



Product manual

IRC5

Trace back information:

Workspace R17-1 version a7

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**Product manual
IRC5
Design 14**

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Overview of this manual

About this manual

This manual contains instructions for:

- installing the controller, mechanically as well as electrically.
- maintenance of the controller.
- mechanical and electrical repair of the controller.

Usage

This manual should be used during:

- installation and preparation work.
- 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.

References

Reference	Document ID
<i>Operating manual - Emergency safety information</i>	3HAC027098-001
<i>Operating manual - IRC5 with FlexPendant</i>	3HAC050941-001
<i>Operating manual - RobotStudio</i>	3HAC032104-001
<i>Operating manual - Getting started, IRC5 and RobotStudio</i>	3HAC027097-001
<i>Operating manual - Trouble shooting IRC5</i>	3HAC020738-001
<i>Application manual - MultiMove</i>	3HAC050961-001
<i>Application manual - Force Control</i>	3HAC050377-001
<i>Application manual - SafeMove</i>	3HAC050974-001
<i>Application manual - Electronic Position Switches</i>	3HAC050996-001
<i>Application manual - Functional safety and SafeMove</i>	3HAC052610-001
<i>Technical reference manual - RAPID Instructions, Functions and Data types</i>	3HAC050917-001
<i>Technical reference manual - System parameters</i>	3HAC050948-001
See Circuit diagrams on page 311 .	

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Overview of this manual

Continued



Note

The document numbers that are listed for software documents are valid for RobotWare 6. Equivalent documents are available for RobotWare 5.

Revisions

Revision	Description
-	<p>First edition. Released with the new computer unit, DSQC1000.</p>
A	<ul style="list-style-type: none">Added information on how to replace the fan in the computer unit, see Replacement of fan in computer unit on page 228.Corrected the spare parts list for controller system parts, see Controller parts on page 295.Added information on how to install an additional drive module, see Installation of additional Drive Module on page 160.Added information on how to install an additional drive unit, see Installation of additional drive units on page 153.Added the IRB 1520 manipulator cables to the spare parts list, see Manipulator cables on page 300.
B	<ul style="list-style-type: none">Added the MultiMove switch to the spare parts list, see Controller parts on page 295.Article numbers for manipulator cables, IRB 120 added, see Manipulator cables on page 300.Article number for DeviceNet Slave (DSQC 1004) changed. See Definition of fieldbuses, IRC5 on page 106Added information about labels on the controller, see Safety symbols on controller labels on page 30.Minor corrections.
C	<ul style="list-style-type: none">New computer unit, DSQC1018, with two PCI slots and no knockout plates. No functional change, but affects illustrations.Added new section, Additional cables on page 309, with drive module cables.Added section Process module on page 161.Clarified the use of the WAN port in section Connectors on the computer unit on page 64.
D	<ul style="list-style-type: none">Some changes on how the ports can be configured and used is described in section Connectors on the computer unit on page 64.
E	<p>Release 15.2.</p> <ul style="list-style-type: none">Minor corrections.Added safety-related information to sections CAUTION - Make sure that all mode selector keys are kept safe on page 40, Installation of external enabling device on page 116, Function tests on page 184, and Refurbish.Updates in section Applicable standards on page 288.Added section Safety data on page 24.Added section Replacement of sensors for the drive system fans on page 259. Also some information about the temperature sensors when replacing MDU and drive system fans.Updated picture and table of cables to the hot plug connector in section Installation of the option Hot plug on page 123.System fan removed

Continues on next page

Revision	Description
F	Release 16.1.
	<ul style="list-style-type: none"> • Added IRB 1200 and 8700 to lists of robots in different places in the manual. • Changed recommended line fusing for some robots at low voltage. • Added section <i>Installation of drive system fans with temperature sensors on page 164</i>. • Simplified procedure in section <i>Replacement of fieldbus adapter in the computer unit on page 223</i>.
G	Release 16.1/RW 6.03.
	<ul style="list-style-type: none"> • Caution about routing cables added in <i>General on page 56</i>. • Section <i>Connection of drive module on page 89</i> added. • Added section <i>Installing the Safety module DSQC1015 for SafeMove on page 141</i>.
H	Release 16.2.
	<ul style="list-style-type: none"> • Added information that function tests should be performed after replacing a component. • Changes in the article names for some spare parts. • Updated cable list with revised option numbers in section <i>Cables customer power/customer signal on page 306</i>. • Removed section <i>Refurbish</i>. • Minor corrections.
J	Release 17.1.
	<ul style="list-style-type: none"> • Added sections <i>Function test of reduced speed control on page 195</i>, and <i>Recover from emergency stops on page 41</i>. • Updated descriptions of stops in section <i>Protective stop and emergency stop on page 19</i>. • Updated section <i>Safety data on page 24</i>. • Updated list of labels in section <i>Safety symbols on controller labels on page 30</i>. • New computer unit DSQC1024 is introduced, see <i>Computer unit parts on page 298</i>. • Added limitation about SafeMove in section <i>Connection of Drive Module Disconnect, by limit switch on page 90</i>. • Minor corrections.

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*

Network security

Network security

This product is designed to be connected to and to communicate information and data via a network interface. It is your sole responsibility to provide and continuously ensure a secure connection between the product and to your network or any other network (as the case may be). You shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Ltd and its entities are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

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 or installation work on the controller. These are applicable for all service work and are found in section [General safety information on page 16](#).
- Safety signals and symbols shown in the manual and on the controller, warning for different types of dangers, are found in [Safety signals and symbols on page 28](#).
- Specific safety information, pointed out in the procedure at the moment of the danger. How to avoid and eliminate the danger is either detailed directly in the procedure, or further detailed in separate instructions, found in section [Safety related instructions on page 34](#).

1 Safety

1.2.1 Introduction to general safety information

1.2 General safety information

1.2.1 Introduction to general safety information

Definitions

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

Sections

The general safety information is divided into the following sections.

Section	Examples of content
<i>Safety in the manipulator system on page 17</i>	This section describes the following: <ul style="list-style-type: none">• safety, service• limitation of liability• related information
<i>Protective stop and emergency stop on page 19</i>	This section describes protective stop and emergency stop.
<i>Safety risks on page 21</i>	This section lists dangers relevant when working with the product. The dangers are split into different categories. <ul style="list-style-type: none">• safety risks during installation or service• risks associated with live electrical parts
<i>Safety actions on page 23</i>	This section describes actions which may be taken to remedy or avoid dangers. <ul style="list-style-type: none">• fire extinguishing• safe use of the teach pendant or jogging device

1.2.2 Safety in the manipulator system

Validity and responsibility

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

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

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

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

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

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

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

Connection of external safety devices

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

Limitation of liability

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

Related information

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

Continues on next page

1 Safety

1.2.2 Safety in the manipulator system

Continued

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

1.2.3 Protective stop and emergency stop

Overview

Protective stops and emergency stops are defined by standards IEC 60204-1:2005 and EN ISO 10218-1:2011.

Stops can be in *category 0* or *category 1*.

Stop category 0	As defined in IEC 60204, stopping by immediate removal of power to the machine actuators (i.e. an uncontrolled stop. In IRC5 this is implemented by removing power immediately in the drive units.)
Stop category 1	As defined in IEC 60204, a controlled stop with power available to the machine actuators to achieve the stop and then removal of power when the stop is achieved. In IRC5 this is implemented by removing power in the drive units after about 1 second using the servos to stop the machine.

Inputs to initiate a protective stop or an emergency stop

There are several safety inputs available to initiate a protective stop or an emergency stop. All these safety inputs are of structure category 3 as described in EN ISO 13849-1.

These safety inputs will initiate a stop of category 0 or category 1.

Safety inputs to initiate a stop	Description
Protective stop in automatic mode	The safety input <i>Automatic Stop</i> is only operational in automatic mode. The default configuration is stop category 1.
Protective stop in automatic and manual mode	There are two safety inputs to initiate a protective stop in both automatic and manual mode. It is the safety input <i>General Stop</i> and the safety input <i>Superior Stop</i> . The default configuration is stop category 1.
Emergency stop	The <i>Emergency Stop</i> is operational in both automatic and manual mode. The default configuration is stop category 0.

To modify the configuration of the stop category, see *Technical reference manual - System parameters*.

Protective stop

Protective stops are activated through the dedicated safety inputs *Automatic Stop*, *General Stop*, and *Superior Stop*, on the controller. For example, the protective inputs are connected to safety outputs of presence sensing devices. This is to provide safeguarding.

See *Installation and commissioning* in *Product manual - IRC5*.

Continues on next page

1 Safety

1.2.3 Protective stop and emergency stop

Continued

Emergency stop

The emergency stop function shall not be applied as a substitute for safeguarding measures and other safety functions but should be designed for use as a complementary protective measure. (See ISO 13850.)



Note

Emergency stop must not be used for protective stop or program stop as this causes extra, unnecessary wear on the robot.

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

Depending on selected options for the robot, the number of emergency stops can vary. See documentation for the robot and the complete machine.

Other methods to stop the robot

There are also other methods to stop the robot. See:

- *Installation and commissioning* in *Product manual - IRC5*
- *Technical reference manual - System parameters*
- *Technical reference manual - RAPID Instructions, Functions and Data types*.

1.2.4 Safety risks

1.2.4.1 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.

Continues on next page

1 Safety

1.2.4.1 Risks associated with live electric parts

Continued

- The external voltage connected to the controller remains live even when the robot is disconnected from the mains.
- Additional connections.

Voltage related risks, robot

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

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

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

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

1.2.5 Safety actions

1.2.5.1 Fire extinguishing



Note

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

1 Safety

1.2.6 Safety data

1.2.6 Safety data

About this section

This chapter describes the necessary safety data required by standard EN ISO 13849-1:2008.

Prevailing directives and standards

For the use of industrial robots and how to protect personnel from being injured, special regulations must be fulfilled as described in the following directives and standards:

- Machinery Directive 2006/42/EC
- EN ISO 10218-1:2011
- EN ISO 13849-1:2008

In addition to these standards covering general machinery safety, a number of more specialized standards referred to as normative, must also be fulfilled. See EN ISO 10218-1 chapter *Normative references*.

Performance level and category

EN ISO 13849-1, which is a B-standard, describes the general concept of performance level (PL) and category. Each machine or machinery is potentially dangerous and can cause personal injury. Based on severity of injury and probability of accident, when using the machine, a certain level of safety performance, so called required performance level (PL_r) can be defined, where *level a* represents the lowest risk and *level e* the highest. According to this, the machine must be equipped with safety related parts, meeting the required performance level, to reduce the risk to accepted low level. As specified in EN ISO 10218-1, normally PL d is required for robots, but depending on the applications a higher requirement could be needed if a risk analysis will result in PL e.

To comply with a certain PL_r, in this case d, the safety related parts of the robots and controllers must be structurally designed according to specific structure categories and using reliable components.

In EN ISO 13849-1 it is in detail specified what category and components data, which must be met, to fulfill PL d. These are:

- Category 3, which is normally fulfilled using double channels
- MTTF_D (Mean Time To dangerous Failure) – high
- DC (Diagnostic Coverage) – low or medium
- CCF (Common Cause Failures) – better than 65 scores according to Annex F

Performance level for ABB IRC5 controller

To verify that robots and controller comply with at least PL d a self assessment has been carried out and documented in a *Technical Report*. The essential conclusions are accounted for below.

Continues on next page

The safety related parts of robot and controller are e.g. the following stop circuits:

- Enabling device
- Emergency stop on operator panel
- Emergency stop on FlexPendant
- Limiting robot motion
- Protective stops
- SafeMove
- EPS
- SafeMove2

For the overall design and structure, the category 3 has been verified and meeting the requirements of CCF.

Each of the stop circuits includes different components like enabling switch, panel board, contactor board, relays etc. For each of these the MTTF_D and DC have been calculated according to EN ISO 13849-1 Annex C, D and E resulting in the values as specified in the following table.

See the SISTEMA/ABB FSDT libraries for details of the safety functions.

IRC5 Single and IRC5 Panel Mounted Controller

Safety function	Calculated MTTF _D [years]	DC _{avg}
Emergency stop inputs	112	Medium
Automatic stop input	120	Medium
General stop input	120	Medium
Superior stop input	120	Medium
Limiting switch input (without customer connection)	176	Medium
Three-position enabling device inputs	75	Medium
Emergency stop status outputs	263	Medium
ISafeMove (option) (without customer connections)	58	Medium
Electronic Position Switches (option) (without customer connections)	105	Medium
SafeMove2 functions (option)		
Protective stop category 0	93	Medium
Protective stop category 1	370	Low
Emergency stop category 0	93	Medium
Emergency stop category 1	370	Low
Emergency stop safe fieldbus output	370	Low
Speed supervision category 0	93	Medium
Speed supervision category 1	370	Low
Speed supervision safe fieldbus output	370	Low
Position supervision category 0	93	Medium

Continues on next page

1 Safety

1.2.6 Safety data

Continued

Safety function	Calculated MTTF _D [years]	DC _{avg}
Position supervision category 1	370	Low
Position supervision safe fieldbus output	370	Low
External power control	88	Low

Based on the values from the previous table of MTTF_D values, the corresponding PFH_D can be calculated using the Annex K, table K1 of EN ISO 13849-1:2008.

These are shown in the following table.

IRC5 Single and IRC5 Panel Mounted Controller

Stop circuit	Calculated PFH _D	PL
Emergency stop inputs	4.29x10E-08	e
Automatic stop input	4.29x10E-08	e
General stop input	4.29x10E-08	e
Superior stop input	4.29x10E-08	e
Limiting switch input (without customer connection)	4.29x10E-08	e
Three-position enabling device inputs	6.62x10E-08	e
Emergency stop status outputs	4.29x10E-08	e
SafeMove (option) (without customer connections)	1.03x10E-07	d
Electronic Position Switches (option)	4.29x10E-08	e
SafeMove2 functions (option)		
Protective stop category 0	4.94x10E-08	e
Protective stop category 1	1.01x10E-07	d
Emergency stop category 0	4.94x10E-08	e
Emergency stop category 1	1.01x10E-07	d
Emergency stop safe fieldbus output	1.01x10E-07	d
Speed supervision category 0	4.94x10E-08	e
Speed supervision category 1	1.01x10E-07	d
Speed supervision safe fieldbus output	1.01x10E-07	d
Position supervision category 0	4.94x10E-08	e
Position supervision category 1	1.01x10E-07	d
Position supervision safe fieldbus output	1.01x10E-07	d
External power control	1.35x10E-07	d

Conclusion according to EN ISO 13849-1:2008

The IRC5 controller safety system has a safety category 3 with performance level PL d according to EN ISO 13849-1:2008 using the simplified method of chapter 4.5.4 of EN ISO 13849-1:2008 and thus fulfills the safety performance requirement of the robot safety standard EN ISO 10218-1:2008.

Continues on next page

The *Common Cause Failure* (CCF) is met according to the standard requirements.

1 Safety

1.3.1 Safety signals in the manual

1.3 Safety signals and symbols

1.3.1 Safety signals in the manual

Introduction to safety signals

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

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

Danger levels

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

Symbol	Designation	Significance
 xx0200000022	DANGER	Warns that an accident <i>will</i> occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, and so on.
 xx0100000002	WARNING	Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
 xx0200000024	ELECTRICAL SHOCK	Warns for electrical hazards which could result in severe personal injury or death.
 xx0100000003	CAUTION	Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment where there is a risk of damaging the product or causing a breakdown.
 xx0200000023	ELECTROSTATIC DISCHARGE (ESD)	Warns for electrostatic hazards which could result in severe damage to the product.

Continues on next page

1.3.1 Safety signals in the manual

Continued

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

1 Safety

1.3.2 Safety symbols on controller labels

1.3.2 Safety symbols on controller labels

Introduction to labels

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

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

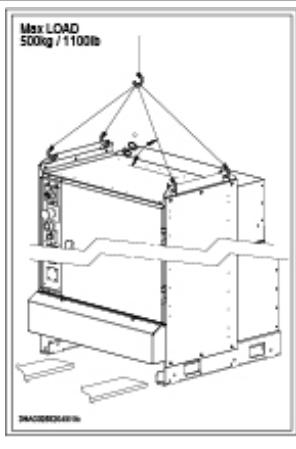
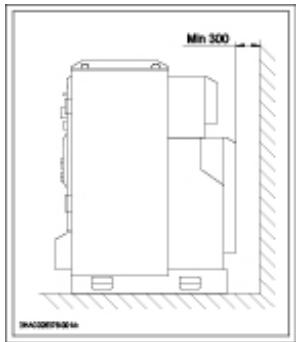
Symbols on safety labels

Label	Description
 xx1400001151	Electrical shock
 xx1400001162	ESD sensitive components inside the controller.
 xx1400001161	Disconnect power supply before servicing the controller.
 xx1400001160	Disconnect power supply before servicing the controller (only for welding equipment).
 xx1700000354	Disconnect power supply before servicing the controller (for controllers without UL mains switch).

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1.3.2 Safety symbols on controller labels

Continued

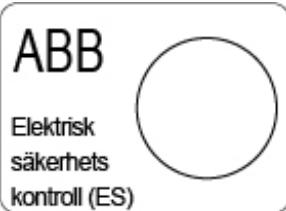
Label	Description
 xx1400001156	High voltage inside the module even if the main switch is in the OFF position.
 xx1400001157	Lifting instruction for the IRC5 controller.
 xx1400001155	Required installation space.
 xx1400001154	QR code for <i>ABB Basic Care</i> service agreement.

Continues on next page

1 Safety

1.3.2 Safety symbols on controller labels

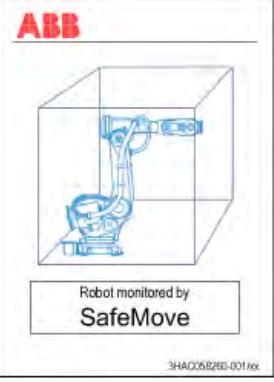
Continued

Label	Description
 xx1400001152	Read the user manual before servicing.
 xx1400001158	Electrical safety check of the robot system (internal).
 xx1400001159	Functional test of the robot system (internal).
 xx1400001163	Rating label
 xx1400002060	UR certified (component)

Continues on next page

1.3.2 Safety symbols on controller labels

Continued

Label	Description
 xx1400002061	UL certified (robot with controller)
 xx1700000355	SafeMove label (for <i>SafeMove Basic</i> and <i>SafeMove Advanced</i> software).
 xx1700000353	Safety UL label (for the <i>Functional Safety</i> solution together with UL mark).

1 Safety

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

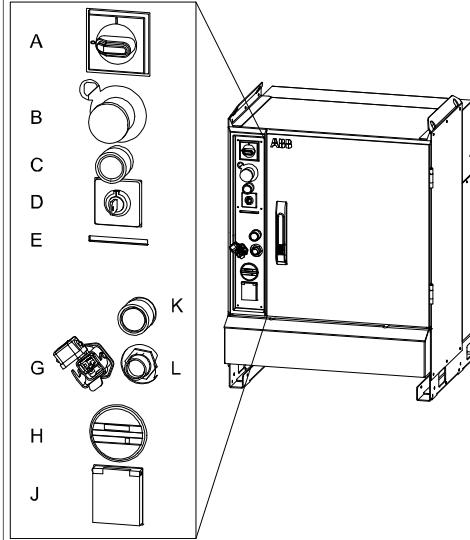
1.4 Safety related instructions

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

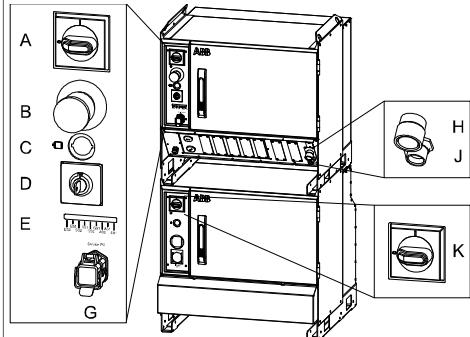
Description

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

Elimination, IRC5 Single Cabinet Controller

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

Elimination, IRC5 Dual Cabinet Controller

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

1.4.2 WARNING - The unit is sensitive to ESD!

1.4.2 WARNING - The unit is sensitive to ESD!

Description

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

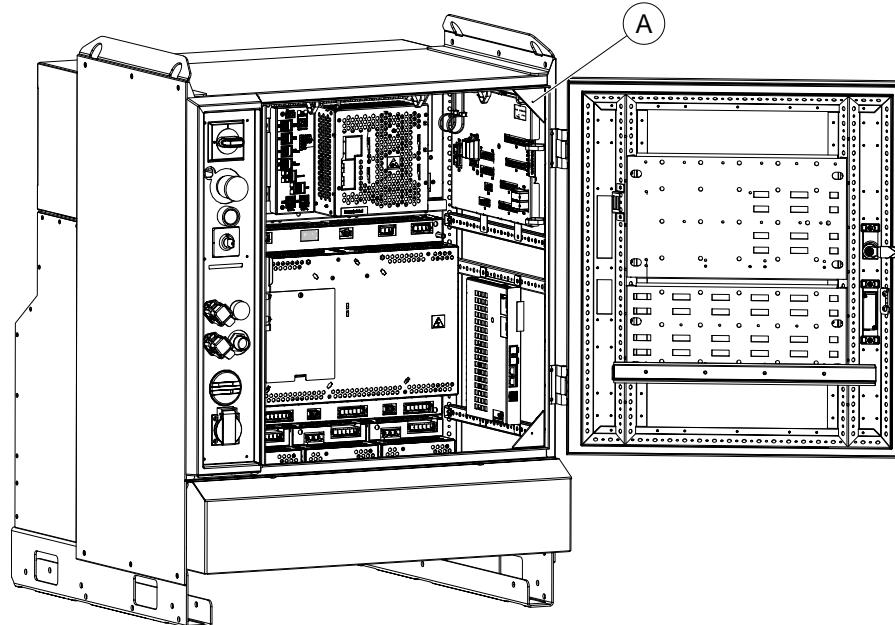
Elimination

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

Location of wrist strap button

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

IRC5



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

1 Safety

1.4.3 CAUTION - Never stand on or use the cabinet as a ladder

1.4.3 CAUTION - Never stand on or use the cabinet as a ladder

Description

To avoid personal injury or damaging the product, it is never allowed to stand on the cabinet. Nor is it allowed to use the cabinet as a ladder.

1.4.4 CAUTION - Make sure that there are no loose screws or turnings

Description

To avoid damaging the product, make sure that there are no loose screws, turnings or other parts inside the cabinet after work has been performed.

1 Safety

1.4.5 CAUTION - Close the cabinet door

Description

The cabinet door must be closed properly when the robot system is in production. If a door is not properly closed, the cabinet does not comply with the protection class IP54. The shield for Electro Magnetic Compatibility is also affected if the door is not properly closed.



Note

To comply with IP54 all openings to the controller cabinet must be covered. This includes unconnected connectors which must be fitted with covers.

1.4.6 CAUTION - Hot components in controller

Description

Units and heat sinks are HOT after running the robot!

Touching the units and heat sinks may result in burns!

With higher environment temperature more surfaces on the controller get HOT and may result in burns.

1 Safety

1.4.7 CAUTION - Make sure that all mode selector keys are kept safe

1.4.7 CAUTION - Make sure that all mode selector keys are kept safe

Description

The key for the mode selector on the IRC5 controller is standard designed to work with all mode switches on all IRC5 controllers. It is the responsibility of the robot system owner to make sure that all keys only are accessible to authorized personnel, to prevent misuse.

1.4.8 Recover from emergency stops

Overview

Recovering from an emergency stop is a simple but important procedure. This procedure ensures that the robot system is not returned to production while maintaining a hazardous condition.

Reset the latch of emergency stop buttons

All push-button style emergency stop devices have a latching feature that must be released in order to remove the emergency stop condition of the device.

In many cases this is done by twisting the push-button as marked, but there are also devices where you pull the button to release the latch.

Reset automatic emergency stop devices

All automatic emergency stop devices also have some kind of latching feature that must be released. Consult your plant or cell documentation to see how your robot system is configured.

Recover from emergency stops

	Action
1	Make sure the hazardous situation that resulted in the emergency stop condition no longer exists.
2	Locate and reset the device or devices that gave the emergency stop condition.
3	Press the Motors On button to recover from the emergency stop condition.

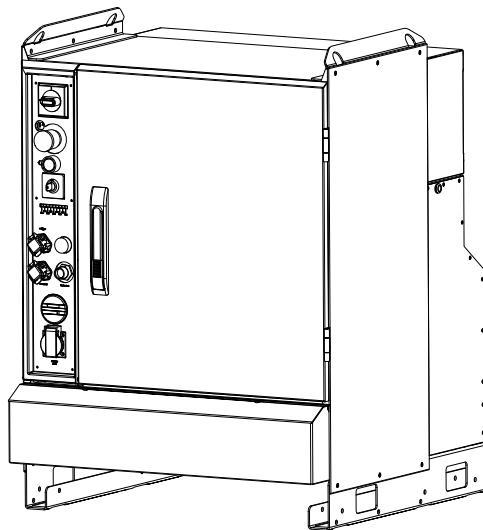
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2 Installation and commissioning

2.1 Overview

General

The ABB IRC5 controller has all components in one cabinet.



xx1300000607



Note

When replacing a unit in the controller, report the following data to ABB, for both the replaced unit and the replacement unit:

- the serial number
- article number
- revision

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

2 Installation and commissioning

2.2 Installation activities

2.2 Installation activities

Prerequisites

The following section details the main steps on how to unload, transport, install, and connect the IRC5 controller

Installing the controller

	Action	Detailed in
1	Unpack the IRC5 controller.	How to lift, unpack and transport the IRC5 controller is detailed in section Lifting the controller cabinet on page 45 and Unpacking the controller on page 46
2	Install the IRC5 Controller.	Bolting down the controller on page 49
3	Connect the manipulator to the IRC5 controller.	Connecting the manipulator to the controller on page 74
4	Connect power supply to the IRC5 controller.	Connecting power supply to the controller on page 69
5	Connect the FlexPendant to the IRC5 controller.	Connecting a FlexPendant on page 60
6	Miscellaneous connections.	How to connect MOTORS ON/MOTORS OFF circuits is detailed in section The MOTORS ON/MOTORS OFF circuit on page 80 . How to connect to an external safety relay is detailed in Connection of external safety relay on page 86 . How to connect buses, for example DeviceNet, is detailed in the respective application manual. How to connect I/O units to the IRC5 controller is detailed in section Installation of I/O, Gateways and encoder interface units, IRC5 on page 118 . How to connect a PC to the controller is described in manual Operating manual - RobotStudio . How to connect to a network is detailed in section Connectors on the computer unit on page 64 .
7	Install add-ons (optional).	Installation of add-ons on page 112

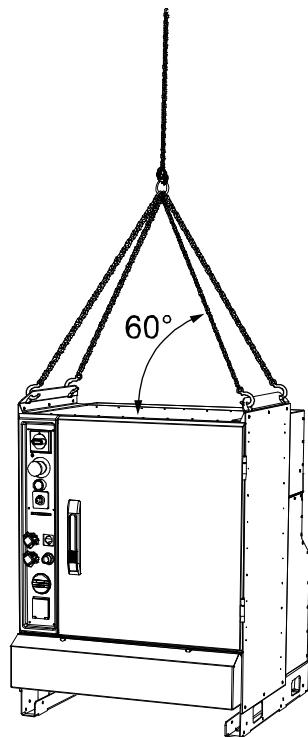
2.3 Transporting and handling

2.3.1 Lifting the controller cabinet

Lifting device

Use the two lifting eyes or a fork lift when lifting the IRC5 controller, as shown below.

The following figure shows the maximum angle between the lifting straps when lifting the controller. The weight of the controller module is detailed in section [Unpacking the controller on page 46](#).



xx0500001847

2 Installation and commissioning

2.3.2 Unpacking the controller

2.3.2 Unpacking the controller

General

Before unpacking and installing the robot system, read the safety regulations and other instructions very carefully. These are found in Chapter [Safety on page 15](#).

The installation must be done by qualified installation personnel and should conform to all national and local codes.

When unpacking the controller, check that it was not damaged during transport.



Note

If the controller is going to be stored before unpacking and installation, read the following information regarding storage conditions.

Storage conditions

The table below shows the recommended storage conditions for the IRC5 controller:

Parameter	Value
Min. ambient temperature	-25°C (-13°F)
Max. ambient temperature	+55°C (+131°F)
Max. ambient temperature (short periods, max 24 h)	+70°C (+158°F)
Max. ambient humidity	Maximum 95% at constant temperature.

After storage, the operating conditions must be met for at least 4 hours before switching on the controller (see [Operating conditions on page 46](#) below).

Operating conditions

The table below shows the allowed operating conditions for the IRC5 controller:

Parameter	Value
Min. ambient temperature	0°C (32°F)
Max. ambient temperature	+45°C (113°F)
Max. ambient temperature (option)	+52°C (125.6°F)
Max. ambient humidity	Maximum 95% at constant temperature.

Weight of controller

The table below shows the weight for the IRC5 controller:

Controller	Part	Weight
IRC5	Complete controller	max. 150 kg
	Extra drive module	100-130 kg

Continues on next page

Protection class

The table below shows the protection classes for the IRC5 controller and the FlexPendant:

Equipment	Protection class
IRC5 controller electronics	IP54
IRC5 controller air cooling ducts	IP33
FlexPendant	IP54

2 Installation and commissioning

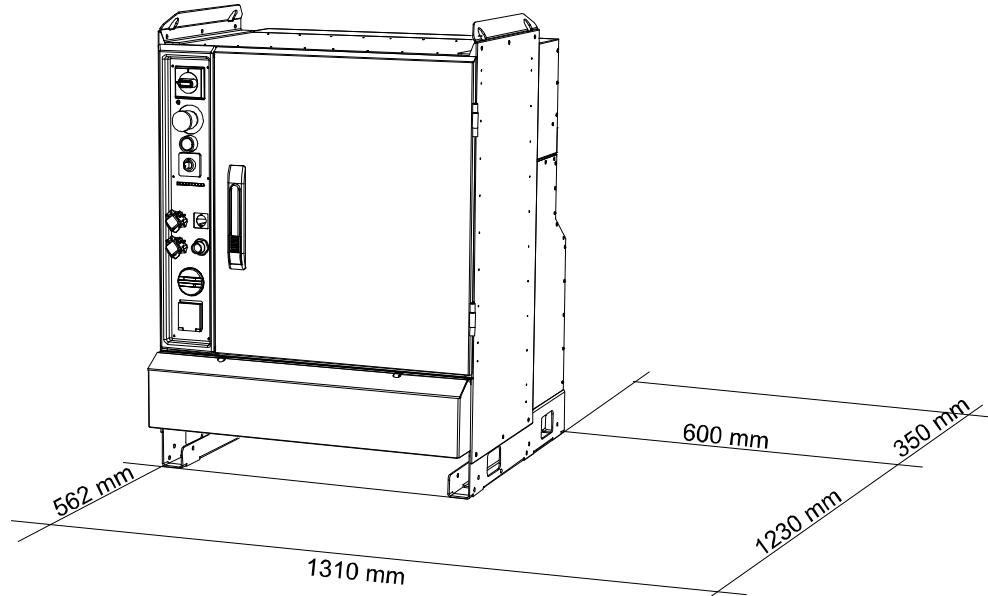
2.4.1 Required installation space, IRC5 Controller

2.4 On-site installation

2.4.1 Required installation space, IRC5 Controller

Dimensions

The figure below shows the required installation space for the IRC5 controller.



xx0500001848



Note

The free space on the right hand side of the controller is required to allow opening the door a full 180° and to access the optional moist dust filter.



Note

The air distance 300 mm on the back of the controller is required to allow inspection and replacement of the optional moist dust filter and ensure proper cooling.



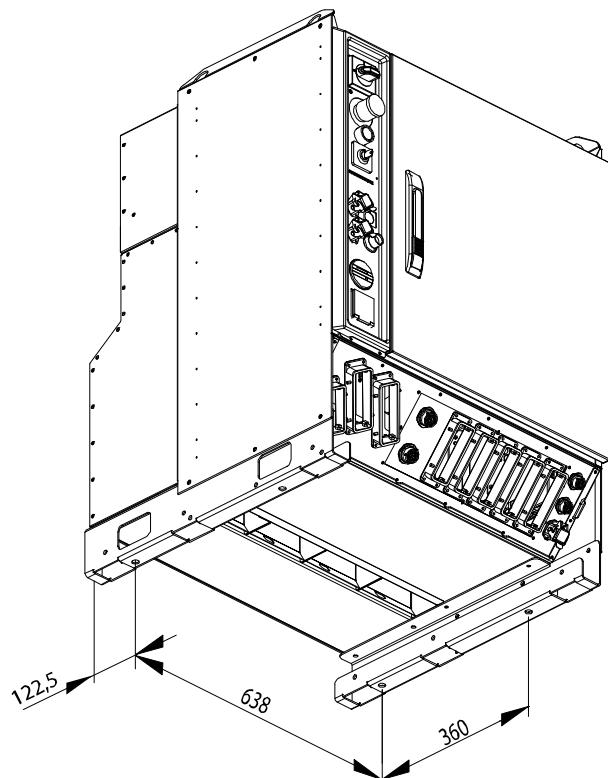
Note

Do not place customer cables over the moist dust filters on the back of the controller. This makes it difficult to inspect and replace the moist dust filters.

2.4.2 Bolting down the controller

Bolt pattern

The figure below shows the bolt pattern for the IRC5 controller. The diameter of the four bolt holes are 14 mm.



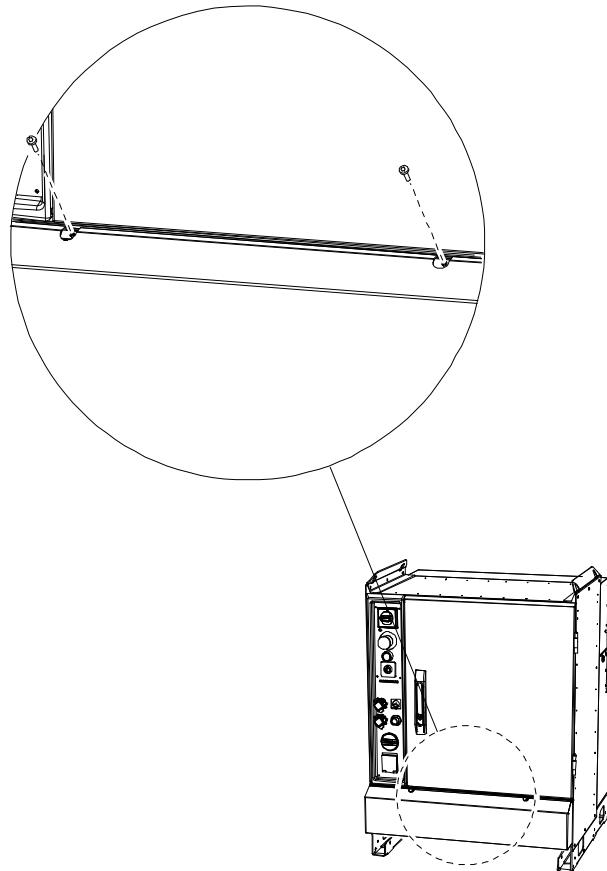
2 Installation and commissioning

2.4.3 Transportation screws

2.4.3 Transportation screws

General

During transportation the connector cover is secured with two screws. The two screws must be removed before removal of the plate and connection of cables. The screws are located as shown in the illustration below.

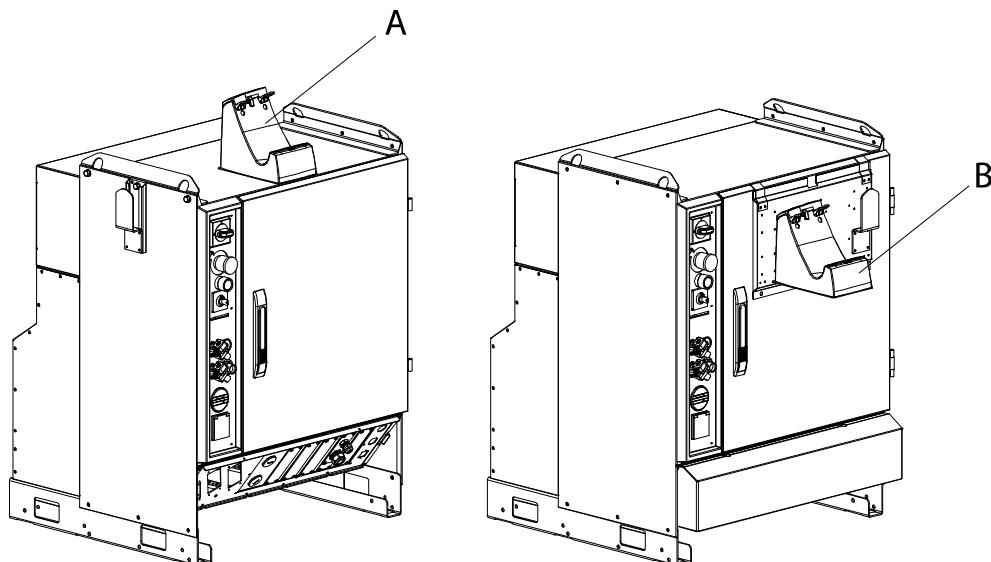


xx0500002038

2.4.4 Mounting the FlexPendant holder

Location

The placement of the FlexPendant holder is shown in the illustration below.



xx0500002542

A	FlexPendant holder mounted on top of the control cabinet.
B	FlexPendant holder mounted on the control cabinet door.



Note

In order to avoid drop of the FlexPendant from high levels, the location of the FlexPendant holder on top of the control cabinet is recommended only with one single cabinet without additional drive modules. Otherwise according to location on the control cabinet door.

Required equipment

Equipment	Note
Standard tool kit	The contents are defined in section, Standard toolkit, IRC5 on page 293
FlexPendant holder	For spare parts, see Miscellaneous parts on page 299 .

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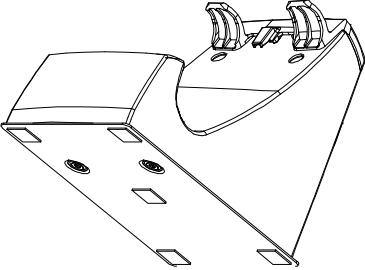
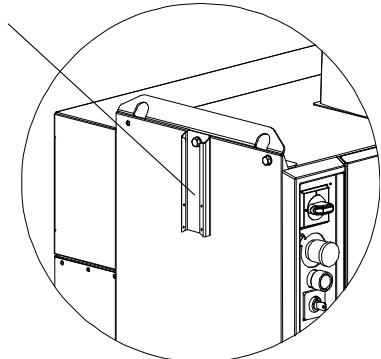
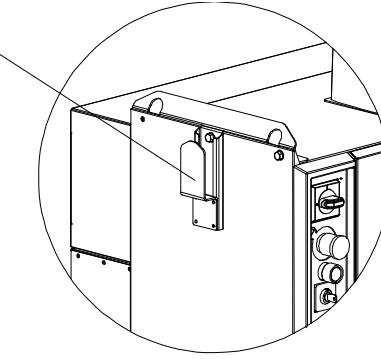
2 Installation and commissioning

2.4.4 Mounting the FlexPendant holder

Continued

Procedure - On top of the control cabinet

The following procedure details how to mount the FlexPendant holder on top of the control cabinet.

Action	Note/illustration
1 Remove the protective liner from the tape.	 xx0500002546
2 Press the mounting plate with FlexPendant holder against the top of the control cabinet.  Note The surface must be clean and dry.	
3 Mount the cable bracket holder on the side of the cabinet. Use one of the existing M8 screws.	 xx0700000240 • A: Cable bracket holder
4 Mount the cable bracket on the cable bracket holder using enclosed Fastite screws (4 pcs).	 xx0700000241 • A: Cable bracket

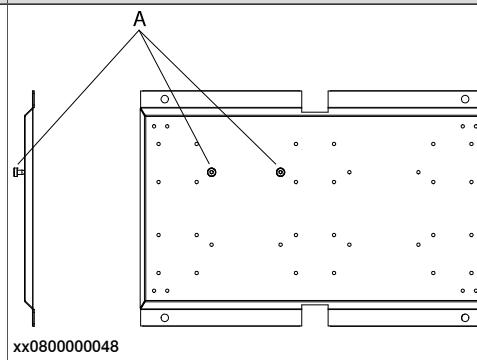
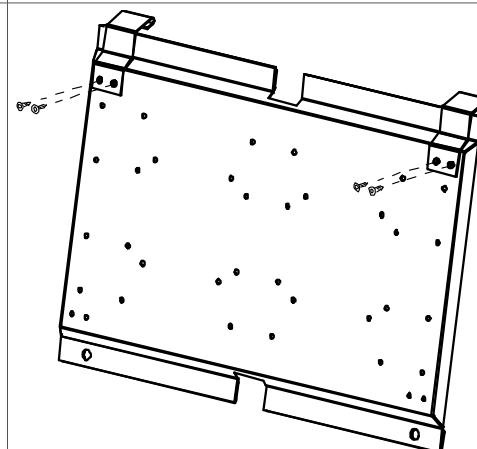
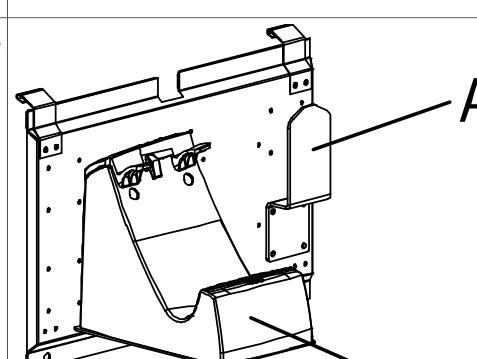
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2.4.4 Mounting the FlexPendant holder

Continued

Procedure - On the control cabinet door

The following procedure details how to mount the FlexPendant holder on the control cabinet door.

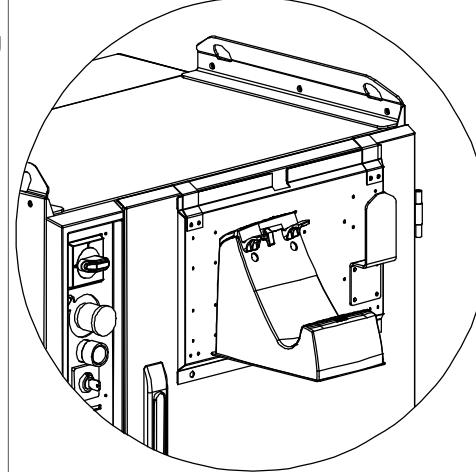
Action	Note/Illustration
1 At assembly of FlexPendant holder on the mounting plate start with fasten the Fastite screws (2 pcs) to the mounting plate.	 <ul style="list-style-type: none"> A: Fastite screw (2 pcs)
2 Fasten the two hooks on the mounting plate with two Fastite screws for each hook.	
3 Mount the FlexPendant holder and cable bracket to the mounting plate with the enclosed Fastite screws (6 pcs).	 <ul style="list-style-type: none"> A: Cable bracket B: FlexPendant holder
4 Make sure the surface of the cabinet door is clean and dry.	
5 Remove the protective liner from the tape on the mounting plate.	

Continues on next page

2 Installation and commissioning

2.4.4 Mounting the FlexPendant holder

Continued

Action	Note/Illustration
6 Hitch the hooks around the top of the cabinet door and then press the mounting plate against the door.	 <p>xx0700000243</p>

2.5 Connections

2.5.1 Connectors on the controller

General

The following section describes the connectors on the front panel of the IRC5 controller.

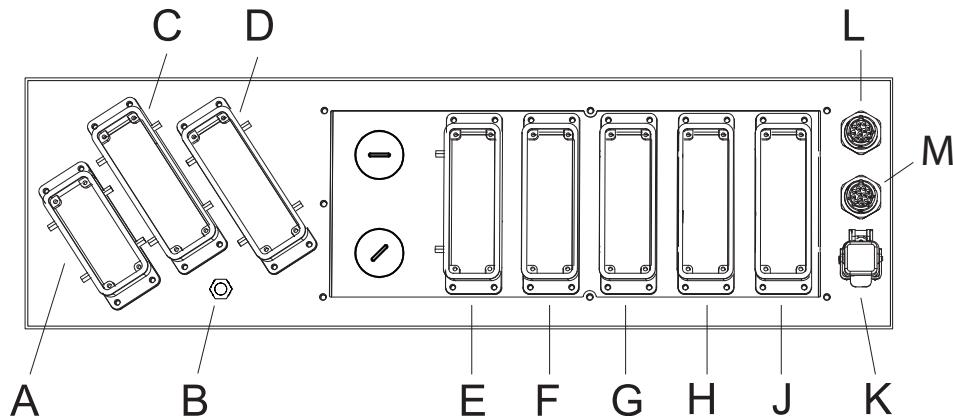


CAUTION

Always inspect the connector for dirt or damage before connecting it to the controller. Clean or replace any damaged parts.

Connectors

The following details the connection interface on the IRC5 controller.



xx0500001852

	Description
A	XP.0 Mains connection
B	Earth connection point
C	XS.1 Robot power connection
D	XS.7 Additional axes power connection
E	XS.13/XS.5 Customer power/signals external connection
F	XS.10 Customer options
G	XS.11 Customer options
H	XS.12 Customer options
J	X3 Customer safety signals
K	XS.28 Network connection
L	XS.41 Additional axes SMB connection
M	XS.2 Robot SMB connection

2 Installation and commissioning

2.5.2 Connecting cables to the controller

General

This section includes important information on how to connect cables and signals to the controller.

Signal classes

Different rules apply to the different classes when selecting and laying cables. Signals from different classes must not be mixed.

Signal class	Description
Power signals	Supplies external motors and brakes.
Control signals	Digital operating and data signals (digital I/O, protective stop, etc.).
Measuring signals	Analog measuring and control signals (resolver and analog I/O).
Data communication signals	Gateway (fieldbus) connection, computer link.

Selecting cables

All cables laid in the control cabinet must be capable of withstanding 70 °C. In addition, the following rules apply to the cables of certain signal classes:

Signal class	Cable type
Power signals	Shielded cable with an area of at least 0.75 mm ² or AWG 18.
Control signals	Shielded cable.
Measuring signals	Shielded cable with twisted pair conductors.
Data communication signals	Shielded cable with twisted pair conductors. A specific cable should be used for field bus connections and Ethernet, according to the standard specification of the respective bus.



Note

Any local standards and regulations concerning insulation and area must always be complied with.

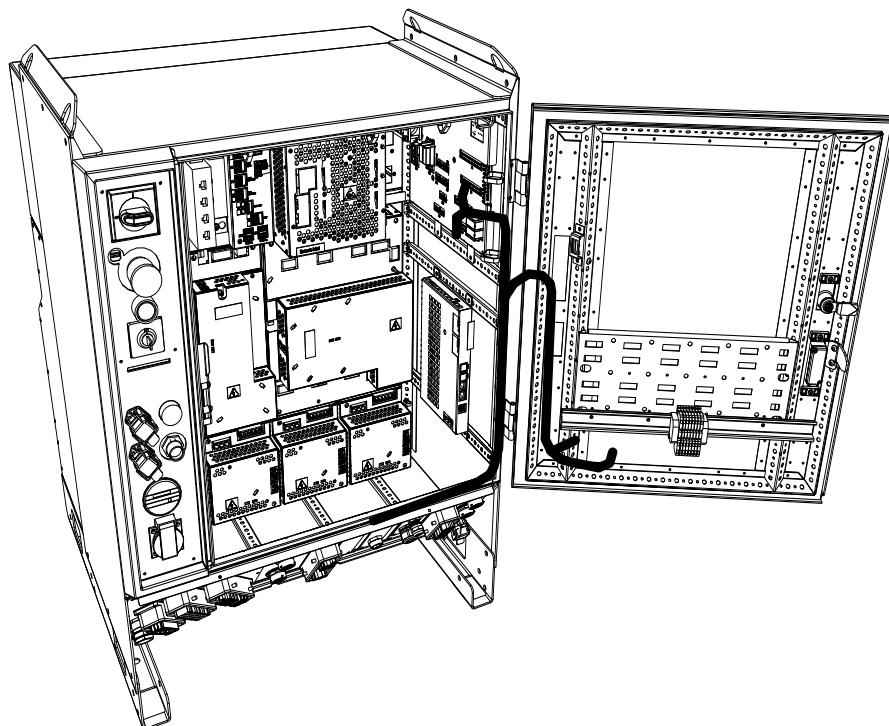
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Route the cables

Cables of different types such as signal cables and power cables must not be routed together as the power cables may introduce noise in the signal cable. When crossing signals of different types it must be done at right angles.

All external cables that are to be connected inside the controller must be shielded in the chassis before entering the cabinet.

All signals that are sensitive to interference should be routed and strapped along the right side of the controller cabinet according to the image.



xx1300000853

Signal class	Cable type
Power signals	<ul style="list-style-type: none">These signals generate a lot of interference and must be laid separate from control, measuring, and communication signals.The shielding must be connected to a paint-free part of the panel chassis of the cabinet at both ends of the cable. Any unshielded cable must be as short as possible.The manipulator power cables are routed on the floor and along the left side of the controller cabinet.Cables should not be wound up like coils. This could cause an electrical field disturbing the signals.
Control signals	
Measuring signals	
Data communication signals	<ul style="list-style-type: none">These signals are very sensitive to interference. To protect these signals they should not be laid along with the power signals.In the cable, each signal must be twisted with a neutral wire.The shielding must be connected directly to the chassis at both ends of the cable.

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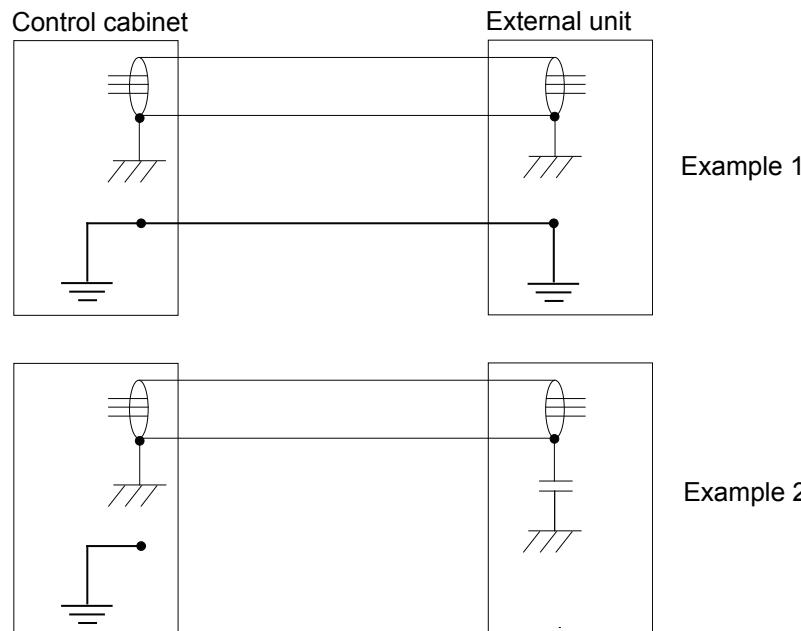
2 Installation and commissioning

2.5.2 Connecting cables to the controller

Continued

Ground and screen connections

The following figure shows 2 examples on how the ground and the signal cable screens can be connected:



xx1200000960

Example 1

Where a good ground is available on all units, the best shielding is obtained by grounding all screens at both ends on all units.

Example 2

If the cable is terminated where a good ground is not available a noise suppression capacitor can be used. The screens of the 2 cables must be connected as shown in the figure, but not connected to the chassis of the unit.

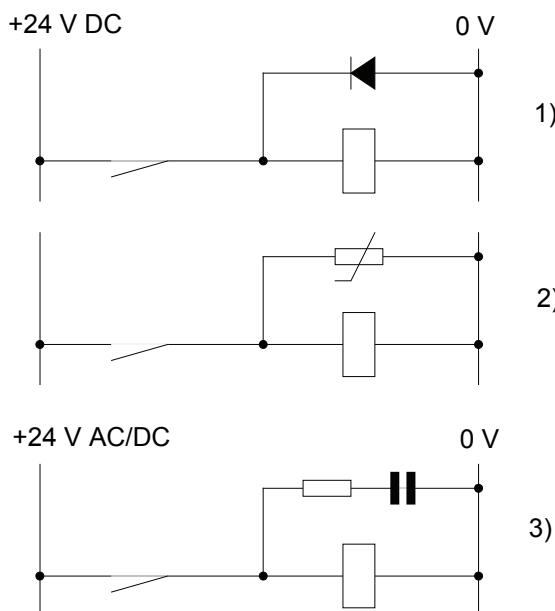
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Interference elimination

Internal relay coils and other units that can generate interference inside the control cabinet are neutralized. External relay coils, solenoids and other units must be clamped in a similar way. The illustration below shows how this can be done.

Note that the turn-off time for DC relays increases after neutralization, especially if a diode is connected across the coil. Varistors give shorter turn-off times.

Neutralizing the coils lengthens the life of the switches that control them.



xx1200000961

- 1 The diode should be dimensioned for the same current as the relay coil, and a voltage of twice the supply voltage.
- 2 The varistor should be dimensioned for the same energy as the relay coil, and a voltage of twice the supply voltage.
- 3 When AC voltage is used, the components needs to be dimensioned for >500 V max voltage and 125 V nominal voltage.
The resistor should be 100 Ω, and the capacitor should be 1W 0.1 - 1 μF (typically 0.47 μF).

2 Installation and commissioning

2.5.3 Connecting a FlexPendant

2.5.3 Connecting a FlexPendant

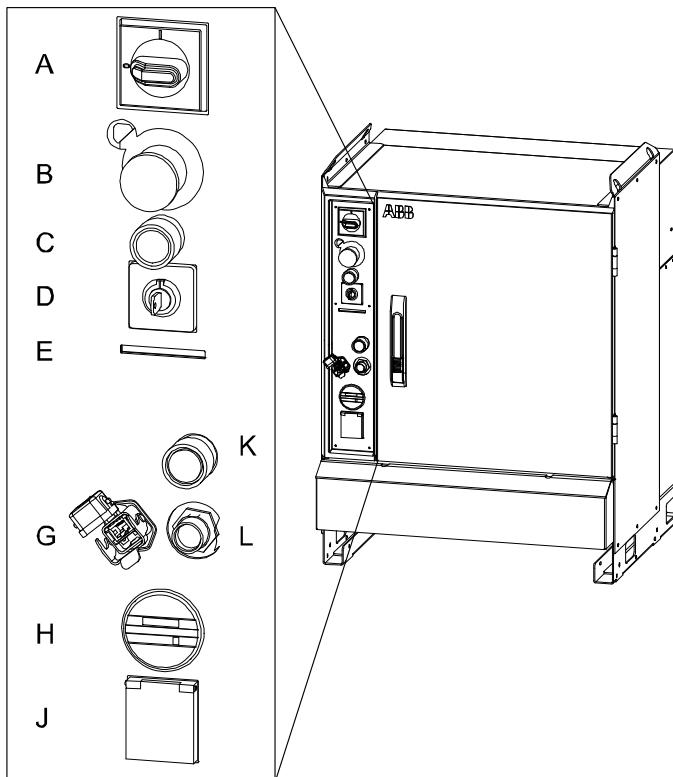
Location of FlexPendant connector

The FlexPendant connector on the IRC5 controller is located on the operator's panel on the controller, or on an external operator's panel.



CAUTION

Always inspect the connector for dirt or damage before connecting it to the controller. Clean or replace any damaged parts.



xx0600002782

L	FlexPendant connector (A22.X1)
---	--------------------------------

Connecting a FlexPendant

	Action	Information
1	Locate the FlexPendant socket connector on the controller or operator's panel.	The controller must be in manual mode. If your system has the option Hot plug, then you can also disconnect in auto mode. See section Using the hot plug option on page 61 .
2	Plug in the FlexPendant cable connector.	
3	Screw the connector lock ring firmly by turning it clockwise.	

