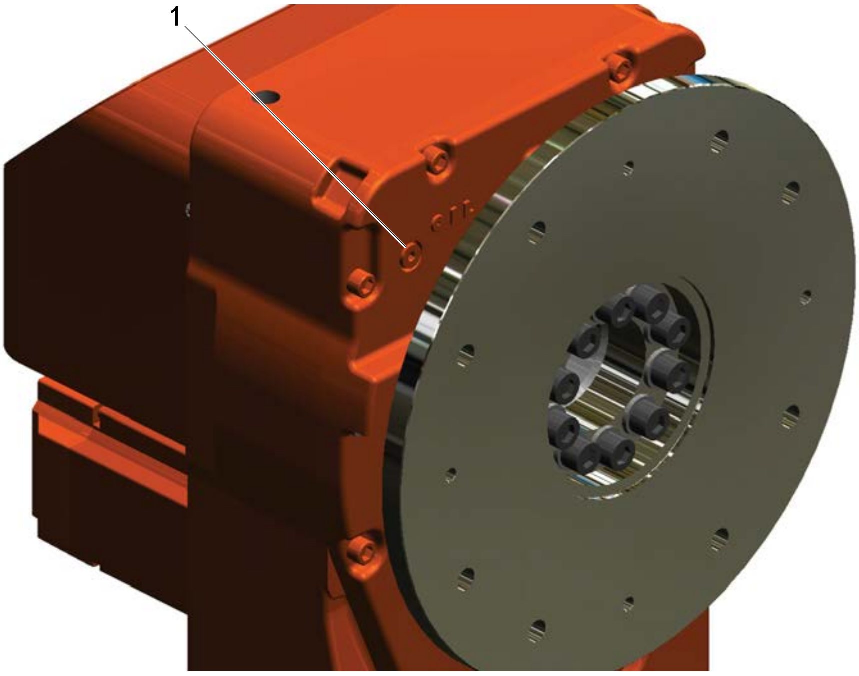
1	Lubrication nipple (4 mm)

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

5.6.2 Oil in gearboxes

Location of oil plugs

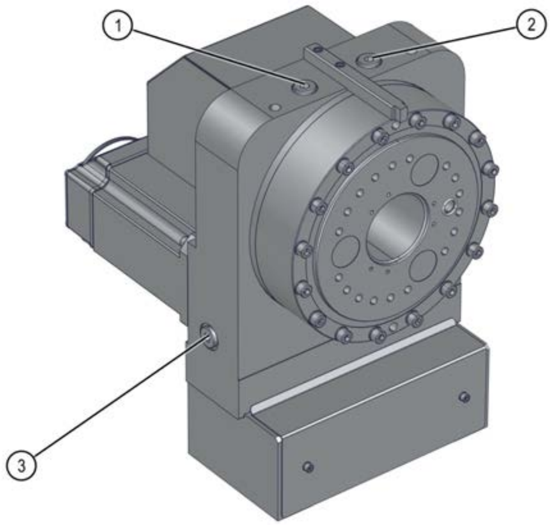
MTD/MID



xx1000000083

1	Oil plug

MTE/MID



xx2300001199

1	Filling- /Vent plug
2	Filling- /Vent plug
3	Draining plug

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Oil in gearbox MTD/MID

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

Oil in gearbox MTE/MID

The oil in the gearbox must be tested after 20,000 hours of operation. If the test is approved, the gearbox can be used for another 20,000 operating hours.

Please contact ABB for support.

Type and amount of oil in gearboxes

Information about the type of lubrication, article number as well as the amount in the specific gearbox can be found in *Technical reference manual - Lubrication in gearboxes* available for registered users on myABB Business Portal, *www.abb.com/myABB*.

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

For ABB personnel: Always check ABB Library for the latest revision of the manual *Technical reference manual - Lubrication in gearboxes*, in order to always get the latest information of updates about lubrication in gearboxes. A new revision will be published on ABB Library immediately after updates.

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.

See also *Safety on page 17*.

Note

This action demands an update of the revolution counters.

Required equipment

Note

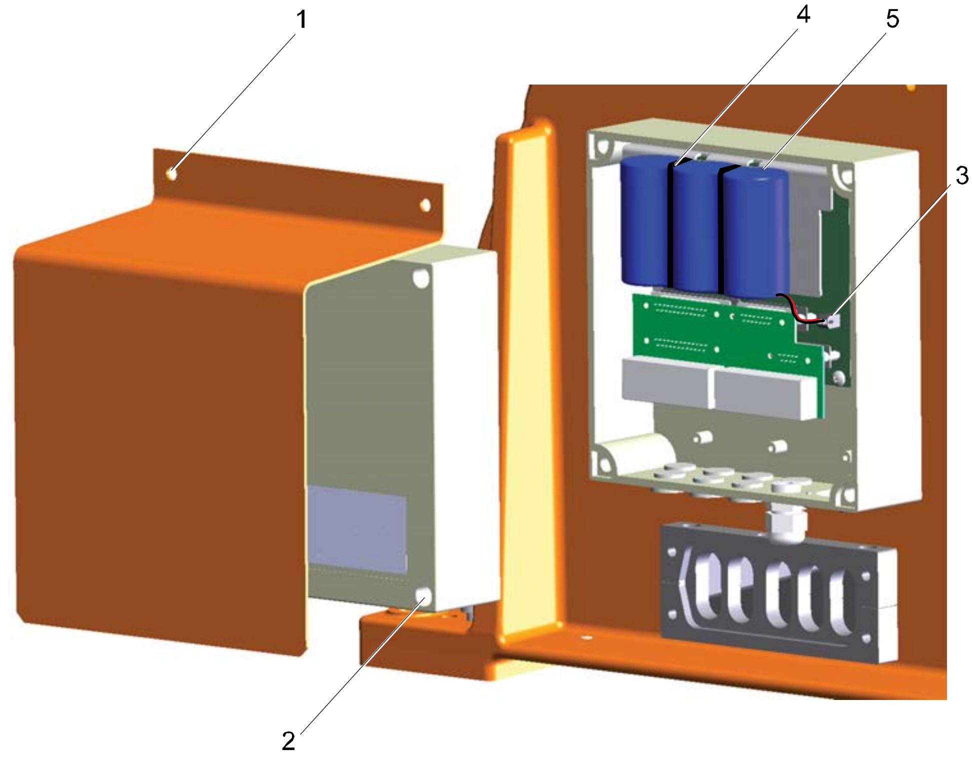
There are two variants of SMB units and batteries. One with 2-pole battery contact and one with 3-pole battery contact. The variant with the 3-pole battery contact has longer lifetime for the battery.

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 toolkit on page 339*
Cable strap (outdoors)	4.8 x 290, 2 pcs
SMB battery	See *Product manual, spare parts - IRBP /D2009*

Continues on next page

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. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.	
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 repair activities for the IRBP. Each procedure contains the information required to perform the activity, for example spare parts numbers, required special tools, and materials.

WARNING

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

Report replaced units

Note

When replacing a part on the IRBP, report to your local ABB the serial number, the article number, and the revision of both the replaced unit and the replacement unit.

This is particularly important for safety equipment to maintain the safety integrity of the installation.

Safety information

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

Note

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

For more information see:

- *Product manual - IRC5*

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	3HAC042536-001	Shell Gadus S2 Used to grease the bearings, if not specified otherwise.

Assembly of all bearings

Attend to 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

Note

This instruction is not valid for solid oil bearings.

Continues on next page

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.
- 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.

6.1.3 Mounting instructions for sealings

General

This section describes how to mount different types of sealings.

Equipment

Consumable	Article number	Note
Grease	3HAC042536-001	Shell Gadus S2

Rotating sealings

The following procedures describe how to fit rotating sealings.

CAUTION

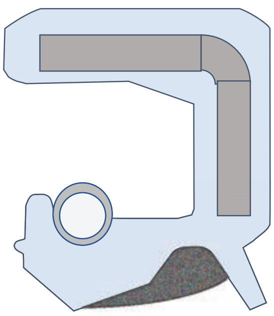
Please observe the following before commencing any assembly of sealings:

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

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

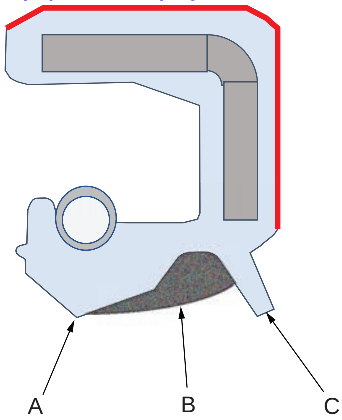
Radial sealings

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



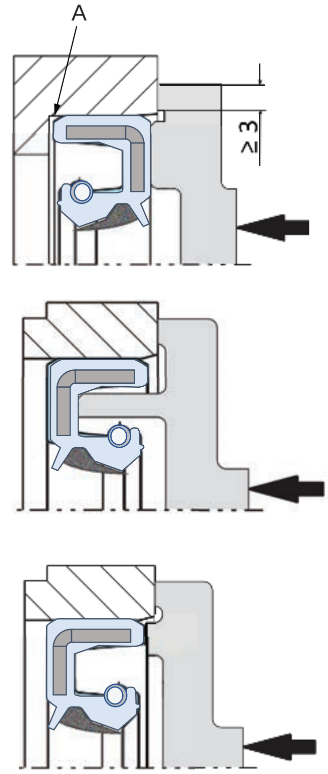
xx2300000433

Continues on next page

<table>
<tr><th></th><th>Action</th><th>Note</th></tr>
<tr><td>1</td><td>Check the sealing to ensure that:
The sealing is of the correct type.
There is no damage on the main lip.</td><td></td></tr>
<tr><td>2</td><td>Inspect the shaft surface before mounting. If scratches or damage are found, the shaft must be replaced since it may result in future leakage. Do not try to grind or polish the shaft surface to get rid of the defect.</td><td></td></tr>
<tr><td>3</td><td>Lubricate the sealing with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the sealing.)
Fill 2/3 of the space between the dust lip and the main lip with grease. If the sealing is without dust lip, just lubricate the main lip with a thin layer of grease.</td><td>Article number is specified in Equipment on page 202.


xx2000000071
A Main lip
B Grease
C Dust lip
 Note
Ensure that no grease is applied to the red marked surface.</td></tr>
</table>

Continues on next page

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

Flange sealings and static sealings

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

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

O-rings

The following procedure describes how to fit o-rings.

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

Continues on next page

	Action	Note
3	Check the o-ring grooves and mating surfaces. They should be free of pores, contamination and obvious scratches/damage.	
4	Lubricate the o-ring with grease.	
5	Tighten the screws evenly while assembling.	
6	Check that the o-ring is not squashed outside the o-ring groove.	

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

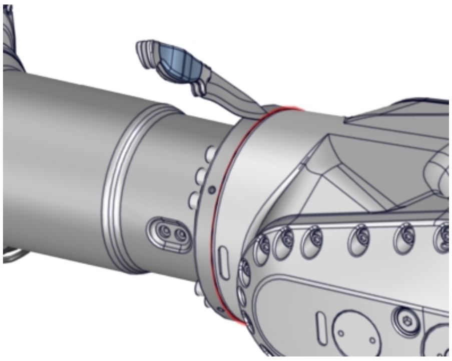
General

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

Required equipment

Equipment	Spare parts	Note
Cleaning agent		Ethanol
Knife		
Lint free cloth		
Touch up paint Standard/Foundry Plus	3HAC067974-001	Graphite White
Touch up paint Standard/Foundry Plus	3HAC037052-001	ABB Orange

Removing

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

6.2 Frame parts

6.2.1 Replacing frame parts

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

Continues on next page

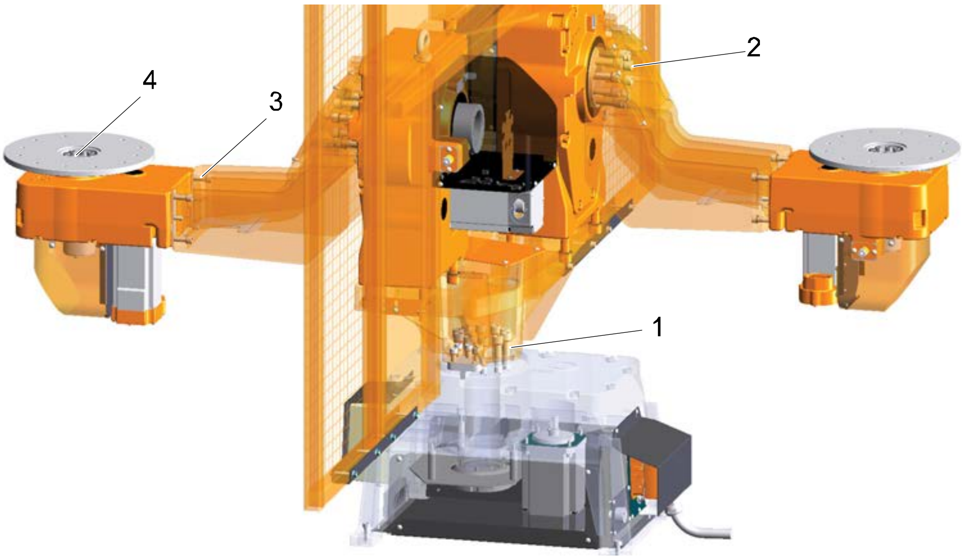
6.2.1.1 Overview

General

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

- *Remove the station frame on page 210*
- *Refit station frame on page 210*
- *Remove the station frame on page 210*
- *Remove the frame and covers on page 214*
- *Refit the frame and covers on page 216*
- *Remove the turning disc, MTD unit on page 217*
- *Refit turning disc, MTD unit on page 217*
- *Remove the turning disc, MTE unit on page 218*
- *Refit turning disc, MTE unit on page 218*

Frame parts



xx1000000019

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

Required equipment

Equipment	Note
Standard tools	For more information, see *Standard toolkit on page 339*.

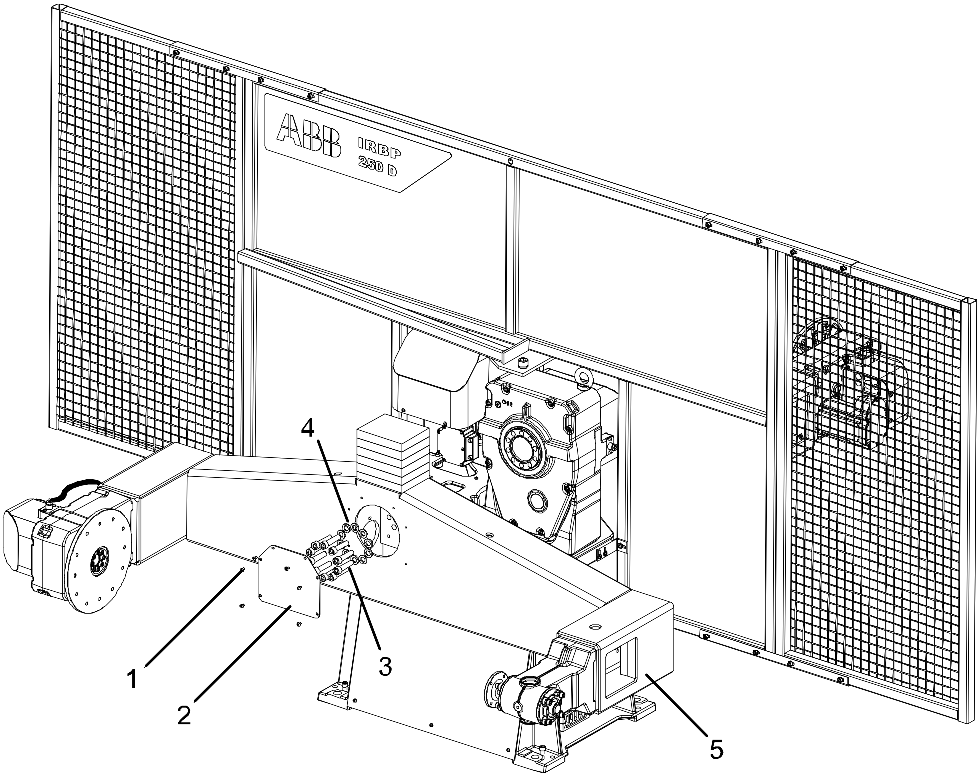
Continues on next page

Screw joints 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
MTE 500/750	Turning axis	16x70		300
MTD 2000	Turning axis	20x90		550
MTD 5000	Turning axis	24x110		950
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 MTE 500/750	Spherical bearing		16x70	300
Support collar MTD 2000	Spherical bearing		20x90	550

6.2.1.2 Replacing the station frame

Remove the station frame



xx1000000015

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

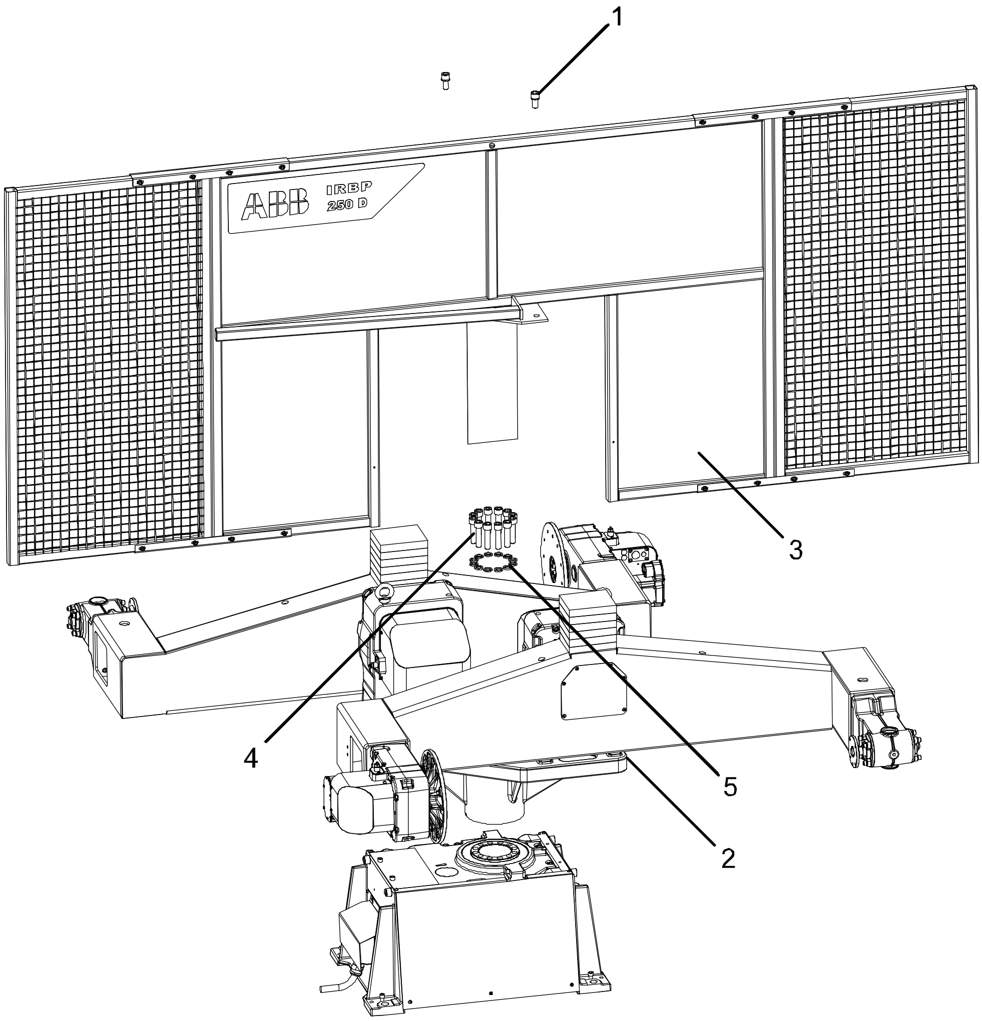
	Action	Note
1	Loosen the screws (1) and remove the cover plate (2).	
2	Loosen the attachment screws.	
3	Lift the station frame.	Described in section *Lifting frame parts on page 224*.

Refit station frame

	Action	Note
1	Clean the contact surface	
2	Lift the station frame.	Described in section *Lifting frame parts on page 224*.
3	Mount the attachment screws	Tightening torque according to table in Screw joints MTD axis.

6.2.1.3 Replacing the base frame

Remove the base frame



xx1000000014

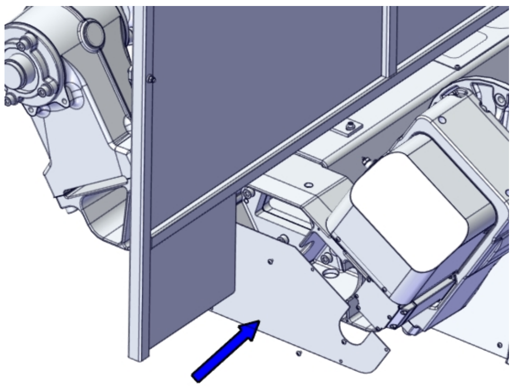
1	Screws
2	Base frame
3	Station shield
4	Attachment screws M20x90 Steel 12.9
5	Washers

	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 224*.

Refit base frame

	Action	Note
1	Clean the contact surface.	
2	Lift the base frame.	Described in section *Lifting frame parts on page 224*.
3	Mount the attachment screws.	Tightening torque according to table in Screw joints MTD axis.
4	Remove the lifting accessories from the frame.	
5	**Valid for IRBP R** Refit the plates at the frame ends.	 xx1700001322

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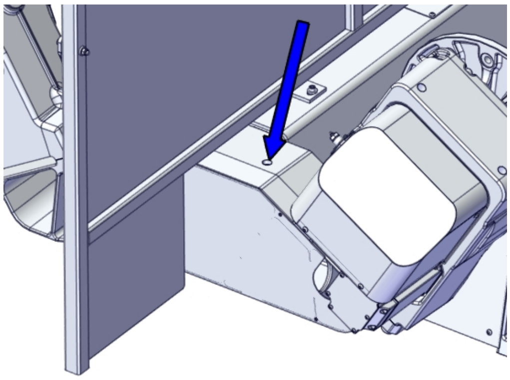
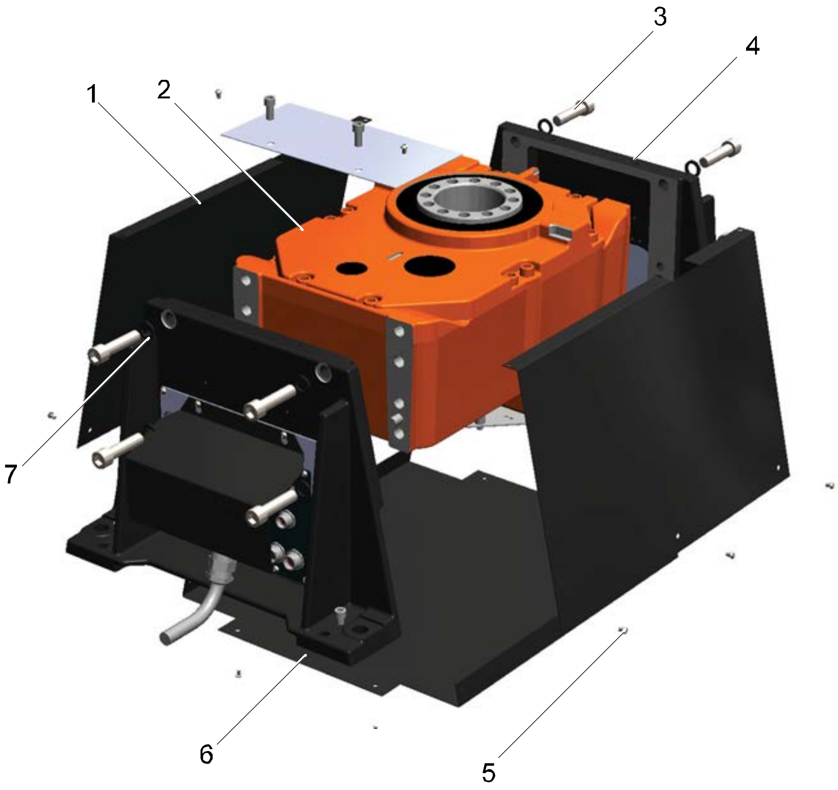
	Action	Note
6	**Valid for IRBP R** Refit the protection plugs to the lifting eye holes.	 xx1700001324
7	Refit the station shield.	

6.2.1.4 Replacing the frame and covers

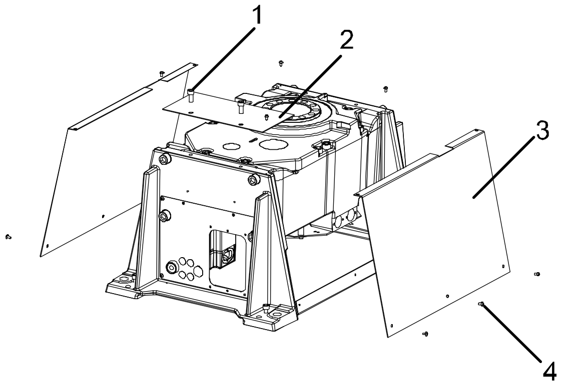
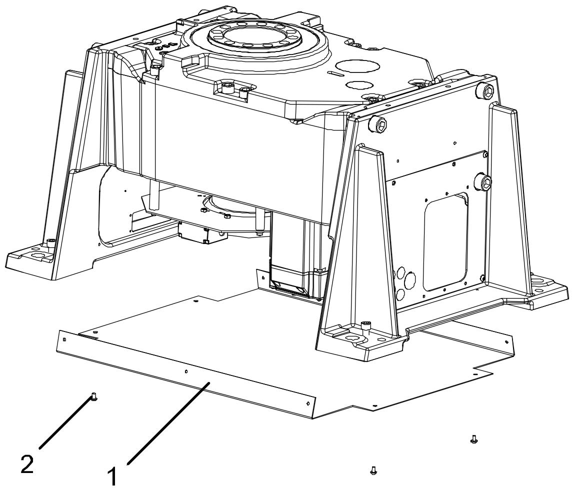
Remove the frame and covers



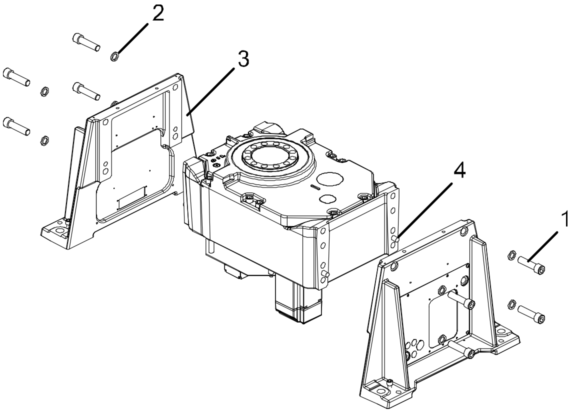
xx1000000020

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

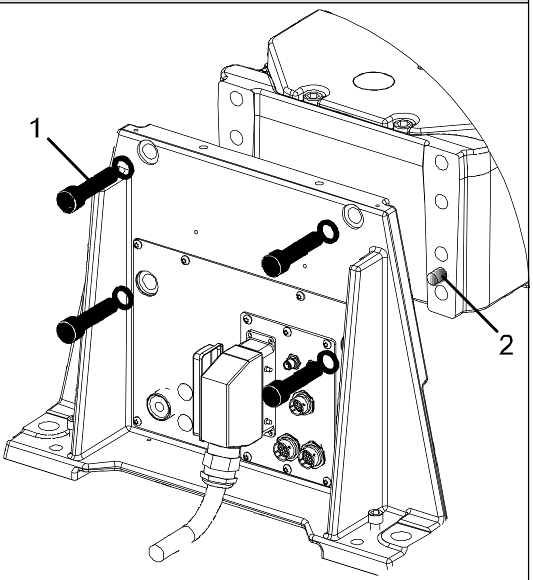
Continues on next page

<table>
<tr><th></th><th>Action</th><th>Note</th></tr>
<tr><td>1</td><td>1 Unscrew (4) and remove the side covers (3).
2 Unscrew (1) and remove the cover plate (2).</td><td>
xx1000000006
1 Screw
2 Cover plate
3 Side cover
4 Screw M6x10</td></tr>
<tr><td>2</td><td>Unscrew (2) and remove the bottom plate (1).</td><td>
xx1000000007
1 Bottom plate
2 Screw M6x10</td></tr>
<tr><td>3</td><td>Remove the electrical connection.</td><td></td></tr>
</table>

Continues on next page

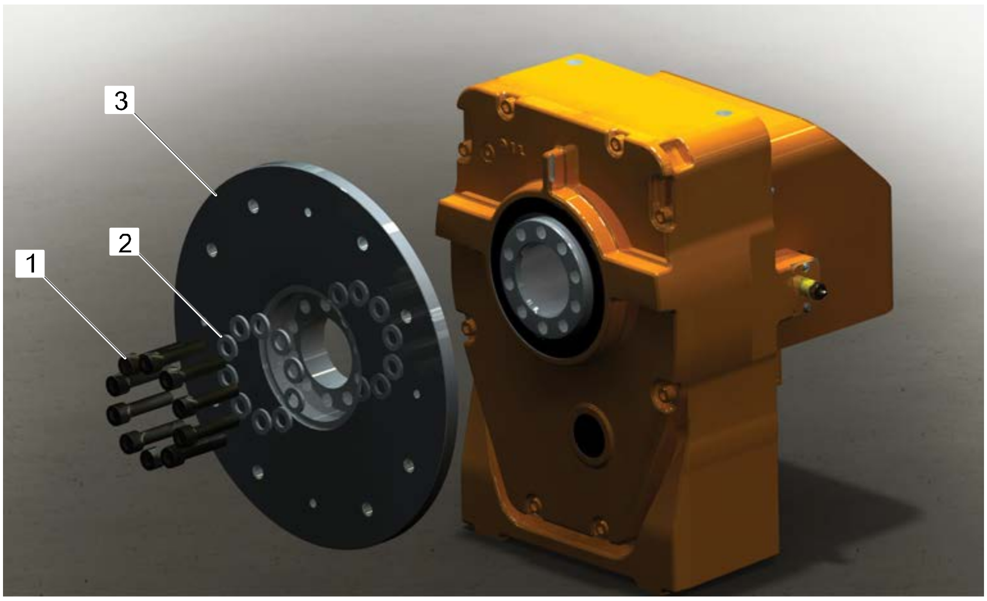
	Action	Note
4	Unscrew (1) and loose the washers (2) and remove the two frames (3).	 xx1000000008 1 Attachment screw M20x90 Steel 12.9 2 Washers 3 Frame 4 Guide pin

Refit the frame and covers

	Actions	Note
1	Mount the frames using the attachment screws M20x90. • Tightening torque is 550 Nm **Note** Use Molycote-lubricant for the screw joints.	 xx1000000077 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.	

