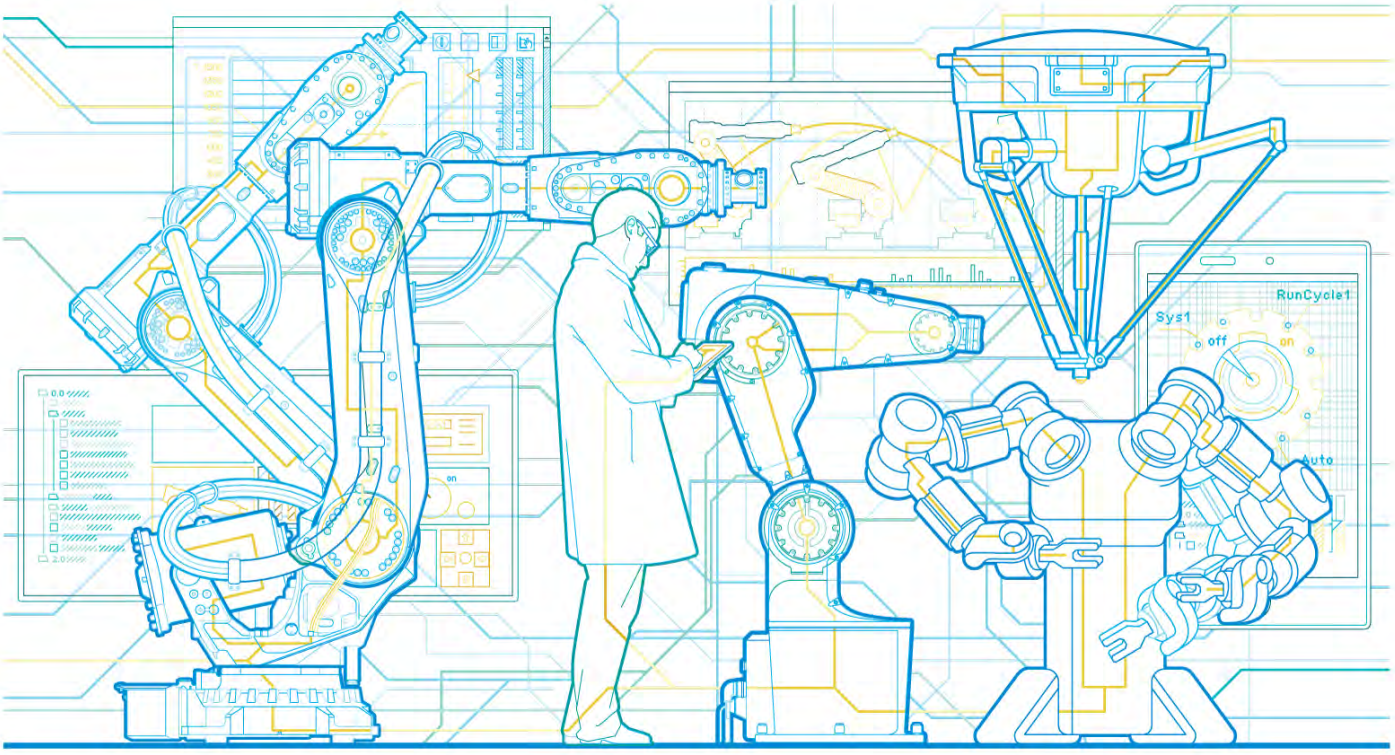

Product manual
Spot welding cabinet

Trace back information:
Workspace R17-1 version a3
Checked in 2017-03-16
Skribenta version 5.1.011

Product manual

Spot welding cabinet

IRC5

Document ID: 3HAC058524-001

Revision: A

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Keep for future reference.

Additional copies of this manual may be obtained from ABB.

Original instructions.

ABB AB, Robotics
Robotics and Motion
Se-721 68 Västerås
Sweden

Table of contents

Overview of this manual

About this manual

This manual contains instructions for

- installing the spot welding cabinet, mechanically as well as electrically
- maintenance of the spot welding cabinet
- mechanical and electrical repair of the spot welding cabinet.

Usage

This manual should be used during

- installation, from lifting the spot welding cabinet to its work site to making it ready for operation
- maintenance work
- repair work.

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

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

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

References

Reference	Document ID
Operating manual - Emergency safety information	*3HAC027098-001*
Operating manual - General safety information	*3HAC031045-001*
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Product manual - IRC5	*3HAC047136-001*
Circuit diagram - Spot welding cabinet	*3HAC057185-001*
Circuit diagram - IRC5	*3HAC024480-011*

Revisions

Revision	Description
-	Release 16.2. First edition

Continues on next page

Continued

Revision	Description
A	Release 17.1. • Updated descriptions of stops in section *Protective stop and emergency stop on page 17*. • Updated list of labels in section *Safety symbols on controller labels on page 21*. • Updated *Spare parts on page 73*.

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*

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 spot welding cabinet. These are applicable for all service work and are found in section *General safety information on page 12*.
- Safety signals and symbols shown in the manual and on cabinets, warning for different types of dangers, are found in *Safety signals and symbols on page 19*.
- 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 25*.

1.2 General safety information

1.2.1 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* [I]
- *Product manual*

[I] 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	*Product manual for the robot*	Installation and commissioning

Continues on next page

Type of information	Detailed in document	Section
Changing operating modes	*Operating manual - IRC5 with FlexPendant* *Operator's Manual - IRC5P*	Operating modes
Restricting the working space	*Product manual for the robot*	Installation and commissioning

1.2.2 Safety risks

1.2.2.1 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 and spot welding cabinet

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

- Be aware of stored electrical energy (weld timer in the spot welding cabinet, DC link and 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

- 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.

1.2.3 Safety actions

1.2.3.1 Fire extinguishing

Note

Use a CARBON DIOXIDE (CO_2) extinguisher in the event of a fire in the robot or controller!

1.2.4 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 *Automatic Stop* 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 *General Stop* and the safety input *Superior Stop*. The default configuration is stop category 1.
Emergency stop	The *Emergency Stop* 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

1.2.4 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*.

1.3 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 *will* 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 *may* occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
 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
 xx0100000004	NOTE	Describes important facts and conditions.
 xx0100000098	TIP	Describes where to find additional information or how to do an operation in an easier way.

1.3.2 Safety symbols on 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).

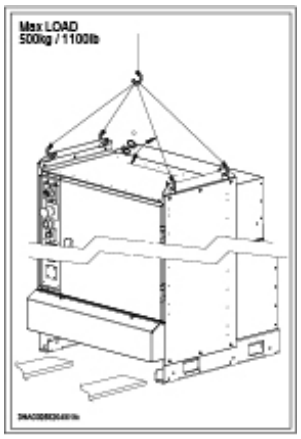
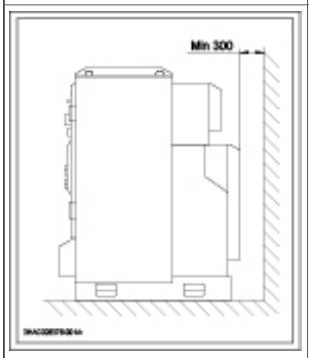
Symbols on safety labels

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).

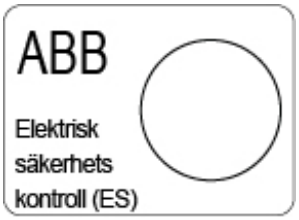
Continues on next page

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 *ABB Basic Care* service agreement.

Continues on next page

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 *SafeMove Basic* and *SafeMove Advanced* software).
 xx1700000353	Safety UL label (for the *Functional Safety* solution together with UL mark).

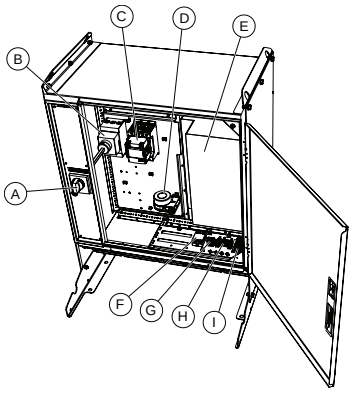
1.4 Safety related instructions

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 by switching off both the spot welding cabinet and the IRC5 controller.

Elimination, spot welding cabinet

	Action	Note/illustration
1	Switch off the main switch on the spot welding cabinet.	 xx1600000257 A: Main switch for weld power
2	Wait for 5 minutes to let the capacitors discharge. **DANGER** Even if the main switch is switched off, the capacitors can cause electric shock if not given the time to discharge.	

Note

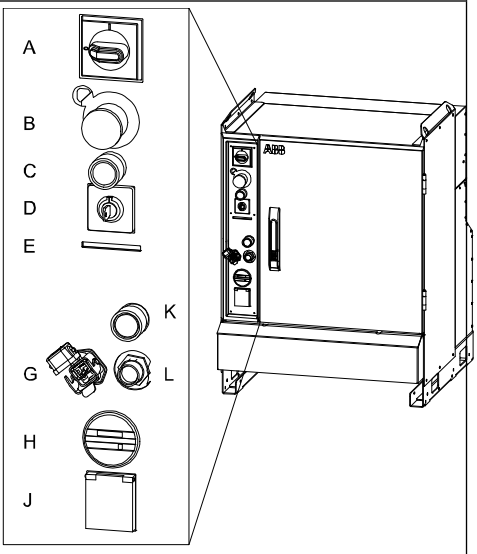
This will only turn off the main power supply to the weld timer.

To turn off the spot welding cabinet's 24V DC power supply and 230/115V AC (weld contactor), see *Elimination, IRC5 controller on page 26*.

Continues on next page

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

Elimination, IRC5 controller

	Action	Note/illustration
1	Switch off the main switch on the IRC5 controller cabinet.	 xx0600002782 A: Main switch, IRC5

Note

This will turn off the 24V DC as well as the 230/115V AC (weld contactor) power supply to the spot welding cabinet.

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.

