

Product manual

IRB 260

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**Product manual
IRB 260
IRC5**

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Overview of this manual

About this manual

This manual contains instructions for:

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

The manual also contains reference information for all procedures detailed in the manual.

Usage

This manual should be used during:

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

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

Maintenance/repair/installation personnel working with an ABB Robot must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.

Organization of chapters

The manual is organized in the following chapters:

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

Continues on next page

Overview of this manual

Continued

Chapter	Contents
Reference information	Useful information when performing installation, maintenance or repair work. Includes lists of necessary tools, additional documents, safety standards, etc.
Spare parts and exploded views	Complete spare part list and complete list of robot components, shown in the exploded views.
Circuit diagram	Reference to the circuit diagram for the robot.

References

Procedures in this product manual contain references to the following manuals:

Document name	Document ID
<i>Product specification - IRB 260</i>	3HAC025046-001
<i>Operating manual - General safety information</i> ⁱ	3HAC031045-001
<i>Product manual, spare parts - IRB 260</i>	3HAC049100-001
<i>Circuit diagram - IRB 260</i>	3HAC025611-001
<i>Product manual - IRC5</i> IRC5 with main computer DSQC 639.	3HAC021313-001
<i>Product manual - IRC5</i> IRC5 with main computer DSQC1000.	3HAC047136-001
<i>Operating manual - IRC5 with FlexPendant</i>	3HAC050941-001
<i>Operating manual - Calibration Pendulum</i>	3HAC16578-1
<i>Operating manual - Service Information System</i>	3HAC050944-001
<i>Application manual - Additional axes and stand alone controller</i>	3HAC051016-001
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001
<i>Technical reference manual - System parameters</i>	3HAC050948-001
<i>Application manual - CalibWare Field 5.0</i>	3HAC030421-001

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

Revisions

Revision	Description
-	First edition
A	Changes made in: <ul style="list-style-type: none">• Prerequisites in section Overview• Oil change in section Maintenance
B	Content updated in chapter/section: <ul style="list-style-type: none">• <i>Maintenance chapter, section Maintenance schedule</i> : Interval for replacement of battery pack changed.• Section <i>What is an emergency stop?</i> added to chapter Safety• The oil Shell Tivela S 150 in gearbox axis 6 has been replaced by Kyodo Yushi TMO 150.

Continues on next page

Revision	Description
C	<p>Content updated in chapter/section:</p> <ul style="list-style-type: none"> • Decommissioning chapter added. • Circuit diagrams are not included in this document but delivered as separate files. See Circuit diagram on page 243. • List of standards updated, see Applicable safety standards on page 222. <p>The chapter <i>Safety</i> updated with:</p> <ul style="list-style-type: none"> • Updated safety signal graphics for the levels <i>Danger</i> and <i>Warning</i>, see Safety signals in the manual on page 39. • New safety labels on the manipulators, see Safety symbols on product labels on page 41. • Revised terminology: <i>robot</i> replaced with <i>manipulator</i>.
D	<p>This revision includes the following updates:</p> <ul style="list-style-type: none"> • A new block, about general illustrations, added in section How to read the product manual on page 14. • Added a KM10 socket to the list of required equipment and the instructions when replacing the lower rod, see section Replacing the linkage - lower rod on page 155. • Some general tightening torques have been changed/added, see updated values in Screw joints on page 225. • Added WARNING - Safety risks during handling of batteries on page 53.
E	<p>This revision includes the following updates:</p> <ul style="list-style-type: none"> • Information about the type and amount of oil has been removed from the manual and can now be found in <i>Technical reference manual - Lubrication in gearboxes</i>. For article number see References on page 10. • A new SMB unit and battery is introduced, with longer battery lifetime.
F	<p>This revision includes the following updates:</p> <ul style="list-style-type: none"> • Spare parts in general corrected. • Missing spare part numbers added. • Added information about risks when scrapping a decommissioned robot, see Scraping of robot on page 220. • <i>Spare parts and exploded views</i> are not included in this document but delivered as a separate document. See <i>Product manual, spare parts - IRB 260</i>.
G	<p>This revision includes the following updates:</p> <ul style="list-style-type: none"> • Minor corrections.
H	<p>Published in release R16.2. The following updates are done in this revision:</p> <ul style="list-style-type: none"> • Corrections due to updates in SAP terminology.

Product documentation, IRC5

Categories for user documentation from ABB Robotics

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

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

Product manuals

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

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

Technical reference manuals

The technical reference manuals describe reference information for robotics products.

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

Continues on next page

Application manuals

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

An application manual generally contains information about:

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

Operating manuals

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

The group of manuals includes (among others):

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

How to read the product manual

Reading the procedures

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

References to figures

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

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

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

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

References to required equipment

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

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

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

	Action	Note/Illustration
3.	Fit a new <i>sealing</i> , <i>axis 2</i> to the <i>gearbox</i> .	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 15](#).

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 Introduction to safety information

Overview

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

- General safety aspects, important to attend to before performing any service work on the robot. These are applicable for all service work and are found in [General safety information on page 16](#).
- Safety signals and symbols shown in the manual and on the robot, warning for different types of dangers, are found in [Safety signals and symbols on page 39](#).
- Specific safety information, pointed out in the procedures. How to avoid and eliminate the danger is either described directly in the procedure, or in specific instructions in the section [Safety related instructions on page 47](#).

1 Safety

1.2.1 Introduction to general safety information

1.2 General safety information

1.2.1 Introduction to general safety information

Definitions

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

Sections

The general safety information is divided into the following sections.

Contents	Examples of content
General information	<ul style="list-style-type: none">• safety, service• limitation of liability• related information
Safety risks lists dangers relevant when working with the product. The dangers are split into different categories.	<ul style="list-style-type: none">• safety risks during installation or service• risks associated with live electrical parts
Safety actions describes actions which may be taken to remedy or avoid dangers.	<ul style="list-style-type: none">• fire extinguishing• safe use of the teach pendant or jogging device
Safety stops describes different types of stops.	<ul style="list-style-type: none">• stopping functions• description of emergency stop• description of safety stop

1.2.2 Safety in the robot system

Validity and responsibility

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

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

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

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

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

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

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

Connection of external safety devices

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

Limitation of liability

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

Related information

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

Continues on next page

1 Safety

1.2.2 Safety in the robot system

Continued

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

1.2.3.1 Safety risks during installation and service work on robots

1.2.3 Safety risks

1.2.3.1 Safety risks during installation and service work on robots

Overview

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

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

General risks during installation and service

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

Spare parts and special equipment

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

Personal protective equipment

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

Nation/region specific regulations

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

Non-voltage related risks

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

Continues on next page

1 Safety

1.2.3.1 Safety risks during installation and service work on robots

Continued

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

To be observed by the supplier of the complete system

When integrating the robot with external devices and machines:

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

Complete robot

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

Continues on next page

1.2.3.1 Safety risks during installation and service work on robots

Continued

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

Cabling

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

Gearboxes and motors

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

1 Safety

1.2.3.2 CAUTION - Hot parts may cause burns!

Description

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

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

Elimination

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

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

1.2.3.3 Safety risks related to tools/work pieces

Safe handling

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

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

Safe design

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

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



CAUTION

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

1 Safety

1.2.3.4 Safety risks related to pneumatic/hydraulic systems

General

Special safety regulations apply to pneumatic and hydraulic systems.



Note

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

Residual energy

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

Safe design

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

1.2.3.5 Safety risks during operational disturbances

General

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

Qualified personnel

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

Extraordinary risks

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

1 Safety

1.2.3.6 Risks associated with live electric parts

1.2.3.6 Risks associated with live electric parts

Voltage related risks, general

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

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

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

All work must be performed:

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

Voltage related risks, IRC5 controller

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

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

Continues on next page

Voltage related risks, robot

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

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

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

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

1 Safety

1.2.4.1 Safety fence dimensions

1.2.4 Safety actions

1.2.4.1 Safety fence dimensions

General

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

Dimensioning

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

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

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

1.2.4.2 Fire extinguishing



Note

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

1 Safety

1.2.4.3 Emergency release of the robot arm

1.2.4.3 Emergency release of the robot arm

Description

In an emergency situation, the brakes on the robot axes can be released manually by pushing the brake release buttons.

How to release the brakes is detailed in the section:

- [*Manually releasing the brakes on page 69.*](#)

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

Increased injury

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

1.2.4.4 Brake testing

When to test

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

How to test

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

- 1 Run each robot axis to a position where the combined weight of the robot arm and any load is maximized (maximum static load).
- 2 Switch the motor to the MOTORS OFF.
- 3 Inspect and verify that the axis maintains its position.
If the robot does not change position as the motors are switched off, then the brake function is adequate.

1 Safety

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



Note

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

1.2.4.6 Safe use of the jogging device

Three-position enabling device

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

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



Note

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

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

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

Hold-to-run function

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

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

1 Safety

1.2.4.7 Work inside the working range of the robot



WARNING

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

- The operating mode selector on the controller must be in the manual mode position to render the three-position enabling device operational and to block operation from a computer link or remote control panel.
- The maximum speed of the robot is limited to 250 mm/s when the operating mode selector is in the position *Manual mode with reduced speed*. This should be the normal position when entering the working space.
The position *Manual mode with full speed (100%)* may only be used by trained personnel who are aware of the risks that this entails. *Manual mode with full speed (100%)* is not available in USA or Canada.
- Pay attention to the rotating axes of the robot. Keep away from axes to not get entangled with hair or clothing. Also, be aware of any danger that may be caused by rotating tools or other devices mounted on the robot or inside the cell.
- Test the motor brake on each axis, according to the section [Brake testing on page 31](#).
- To prevent anyone else from taking control of the robot, always put a safety lock on the cell door and bring the three-position enabling device with you when entering the working space.



WARNING

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

1.2.5 Safety stops

1.2.5.1 What is an emergency stop?

Definition of emergency stop

An emergency stop is a state that takes precedence over all other robot controls, causes all controlled hazards to stop, removes drive power from the robot actuators, remains active until it is reset, and can only be reset by manual action.

An emergency stop state means that all power is disconnected from the robot except for the manual brake release circuits. You must perform a recovery procedure, that is, resetting the emergency stop button and pressing the Motors On button, to return to normal operation.

The robot system can be configured so that the emergency stop results in either:

- A category 0 stop, immediately stopping the robot actions by disconnecting power from the motors.
- A category 1 stop, stopping the robot actions with power available to the motors so that the robot path can be maintained. When completed, power is disconnected from the motors.

The default setting is a category 0 stop. However, category 1 stops are preferred since they minimize unnecessary wear on the robot and the actions needed to return the system back to production. Consult your plant or cell documentation to see how your robot system is configured.



Note

The emergency stop function may only be used for the purpose and under the conditions for which it is intended.



Note

The emergency stop function is intended for immediately stopping equipment in the event of an emergency.



Note

Emergency stop should not be used for normal program stops as this causes extra, unnecessary wear on the robot.

For how to perform normal program stops, see section *Stopping programs in Operating manual - IRC5 with FlexPendant*.

Classification of stops

The safety standards that regulate automation and robot equipment define categories in which each type of stop applies:

If the stop is...	... then it is classified as...
category 0 (zero)	uncontrolled

Continues on next page

1 Safety

1.2.5.1 What is an emergency stop?

Continued

If the stop is...	... then it is classified as...
category 1	controlled

Emergency stop buttons

In a robot system there are several emergency stop buttons that can be operated in order to achieve an emergency stop. There are emergency stop buttons available on the FlexPendant and on the controller cabinet. There can also be other types of emergency stops on your robot. Consult your plant or cell documentation to see how your robot system is configured.

1.2.5.2 What is a safety stop or protective stop?

1.2.5.2 What is a safety stop or protective stop?

Definition of safety stops

A safety stop is a state that stops all robot motion and removes power to the robot drive actuators. There is no recovery procedure. You need only to restore motor power to recover from a safety stop. Safety stop is also called protective stop.

The robot system can be configured so that the safety stop results in either:

- A category 0 stop, immediately stopping the manipulator actions by disconnecting power from the motors.
- A category 1 stop, stopping the manipulator actions with power available to the motors so that the manipulator path can be maintained. When completed, power is disconnected from the motors.

The default setting is a category 1 stop.

Category 1 stops are preferred since they minimize unnecessary wear on the manipulator and the actions needed to return the system back to production. Consult your plant or cell documentation to see how your robot system is configured.

**Note**

The safety stop function may only be used for the purpose and under the conditions for which it is intended.

**Note**

Safety stop should not be used for normal program stops as this causes extra, unnecessary wear on the manipulator.

For how to perform normal program stops, see section *Stopping programs* in *Operating manual - IRC5 with FlexPendant*.

Classification of stops

The safety standards that regulate automation and robot equipment define categories in which each type of stop applies:

If the stop is...	... then it is classified as...
category 0 (zero)	uncontrolled
category 1	controlled

Continues on next page

1 Safety

1.2.5.2 What is a safety stop or protective stop?

Continued

Type of safety stops

Safety stops are activated through special signal inputs to the controller, see *Product manual - IRC5*.

The inputs are intended for safety devices such as cell doors, light curtains, or light beams.

Safety stop:	Description:
Automatic mode stop (AS)	Disconnects drive power in automatic mode. In manual mode this input is inactive.
General stop (GS)	Disconnects drive power in all operating modes.
Superior stop (SS)	Disconnects drive power in all operating modes. Intended for external equipment.



Note

Use normal program stop for all other types of stop.

1.3 Safety signals and symbols

1.3.1 Safety signals in the manual

Introduction to safety signals

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

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

Danger levels

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

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

Continues on next page

1 Safety

1.3.1 Safety signals in the manual

Continued

Symbol	Designation	Significance
 xx010000004	NOTE	Describes important facts and conditions.
 xx0100000098	TIP	Describes where to find additional information or how to do an operation in an easier way.

1.3.2 Safety symbols on product labels

Introduction to labels

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

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



Note

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

Types of labels

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

The safety labels are language independent, they only use graphics. See [Symbols on safety labels on page 41](#).

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

The labels are identified and located on the product as shown in the section:

- [Inspection of information labels on page 102](#).

Symbols on safety labels

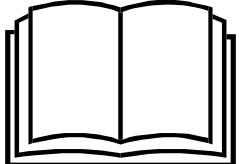
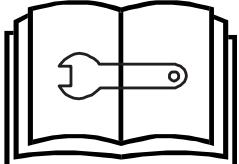
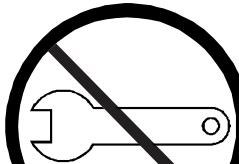
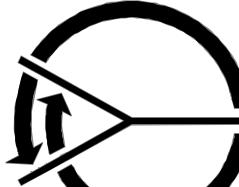
Symbol	Description
xx0900000812	Warning! Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical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

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1 Safety

1.3.2 Safety symbols on product labels

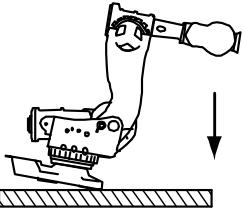
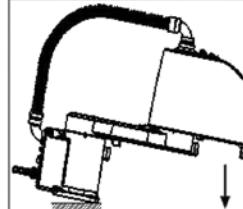
Continued

Symbol	Description
 xx0900000839	Prohibition Used in combinations with other symbols.
 xx0900000813	See user documentation Read user documentation for details. Which manual to read is defined by the symbol: <ul style="list-style-type: none">• No text: <i>Product manual</i>.• EPS: <i>Application manual - Electronic Position Switches</i>.
 xx0900000816	Before disassemble, see product manual
 xx0900000815	Do not disassemble Disassembling this part can cause injury.
 xx0900000814	Extended rotation This axis has extended rotation (working area) compared to standard.
 xx0900000808	Brake release Pressing this button will release the brakes. This means that the robot arm can fall down.

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1.3.2 Safety symbols on product labels

Continued

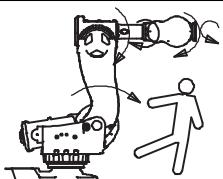
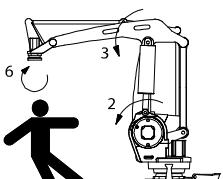
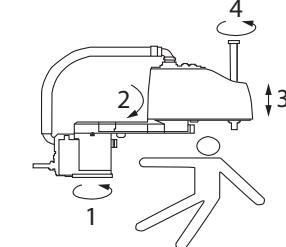
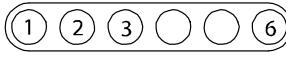
Symbol	Description
 xx0900000810	Tip risk when loosening bolts The robot can tip over if the bolts are not securely fastened.
  3HAC 057068-001	
 xx0900000817	Crush Risk of crush injuries.
 xx0900000818	Heat Risk of heat that can cause burns.

Continues on next page

1 Safety

1.3.2 Safety symbols on product labels

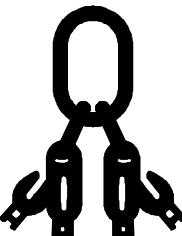
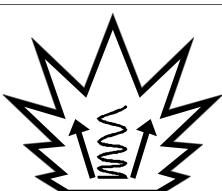
Continued

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

Continues on next page

1.3.2 Safety symbols on product labels

Continued

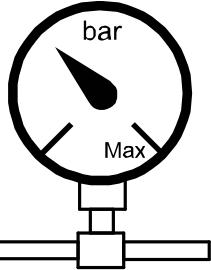
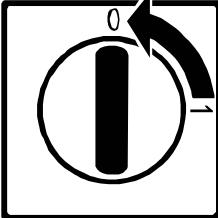
Symbol	Description
 xx1000001242	Chain sling with shortener
 xx0900000822	Lifting of robot
 xx0900000823	Oil Can be used in combination with prohibition if oil is not allowed.
 xx0900000824	Mechanical stop
 xx1000001144	No mechanical stop
 xx0900000825	Stored energy Warns that this part contains stored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

Continues on next page

1 Safety

1.3.2 Safety symbols on product labels

Continued

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

1.4.1 DANGER - Moving robots are potentially lethal!

1.4 Safety related instructions

1.4.1 DANGER - Moving robots are potentially lethal!

Description

Any moving robot is a potentially lethal machine.

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

Elimination

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

1 Safety

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

Description

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

Elimination

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

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

Collision risks



CAUTION

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

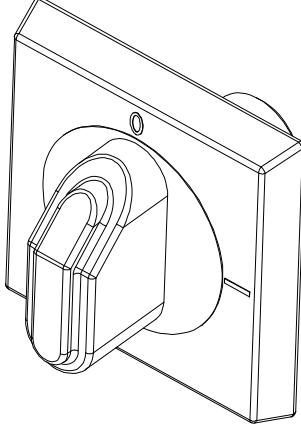
1.4.3 DANGER - Make sure that the main power has been switched off!

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

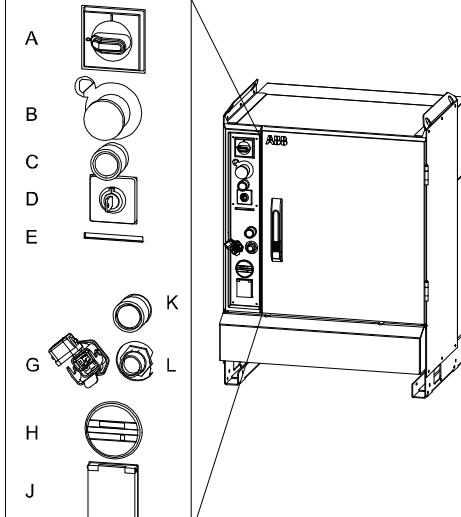
Description

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

Elimination, Panel Mounted Controller

Action	Note/illustration
1 Switch off the main switch for the controller.	 xx0600003255

Elimination, Single Cabinet Controller

Action	Note/illustration
1 Switch off the main switch on the controller cabinet.	 xx0600002782 A: Main switch

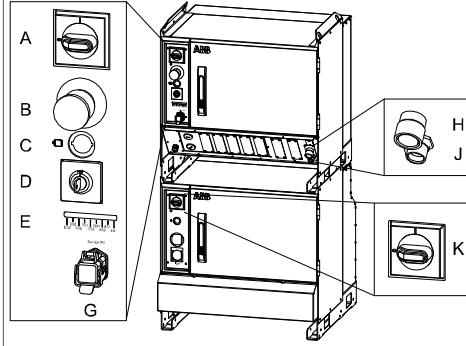
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1 Safety

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

Continued

Elimination, Dual Cabinet Controller

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

1.4.4 WARNING - The unit is sensitive to ESD!

1.4.4 WARNING - The unit is sensitive to ESD!

Description

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

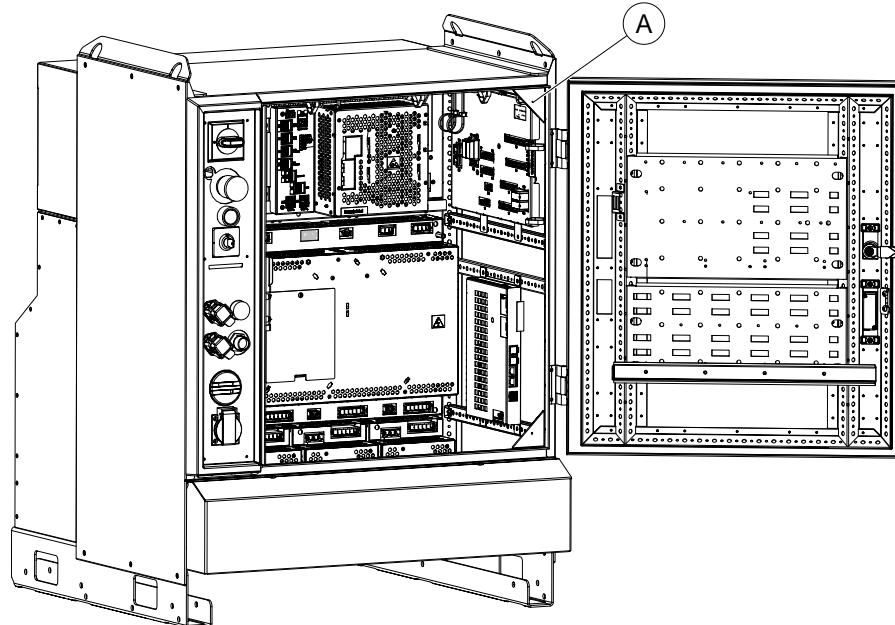
Elimination

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

Location of wrist strap button

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

IRC5



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

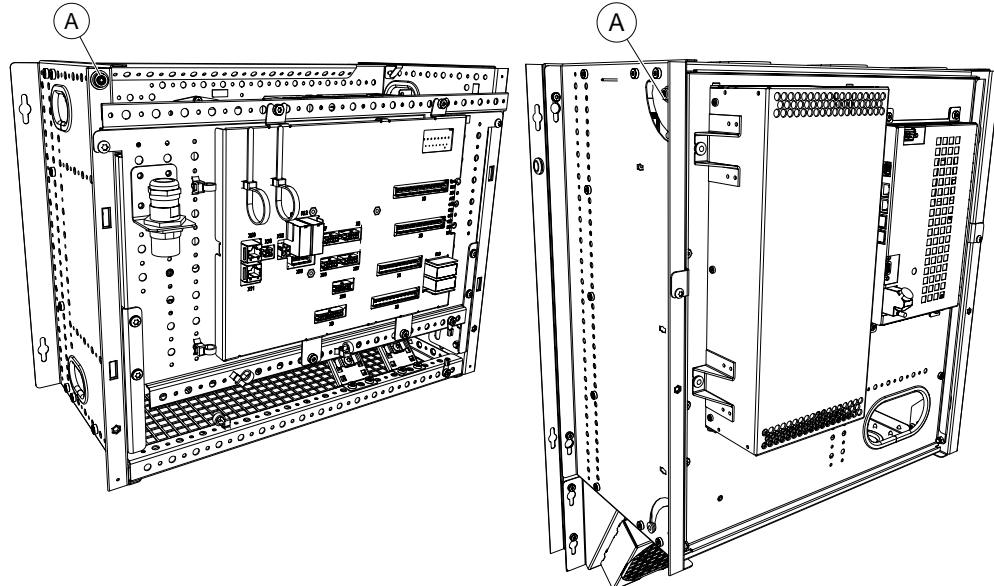
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1 Safety

1.4.4 WARNING - The unit is sensitive to ESD!

Continued

Panel Mounted Controller



xx1300001960

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

1.4.5 WARNING - Safety risks during handling of batteries

Description

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

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



Note

Appropriate disposal regulations must be observed.

Elimination

	Action	Note
1	Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion.	Operating temperatures are listed in Pre-installation procedure on page 58 .
2	Use safety glasses when handling the batteries.	
3	In the event of leakage, wear gloves and chemical apron.	
4	In the event of fire, use self-contained breathing apparatus.	

1 Safety

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

Description

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



Note

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



Note

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



Note

Appropriate disposal regulations must be observed.



Note

Take special care when handling hot lubricants.

Warnings and elimination

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

Continues on next page

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

Continued

Warning	Description	Elimination/Action
 xx0100000002 Do not overfill	<p>Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may:</p> <ul style="list-style-type: none"> • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely. 	<p>Make sure not to overfill the gearbox when filling it with oil or grease!</p> <p>After filling, verify that the level is correct.</p>
 xx0100000002 Do not mix types of oil	<p>Mixing types of oil may cause severe damage to the gearbox.</p>	<p>When filling gearbox oil, do not mix different types of oil unless specified in the instructions. Always use the type of oil specified by the manufacturer!</p>
 xx0100000098 Heat up the oil	<p>Warm oil drains quicker than cold oil.</p>	<p>When changing gearbox oil, first run the robot for a time to heat up the oil.</p>
 xx0100000004 Specified amount depends on drained volume	<p>The specified amount of oil or grease is based on the total volume of the gearbox. When changing the lubricant, the amount refilled may differ from the specified amount, depending on how much has previously been drained from the gearbox.</p>	<p>After filling, verify that the level is correct.</p>
 xx0100000003 Contaminated oil in gear boxes	<p>When draining the oil make sure that as much oil as possible is drained from the gearbox. The reason for this is to drain as much oil sludge and metal chips as possible from the gearbox. The magnetic oil plugs will take care of any remaining metal chips.</p>	

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2 Installation and commissioning

2.1 Introduction

General

This chapter contains assembly instructions and information for installing the IRB 260 at the working site.

More detailed technical data can be found in the *Product specification* for the IRB 260, such as:

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

Safety information

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

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



Note

If the IRB 260 is connected to power, always make sure that the robot is connected to *protective earth* before starting any installation work!

For more information see:

- *Product manual - IRC5*
- *Product manual - IRC5 Panel Mounted Controller*

2 Installation and commissioning

2.2.1 Pre-installation procedure

2.2 Unpacking

2.2.1 Pre-installation procedure

Introduction

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

Checking the pre-requisites for installation

Installation personnel working with an ABB product must:

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

Checking the pre-requisites for installation

Installation personnel working with an ABB robot must:

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

	Action
1	Make a visual inspection of the packaging and make sure that nothing is damaged.
2	Remove the packaging.
3	Check for any visible transport damage.  Note Stop unpacking and contact ABB if transport damages are found.
4	Clean the unit with a lint-free cloth, if necessary.
5	Make sure that the lifting accessory used is suitable to handle the weight of the robot as specified in: Weight, robot on page 59
6	If the robot is not installed directly, it must be stored as described in: Storage conditions, robot on page 60
7	Make sure that the expected operating environment of the robot conforms to the specifications as described in: Operating conditions, robot on page 60
8	Before taking the robot to its installation site, make sure that the site conforms to: <ul style="list-style-type: none">• Loads on foundation, robot on page 59• Protection classes, robot on page 61• Requirements, foundation on page 60
9	Before moving the robot, please observe the stability of the robot: Risk of tipping/stability on page 64
10	When these prerequisites are met, the robot can be taken to its installation site as described in section: On-site installation on page 65
11	Install required equipment, if any.

Continues on next page

Weight, robot

The table shows the weight of the robot.

Robot model	Weight
IRB 260	340 kg

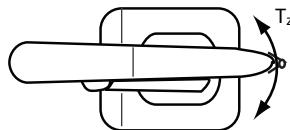
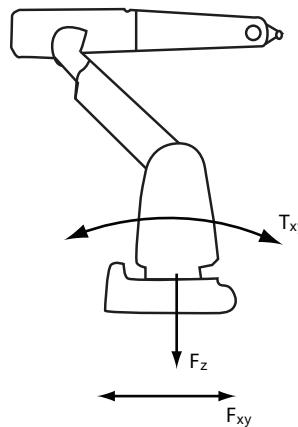
**Note**

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

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

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



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

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

**Note**

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

Continues on next page

2 Installation and commissioning

2.2.1 Pre-installation procedure

Continued

Floor mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 1400 N	± 2900 N
Force z	3500 ± 1100 N	3500 ± 2300 N
Torque xy	± 2100 Nm	± 3900 Nm
Torque z	± 650 Nm	± 950 Nm§

Requirements, foundation

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

Requirement	Value	Note
Maximum deviation from levelness	0.5 mm	Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB. The value for levelness aims at the circumstance of the anchoring points in the robot base.
Maximum tilt	5°	The limit for the maximum payload on the robot is reduced if the robot is tilted from 0°. Contact ABB for further information about acceptable loads.
Minimum resonance frequency	30 Hz	

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25° C
Maximum ambient temperature	+55° C
Maximum ambient temperature (less than 24 hrs)	+70° C
Maximum ambient humidity	Max.100% at constant temperature (gaseous only)

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	+5° C
Maximum ambient temperature	+45° C
Maximum ambient humidity	Max.100% at constant temperature (gaseous only)

Continues on next page

Protection classes, robot

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

Protection type	Protection class
Manipulator, protection type Standard	IP 67

2 Installation and commissioning

2.2.2 Working range

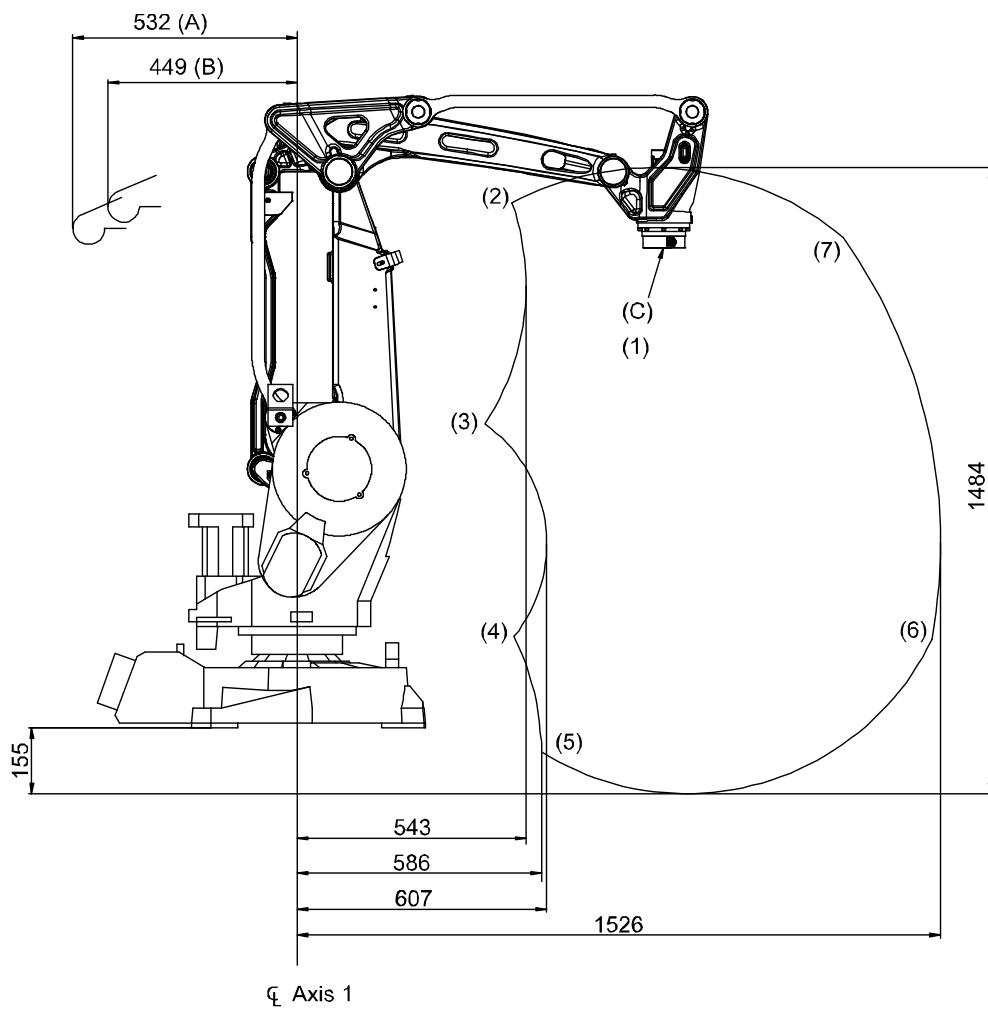
2.2.2 Working range

Working range

This section specifies the working areas of the robot models.

IRB 260

The extreme positions of the robot are specified at the tool flange center (dimensions in mm).



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A	Position at mechanical stop
B	Position at maximum working range, axis 2
C	Tool flange center

Continues on next page

Positions in the working range

The table below specifies the positions inside the working range, shown in the figure above.

Position in figure	Position (mm)		Angles (°)	
	X	Z	Axis 2	Axis 3
1	870	1139	0	0
2	510	1246	-28	-17
3	446	722	-28	31
4	515	218	60	119
5	607	-73	85	119
6	1506	210	85	26
7	1313	1148	42	-17

Type of motion

Axis	Type of motion	Range of movement
1	Rotation motion	+180° to -180°
2	Arm motion	+85° to -28°
3	Arm motion	+119° to -17°
6	Turn motion	+400° to -400° (default) +150 revolutions to -150 revolutions max. ⁽¹⁾

⁽¹⁾ The default working range for axis 6 can be extended by changing parameter values in the software (option Advanced Motion is required).

2 Installation and commissioning

2.2.3 Risk of tipping/stability

2.2.3 Risk of tipping/stability

Risk of tipping

If the robot is not fastened to the foundation and standing still, the robot is not stable in the whole working area. Moving the arms will displace the center of gravity, which may cause the robot to tip over.

The shipping position is the most stable position.

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



WARNING

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

2.3 On-site installation

2.3.1 Lifting of robot

Methods for lifting

The robot can be lifted with:

- lifting slings, or
- lifting chains.

Required equipment

Equipment	Specification
Overhead crane	Lifting capacity: 500 kg.
Lifting slings	-
Lifting chains, 3 pcs	Lengths: <ul style="list-style-type: none">• axis 2: 950 mm• axis 3: 920 mm• upper arm: 680 mm

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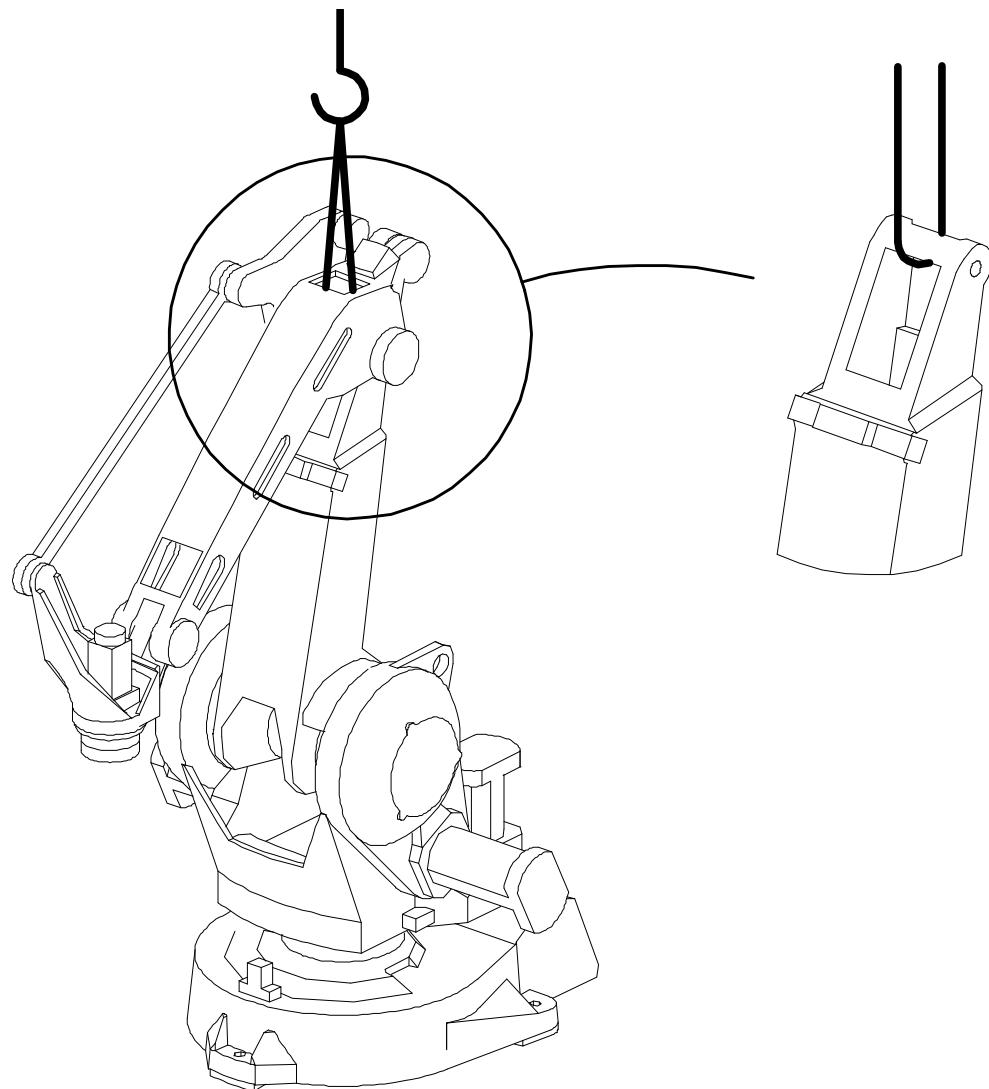
2 Installation and commissioning

2.3.1 Lifting of robot

Continued

Liftings slings - attachment and axis position

The lifting slings are attached to the robot as shown in the figure below. The axis positions are specified below the figure.

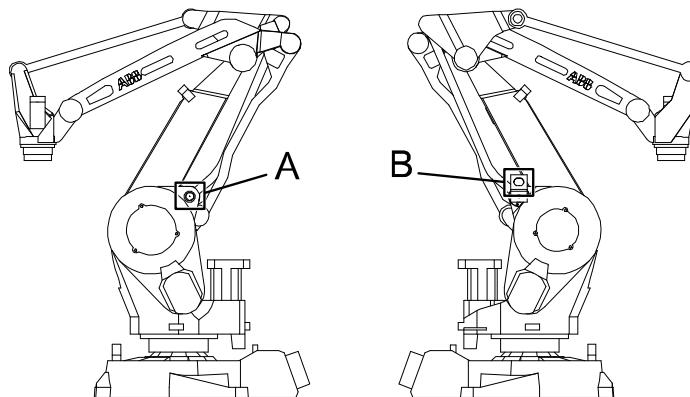
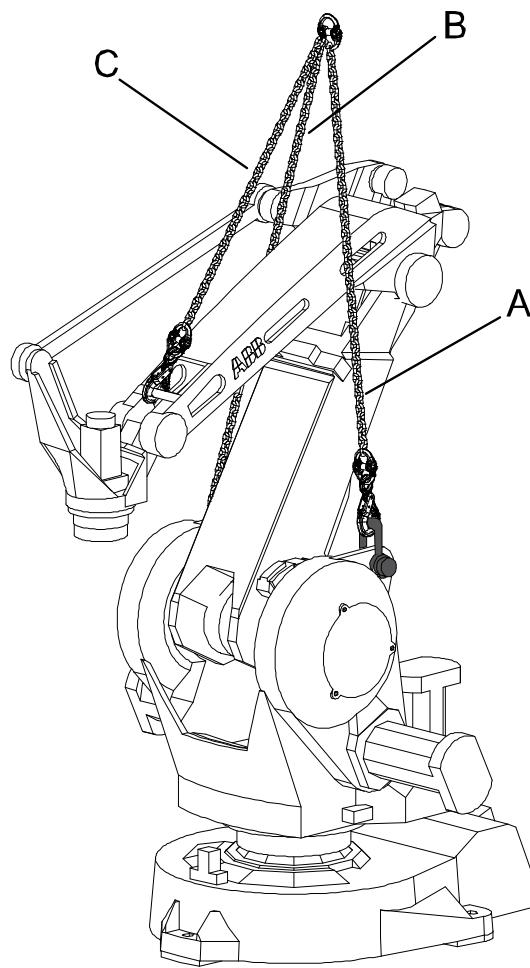


Axis 2 position:	-10°
Axis 3 position:	+35°

Continues on next page

Lifting chains - attachment and axis position

The lifting chains are attached to the robot as shown in the figure below. The axis positions are specified below the figure.



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Axis 2 position:	-28°
Axis 3 position:	+17°
A	Lifting chain, axis 2

Continues on next page

2 Installation and commissioning

2.3.1 Lifting of robot

Continued

B	Lifting chain, axis 3
C	Lifting chain, upper arm

Lifting of robot

The procedure below details how to lift the complete robot.

	Action	Note
1	Move the robot to the correct lifting position. If necessary, release the brakes of affected axis, according to section Manually releasing the brakes on page 69 .	Depending on the method of lifting, the correct axis positions are shown in: <ul style="list-style-type: none">• Liftings slings - attachment and axis position on page 66• Lifting chains - attachment and axis position on page 67.
2	 CAUTION The robot weighs 340 kg! All lifting equipment used must be sized accordingly!	
3	Attach the lifting equipment to the robot as shown in the previous figures and lift the robot.	