6.2.1.5 Replacing the turning disc

Remove the turning disc, MTD unit



xx1000000023

1	Attachment screws
2	Washers
3	Turning disc

	Action	Note
1	Remove the screws (1) by holding the turning disc (3).	

Refit turning disc, MTD unit

	Action	Note
1	Refit the turning disc (3) with screws (1).	Tightening torque according to the table in *Screw joints axis on page 209*.

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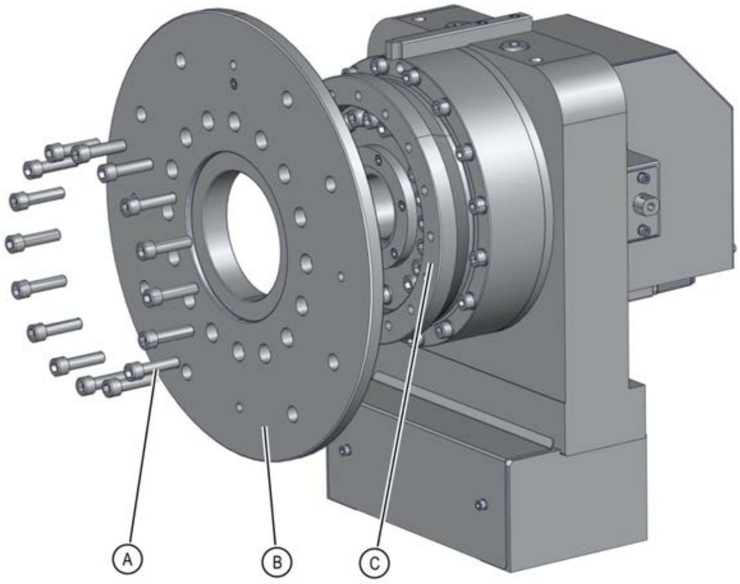
Remove the turning disc, MTE unit



xx2300001200

A	Attachment screws
B	Turning disc
C	Turning disc adapter

	Action	Note
1	Remove the M12x45 screws (1) holding the turning disk (2) to the disk adapter (3).	The turning disc weighs 22kg
2	Loosen the M6 attachment screw, and remove synchronization mark.	 xx2300001475

Refit turning disc, MTE unit

	Action	Note
1	Refit the turning disc (2) with M12x45 screws (1) to the disc adapter.	Tightening torque according to the table in *Screw joints axis on page 209*.

Continues on next page

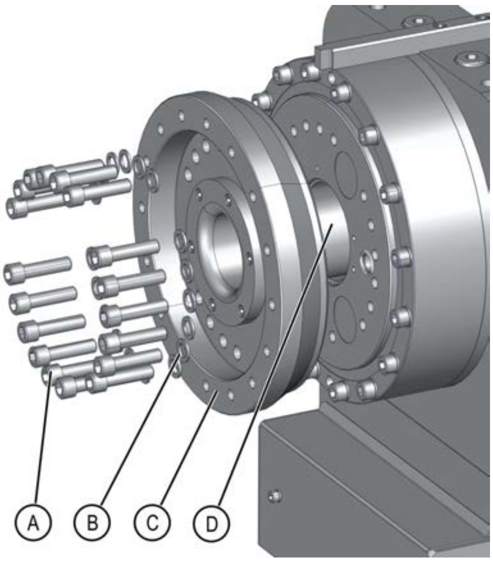
	Action	Note
2	Refit the synchronization mark with M6 attachment screw.	Tightening torque: 14 Nm  xx2300001475

6.2.1.6 Replacing the gearbox

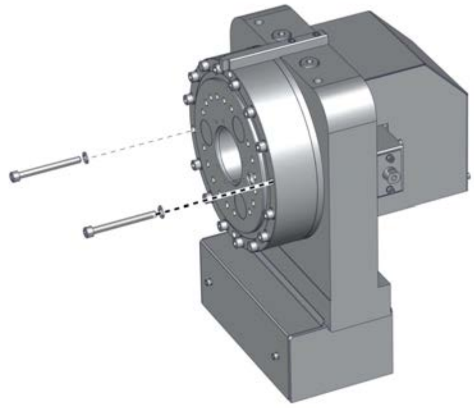
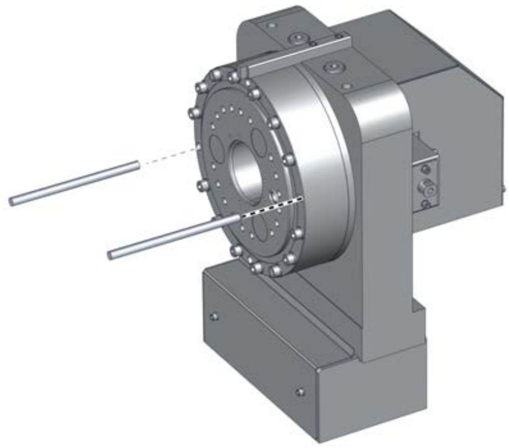
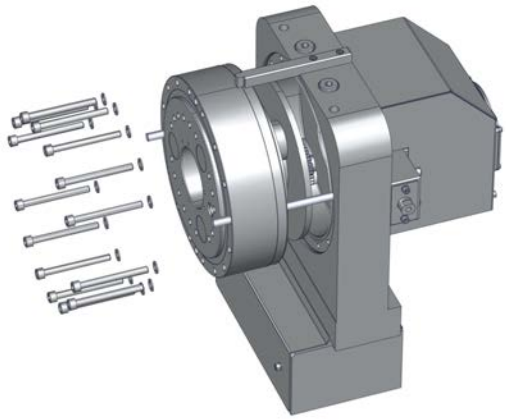
Required equipment

Equipment	Note
Gearbox	See *Spare parts on page 357*.
Guide pins	Guide pin: M10x150, 3HAC15521-2 Used to guide the gearbox during removal/refitting. Always use guide pins in pairs.
Standard toolkit	Content is defined in section *Standard toolkit on page 339*.
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.	These procedures include references to the tools required.

Remove the gearbox

	Actions	Note
1	Drain the oil from the rotary unit.	Location of oil plugs is described in section: • *MTE/MID on page 195*.
2	Remove the turning disc	See section *Remove the turning disc, MTE unit on page 218*.
3	Remove the M12x45 attachment screws with washers, and turning disc adapter	 xx2300001476

Continues on next page

	Actions	Note
4	Remove two of the M10x100 gearbox attachment screws with washers.	 xx2300001203
5	Fit two guide pins to the through the holes in the gearbox.	 xx2300001204
6	Remove the remaining M10x100 attachment screws and slide the gearbox out onto the guide pins. If necessary use removal tools to remove the gearbox.	 xx2300001337 The weight of the gearbox is 37 kg
7	Attach the lifting tool and lift it away.	Lifting tool: 3HAC081585-001.

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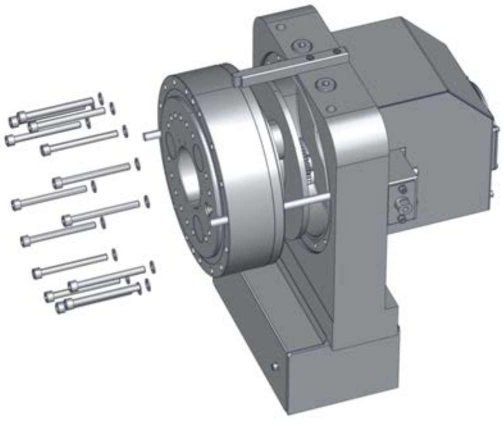
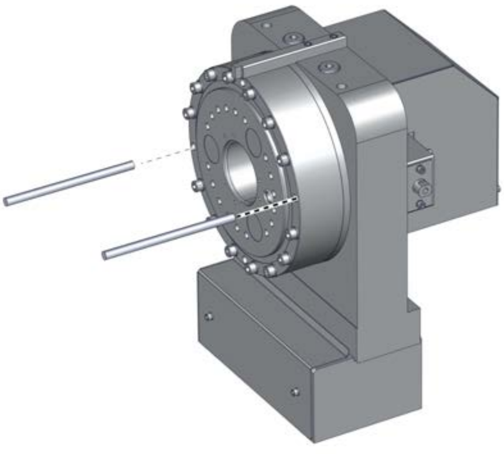
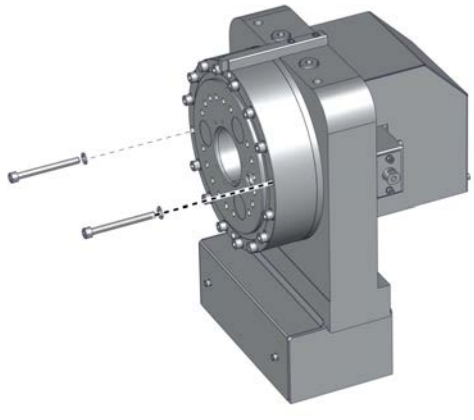
Refit the gearbox

	Actions	Note
1	Place the gearbox on the guiding pins, and slit it in place.	 xx2300001337
2	Refit the M10x100 gearbox attachment screws with washers.	Tightening torque according to section *Screw joints axis on page 209*.
3	Remove the two guide pins.	 xx2300001204
4	Refit the last two M10x100 gearbox attachment screws with washers.	 xx2300001203 Tightening torque according to section *Screw joints axis on page 209*.

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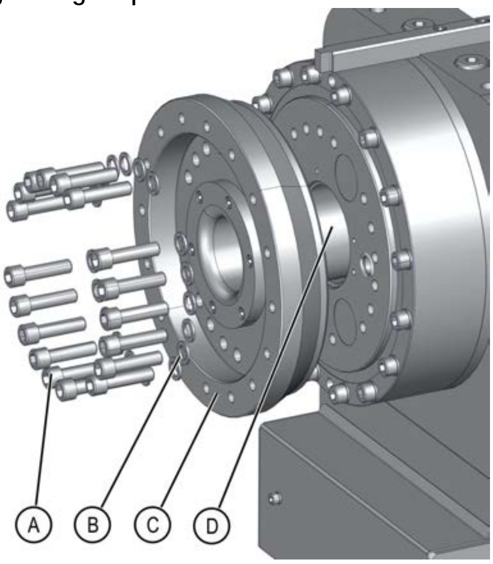
	Actions	Note
5	Refit turning disc adapter with the M12x45 attachment screws.	Tightening torque:  xx2300001476
6	Refit the turning disc and turning disc adapter.	See section *Remove the turning disc, MTE unit on page 218*.
7	Refill oil in the rotary unit.	See section *Oil levels on page 187*.

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 77*. For information about replacing rotary units see the section *Replacing rotary unit on page 246*.

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!

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded 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 toolkit on page 339*.
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	

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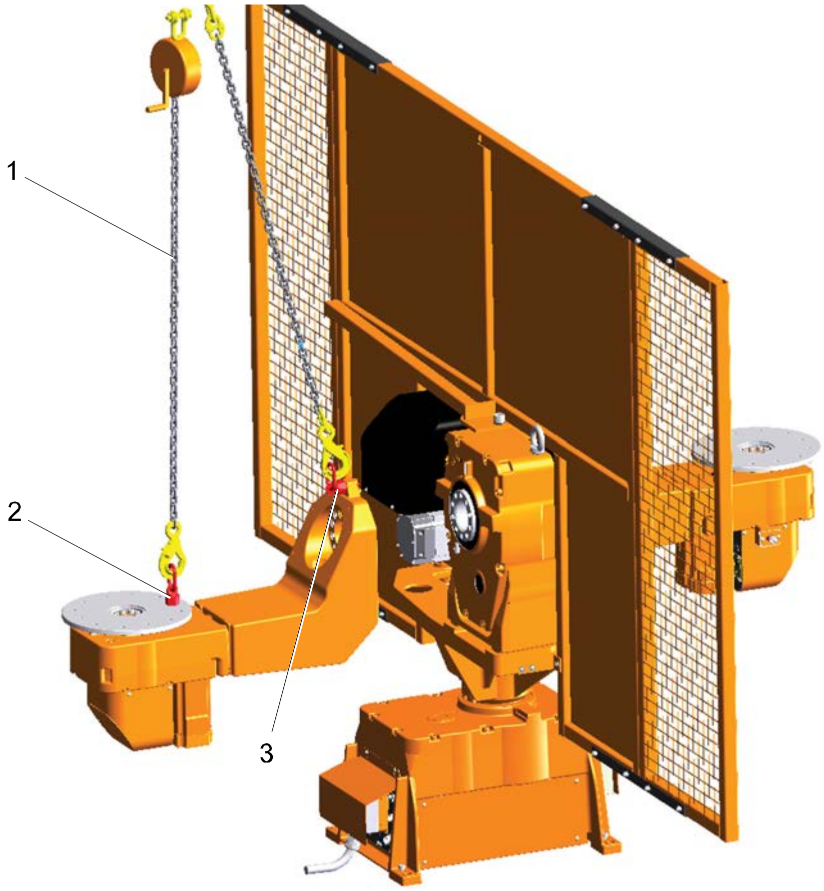
Lifting A, B station arm



xx1000000078

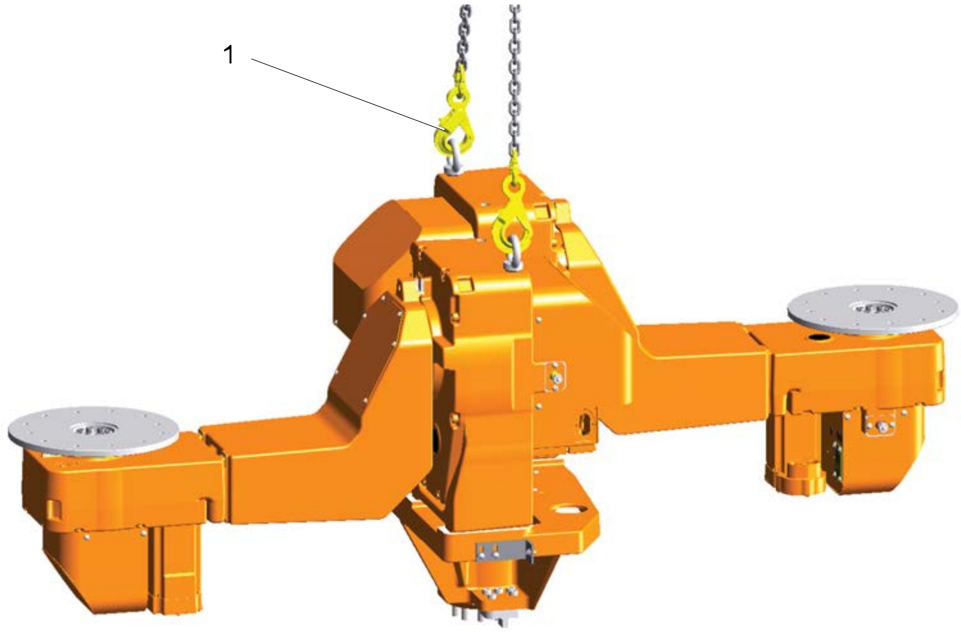
1	Winch min. 500 Kg
2	Lifting eye, swivel
3	Lifting eye, swivel 14 mm

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.	

Continues on next page

Lifting A, B station frame



xx1000000125

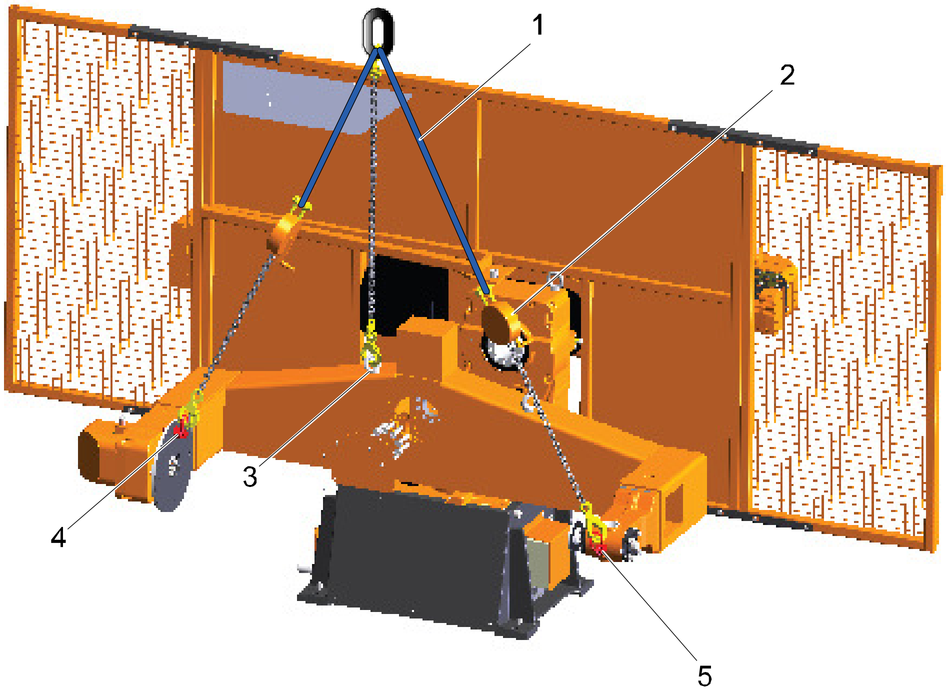
1	Lifting eye (2 pcs)

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

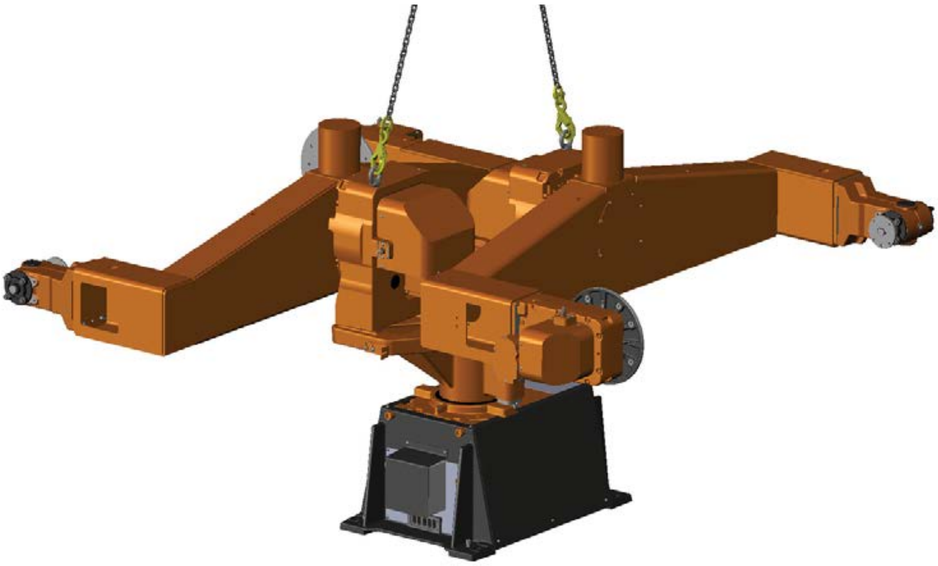
1	Lifting sling
2	Winch min.500 Kg
3	Lifting eye 24 mm
4	Lifting eye, swivel
5	Lifting eye, swivel

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	

Continues on next page

Lifting D stations



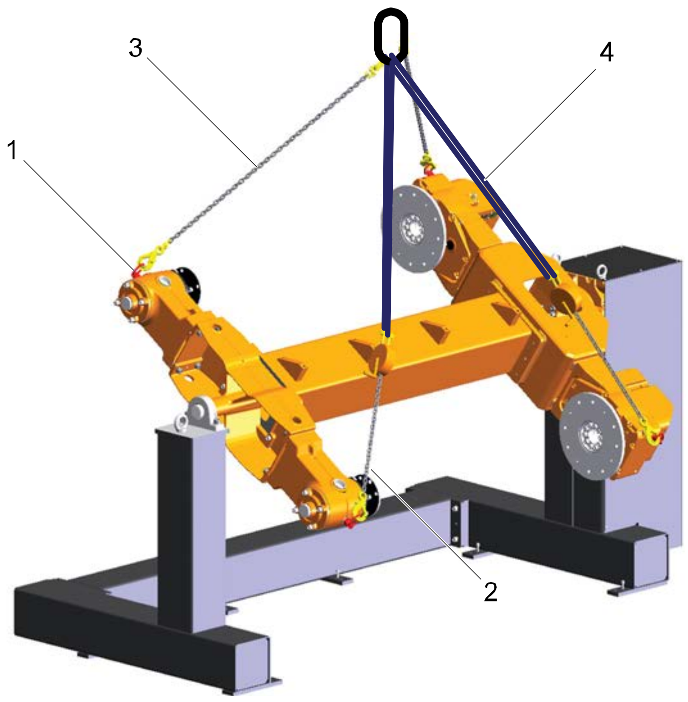
xx1000000090

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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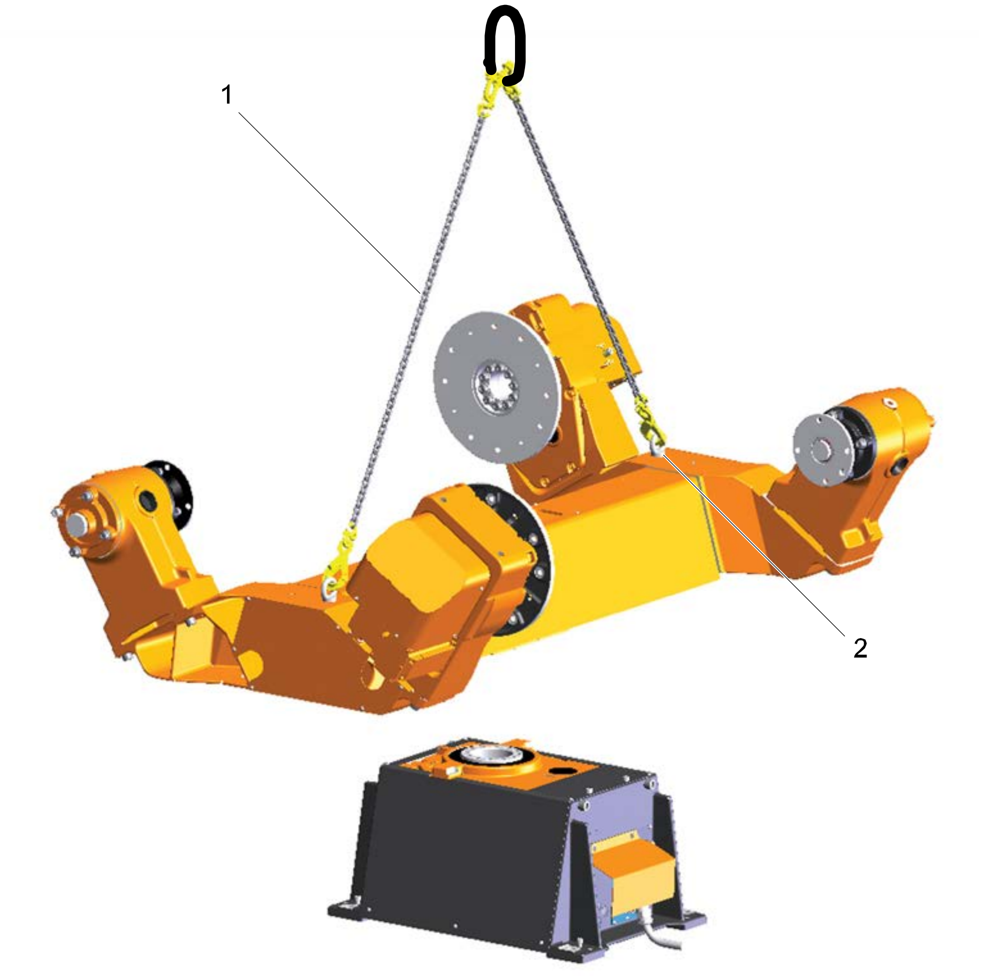
Lifting R stations

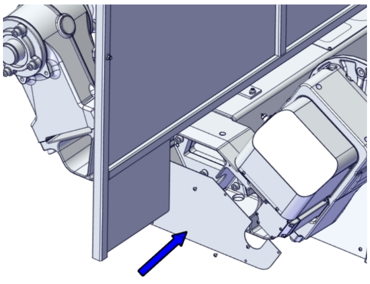
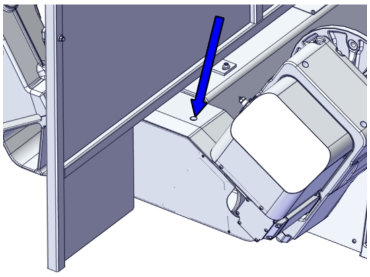
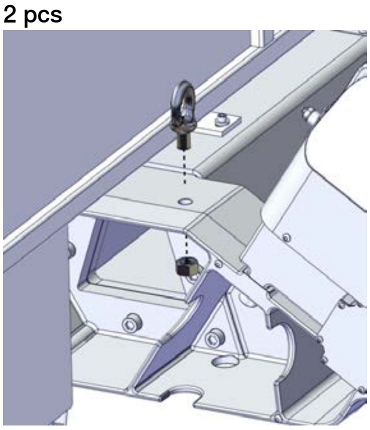


xx1000000081

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

Continues on next page

	Action	Note
1	Remove the plates to get access to the lifting eye holes in the frame.	 xx1700001322
2	Remove the protection plugs from the lifting eye holes.	 xx1700001324
3	Attach the lifting eyes.	2 pcs  xx1700001323
4	Stretch the lifting chains	
5	Remove the attachment screws	
6	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
MTE 500/750	170 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	

6.3 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:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

Note

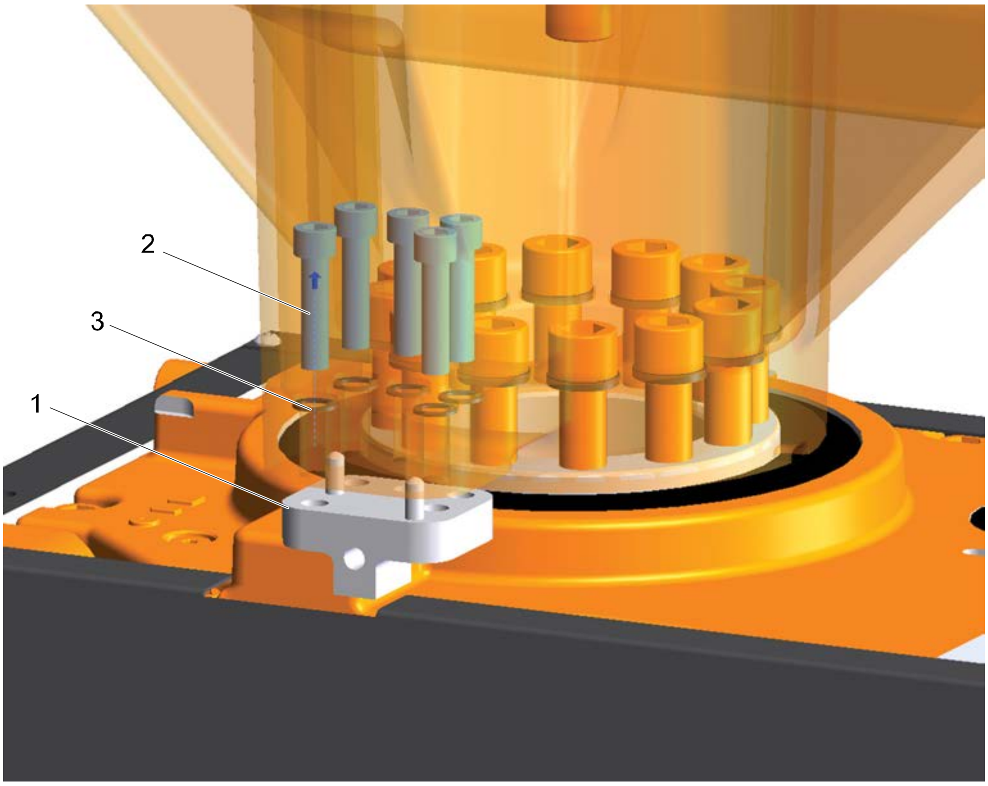
Keep the contact surfaces clean.