2.5.4 Using the hot plug option

Hot plug option

The hot plug option makes it possible to:

- Disconnect the FlexPendant from a system in automatic mode and thereby run the system without a FlexPendant connected.
- Temporarily connect and operate a FlexPendant without interrupting the application running on the system.



WARNING

Pressing the hot plug button disables the emergency stop button on the FlexPendant. Only press the hot plug button while connecting or disconnecting the FlexPendant.



WARNING

A disconnected FlexPendant must always be stored separated from the IRC5 controller!

Connect and disconnect the FlexPendant using the hot plug button

The following procedure describes how to connect or disconnect the FlexPendant on a system in automatic mode using the hot plug button option.



Note

Do not switch to manual mode (or manual full speed mode) while the system is running without the FlexPendant. The FlexPendant must be connected when you switch to automatic mode otherwise you cannot confirm the mode change.

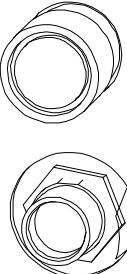
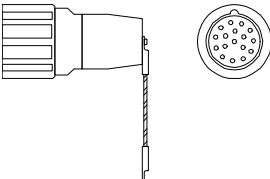
	Action	Information
1	Make sure that the system is in automatic mode.	
2	Press and hold the hot plug button.	A red lamp inside the button indicates when pressed.

Continues on next page

2 Installation and commissioning

2.5.4 Using the hot plug option

Continued

Action	Information
3 Keep pressing the hot plug button and at the same time, switch the jumper plug with the FlexPendant plug.	 A B xx0600002784 A: Hot plug button B: FlexPendant connector  xx0600002796 Jumper plug
4 Release the hot plug button.	Make sure that the button is not stuck in the actuated position since this disables the FlexPendant emergency stop button.



Note

When the FlexPendant is disconnected, the jumper plug must be connected in its place.



Note

If the hot plug button is released while neither the jumper plug, nor the FlexPendant is connected, the robot movements will be stopped since the emergency stop chains are opened.

Limitations for messages on the FlexPendant

When using the hot plug option, the following limitations apply to messages on the FlexPendant:

Operator messages

Some applications may require input from the operator by using the FlexPendant (e.g. applications using RAPID instructions TPReadNum, UIMsgBox, etc.). If the application encounters such an operator message, program execution will wait. After connecting the FlexPendant you must then stop and start the program execution to be able to see and respond to these messages. They are not displayed automatically by just connecting the FlexPendant.

If possible, avoid using these types of instructions when programming systems that are using the hot plug button option.

Continues on next page

Event log messages

When connecting the FlexPendant, event log messages can be viewed also for the period when the FlexPendant was disconnected, since these are stored on the controller.

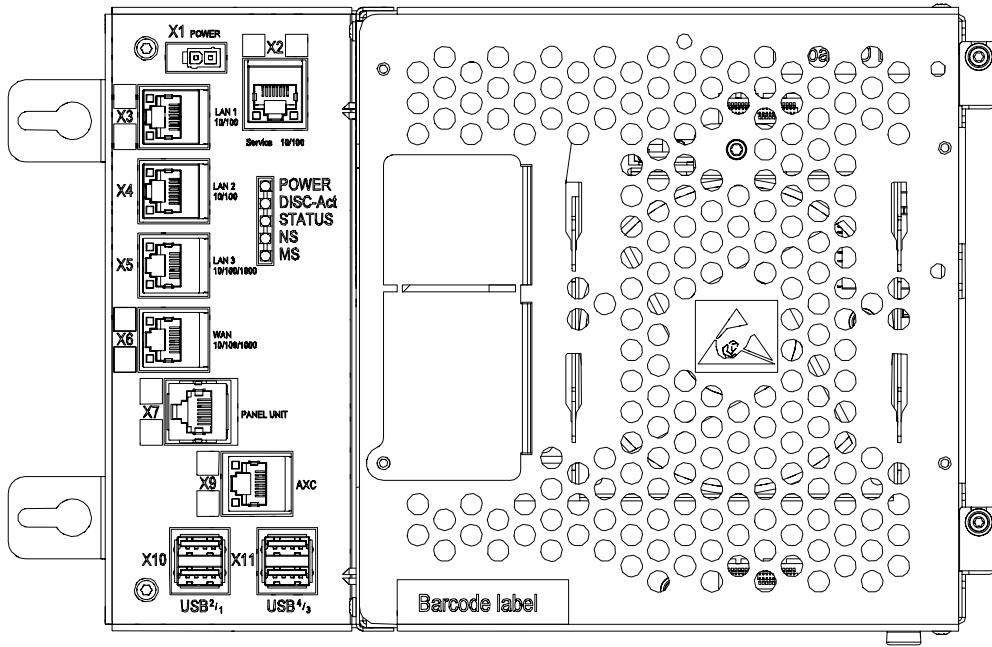
2 Installation and commissioning

2.5.5 Connectors on the computer unit

2.5.5 Connectors on the computer unit

Overview of the computer unit

The following illustration shows an overview of the computer unit.



xx1300000608

X1	Power supply
X2 (yellow)	Service (connection of PC).
X3 (green)	LAN1 (connection of FlexPendant).
X4	LAN2 (connection of Ethernet based options).
X5	LAN3 (connection of Ethernet based options).
X6	WAN (connection to factory WAN).
X7 (blue)	Panel unit
X9 (red)	Axis computer
X10, X11	USB ports (4 ports)



Note

It is not supported to connect multiple ports of the main computer (X2 - X6) to the same external switch, unless static VLAN isolation is applied on the external switch.

Service port

The service port is intended for service engineers and programmers connecting directly to the controller with a PC.

Continues on next page

The service port is configured with a fixed IP-address, which is the same for all controllers and cannot be changed, and has a DHCP server that automatically assigns an IP-address to the connected PC.



Note

For more information about connecting a PC to the service port, see section *Working online* in *Operating manual - RobotStudio*.

WAN port

The WAN port is a public network interface to the controller, typically connected to the factory network with a public IP address provided by the network administrator.

The WAN port can be configured with fixed IP-address, or DHCP, from the **Boot application** on the FlexPendant. By default the IP-address is blank.

Some network services, like FTP and RobotStudio, are enabled by default. Other services are enabled by the respective RobotWare application.



Note

The WAN port cannot use any of the following IP-addresses which are allocated for other functions on the IRC5 controller:

- 192.168.125.0 - 255
- 192.168.126.0 - 255
- 192.168.127.0 - 255
- 192.168.128.0 - 255
- 192.168.129.0 - 255
- 192.168.130.0 - 255

The WAN port cannot be on a subnet which overlaps with any of the above reserved IP-addresses. If a subnet mask in the class B range has to be used, then a private address of class B must be used to avoid any overlapping. Please contact your local network administrator regarding network overlapping.

See the section about topic *Communication* in *Technical reference manual - System parameters*.



Note

For more information about connecting a PC to the WAN port, see section *Working online* in *Operating manual - RobotStudio*.

LAN ports

The LAN 1 port is dedicated for connecting the FlexPendant.

The LAN 2 and LAN 3 ports are intended for connecting network based process equipment to the controller. For example field buses, cameras, and welding equipment.

Continues on next page

2 Installation and commissioning

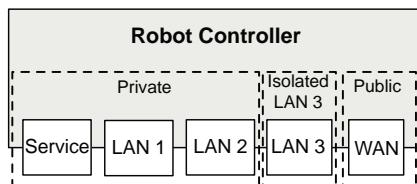
2.5.5 Connectors on the computer unit

Continued

LAN 2 can only be used as private network to the IRC5 controller.

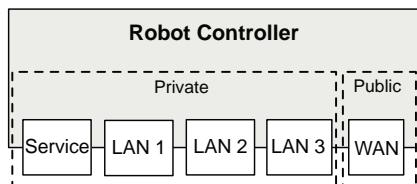
Isolated LAN 3 or LAN 3 as part of the private network (only for RobotWare 6.01 and later)

The default configuration is that LAN 3 is configured as an isolated network. This allows LAN 3 to be connected to an external network, including other robot controllers. The isolated LAN 3 network has the same address limitations as the WAN network.



xx1500000393

An alternative configuration is that LAN 3 is part of the private network. The ports Service, LAN 1, LAN 2, and LAN 3 then belong to the same network and act just as different ports on the same switch. This is configured by changing the system parameter *Interface*, in topic *Communication* and type *Static VLAN*, from "LAN 3" to "LAN". See *Technical reference manual - System parameters*.



xx1500000394



Note

For more information and examples of connecting to different networks, see *Application manual - EtherNet/IP Scanner/Adapter* or *Application manual - PROFINET Controller/Device*.

USB ports

The USB ports are intended for connecting USB memory devices.



Note

It is recommended to use the USB ports USB¹ and USB² on the X10 connector for connecting USB memory devices.

The USB ports on the X11 connector are intended for internal use.

2.5.6 Connecting a serial channel to the controller

General

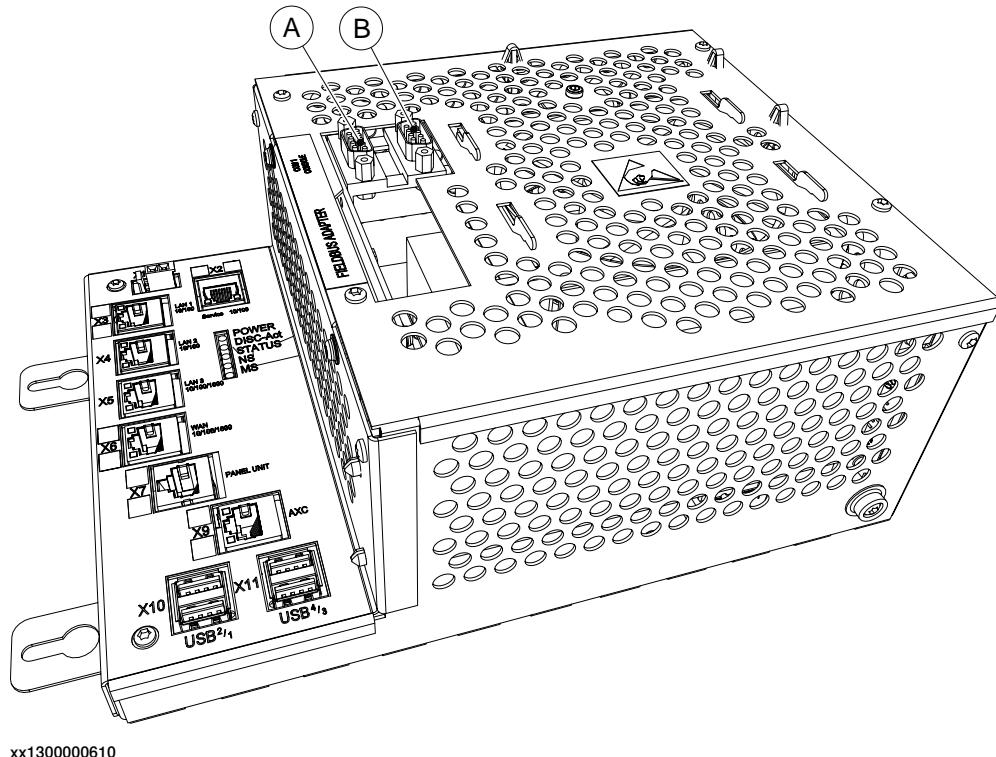
The serial channel is an option. To be able to connect a serial channel to the controller, the main computer needs to be equipped with the expansion board DSQC1003.

The expansion board has one RS232 serial channel, COM1, which can be used to communicate with process equipment.

The expansion board also enables the connection of a fieldbus adapter. For more information on how to connect a fieldbus adapter, see [Definition of fieldbuses, IRC5 on page 106](#).

Location

The serial channel connector is located on the expansion board in the computer unit as shown below.



xx1300000610

A	COM1
B	CONSOLE



Note

The CONSOLE connector is used for debugging purposes only.

Continues on next page

2 Installation and commissioning

2.5.6 Connecting a serial channel to the controller

Continued

Conversion of the RS232 channel

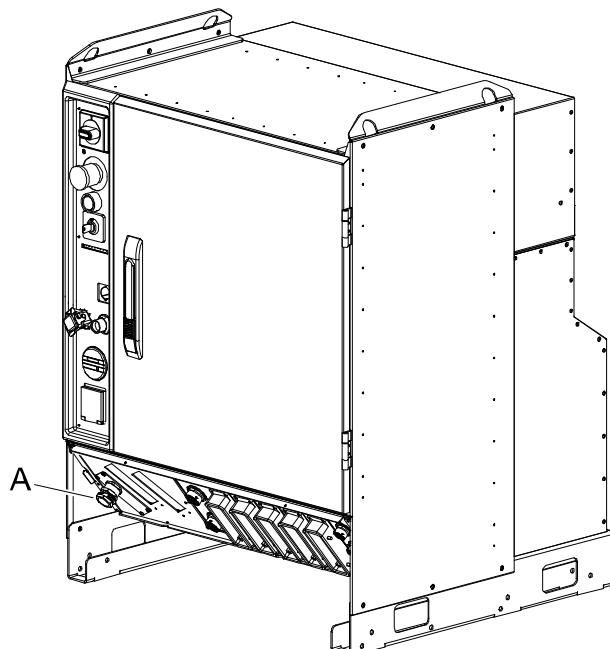
The RS232 channel can be converted to RS422 full duplex with an optional adapter, DSQC 615.

The RS422 enables a more reliable point to point communication (differential) over longer distances, from RS232 = 15m to RS422 = 120m.

	Action	Info/Illustration
1	Connect the adapter to the serial channel connector.	<p>A cable is needed between the serial channel connector and the adapter.</p> <p>xx1300000854</p> <p>A cable B adapter</p>

2.5.7 Connecting power supply to the controller

Location of power supply connection



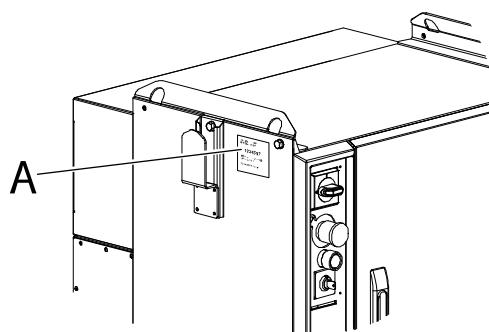
xx0500001869

A	Cable gland
---	-------------

Rated voltage and current

To find the rated voltage, rated current and interrupting capacity of the controller, see the name plate on the side of the cabinet.

The illustration shows an example of lable position.



xx0900000273

A	Controller name plate
---	-----------------------

Continues on next page

2 Installation and commissioning

2.5.7 Connecting power supply to the controller

Continued

Line fusing

Recommended line fusing, slow-blowing diazed or circuit breaker with trip characteristic K. Max. fuse 35 A, with options 80 A.

Robot	Voltage	Description
IRB 120, 1200, 140, 1410, 1600, 2400, 2600, 260, 360, 4400	at 400-660 V	3x16 A
IRB 120, 1200, 140, 1410, 1600, 2400, 2600, 260, 360, 4400	at 200-220 V	3x16 A
IRB 4600, 660, 460, 760, 66XX, 6700, 7600, 8700	at 400-600 V	3x25 A
IRB 660, 66XX, 6700, 760, 7600, 8700	at 200-220 V	3x35 A
IRB 4600, 660, 460, 760, 66XX, 6700, 7600, 8700	at 200-220 V	3x35 A

Prerequisites

Equipment	Note
Power supply cable (3-phase)	
External earth fault protection (residual current circuit breaker, Class B for frequency converters, 300mA)	For control cables up to 7m, a 30mA earth fault protection can be used if it is Hager CDH440R or equal residual current circuit breaker.
Standard toolkit	The contents are defined in section Standard toolkit!
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 Circuit diagrams on page 311 .

Connection through a cable gland

The following procedures detail how to connect the mains power to the controller through a cable gland.

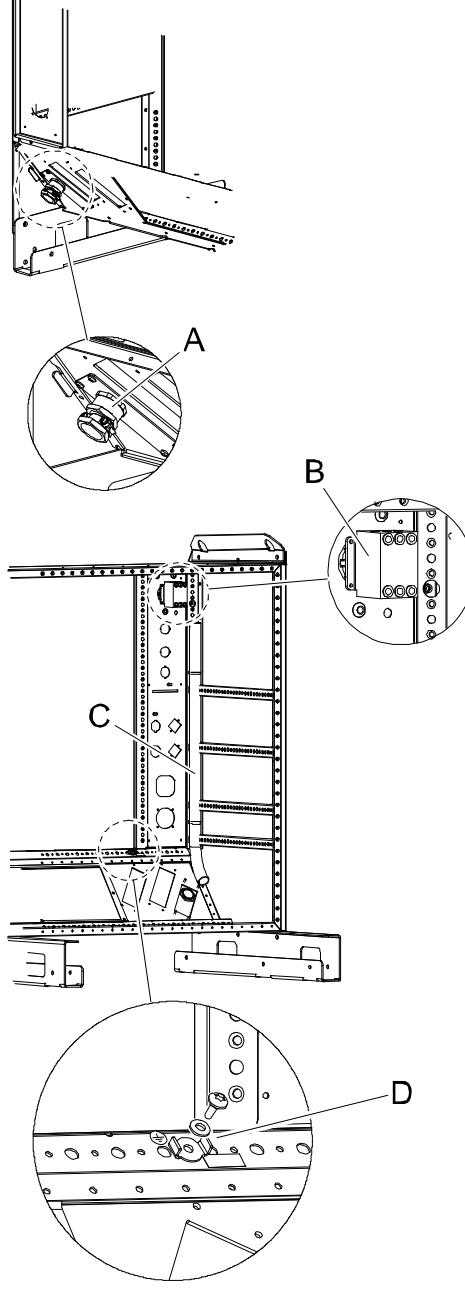
	Action	Note/illustration
1	Connect power supply from an external earth fault protection.	Prerequisites on page 70

Continues on next page

2 Installation and commissioning

2.5.7 Connecting power supply to the controller

Continued

Action	Note/illustration
2 Fit the cable trough the cable gland and tighten.	 <p>xx0500001870</p> <p>Parts:</p> <ul style="list-style-type: none"> • A: cable gland • B: rotary switch • C: cable pipe • D: grounding point
3 Strip the insulation on the power supply cable long enough to reach the rotary switch.	
4 Connect the ground cable at the <i>grounding point</i> .	See illustration in step 2. Tightening torque, 4.5 Nm.

Continues on next page

2 Installation and commissioning

2.5.7 Connecting power supply to the controller

Continued

	Action	Note/illustration
5	Route the phase wires through the pipe up to the rotary switch.	See illustration in step 2.
6	Connect the wires as shown in the illustration.	<p>For three phase: Rotary Switch</p> <p>xx0500001882</p> <p>For single phase: Rotary Switch</p> <p>xx1100000019</p> <p>For single phase, pin 5 is plugged.</p>

Connection through a connector

The following procedures detail how to connect the mains power to the controller through a connector.



CAUTION

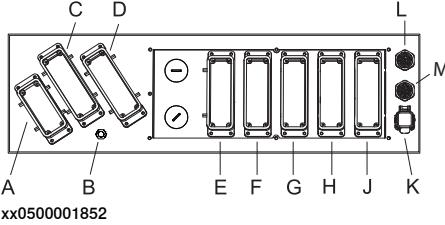
Always inspect the connector for dirt or damage before connecting it to the controller. Clean or replace any damaged parts.

Continues on next page

2 Installation and commissioning

2.5.7 Connecting power supply to the controller

Continued

	Action	Note/illustration
1	Connect the power cable from the shop supply to connector XP0 on the front panel on the controller.	 <p>xx0500001852</p> <p>Parts:</p> <ul style="list-style-type: none">• A: XP0 Mains power connector

2 Installation and commissioning

2.5.8 Connecting the manipulator to the controller

General

Connect the manipulator and the controller to each other after installing them. The lists below specify which cables to be used in each application.

All connectors on the controller are shown in section [*Connectors on the controller on page 55*](#).

Main cable categories

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

Cable category	Description
Manipulator cables	Handles power supply to and control of the manipulator's motors as well as feedback from the serial measurement board.
Position switch cables (option)	Handles supply to and feedback from any position switches.
Customer cables (option)	Handles communication with equipment fitted on the manipulator by the customer.
Additional axes cables (option)	Handles power supply to and control of the external axes motors as well as feedback from the servo system.

These categories above are divided into sub-categories which are specified in section [*Manipulator cables on page 300*](#).

2.5.9 Connecting safety signals

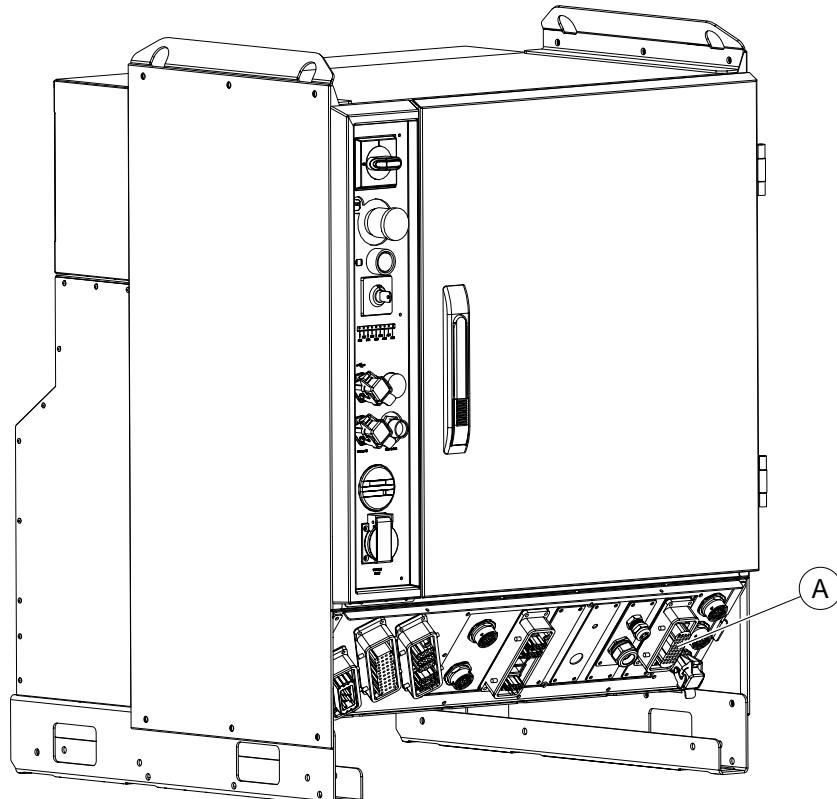
External customer connection

If the cabinet is equipped with the option external customer connection, connect the connector as shown in the following illustration.



CAUTION

Always inspect the connector for dirt or damage before connecting it to the controller. Clean or replace any damaged parts.



xx1300000601

A

External customer connection of safety signals.

Continues on next page

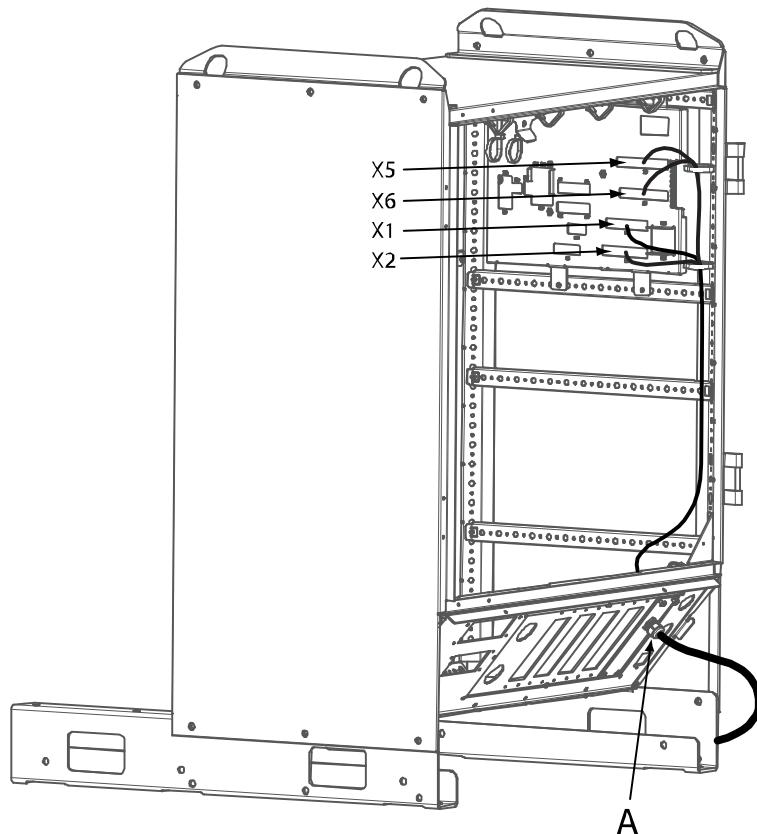
2 Installation and commissioning

2.5.9 Connecting safety signals

Continued

Internal customer connection

If the cabinet is not equipped with the option external customer connection, the signal cables must go through a cable gland and be connected to the panel board inside the cabinet.



xx1000000141

A	Cable gland
---	-------------



Note

The signal cable should be shielded and the shielding connected to the cable gland, or a ferrite ring should be used around the cable inside the cabinet close to the cable gland. The same goes for all customer I/O signals.

2.5.10 Programmable stop functions

Stopping functions

There are different methods to stop the robot, in addition to manually initiated stops.

- Stop with system input signals
- Stop with RAPID instructions
- Other stops

Stop category configuration

The stop category can be configured, see *Technical reference manual - System parameters*.

Safety inputs	System parameter Function	Description
Automatic Stop	SoftAS	<i>SoftAS</i> can be used to configure the protective stop in automatic mode either as stop category 0 or category 1. The default configuration is <i>TRUE</i> (stop category 1).
General Stop	SoftGS	<i>SoftGS</i> can be used to configure the protective stop in automatic and manual mode, either as stop category 0 or category 1. The default configuration is <i>TRUE</i> (stop category 1).
Superior Stop	SoftSS	<i>SoftSS</i> can be used to configure the protective stop in automatic and manual mode, either as stop category 0 or category 1. The default configuration is <i>TRUE</i> (stop category 1).
Emergency Stop	SoftES	<i>SoftES</i> is used to configure the emergency stop in automatic and manual mode. The default configuration is <i>FALSE</i> (stop category 0).

Stop with system input signals

In the control system, it is possible to define system input signals to be set/reset through different interactions, for example, through networks, I/O blocks, RobAPI, etc. See *Application manual - Controller software IRC5*.

Pre-defined system input	Description
<i>Stop</i>	The RAPID program execution is stopped, and the manipulator is stopped on path with no deviation. The RAPID program cannot be started when this system input signal is high. This stop is similar to a normal program stop using stop button on the FlexPendant.
<i>SoftStop</i>	This is a faster stop of the manipulator than <i>Stop</i> . This stop is more stressing for the mechanics than normal stop, therefore there might be a minor deviation on path.
<i>QuickStop</i>	This is a faster stop of the manipulator than <i>Stop</i> and <i>SoftStop</i> . This stop is more stressing for the mechanics than normal stop or <i>SoftStop</i> , therefore there might be a deviation on path.
<i>Stop at End of Cycle</i>	Stops the RAPID program when the complete program is executed, that means when the last instruction in the main routine has been completed.

Continues on next page

2 Installation and commissioning

2.5.10 Programmable stop functions

Continued

Pre-defined system input	Description
<i>Stop at End of Instruction</i>	Stops program execution after the current instruction is completed.

All of these stops are performed without using the brakes, and the power is never disconnected. The program execution can be continued directly, for example by activating a start signal.



Note

Only safety rated input signals are allowed to be used for safety.

Stop with RAPID instructions

There are several RAPID instructions available that stops the robot.

Instruction	Description	Arguments
SystemStopAction	Stops all robots in all tasks immediately.	\Stop: similar to a normal program stop with stop button. \StopBlock: as above, but to restart the PP has to be moved. \Halt: this is like a category 0 stop, i.e. it will result in motors off state, stop of program execution and robot movements in all motion tasks. The Motors on button must be pressed before the program execution can be restarted.
Stop	The current move instruction will be finished before the robot stops. A restart will continue the program execution.	\NoRegain: the robot will not return to the stop point when restarted, e.g. after having been jogged away. \AllMoveTasks: all robots will be stopped.
StopMove	The current move instruction will be stopped immediately as a normal program stop but the program execution will continue with the next instruction. This is often used in for example trap routines.	\Quick: the stop will be a soft stop on path, as described for system input <i>SoftStop</i> , otherwise similar to a normal program stop. \AllMotionTasks: all robots will be stopped.
BREAK	The current move instruction and the program execution will be stopped immediately as a normal program stop. A restart will continue the program execution.	
EXIT	The current move instruction and the program execution will be stopped immediately as a normal program stop. After stop the Program Pointer has to be reset to Main.	
EXITCYCLE	The current move instruction and program execution will be stopped immediately. The Program Pointer will be reset to Main and if running mode is continuous, the program will be restarted.	

Continues on next page

Instruction	Description	Arguments
SearchX	Search instructions can be programmed with arguments to stop the robot movement close to the point where a search hit was noticed. The program execution will continue with the next instruction.	\Stop: the robot will stop as fast as possible. This stop is performed by ramping down motion in each motor separate from each other, and as fast as possible. Since it will be without any coordination, the robot may slide off path fairly much. \PStop: the robot will stop like after a normal program stop. \SStop: the robot will stop on path but quicker than a normal program stop. This is similar to a system input <i>SoftStop</i> . \Sup: the robot will continue to the ToPoint. If more than one search hit is found, an error will be reported.

RAPID instructions valid for IRC5 are described in *Technical reference manual - RAPID Instructions, Functions and Data types*.

Other unexpected stops

Type of stop	Description
SysFail	In the control system there is a surveillance and monitoring function that can detect abnormal situations. In such cases a stop will be initiated. The robot controller must be restarted.
Power fail	In the control system there is a monitoring function that can detect power failure. In such cases a stop will be initiated.
Stop at collision	In the control system there is a monitoring function that can detect collisions. In such cases a stop will be initiated.  WARNING Special care must be taken when restarting a machine that is stopped due to a collision. The robot might make a limited movement when restarted.  WARNING The revolution counters might need to be updated after a collision to ensure path accuracy.

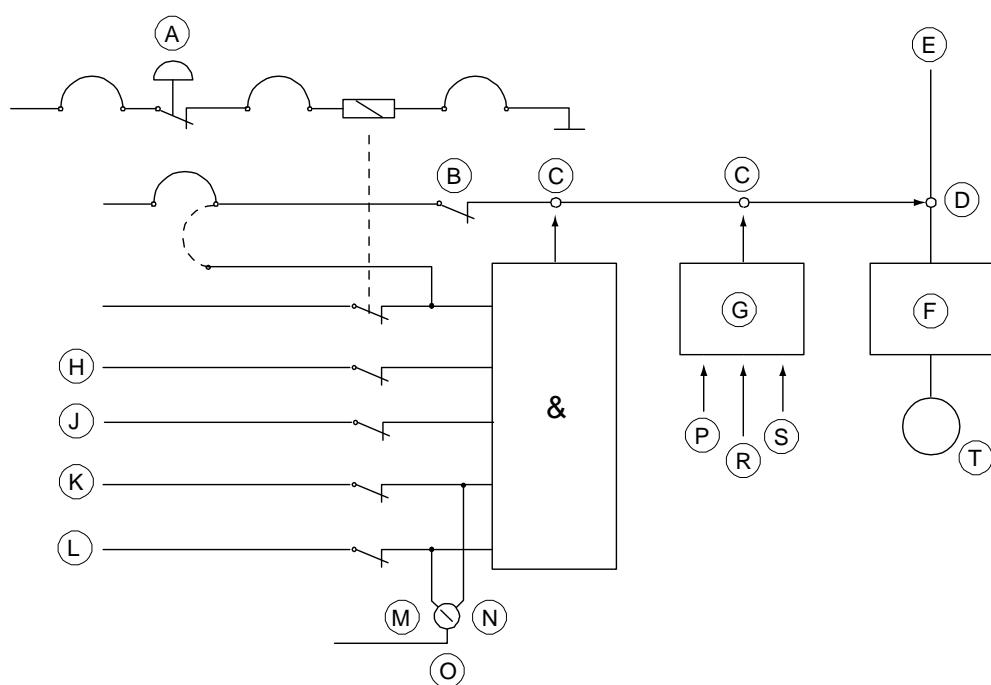
2 Installation and commissioning

2.5.11 The MOTORS ON/MOTORS OFF circuit

Outline diagram

The MOTORS ON/MOTORS OFF circuit is made up of two identical chains of switches.

The diagram shows the available customer connections, AS, GS, SS and ES.



xx0100000174

A	ES (emergency stop)
B	LS (Limit switch)
C	Solid state switches
D	Contactor
E	Mains
F	Drive unit
G	Second chain interlock
H	GS (general mode safeguarded space stop)
J	SS (superior stop, same function as GS)
K	AS (Automatic mode safeguarded space stop)
L	ED (FlexPendant three-position enabling device)
M	Manual mode
N	Automatic mode
O	Operating mode selector
P	RUN
R	EN1

Continues on next page

S	EN2
T	Motor



Note

Make sure the polarity is correct and that the voltage is not more than 24 V.

Function of the MOTORS ON/MOTORS OFF circuit

The circuit monitors all safety related equipment and switches. If any of the switches is opened, the MOTORS ON/MOTORS OFF circuit switches the power to the motors off.

As long as the two chains not are in an identical state, the robot will remain in MOTORS OFF mode.

Continues on next page

2 Installation and commissioning

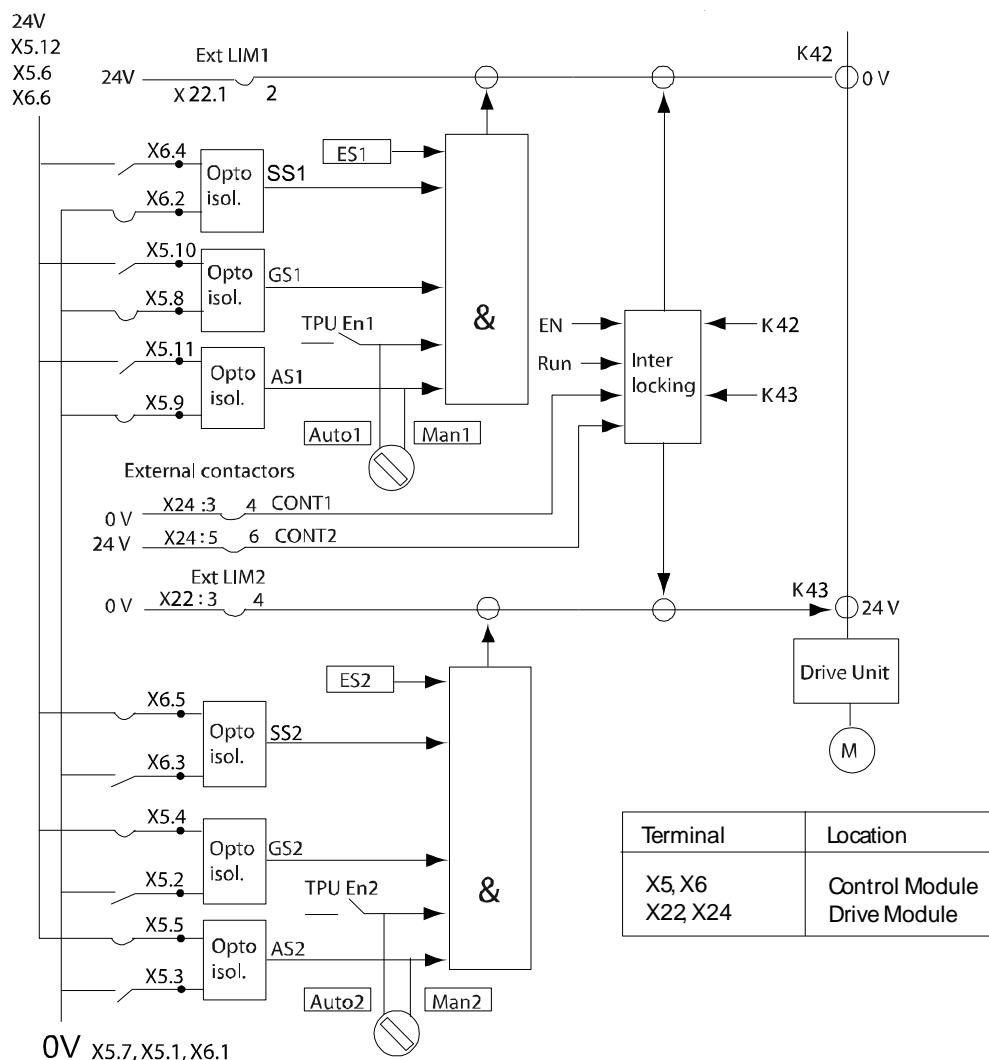
2.5.11 The MOTORS ON/MOTORS OFF circuit

Continued

Connection of safety chains

The diagram below shows the dual channel safety chain.

The supply from internal 24V and 0 V is displayed. For external supply of GS and AS check the circuit diagram.



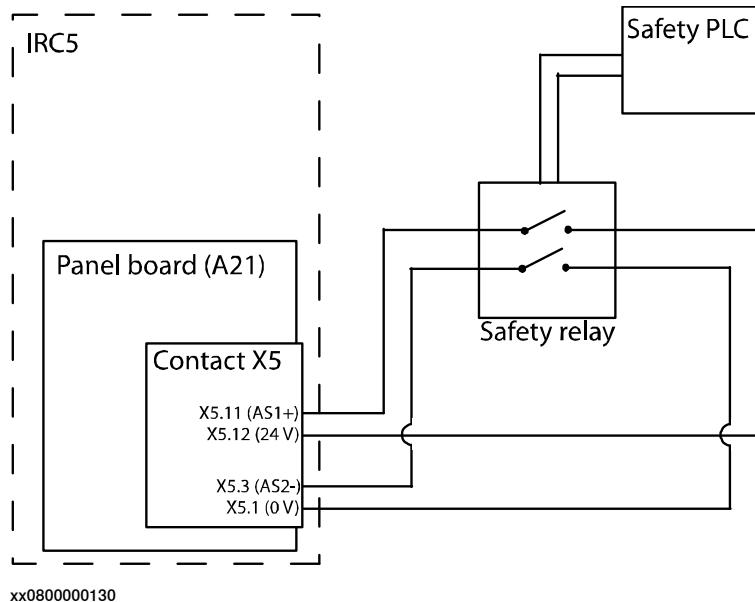
xx0100000166

Technical data per chain	
Limit switch	Load: 300 mV Max. voltage drop: 1 V
External connectors	Load: 10 mA Max. voltage drop: 4 V
GS/AS/SS load at 24 V	25 mA
GS/AS/SS closed "1"	>18 V
GS/AS/SS open "0"	< 5 V
External supply of GS/AS/SS	Max. + 35 VDC Min. - 35 VDC
GS/AS/SS Filter time	2.0 ms ⁱ

Continues on next page

Technical data per chain	
Max. potential in relation to the cabinet earthing and other signal groups.	300 V
Signal class	Control signals

- i When connecting for example a safety PLC to a safety stop, make sure that the safety check pulses not exceeds 2.0 ms, otherwise a safety relay must be connected in between. See the following illustration.



Continues on next page

2 Installation and commissioning

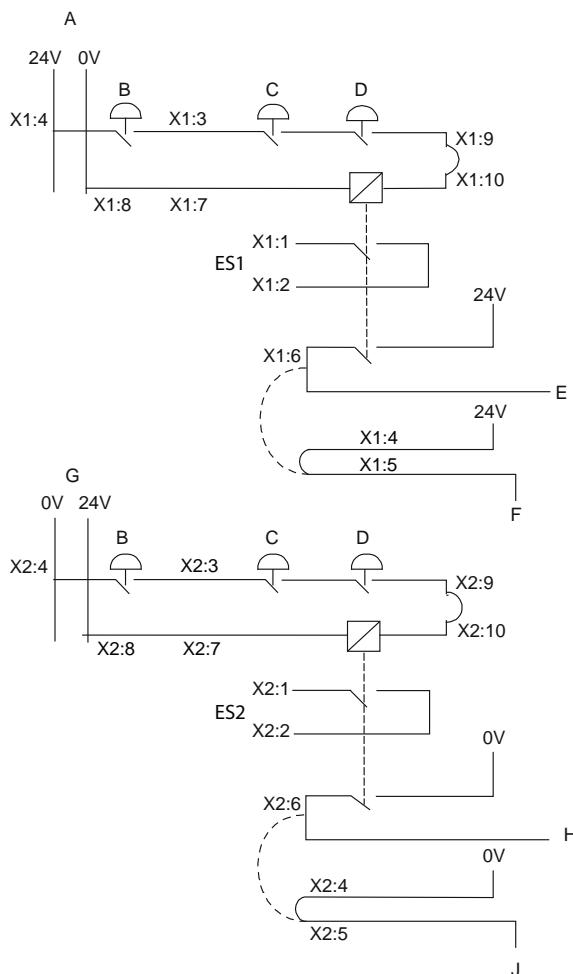
2.5.11 The MOTORS ON/MOTORS OFF circuit

Continued

Connection of ES1/ES2 on panel unit

The diagram below shows the terminals for the emergency circuits.

The supply from internal 24V (X1:4/X2:8) and 0V (X1:8/X2:4) is displayed. For an ext. supply, X1:3 / X2:7 is connected to ext. 24V, and X1:7 / X2:3 is connected to ext. 0V.



xx0100000191

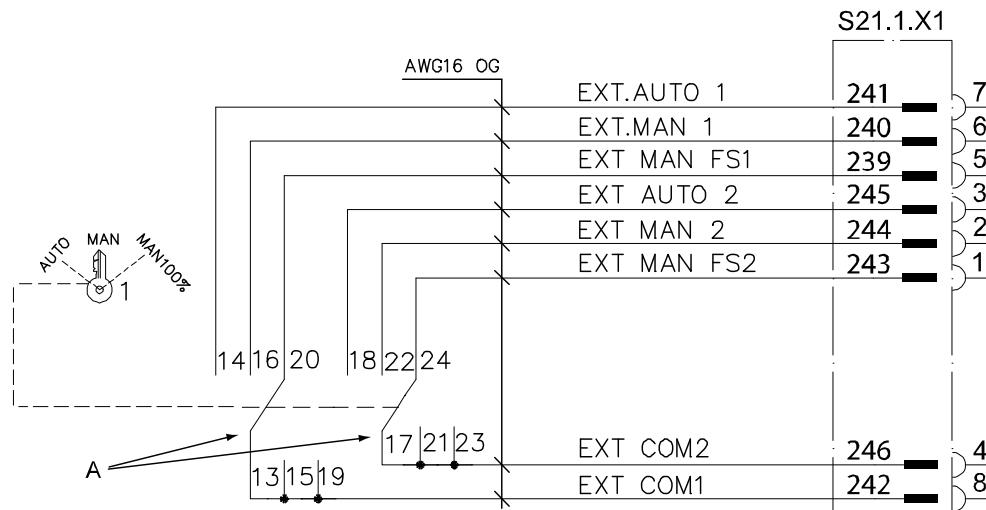
A	Internal
B	Ext stop
C	FlexPendant
D	Cabinet
E	ES1 internal
F	Run chain 1 top
G	Internal
H	ES2 internal
J	Run chain 2 top
ES1	Emergency stop output 1
ES2	Emergency stop output 2

Continues on next page

Technical data	
ES1 and ES2 max output voltage	120 VAC or 48 VDC
ES1 and ES2 max output current	120 VAC: 4 A 48 VDC L/R: 50 mA 24 VDC L/R: 2 A 24 VDC R load: 8 A
External supply of ES relay	24 VDC ± 10% between terminals X1:3, 7 and X2:7, 3 respectively.
	 Note
	In case of interference, the external supply must be properly filtered.
Rated current per chain	40 mA
Max. potential in relation to the cabinet earthing and other signal groups.	300 V
Signal class	Control signals

Connection to operating mode selector

The illustration below shows the connection of terminals for customer use.



A	Mode selector
Technical data	
Max. voltage	48 VDC
Max. current	4 A
Max. potential in relation to the cabinet earthing and other signal groups.	300 V
Signal class	Control signals

2 Installation and commissioning

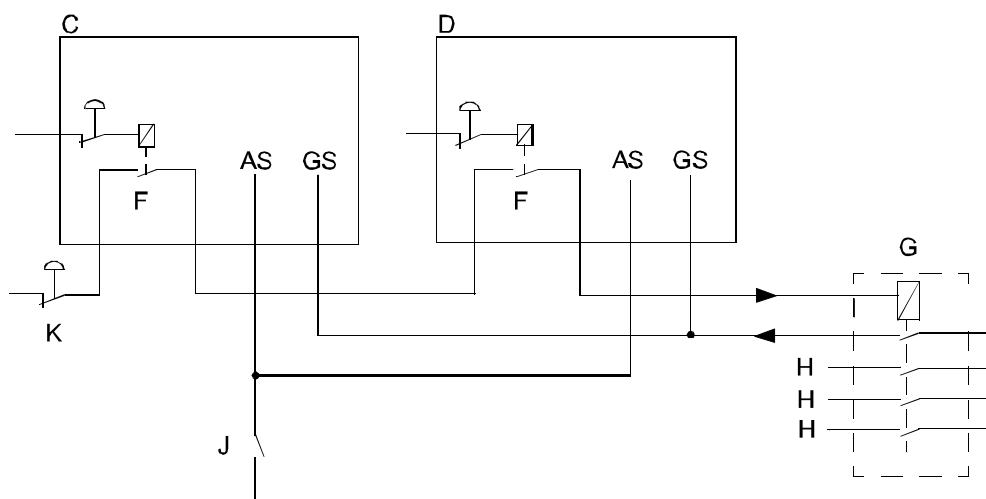
2.5.12 Connection of external safety relay

Description

The motor contactors K42 and K43 in the controller can operate with external equipment if external relays are used.

Connection example

The following figure shows an example of how to connect an external safety relay.



xx0100000246

C	Robot 1
D	Robot 2
F	ES (emergency stop) relay
G	External Safety relay
H	To other equipment
J	Safety gate
K	Cell ES (emergency stop)

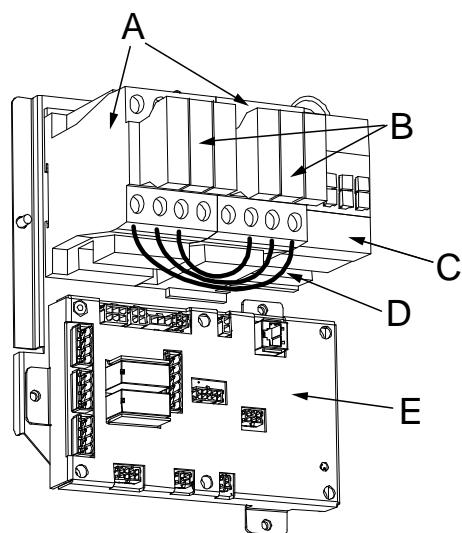
2.5.13 Connection to MOTORS ON/MOTORS OFF contactor

General

This section details connection to the MOTORS ON/MOTORS OFF contactor. To be used when the customer wants external equipment to follow the robot control.

Location

The MOTORS ON/MOTORS OFF contactor is located on the left hand side in the controller.



xx0400001058

A	MOTOR ON contactor K42 / K43
B	Contactor auxiliary block 33-34
C	Brake contactor
D	Jumper (3 pcs)
E	Contactor interface board

Required equipment

The table below details the required equipment.

Equipment	Note
Standard toolkit	
Circuit diagram	See Circuit diagrams on page 311 .

Technical data

The table below shows technical data.

Technical data	
Max. voltage	48 VDC
Max. current	4 A

Continues on next page

2 Installation and commissioning

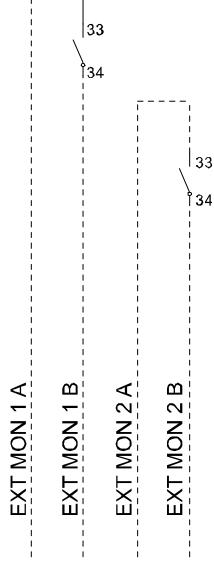
2.5.13 Connection to MOTORS ON/MOTORS OFF contactor

Continued

Technical data	
Max. potential in relation to the cabinet earthing and other signal groups.	300 V
Signal class	Control signals

Procedure

Following procedure describes connection to the MOTORS ON/MOTORS OFF contactor.

Action	Info/Illustration
<p>1</p> <p> DANGER</p> <p>Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.</p>	
<p>2</p> <p>Connect the wires to the contactor auxiliary blocks 33-34, according to the diagram to the right.</p>	 <p>xx0400001231</p>

2.5.14 Connection of drive module

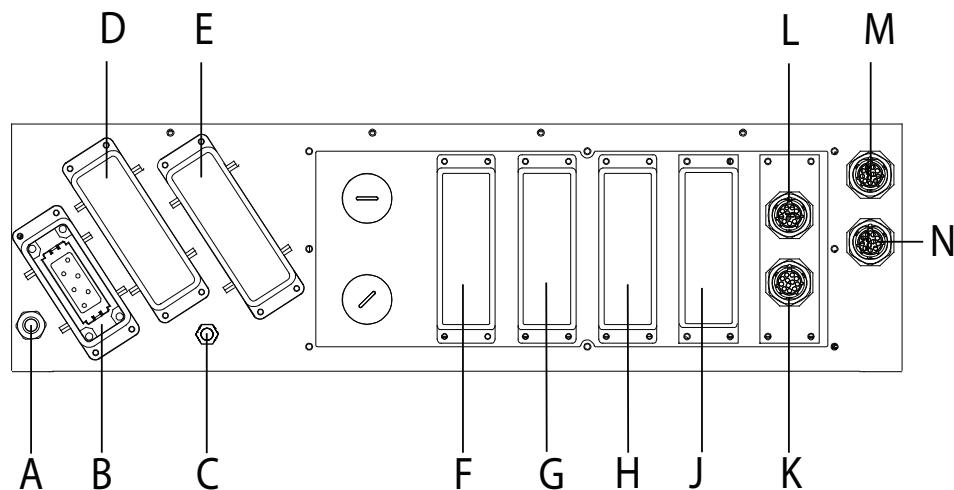
General

A controller that handles several robots or an application that requires more than three external axes needs extra drive modules (one drive module per robot). Up to four drive modules can be used, including the one assembled in the IRC5 controller.

This manual only describes the connector interface on the drive module. More information about installation of the drive module with the applications MultiMove can be found in *Application manual - MultiMove*.

Connectors

The following details the connectors on the front panel of the drive module.



xx0600002931

	Description
A	Power connection to IRC5 controller
B	A4.X0: Mains connection to transformer
C	Earth connection point
D	A4.X1: Robot power connection
E	A4.X7: External axes power connection
F	A4.XX: Customer options
G	A4.XX: Customer options
H	A4.XX: Customer options
J	A4.XX: Customer options
K	Communication cabling between controller/drive module
L	Communication cabling between controller/drive module
M	A4.XS41: Additional axes SMB connection
N	A4.XS2: Robot SMB connection

2 Installation and commissioning

2.5.15 Connection of Drive Module Disconnect, by limit switch

General

This function enables you to temporarily disconnect a drive module and deactivate any robot or additional mechanical units connected to this module. The procedures are detailed below.

It is also possible to connect a remote switch to enable a Drive Module Disconnect. The required equipment and procedure for connection of a switch are specified below.



Note

The system diagnostics monitors the connection and disconnection of drive modules, and event log messages regarding these events will be stored in the event log when required. These messages are accessible using the FlexPendant or RobotStudio.



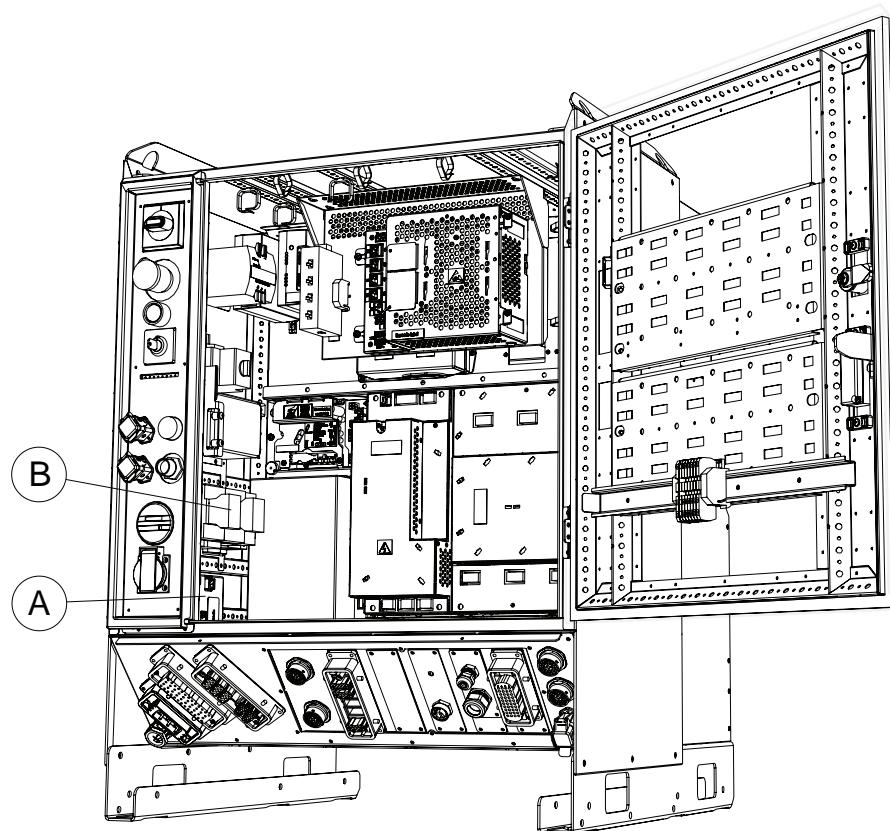
Note

This functionality cannot be used together with SafeMove, option 810-2.

Continues on next page

Location

The contactor interface board unit is located on the left hand side of the controller as shown below.



xx1300000855

A	Contactor interface board
B	Contactors

Required equipment

The table below details the required equipment.

Equipment	Note
Wire	AWG20
Switch	24V 0.5A
<i>Operating manual - RobotStudio</i>	
<i>Operating manual - IRC5 with FlexPendant</i>	
Standard toolkit	
Circuit diagram	See Circuit diagrams on page 311 .

Continues on next page

2 Installation and commissioning

2.5.15 Connection of Drive Module Disconnect, by limit switch

Continued

Enabling Drive Module Disconnect in RobotStudio

The following procedures details how to enable the system for Drive Module Disconnect.

Action	
1	In the Configuration editor in RobotStudio, select the topic Motion .
2	Select the type Drive Module User Data .
3	Set the parameter for selected drive module to YES .
4	Restart the system.

Enabling Drive Module Disconnect with the FlexPendant

The following procedures details how to enable the system for Drive Module Disconnect.

Action	
1	In the Control panel on the FlexPendant, tap Topics , and select Motion .
2	Tap the type Drive Module User Data , and then tap to select the drive module.
3	Set the parameter for selected drive module to YES .
4	Restart the system.

Disconnecting the drive module

Use this procedure to disconnect a drive module.