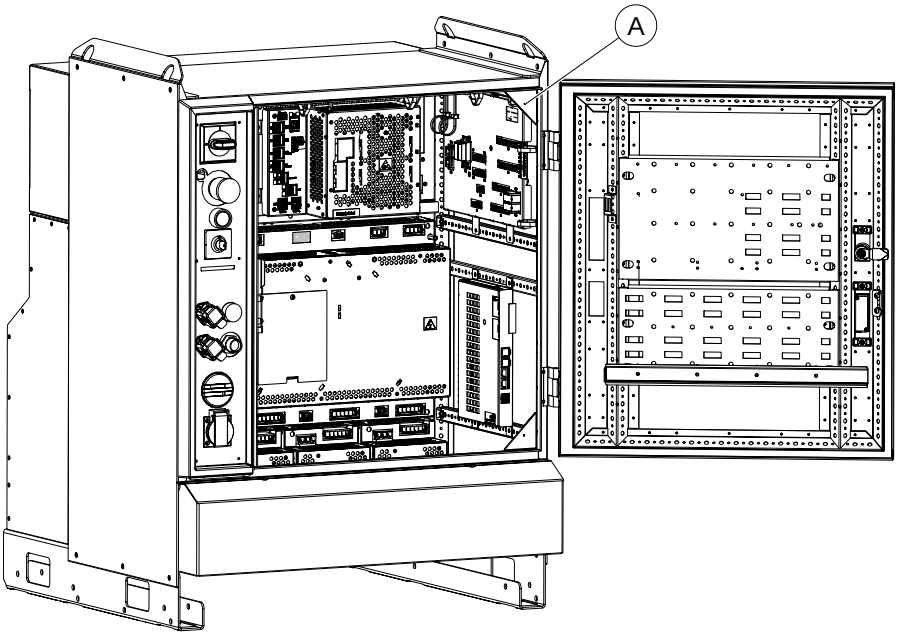
Elimination

	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



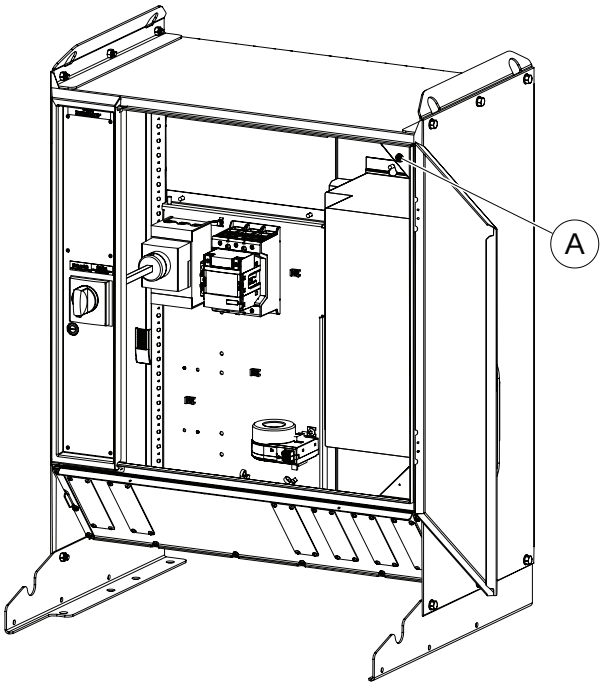
xx1300000856

A	Wrist strap button

Continues on next page

1.4.2 WARNING - The unit is sensitive to ESD!
Continued

Spot welding cabinet



xx1600000253

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.

1.4.5 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 cabinet

Description

Units and heat sinks are HOT after usage!

Touching the units and heat sinks may result in burns!

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

2 Installation and commissioning

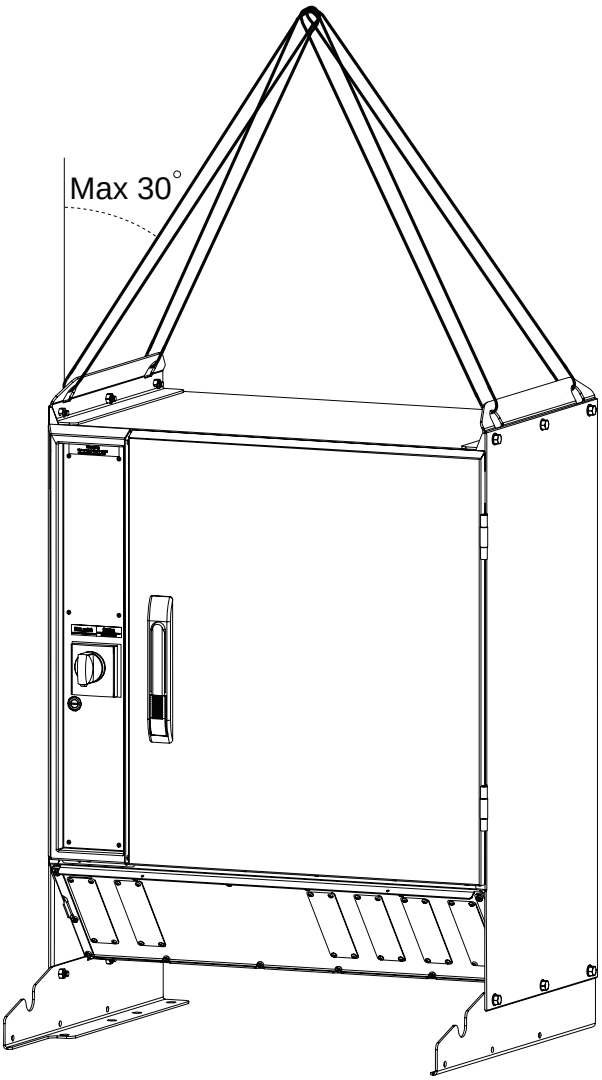
2.1 Transporting and handling

2.1.1 Lifting the spot welding cabinet

General

The spot welding cabinet is usually fitted on top of an IRC5 controller on delivery, but it also possible to refit it to an existing controller cabinet. This procedure details how to lift the spot welding cabinet.

Lifting position



xx1600000254

Continues on next page

2.1.1 Lifting the spot welding cabinet
Continued

Lifting the spot welding cabinet

WARNING

The spot welding cabinet may be lifted separately or fitted to the top of the IRC5 controller. Use a suitable lifting accessory to avoid injury to personnel!

	Action	Note
1	Fit the slings to the lifting eyes of the spot welding cabinet.	Make sure that the capacity of the slings matches the weight of the spot welding cabinet.
2	Gently stretch the slings to take up the slack before lifting.	
3	**CAUTION** The complete spot welding cabinet weighs 70 kg without any additional equipment fitted. Use a suitable lifting accessory to avoid injury to personnel! **Note** If the spot welding cabinet is lifted together with the controller, the extra weight of the controller must be taken in consideration! Use a suitable lifting accessory to avoid injury to personnel!	
4	Lift and move the spot welding cabinet, or the controller with spot welding cabinet, to its intended position.	

2.1.2 Unpacking the controller

General

Before unpacking and installing the robot system, read the safety regulations and other instructions very carefully. These are found in *Safety on page 11*.

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

When unpacking the cabinet, inspect that it was not damaged during transport.

Note

If the cabinet 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 spot welding cabinet:

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 spot welding cabinet (see *Operating conditions on page 35*).

Operating conditions

The table below shows the allowed operating conditions for the spot welding cabinet:

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 spot welding cabinet

The maximum weight of the spot welding cabinet (fully equipped) is 70 kg.

Protection class

The table below shows the protection classes for the spot welding cabinet:

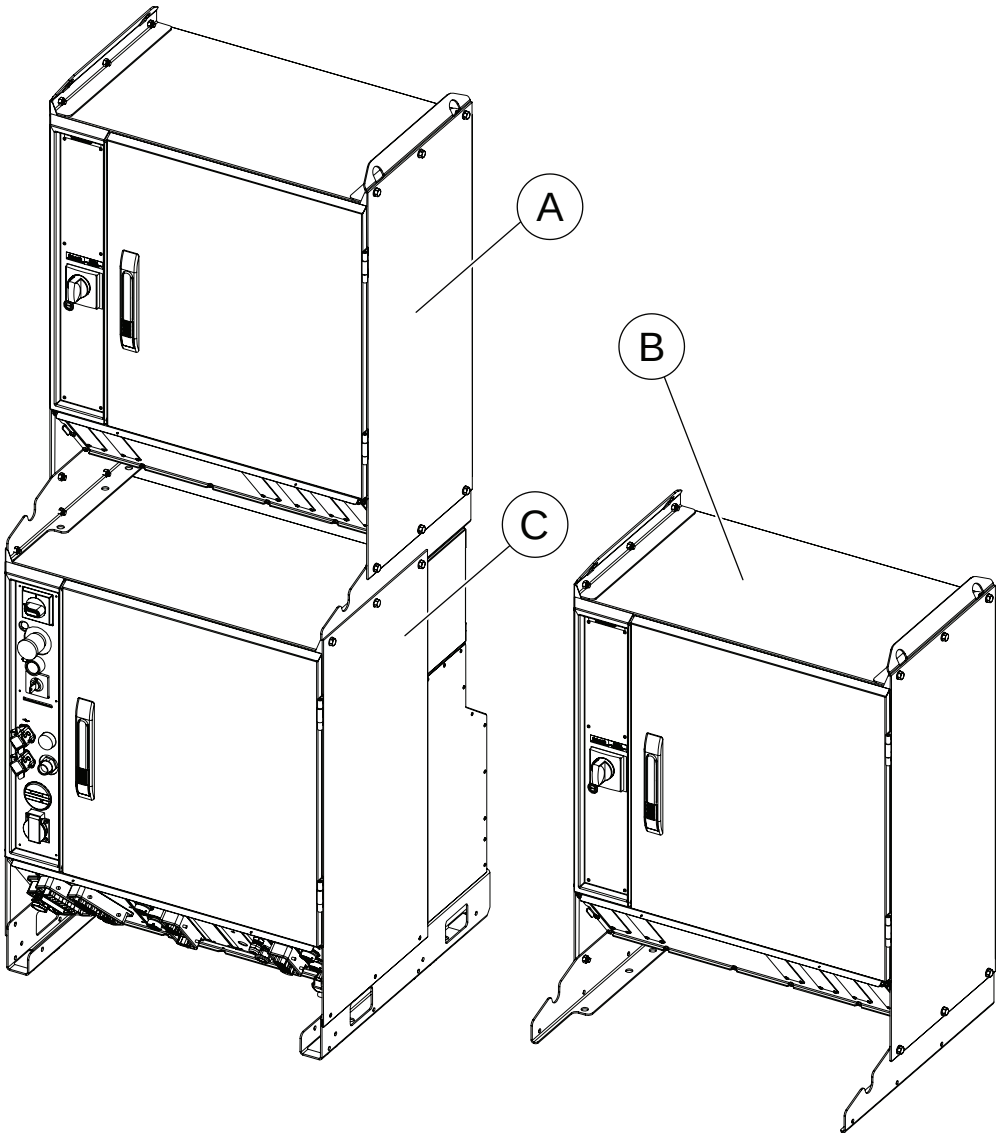
Equipment	Protection class
Spot welding cabinet electronics	IP54
Spot welding cabinet air cooling ducts	IP33