2.3.2 Manually releasing the brakes

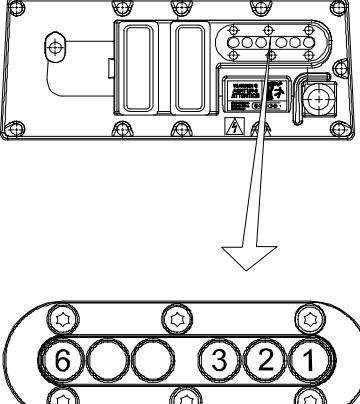
General

The holding brakes of each axis' motor are of an electromechanical type and are released when voltage is applied. This section details how to release the brakes, using the internal brake release unit, in order to enable the axes to move manually.

The brake of each motor can also be released by connecting an external voltage supply directly on the motor connector, see the circuit diagram or the repair procedures for each motor (section [Motors on page 184](#)).

Releasing the brakes using the brake release unit

The procedure below details how to release the holding brakes using the internal brake release unit.

	Action	Note/Illustration
1	 DANGER When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!	
2	If the robot is not connected to the controller, power must be supplied to the connector R1.MP.	Detailed in section Supplying power to connector R1.MP on page 70 .
3	The internal brake release unit is located at the base of the robot and equipped with buttons for controlling the holding brakes for each axis separately. The buttons are numbered according to the numbers of the axes. To release the brake on a particular robot axis, push the corresponding button on the internal brake release panel and keep it depressed. The brake will function again as soon as the button is released.	 xx0500001930

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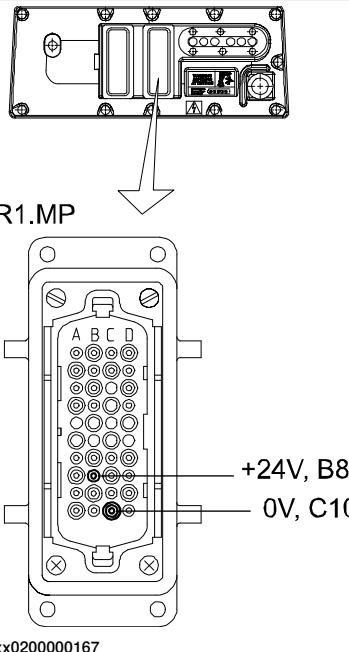
2 Installation and commissioning

2.3.2 Manually releasing the brakes

Continued

Supplying power to connector R1.MP

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

	Action	Note/Illustration
1	 CAUTION Be careful not to interchange the 24 VDC and 0V pins! If they are mixed up, damage can be caused to a resistor diode and to the system board.	
2	Connect an external power supply to connector R1.MP, at the robot base. Supply: <ul style="list-style-type: none">• +24 V on pin B8• 0 V on pin C10	
3	Release the brakes with the brake release unit as detailed in the previous procedure.	

2.3.3 Orienting and securing the robot

General

This section details how to orient and secure the robot to the foundation in order to safely run the robot. The requirements for the foundations are shown in [Requirements, foundation on page 60](#).

Bolting requirements

When bolting a base plate or the base to a concrete floor, follow the general instructions for expansion-shell bolts. The screw joint must be able to withstand the stress loads defined in section [Pre-installation procedure on page 58](#).

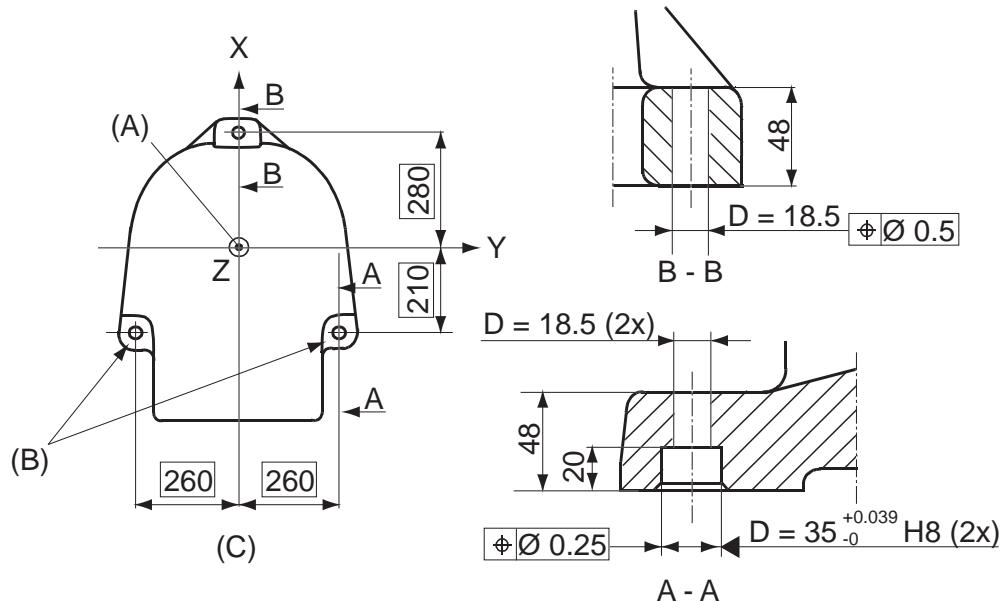
Attachment screws

The table below specifies the type of securing screws and washers to be used for securing the robot to the base plate/foundation.

Suitable screws, lightly lubricated:	M16 x 50
Quality	Quality 8.8
Suitable washer:	Thickness: 3 mm Outer diameter: 30 mm Inner diameter: 17 mm
Tightening torque:	190 Nm

Hole configuration

The figure below shows the hole configuration of the robot base, and cross section of the guide sleeve holes used when securing the robot.



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Continues on next page

2 Installation and commissioning

2.3.3 Orienting and securing the robot

Continued

Guide sleeves

Two guide sleeves can be fitted to the two rear bolt holes to allow the same robot to be remounted without re-adjusting the program.

Equipment	Art. no.
Guide sleeves	2151 0024-169

2.3.4 Fitting equipment on the robot and robot dimensions

2.3.4 Fitting equipment on the robot and robot dimensions

General

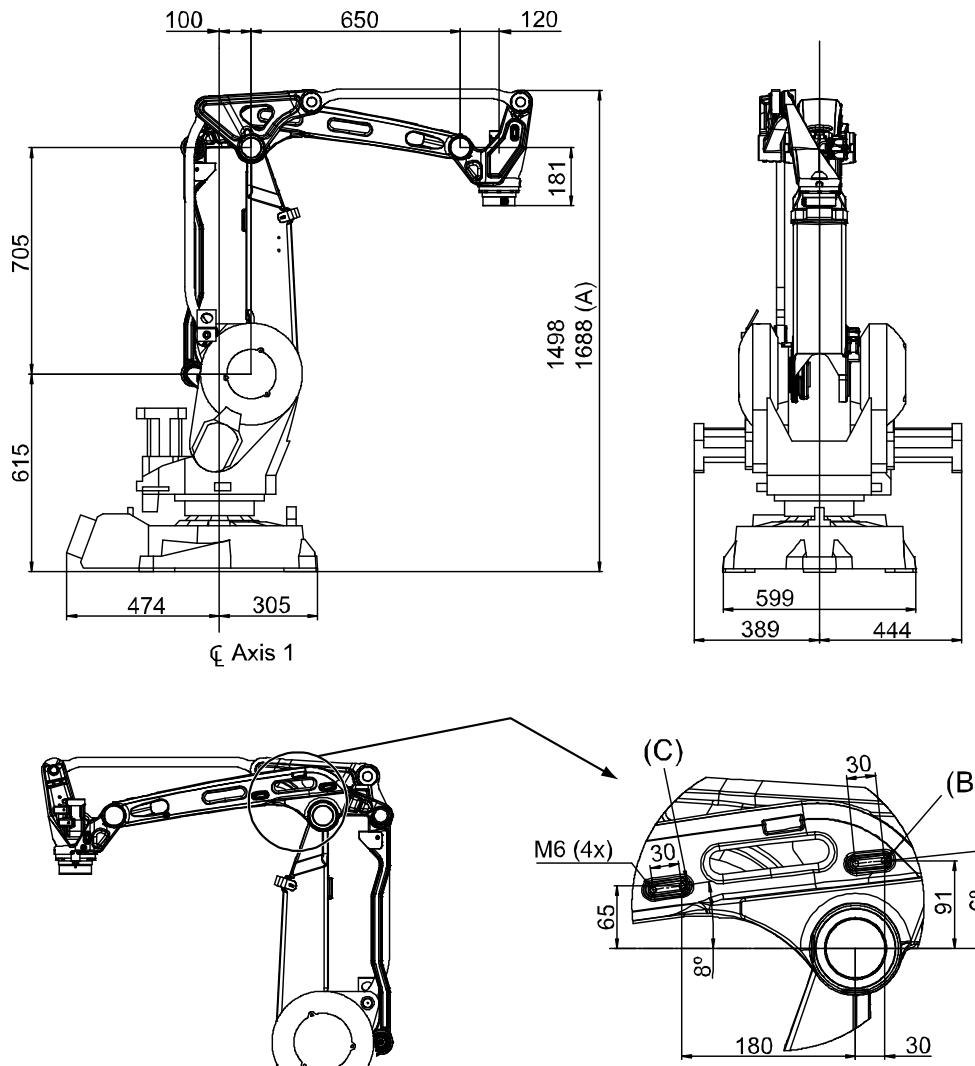
This section shows the dimensions and available mounting holes on the robot.



Note

All equipment and cables used on the robot, must be designed and fitted not to damage the robot and/or its parts.

Main dimensions



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A	At maximum working range axis 3
B	Mounting hole for safety lamp
C	Mounting hole for external air hose

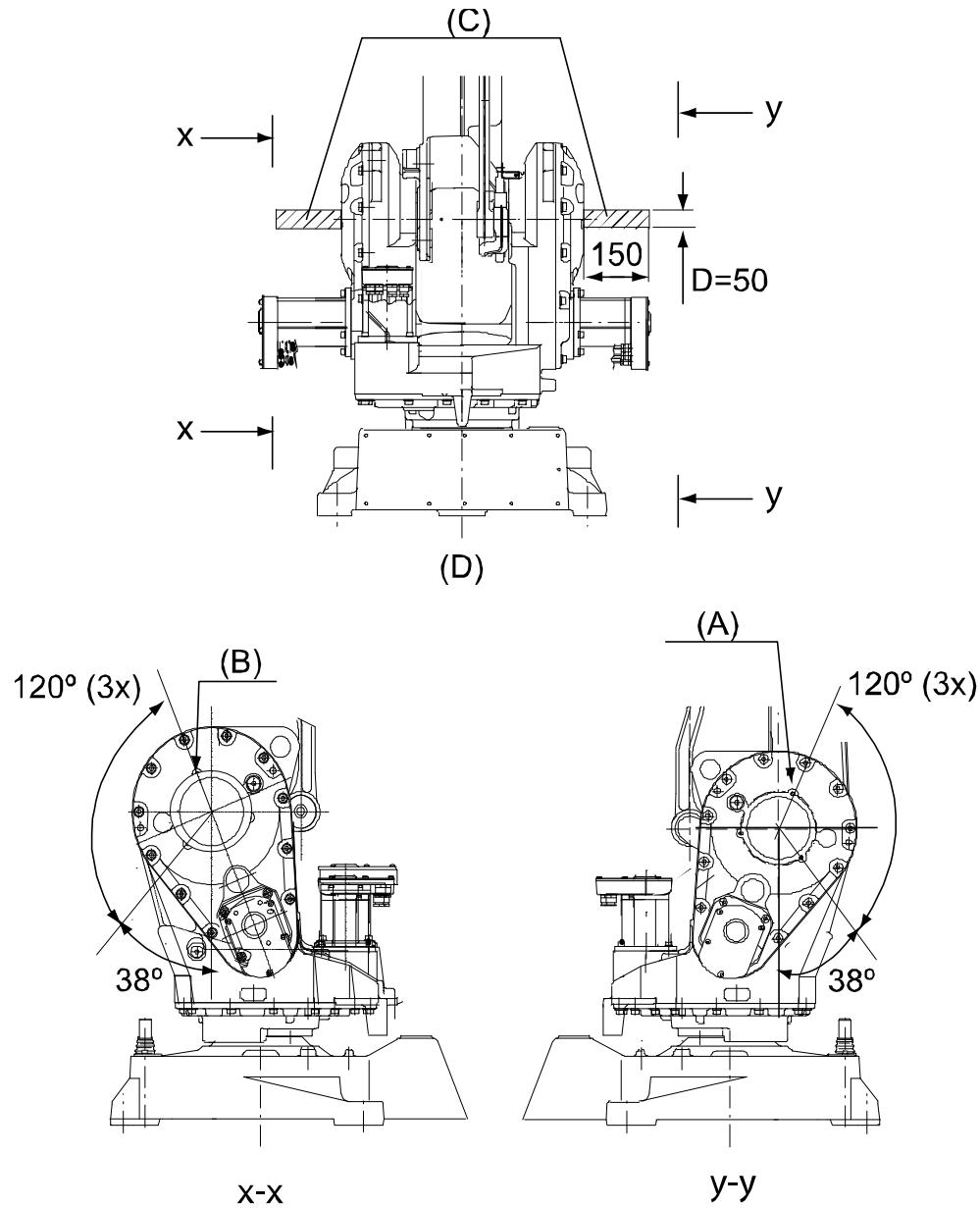
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2 Installation and commissioning

2.3.4 Fitting equipment on the robot and robot dimensions

Continued

Fitting equipment on the robot

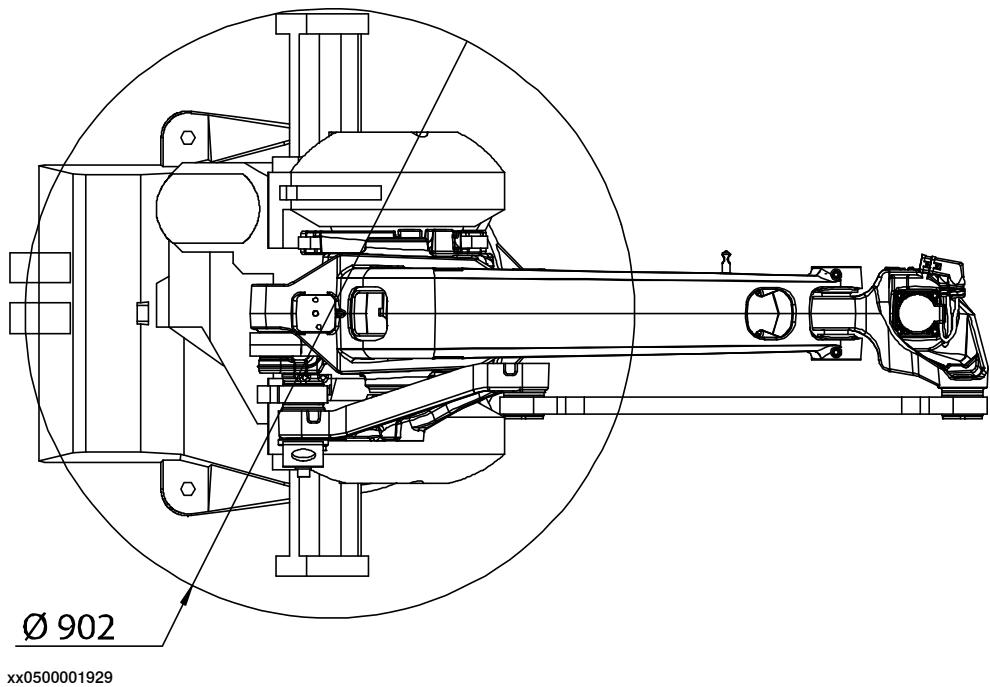


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A	M8 (3x) Depth 16 mm, R=77
B	M8 (3x) Depth 16 mm, R=92
C	Max. 35 kg total
D	The rear side of the robot

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Turning radius, axis 2



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Continues on next page

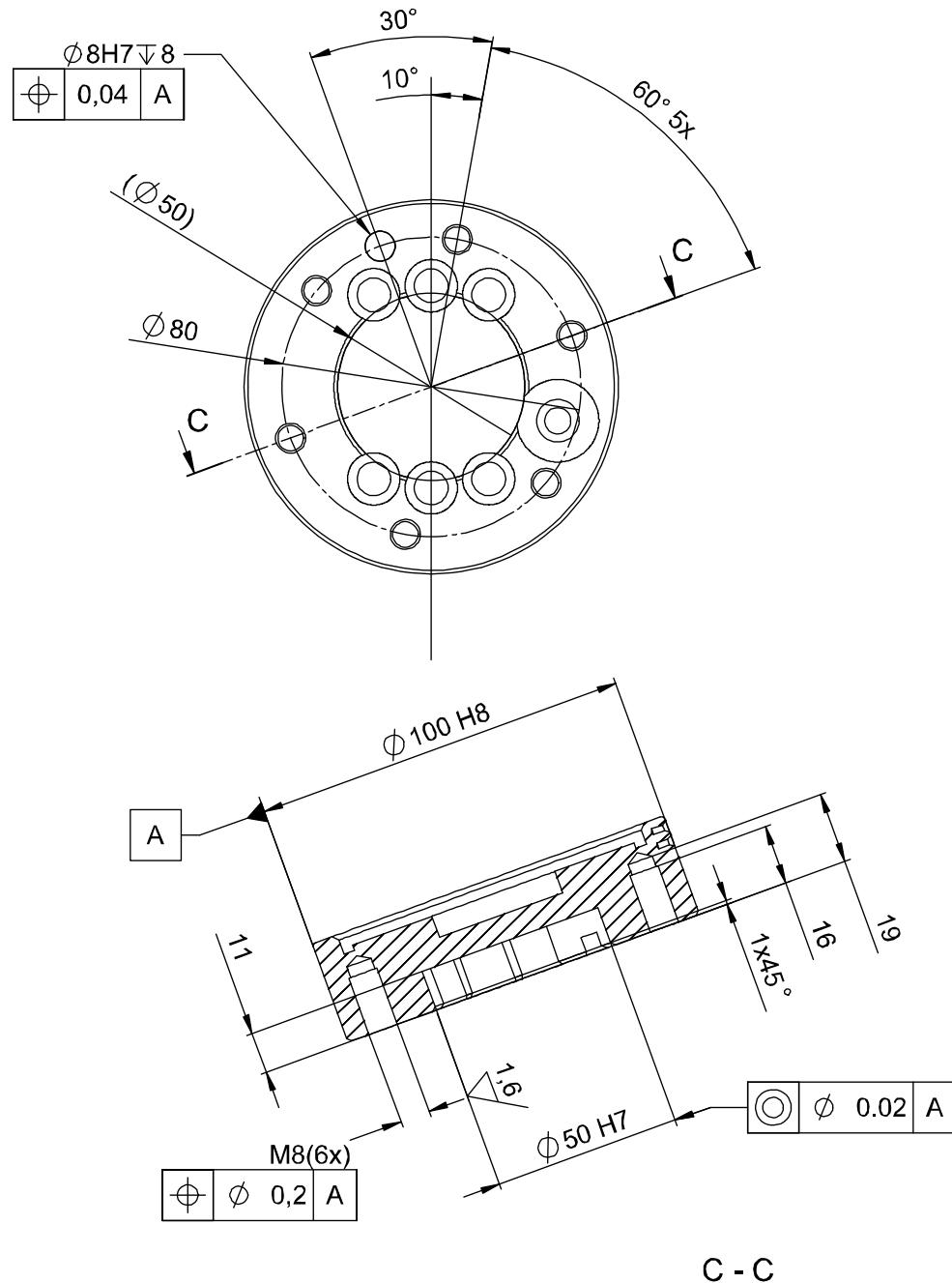
2 Installation and commissioning

2.3.4 Fitting equipment on the robot and robot dimensions

Continued

Turning disk, dimensions

The figure below shows the mounting holes available for fitting equipment on the turning disk.



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

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

General

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



CAUTION

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

References

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

- *Operating manual - IRC5 with FlexPendant*

Stopping time and braking distances

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

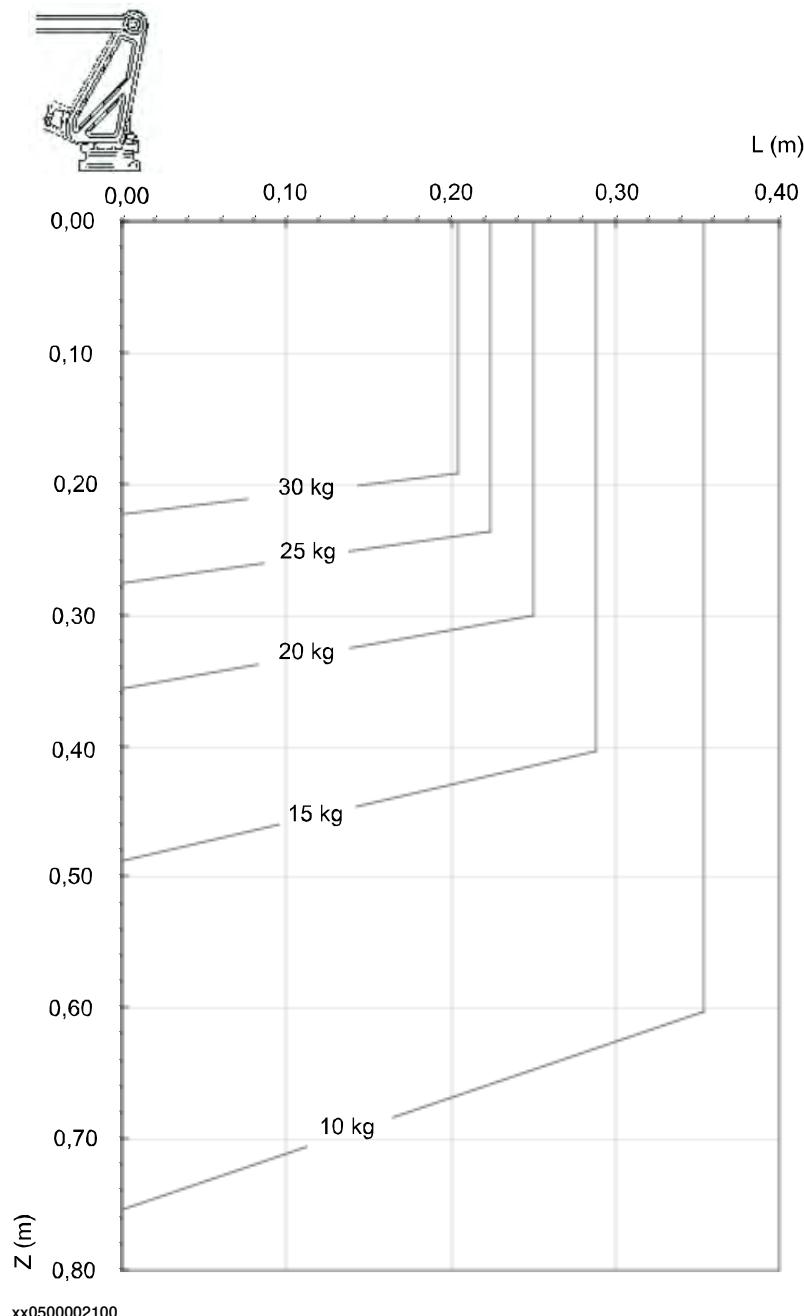
2 Installation and commissioning

2.3.6 Load diagram

2.3.6 Load diagram

Load diagram, IRB 260-30/1.5

The figure below shows the maximum permitted load mounted on the robot tool flange at different positions (center of gravity).



2.3.7 Installation of signal lamp (option)

General

As an option, a signal lamp can be installed on the robot. The lamp is activated when the controller is in the MOTORS ON state.

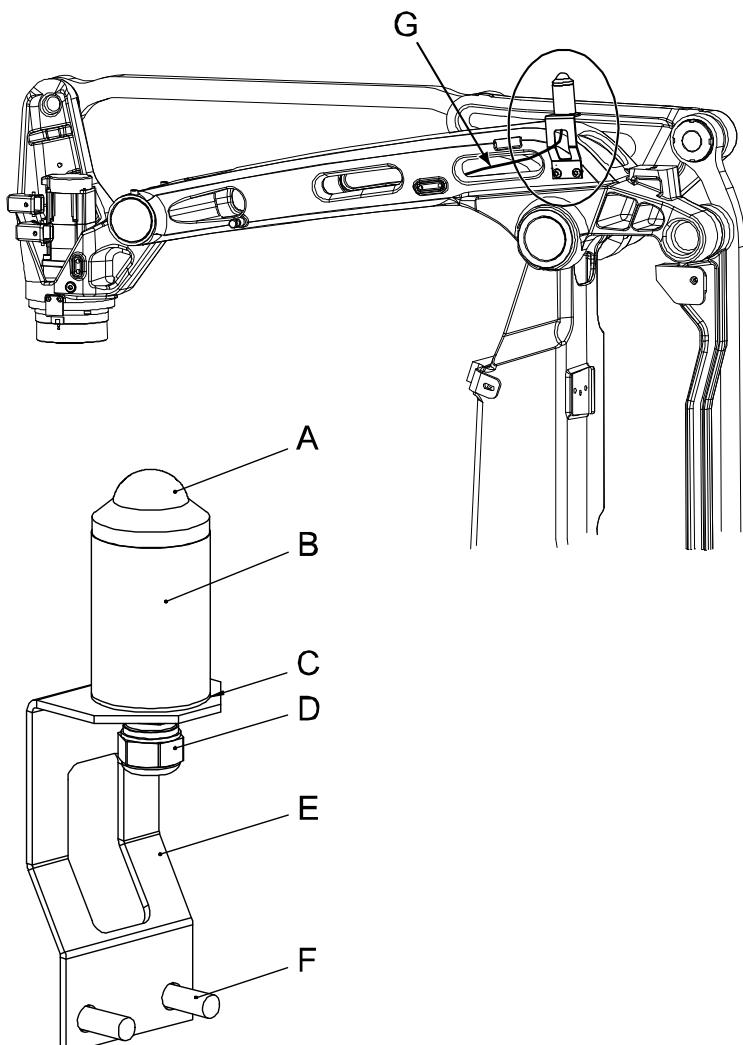


Note

Do not use the Signal Lamp option in a Clean Room environment.

Signal lamp on robot

The signal lamp is installed on the upper arm, as shown in the figure below.



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A	Indicator lamp
B	Lamp holder
C	O-ring
D	Cable gland

Continues on next page

2 Installation and commissioning

2.3.7 Installation of signal lamp (option)

Continued

E	Bracket
F	Attachment screws, 2 pcs
G	Cabling for the signal lamp (included in the robot cabling for axis 6)

Required equipment

Equipment	Spare part no.	Note
Signal lamp	3HAC025254-001	Includes all components shown in the previous figure.
Standard toolkit	-	The content is defined in the section Standard tools on page 229 .

Installation, signal lamp

The procedure below details how to install the signal lamp on the robot.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Connect the two cables to the signal lamp.	Run the cables from inside the upper arm, as shown in the figure Signal lamp on robot on page 79 . Connectors R3.H1 and R3.H2.
3	Fit the signal lamp to the upper arm by securing the <i>bracket</i> with two attachment screws.	2 pcs; M6x16. Shown in the figure Signal lamp on robot on page 79 .
4	Make sure that the lamp is lit when the controller is in MOTORS ON mode.	

2.4 Restricting the working range

2.4.1 Axes with restricted working range

General

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

The working range of the following axes may be restricted:

- Axis 1, hardware (mechanical stop and position switch)
- Axis 2, hardware (mechanical stop). **Note!** The axis 2 stop is a fixed stop that must be installed during operation of robot!
- Axis 3, hardware (mechanical stop). **Note!** The axis 3 stop is a fixed stop that must be installed during operation of robot!

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



Note

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

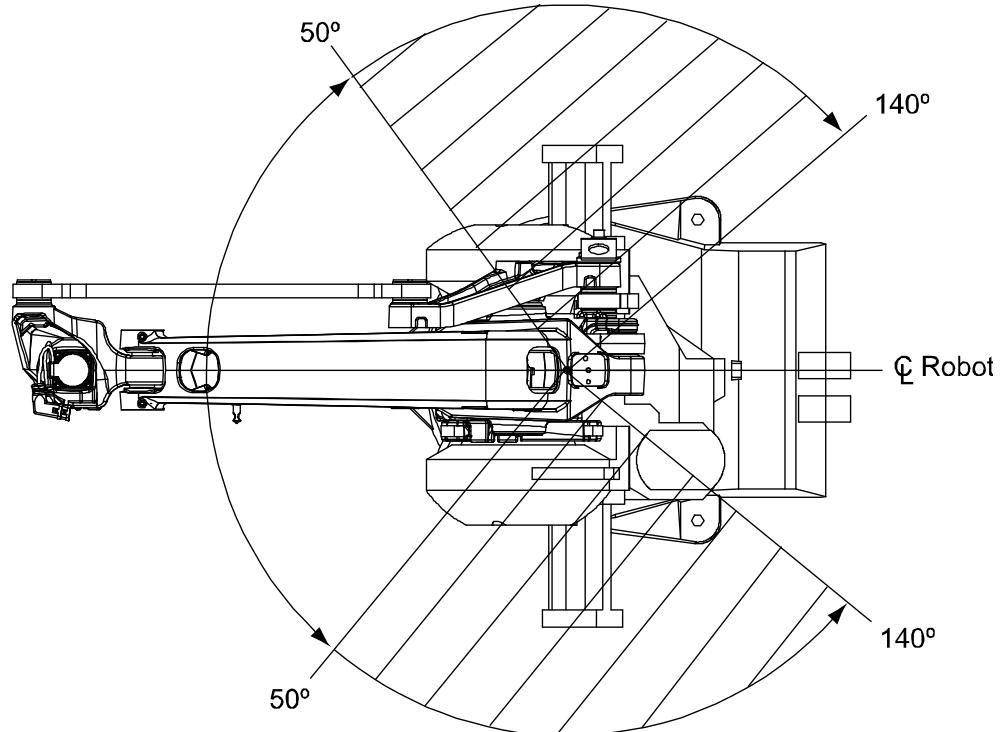
2 Installation and commissioning

2.4.2 Mechanically restricting the working range of axis 1

2.4.2 Mechanically restricting the working range of axis 1

Restrictions in the working range

The working range of axis 1 can be restricted within the area from 50° to 140° as shown in the figure below. The restrictions are made by fitting two extra stops to the robot base and adjusting the system parameter configuration.



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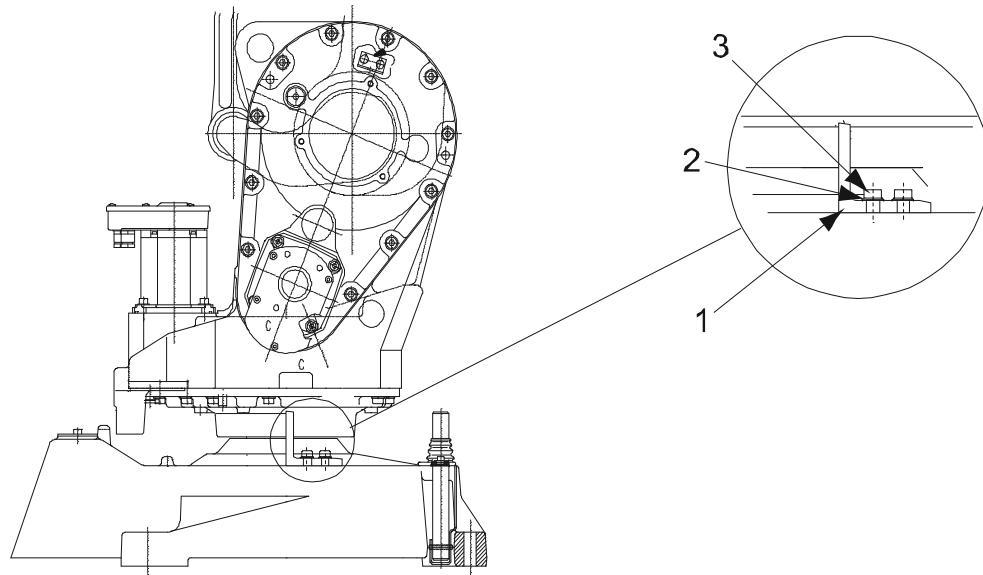
2.4.2 Mechanically restricting the working range of axis 1

Continued

Location of the mechanical stop, axis 1

The extra mechanical stop is fitted to the robot base as shown in the figure below.

Note! The stop must only be mounted in the direction shown below!



xx0200000205

1	Mechanical stop, axis 1, removable
2	Plain washer
3	Hex socket head cap screw

Required equipment

Equipment	Art. no.	Note
Mechanical stop unit, axis 1	3HAB7298-1	Includes: <ul style="list-style-type: none"> • removable stop (2 pcs) • plain washers (4 pcs) • hex socket head cap screw (4 pcs, M12x30) • drill template (1 pc)
Technical reference manual - System parameters	-	Art. no. is specified in References on page 10 .

Fitting, mechanical stop axis 1

The procedure below details how to fit a mechanical stop to the robot base.

	Action	Note
1	Decide where to fit the extra mechanical stops, according to the figure Location of where to drill holes for extra stops on page 85 .	
2	Make a copy of the drill template, enclosed with the mechanical stop.	The template is also shown in the figure Drill template on page 87 in scale 1:1.

Continues on next page

2 Installation and commissioning

2.4.2 Mechanically restricting the working range of axis 1

Continued

	Action	Note
3	Use the template to mark the center of the two holes on each stop.	Place the template edge edge with the robot base, as shown in the figure Location of where to drill holes for extra stops on page 85 .
4	Drill the holes through, Ø 10.2. Cut threads, M12.	
5	Fit the stops to the robot base, but without tightening the screws.	Note! The stops must be mounted in correct direction, as shown in the figure Location of where to drill holes for extra stops on page 85 .
6	Turn axis 1 manually and check the working range between the stops.	If necessary; correct the angle of impact.
7	Tighten the screws.	
8	Adjust the software working range limitations (system parameter configuration) to correspond to the mechanical limitations.	The system parameters that must be changed (<i>Upper joint bound</i> and <i>Lower joint bound</i>) are described in <i>Technical reference manual - System parameters</i> .
9	 WARNING If the <i>mechanical stop pin</i> is deformed after a hard collision, it must be replaced! Deformed <i>movable stops</i> and/or <i>additional stops</i> as well as deformed <i>attachment screws</i> must also be replaced after a hard collision.	

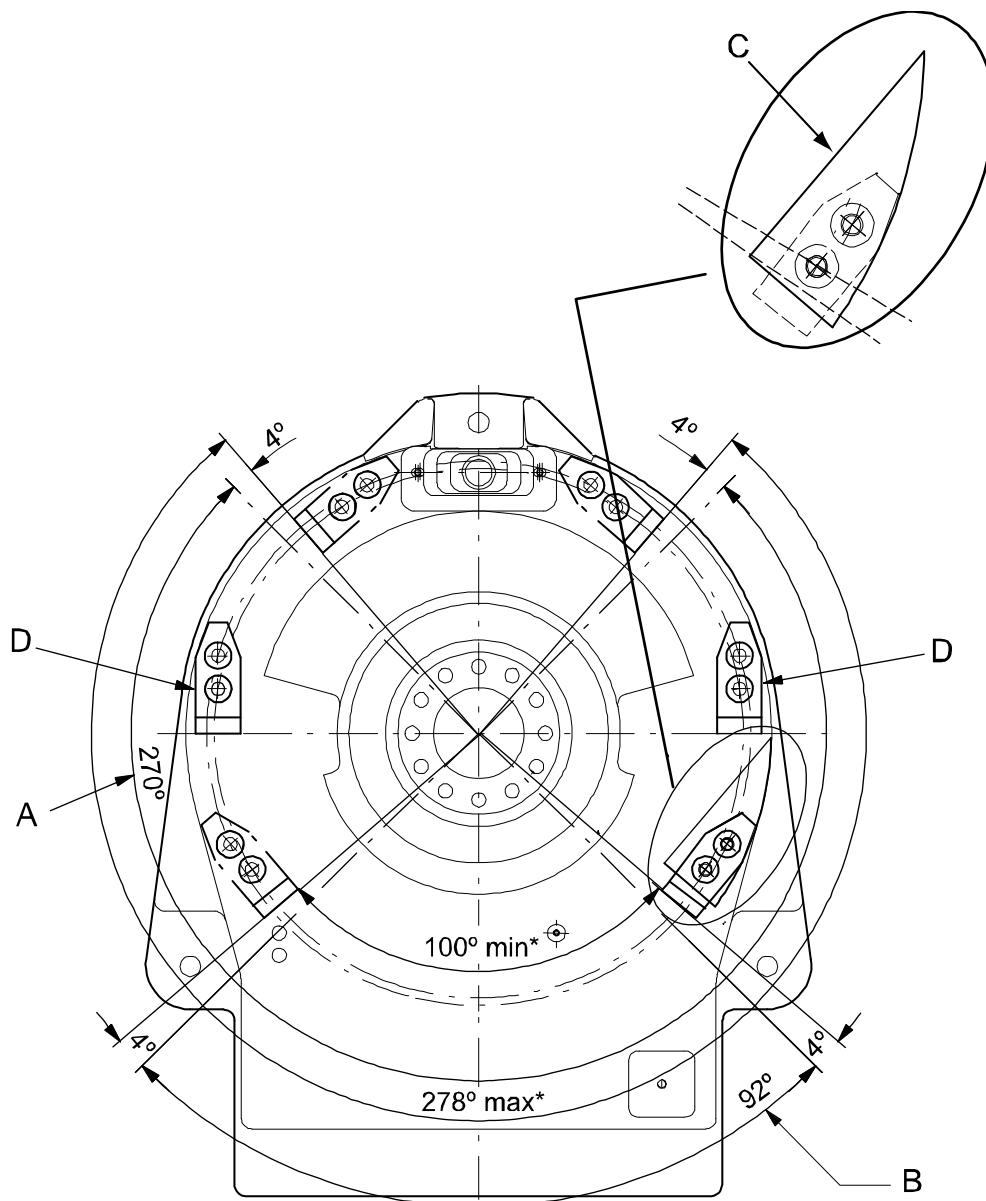
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2.4.2 Mechanically restricting the working range of axis 1

Continued

Location of where to drill holes for extra stops

The figure below shows the drill pattern used when drilling for mechanical stops on axis 1.



xx0200000206

A	Maximum working range, axis 1
B	Minimum working range, axis 1
C	Drilling pattern enclosed with the mechanical stop.
D	This mounting direction only
*	The minimum and maximum measurement between the mechanical stops. The difference between the measurement and the minimum and maximum working range is $2 \times 4^\circ$, which corresponds to the width of the stop pin (at the frame).