	Action	Note/illustration
1	Make sure that the system is in the MO-TORS_OFF state.	
2	Disconnect the connector X22.	<p>It is also possible to use connector X21, but this is typically used for limit switches on the robot.</p> <p>xx0500002087</p>

Reconnecting the drive module

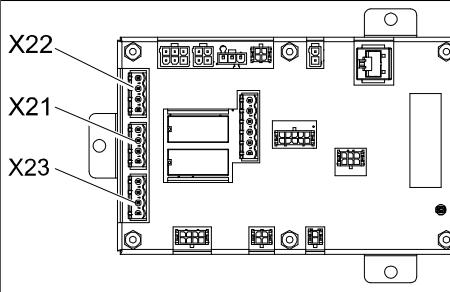
Use this procedure to reconnect the drive module.

	Action	Note/illustration
1	Make sure that the system is in the MO-TORS_OFF state.	

Continues on next page

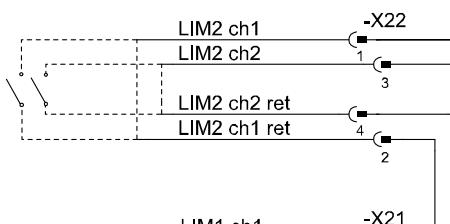
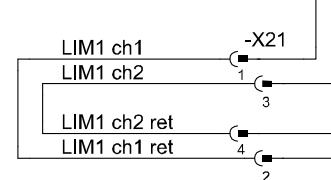
2.5.15 Connection of Drive Module Disconnect, by limit switch

Continued

Action	Note/illustration
2 Reconnect the X22 connector.	
3 Move the program pointer to main in the RAPID-program where the disconnected mechanical units are active.	

Connect a remote switch

The following procedures details how to connect a remote switch.

Action	Note/illustration
1 Make sure that the system is in the MOTORS_OFF state.	
2 Disconnect the jumpers from the connector X22.	
3 Connect the wires to the connector X22 according to the diagram on the right.	<p>LIMIT SWITCH 2 EXTERNAL AXIS</p>  <p>LIMIT SWITCH 1 CONTROL CABLE</p>  <p>xx0500002091</p>

2 Installation and commissioning

2.5.16 Connection of servo disconnect, by servo power switch

General

The IRC5 controller is pre-wired to accept a customer servo disconnect.

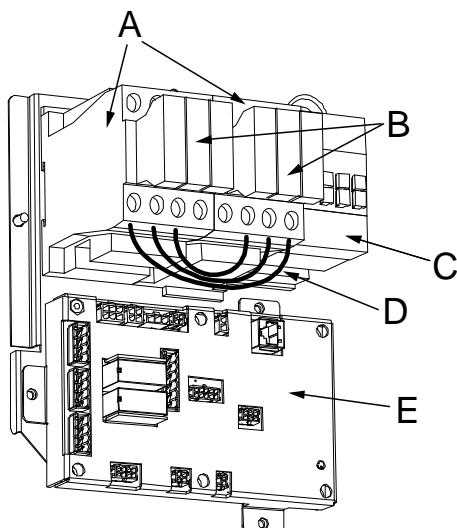


Note

Due to risk of voltage drop, the switch to the servo disconnect circuit should not be mounted more than 50 meters from the Drive Module.

Location

The contactor is found on the left hand side inside the controller as shown below.



xx0400001058

A	MOTOR ON contactor K42 / K43
B	Contactor block3
C	Brake contactor
D	Jumper (4 pcs)
E	Contactor interface board

Required equipment

The table below details the required equipment.

Equipment	Note
Wire	AWG 10, brake AWG 16
Switch	500V 40 A, brake 24V 10A
Standard toolkit	
Circuit diagram	See Circuit diagrams on page 311 .

Continues on next page

**WARNING**

It is recommended to also open the 24V to the brake (wire 489) to avoid accidental release of the brakes when the drive system is disconnected.

Procedure

Following procedure details how to connect a servo disconnect.

	Action	Note/Illustration
1	DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2	Remove the four jumpers between contactors R2 and R3	
3	Connect the wires according to the diagram on the right.	 xx0400001057 <ul style="list-style-type: none"> • A: MOTOR ON contactor K43 • B: Jumper (4 pcs) • C: MOTOR ON contactor K42 • D: Wires to external main switch • E: External switch

2 Installation and commissioning

2.5.17 Connecting a Limit switch override push button



DANGER

The Limit switch override is used to disconnect safety limitations. Make sure the Limit switch override function is not active longer than absolutely necessary.

If the option SafeMove is implemented, Limit switch override must never be used at all. The SafeMove safety controller has its own override function.

General

The override circuit enables the possibility to jog an axis out of a forbidden (limited) zone.

Limitations

The switch has to be placed inside the controller to eliminate the risk of electrical noise.

Required equipment

Equipment	Art. no	Note
Contact block (2 pcs)	3SFA 611 610 R1001	ABB CW Control
Push button (in Dual Cabinet)	1SFA 611 102 R1105	ABB CW Control
Connector X23	3HAC021085-001	
Wire		Cable AWG 20 Blue
Standard toolkit		This is detailed in section Standard toolkit, IRC5 on page 293 .
Circuit diagram		See Circuit diagrams on page 311 .



Note

The parts needs to be ordered separately from ABB and are not part of an option package.

Procedure

The following procedure details how to connect a Limit switch override circuit in the controller.

	Action	Note/illustration
1	 DANGER Before any work inside the IRC5 controller please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	

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2.5.17 Connecting a Limit switch override push button

Continued

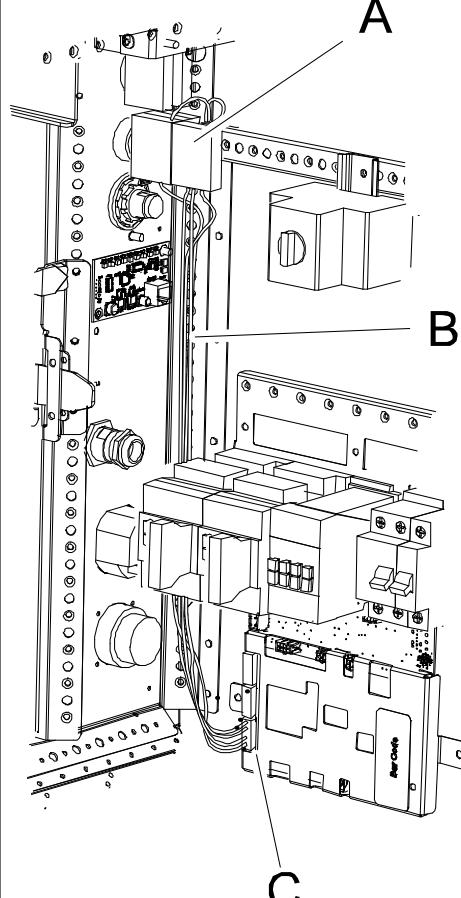
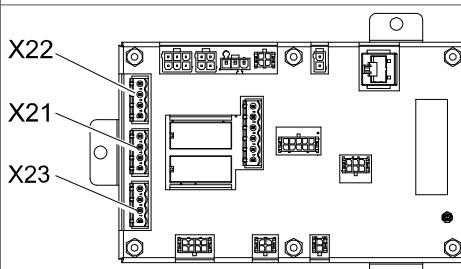
Action	Note/illustration
<p>2 Attach two additional contact blocks on the existing push button (Motors on).</p> <p>Note</p> <p>There is only room for one additional contact block beside the two existing. Therefore, place one additional block on top of the other.</p>	<p>xx0500002553</p> <ul style="list-style-type: none"> A: Additional contact blocks B: Existing contact, lamp blocks C: Holder D: Push button
<p>3 Connect wires from the contact blocks to the connector according to the diagram to the right.</p>	<p>xx0500002556</p>

Continues on next page

2 Installation and commissioning

2.5.17 Connecting a Limit switch override push button

Continued

Action	Note/illustration
4 Route the wires together with the existing harness on the left wall.	 <p>xx0500002557</p> <ul style="list-style-type: none"> • A: Contact blocks • B: Wires • C: Connector X23
5 Fit the connector to the X23 connector on the contactor interface board.	 <p>xx0500002087</p>

2.6 Drive system

2.6.1 Drive functions, general

General

The robot is powered by power electronics found in the IRC5 controller. This also includes power electronics for driving additional axes.

Standard configurations

The drive system is available in different sizes depending on which robot to drive and other power requirements.

How the drive system is configured is described in section [Configuration of the drive system on page 100](#).

Replacing drive system parts

How to replace drive system parts is described in section [Replacement of drive units on page 234](#).

Installation of additional drive units

How to install additional drive units is described in section [Installation of additional drive units on page 153](#).

2 Installation and commissioning

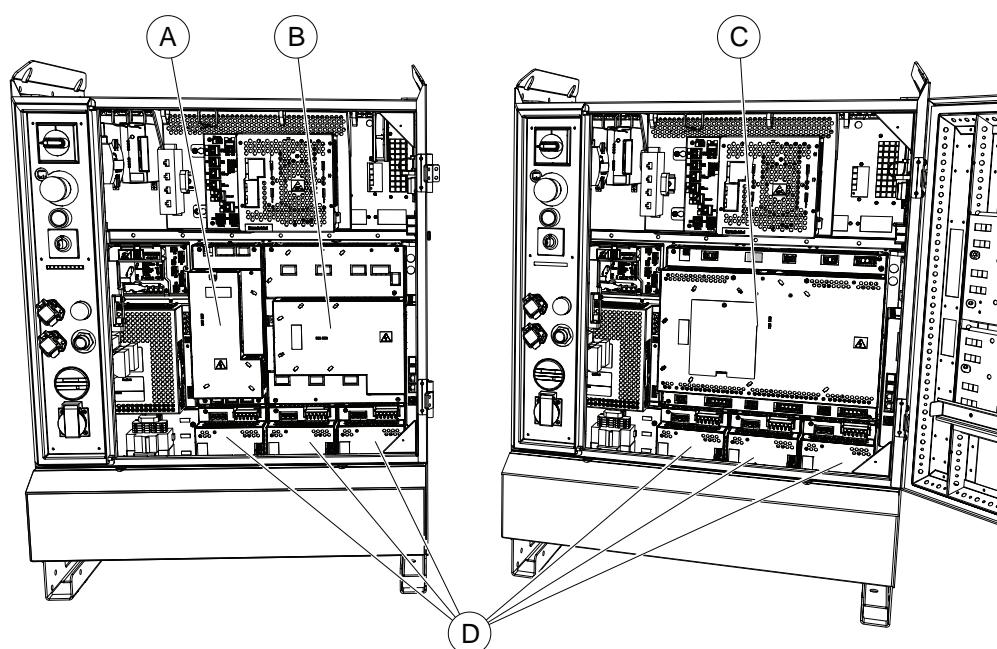
2.6.2 Configuration of the drive system

General

The IRC5 Controller contains one Main Drive Unit and up to three Additional Drive Units, and in some cases an Additional Rectifier Unit. The allowed combinations of these, depending on the robot type, is specified below.

Location

The drive system is located in the controller as shown below.



xx1300000808

A	Additional Rectifier Unit (only used for additional axes in combination with small robots)
B	Main Drive Unit MDU-430A (for small robots)
C	Main Drive Unit MDU-790A (for large robots)
D	Additional Drive Units (for additional axes)

DC bus cables

Between the units are fitted DC bus cables, which are specified below:

Description	Art. no.	Note
DC bus cable	3HAC032612-001	Between Main Drive Unit MDU-790A and Additional Drive Units.
DC bus cable	3HAC036612-001	Between Additional Rectifier Unit and first Additional Drive Unit.
DC bus cable	3HAC036612-002	Between Additional Rectifier Unit and second Additional Drive Unit.
DC bus cable	3HAC036612-003	Between Additional Rectifier Unit and third Additional Drive Unit.

Continues on next page

IRB 120, 1200, 140, 1410, 260, 360, 1600

The following illustration shows the drive units. The table specifies which units may be fitted in which positions.

X	Y	Z
1		MDU
2		
3	ADU	ADU

en0800000293

Pos.	Identification	Description	Art. no.	Note
Y1, Y2, Z1, Z2	DSQC 406	Main Drive Unit MDU-430A	3HAC035301-001	
X1, X2	DSQC 417	Additional Rectifier Unit ARU-430A	3HAC035381-001	Required if any Additional Drive Unit is used.
X3	DSQC 664	Additional Drive Unit ADU-790A	3HAC030923-001	For first addition- al axis
Y3	DSQC 664	Additional Drive Unit ADU-790A	3HAC030923-001	For second addition- al axis
Z3	DSQC 664	Additional Drive Unit ADU-790A	3HAC030923-001	For third addition- al axis

IRB 2400, 2600, 4400, 460, 4600, 660, 6600, 6620, 6640, 6650, 6660, 6700, 760, 7600, 8700*

The following illustration shows the drive units. The table specifies which units may be fitted in which positions.

X	Y	Z
1		MDU
2		
3	ADU	ADU

en0800000292

Continues on next page

2 Installation and commissioning

2.6.2 Configuration of the drive system

Continued

Pos.	Identification	Description	Art. no.	Note
X1, X2, Y1, Y2, Z1, Z2	DSQC 663	Main Drive Unit MDU-790A	3HAC029818-001	
X3	DSQC 664	Additional drive unit ADU-790A	3HAC030923-001	For first additional axis
Y3	DSQC 664	Additional drive unit ADU-790A	3HAC030923-001	For second additional axis
Z3	DSQC 664	Additional drive unit ADU-790A	3HAC030923-001	For third additional axis

* IRB 8700 uses two ADU, in addition to the MDU, for the robot. Therefore, only one ADU can be used for an additional axis.

2.7 Memory functions

2.7.1 Memory functions

General

The controller is fitted with an SD-card memory containing ABB Boot Application software. The SD-card memory is located inside the computer unit.

For more information on how to replace the SD-card memory, see [Replacement of SD-card memory in computer unit on page 231](#).



Note

Only use SD-card memory supplied by ABB.



CAUTION

Reformatting the SD-card or modifying the disk partition can cause irreparable boot-up problems.

2 Installation and commissioning

2.7.2 Connecting a USB memory

2.7.2 Connecting a USB memory

Handling USB

Handling of USB memory is described in *Operating manual - IRC5 with FlexPendant*.

Location on FlexPendant

The location of the USB port on the FlexPendant is shown by the following illustration:

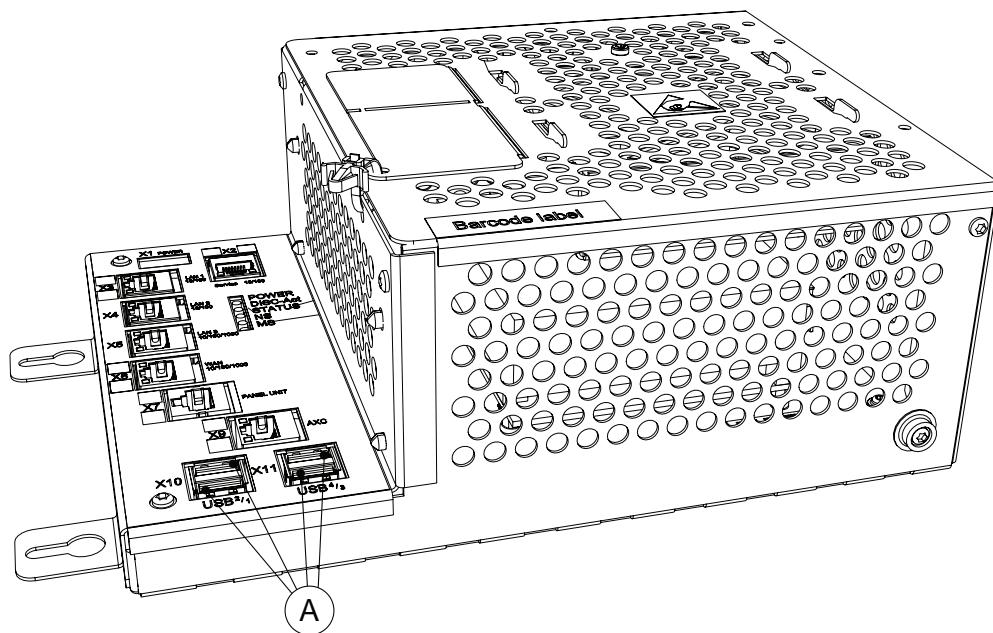


xx0900000022

A	USB port (located behind rubber cover)
---	--

Location on main computer

The location of the USB ports on the main computer is shown by the following illustration:



xx1300000602

A	USB ports
---	-----------

Continues on next page



Note

It is recommended to use the USB ports USB¹ and USB² on the X10 connector for connecting USB memory devices.

The USB ports on the X11 connector are intended for internal use.

2 Installation and commissioning

2.8.1 Definition of fieldbuses, IRC5

2.8 I/O system

2.8.1 Definition of fieldbuses, IRC5

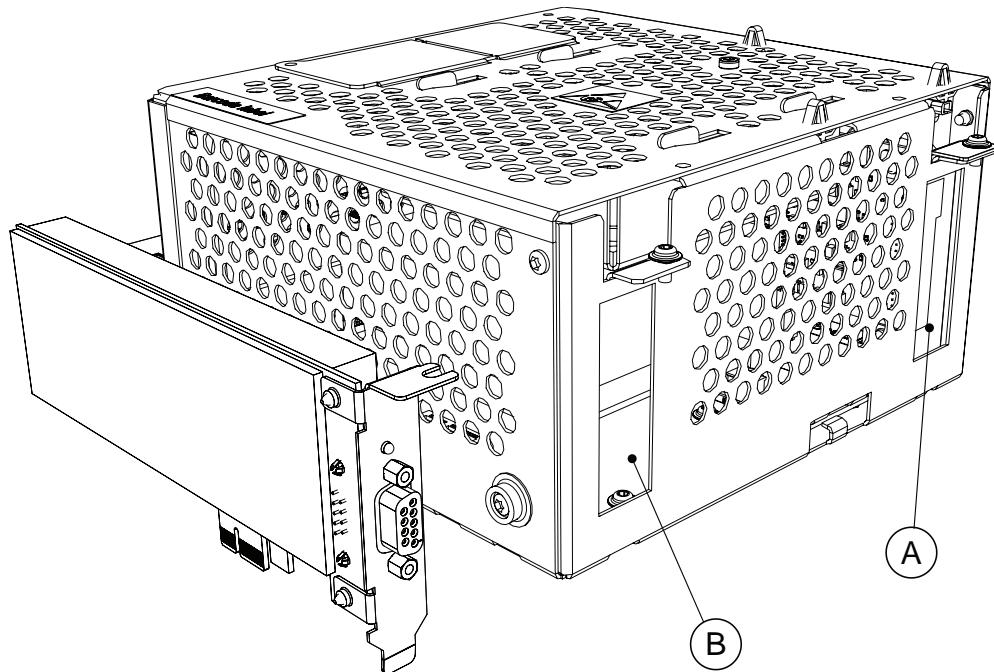
General

The IRC5 Controller may be fitted with a number of different fieldbus adapters and fieldbus master/slave boards.

In the standard form, no fieldbus is mounted to the controller.

Fieldbus master/slave boards

On the main computer unit there are slots available for installing a master/slave board.



xx1600000536

A	Slot for PClexpress boards
B	Slot for safety board (option SafeMove Pro or SafeMove Basic)

Following master/slave boards are available:

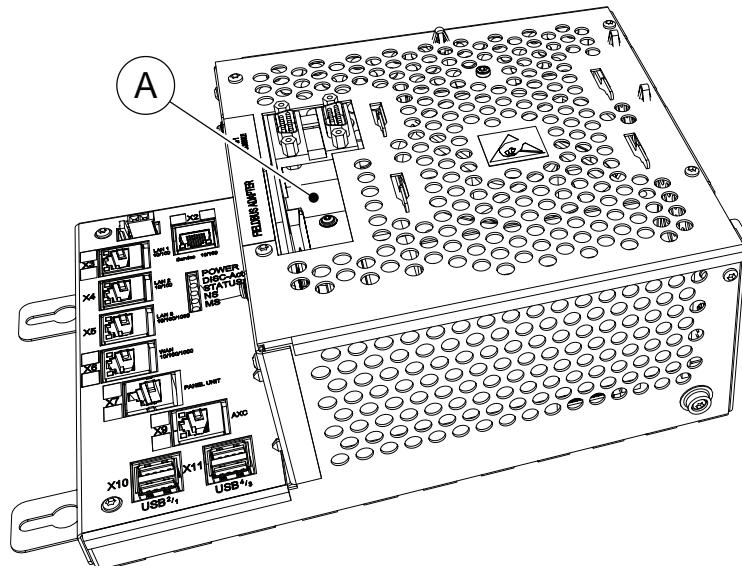
Description	Art. no.	Type designation
PROFIBUS Master PClexpress	3HAC044872-001	DSQC1005
DeviceNet Master/Slave PClexpress	3HAC043383-001	DSQC1006

Continues on next page

Expansion board for fieldbus adapters

An expansion board needs to be installed to be able to fit a fieldbus adapter. On top of the main computer unit, there is one slot available for installing the expansion board.

The expansion board is also equipped with a serial channel. For more information on how to connect to the serial channel, see [Connecting a serial channel to the controller on page 67](#).



xx1300000605

A	Assembled expansion board for fieldbus adapters, without adapter.	
Description	Art. no.	Type designation
AnybusCC / RS232 expansion board	3HAC046408-001	DSQC1003

Continues on next page

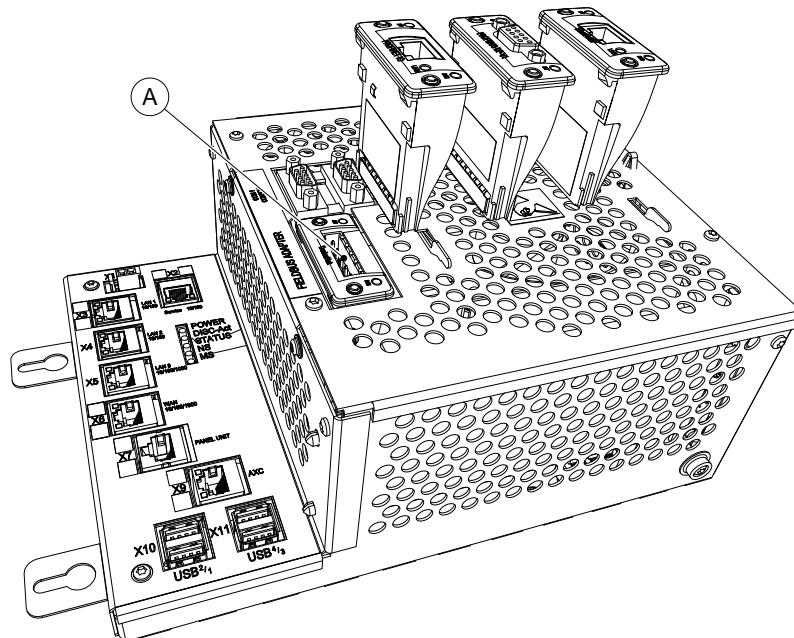
2 Installation and commissioning

2.8.1 Definition of fieldbuses, IRC5

Continued

Fieldbus adapters

The fieldbus adapters are inserted into the expansion board on top of the main computer unit. There is one slot available for installing a fieldbus adapter.



xx1300000604

A	Slot for AnybusCC fieldbus adapters
---	-------------------------------------

Following fieldbus adapters are available:

Description	Art. no.	Type designation
AnybusCC DeviceNet slave	3HAC045973-001	DSQC1004
AnybusCC PROFIBUS slave	3HAC026840-001	DSQC 667
AnybusCC Ethernet/IP slave	3HAC027652-014	DSQC 669
AnybusCC PROFINET slave	3HAC031670-001	DSQC 688

References

For more information on how to install and configure the fieldbuses, see the respective fieldbus manual:

Manual title	Art. no.
<i>Application manual - DeviceNet Master/Slave</i>	3HAC050992-001
<i>Application manual - DeviceNet Anybus Slave</i>	3HAC050993-001
<i>Application manual - EtherNet/IP Anybus Adapter</i>	3HAC050997-001
<i>Application manual - EtherNet/IP Scanner/Adapter</i>	3HAC050998-001
<i>Application manual - PROFIBUS Anybus Device</i>	3HAC050965-001
<i>Application manual - PROFIBUS Controller</i>	3HAC050966-001
<i>Application manual - PROFlenergy Device</i>	3HAC050967-001

Continues on next page

2 Installation and commissioning

2.8.1 Definition of fieldbuses, IRC5

Continued

Manual title	Art. no.
<i>Application manual - PROFINET Anybus Device</i>	<i>3HAC050968-001</i>
<i>Application manual - PROFINET Controller/Device</i>	<i>3HAC050969-001</i>

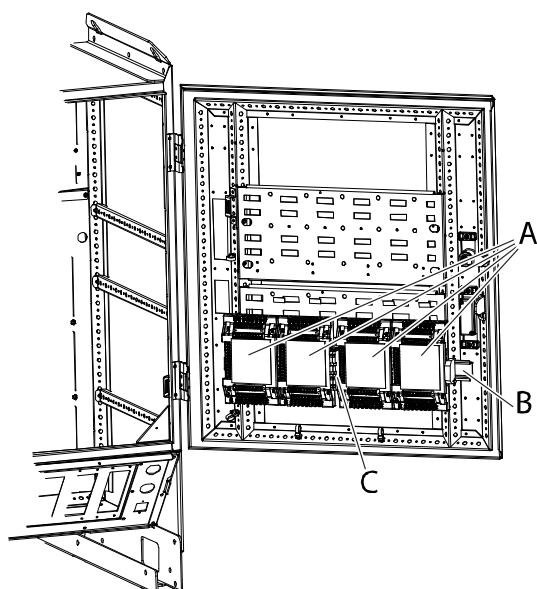
2 Installation and commissioning

2.8.2 Definition of I/O units, IRC5

General

The IRC5 controller may be fitted with I/O or encoder units. These are configured in an identical way.

The IRC5 controller is prepared for up to four I/O units or encoder interfaces units. This means that the harness inside the controller is equipped with necessary connectors. The units are placed on the inside of the door, as shown in the illustration below.



xx0500001859

A	I/O or encoder units
B	Mounting rail
C	Connection terminal XT31

Standard configuration

In the standard form, no fieldbus is mounted to the controller.

It is possible to connect any type of DeviceNet compliant I/O unit on the DeviceNet - master bus. All I/O units should comply with the DeviceNet standard and be conformance tested by ODVA.

I/O units

The table below specifies the I/O units:

Description	Note
AD Combi I/O	DSQC 651
Digital I/O	DSQC 652

See [Spare parts on page 295](#) for the spare part numbers.

Continues on next page

Encoder interface units

The table below specifies the encoder interface units:

Description	Art. no.	Note
Encoder interface unit for conveyor tracking	3HNE 01586-1	DSQC 377B

Further information

The table below gives references to additional information:

Information:	Found in:
How to install the I/O units mechanically and electrically.	Fit the expansion board and/or field bus adapter according to Replacement of expansion board in the computer unit on page 220 and/or Replacement of fieldbus adapter in the computer unit on page 223 .
Allowed configurations of I/O units and how to setup the configurations.	<i>Technical reference manual - System parameters</i>
How to install the I/O unit software related in a new system.	The application manual for the different I/O buses respectively, see listing in Definition of fieldbuses, IRC5 on page 106 .
Detailed descriptions of all available I/O units.	The application manual for the different I/O buses respectively, see listing in Definition of fieldbuses, IRC5 on page 106 .

2 Installation and commissioning

2.9.1 Installation of external operator's panel, IRC5

2.9 Installation of add-ons

2.9.1 Installation of external operator's panel, IRC5

Overview

External operator's panels can be either simply a panel or a panel box. See illustrations below.



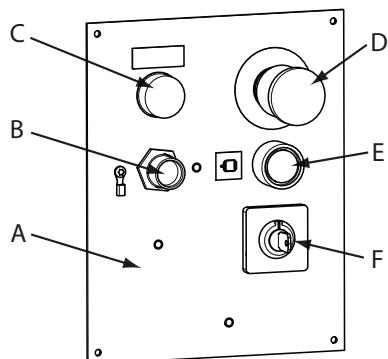
Note

When ordering the external operator's panel as an add-on, the external operator's panel is delivered empty together with labels and blanking plugs.

When installing, the following components must be moved from the controller to the external operator's panel:

- Mode switch
- Motor ON button
- Emergency stop button

External operator's panel (option 733-3)

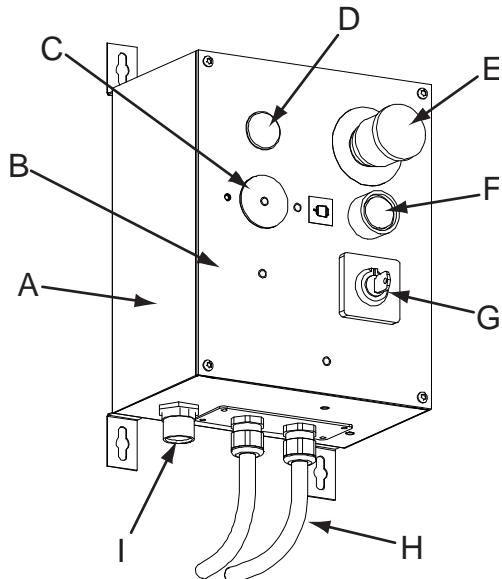


xx1100000522

A	Front panel
B	FlexPendant connector
C	Blanking plug for actuator red
D	Emergency stop button
E	Motor ON button
F	Mode switch

Continues on next page

External operator's panel box (option 733-4)



xx1000000954

A	Wall cabinet
B	Front panel
C	Blanking plug for FlexPendant
D	Blanking plug for actuator red
E	Emergency stop button
F	Motor ON button
G	Mode switch
H	External operator's panel harness
I	FlexPendant connector

Required equipment

Equipment	Art. no.	Note
External operator's panel (733-3)	3HAC040643-003	
External operator's panel box (733-4)	3HAC040644-003	
External operator's panel cable	3HAC038767-001 3HAC038768-001 3HAC038769-001	7 m 15 m 30 m
Standard toolkit		The contents are defined in section, <i>Standard toolkit, IRC5</i> on page 293
Circuit diagram		See <i>Circuit diagrams</i> on page 311.

Continues on next page

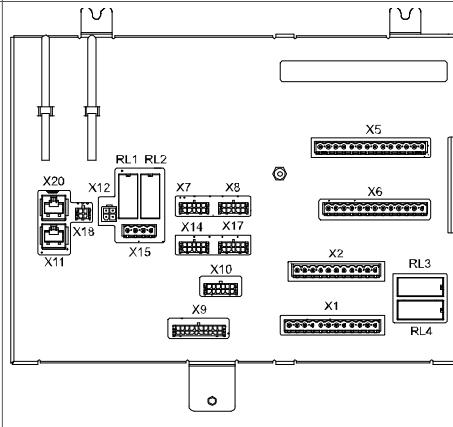
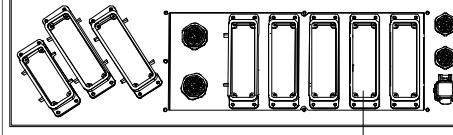
2 Installation and commissioning

2.9.1 Installation of external operator's panel, IRC5

Continued

Procedure

The procedure below details how to install the external control panel.

Action	Info/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2 Disconnect the cable from the ethernet connector for FlexPendant on the computer unit.	
3 Disconnect signal cabling from the panel board unit. Connectors: <ul style="list-style-type: none">• A21.X9• A21.X10	
4 Remove the following components together with the attached cable harness: <ul style="list-style-type: none">• S21.1, Mode switch• S21.2, Motor ON button• S21.3, Emergency stop button• XS4, FlexPendant connector	All components will be moved to the external operator's panel, except the FlexPendant connector and the cable harness which can be discarded.
5 Remove the cover to a free customer connector slot on the connection panel.	The illustration below shows the connection panel for the controller.  A xx0500001960 <ul style="list-style-type: none">• A: Customer connection slot
6 Fit the harness from the external control panel to the empty slot with the four attachment screws.	
7 Connect the earth cable to the chassis.	
8 Connect the ethernet connector A31.X3 for the FlexPendant to the computer unit.	

Continues on next page

2 Installation and commissioning

2.9.1 Installation of external operator's panel, IRC5

Continued

	Action	Info/Illustration
9	Connect the signal connectors A21.X9 and A21.X10 to the connector X9 and X10 on the panel board unit.	
10	Strap the cabling to the existing cable strapping inside the controller.	
11	Fit the labels and blanking plugs to the empty slots on the operator's panel.	
12	Fit the following components to the correct positions on the external operator's panel: <ul style="list-style-type: none">• S21.1, Mode switch• S21.2, Motor ON button• S21.3, Emergency stop button	
13	Fit the cabling to the panel box with the four attachment screws.	
14	Attach the XS4 connector to the external operator's panel, and connect the free ends of the harness to the components on the external operator's panel.	See Circuit diagrams on page 311 .
15	Connect the earth cable.	
16	Strap the cabling on the external operator's panel.	
17	Power on the controller and test the functionality of the Mode switch, Motor ON button, and the Emergency stop button.	

2 Installation and commissioning

2.9.2 Installation of external enabling device

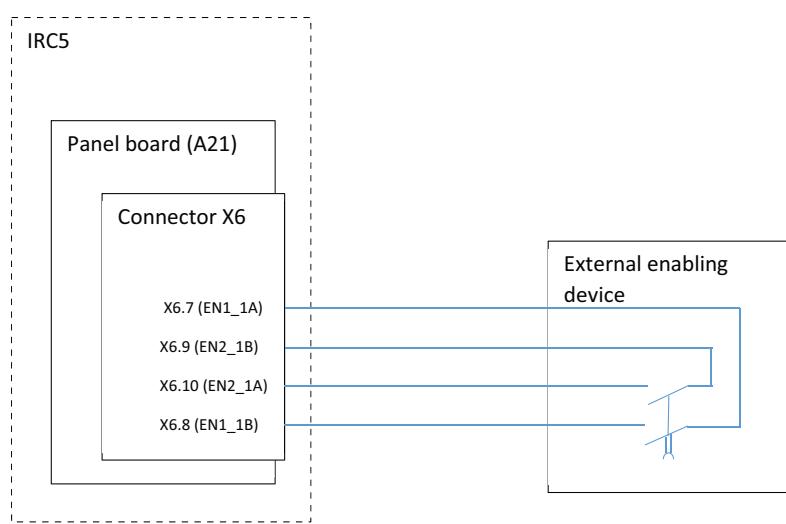
Overview

IRC5 is delivered with one enabling device but have the possibility to connect one additional external enabling device (cannot be ordered from ABB Robotics).

When an external enabling device is used together with the three-position enabling device on the teach pendant, both enabling devices must be enabled to be able to operate the manipulator in manual mode.

Connecting the external enabling device

The external enabling device must be connected to the panel board connector X6 pin 7-10 as shown in the figure below.



xx1500000534

The enabling device chain is enabled if X6 pin 7 is short circuited with X6 pin 8 at the same time as X6 pin 9 is short circuited with X6 pin 10.

Requirement on the external enabling device

The external enabling device connected to IRC5 must have the following characteristics:

- Redundant channels.
- Three-position enabling device. When the enabling device is pressed to the center position the enabling device chain must be enabled. When the enabling device is released or pressed to third position, the enabling device chain must be disabled.
- The enabling device must have a B10 value of at least 100000 cycles (less than 10% chance of failure before 100000 cycles).
- The mean time to dangerous failure (MTTF_d) of the external enabling device must be high enough to ensure that the external enabling device together

Continues on next page

with IRC5's enabling device chain is above 55 years. See safety related performance for the enabling device chain below.

Performance of IRC5 original enabling device chain

The safety-related performance of the enabling device chain, without the external enabling device, is as follows:

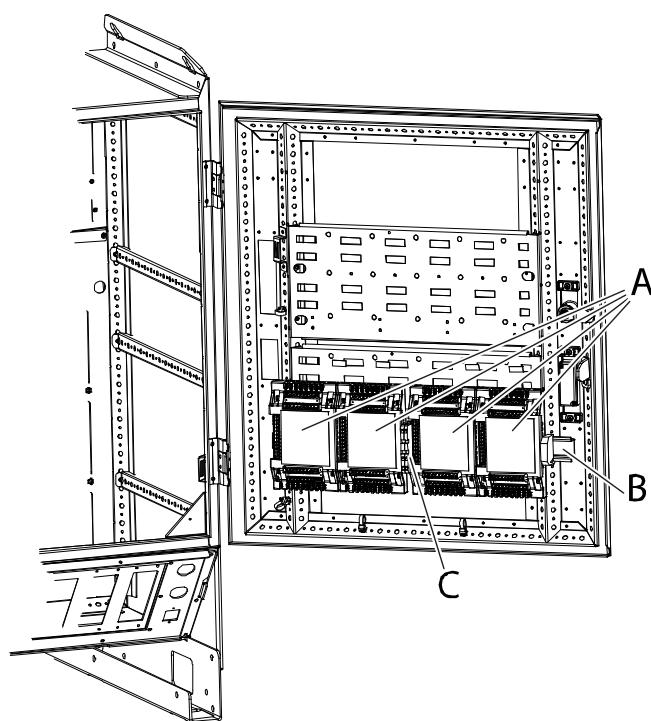
- MTTF_d for IRC5 enabling device chain is 80 years.
- IRC5's enabling device chain's calculated average probability of dangerous failure per hour (PFH_d) is 6.62x10E-08.
- IRC5's enabling device chain's design and structure is category 3.
- IRC5's enabling device chain's Diagnostic Coverage is medium (90% < DCavg < 99%).
- The Common Cause Failure (CCF) is met according to the standard requirements.

2 Installation and commissioning

2.9.3 Installation of I/O, Gateways and encoder interface units, IRC5

Location

The I/O units, Gateway or encoder interface units to be installed are shown in the illustration below.



xx0500001859

A	I/O units, Gateways or encoder interface units
B	Mounting rail
C	Connection terminal XT31

Required equipment

Equipment	Art. no.	Note
I/O units, Gateways or encoder interface units		
<i>Application manual - DeviceNet Master/Slave</i>	3HAC050992-001	
Circuit diagram	See <i>Circuit diagrams on page 311</i> .	

Continues on next page

Fitting

The procedure below details how to fit the units.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .	
2	Fit the I/O unit by snapping it onto the mounting rail.	
3	Connect the DC supply to the board.	
4	Connect wires to the inputs and output connectors as required.	Described in the Application manual for the respective busses.

24 V power supply

I/O units are supplied with 24 V power from the connector XT31 (see previous illustration).

Parallel connection

The 24V coming from DSQC 662, terminal XT31.1, can not be increased by adding power from any other 24 V power supply (not even DSQC 609). There is no load levelling function that ensures current distribution. The unit will not be destroyed but the lifetime may be affected.

The parallel connection of two DSQC 609 is permitted (factory setting) but not more than two.

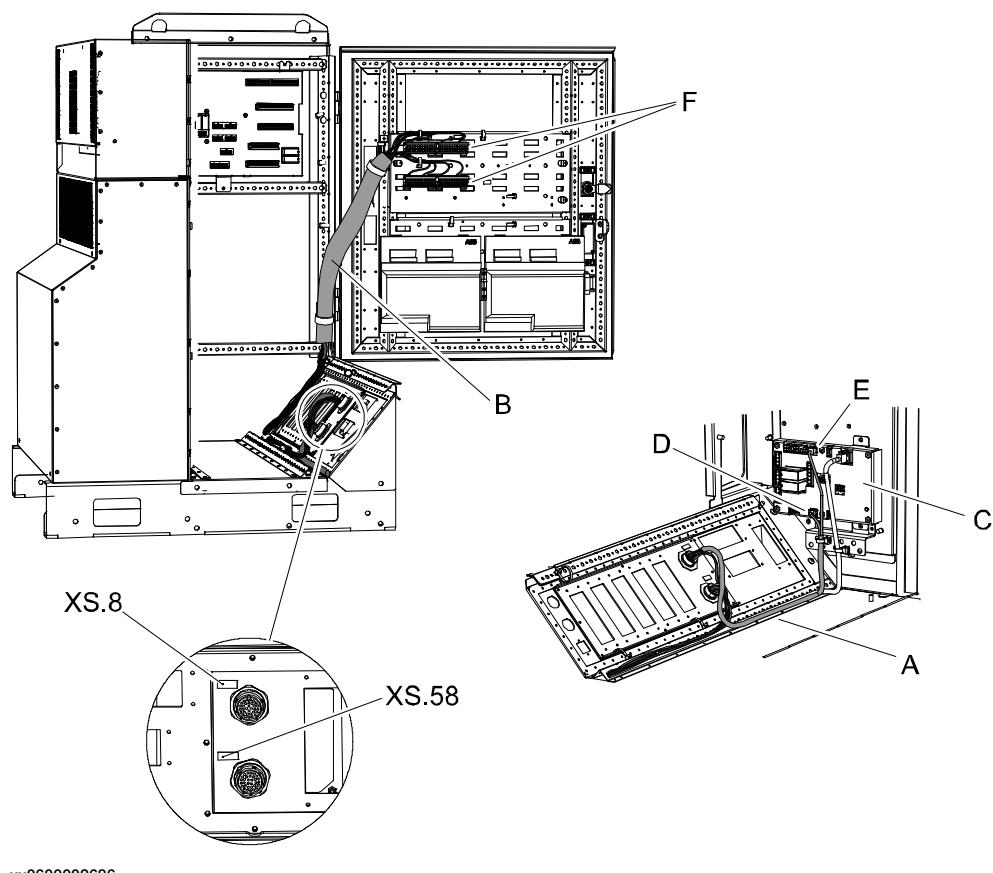
2 Installation and commissioning

2.9.4 Installation of cooling fan harness axis 1 and 2

General

If the robot is going to be supplemented with cooling fans on axis 1 and 2 the controller has to be supplemented with an internal harness.

Locations in controller



xx0600002686

A	Harness, cooling - Axis 1 and 2
B	Cable protection
C	Contactor interface board
D	Connector A43.X10
E	Connector A43.X11
F	Position switch terminals

Required equipment

Equipment	Article no.	Note
Harness, cooling - Axis 1 and 2 kit	3HAC025488-001	
Standard toolkit IRC5		See Standard toolkit, IRC5 on page 293 .

Continues on next page

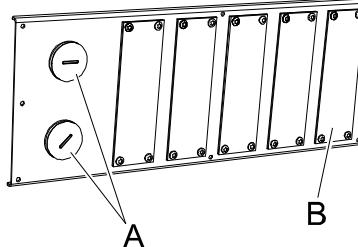
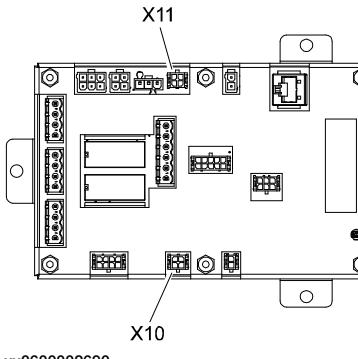
2.9.4 Installation of cooling fan harness axis 1 and 2

Continued

Equipment	Article no.	Note
Circuit diagram		See Circuit diagrams on page 311 .

Procedure

Following procedure details how to install the harness, cooling - Axis 1 and 2 kit in the controller.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	 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 35	
3	Remove the two sealing plugs.	 xx0600002688 <ul style="list-style-type: none"> • A: Sealing plug • B: Cover plate with gasket
4	Fit the two connectors XS.8 and XS.58 from the inside.	
5	Route the cable to the left and connect the harness connectors to the contactor interface board. <ul style="list-style-type: none"> • A43.X11 to X11 • A43.X10 to X10 	 xx0600002690
6	Route the wires with terminals to be mounted on the cabinet door inside the cable protection according to the illustration.	

Continues on next page

2 Installation and commissioning

2.9.4 Installation of cooling fan harness axis 1 and 2

Continued

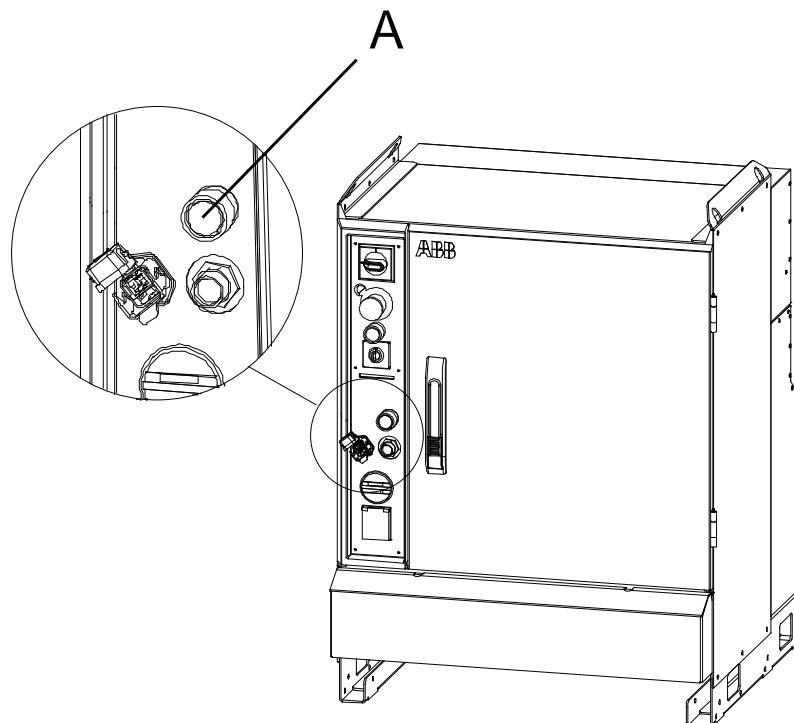
Action	Note/Illustration
7 Fit the snap locking terminals to the plate on the cabinet door according to the illustration.	<p>xx0600002693</p> <p>XT8/8.1 XT8/8.2 XP58.2 XP58.1</p>

2.9.5 Installation of the option Hot plug

Location

To be able to use the Hot plug function an additional hot plug button is needed.

The figure below shows the location of the hot plug button on the controller.



A	Hot plug button
---	-----------------

Required equipment

Equipment	Art. no.	Note
Hot plug	3HAC026225-002	
Standard toolkit		The contents are defined in section <i>Standard toolkit</i> .
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 Circuit diagrams on page 311 .

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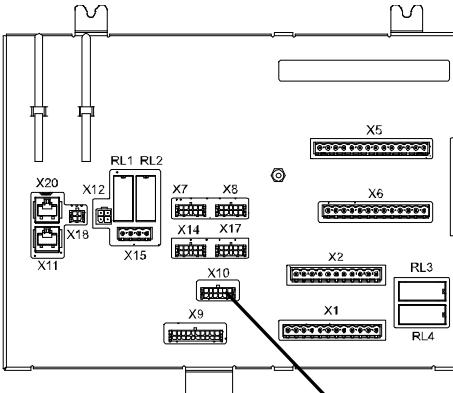
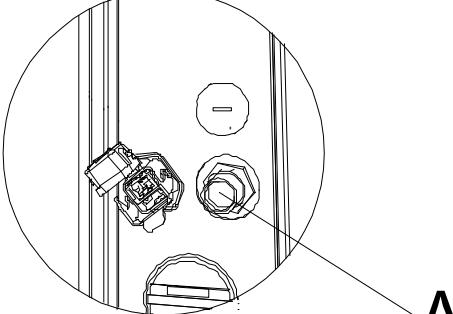
2 Installation and commissioning

2.9.5 Installation of the option Hot plug

Continued

Procedure Single Cabinet Controller

The procedure below details how to install the hot plug button in the controller.

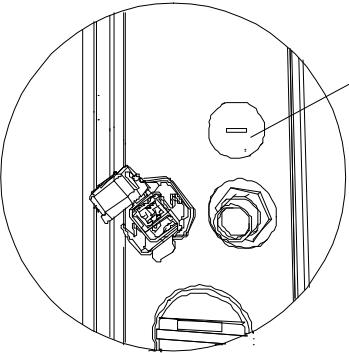
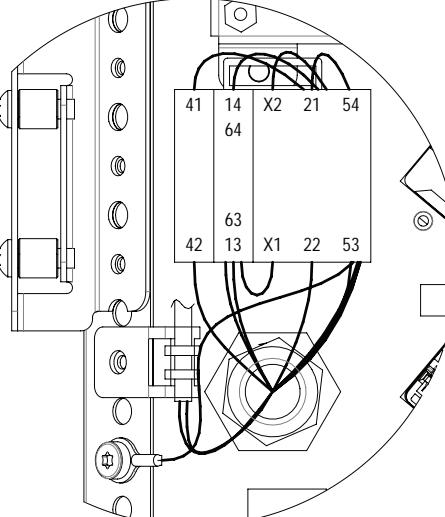
	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	 WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35	
3	Disconnect the cable from the ethernet connector for FlexPendant on the computer unit.	
4	Disconnect signal cabling from the panel board unit.	 xx0600002946 • A: Connector X10
5	Remove the FlexPendant connector with harness from the Operator panel.	 xx0600002948 • A: FlexPendant connector

Continues on next page

2 Installation and commissioning

2.9.5 Installation of the option Hot plug

Continued

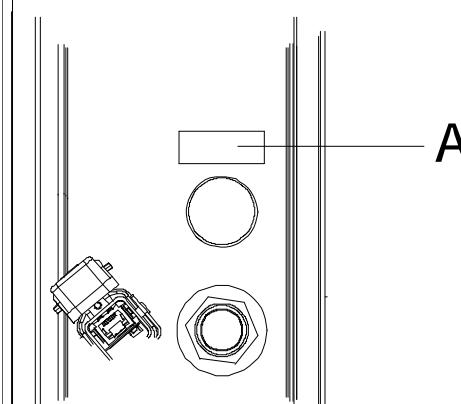
Action	Note/Illustration																																				
6 Remove the plug that covers the hot plug hole.	 xx0600002949 <ul style="list-style-type: none"> • A: Plug 																																				
7 Fit the new FlexPendant connector and hot plug button with harness into the empty hole on the operator panel.																																					
8 Connect the ethernet connector for Flex-Pendant to the computer unit.																																					
9 Connect the signal connector A21.X10 to the panel board unit.																																					
10 Connect the cables to the hot plug button connector.	 <table border="1" data-bbox="1024 1605 1262 1920"> <thead> <tr> <th>Wire no.</th> <th>Conn. A</th> <th>Conn. B</th> </tr> </thead> <tbody> <tr> <td>207</td> <td>22</td> <td></td> </tr> <tr> <td>RD</td> <td>21</td> <td></td> </tr> <tr> <td>208</td> <td>42</td> <td></td> </tr> <tr> <td>OG</td> <td>41</td> <td></td> </tr> <tr> <td>209/BU1</td> <td>14</td> <td></td> </tr> <tr> <td>YE/BU1</td> <td>64</td> <td></td> </tr> <tr> <td>210/GN</td> <td>13</td> <td></td> </tr> <tr> <td>211/BU</td> <td>53</td> <td></td> </tr> <tr> <td>212/VT</td> <td>54</td> <td></td> </tr> <tr> <td>Bridge</td> <td>63</td> <td>X1</td> </tr> <tr> <td>213</td> <td>X2</td> <td>GND</td> </tr> </tbody> </table> xx0600002953	Wire no.	Conn. A	Conn. B	207	22		RD	21		208	42		OG	41		209/BU1	14		YE/BU1	64		210/GN	13		211/BU	53		212/VT	54		Bridge	63	X1	213	X2	GND
Wire no.	Conn. A	Conn. B																																			
207	22																																				
RD	21																																				
208	42																																				
OG	41																																				
209/BU1	14																																				
YE/BU1	64																																				
210/GN	13																																				
211/BU	53																																				
212/VT	54																																				
Bridge	63	X1																																			
213	X2	GND																																			

Continues on next page

2 Installation and commissioning

2.9.5 Installation of the option Hot plug

Continued

Action	Note/Illustration
11 Place the warning label above the hot plug button.	 xx0600002957 <ul style="list-style-type: none"> • A: Warning label
12 Test the hot plug button function.	See section Test of hot plug button function on page 126 .

Test of hot plug button function

The procedure below details how to test the hot plug button function.

Action	Note/Illustration
1 Make sure that the system is in automatic mode.	
2 Press the motors on button.	
3 Press and hold the hot plug button. <ul style="list-style-type: none"> • Verify that the red lamp indicates when actuated. • Verify that the system still has motors on. 	
4 Keep pressing the hot plug button and at the same time, switch the jumper plug with the FlexPendant plug. <ul style="list-style-type: none"> • Verify that the system still has motors on. 	
5 Release the hot plug button. <ul style="list-style-type: none"> • Verify that the system still has motors on. 	Make sure that the button is not stuck in the actuated position since it disables the FlexPendant emergency stop button.
6 Press and hold the hot plug button.	
7 Keep pressing the hot plug button and at the same time, switch the FlexPendant plug with the jumper plug.	
8 Release the hot plug button. <ul style="list-style-type: none"> • Verify that the FlexPendant starts up correctly. • Verify that the system still has motors on. 	
9 Switch to Manual mode.	Motors off
10 Confirm the mode change. <ul style="list-style-type: none"> • Verify motors on. 	
11 Press the hot plug button. <ul style="list-style-type: none"> • Verify motors off. 	

2.9.6 Installing the EPS board DSQC 646 for Electronic Position Switches

2.9.6 Installing the EPS board DSQC 646 for Electronic Position Switches

General

To use the option Electronic Position Switches you need to install an EPS board in the robot controller. The procedure below will show how to install this board.



Note

It is not possible to have the options EPS and SafeMove installed at the same time - that is, only one of these two options can be installed and used.

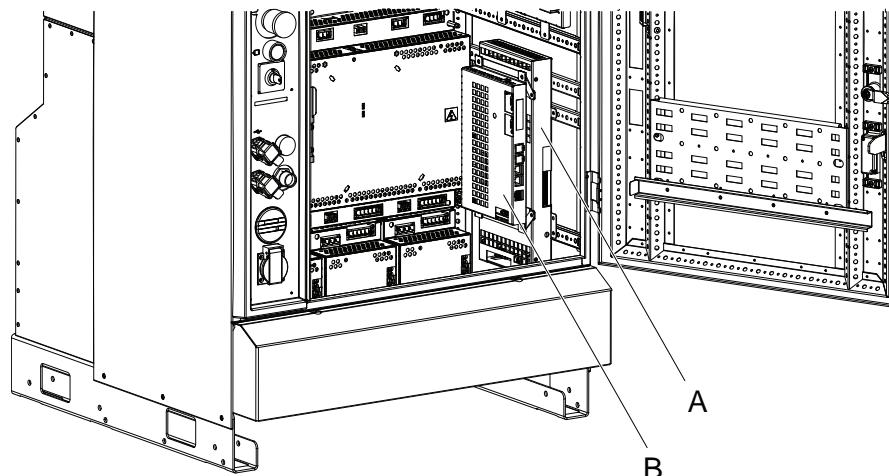


WARNING

The safety controller has passive monitoring, i.e. it does not stop the robot. If an axis is outside its configured range, an output signal goes low. It is the responsibility of the installation personnel to connect the output signals in such a way that the robot is stopped if there is a risk of a dangerous situation.

Illustration

The EPS board should be mounted behind the axis computer.



xx0600003203

A	EPS board
B	Axis computer

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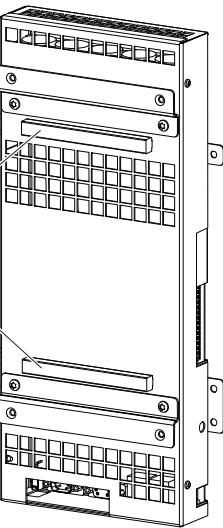
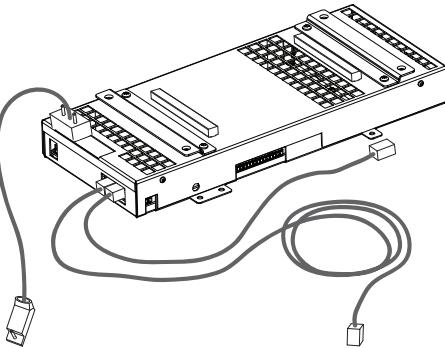
2 Installation and commissioning

2.9.6 Installing the EPS board DSQC 646 for Electronic Position Switches

Continued

Procedure

The procedure below details how to install an EPS board.