2.2 Installation

2.2.1 Fitting of spot welding cabinet

Location of spot welding cabinet

The spot welding cabinet is normally mounted on the IRC5 controller, but can be placed separately on the floor.



xx1600000525

A	Spot welding cabinet, mounted on IRC5 controller
B	Spot welding cabinet, standing on the floor
C	IRC5 controller

Continues on next page

Required equipment

Equipment	Note
Standard toolkit	See *Standard toolkit on page 72*.
2 wrenches 13 mm	

WARNING

During installation of the spot welding cabinet:

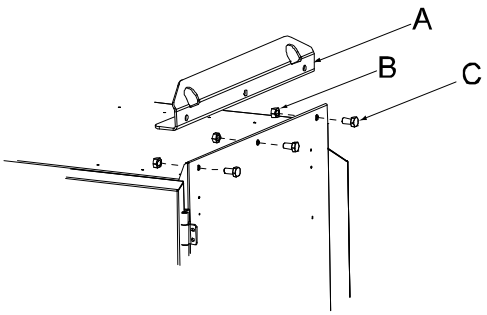
- Do not remove the lifting slings from the spot welding cabinet before securing it with the six screw joint reinforcement.

During removal of the spot welding cabinet:

- Never remove the six screw joint reinforcement without securing the spot welding cabinet with lifting slings.

Installing the spot welding cabinet

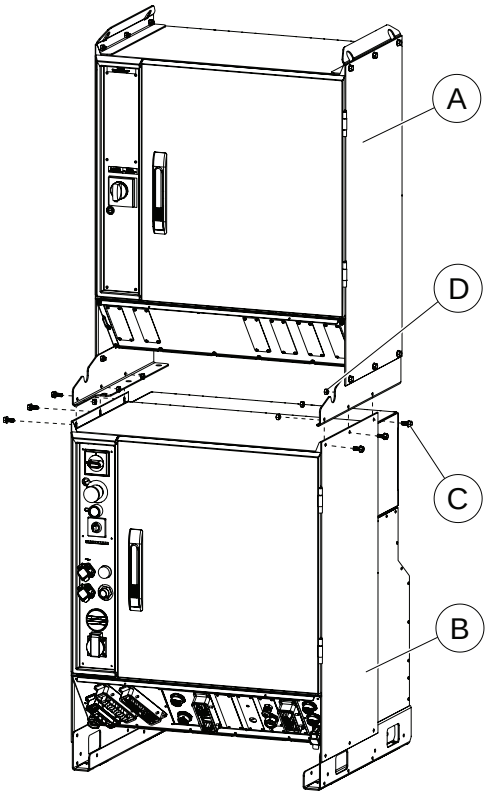
The procedure in this section describes how to install the spot welding cabinet on top of the IRC5 controller and secure it.

	Action	Note
1	**DANGER** Before any work inside the cabinet, read the safety information in the section *DANGER - Make sure that the main power has been switched off! on page 25*.	
2	Remove the two *lift beams*, by loosening the six screw joint reinforcement. Use two ring wrenches size 13.	 en0500001856 • A: Lift beam (2 pcs) • B: M6M Nut M8 (6 pcs) • C: Screw M6S M8x16 (6 pcs)
3	Follow the instructions for lifting, see *Lifting the spot welding cabinet on page 33*.	

Continues on next page

2.2.1 Fitting of spot welding cabinet

Continued

	Action	Note
4	Secure the spot welding cabinet on top of IRC5 controller with the six screw joints.	 xx1600000526 • A: Spot welding cabinet • B: IRC5 controller • C: Screw M6S M8x16 (6 pcs) • D: M6M Nut M8 (6 pcs)
5	Connect all power and signal connections as specified in the circuit diagram.	See *Circuit diagrams on page 77*.

2.2.2 Electrical installation

Required equipment

Equipment	Note
Standard toolkit	See *Standard toolkit on page 72*.
Hole saw	Maximum width: Ø60 mm  xx1400001397
Circuit diagram	See *Circuit diagrams on page 77*.

WARNING

During installation of the spot welding cabinet:

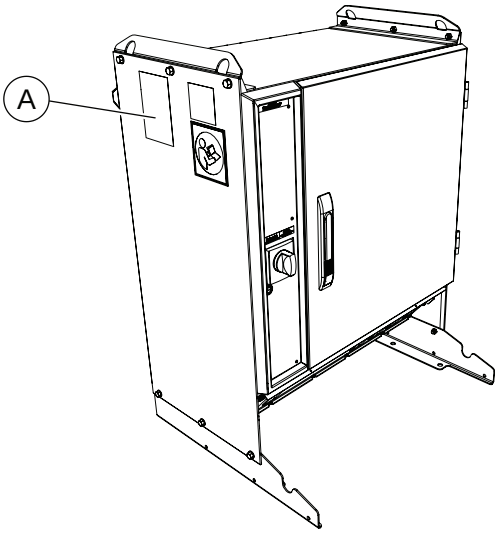
- Do not remove the lifting slings from the spot welding cabinet before securing it with the six screw joint reinforcement.

During removal of the spot welding cabinet:

- Never remove the six screw joint reinforcement without securing the spot welding cabinet with lifting slings.

Rated voltage and current

To find the rated voltage, rated current and interrupting capacity of the spot welding cabinet, see the rating label on the side of the cabinet.



xx1600000542

A	Spot welding rating label

Continues on next page

2.2.2 Electrical installation
Continued

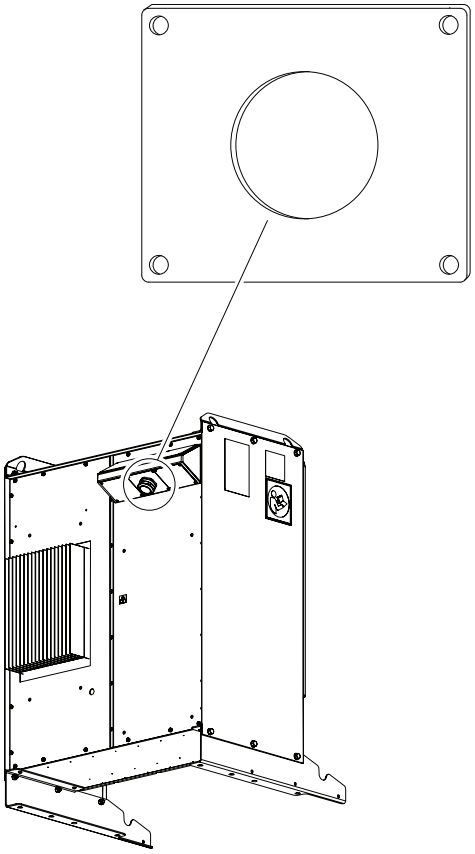
Line fusing

Recommended line fusing, slow-blowing diazed or circuit breaker with trip characteristic K. Max. fuse 100 A.

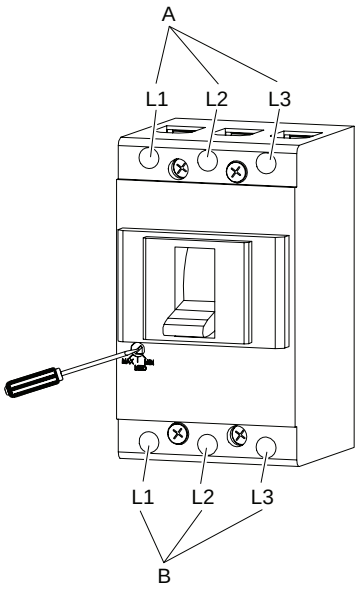
Connecting power and signals

The following procedures describes how to connect the power and signals to the spot welding cabinet.

For connections in IRC5 controller, see *Installation of add-ons*, in *Product manual - IRC5*.

	Action	Note
1	Use a hole saw and drill a hole for the cable gland in one of the covers on the rear plate. **Note** Locknut maximum width Ø60 mm.	 xx1600000255
2	Fit the cable gland.	

Continues on next page

	Action	Note
3	Connect the incoming power. **Note** Max wire range: 3 x 50 mm^2 XT1	 xx1600000541 A – Incoming power B – Outgoing power
4	Make sure that the breaker is correctly adjusted for the weld timer mounted in the spot welding cabinet. The XT1N breaker is by default adjusted to 100 A (Max.).	See weld timer types in, *Replacement of weld timer on page 56*.

Earth fault protection

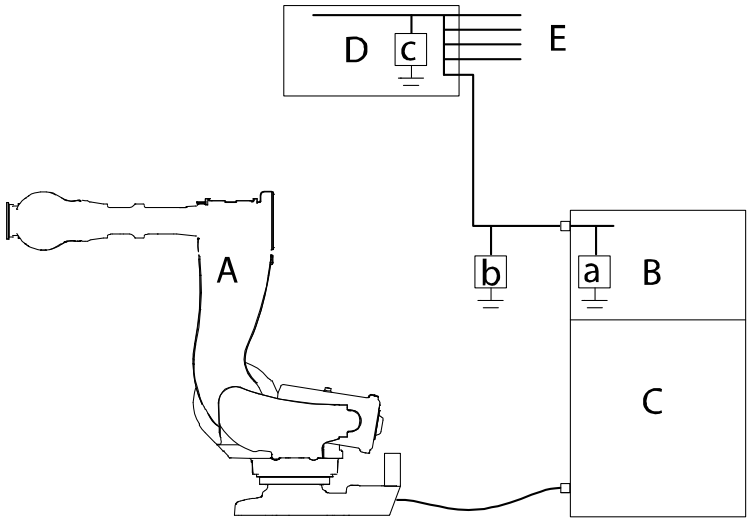
The installation must be fitted with some sort of earth fault protection *if any local regulations require this*.