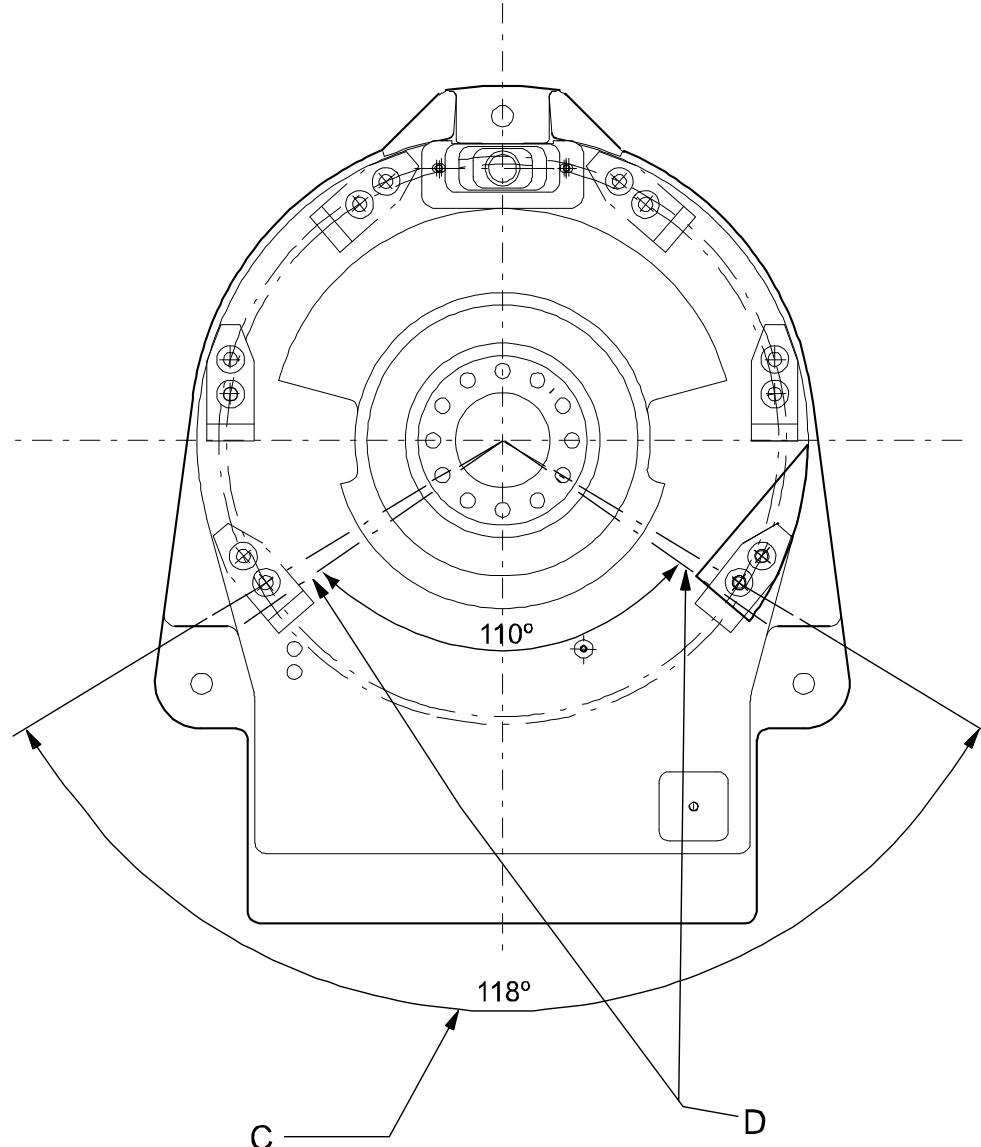
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2 Installation and commissioning

2.4.2 Mechanically restricting the working range of axis 1

Continued

Hidden stiffening ribs and forbidden drilling sector

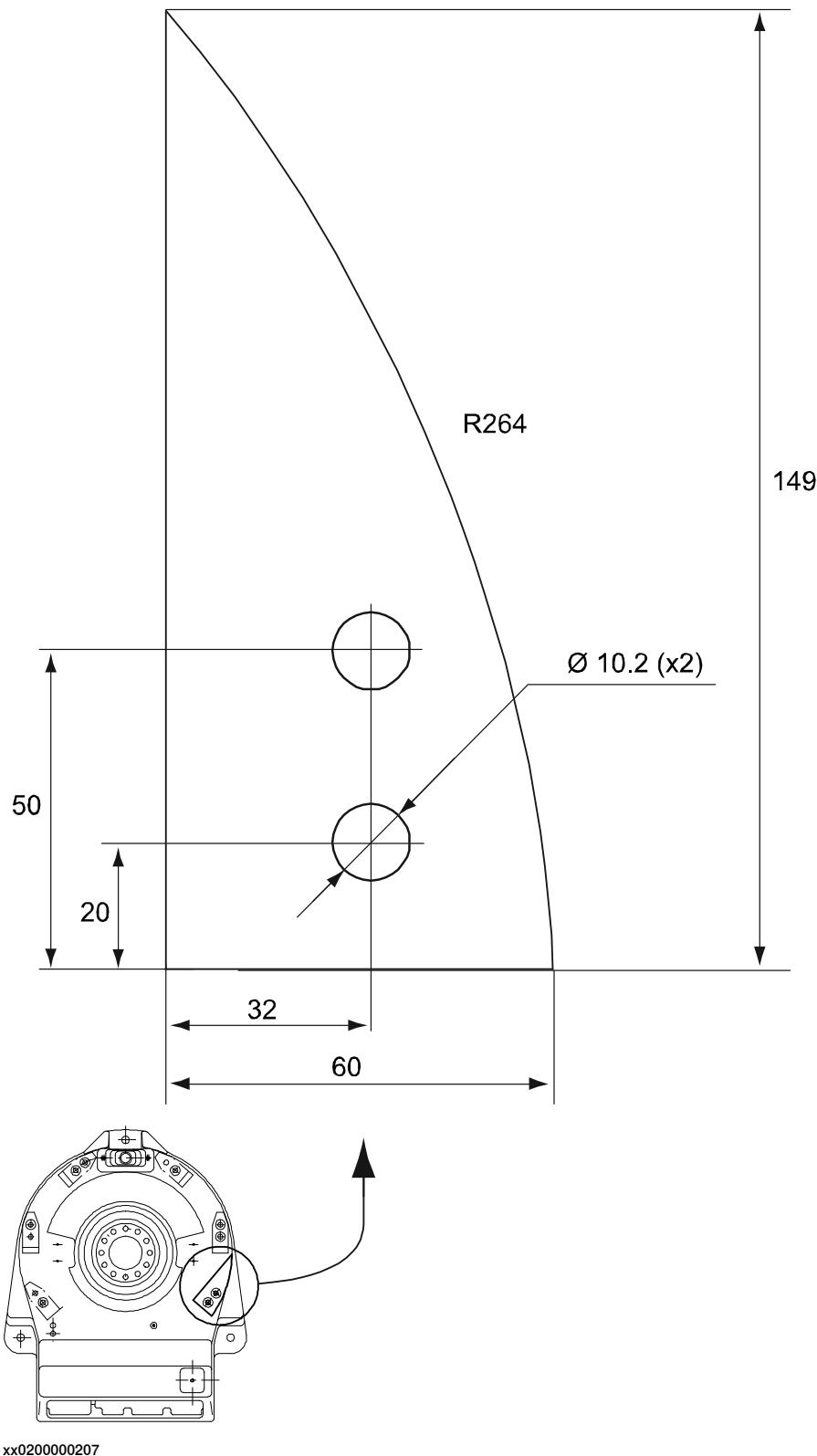


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C	Drilling not allowed inside this sector!
D	Center lines for the hidden stiffening ribs

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Drill template



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2 Installation and commissioning

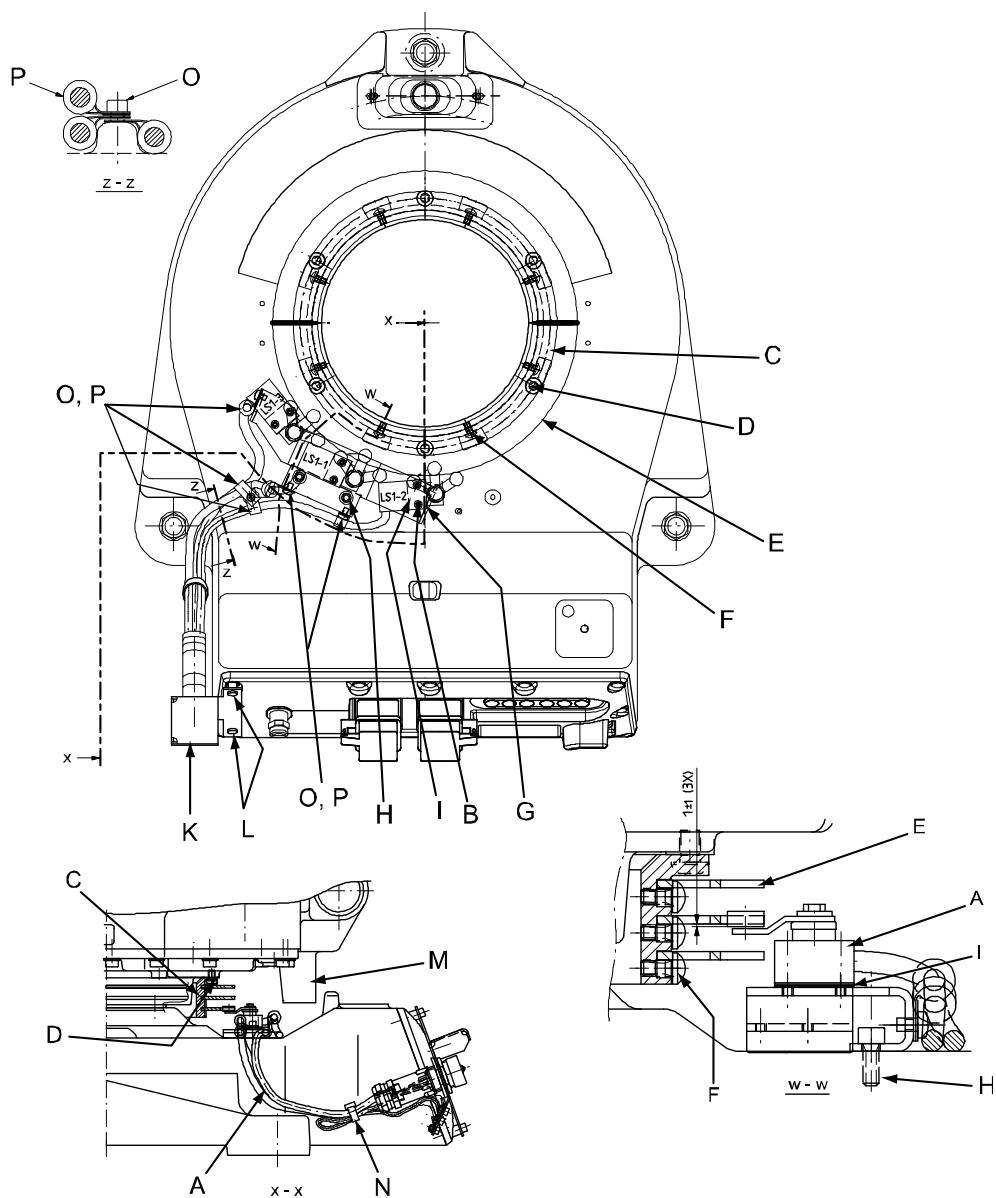
2.4.3 Installation of position switch, axis 1

General

This section details how to install the position switch to axis 1.

Location of position switch, axis 1

The position switch is installed between the frame and the base, as shown in the figure below.



xx0600002676

A	Position switch
B	Attachment screws, position switch (2 pcs for each switch) M4 x 16
C	Holder ring
D	Attachment screws, holder ring, 6 pcs: M8 x 12

Continues on next page

2 Installation and commissioning

2.4.3 Installation of position switch, axis 1

Continued

E	Cam
F	Attachment screws, cam, (8 pcs for each cam) M6 x 12
G	Attachment plate
H	Attachment screws, attachment plate (2 pcs) M6 x 16
I	Shims
K	Bracket
L	Attachment screws, bracket (2 pcs) M6 x 30
M	Mechanical stop
N	Cable straps
O	Attachment screw, clamp
P	Clamp

Required equipment

All parts are included in the delivery of the kits specified below. An instruction of how to cut the cams is also enclosed in the kit.

Equipment	Art. no.	Note
Position switch axis 1	3HAC12062-1	Includes one switch.
Position switch axis 1	3HAC12062-2	Includes two switches.
Position switch axis 1	3HAC12062-3	Includes three switches.
Technical reference manual - System parameters		Art. no. is specified in section References on page 10 .

Installation, position switch axis 1

The procedure below details how to install the position switch to the robot.

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2	Fit the two <i>holder rings</i> underneath the frame with the six attachment screws. 6 pcs, M8 x 12.	Shown in the figure Location of position switch, axis 1 on page 88 .
3	Cut the cams according to instructions, enclosed with the position switch kit.	
4	Fit the <i>cams</i> to the holder ring with the attachment screws. M6 x 12.	Shown in the figure Location of position switch, axis 1 on page 88 .
5	Fit the complete <i>bracket</i> to the base of the robot with the two attachment screws.	Shown in the figure Location of position switch, axis 1 on page 88 .

Continues on next page

2 Installation and commissioning

2.4.3 Installation of position switch, axis 1

Continued

	Action	Note
6	Fit the <i>attachment plate</i> to the base of the robot with the two attachment screws. Fit the switches to the attachment plate. Adjust the height of the switches with <i>shims</i> until each roller aligns with corresponding cam. Note! Make sure the cabling has clearance to the <i>mechanical stop</i> at the base!	2 pcs, M6 x 16. Shown in the figure Location of position switch, axis 1 on page 88 .
7	Secure the cabling with <i>straps</i> and <i>clamps</i> .	Shown in the figure Location of position switch, axis 1 on page 88 .
8	Connect the position switch cabling.	The cabling and connection points are specified in section Position switch cables, robot base to controller (option) on page 98 .
9	Adjust the software working range limitations (system parameter configuration) to correspond to the mechanical limitations.	The system parameters that must be changed (<i>Upper joint bound</i> and <i>Lower joint bound</i>) are described in Technical reference manual - System parameters .

2.4.4 Mechanically restricting the working range of axis 2

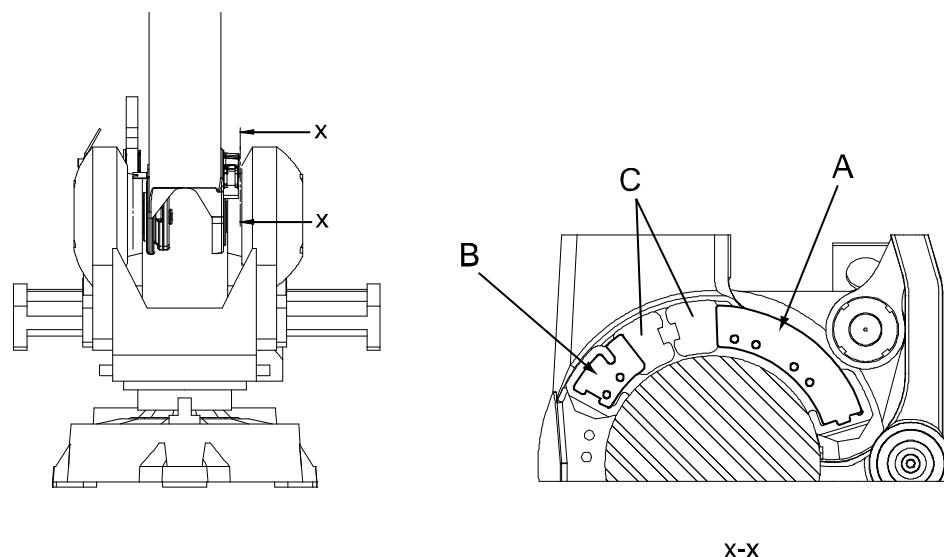
General

The stops are installed as standard, not movable and must always be installed during operation of the robot!

Restrictions in working range

The mechanical stops are not movable or optional! They function as solid stops and must be installed during robot operation. The working range of axis 2 cannot be restricted further.

Location of mechanical stops



xx0500002036

A	Mechanical stop (spacer), long
B	Mechanical stop (spacer), short
C	Fixed stops

Required equipment

Equipment	Art. no.	Note
Spacer, axis 2	3HAC025740-001	Long.
Spacer, axis 2	3HAC025741-001	Short.
<i>Technical reference manual - System parameters</i>	-	Art. no. is specified in section References on page 10 .
Standard toolkit	-	The content is defined in the section Standard tools on page 229 .

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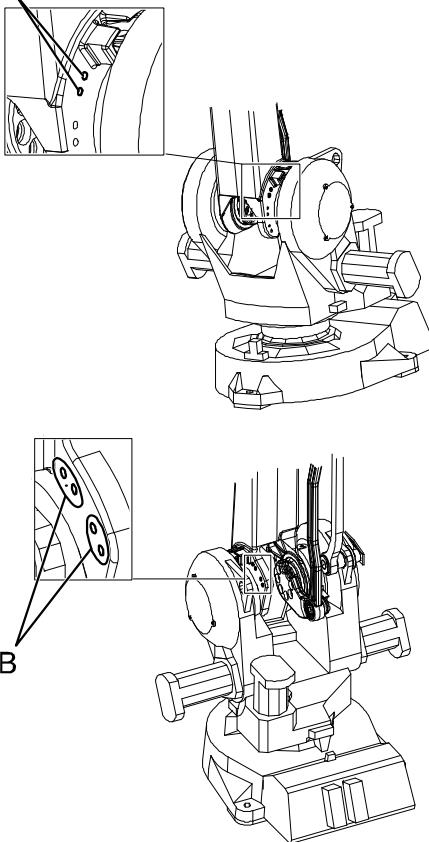
2 Installation and commissioning

2.4.4 Mechanically restricting the working range of axis 2

Continued

Installation, mechanical stops axis 2

The procedure below details how to fit the mechanical stops to the axis 2.

	Action	Note
1	Move the robot to its calibration position.	This is detailed in section Synchronization marks and synchronization position for axes on page 211 .
2	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
3	 DANGER The two mechanical stops must be installed correctly on axis 2! The robot may never be run without the stops fitted!	
4	Fit the two <i>spacers</i> directly next to the fixed stops of axis 2, with attachment screws.	<p>2 + 4 pcs: M8x25. Tightening torque: 17 Nm.</p>  <p>xx0500002037</p> <ul style="list-style-type: none">• A: Attachment holes for the short stop (spacer)• B: Attachment holes for the long stop (spacer)
5	Fit the dampers to the mechanical stops.	

Continues on next page

2.4.4 Mechanically restricting the working range of axis 2

Continued

	Action	Note
6	Adjust the software working range limitations (system parameter configuration) to correspond to the mechanical limitations.	The system parameters that must be changed (<i>Upper joint bound</i> and <i>Lower joint bound</i>) are described in <i>Technical reference manual - System parameters</i> .
7	 WARNING If the <i>mechanical stop pin</i> is deformed after a hard collision, it must be replaced! Deformed <i>movable stops</i> and/or <i>additional stops</i> as well as deformed <i>attachment screws</i> must also be replaced after a hard collision.	

2 Installation and commissioning

2.4.5 Mechanically restricting the working range of axis 3

General

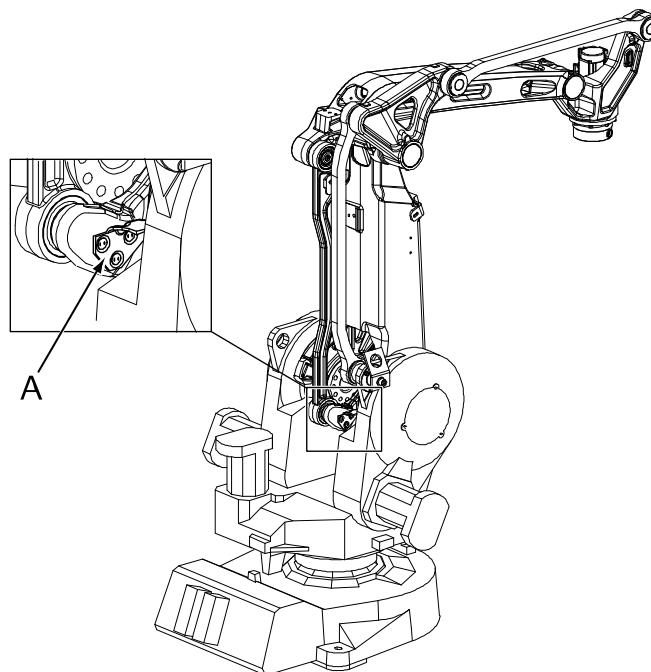
The stop of axis 3 is installed as standard, not movable and must always be installed during operation of robot!

Restrictions in working range

The mechanical stop is not movable or optional! It functions as a solid stop and must be installed during robot operation. The working range of axis 3 cannot be restricted further.

Location of mechanical stop

The figure below shows the location of the mechanical stop on axis 3.



xx0500002039

A	Mechanical stop, axis 3
---	-------------------------

Required equipment

Equipment	Art. no.	Note
Mechanical stop, axis 3	3HAC024253-001	
Locking liquid	-	Loctite 243
<i>Technical reference manual - System parameters</i>	-	Art. no. is specified in section References on page 10 .
Standard toolkit	-	The content is defined in the section Standard tools on page 229 .

Continues on next page

Installation, mechanical stop

The procedure below details how to fit the mechanical stop to the robot.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Fit the <i>mechanical stop</i> to the parallel bar with the three attachment screws. Use locking liquid.	Shown in the figure Location of mechanical stop on page 94 . 3 pcs; M6x16. Tightening torque: 11 Nm. Locking liquid is specified in Required equipment on page 94 .
3	Adjust the software working range limitations (system parameter configuration) to correspond to the mechanical limitations.	The system parameters that must be changed (<i>Upper joint bound</i> and <i>Lower joint bound</i>) are described in Technical reference manual - System parameters .
4	 WARNING If the <i>mechanical stop pin</i> is deformed after a hard collision, it must be replaced! Deformed <i>movable stops</i> and/or <i>additional stops</i> as well as deformed <i>attachment screws</i> must also be replaced after a hard collision.	

2 Installation and commissioning

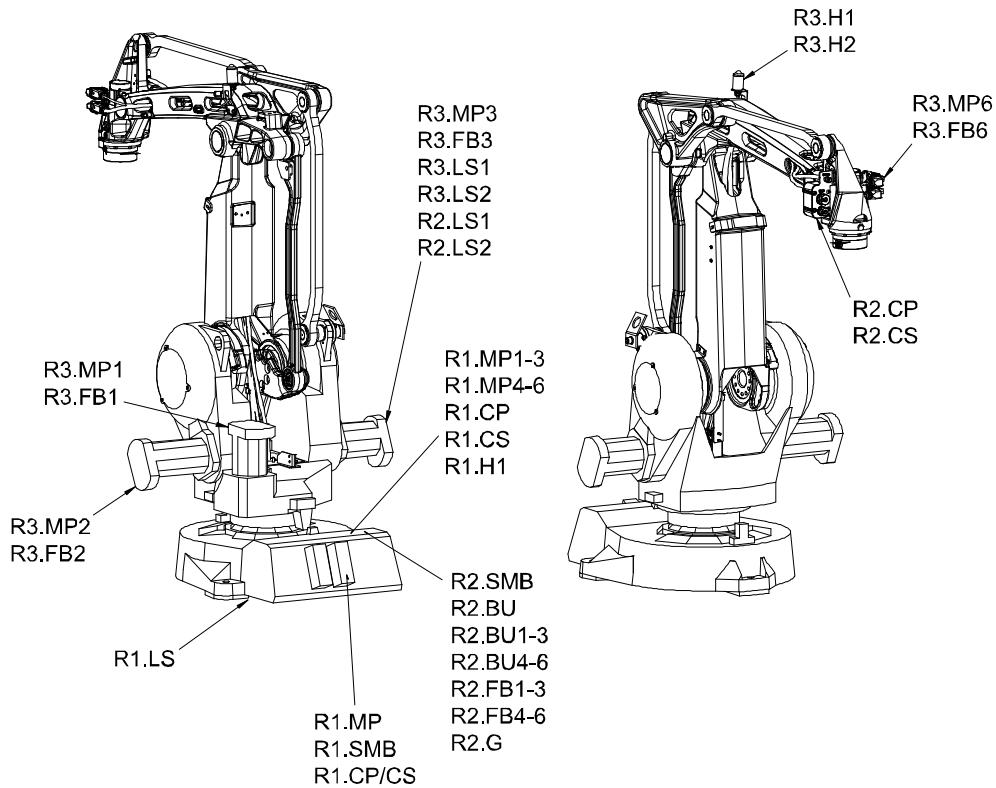
2.5.1 Connectors on robot

2.5 Electrical connections

2.5.1 Connectors on robot

Connectors on the robot

The figure below shows all connections of the robot cabling, including the customer connections.



xx0500002434

2.5.2 Robot cabling and connection points

Introduction

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

Main cable categories

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

Cable category	Description
Robot cables	Handles power supply to and control of the robot's motors as well as feedback from the serial measurement board. Specified in the table Robot cables on page 97 .
Position switch cables (option)	Handles supply to and feedback from any position switch on the robot. Specified in the table Position switch cables, robot base to controller (option) on page 98 .
Customer cables (option)	Handles communication with equipment fitted on the robot by the customer, low voltage signals and high voltage power supply + protective ground. See the product manual for the controller, see document number in References on page 10 .

Robot cables

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

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

Robot cable, power

Cable	Art. no.
Robot cable, power: 7 m	3HAC9038-1
Robot cable, power: 15 m	3HAC9038-2
Robot cable, power: 22 m	3HAC9038-3
Robot cable, power: 30 m	3HAC9038-4

Robot cable, signals

Cable	Art. no.
Robot cable signal, shielded: 7 m	3HAC7998-1
Robot cable signal, shielded: 15 m	3HAC7998-2
Robot cable signal, shielded: 22 m	3HAC7998-3

Continues on next page

2 Installation and commissioning

2.5.2 Robot cabling and connection points

Continued

Cable	Art. no.
Robot cable signal, shielded: 30 m	3HAC7998-4

Position switch cables, robot base to controller (option)

These cables are *not* included in the standard delivery, but are included in the delivery if the position switch option is ordered. The position switches can also be ordered without cables. The cables are completely pre-manufactured and ready to plug in.

Cabling between robot base and controller

Cable	Art. no.	Connection point, robot	Connection point, cabinet
Position switch cable, axis 1, 7 m	3HAC7997-1	R1.SW	XS8
Position switch cable, axis 1, 15 m	3HAC7997-2	R1.SW	XS8
Position switch cable, axis 1, 22 m	3HAC7997-3	R1.SW	XS8
Position switch cable, axis 1, 30 m	3HAC7997-4	R1.SW	XS8

Customer cables (option)

The customer cables specified below are connected between robot and controller.

Customer cables

Cable	Art. no.	Connection point, robot
Customer cable, power-signal, 7 m	3HAC8183-1	R1.CP/CS
Customer cable, power-signal, 15 m	3HAC8183-2	R1.CP/CS
Customer cable, power-signal, 22 m	3HAC8183-3	R1.CP/CS
Customer cable, power-signal, 30 m	3HAC8183-4	R1.CP/CS

3 Maintenance

3.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 260.

It is based on the maintenance schedule found at the beginning of the chapter. The schedule contains information about required maintenance activities including intervals, and refers to procedures for the activities.

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

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

Safety information

Observe all safety information before conducting any service work!

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



Note

If the IRB 260 is connected to power, always make sure that the IRB 260 is connected to protective earth before starting any maintenance work!

For more information see:

- *Product manual - IRC5*
- *Product manual - IRC5 Panel Mounted Controller*

3 Maintenance

3.2.1 Specification of maintenance intervals

3.2 Maintenance schedule

3.2.1 Specification of maintenance intervals

Introduction

The intervals are specified in different ways depending on the type of maintenance activity to be carried out and the working conditions of the IRB 260:

- Calendar time: specified in months regardless of whether the system is running or not.
- Operating time: specified in operating hours. More frequent running means more frequent maintenance activities.
- SIS: specified by the robot's SIS (Service Information System). A typical value is given for a typical work cycle, but the value will differ depending on how hard each part is run. The SIS used in M2004 is further described in the *Operating manual - Service Information System*.

3.2.2 Maintenance schedule

General

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

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

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

Activities and intervals, standard equipment

The table below specifies the required maintenance activities and intervals and also refers to the section where performing the activity is detailed.

Maintenance activity	Interval	Note	Detailed in section:
Oil change in gearboxes, axes 1,2, 3.	40000 h	Lubricated for life. Maintenance free units.	
Oil change in wrist unit	-	No preventive maintenance in terms of changing the gear oil is needed when gearbox is lubricated with Shell Tivela S 150.	Oil change, gearbox axis 6 (wrist unit) on page 106.
Replacement of battery pack, SMB unit	Battery low alert ⁱ	Battery pack, measurement system with 2-pole battery contact, e.g. DSQC633A	Replacement of SMB battery on page 108.
Replacement of battery pack, SMB unit	36 months or battery low alert ⁱⁱ	Battery pack, measurement system of type RMU101 or RMU102 (3-pole battery contact)	Replacement of SMB battery on page 108.
Inspection of all signal cabling in lower and upper arm	36 months	Replace if damaged.	
Replacement of mechanical stop axis 1	60 months	Replace if bent.	Fitting, mechanical stop axis 1 on page 83.

ⁱ The battery low alert (38213 Battery charge low) is displayed when remaining backup capacity (robot powered off) is less than 2 months. The typical lifetime of a new battery is 36 months if the robot is powered off 2 days/week or 18 months if the robot is powered off 16 h/day. The lifetime can be extended with a battery shutdown service routine. See *Operating manual - IRC5 with FlexPendant* for instructions.

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

See the replacement instruction for more details.

3 Maintenance

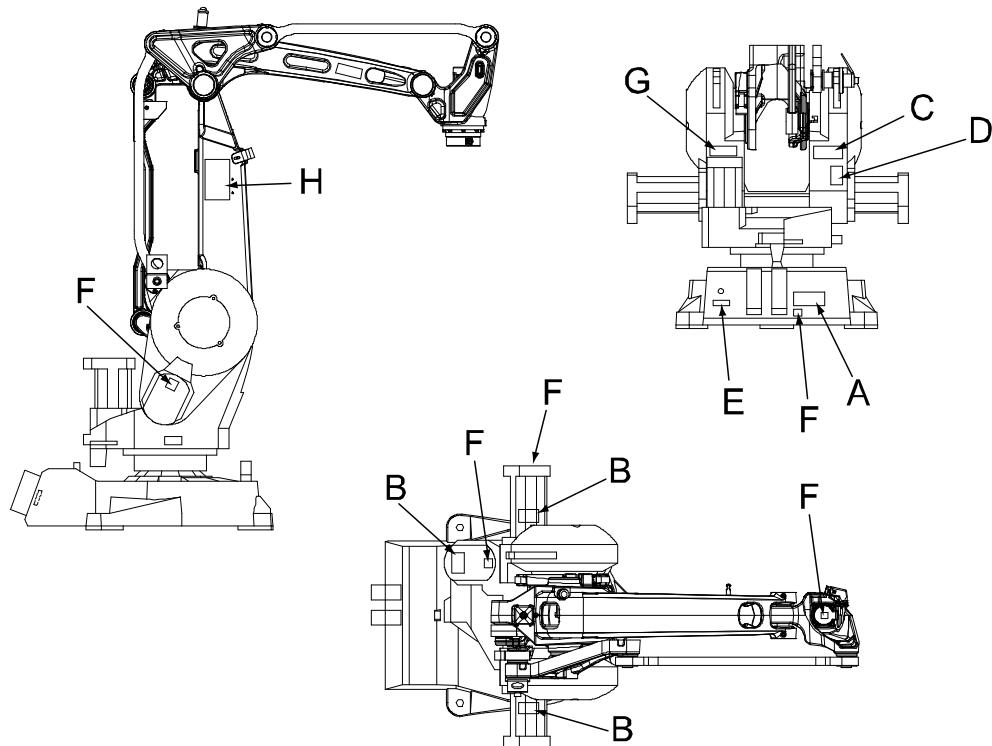
3.3.1 Inspection of information labels

3.3 Inspection activities

3.3.1 Inspection of information labels

Location of labels

The labels are located on the robot as shown in the figure below.



xx0600002622

A, B	Instruction plate. Specified further in the following table.
C	Rating label (silver coloured)
D	Calibration label. Specified further in the following table.
E	Label with maximum air pressure.
F	Warning sign. Specified further in the following table.
G	UL label
H	Instruction plate. Specified further in the following table.

List of labels

Equipment	Spare part no.	Note
Instruction plate	3HAC2814-2	Item A in the figure. Warning of brake release.
Instruction plate	2945 4489-16	Item B in the figure.
Calibration label	3HAC024307-001	Item D in the figure.
Instruction plate	3HAC025469-001	Item H in the figure. Lifting of robot.

Continues on next page

3.3.1 Inspection of information labels

Continued

Equipment	Spare part no.	Note
Warning sign	3HAC1589-1	Item F in the figure. Lightning flash.

Inspection, labels

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Inspect that all labels are fitted to the robot. Replace them if damaged or missing.	Shown in the figure Location of labels on page 102 .

3 Maintenance

3.4.1 Type of lubrication in gearboxes

3.4 Changing activities

3.4.1 Type of lubrication in gearboxes

Introduction

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

Type and amount of oil in gearboxes

Information about the *type of lubrication*, *article number* as well as the *amount* in the specific gearbox can be found in *Technical reference manual - Lubrication in gearboxes* on the Documentation DVD (released twice a year). The revision of the manual published on the Documentation DVD will contain the latest updates when the Documentation DVD is released.

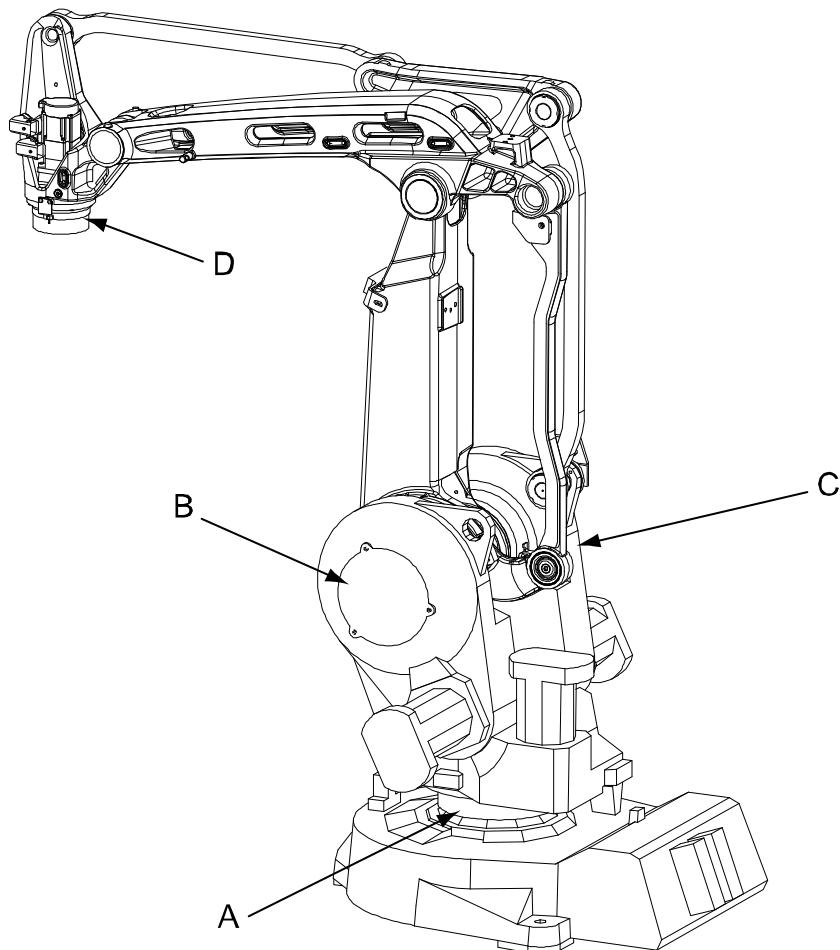
Before starting any inspection, maintenance, or changing activities of lubrication, **always** contact the local ABB Service organization for more information.

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 any updates. Therefore the manual published on the documentation DVD may not contain the latest updates about lubrication.

Continues on next page

Location of gearboxes

The figure shows the location of the gearboxes.



xx0500001950

A	Gearbox, axis 1
B	Gearbox, axis 2
C	Gearbox, axis 3
D	Gearbox, axis 6

Equipment

Equipment	Note
Oil dispenser	Includes pump with outlet pipe. Use the suggested dispenser or a similar one: <ul style="list-style-type: none">• Orion OriCan art. no. 22590 (pneumatic)
Nipple for quick connect fitting, with o-ring	

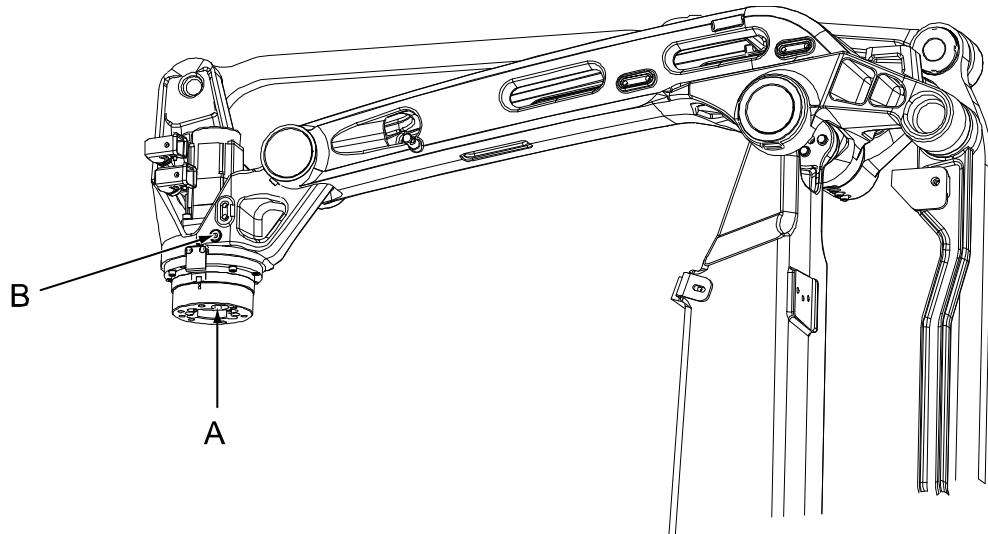
3 Maintenance

3.4.2 Oil change, gearbox axis 6 (wrist unit)

3.4.2 Oil change, gearbox axis 6 (wrist unit)

Location of oil plugs, gearbox

The gearbox is located in the frontmost part of the upper arm. Oil plugs are located as shown in the figure below.



xx0500001949

A	Oil plug, draining
B	Oil plug, filling

Required equipment

Equipment	Note
Lubricating oil	Information about the oil is found in <i>Technical reference manual - Lubrication in gearboxes</i> . See Type and amount of oil in gearboxes on page 104 .
Oil collecting vessel	The capacity of the vessel must be sufficient to take the complete amount of oil.
Standard toolkit	The content is defined in the section Standard tools on page 229 .

Draining oil, gearbox axis 6

The procedure below details how to drain the oil from the gearbox, axis 6.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	

Continues on next page

Action	Note
2  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54 .	
3 Place the oil collecting vessel underneath the gearbox of axis 6.	
4 Remove the both <i>oil plugs</i> to drain the gearbox.	Shown in the figure Location of oil plugs, gearbox on page 106 .
5 Refit the <i>oil plug, draining</i> .	

Filling oil, gearbox axis 6

The procedure below details how to refill the gearbox, axis 6, with lubricating oil.

Action	Note
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2  WARNING Handling gearbox oil involves several safety risks. Before proceeding, please read the safety information in the section WARNING - Safety risks during work with gearbox lubricants (oil or grease) on page 54 .	
3 Fill <i>lubricating oil</i> to the wrist unit until the oil reaches to the hole for the <i>oil plug, filling</i> .	Where to find type of oil and total amount is detailed in Type and amount of oil in gearboxes on page 104 . Oil plugs are shown in the figure Location of oil plugs, gearbox on page 106 .
4 Refit the <i>oil plug</i> .	

3 Maintenance

3.4.3 Replacement of 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.



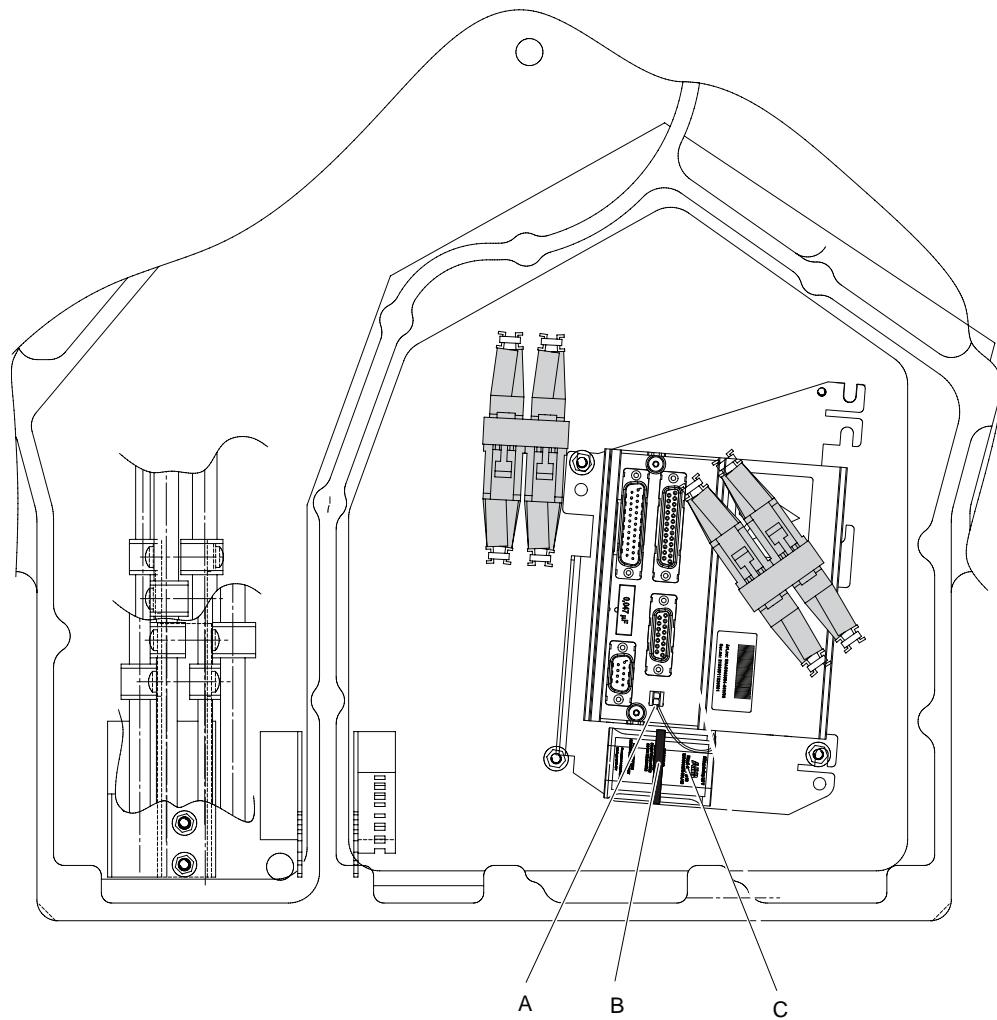
WARNING

See instructions for batteries, [WARNING - Safety risks during handling of batteries on page 53](#).

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Location of SMB battery unit

The SMB battery unit is located inside the robot base, as shown in the figure below.



xx1300000288

A	SMB battery cable
B	Cable strap
C	SMB battery RMU (3-pole battery contact)
A	SMB connection
B	SMB battery RMU
C	SMB battery connector

Continues on next page

3 Maintenance

3.4.3 Replacement of SMB battery

Continued

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 battery with the 3-pole contact has a longer lifetime.

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	Spare part no.	Note
Battery pack (2-pole battery contact)	3HAC16831-1	Lithium battery. Can only be used with SMB unit 3HAC17396-1 containing SMB board 3HAC031851-001.
Battery pack (3-pole battery contact)	3HAC044075-001	RMU Lithium battery. Can only be used with SMB unit 3HAC046277-001 containing SMB board 3HAC044168-001.
Gasket, cover	3HAC3200-1	Always replace with a new one!
Standard toolkit		The content is defined in the section Standard tools on page 229 .
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.

Replacement, SMB battery

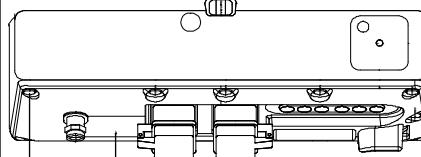
The procedure below details how to replace the SMB battery.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	 xx0200000023  WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 51	

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3.4.3 Replacement of SMB battery

Continued

Action	Note
3 Remove the rear cover plate (A) on the robot by unscrewing its attachment screws (B).	 xx0200000399
4 Remove the battery terminals from the serial measuring board and cut the clasp that keeps the battery unit in place.	
5 Fit the new battery and connect the terminals to the serial measuring board.	Shown in the figure Location of SMB battery unit on page 109 .
6 Refit the cover to the robot base, together with a new gasket .	Always replace a removed gasket with a new! Spare part no. is specified in Required equipment on page 110 .
7 Update the revolution counters!	Detailed in the section Updating revolution counters on page 213 .

