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ABB Automation Technology Products AB

Arc Welding & Application Equipment

S-695 82 Laxå

Sverige
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<td>Connection</td>
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<tr>
<td>4.4</td>
<td>No process equipment - Jumper device NO AW</td>
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1 General

1.1 Types of robot

The top cabinet for equipment from the standard product range is adapted for connection to the control system S4Cplus.

Please refer to the Product and User Guide for a description of the control system.

The product range has been produced for robot types:

- IRB 140/1400/2400 in AW design.

However, some products can, without further modification, be connected in combination with other robot types.
2 Description of the top cabinet

2.1 Structure

The Control Cabinet consists of the following units:

1. Control system S4Cplus

2. The top cabinet, which is available in two heights 620 mm/ 820 mm, with interfaces for:
   - positioner
   - process equipment
   - Operator communications and safety equipment

3. Welding power source ARCITEC LRB (if applicable)

![Diagram of Control Cabinet](image)

Figure 1 Control Cabinet
2.2 Connections

2.2.1 External connections

The figure below shows the external connections on the left of the top cabinet.

![Connections Diagram](image)

The interface modules in the top cabinet are connected to the control system via a signal interface that distributes the requisite system signals and feeds. Connections to the different units are made using jackable terminals to facilitate service and repair work.
2.2.2 **Inside the top cabinet with component interface modules.**

The figure below shows the inside of the top cabinet.

![Top cabinet, inside](image)

**Figure 3  Top cabinet, inside**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
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<tr>
<td>2</td>
<td>Positioner interface</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Option, Extended emergency stop</td>
<td></td>
</tr>
</tbody>
</table>
2.2.3 Extra customer space in the top cabinet

Extra customer space is only available in the high top cabinet (820 mm)

![Figure 4 Extra customer space in the top cabinet 820 mm](image)

2.3 Customer connections

As standard the following signals and feeds are available on jackable terminals to allow the addition of customer specific equipment:

- Terminal A204-X1: 24V I/O (DC) max 2A
- Terminal A204-X2: Contactor/relay control via "MOTORS ON"
  - Two channel function control
- Terminal A204-X3: Two channel connection for emergency stop device
- Terminal A204-X4: CAN-bus connection

If the "Extended emergency stop" option is included the following signals are also available:

- Terminal A204-X5: Two channel contactor/relay control via "EMSTOP"
  - Two channel function control of contactor/relay control as above

See Figure 3 for customer connections.
2.4 Option - Extended emergency stop

Some installations require more emergency stop signals from the control system than are available in the standard design. This applies, for example, when emergency stop functions are required to be integrated in fixture control or distributed to external equipment. This option offers a possibility of connecting an optional number of redundant relays as required. See Figure 3
2.5 Option - Pivot frame

A pivot frame is available as an accessory to top cabinet 620/820.
The pivot frame is fitted to the left-hand end of the top cabinet door opening. On the inside of the pivot frame space is provided for the installation of further equipment and components.

Figure 5  Pivot frame (option)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Frame section</td>
</tr>
<tr>
<td>2</td>
<td>Lock</td>
</tr>
<tr>
<td>3</td>
<td>Transport locking device</td>
</tr>
</tbody>
</table>
2.6 Safety/Directives and Standards

The electrical equipment is designed to comply with applicable demands, for further information, see "Introduction and safety", chapter "Declaration", under tab 1.

2.6.1 Safety categories

Equipment for safety has been designed so that safety functions are maintained in the event of individual faults, such as a sticking relay, in the supervision system. Faults are detected at the latest with the next call to the safety function.

This corresponds with category 4 in accordance with EN 954-1, Safety of machinery, Control safety, Safety related parts of control systems. Part 1: General principles for design.

For other parts of the control system please refer to


2.7 ReservdelsförteckningSpare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppgive typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan avisering förbehålls.

*Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.*

*Rights to reserved to alter specifications without notice.*
Control Cabinet

Description of the top cabinet

<table>
<thead>
<tr>
<th>Positionsnummer</th>
<th>Antal (Quantity)</th>
<th>Beställningsnummer (Ordering number)</th>
<th>Benämning (Denomination)</th>
<th>Anmärkningar (Remarks)</th>
</tr>
</thead>
<tbody>
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<td>11</td>
<td>502 146-001</td>
<td>Controller IF</td>
<td>Controller Interface</td>
<td>M2001 620 mm</td>
</tr>
<tr>
<td>41</td>
<td>502 282-880</td>
<td>Skåp</td>
<td>Cabinet</td>
<td>620 mm</td>
</tr>
<tr>
<td>42</td>
<td>502 285-880</td>
<td>Huvudkabelstam</td>
<td>Cable harness</td>
<td>M2001</td>
</tr>
<tr>
<td>43</td>
<td>502 796-880</td>
<td>Kabelstam, Op-panel</td>
<td>Cable harness, Op-panel</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>503 172-880</td>
<td>Canbus</td>
<td>Canbus</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Byglingsdon</td>
<td>Clamping unit</td>
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### Control Cabinet