Required equipment

Equipment	Note
Standard tools	For more information, see *Standard toolkit on page 339*.
Stop lug	See *Product manual, spare parts - IRBP /D2009*

Continues on next page

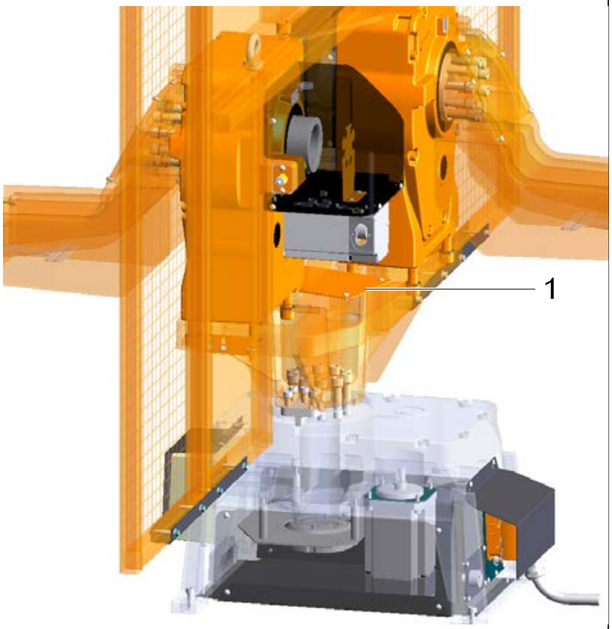
Remove stop lug



xx1000000082

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

Continues on next page

	Action	Mote
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)	Use standard torque, see section *Screw joints on page 89*.

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.

CAUTION

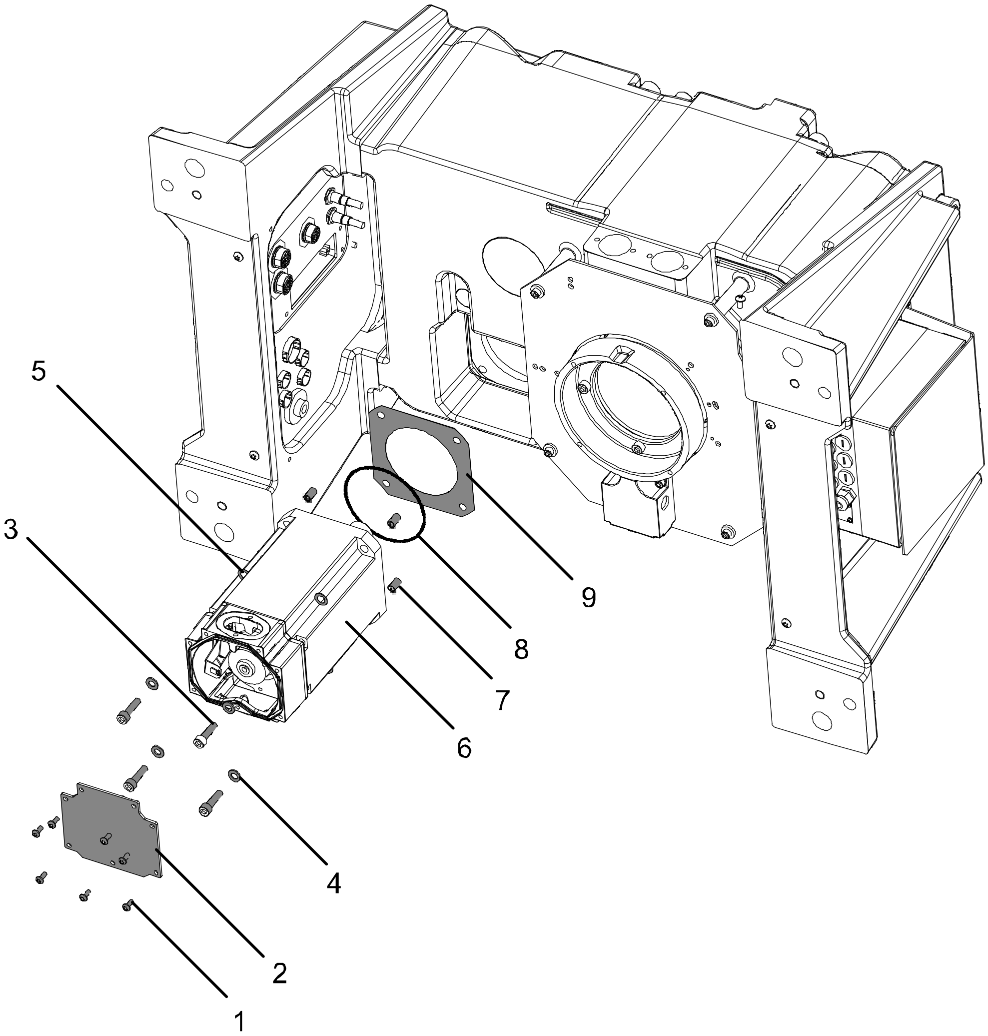
Galvanic contact between the gearbox and the motor can seriously damage the motor, see section *Checking insulation on page 244*.

Required equipment

Equipment	Note
Standard tools	For more information, see *Standard toolkit on page 339*.
Spareparts	Product Manual Sparepart IRBP /D2009

Continues on next page

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
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Remove all the covers on the manipulator foot. **Not required on rotary units for axis two or three.**	Detailed in the section *Replacing frame parts on page 207*.
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).	

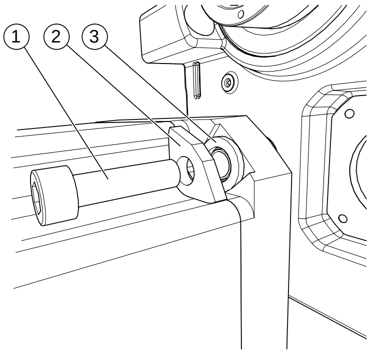
Refit motor rotary units axis 1

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

	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 *Screw joints on page 89*.
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 207*.

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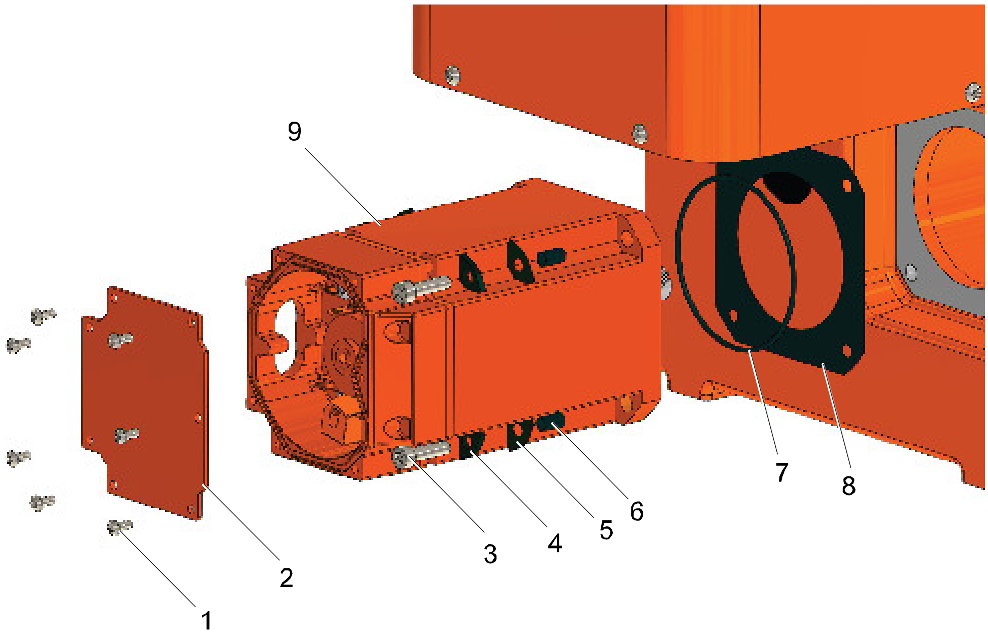
Remove MTD rotary unit motor, axis 2-3



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	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
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.	
5	Remove the motor by unscrewing the attachment screws and washers (3-4).	

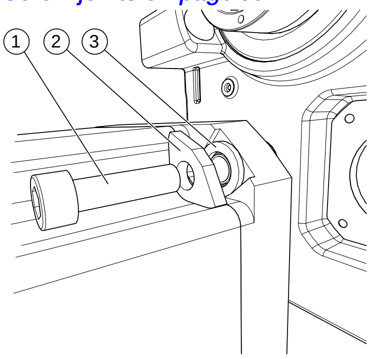
Continues on next page

	Action	Note
6	Remove the motor (9).	
7	Remove the o-ring (7).	
8	Remove the insulating material and insulating tubes (5, 6, 8).	

Refit MTD rotary unit motor, axis 2-3

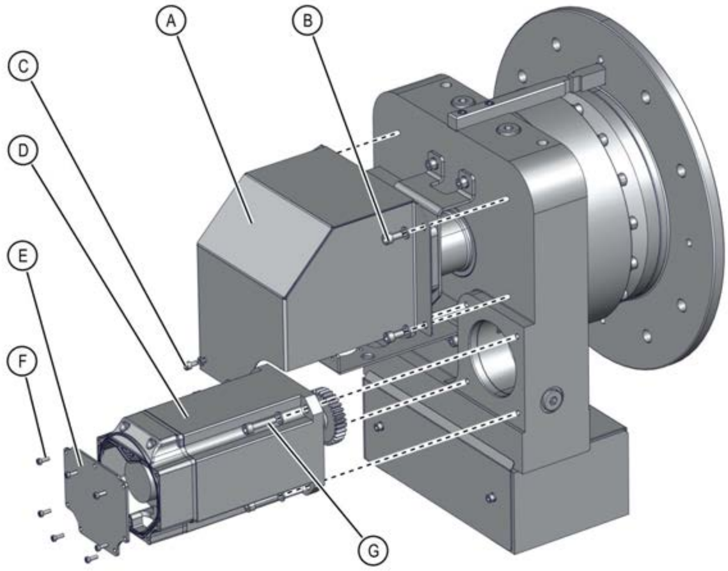
CAUTION

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 *Screw joints on page 89*.  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).	

Continues on next page

Remove MTE rotary unit motor, axis 2-3



xx2300001479

A	Cover
B	Hex socket head cap screw, M8x16 with washer (4 pcs)
C	Hex socket head cap screw M6x10 with washer (2 pcs)
D	Motor
E	Motor cover
F	Hexa lobular socket pan head screw M5x15 (7 pcs)
G	Hex socket head cap screw M8x35 with washer (4 pcs)

	Action	Note
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Drain the oil from the rotary unit.	Location of oil plugs is described in section: • *MTE/MID on page 195*.
3	Remove the back cover (A) by unscrewing the attachment screws with washers (B) and (C).	
4	Remove the motor cover (E) on top of the motor by unscrewing the attachment screws (F).	
5	Remove the cable gland cover at the cable exit by unscrewing its the attachment screws.	
6	Disconnect all connectors.	

Continues on next page

	Action	Note
7	Remove the motor by unscrewing the attachment screws with washers (G).	
8	Remove the motor (D). If necessary use removal tools to remove the motor.	The weight of the motor is: 14 kg

Refit MTE rotary unit motor, axis 2-3

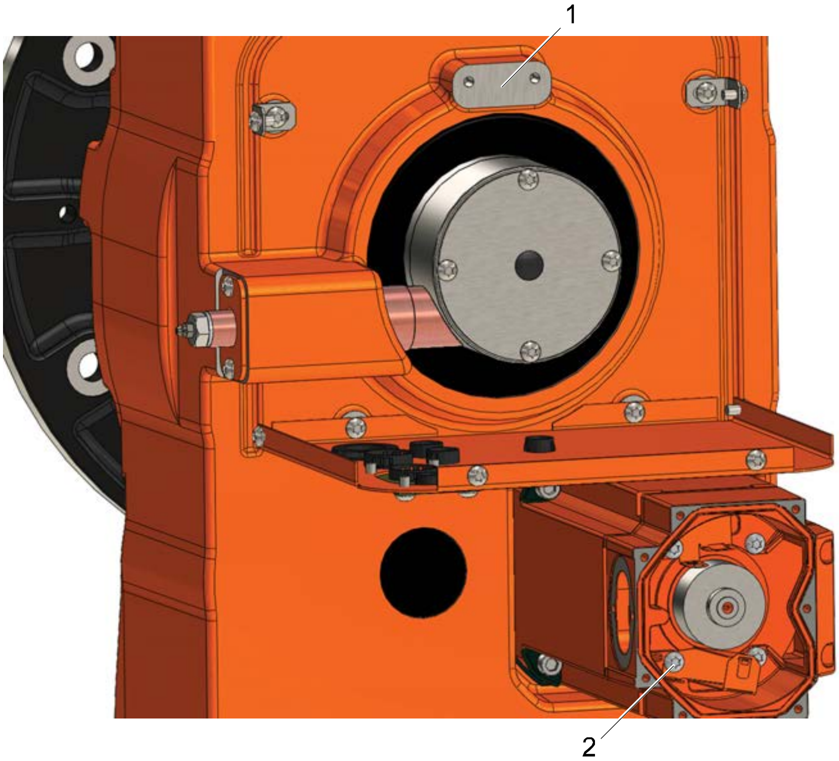
	Action	Note
1	Fit a new o-ring on the motor.	
2	Refit the motor (D) using the attachment screws with washers (G).	Use standard torque, see section *Screw joints on page 89*.
3	Connect all connectors.	
4	Refit the cable gland cover at the cable exit.	
5	Refit the cover (A) with attachment screws (B) and (C).	Use standard torque, see section *Screw joints on page 89*.
6	Refit the motor cover (E) on top of the motor with the attachment screws (F).	Use standard torque, see section *Screw joints on page 89*.
7	Refill oil in the rotary unit.	See section *Oil levels on page 187*.

6.4.2 Checking insulation

Measuring points

Note

The following instructions are not available for the rotary unit MTE.



xx1000000209

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

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

Insulation resistance tests

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

Continues on next page

Voltage tests

1 kVolt AC 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.

6.5 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 232*

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded 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	For more information, see *Standard toolkit on page 339*.

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
MTE 500/750	12.9	M20	4	550
MTD 2000	12.9	M20	8	550
MTD 5000	12.9	M24	12	1150

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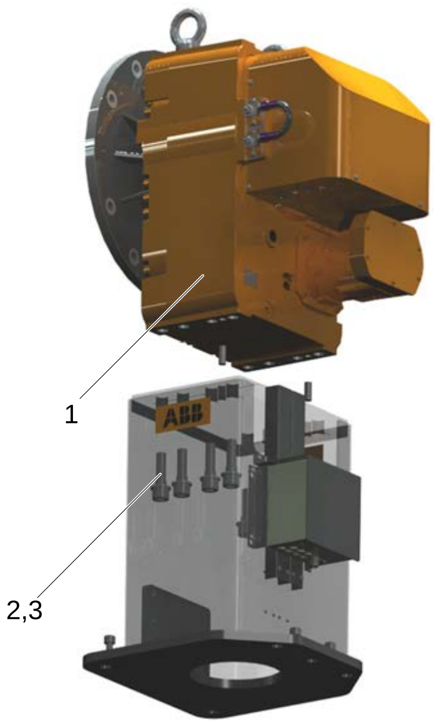
Remove rotary unit

Note

The illustration is showing a MTD unit, but this is also valid for the MTE unit.



xx1000000013

1	Rotary unit
2	Attachment screws
3	Washers

	Action	Information
1	Remove the cable harness from the motor, slipring.	
2	Attach the lifting accessories.	
3	Remove the attachment screws.	Use standard tools
4	Lift the rotary unit according to section *Lifting rotary units on page 232*.	

Refit rotary unit

	Action	Information
1	Lift the rotary unit according to section *Lifting rotary units on page 232*.	
2	Refit the attachment screws and washers.	Use standard tools, For Tightening torque see table *Screw joints on page 246*

Continues on next page

	Action	Information
3	Assemble the cable harness.	

6.6 Support collar

6.6.1 Replacing support collar axis

General

DANGER

Turn off all:

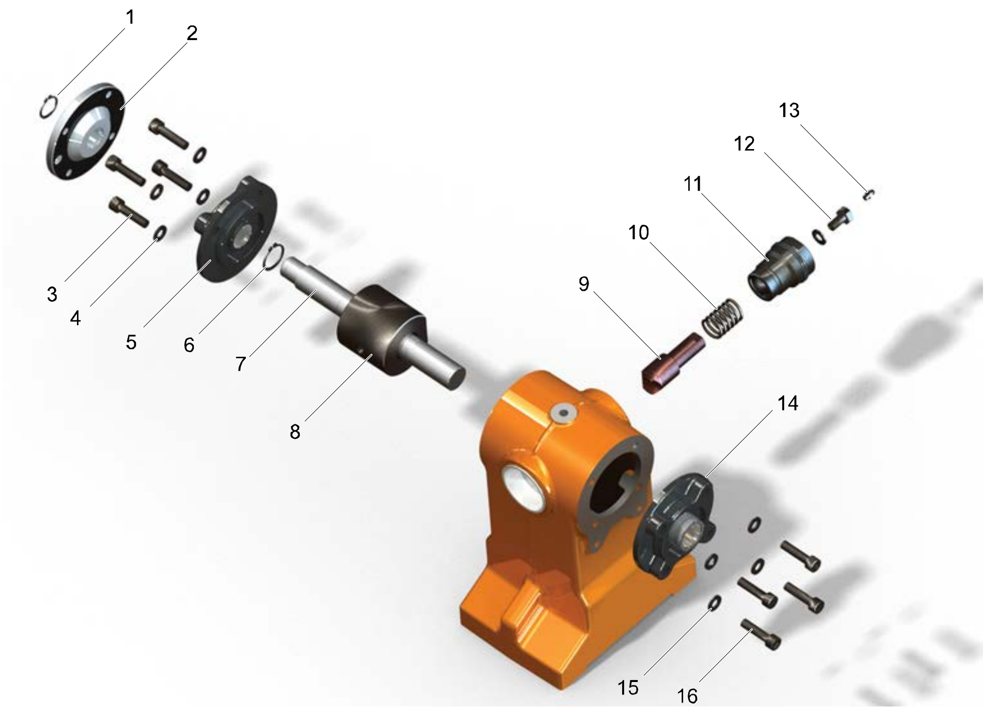
- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

Required equipment

Equipment	Note
Standard tools	*Standard toolkit on page 339*
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 section *Screw joints on page 89*.
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 section *Screw joints on page 89*.
6	Tightening the flange bearing locking screw.	Use standard torque, see section *Screw joints on page 89*.
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 193*

6.7 Electrical

6.7.1 Replacing current collector

General

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

Required equipment

Equipment	Note
Standard tools	See section *Standard toolkit on page 339*.
Current collector	See Product Manual Spareparts IRBP / D2009

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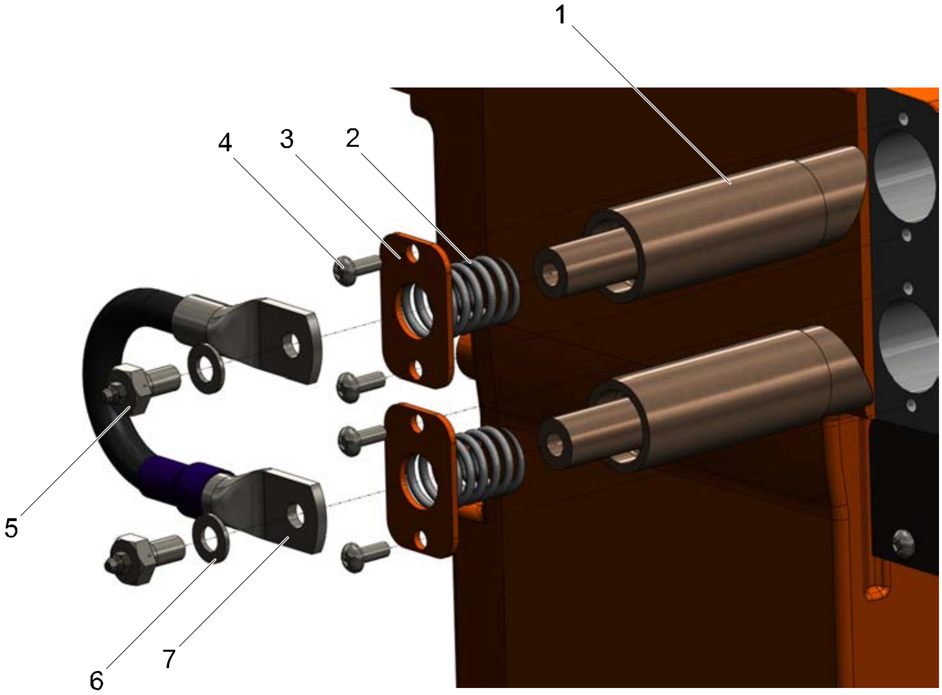
Replacing current collector



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 193*.

6.7.2 Replacing SMB board

WARNING

See *Hazards related to batteries on page 35*.

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 357*.

Removing the SMB board

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

	Action	Information
1	**DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	**ELECTROSTATIC DISCHARGE (ESD)** Before handling the unit, see *The unit is sensitive to ESD on page 92*.	
3	Open the cover on the SMB box. **CAUTION** Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.	
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 *Environmental information on page 328*.

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 *Calibration information on page 287*.

6.7.3 Station changing indication

General

DANGER

Turn off all:

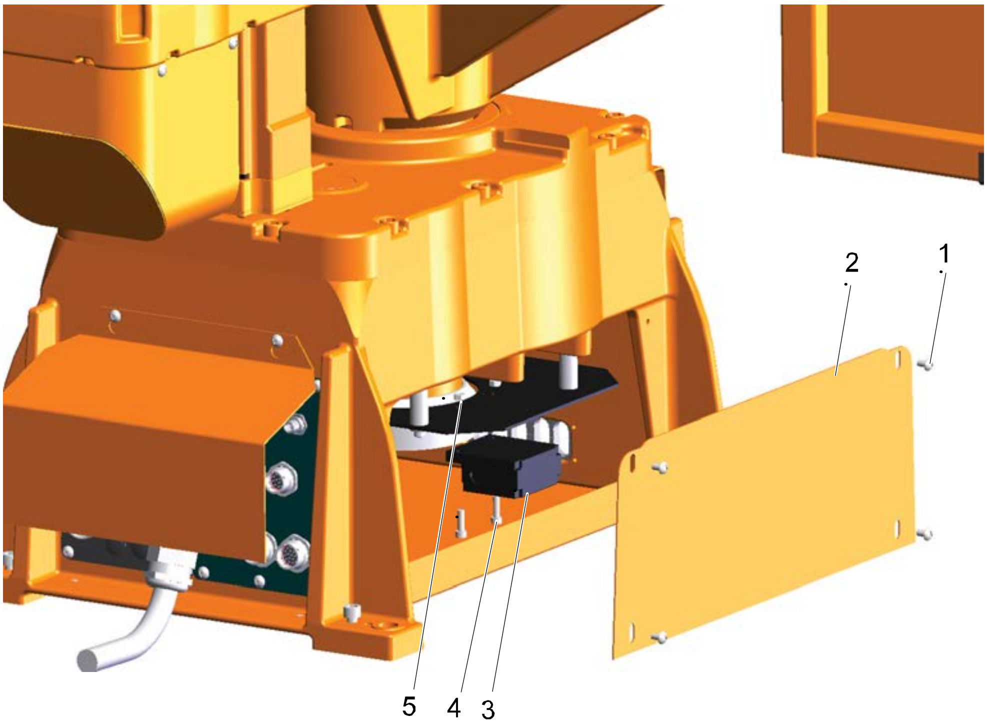
- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

Required equipment

Equipment	Note
Standard tools	This is detailed in section *Standard toolkit on page 339*.
Spareparts in	Product Manual Spareparts IRBP / D2009

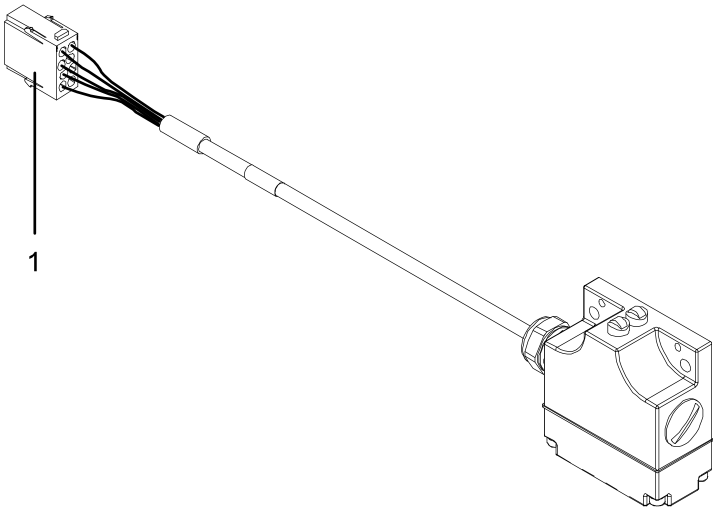
Change breaker



xx1000000026

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

Continues on next page

	Action	Information
1	 **DANGER** Turn off all: • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Remove the side cover.	Use standard tools
3	Loosen the cable connection (1) on the station sync cable.	 xx1000000299

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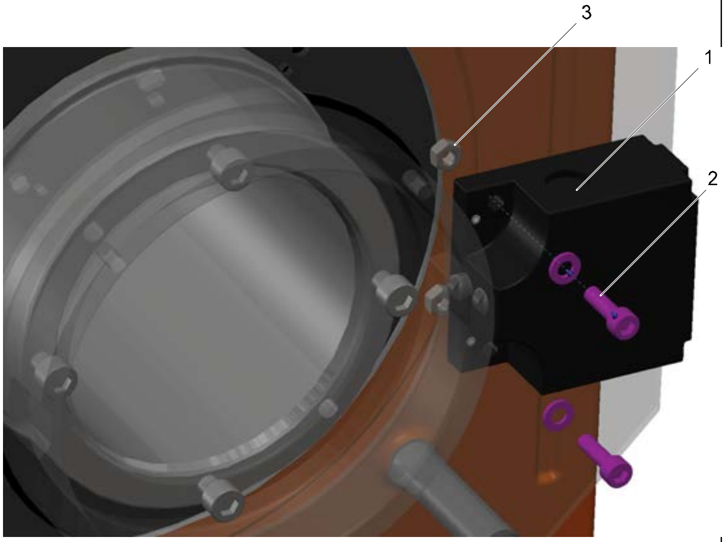
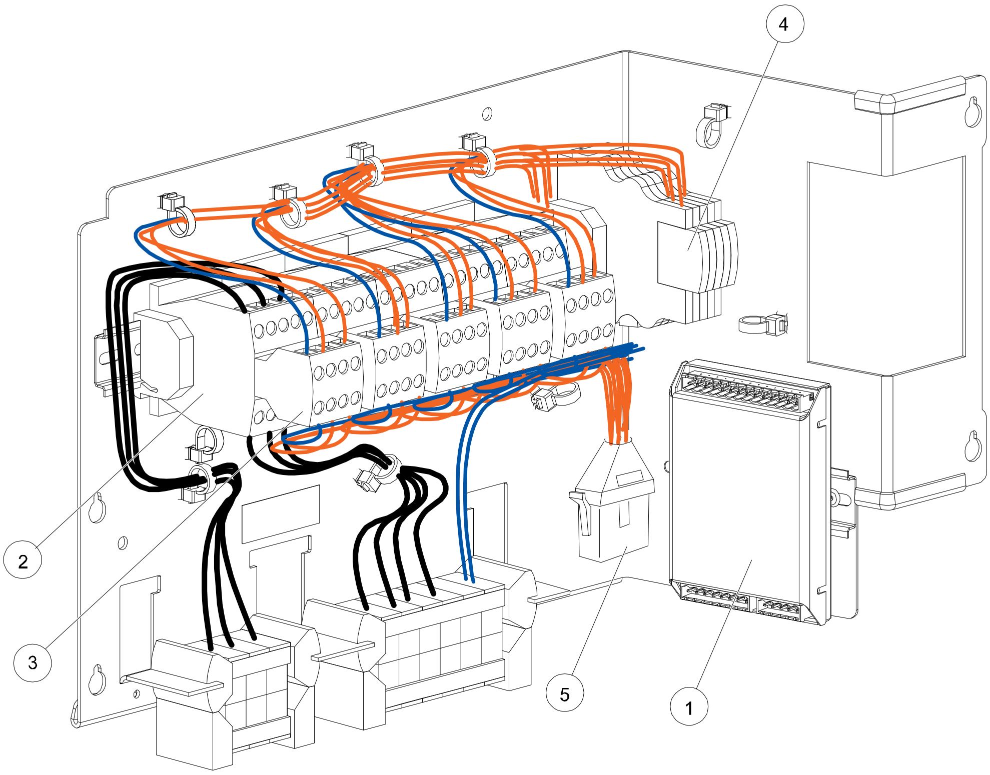
	Action	Information
4	Remove the station breaker.	 xx1000000075 1 Station indication 2 Screw 3 Nut

6.8 Controller

6.8.1 Overview of the controller

Location of parts



xx1000000230

1	Drive module
2	Contactor
3	Auxiliary contact
4	Relay

6.8.2 Replacing drive module I/O

Overview

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

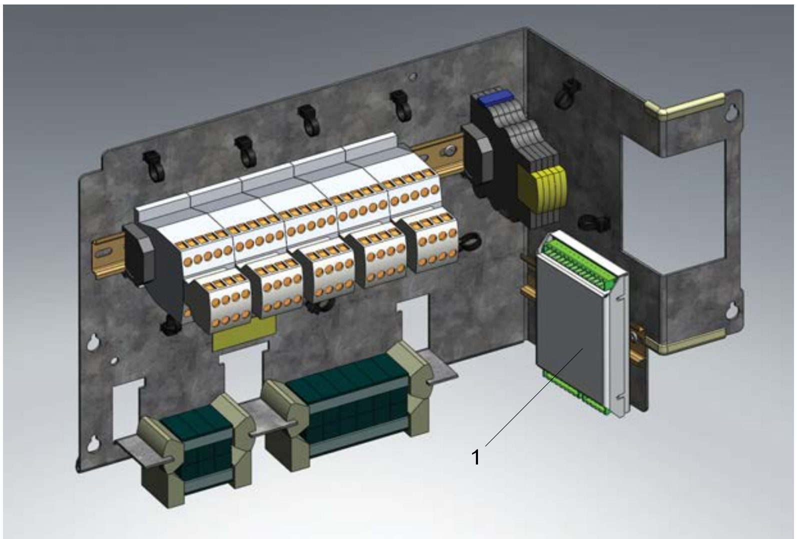
ELECTROSTATIC DISCHARGE (ESD)

The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 92*.