3 Maintenance

3.5.1 Cleaning the IRB 260

3.5 Cleaning activities

3.5.1 Cleaning the IRB 260



WARNING

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

General

To secure high uptime it is important that the IRB 260 is cleaned regularly. The frequency of cleaning depends on the environment in which the manipulator works. Different cleaning methods are allowed depending on the type of protection of the IRB 260.



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 102](#).
- 2 Write down the oil level.
- 3 Inspect the oil level again after, for example, 6 months.
- 4 If the oil level is decreased then replace the gearbox.

Oil spills discolors painted surfaces

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



Note

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

Dos and don'ts!

This section specifies some special considerations when cleaning the robot.

Always!

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

Continues on next page

Never!

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

Cleaning methods

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

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water or steam
Standard	Yes	Yes. With light cleaning detergent.	Yes. It is highly recommended that the water contains a rust-prevention solution and that the manipulator is dried afterwards.	No

Cleaning with water and steam

Instructions for rinsing with water

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

The following list defines the prerequisites:

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

¹ Typical tap water pressure and flow

Cables

Movable cables need to be able to move freely:

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

¹ See [Cleaning methods on page 113](#) for exceptions.

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4 Repair

4.1 Introduction

Structure of this chapter

This chapter describes all repair activities recommended for the IRB 260 and any external unit.

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

The procedures are gathered in sections, divided according to the component location on the IRB 260.

Required equipment

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

The details of equipment are also available in different lists in the chapter [Reference information on page 221](#).

Safety information

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



Note

If the IRB 260 is connected to power, always make sure that the IRB 260 is connected to earth before starting any repair work.

For more information see:

- *Product manual - IRC5*
- *Product manual - IRC5 Panel Mounted Controller*

4 Repair

4.2.1 Performing a leak-down test

4.2 General procedures

4.2.1 Performing a leak-down test

When to perform a leak-down test

After refitting any motor and gearbox, the integrity of all seals enclosing the gearbox oil must be tested. This is done in a leak-down test.

Required equipment

Equipment, etc.	Article number	Note
Leak-down tester	-	
Leak detection spray	-	

Performing a leak-down test

Action	Note
1 Finish the refitting procedure of the motor or gear in question.	
2 Remove the topmost oil plug on the gear and replace it with the <i>leak-down tester</i> . Regulators, which are included in the leak-down test, may be required.	
3 Use caution, apply compressed air and raise the pressure with the knob until the correct value is shown on the manometer.  CAUTION The pressure must under no circumstance be higher than 0.25 bar (20-25 kPa). Also during the time when the pressure is raised.	Correct value: 0.2-0.25 bar (20-25 kPa)
4 Disconnect the compressed air supply.	
5 Wait for approximately 8-10 minutes and make sure that no pressure loss occurs.	If the compressed air is significantly colder or warmer than the gearbox to be tested, a slight pressure increase or decrease may occur. This is quite normal.
6 If any pressure drop occurred, then localize the leak as described in step 7. If no pressure drop occurred, then remove the leak-down tester and refit the oil plug. The test is complete.	
7 Spray any suspected leak areas with the leak detection spray. Bubbles indicate a leak.	
8 When the leak has been localized, take the necessary measures to correct the leak.	

4.2.2 Mounting instructions for bearings

General

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

Equipment

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

Assembly of all bearings

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

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

Assembly of tapered bearings

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

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

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

Greasing of bearings

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

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

Continues on next page

4 Repair

4.2.2 Mounting instructions for bearings

Continued

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

Grease the different types of bearings as following description:

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

4.2.3 Mounting instructions for seals

General

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

Equipment

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

Rotating seals

The procedure below describes how to fit rotating seals.



CAUTION

Please observe the following before commencing any assembly of seals:

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

Action	Note
1 Check the seal to ensure that: <ul style="list-style-type: none"> • The seal is of the correct type (provided with cutting edge). • There is no damage to the sealing edge (feel with a fingernail). 	
2 Inspect the sealing surface before mounting. If scratches or damage are found, the seal must be replaced since it may result in future leakage.	
3 Lubricate the seal with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the seal.) Fill 2/3 of the space between the dust tongue and sealing lip with grease. The rubber coated external diameter must also be greased, unless otherwise specified.	Article number is specified in Equipment on page 119 .
4 Mount the seal correctly with a mounting tool. Never hammer directly on the seal as this may result in leakage.	

Continues on next page

4 Repair

4.2.3 Mounting instructions for seals

Continued

Flange seals and static seals

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

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

O-rings

The following procedure describes how to fit o-rings.

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

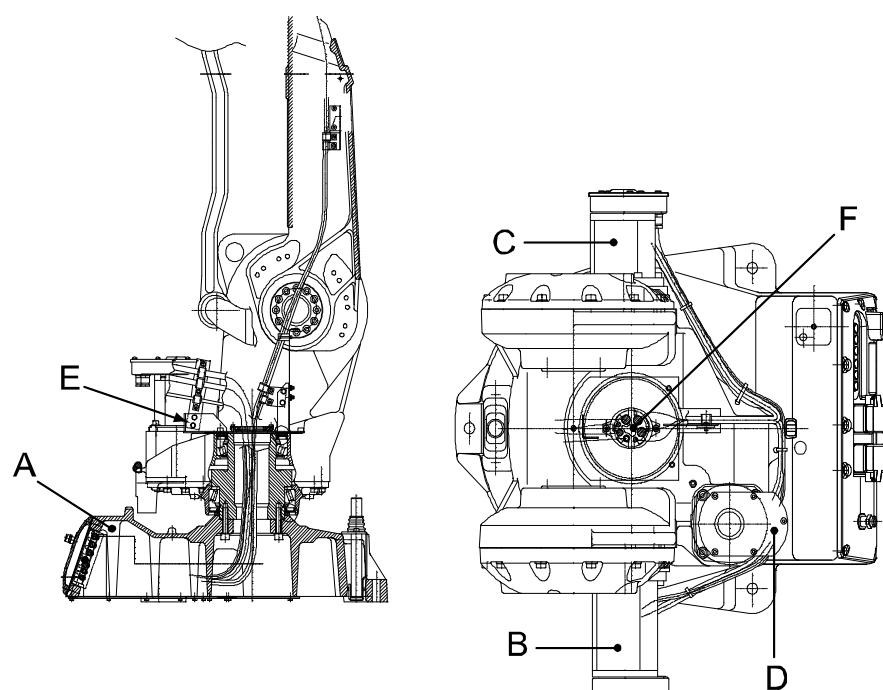
4.3 Complete robot

4.3.1 Replacement of cable unit, axes 1-3

Location of cabling

The cable unit of axes 1-3 is run from the base of the robot to the motors, axes 1, 2 and 3, as shown in the figure below.

A more detailed view of the component and its position may be found in section *Axis 1-3, spare part view 3* in *Product manual, spare parts - IRB 260*.



xx0500002541

A	Connectors behind the cover plate at the robot base; R1.MP1-3 and R2.BU1-3. At the serial measurement board; R2.G (battery), R2.FB1-3.
B	Connectors at motor 2; R3.MP2 and R3.FB2
C	Connectors at motor 3; R3.MP3, R3.FB3, R3.LS1 and R3.LS2
D	Connectors at motor 1; R3.MP1, R3.FB1
E	Upper bracket
F	Cable guide in the middle of the frame

Required equipment

Equipment, etc.	Spare part no.	Art. no.	Note
Cable unit, axes 1-3	3HAC025725-001		Includes: <ul style="list-style-type: none">• cabling• motor covers• attachment screws• gaskets, motor 1-3

Continues on next page

4 Repair

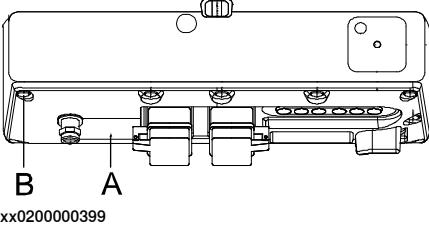
4.3.1 Replacement of cable unit, axes 1-3

Continued

Equipment, etc.	Spare part no.	Art. no.	Note
Sealing	3HAC4113-1		Sealing in the base for the cables. Always use a new sealing.
Gasket, cover	3HAC3200-1		
Cable straps, outdoor		2166 2055-3	
Flange sealing		12340011-116	Loctite 574
Circuit diagram			See the chapter Circuit diagram on page 243 .
Standard toolkit			The content is defined in the section Standard tools on page 229 .
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.

Removal, cable unit, axes 1-3

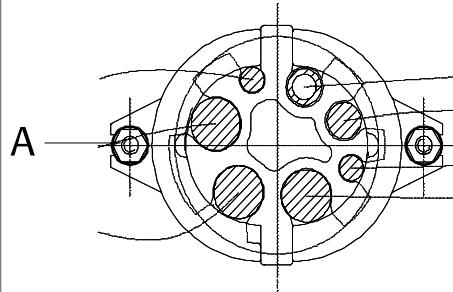
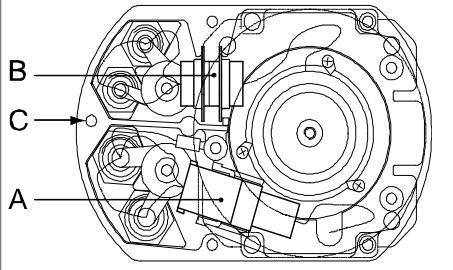
The procedure below details how to remove the cabling of axes 1-3.

	Action	Note/Illustration
1	In order to facilitate refitting of the cable harness, move the robot to the specified position: <ul style="list-style-type: none">• Axis 1: 0°• Axis 2: 0°• Axis 3: 0°• Axis 6: no significance	Axes 2 and 3 may be tilted slightly to improve access.
2	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
3	Remove the rear cover plate (A) on the robot by unscrewing its attachment screws (B).	 xx0200000399
4	Disconnect the connectors R1.MP1-3 and R2.BU1-3 inside the base.	
5	Disconnect all the earth cables on the R1.M1-3 cable from the back of the cover.	

Continues on next page

4.3.1 Replacement of cable unit, axes 1-3

Continued

Action	Note/Illustration
6 Loosen the nuts and remove the SMB unit carefully from the bracket. The cable between the battery and the SMB unit may stay connected, in order to avoid recalibration of the robot. Be careful not to let the weight of the SMB unit strain the cable! In order to remove the SMB unit completely, the connector R2.G must be disconnected! This causes a necessary recalibration of the robot!	
7 Disconnect the connector R2.FB 1-3 from the connection R2.SMB1-4 on the SMB unit.	
8 Unscrew the four screws securing the cable gland.	This releases the cable harness from the frame.
9 Remove the cable guide in the middle of the frame by removing the attachment screws of the holder (A). Remove the cables from the guide.	 xx0200000404 <p>Note! Different robot versions are fitted with different versions of the holder. Make sure the correct one is used to avoid cable failure.</p>
10 Remove the upper bracket securing the cables to the arm house by unscrewing its two attachment screws.	Note! Do not remove or loosen any of the cable brackets from the new harness, the angle of the brackets is factory optimized.
11 Remove the cover of the motors 1-3.	
12 Disconnect all the connectors at the motors of axes 1, 2 and 3.	 xx0200000401 R3.MP1-3 R3.FB1-3 Connection box
13 Remove the three screws of the connection box for the motors of axes 1, 2 and 3.	
14 Gently pull the cable harness out.	

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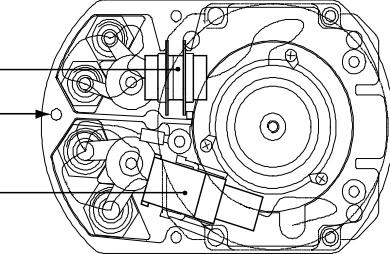
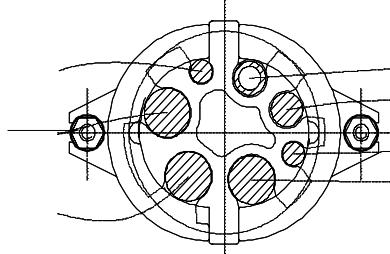
4 Repair

4.3.1 Replacement of cable unit, axes 1-3

Continued

Refitting, cable unit, axes 1-3

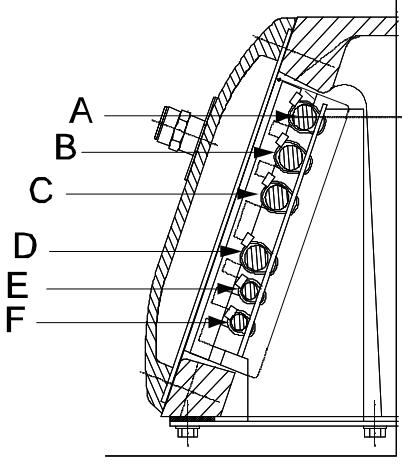
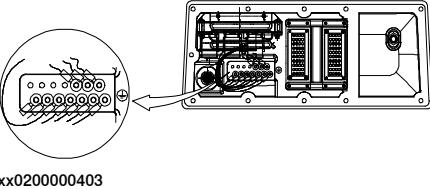
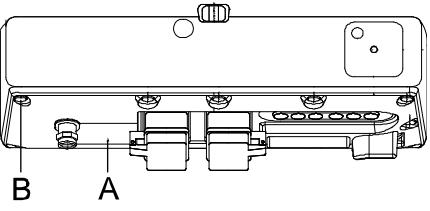
The procedure below details how to refit the cabling of axes 1-3 to the robot.

	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Gently pull down the cable harness through the center hole of axis 1.	
3	Fit a new gasket and fit the connection box on motor 1, 2 and 3, using the three attachment screws.	The gasket is included in the spare part of the cable unit, spare part no. is specified in Required equipment on page 121 .
4	Reconnect all the connectors at motors 1, 2 and 3.	 xx0200000401 R3.MP1-3 R3.FB1-3 Connection box
5	Refit the cover of the motors, axes 1, 2 and 3, with the five attachment screws.	
6	Refit the upper bracket securing the cables to the arm house, using the two attachment screws.	
7	Fit the cable guide to the harness and secure the holder to the frame with its two attachment screws (A).	 xx0200000404 Note! Different robot versions are fitted with different versions of the holder. Make sure the correct one is used to avoid cable failure.

Continues on next page

4.3.1 Replacement of cable unit, axes 1-3

Continued

Action	Note/Illustration
<p>8 Secure the cabling inside the base. Insert the cables in the sealing: Power cable Power cable Power cable Customer cable Signal cable Signal cable Note! Make sure that each cable is fitted in the same position as the old one, otherwise the conduit entry will not be watertight. Use six <i>cable straps</i>. Note! Always use a new <i>sealing</i>, combined with a <i>flange sealing</i> (Loctite 574).</p>	 <p>xx0200000402 Art. numbers are specified in Required equipment on page 121.</p>
9 Connect the connectors R2.FB 1-3 to the connection R2.SMB1-4 on the SMB unit.	
10 Refit the SMB unit to the bracket with the nuts. Be careful not to let the weight of the SMB-unit strain the cable!.	<p>Note! The cable between the battery and the SMB-unit may stay connected, in order to avoid recalibration of the robot.</p>
11 Connect all the earth cables on the R1.M1-3 cable to the back of the cover.	 <p>xx0200000403</p>
12 Connect the connectors R1.MP1-3 and R2.BU1-3 inside the base.	
13 Refit the rear cover plate (A) on the robot with its attachment screws (B), together with a new <i>gasket</i> .	 <p>xx0200000399 Spare part no. is specified in Required equipment on page 121.</p>
14 If the battery has been disconnected from the SMB unit, the revolution counters must be updated!	<p>Detailed in the section Updating revolution counters on page 213.</p>
<p>15</p> <p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48.</p>	

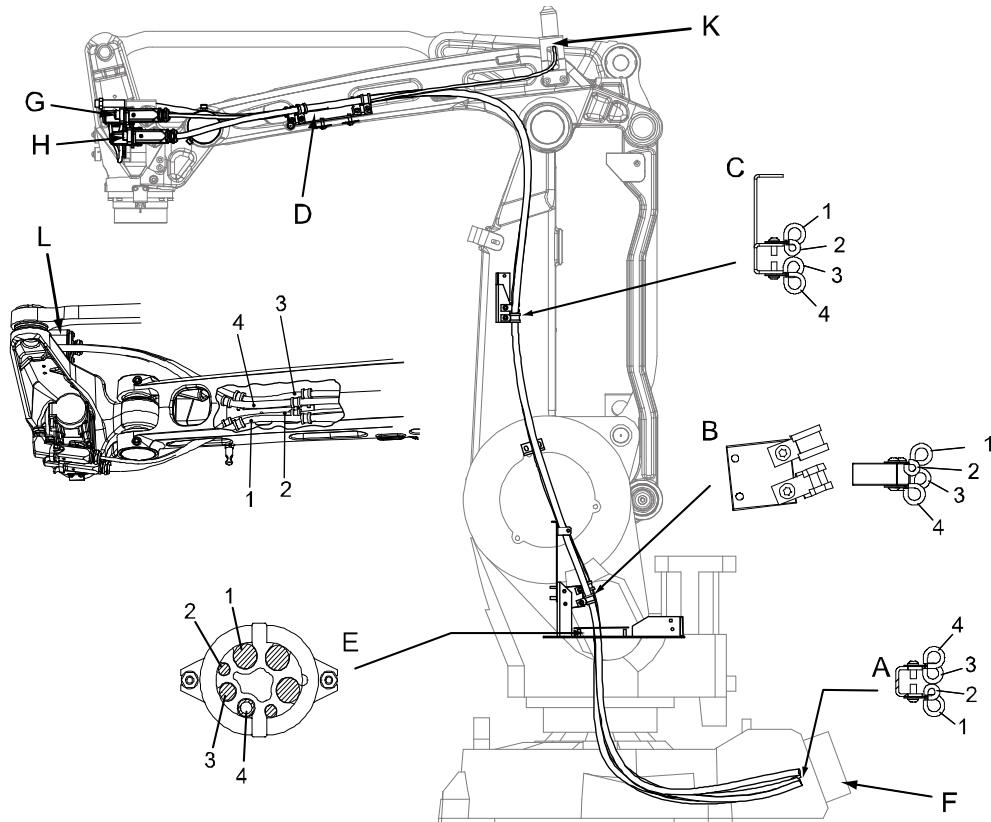
4 Repair

4.3.2 Replacement of cable unit, axis 6

4.3.2 Replacement of cable unit, axis 6

Location of cable unit, axis 6

The cabling of axis 6 is run throughout the robot, from the base to the wrist unit. Besides the power and signal cable, the cable unit also includes a customer cable, an UL lamp cable and an air hose.



xx0500002540

A	Cable bracket inside the base
B	Cable attachment inside the frame (view from above)
C	Cable bracket inside the lower arm (view from above)
D	Cable bracket inside the upper arm
E	Cable guide in the middle of the frame (view from above)
F	Connectors at the base: Power cable: R1.MP4-6, signal cable: R2.FB4-6, brake release: R2.BU4-6, UL-lamp: R1.H1, Customer cable: R1.CP and R1.CS, air hose: R1.CAIR
G	Connector at motor axis 6: R3.FB6 (signal)
H	Connector at motor axis 6: R3.MP6 (power)
K	Connector at UL lamp: R3.H1 and R3.H2.
L	Customer connectors / air hose are located on the opposite side of the wrist unit: R2.CS, R2.CP and R2.CAIR
1	Power cable
2	Signal cable

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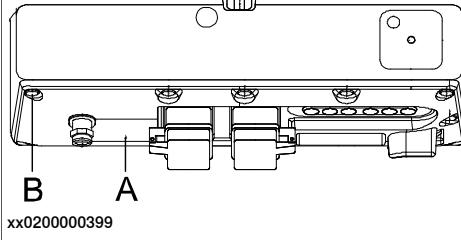
3	Customer cable
4	Air hose

Required equipment

Equipment	Spare part no.	Note
Cable unit axis 6	3HAC024115-001	
Standard toolkit	-	The content is defined in the section Standard tools on page 229 .
Circuit diagram	-	See the chapter Circuit diagram on page 243 .

Removal, cable unit axis 6

The procedure below details how to remove the cable unit of axis 6 from the robot.

	Action	Note/Illustration
1	In order to facilitate removal of the cable unit, move the robot to positions: <ul style="list-style-type: none">• Axis 1: 0°• Axis 2: 45°• Axis 3 (upper arm): horizontal• Axis 6: no significance	
2	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
3	Remove the rear cover plate (A) from the base of the robot by unscrewing the attachment screws (B).	 xx0200000399
4	Disconnect the connectors R1.MP4-6 and R2.BU4-6 from the base. Also disconnect the customer cables and the air hose.	Specified in the figure Location of cable unit, axis 6 on page 126 .
5	Disconnect all earth cables.	
6	Loosen the nuts and remove the SMB-unit from the bracket carefully. Leaving the cable between the battery and the SMB-unit connected avoids recalibration of the robot. But be careful not to let the weight of the SMB-unit strain the cable! In order to remove the SMB-unit completely, the connector R2.G must be disconnected, which causes a necessary recalibration of the robot!	
7	Disconnect the connector R2.FB4-6 from the SMB-unit, connector R2.SMB3-6.	

Continues on next page

4 Repair

4.3.2 Replacement of cable unit, axis 6

Continued

Action	Note/Illustration
8 Loosen the <i>cable brackets</i> by removing their attachment screws: <ul style="list-style-type: none">• inside the base• inside the frame• inside the lower arm• inside the upper arm.	Shown in the figure Location of cable unit, axis 6 on page 126 .
9 Loosen the cables from the <i>cable guide in the middle of the frame</i> , by unscrewing the holder and assembling the guide.	Shown in the figure Location of cable unit, axis 6 on page 126 .
10 Gently pull up the cable harness from inside the base.	
11 Disconnect the connectors at the upper arm: <ul style="list-style-type: none">• at the UL lamp• at motor, axis 6 (R3.MP6 and R3.FB6)• at customer connections (R2.CS, R2.CP and R2.CAIR).	
12 Gently pull down the cable harness through the lower arm and remove it from the robot.	

Refitting, cable unit axis 6

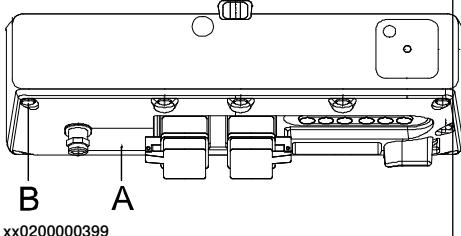
The procedure below details how to refit the cable unit of axis 6 to the robot.

Action	Note/Illustration
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2 Insert the lower part of the cable unit through the frame, into the base.	
3 Connect the connectors R1.MP4-6 and R2.BU4-6 to the base. Also connect the customer cables and the air hose.	
4 Connect the earth cables.	
5 Connect the connector R2.FB4-6 to the SMB-unit, connector R2.SMB3-6.	
6 Refit the SMB unit to the bracket by tightening the nuts. Reconnect the battery cable, if disconnected.	
7 Secure the <i>cable bracket inside the base</i> .	Shown in the figure Location of cable unit, axis 6 on page 126 .
8 Insert the cabling through the <i>cable guide in the middle of the frame</i> and secure the guide with the holder and its attachment screws.	Shown in the figure Location of cable unit, axis 6 on page 126 .
9 Secure the <i>cable attachment inside the frame</i> with its attachment screws.	Shown in the figure Location of cable unit, axis 6 on page 126 .

Continues on next page

4.3.2 Replacement of cable unit, axis 6

Continued

	Action	Note/Illustration
10	Pull the cabling up through the lower arm and secure the <i>cable bracket inside the lower arm</i> with its attachment screws. Note! Run the cabling in front of the upper arm attachment, as shown in the figure!	Shown in the figure Location of cable unit, axis 6 on page 126 .
11	Run the cabling through the upper arm and secure the <i>cable bracket inside the upper arm</i> .	Shown in the figure Location of cable unit, axis 6 on page 126 .
12	Connect all the connectors at the upper arm: <ul style="list-style-type: none">• at the UL lamp• at motor, axis 6 (R3.MP6 and R3.FB6)• at customer connections (R2.CS, R2.CP and R2.CAIR).	
13	Refit the rear cover plate (A) to the base with its attachment screws (B).	 xx0200000399
14	If the battery has been disconnected from the SMB unit, the revolution counters must be updated!	Detailed in the section Updating revolution counters on page 213 .
15	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4 Repair

4.4.1 Replacement of shaft and bearings, tilthouse

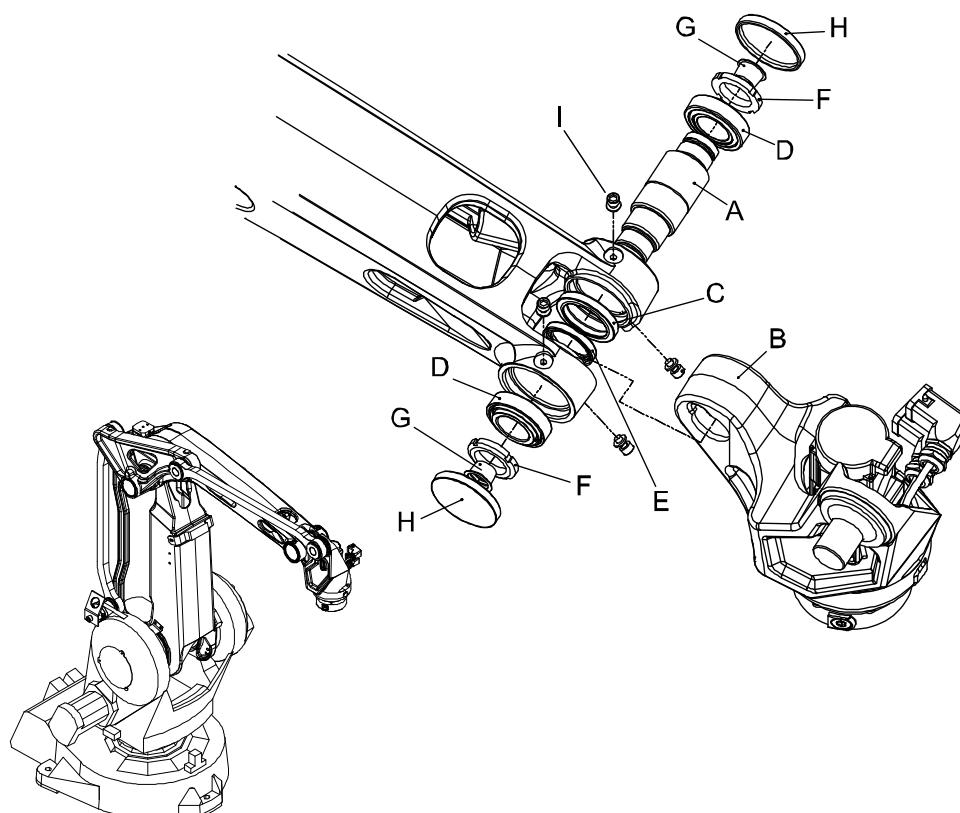
4.4 Upper arm

4.4.1 Replacement of shaft and bearings, tilthouse

Location of shaft and bearings

The tilthouse is located in the front part of the upper arm, linked to the upper arm with a shaft, as shown in the figure below.

A more detailed view of the component and its position may be found in section *Upper arm, exploded view* in *Product manual, spare parts - IRB 260*.



xx0500002566

A	Shaft, tilthouse
B	Tilthouse
C	Sealing ring
D	Taper roller bearing (2 pcs)
E	Sealing ring with dust lip
F	Lock nut (2 pcs)
G	Protection hood (2 pcs)
H	VK cover (2 pcs)
I	M6 screws, including washers (4 pcs)

Continues on next page

4.4.1 Replacement of shaft and bearings, tilthouse
Continued

Required equipment

Equipment	Spare part no.	Art. no.	Note
Shaft	3HAC024867-001		
Taper roller bearing	3HAA2103-14		2 pcs.
Sealing ring with dust lip	3HAB3701-25		Always replace with a new one!
Sealing ring	3HAC7877-2		Always replace with a new one!
VK-cover	3HAA2166-15		2 pcs. Always replace with a new one!
Washer	3HAC020537-001		4 pcs. To the lubrication holes for the bearings.
Protection hood		25222101-17	2 pcs. Must be replaced if damaged!
Bearing grease		3HAB3537-1	To fill the bearings at the shaft (2 x 25 ml). Also for lubricating the mounting surfaces in the upper arm.
Locking liquid		-	Loctite 243
Toolkit for service		3HAC023963-026	Required tools for removal/refitting are assembled from the loose parts in the kit. The content is defined in section <i>Special tools on page 230</i> .
Hydraulic pump, 80 Mpa		3HAC13086-1	
Standard toolkit		-	The content is defined in the section <i>Standard tools on page 229</i> .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.

Dismantling tool, tilthouse shaft

The tool for removing the tilthouse shaft from the tilthouse is assembled with the parts shown in the figure below (included in the toolkit for service).



Note

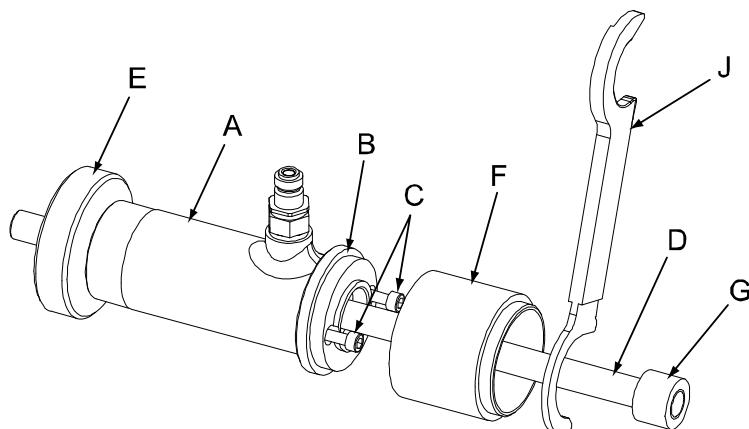
The parts cannot be ordered separately, but are included in the complete toolkit! The article numbers are only given for identification.

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4 Repair

4.4.1 Replacement of shaft and bearings, tilthouse

Continued



xx0600002589

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
D	Connection rod, M16, length= 400 mm
E	Nut, 3HAC5507-1
F	Sleeve, 3HAC023963-027
G	Nut, 3HAC023963-028
J	Pad, 3HAC023963-029

Dismantling tool, bearing race, upper arm

The tool for removing the bearing race from the upper arm is assembled with the parts shown in the figure below (included in the toolkit for service).

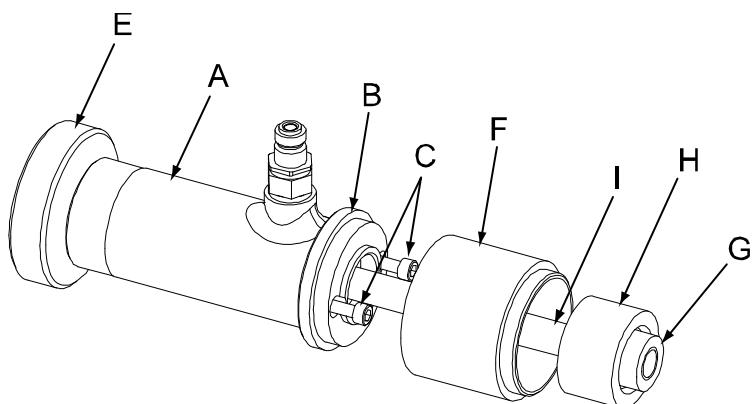


Note

The parts cannot be ordered separately, but are included in the complete toolkit!
The article numbers are only given for identification.

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4.4.1 Replacement of shaft and bearings, tilthouse Continued



xx0600002656

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
E	Nut, 3HAC5507-1
F	Sleeve, 3HAC023963-027
G	Nut, 3HAC023963-028
H	Press sleeve, 3HAC023963-038
I	Connection rod, 3HAC025192-006

Dismantling tool, bearing race, tilthouse shaft

The tool for removing the bearing race from the tilthouse shaft is assembled with the parts shown in the figure below (included in the toolkit for service).



Note

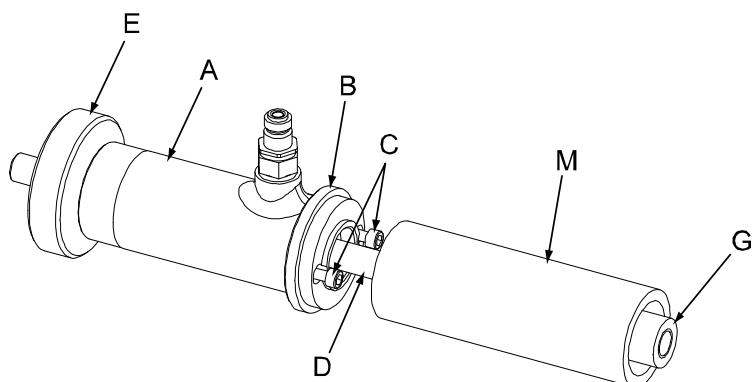
The parts cannot be ordered separately, but are included in the complete toolkit! The article numbers are only given for identification.

Continues on next page

4 Repair

4.4.1 Replacement of shaft and bearings, tilthouse

Continued



xx0600002657

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
D	Connection rod, M16, length= 400 mm
E	Nut, 3HAC5507-1
G	Nut, 3HAC023963-028
M	Sleeve, 3HAC023963-037

Mounting tool, tilthouse shaft

The tool for fitting the tilthouse shaft to the tilthouse is assembled with the parts shown in the figure below (included in the toolkit for service).

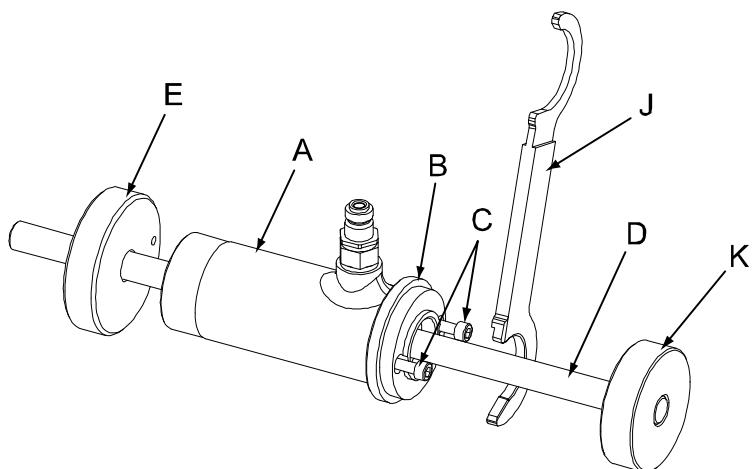


Note

The parts cannot be ordered separately, but are included in the complete toolkit!
The article numbers are only given for identification.

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4.4.1 Replacement of shaft and bearings, tilthouse
Continued



xx0500002581

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
D	Connection rod, M16, length= 400 mm
E	Nut, 3HAC5507-1
J	Pad, 3HAC023963-029
K	Press washer, 3HAC023963-014

Mounting tool, bearing race and sealing, upper arm

The tool for fitting the bearing race and sealing to the upper arm is assembled with the parts shown in the figure below (included in the toolkit for service).



Note

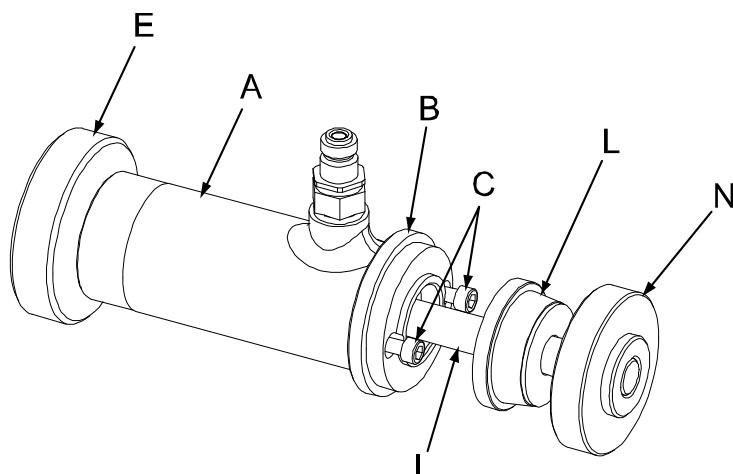
The parts cannot be ordered separately, but are included in the complete toolkit!
 The article numbers are only given for identification.

Continues on next page

4 Repair

4.4.1 Replacement of shaft and bearings, tilthouse

Continued



xx0500002582

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
E	Nut, 3HAC5507-1
I	Connection rod, 3HAC025192-006
L	Press head, 3HAC023963-039
N	Press sleeve, 3HAC023963-015

Mounting tool, bearing race, tilthouse shaft

The tool for fitting a bearing race to the tilthouse shaft is assembled with the parts shown in the figure below (included in the toolkit for service).

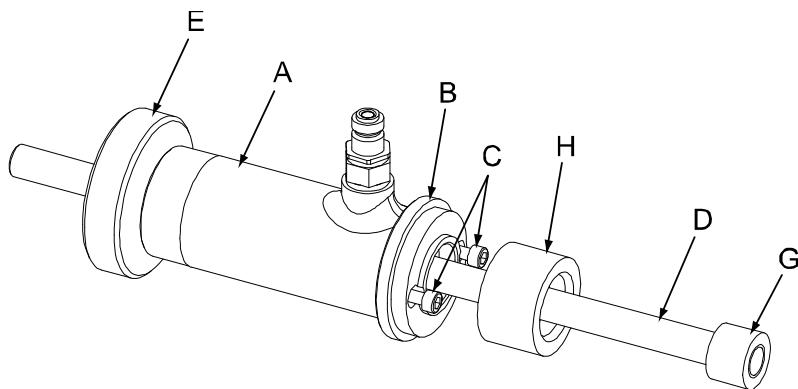


Note

The parts cannot be ordered separately, but are included in the complete toolkit!
The article numbers are only given for identification.

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4.4.1 Replacement of shaft and bearings, tilthouse Continued



xx0600002658

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
D	Connection rod, M16, length= 400 mm
E	Nut, 3HAC5507-1
G	Nut, 3HAC023963-028
H	Sleeve, 3HAC023963-037

Removal, shaft and bearings

The procedure below details how to remove the shaft and bearings.

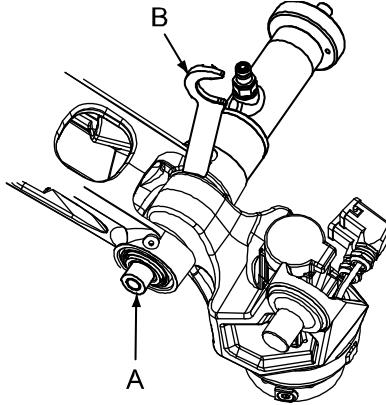
	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Remove the upper parallel rod.	Detailed in section Removal, upper rod on page 153 .
3	Remove the both VK covers by making a hole in the middle and bending them off.	Shown in the figure Replacement of linkage - upper rod on page 152 .
4	Remove the both <i>protection hoods</i> and <i>lock nuts</i> .	Shown in the figure Location of shaft and bearings on page 130 .
5	Gather the required parts to assemble a dismantling tool for the tilthouse shaft from the <i>toolkit for service</i> .	The assembly is shown in the figure Dismantling tool, tilthouse shaft on page 131 . Art. no. for the toolkit is specified in Required equipment on page 131 .

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4 Repair

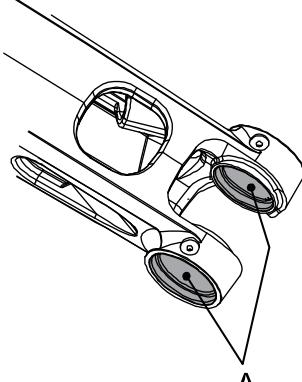
4.4.1 Replacement of shaft and bearings, tilthouse

Continued

Action	Note/Illustration
6 Insert the <i>dismantling tool, tilthouse shaft</i> through the shaft. Fit the nut (A) to the end of the bar and use the pad (B) when pulling out the shaft.	 xx0600002590
7 Connect the <i>hydraulic pump</i> to the cylinder and pull out the shaft.	Art. no. is specified in Required equipment on page 131 .
8 Rebuild the dismantling tool into a <i>dismantling tool, bearing race, upper arm</i> .	The assembly is shown in the figure Dismantling tool, bearing race, upper arm on page 132 .
9 Remove the bearing races and sealings from the seating, using the dismantling tool.	
10 If removing the remaining bearing race from the shaft, rebuild the tool to a <i>dismantling tool, bearing race, tilthouse shaft</i> .	The assembly is shown in the figure Dismantling tool, bearing race, tilthouse shaft on page 133 .

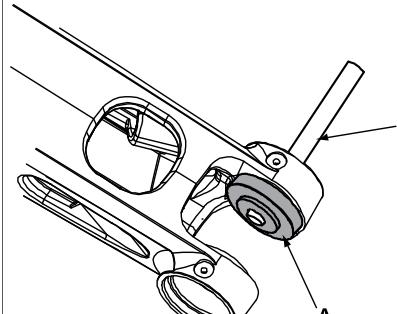
Refitting, shaft and bearings

The procedure below details how to refit the shaft, bearings and the tilthouse.