The earth fault protection may be integrated with the spot welding cabinet itself (option available from ABB), or be installed on the external shop power supply. If an alternative other than the one available from ABB is chosen, the *local installer is responsible* for the compliance to any national or international standards and regulations.

Continues on next page

2.2.2 Electrical installation
Continued

Three different installation alternatives a), b) and c) are specified in the illustration below:



xx0300000175

A	Robot
B	Spot welding cabinet
C	Controller cabinet
D	External shop power supply (by customer/user)
E	Equipment group, supplied by external shop power supply
a	Integrated earth fault protection
b	External earth fault protection for the spot welding cabinet **only**
c	External earth protection for equipment group including the spot welding cabinet

The following table shows the requirement specification regarding the earth fault protection:

Voltage, MFDC welder	400 - 480 VAC, 50/60 Hz
Current	100 A, RMS

Contactor

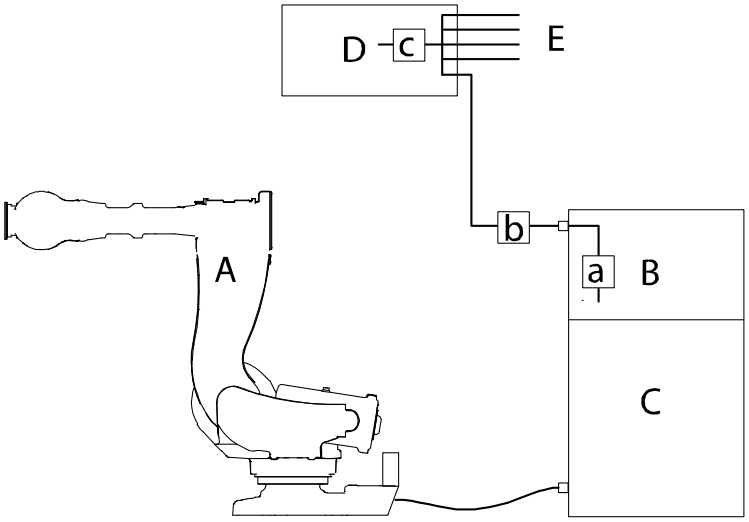
The installation may be fitted with some sort of contactor (electro-mechanical disconnector):

- if any local regulations require this
- to protect any personnel working with the equipment
- to protect any parts of the equipment
- to enable monitoring of system status POWER ON.

This may be integrated with the spot welding cabinet itself, or be installed on the external shop power supply. The *local installer is responsible* for the compliance to any national or international standards and regulations.

Continues on next page

Three different installation alternatives a), b) and c) are specified in the illustration below:



xx0300000177

A	Robot
B	Spot welding cabinet
C	Controller cabinet
D	External shop power supply (by customer/user)
E	Equipment group, supplied by external shop power supply
a	Integrated contactor
b	External contactor for the spot welding cabinet **only**
c	External contactor for equipment group including the spot welding cabinet

The table below shows the requirement specification regarding the contactor:

Voltage, MFDC welder	400 - 480 VAC, 50/60Hz
Current	100 A, RMS

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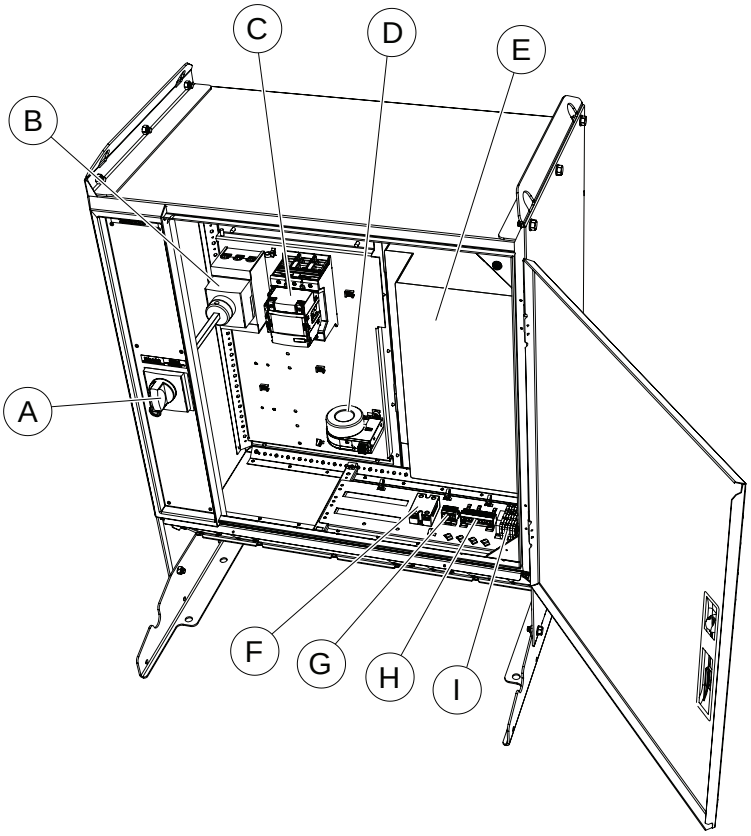
3 Maintenance

3.1 Preventive inspection of spot welding cabinet

Location of parts



xx1600000257

A	Main switch (weld power only)
B	Circuit breaker, QB101
C	Welding contactor, QC101 (Part of option *Contactor for welding power*)
D	Residual current release, QI101 (for option *Earth fault protection*)
E	Weld timer V101
F	Solid state relay (Part of option *Contactor for welding power*)
G	230V/115V terminals
H	Harness terminal
I	24V terminals
	Fan unit (placed at the back of the spot welding cabinet)

Continues on next page

Required equipment

Equipment	Note
Standard toolkit	See *Standard toolkit on page 72*.
Multimeter	For measuring resistance.

General inspection

The following procedure describes how to perform a general inspection of the spot welding cabinet.

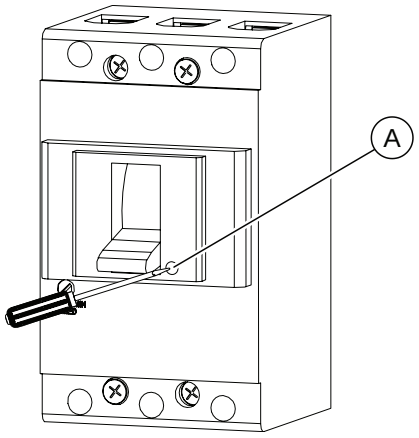
	Action	Note
1	**DANGER** Before commencing any work inside the cabinet, read the safety information in section *DANGER - Make sure that the main power has been switched off! on page 25*	
2	Verify that the spot welding cabinet is not contaminated. Especially check the fans and the weld timer.	Clean if required.
3	Verify that all bolts are fastened.	Recommended tightening torques are specified in section *Screw joints on page 71*.
4	Verify that all connections are safely made and that no connectors are loose.	Tighten if necessary.

Inspection, contactor, fuses and circuit breaker

The following procedure describes how to inspect contactor (if included), fuses and circuit breaker in the spot welding cabinet.

	Action	Note
1	**DANGER** Before any work inside the cabinet, switch off the main switch of the spot welding cabinet. See *Elimination, spot welding cabinet on page 25*.	The main switch of the IRC5 controller should be on, since the 24 V DC power supply is needed for the test of the circuit breaker.
2	Verify the settings.	
3	Verify that the contactor is working.	Secure the function of the contactor.

Continues on next page

	Action	Note
4	Verify the function of the circuit breaker by pressing the test button. The circuit breaker should trip when the test button is pressed.	 xx1600000543
5	Inspect the cable connections.	

Inspection, residual current release

The residual current release unit is not a standard feature of the spot welding cabinet! This instruction describes how to inspect the optional residual current release unit fitted by ABB Robotics. Other residual current release units fitted by others require inspection as specified by that manufacturer respectively.

The procedure below describes how to inspect the ABB Robotics residual current release unit.

	Action	Note
1	**DANGER** Before any work inside the cabinet, switch off the main switch of the spot welding cabinet. See *Elimination, spot welding cabinet on page 25*.	The main switch of the IRC5 controller should be on, since the 24 V DC power supply is needed for the test.
2	Make sure the RCMB is in standard operating condition (LED is green).	
3	Press and hold down the test/reset button (> 1 s) until the multi-color LED flashes quickly. After releasing the button, a self test is carried out.	During the self test, internal relays will open and create under-voltage. This shall result in the release of the main switch. The multi-color LED is flashing green in a fast sequence during the self test. After finishing the test, the LED shows the following result: • LED lights constantly red = no faults detected during the self test. Switching output opened due to the test current. • LED flashes red (slowly) = fault occurred during the self test. Switching output opened due to the fault. Possible faults can be: - measurement technique fault - no self test signal recognized

Continues on next page

	Action	Note
4	If the response value is exceeded or in the event of a fault (LED = red), reset by pressing the test/reset button.	The RCMB returns to normal operation mode.