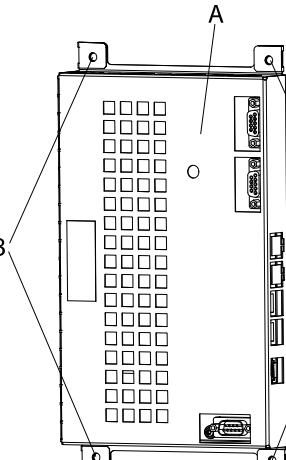
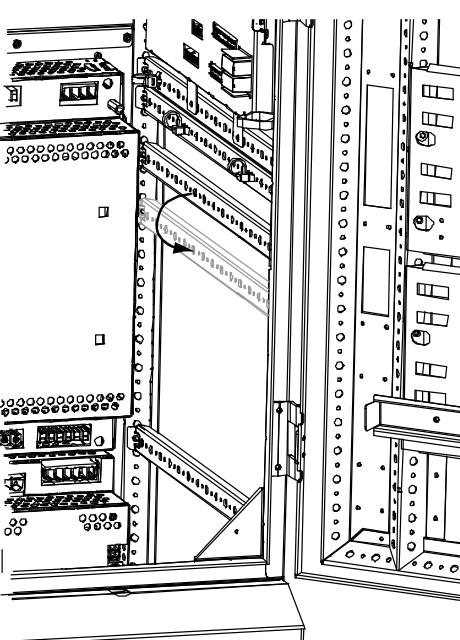
	Action	Note/illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2	 WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35	
3	If not already in place, fit the EMC strips on the EPS board.	 xx0700000087
4	Connect the short SMB cable and both Ethernet cables to the EPS board before mounting the board. These connections may be difficult to reach once the board is mounted. The two Ethernet connectors on the EPS board are interchangeable (it does not matter which is connected to the main computer and which is connected to the axis computer).	 xx0600003303

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2 Installation and commissioning

2.9.6 Installing the EPS board DSQC 646 for Electronic Position Switches

Continued

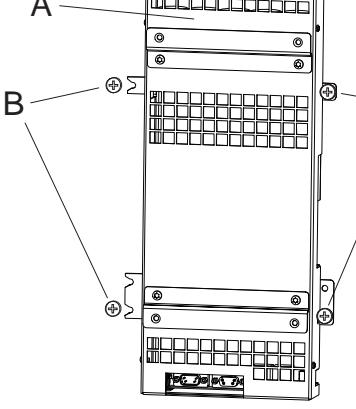
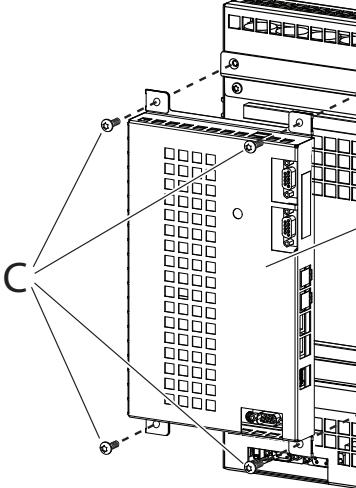
Action	Note/illustration
5	<p>Remove the attachment screws of the axis computer. Lift out the axis computer so that the EPS board can be fitted behind the axis computer.</p>  <p>xx0900000030</p> <ul style="list-style-type: none"> • A: axis computer • B: attachment screws
6	<p>Move the upper mounting rail:</p> <ol style="list-style-type: none"> 1 Remove the Main Drive Unit. See Replacement of drive units on page 234. 2 Move the upper mounting rail two steps (50 mm) down. 3 Replace the Main Drive Unit.  <p>xx0900000737</p>

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2 Installation and commissioning

2.9.6 Installing the EPS board DSQC 646 for Electronic Position Switches

Continued

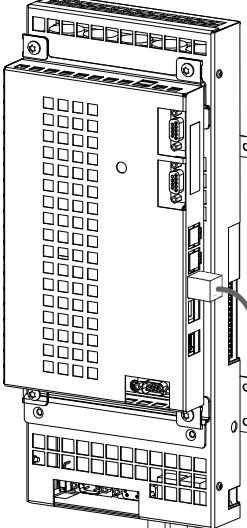
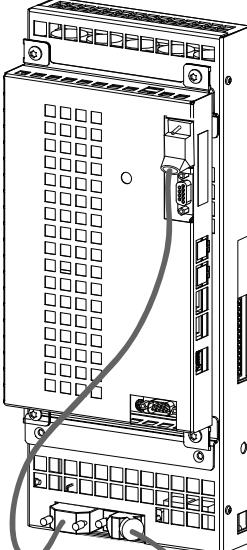
Action	Note/illustration
7	<p>Fit the EPS board in the same place as the axis computer was before.</p>  <p>xx0600003204</p> <ul style="list-style-type: none"> A: EPS board B: attachment screws
8	<p>Fit the axis computer on the EPS board.</p>  <p>xx0900000438</p> <ul style="list-style-type: none"> A: axis computer B: EPS board C: attachment screws

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2 Installation and commissioning

2.9.6 Installing the EPS board DSQC 646 for Electronic Position Switches

Continued

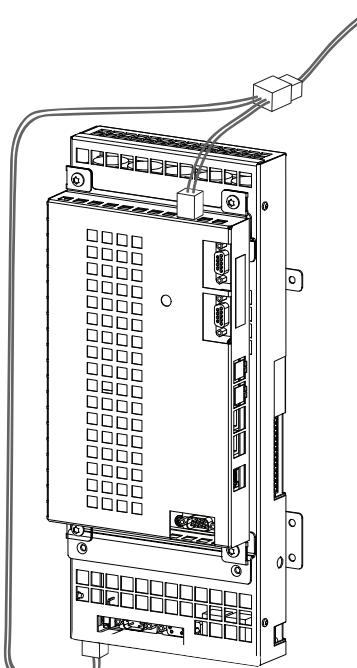
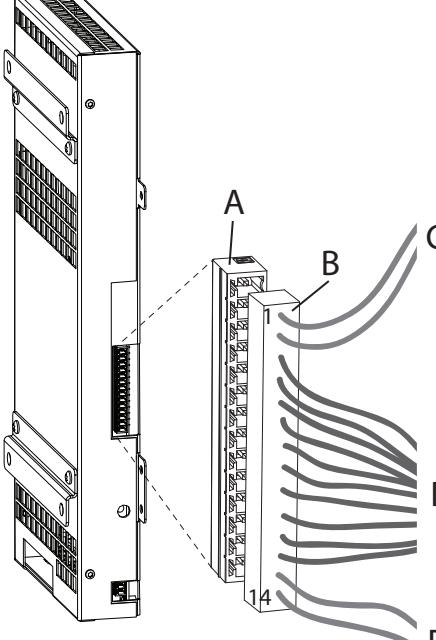
Action	Note/illustration
9 Remove the Ethernet cable between the main computer and the axis computer. Replace it with the long Ethernet cable from the EPS board to the main computer. Connect the short Ethernet cable between the EPS board and the axis computer.	 xx0600003218
10 Remove the SMB cable from the axis computer and connect it to the EPS board. Connect the SMB cable from the EPS board to the axis computer.	 xx0600003207

Continues on next page

2 Installation and commissioning

2.9.6 Installing the EPS board DSQC 646 for Electronic Position Switches

Continued

Action	Note/illustration
11 Remove the power cable from the axis computer and connect it to the split cable. Connect the split cable to the EPS board and the axis computer.	 xx0600003208
12 Connect signal cables to the plug contact, which is then connected to the I/O connector of the EPS board. <ul style="list-style-type: none"> • Connect a power supply, 24 V to pin 1 and 0 V to pin 2. Check with a voltmeter that the voltage is 24 V between pin 1 and 2 on the Phoenix connector. • Connect the output signals from the EPS board (pin 3-12). • Connect the sync switch signals to pin 13 and 14. If dual channel wiring is not used, connect only pin 14. 	 xx0600003209 <ul style="list-style-type: none"> • A: I/O Connector • B: Plug contact • C: Power supply • D: 5 safe outputs (10 signals) • E: Sync switch (dual signal)

2.9.7 Installing the SafeMove board DSQC 647

General

To use the option SafeMove you need to install a SafeMove board DSQC 647 in the robot controller. The procedure below will show how to install this board.

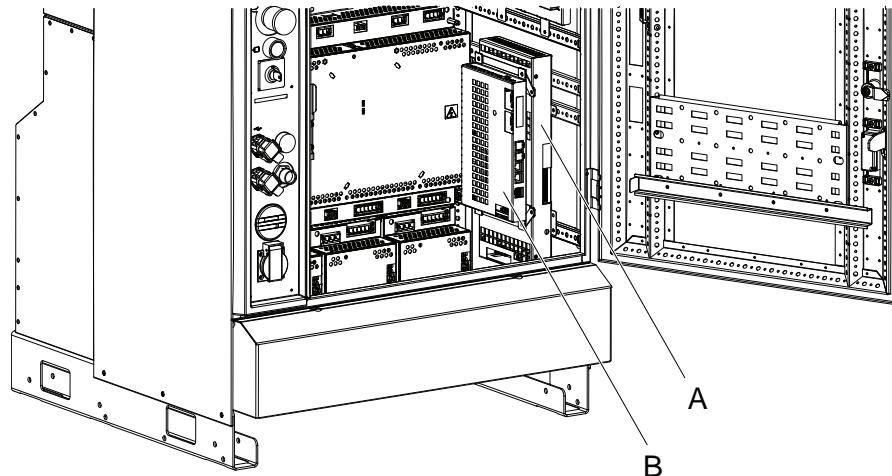


Note

It is not possible to have the options SafeMove and EPS installed at the same time - that is, only one of these two options can be installed and used.

Location

The SafeMove board should be mounted behind the axis computer.



xx0600003203

A	SafeMove board
B	Axis computer

Procedure

The procedure below details how to install the SafeMove board.

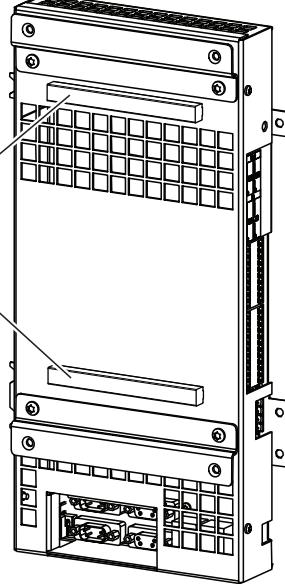
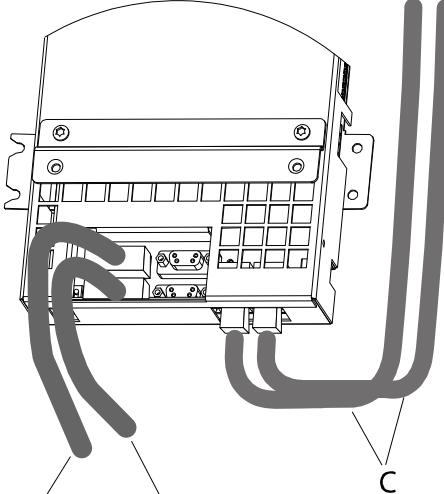
	Action	Note/illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	

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2 Installation and commissioning

2.9.7 Installing the SafeMove board DSQC 647

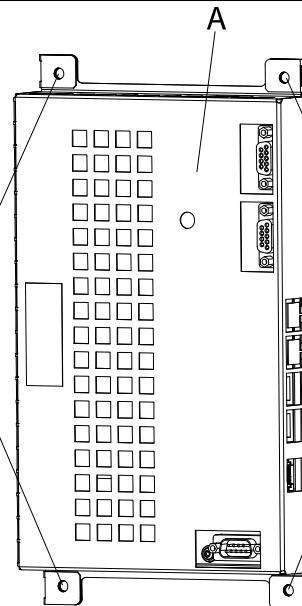
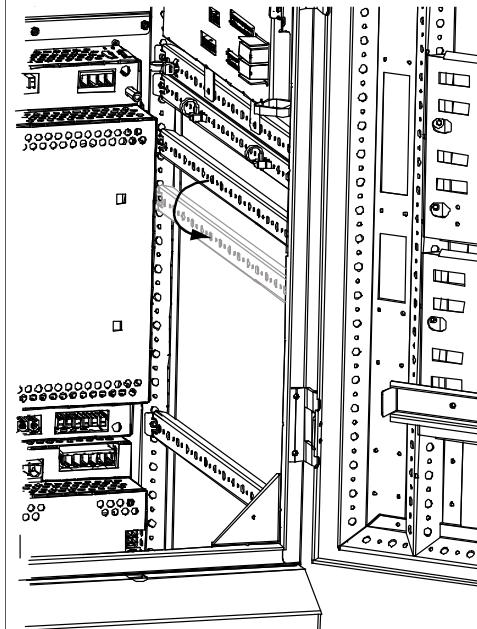
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Action	Note/illustration
2 <p> WARNING</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35</p>	
3 <p>If not already in place, fit the EMC strips on the SafeMove board.</p>	 <p>xx0800000204</p> <ul style="list-style-type: none"> A: EMC strips
4 <p>Connect both SMB cables and both Ethernet cables to the SafeMove board before mounting the board. These connections may be difficult to reach once the board is mounted.</p> <p>The two Ethernet connectors on the SafeMove board are interchangeable (it does not matter which is connected to the main computer and which is connected to the axis computer).</p>	 <p>xx0800000103</p> <ul style="list-style-type: none"> A: SMB1 cable B: SMB2 cable C: Ethernet cables

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2.9.7 Installing the SafeMove board DSQC 647

Continued

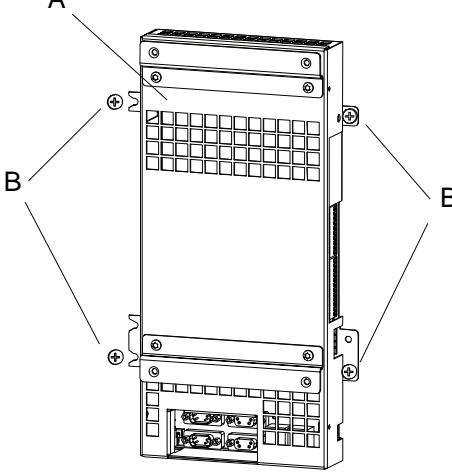
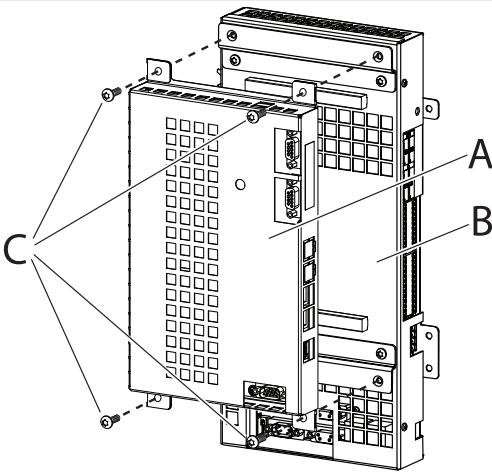
Action	Note/illustration
5 Remove the attachment screws of the axis computer. Lift out the axis computer so that the SafeMove board can be fitted behind the axis computer.	 <p>xx0900000030</p> <ul style="list-style-type: none"> • A: axis computer • B: attachment screws (4 pcs)
6 Move the upper mounting rail: <ol style="list-style-type: none"> 1 Remove the Main Drive Unit. See Replacement of drive units on page 234. 2 Move the upper mounting rail two steps (50 mm) down. 3 Replace the Main Drive Unit. 	 <p>xx0900000737</p>

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2 Installation and commissioning

2.9.7 Installing the SafeMove board DSQC 647

Continued

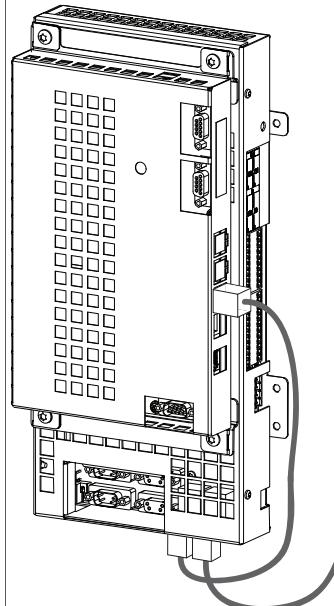
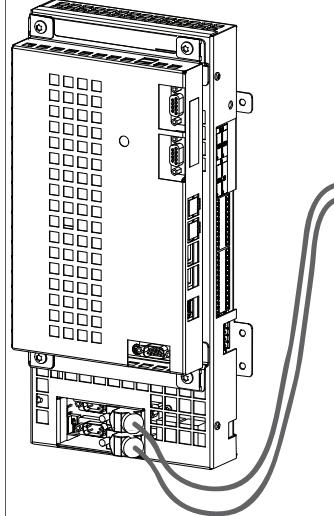
Action	Note/illustration
7 Fit the SafeMove board in the same place as the axis computer was before.	 <p>xx0800000104</p> <ul style="list-style-type: none"> • A: SafeMove board • B: attachments screws (4 pcs)
8 Fit the axis computer on the SafeMove board.	 <p>xx0900000441</p> <ul style="list-style-type: none"> • A: Axis computer • B: SafeMove board • C: attachment screws (4 pcs)

Continues on next page

2 Installation and commissioning

2.9.7 Installing the SafeMove board DSQC 647

Continued

Action	Note/illustration
9 Remove the Ethernet cable between the main computer and the axis computer. Replace it with the long Ethernet cable from the SafeMove board to the main computer. Connect the short Ethernet cable between the SafeMove board and the axis computer.	 xx0800000018
10 Disconnect the SMB cables from the axis computer and connect them to the SafeMove board.	 xx0800000031 <ul style="list-style-type: none"> • A: SMB1 cable (robot) • B: SMB2 cable (external axes)

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2 Installation and commissioning

2.9.7 Installing the SafeMove board DSQC 647

Continued

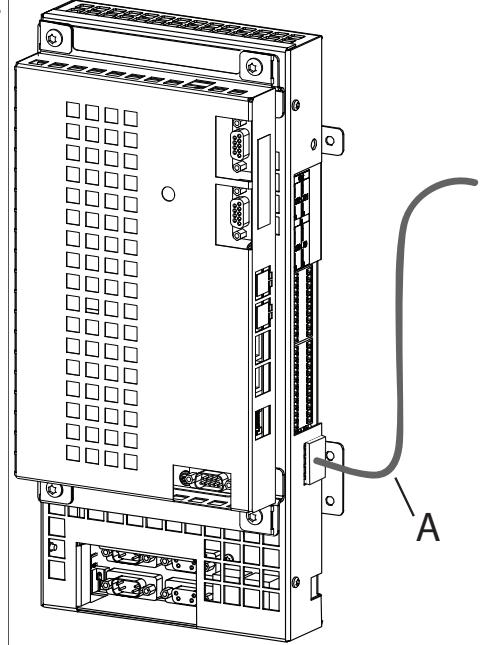
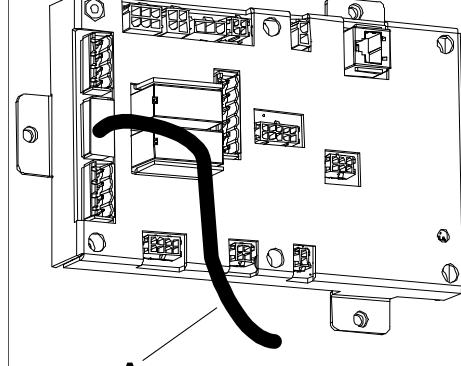
Action	Note/illustration
11 Connect the SMB cables from the SafeMove board to the axis computer	<p>A B</p> <p>xx0800000032</p> <ul style="list-style-type: none">• A: SMB1 cable• B: SMB2 cable
12 Disconnect the power cable from the axis computer and connect it to the split cable. Connect the split cable to the SafeMove board and the axis computer.	<p>xx0800000028</p>

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2 Installation and commissioning

2.9.7 Installing the SafeMove board DSQC 647

Continued

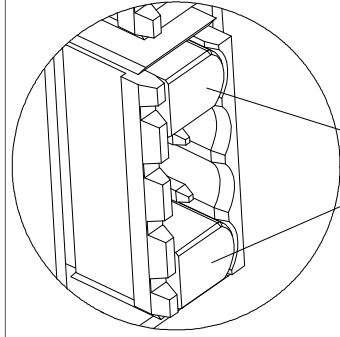
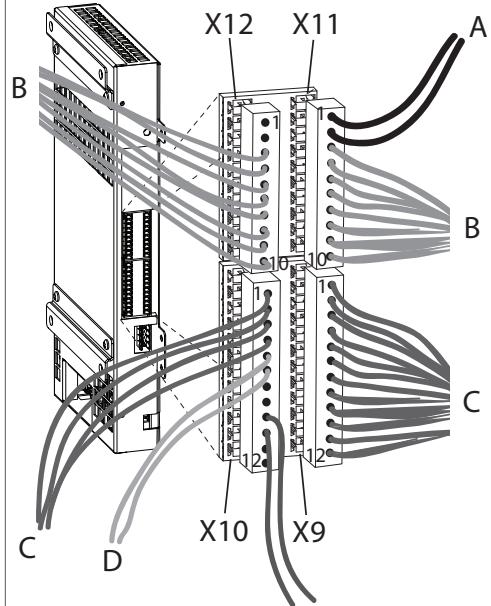
Action	Note/illustration
13 Connect the limit switch cable between the SafeMove board (X13) and the contactor interface board (X21)	<p>SafeMove board:  xx0800000033</p> <p>Contactor interface board:  xx0800000105</p> <ul style="list-style-type: none">A: limit switch cable

Continues on next page

2 Installation and commissioning

2.9.7 Installing the SafeMove board DSQC 647

Continued

	Action	Note/illustration
14	Mount the plugs in the limit switch override contact (X23) at pin 1 and 4 on the contactor interface board.	<p>The limit switch override contact must be plugged and not used when using SafeMove.</p>  <p>xx0800000035</p> <ul style="list-style-type: none"> A: plug (2pcs)
15	Connect signal cables to the plug contacts, which is then connected to the I/O connector of the SafeMove board.	 <p>xx0700000640</p> <ul style="list-style-type: none"> A: Power supply B: 8 safe outputs (16 signals) C: 8 safe inputs (16 signals) D: Sync switch (dual signal) E: Override operation input (dual signal)

2.9.8 Installing the Safety module DSQC1015 for SafeMove

General

To use the options SafeMove Basic and SafeMove Pro you need to install the Safety module DSQC1015 in the robot controller.

The procedure below describes how to install the Safety module and how to connect the cables. There are different sets of harnesses depending on if SafeMove is used with a software switch or a hardware switch.

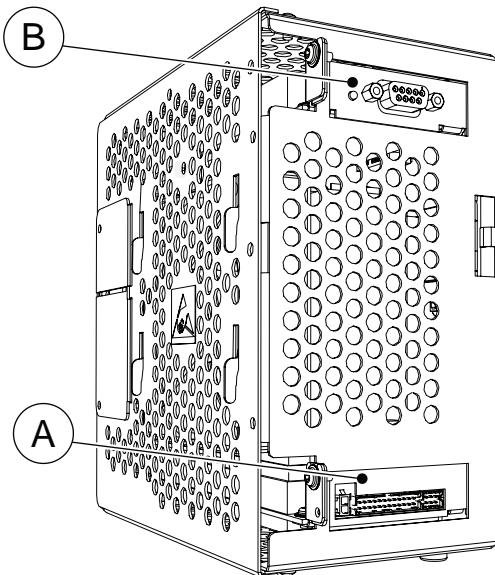


Note

It is not possible to have the options SafeMove Basic or SafeMove Pro installed at the same time as Electronic Position Switches or first generation SafeMove.

Location

The Safety module DSQC1015 is a PClexpress board that is located inside the IRC5 main computer unit.



xx1500001760

A	Safety module DSQC1015
B	PClexpress slot for other devices.



Note

Any PClexpress board will fit in any of the PClexpress slots. However, to minimize temperature sensitivity, place the Safety module in the lower PClexpress slot. If there already is another unit (for example a fieldbus board) in the lower PClexpress slot, it is recommended to move this to the upper PClexpress slot.

Continues on next page

2 Installation and commissioning

2.9.8 Installing the Safety module DSQC1015 for SafeMove

Continued

Required equipment

Illustrations of the cable harnesses are found in sections:

- [Connecting the cables to the Safety module \(software switch and 731-1\) on page 144](#)
- [Connecting the cables to the Safety module \(software switch and 731-2\) on page 146](#)
- [Connecting the cables to the Safety module \(hardware switch and 731-1\) on page 148](#)
- [Connecting the cables to the Safety module \(hardware switch and 731-2\) on page 150](#)

Item	Equipment	Note
	DSQC1015 Safety module	3HAC048858-001
A	Harness safety keyless	3HAC056648-001 Used when the controller has software switch.
A2	Harness safety hard Key switch	3HAC057150-001 Used when the controller has hardware switch.
D	Harness 24 V I/O DSQC1015	3HAC055633-001
B	Harness auxiliary contact	3HAC055642-001
E	Harness internal customer connection	3HAC056638-001 Used when the controller has the option 731-1 <i>Safety internal connection</i> .
F	Harness external customer connection	3HAC056622-001 Used when the controller has the option 731-2 <i>Safety external connection</i> .
C	Harness control panel emergency stop	3HAC056527-001 Used when the controller has the option 735-3 or 735-4 <i>Additional contacts</i> .
G	Harness extended Key switch	3HAC023476-001 Used when the controller has the option 735-3 or 735-4 <i>Additional contacts</i> .
	Standard toolkit	The contents are defined in section Standard toolkit.
	Circuit diagram	See Circuit diagrams on page 311 .

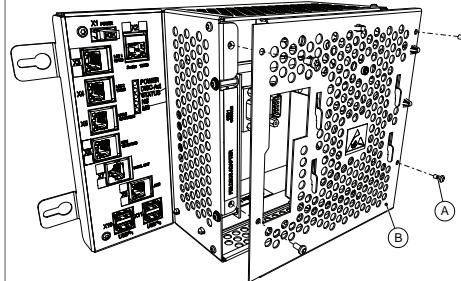
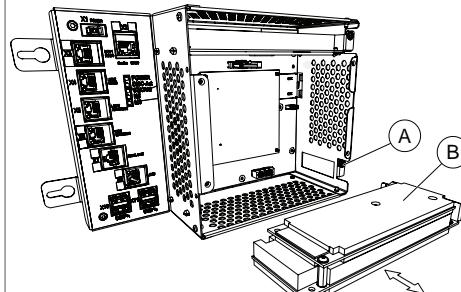
Installing the Safety module

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	

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2 Installation and commissioning

2.9.8 Installing the Safety module DSQC1015 for SafeMove Continued

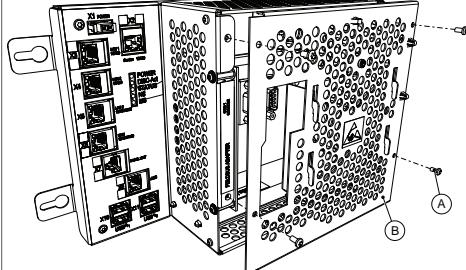
Action	Note/Illustration
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3 Open the computer unit by removing the attachment screws and lift off the cover. Disconnect the fan connector.  CAUTION Be careful with the fan cable when opening and removing the upper cover. The fan cable must not be stretched.	 xx1300000684 A Attachment screws (4 pcs.) B Cover
4 Remove the attachment screw on top of the slot bracket.	
5 Fit the Safety module in position by pushing it into the socket on the motherboard.	 xx1500001761 A Attachment screw B Safety module  CAUTION Always grip the board around the edges to avoid damage to the board or its components.
6 Refit the attachment screw on top of the Safety module bracket.	

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2 Installation and commissioning

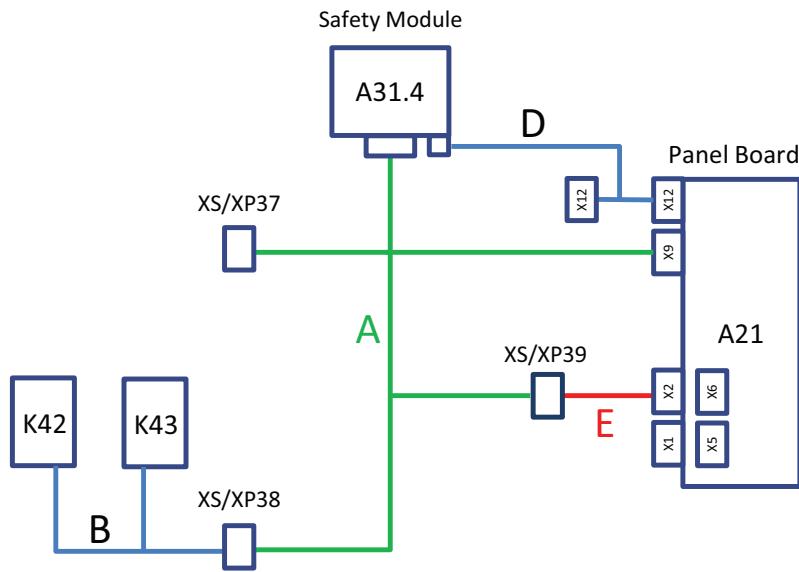
2.9.8 Installing the Safety module DSQC1015 for SafeMove

Continued

Action	Note/Illustration
<p>7 Refit the fan connector and close the computer unit.</p> <p>CAUTION Be careful with the fan cable when closing the cover. The fan cable must not be squeezed.</p>	 xx1300000684 A Attachment screws (4 pcs.) B Cover
8 Connect all cables according to the procedures described below.	

Connecting the cables to the Safety module (software switch and 731-1)

This procedure describes how to connect the cables for a robot controller equipped with the options *Software switch* and *731-1 Safety internal connection*.



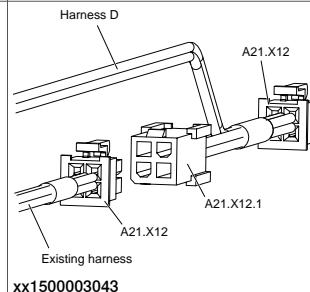
xx1500003028

Action	Note/Illustration
<p>1</p> <p>DANGER</p> <p>Before commencing any work inside the cabinet, read the safety information in section <i>DANGER - Make sure that the main power has been switched off!</i> on page 34</p>	
<p>2</p> <p>WARNING</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>WARNING - The unit is sensitive to ESD!</i> on page 35</p>	

Continues on next page

2.9.8 Installing the Safety module DSQC1015 for SafeMove

Continued

Action	Note/Illustration
3 Dismantle mode switch, emergency stop button, motor on button, and plug the holes on the front panel.	
4 Disconnect connector A21.X9 from the panel board, and remove the harness.	
5 Connect connector A21.X9 on safety keyless harness (A) to panel board.	
6 Mount auxiliary contact harness contact blocks (B) on contactors K42 and K43.	
7 Connect auxiliary contact harness (B) to safety keyless harness (A) at connector XS/XP38.	
8 Connect safety keyless harness connector A31.4.X6 (A) to Safety board DSQC1015.	
9 Connect connector A31.4.X1 on 24 V I/O harness (D) to safety board DSQC1015.	
10 Disconnect existing connector A21.X12 from the panel board, and connect to connector A21.X12.1 on 24 V I/O harness (D).	 <p>xx1500003043</p>
11 Connect connector A21.X12 on 24 V I/O harness (D) to panel board.	
12 Disconnect existing connectors A21.X1, A21.X2, A21.X5 and A21.X6 from the panel board.	
13 Connect connectors from internal customer connection harness (E) to panel board.	
14 Connect safety keyless harness (A) with internal customer connection harness (E) at connector XS/XP39.	
15 Route cables properly in existing cable holders.	

Continues on next page

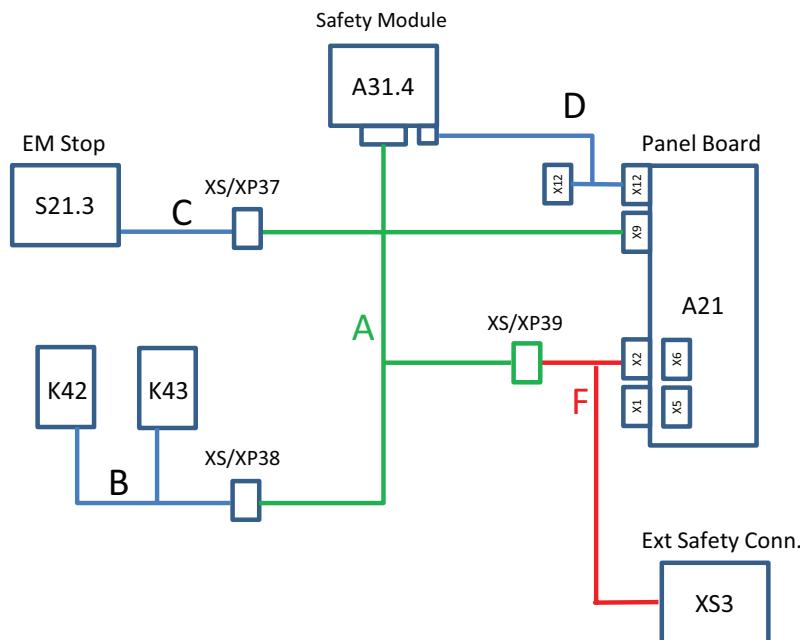
2 Installation and commissioning

2.9.8 Installing the Safety module DSQC1015 for SafeMove

Continued

Connecting the cables to the Safety module (software switch and 731-2)

This procedure describes how to connect the cables for a robot controller equipped with the options *Software switch* and *731-2 Safety external connection*.

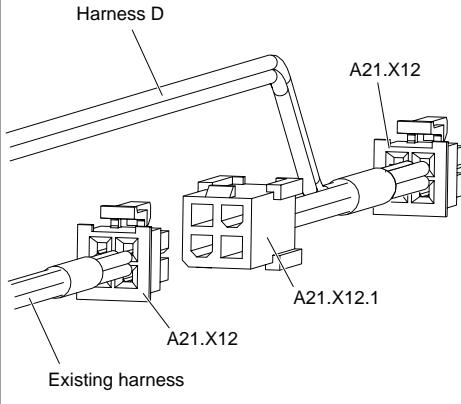
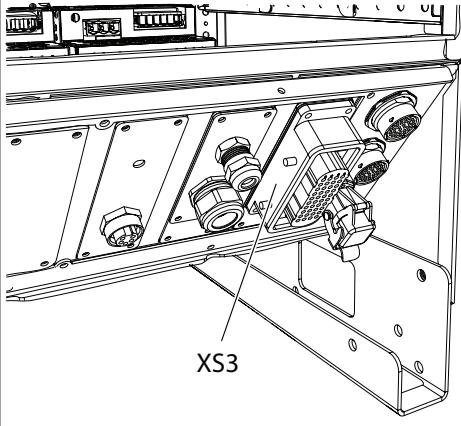


xx1500003029

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, read the safety information in section DANGER - Make sure that the main power has been switched off! on page 34	
2  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 35	
3 Dismantle mode switch and motor on button, and plug the holes on the front panel.	
4 Remove cabling from the emergency stop button, and replace with emergency Stop harness (C).	Note wire numbers and placement before removal.
5 Disconnect connector A21.X9 from the panel board, and remove the harness.	
6 Connect connector A21.X9 on safety keyless harness (A) to panel board.	
7 Mount auxiliary contact harness contact blocks (B) on contactors K42 and K43.	

Continues on next page

2.9.8 Installing the Safety module DSQC1015 for SafeMove *Continued*

Action	Note/Illustration
8 Connect auxiliary contact harness (B) to safety keyless harness (A) at connector XS/XP38.	
9 Connect safety keyless harness connector A31.4.X6 (A) to Safety board DSQC1015.	
10 Connect connector A31.4.X1 on 24 V I/O harness (D) to safety board DSQC1015.	
11 Disconnect existing connector A21.X12 from the panel board, and connect to connector A21.X12.1 on 24 V I/O harness (D).	 <p style="text-align: center;">xx1500003043</p>
12 Connect connector A21.X12 on 24 V I/O harness (D) to panel board.	
13 Disconnect existing connectors A21.X1, A21.X2, A21.X5 and A21.X6 from the panel board.	
14 Connect connectors from external customer connection harness (F) to panel board.	
15 Connect safety keyless harness (A) with external customer connection harness (F) at connector XS/XP39.	
16 Fit connector XS3 in to a free customer connector slot on the connection panel.	 <p style="text-align: center;">xx1500003045</p>
17 Route cables properly in existing cable holders.	

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2 Installation and commissioning

2.9.8 Installing the Safety module DSQC1015 for SafeMove

Continued

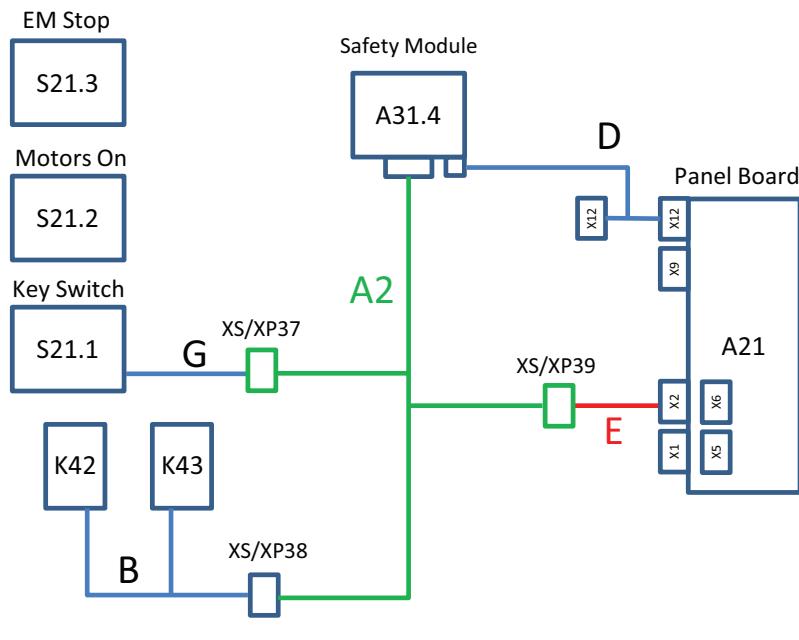
Connecting the cables to the Safety module (hardware switch and 731-1)

This procedure describes how to connect the cables for a robot controller equipped with the options *Hardware switch* and *731-1 Safety internal connection*.



Note

This application requires options 735-3 additional contacts, (3 modes) or option 735-4 additional contacts, (2 modes).



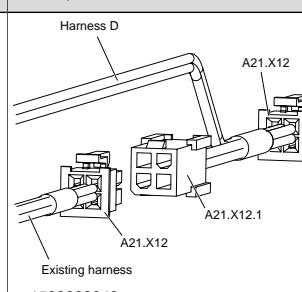
xx1500003030

Action	Note/Illustration
1	<p> DANGER</p> <p>Before commencing any work inside the cabinet, read the safety information in section DANGER - Make sure that the main power has been switched off! on page 34</p>
2	<p> WARNING</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35</p>
3	Mount auxiliary contact harness contact blocks (B) on contactors K42 and K43.
4	Connect auxiliary contact harness (B) to safety hard Key switch harness (A2) at connector XS/XP38.
5	Connect safety hard Key switch harness connector A31.4.X6 (A2) to Safety board DSQC1015.
6	Connect connector A31.4.X1 on 24 V I/O harness (D) to safety board DSQC1015.

Continues on next page

2 Installation and commissioning

2.9.8 Installing the Safety module DSQC1015 for SafeMove *Continued*

	Action	Note/Illustration
7	Disconnect existing connector A21.X12 from the panel board, and connect to connector A21.X12.1 on 24 V I/O harness (D).	 xx1500003043
8	Connect connector A21.X12 on 24 V I/O harness (D) to panel board.	
9	Disconnect existing connectors A21.X1, A21.X2, A21.X5 and A21.X6 from the panel board.	
10	Connect connectors from internal customer connection harness (E) to panel board.	
11	Connect safety hard Key switch harness (A2) with internal customer connection harness (E) at connector XS/XP39.	
12	Connect extended Key switch harness (G) to safety hard Key switch harness (A2) at connector XS/XP37.	
13	Route cables properly in existing cable holders.	

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2 Installation and commissioning

2.9.8 Installing the Safety module DSQC1015 for SafeMove

Continued

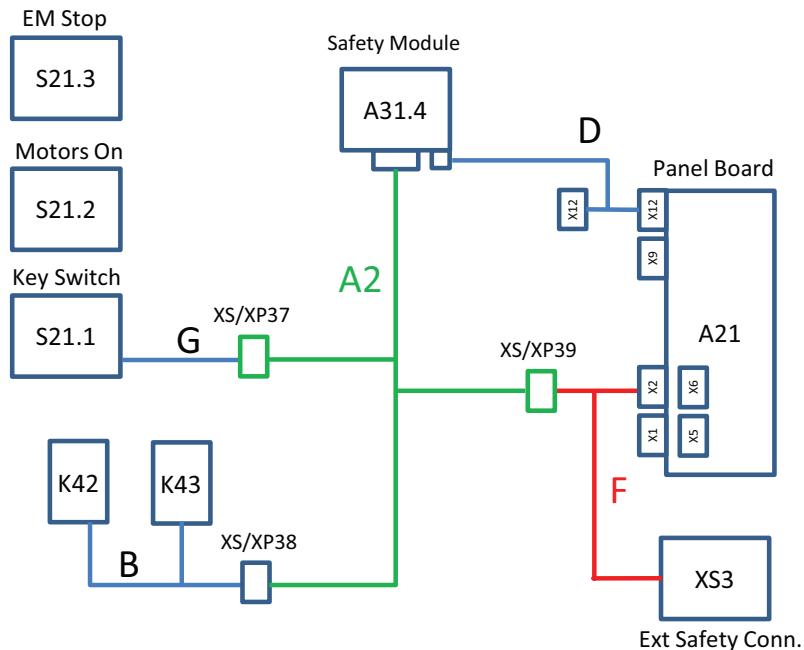
Connecting the cables to the Safety module (hardware switch and 731-2)

This procedure describes how to connect the cables for a robot controller equipped with the options *Hardware switch* and *731-2 Safety external connection*.



Note

This application requires options 735-3 additional contacts, (3 modes) or option 735-4 additional contacts, (2 modes).

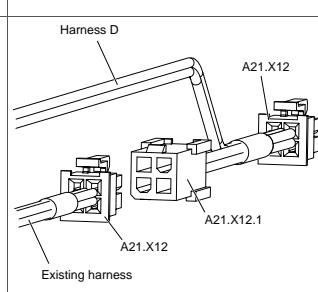
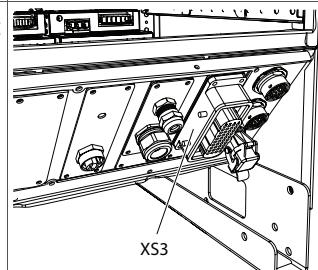


xx1500003031

	Action	Note/Illustration
1	DANGER Before commencing any work inside the cabinet, read the safety information in section DANGER - Make sure that the main power has been switched off! on page 34	
2	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 35	
3	Mount auxiliary contact harness contact blocks (B) on contactors K42 and K43.	
4	Connect auxiliary contact harness (B) to safety hard Key switch harness (A2) at connector XS/XP38.	
5	Connect safety hard Key switch harness connector A31.4.X6 (A2) to Safety board DSQC1015.	

Continues on next page

2.9.8 Installing the Safety module DSQC1015 for SafeMove Continued

Action	Note/Illustration
6 Connect connector A31.4.X1 on 24 V I/O harness (D) to safety board DSQC1015.	
7 Disconnect existing connector A21.X12 from the panel board, and connect to connector A21.X12.1 on 24 V I/O harness (D).	 <p>xx1500003043</p>
8 Connect connector A21.X12 on 24 V I/O harness (D) to panel board.	
9 Disconnect existing connectors A21.X1, A21.X2, A21.X5 and A21.X6 from the panel board.	
10 Connect connectors from external customer connection harness (F) to panel board.	
11 Connect safety hard Key switch harness (A2) with external customer connection harness (F) at connector XS/XP39.	
12 Fit connector XS3 in to a free customer connector slot on the connection panel.	 <p>xx1500003045</p>
13 Connect extended Key switch harness (G) to safety hard Key switch harness (A2) at connector XS/XP37.	
14 Route cables properly in existing cable holders.	

2 Installation and commissioning

2.9.9 Installation of DispensePac support

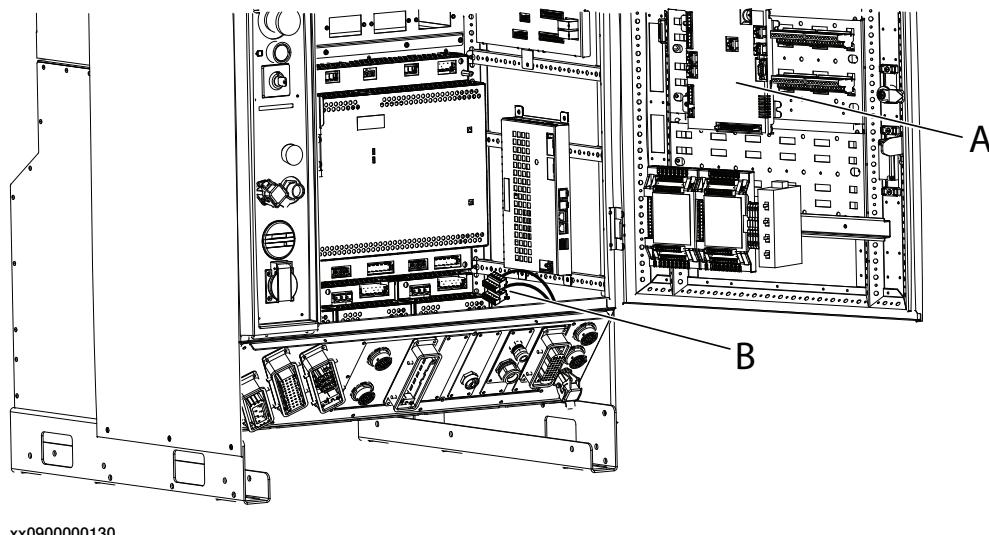
2.9.9 Installation of DispensePac support

About DispensePac

To use the DispensePac option you need to connect externally placed Process I/O board(s). The procedure below shows how to connect the DeviceNet cable from the Process I/O board to the DeviceNet signal cable from the Process Interface Board.

Location

The illustration below shows the location of the Process Interface Board and the connection point of the DeviceNet cable(s).



A	Process Interface Board
B	A57.X1 and A57.X2 DeviceNet connectors

Connecting Process I/O boards

Action	Note
1 The DeviceNet cable from the Process I/O board (not included in the DispensePac support option) is connected (without termination resistance) to the DeviceNet cable, marked A57.XT1/XT2, from the Process Interface Board.	The connectors A57.XT1 and A57.XT2 are found on the bottom of the Controller cabinet, at the end of the cable from the Process Interface Board.
2 If a second Process I/O board is to be connected, remove the termination resistance on the second cable and connect the second Process I/O board to this cable.	

2.9.10 Installation of additional drive units

General

The following sections describes the standard installation of additional drive units. For more complex configurations please contact ABB.

For information about additional axes, see *Application manual - Additional axes and stand alone controller*.

For information about motor units and gear units, see *Product manual - Motor Units and Gear Units*.

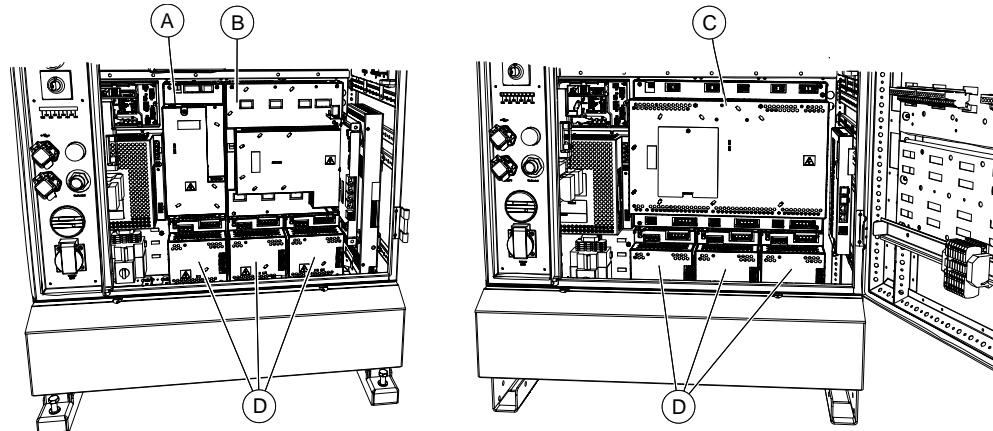


Note

Make sure the robot software is configured to reflect the drive functions installed.

Location

The illustration shows the location of drive units in the controller.



xx1400000484

A	Additional Rectifier Unit (only used for additional axes in combination with small robots)
B	Main Drive Unit for small robots
C	Main Drive Unit for large robots
D	Additional Drive Units (for additional axes)

Configuration

The drive module exists in a number of versions, these are described in section [Configuration of the drive system on page 100](#).

Required equipment

General

Equipment	Note
Drive units	Specified in section Configuration of the drive system on page 100 .

Continues on next page

2 Installation and commissioning

2.9.10 Installation of additional drive units

Continued

Equipment	Note
Standard toolkit	The contents are defined in section Standard toolkit, IRC5 on page 293 .
Circuit diagram	See Circuit diagrams on page 311 .

First additional drive unit, low voltage system

Article number	Equipment	Quantity	Note
3HAC030923-001	DSQC664 HV ADU Drive unit	1	
3HAC035381-001	DSQC 417 LVHC ARU	1	
3HAC036612-001	Harn-ARU/ADU DC-bus	1	
3HAC036680-001	Adapter MDU - ARU	1	
3HAC036686-001	Harn-ARU/MDU 24V	1	
3HAC024254-005	Ethernet cable strait con	1	650 mm
3HAC024254-010	Ethernet cable strait con	1	400 mm
3HAC032595-001	Harn-MDU/ADU 24V	1	
3HAC049514-001 ⁱ	Harn-External axis 7	1	
3HAC049197-001 ⁱ	Ext.axis brake harness	1	
3HAB9310-2	Gasket	1	
3HAC035583-001	Bleeder 1,8 kW ass.	1	
3HAC036275-001	Bracket bleeder 2	2	
3HAC037758-001	Plug part with marking 2p	1	For bleeder.
3HAC029105-001	Fan	2	Not needed if option 708-2 and/or 764-2 is installed.
3HAC020677-001	Harness axc/XS41	1	This connector is only needed if the external axis uses a separate serial measurement board (SMB) than the manipulator.

ⁱ The old harness 3HAC032591-001 can be used instead of harnesses 3HAC049514-001 and 3HAC049197-001.

Second and third additional drive unit, low voltage system

Article number	Equipment	Quantity	Note
3HAC030923-001	DSQC664 HV ADU Drive unit	1	
3HAC036612-001	Harn-ARU/ADU DC-bus	1	
3HAC032601-001	Harn-ADU 24V	1	
3HAC024254-008	Ethernet cable strait con	1	280 mm
3HAC032592-001	Harn-External axis 8/9	1	

First additional drive unit, high voltage system

Article number	Equipment	Quantity	Note
3HAC030923-001	DSQC664 HV ADU Drive unit	1	
3HAC032612-001	Harn-MDU/ADU DC-bus	1	

Continues on next page

2 Installation and commissioning

2.9.10 Installation of additional drive units

Continued

Article number	Equipment	Quantity	Note
3HAC032595-001	Harn-MDU/ADU 24V	1	
3HAC024254-007	Ethernet cable strait con	1	1000 mm
3HAC049514-001 ⁱ	Harn-External axis 7	1	
3HAC049197-001 ⁱ	Ext.axis brake harness	1	
3HAB9310-2	Gasket	1	
3HAC029105-001	Fan	1	Not needed if option 708-2 and/or 764-2 is installed.
3HAC020677-001	Harness axc/XS41	1	This connector is only needed if the external axis uses a separate serial measurement board (SMB) than the manipulator.

ⁱ The old harness 3HAC032591-001 can be used instead of harnesses 3HAC049514-001 and 3HAC049197-001.

Second and third additional drive unit, high voltage system

Article number	Equipment	Quantity	Note
3HAC030923-001	DSQC664 HV ADU Drive unit	1	
3HAC032612-001	Harn-MDU/ADU DC-bus	1	
3HAC032601-001	Harn-ADU 24V	1	
3HAC024254-008	Ethernet cable strait con	1	280mm
3HAC032592-001	Harn-External axis 8/9	1	

Installing the first additional drive unit

The procedure below details how to install the first additional drive unit.

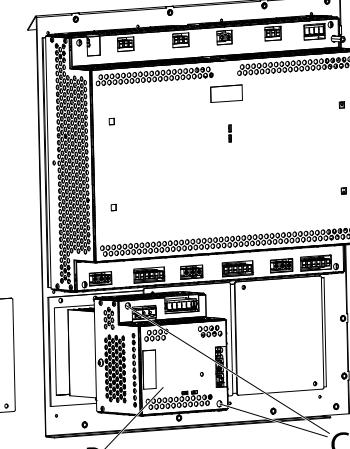
	Action	Note/Illustration
1	 DANGER Before any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	

Continues on next page

2 Installation and commissioning

2.9.10 Installation of additional drive units

Continued

	Action	Note/Illustration
2	Install the first additional drive unit in the empty slot to the left.	 xx0900000127 <ul style="list-style-type: none"> • A: cover plate • B: Additional Drive Unit • C: attachment screws
3	Install the additional rectifier unit.	 Note Only for small robots with low voltage system.
4	Install the bleeder for the additional rectifier unit. See Replacement of brake resistor bleeder on page 266 .	 Note Only for small robots with low voltage system.
5	Install the additional drive system fans. See Replacement of drive system fans on page 256 .	 Note Only for small robots with low voltage system.
6	Install the XS7 additional axes power connector and gasket to the front panel of the IRC5 controller and connect the ground cable.	
7	Connect the additional axes brake harness i between the contactor board (A43) and the internal signal connector from XS7.	The additional axes brake harness contains signals for external brake release, external brake release push button, and PTC2.
8	Plug in the internal power connector from XS7 to the additional drive unit (A41.3).	

Continues on next page

2 Installation and commissioning

2.9.10 Installation of additional drive units

Continued

	Action	Note/Illustration
9	For small robots with low voltage system: <ul style="list-style-type: none"> • Connect the 24V cable between the main drive unit (A41.1) and the additional rectifier unit (A41.2). • Connect the power cable adapter between the power supply to the main drive unit (A41.1) and the additional rectifier unit (A41.2). • Connect the power cable between the additional rectifier unit (A41.2) and the additional drive unit (A41.3) and connect the ground cable. • Connect the Ethernet cable between the main drive unit (A41.1) and the additional rectifier unit (A41.2). 	 Note Only for small robots with low voltage system.
10	For large robots with high voltage system: <ul style="list-style-type: none"> • Connect the power cable between the main drive unit (A41.1) and the additional drive unit (A41.3) and connect the ground cable. 	 Note Only for large robots with high voltage system.
11	Connect the 24V cable between the main drive unit (A41.1) and the additional drive unit (A41.3).	
12	Connect the Ethernet cable between the main drive unit (A41.1) and the additional drive unit (A41.3).	
13	Install the XS41 additional axes SMB connector to the front panel of the IRC5 controller and plug in the connector to the axis computer (A42).	 Note This connector is only needed if the external axis uses a separate serial measurement board (SMB) than the manipulator.
14	Strap the new cabling together with the existing cabling inside the module.	 ELECTROSTATIC DISCHARGE (ESD) All cables inside the controller must be properly routed and strapped to avoid interference.
15	Make sure the robot software is configured to reflect the drive functions installed.	