Action	Note/Illustration
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2 Lubricate the seating (A) of the bearings and sealing rings in the upper arm with <i>bearing grease</i> .	Art. no. is specified in Required equipment on page 131 .  xx0500002580

Continues on next page

4.4.1 Replacement of shaft and bearings, tilthouse Continued

Action	Note/Illustration
3 Gather the required parts to assemble a mounting tool for the bearing race and sealings from the <i>toolkit for service</i> . Following steps detail the fitting of the bearing, additional information is also found in section <i>Mounting instructions for bearings on page 117</i> .	Art. no. for the toolkit is specified in <i>Required equipment on page 131</i> . The assembly of the tool is shown in the figure <i>Mounting tool, bearing race and sealing, upper arm on page 135</i> .
4 Fit a new <i>sealing ring</i> to the press washer (A) and place it on the inner side of the seating, as shown in the figure to the right. Fasten the bar (B) to the press washer.	 xx0500002583 <p>Spare part no. for the sealing ring is specified in <i>Required equipment on page 131</i> and it is shown in the figure <i>Location of shaft and bearings on page 130</i>.</p>
5 If not already fitted, fit the <i>press washer</i> to the <i>hydraulic cylinder</i> , using the two <i>M6 bolts</i> .	Shown in the figure <i>Mounting tool, bearing race and sealing, upper arm on page 135</i> .
6 Thread the <i>bearing race</i> on to the press washer/hydraulic cylinder and fit the complete assembly to the bar.	Spare part no. for the bearing is specified in <i>Required equipment on page 131</i> .
7 Fit the <i>nut</i> to the end of the bar.	Shown in the figure <i>Mounting tool, bearing race and sealing, upper arm on page 135</i> .
8 Press both the sealing ring and the bearing race into the seating.	
9 Repeat the procedure to fit the other bearing race and the new <i>sealing ring with dust lip</i> to the opposite side.	Spare part no. is specified in <i>Required equipment on page 131</i> .
10 Press the inner bearing race on to the shaft, by using a mounting tool, assembled of the parts in the toolkit for service.	The assembly of the mounting tool is shown in the figure <i>Mounting tool, bearing race, tilthouse shaft on page 136</i> .
11 Lubricate the shaft and the mounting surfaces in the upper arm and in the tilthouse with <i>bearing grease</i> .	Art. no. is specified in <i>Required equipment on page 131</i> .
12 Gather the required parts to assemble a mounting tool for the tilthouse shaft from the toolkit for service.	The assembly of the mounting tool is shown in the figure <i>Mounting tool, tilthouse shaft on page 134</i> .
13 Place the tilthouse in mounting position and insert the shaft through the upper arm and tilthouse.	

Continues on next page

4 Repair

4.4.1 Replacement of shaft and bearings, tilthouse

Continued

	Action	Note/Illustration
14	Insert the bar (A) through the shaft and secure with press washer (B).	 xx0500002584
15	If not already fitted, fit the <i>press washer</i> to the hydraulic cylinder with the two <i>M6 bolts</i> .	Shown in the figure Mounting tool, tilthouse shaft on page 134 .
16	Thread the remaining bearing race on to the bar and fit also the hydraulic cylinder and the nut.	
17	Press the both bearings into the upper arm, on either ends of the shaft, with a hydraulic pump. Use the pad (G). Press until the both bearings reaches bottom.	 xx0500002585
18	Lubricate the both bearings with <i>bearing grease</i> .	25 ml in each bearing. Art. no. is specified in Required equipment on page 131 .
19	Apply <i>locking liquid</i> to the both <i>lock nuts</i> and fit the nuts on each side of the shaft, facing the flat surface outwards. Tighten one of them with 30 Nm. Tighten the other with 35 Nm, untighten it and retighten with 30 Nm.	Shown in the figure Location of shaft and bearings on page 130 . Locking liquid is specified in Required equipment on page 131 .
20	Fit the <i>protection hoods</i> on each side of the shaft. Replace them if damaged!	Shown in the figure Location of shaft and bearings on page 130 .
21	Fit new <i>VK covers</i> on each side of the upper arm.	Spare part no. is specified in Required equipment on page 131 . Shown in the figure Location of shaft and bearings on page 130 .
22	Fit four <i>M6 screws</i> , including <i>washers</i> , to the lubrication holes.	Shown in the figure Location of shaft and bearings on page 130 . Spare part no. for washer is specified in Required equipment on page 131 .

Continues on next page

4.4.1 Replacement of shaft and bearings, tilthouse
Continued

	Action	Note/Illustration
23	Refit the upper parallel rod.	Detailed in section <i>Refitting, upper rod on page 154</i> .
24	Recalibrate the robot.	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section <i>Calibration information on page 209</i> .
25	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section <i>DANGER - First test run may cause injury or damage! on page 48</i> .	

4 Repair

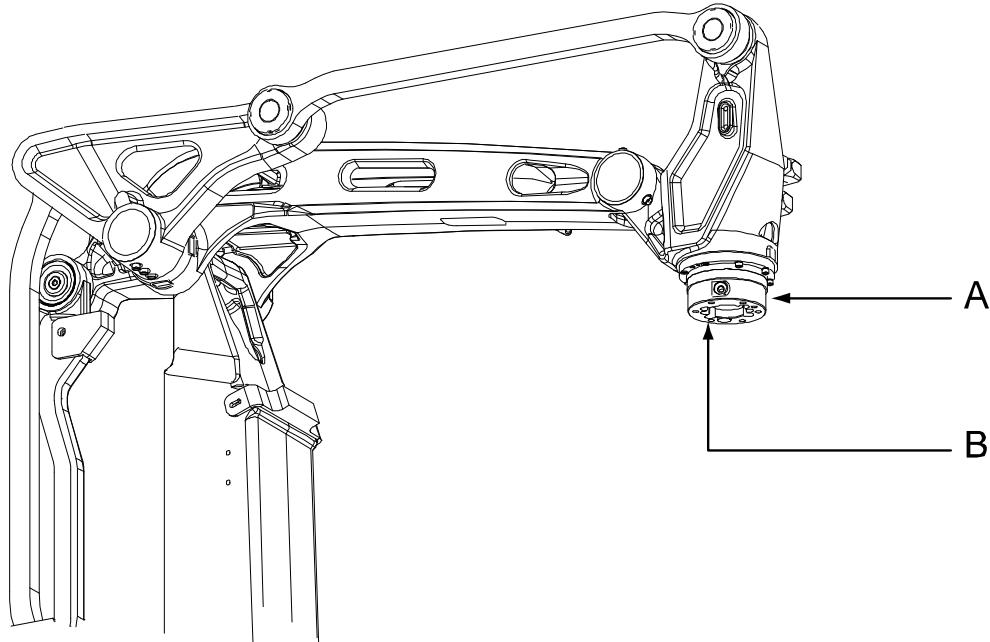
4.4.2 Replacement of turning disk

4.4.2 Replacement of turning disk

Location of turning disk

The turning disk is located at the frontmost part of the robot, as shown in the figure below.

A more detailed view of the component and its position may be found in section *Tilthouse, exploded view in Product manual, spare parts - IRB 260*.



xx0500001938

A	Turning disk
B	Attachment screws and o-rings, turning disk (6 pcs)

Required equipment

Equipment	Spare part no.	Art. no.	Note
Turning disk	3HAC023881-001		
O-ring	3HAB3772-16		Replace if damaged.
O-ring	3HAB3772-89		6 pcs; one o-ring at each attachment screw. Replace if damaged.
Locking liquid	-		Loctite 243
Standard toolkit	-		The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.

Continues on next page

4.4.2 Replacement of turning disk

Continued

Equipment	Spare part no.	Art. no.	Note
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.

Removal, turning disk

The procedure below details how to remove the turning disk from the robot.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Drain the oil from the axis 6 gearbox.	Detailed in section Draining oil, gearbox axis 6 on page 106 .
3	Remove the turning disk by removing its six attachment screws and washers.	Shown in the figure Location of turning disk on page 142 .

Refitting, turning disk

The procedure below details how to refit the turning disk to the robot.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Make sure that the o-ring is fitted properly to the turning disk. Replace it if damaged!	Spare part no. is specified in Required equipment on page 142 .
3	Lubricate and fit the six o-rings to the holes of the attachment screws. Replace if damaged!	Spare part no. is specified in Required equipment on page 142 .
4	Fit the turning disk to the axis 6 gearbox with the six attachment screws and o-rings, using locking liquid.	6 pcs; M8x20. Tightening torque: 30 Nm. Locking liquid is specified in Required equipment on page 142 . Shown in the figure Location of turning disk on page 142 .
5	Perform a leak-down test.	Detailed in section Performing a leak-down test on page 116 .
6	Refill the gearbox with oil.	Detailed in section Filling oil, gearbox axis 6 on page 107 .
7	Recalibrate the robot.	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .

Continues on next page

4 Repair

4.4.2 Replacement of turning disk

Continued

	Action	Note
8	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section <i>DANGER - First test run may cause injury or damage!</i> on page 48.	

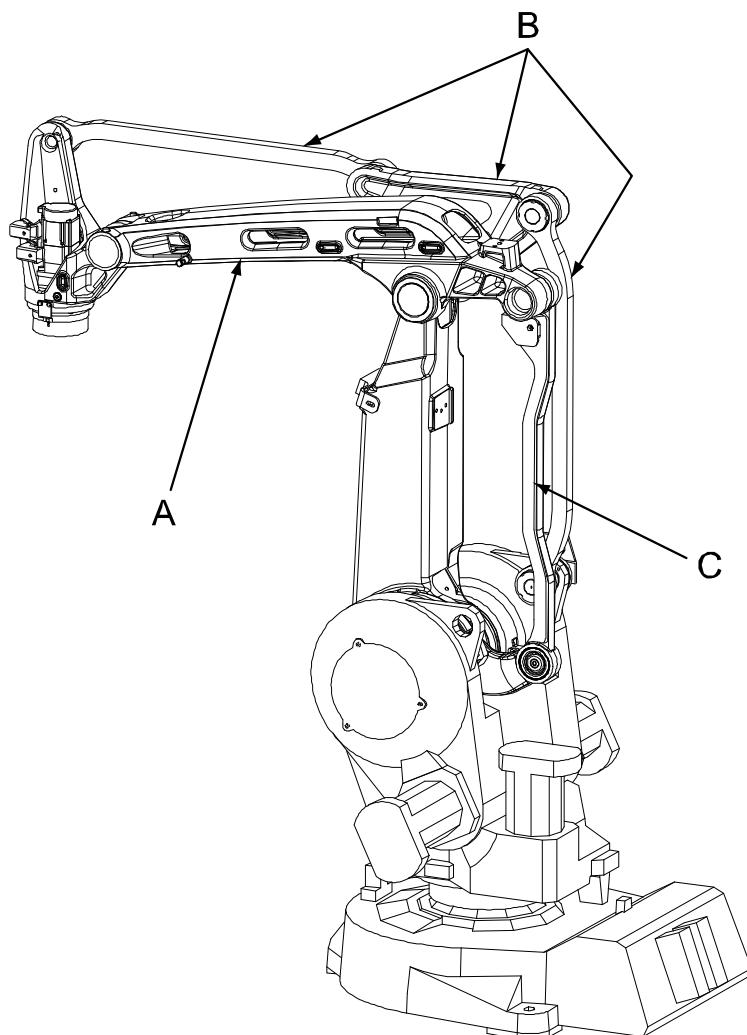
4.4.3 Replacement of complete upper arm

4.4.3 Replacement of complete upper arm

Location of upper arm

The upper arm is located as shown in the figure below.

A more detailed view of the component and its position may be found in section *Robot IRB 260, exploded view 1 of 2 in Product manual, spare parts - IRB 260*.



xx0600002601

A	Upper arm
B	Linkage (upper parallel rod, link and lower parallel rod)
C	Parallel bar

Required equipment

Equipment	Spare part no.	Art. no.	Note
Sealing ring	3HAC7877-2		2 pcs. Always replace with new.
Shaft end	3HAC025034-001		

Continues on next page

4 Repair

4.4.3 Replacement of complete upper arm

Continued

Equipment	Spare part no.	Art. no.	Note
VK-cover	3HAC12165-2		2 pcs.
Grease		3HAB3537-1	For lubrication of mounting surfaces.
Locking liquid		-	Loctite 243
Lifting straps		-	For lifting the upper arm.
Guide pins		3HAC024097-006	3 pcs required. Length: 62 mm. Diameter: 6 mm. Thread: M6x12. Used for guiding the shaft end of the upper arm into place.
Toolkit for service		3HAC023963-026	If additional aid is required for pulling out the shaft from the upper arm, a tool can be assembled from the loose parts in the kit. The assembly is shown in the figure Press tool, link on page 161 .
Hydraulic pump, 80 Mpa		3HAC13086-1	
Extended KM nut (KM7)		3HAC023963-040	Length: 135 mm.
Standard toolkit		-	The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.

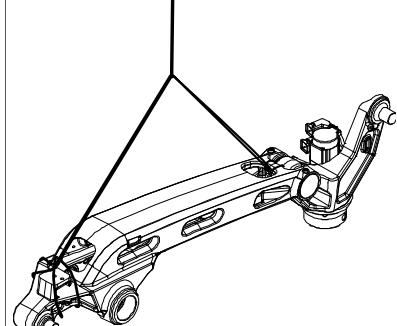
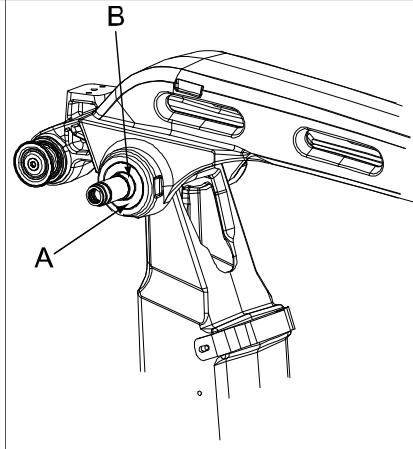
Removal, upper arm

The procedure below details how to remove the upper arm from the robot.

	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Disconnect all the <i>connectors</i> at the tilthouse (motor and customer connections) and unfasten the cabling from the upper arm by removing all <i>brackets</i> available.	Shown in the figure Location of cable unit, axis 6 on page 126 .
3	Remove the linkage.	Detailed in sections: <ul style="list-style-type: none"> • Removal, upper rod on page 153 • Removal, lower rod on page 156 • Removal, link on page 162

Continues on next page

4.4.3 Replacement of complete upper arm
Continued

Action	Note/Illustration
4 Remove the parallel bar.	Detailed in section Removal, parallel bar on page 170 .
5  CAUTION The complete upper arm weighs 23 kg without any additional equipment fitted! Use a suitable lifting device to avoid injury to personnel!	
6 Fit the lifting equipment to the upper arm according to the figure to the right.	 xx0500002549
7 Remove the distance and the radial sealing from the end shaft.	 xx0600002607
8 Untighten and remove the lock nut with the <i>extended KM nut</i> .	Art. no. is specified in Required equipment on page 145 .
9 Remove the bearing.	
10 Unfasten the shaft end by removing the flanged bolts from inside the lower arm.	
11 Remove the VK cover from the opposite side by making a hole in the middle. Be careful not to damage the parts underneath!	
12 Untighten and remove the lock nut and the bearing also from this side of the upper arm.	
13 Unscrew the attachment screw and washer and remove the end shaft from both sides.	If necessary, use the <i>press tool, link</i> as a puller tool (fit the auxiliary shaft to the upper arm shaft). Assembly of the tool is shown in the figure Press tool, link on page 161 .

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4 Repair

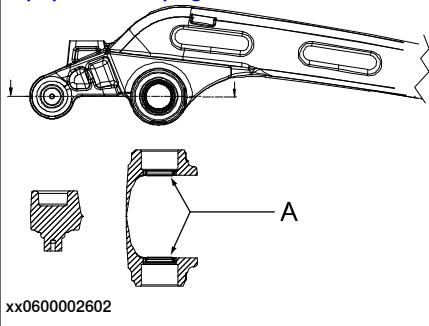
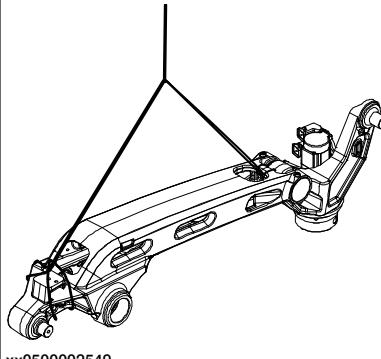
4.4.3 Replacement of complete upper arm

Continued

	Action	Note/Illustration
14	Make sure the cabling lies freely inside the upper arm. Then lift the upper arm while feeding the cabling from inside the arm.	Note! The tilthouse is movable, be careful not to damage it!

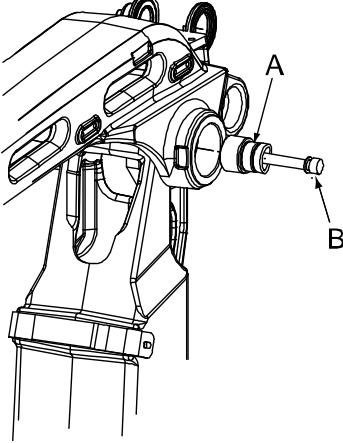
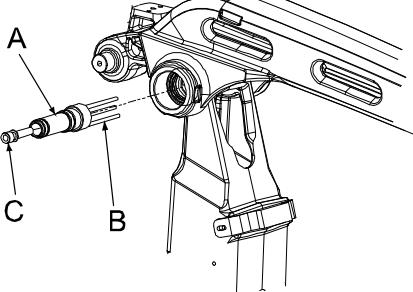
Refitting, upper arm

The procedure below details how to refit the upper arm to the robot.

	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	 CAUTION The complete upper arm weighs 23 kg without any additional equipment fitted! Use a suitable lifting device to avoid injury to personnel!	
3	Make sure that the <i>sealing rings</i> are fitted properly in the upper arm, facing the flat surface outwards! Replace them if any damage is detected!	Spare part no. is specified in Required equipment on page 145 .  xx0600002602 A Sealing rings
4	Fit the lifting equipment to the upper arm according to the figure to the right. Note! The tilthouse is movable, be careful not to damage it!	 xx0500002549
5	Lubricate the mounting holes of the upper arm with <i>grease</i> .	Art. no. is specified in Required equipment on page 145 .
6	Insert the cabling into the upper arm while placing the arm into mounting position.	

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4.4.3 Replacement of complete upper arm
Continued

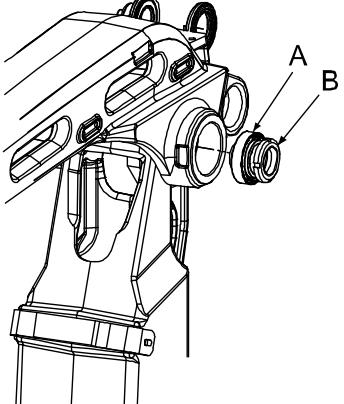
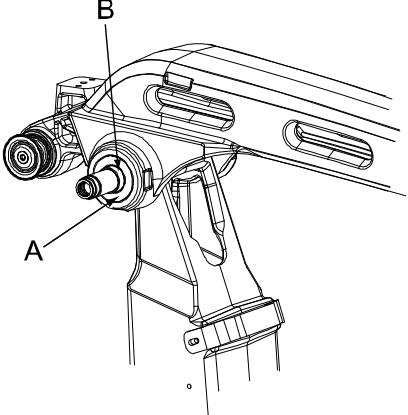
	Action	Note/Illustration
7	Secure the upper arm to the lower arm by fastening the shaft end (A) with the attachment screw and washer (B), as shown in the figure to the right.	 <p>A Shaft end B 1 pc, M12 x 60, (UNBRAKO 12.9) and washer. Tightening torque: 90 Nm. Reused screws may be used, providing they are lubricated as detailed in the section Screw joints on page 225 before fitting.</p>
8	Fit three <i>guide pins</i> to the other <i>shaft end</i> .	The guide pins and the spare part no. for the shaft end are specified in Required equipment on page 145 .
9	Secure the other side of the upper arm to the lower arm by fitting the shaft end with guidance from the guide pins.	 <p>A Shaft end B Guide pins, 3 pcs C Attachment screw and washer</p>
10	Remove the guide pins and secure the shaft end with three flanged bolts from the inside of the lower arm, using <i>locking liquid</i> . Do not tighten yet.	Specified in Required equipment on page 145 .
11	Fit the one attachment screw and washer (C in the previous figure) to the shaft end.	<p>1 pc, M12 x 60, UNBRAKO 12.9. Tightening torque: 90 Nm. Reused screws may be used, providing they are lubricated as detailed in the section Screw joints on page 225 before fitting.</p>
12	Tighten the flanged bolts.	Tightening torque: 10 Nm.

Continues on next page

4 Repair

4.4.3 Replacement of complete upper arm

Continued

	Action	Note/Illustration
13	Return to the other side of the upper arm and prepare the lock nut by lubricating it with <i>locking liquid</i> .	Specified in Required equipment on page 145 .
14	Fit the tapered roller bearing and the lock nut (flat side outwards) to the shaft end.	 xx0600002606 <p>A Tapered roller bearing B Lock nut, tightening torque: 35 Nm.</p>
15	Fit a new VK cover to the upper arm.	
16	Fit the other tapered roller bearing and lubricated lock nut to the opposite side of the upper arm. Use the <i>extended KM nut</i> and tighten the lock nut with 55 Nm, then untighten and retighten with 35 Nm.	Art. no. is specified in Required equipment on page 145 .
17	Fit the distance and the radial sealing to the shaft end by hand. Note! Make sure to fit the radial sealing with the flat side outwards!	 xx0600002607 <p>A Radial sealing B Distance</p>
18	Refit the parallel bar.	Detailed in section Refitting, parallel bar on page 171 .
19	Refit the linkage.	Detailed in sections: <ul style="list-style-type: none">• Refitting, link on page 163• Refitting, upper rod on page 154• Refitting, lower rod on page 158

Continues on next page

4.4.3 Replacement of complete upper arm

Continued

Action	Note/Illustration
20 Run the cable unit inside the upper arm. Re-connect all connectors and refit all brackets.	Cable run, connectors and brackets are shown in the figure <i>Location of cable unit, axis 6 on page 126</i> . The refitting is further detailed in section <i>Refitting, cable unit axis 6 on page 128</i> .
21 Recalibrate the robot.	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section <i>Calibration information on page 209</i> .
22  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section <i>DANGER - First test run may cause injury or damage! on page 48</i> .	

4 Repair

4.4.4 Replacement of linkage - upper rod

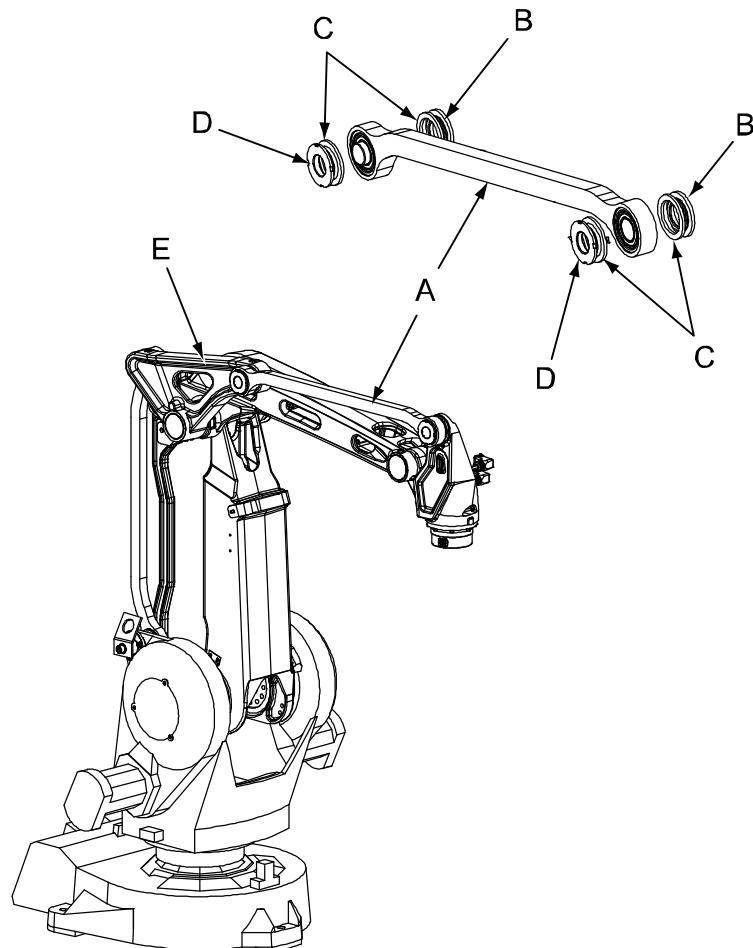
4.4.4 Replacement of linkage - upper rod

Overview

The link system consists of three basic parts - upper rod, lower rod and link. These procedures describes how to remove and refit the upper rod.

Location of upper rod

The upper rod is located as shown in the figure below.



xx0600002615

A	Upper rod
B	Sealing ring (2 pcs)
C	Support washer (4 pcs)
D	Lock nut (2 pcs)
E	Link

Required equipment

Equipment	Spare part no.	Art no.	Note
Parallel rod upper	3HAC024575-001		

Continues on next page

4.4.4 Replacement of linkage - upper rod

Continued

Equipment	Spare part no.	Art no.	Note
Needle bearing	3HAB6432-1		Replace if damaged.
Support washer	3HAB6279-1		Replace if damaged.
Bearing grease		3HAB3537-1	Used to lubricate the bearings.
Locking liquid		3HAB7116-1	Loctite 243
Press sleeve		3HAC023963-013	Used for pressing new bearings into the rod, if replaced.
Standard toolkit		-	Content is defined in section Standard tools on page 229 .
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.

Removal, upper rod

The procedure below details how to remove the upper rod of the linkage.

	Action	Note
1	Put the robot in a position where it is possible to reach all parts that shall be removed.	Check especially that it is possible to remove the lock nut at the link.
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	Remove the <i>lock nuts</i> and <i>support washers</i> holding the upper rod at each end.	
4	 Note The support washers on the inside of the rod can stick to the grease of the bearings when the rod is being removed. Remove them from the link arm!	
5	Remove the <i>support washers</i> and the <i>sealing rings</i> .	
6	Remove residual grease.	

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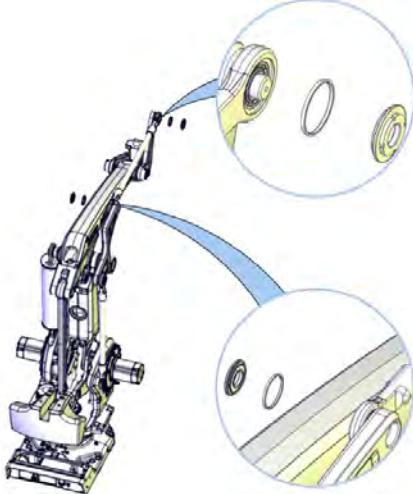
4 Repair

4.4.4 Replacement of linkage - upper rod

Continued

Refitting, upper rod

The procedure below details how to refit the upper rod of the linkage.

Action	Note
1 If needed, replace the <i>bearings</i> in the rod. Use the <i>press sleeve</i> .	Spare part no. is specified in Required equipment on page 152 .
 Note The bearings are sensitive for pushes. Make sure they are not damaged!	
2 Lubricate the bearings properly with <i>bearing grease</i> .	Specified in Required equipment on page 152 .
3 Refit the <i>sealing rings</i> on the shaft ends of the link and tilthouse.	
4 Refit the <i>support washers</i> on the shaft ends.	
5 Refit the upper rod to its place on the shafts.	Check that the rod is pushed in completely.
6 Refit the <i>support washers</i> on the outside of the upper rod on the shaft ends.	 xx1000001080 Lock nut (2 pcs) Support washer (2 pcs)
7 Apply <i>locking liquid</i> on the threads for the lock nuts.	
8 Refit the <i>lock nuts</i> on the link and tilthouse, using <i>locking liquid</i> .	Tightening torque: 20 Nm.
9  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4.4.5 Replacing the linkage - lower rod

Overview

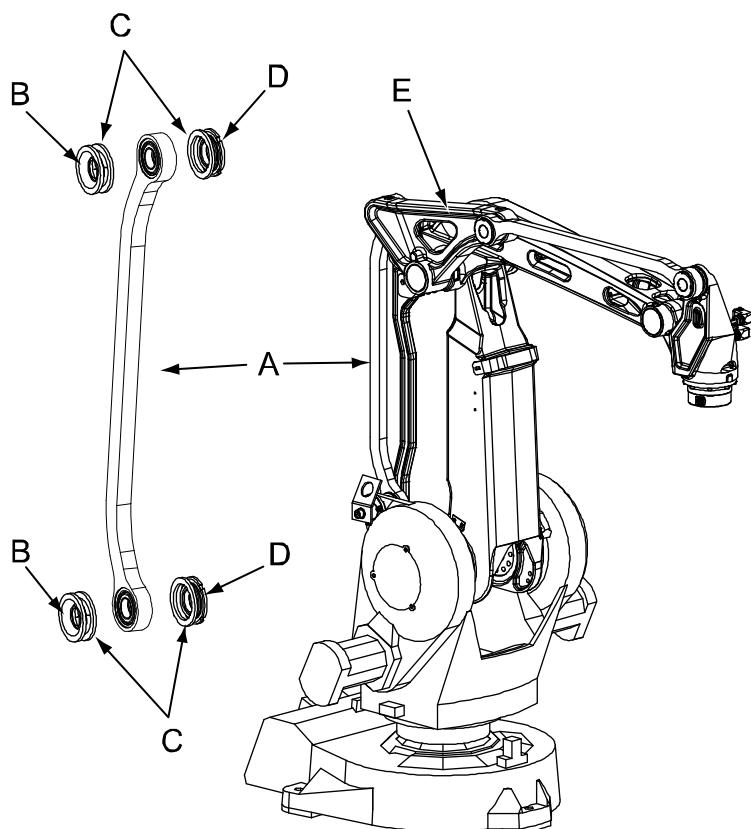
The linkage consists of three basic parts - upper rod, lower rod and link. The procedures below details how to remove and refit the lower rod.

How to replace the upper rod and link, see:

- [Replacement of linkage - upper rod on page 152](#).
- [Replacement of linkage - link on page 160](#)

Location of lower rod

The lower rod is located as shown in the figure below.



xx0600002617

A	Lower rod
B	Sealing ring (2 pcs)
C	Support washer (4 pcs)
D	Lock nut (2 pcs)
E	Link

Continues on next page

4 Repair

4.4.5 Replacing the linkage - lower rod

Continued

Required equipment

Equipment	Art no.	Note
Lower rod	For spare part no. see: • Spare part lists on page 241	
Needle bearing	For spare part no. see: • Spare part lists on page 241	Replace if damaged.
Support washer	For spare part no. see: • Spare part lists on page 241	Replace if damaged.
Bearing grease	3HAB3537-1	
Locking liquid	3HAB7116-1	Loctite 243
Press sleeve	3HAC023963-013	Used for pressing new bearings into the rod.
KM10 socket	-	Standard
Standard toolkit		Content is defined in section Standard tools on page 229 .
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.

Removal, lower rod

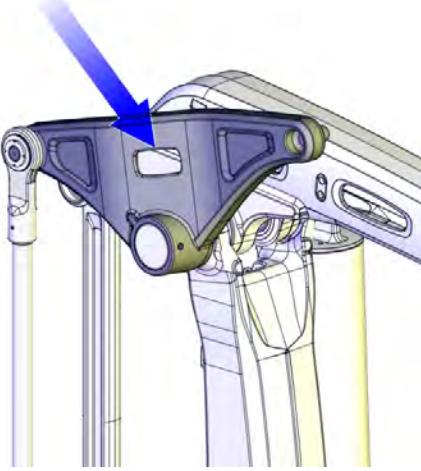
Use this procedure to remove the lower rod of the linkage.

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

Continues on next page

4.4.5 Replacing the linkage - lower rod

Continued

Action	Note
2 If the upper rod is removed, secure the link with a roundsling in a crane. Use the hole in the middle of the link.	 xx1000001252 This is done in order to prevent the link from moving if both the upper rod and lower rod are removed.
3 Remove the <i>lock nuts</i> and <i>support washers</i> that hold the lower rod at each end. Note The support washers can stick to the grease and can easily be forgotten and lost when removing the lock nuts.	Shown in the figure Location of lower rod on page 155 .
4 ! CAUTION The link weighs xx. All lifting accessories used must be sized accordingly!	
5 Remove the lower rod by lifting it straight out. Note The support washers on the inside of the rod can stick to the grease of the bearings when the rod is being removed. Remove them from the rod!	
6 Remove the inner <i>support washers</i> and the <i>sealing/spacer rings</i> .	
7 Remove residual grease.	

Continues on next page

4 Repair

4.4.5 Replacing the linkage - lower rod

Continued

Refitting, lower rod

Use this procedure to refit the lower rod of the linkage.

	Action	Note
1	If needed, replace the <i>bearings</i> . Use a <i>press sleeve</i> .  Note The bearings are sensitive for pushes. Make sure they are not damaged!	Spare part no. is specified in Required equipment on page 156 . Art. no. for the press sleeve is also specified in Required equipment on page 156 .
2	Lubricate the bearings properly with <i>bearing grease</i> .	Specified in Required equipment on page 156 .
3	Refit the sealing/spacer rings to the shaft ends on the link and frame.	Shown in the figure Location of lower rod on page 155 .
4	Refit the <i>support washers</i> on the sealing/spacer rings.	Replace if damaged. Shown in the figure Location of lower rod on page 155 .  Tip Putting some grease on the support washers will keep them in position.
5	Check that the bearings in the lower rod are fitted correctly, that is in the center of the hole. (The same distance from bearing to the edge of the lower rod on both sides.)	
6	 CAUTION The link weighs xx. All lifting accessories used must be sized accordingly!	
7	Place the lower rod on the shaft ends of the link and frame.  Note Check that the lower rod is pushed completely in.	
8	Refit the support washers on the outside of the lower rod, on the link and frame shafts.	
9	Apply <i>locking liquid</i> on the threads of the lock nuts.	Specified in Required equipment on page 156 .
10	Refit the lock nuts on the shaft ends. Use a KM10 socket.	Tightening torque: 20 Nm.

Continues on next page

4.4.5 Replacing the linkage - lower rod

Continued

Action	Note
11  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48.	

4 Repair

4.4.6 Replacement of linkage - link

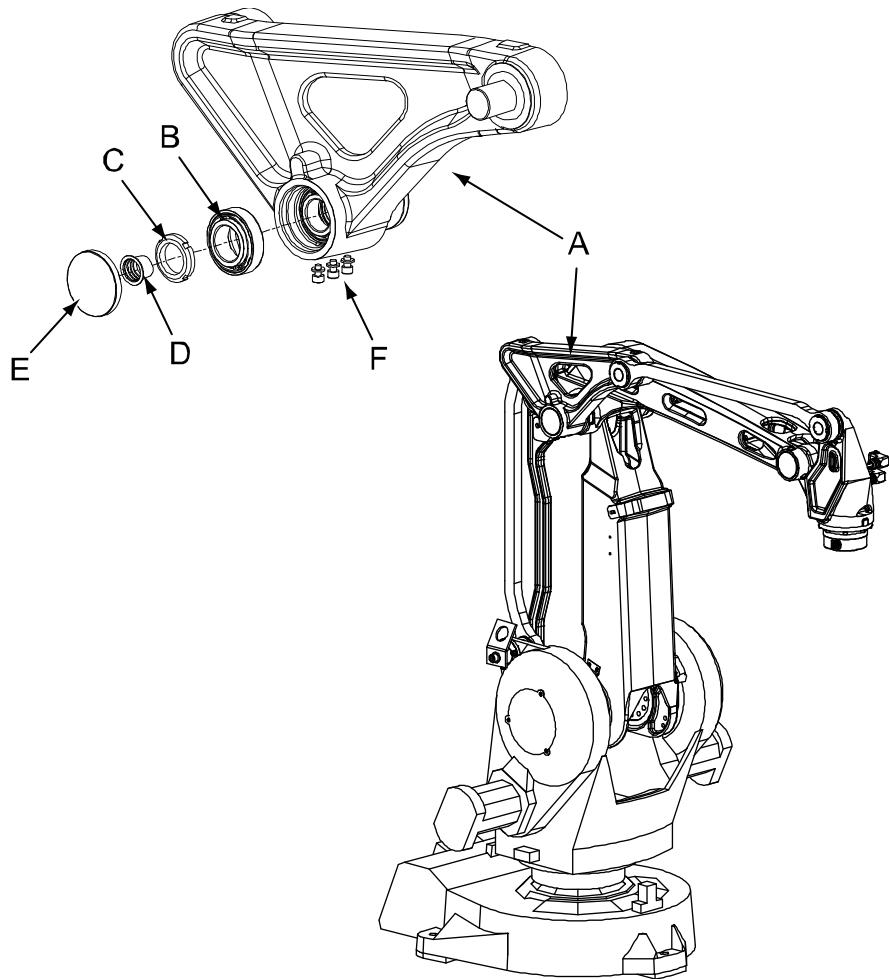
4.4.6 Replacement of linkage - link

Overview

The link system consists of three basic parts - upper rod, lower rod and link. The procedures below details how to remove and refit the link.

Location of link

The link is located at the upper arm as shown in the figure below. It is fitted to the same shaft that holds the upper arm to the lower arm.



xx0600002619

A	Link
B	Bearing (shown as complete bearing, but the outer race should already be mounted inside the seating prior to refitting of link)
C	Lock nut
D	Protection hood
E	VK cover
F	Screws and washers for lubrication and venting holes (3 pcs)

Continues on next page

Required equipment

Equipment	Spare part no.	Art. no.	Note
Protection hood	2522 2101-17		Replace if damaged!
VK-cover	3HAC12165-2		Replace if damaged!
Toolkit for service		3HAC023963-026	A tool for pressing the bearing and the link to the upper arm shaft is assembled from the loose parts in the kit. The assembly is shown in the figure Press tool, link on page 161 .
Bearing grease		3HAB3537-1	
Locking liquid		-	Loctite 243
Standard toolkit		-	The content is defined in the section Standard tools on page 229 .
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.

Press tool, link

The tool for fitting the bearing and the link to the upper arm shaft includes the parts shown in the figure below (included in the toolkit for service).

**Note**

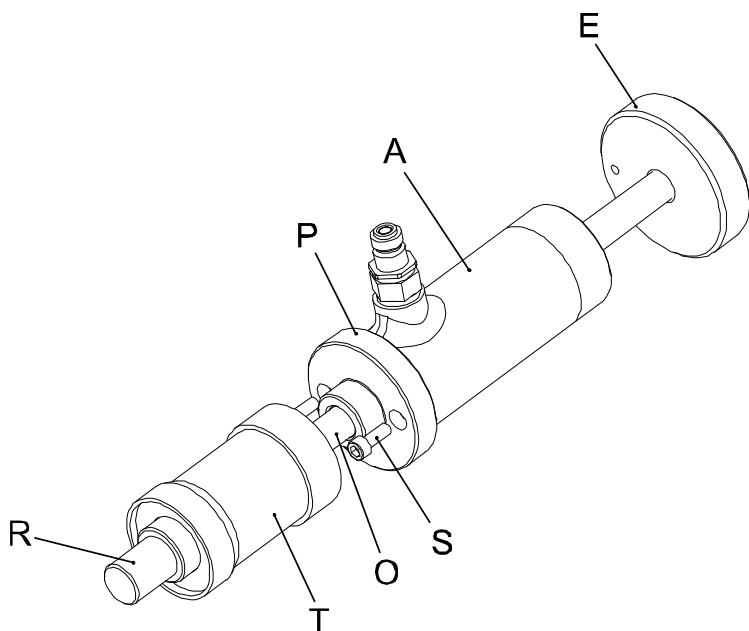
The parts cannot be ordered separately, but are included in the complete toolkit! The article numbers are only given for identification.

Continues on next page

4 Repair

4.4.6 Replacement of linkage - link

Continued



xx0600002618

A	Hydraulic cylinder, 3HAC11731-1
E	Nut, 3HAC5507-1
O	Connecting rod, 3HAC023081-003
P	Press housing, 3HAC024097-002
R	Auxiliary shaft, 3HAC024097-005
S	Screw, M6x12, 9ADA183-24 (2 pcs)
T	Distance, 3HAC023062-001

Removal, link

The procedure below details how to remove the link from the robot.

	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Secure the link with a roundsling in a crane. Use the hole in the middle of the link.	
3	Remove the upper and lower rods.	Detailed in sections: <ul style="list-style-type: none">• Removal, upper rod on page 153.• Removal, lower rod on page 156.
4	Remove the center screw and washer in the hole for filling grease.	

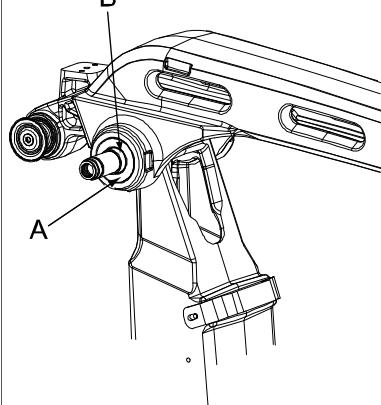
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4.4.6 Replacement of linkage - link Continued

Action	Note/Illustration
5 Use compressed air to remove the <i>VK</i> cover. Blow with a very low air pressure into the hole for filling grease. Note! A very low air pressure is needed!	Shown in the figure Location of link on page 160 . Put one hand with some paper on top of the <i>VK</i> cover in order to catch it when released.
6 Remove the protection hood.	
7 Remove the <i>lock nut</i> .	Shown in the figure Location of link on page 160 .
8 Fit the <i>auxiliary shaft</i> on the shaft in order to let the weight of the link rest on it.	Included in the <i>toolkit for service</i> . Art. no. is specified in Required equipment on page 161 .
9 Loosen the roundsling and turn the link up side down in order to find room to knock on it from the inside as close to its center as possible.	Note! Loosen the roundsling some before knocking! Otherwise the link may be locked by the lifting power.
10 Use a pair of levers, to bend the link loose.	
11 Remove the link.	
12 Wipe off residual grease.	

Refitting, link

The procedure below details how to refit the link to the robot.

Action	Note/Illustration
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2 Check that the bearings and the radial sealing inside the link seating are undamaged.	
3 Make sure that the radial sealing and the distance are fitted to the shaft end in the upper arm.	 Radial sealing Distance The fitting is further detailed in section Refitting, upper arm on page 148 .