Required equipment

Equipment	Note
Spare parts	*Product manual, spare parts - IRBP /D2009*
Standard tools	See *Contents, standard toolkit, IRC5 on page 338*.

Drive module



xx1000000231

1	Drive module I/O

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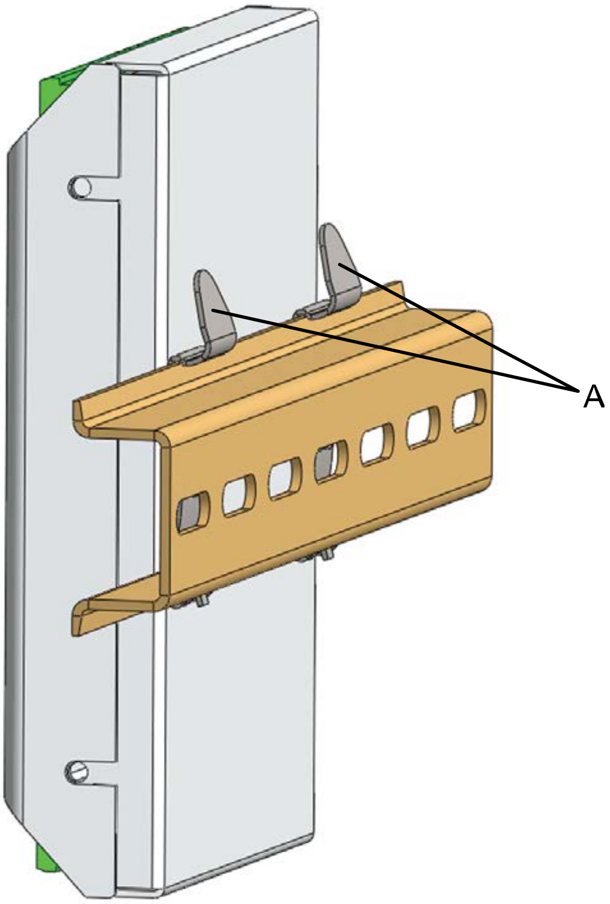
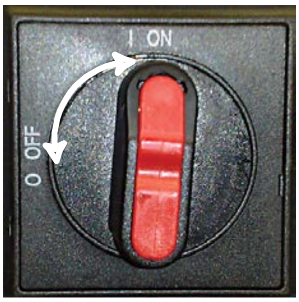
Replacing drive module



xx1000000232

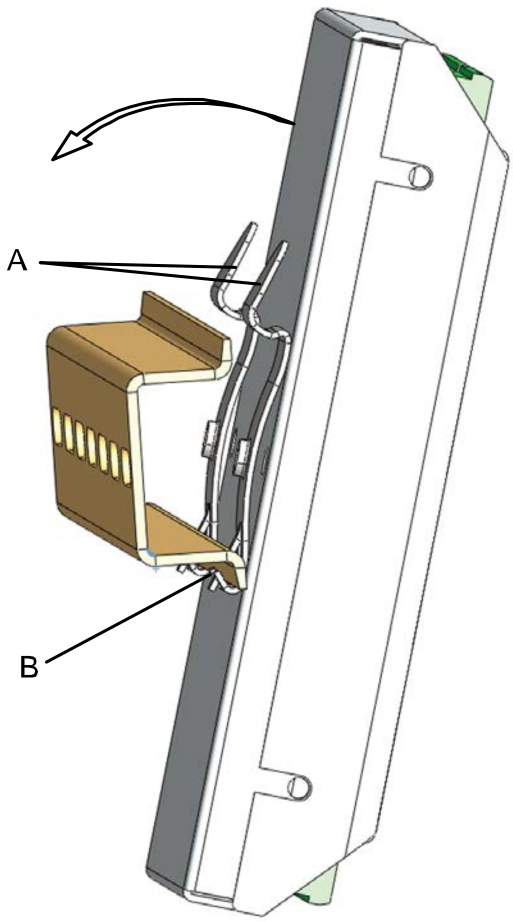
A	Mounting foot upper end

	Action	Note
1	 **DANGER** Before doing any work inside the cabinet, disconnect the mains power. For more information, see *Electrical safety on page 29*.	
2	Turn the main power switch to *OFF*.	 xx1000000212

Continues on next page

	Action	Note
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

	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.	

6.8.3 Replacing contactor

Overview

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

ELECTROSTATIC DISCHARGE (ESD)

The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 92*.

Required equipment

Equipment	Note
Standard tools	See *Contents, standard toolkit, IRC5 on page 338*.
Spare parts	*Product manual, spare parts - IRBP /D2009*

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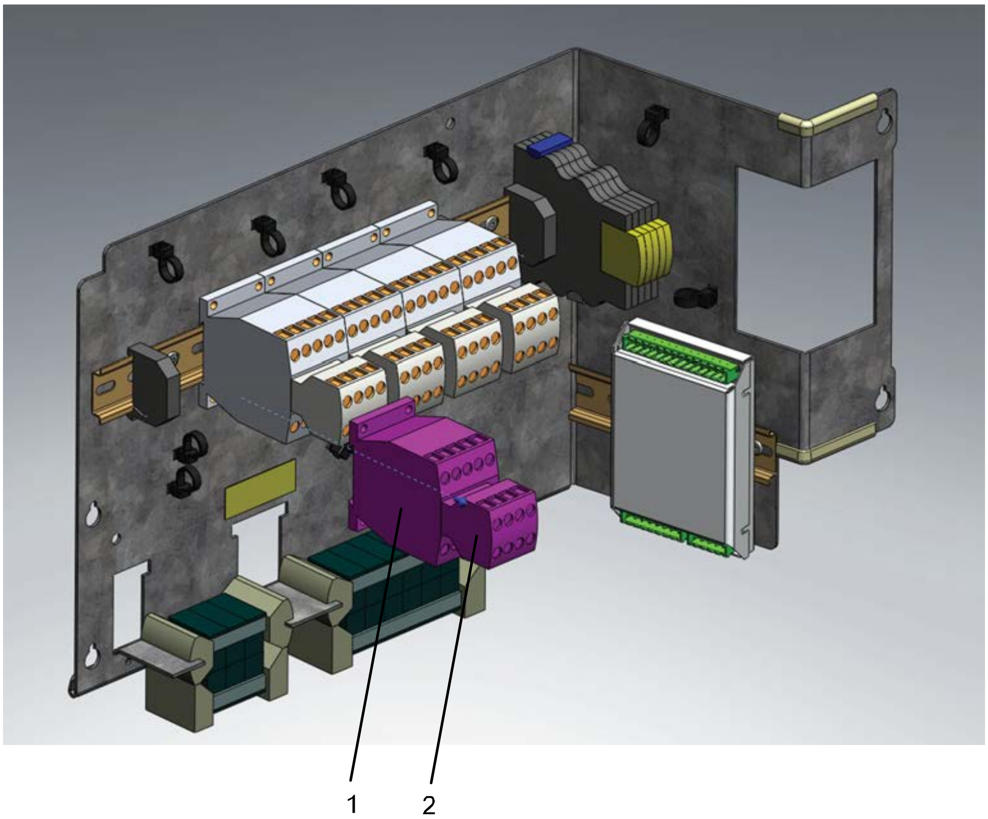
Location of contactors



xx1000000234

1	Contactor
2	Auxiliary contact

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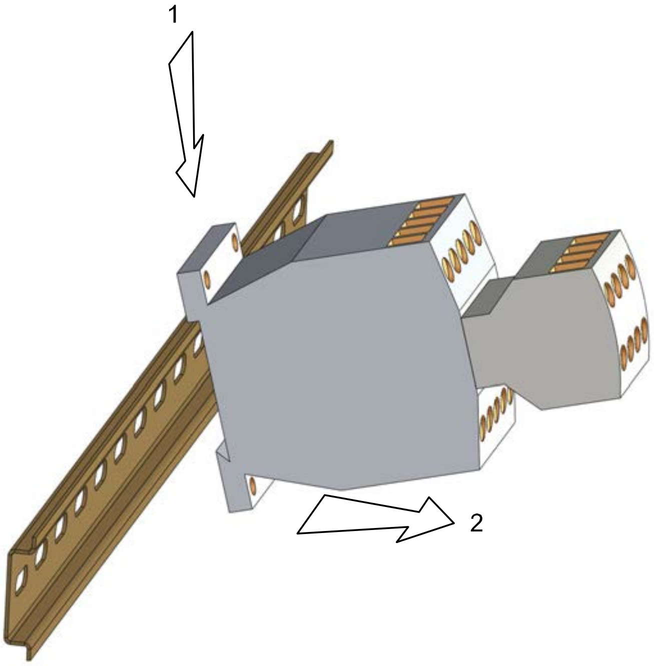
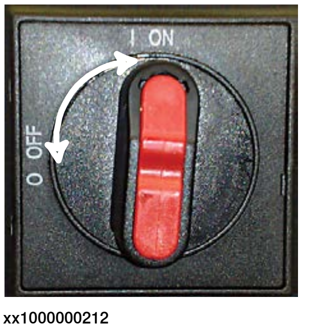
Removal

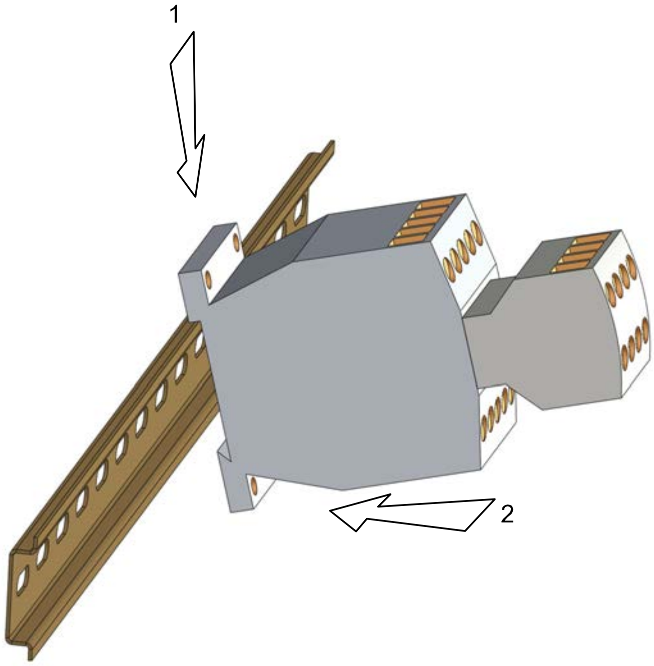


xx1000000237

	Action	Information
1	**DANGER** Before doing any work inside the cabinet, disconnect the mains power. For more information, see *Electrical safety on page 29*.	
2	Turn the main power switch to *OFF*.	 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.	

6.8.4 Replacing auxiliary contact

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

ELECTROSTATIC DISCHARGE (ESD)

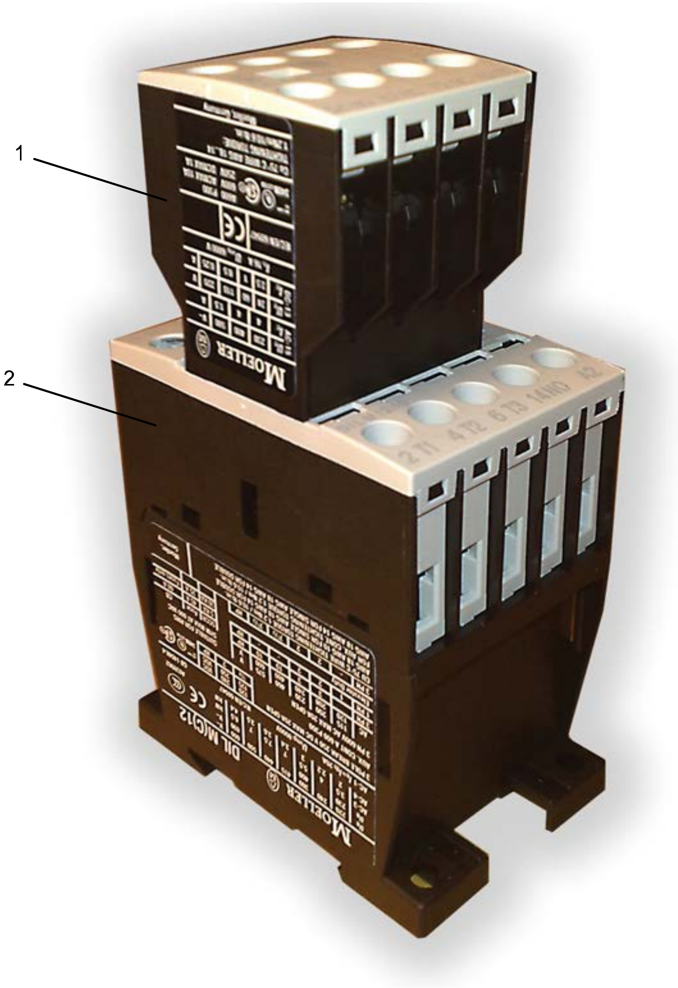
The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 92*.

Required equipment

Equipment	Note
Standard tools	See *Contents, standard toolkit, IRC5 on page 338*.
Auxiliary contact	*Product manual, spare parts - IRBP /D2009*

Continues on next page

Location



xx1000000241

1	Auxiliary contact
2	Contactor

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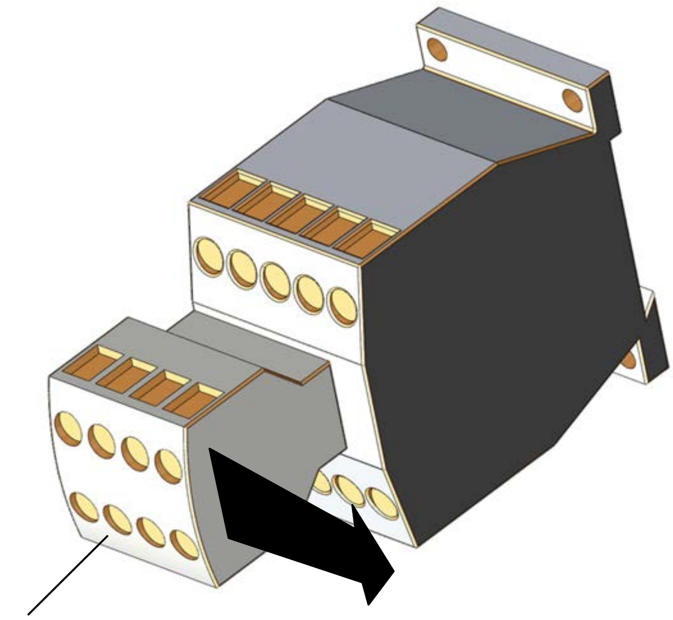
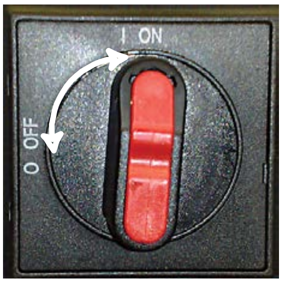
Removal



xx1000000238

1	Auxiliary contact

	Action	Information
1	**DANGER** Before doing any work inside the cabinet, disconnect the mains power. For more information, see *Electrical safety on page 29*.	
2	Turn the main power switch to *OFF*.	 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.	

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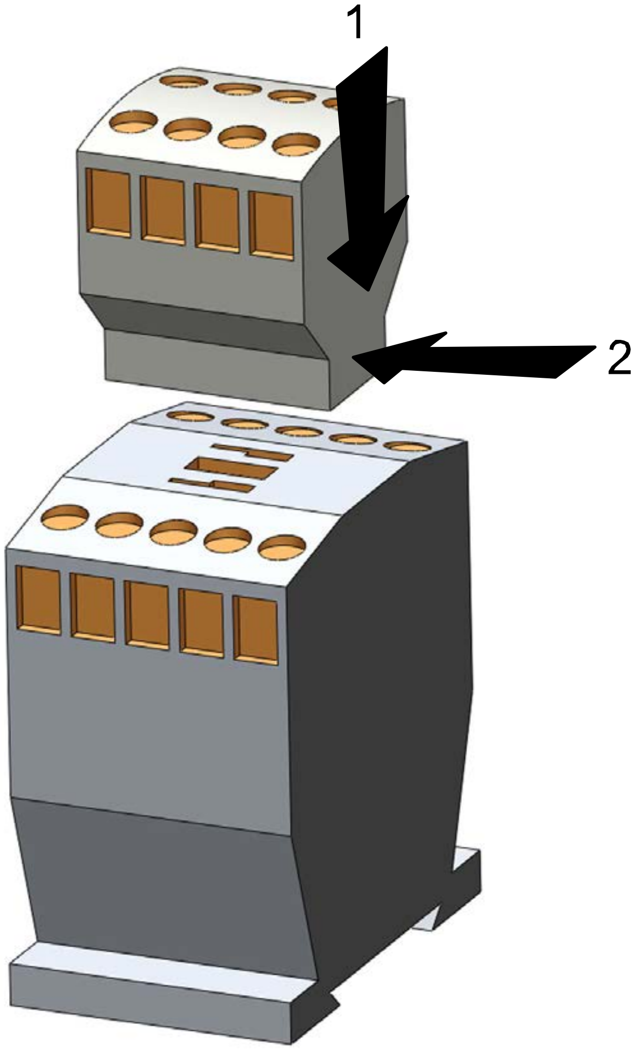
Refitting



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.	

6.8.5 Replacing auxiliary relays for breaker

Overview

DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

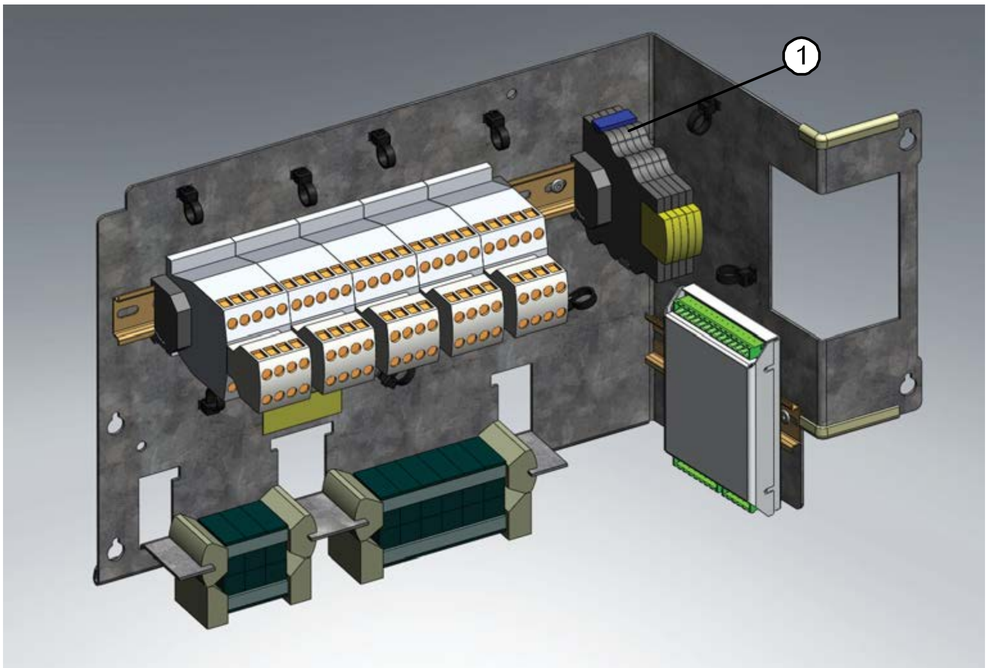
ELECTROSTATIC DISCHARGE (ESD)

The unit is sensitive to ESD. Before handling the unit read the safety information in section *The unit is sensitive to ESD on page 92*.

Prerequisites

Equipment	Note
Standard tools	See *Standard toolkit on page 339*
Auxiliary relay	*Product manual, spare parts - IRBP /D2009*

Location



xx1000000243

1	Auxiliary relay

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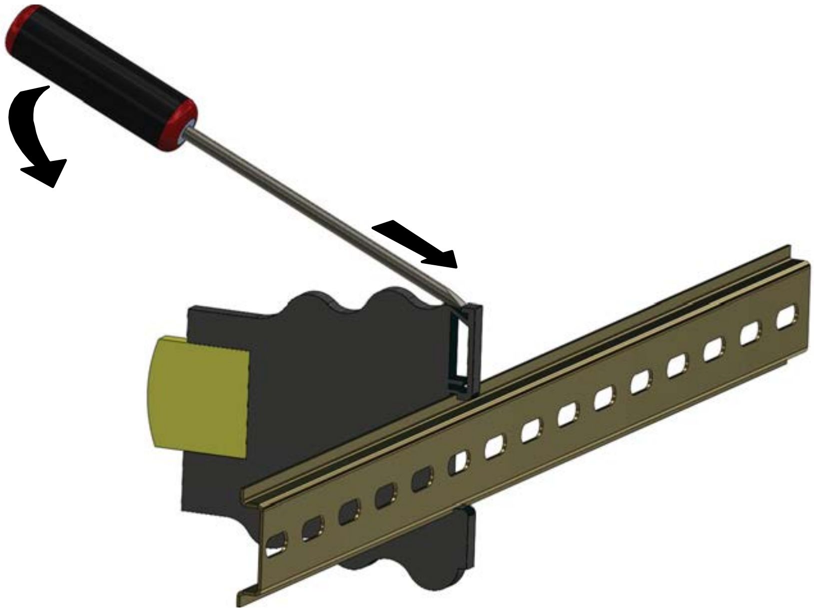
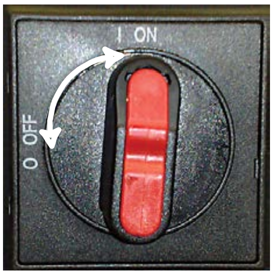
Replacing

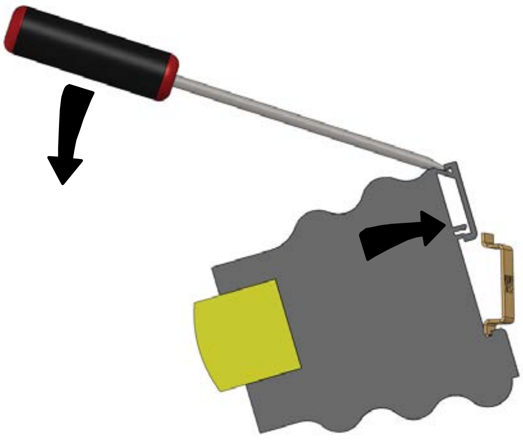


xx1000000242

	Action	Information
1	**DANGER** Before doing any work inside the cabinet, disconnect the mains power. For more information, see *Electrical safety on page 29*.	
2	Turn the main power switch to *OFF*.	 xx1000000212
3	Remove the cable harness from the auxiliary relay.	
4	Remove the auxiliary relay using a screw driver.	

Continues on next page

Refitting

1	Refit the auxiliary relay using a screw driver.	 xx1000000244

7 Operation

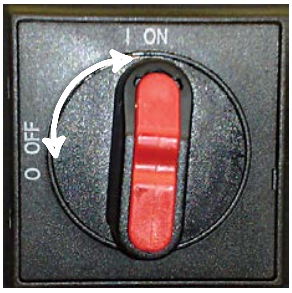
7.1 Start up

7.1.1 Starting production

WARNING

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

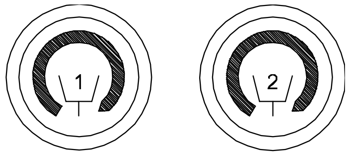
Robot, positioner and travel track

	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 See section *Control system with control panel at front on page 54*.
3	Check that: • The correct program is loaded. • The program pointer is set to the right start position. See the operating manual for the controller.	

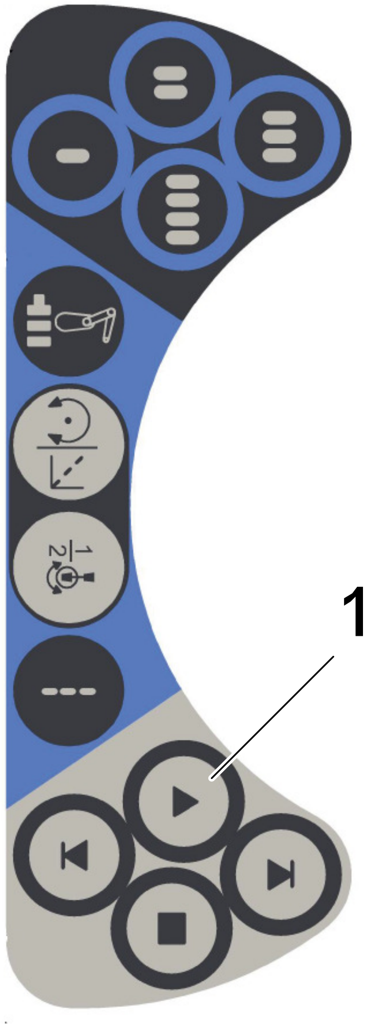
Resetting the light barriers during start-up

	Action	Note
1	Press the **Pre-reset button** (optional) inside the service area.	See section *Light barriers for positioners on page 31*.
2	Check that the service gate (optional) is closed.	
3	Press the service gate's reset button (optional).	

Continues on next page

	Action	Note
4	Press the **Start Process** button for one or two stations (see figure) for the light barriers on the operator panel to: • Give the ready signal to the robot system that the loading of the workpiece in the station is complete. • Reset the personal safety protection around the working area of the station. • Start the process. **Note** This must be performed within 10 seconds of pressing the pre-reset button; otherwise the light barriers will not reset. If the above does not work, start again from step 1.	 xx1000000213
5	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 1 Mode selector (100% optional) 2 Auto mode 3 Motors On button See section *Control system with control panel at front on page 54*.

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 *External control units on page 62*

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. **Note** Loading an IRBP B positioner in a position that is not calibration position can cause vibration on the opposite station side.	
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) inside the service area.	See section *Light barriers for positioners on page 31*.
4	Press either the **Start Process** button or the button for the light barriers on the operator panel. **Note** This must be performed within 10 seconds of pressing the pre-reset button; otherwise the light barriers will not reset.	See *Operator panel on page 63*.

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

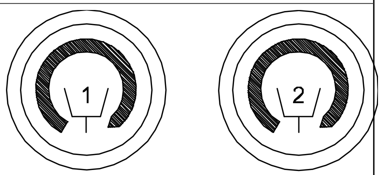
General

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 for positioners on page 31*.

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) inside the service area.	See section *Light barriers for positioners on page 31*.
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

	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 1 Operation mode (100% optional) 2 Auto mode 3 Motors on button See section *Control system with control panel at front on page 54*.
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).	

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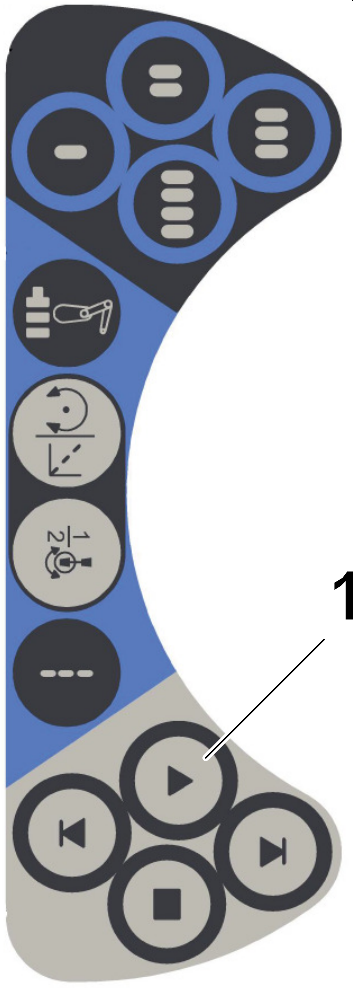
	Action	Information
8	Press the **Start** button on the FlexPendant.	 xx1000000215 1 Start button
9	Press **Program Start** on the operator panel to start the robot program. Do not go back to the original station side.	See *Operator panel on page 63*.
10	Run the setting procedure to verify the positioner's station positions. See *Drivers on page 310*.	

7.2 Program stop and restart of program

7.2.1 Program stop

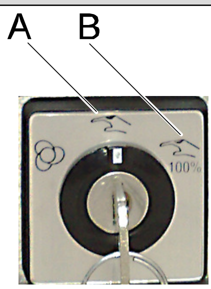
Programmed operation

Programmed operation can be stopped in various ways:

Stopping method	Button
Manually using the **Stop button** on the FlexPendant.	See *The FlexPendant on page 56*.
Manually using the **Stop button** on the operator panel.	See *External control units on page 62*.
Automatically using a programmed stop in the robot program.	

Programmed operation in positions

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

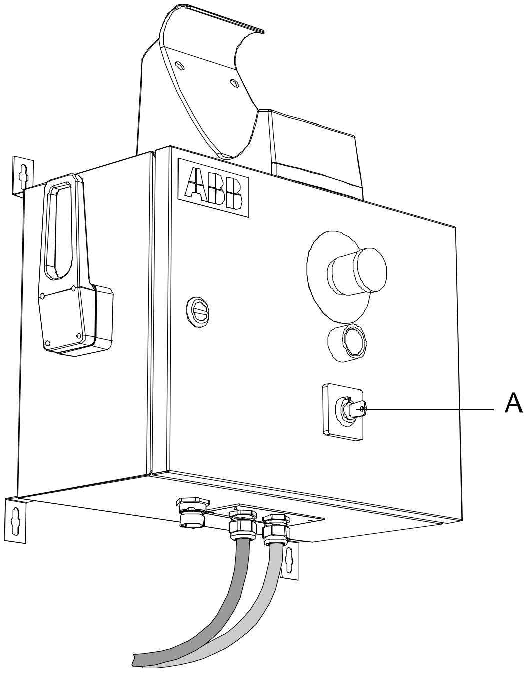
Stopping method	Mode
This should always be done using the **Program Stop button** before the continuous pressure switch on the FlexPendant is released. Otherwise, the system is stopped by AUTO stop, which is harder than the computer-controlled braking of movement.	 xx1000000219 A Manual reduced speed <250mm/s B 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 *The FlexPendant on page 56*.
Press the **Program Stop button** on the operator panel.	See *Operator panel on page 63*.