ⁱ The old harness 3HAC032591-001 can be used instead of harnesses 3HAC049514-001 and 3HAC049197-001.

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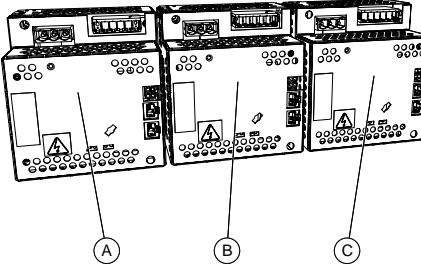
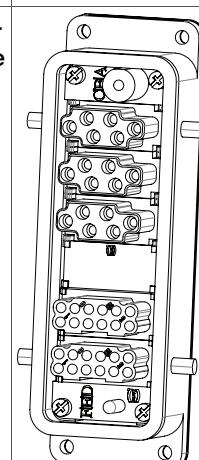
2 Installation and commissioning

2.9.10 Installation of additional drive units

Continued

Installing a second and third additional drive unit

The procedure below details how to install a second and third additional drive unit. A prerequisite is that the first additional drive unit is installed.

Action	Note/Illustration
1  DANGER Before any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34.</i>	
2 Install the additional drive units in the IRC5 controller.	 xx1400000272 A Additional drive unit 1 B Additional drive unit 2 C Additional drive unit 3
3 Install the additional axes power connector modules (B, C) to the XS7 connector on the front panel of the IRC5 controller.	 xx1400000273 A Additional drive unit 1 B Additional drive unit 2 C Additional drive unit 3 D Empty, not used E Signals F Signals
4 Plug in the internal connectors from XS7 to the additional drive units (A41.4 and A41.5).	
5 Connect the power cables between the additional rectifier unit (A41.2) and the additional drive units (A41.4 and A41.5) and connect the ground cables.	 Note Only for small robots with low voltage system.

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2 Installation and commissioning

2.9.10 Installation of additional drive units

Continued

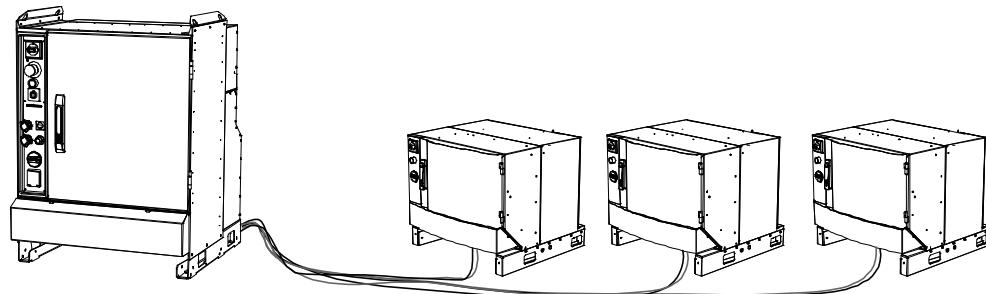
	Action	Note/Illustration
6	Connect the power cables between the main drive unit (A41.1) and the additional drive units (A41.4 and A41.5) and connect the ground cables.	 Note Only for large robots with high voltage system.
7	Connect the 24V cables between the main drive unit (A41.1) and the additional drive units (A41.4 and A41.5).	
8	Connect the Ethernet cables between the main drive unit (A41.1) and the additional drive units (A41.4 and A41.5).	
9	Install the XS41 additional axes SMB connector to the front panel of the IRC5 controller and plug in the connector to the axis computer (A42).	 Note This connector is only needed if the external axis uses a separate serial measurement board (SMB) than the manipulator.
10	Strap the new cabling together with the existing cabling inside the module.	 ELECTROSTATIC DISCHARGE (ESD) All cables inside the controller must be properly routed and strapped to avoid interference.
11	Make sure the robot software is configured to reflect the drive functions installed.	

2 Installation and commissioning

2.9.11 Installation of additional Drive Module

General

To be able to use a MultiMove system or to control more than 3 additional axes, an additional Drive Module is needed. The IRC5 Controller is prepared for up to three additional Drive Modules.



xx0400001042

For more information about installing additional Drive Modules, see *Application manual - MultiMove*.

2.9.12 Process module

About the process module

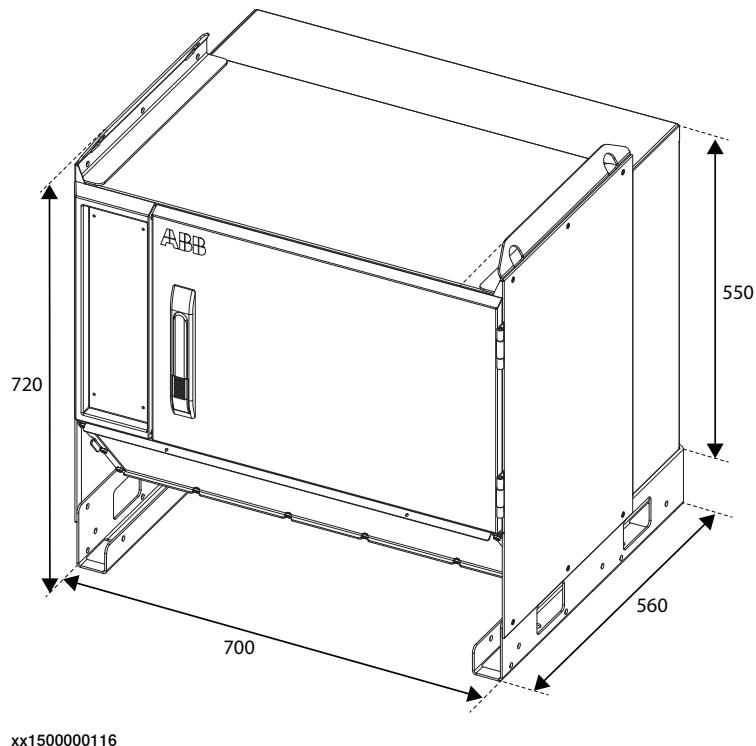
As an option an empty process module can be purchased, to use for custom equipment. There is one small and one large variant of the process module. An installation kit is available to provide easy mounting of equipment inside the process module.

Option numbers

Product	Option number
Process module, Small	768-1
Process module, Large	768-2
Installation kit	715-1

Measurements

Small process module



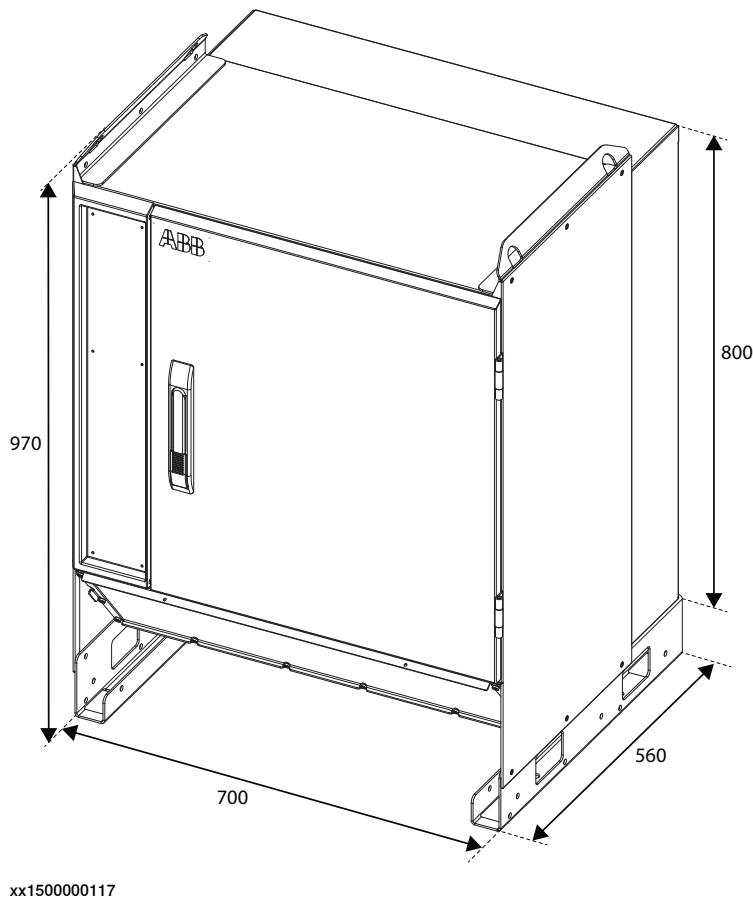
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2 Installation and commissioning

2.9.12 Process module

Continued

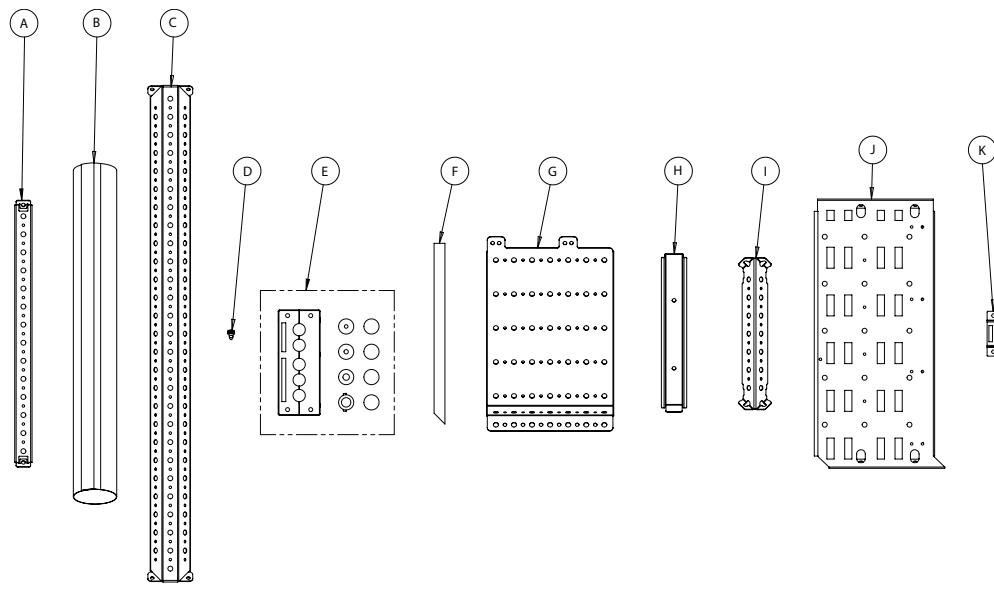
Large process module



xx1500000117

Installation kit

The installation kit can be used for both the small and the large process module. It consists of the following parts.

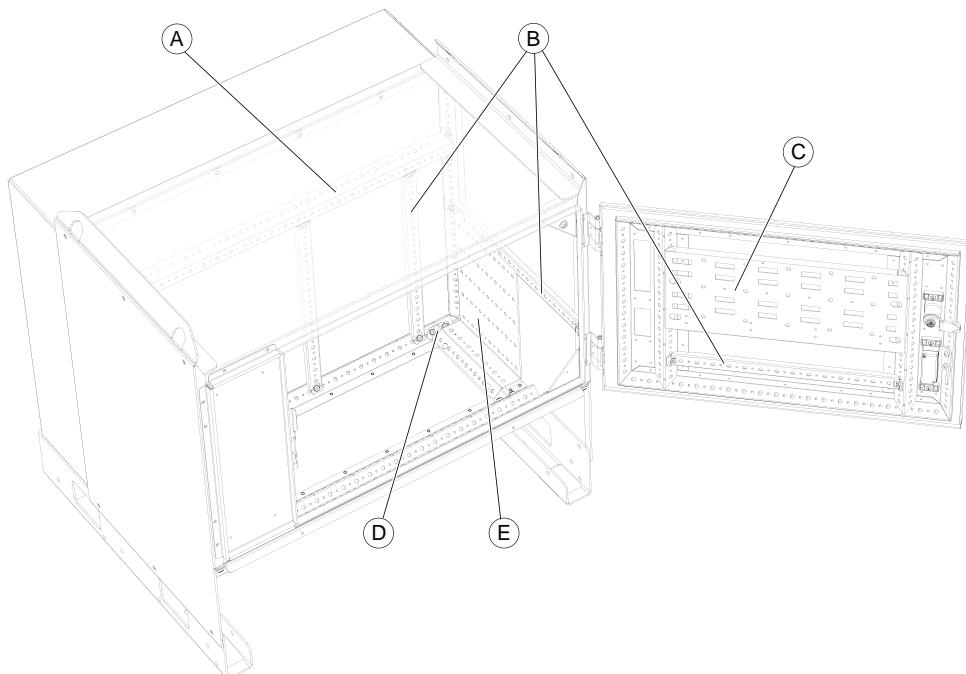


xx1500000118

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A	Mounting bracket (10 pcs)
B	Cable protection
C	Mounting beam (2 pcs)
D	Fastite screw (54 pcs)
E	Cable inlet
F	Velcro closing (2 pcs)
G	I/O mounting plate
H	Terminal rail
I	Mounting bracket, short (3 pcs)
J	Connection block bracket
K	Holder for cables (2 pcs)

Example of process module interior



xx1500000115

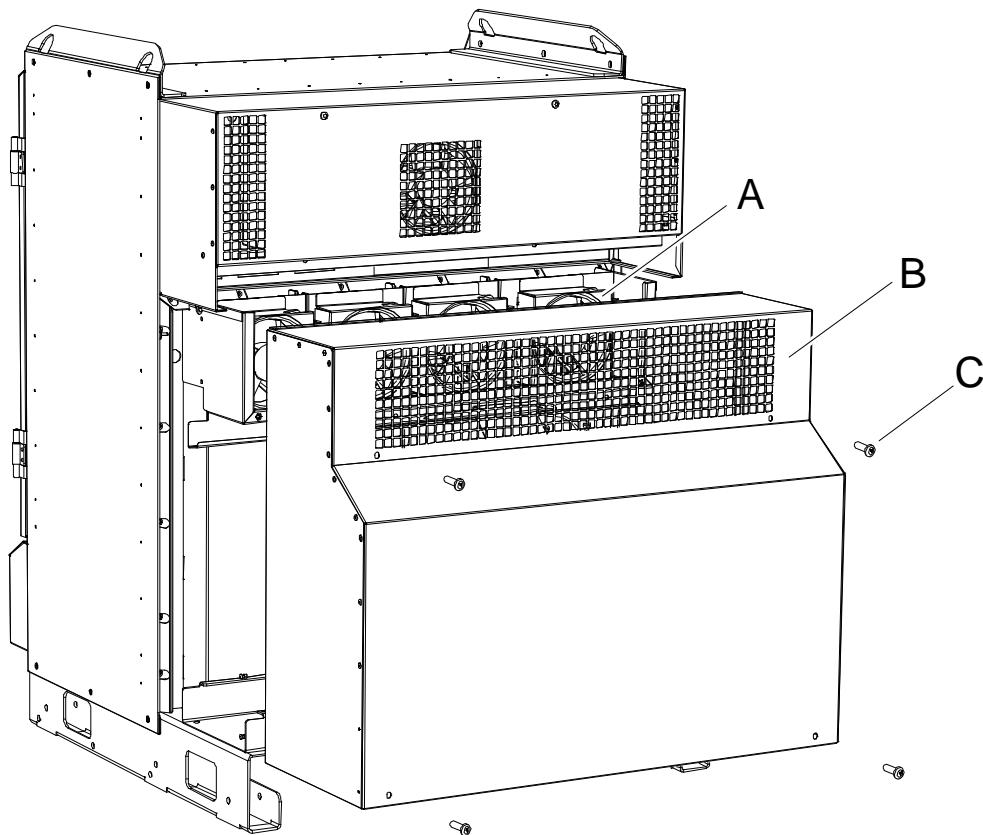
A	Mounting beam
B	Mounting bracket
C	Connection block bracket
D	Mounting bracket, short
E	I/O mounting plate

2 Installation and commissioning

2.9.13 Installation of drive system fans with temperature sensors

Location

The illustration below shows the location of the drive system fan unit in the controller.



A	Drive system fan (up to 4 pcs)
B	Cover
C	Attachment screw (4 pcs)

Required equipment

Equipment	Note
The retrofit set includes the following for each fan: <ul style="list-style-type: none">• Grommet• Fan holder• Fan• Temp sensor with sensor bracket• Gasket (4 pcs)	Retrofit set Temp Sensor Fan: 3HAC056513-001, one fan 3HAC056513-002, two fans 3HAC056513-003, three fans 3HAC056513-004, four fans
Standard toolkit	The contents are defined in section Standard toolkit.

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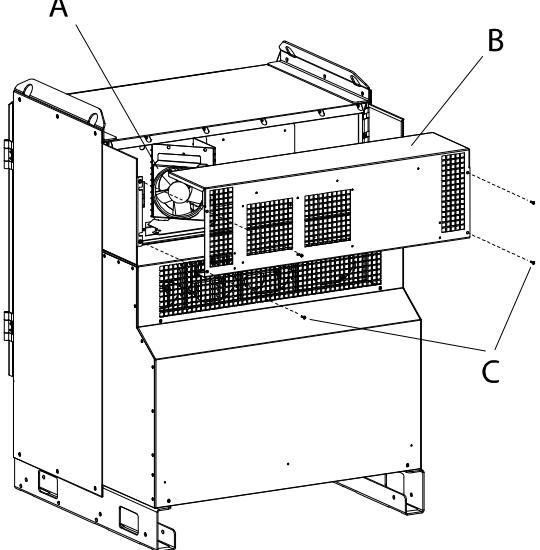
2.9.13 Installation of drive system fans with temperature sensors

Continued

Equipment	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.
Circuit diagram	See Circuit diagrams on page 311 .

Removing the system fan

If a system fan is used, it should be removed when installing sensor controlled drive system fans.

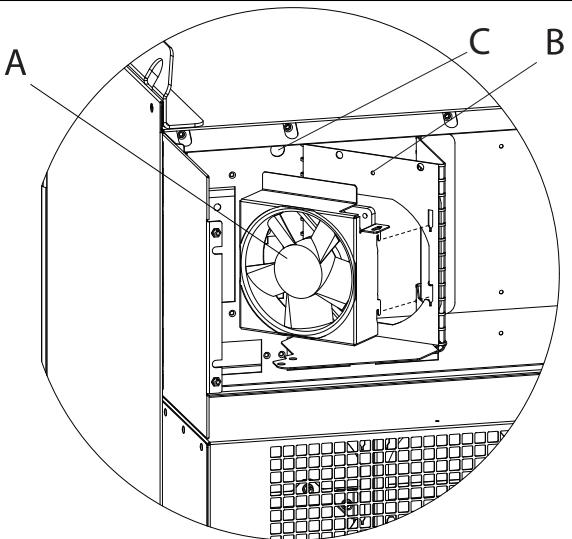
Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2 Remove the attachment screws on the top cover.	 <p>A B C</p> <p>xx0700000416</p> <p>A Fan B Top cover C Attachment screws (4 pcs)</p>
3 Remove the top cover.	
4 Disconnect the connector to the fan.	
5 Remove the screw (item B in image below).	

Continues on next page

2 Installation and commissioning

2.9.13 Installation of drive system fans with temperature sensors

Continued

Action	Note/Illustration
6 Push the fan upwards, and pull it out.	 xx0700000417 A Fan B Screw C Cable gland
7 Remove the cable and replace the cable gland with the grommet.	

Removing the old drive system fan

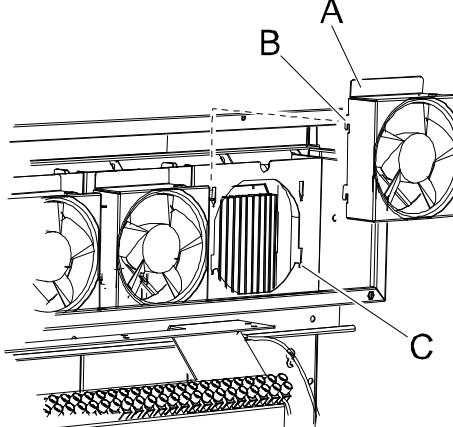
Action	Note /illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .	
2 Remove the moist dust filter magazine. (Option)	How to remove the moist dust filter magazine is detailed in section <i>Replacement of moist dust filter on page 175</i> .
3 Loosen the four attachment screws to the cover.	
4 Remove the cover.	
5 Disconnect the connector to the fan.	

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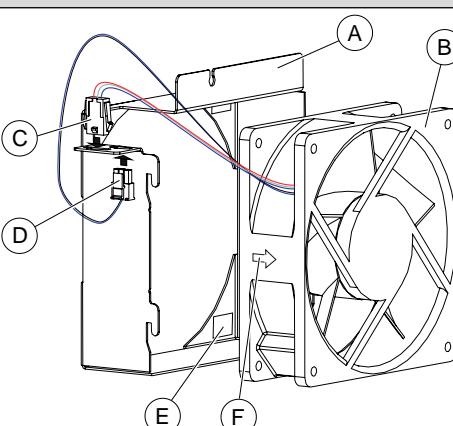
2 Installation and commissioning

2.9.13 Installation of drive system fans with temperature sensors

Continued

Action	Note /illustration
6 Push the fan upwards and remove it.	 <p>xx0500002015</p> <p>A Fan B Latches C Grooves</p>

Assemble the sensor controlled fan

Action	Note/illustration
1 Fit the gaskets in all the four corners on the inside of the fan holder.	 <p>xx1500001754</p> <p>A Fan holder B Fan C Power supply connector D Sensor connector E Gasket (4 pcs) F Indication of air flow direction</p>
2 Fit the fan in the fan holder. Look at the indication of air flow direction to make sure the fan is inserted the correct way.	
3 Fit the connector for fan power supply from above into the outer hole on the bracket of the fan holder.	
4 Fit the sensor connector from below into the inner hole on the bracket of the fan holder.	

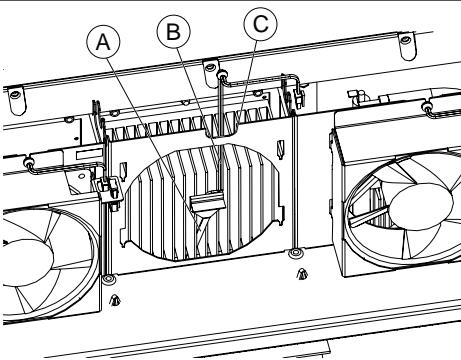
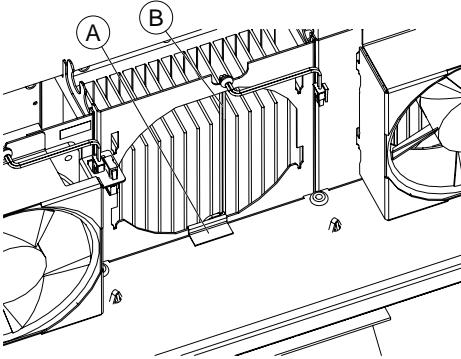
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2 Installation and commissioning

2.9.13 Installation of drive system fans with temperature sensors

Continued

Fitting the drive system fan with temp sensor

Action	Note/illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34.</i>	
2 Insert the sensor between the heat sink fins in the middle.	 xx1500000858 A Sensor on sensor holder B Sensor cable C Fan channel bracket
3 Route the fan cable behind the fan channel bracket.	
4 Fit the sensor holder on the edge of the fan channel bracket.	 xx1500000857 A Sensor holder B Sensor cable

Continues on next page

2 Installation and commissioning

2.9.13 Installation of drive system fans with temperature sensors

Continued

Action	Note/illustration
5 Fit the fan by placing the latches in the back of the fan housing into the grooves and press the fan down.	 xx1500000856 <ul style="list-style-type: none">A FanB LatchesC GroovesD Temp sensor cableE Cable gland
6 Slide the cable gland into the indentation in the fan housing. Gently pull the cable so there is no slack on the cable between the sensor and the cable gland.	
7 Connect the connectors to the fan.	
8 Refit the cover and the attachment screws.	
9 Refit the moist dust filter magazine. (Option)	

2 Installation and commissioning

2.10 Testing

2.10 Testing

Function tests

When the installation is complete, perform the function tests in section *Function tests on page 184* to verify that the safety features work properly.

3 Maintenance

3.1 Maintenance schedule, controller IRC5

General

The controller must be maintained at regular intervals to ensure its function. The maintenance activities and their respective intervals are specified below:

Certain activities to be performed as specified in the Maintenance Schedule are not all detailed in this chapter, but in the Repair chapter.

Please refer to the Repair chapter of the equipment in question.

Intervals

Equipment	Maintenance activity	Interval	Note
Complete controller modules	Inspection	12 months *	<i>Inspection of the controller on page 173.</i>
Moist dust filter	Cleaning		<i>Cleaning moist dust filter on page 179</i>
Moist dust filter	Replacement	24 months *	<i>Replacement of moist dust filter on page 175</i>
Heat exchanger fan	Inspection	6 months *	<i>Inspection of the controller on page 173.</i>
Heat exchanger fan	Cleaning	12 months *	<i>Cleaning of the controller cabinet on page 178.</i>
FlexPendant	Cleaning	When needed	<i>Cleaning the FlexPendant on page 181.</i>
Earth fault breaker F4 (tested if used)	Function test	6 months	<i>Function test of earth fault breaker F4 on page 184</i>
Emergency stop (operating panel)	Function test	12 months	<i>Function test of emergency stop on page 185</i>
Emergency stop (FlexPendant)	Function test	12 months	<i>Function test of emergency stop on page 185</i>
Mode switch	Function test	12 months	<i>Function test of mode switch on page 186</i>
Enable device	Function test	12 months	<i>Function test of three-position enabling device on page 187</i>
Motor contactors K42, K43	Function test	12 months	<i>Function test of motor contactors K42 and K43 on page 188</i>
Brake contactor K44	Function test	12 months	<i>Function test of brake contactor K44 on page 189</i>
Auto stop (tested if used)	Function test	12 months	<i>Function test of auto stop on page 190</i>
General stop (tested if used)	Function test	12 months	<i>Function test of general stop on page 191</i>
Superior stop (tested if used)	Function test	12 months	<i>Function test of superior stop on page 192</i>

Continues on next page

3 Maintenance

3.1 Maintenance schedule, controller IRC5

Continued

Equipment	Maintenance activity	Interval	Note
Limit switch (tested if used)	Function test	12 months	Function test of limit switch on page 193
Automatic fuse F1	Function test	12 months	Function test of automatic fuse F1 on page 194
Reduced speed control	Function test	During commissioning	Function test of reduced speed control on page 195.

*) The time interval depends on the working environment of the equipment: a cleaner environment may extend the maintenance interval and vice versa.

Function test after replacement of component

In addition to performing the function tests according to the intervals, function tests should be performed after replacing a component in the controller.

3.2 Inspection activities

3.2.1 Inspection of the controller

Inspection

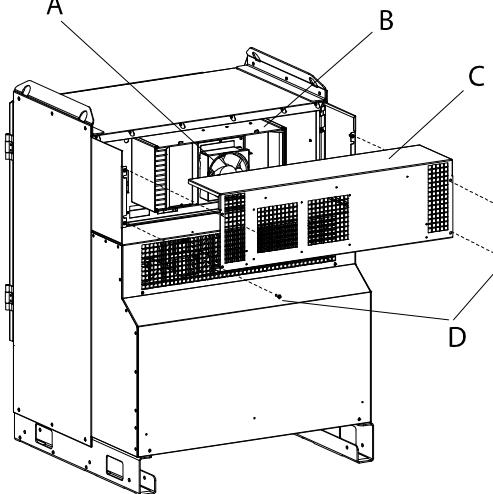
The procedure below describes how to inspect the IRC5 controller.



WARNING

Please observe the following before commencing any repair work on the IRC5 controller, or units connected to the controller:

- Switch off all electric power supplies with the power switch!
- Before handling, make sure you are grounded through a special ESD wrist bracelet or similar. Many components inside the module are sensitive to ESD (ElectroStatic Discharge) and can be destroyed if exposed to discharge. See the Safety chapter, [WARNING - The unit is sensitive to ESD! on page 35](#)

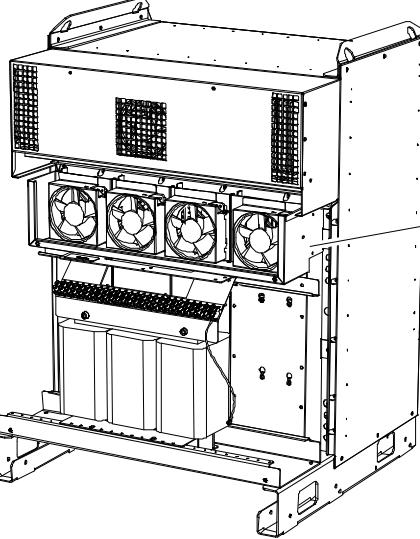
	Action	Note/Illustration
1	Inspect all sealing joints and cable glands to make sure they are airtight in order to prevent dust and dirt from penetrating into the controller cabinet.	
2	Inspect connectors and cabling to make sure they are securely fastened and cabling not damaged.	
3	Inspect the heat exchanger and the fan on the controller to make sure it is clean.	 xx0500001952 Parts: <ul style="list-style-type: none"> • A: fan • B: heat exchanger • C: top cover • D: attachment screw (4 pcs)

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3 Maintenance

3.2.1 Inspection of the controller

Continued

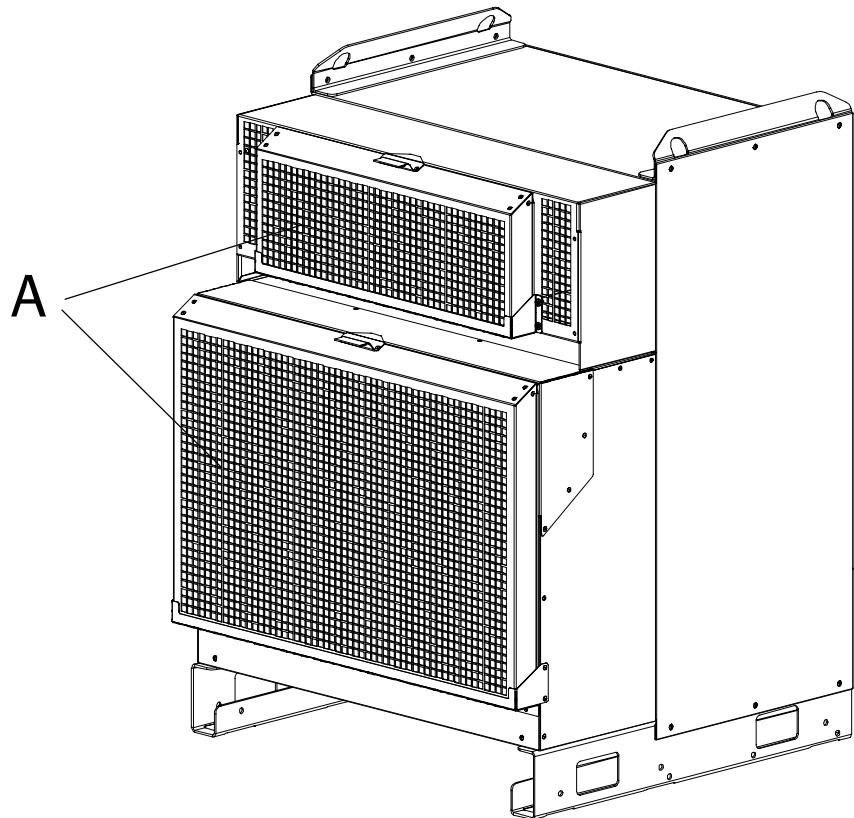
	Action	Note/Illustration
4	Inspect the drive system fans and air channels in the controller to make sure they are clean.	 xx0500002172 • A: drive system fans (4 pcs)
5	After cleaning: <ul style="list-style-type: none">• Temporarily turn the power supply to the modules on.• Inspect all fans to make sure they function correctly.• Turn the power supply back off.	
6	Replace any malfunctioning fans as described in Replacement of heat exchange unit and fan on page 208 .	

3.3 Changing/replacing activities

3.3.1 Replacement of moist dust filter

Location

The moist dust filters are located as shown in the illustration below.



xx1300000852

A	Moist dust filter magazine
---	----------------------------

Required equipment

Equipment	Note
Moist dust filter	
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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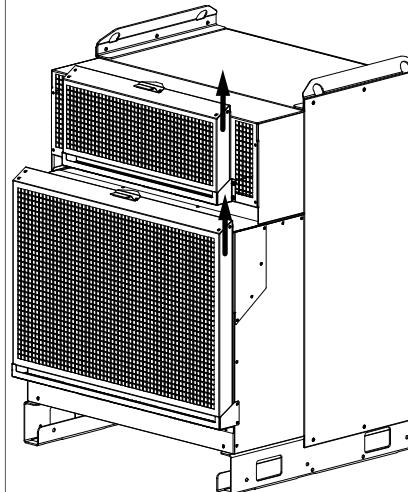
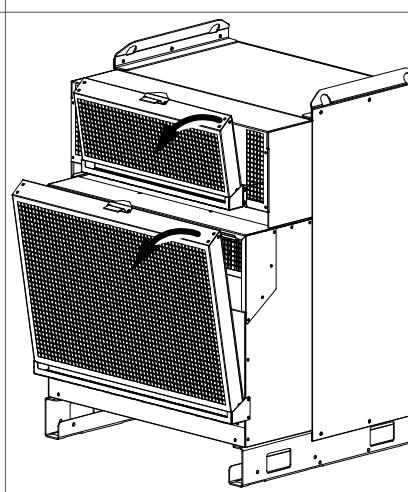
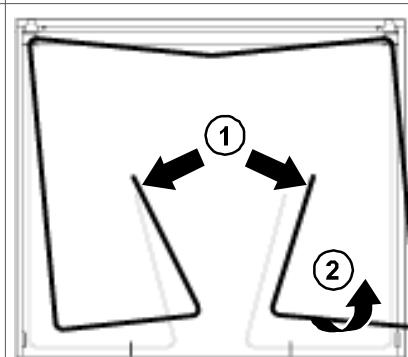
3 Maintenance

3.3.1 Replacement of moist dust filter

Continued

Removal

The procedure below details how to replace the moist dust filter.

Action	Note/Illustration
1 Pull the moist dust filter magazine upwards.	 xx0700000131
2 Pull the moist dust filter magazine in the arrow direction and remove it.	 xx0700000132
3 Remove the old moist dust filter by releasing the lock shackle and lifting it.	 xx0200000003

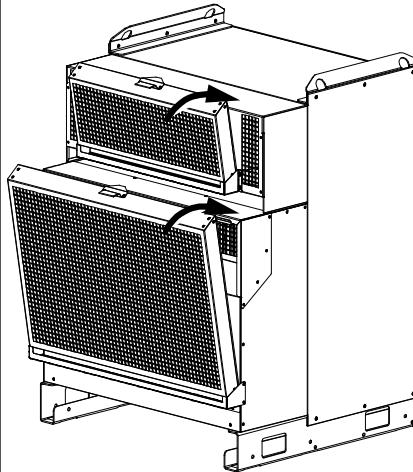
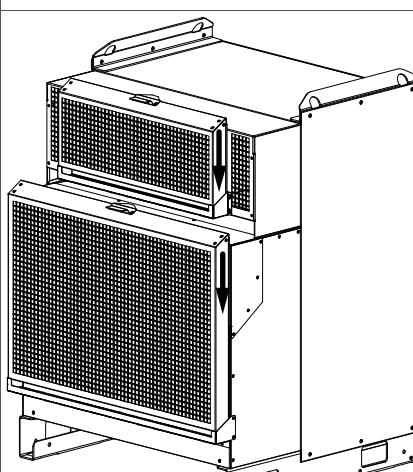
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3.3.1 Replacement of moist dust filter

Continued

Refitting

The procedure below details how to refit the moist dust filter.

	Action	Note/Illustration
1	<p>Fit the new moist dust filter in the magazine and lock it with the lock shackle.</p> <p>Note</p> <p>The compact surface on the moist dust filter must be turned inwards to the cabinet.</p>	
2	<p>Fit the moist dust filter magazine on the cabinet and push inwards.</p>	 xx0700000134
3	<p>Push the moist dust filter magazine downwards until it stops.</p>	 xx0700000135

3 Maintenance

3.4.1 Cleaning of the controller cabinet

3.4 Cleaning activities

3.4.1 Cleaning of the controller cabinet

Required equipment

Equipment, etc.	Note
Vacuum cleaner	ESD protected
Cleaning agent, exterior cleaning	If necessary, use rag with e.g. alcohol

Internal cleaning

The procedure below details how to clean the interior of the controller.

	Action	Note/Illustration
1	Clean the cabinet interior with a vacuum cleaner if necessary.	
2	The control module is equipped with a heat exchanger, it is important that it is clean. The heat exchanger is located on the rear of the controller.	If required, remove any heat exchangers before cleaning as detailed in the section, Replacement of heat exchange unit and fan on page 208 .
3	Remove the drive module fans and use compressed air to clean: <ul style="list-style-type: none">• the fans• the air channels• the drive unit heat sinks.	How to remove the fans is detailed in section, Replacement of drive system fans on page 256 .

Do's and don'ts!

Always!

- Always use ESD protection.
- Always use cleaning equipment as specified above! Any other cleaning equipment may shorten the life of paint work, rust inhibitors, signs, or labels!
- Always make sure that all protective covers are fitted to the controller before cleaning!

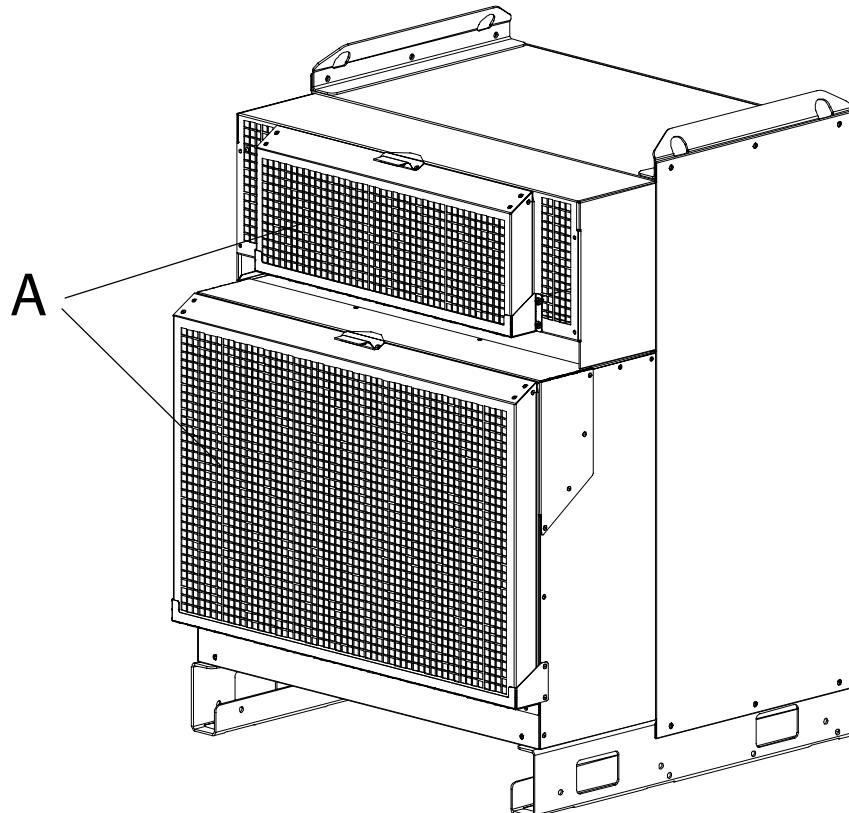
Never!

- Never remove any covers or other protective devices when cleaning the outside of the controller.
- Never use compressed air or spray with a high pressure cleaner.
- Never leave the door open when cleaning the exterior.

3.4.2 Cleaning moist dust filter

Location

The moist dust filters are located as shown in the illustration below.



xx1300000852

A	Moist dust filter magazine
---	----------------------------

Required equipment

Equipment	Note
Cleaning agent	Water 30-40°C with cleansing liquid or detergent.
Compressed air	

Cleaning

The procedure below details how to clean the moist dust filter.

	Action	Note/Illustration
1	Remove the moist dust filter.	How to remove the moist dust filter is detailed in section Replacement of moist dust filter on page 175 .
2	Clean the filter three or four times.	
3	Allow the filter to dry in one of these ways: • Lying flat on a flat surface • Blow with compressed air in opposite direction of filter airflow.	<p> Note</p> <p>Do not wring the filter out!</p>

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3 Maintenance

3.4.2 Cleaning moist dust filter

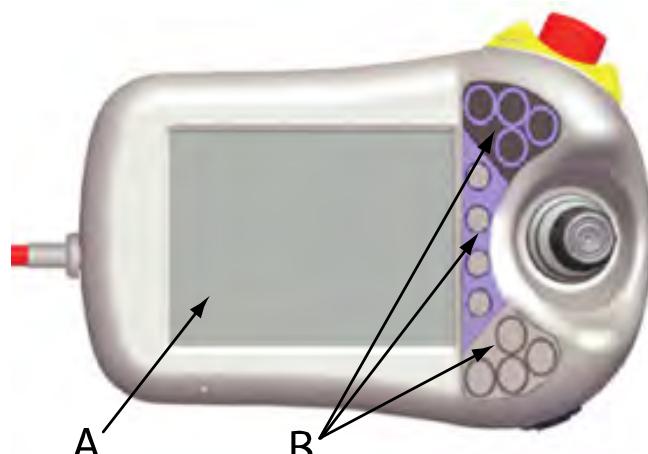
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	Action	Note/Illustration
4	Refit the moist dust filter.	

3.4.3 Cleaning the FlexPendant

Location

The surfaces to clean are shown in the illustration below.



xx0400000973

A	Touch screen
B	Hard buttons

Required equipment

Equipment, etc.	Note
Soft cloth	ESD Protected
Warm water/Mild cleaning agent	

Clean the touch screen

This section details how to clean the touch screen.

Action	Info/Illustration
1 Before cleaning the screen, tap Lock Screen on the ABB menu.	An inset image showing the 'Lock Screen' option highlighted in the ABB menu. The menu includes icons for FlexPendant Explorer, Inputs and Outputs, Jogging, Production Window, Program Data, Program Editor, RobotWare Arc, Logout (Default User), Backup and Restore, Calibration, Control Panel, Event Log, Operator Window, System Info, and Restart. <p>en0400001221</p>

Continues on next page

3 Maintenance

3.4.3 Cleaning the FlexPendant

Continued

Action	Info/Illustration
2 Tap the Lock button in the following window.	 <p>In order to clean the touch screen you need to lock the screen.</p> <p>Tap Lock to lock the screen.</p> <p>Lock</p>
3 When the next window appears, it is safe to clean the screen.	<p>To let you clean the touch screen all keystrokes are now disabled.</p> <p>Tap the two buttons below in sequence to unlock the screen.</p> <p>First to Tap</p> <p>Second to Tap</p> <p>en0400000658</p>
4 Clean the touch screen and hardware buttons using a soft cloth and water or a mild cleaning agent.	
5 To unlock the screen, follow the instructions on the screen.	<p>To let you clean the touch screen all keystrokes are now disabled.</p> <p>Tap the two buttons below in sequence to unlock the screen.</p> <p>First to Tap</p> <p>Second to Tap</p> <p>en0400000658</p>

Do's and don'ts!

The section below specifies some special considerations when cleaning the FlexPendant.

Always:

- use ESD Protection

Continues on next page

3.4.3 Cleaning the FlexPendant *Continued*

- use cleaning equipment as specified above! Any other cleaning equipment may shorten the life time of the touch screen.
- check that all protective covers are fitted to the device before cleaning.
- make sure that no foreign objects or liquids can penetrate into the device.

Never:

- remove any covers before cleaning the FlexPendant.
- spray with a high pressure cleaner.
- clean the device, operating panel and operating elements with compressed air, solvents, scouring agent or scrubbing sponges.

3 Maintenance

3.5.1 Function test of earth fault breaker F4

3.5 Function tests

3.5.1 Function test of earth fault breaker F4

Performing the function test

	Action	Note
1	Start the robot system.	
2	Press the button with the text “test” on the earth fault breaker.	This test is passed if the earth fault breaker is released when pressing the test button. If the earth fault breaker did not release, the test failed and the root cause of the failure must be found.
3	After the test, reset the earth fault breaker.	

3.5.2 Function test of emergency stop

Overview

Perform this test on the emergency stop button both on the operating panel and on the FlexPendant.

Performing the function test

	Action	Note
1	Make a visual inspection of the emergency stop button to make sure it is not physically damaged.	If any damage is found on the emergency stop button, it must be replaced.
2	Start the robot system.	
3	Press the emergency stop button.	The test is passed if the event message "10013 emergency stop state" appears in the FlexPendant log. If the event message "10013 emergency stop state" does not appear or if the event message "20223 Emergency stop conflict" appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.
4	After the test, release the emergency stop button and press the motors on button to reset the emergency stop state.	

3 Maintenance

3.5.3 Function test of mode switch

3.5.3 Function test of mode switch

2-position mode switch

	Action	Note
1	Start the robot system.	
2	Start with the mode switch in manual mode and then switch the mode switch to auto mode. Run the robot in auto mode.	This test is passed if it is possible to run the robot in auto mode. If it is not possible to run the robot in auto mode, this test is failed and the root cause of the failure must be found.
3	Switch the mode switch to manual mode.	This test is passed if the event message “10015 Manual mode selected” appears in the FlexPendant log. If the event message “10015 Manual mode selected” is not shown in the FlexPendant log, the test failed and the root cause of the failure must be found.

3-position mode switch

	Action	Note
1	Start the robot system.	
2	Start with the mode switch in manual mode and then switch the mode switch to auto mode. Run the robot in auto mode.	This test is passed if it is possible to run the robot in auto mode. If it is not possible to run the robot in auto mode, this test is failed and the root cause of the failure must be found.
3	Switch the mode switch to manual full speed mode. Run the program in manual full speed mode.	This test is passed if it is possible to run the program in manual full speed mode. If it is not possible to run the program in manual full speed mode, this test is failed and the root cause of the failure must be found.
4	Switch the mode switch to manual mode.	This test is passed if the event message “10015 Manual mode selected” appears in the FlexPendant log. If the event message “10015 Manual mode selected” is not shown in the FlexPendant log, the test failed and the root cause of the failure must be found.

3.5.4 Function test of three-position enabling device

Performing the function test

	Action	Note
1	Start the robot system and turn the mode switch to manual mode.	
2	Press the three-position enabling device to the middle position and then hold the enabling device in this position.	This test is passed if the event message "10011 Motors ON state" appears in the FlexPendant log. If the event message "10011 Motors ON state" does not appear or if the event message "20224 Enabling device conflict" appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.
3	While still holding the three-position enabling device pressed, press the enabling device harder to the enable the device's third position.	This test is passed if the event message "10012 safety guard stop state" appears in the FlexPendant log. If the event message "10012 safety guard stop state" does not appear or if the event message "20224 Enabling device conflict" appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.

3 Maintenance

3.5.5 Function test of motor contactors K42 and K43

3.5.5 Function test of motor contactors K42 and K43

Performing the function test

	Action	Note
1	Start the robot system and turn the mode switch to manual mode.	
2	Press the three-position enabling device to the middle position and then hold the enabling device in this position.	This test is passed if the event message "10011 Motors ON state" appears in the FlexPendant log. If the event message "37001 Motor on activation error" appears on the FlexPendant log, the test is failed and the root cause of the failure must be found.
3	Release the three-position enabling device.	This test is passed if the event message "10012 safety guard stop state" appears in the FlexPendant log. If the event message "20227 Motor contactor conflict" appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.

3.5.6 Function test of brake contactor K44

Performing the function test

	Action	Note
1	Start the robot system and turn the mode switch to manual mode.	
2	Press the three-position enabling device to the middle position and then hold the enabling device in this position. While having eye contact with the manipulator, move the joystick slightly in any direction to disengage the brakes.	This test is passed if the brakes is disengaged and the manipulator can be moved. If the Event message "50056 Joint collision" appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.
3	Release the three-position enabling device to engage the brakes.	This test is passed if the event message "10012 safety guard stop state" appears in the FlexPendant log. If the event message "37101 Brake failure" appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.

3 Maintenance

3.5.7 Function test of auto stop

3.5.7 Function test of auto stop

Performing the function test

Action	Note
1 Start the robot system and turn the mode switch to auto mode.	
2 Activate the auto stop, e.g. by opening the connected robot cell door.	The test is passed if the event message “20205 Auto stop open” appears in the FlexPendant log. If the event message “20205 Auto stop open” does not appear or if the event message “20225 Auto stop conflict” appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.

3.5.8 Function test of general stop**Performing the function test**

	Action	Note
1	Start the robot system.	
2	Activate the general stop.	The test is passed if the event message “20206 General stop open” appears in the FlexPendant log. If the event message “20206 General stop open” does not appear or if the event message “20226 General stop conflict” appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.

3 Maintenance

3.5.9 Function test of superior stop

3.5.9 Function test of superior stop

Performing the function test

	Action	Note
1	Start the robot system.	
2	Activate the superior stop.	The test is passed if the event message “20215 Superior stop open” appears in the FlexPendant log. If the event message “20215 Superior stop open” does not appear or if the event message “20220 Superior stop conflict” appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.

3.5.10 Function test of limit switch

Testing limit switches on manipulator

This must be tested on all the axes that has mounted limit switches.

	Action	Note
1	Start the robot system.	
2	Jog the axis under test to the limit switch activation position.	The test is passed if the event message "20214 Limit switch open" appears in the FlexPendant log when the axis reaches the limit switch activation position. If the event message "20214 Limit switch open" does not appear or if the event message "20222 Limit switch conflict" appears in the FlexPendant log, the test is failed and the root cause of the failure must be found.
3	After the test the robot must be jogged out of the limit switch activation position again. This is done by jogging the robot after pressing the limit switch override push button. See Connecting a Limit switch override push button on page 96 .	

Testing limit switches for a SafeMove system

Perform validation of the function Safe Axis Speed. See *Application manual - SafeMove*. If this test is passed the limit switch works as intended.

3 Maintenance

3.5.11 Function test of automatic fuse F1

3.5.11 Function test of automatic fuse F1

Performing the function test

	Action	Note
1	Start the robot system.	
2	To test the automatic fuse, insert a screw driver in the test opening.	This test is passed if the automatic fuse is released when inserting the screw driver in the test opening. If the automatic fuse did not release, the test failed and the root cause of the failure must be found.
3	After the test, reset the automatic fuse.	

3.5.12 Function test of reduced speed control

Performing the function test

	Action	Note
1	Start the robot system and turn the mode switch to manual mode.	
2	Create a test program where the robot moves along a known distance with a programmed speed higher than 250 mm/s.	The distance and speed must be adapted to the current installation and robot model.
3	Start the program in manual mode and measure the time it takes for the robot to travel the distance.  Tip To get accurate results, use sensors or I/O signals to measure the time.	This test is passed if the speed of the robot does not exceed 250 mm/s, otherwise the test is failed and the root cause of the failure must be found.

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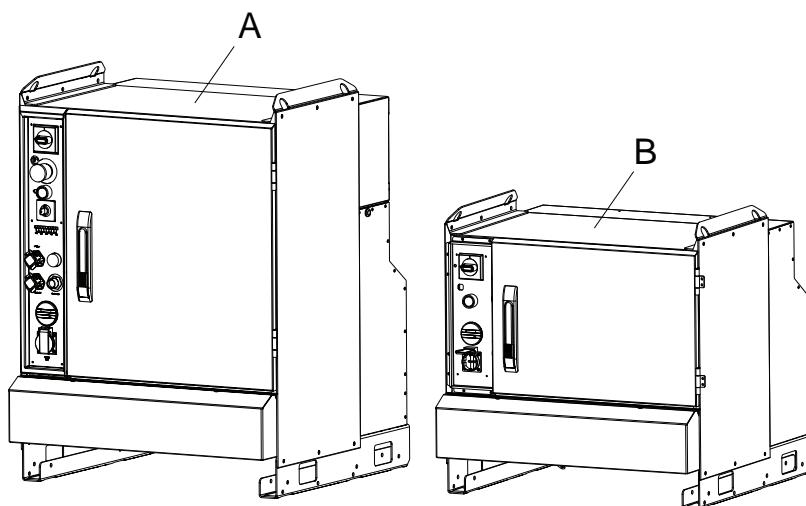
4 Repair

4.1 Overview

General

The ABB IRC5 controller has all components in one cabinet.

Additional drive modules can be connected to the controller. These are used in MultiMove applications where one controller is controlling up to four manipulators.



xx1300000678

A	IRC5 controller
B	Additional drive module

The IRC5 controller is regarded as the standard configuration and therefore the illustration in the procedures detailed in this manual are based on that.

If the procedure in general is the same, it is mentioned in each procedure where the part is located in the IRC5 controller. If there are significant differences, both the IRC5 controller and the drive module configurations are shown.



Note

When replacing a unit in the controller, report to ABB:

- the serial number
- article number
- revision

of both the replaced unit and the replacement unit.

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

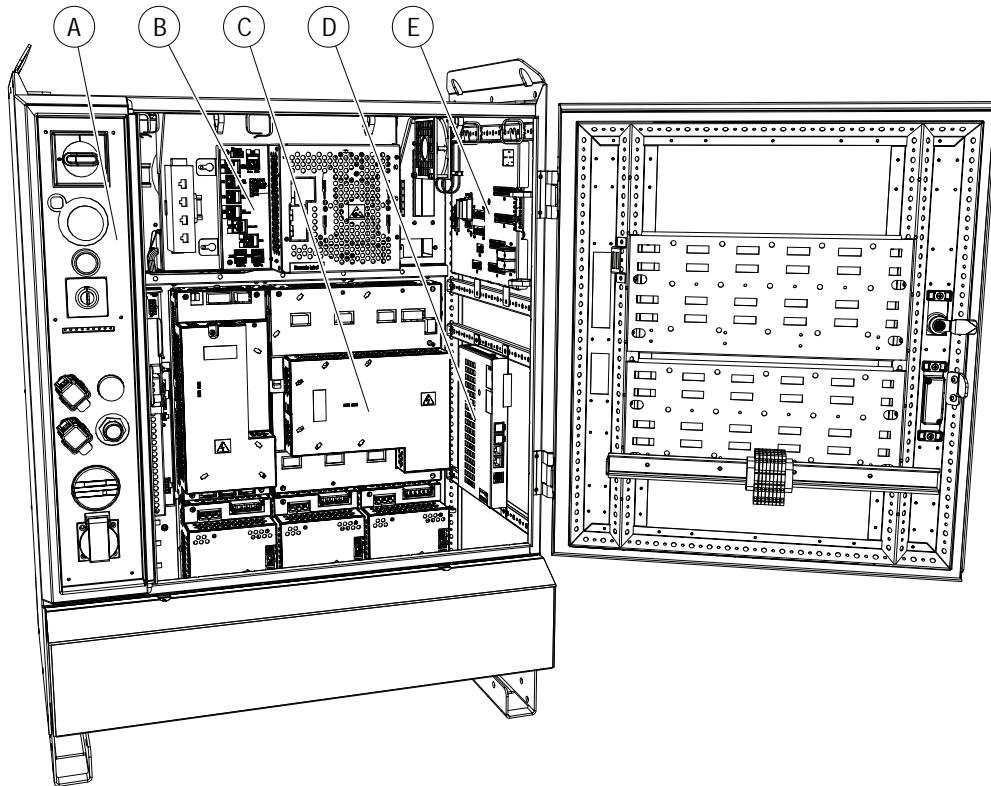
4 Repair

4.2 Replacement of panel board

4.2 Replacement of panel board

Location

The panel board unit, DSQC 643, is located as shown in the illustration below.



xx1300000679

A	Operator's panel
B	Computer unit
C	Drive system
D	Axis computer
E	Panel board unit

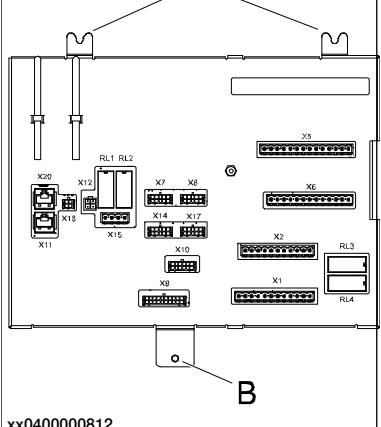
Required equipment

Equipment	Note
Panel board unit	DSQC 643 See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit!
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 Circuit diagrams on page 311 .