Continues on next page

4 Repair

4.4.6 Replacement of linkage - link

Continued

Action	Note/Illustration
4 Lubricate the shaft end with <i>bearing grease</i> .	Specified in Required equipment on page 161 .
5 Gather the required parts to assemble a press tool for the link and bearing from the <i>toolkit for service</i> .	The assembly is shown in the Press tool, link on page 161 . Art. no. for the toolkit is specified in Required equipment on page 161 .
6 Fit the auxiliary shaft to the shaft end.	
7 Thread the link and the bearing onto the auxiliary shaft.	
8 Fit the remaining parts of the press tool and press the link and the bearing onto the shaft end.	
9 Apply <i>locking liquid</i> to the lock nut and fit it to the shaft end, facing the flat surface outwards. Fit it first with a tightening torque of 55 Nm, then unscrew it and fit it once again. This time with a tightening torque of 35 Nm.	Specified in Required equipment on page 161 .
10 Fit a <i>protection hood</i> to the lock nut. It must be replaced if damaged!	Spare part no. is specified in Required equipment on page 161 . Shown in the figure Location of link on page 160 .
11 Fit the <i>VK cover</i> . Replace if damaged!	Spare part no. is specified in Required equipment on page 161 .
12 Fill the link with grease, and refit the three screws and washers. Note! Fill through the center hole. The two holes at the sides are meant for venting while filling.	
13 Refit the upper and lower rods.	Detailed in sections: <ul style="list-style-type: none">• Refitting, upper rod on page 154.• Refitting, lower rod on page 158.
14  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4.5.1 Replacement of complete lower arm

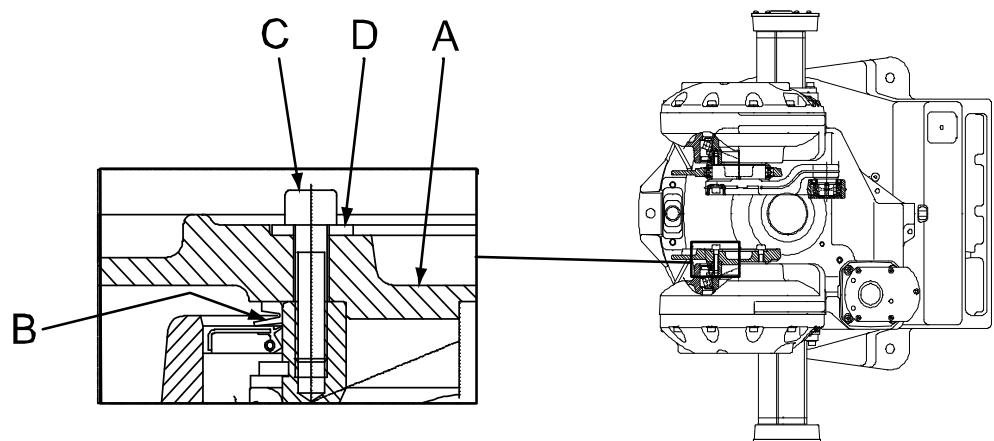
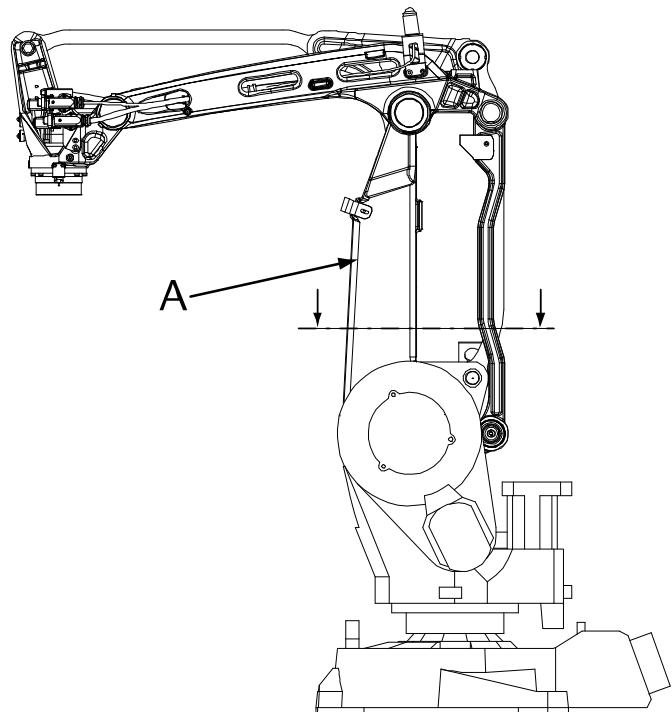
4.5 Lower arm

4.5.1 Replacement of complete lower arm

Location of lower arm

The lower arm is located as shown in the figure below.

A more detailed view of the component and its position may be found in section *Axis 1-3, spare part view 2* in *Product manual, spare parts - IRB 260*.



xx0500002548

A	Lower arm
B	Sealing ring

Continues on next page

4 Repair

4.5.1 Replacement of complete lower arm

Continued

C	Attachment screw (12 pcs)
D	Spring tension plate

Required equipment

Equipment, etc.	Spare part no.	Art. no.	Note
Lower arm	3HAC025729-001		
Sealing ring (V-ring)	3HAB3732-13		Replace if damaged.
Bearing grease		3HAB3537-1	Used to lubricate the sealing ring.
Hoisting equipment		-	
Standard toolkit			The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.

Removal, lower arm

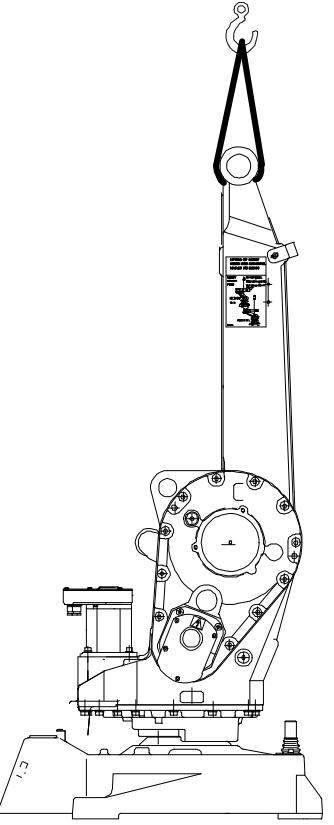
The procedure below details how to remove the complete lower arm.

	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Remove the upper arm.	Detailed in section Removal, upper arm on page 146 .
3	 CAUTION The robot lower arm weighs without any additional equipment fitted. All lifting accessories used must be sized accordingly!	

Continues on next page

4.5.1 Replacement of complete lower arm

Continued

	Action	Note/Illustration
4	Fit the lifting equipment to the lower arm to secure its weight.	 xx0200000439
5	Remove the parallel bar.	Detailed in section Removal, parallel bar on page 170 .
6	Remove the parallel arm.	Detailed in section Removal, parallel arm on page 181 .
7	Pull down the cabling from inside the lower arm and remove any cable attachments.	
8	Remove the attachment screws and the spring tension plate.	Shown in the figure Location of lower arm on page 165 .
9	Remove the lower arm.	

Refitting, lower arm

The procedure below details how to refit the complete lower arm.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Move the damper and calibration marking to the new lower arm.	

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4 Repair

4.5.1 Replacement of complete lower arm

Continued

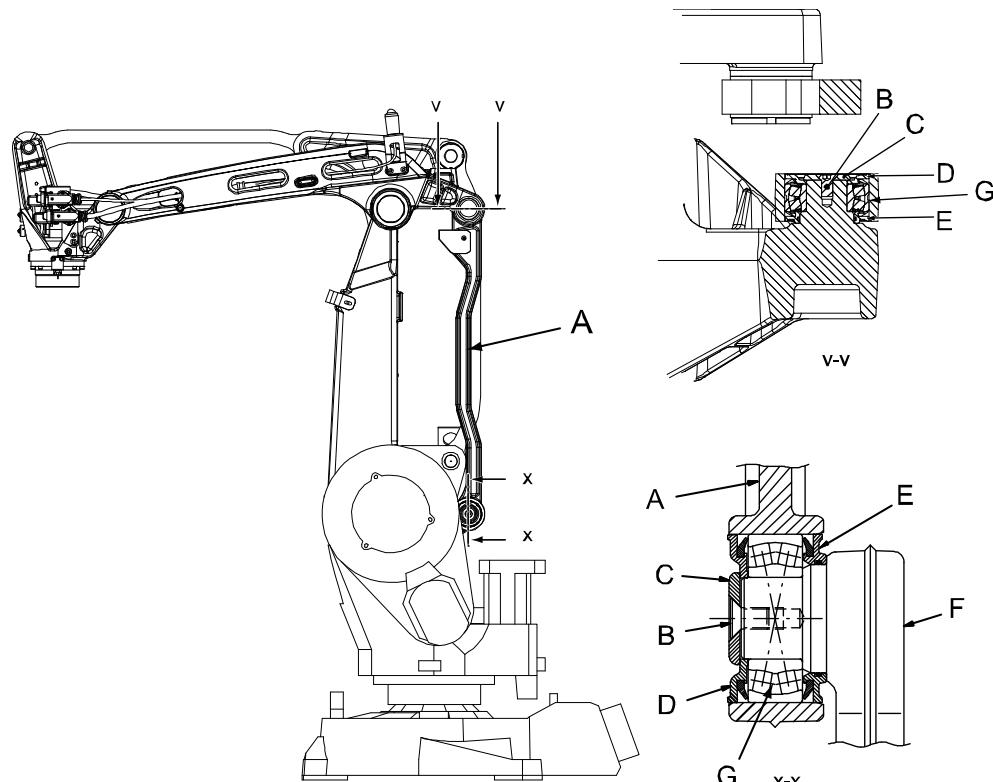
Action	Note
3	Make sure that the <i>sealing ring</i> is fitted properly to the gearbox, undamaged and properly lubricated with <i>grease</i> . If damaged, replace with a new one.
4	 CAUTION The robot lower arm weighs without any additional equipment fitted. All lifting accessories used must be sized accordingly!
5	Lift the lower arm into position.
6	Fit the <i>spring tension plate</i> to the lower arm and secure the arm to the gearbox with the 12 <i>attachment screws</i> .
7	Refit the parallel arm.
8	Refit the parallel bar.
9	Refit the upper arm.
10	Refit the cabling.
11	Recalibrate the robot!
12	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section <i>DANGER - First test run may cause injury or damage!</i> on page 48.

4.5.2 Replacement of parallel bar

Location of parallel bar

The parallel bar is located as shown in the figure below.

A more detailed view of the component and its position may be found in section *Axis 1-3, spare part view 1* in *Product manual, spare parts - IRB 260*.



xx0500002552

A	Parallel bar
B	Attachment screw (2 pcs)
C	Locking washer (2 pcs)
D	Bearing sealing (2 pcs)
E	Bearing sealing (2 pcs)
F	Parallel arm
G	Spherical roller bearing (2 pcs)

Required equipment

Equipment, etc.	Spare part no.	Art. no.	Note
Parallel bar complete	3HAC025714-001		Includes: <ul style="list-style-type: none">• spherical roller bearings• bearing sealings
Spherical roller bearing	3HAA2167-12		2 pcs

Continues on next page

4 Repair

4.5.2 Replacement of parallel bar

Continued

Equipment, etc.	Spare part no.	Art. no.	Note
Bearing sealing	3HAC10088-4		One at each end of the bar. (Item D in the figure Location of parallel bar on page 169.)
Bearing sealing	3HAC10089-2		One at each end of the bar. (Item E in the figure Location of parallel bar on page 169.)
Locking liquid		3HAB7116-1	Loctite 243
Bearing grease		3HAB3537-1	
Press tool, parallel bar bearing		3HAB6324-1	
Mounting tool, parallel bar		3HAB6331-1	
Standard toolkit		-	The content is defined in the section Standard tools on page 229.
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.

Removal, parallel bar

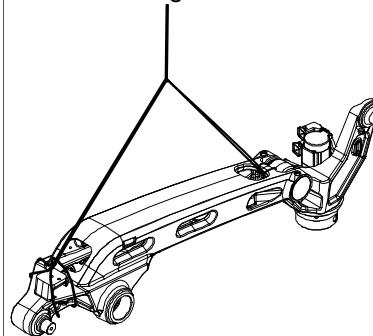
The procedure below details how to remove the parallel bar from the robot.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	 CAUTION The robot upper arm weighs without any additional equipment fitted. All lifting accessories used must be sized accordingly!	

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4.5.2 Replacement of parallel bar

Continued

Action	Note
3 Use a crane to secure the weight of the upper arm.	If the upper arm is also to be removed, secure the weight as shown in the figure below.  xx0500002549
4 Remove the attachment screw from the upper and lower end.	Shown in the figure Location of parallel bar on page 169 .
5 Remove the <i>locking washer</i> from both ends.	Shown in the figure Location of parallel bar on page 169 .
6 Insert a screw in the center of each end, to be used as support.	M8
7 Use a puller to pull out the parallel bar.	
8 Remove the bearings and seals.	Shown in the figure Location of parallel bar on page 169 .

Refitting, parallel bar

The procedure below details how to refit the parallel bar to the robot.

Action	Note
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2 Make sure the weight of the upper arm is properly secured.	Use a crane!
3 Fit the new <i>spherical roller bearings</i> to the parallel bar using the <i>press tool, parallel bar bearing</i> . Lubricate the bearings with bearing grease.	Shown in the figure Location of parallel bar on page 169 . Art. no. is specified in Required equipment on page 169 .
4 Fit new <i>bearing sealings</i> to the shaft ends and lubricate the shaft ends with grease.	Shown in the figure Location of parallel bar on page 169 . Spare part no. is specified in Required equipment on page 169 .
5 Refit the parallel bar, using the <i>mounting tool, parallel bar</i> .  Note Press by hand!	Art. no. is specified in Required equipment on page 169 .

Continues on next page

4 Repair

4.5.2 Replacement of parallel bar

Continued

	Action	Note
6	Fit new bearing sealings to the bearings.	
7	Refit the locking washer.	Shown in the figure Location of parallel bar on page 169 .
8	Refit the <i>attachment screw</i> at both ends of the bar, using <i>locking liquid</i> .	M8 x 16. Loctite 243 Shown in the figure Location of parallel bar on page 169 .
9	Recalibrate the robot!	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .
10	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4.6 Frame and base

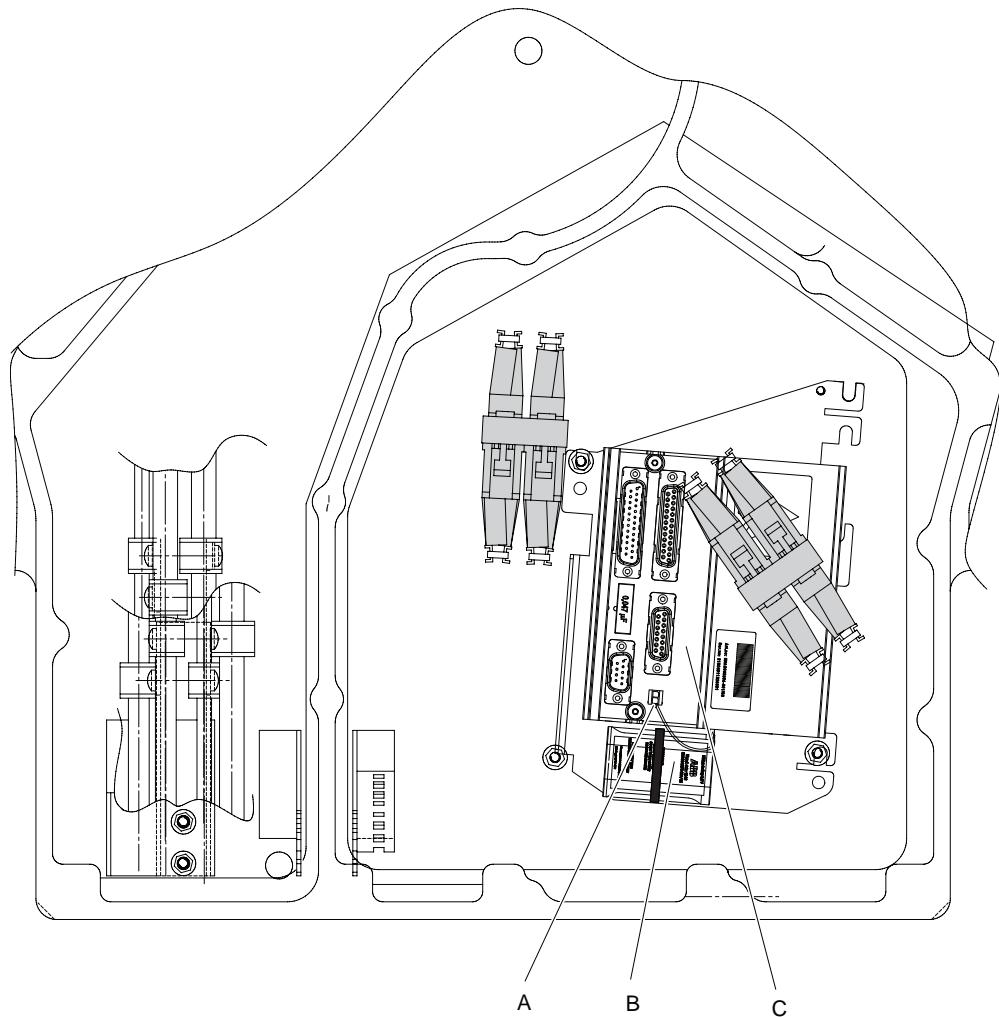
4.6.1 Replacement of SMB unit

Location of SMB unit

The SMB unit (SMB = serial measurement board) is located on the left hand side of the base, as shown in the figure below.

A more detailed view of the component and its position may be found in section *Axis 1-3, spare part view 5* in *Product manual, spare parts - IRB 260*.

Note that the robot is shown with the SMB cover already removed!



xx1300000289

A	SMB battery cable
B	SMB battery RMU (3-pole battery contact)
C	SMB unit RMU 101

Continues on next page

4 Repair

4.6.1 Replacement of SMB unit

Continued

Required equipment



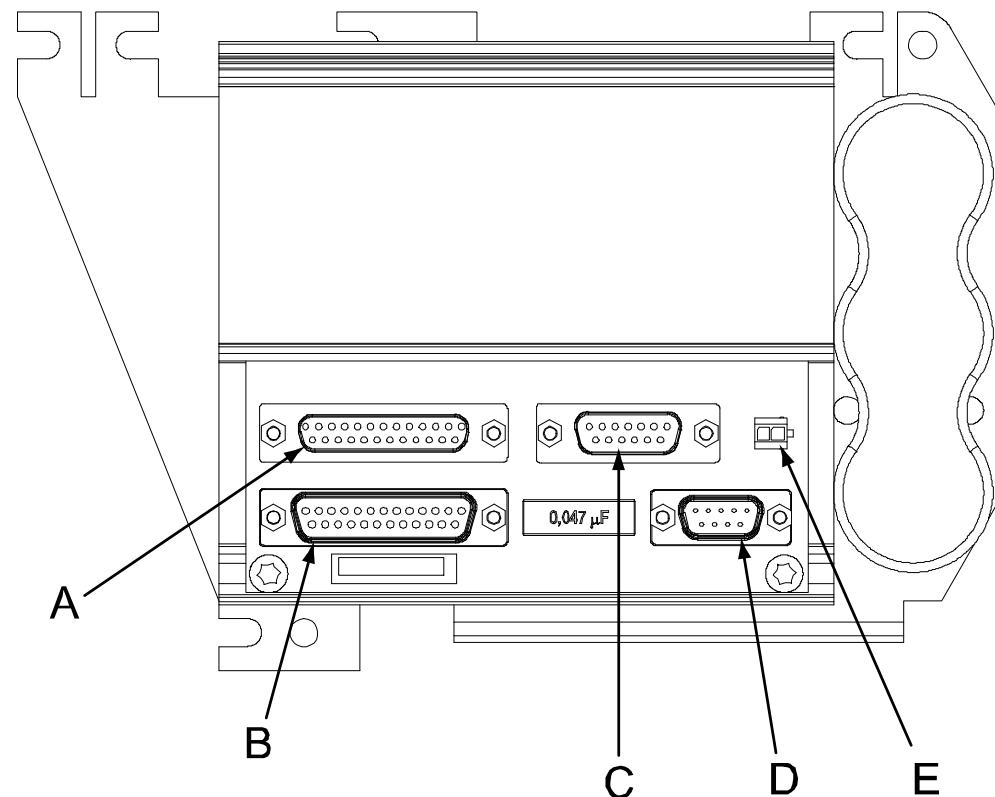
Note

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	Spare part no.	Art. no.	Note
Gasket, cover	3HAC3200-1		Must always be replaced!
Serial measurement unit	3HAC17396-1		Contains serial measurement board 3HAC031851-001 and battery pack 3HAC16831-1.
Serial measurement unit	3HAC046277-001		Contains serial measurement board 3HAC044168-001 and battery pack 3HAC044075-001.
Standard toolkit			The content is defined in the section Standard tools on page 229 .
Circuit diagram		-	See the chapter Circuit diagram on page 243 .
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.

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SMB unit, layout

xx0600002645

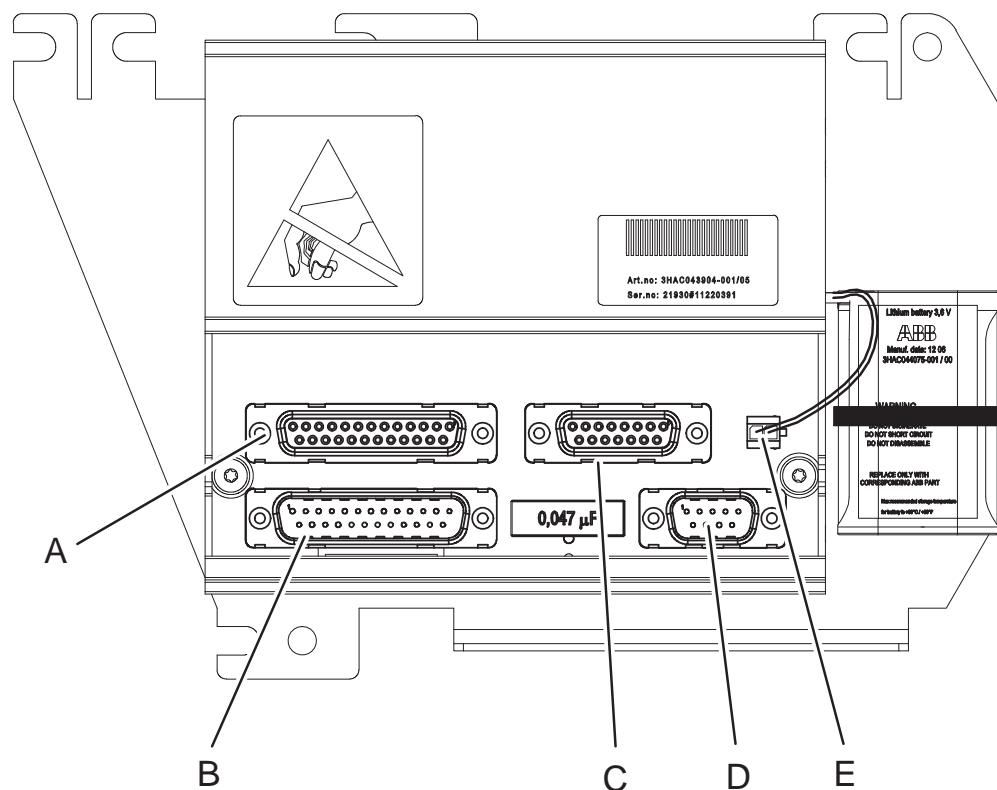
A	Connector R2.SMB4-6
B	Connector R2.SMB1-3
C	Connector R2.SMB1-2 (external axis)
D	Connector R2.SMB
E	Connector R2.G (battery unit)

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4 Repair

4.6.1 Replacement of SMB unit

Continued

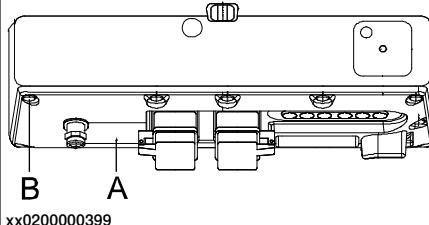


xx1300000310

A	Connector R2.SMB4-6
B	Connector R2.SMB1-3
C	Connector R2.SMB1-2 (external axis)
D	Connector R2.SMB
E	Connector R2.G (battery unit)

Replacement, SMB unit

The procedure below details how to replace the SMB unit.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Remove the rear cover plate (A) from the base by unscrewing the attachment screws (B).	 xx0200000399
3	Remove the SMB battery.	Detailed in section Replacement, SMB battery on page 110 .

Continues on next page

4.6.1 Replacement of SMB unit
Continued

Action	Note
4 Remove the SMB cover by unscrewing its attachment screws. Pull the battery cable through the hole in the SMB cover.	
5 Remove the two locknuts and washers from the <i>pins</i> securing the board.	
6 Gently disconnect the connectors from the SMB unit when pulling the board out. Also disconnect the battery cable from the SMB unit.	All connectors are shown in the figure SMB unit, layout on page 175 .
7 Gently connect the connectors to the new SMB unit and push the board in.	All connectors are shown in the figure SMB unit, layout on page 175 .
8 Refit the SMB cover using the attachment lock nuts. Pull the battery cable through the hole in the SMB cover.	
9 Reassemble the two locknuts and washers to the pins securing the board.	
10 Refit the SMB battery.	
11 Fit a new <i>gasket</i> to the cover and refit the cover with the attachment screws.	Always replace a removed gasket with a new! Art. no. is specified in Required equipment on page 174 .
12 Update the revolution counters!	Detailed in the section Updating revolution counters on page 213 .

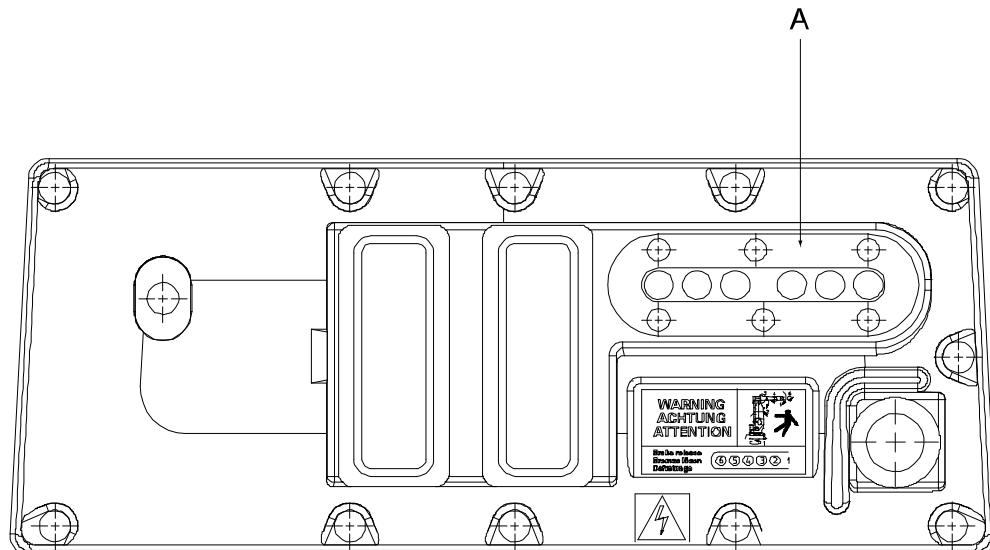
4 Repair

4.6.2 Replacement of brake release unit

4.6.2 Replacement of brake release unit

Location of brake release unit

The brake release unit is located behind the flange plate at the robot base, as shown below.



xx0200000463

A	Brake release unit with buttons
---	---------------------------------

Required equipment

Equipment, etc.	Spare part no.	Note
DSQC 563 Brake release board	3HAC16035-1	
Standard toolkit	-	The content is defined in the section Standard tools on page 229 .
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.

Replacement, brake release board

The procedure below details how to replace the brake release board from the robot base.

	Action
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!
2	Remove the cover at the rear of the base.

Continues on next page

4.6.2 Replacement of brake release unit

Continued

Action
3 Unscrew the six attachment screws of the brake release board on the outside of the base.  Note The guard plate will be dismantled when the screws for brake release board are unscrewed.
4 Disconnect the cable from the brake release board and remove it from the base.
5 Reconnect the cable to the new brake release board and fit it to the base.
6 Secure the board with its six attachment screws on the outside of the base.  Note Make sure that the guard plate is mounted when the screws for brake release board are reassembled.
7 Refit the cover to the rear of the base.
8  DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .

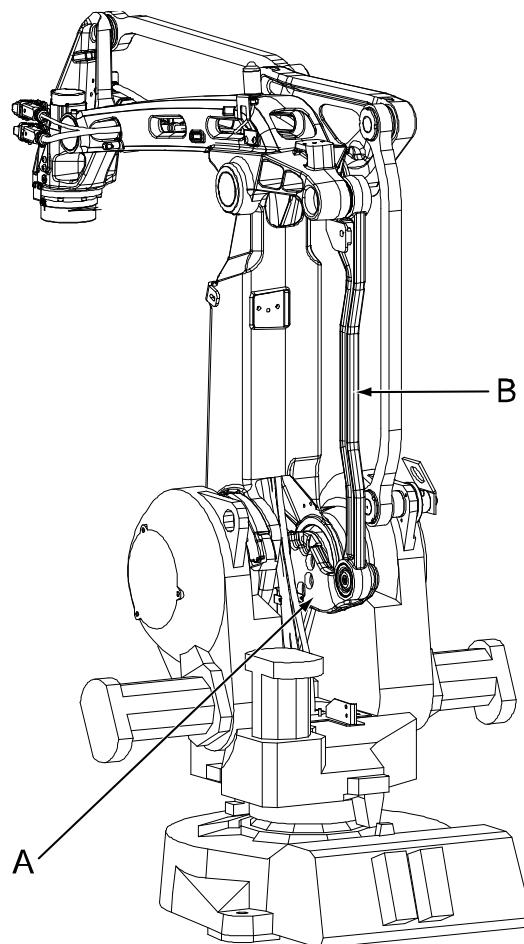
4 Repair

4.6.3 Replacement of parallel arm

4.6.3 Replacement of parallel arm

Location of parallel arm

The parallel arm is located at the frame, as shown in the figure below.



xx0600002591

A	Parallel arm
B	Parallel bar

Required equipment

Equipment	Spare part no.	Art. no.	Note
Parallel arm complete	3HAC025727-001		Includes: <ul style="list-style-type: none">• groove ball bearing• sealing ring
Bearing grease		3HAB3537-1	
Standard toolkit			The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.

Continues on next page

Equipment	Spare part no.	Art. no.	Note
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.

Removal, parallel arm

The procedure below details how to remove the parallel arm.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Remove the parallel bar.	Detailed in section Removal, parallel bar on page 170 .
3	Remove the parallel arm by removing its eight attachment screws and washers.	

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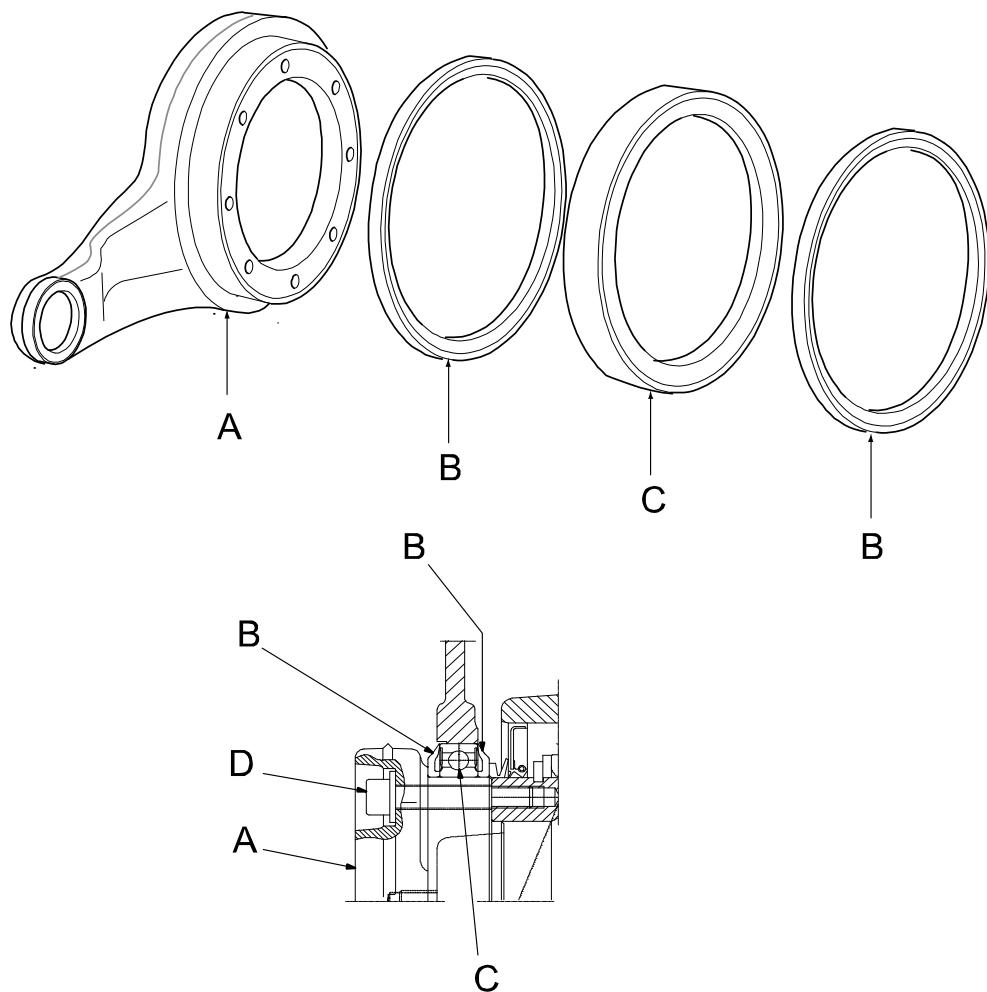
4 Repair

4.6.3 Replacement of parallel arm

Continued

Assembly, parallel arm

The figure below shows the assembly of the parallel arm.



xx0200000450

A	Parallel arm
B	Sealing V- ring (2 pcs)
C	Groove ball bearing
D	Attachment screws and washers (8 pcs)

Refitting, parallel arm

The procedure below details how to refit the complete parallel arm to the robot.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Fit the complete parallel arm to the robot with the eight attachment screws and washers. 8 pcs; M10x60. Tightening torque: 72 Nm.	

Continues on next page

4.6.3 Replacement of parallel arm

Continued

	Action	Note
3	Refit the parallel bar.	Detailed in section Refitting, parallel bar on page 171 .
4	Recalibrate the robot!	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .
5	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4 Repair

4.7.1 Replacement of motor, axis 1

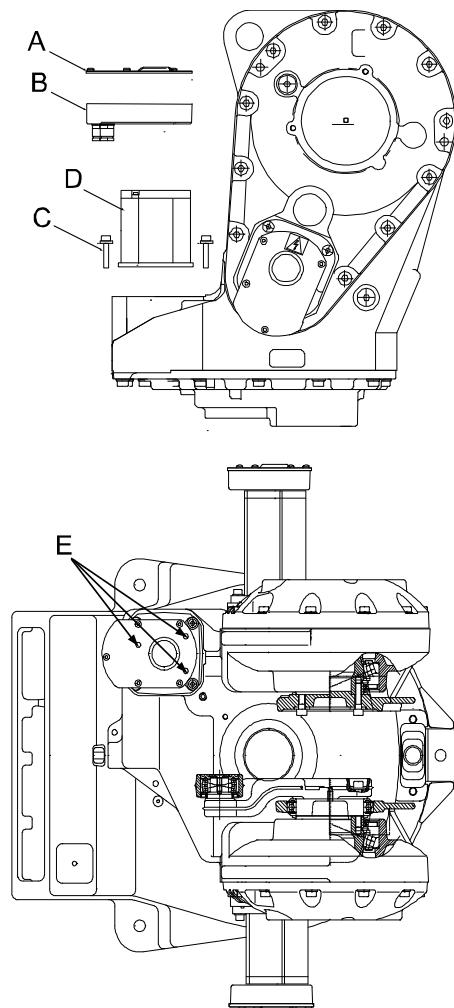
4.7 Motors

4.7.1 Replacement of motor, axis 1

Location of motor, axis 1

The motor, axis 1, is located on the left hand side of the robot as shown in the figure below:

A more detailed view of the component and its position may be found in section *Axis 1-3, spare part view 1* in *Product manual, spare parts - IRB 260*.



xx0200000465

A	Cover
B	Connection box
C	Attachment screws and washers, motor (4 pcs)
D	Motor axis 1
E	Correct orientation of holes

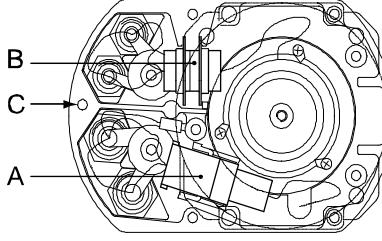
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Required equipment

Equipment	Spare part no.	Art. no.	Note
Motor unit, axes 1 and 3	3HAC025712-001		
O-ring		3HAB 3772-1	Always fit a new one!
Gasket		3HAB 3676-1	
Measuring tool, motor		3HAB7887-1	
Power supply		-	24 VDC, max. 1.5 A. For releasing the brakes.
Standard toolkit			The content is defined in the section Special tools on page 230 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.
Circuit diagram			See the chapter Circuit diagram on page 243 .

Removal, motor axis 1

The procedure below details how to remove the motor, axis 1.

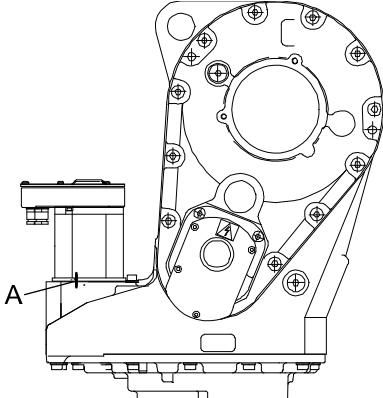
	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Remove the cover of the connection box.	Shown in the figure Location of motor, axis 1 on page 184
3	Disconnect the connectors R3.MP1 and R3.FB1.	 xx020000401 <ul style="list-style-type: none"> • A: R3.MP1 • B: R3.FB1 • C: Connection box
4	Remove the connection box by unscrewing its three attachment screws and plain washers.	Shown in the figure Location of motor, axis 1 on page 184 .

Continues on next page

4 Repair

4.7.1 Replacement of motor, axis 1

Continued

Action	Note/Illustration
5 Use a marker pen to mark the position of the motor (A), if the same motor is to be refitted.	
6 Unscrew the four <i>attachment screws and washers</i> of the motor.	Shown in the figure Location of motor, axis 1 on page 184 .
7 Gently lift the motor straight up, making sure not to damage the motor pinion.	

Refitting, motor axis 1

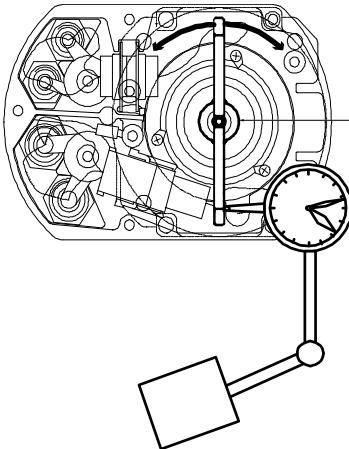
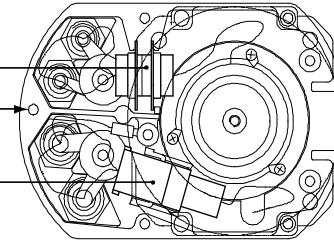
The procedure below details how to refit the motor, axis 1.

Action	Note/Illustration
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2 Check that the assembly surfaces are clean and the motor is unscratched.	
3 Fit the new <i>o-ring</i> .	Always fit a new one, see art. no. in Required equipment on page 185 .
4 Fit the motor by gently lowering it straight down.	Note the position of the motor! Use the mark , made on the motor base before removal. See also orientation of the holes on top of the motor, shown in the figure Location of motor, axis 1 on page 184 .
5 Tighten the four <i>attachment screws and washers</i> .	4 pcs. Tightening torque: 2 Nm.
6 In order to release the brakes, connect the 24 VDC power supply to the motor.	Connect power supply to connector R3.MP1: <ul style="list-style-type: none"> • + : pin 7 • -: pin 8
7 Fit the <i>measuring tool</i> to the rear of the motor.	Art. no. is specified in Required equipment on page 185 . Shown in the figure below.
8 Rotate the motor shaft several turns, using the measuring tool. There must always be some backlash, meaning that the shaft should go easy to rotate!	

Continues on next page

4.7.1 Replacement of motor, axis 1

Continued

Action	Note/Illustration
9 Place the tip of a dial indicator against the scribed mark on the measuring tool.	The tip of the dial indicator must measure on a 50 mm radius from the center of the motor shaft.  xx0200000473 Measuring tool
10 Set the gear play to 0.02 mm, which corresponds to a reading on the dial indicator of 0.13 mm.	
11 Pull gently in one direction. Note the reading. (The gear must not turn.)	
12 Then gently knock on the tool in the other direction and note the reading. The difference in reading = gear play. The gear play should be 0.02 mm which corresponds to a reading on the dial indicator of 0.13 mm.	
13 Tighten the motor attachment screws.	4 pcs. Tightening torque: 23 Nm.
14 Refit the <i>connection box</i> with the three attachment screws and plain washers. Make sure the gasket is fitted properly!	Shown in the figure Location of motor, axis 1 on page 184 .
15 Reconnect the connectors R3.MP1 and R3.FB1.	 xx0200000401 <ul style="list-style-type: none"> • A: R3.MP1 • B: R3.FB1 • C: Connection box
16 Refit the cover of the connection box.	Shown in the figure Location of motor, axis 1 on page 184 .
17 Recalibrate the robot.	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .