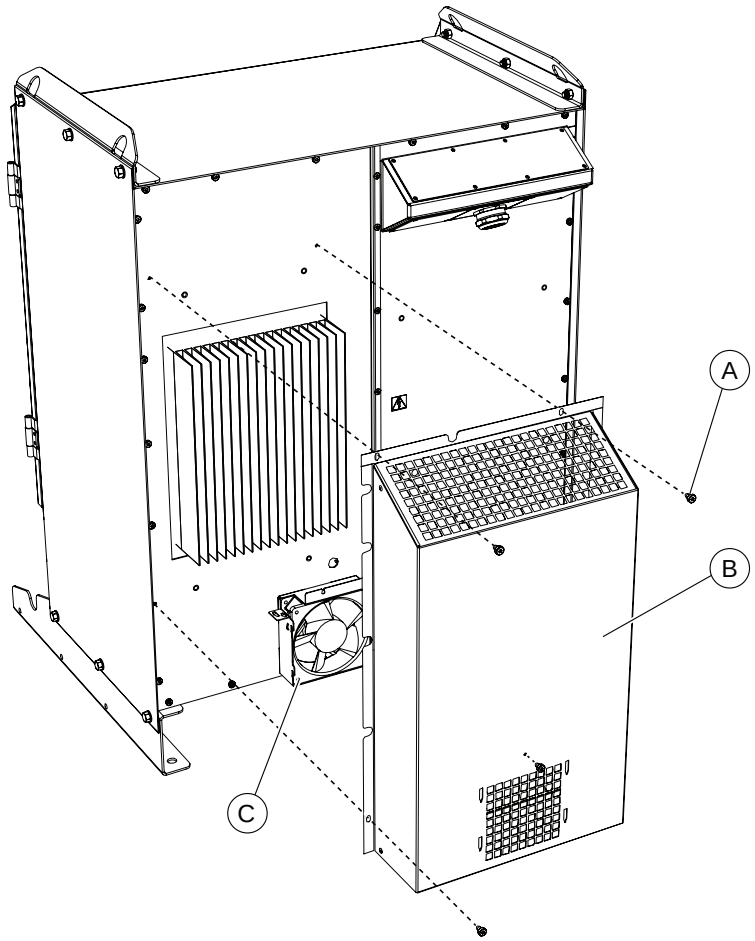
Inspection, fan unit

This procedure describes how to inspect the fan unit.

	Action	Note
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 25*	
2	Inspect the function of the fan unit.	Listen for abnormal sounds.
3	Inspect the fan unit.	If necessary, clean. See *Cleaning the fan unit on page 49*.

3.2 Cleaning the fan unit

Location



xx1600000534

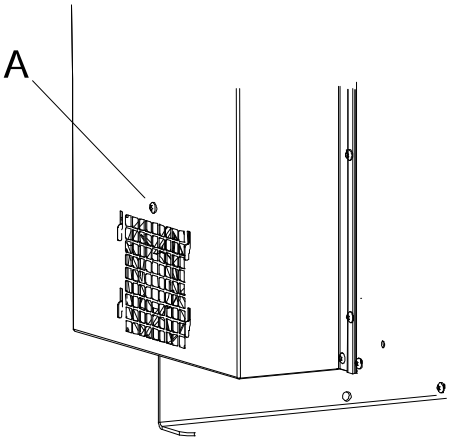
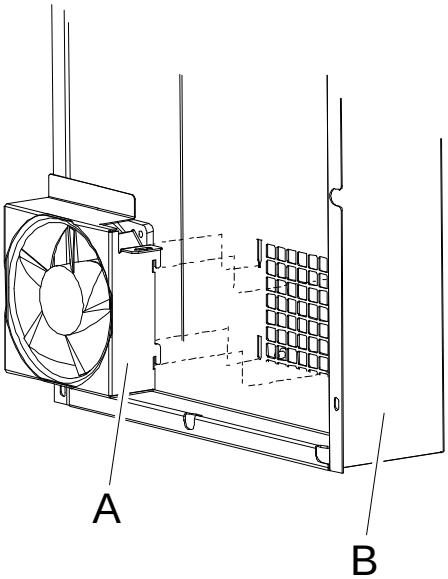
A	Attachment screws M5x9, Fastite screw (3 pcs)
B	Fan casing
C	Fan unit

Required equipment

Equipment	Note
Standard toolkit	See *Standard toolkit on page 72*.
Vacuum cleaner	

Continues on next page

Cleaning the fan unit

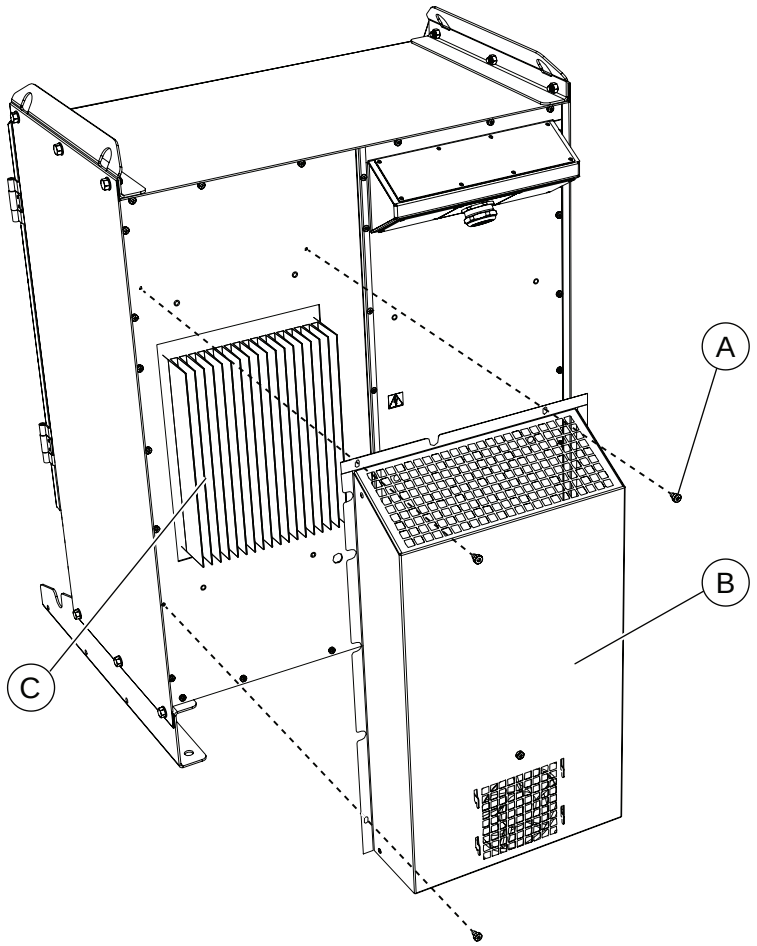
	Action	Note
1	**DANGER** Before commencing any work inside the cabinet, read the safety information in section *DANGER - Make sure that the main power has been switched off! on page 25*	
2	Remove the attachment screws holding the fan casing.	Shown in the section *Location on page 49*
3	Disconnect the fan connector.	
4	Remove the stop screw.	 xx0500002232 • A: Stop screw
5	Lift out the fan holder with fan.	 xx0500002234 • A: Fan holder with fan • B: Fan casing
6	Clean the fan.	

Continues on next page

	Action	Note
7	Refit according to the steps above, in reverse order.	

3.3 Cleaning the weld timer cooling fins

Location



xx1600000535

A	Attachment screws M5x9 Fastite screw (3 pcs)
B	Fan casing
C	Cooling fins

Required equipment

Equipment	Note
Standard toolkit	See *Standard toolkit on page 72*.
Vacuum cleaner	

Continues on next page

Maintenance procedure

	Action
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 25*
2	Remove the attachment screws.
3	Disconnect the fan connector.
4	Remove the fan casing.
5	Clean the cooling fins with a vacuum cleaner.
6	Refit the fan connector and fan casing.

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4 Repair

4.1 Overview

Report replacements

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

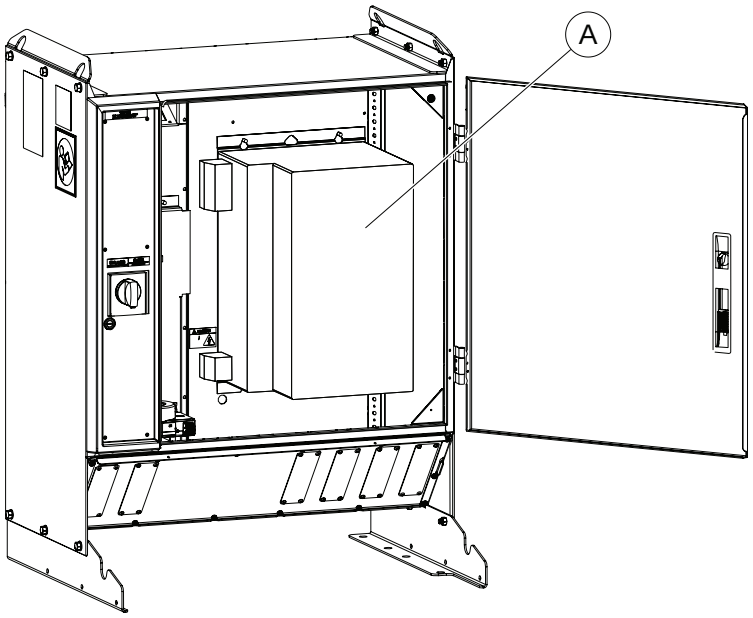
- the serial number
- article number
- revision

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

4.2 Replacement of weld timer

Location

The figure shows the location of the weld timer in the spot welding cabinet.



xx1600000256

A	Weld timer

Required equipment

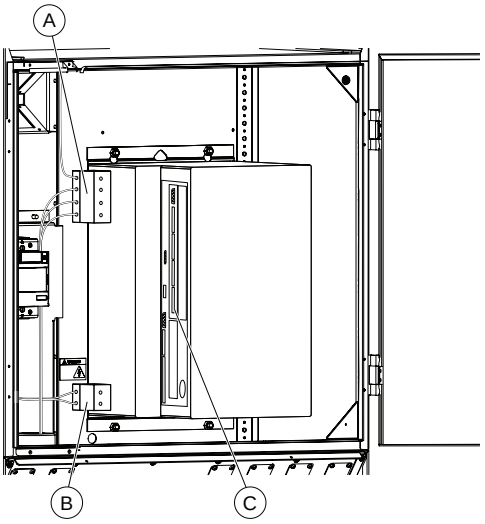
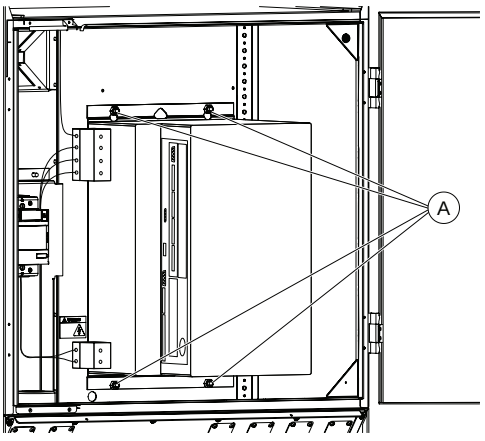
Equipment	Spare part no.	Note
Weld Timer Bosch: PSI 61C0.751-L1	3HAC041051-001	Bosch Basic MFDC Max current: 110 A rms mains nominal current (36 kA max secondary current from transformer)
Standard toolkit		See *Standard toolkit on page 72*.
Circuit diagram		See *Circuit diagrams on page 77*.