Continues on next page

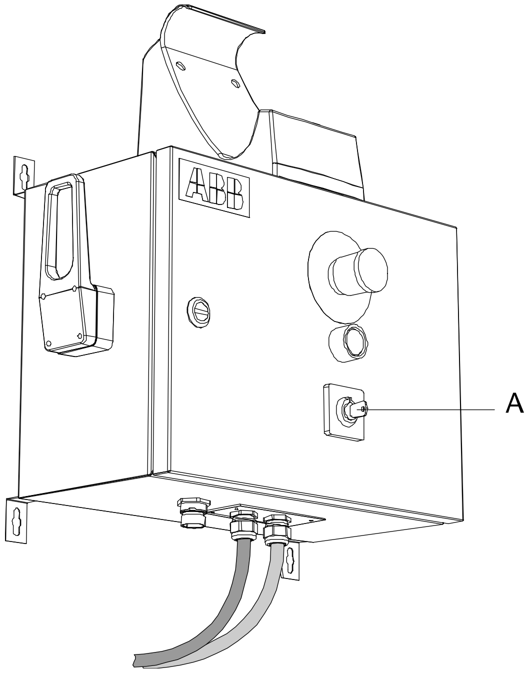
Stopping method	Button
Turn the operating mode selector on the control module's external control panel. Result: Motors off.	xx1000000220 A mode selector

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 *The FlexPendant on page 56*.
Press the **Program Stop** button on the operator panel.	See *Operator panel on page 63*.

Continues on next page

Stopping method	Button
Turn the operating mode selector on the control module's external control panel. Result: Motors off.	 xx1000000220 A mode selector
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 63*.

	Action	Note/Illustration
1	Rectify any malfunctions that caused the stop.	
2	Check that: • The service gate is closed • The robot, positioner, and travel track working areas are clear.	
3	Press the service gate's **Reset button** (option).	
4	Press the **Pre-reset button** (optional) inside the service area.	See section *Light barriers for positioners on page 31*.
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.	See section *Operator panel on page 63*.
6	Press the **Motors On** button on the control module's control panel.	See section *Control system with control panel at front on page 54*.
7	Press **Program Start** on the operator panel to start the robot program.	See section *Operator panel on page 63*.

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 63*.

	Action	Note/Illustration
1	Rectify any malfunctions that caused the stop.	
2	Check that: • The service gate is closed • The robot, positioner and travel track working areas are clear.	
3	Press the service gate's **Reset button** (option).	
4	Press the **Pre-reset button** (optional) inside the service area.	See section *Light barriers for positioners on page 31*.
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.	See section *Control system with control panel at front on page 54*.
7	Press **Program Start** on the operator panel to start the robot program.	See section *Operator panel on page 63*.

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 re-calibrated 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 IRC5 robots on page 290*. This will occur when:

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

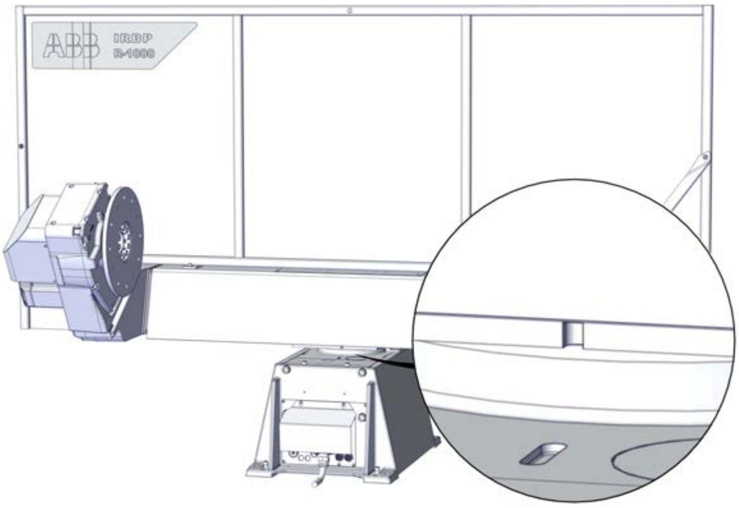
The revolution counters must also be updated after the robot and controller are connected at the first installation.

The robot is rebuilt

If the robot is rebuilt, for example, after a crash or when the reachability of a robot is changed, it needs to be re-calibrated for new resolver values.

8.2 Calibration marks

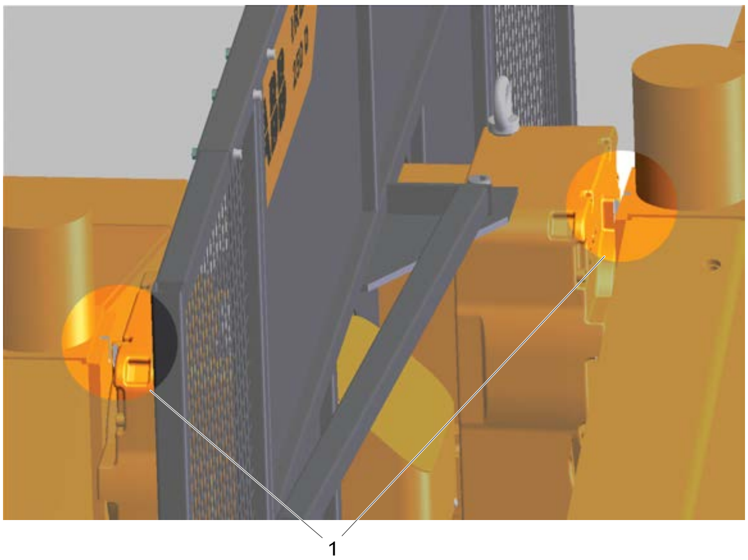
Synchronization mark MID station foot



xx1000000121

1	Synchronization mark MID 2.1

Synchronization mark MTD station unit



xx1000000122

1	Synchronization mark MTD

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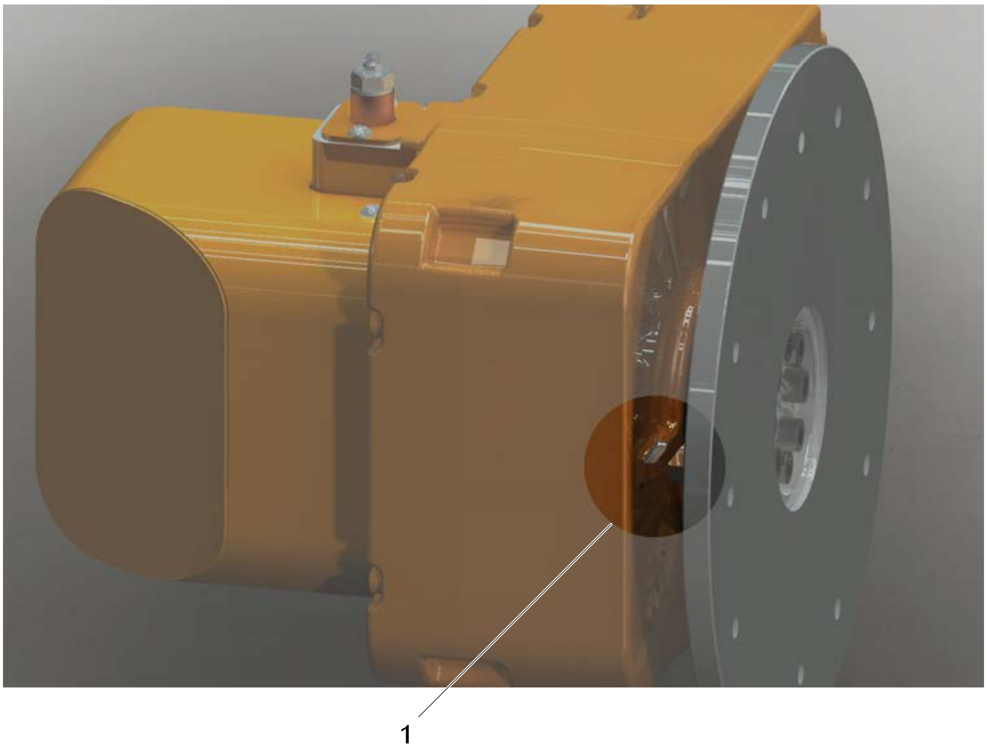
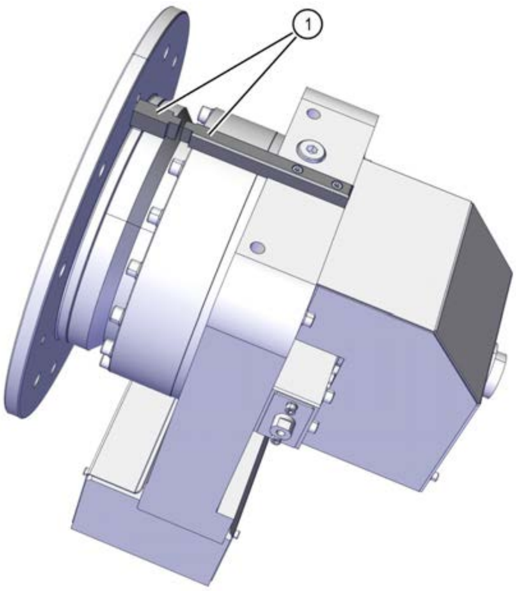
Synchronization mark MTD rotary unit



xx1000000117

1	Synchronization mark MTD

Synchronization mark MTE rotary unit



xx2300001201

1	Synchronization mark MTE

8.3 Updating revolution counters on IRC5 robots

Introduction

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

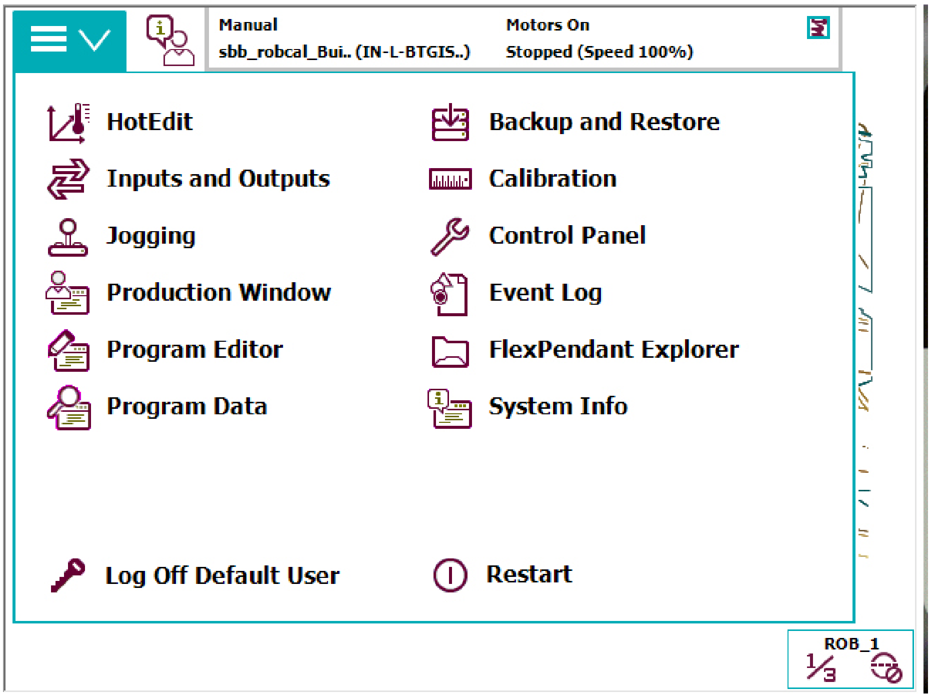
Step 1 - Manually running the manipulator to the synchronization position

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

	Action	Note
1	Select axis-by-axis motion mode.	
2	Jog the manipulator to align the synchronization marks.	See *Calibration marks on page 288*.
3	When all axes are positioned, update the revolution counter.	*Step 2 - Updating the revolution counter with the FlexPendant on page 290*.

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**.  xx1500000942

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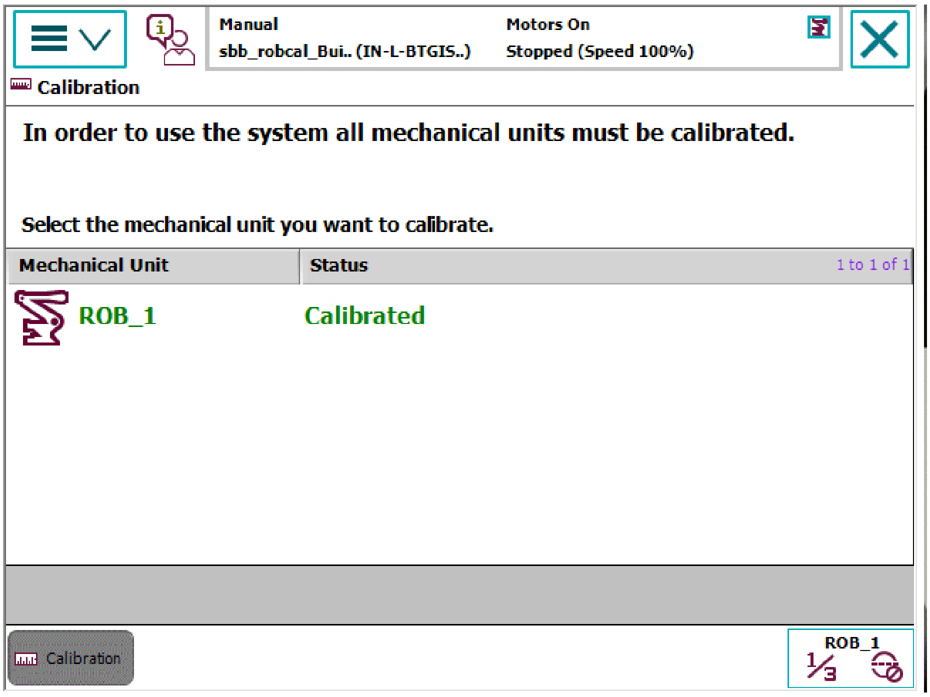
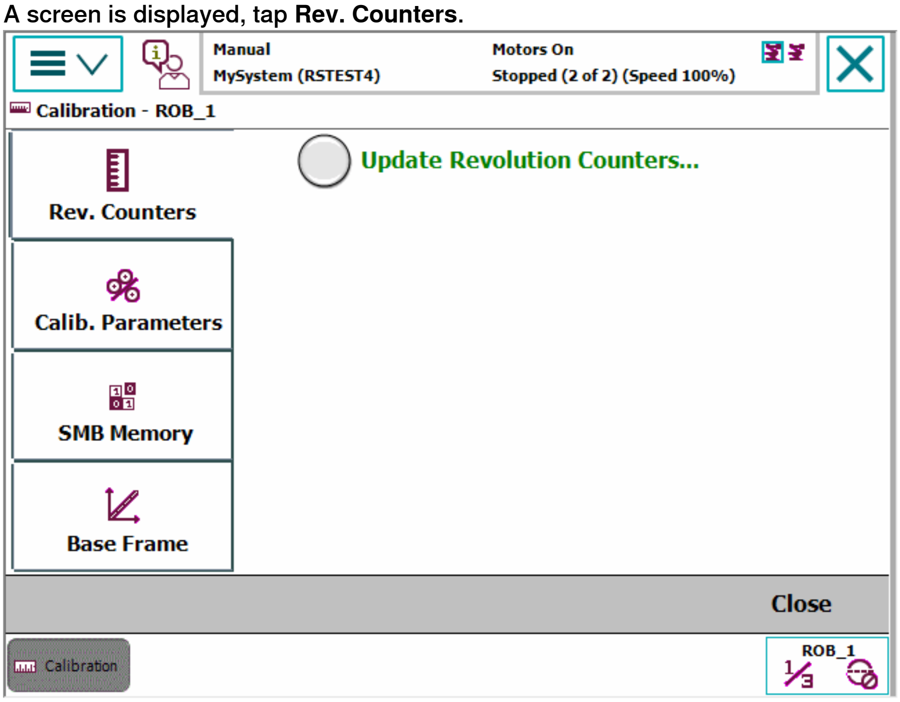
<table>
<tr><th></th><th>Action</th></tr>
<tr><td>2</td><td>All mechanical units connected to the system are shown with their calibration status.
Tap the mechanical unit in question.



xx1500000943</td></tr>
<tr><td>3</td><td>A screen is displayed, tap Rev. Counters.



en0400000771</td></tr>
</table>

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	Action
4	Tap **Update Revolution Counters....** A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: • Tap **Yes** to update the revolution counters. • Tap **No** to cancel updating the revolution counters. Tapping **Yes** displays the axis selection window.
5	Select the axis to have its revolution counter updated by: • Ticking in the box to the left • Tapping **Select all** to update all axes. Then tap **Update**.
6	A dialog box is displayed, warning that the updating operation cannot be undone: • Tap **Update** to proceed with updating the revolution counters. • Tap **Cancel** to cancel updating the revolution counters. Tapping **Update** updates the selected revolution counters and removes the tick from the list of axes.
7	**CAUTION** If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury!

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 are 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: • Tap **Yes** to proceed.	
7	Tap on the axis where the value is to be modified. • Enter the new value with the help of the keypad.	
8	Confirm the value by tapping **OK.**	
9	The system awaits a response: • 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 MTD

	Action	Note
1	Move the positioner's axes (axis) to respective zero positions (synchronization marking). • 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: • Tap **Yes** to proceed.	
8	Select one or more axes, to be recalibrated.	
9	Tap **Calibrate**.	
10	The system awaits a response: • Tap **Calibrate**, to confirm recalibration.	
11	Tap **Close**.	

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 *CalibIntch1* 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 (not IRBP C)

8.7.1 Introduction

General

Before the system can be used, the system has to be calibrated. The calibration principle is based on tools with defined TCPs that are moved together a number of times.

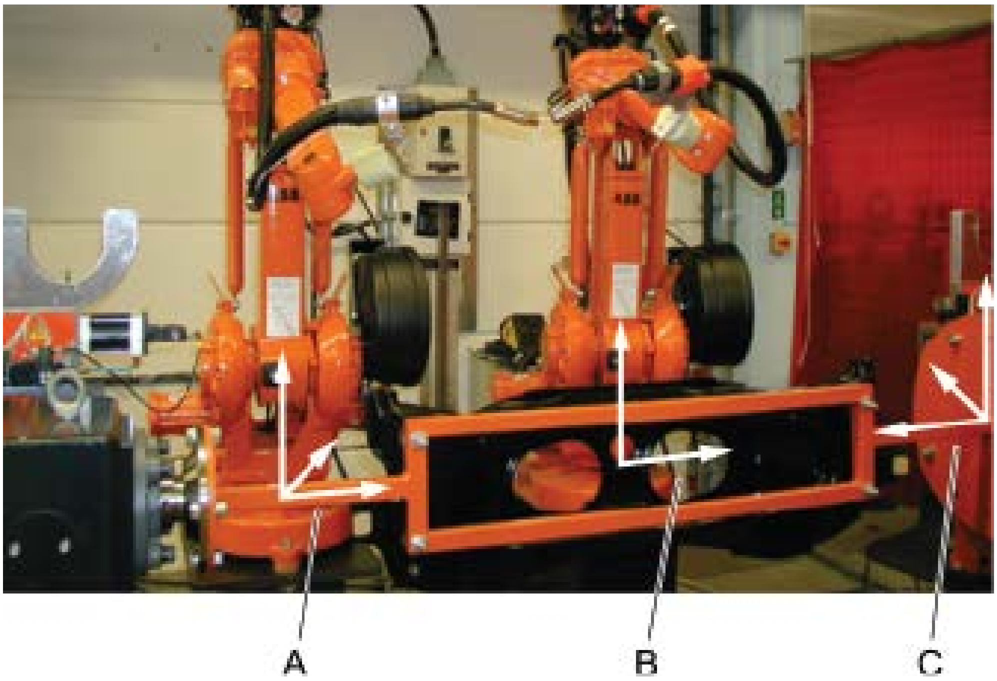
This method will move and rotate the base frame in relation to the world frame. Normally the base frame is centered and aligned with the world frame.

Positioner IRBP C is not calibrated for base frame (it has no stations).

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

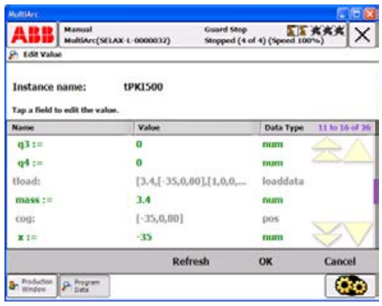
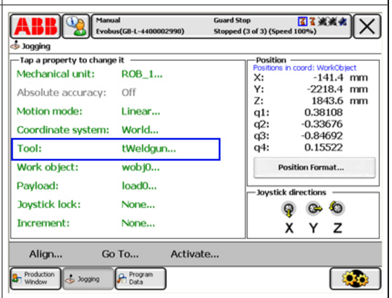
8.7.2 Calibrating the multi-arc system

Required equipment

Equipment	Article number	Note
Pointer	-	Make a pointer that screws into the tip adapter. The point of the pointer should be in exactly the same position as the defined TCP, e.g. 15 mm from the end of the nozzle.  xx1800000747
Centre punch and hammer	-	Used for making a punch mark on the turning disc and the bearing disc spigot (if available).

Tool calibration

Start to calibrate the welding tool TCP using BullsEye.

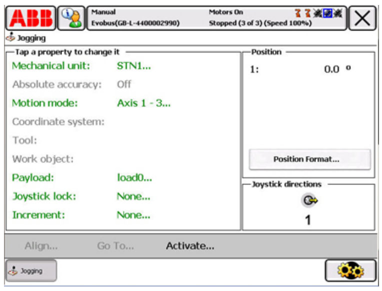
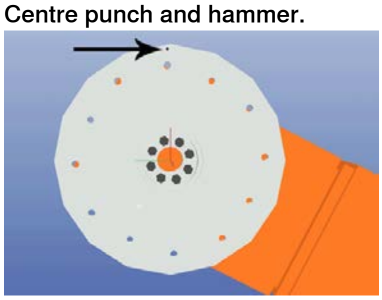
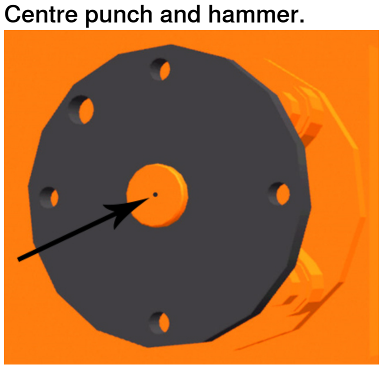
	Action	Note
1	Change the mass in the tool data from the negative value to the correct value for your tool, see figure.	 xx1400000898
2	Activate the tool.	 xx1800000746

Continues on next page

Preparing the robot

	Action	Note
1	Attach the pointer to the tip adapter on the robot. The point of the pointer should be in exactly the same position as the defined TCP, e.g. 15 mm from the end of the nozzle.	 xx1800000747

Preparing the positioner discs

	Action	Note
1	Activate the station, then jog the turning disc to 0°.	 xx1800000748
2	Make a small punch mark at the top dead centre on the turning disc.	Centre punch and hammer.  xx1800000749
3	Valid for positioners that have a tailstock (IRBP K, IRBP L, IRBP R): Mark out the centre of the bearing disc spigot and carefully make a small punch mark there.	Centre punch and hammer.  xx1800000750

Calibrating the base frame of robot 1

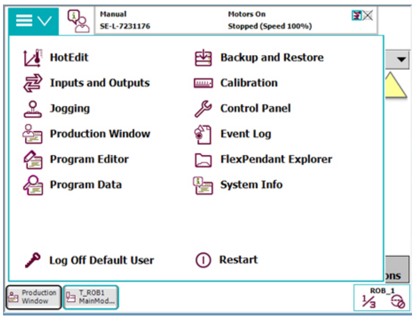
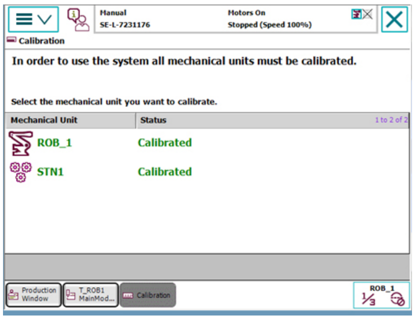
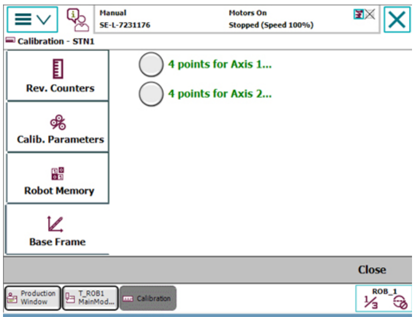
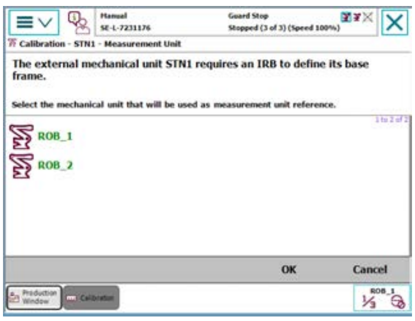
Use the procedure to calibrate the base frame of robot 1. The FlexPendant images shown in the procedure can differ between the positioner variants.

Continues on next page

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

Note

If robot 1 (**ROB_1**) is selected, you cannot do the base frame calibration between robot 2 (**ROB_2**) and positioner.