Continues on next page

4 Repair

4.7.1 Replacement of motor, axis 1

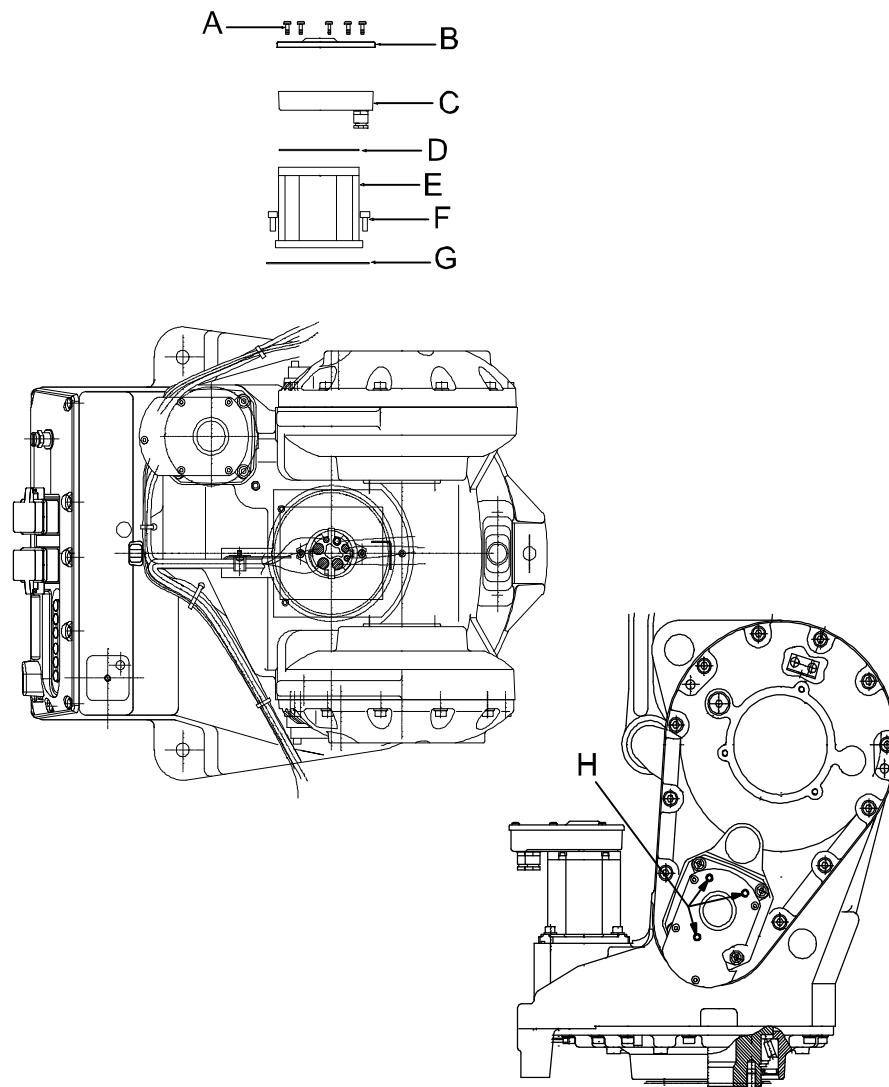
Continued

	Action	Note/Illustration
18	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section <i>DANGER - First test run may cause injury or damage!</i> on page 48.	

4.7.2 Replacement of motor, axis 2

Location of motor, axis 2

The motor, axis 2, is located on the left hand side of the robot as shown in the figure below:



xx0200000470

A	Attachment screws, cover (5 pcs)
B	Cover
C	Connection box
D	Gasket
E	Motor, axis 2
F	Attachment screws, motor (4 pcs)
G	O-ring
H	Correct orientation of holes on top of motor

Continues on next page

4 Repair

4.7.2 Replacement of motor, axis 2

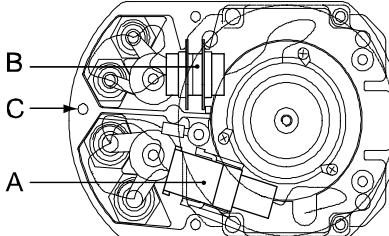
Continued

Required equipment

Equipment, etc.	Spare part no.	Art. no.	Note
Motor unit, axis 2	3HAC025713-001		
O-ring		3HAB3772-1	Always fit a new one!
Gasket		3HAB3676-1	
Measuring tool, motor		3HAB7887-1	
Power supply			24 VDC, max. 1.5 A. For releasing the brakes.
Standard toolkit			The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.
Circuit diagram			See the chapter Circuit diagram on page 243 .

Removal, motor axis 2

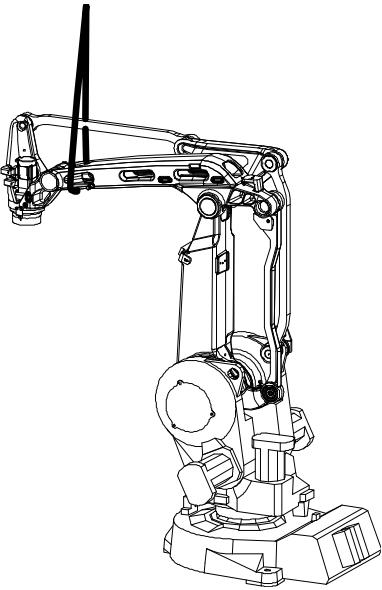
The procedure below details how to remove the motor, axis 2.

	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Remove the cover of the connection box.	Shown in the figure Location of motor, axis 2 on page 189 .
3	Disconnect the motor connectors R3.MP2 and R3.FB2.	 xx0200000401 <ul style="list-style-type: none">• A: R3.MP2• B: R3.FB2• C: Connection box
4	Remove the connection box by unscrewing its three attachment screws and plain washers.	
5	Use a marker pen to mark out the position of the motor, if the same motor is to be refitted.	

Continues on next page

4.7.2 Replacement of motor, axis 2

Continued

Action	Note/Illustration
6  DANGER Secure the weight of the lower arm properly before releasing the brakes of motor, axis 2! When releasing the holding brakes of the motor, the lower arm will be movable and may fall down!	Secure the robot arms before unscrewing any of the attachment screws of the axis 2 motor.  xx0300000107
7  WARNING Oil will be running out of the motor attachment hole when removing the motor! It may also be hot! Take any necessary measures to collect the oil.	
8 Unscrew the four attachment screws and washers of the motor.	Shown in the figure Location of motor, axis 2 on page 189 .
9 Remove the motor by gently lifting it straight out.	

Refitting, motor axis 2

The procedure below details how to refit the motor, axis 2.

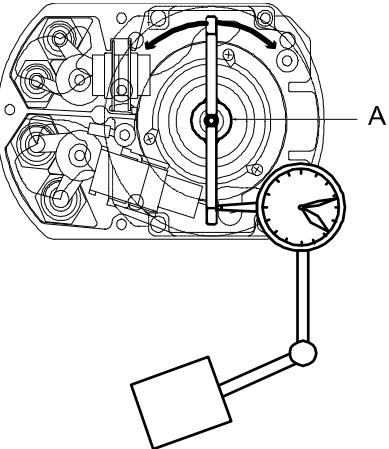
Action	Note/Illustration
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2 Check that the assembly surfaces are clean and the motor is unscratched.	
3 Fit the <i>o-ring</i> .	Always fit a new one, see art. no. in Required equipment on page 190 .
4 Fit the motor by gently lifting it straight on.	Note the position of the motor! Use the mark on the motor base, made before removing the motor. Also see the orientation holes on the motor cover, shown in the figure Location of motor, axis 2 on page 189 .

Continues on next page

4 Repair

4.7.2 Replacement of motor, axis 2

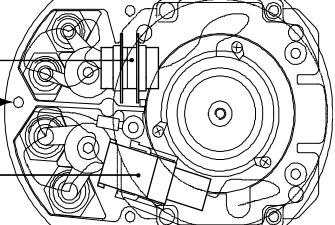
Continued

	Action	Note/Illustration
5	Fit the four attachment screws and tighten them slightly. Make the adjustments described below before tightening the screws properly.	4 pcs. Tightening torque: 2 Nm.
6	In order to release the brakes, connect the 24 VDC power supply to the motor.	Connect to connector R3.MP2: • +: pin 7 • -: pin 8
7	Fit the <i>measuring tool</i> to the rear of the motor.	See the figure below. Art. no. is specified in Required equipment on page 190 .
8	Rotate the motor shaft several turns, using the measuring tool. There must always be some backlash, meaning that the shaft should go easy to rotate!	
9	Place the tip of a dial indicator against the scribed mark on the measuring tool.	The tip of the dial indicator must measure on a 50 mm radius from the center of the motor shaft.  A Measuring tool
10	Set the gear play to 0.02 mm, which corresponds to a reading on the dial indicator of 0.13 mm.	
11	Pull gently in one direction. Note the reading. (The gear must not turn.)	See the figure above.
12	Then gently knock on the tool in the other direction and note the reading. The difference in reading = gear play. The gear play should be 0.02 mm which corresponds to a reading on the dial indicator of 0.13 mm.	See the figure above.
13	Tighten the four attachment screws.	4 pcs. Tightening torque: 23 Nm.
14	Perform a leak-down test.	Detailed in section Performing a leak-down test on page 116 .
15	Fill the gearbox with oil.	Where to find type of oil and total amount is detailed in Type and amount of oil in gearboxes on page 104 .
16	Refit the <i>connection box</i> and secure with the three attachment screws and plain washers. Make sure that the gasket is fitted properly!	Shown in the figure Location of motor, axis 2 on page 189 .

Continues on next page

4.7.2 Replacement of motor, axis 2

Continued

	Action	Note/Illustration
17	Reconnect connectors R3.MP2 and R3.FB2.	 xx0200000401 <ul style="list-style-type: none"> • A: R3.MP2 • B: R3.FB2 • C: Connection box
18	Refit the cover of the connection box.	Shown in the figure Location of motor, axis 2 on page 189 .
19	Recalibrate the robot.	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .
20	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4 Repair

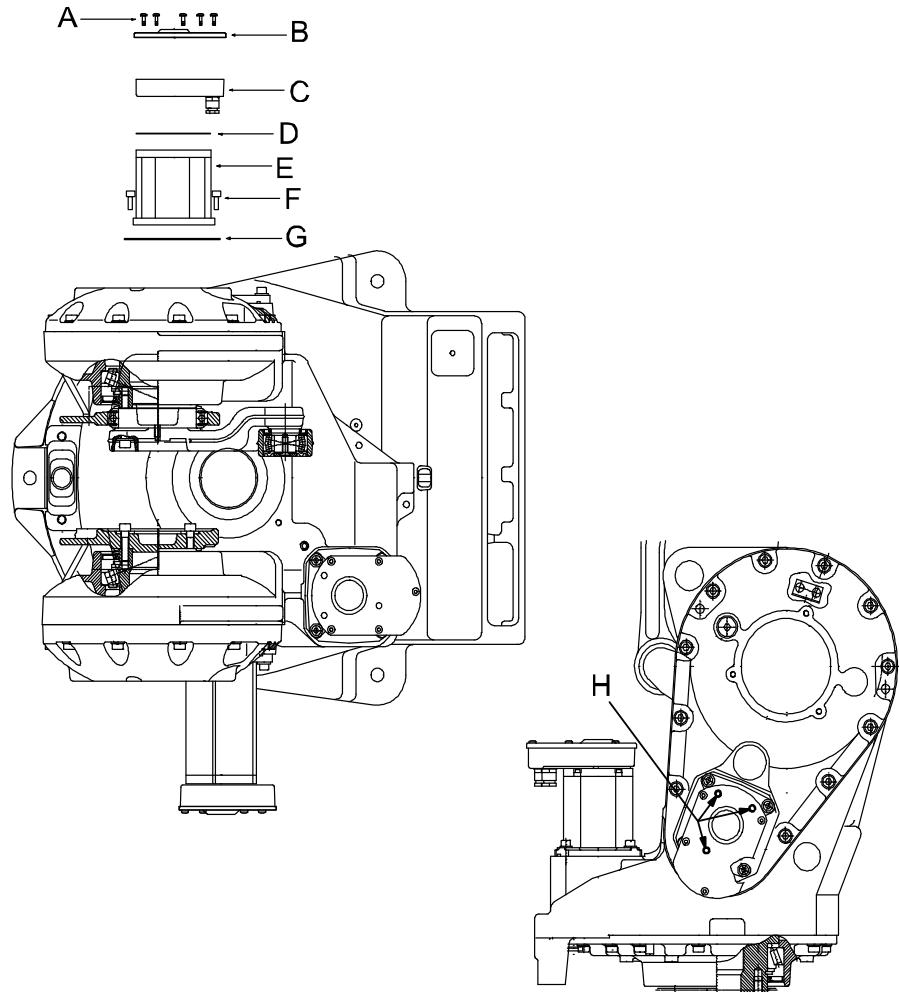
4.7.3 Replacement of motor, axis 3

4.7.3 Replacement of motor, axis 3

Location of motor, axis 3

The motor, axis 3, is located on the right hand side of the robot, as shown in the figure below:

A more detailed view of the component and its position may be found in section *Axis 1-3, spare part view 2* in *Product manual, spare parts - IRB 260*.



xx0200000471

A	Attachment screws, cover
B	Cover
C	Connection box
D	Gasket
E	Motor, axis 2
F	Attachment screws, motor (4 pcs)
G	O-ring
H	Correct orientation of holes on top of motor

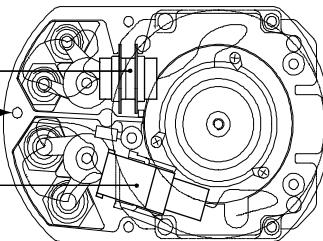
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Required equipment

Equipment	Spare part no.	Art. no.	Note
Motor unit, axes 1 and 3	3HAC025712-001		
Gasket		3HAB3676-1	
O-ring		3HAB3772-1	Always fit a new one.
Measuring tool, motor		3HAB7887-1	
Power supply		-	24 VDC, max. 1.5 A. For releasing the brakes.
Standard toolkit		-	The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.
Circuit diagram		-	See the chapter Circuit diagram on page 243 .

Removal, motor axis 3

The procedure below details how to remove the motor, axis 3.

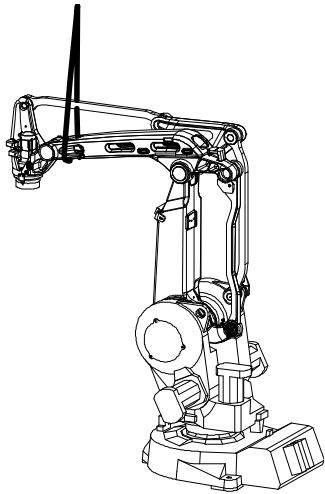
	Action	Note/Illustration
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Remove the cover of the connection box.	Shown in the figure Location of motor, axis 3 on page 194 .
3	Disconnect the motor connectors R3.MP3 and R3.FB3.	 xx0200000401 <ul style="list-style-type: none"> • A: R3.MP3 • B: R3.FB3 • C: Connection box
4	Remove the connection box by unscrewing its three attachment screws and plain washers.	Shown in the figure Location of motor, axis 3 on page 194 .
5	Use a marker pen to mark out the position of the motor, if the same motor is to be refitted.	

Continues on next page

4 Repair

4.7.3 Replacement of motor, axis 3

Continued

Action	Note/Illustration
<p>6</p> <p> DANGER</p> <p>Secure the weight of the upper arm properly before releasing the brakes of motor, axis 3. When releasing the holding brakes of the motor, the upper arm will be movable and may fall down!</p>	<p>Secure the upper arm before loosening any of the screws on the motor!</p>  <p>xx0300000107</p>
<p>7</p> <p> WARNING</p> <p>Oil will be running out of the motor attachment hole when removing the motor! It may also be hot! Take any necessary measures to collect the oil.</p>	
<p>8</p> <p>Unscrew the four <i>attachment screws</i> and plain washers of the motor.</p>	Shown in the figure Location of motor, axis 3 on page 194 .
<p>9</p> <p>Remove the motor by gently lifting it straight out.</p>	

Refitting, motor axis 3

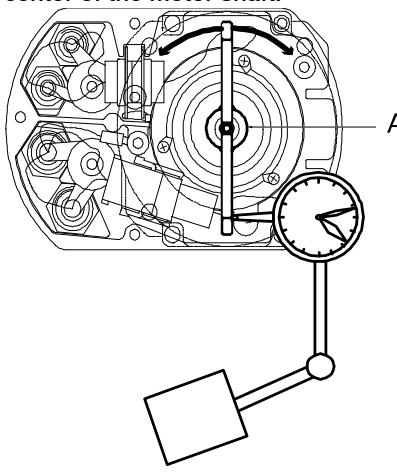
The procedure below details how to refit the motor, axis 3.

Action	Note/Illustration
<p>1</p> <p> DANGER</p> <p>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!</p>	
<p>2</p> <p>Check that the assembly surfaces are clean and the motor is unscratched.</p>	
<p>3</p> <p>Fit a new <i>o-ring</i> to the motor.</p>	Always mount a new one, see art. no. in section Required equipment on page 195 .
<p>4</p> <p>Fit the motor, by gently lifting it straight on.</p>	Note the position of the motor! Use the mark on the motor base, made before removal. Also see the orientation holes on the motor cover, shown in the figure Location of motor, axis 3 on page 194 .
<p>5</p> <p>Tighten the four screws lightly.</p>	Tightening torque: 2 Nm.

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4.7.3 Replacement of motor, axis 3

Continued

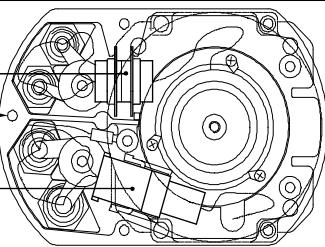
	Action	Note/Illustration
6	In order to release the brakes, connect the 24 VDC power supply to the motor.	Connect to connector R3.MP3: • +: pin 7 • -: pin 8
7	Fit the <i>measuring tool</i> to the rear of the motor.	See the figure below. Art. no. is specified in Required equipment on page 195 .
8	Rotate the motor shaft several turns, using the measuring tool. There must always be some backlash, meaning that the shaft should go easy to rotate!	See the figure below.
9	Place the tip of a dial indicator against the scribed mark on the measuring tool.	The tip of the dial indicator must measure on a 50 mm radius from the center of the motor shaft.  xx0200000473 A Measuring tool
10	Set the gear play to 0.02 mm, which corresponds to a reading on the dial indicator of 0.13 mm.	
11	Pull gently in one direction. Note the reading. (<i>The gear must not turn.</i>)	See the figure above.
12	Then gently knock on the tool in the other direction and note the reading. The difference in reading = gear play. The gear play should be 0.02 mm which corresponds to a reading on the dial indicator of 0.13 mm.	See the figure above.
13	Tighten the four motor attachment screws.	4 pcs. Tightening torque: 23 Nm.
14	Perform a leak-down test.	Detailed in section Performing a leak-down test on page 116 .
15	Refill the gearbox with oil.	Where to find type of oil and total amount is detailed in Type and amount of oil in gearboxes on page 104 .
16	Refit the <i>connection box</i> with the three attachment screws and plain washers. Make sure that the gasket is fitted properly!	Shown in the figure Location of motor, axis 3 on page 194 .

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4 Repair

4.7.3 Replacement of motor, axis 3

Continued

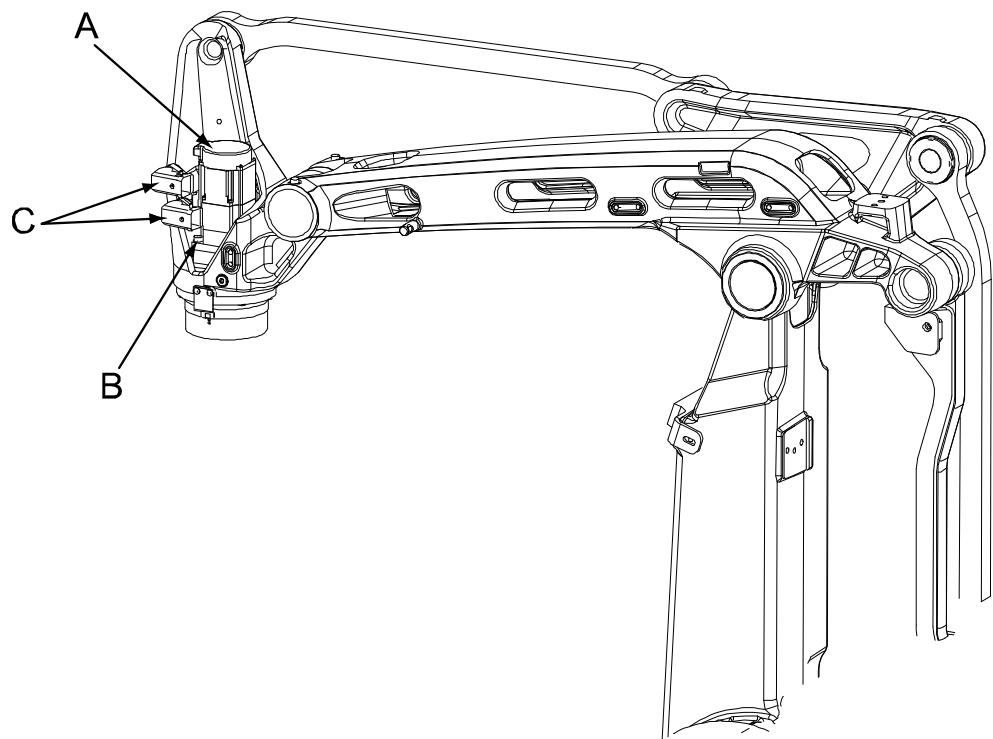
	Action	Note/Illustration
17	Reconnect the motor connectors R3.MP3 and R3.FB3.	 xx0200000401 <ul style="list-style-type: none"> • A: R3.MP3 • B: R3.FB3 • C: Connection box
18	Refit the <i>cover</i> of the connection box.	Shown in the figure Location of motor, axis 3 on page 194 .
19	Recalibrate the robot.	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .
20	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4.7.4 Replacement of motor, axis 6

Location of motor, axis 6

The motor, axis 6 is located in the tilthouse, as shown in the figure below.

A more detailed view of the component and its position may be found in section *Tilthouse, exploded view in Product manual, spare parts - IRB 260*.



xx0500001940

A	Motor, axis 6
B	Attachment screws and washers, axis 6 motor (4 pcs)
C	Motor connectors, R3.MP6 and R3.FB6

Required equipment

Equipment	Spare part no.	Art. no.	Note
Rot. ac motor incl. pin-ion	3HAC025734-001		
Power supply	-		24 VDC, max. 1.5 A. For releasing the brakes.
Locking liquid	-		Loctite 243
Standard toolkit	-		The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
Circuit diagram	-		See the chapter Circuit diagram on page 243 .

Continues on next page

4 Repair

4.7.4 Replacement of motor, axis 6

Continued

Removal, motor, axis 6

The procedure below details how to remove the motor, axis 6 from the robot.

Action	Note
1	 DANGER
	Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!
2	Disconnect the motor connectors R2.MP6 and R2.FB6.
3	In order to release the brakes, connect the 24 VDC power supply to the motor.
4	Unscrew the four <i>attachment screws and washers</i> .
5	Remove the motor by gently lifting it straight up. Be careful not to damage the motor pinion!

Refitting, motor, axis 6

The procedure below details how to refit the motor, axis 6 to the robot.

Action	Note
1	 DANGER
	Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!
2	In order to release the brakes, connect the 24 VDC power supply to the motor.
3	Gently fit the motor to the tilthouse. Be careful not to damage the motor pinion when mating it to the gearbox!
4	Secure the motor with its four <i>attachment screws and washers</i> , using locking liquid.
5	Shown in the figure Location of motor, axis 6 on page 199 . 4 pcs; M6x20. Tightening torque: 10 Nm. Locking liquid is specified in Required equipment on page 199 .
6	Detailed in section Performing a leak-down test on page 116 .
7	Reconnect the motor connectors R3.MP6 and R3.FB6.
8	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .

Continues on next page

	Action	Note
9	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section <i>DANGER - First test run may cause injury or damage!</i> on page 48.	

4 Repair

4.8.1 Replacement of gearbox, axis 1-3

4.8 Gearboxes

4.8.1 Replacement of gearbox, axis 1-3

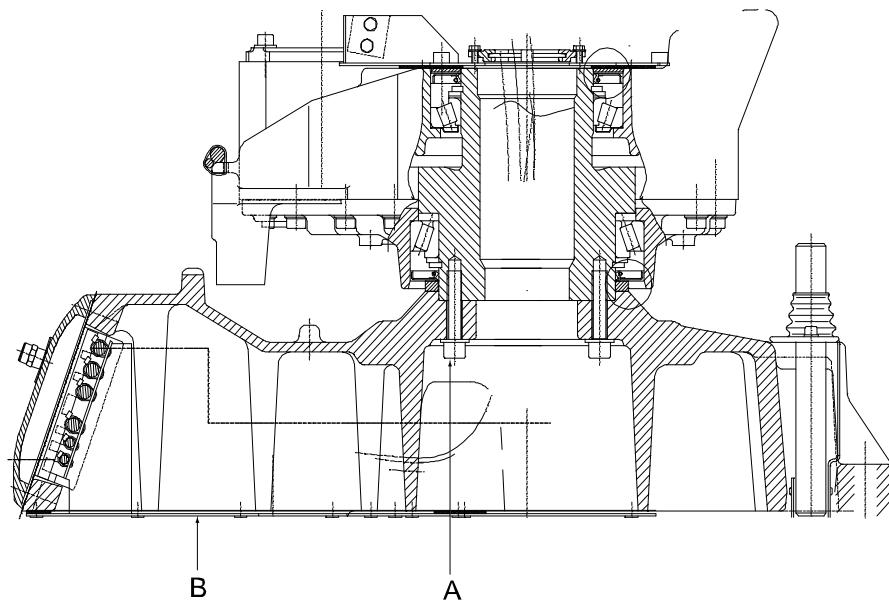
Location of gearbox, axis 1-3

The axis 1 gearbox is located between the frame and base as shown in the figure below.

Axis 1 gearbox is of the conventional type, manufactured with high precision. Together with the gearboxes for axes 2 and 3, it forms a complete unit.

A more detailed view of the component and its position may be found in section *Axis 1-3, spare part view 1* in *Product manual, spare parts - IRB 260*.

Note! The gearbox is not normally serviced or adjusted.



xx0300000007

A	Attachment screws, gearbox unit
B	Bottom plate

Required equipment

Equipment	Spare part no.	Art. no.	Note
Gearbox, axes 1-3	3HAC025711-001		
Standard toolkit	-		The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.

Continues on next page

Removal, gearbox axis 1-3

The procedure below details how to remove the gearbox, axis 1-3.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	Remove the cable unit, axes 1-3.	Detailed in section Removal, cable unit, axes 1-3 on page 122 .
3	Remove the complete lower arm.	Detailed in section Removal, lower arm on page 166 .
4	Remove the motor, axis 1.	Detailed in section Removal, motor axis 1 on page 185 .
5	Remove the motor, axis 2.	Detailed in section Removal, motor axis 2 on page 190 .
6	Remove the motor, axis 3.	Detailed in section Removal, motor axis 3 on page 195 .
7	 CAUTION The complete gearbox unit weighs without the base. All lifting accessories used must be sized accordingly!	
8	Place the remaining parts of the robot upside-down on a table or similar surface and remove the bottom plate.	
9	Undo the 12 attachment screws.	
10	Lift away the base from the gearbox unit.	

Refitting, gearbox axis 1-3

The procedure below details how to refit the gearbox, axis 1-3.

	Action	Note
1	 DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2	 CAUTION The complete gearbox unit weighs without the base. All lifting accessories used must be sized accordingly!	
3	Place the gearbox unit upside-down on a table or similar surface.	

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4 Repair

4.8.1 Replacement of gearbox, axis 1-3

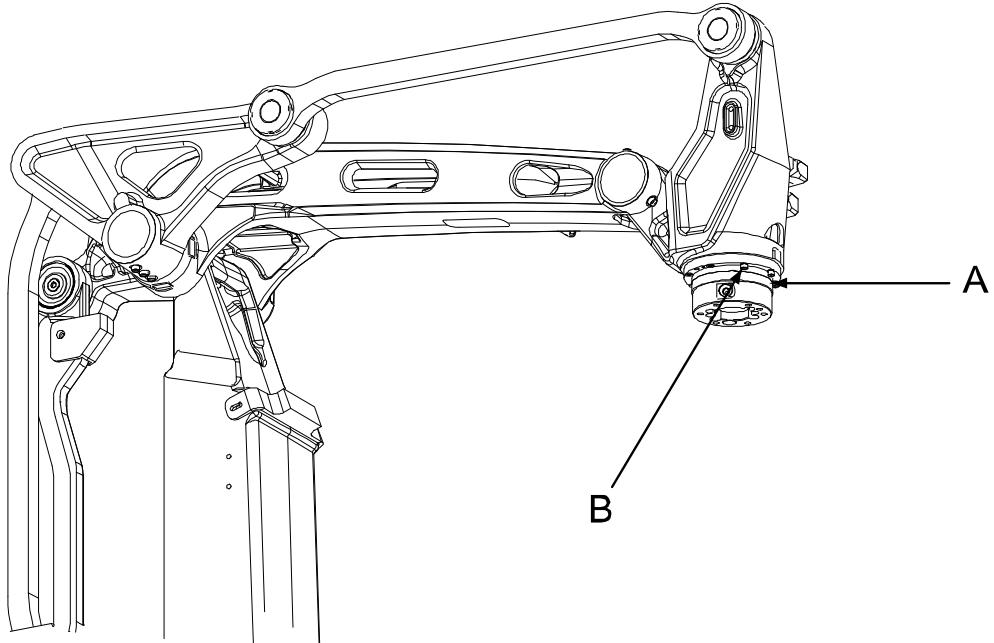
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	Action	Note
4	Fit the base to the gearbox unit and secure with the 12 screws and washers.	12 pcs; M12x50. Tightening torque: 54 Nm.
5	Refit the bottom plate to the base.	
6	Turn the base and gearbox unit around and secure to the installation site.	This is detailed in section Orienting and securing the robot on page 71 .
7	Refit the motor, axis 1.	Detailed in section Refitting, motor axis 1 on page 186 .
8	Refit the motor, axis 2.	Detailed in section Refitting, motor axis 2 on page 191 .
9	Refit the motor, axis 3.	Detailed in section Refitting, motor axis 3 on page 196 .
10	Refit the complete lower arm.	Detailed in section Refitting, lower arm on page 167 .
11	Refit the cable unit, axes 1-3.	Detailed in section Refitting, gearbox axis 1-3 on page 203 .
12	Calibrate the robot.	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .
13	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section DANGER - First test run may cause injury or damage! on page 48 .	

4.8.2 Replacement of gearbox, axis 6

Location of gearbox, axis 6

The gearbox, axis 6, is located at the frontmost part of the robot, as shown in the figure below.



xx0500001939

A	Gearbox, axis 6
B	Attachment screws, gearbox (8 pcs)

Required equipment

Equipment	Spare part no.	Art. no.	Note
RV-6E, i=79	3HAC025110-001		
O-ring	3HAB3772-88		Replace if damaged!
Locking liquid	-		Loctite 243
Bearing grease	3HAB3537-1		Used to lubricate o-rings and contact surfaces.
Standard toolkit	-		The content is defined in the section Standard tools on page 229 .
Calibration Pendulum toolkit		3HAC15716-1	Complete kit that also includes operating manual.
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.

Continues on next page

4 Repair

4.8.2 Replacement of gearbox, axis 6

Continued

Removal, gearbox, axis 6

The procedure below details how to remove the gearbox, axis 6 from the robot.

Action	Note
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2 Drain the oil from the gearbox.	Detailed in section Draining oil, gearbox axis 6 on page 106 .
3 Remove the turning disk.	Detailed in section Removal, turning disk on page 143 .
4 Remove the gearbox from the robot by removing its <i>attachment screws and washers</i> .	Shown in the figure Location of gearbox, axis 6 on page 205 .
5 If necessary, press out the gearbox by inserting screws into the two M5 holes on the gearbox.	Press out holes: 2 x M5.

Refitting, gearbox, axis 6

The procedure below details how to refit the gearbox, axis 6 to the robot.

Action	Note
1  DANGER Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot!	
2 Lubricate the contact surfaces inside the housing with grease.	
3 Make sure the <i>o-ring</i> is lubricated and fitted properly to the upper side of the gearbox. Replace if damaged!	Spare part no. is specified in Required equipment on page 205 .
4 Refit the gearbox with the attachment screws and washers, using locking liquid.	8 pcs; M5x25. Tightening torque: 8 Nm. Locking liquid is specified in Required equipment on page 205 .
5 Refit the turning disk.	Detailed in section Refitting, turning disk on page 143 .
6 Perform a leak-down test.	Detailed in section Performing a leak-down test on page 116 .
7 Refill the gearbox with oil.	Detailed in section Filling oil, gearbox axis 6 on page 107 .
8 Recalibrate the robot.	Calibration is detailed in a separate calibration manual enclosed with the calibration tools. General calibration information is included in the section Calibration information on page 209 .

Continues on next page

	Action	Note
9	 DANGER Make sure all safety requirements are met when performing the first test run. These are further detailed in the section <i>DANGER - First test run may cause injury or damage!</i> on page 48.	

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5 Calibration information

5.1 When to calibrate

When to calibrate

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

The resolver values are changed

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

The resolver values will change when parts affecting the calibration position are replaced on the robot, for example motors or parts of the transmission.

The revolution counter memory is lost

If the revolution counter memory is lost, the counters must be updated. See [Updating revolution counters on page 213](#). This will occur when:

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

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

The robot is rebuilt

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

5 Calibration information

5.2 Calibration methods

5.2 Calibration methods

Overview

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

Types of calibration

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

Brief description of calibration methods

Calibration Pendulum method

Calibration Pendulum is a standard calibration method for calibration of all ABB robots (except IRB 6400R, IRB 640, IRB 1400H, and IRB 4400S).

Two different routines are available for the Calibration Pendulum method:

- Calibration Pendulum II
- Reference calibration

The calibration equipment for Calibration Pendulum is delivered as a complete toolkit, including the *Operating manual - Calibration Pendulum*, which describes the method and the different routines further.

References

Article numbers for the calibration tools are listed in the section [Special tools on page 230](#).

The calibration equipment for Calibration Pendulum is delivered as a complete toolkit, including the *Operating manual - Calibration Pendulum*, which describes the method and the different routines further.

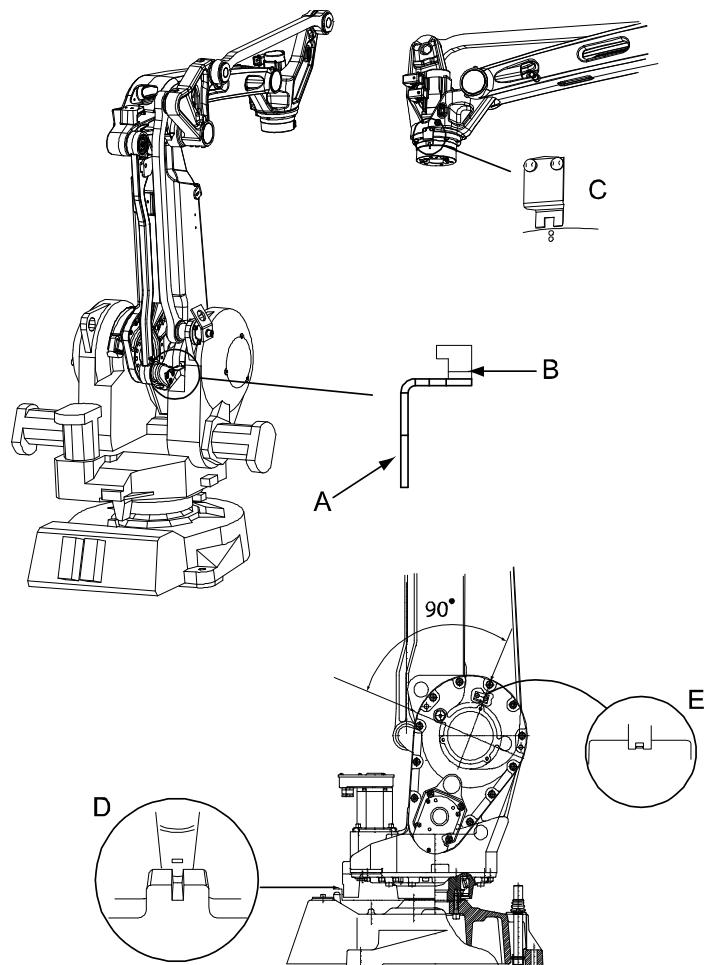
5.3 Synchronization marks and synchronization position for axes

Introduction

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

Synchronization marks, IRB 260

When axis 3 is put in calibration position, the mark on the calibration plate is visible above the mechanical stop, as shown in the figure below.



xx0500002485

A	Mechanical stop of axis 3
B	Calibration mark on calibration plate, axis 3
C	Calibration plate and marking, axis 6
D	Punch, axis 1, 3HAB8223-1
E	Punch, axis 2, 3HAB8223-1 (1 marking)

5 Calibration information

5.4 Calibration movement directions for all axes

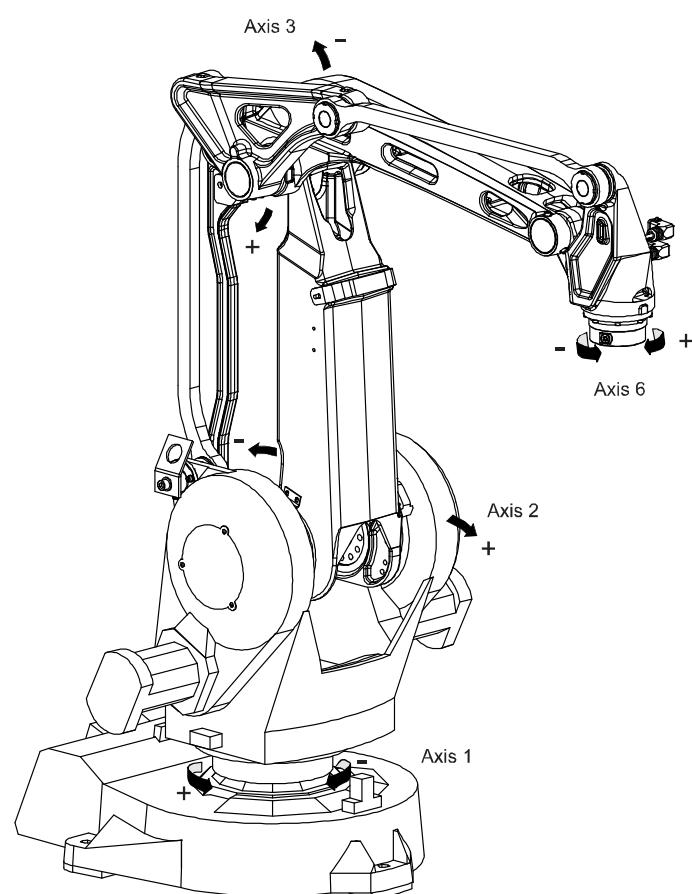
Overview

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

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

Manual movement directions, 4 axes

Note! The graphic shows an IRB 260. The positive direction is the same for all 4-axis robots



5.5 Updating revolution counters

Introduction

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

Step 1 - Manually running the manipulator to the synchronization position

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

	Action	Note
1	Select axis-by-axis motion mode.	
2	Jog the manipulator to align the synchronization marks.	See Synchronization marks and synchronization position for axes on page 211 .
3	When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 214 .

Correct calibration position of axis 4 and 6

When jogging the manipulator to synchronization position, it is extremely important to make sure that axes 4 and 6 of the following mentioned manipulators are positioned correctly. The axes can be calibrated at the wrong turn, resulting in an incorrect manipulator calibration.

Make sure the axes are positioned according to the correct calibration values, not only according to the synchronization marks. The correct values are found on a label, located either on the lower arm, underneath the flange plate on the base or on the frame.

At delivery the manipulator is in the correct position, do NOT rotate axis 4 or 6 at power up before the revolution counters are updated.

If one of the following mentioned axes are rotated one or more turns from its calibration position before updating the revolution counter, the correct calibration position will be lost due to non-integer gear ratio. This affects the following manipulators:

Manipulator variant	Axis 4	Axis 6
IRB 260	-	No

If the synchronization marks seem to be wrong (even if the motor calibration data is correct), try to rotate the axis one turn, update the revolution counter and check the synchronization marks again (try both directions, if needed).