Replacing the weld timer

The following procedures details how to replace the weld timer.

	Action	Note
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 25*	

Continues on next page

	Action	Note
2	 **ELECTROSTATIC DISCHARGE (ESD)** The unit is sensitive to ESD. Before handling the unit read the safety information in section *WARNING - The unit is sensitive to ESD! on page 27*	
3	Disconnect all electrical power cables and signal cables from the weld timer.	 xx1600000258 A – Power cables; U1B, V1B, W1B, PE B – Power cables; U1C, V1C C – Signal cable contacts
4	Secure the weld timer with appropriate lifting device.	The weld timer weighs 30 kg.
5	Remove the nuts holding the weld timer.	 xx1600000259 A – Nut M8 8.8-A2F (4 pcs)
6	Lift out the weld timer.	
7	Refit the weld timer.	Follow the above steps in reverse order.

4.3 Replacement of Bosch weld timer battery

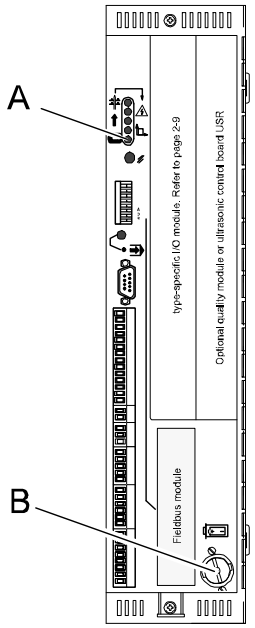
Note

Replacement of battery shall be done at least every two years!

Location

In order to buffer the RAM (contains the entire parameterization with all welding programs) and the internal clock, an integrated battery is provided.

Type S



xx0500002531

A	Battery error LED: RED is lit when the battery must be exchanged
B	Location of battery

Required equipment

Equipment	Description
Battery	Type: Lithium Size: AA Voltage 3.6 V Bosch no. 1070 9144446
Standard toolkit	See *Standard toolkit on page 72*.

Low capacity

When the remaining battery capacity becomes critical, the timer generates an error message or warning (parameterized). The battery fault LED at the front of the timer is lit, see *Location on page 58*. If the event has been defined as an error message, a welding process is not possible in this state.

Continues on next page

CAUTION

Data loss! Without a pending supply voltage and after removal of the battery, data back-up is guaranteed for up to 24 hours only. Always have a new battery at your disposal and insert it immediately upon removal of the old one.

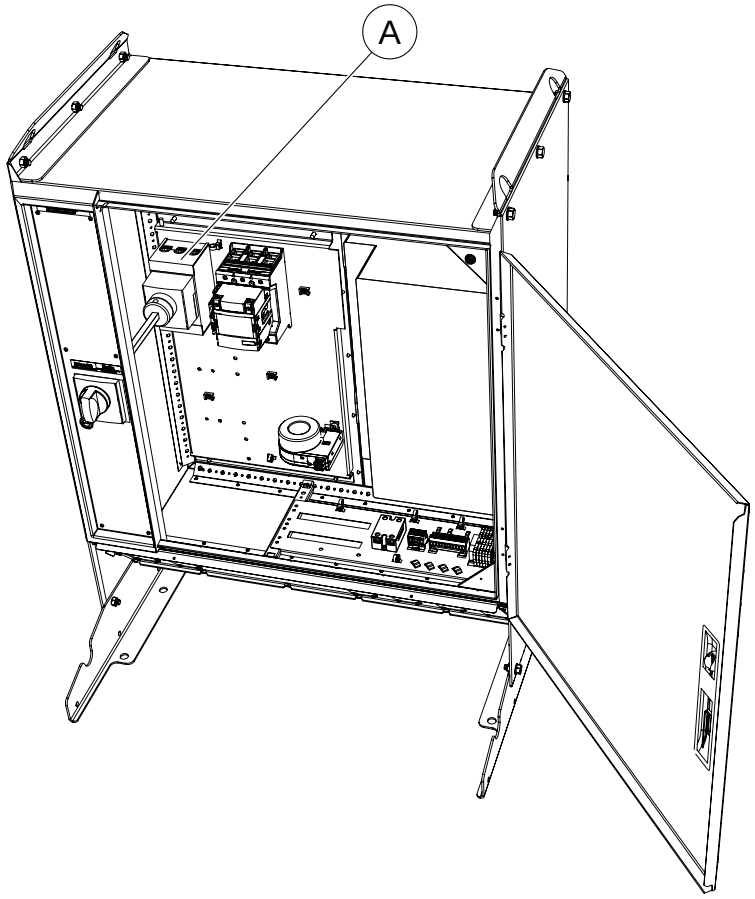
Replacing the battery

The following procedure describes how to replace the battery.

	Action	Note
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 25*	
2	Turn the battery cover on the weld timer's front to the left.	Shown in the figure in *Location on page 58*.
3	Remove the old battery.	
4	Insert the new battery. Observe the correct polarity.	See the illustration on the front of the timer.
5	Close the battery cover.	

4.4 Replacement of circuit breaker

Location



xx1600000260

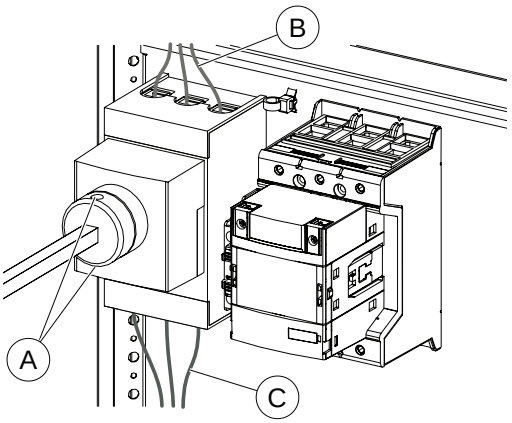
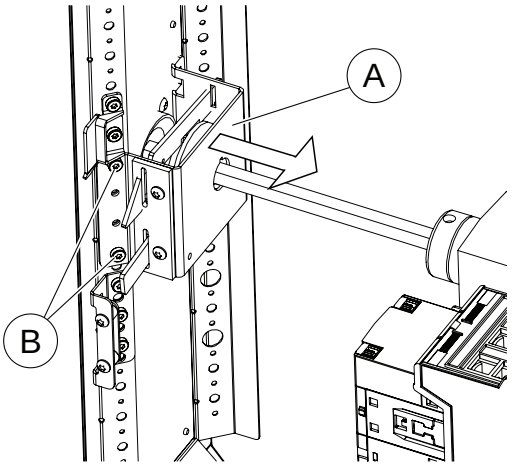
A	Circuit breaker

Required equipment

Equipment	Spare part no.	Note
Circuit breaker	3HAC058321-001	XT1N 160 TMD 100-1000 3P (Adjustable)
Circuit breaker	3HAC058322-001	XT1H 125 TMF 100-1000 3P UL/CSA (Fixed)
Hacksaw		
Standard toolkit		See *Standard toolkit on page 72*.
Circuit diagram		See *Circuit diagrams on page 77*.

Continues on next page

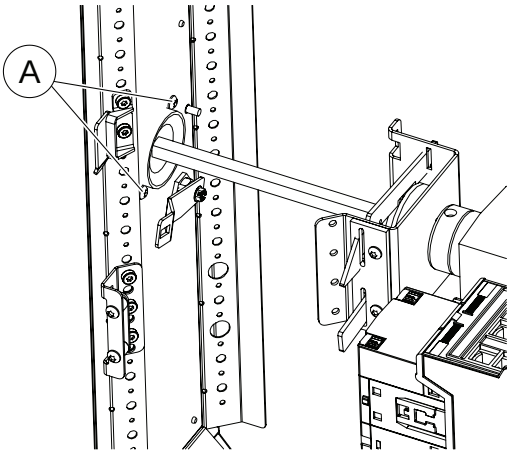
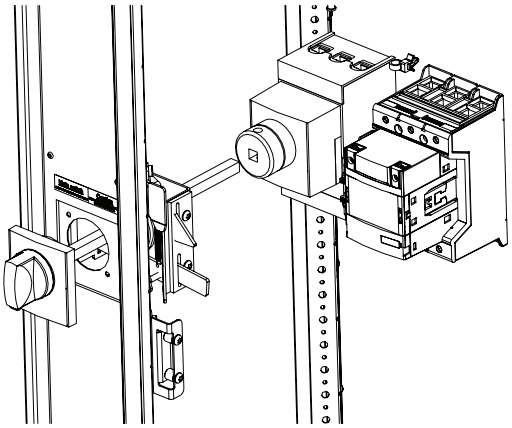
Replacing the circuit breaker

	Action	Note
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 25*	
2	Loosen the two screws locking the extension rod.	 xx1600000524 A – Screws locking the extension rod B – Terminal cables, incoming C – Terminal cables, outgoing
3	Remove all terminal cables attached to the circuit breaker.	Make a note of the terminal to which each wire is connected. This will facilitate reconnecting to the same terminal.
4	Remove the attachment screws to the door interlocking (located inside the cabinet, behind the main switch).	 xx1600000528 A – Door interlocking B – Attachment screws
5	Slide the door interlocking away from the main switch.	