	Action	Note
1	On the FlexPendant, select **Calibration**.	 xx1800000751
2	Select Mechanical Unit **STN1**.	 xx1800000752
3	Select **Base Frame** and then select which points to calibrate. The number of axes and points to calibrate differ depending on positioner variant. IRBP A, IRBP B, IRBP D: **4 points for Axis 1** or **4 points for Axis 2**. (Both axes need to be calibrated. Choose axis 1 first and run the complete procedure according to the following steps. When done, repeat the procedure for axis 2, keeping axis 1 at 0° meanwhile.) IRBP K, IRBP L, IRBP R: **4 points Z**	 xx1800000753
4	Select the robot you will use to measure the base frame. **Note** If robot 1 (**ROB_1**) is selected you cannot do the base frame calibration between robot 2 and positioner.	 xx1800000785

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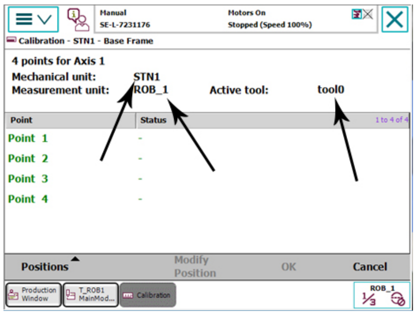
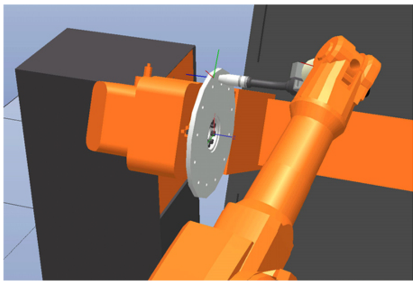
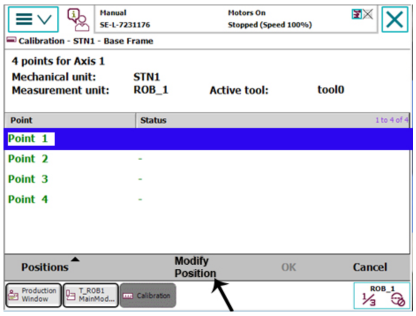
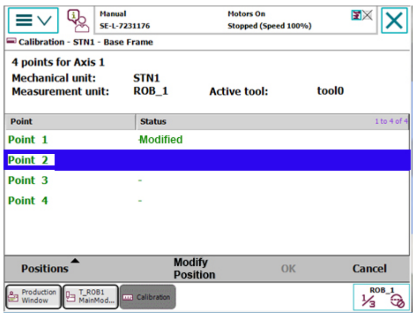
	Action	Note
5	Check that the correct **Mechanical unit**, **Measurement unit** and **Active tool** are selected.	 xx1800000754
6	With the station at 0°, jog the robots TCP to position the pointer exactly onto the punch mark.	 xx1800000755
7	Highlight **Point 1** and tap **Modify Position**.	 xx1800000756
8	**Point 1** will now show **Modified** and **Point 2** will automatically be highlighted.	 xx1800000757

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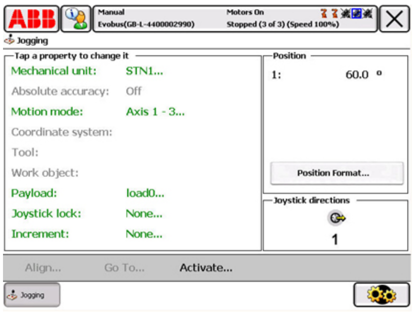
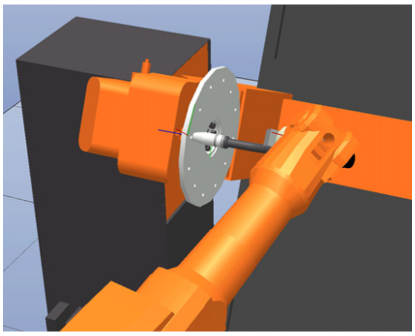
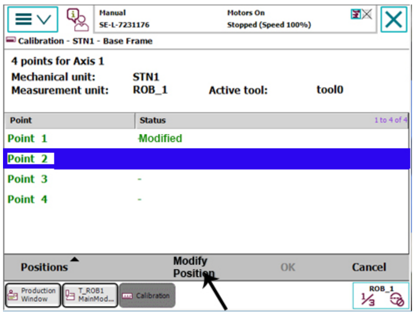
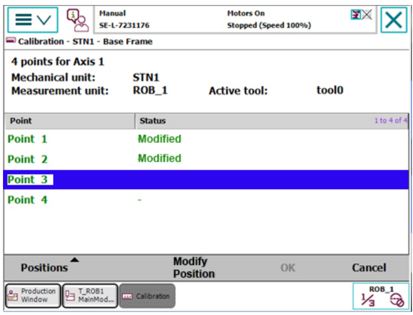
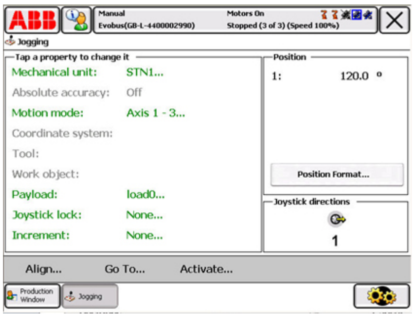
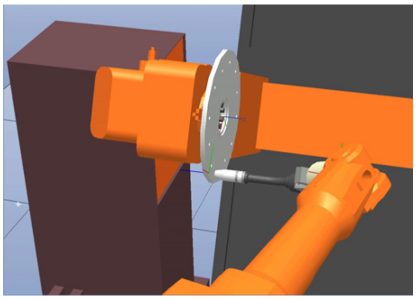
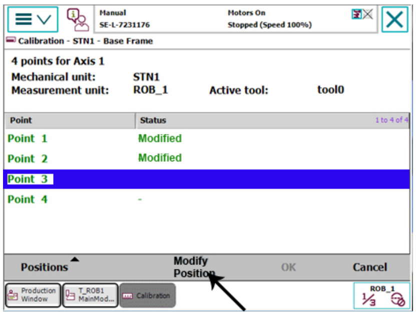
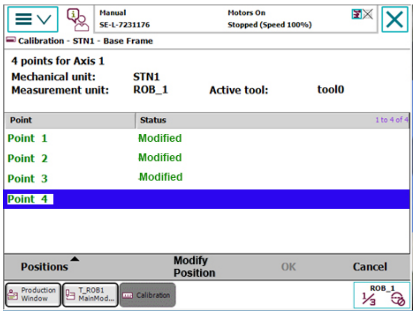
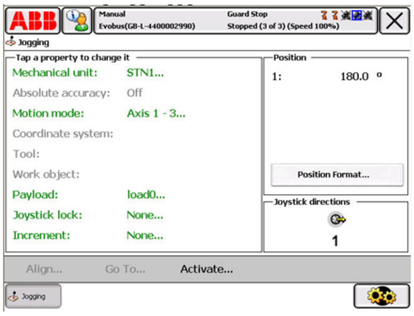
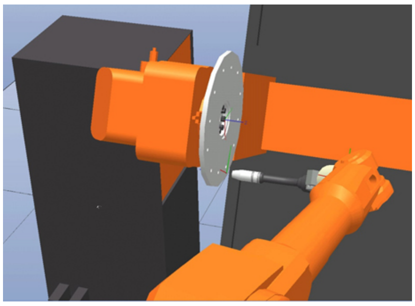
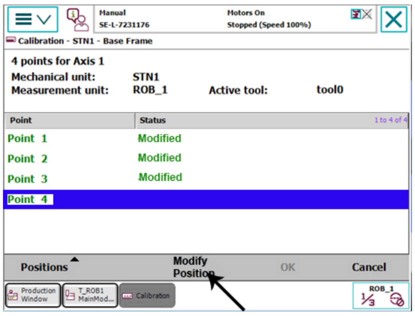
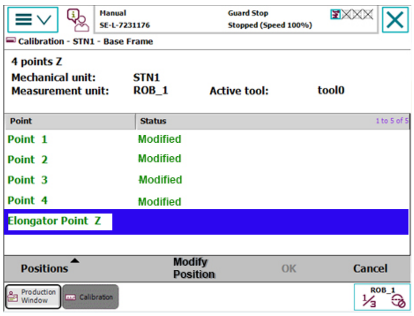
	Action	Note
9	Rotate the turning disc to 60°, using the jogging window to see the exact position information.	 xx1800000758
10	Position the pointer exactly on the punch mark.	 xx1800000759
11	Ensure that **Point 2** is highlighted and tap **Modify Position**.	 xx1800000760
12	**Point 2** will now show **Modified** and **Point 3** will automatically be highlighted.	 xx1800000761

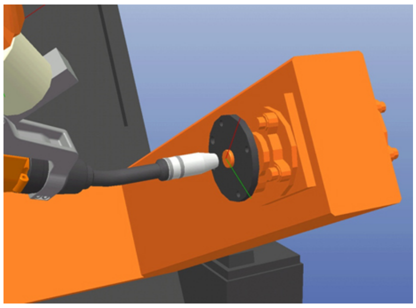
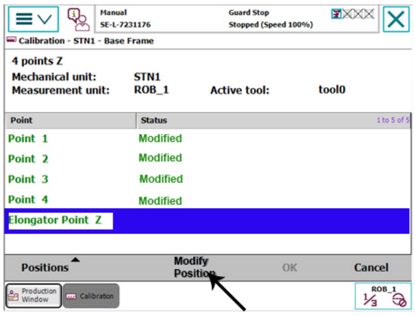
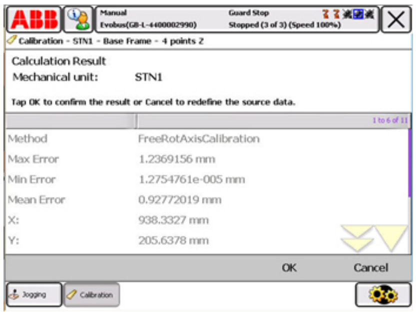
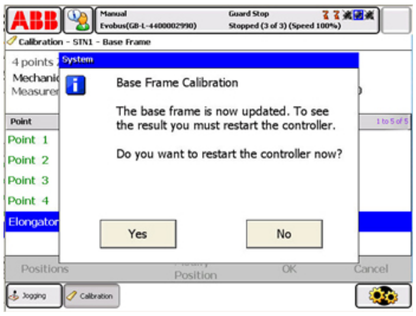
Continues on next page

	Action	Note
13	Rotate the turning disc to 120°, using the jogging window to see the exact position information.	 xx1800000762
14	Position the pointer exactly on the punch mark.	 xx1800000763
15	Ensure that **Point 3** is highlighted and tap **Modify Position.**	 xx1800000764
16	**Point 3** will now show **Modified** and **Point 4** will automatically be highlighted.	 xx1800000765

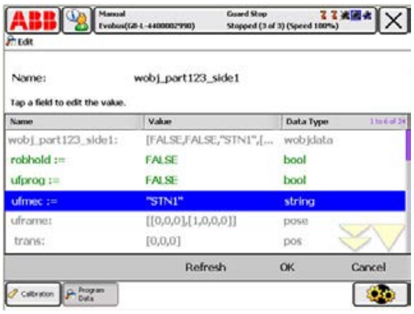
Continues on next page

	Action	Note
17	Rotate the turning disc to 180°, using the jogging window to see the exact position information.	 xx1800000766
18	Position the pointer exactly on the punch mark.	 xx1800000767
19	Ensure that **Point 4** is highlighted and tap **Modify Position**.	 xx1800000768
20	Valid for positioners that have a tailstock (IRBP K, IRBP L, IRBP R): **Point 4** will now show **Modified** and **Elongator Point Z** will automatically be highlighted.	 xx1800000769

Continues on next page

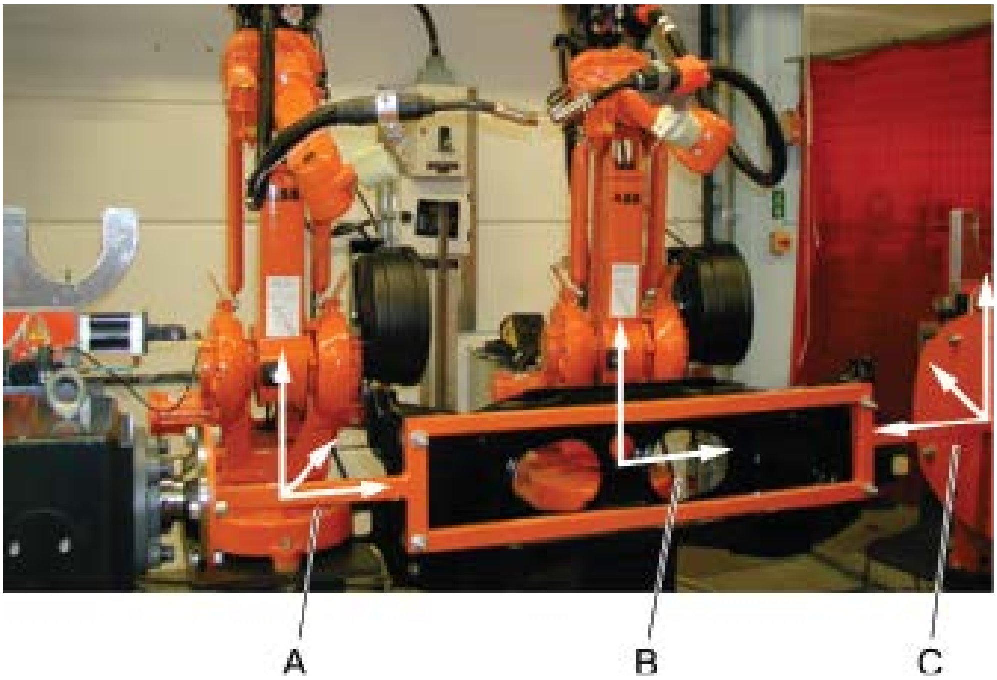
	Action	Note
21	Valid for positioners that have a tailstock (IRBP K, IRBP L, IRBP R): Jog the robots TCP to position the pointer exactly onto the punch mark on the bearing disc spigot.	 xx1800000770
22	Valid for positioners that have a tailstock (IRBP K, IRBP L, IRBP R): Ensure that **Elongator Point Z** is highlighted and tap **Modify Position**.	 xx1800000771
23	The **Calculation Result** will be shown. Tap **OK**.	 xx1800000772
24	Restart the controller by tapping **Yes**.	 xx1800000773
25	Valid for positioners IRBP A, IRBP B, IRBP D: Go to step 2 and repeat the calibration procedure for the 4 points of the second axis.	

Continues on next page

	Action	Note
26	To use the base frame in your WorkObject: 1 Change the **ufprog** to **FALSE**. 2 Insert the station name in the **ufmec** field and then define your fixture or part WorkObject.	 xx1800000774

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

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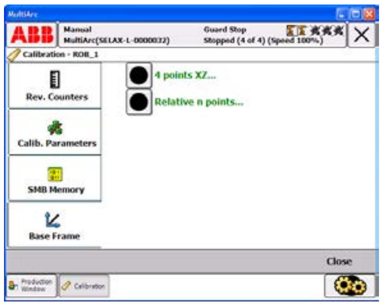
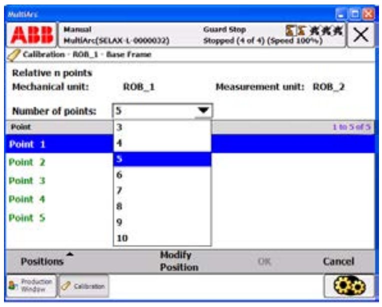
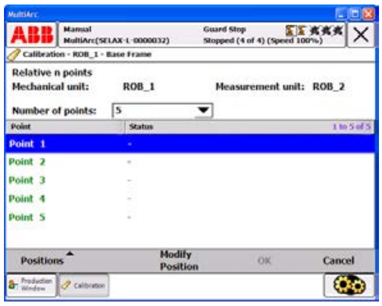
	Action	Note
2	Select robot 1 (**ROB_1**).	 xx1400000906
3	Select **base frame** and then **Relative n points**.	 xx1400000907
4	Select **Number of points**.	 xx1400000908
5	Point the TCPs of the robots towards each other.	 xx1400000909
6	Tap **Modify position**.	 xx1400000910

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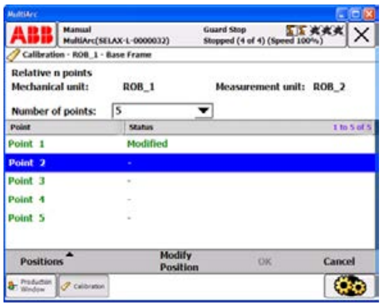
	Action	Note
7	For each of the steps: Move the robots to a new position where they are far apart compared to the previous position.	
8	Tap **Modify position**.	
9	When all postions are modified, tap **OK**.	 xx1400000911
10	Create a work object according to *Operating manual - IRC5 with FlexPendant*, to confirm that the calibration is correct.	

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.

WARNING

It is very important to always define correct actual load data and correct payload of the positioner. Incorrect definitions of load data can result in overloading of the positioner.

If incorrect load data and/or loads are outside load diagram is used the following parts can be damaged due to overload:

- motors
- gearboxes
- mechanical structure

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.

Continues on next page

- 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 310*.

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.

Speed data for external axes

Use the following maximum speed data for IRBP.

IRBP positioner	Maximum speed of rotation
MTD 250	180 degree/s
MTD 250	150 degree/s
MTD 750	150 degree/s
MTE 500/750	150 degree/s
MTD 2000	90 degree/s
MTD 5000	39 degree/s
MID 500	90 degree/s
MID 1000	90 degree/s

8.9 Drivers

8.9.1 Identification of load data for positioners IRBP

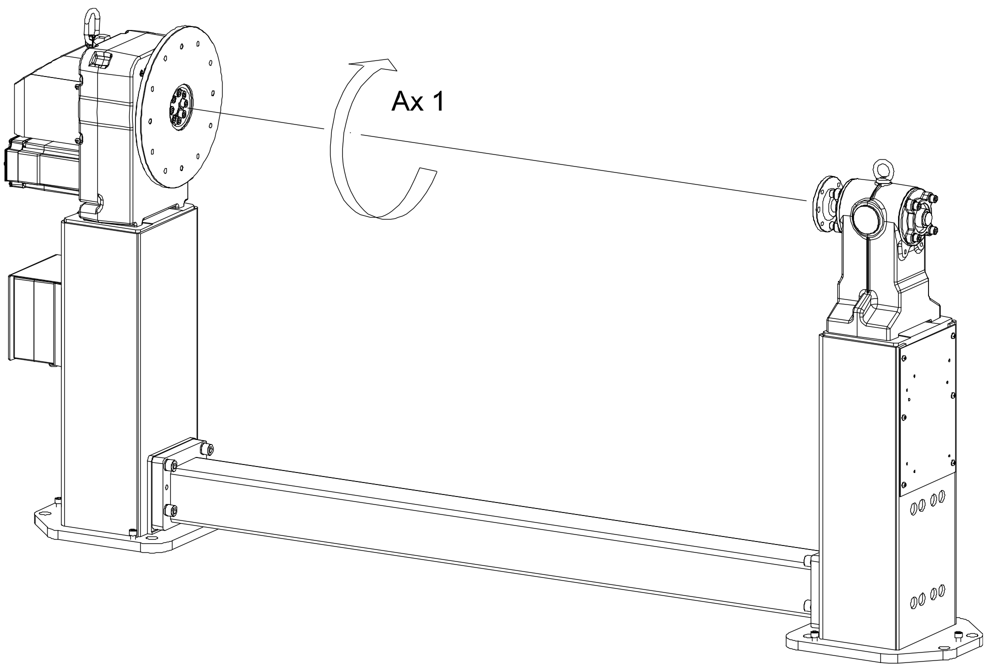
Introduction

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.



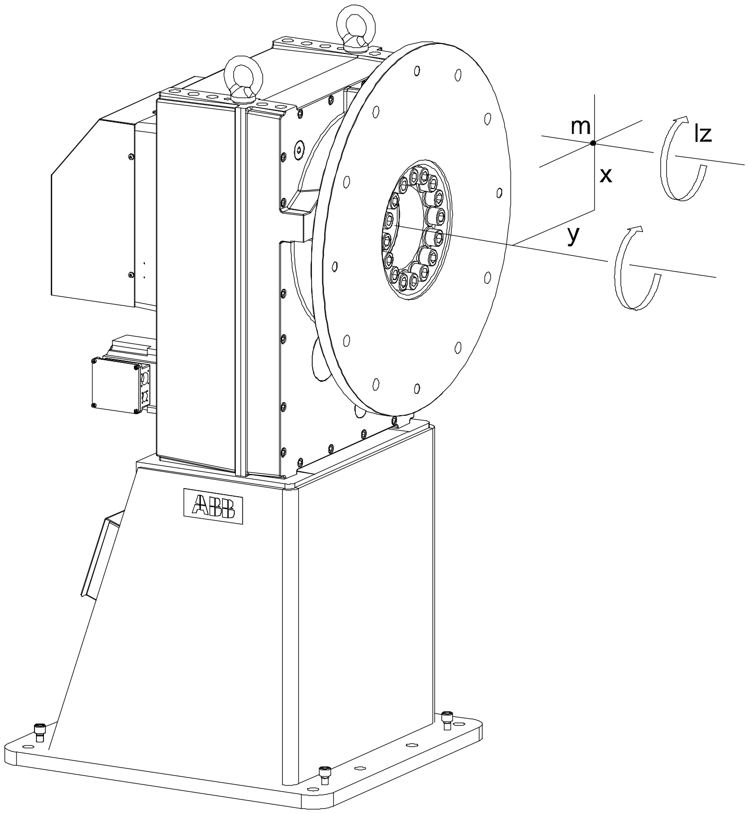
xx1000000139

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

Parameters



xx1000000140

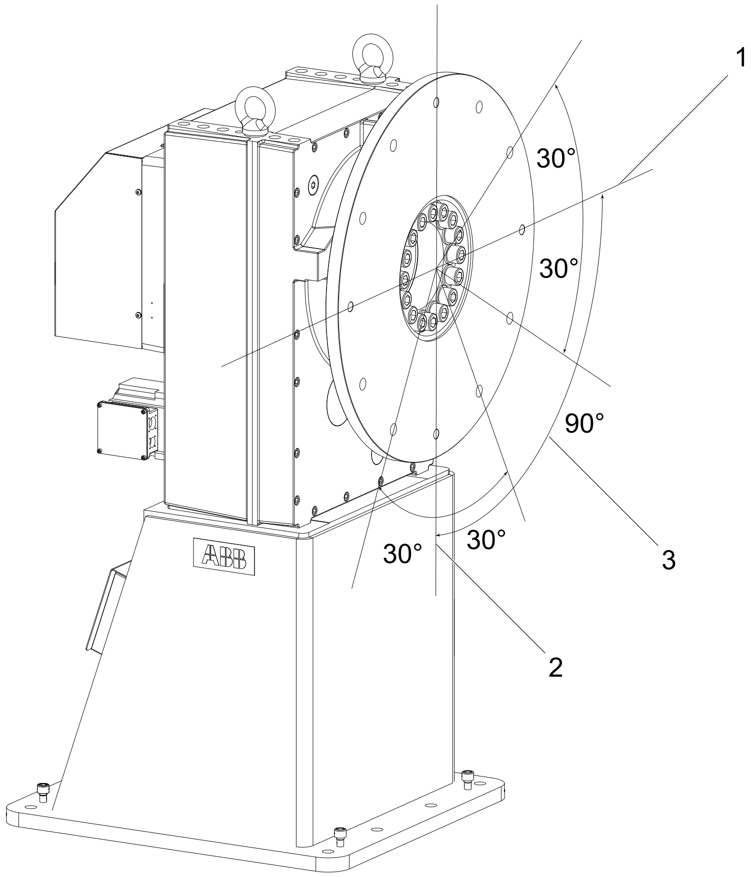
The parameters that are identified are the center of gravity in a plane perpendicular to the axis, and moments of inertia around the axis, see figure.

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

Continues on next page

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

Load identification for IRBP C

Load identification can be performed in positions according to load identification service routine (*ManLoadIdentify*).

> **Note**
>
> The data entered when performing the load identification is the sum of the loads applied. Load identification should be performed separately for all different load scenarios that is used.

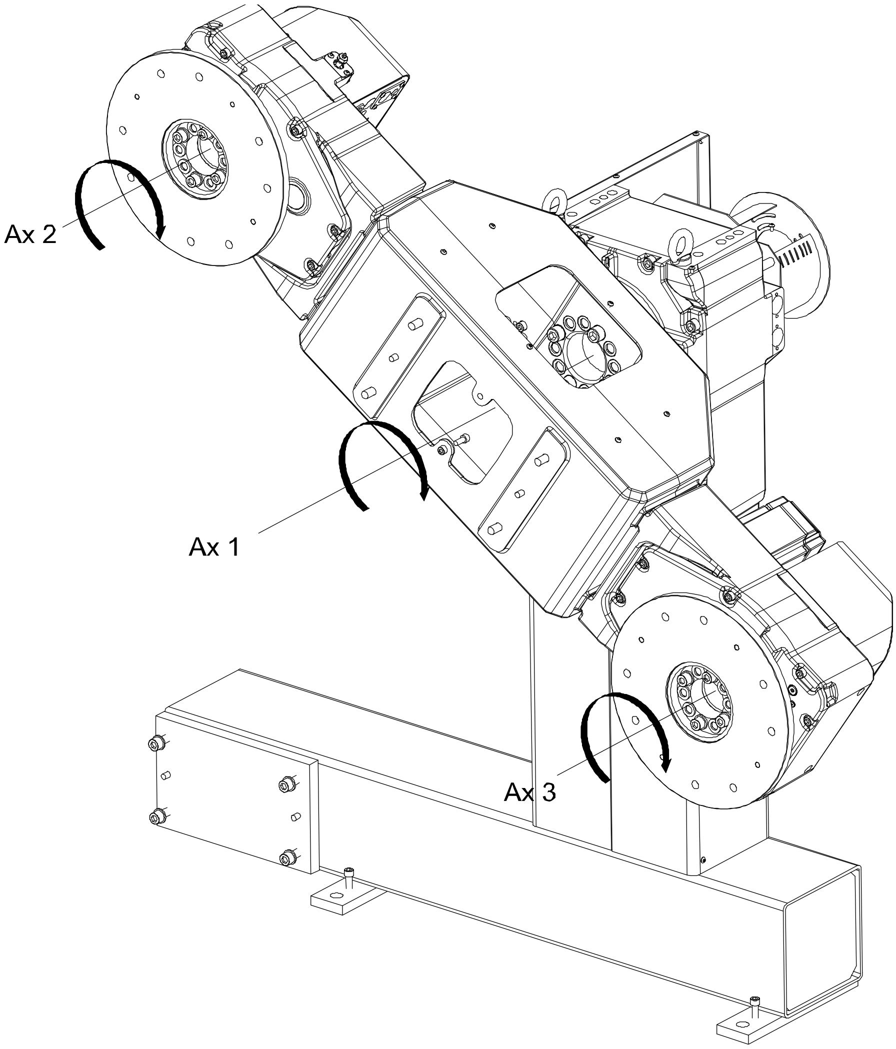
Parameters

The parameter identified is the total moments of inertia around the axis. Note that the mass of the loads must be known in advance.

Continues on next page

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

Parameters

The identified parameters and movements for each axis are the same as for the IRBP L positioner. See *Parameters and movements on page 310*.

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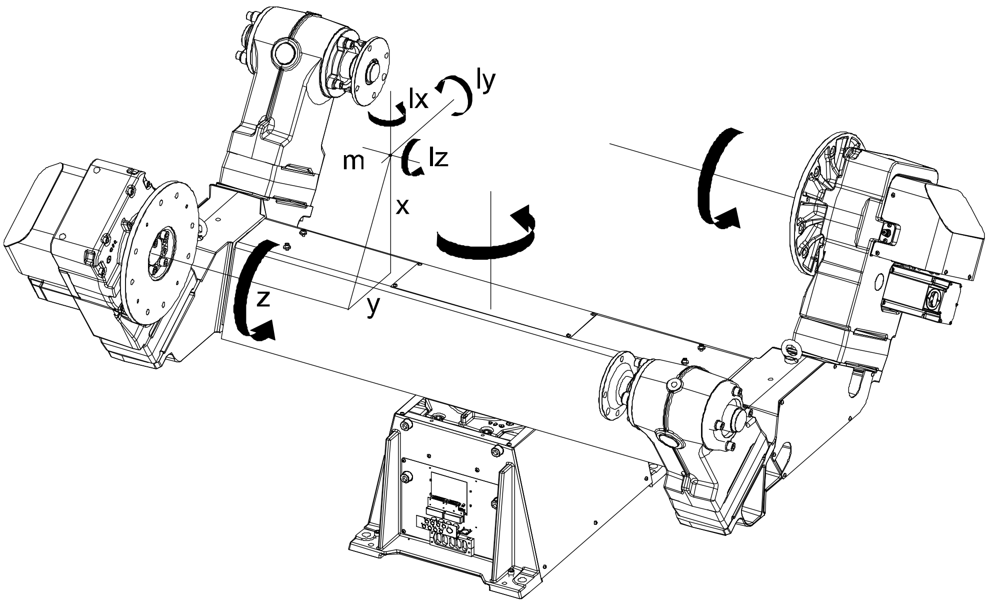
Load identification for IRBP R

A simplified view of the positioner IRBP R is shown in the following figure.



xx1000000149

Parameters

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.

Movements

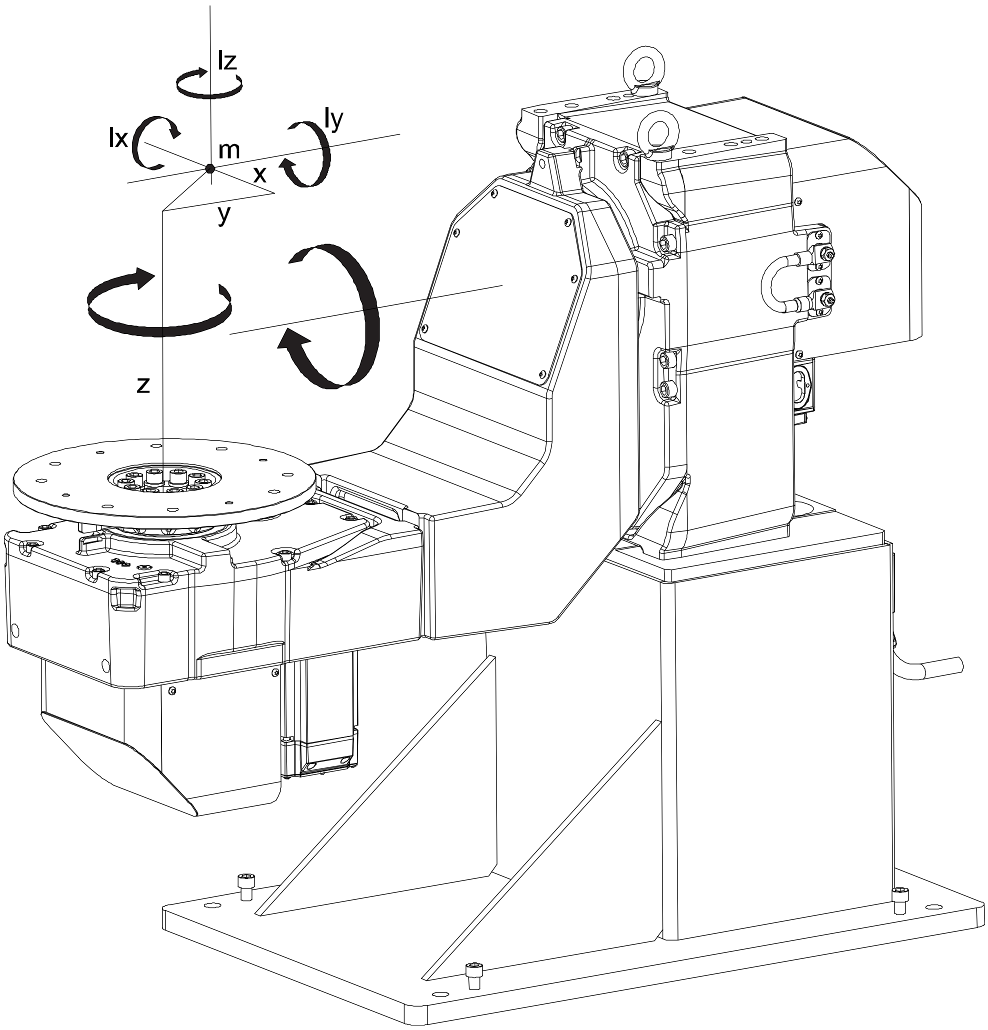
One part of the identification movements for one axis is the same as for the positioner IRBP L. To find the extra moment of inertia we also move the interchange axis with the load to two different positions. The movements for the interchange axis are the movements described in the figure in section *Parameters and movements on page 310*, 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.

Continues on next page

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

Parameters

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.

Movements

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 310*. 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**.	

8.9.3 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 ran 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. • Tap **Production Manager**.	
2	Tap **Setup**	
3	Choose the station for which the load position will be changed. • 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. • Tap **Production Manager.**	
2	Tap **Setup**.	
3	Choose the station for which the process position will be changed. • 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.	

8.9.5 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. • Tap **Production Manager.**	
2	Tap Setup.	
3	Choose the station for which the service position will be changed. • 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.

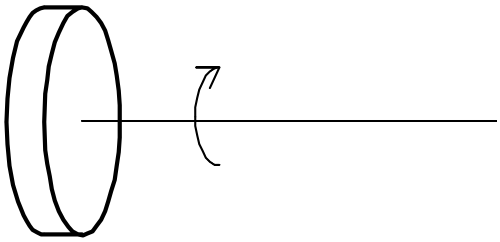
The `MechUnitLoad` instruction should always be executed after execution of the instruction `ActUnit`.