Continues on next page

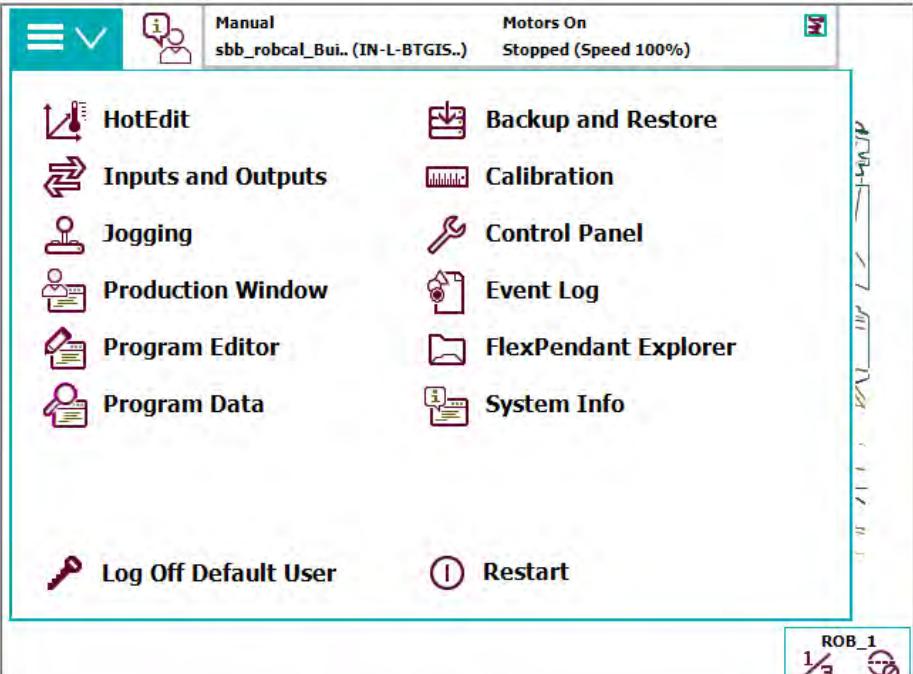
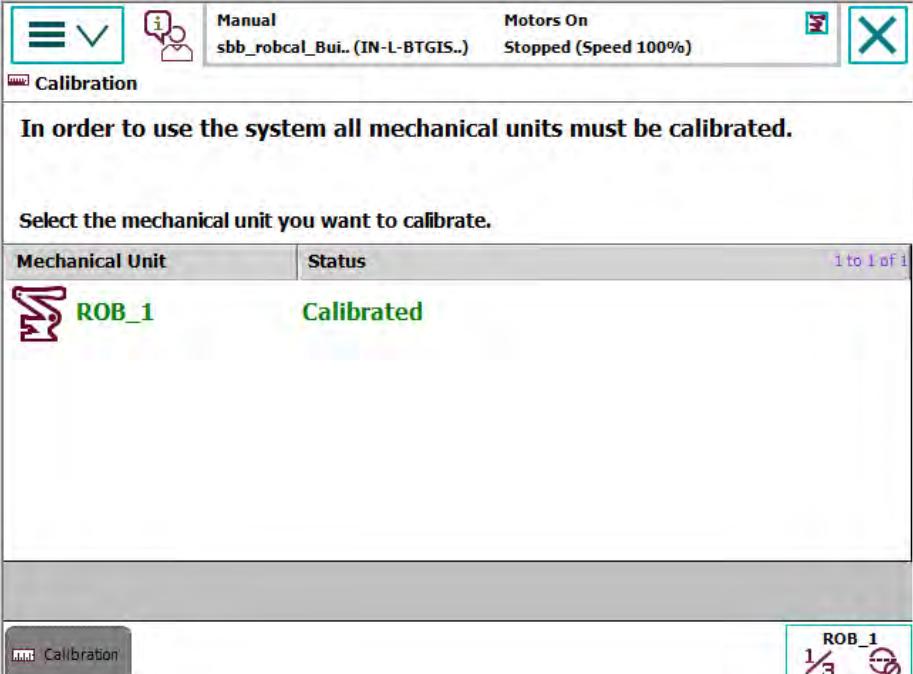
5 Calibration information

5.5 Updating revolution counters

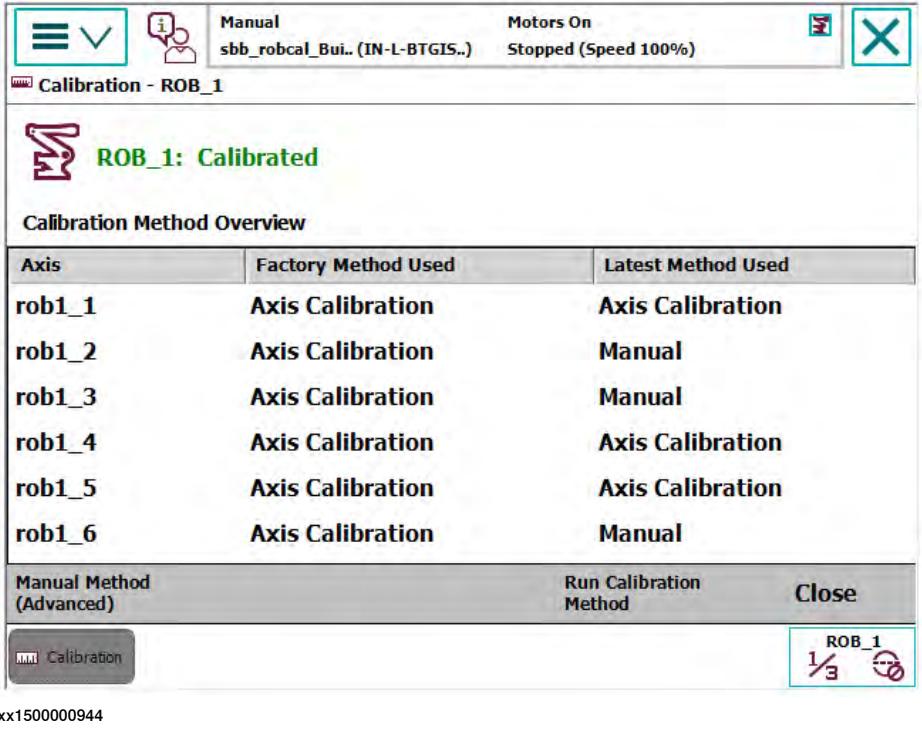
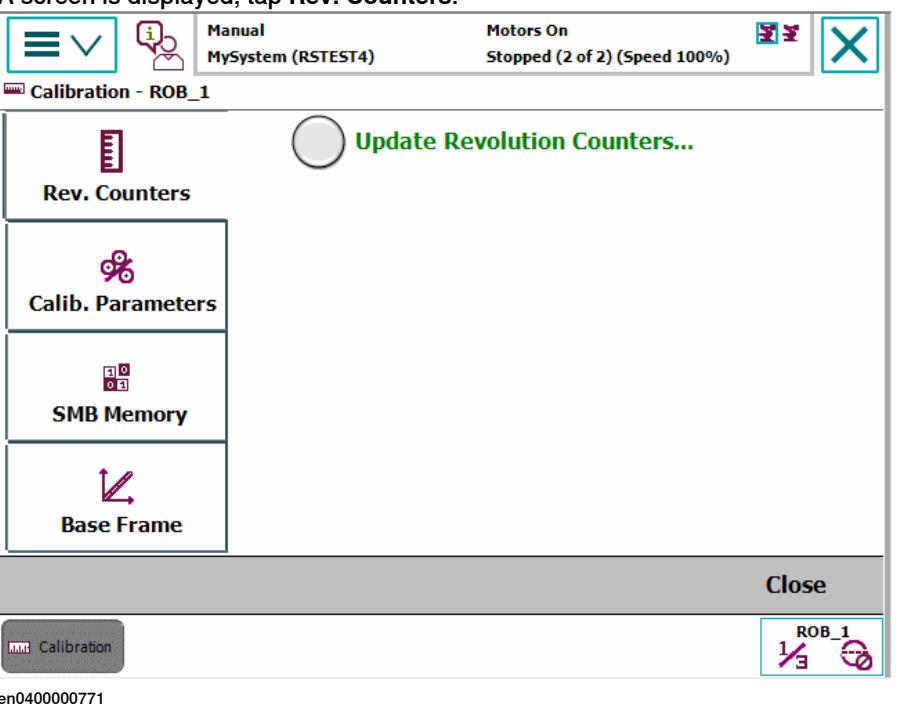
Continued

Step 2 - Updating the revolution counter with the FlexPendant

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

Action
<p>1 On the ABB menu, tap Calibration.</p>  <p>The screenshot shows the ABB menu interface. At the top, it says "Manual sbb_robcal_Bui.. (IN-L-BTGIS..)" and "Motors On Stopped (Speed 100%)". Below this is a grid of icons and labels: HotEdit, Backup and Restore; Inputs and Outputs, Calibration; Jogging, Control Panel; Production Window, Event Log; Program Editor, FlexPendant Explorer; Program Data, System Info. At the bottom are two buttons: "Log Off Default User" and "Restart". A status bar at the bottom left says "xx1500000942".</p>
<p>2 All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.</p>  <p>The screenshot shows the "Calibration" screen. At the top, it says "Manual sbb_robcal_Bui.. (IN-L-BTGIS..)" and "Motors On Stopped (Speed 100%)". Below this is a table titled "Select the mechanical unit you want to calibrate." with columns "Mechanical Unit" and "Status". It shows one entry: "ROB_1" with "Calibrated" status. At the bottom are two buttons: "Calibration" and a status bar at the bottom left saying "xx1500000943".</p>

Continues on next page

	Action																					
3	<p>This step is valid for RobotWare 6.02 and later.</p> <p>Calibration method used at factory for each axis is shown, as well as calibration method used during last field calibration.</p> <p>Tap Manual Method (Advanced).</p>  <table border="1"> <thead> <tr> <th>Axis</th> <th>Factory Method Used</th> <th>Latest Method Used</th> </tr> </thead> <tbody> <tr> <td>rob1_1</td> <td>Axis Calibration</td> <td>Axis Calibration</td> </tr> <tr> <td>rob1_2</td> <td>Axis Calibration</td> <td>Manual</td> </tr> <tr> <td>rob1_3</td> <td>Axis Calibration</td> <td>Manual</td> </tr> <tr> <td>rob1_4</td> <td>Axis Calibration</td> <td>Axis Calibration</td> </tr> <tr> <td>rob1_5</td> <td>Axis Calibration</td> <td>Axis Calibration</td> </tr> <tr> <td>rob1_6</td> <td>Axis Calibration</td> <td>Manual</td> </tr> </tbody> </table>	Axis	Factory Method Used	Latest Method Used	rob1_1	Axis Calibration	Axis Calibration	rob1_2	Axis Calibration	Manual	rob1_3	Axis Calibration	Manual	rob1_4	Axis Calibration	Axis Calibration	rob1_5	Axis Calibration	Axis Calibration	rob1_6	Axis Calibration	Manual
Axis	Factory Method Used	Latest Method Used																				
rob1_1	Axis Calibration	Axis Calibration																				
rob1_2	Axis Calibration	Manual																				
rob1_3	Axis Calibration	Manual																				
rob1_4	Axis Calibration	Axis Calibration																				
rob1_5	Axis Calibration	Axis Calibration																				
rob1_6	Axis Calibration	Manual																				
4	<p>A screen is displayed, tap Rev. Counters.</p> 																					

Continues on next page

5 Calibration information

5.5 Updating revolution counters

Continued

	Action
5	<p>Tap Update Revolution Counters....</p> <p>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none">• Tap Yes to update the revolution counters.• Tap No to cancel updating the revolution counters. <p>Tapping Yes displays the axis selection window.</p>
6	<p>Select the axis to have its revolution counter updated by:</p> <ul style="list-style-type: none">• Ticking in the box to the left• Tapping Select all to update all axes. <p>Then tap Update.</p>
7	<p>A dialog box is displayed, warning that the updating operation cannot be undone:</p> <ul style="list-style-type: none">• Tap Update to proceed with updating the revolution counters.• Tap Cancel to cancel updating the revolution counters. <p>Tapping Update updates the selected revolution counters and removes the tick from the list of axes.</p>
8	<p> CAUTION</p> <p>If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury!</p> <p>Check the synchronization position very carefully after each update. See Checking the synchronization position on page 217.</p>

5.6 Checking the synchronization position

Introduction

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

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

Using a **MoveAbsJ** instruction

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

	Action	Note
1	On ABB menu tap Program editor .	
2	Create a new program.	
3	Use MoveAbsJ in the Motion&Proc menu.	
4	Create the following program: <pre>MoveAbsJ [[0,0,0,0,0,0], [9E9,9E9,9E9,9E9,9E9,9E9]] \NoEOoffs, v1000, fine, tool0</pre>	
5	Run the program in manual mode.	
6	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See Synchronization marks and synchronization position for axes on page 211 and Updating revolution counters on page 213 .

Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

	Action	Note
1	On the ABB menu, tap Jogging .	
2	Tap Motion mode to select group of axes to jog.	
3	Tap to select the axis to jog, axis 1, 2, or 3.	
4	Manually run the robots axes to a position where the axis position value read on the FlexPendant, is equal to zero.	
5	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See Synchronization marks and synchronization position for axes on page 211 and Updating revolution counters on page 213 .

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6 Decommissioning

6.1 Environmental information

Hazardous material

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

Dispose components properly to prevent health or environmental hazards.

Material	Example application
Batteries, NiCad or Lithium	Serial measurement board
Copper	Cables, motors
Cast iron/nodular iron	Base, lower arm, upper arm
Steel	Gears, screws, base frame, and so on.
Neodymium	Brakes, motors
Plastic/rubber	Cables, connectors, drive belts, and so on.
Oil, grease	Gearboxes
Aluminium	Covers, synchronization brackets

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.

6 Decommissioning

6.2 Scrapping of robot

6.2 Scrapping of robot

Important when scrapping the robot



DANGER

When a robot is disassembled while being scrapped, it is very important to remember the following before disassembling starts, in order to prevent injuries:

- Always remove all batteries from the robot. If a battery is exposed to heat, for example from a blow torch, it will explode.
- Always remove all oil/grease in gearboxes. If exposed to heat, for example from a blow torch, the oil/grease will catch fire.
- When motors are removed from the robot, the robot will collapse if it is not properly supported before the motor is removed.

7 Reference information

7.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

7 Reference information

7.2 Applicable safety standards

7.2 Applicable safety standards

Standards, EN ISO

The robot system is designed in accordance with the requirements of:

Standard	Description
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13849-1	Safety of machinery, safety related parts of control systems - Part 1: General principles for design
EN ISO 13850	Safety of machinery - Emergency stop - Principles for design
EN ISO 10218-1	Robots for industrial environments - Safety requirements -Part 1 Robot
EN ISO 9787	Robots and robotic devices -- Coordinate systems and motion nomenclatures
EN ISO 9283	Manipulating industrial robots, performance criteria, and related test methods
EN ISO 14644-1 ⁱ	Classification of air cleanliness
EN ISO 13732-1	Ergonomics of the thermal environment - Part 1
EN IEC 61000-6-4 (option 129-1)	EMC, Generic emission
EN IEC 61000-6-2	EMC, Generic immunity
EN IEC 60974-1 ⁱⁱ	Arc welding equipment - Part 1: Welding power sources
EN IEC 60974-10 ⁱⁱ	Arc welding equipment - Part 10: EMC requirements
EN IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1 General requirements
IEC 60529	Degrees of protection provided by enclosures (IP code)

ⁱ Only robots with protection Clean Room.

ⁱⁱ Only valid for arc welding robots. Replaces EN IEC 61000-6-4 for arc welding robots.

European standards

Standard	Description
EN 614-1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN 574	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design
EN 953	Safety of machinery - General requirements for the design and construction of fixed and movable guards

Other standards

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740 (option 429-1)	Safety standard for robots and robotic equipment

Continues on next page

7 Reference information

7.2 Applicable safety standards

Continued

Standard	Description
CAN/CSA Z 434-03 (option 429-1)	Industrial robots and robot Systems - General safety requirements

7 Reference information

7.3 Unit conversion

7.3 Unit conversion

Converter table

Use the following table to convert units used in this manual.

Quantity	Units		
Length	1 m	3.28 ft.	39.37 in
Weight	1 kg	2.21 lb.	
Weight	1 g	0.035 ounces	
Pressure	1 bar	100 kPa	14.5 psi
Force	1 N	0.225 lbf	
Moment	1 Nm	0.738 lbf-ft	
Volume	1 L	0.264 US gal	

7.4 Screw joints

General

This section describes how to tighten the various types of screw joints on the IRB 260.

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

UNBRAKO screws

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

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

Gleitmo treated screws

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

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

Screws lubricated in other ways

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

In such cases, proceed as follows:

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

Lubricant	Article number
Molycote 1000 (molybdenum disulphide grease)	11712016-618

Tightening torque

Before tightening any screw, note the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard** torques are specified in the following tables. Any **special** torques are specified in the repair, maintenance or installation procedure descriptions. **Any special torque specified overrides the standard torque!**
- Use the *correct* tightening torque for each type of screw joint.
- Only use *correctly calibrated* torque keys.

Continues on next page

7 Reference information

7.4 Screw joints

Continued

- Always *tighten the joint by hand*, and never use pneumatic tools.
- Use the *correct tightening technique*, that is *do not jerk*. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is 10%!

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

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

Oil-lubricated screws with allen head screws

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

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

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

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

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

ⁱ Lubricated with Molykote 1000, Gleitmo 603 or equivalent

Continues on next page

Water and air connectors

The following table specifies the recommended standard tightening torque for *water and air connectors* when *one or both* connectors are made of *brass*. Any special torque specified in the repair, maintenance or installation procedure overrides the standard torque!

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

7 Reference information

7.5 Weight specifications

7.5 Weight specifications

Definition

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

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

Example

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

	Action	Note
	 CAUTION The robot weighs 340 kg. All lifting accessories used must be sized accordingly!	

7.6 Standard tools

General

All service (repairs, maintenance, and installation) procedures contains lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the following table.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

Contents, standard toolkit

Qty	Tool
1	Ring-open-end spanner 8-19 mm
1	Socket head cap 2.5-17 mm
1	Torx socket no: 20-60
1	Torque wrench 8-100 Nm
1	Small screwdriver
1	Plastic mallet
1	Ratchet head for torque wrench 1/2"
1	KM nut (KM7)
1	Socket head cap no: 5, socket 1/2" bit L 20 mm
1	Socket head cap no: 6, socket 1/2" bit L 20 mm
1	Socket head cap no: 8, socket 1/2" bit L 20 mm
1	Small cutting plier
1	T-handle with ball head

7 Reference information

7.7 Special tools

7.7 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 tools on page 229](#), 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 service procedures. The tools are also specified directly in concerned procedures for repair.

Item	Description	Art. no.	Note
-	Guide pins	3HAC024097-006	3 pcs required. Length: 62 mm. Diameter: 6 mm. Thread: M6x12. Used for guiding the shaft end of the upper arm into place.
-	Hydraulic pump, 80 Mpa	3HAC13086-1	
-	Press tool, parallel bar bearing	3HAB6324-1	
-	Mounting tool, parallel bar	3HAB6331-1	
-	Measuring tool, motor	3HAB7887-1	Used when refitting motor axes 1, 2 and 3.
-	Extended KM nut (KM7)	3HAC023963-040	Length: 135 mm.
-	Toolkit for service	3HAC023963-026	The kit contains loose parts that are assembled into different tools for different service occasions. The content is specified in the following table (Content, toolkit for service, 3HAC023963-026 on page 230). The different assemblies are shown in the figures on the following pages, as in the service procedures that require the tool assembly.
H	Press sleeve	3HAC023963-013	

Content, toolkit for service, 3HAC023963-026

The following table specifies the loose parts in the toolkit for service. The item numbers refer to the items shown in the figures for each assembly of the complete tools, on following pages.

Item	Description	Art. no.	Note
A	Hydraulic cylinder	3HAC11731-1	
B	Press washer	3HAC023963-007	
C	Hex socket head cap screw	9ADA183-25	2 pcs, M6 x 25
D	Connection rod	-	M16, length= 400 mm
E	Nut	3HAC5507-1	
F	Sleeve	3HAC023963-027	D= 70 mm

Continues on next page

Item	Description	Art. no.	Note
G	Nut	3HAC023963-028	D= 28 mm
H	Press sleeve	3HAC023963-038	D= 48.8 mm
I	Connection rod	3HAC025192-006	M16, length= 280 mm
J	Pad	3HAC023963-029	
K	Press washer	3HAC023963-014	D= 70 mm
L	Press head	3HAC023963-039	D= 55 mm
M	Sleeve	3HAC023963-037	D= 55 mm
N	Press sleeve	3HAC023963-015	D= 70 mm
O	Connecting rod	3HAC023081-003	Mxx, length= xx mm
P	Press housing	3HAC024097-002	
R	Auxiliary shaft	3HAC024097-005	
S	Hex socket head cap screw	9ADA183-24	2 pcs, M6 x 12
T	Distance	3HAC023062-001	

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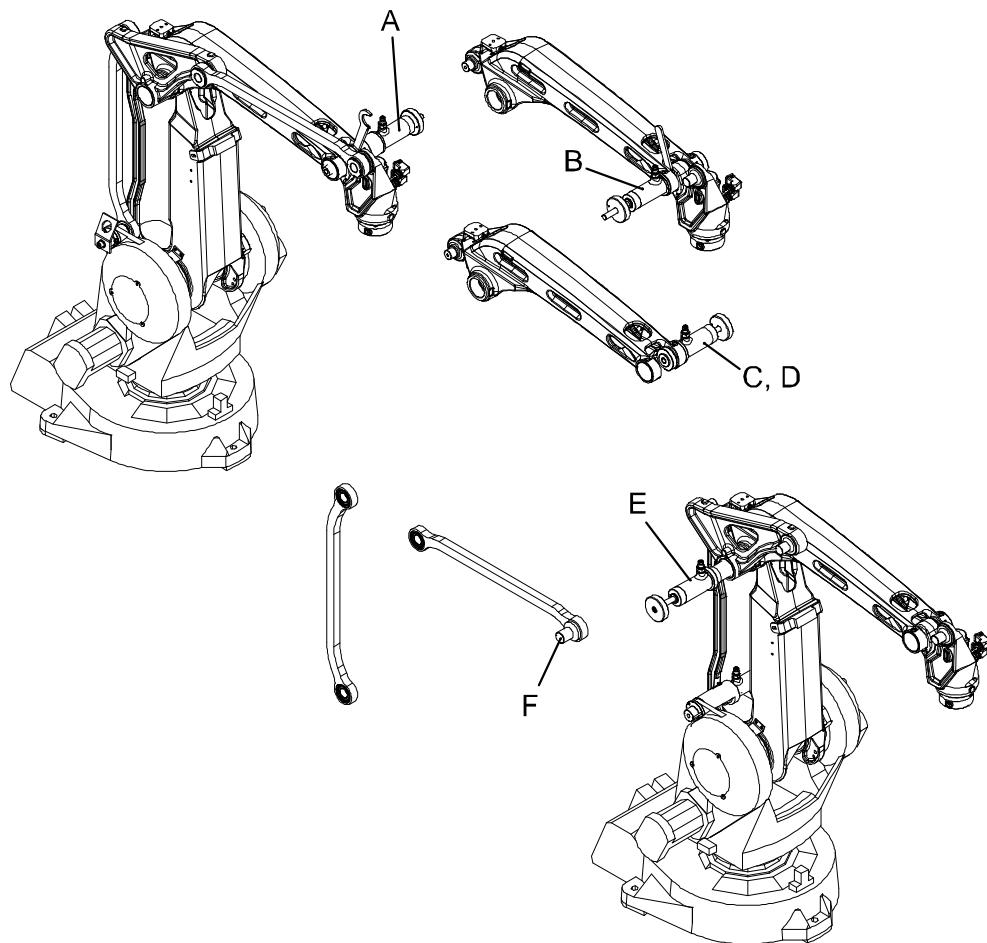
7 Reference information

7.7 Special tools

Continued

Special tools, location of usage

The toolkit for service includes loose parts that are assembled into different tools, depending on usage. The following figure shows some of the assembled tools and where to use them on the robot. The detailed assemblies are shown in separate figures, referred to in the item list.



xx0600002588

A	Dismantling tool, tilthouse shaft. Assembly is shown in the figure Dismantling tool, tilthouse shaft on page 233 .
B	Mounting tool, tilthouse shaft. Assembly is shown in the figure Mounting tool, tilthouse shaft on page 233 .
C	Mounting tool, bearing race and sealing, upper arm. Assembly is shown in the figure Mounting tool, bearing race and sealing, upper arm on page 234 .
D	Dismantling tool, bearing race, upper arm. Assembly is shown in the figure Dismantling tool, bearing race, upper arm on page 235 .
E	Press tool, link. Assembly is shown in the figure Press tool, link on page 238 .
F	Press sleeve, art. no. specified in the table Special tools on page 230 .

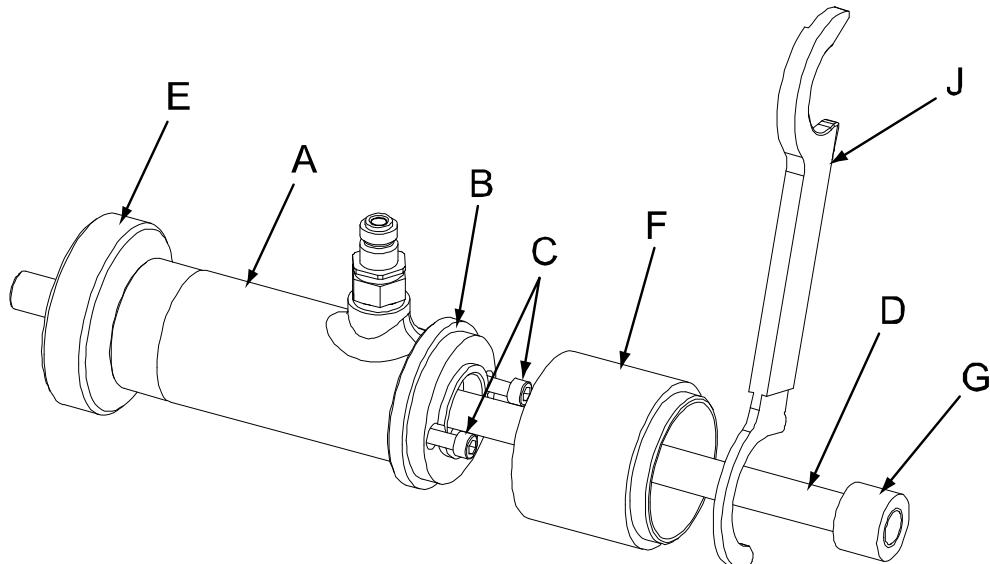
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Dismantling tool, tilthouse shaft

The tool for removing the tilthouse shaft from the tilthouse is assembled with the parts shown in the following figure (included in the toolkit for service).

**Note**

The parts cannot be ordered separately, but are included in the complete toolkit! The article numbers are only given for identification.



xx0600002589

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
D	Connection rod, M16, length= 400 mm
E	Nut, 3HAC5507-1
F	Sleeve, 3HAC023963-027
G	Nut, 3HAC023963-028
J	Pad, 3HAC023963-029

Mounting tool, tilthouse shaft

The tool for fitting the tilthouse shaft to the tilthouse is assembled with the parts shown in the following figure (included in the toolkit for service).

**Note**

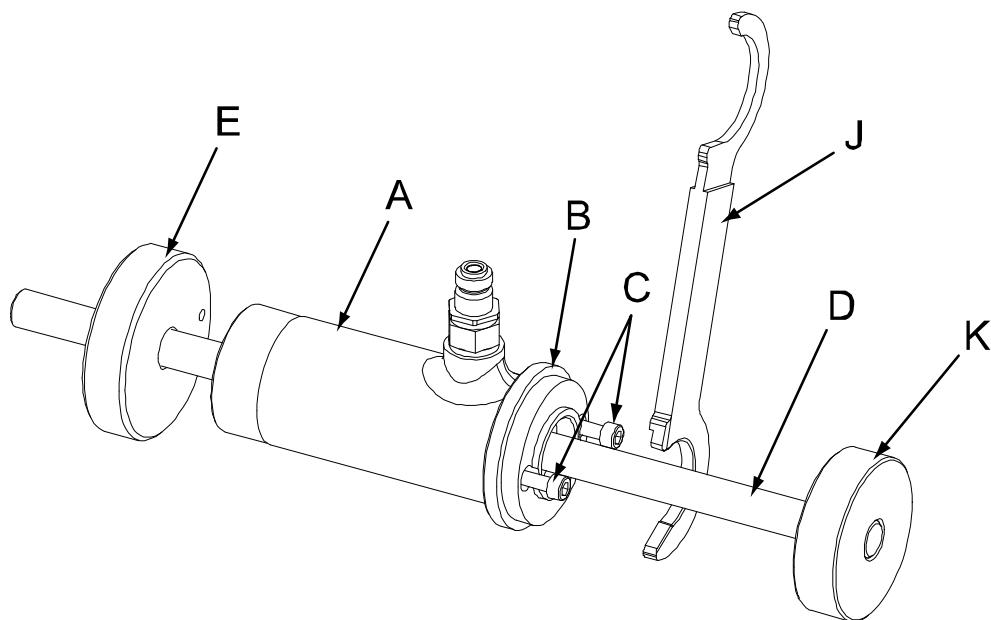
The parts cannot be ordered separately, but are included in the complete toolkit! The article numbers are only given for identification.

Continues on next page

7 Reference information

7.7 Special tools

Continued



xx0500002581

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
D	Connection rod, M16, length= 400 mm
E	Nut, 3HAC5507-1
J	Pad, 3HAC023963-029
K	Press washer, 3HAC023963-014

Mounting tool, bearing race and sealing, upper arm

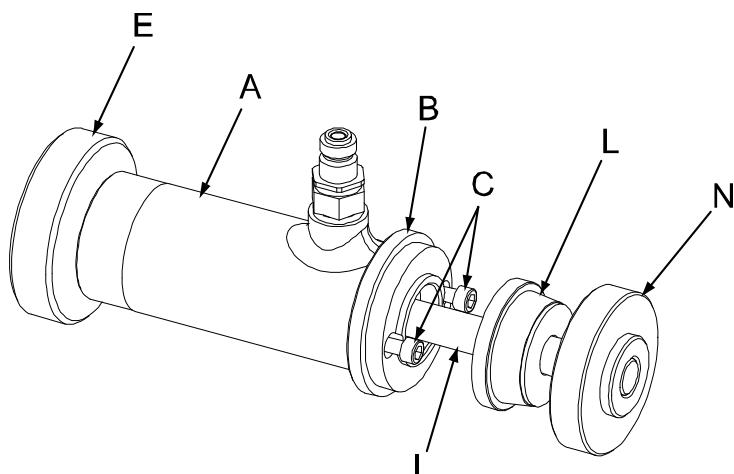
The tool for fitting the bearing race and sealing to the upper arm is assembled with the parts shown in the following figure (included in the toolkit for service).



Note

The parts cannot be ordered separately, but are included in the complete toolkit! The article numbers are only given for identification.

Continues on next page



xx0500002582

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
E	Nut, 3HAC5507-1
I	Connection rod, 3HAC025192-006
L	Press head, 3HAC023963-039
N	Press sleeve, 3HAC023963-015

Dismantling tool, bearing race, upper arm

The tool for removing the bearing race from the upper arm is assembled with the parts shown in the following figure (included in the toolkit for service).

**Note**

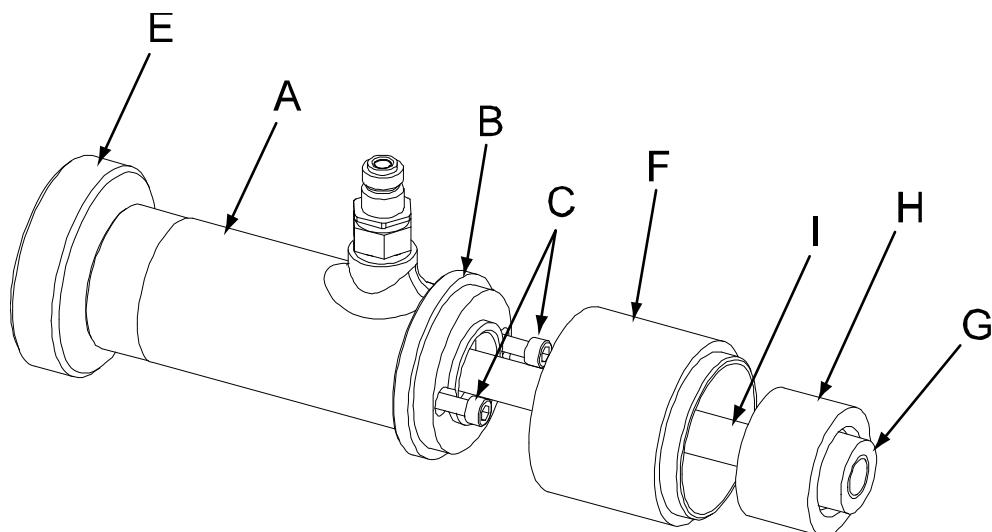
The parts cannot be ordered separately, but are included in the complete toolkit!
The article numbers are only given for identification.

Continues on next page

7 Reference information

7.7 Special tools

Continued



xx0600002656

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
E	Nut, 3HAC5507-1
F	Sleeve, 3HAC023963-027
G	Nut, 3HAC023963-028
H	Press sleeve, 3HAC023963-038
I	Connection rod, 3HAC025192-006

Dismantling tool, bearing race, tilthouse shaft

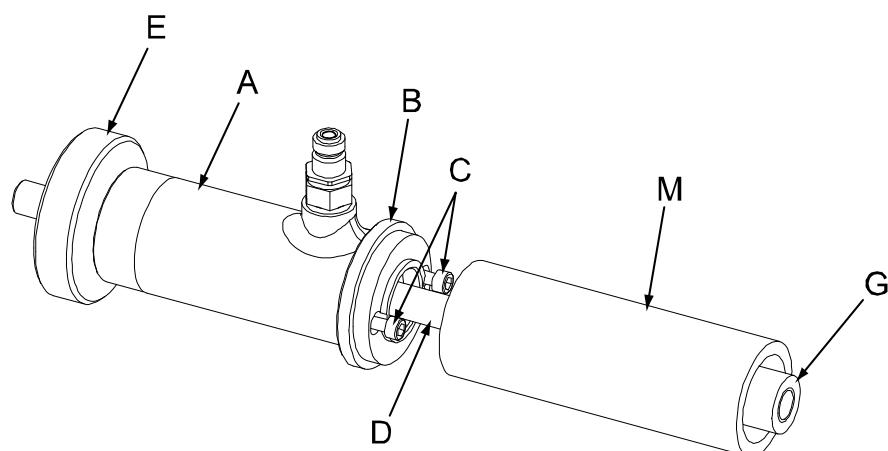
The tool for removing the bearing race from the tilthouse shaft is assembled with the parts shown in the following figure (included in the toolkit for service).



Note

The parts cannot be ordered separately, but are included in the complete toolkit!
The article numbers are only given for identification.

Continues on next page



xx0600002657

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
D	Connection rod, M16, length= 400 mm
E	Nut, 3HAC5507-1
G	Nut, 3HAC023963-028
M	Sleeve, 3HAC023963-037

Mounting tool, bearing race, tilthouse shaft

The tool for fitting a bearing race to the tilthouse shaft is assembled with the parts shown in the following figure (included in the toolkit for service).



Note

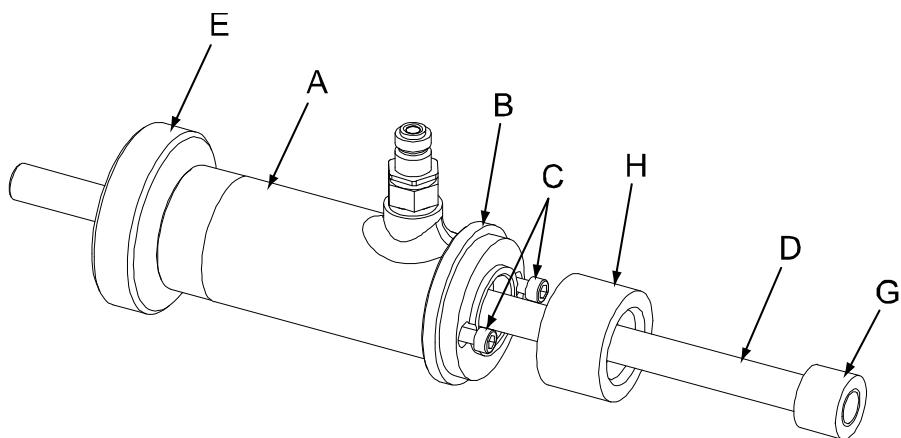
The parts cannot be ordered separately, but are included in the complete toolkit! The article numbers are only given for identification.

Continues on next page

7 Reference information

7.7 Special tools

Continued



xx0600002658

A	Hydraulic cylinder, 3HAC11731-1
B	Press washer, 3HAC023963-007
C	Hex socket head cap screw, 9ADA183-25, 2 pcs, M6 x 25
D	Connection rod, M16, length= 400 mm
E	Nut, 3HAC5507-1
G	Nut, 3HAC023963-028
H	Sleeve, 3HAC023963-037

Press tool, link

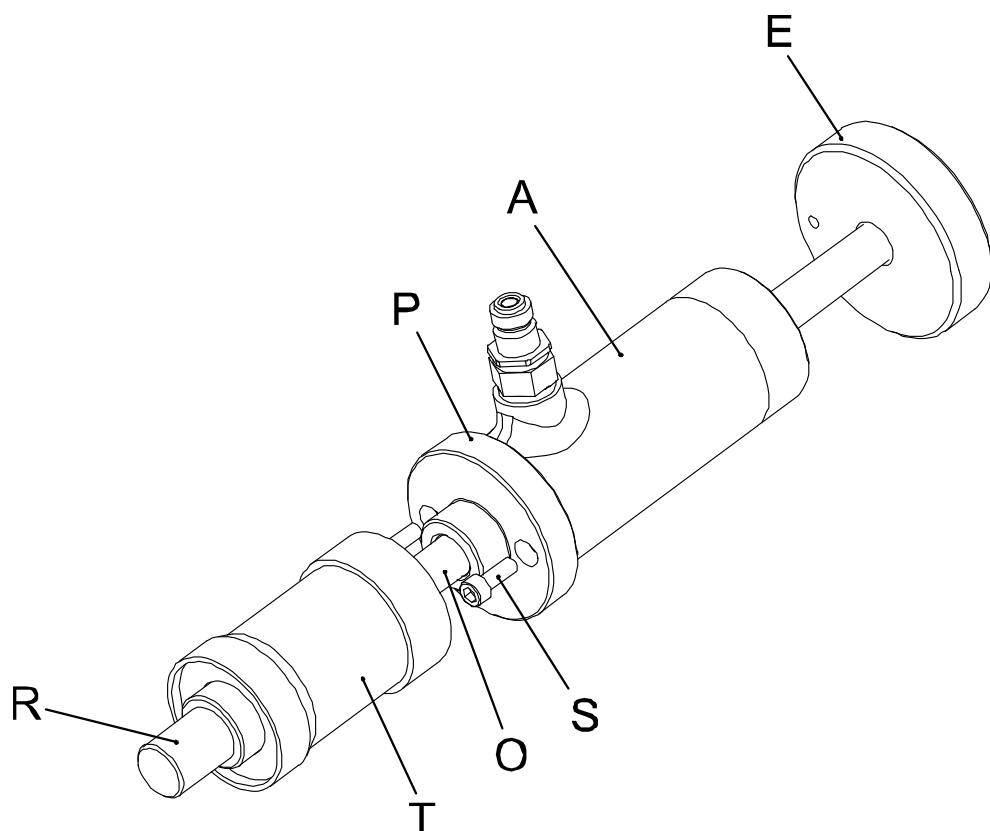
The tool for fitting the bearing and the link to the upper arm shaft includes the parts shown in the following figure (included in the toolkit for service).



Note

The parts cannot be ordered separately, but are included in the complete toolkit!
The article numbers are only given for identification.

Continues on next page



xx0600002618

A	Hydraulic cylinder, 3HAC11731-1
E	Nut, 3HAC5507-1
O	Connecting rod, 3HAC023081-003
P	Press housing, 3HAC024097-002
R	Auxiliary shaft, 3HAC024097-005
S	Screw, M6x12, 9ADA183-24 (2 pcs)
T	Distance, 3HAC023062-001

Calibration equipment, Calibration Pendulum

The following table specifies the calibration equipment needed when calibrating the robot with the Calibration Pendulum method.

Description	Art. no.	Note
Calibration Pendulum toolkit	3HAC15716-1	Complete kit that also includes operating manual.

7 Reference information

7.8 Lifting accessories and lifting instructions

General

Many repair and maintenance activities require different pieces of lifting accessories, which are specified in each procedure.

The use of each piece of lifting accessories is *not* detailed in the activity procedure, but in the instruction delivered with each piece of lifting accessories.

This implies that the instructions delivered with the lifting accessories should be stored for later reference.

8 Spare part lists

8.1 Spare part lists and illustrations

Location

Spare parts and exploded views are not included in the manual but delivered as a separate document on the documentation DVD.

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9 Circuit diagram

9.1 Circuit diagrams

Overview

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

Controllers

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

Robots

Product	Article numbers for circuit diagrams
<i>Circuit diagram - IRB 120</i>	<i>3HAC031408-003</i>
<i>Circuit diagram - IRB 140 type C</i>	<i>3HAC6816-3</i>
<i>Circuit diagram - IRB 260</i>	<i>3HAC025611-001</i>
<i>Circuit diagram - IRB 360</i>	<i>3HAC028647-009</i>
<i>Circuit diagram - IRB 460</i>	<i>3HAC036446-005</i>
<i>Circuit diagram - IRB 660</i>	<i>3HAC025691-001</i>
<i>Circuit diagram - IRB 760</i>	<i>3HAC025691-001</i>
<i>Circuit diagram - IRB 1200</i>	<i>3HAC046307-003</i>
<i>Circuit diagram - IRB 1410</i>	<i>3HAC2800-3</i>
<i>Circuit diagram - IRB 1600/1660</i>	<i>3HAC021351-003</i>
<i>Circuit diagram - IRB 1520</i>	<i>3HAC039498-007</i>
<i>Circuit diagram - IRB 2400</i>	<i>3HAC6670-3</i>
<i>Circuit diagram - IRB 2600</i>	<i>3HAC029570-007</i>
<i>Circuit diagram - IRB 4400/4450S</i>	<i>3HAC9821-1</i>
<i>Circuit diagram - IRB 4600</i>	<i>3HAC029038-003</i>
<i>Circuit diagram - IRB 6400RF</i>	<i>3HAC8935-1</i>
<i>Circuit diagram - IRB 6600 type A</i>	<i>3HAC13347-1 3HAC025744-001</i>
<i>Circuit diagram - IRB 6600 type B</i>	<i>3HAC13347-1 3HAC025744-001</i>
<i>Circuit diagram - IRB 6620</i>	<i>3HAC025090-001</i>

Continues on next page

9 Circuit diagram

9.1 Circuit diagrams

Continued

Product	Article numbers for circuit diagrams
<i>Circuit diagram - IRB 6620 / IRB 6620LX</i>	<i>3HAC025090-001</i>
<i>Circuit diagram - IRB 6640</i>	<i>3HAC025744-001</i>
<i>Circuit diagram - IRB 6650S</i>	<i>3HAC13347-1</i> <i>3HAC025744-001</i>
<i>Circuit diagram - IRB 6660</i>	<i>3HAC025744-001</i> <i>3HAC029940-001</i>
<i>Circuit diagram - IRB 6700</i>	<i>3HAC043446-005</i>
<i>Circuit diagram - IRB 7600</i>	<i>3HAC13347-1</i> <i>3HAC025744-001</i>
<i>Circuit diagram - IRB 14000</i>	<i>3HAC050778-003</i>
<i>Circuit diagram - IRB 910SC</i>	<i>3HAC056159-002</i>

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