Continues on next page

Removal

The procedure below details how to remove the panel board unit.

Action	Note/Illustration
1  DANGER <p>Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.</p>	
2  xx0200000023  WARNING <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35</p>	
3 Disconnect all connectors.	 Note <p>Make a note of any connections.</p>
4 Remove the lower attachment screw, and remove the Panel Unit.	 xx0400000812 <ul style="list-style-type: none"> • A: fixed attachments • B: hole for attachment screw

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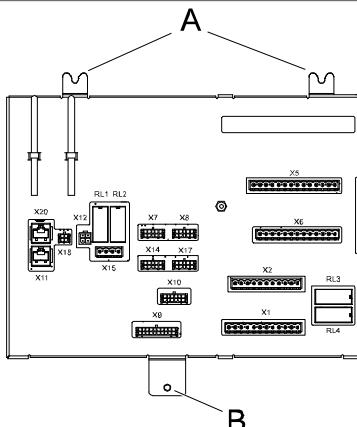
4 Repair

4.2 Replacement of panel board

Continued

Refitting

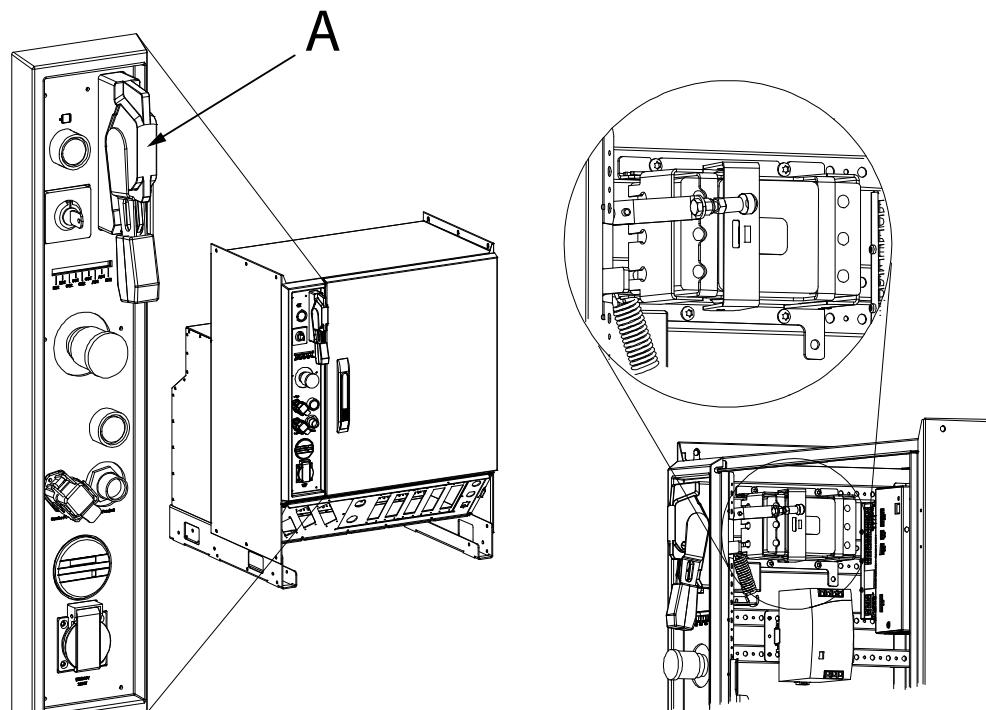
The procedure below details how to refit the panel board unit.

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .	
2  xx0200000023  WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>WARNING - The unit is sensitive to ESD! on page 35</i>	
3 Refit the panel board unit.	
4 Refit the lower attachment screw.	 xx0400000812 <ul style="list-style-type: none">• A: fixed attachments• B: hole for attachment screw
5 Reconnect all connectors.	
6 Perform the function tests in section <i>Function tests on page 184</i> to verify that the safety features work properly.	

4.3 Replacement of Flange disconnect

Location

The Flange disconnect unit is located as shown in the illustration below.



xx0600003133

A	Flange disconnect
---	-------------------

Required equipment

Equipment	Art. no.	Note
Flange disconnect	3HAC027113-001	
Standard toolkit		The contents are defined in section Standard toolkit!
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 needed.
Circuit diagram		See Circuit diagrams on page 311 .

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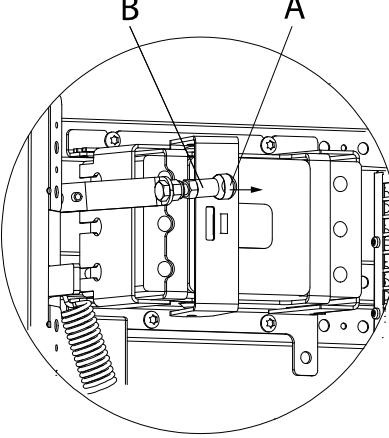
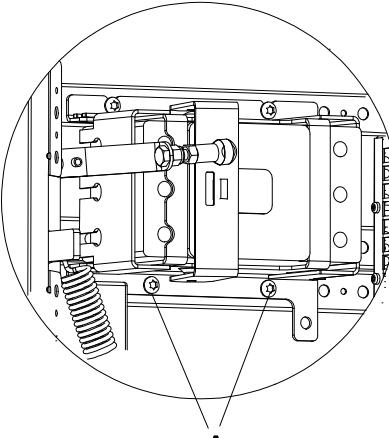
4 Repair

4.3 Replacement of Flange disconnect

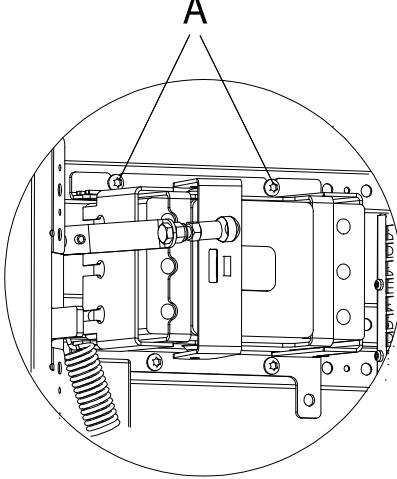
Continued

Removal

The procedure below details how to remove the Flange disconnect unit.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2	 WARNING Be careful when removing the link. The link is spring-loaded and the spring can with high force pull the link down when it is released.	 xx0600003141 <ul style="list-style-type: none">• A: spring• B: link
3	Remove the two lower attachment screws.	 xx0600003139 <ul style="list-style-type: none">• A: attachment screws

Continues on next page

Action	Note/Illustration
4 Loosen the two upper attachment screws and remove the unit.	 <p>xx0600003140</p> <ul style="list-style-type: none"> • A: attachment screws
5 Disconnect the cables.	

Refitting

The procedure below details how to refit the Flange disconnect unit.

Action
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.
2 Reconnect the cables.
3 Refit the unit and fasten the two upper attachment screws.
4 Refit the two lower attachment screws.
5 Refit the link to the unit.
6 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.

4 Repair

4.4 Replacement of I/O units and Gateways

4.4 Replacement of I/O units and Gateways

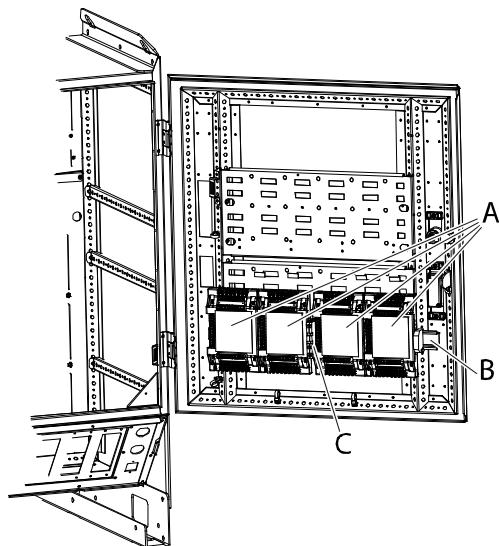
General

A number of I/O units and gateway units may be installed in the controller. These are specified in [Definition of I/O units, IRC5 on page 110](#).

How to configure the I/O units is detailed in [Operating manual - RobotStudio](#).

Location

The location of the I/O units, gateway units, or encoder interface units are shown in the illustration below.



xx0500001859

A	Gateway, I/O Units or encoder interface units
B	Mounting rail
C	Connection terminal XT31

Required equipment

Equipment	Note
A number of units are available.	Specified in section Definition of I/O units, IRC5 on page 110 .
Standard toolkit	The contents are defined in section Standard toolkit!
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 Circuit diagrams on page 311 .

Continues on next page

Removal

The procedure below details how to remove the I/O units or gateway units.

Action	Note/illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .	
2  WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>WARNING - The unit is sensitive to ESD! on page 35</i>	
3 Identify the I/O unit or gateway unit to be replaced.	
4 Disconnect the connectors from the unit.	Note which connector goes where, to facilitate reassembly.
5 Tip the unit away from the mounting rail and remove it.	

Refitting

The procedure below details how to refit the I/O units or gateway units.

Action
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .
2  WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>WARNING - The unit is sensitive to ESD! on page 35</i>
3 Hook the unit back onto the mounting rail and snap it gently in position.
4 Reconnect all connectors disconnected during removal.
5 Perform the function tests in section <i>Function tests on page 184</i> to verify that the safety features work properly.

4 Repair

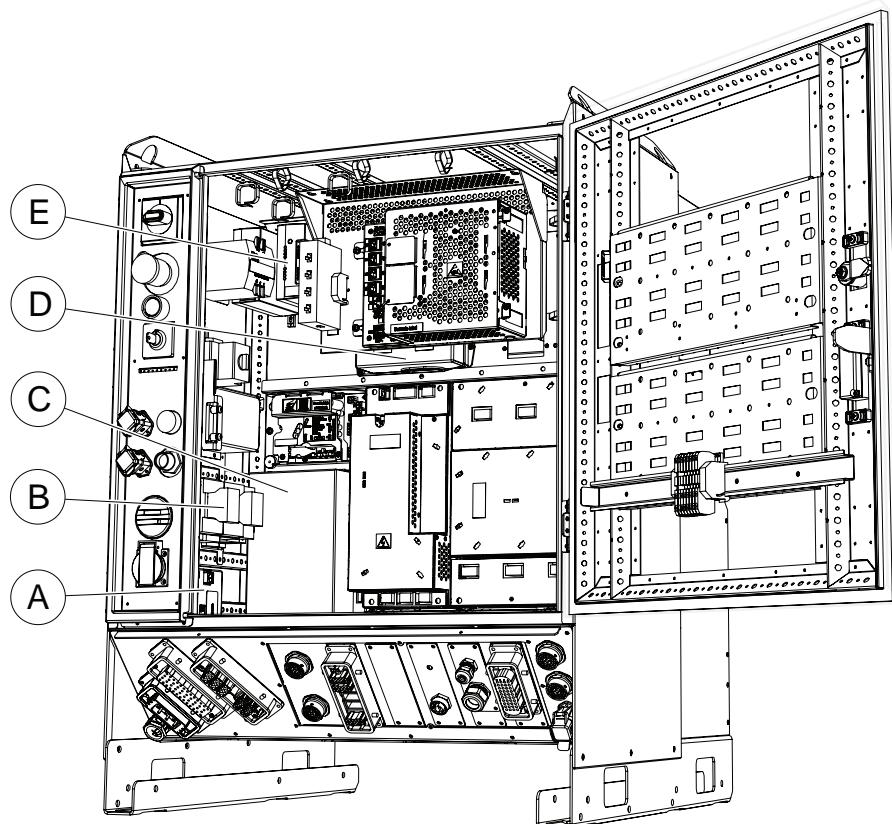
4.5 Replacement of backup energy bank

4.5 Replacement of backup energy bank

Location

The illustration below shows the location of the backup energy bank in the IRC5 controller.

The backup energy bank is located behind the main computer attachment plate.



xx1300000680

A	Contactor interface board
B	Contactor
C	Drive system power supply
D	Backup energy bank Customer I/O power supply
E	Control power supply

Required equipment

Equipment	Note
Backup energy bank	DSQC 655 with or without adapter plate. See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit.

Continues on next page

Equipment	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.
Circuit diagram	See Circuit diagrams on page 311 .

Removal

The procedure below details how to remove the backup energy bank.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	Disconnect the connector X4 from the distribution board.	
3	Remove the <i>attachment screw</i> .	
4	Pull the <i>backup energy bank</i> out.	

Refitting

The procedure below details how to refit the backup energy bank.

	Action
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .
2	Refit the new backup energy bank.
3	Refit and tighten the <i>attachment screw</i> .
4	Reconnect the connector to the <i>control power supply</i> connector X4.
5	Refit the front with the Panel Board Unit.
6	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.

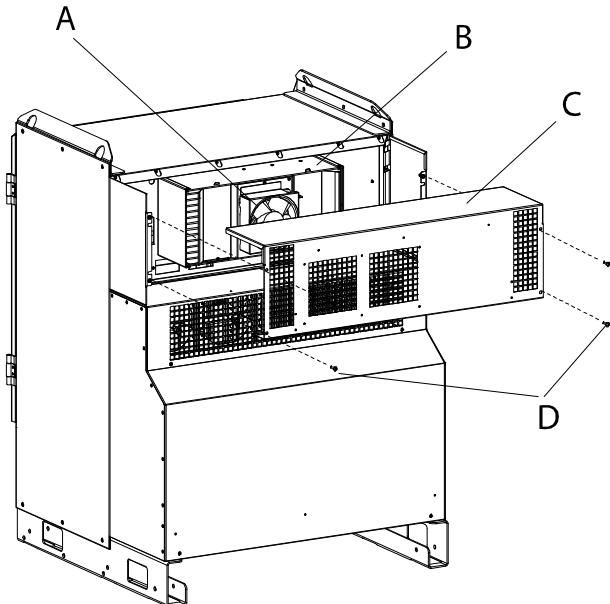
4 Repair

4.6 Replacement of heat exchange unit and fan

4.6 Replacement of heat exchange unit and fan

Location

The heat exchanger unit is located in the back of the controller as shown below.



xx0500001952

A	Fan
B	Heat exchanger
C	Top cover
D	Attachment screws (4 pcs)

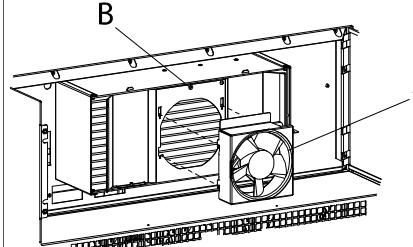
Required equipment

Equipment	Note
Fan	See Spare parts on page 295 .
Heat exchange unit	See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit, IRC5 on page 293 .
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 Circuit diagrams on page 311 .

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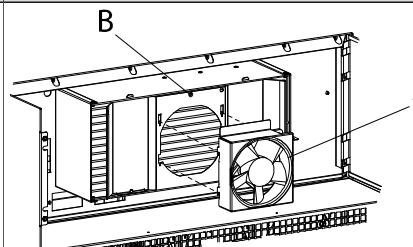
Removal of heat exchanger fan

The procedure below details how to remove the heat exchange unit fan.

Action	Note/illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .	
2 Remove the attachment screws on the top cover.	
3 Remove the <i>top cover</i> .	Shown in the figure above.
4 Disconnect the connector to the fan.	
5 Remove the screw (item B in image below).	
6 Push the fan upwards, and pull it out.	 xx0500001954 <ul style="list-style-type: none"> • A: fan • B: screw

Refitting of heat exchanger fan

The procedure below details how to refit the heat exchange unit fan.

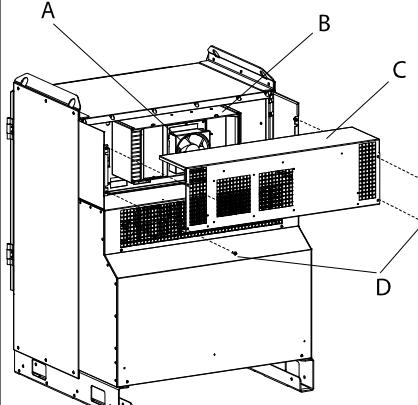
Action	Note/illustration
1 Put the new fan in place, and push down.	 xx0500001954 <ul style="list-style-type: none"> • A: fan • B: screw
2 Refit the screw (item B in image above).	
3 Reconnect the connector to fan.	

Continues on next page

4 Repair

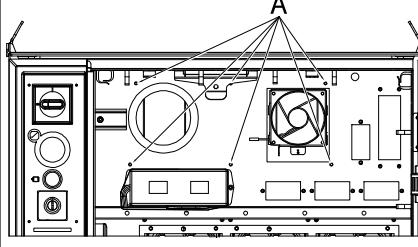
4.6 Replacement of heat exchange unit and fan

Continued

Action	Note/illustration
4 Refit the top cover.	 xx0500001952 <ul style="list-style-type: none"> • A: fan • B: heat exchanger • C: top cover • D: attachment screws (4 pcs)
5 Refit the <i>attachment screws</i> .	Shown in the figure above.
6 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

Removal of heat exchange unit

The procedure below details how to remove the heat exchange unit.

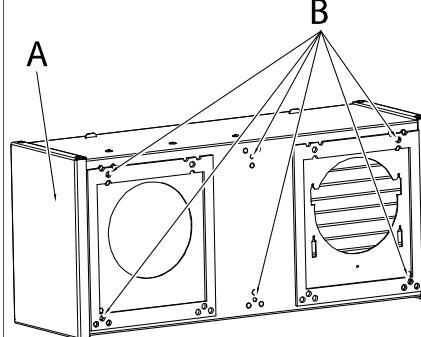
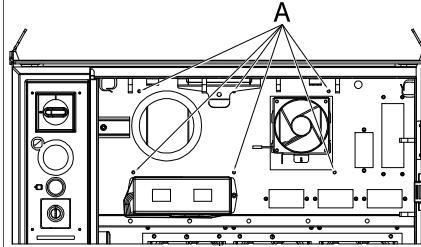
Action	Note/illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2 Follow step 2 through 5 in Removal of heat exchanger fan on page 209 .	
3 Have one person holding the heat exchange unit while another person unscrews the attachment screws from inside the controller cabinet.	 xx1000000973 <ul style="list-style-type: none"> • A: attachment screw for heat exchange unit

Continues on next page

Refitting of heat exchange unit

The procedure below details how to refit the heat exchange unit.

Have one person hold the heat exchange unit in place while another person fits the attachment screws from inside the controller cabinet.

	Action	Note/illustration
1	Hold the heat exchange unit against the controller so that the screw holes in the heat exchange unit are aligned with the holes in the controller cabinet.	 xx1000000974 <ul style="list-style-type: none"> • A: heat exchange unit • B: screw holes
2	Fit the attachment screws through the holes in the controller cabinet and screw them into the heat exchange unit.	 xx1000000973 <ul style="list-style-type: none"> • A: holes in the controller cabinet for attaching the heat exchange unit
3	Follow the step 1 to 4 in Refitting of heat exchanger fan on page 209 .	
4	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

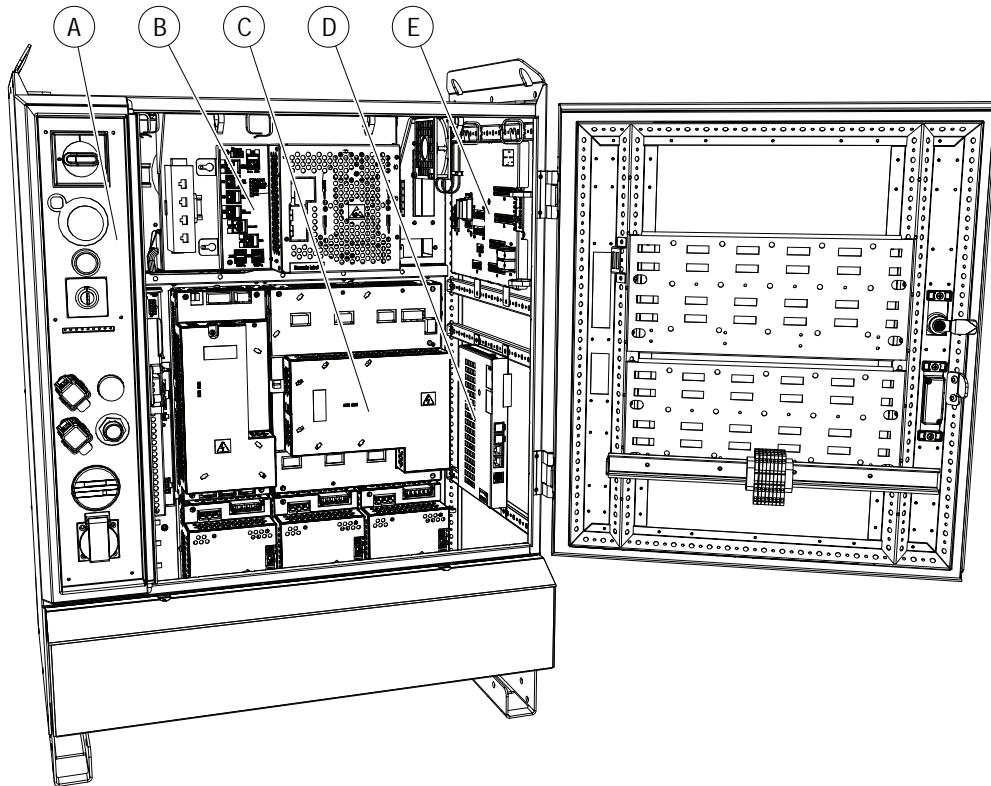
4 Repair

4.7 Replacement of computer unit

4.7 Replacement of computer unit

Location

The computer unit is located as shown in the illustration below.



A	Operator's panel
B	Computer unit
C	Drive system
D	Axis computer
E	Panel board unit

Required equipment

Equipment	Note
Computer unit	DSQC1024, DSQC1018, or DSQC1000. See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit.
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 Circuit diagrams on page 311 .

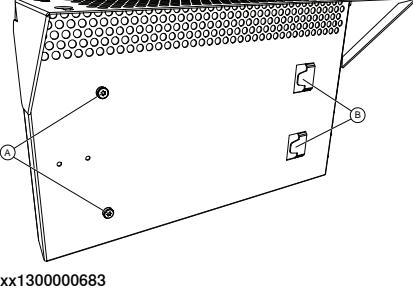
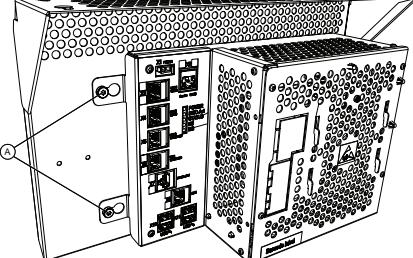
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Removal

The procedure below details how to remove the computer unit.

**Note**

If possible, do a backup of the system before removing the computer unit. For information on how to do a backup see *Operating manual - IRC5 with FlexPendant*.

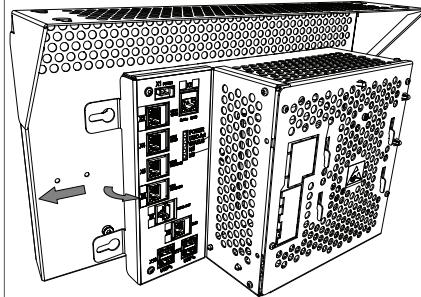
	Action	Note/illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	 WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35	
3	Disconnect all connectors from the computer unit.	 Tip Make a note of the connections.
4	The computer unit is suspended by attachment screws to the left, and latches to the right.	 xx1300000683 A Attachment screws B Latches
5	Loosen the attachment screws.	 xx1300000681 A Attachment screws

Continues on next page

4 Repair

4.7 Replacement of computer unit

Continued

Action	Note/illustration
6 Support the computer unit beneath by hand and pull the computer unit in the arrow direction.	 xx1300000682  WARNING Prevent the computer unit from falling down due to gravity by supporting the computer unit from beneath by hand.

Refitting

The procedure below describes how to refit the computer unit.



Note

After replacing the main computer, the RobotWare system can be reset. It is then necessary to restore a backup. For information on how to restore a backup see *Operating manual - IRC5 with FlexPendant*.

Action	Note/illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2  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 35	

Continues on next page

4.7 Replacement of computer unit

Continued

Action	Note/illustration
3 The computer unit is suspended by attachment screws to the left, and latches to the right.	 xx1300000683 <p>A Attachment screws B Latches</p>
4 Fit the computer unit in position.	
5 Tighten the attachment screws.	 xx1300000681 <p>A Attachment screws</p>
6 Reconnect all connectors to the computer unit.	
7 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

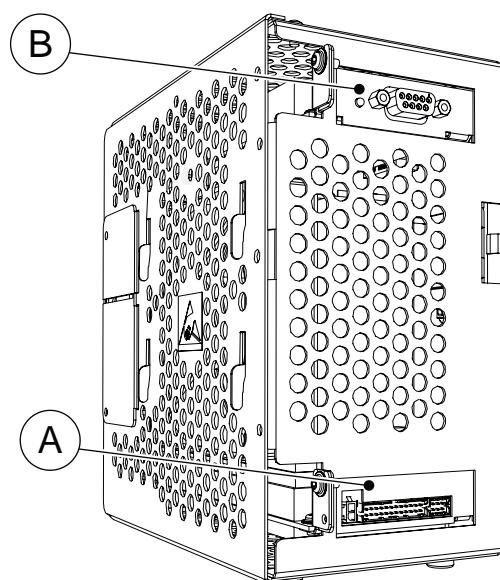
4 Repair

4.8 Replacement of PClexpress boards in the computer unit

Location

The following PClexpress boards may be fitted in the slots in the computer unit as shown in the figure below:

- DeviceNet Master/Slave
- PROFIBUS-DP Master
- Safety board (second generation SafeMove safety controller)



xx1500001760

A	Safety module DSQC1015
B	PClexpress slot for other devices.

Required equipment

Equipment	Art. no.	Note
Profibus-DP Master	3HAC044872-001	DSQC1005 Profibus communication is described in <i>Application manual - PROFIBUS Controller</i> .
DeviceNet Master/Slave	3HAC043383-001	DSQC1006 DeviceNet communication is described in <i>Application manual - DeviceNet Master/Slave</i> .
Safety board	3HAC048858-001	DSQC1015 SafeMove (2nd generation) is described in <i>Application manual - Functional safety and SafeMove</i> .
Standard toolkit		The contents are described in section Standard toolkit, IRC5 on page 293 .

Continues on next page

4.8 Replacement of PClexpress boards in the computer unit

Continued

Equipment	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 tools required.

References

Equipment	Art. no.	Note
<i>Application manual - PROFIBUS Controller</i>	3HAC050966-001	Contains information on how to configure the system for PROFIBUS devices.
<i>Application manual - DeviceNet Master/Slave</i>	3HAC050992-001	Contains information on how to configure the system for DeviceNet devices.
Circuit diagram	See <i>Circuit diagrams on page 311</i> .	

Removal

The procedure below details how to remove a PClexpress board.

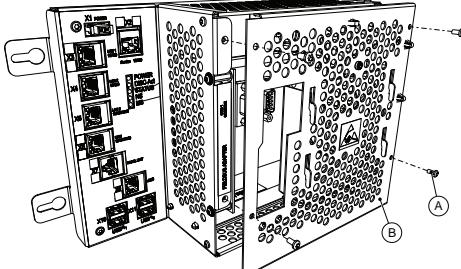
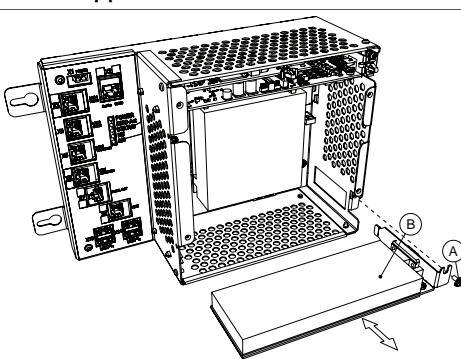
	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section <i>WARNING - The unit is sensitive to ESD! on page 35</i>	
3	Disconnect any cables to/from the PClexpress board.	 Tip Make a note of which cables are disconnected.

Continues on next page

4 Repair

4.8 Replacement of PClexpress boards in the computer unit

Continued

Action	Note/Illustration
4 Open the computer unit by removing the attachment screws and lift off the upper cover. Disconnect the fan connector.  CAUTION Be careful with the fan cable when opening and removing the upper cover. The fan cable must not be stretched.	 xx1300000684 A Attachment screws (4 pcs.) B Upper cover
5 Remove the attachment screw on top of the PClexpress board bracket.	 xx1300000685 A Attachment screw B PClexpress board
6 Gently pull the board straight out.	 CAUTION Always grip the board around the edges to avoid damage to the board or its components.  CAUTION Immediately put the board in an ESD safe bag or similar.

Refitting

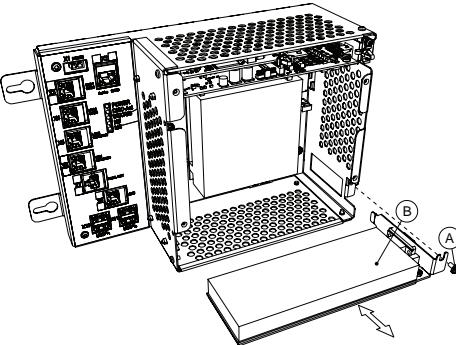
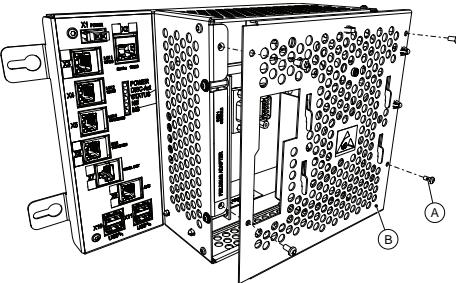
The procedure below details how to refit a PClexpress board.

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	

Continues on next page

4.8 Replacement of PClexpress boards in the computer unit

Continued

	Action	Note/Illustration
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3	Fit the PClexpress board in position by pushing the PClexpress board into the socket on the motherboard.	 xx1300000685 A Attachment screw B PClexpress board  CAUTION Always grip the board around the edges to avoid damage to the board or its components.
4	Refit the attachment screw on top of the PClexpress board bracket.	
5	Reconnect any additional cables to the PClexpress board.	
6	Refit the fan connector and close the computer unit.  CAUTION Be careful with the fan cable when closing the upper cover. The fan cable must not be squeezed.	 xx1300000684 A Attachment screws (4 pcs.) B Upper cover
7	Make sure the robot system is configured to support the installed PClexpress board.	
8	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

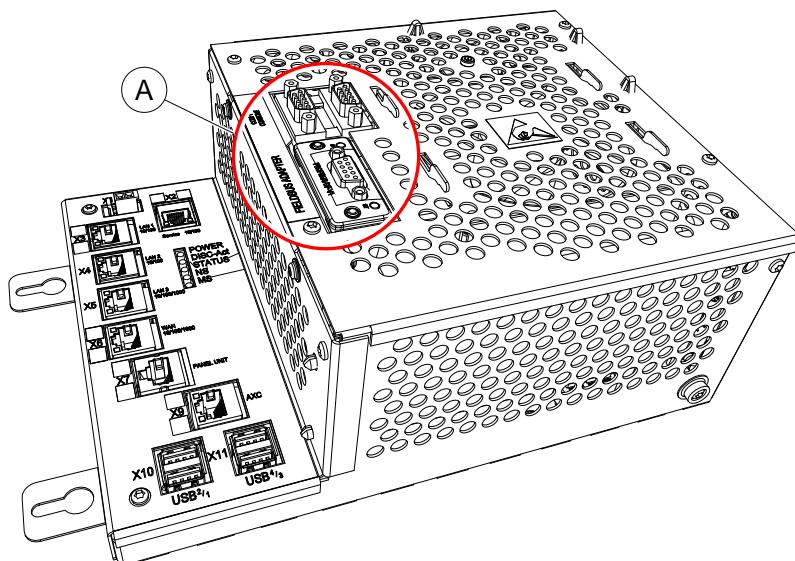
4 Repair

4.9 Replacement of expansion board in the computer unit

Location

To connect a serial channel or a fieldbus adapter to the controller, the main computer must be equipped with the expansion board DSQC1003.

The expansion board is located in the computer unit as shown below.



xx1300000860

A	Expansion board with serial channel and one slot for AnybusCC fieldbus adapter.
---	---

Required equipment

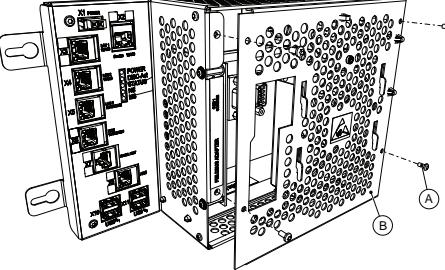
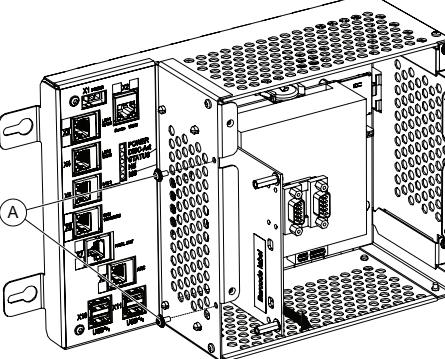
Equipment	Art. no.	Note
Expansion Board	3HAC046408-001	DSQC1003
Standard toolkit		The contents are described in section Standard toolkit, IRC5 on page 293 .

Continues on next page

4.9 Replacement of expansion board in the computer unit

*Continued***Removal**

The following procedure describes how to remove the expansion board from the computer unit.

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3 Disconnect any cables to/from the fieldbus adapter.	
4 Open the computer unit by removing the attachment screws and lift off the upper cover. Disconnect the fan connector.  CAUTION Be careful with the fan cable when opening and removing the upper cover. The fan cable must not be stretched.	 xx1300000684 A Attachment screws (4 pcs.) B Upper cover
5 If there is a fieldbus adapter, remove it.	See Replacement of fieldbus adapter in the computer unit on page 223 .
6 Remove the attachment screws on the computer unit.	 xx1300000859 A Attachment screws (2 pcs)

Continues on next page

4 Repair

4.9 Replacement of expansion board in the computer unit

Continued

Action	Note/Illustration
7 Grip the expansion board and gently pull it straight out.	 CAUTION Always grip the expansion board around the edges to avoid damage to the board or its components.

Refitting

The following procedure describes how to refit the expansion board in the computer unit.

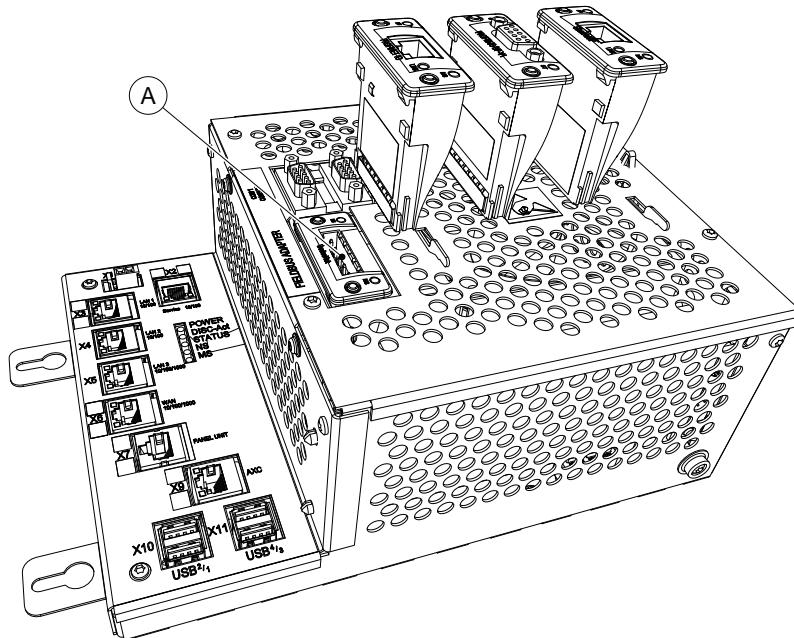
Action	Note/Illustrator
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3 Fit the expansion board in position by pushing the expansion board into the connector on the motherboard.  CAUTION Push carefully so no pins are damaged. Make sure that the expansion board is pushed straight into the connector.	 CAUTION Always grip the expansion board around the edges to avoid damage to the board or its components.
4 Secure the expansion board in the computer unit with the attachment screws.	
5 Refit the fan connector and close the computer unit.  CAUTION Be careful with the fan cable when closing the upper cover. The fan cable must not be squeezed.	
6 Reconnect any cable to the fieldbus adapter.	
7 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

4.10 Replacement of fieldbus adapter in the computer unit

4.10 Replacement of fieldbus adapter in the computer unit**Location**

One of the following fieldbus adapters may be fitted in the slot in the computer unit as shown in the figure below:

- AnybusCC EtherNet/IP slave
- AnybusCC PROFIBUS slave
- AnybusCC PROFINET slave
- AnybusCC DeviceNet slave



xx1300000604

A	Slot for AnybusCC fieldbus adapters
---	-------------------------------------

Required equipment

Equipment	Art. no.	Note
AnybusCC EtherNet/IP slave fieldbus adapter	3HAC027652-001	DSQC 669 Ethernet/IP communication is described in <i>Application manual - EtherNet/IP Anybus Adapter</i>
AnybusCC PROFIBUS slave fieldbus adapter	3HAC026840-001	DSQC 667 PROFIBUS communication is described in <i>Application manual - PROFIBUS Anybus Device</i>
AnybusCC PROFINET slave fieldbus adapter	3HAC031670-001	DSQC 688 PROFINET communication is described in <i>Application manual - PROFINET Anybus Device</i>

Continues on next page

4 Repair

4.10 Replacement of fieldbus adapter in the computer unit

Continued

Equipment	Art. no.	Note
AnybusCC DeviceNet slave fieldbus adapter	3HAC045973-001	DSQC1004 DeviceNet communication is described in <i>Application manual - DeviceNet Anybus Slave</i> .
Standard toolkit		The contents are described in section Standard toolkit, IRC5 on page 293 .

References

Equipment	Art. no.	Note
<i>Application manual - EtherNet/IP Anybus Adapter</i>	3HAC050997-001	Contains information on how to configure the system for EtherNet/IP Fieldbus Adapter DSQC 669.
<i>Application manual - PROFIBUS Anybus Device</i>	3HAC050965-001	Contains information on how to configure the system for PROFIBUS Fieldbus Adapter DSQC 667.
<i>Application manual - PROFINET Anybus Device</i>	3HAC050968-001	Contains information on how to configure the system for PROFINET Fieldbus Adapter DSQC 688.
<i>Application manual - DeviceNet Anybus Slave</i>	3HAC050993-001	Contains information on how to configure the system for DeviceNet Fieldbus Adapter DSQC1004.
Circuit diagram	See Circuit diagrams on page 311 .	

Removal

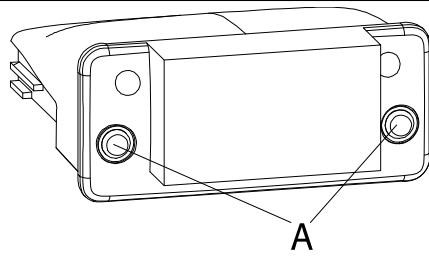
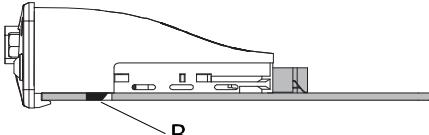
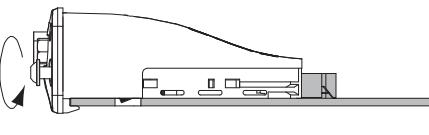
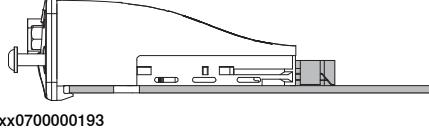
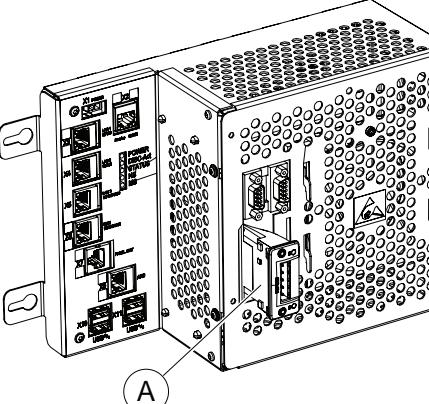
The following procedure details how to remove the fieldbus adapter from the computer unit.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3	Disconnect any cables to/from the fieldbus adapter.	

Continues on next page

4.10 Replacement of fieldbus adapter in the computer unit

Continued

Action	Note/Illustration
<p>4 Loosen the attachment screws (2 pcs) on front of the fieldbus adapter to release the fastening mechanism.</p> <p> Note</p> <p>Only loosen the attachment screws. Do not remove them.</p>	    <p>xx070000193</p> <p>A Attachment screws (2 pcs) B Fastening mechanism</p>
<p>5 Grip the loosened attachment screws and gently pull the fieldbus adapter straight out.</p>	 <p>xx1500001755</p> <p>A Fieldbus adapter</p>

Continues on next page

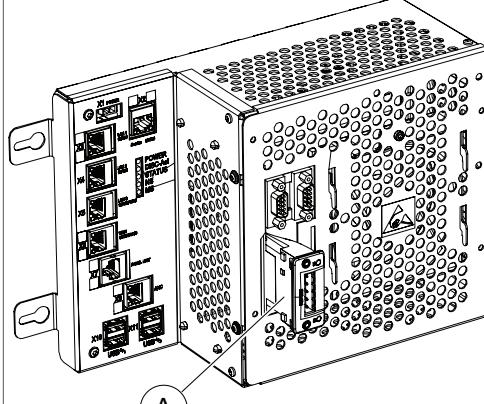
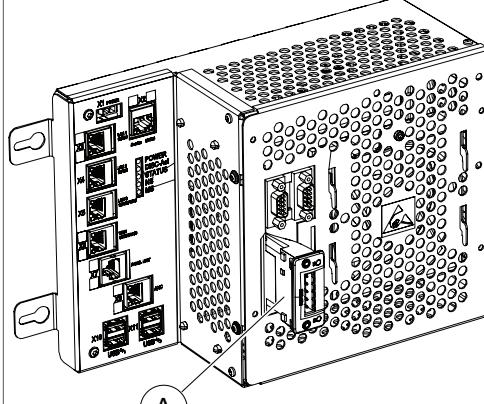
4 Repair

4.10 Replacement of fieldbus adapter in the computer unit

Continued

Refitting

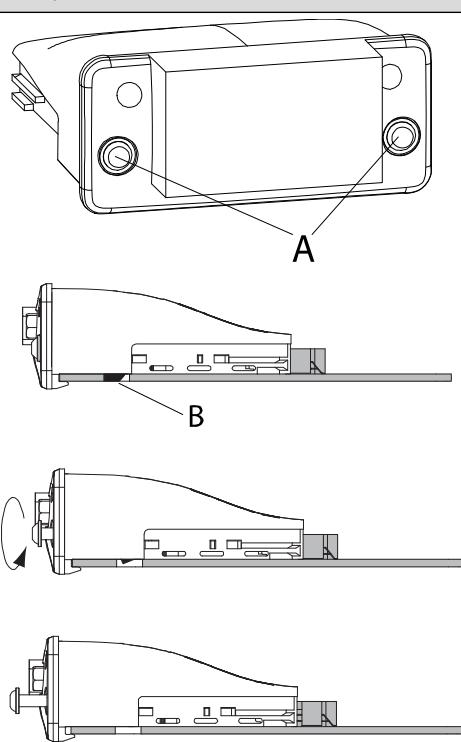
The following procedure details how to refit the fieldbus adapter in the computer unit.

Action	Note/Illustrator
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3  CAUTION Push carefully so no pins are damaged. Make sure that the adapter is pushed straight onto the rails.  xx1500001755 A Fieldbus adapter	 xx1500001755 A Fieldbus adapter  CAUTION Always grip the fieldbus adapter around the edges to avoid damage to the adapter or its components.

Continues on next page

4.10 Replacement of fieldbus adapter in the computer unit

Continued

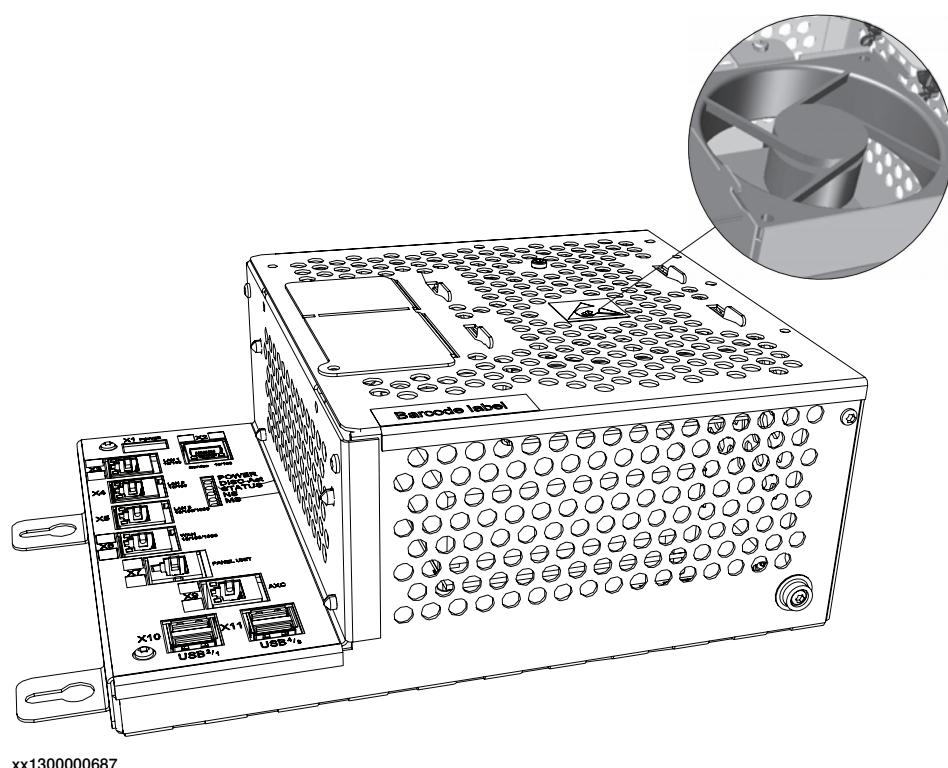
Action	Note/Illustrator
4 Secure the fieldbus adapter with its attachment screws (2 pcs).	 <p>A B</p> <p>xx0700000193</p> <p>A Attachment screws (2 pcs) B Fastening mechanism</p>
5 Reconnect the cable to the fieldbus adapter.	
6 Make sure the robot system is configured to reflect the fieldbus adapter installed.	
7 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

4 Repair

4.11 Replacement of fan in computer unit

Location

The computer fan is located under the upper cover as shown in the figure below.



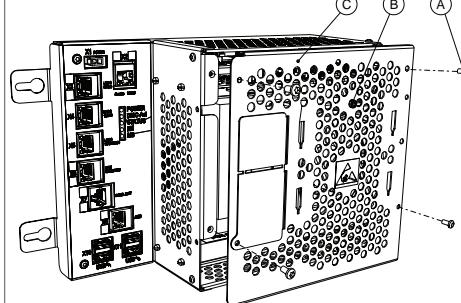
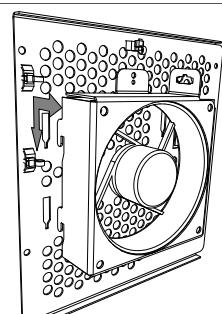
Required equipment

Equipment	Note
Fan	See Spare parts on page 295 .
Cable straps	
Standard toolkit	The contents are defined in section Standard toolkit.
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 Circuit diagrams on page 311 .

Continues on next page

Removal

The procedure below details how to remove the fan in the computer unit.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3	Open the computer unit by removing the upper cover attachment screws and lift off the upper cover.	 xx1300000688 A Upper cover attachment screws (4 pcs.) B Fan attachment screw C Upper cover
4	Disconnect the fan connector and remove the cable straps.	 CAUTION Be careful with the fan cable when opening and removing the upper cover. The fan cable must not be stretched.
5	Remove the fan attachment screw.	
6	Remove the fan from the upper cover.	 xx1300000806

Continues on next page

4 Repair

4.11 Replacement of fan in computer unit

Continued

Refitting

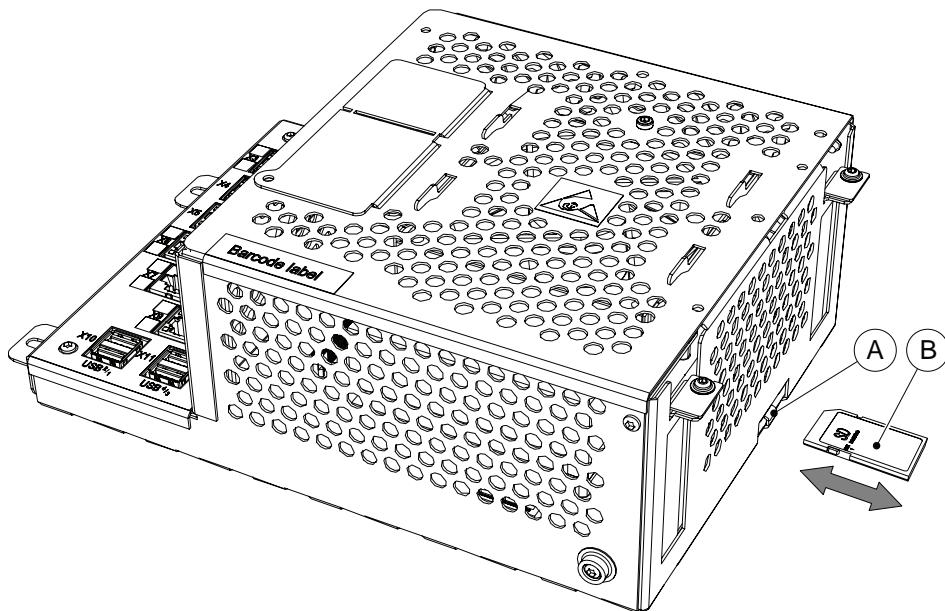
The procedure below details how to refit the fan in the computer unit.

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .	
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section <i>WARNING - The unit is sensitive to ESD! on page 35</i>	
3 Refit the fan on the upper cover.	
4 Refit the attachment screw.	
5 Strap the fan cable to the upper cover.	 CAUTION When strapping the cable make sure that the cable is not stretched or squeezed, and that the cable does not get caught in the fan.
6 Refit the fan connector and close the computer unit.	 CAUTION Be careful with the fan cable when closing the upper cover. The fan cable must not be squeezed.
7 Perform the function tests in section <i>Function tests on page 184</i> to verify that the safety features work properly.	

4.12 Replacement of SD-card memory in computer unit

Location

The location and orientation of the SD-card memory is shown by the following illustration.



xx1300000807

A	Slot for SD-card memory
B	SD-card memory



Note

Only use SD-card memory supplied by ABB.



CAUTION

Reformatting the SD-card or modifying the disk partition can cause irreparable boot-up problems.

Continues on next page

4 Repair

4.12 Replacement of SD-card memory in computer unit

Continued

Required equipment

Equipment	Note
SD-card 2GB	<p>See Spare parts on page 295.</p> <p> Note</p> <p>Only use SD-card memory supplied by ABB.</p> <p>Includes <i>ABB Boot Application</i> software to correctly reboot the robot controller.</p> <p>SD-cards with blue label support main computer DSQC1000 and DSQC1018. SD-cards with red label support main computer DSQC1024.</p>
Standard toolkit	The content is described in section Standard toolkit, IRC5 on page 293 .

Removal

Use the following procedure to remove the SD-card memory.

	Action
1	 DANGER <p>Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.</p>
2	 ELECTROSTATIC DISCHARGE (ESD) <p>The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35</p>
3	Gently push the SD-card memory with your finger until it clicks, and then pull it straight out.

Refitting

Use the following procedure to refit the SD-card memory.

	Action
1	 DANGER <p>Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.</p>
2	 ELECTROSTATIC DISCHARGE (ESD) <p>The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35</p>

Continues on next page

Action	
3	 CAUTION Make sure that the SD-card memory is correctly oriented before inserting it. Otherwise the SD-card memory or the SD-card memory slot may be damaged.
4	Gently push the SD-card memory with your finger until it clicks into place.
5	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.

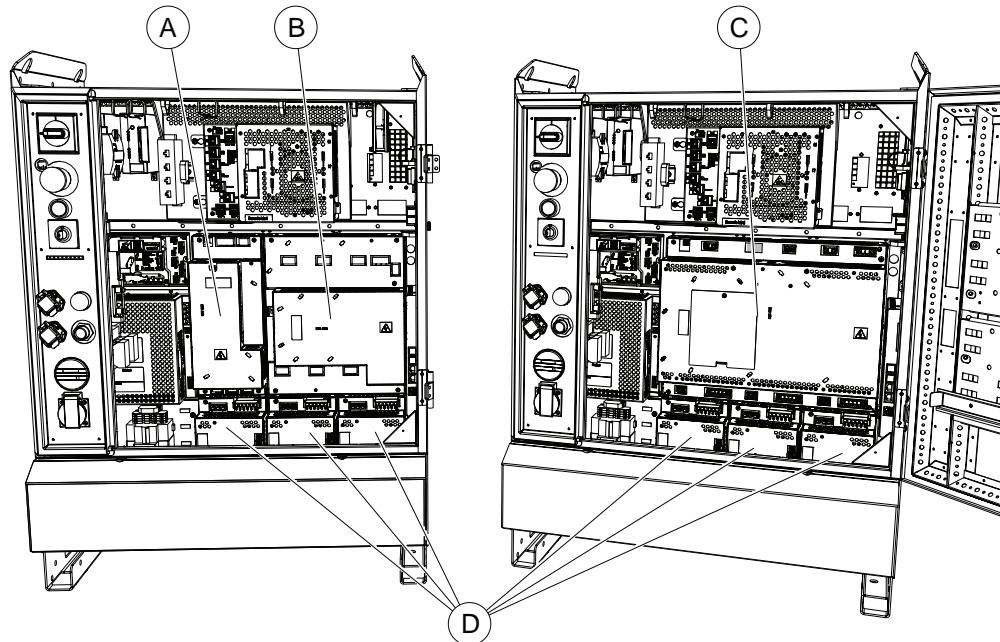
4 Repair

4.13 Replacement of drive units

4.13 Replacement of drive units

Location

The illustration shows the location of drive units in the controller.



xx1300000808

A	Additional Rectifier Unit (only used for additional axes in combination with small robots)
B	Main Drive Unit for small robots
C	Main Drive Unit for large robots
D	Additional Drive Units (for additional axes)

Configuration

The drive units exist in a number of versions, these are described in section [Configuration of the drive system on page 100](#).