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.



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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

`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 meansthat the payload is controlled and monitored by the control system.

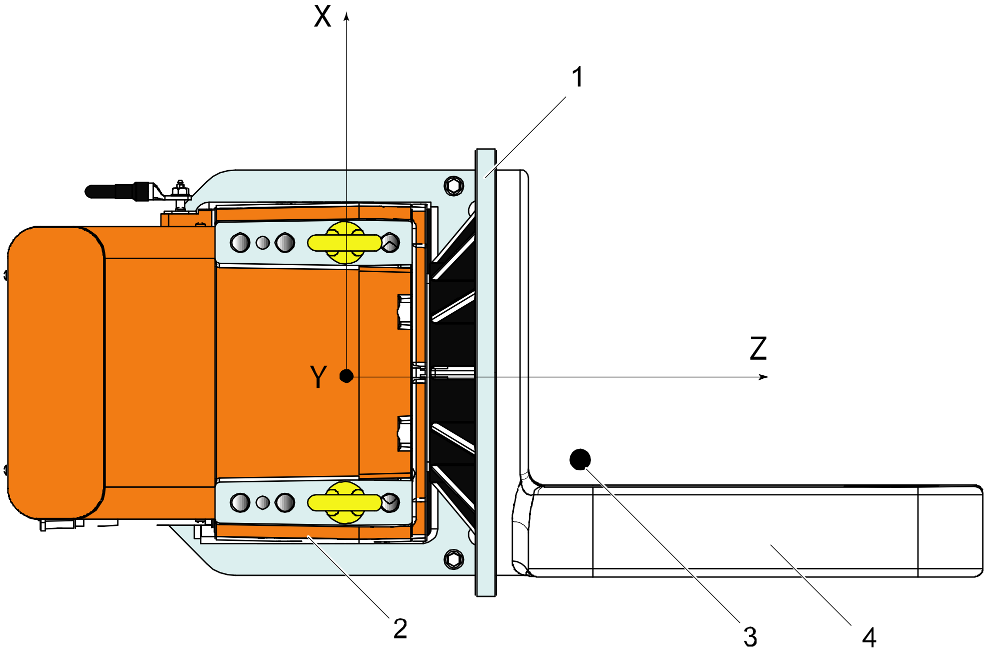
The default payload at cold start for a certain mechanical unit type, is the predefined maximalpayload for this mechanical unit type.

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

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).



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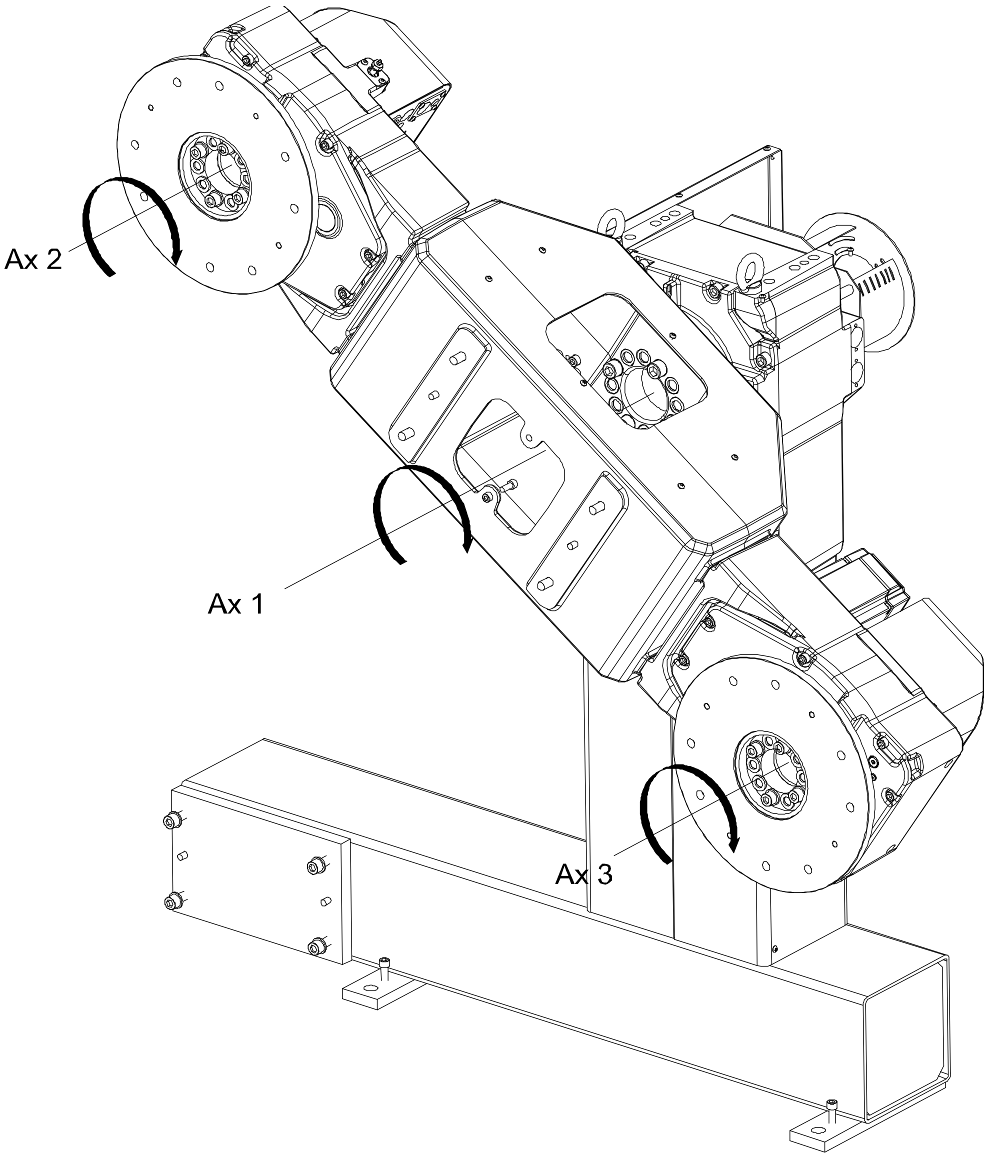
1	Fixture
2	Mechanical unit
3	Center of gravity for the payload (fixture + work piece)
4	Work piece

Continues on next page

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	*Technical reference manual - RAPID Instructions, Functions and Data types*, data type `mecunit`
Definition of load data	*Technical reference manual - RAPID Instructions, Functions and Data types*, data type `loaddata`
Definition of payload for the robot	*Technical reference manual - RAPID Instructions, Functions and Data types*, instruction `GripLoad` and data type `tooldata`

8.9.7 Define base frame

General

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

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9 Decommissioning

9.1 Introduction to decommissioning

Introduction

This section contains information to consider when taking a product, robot or controller, out of operation.

It deals with how to handle potentially dangerous components and potentially hazardous materials.

Note

The decommissioning process shall be preceded by a risk assessment.

Disposal of materials used in the robot

All used grease/oils and dead batteries **must** be disposed of in accordance with the current legislation of the country in which the robot and the control unit are installed.

If the robot or the control unit is partially or completely disposed of, the various parts **must** be grouped together according to their nature (which is all iron together and all plastic together), and disposed of accordingly. These parts **must** also be disposed of in accordance with the current legislation of the country in which the robot and control unit are installed.

See also *Environmental information on page 328*.

Transportation

Prepare the robot or parts before transport, this to avoid hazards.

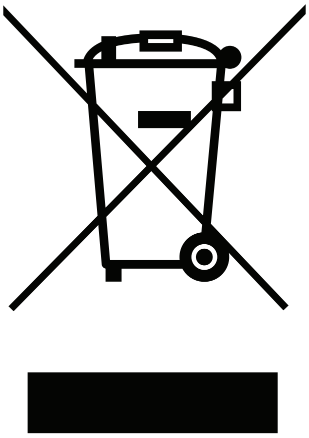
9.2 Environmental information

Introduction

ABB robots contain components in different materials. During decommissioning, all materials should be dismantled, recycled, or reused responsibly, according to the relevant laws and industrial standards. Robots or parts that can be reused or upcycled helps to reduce the usage of natural resources.

Symbol

The following symbol indicates that the product must not be disposed of as common garbage. Handle each product according to local regulations for the respective content (see table below).



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Materials used in the product

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

Dispose components properly according to local regulations to prevent health or environmental hazards.

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

Continues on next page

Oil and grease

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

Also note that:

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

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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.

General

The product is designed in accordance with ISO 10218-1:2011, Robots for industrial environments - Safety requirements -Part 1 Robots, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviations from ISO 10218-1:2011, these are listed in the declaration of incorporation which is part of the product delivery.

Normative standards as referred to from ISO 10218-1

Standard	Description
ISO 9283:1998	Manipulating industrial robots - Performance criteria and related test methods
ISO 10218-2	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration
ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
ISO 13849-1:2006	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design
ISO 13850	Safety of machinery - Emergency stop - Principles for design
IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Deviations from ISO 10218-1:2011 for IRC5 with MultiMove

A deviation exists towards ISO 10218-1:2011, paragraph *5.9 Control of simultaneous motion*, for the option MultiMove. See the application manual for MultiMove.

Deviations from ISO 10218-1:2011 for IRBP

Deviations from the standard are motivated for IRBP in the table below.

Requirement	Deviation for IRBP	Motivation
§5.12.1 Limiting the range of motion by adjustable stops (§5.12.2) or by safety functions (§5.12.3).	IRBP does not have adjustable mechanical stops.	The positioner is designed with fixed positions.

Region specific standards and regulations

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems

Continues on next page

Standard	Description
CAN/CSA Z 434-03	Industrial robots and robot Systems - General safety requirements

Other standards used in design

Standard	Description
ISO 9787:2013	Robots and robotic devices -- Coordinate systems and motion nomenclatures
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
ISO 13732-1:2006	Ergonomics of the thermal environment - Part 1
IEC 60974-1:2012[i]	Arc welding equipment - Part 1: Welding power sources
IEC 60974-10:2014[i]	Arc welding equipment - Part 10: EMC requirements
ISO 14644-1:2015[ii]	Classification of air cleanliness
IEC 60529:1989 + A2:2013	Degrees of protection provided by enclosures (IP code)

i Only valid for arc welding robots. Replaces IEC 61000-6-4 for arc welding robots.
ii Only robots with protection Clean Room.

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	

10.3 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 arm weighs 25 kg. All lifting accessories used must be sized accordingly.	

10.4 Screw joints

General

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

The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.

UNBRAKO screws

UNBRAKO is a special type of screw recommended by ABB for certain screw joints. It features special surface treatment (Gleitmo as described below) and is extremely resistant to fatigue.

Whenever used, this is specified in the instructions, and in such cases, *no other type of replacement screw* is allowed. Using other types of screws will void any warranty and may potentially cause serious damage or injury.

Gleitmo treated screws

Gleitmo is a special surface treatment to reduce the friction when tightening the screw joint. It is recommended by ABB for M6-M20 screw joints. Screws treated with Gleitmo may be reused 3-4 times before the coating disappears. After this the screw must be discarded and replaced with a new one.

When handling screws treated with Gleitmo, protective gloves of **nitrile rubber** type should be used.

Generally, screws are lubricated with *Gleitmo 603* mixed with *Geomet 500* or *Geomet 702* in proportion 1:3. *Geomet* thickness varies according to screw dimensions, refer to the following.

Dimension	Lubricant	Geomet thickness
M6-M20 (any length except M20x60)	*Gleitmo 603* + *Geomet 500*	3-5 μm
M6-M20 (any length except M20x60)	*Gleitmo 603* + *Geomet 720*	3-5 μm
M20x60	*Gleitmo 603* + *Geomet 500*	8-12 μm
M20x60	*Gleitmo 603* + *Geomet 720*	6-10 μm

Screws lubricated in other ways

Screws lubricated with Molykote 1000 or Molykote P1900 should *only* be used when specified in the repair, maintenance or installation procedure descriptions.

In such cases, proceed as follows:

1. Apply lubricant to the screw thread.
2. Apply lubricant between the plain washer and screw head.
3. Screw dimensions of M8 or larger must be tightened with a torque wrench. Screw dimensions of M6 or smaller may be tightened without a torque wrench *if* this is done by trained and qualified personnel.

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Lubricant	Article number
Molykote 1000 (molybdenum disulphide grease)	3HAC042472-001
Molykote P1900 (molybdenum disulphide grease)	3HAC070875-001

Tightening torque

Before tightening any screw, note the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard torques** are specified in the following tables. Any **special torques** are specified in the repair, maintenance or installation procedure descriptions. **Any special torque specified overrides the standard torque!**
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- Always *tighten the joint by hand,* and never use pneumatic tools.
- Use the *correct tightening technique*, that is *do not* jerk. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is **10%**!

Tightening torque for oil-lubricated screws with slotted or cross-recess head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws* with *slotted or cross-recess head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Tightening torque for oil-lubricated screws with allen head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws* with *allen head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

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

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Dimension	Tightening torque (Nm) Class 8.8, oil-lubricated	Tightening torque (Nm) Class 10.9, oil-lubricated	Tightening torque (Nm) Class 12.9, oil-lubricated
M24	680	960	1150

Tightening torque for lubricated screws (Molykote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for *screws lubricated with Molycote 1000, Gleitmo 603 or equivalent* with *allen head screws.*

Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Dimension	Tightening torque (Nm) Class 10.9, lubricated [i]	Tightening torque (Nm) Class 12.9, lubricated [i]
M5		8
M6		14
M8	28	35
M10	55	70
M12	96	120
M16	235	300
M20	460	550
M24	790	950

i Lubricated with Molycote 1000, Gleitmo 603 or equivalent

10.5 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

10.6 Standard toolkit

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	Note
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	

10.7 Special tools

General

All service instructions contain lists of tools required to perform the specified activity. The required tools are a sum of standard tools, defined in the section *Standard toolkit on page 339*, and of special tools, listed directly in the instructions and also gathered in this section.

Special tools

The following table specifies the special tools required during several of the service procedures. The tools may be ordered separately and are also specified directly in concerned instructions in the product manual.

Description	Qty	Art. no.
Guide pins, removal/refitting of MTE Rotary unit gearbox (M10x150)	2 pcs	3HAC15521-2
Removal tool, MTE Rotary unit motor (M10)	2 pcs	3HAC14972-1
Removal tool, MTE Rotary unit motor (M8)	2 pcs	
Brake release tool	1 pcs	3HAC081310-001
Lifting tool, MTE Rotary unit gearbox	1 pcs	3HAC081585-001

10.8 Circuit diagrams

Overview

The circuit diagrams are not included in this manual, but are available for registered users on myABB Business Portal, *www.abb.com/myABB*.

See the article numbers in the tables below.

Controllers

Product	Article numbers for circuit diagrams
Circuit diagram - IRC5	*3HAC024480-011*

Positioners

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

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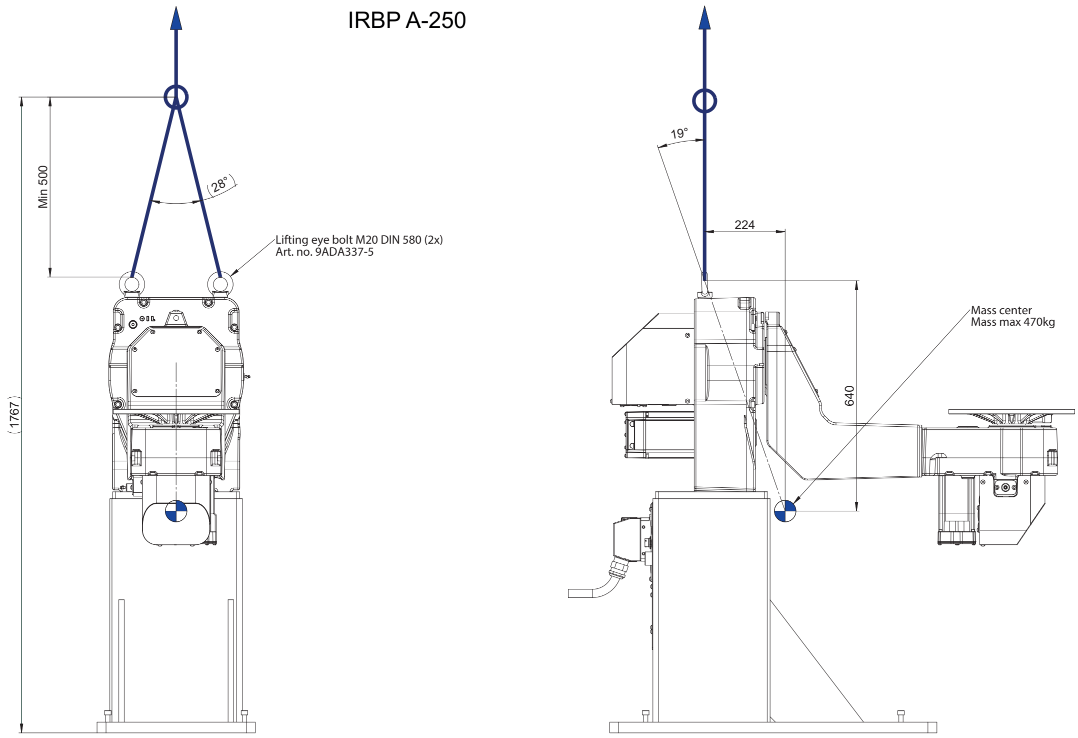
11 Lifting instructions

IRBP A-250



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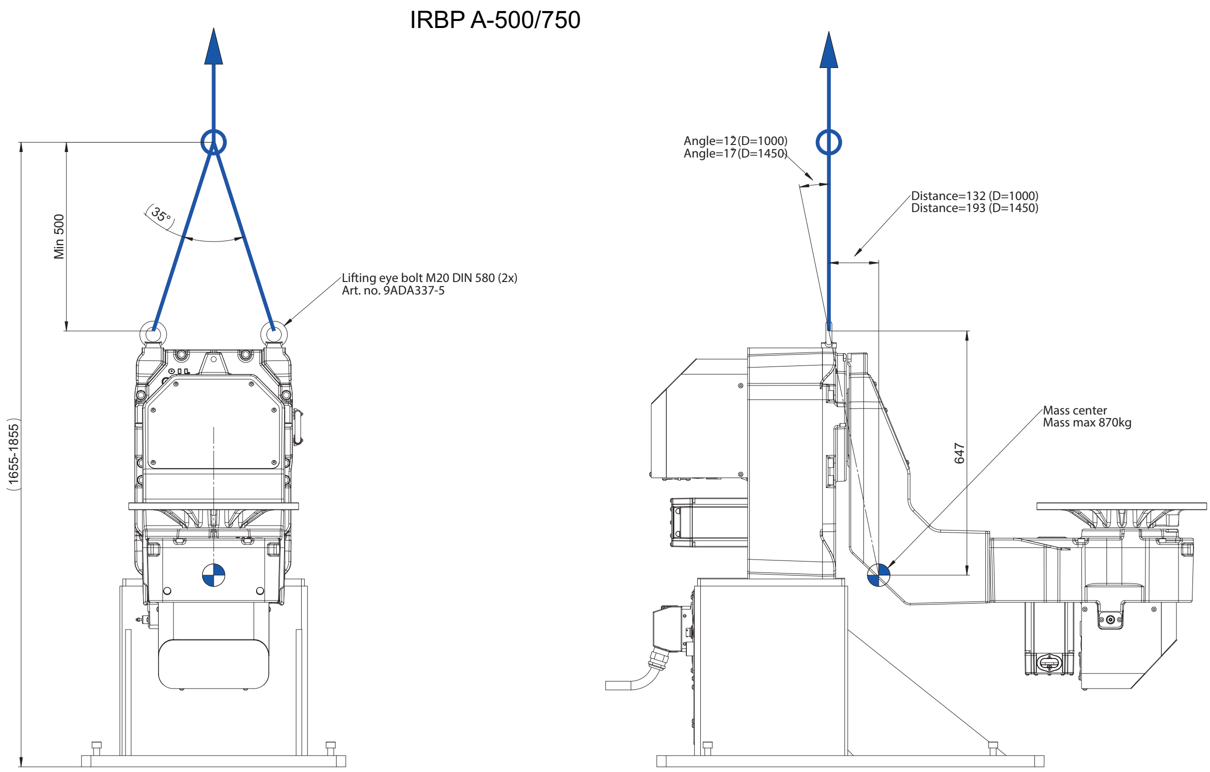
IRBP A-500/750



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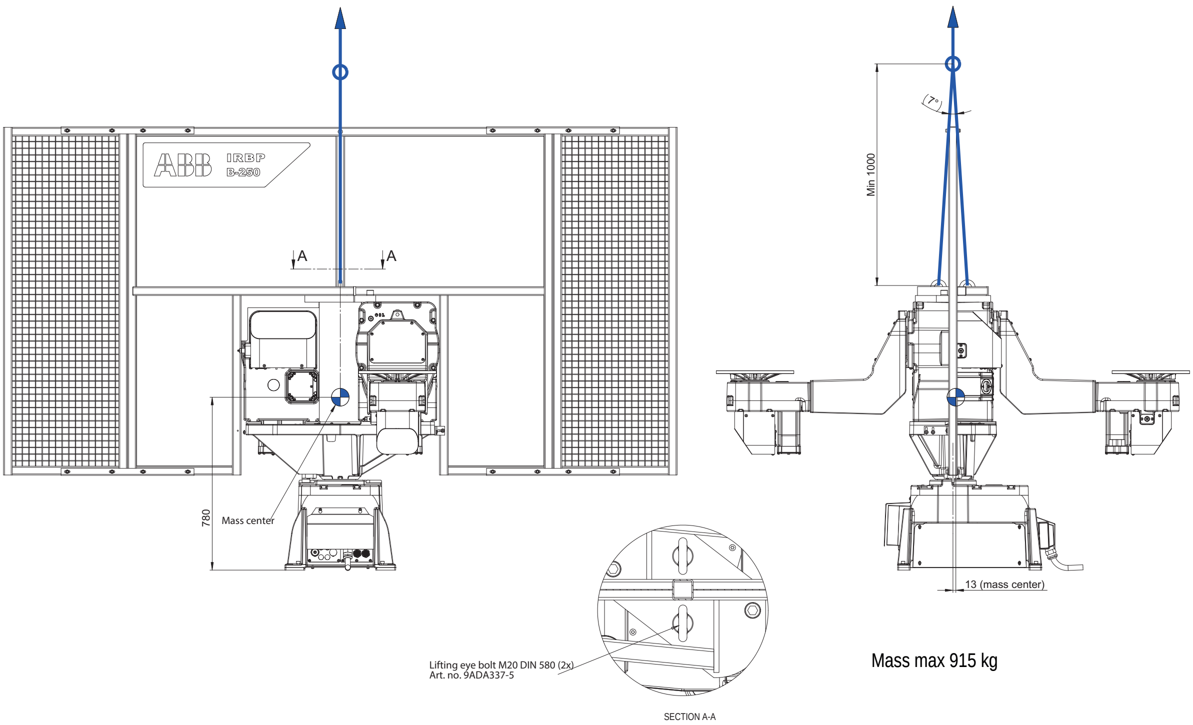
IRBP B-250

IRBP B-250



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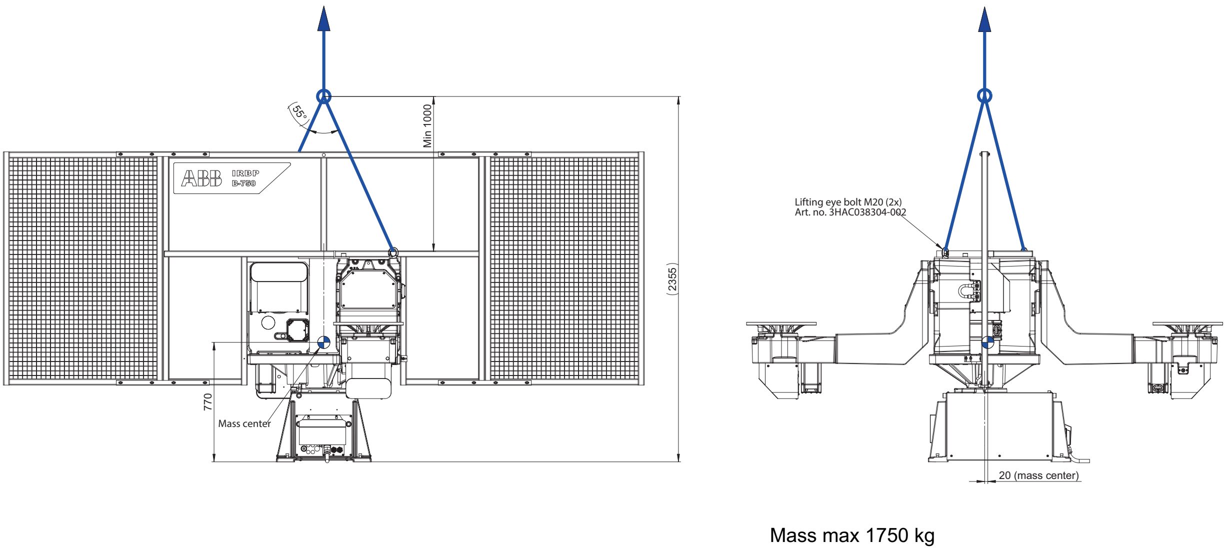
IRBP B-500/750

IRBP B-500/750



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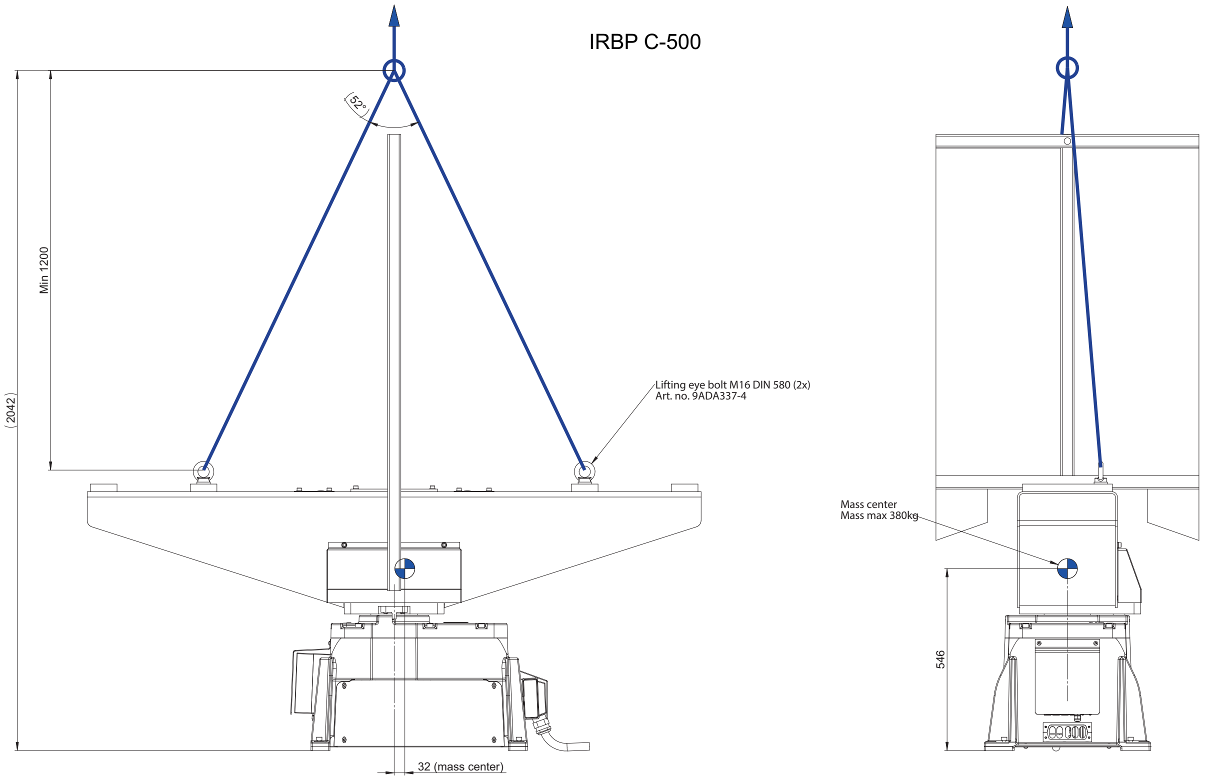
IRBP C-500