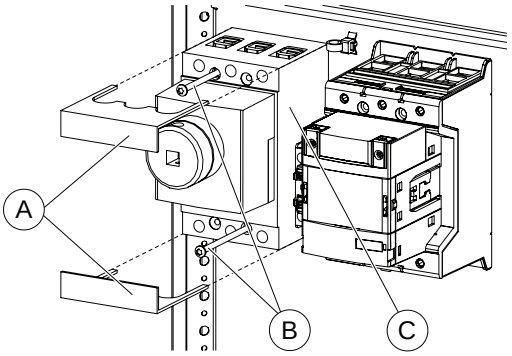
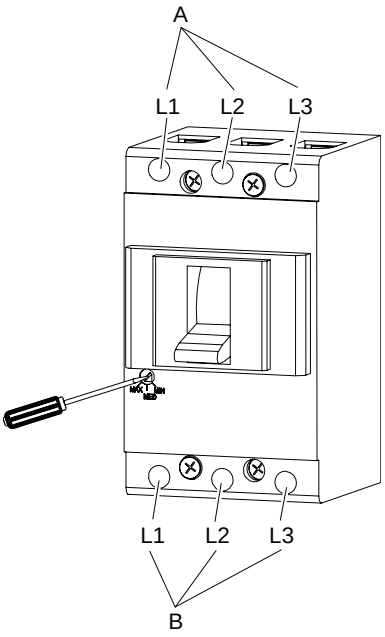
Continues on next page

4.4 Replacement of circuit breaker

Continued

	Action	Note
6	Remove the attachment screws for the main switch.	 xx1600000529 A: Main switch attachment screws
7	Hold the door interlocking in one hand while pulling the main switch with extension rod 5 cm outwards.	 xx1600000530 **CAUTION** If the extension rod is pulled out without holding the door interlocking, the door interlocking may fall and cause damages.

Continues on next page

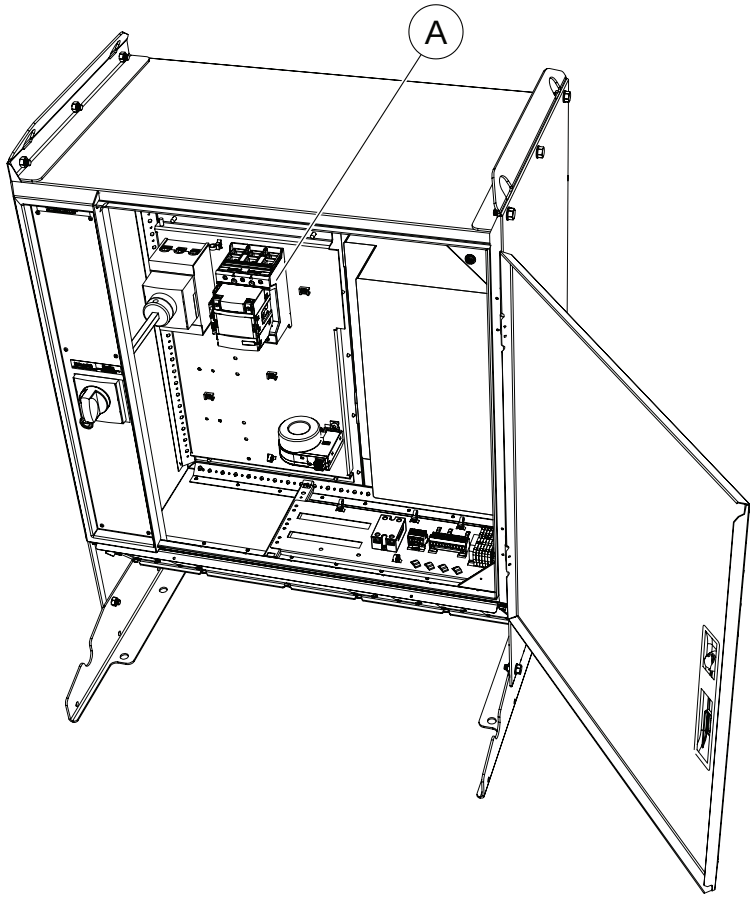
	Action	Note
8	Remove the terminal covers from the circuit breaker.	 xx1600000531 A – Terminal covers B – Attachment screws C – Circuit breaker
9	Remove the attachment screws and remove the circuit breaker.	
10	Refit the circuit breaker.	Follow the steps above in reverse order.
11	Make sure that the breaker is correctly adjusted for the weld timer mounted in the spot welding cabinet. The XT1N breaker is by default adjusted to 100 A (Max.).	 xx1600000541 A – Incoming power B – Outgoing power

Extension rod

The extension rod is included as a kit together with the main switch. At delivery the extension rod is too long and has to be cut. Compare the new rod with the one to be replaced, and cut to the same length.

4.5 Replacement of contactor

Location



xx1600000532

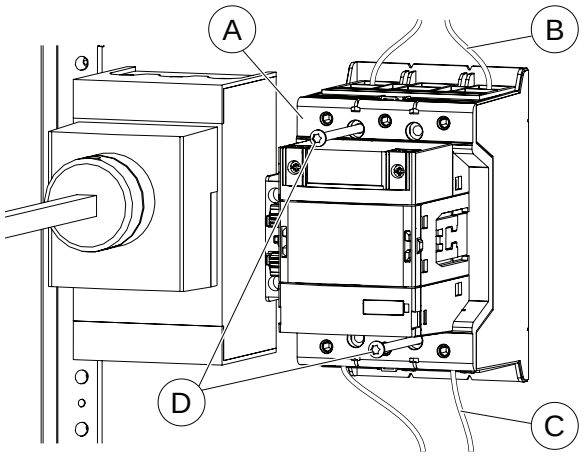
A	Contactor

Required equipment

Equipment	Spare part no.	Note
Contactor	3HAC057399-001	AF116-30-11-13 100-250V 50/60Hz
Standard toolkit		See *Standard toolkit on page 72*.
Circuit diagram		See *Circuit diagrams on page 77*.

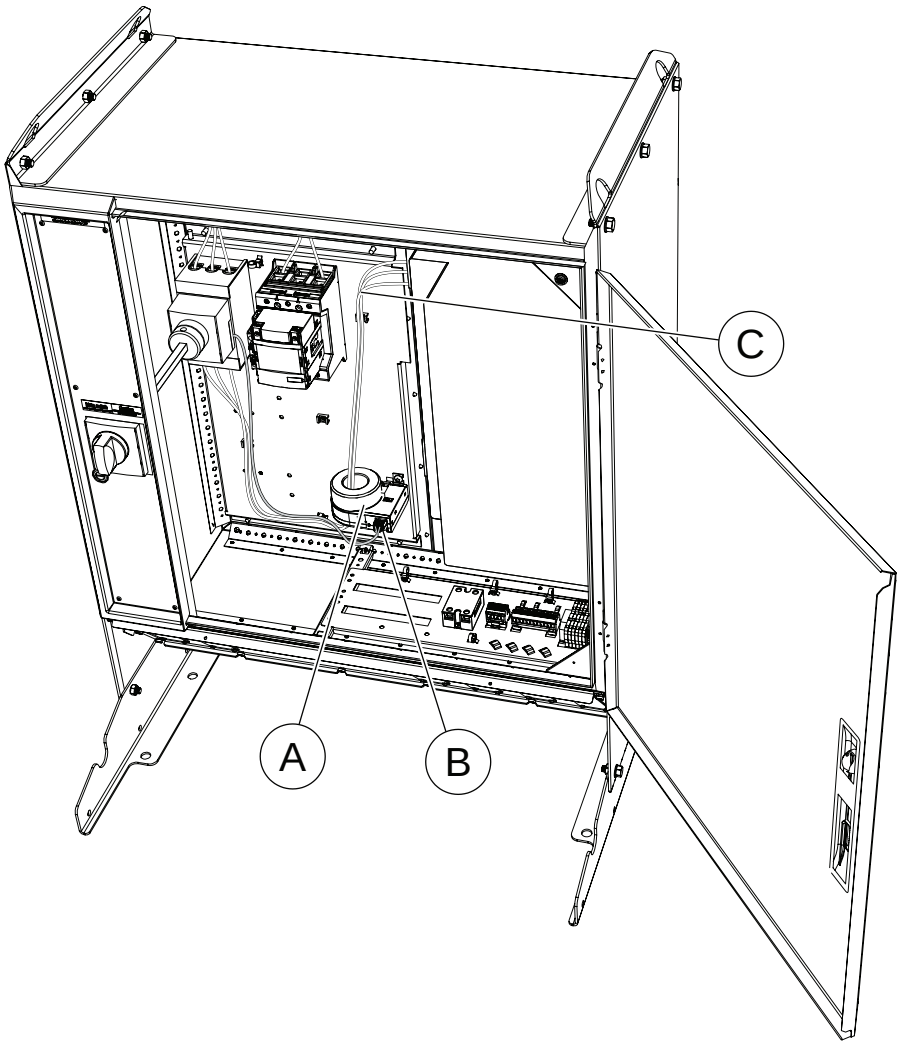
Continues on next page

Replacing the contactor

	Action	Note
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 25*	
2	Remove all cables from the contactor.	 xx1600000533 A – Contactor B – Terminal cables, incoming C – Terminal cables, outgoing D – Attachment screws **Note** Make a note of the terminal to which each of the wires are connected. This will make it easier to reconnect to the same terminal.
3	Remove the attachment screws and remove the contactor.	
4	Refit the contactor	Follow the steps above in reverse order.

4.6 Replacement of external residual current release

Location



xx1600000527

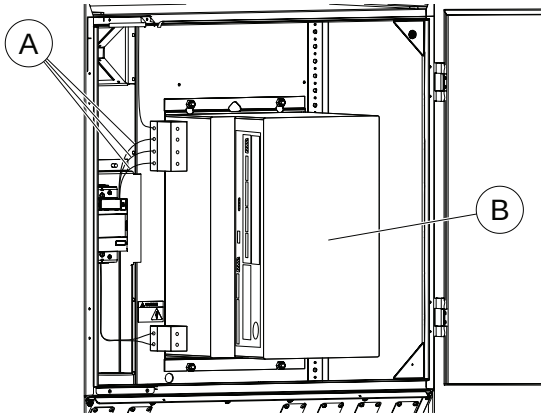
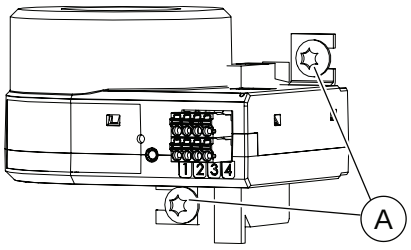
A	Residual current release (MFDC)
B	Connector on residual current release
C	Power cables U1B, V1B, and W1B

Required equipment

Equipment	Spare part no.	Note
Residual current release (MFDC)	3HAC057205-001	
Standard toolkit		See *Standard toolkit on page 72*.
Circuit diagram		See *Circuit diagrams on page 77*.