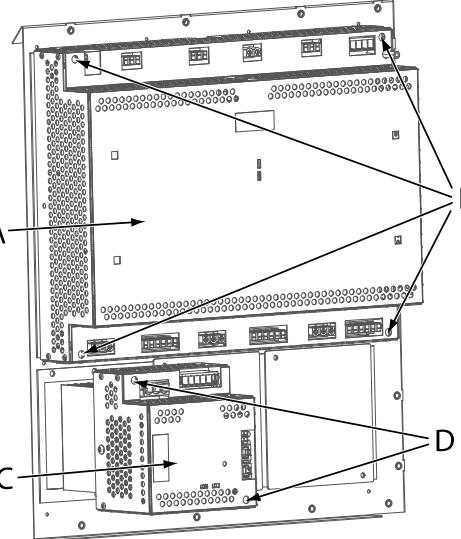
Required equipment

Equipment	Note
Drive units	Specified in section Configuration of the drive system on page 100 .
Standard toolkit	The contents are defined in section Standard toolkit, IRC5 on page 293 .
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 Circuit diagrams on page 311 .

Continues on next page

Removal

The procedure below describes how to remove the Main Drive Unit and the Additional Drive Units. If your drive system contains an Additional Rectifier Unit, it is replaced in a similar way.

Action	Note/Illustration
1	 DANGER Before any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .
2	If an EPS or SafeMove board (option <i>Electronic Position Switches</i> or <i>Safe-Move</i>) is mounted, the Axis computer unit must be removed before removal of the Main Drive Unit.
3	Disconnect all connectors from the unit to be replaced.
4	Remove the drive unit after unscrewing its attachment screws.
	 <p>xx090000025</p> <p>Parts:</p> <ul style="list-style-type: none"> • A: Main Drive Unit • B: Attachment screws for MDU • C: Additional Drive Unit • D: Attachment screws for ADU

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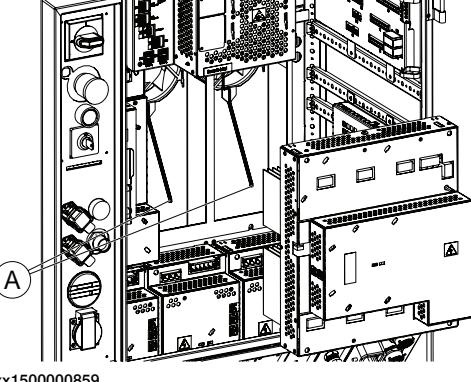
4 Repair

4.13 Replacement of drive units

Continued

Refitting

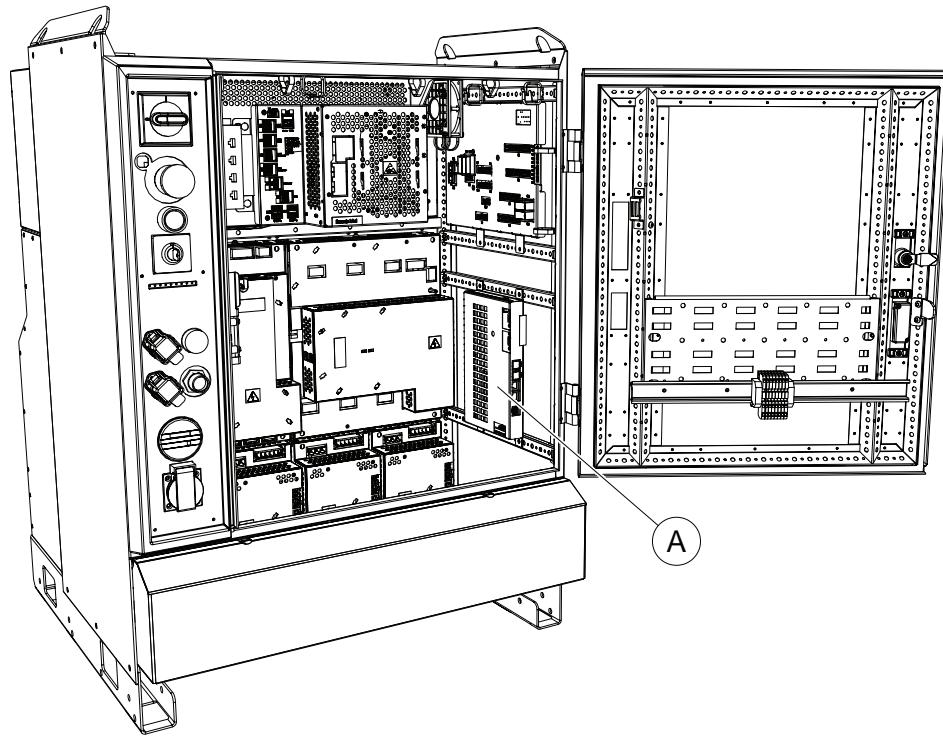
The procedure below describes how to refit the drive units.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2	 CAUTION If the controller is equipped with temperature sensor controlled fans, remove the sensors before fitting an MDU. See Replacement of sensors for the drive system fans on page 259 . If the MDU is fitted with the sensors still in place at the back wall of the cabinet, the sensor holders will be bent and the sensors will measure the temperature in the wrong place. This will result in too high temperature in the controller cabinet and shorter life time for the components.	 A Temperature sensors
3	Fit the unit in its intended position and orientation. Secure it with its <i>attachment screws</i> .	
4	Refit the Axis computer unit if it was removed before the drive unit was removed.	
5	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

4.14 Replacement of Axis computer

Location

The illustration below shows the location of the axis computer in the controller.



A	Axis computer
---	---------------

Removal

The procedure below details how to remove the axis computer.

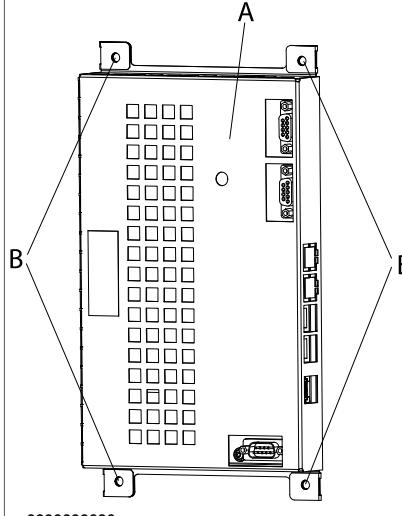
Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2  WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35	

Continues on next page

4 Repair

4.14 Replacement of Axis computer

Continued

Action	Note/Illustration
3 Disconnect all connectors from the axis computer.	 Tip Make a note of the connections.
4 Remove the attachment screws.	 xx0900000030 <ul style="list-style-type: none">• A: axis computer• B: attachment screws
5 Remove the axis computer.	

Refitting

The procedure below details how to refit the axis computer.

Action
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .
2 Fit the new axis computer.
3 Refit the attachment screws.
4 Reconnect all the connectors.
5 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.

4.15 Replacement of EPS board DSQC 646 for Electronic Position Switches

4.15 Replacement of EPS board DSQC 646 for Electronic Position Switches**General**

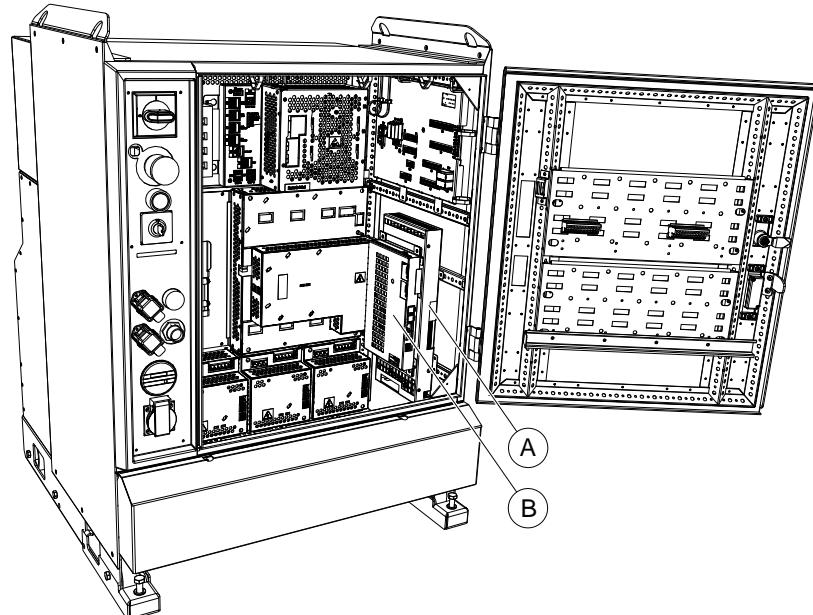
An Electronic Position Switches safety controller, EPS board, is mounted if the option Electronic Position Switches is used.

**Note**

After replacement of the safety controller, the Electronic Position Switches configuration must be downloaded to the new safety controller and then validated. For more information, see *Application manual - Electronic Position Switches*.

Location

The EPS board is mounted behind the axis computer.



xx1300000810

A	EPS board
B	Axis computer

Removal

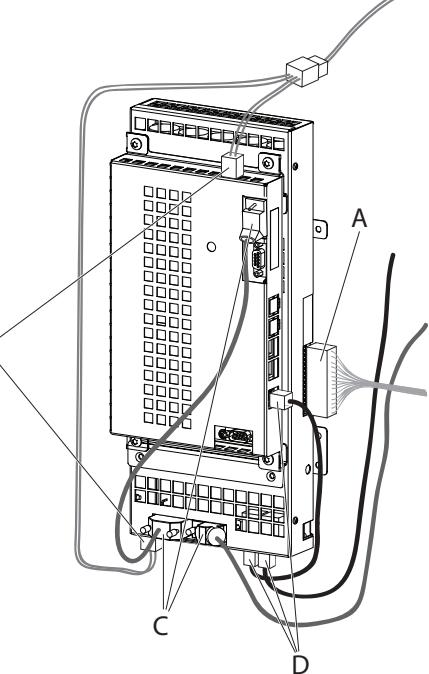
	Action	Note/illustration
1	 DANGER Before any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	

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4 Repair

4.15 Replacement of EPS board DSQC 646 for Electronic Position Switches

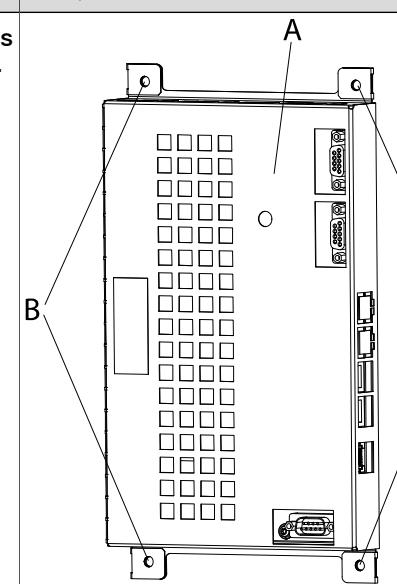
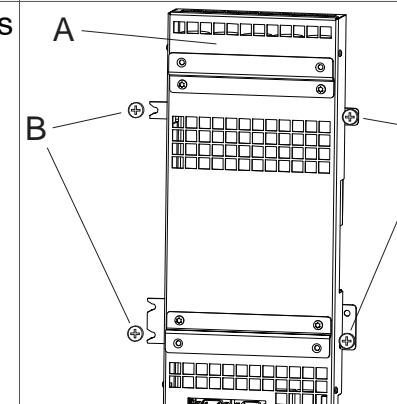
Continued

Action	Note/illustration
2  WARNING The unit is sensitive to ESD, before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3 Disconnect the following cables connected to the EPS board and axis computer: <ul style="list-style-type: none">• Plug contact in I/O connector• Power cables• SMB cables• Ethernet cables	 <p>xx0700000101</p> <p>A: Plug contact in I/O connector B: Power cables C: SMB cables D: Ethernet cables</p>

Continues on next page

4.15 Replacement of EPS board DSQC 646 for Electronic Position Switches

Continued

Action	Note/illustration
4 Remove the attachment screws of the axis computer and remove the axis computer.	 <ul style="list-style-type: none"> • A: axis computer • B: attachment screws
5 Remove the attachment screws of the EPS board and remove the EPS board.	 <ul style="list-style-type: none"> • A: EPS board • B: attachment screws

Refitting

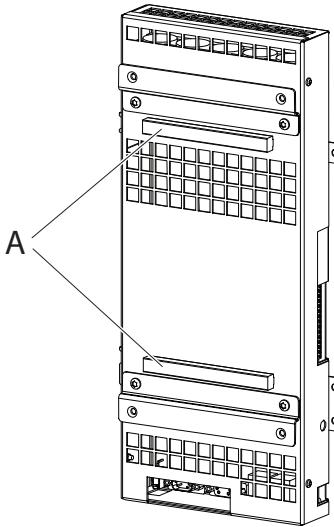
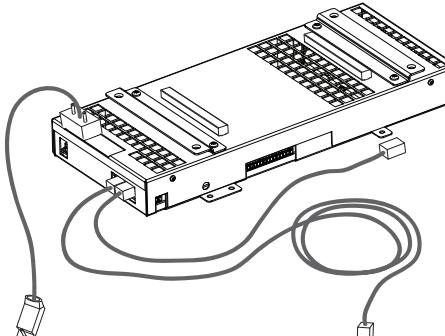
Action	Note/illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	

Continues on next page

4 Repair

4.15 Replacement of EPS board DSQC 646 for Electronic Position Switches

Continued

Action	Note/illustration
2  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 35	
3 If not already in place, fit the EMC strips on the EPS board.	 xx0700000087
4 Connect the short SMB cable and both Ethernet cables to the EPS board before mounting the board. These connections may be difficult to reach once the board is mounted. The two Ethernet connectors on the EPS board are interchangeable (it does not matter which is connected to the main computer and which is connected to the axis computer).	 xx0600003303
5 Refit the EPS board and the axis computer.	
6 Refit all the cables.	
7 After replacement of the safety controller, the EPS configuration must be downloaded to the new safety controller and then validated. For more information, see <i>Application manual - Electronic Position Switches</i> .	
8 Perform the function tests in section Function tests on page 184 to verify that the basic safety features (e.g. emergency stop) work properly.	

4.16 Replacement of SafeMove board DSQC 647

General

A SafeMove safety controller, SafeMove board, is mounted if the option SafeMove is used.

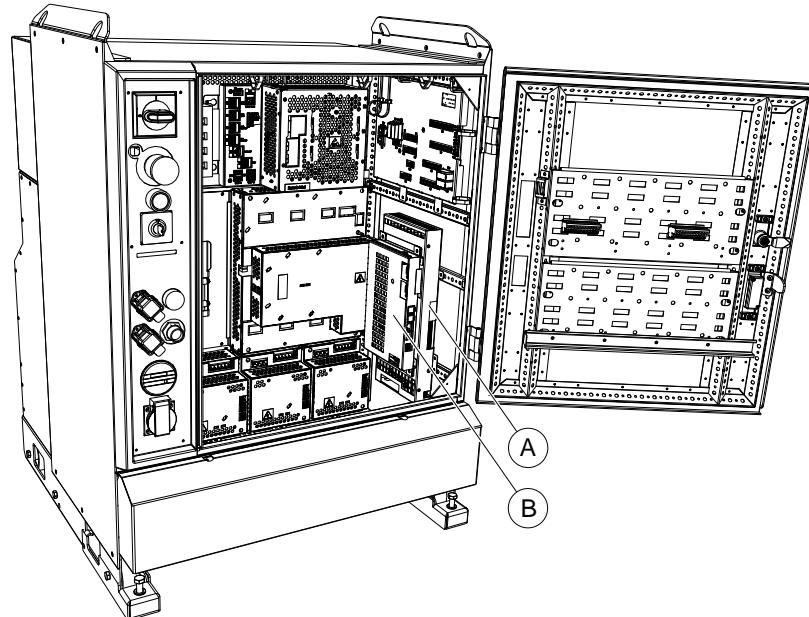


Note

After replacement of the safety controller, the SafeMove configuration must be downloaded to the new safety controller and then validated. For more information, see *Application manual - SafeMove*.

Location

The SafeMove board is mounted behind the axis computer.



xx1300000810

A	SafeMove board
B	Axis computer

Continues on next page

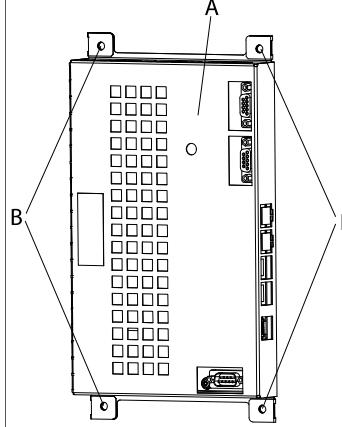
4 Repair

4.16 Replacement of SafeMove board DSQC 647

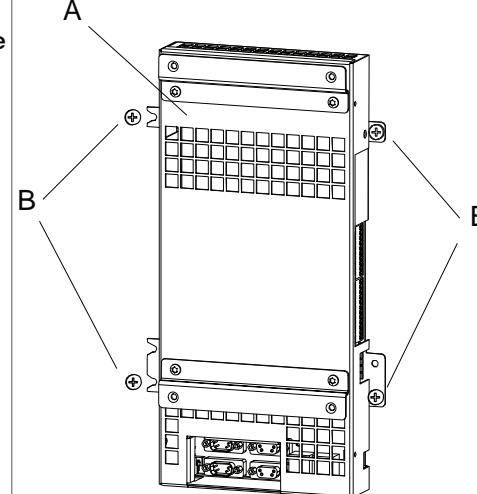
Continued

Removal

The procedure below details how to remove the SafeMove board.

Action	Note/illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34</i> .	
2  WARNING The unit is sensitive to ESD. Before handling the unit please observe the safety information in section <i>WARNING - The unit is sensitive to ESD! on page 35</i> .	
3 Disconnect the cables connected to the SafeMove board and the cables between the SafeMove board and the axis computer.	
4 Remove the attachment screws of the axis computer and remove the axis computer.	 <p>xx0900000030</p> <ul style="list-style-type: none">• A: axis computer• B: attachment screws (4 pcs)

Continues on next page

Action	Note/illustration
5 Remove the attachment screws of the SafeMove board and remove the SafeMove board.	 <p>xx0800000104</p> <ul style="list-style-type: none"> • A: SafeMove board • B: attachment screws (4 pcs)

Refitting

The procedure below details how to refit the SafeMove board.

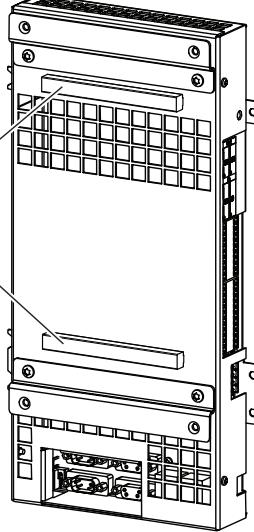
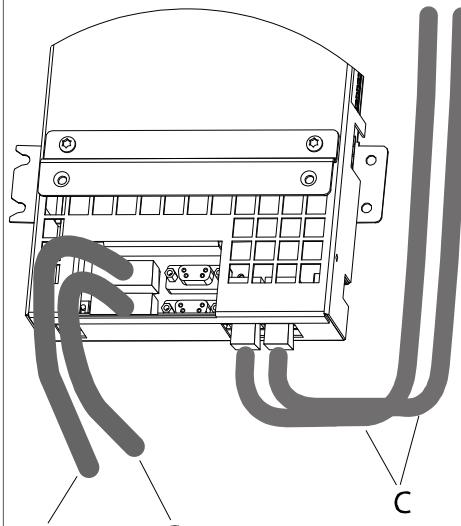
Action	Note/illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2  WARNING The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35.	

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4 Repair

4.16 Replacement of SafeMove board DSQC 647

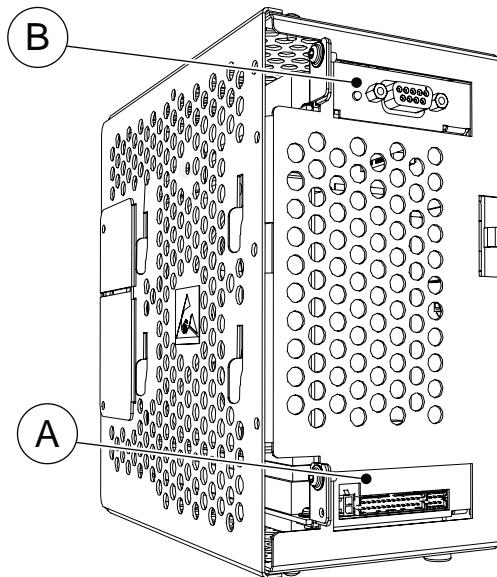
Continued

Action	Note/illustration
3 If not already in place, fit the EMC strips on the SafeMove board.	 xx0800000204 <ul style="list-style-type: none"> • A: EMC strips
4 Connect both SMB cables and both Ethernet cables to the SafeMove board before mounting the board. These connections may be difficult to reach once the board is mounted. The two Ethernet connectors on the SafeMove board are interchangeable (it does not matter which is connected to the main computer and which is connected to the axis computer).	 xx0800000103 <ul style="list-style-type: none"> • A: SMB1 cable • B: SMB2 cable • C: Ethernet cables
5 Refit the SafeMove board and the axis computer.	
6 Refit all cables.	
7 After replacement of the safety controller, the SafeMove configuration must be downloaded to the new safety controller and then validated. For more information, see <i>Application manual - SafeMove</i> .	
8 Perform the function tests in section Function tests on page 184 to verify that the basic safety features (e.g. emergency stop) work properly.	

4.17 Replacement of Safety module DSQC1015 for SafeMove

Location

The Safety module DSQC1015 is a PClexpress board that is located inside the IRC5 main computer unit.



xx1500001760

A	Safety module DSQC1015
B	PClexpress slot for other devices.

Required equipment

Equipment	Note
DSQC1015 Safety module	3HAC048858-001
Standard toolkit	The contents are defined in section Standard toolkit, IRC5 on page 293 .
Circuit diagram	See Circuit diagrams on page 311 .

Removing the Safety module

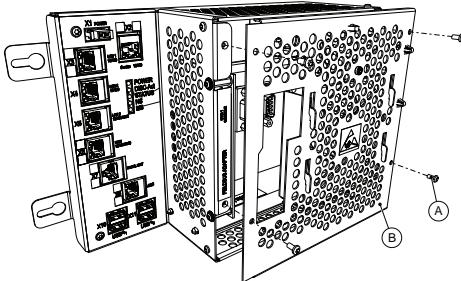
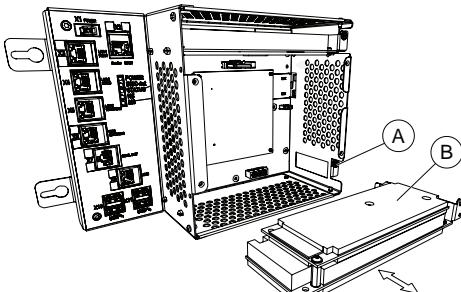
	Action	Note/Illustration
1	DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	

Continues on next page

4 Repair

4.17 Replacement of Safety module DSQC1015 for SafeMove

Continued

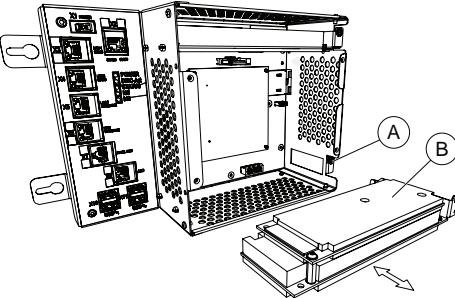
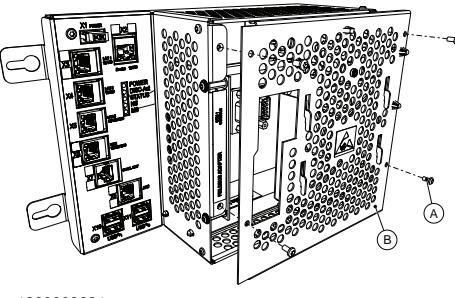
Action	Note/Illustration
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3 Open the computer unit by removing the attachment screws and lift off the cover. Disconnect the fan connector.  CAUTION Be careful with the fan cable when opening and removing the upper cover. The fan cable must not be stretched.	 xx1300000684 A Attachment screws (4 pcs.) B Cover
4 Remove the attachment screw on top of the slot bracket.	
5 Remove the Safety module by pulling it out of the socket on the motherboard.	 xx1500001761 A Attachment screw B Safety module  CAUTION Always grip the board around the edges to avoid damage to the board or its components.

Refitting the Safety module

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	

Continues on next page

**4.17 Replacement of Safety module DSQC1015 for SafeMove
Continued**

Action	Note/Illustration
2  ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35	
3 Fit the Safety module in position by pushing it into the socket on the motherboard.	 xx1500001761 A Attachment screw B Safety module  CAUTION Always grip the board around the edges to avoid damage to the board or its components.
4 Refit the attachment screw on top of the Safety module bracket.	
5 Refit the fan connector and close the computer unit.  CAUTION Be careful with the fan cable when closing the cover. The fan cable must not be squeezed.	 xx1300000684 A Attachment screws (4 pcs.) B Cover
6 Perform the function tests in section Function tests on page 184 to verify that the basic safety features (e.g. emergency stop) work properly.	
7 Perform a synchronization.	See Application manual - Functional safety and SafeMove .
8 Perform a Cyclic Brake Check.	See Application manual - Functional safety and SafeMove .
9 Lock the SafeMove configuration file.	See Application manual - Functional safety and SafeMove .

4 Repair

4.18 Replacement of Remote Service box

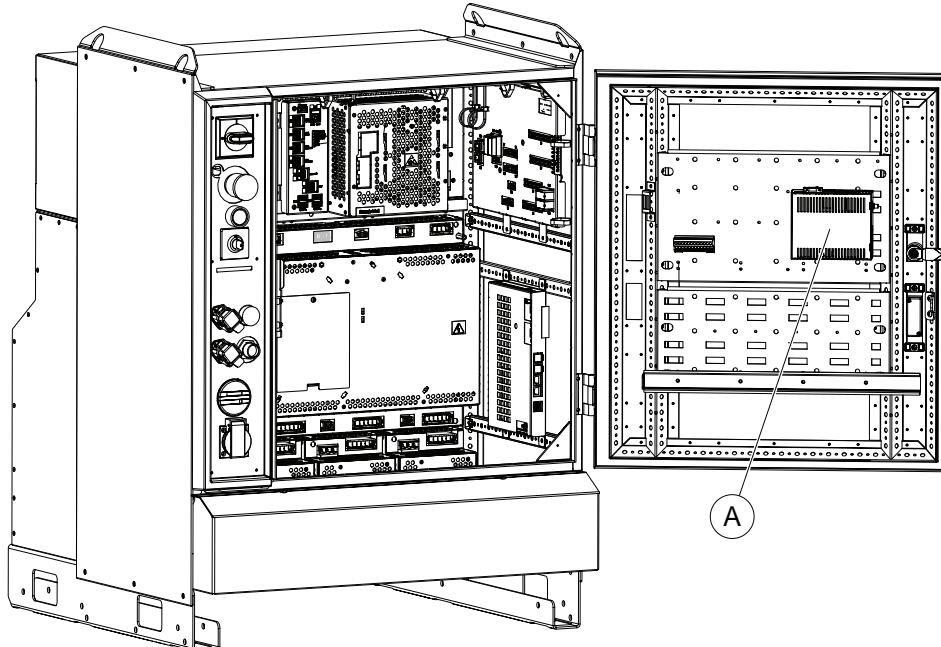
4.18 Replacement of Remote Service box

General

A Remote Service box is mounted in the controller if the option Remote Service is used.

Location

The illustration below shows the Remote Service box in the controller.



xx1300000811

A	Remote Service box
---	--------------------

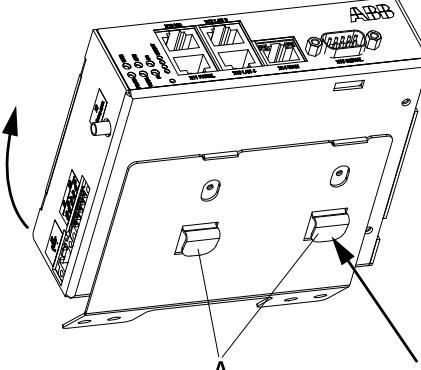
Required equipment

Equipment	Note
Remote Service box	DSQC 680 See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit.
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.	
Circuit diagram	See Circuit diagrams on page 311 .

Continues on next page

Removal

Use this procedure to remove the Remote Service box.

Action	Note/illustration
 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
 WARNING The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35.	
3 Disconnect all connectors from the Remote Service box.	
4 Push the spring locks in the arrow direction and lift the box out.	 xx0800000091 <ul style="list-style-type: none"> • A: Spring lock

Refitting

Use this procedure to refit the Remote Service box.

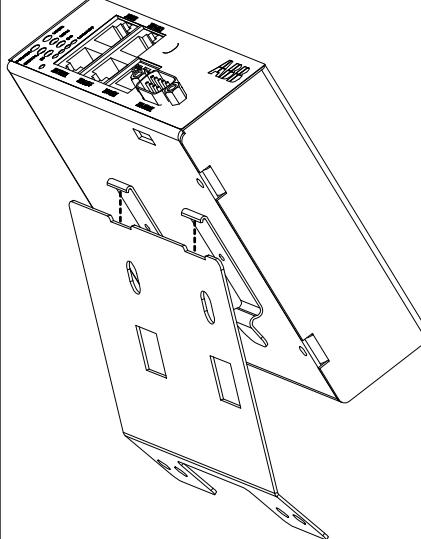
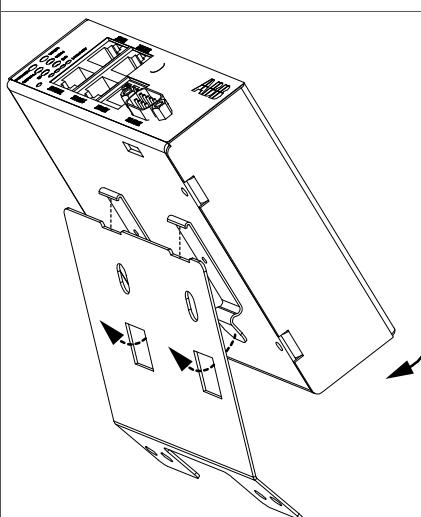
Action	Note/illustration
 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
 WARNING The unit is sensitive to ESD. Before handling the unit please observe the safety information in section WARNING - The unit is sensitive to ESD! on page 35.	

Continues on next page

4 Repair

4.18 Replacement of Remote Service box

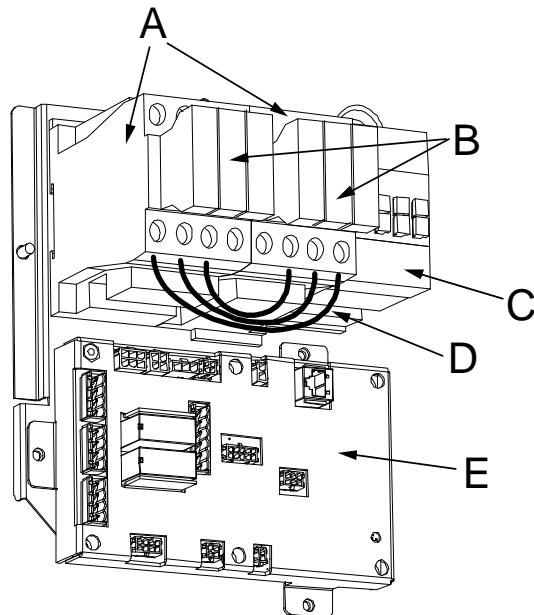
Continued

Action	Note/illustration
3	<p>Fit the Remote Service box in position.</p>  <p>xx0800000092</p>
4	<p>Push the Remote Service box in the arrow direction until the spring locks snaps into position.</p>  <p>xx0800000093</p>
5	<p>Reconnect all connectors to the Remote Service box.</p>
6	<p>Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.</p>

4.19 Replacement of Contactor Interface Board

Location

The illustration below shows the location of the contactor interface board in the controller.



xx0400001058

A	MOTOR ON contactor K42
B	MOTOR ON contactor K43
C	Brake contactor
D	Jumpers (3pcs)
E	Contactor interface board

Required equipment

Equipment	Note
Contactor Interface board	DSQC 611 See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit.
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 Circuit diagrams on page 311 .

Continues on next page

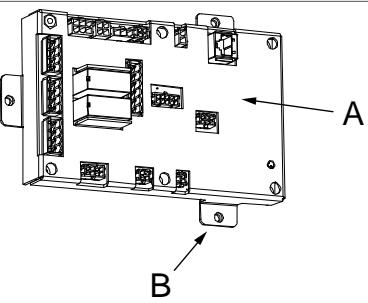
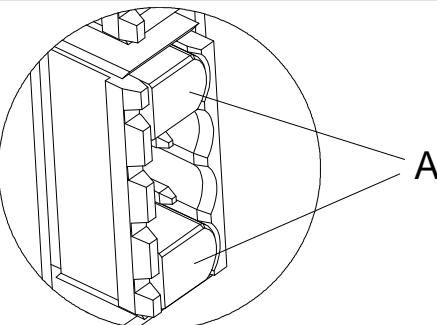
4 Repair

4.19 Replacement of Contactor Interface Board

Continued

Removal

The procedure below details how to remove the contactor board.

Action	Note/Illustration
1	<p> DANGER</p> <p>Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.</p>
2	<p> WARNING</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35</p>
3	<p>Disconnect all connectors.</p> <p> Tip</p> <p>Make a note of any connections.</p>
4	<p>Remove the attachment screws.</p>  <p>xx0400001062</p> <ul style="list-style-type: none">A: contactor interface boardB: attachment screws
5	<p>Remove the contactor interface board.</p>
6	<p>If SafeMove option is used, the plugs in the limit switch override contact (X23) pin 1 and 4, must be moved to the new contactor interface board.</p> <p>Use a small flat pliers to remove the plugs.</p>  <p>xx0800000035</p> <ul style="list-style-type: none">A: plug (2 pcs)

Continues on next page

Refitting

The procedure below details how to refit the contactor board.

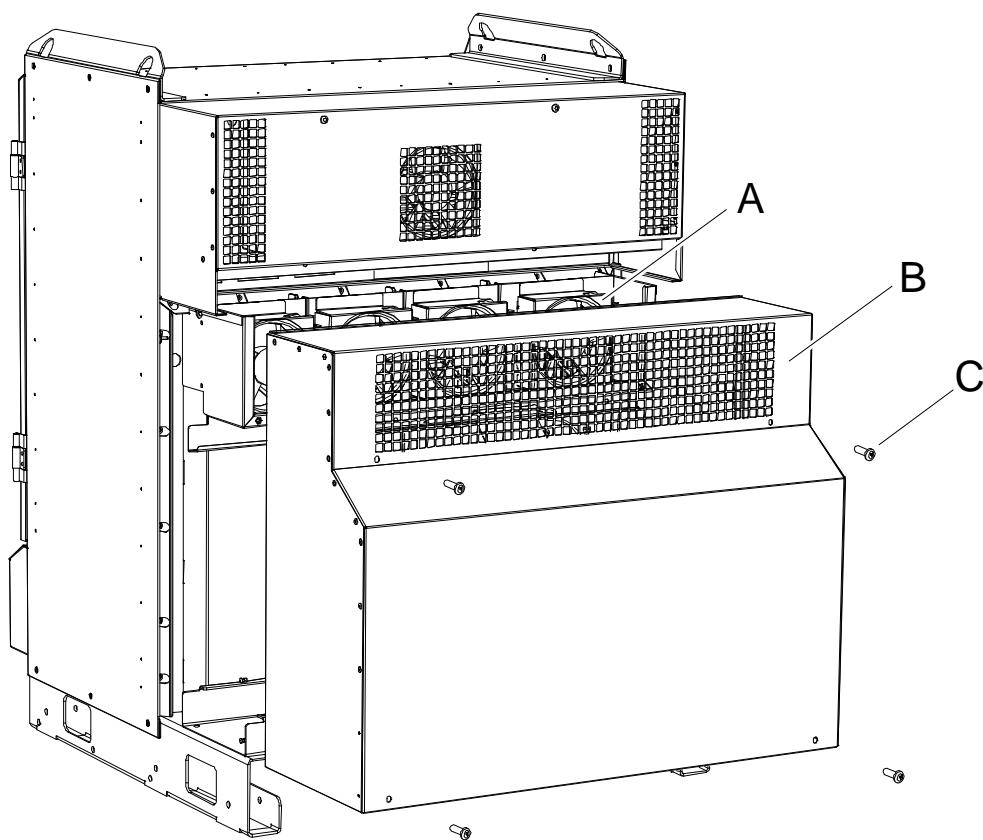
Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2  WARNING The unit is sensitive to ESD. Before handling the unit please read the safety information in the section WARNING - The unit is sensitive to ESD! on page 35	
3 If SafeMove is used, mount the plugs in the limit switch override contact (X23) pin 1 and 4.	 Note The limit switch override contact must be plugged and not used when using Safe-Move.
4 Refit the contactor interface board.	
5 Refit the attachment screws.	
6 Reconnect all connectors.	
7 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

4 Repair

4.20 Replacement of drive system fans

Location

The illustration below shows the location of the fan unit in the controller.



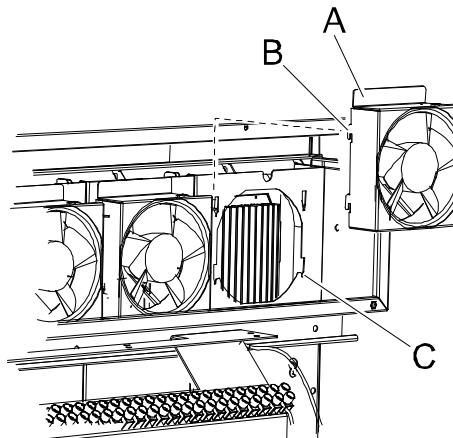
A	Fan (4 pcs)
B	Cover
C	Attachment screw (4 pcs)

Required equipment

Equipment	Note
Fan	See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit.
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 Circuit diagrams on page 311 .

Continues on next page

Removal

	Action	Note /illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34.</i>	
2	Remove the moist dust filter magazine. (Option)	How to remove the moist dust filter magazine is detailed in section <i>Replacement of moist dust filter on page 175.</i>
3	Loosen the four attachment screws to the cover.	
4	Remove the cover.	
5	Disconnect the connector to the fan.	
6	If the fan is temperature sensor controlled, disconnect the sensor as described in <i>Replacement of sensors for the drive system fans on page 259.</i>	
7	Push the fan upwards and remove it.	 xx0500002015 A Fan B Latches C Grooves

Refitting

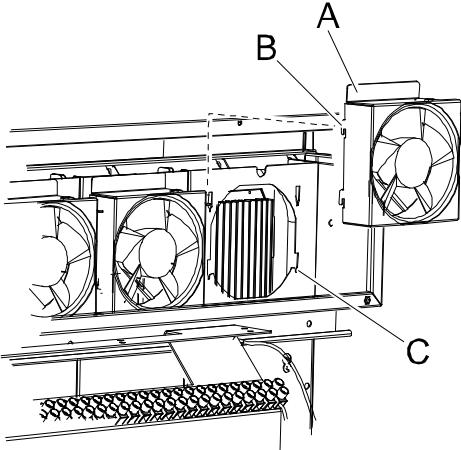
	Action	Note/illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section <i>DANGER - Make sure that the main power has been switched off! on page 34.</i>	

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4 Repair

4.20 Replacement of drive system fans

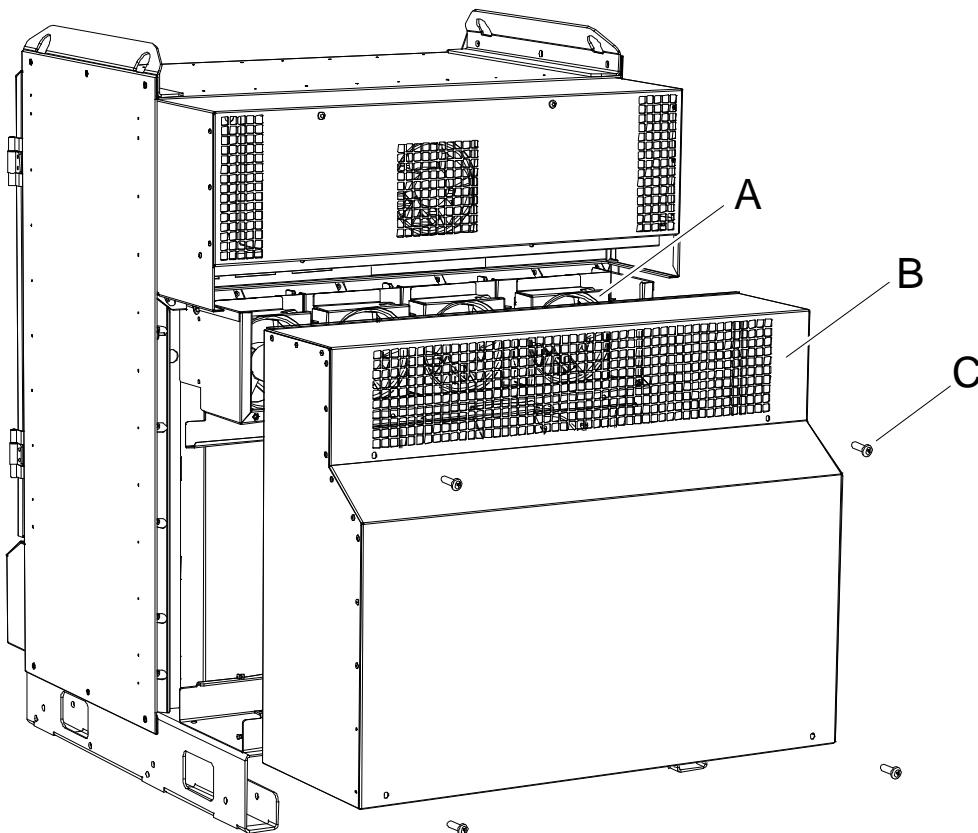
Continued

Action	Note/illustration
2 If the fan is temperature sensor controlled, fit the sensor and connect it as described in Replacement of sensors for the drive system fans on page 259 .	
3 Reconnect the connector to the fan.	
4 Refit the fan by placing the latches in the back of the fan housing in the grooves.	 <p>xx0500002015</p> <p>A Fan B Latches C Grooves</p>
5 Refit the cover and the attachment screws.	
6 Refit the moist dust filter magazine. (Option)	
7 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

4.21 Replacement of sensors for the drive system fans

Location

The illustration below shows the location of the drive system fan unit in the controller.



xx0500002011

A	Fan (up to 4 pcs)
B	Cover
C	Attachment screw (4 pcs)

Required equipment

Equipment	Note
Temp sensor for drive system fans	See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit.
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 Circuit diagrams on page 311 .

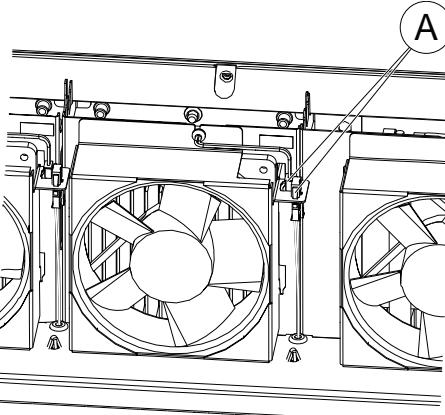
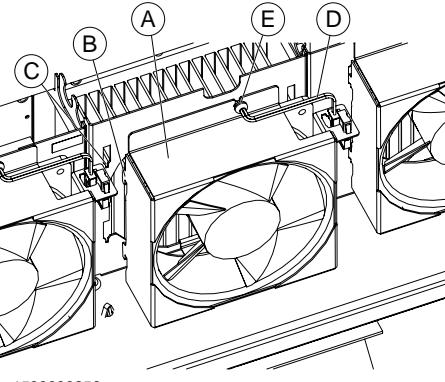
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4 Repair

4.21 Replacement of sensors for the drive system fans

Continued

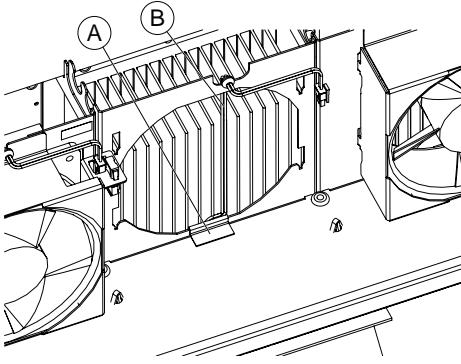
Removal

Action	Note /illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2 Remove the moist dust filter magazine. (Option)	How to remove the moist dust filter magazine is detailed in section Replacement of moist dust filter on page 175 .
3 Loosen the four attachment screws to the cover.	
4 Remove the cover.	
5 Disconnect the connectors to the fan.	 xx1500000855 A Connectors
6 Slide the cable gland out of the indentation.	 xx1500000856 A Fan B Latches C Grooves D Temp sensor cable E Cable gland
7 Push the fan upwards and remove it.	

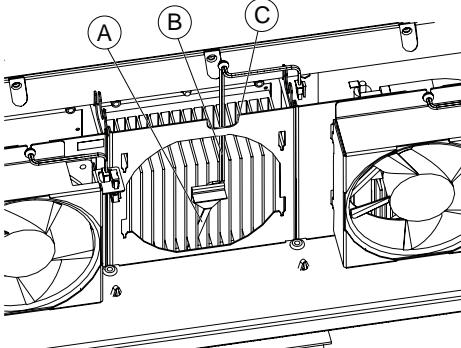
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4.21 Replacement of sensors for the drive system fans

Continued

	Action	Note /illustration
8	Lift the sensor holder and remove it together with the sensor cable.	 <p>xx1500000857</p> <p>A Sensor holder B Sensor cable</p>

Refitting

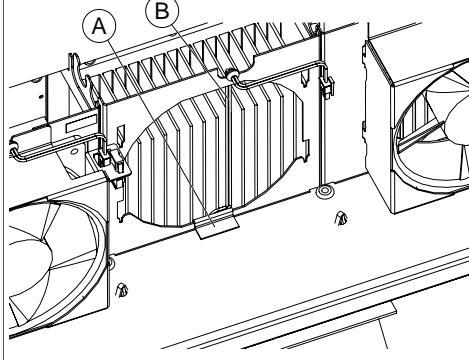
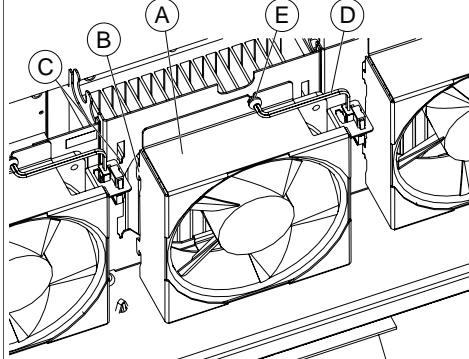
	Action	Note/illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2	Insert the sensor between the heat sink fins in the middle.	 <p>xx1500000858</p> <p>A Sensor on sensor holder B Sensor cable C Fan channel bracket</p>
3	Route the fan cable behind the fan channel bracket.	

Continues on next page

4 Repair

4.21 Replacement of sensors for the drive system fans

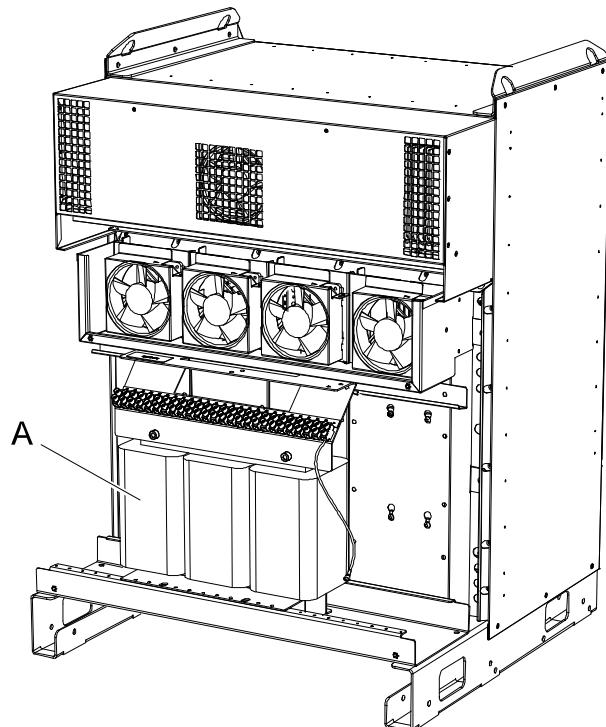
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Action	Note/illustration
4 Fit the sensor holder on the edge of the fan channel bracket.	 xx1500000857 A Sensor holder B Sensor cable
5 Refit the fan by placing the latches in the back of the fan housing into the grooves and press the fan down.	 xx1500000856 A Fan B Latches C Grooves D Temp sensor cable E Cable gland
6 Slide the cable gland into the indentation in the fan housing. Gently pull the cable so there is no slack on the cable between the sensor and the cable gland.	
7 Reconnect the connectors to the fan.	
8 Refit the cover and the attachment screws.	
9 Refit the moist dust filter magazine. (Option)	
10 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

4.22 Replacement of transformer unit

Location

The illustration below shows the location of the transformer unit in the controller.



xx0500002028

A	Transformer
---	-------------

Required equipment

Equipment	Note
Transformer unit	13kVA, 6kVA, 4.2kVA, 1.2kVA See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit
Circuit diagram	See Circuit diagrams on page 311 .

Removal

The following procedures details how to remove the transformer unit.

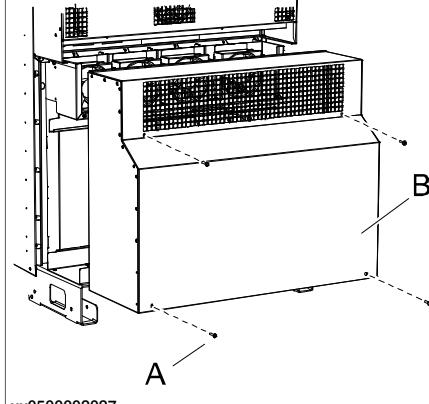
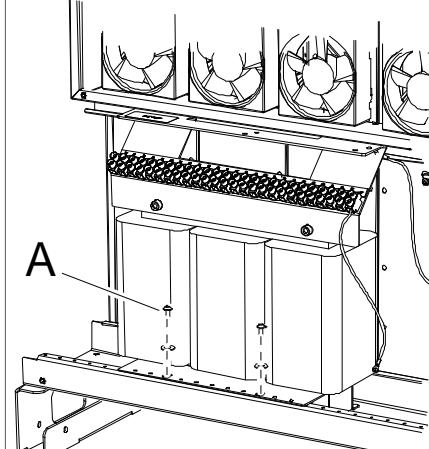
	Action	Note/illustration
1	DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	

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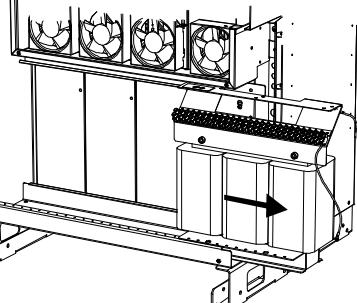
4 Repair

4.22 Replacement of transformer unit

Continued

Action	Note/illustration
2  WARNING The transformer weighs between 15 and 40 kg, use a hoist and lifting slings.	
3 Remove the moist dust filter magazine. (Option)	How to remove the moist dust filter magazine is detailed in section Replacement of moist dust filter on page 175 .
4 Loosen the attachment screws.	 xx0500002027 <ul style="list-style-type: none"> • A: attachment screw (4pcs) • B: cover
5 Remove the cover.	
6 Disconnect the two grounding wires (grey, blue).	
7 Disconnect the mains power supply wires.	 Note Make a note of the terminal to which each of the wires are connected. This will facilitate reconnection to the same terminal.
8 Remove the two transformer attachment screws.	 xx0500002032 <ul style="list-style-type: none"> • A: attachment screw (2pcs)

Continues on next page

Action	Note/illustration
9 Push the transformer unit side ways and lift it out with lifting slings and a hoist.	 xx0500002033

Refitting

The following procedure details how to refit the transformer unit.

Action
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .
2  WARNING The transformer weighs between 15 and 40 kg, use a hoist and lifting slings.
3 Fit the new transformer in place with a hoist and lifting slings.
4 Refit the attachment screws.
5 Reconnect the mains power supply wires and grounding wires.
6 Refit the cover.
7 Refit the moist dust filter magazine. (Option)
8 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.

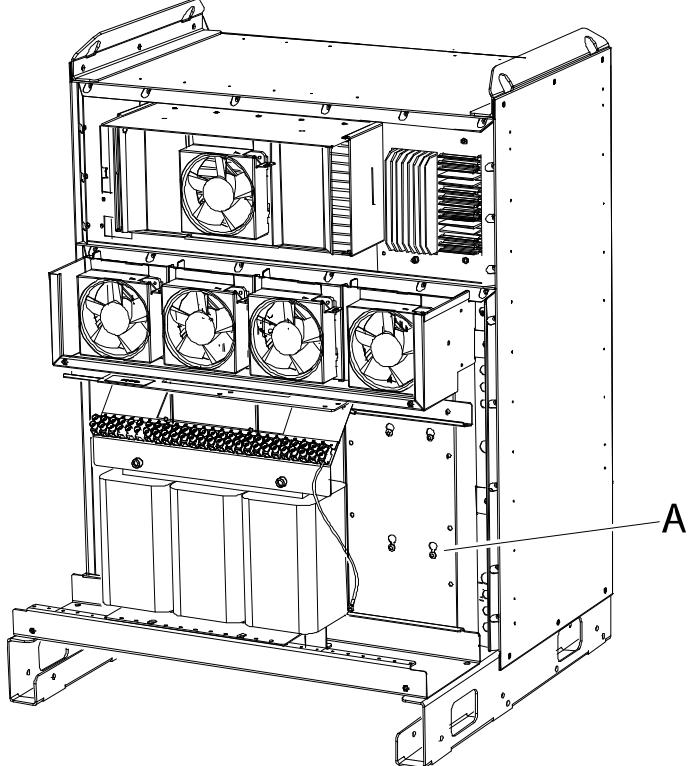
4 Repair

4.23 Replacement of brake resistor bleeder

4.23 Replacement of brake resistor bleeder

Location

The illustration below shows the location of the brake resistor bleeder in the controller (behind the cover).



xx0500002022

A	Brake resistor bleeder (behind the cover, not visible).
---	---

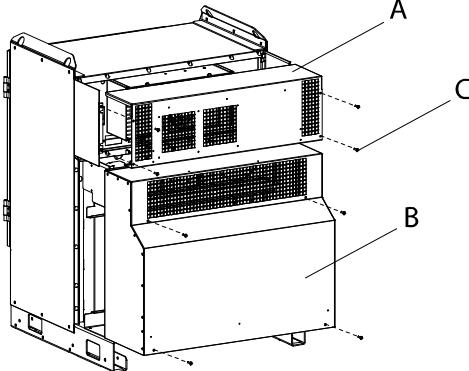
Required equipment

Equipment	Note
Brake resistor bleeder	See Spare parts on page 295 .
Standard toolkit	The contents are defined in section Standard toolkit
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 Circuit diagrams on page 311 .

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Removal

The following procedure details how remove the brake resistor bleeder.