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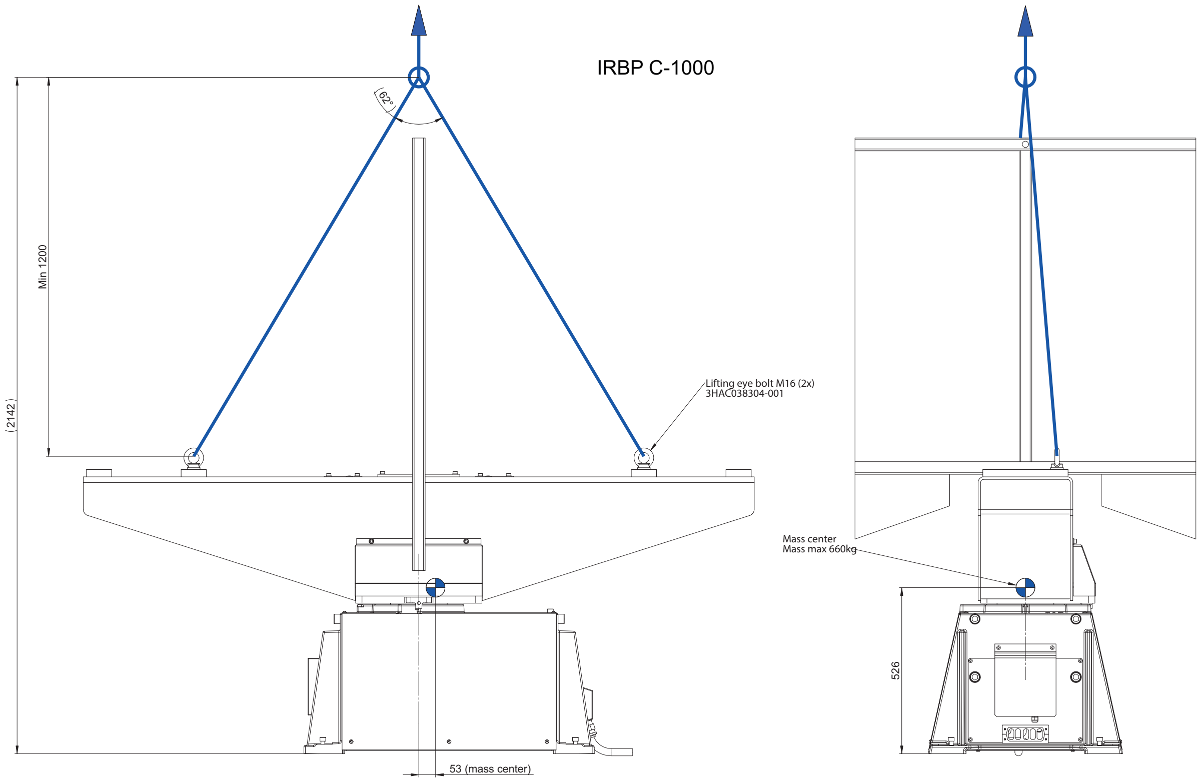
IRBP C-1000



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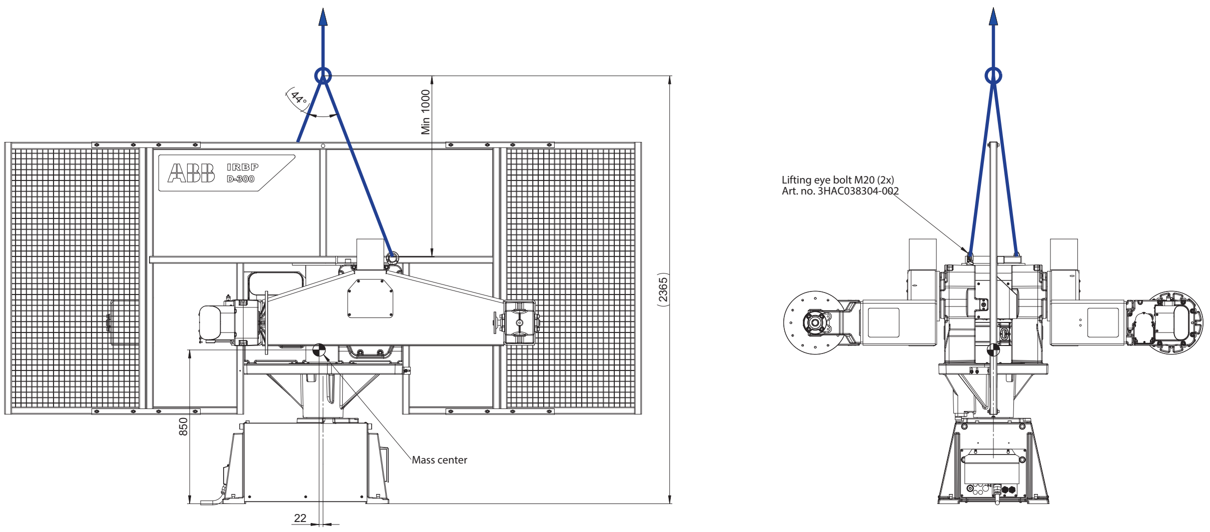
IRBP D-300

IRBP D-300



Mass max 1560kg

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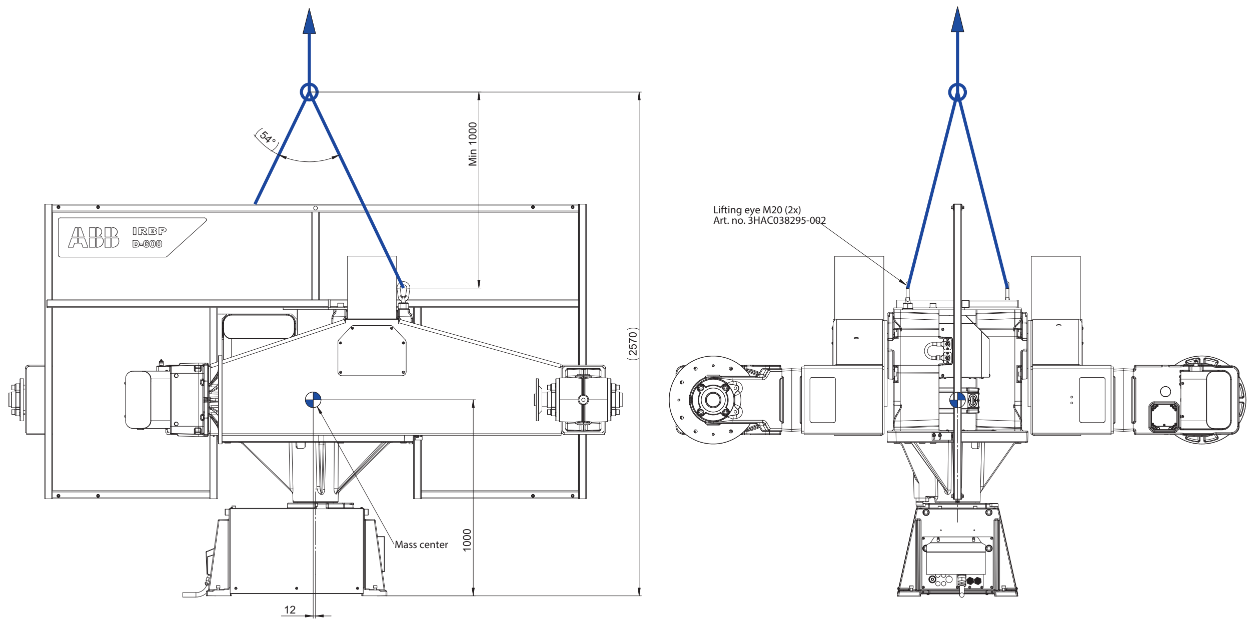
IRBP D-600

IRBP D-600



Mass max 2960kg

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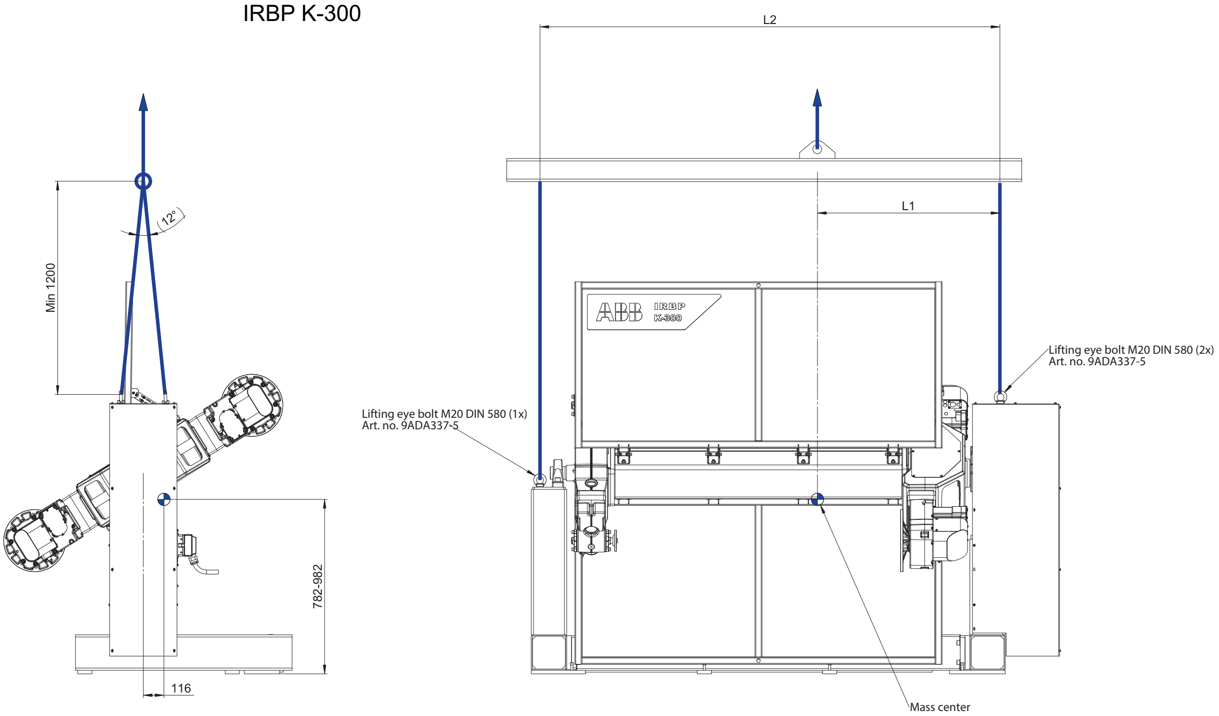
IRBP K-300



Positioner length	Mass [kg]	L1 [mm]	L2 [mm]
L=1600	1170	1025	2590
L=2000	1250	1200	2990
L=2500	1310	1405	3490
L=3150	1400	1685	4140
L=3500	1450	1840	4490
L=4000	1515	2060	4990

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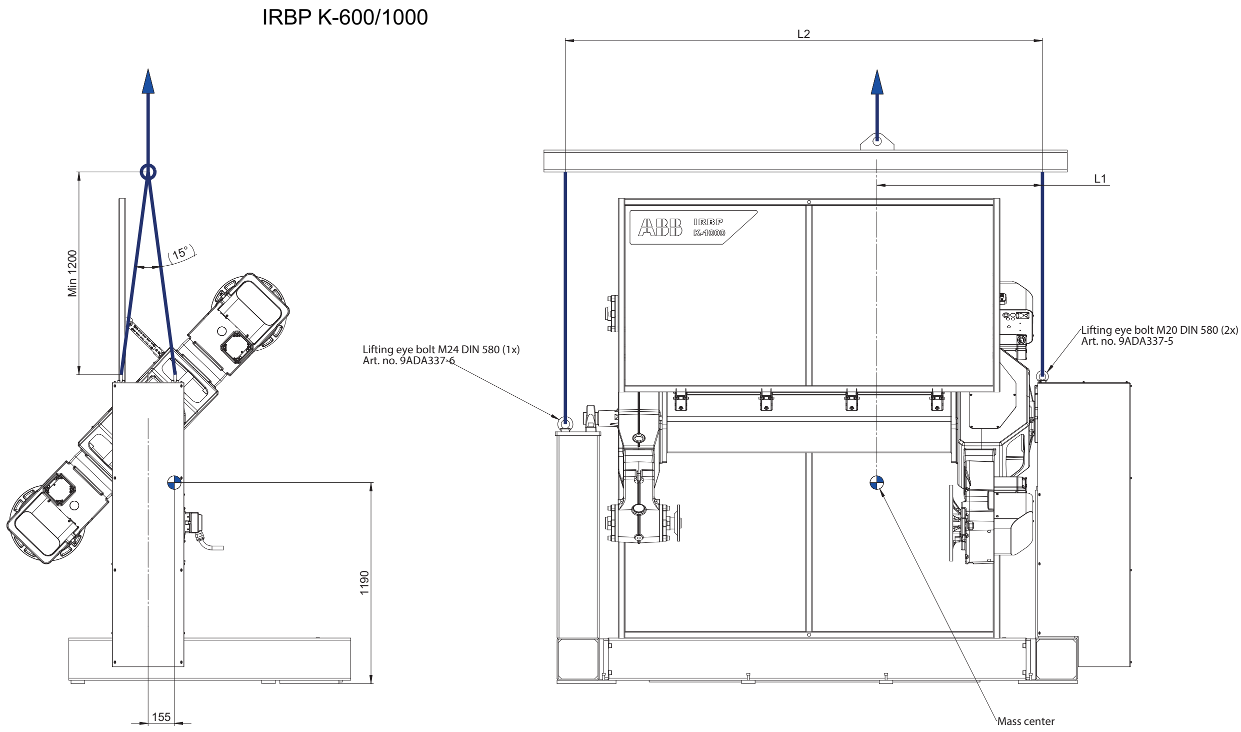
IRBP K-600/1000



Positioner length	Mass [kg]	L1 [mm]	L2 [mm]
L=1600	2080	980	2826
L=2000	2190	1145	3226
L=2500	2290	1345	3726
L=3150	2410	1615	4376
L=3500	2480	1760	4726
L=4000	2570	1970	5226

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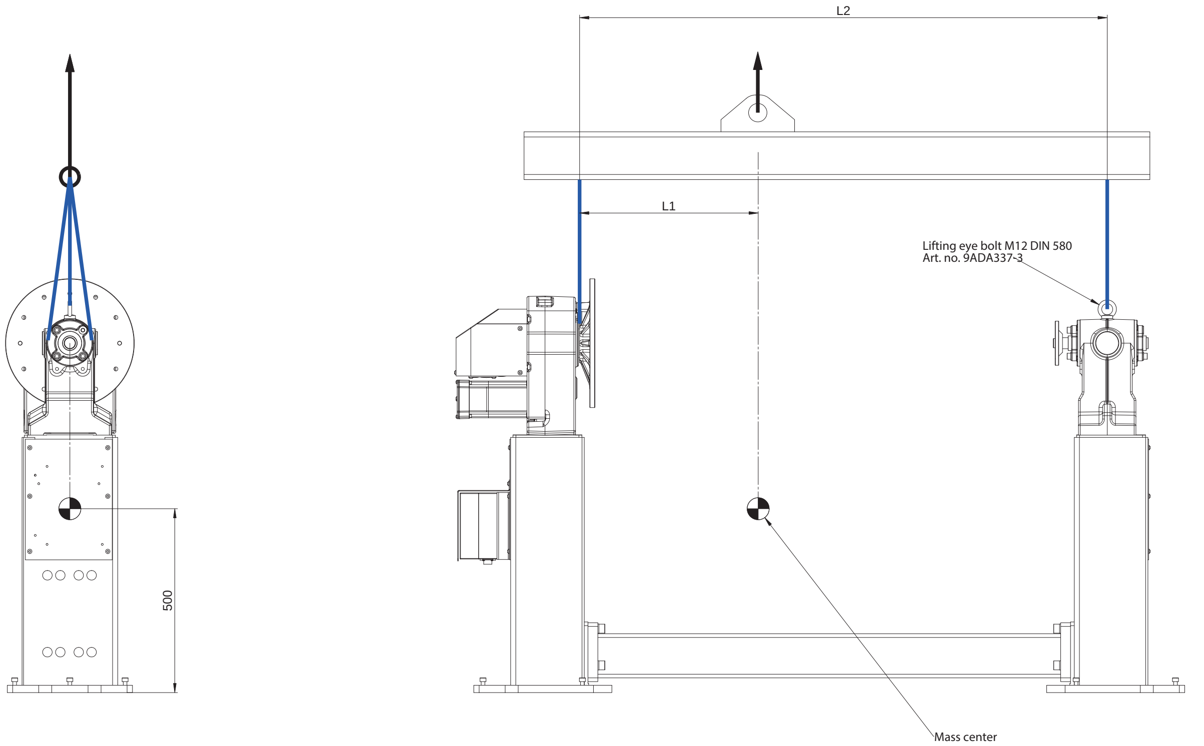
IRBP L-300

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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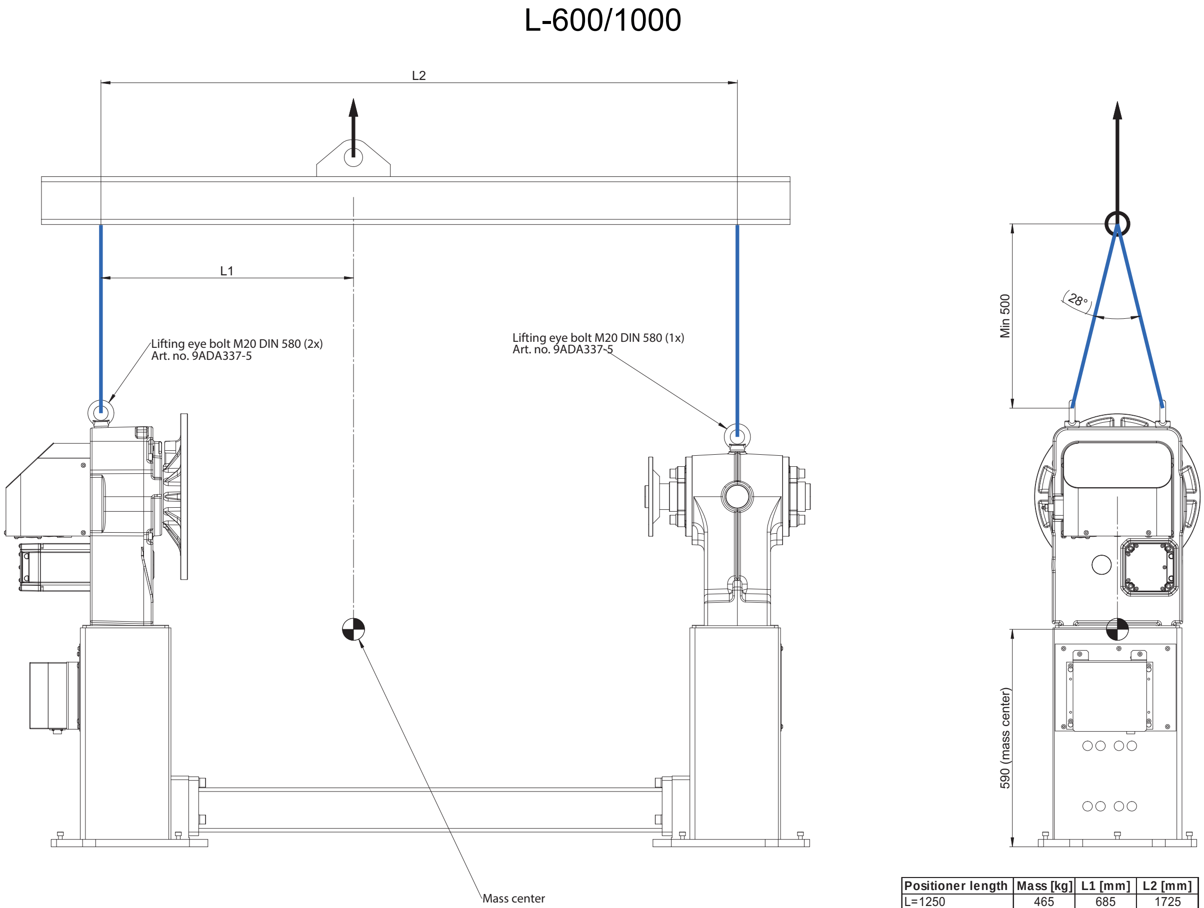
IRBP L-600/1000



Positioner length	Mass [kg]	L1 [mm]	L2 [mm]
L=1250	465	685	1725
L=1600	470	820	2075
L=2000	480	975	2475
L=2500	485	1170	2975
L=3150	500	1430	3625
L=4000	515	1770	4475

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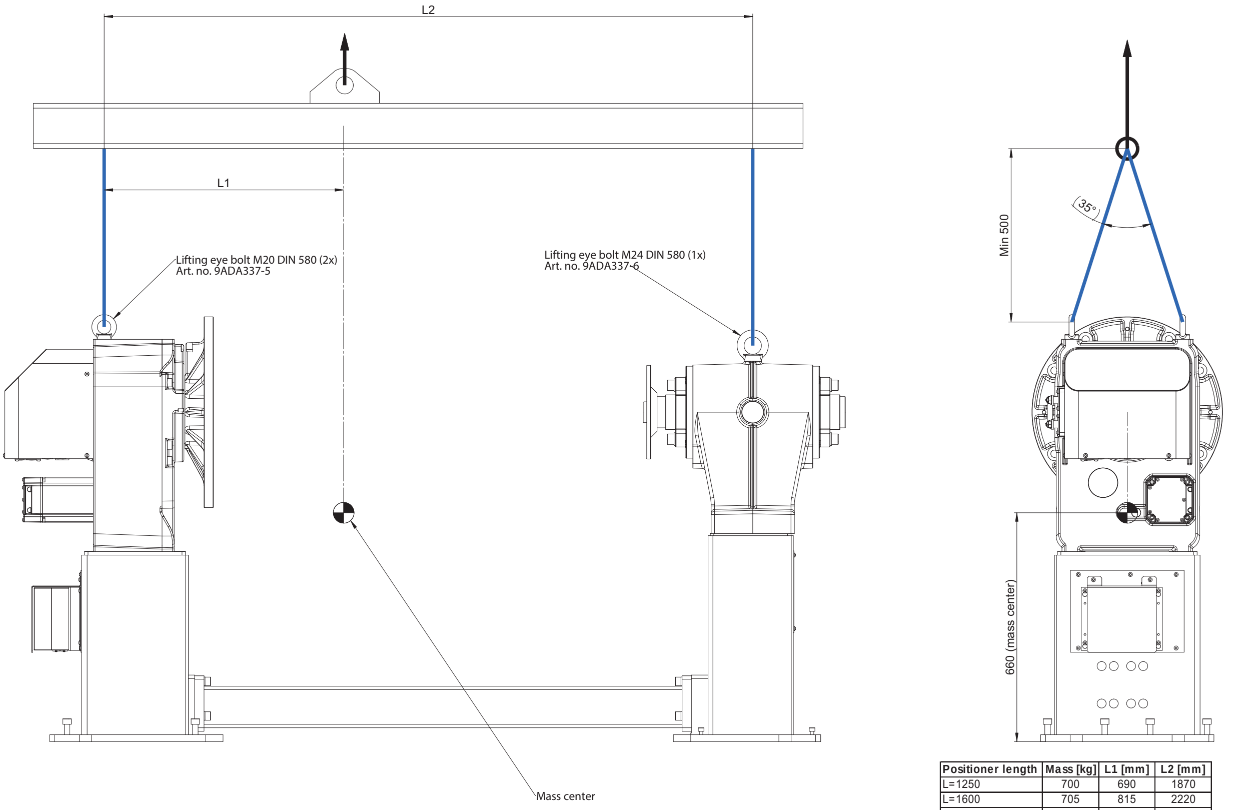
IRBP L-2000

IRBP L-2000



Positioner length	Mass [kg]	L1 [mm]	L2 [mm]
L=1250	700	690	1870
L=1600	705	815	2220
L=2000	710	950	2620
L=2500	720	1130	3120
L=3150	730	1360	3770
L=4000	740	1670	4620

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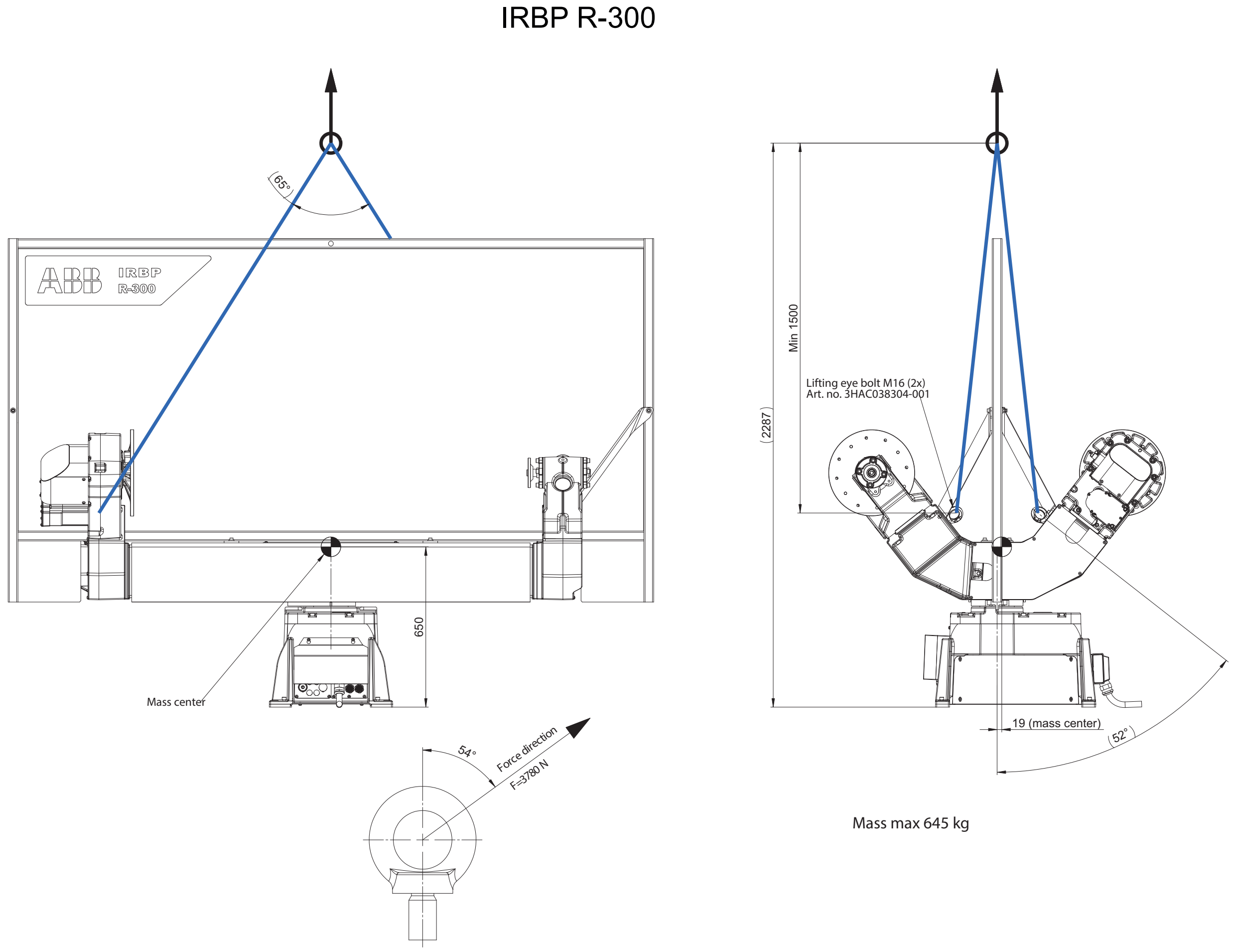
IRBP R-300



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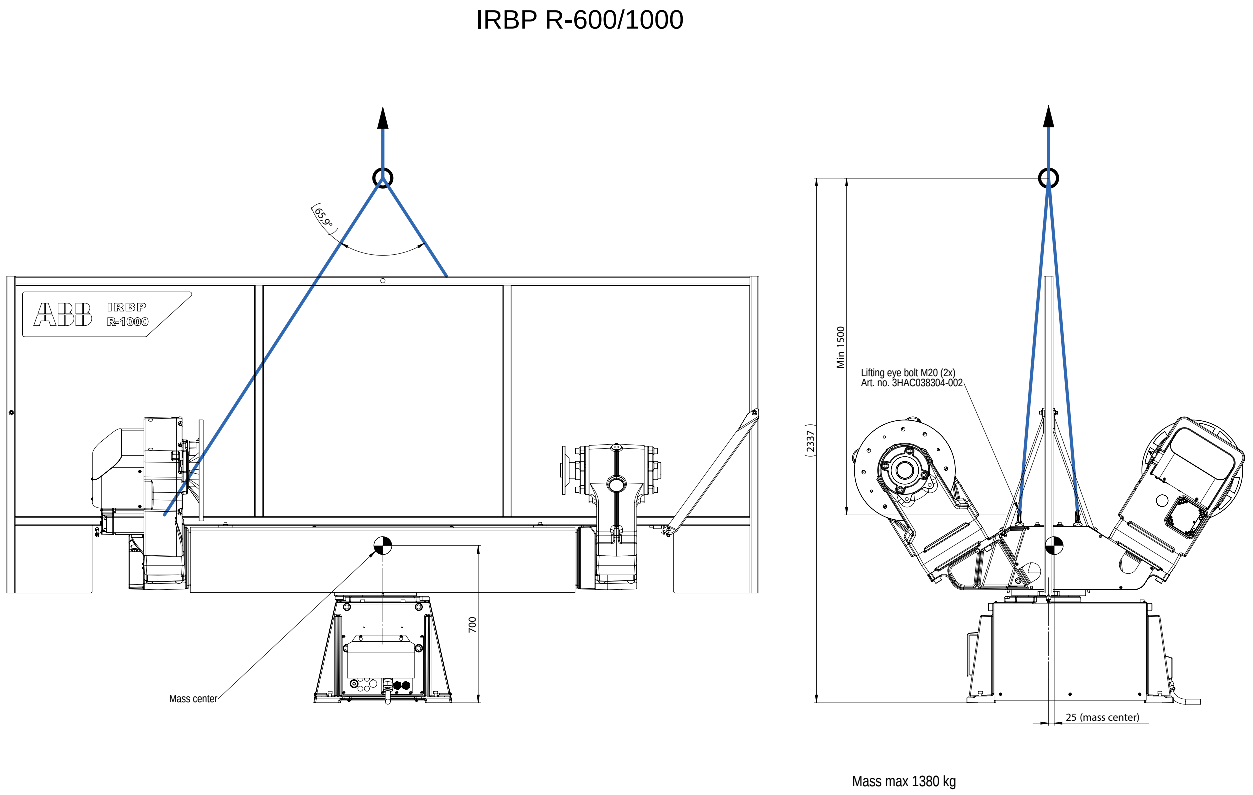
IRBP R-600/1000



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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 for registered users on myABB Business Portal, www.abb.com/myABB.

Tip

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

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