Continues on next page

Replacing the external residual current release

	Action	Note
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 25*	
2	Wait a least 5 minutes after the main power has been switched off.	After 5 minutes, the voltage of the capacitors in the weld timer is less than 50 V.
3	Disconnect the connector from the residual current release.	
4	Disconnect power cables U1B, V1B, and W1B from the weld timer.	 xx1600000539 A: Power cables U1B, V1B, and W1B B: Weld timer
5	Lead the power cables though the residual current release.	
6	Remove the two attachment screws on the residual current release and remove the unit.	 xx1600000540 A: Attachment screws
7	Refit the residual current release.	Follow the steps above in reverse order.

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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.

5.2 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	Weld timer
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 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 pneumatical 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

6.2 Standard toolkit

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.

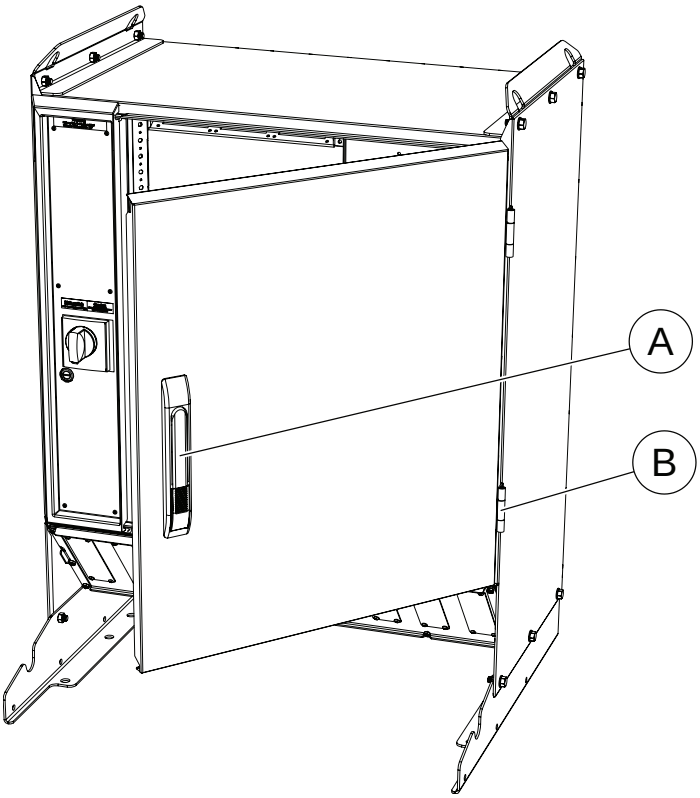
This way, the tools required are the sum of the Standard Toolkit and any tools listed in the instructions.

Contents, standard toolkit

Tool	Description
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
Wrench	8 mm
Wrench	10 mm
Wrench	13 mm

7 Spare parts

Cabinet exterior



xx1600000538

	Description	Spare part number	Qty	Note
A	Swinghandle with cam	3HAC020932-097	1	
B	Hinge	3HAC024742-001	2	

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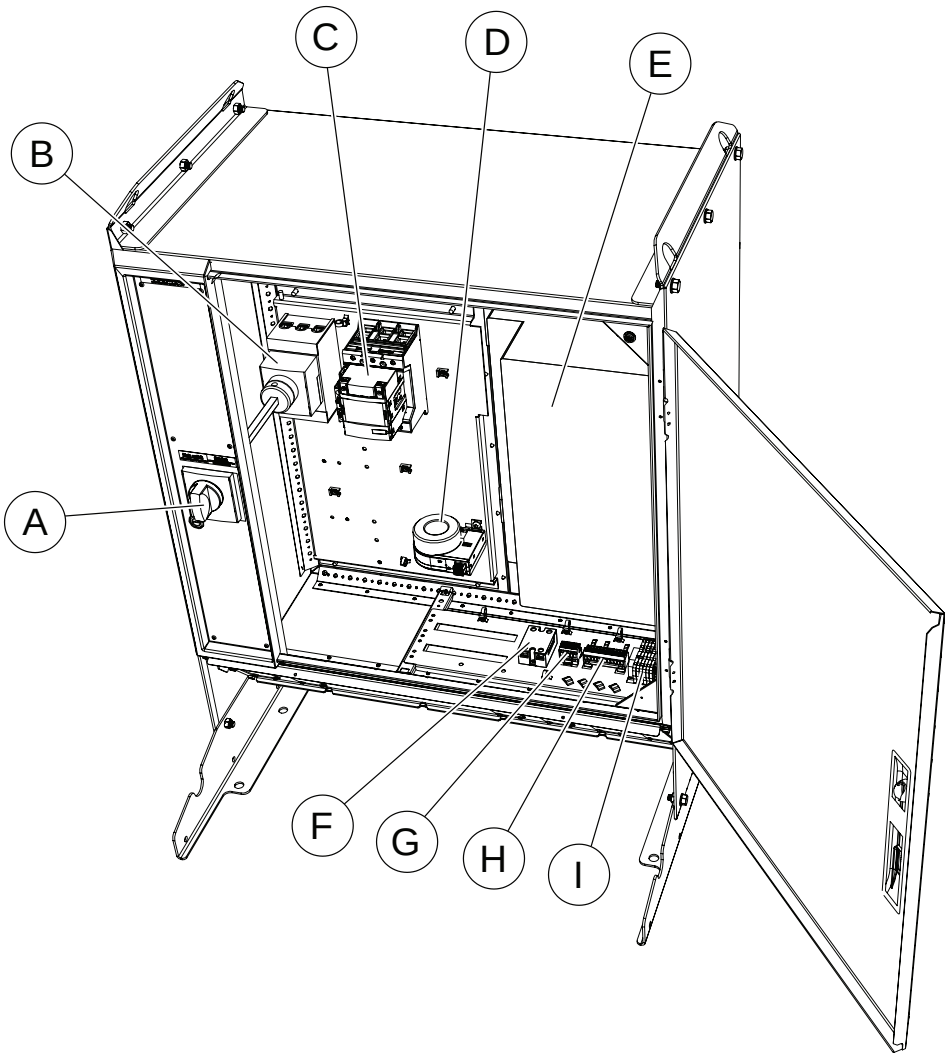
Continued

Cabinet interior



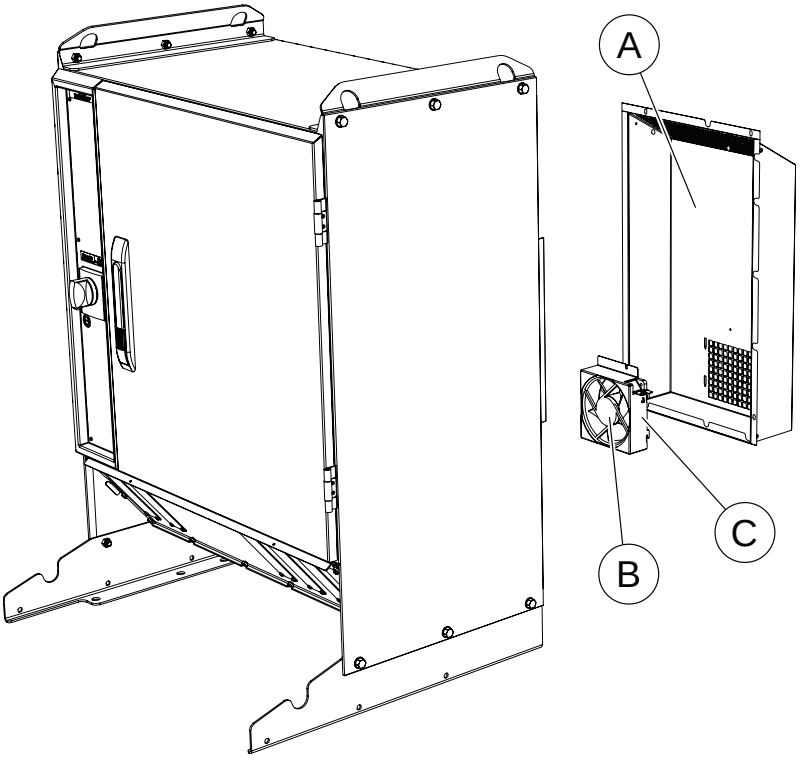
xx1600000257

	Description	Spare part number	Qty	Note
A	Main switch incl. extension rod	1SDA066479R1	1	
B	Circuit breaker Front terminals	1SDA067416R1 1SDA075871R1	1 1	
B	Circuit breaker Front terminals	1SDA074706R1 1SDA075871R1	1 1	UL
	Under voltage release (located inside circuit breaker)	1SDA066389R1	1	
	Auxiliary contacts (located inside circuit breaker)	1SDA066422R1	1	
	Terminal covers (mounted on the circuit breaker)	1SDA066655R1	1	
C	Contactor	1SFL427001R1311	1	
D	Residual current release	3HAC057205-001	1	

Continues on next page

	Description	Spare part number	Qty	Note
E	Weld timer Bosch PSI61CO.75L1	3HAC041051-001	1	
F	Solid state relay	3HAC026204-003	1	

Accessories



xx1600000537

	Description	Spare part no.	Qty	Note
A	Fan casing assembly	3HAC024701-015	1	
B	Fan with receptacle	3HAC029105-001	1	
C	Fan holder, sensor	3HAC054849-001	1	

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8 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.

Circuit diagram article numbers

Product	Article numbers for circuit diagrams
Circuit diagram - Spot welding cabinet	*3HAC057185-001*
Circuit diagram - IRC5	*3HAC024480-011*

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