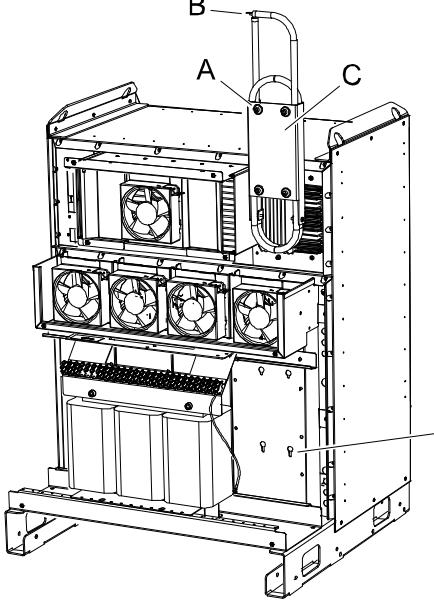
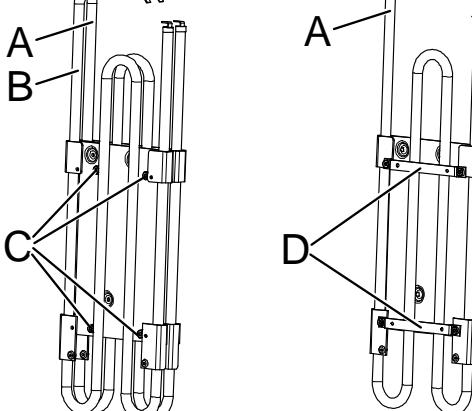
	Action	Note/illustration
1	 DANGER <p>Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.</p>	
2	Remove the moist dust filter magazine. (Option)	How to remove the moist dust filter magazine is detailed in section Replacement of moist dust filter on page 175 .
3	Remove the covers in the back of the controller.	 xx0700000418 <ul style="list-style-type: none"> • A: top cover • B: transformer cover • C: attachment screw (8 pcs)
4	 CAUTION <p>If the controller is equipped with temperature sensor controlled fans, remove the sensor at the bleeder before removing the bleeder. See Replacement of sensors for the drive system fans on page 259. Attempting to remove the bleeder with the sensor still in place will cause the sensor holder to be bent and the sensor will measure the temperature in the wrong place. This will result in too high temperature in the controller cabinet and shorter life time for the components.</p>	

Continues on next page

4 Repair

4.23 Replacement of brake resistor bleeder

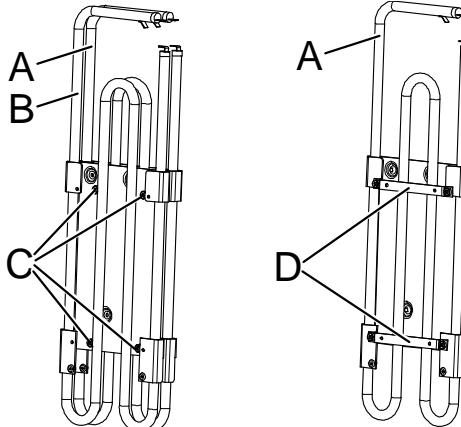
Continued

Action	Note/illustration
5 Disconnect the two connectors from the bleeder.	 <p>xx0500002020</p> <ul style="list-style-type: none"> • A: attachment screw (4 pcs) • B: connectors • C: brake resistor bleeder • D: bleeder attachment screw (4 pcs)
6 Loosen the <i>attachment screws</i> for the brake resistor bleeder.	
7 Lift the <i>bleeder</i> slightly and push it in to release the attachments.	
8 Lift the <i>bleeder</i> straight up.	
9 If the IRC5 controller uses an Additional Rectifier Unit, an extra ARU bleeder is mounted on the MDU bleeder. Remove the attachment screws and remove the ARU bleeder from the MDU bleeder. Remove the mounting brackets for the ARU bleeder.	 <p>xx1000000030</p> <ul style="list-style-type: none"> • A: MDU bleeder • B: ARU bleeder • C: Attachment screws • D: Mounting brackets for ARU bleeder

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Refitting

The following procedure details how to refit the brake resistor bleeder.

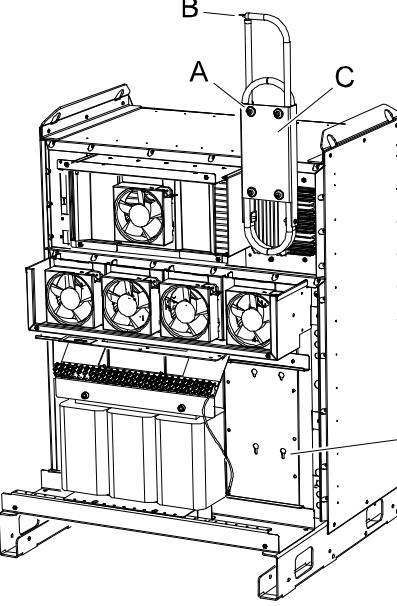
	Action	Note/illustration
1	 DANGER <p>Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.</p>	
2	<p>If the IRC5 controller uses an Additional Rectifier Unit, an extra ARU bleeder is required.</p> <p>Attach the mounting brackets for ARU bleeder on the MDU bleeder.</p> <p>Attach the ARU bleeder to the MDU bleeder.</p>	 <p>xx1000000030</p> <ul style="list-style-type: none"> • A: MDU bleeder • B: ARU bleeder • C: Attachment screws • D: Mounting brackets for ARU bleeder

Continues on next page

4 Repair

4.23 Replacement of brake resistor bleeder

Continued

	Action	Note/illustration
3	Slide the new bleeder in to place and fit the attachment screws in the key hole attachments.	 <p>xx0500002020</p> <ul style="list-style-type: none"> • A: attachment screw (4 pcs) • B: connectors • C: brake resistor bleeder • D: bleeder attachment screw (4 pcs)
4	Tightening the four attachment screws.	
5	Reconnect the connectors.	
6	Refit the covers.	
7	Refit the moist dust filter magazine. (Option)	
8	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

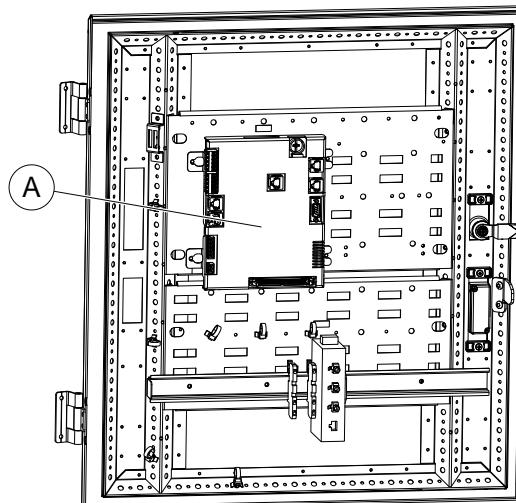
4.24 Replacement of Process Interface Board

About the Process Interface Board

A Process Interface Board is mounted in the controller cabinet if option *DispensePac support* is used.

Location

The illustration below shows the location of the Process Interface Board.



xx1300000812

A	Process Interface Board
---	-------------------------

Required equipment

Equipment	Note
Standard toolkit	The contents are defined in section Standard toolkit

Removing the Process Interface Board

Action	
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.

Continues on next page

4 Repair

4.24 Replacement of Process Interface Board

Continued

Action	
2	 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 35
3	Disconnect all connectors from the Process Interface Board.
4	Remove the 4 attachment screws and remove the board.

Refitting the Process Interface Board

Action	
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .
2	 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 35
3	Fit the Process Interface Board on the attachment plate and fasten it with the 4 attachment screws.
4	Connect all connectors to the Process Interface Board.
5	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.

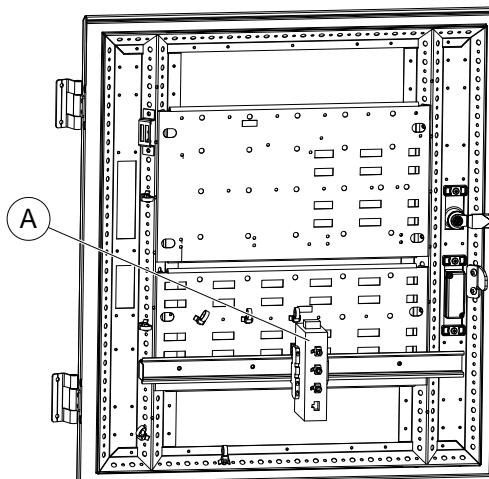
4.25 Replacement of Ethernet switch

General

For some options an Ethernet switch is mounted in the controller.

Location

The illustration below shows the location of the Ethernet switch.



xx1300000814

B	Ethernet switch
---	-----------------

Removing the switch

	Action
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.
2	 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 35
3	Disconnect all connectors from the switch.
4	Pull the spring lock to remove the switch.

Continues on next page

4 Repair

4.25 Replacement of Ethernet switch

Continued

Refitting the switch

	Action
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .
2	 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 35
3	Pull the spring lock and attach the switch to the mounting bar.
4	Connect all connectors to the switch.
5	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.

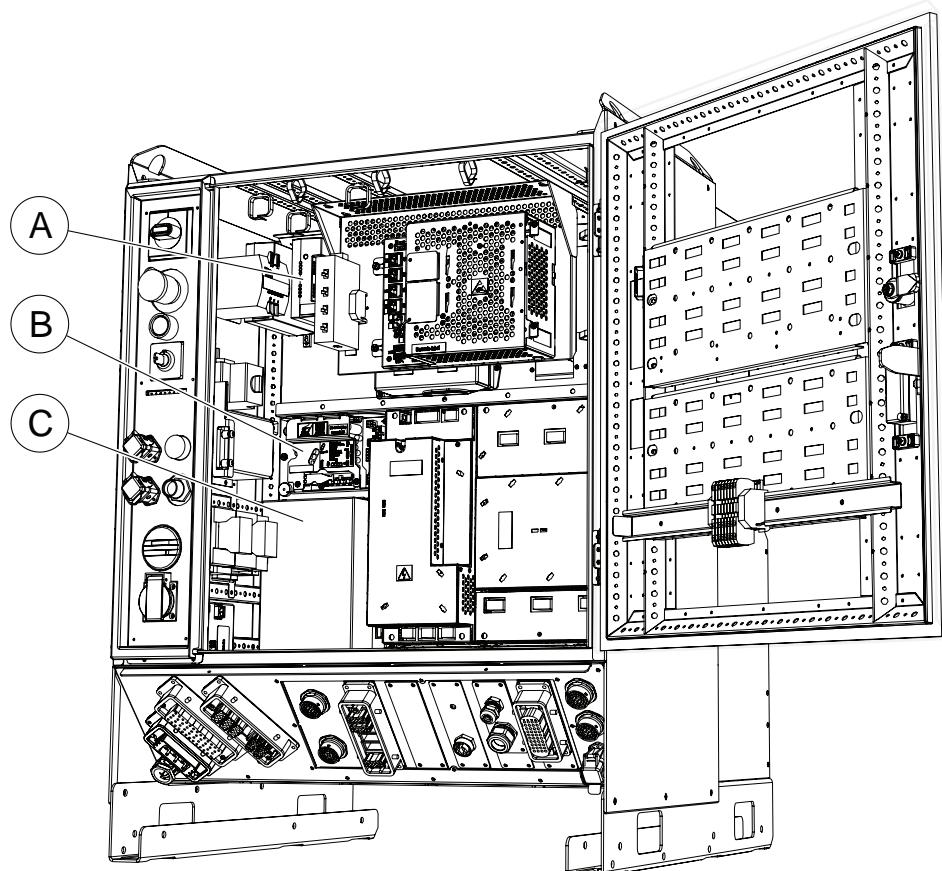
4.26.1 Replacement of power distribution unit

4.26 Replacement of power supply

4.26.1 Replacement of power distribution unit

Location

The power distribution unit, DSQC 662, is located on the left side as shown in the illustration below.



xx1300000813

A	Customer I/O power supply
B	Power distribution unit
C	System power supply



CAUTION

Hot surface on top of the power distribution unit.

Risk of burns. Be careful when removing the unit.

Do not route or place cables on top of the power distribution unit.

Continues on next page

4 Repair

4.26.1 Replacement of power distribution unit

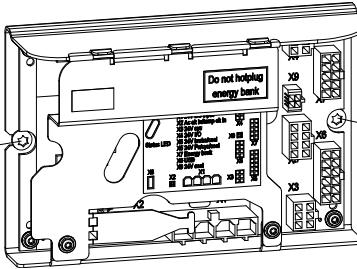
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Required equipment

Equipment	Article number	Note
Power distribution unit	3HAC026254-001	DSQC 662
Standard toolkit		The contents are defined in section Standard toolkit.
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.		
Circuit diagram	See Circuit diagrams on page 311 .	

Removal

The procedure below details how to remove the power distribution unit.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	 CAUTION Hot surface on top of the power distribution unit. Risk of burns. Be careful when removing the unit.	
3	Disconnect the connectors X1 - X9 on the power distribution unit.	
4	Loosen the left attachment screw, remove the right attachment screw and pull the power distribution unit rightward to release it from the left screw head.	 <ul style="list-style-type: none">A: left attachment screwB: right attachment screw
5	Remove the power distribution unit.	

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Refitting

The procedure below details how to refit the power distribution unit.

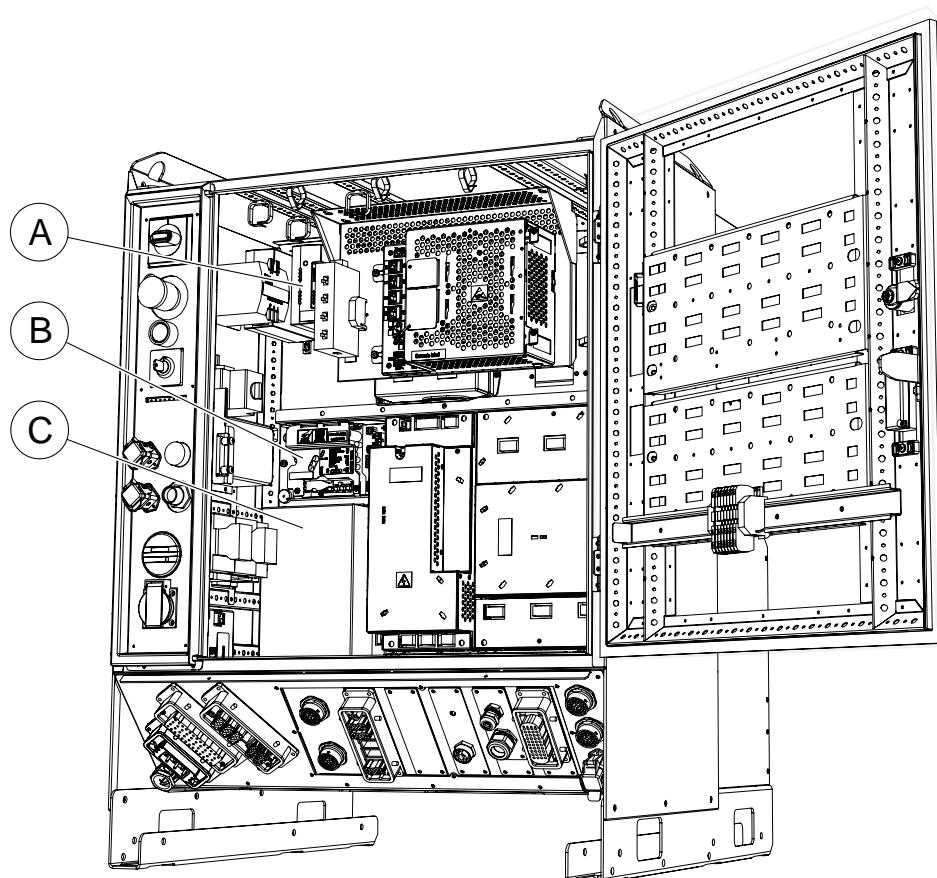
	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	Refit the new power distribution unit by pushing it leftward to fit the left screw head. Refit the right screw.	
3	Lock the unit in place by tighten the attachment screws.	
4	Reconnect the connectors X1 - X9.	 CAUTION Hot surface on top of the power distribution unit. Do not route or place cables on top of the power distribution unit.
5	Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

4 Repair

4.26.2 Replacement of customer I/O power supply

Location

The customer I/O power supply, DSQC 609, is located as shown in the figure below.



A	Customer I/O power supply
B	Power distribution unit
C	System power supply



CAUTION

If there are two or more Customer I/O power supply units mounted in a row and too close to each other, there will be a heating problem and the units can be damaged.

To avoid damaging the Customer I/O power supply units, the units must be separated with 3 pcs of exterior support.

Required equipment

Equipment	Article number	Note
Customer I/O power supply	3HAC14178-1	DSQC 609

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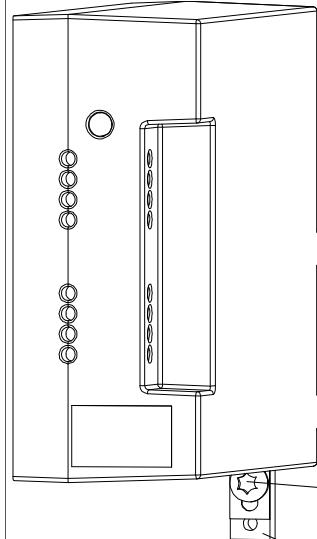
4.26.2 Replacement of customer I/O power supply

Continued

Equipment	Article number	Note
Standard toolkit		The contents are defined in section Standard toolkit.
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 Circuit diagrams on page 311 .	

Removal

The procedure below details how to remove the customer I/O power supply.

	Action	Note/Illustration
1	 DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34 .	
2	Remove the Flange disconnect unit (option).	Detailed in section Replacement of Flange disconnect on page 201
3	Loosen the terminal screws for each connected wire. Remove wires from the terminals.	
4	Loosen the DIN-lock fixing screw.	 xx0700000124 <ul style="list-style-type: none"> • A: DIN-lock fixing screw • B: DIN-lock lever
5	Pull the DIN-lock lever downwards to release the power supply unit.	
6	Remove the power supply unit.	

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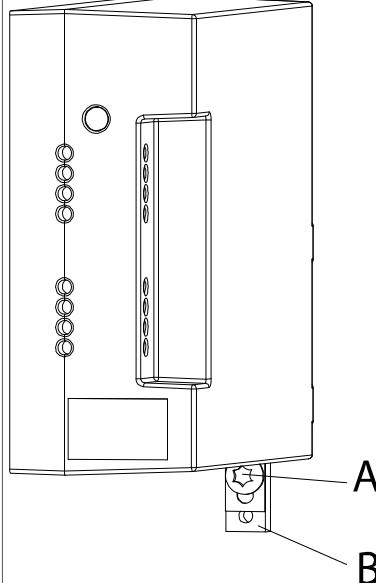
4 Repair

4.26.2 Replacement of customer I/O power supply

Continued

Refitting

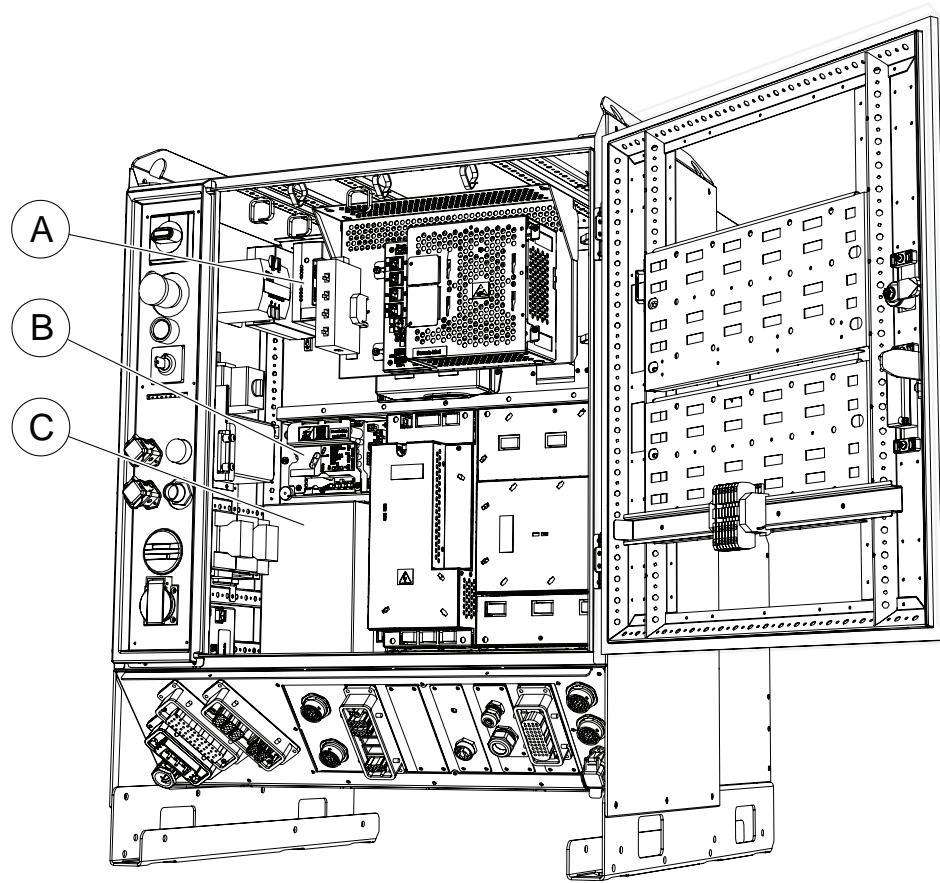
The procedure below details how to refit the customer I/O power supply.

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2 Refit the new power supply unit on the DIN-rail.	
3 Fasten the DIN-lock fixing screw.	 <p>xx0700000124</p> <ul style="list-style-type: none">• A: DIN-lock fixing screw• B: DIN-lock lever
4 Refit all wires in the screw terminals.	
5 Fasten the screw terminal screws with correct torque.	
6 Refit the Flange disconnect unit (option).	
7 Perform the function tests in section Function tests on page 184 to verify that the safety features work properly.	

4.26.3 Replacement of system power supply

Location

The illustration below shows the location of the system power supply, DSQC 661, in the controller.



xx1300000813

A	Customer I/O power supply
B	Power distribution unit
C	System power supply

Required equipment

Equipment	Article number	Note
System power supply	3HAC026253-001	DSQC 661
Standard toolkit		The contents are defined in section Standard toolkit.
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.		
Circuit diagram	See Circuit diagrams on page 311 .	

Continues on next page

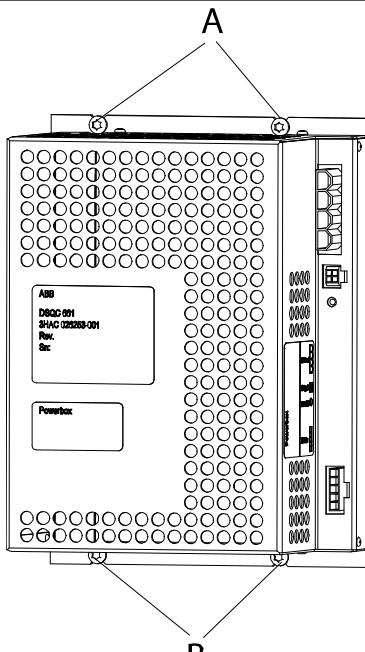
4 Repair

4.26.3 Replacement of system power supply

Continued

Removal

The procedure below details how to remove the system power supply.

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	
2 Disconnect all connectors from the unit.	
3 Loosen the two lower attachment screws.	 <p>A B</p> <p>xx0700000125</p> <ul style="list-style-type: none">• A: upper attachment screws• B: lower attachment screws
4 Remove the two upper attachment screws.	
5 Pull the power supply unit outwards and then upwards to release it from the lower screw heads, and remove it.	

Refitting

The procedure below details how to refit the system power supply.

Action	Note/Illustration
1  DANGER Before commencing any work inside the cabinet, please observe the safety information in section DANGER - Make sure that the main power has been switched off! on page 34.	

Continues on next page

4.26.3 Replacement of system power supply

Continued

Action	Note/Illustration
2 Refit the power supply by sliding the recesses in beneath the lower screw heads, and push it inwards and the downwards.	<ul style="list-style-type: none"> A: upper attachment screws B: lower attachment screws
3 Refit the two upper attachment screws.	
4 Tighten the attachment screws (4 pcs).	
5 Reconnect all connectors to the unit.	
6 Perform the function tests in section <i>Function tests on page 184</i> to verify that the safety features work properly.	

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5 Decommissioning

5.1 Introduction

Introduction

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

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

General

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

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

5 Decommissioning

5.2 Environmental information

5.2 Environmental information

Hazardous material

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

Dispose components properly to prevent health or environmental hazards.

Material	Example application
Batteries, NiCad or Lithium	Main computer
Copper	Cables
Steel	Cabinet structure, plates, screws, etc.
Plastic/rubber	Cables, connectors, etc.
Aluminium	Heat sinks on power supplies and drive units
Lead	Electronics
Brominated flame retardants	Electronics

6 Reference information

6.1 Introduction

General

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

6 Reference information

6.2 Applicable standards

Note

The listed standards are valid at the time of the release of this document. Phased out or replaced standards are removed from the list when needed.

Standards, EN ISO

The product is designed in accordance with the requirements of:

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

ⁱ Only robots with protection Clean Room.

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

European standards

Standard	Description
EN 614-1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN 574	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design

Continues on next page

Other standards

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-14	Industrial robots and robot Systems - General safety requirements

6 Reference information

6.3 Unit conversion

6.3 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	

6.4 Screw joints

General

This section details how to tighten the various types of screw joints on the controller. The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.

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 tables below. Any special torques are specified in the Repair, Maintenance or Installation procedure description. Any special torque specified overrides the standard value.
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- Always *tighten the joint by hand*, and never use pneumatic tools.
- Use the *correct tightening technique*, i.e. *do not jerk*. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is 10%!

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

Dimension	Tightening torque (Nm) Class 4.8, oil-lubricated
M2.5	0.25
M3	0.5
M4	1.2
M5	2.5
M6	5.0

6 Reference information

6.5 Weight specifications

6.5 Weight specifications

Definition

In all repair and maintenance instructions, 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 lifting equipment when handling components with a weight exceeding 22 kg.

Example

Below is an example of how a weight specification is presented:



CAUTION

The transformer weighs 55 kg! All lifting equipment used must be sized accordingly!

6.6 Standard toolkit, IRC5

General

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

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

Contents, standard toolkit, IRC5

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

6 Reference information

6.7 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.

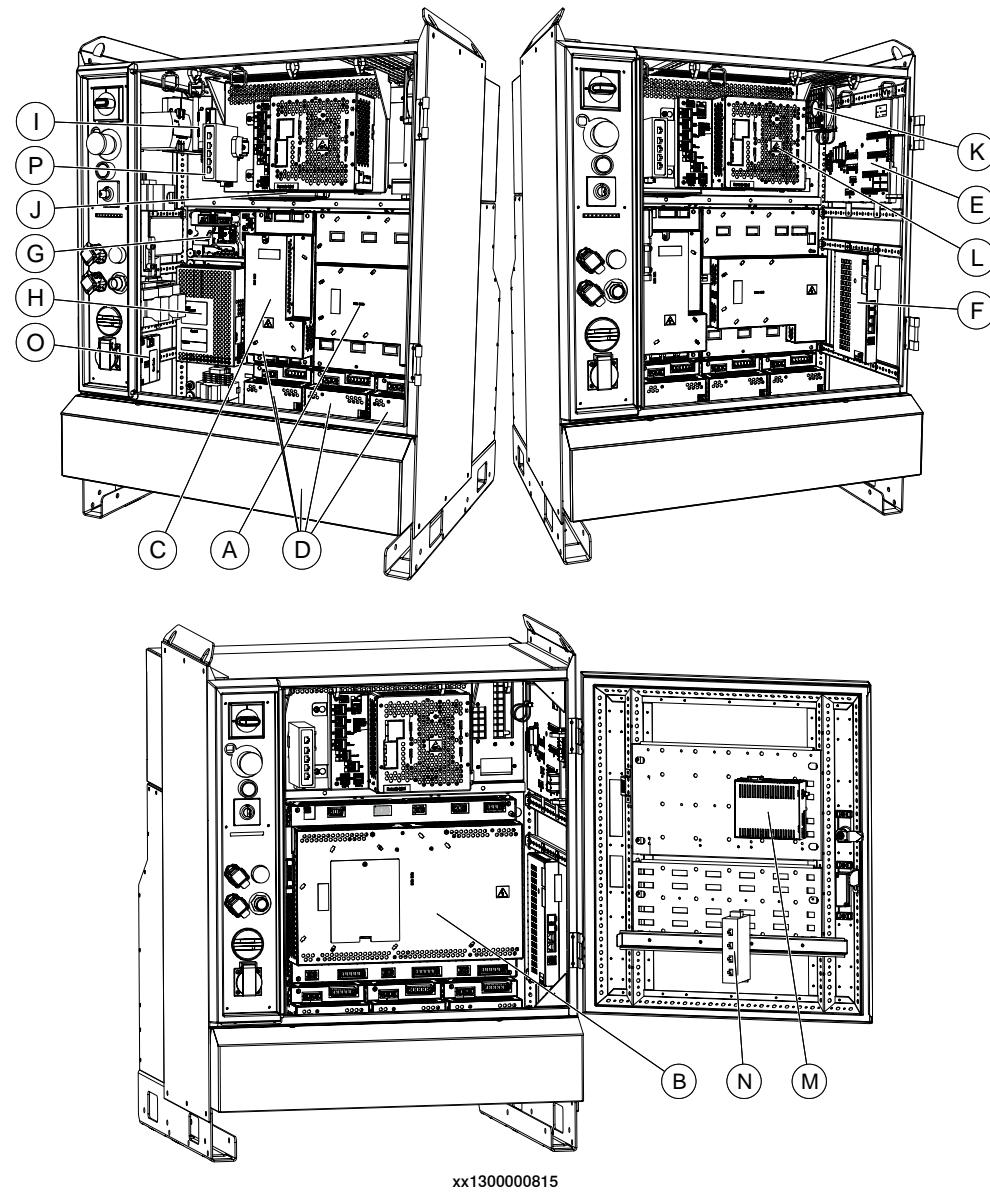
This implies that the instructions delivered with the lifting accessories should be stored for later reference.

7 Spare parts

7.1 Controller parts

Controller system parts

The illustration below shows the placement of the controller system parts in the recommended spare part list.



xx1300000815

	Spare part no.	Description	Type
A	3HAC035301-001	Main Drive Unit, MDU-430A (small robots)	DSQC 406
B	3HAC029818-001	Main Drive Unit, MDU-790A (large robots)	DSQC 663
C	3HAC035381-001	Additional Rectifier Unit, ARU-430A (small robots with additional drive unit)	DSQC 417

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7 Spare parts

7.1 Controller parts

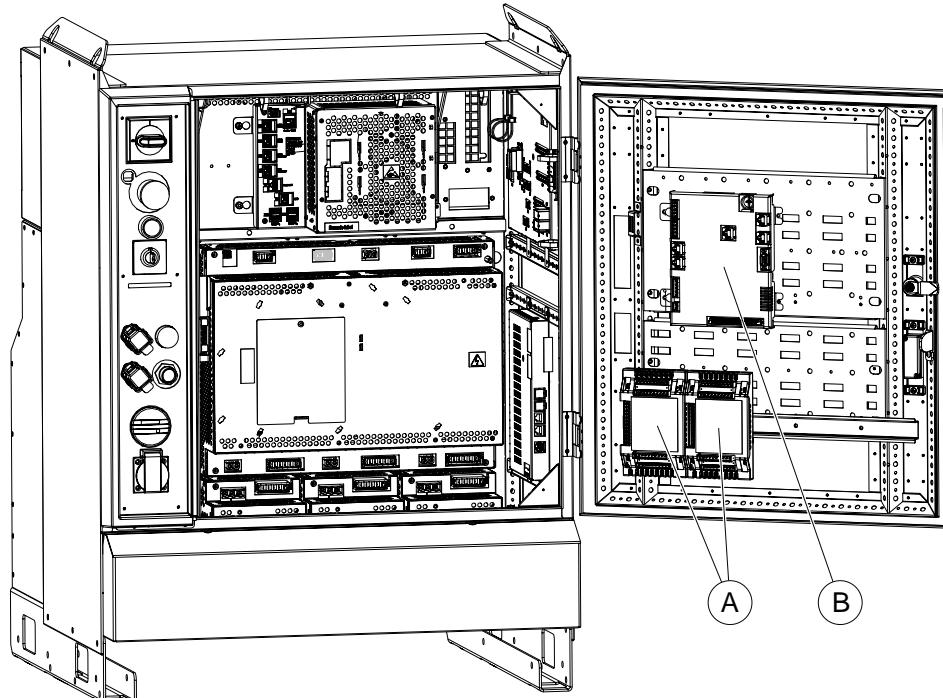
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	Spare part no.	Description	Type
D	3HAC030923-001	Additional Drive Unit, ADU-790A	DSQC 664
E	3HAC024488-001	Panel board unit	DSQC 643
F	3HAC029157-001	Axis computer	DSQC 668
G	3HAC026254-001	Power distribution unit	DSQC 662
H	3HAC026253-001	System power supply	DSQC 661
I	3HAC14178-1	Customer I/O power supply	DSQC 609
J	3HAC026585-001	Backup energy bank with adapter plate	DSQC 655
J	3HAC025562-001	Backup energy bank	DSQC 655
K	3HAC025466-001	Fan	
L	See Computer unit parts on page 298 .		
M	3HAC043053-001	Remote Service box	DSQC 680
N	3HAC034884-001	Ethernet switch	
O	3HAC13389-2	Contactor interface board	DSQC 611
P	3HAC045976-001	DSQC1007 Eth. switch (MultiMove)	DSQC1007
	3HAC052287-002	Mode selector 3-pos Std	
	3HAC052287-004	Mode selector 3-pos Extended	
	3HAC052287-001	Mode selector 2-pos Std	
	3HAC052287-003	Mode selector 2-pos Extended	
	3HAC028357-001	Teach Pendant with 10m cable	

Continues on next page

I/O System parts

The illustration below shows the placement of the I/O system parts in the recommended spare part list.



xx1300000816

	Spare part no.	Description	Type
A	3HAC025784-001	ADCombi I/O unit	DSQC 651
A	3HAC025917-001	Digital I/O unit	DSQC 652
B	3HNA006144-001	Process Interface Board	

Continues on next page

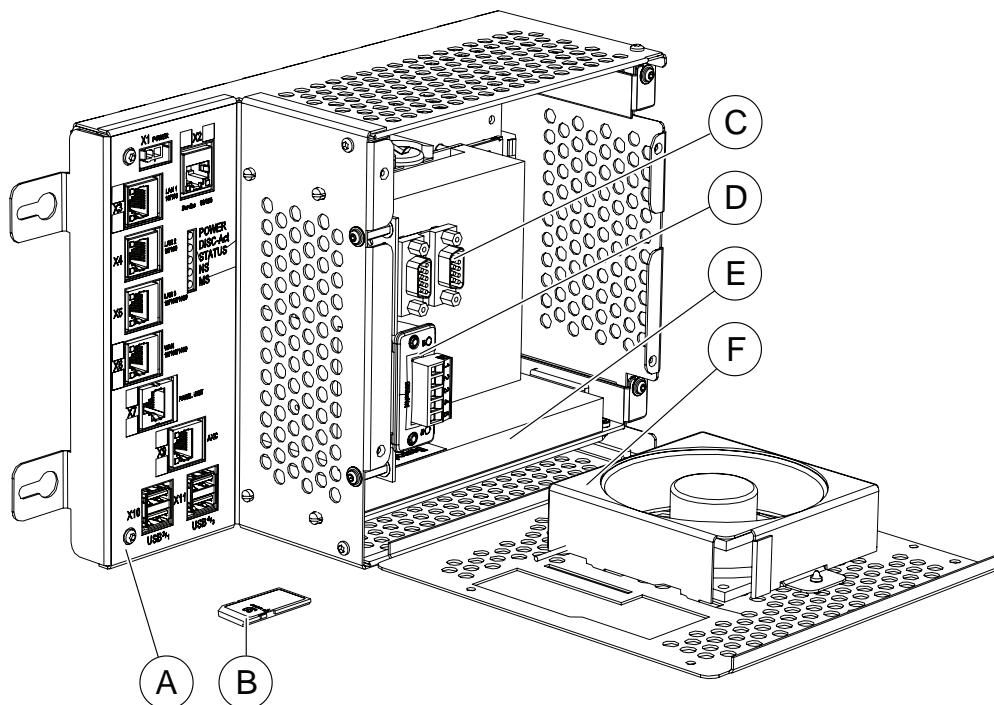
7 Spare parts

7.1 Controller parts

Continued

Computer unit parts

The illustration below shows the placement of the computer unit parts in the recommended spare part list.



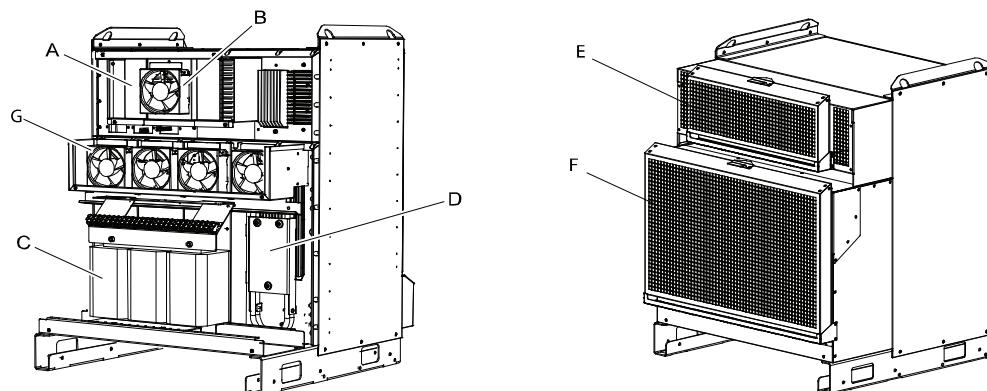
xx1300000851

	Spare part no.	Description	Type
A	3HAC042766-001	Computer unit (1 PCI slot)	DSQC1000
A	3HAC050363-001	Computer unit (2 PCI slots)	DSQC1018
A	3HAC058366-001	Computer unit (2 PCI slots)	DSQC1024
B	3HAC047184-003	Mass Memory with boot loader 2GB (SD-card with blue label for main computer DSQC1000 and DSQC1018) (previously called DSQC1008)	-
B	3HAC061416-003	Mass Memory with boot loader 2GB (SD-card with red label for main computer DSQC1024)	-
C	3HAC046408-001	Expansion Board complete	DSQC1003
D	3HAC031670-001	PROFINET Slave Fieldbus Adapter	DSQC 688
D	3HAC026840-001	PROFIBUS Slave Fieldbus Adapter	DSQC 667
D	3HAC027652-001	Ethernet/IP Slave Fieldbus Adapter	DSQC 669
D	3HAC045973-001	DeviceNet Slave Fieldbus Adapter	DSQC1004
E	3HAC043383-001	DeviceNet Master/Slave PClexpress	DSQC1006
E	3HAC044872-001	PROFIBUS-DP Master PClexpress	DSQC1005
F	3HAC026525-001	Fan	-
-	3HAC14944-1	RS-232/422 Converter	DSQC 615

Continues on next page

Miscellaneous parts

The illustration below shows the placement of the Miscellaneous parts in the recommended spare part list.



xx0600002683

	Spare part no.	Description	Note
C	3HAC037015-001	Transformer unit 400-480V	1.2kVA
C	3HAC037016-001	Transformer unit 200-220V	4.2kVA
C	3HAC037017-001	Transformer unit 400V	4.2kVA
C	3HAC037018-001	Transformer unit 440-600V	4.2kVA
C	3HAC024180-001	Transformer unit 200-600V	6kVA
C	3HAC024138-001	Transformer unit 200-600V	13kVA
A	3HAC038564-001	Heat exchange unit	52 °C
D	3HAC024628-001	Brake resistor bleeder unit	
	3HAC035583-001	Bleeder for Additional Rectifier Unit	
	3HAC036275-001	Mounting bracket for ARU bleeder	
B	3HAC029105-001	Fan	45 °C/52 °C
G	3HAC029105-001	Fan	
G	3HAC054680-001	Sensor controlled fan	Part of option 1170-1
	3HAC054852-001	Temp sensor with sensor bracket for sensor controlled fan	Part of option 1170-1
E	3HAC027697-001	Moist dust filter	Option
F	3HAC027641-001	Moist dust filter	Option
	3HAC033498-001	FlexPendant holder	
	3HAC033596-002	FlexPendant holder upper part	

7 Spare parts

7.2.1 Manipulator cables

7.2 Manipulator cables

7.2.1 Manipulator cables

Signal cables, IRB 120

Cable	Art. no.	Option no.
3HAC035320-001	Robot cable, signal 3 m	210-1
3HAC2493-1	Robot cable, signal 7 m	210-2
3HAC2530-1	Robot cable, signal 15 m	210-3

Signal cables, IRB 1200, 1410, 1520, 1600, 2600, 460, 4600, 6700, 8700

Art. no.	Description	Option no.
3HAC2493-1	Control cable signal 7 m	210-2
3HAC2530-1	Control cable signal 15 m	210-3
3HAC2540-1	Control cable signal 22 m	210-4
3HAC2566-1	Control cable signal 30 m	210-5

Signal cables, IRB 260, 660, 760, 2400, 4400, 6600, 6650, 6620, 6640, 6660, 6650S, 7600

Art. no.	Description	Option no.
3HAC7998-1	Control cable signal 7 m	210-2
3HAC7998-2	Control cable signal 15 m	210-3
3HAC7998-3	Control cable signal 22 m	210-4
3HAC7998-4	Control cable signal 30 m	210-5

Cable packages for IRB 140 (including signal, power and customer cables)

Art. no.	Description	Option no.
3HAC7996-1	Control cable power 3 m	210-1
3HAC7996-5	Control cable power 7 m	210-2
3HAC7996-6	Control cable power 15 m	210-3
3HAC7996-7	Control cable power 22 m	210-4
3HAC7996-8	Control cable power 30 m	210-5

Power cables, IRB 1410, 1600, 2400

Art. no.	Description	Option no. ⁱ
3HAC2492-1	Control cable power 7 m	Standard: 210-2 and 287-4
3HAC2529-1	Control cable power 15 m	Standard: 210-3 and 287-4
3HAC2539-1	Control cable power 22 m	Standard: 210-4 and 287-4
3HAC2564-1	Control cable power 30 m	Standard: 210-5 and 287-4

Continues on next page

Art. no.	Description	Option no. ⁱ
3HAC9038-1	Control cable power 7 m	Foundry: 210-2 and 287-3 Wash: 210-2 and 287-5
3HAC9038-2	Control cable power 15 m	Foundry: 210-3 and 287-3 Wash: 210-3 and 287-5
3HAC9038-3	Control cable power 22 m	Foundry: 210-4 and 287-3 Wash: 210-4 and 287-5
3HAC9038-4	Control cable power 30 m	Foundry: 210-5 and 287-3 Wash: 210-5 and 287-5

ⁱ The option number depends on the protection type of the manipulator.

Power cables, IRB 1200, 1520

Art. no.	Description	Option no.
3HAC040503-007	Control cable power 3 m	210-1 (only for IRB 1200)
3HAC040503-001	Control cable power 7 m	210-2
3HAC040503-002	Control cable power 15 m	210-3
3HAC040503-003	Control cable power 22 m	210-4 (only for IRB 1200)
3HAC040503-004	Control cable power 30 m	210-5 (only for IRB 1200)

Power cables, IRB 120

Cable	Art. no.	Option no.
3HAC032694-001	Robot cable power 3 m	210-1
3HAC032695-001	Robot cable power 7 m	210-2
3HAC032696-001	Robot cable power 15 m	210-3

Power cables, IRB 260

Art. no.	Description	Option no. ⁱ
3HAC9038-1	Control cable power 7 m	Foundry: 210-2 and 287-3 Wash: 210-5 and 287-5
3HAC9038-2	Control cable power 15 m	Foundry: 210-3 and 287-3 Wash: 210-5 and 287-5
3HAC9038-3	Control cable power 22 m	Foundry: 210-4 and 287-3 Wash: 210-5 and 287-5
3HAC9038-4	Control cable power 30 m	Foundry: 210-5 and 287-3 Wash: 210-5 and 287-5

ⁱ The option number depends on the protection type of the manipulator.

Power cables, IRB 360

Art. no.	Description	Option no.
3HAC029903-001	Control cable, power and signal 3 m	(435-80 or 435-81 or 435-82)
3HAC029903-002	Control cable, power and signal 7 m	(435-80 or 435-81 or 435-82)

Continues on next page

7 Spare parts

7.2.1 Manipulator cables

Continued

Art. no.	Description	Option no.
3HAC029903-003	Control cable, power and signal 15 m	(435-80 or 435-81 or 435-82)
3HAC029903-004	Control cable, power and signal 22 m	(435-80 or 435-81 or 435-82)
3HAC029903-005	Control cable, power and signal 30 m	(435-80 or 435-81 or 435-82)
3HAC029903-007	Control cable, power and signal 50 m	(435-80 or 435-81 or 435-82)
3HAC038411-001	Control cable, power and signal, stainless contact screws, 3 m	(435-80 or 435-81 or 435-82)
3HAC038411-002	Control cable, power and signal, stainless contact screws, 7 m	(435-80 or 435-81 or 435-82)
3HAC038411-003	Control cable, power and signal, stainless contact screws, 15 m	(435-80 or 435-81 or 435-82)
3HAC038411-004	Control cable, power and signal, stainless contact screws, 22 m	(435-80 or 435-81 or 435-82)
3HAC038411-005	Control cable, power and signal, stainless contact screws, 30 m	(435-80 or 435-81 or 435-82)
3HAC038411-006	Control cable, power and signal, stainless contact screws, 50 m	(435-80 or 435-81 or 435-82)

Power cables, IRB 4400

Art. no.	Description	Option no. ⁱ
3HAC2512-1	Control cable power 7 m	Standard: 210-2 and 287-4 Clean room: 210-2 and 287-1
3HAC2535-1	Control cable power 15 m	Standard: 210-3 and 287-4 Clean room: 210-3 and 287-1
3HAC2560-1	Control cable power 22 m	Standard: 210-4 and 287-4 Clean room: 210-4 and 287-1
3HAC2572-1	Control cable power 30 m	Standard: 210-5 and 287-4 Clean room: 210-5 and 287-1
3HAC8182-1	Control cable power 7 m	Foundry: 210-2 and 287-3 Wash: 210-2 and 287-5
3HAC8182-2	Control cable power 15 m	Foundry: 210-3 and 287-3 Wash: 210-3 and 287-5
3HAC8182-3	Control cable power 22 m	Foundry: 210-4 and 287-3 Wash: 210-4 and 287-5
3HAC8182-4	Control cable power 30 m	Foundry: 210-5 and 287-3 Wash: 210-5 and 287-5

ⁱ The option number depends on the protection type of the manipulator.

Power cable, IRB 460, 660, 760, 2600, 4600, 6600, 6620, 6640, 6650, 6650S, 6660, 6700, 7600, 8700

Art. no.	Description	Option no.
3HAC026787-001	Control cable power 7 m	(435-6 or 435-18 or 435-24 or 435-36) and 210-2
3HAC026787-002	Control cable power 15 m	(435-6 or 435-18 or 435-24 or 435-36) and 210-3

Continues on next page

Art. no.	Description	Option no.
3HAC026787-003	Control cable power 22 m	(435-6 or 435-18 or 435-24 or 435-36) and 210-4
3HAC026787-004	Control cable power 30 m	(435-6 or 435-18 or 435-24 or 435-36) and 210-5

**Note**

IRB 8700 requires two power cables.

7 Spare parts

7.2.2 Fan cables

7.2.2 Fan cables

IRB 6600 and IRB 7600

Art. no.	Description	Option no.
3HAC022723-001	Harness - Axis 1&2 cooling	(87-1 or 88-1 or 89-1) and 210-2
3HAC022723-004	Harness - Axis 1&2 cooling	(87-1 or 88-1 or 89-1) and 210-3
3HAC022723-005	Harness - Axis 1&2 cooling	(87-1 or 88-1 or 89-1) and 210-4
3HAC022723-006	Harness - Axis 1&2 cooling	(87-1 or 88-1 or 89-1) and 210-5
3HAC022708-001	Harness - axis 1/2/3 cooling	(87-1 or 88-1 or 89-1) and 274-1 or 274-2 or 274-3 or 274-4

7.2.3 CP/CS Harness

CP/CS for IRB 2600, 460, 4600, 660, 6600, 6620, 6640, 6700, 760, 7600

Art. no.	Description	Option no.
3HAC022957-001	Harness CP/CS L=7m	94-1
3HAC022957-002	Harness CP/CS L=15m	94-2
3HAC022957-006	Harness CP/CS L=22m	94-3
3HAC022957-003	Harness CP/CS L=30m	94-4

CP/CS/Profibus for IRB 2600, 460, 4600, 660, 6600, 6620, 6640, 6700, 760, 7600

Art. no.	Description	Option no.
3HAC022988-001	Harness CP/CS, PROFIB L=7m	92-2
3HAC022988-002	Harness CP/CS, PROFIB L=15m	92-3
3HAC022988-006	Harness CP/CS, PROFIB L=22m	92-4
3HAC022988-003	Harness CP/CS, PROFIB L=30m	92-5

CP/CS DeviceNet for IRB 2600, 460, 4600, 660, 6600, 6620, 6640, 6700, 760, 7600

Art. no.	Description	Option no.
3HAC022978-001	Harness CP/CS, DeviceNet L=7m	90-2
3HAC022978-002	Harness CP/CS, DeviceNet L=15m	90-3
3HAC022978-006	Harness CP/CS, DeviceNet L=22m	90-4
3HAC022978-003	Harness CP/CS, DeviceNet L=30m	90-5

Ethernet/PROFINET cable for IRB 2600, 460, 4600, 660, 6600, 6620, 6640, 6700, 760, 7600, 8700

Art. no.	Description	Option no.
3HAC031924-001	Connection of Ethernet, L=7m	859-1
3HAC031924-002	Connection of Ethernet, L=15m	859-2
3HAC031924-003	Connection of Ethernet, L=22m	859-3
3HAC031924-004	Connection of Ethernet, L=30m	859-4

Ethernet/PROFINET cable for IRB 1200

Art. no.	Description	Option no.
3HAC055518-001	Connection of Ethernet, L=3m	859-9
3HAC055518-002	Connection of Ethernet, L=7m	859-1
3HAC055518-003	Connection of Ethernet, L=15m	859-2
3HAC055518-004	Connection of Ethernet, L=22m	859-3
3HAC055518-005	Connection of Ethernet, L=30m	859-4

7 Spare parts

7.2.4 Cables customer power/customer signal

7.2.4 Cables customer power/customer signal

IRB 1200

Art. no.	Description	Option no.
3HAC049089-001	Cable CP/CS 3 m	16-1 and 94-6
3HAC049089-004	Cable CP/CS 7 m	16-1 and 94-1
3HAC049089-005	Cable CP/CS 15 m	16-1 and 94-2
3HAC049089-006	Cable CP/CS 22 m	16-1 and 94-3
3HAC049089-007	Cable CP/CS 30 m	16-1 and 94-4

IRB 1400

Art. no.	Description	Option no.
3HAC3346-1	Cable CP/CS 7 m	16-1 and 17-5 and 94-1
3HAC3347-1	Cable CP/CS 15 m	16-1 and 17-5 and 94-2
3HAC3348-1	Cable CP/CS 22 m	16-1 and 17-5 and 94-3
3HAC3349-1	Cable CP/CS 30 m	16-1 and 17-5 and 94-4

IRB 2400, 4400

Art. no.	Description	Option no. ⁱ
3HAC3353-1	Cable CP/CS 7 m	Standard: 94-1, 16-1 and 287-4 Clean: 94-1, 16-1 and 287-1
3HAC3354-1	Cable CP/CS 15 m	Standard: 94-2, 16-1 and 287-4 Clean: 94-2, 16-1 and 287-1
3HAC3355-1	Cable CP/CS 22 m	Standard: 94-3, 16-1 and 287-4 Clean: 94-3, 16-1 and 287-1
3HAC3356-1	Cable CP/CS 30 m	Standard: 94-4, 16-1 and 287-4 Clean: 94-4, 16-1 and 287-1
3HAC8183-1	Cable CP/CS 7 m	Foundry: 94-1, 16-1 and 287-3 Wash: 94-1, 16-1 and 287-5 Foundry Prime: 94-1, 16-1 and 287-6
3HAC8183-2	Cable CP/CS 15 m	Foundry: 94-2, 16-1 and 287-3 Wash: 94-2, 16-1 and 287-5 Foundry Prime: 94-2, 16-1 and 287-6
3HAC8183-3	Cable CP/CS 22 m	Foundry: 94-3, 16-1 and 287-3 Wash: 94-3, 16-1 and 287-5 Foundry Prime: 94-3, 16-1 and 287-6
3HAC8183-4	Cable CP/CS 30 m	Foundry: 94-4, 16-1 and 287-3 Wash: 94-4, 16-1 and 287-5 Foundry Prime: 94-4, 16-1 and 287-6

ⁱ The option number depends on the protection type of the manipulator.

Continues on next page

IRB 1600

Art. no.	Description	Option no.
3HAC8183-1	Cable CP/CS 7 m	94-1, 16-1 and 17-5
3HAC8183-2	Cable CP/CS 15 m	94-2, 16-1 and 17-5
3HAC8183-3	Cable CP/CS 22 m	94-3, 16-1 and 17-5
3HAC8183-4	Cable CP/CS 30 m	94-4, 16-1 and 17-5

IRB 260

Art. no.	Description	Option no.
3HAC8183-1	Cable CP/CS 7 m	94-1 and 16-1
3HAC8183-2	Cable CP/CS 15 m	94-2 and 16-1
3HAC8183-3	Cable CP/CS 22 m	94-3 and 16-1
3HAC8183-4	Cable CP/CS 30 m	94-4 and 16-1

IRB 360

Art. no.	Description	Option no. ⁱ
3HAC14860-1	Cable CP/CS 7 m	218-9 and 94-1
3HAC14860-2	Cable CP/CS 15 m	218-9 and 94-2
3HAC14860-3	Cable CP/CS 22 m	218-9 and 94-3
3HAC14860-4	Cable CP/CS 30 m	218-9 and 94-4

ⁱ The option number depends on the protection type of the manipulator.

7 Spare parts

7.2.5 Other customer cables

7.2.5 Other customer cables

IRB 360

Art. no.	Description	Option no. ⁱ
3HAC030198-001	Internal Customer cable 3 m	218-5 and 94-6
3HAC030198-002	Internal Customer cable 7 m	218-5 and 94-1
3HAC030198-003	Internal Customer cable 15 m	218-5 and 94-2
3HAC030198-004	Internal Customer cable 22 m	218-5 and 94-3
3HAC030198-005	Internal Customer cable 30 m	218-5 and 94-4

ⁱ The option number depends on the protection type of the manipulator.

Euromap cables

Art. no.	Description	Option no.
3HAC024328-001	Cable EMP67 10 m	671-2 and 673-1
3HAC024328-005	Cable EMP67 15 m	671-2 and 673-2
3HAC024330-001	Cable EMP12 10 m	671-1 and 673-1
3HAC024330-004	Cable EMP12 15 m	671-1 and 673-2

7.2.6 Additional cables**Drive module cables**

Cable	Art. no.	Option no.
3HAC025600-001	Cable between control module and drive module: L=1.7 m	
3HAC025600-005	Cable between control module and drive module: L=4 m	761-1
3HAC025600-006	Cable between control module and drive module: L=30 m	761-3

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8 Circuit diagrams

8.1 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

8 Circuit diagrams

8.1 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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