#### Description of the top cabinet

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<th>Beställningsnummer Ordering number</th>
<th>Benämning</th>
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<th>Anmärkningar Remarks</th>
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</thead>
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<td>502 145-001</td>
<td>Controller IF</td>
<td>Skåp</td>
<td>Controller InterFace</td>
<td>M2001 820 mm 820 mm</td>
</tr>
<tr>
<td>41</td>
<td>502 282-880</td>
<td>Huvudkabelstam</td>
<td>Kabelstam, Op-panel</td>
<td>Cabinet Cable harness</td>
<td>M2001</td>
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<tr>
<td>42</td>
<td>502 285-880</td>
<td>Canbus</td>
<td>Canbus</td>
<td>Cable harness, Op-panel</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>502 796-880</td>
<td>Byglingsdon</td>
<td>Byglingsdon</td>
<td>Clamping unit</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>503 172-880</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

504868-02_en.fm
Control Cabinet

Description of the top cabinet
Control Cabinet

Description of the top cabinet
3 Manipulator interface

There is a modular based interface fitted to the left of the cabinet’s rear panel for the positioner. This may be equipped differently from case to case, depending on the type of manipulator.

![Manipulator interface diagram](image)

**Figure 6  Top cabinet, inside**

1. Distribution contactor drive unit connection
2. Motor contactors with interface relay and auxiliary contact blocks for the manipulator axis
3. Dig. I/O card
4. Terminal block for internal wiring
5. Serial measurement board
6. Auxiliary relay for brake activation

The interface is fitted with internal wiring for connection to the robot control system. See Figure 6.
3.1 Connections

Cables to external equipment are connected to the outputs on the left-hand side of the top cabinet.

![Figure 7 Terminations - positioner](image)

1 Positioner

2 Travel track motor/resolver
3.2 Drive system

3.2.1 Axis computer

Control cabinet S4Cplus is equipped with an axis computer for the robot (axis computer 1) and an axis computer card for the manipulator IRBP (axis computer 2). Connection to the drive unit and serial measurement board is made via a connector card. Each axis computer has its own connector card. See Figure 8.

Axis computer 1  6 axes for the robot (+ 1 external axis)
Axis computer 2  Up to 6 axes for the manipulator

Each axis computer has two drive systems (DS1 and DS2) and two measurement systems (MS1 and MS2)

**Axis computer 1**

- Drive system 1 (DS1)  Drive unit for the robot
- Drive system 2 (DS2)  Rectifier or Rectifier + a drive unit for the positioner/conveyor

**Axis computer 2**

- Drive system 1 (DS1)  Drive unit for manipulator and/or conveyor
- Drive system 2 (DS2)  Rectifier or Rectifier + a drive unit for the positioner.

(Only used when the multi-axes IRBP positioner is included in the system, moved over from drive system 2 on axis computer 1)

![Figure 8 Connector card top cabinet](image)
In order to control positioner IRBP the control cabinet must be ordered with ABB Robotics’ option 397 "Prepared for external axes".

Option 397 contains the following components:

- Transformer T4
- Rectifier DC4 including a U type drive unit
- Axis computer 2
- Connector card 2
3.3 Drive unit

The control cabinet for IRB140/1400 and 2400 can be equipped with max three drive units for the positioner and/or robot carrier.

The control cabinet for IRB4400 and 6400 can be equipped with max one drive unit for the positioner and/or robot carrier.

On delivery the control cabinet is equipped with drive units for the robot and positioner axes included in the system.

![Drive unit positions in the top cabinet](image)

**Figure 9  Drive unit positions in the top cabinet**

![Drive unit diagram](image)

**Figure 10  Drive unit**

Drive unit Robot IRB140/1400/2400

Drive unit Robot IRB4400/6400
**Control Cabinet**

**Manipulator interface**

**Drive unit set-up for robots IRB 140/1400/2400**

The following drive unit set-ups are available for robots IRB140/1400/2400 with manipulator IRBP: See Figure 9.

<table>
<thead>
<tr>
<th>Position 0</th>
<th>Position 3</th>
<th>Position 2</th>
<th>Position 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Empty</td>
<td>Robot</td>
<td>Robot</td>
</tr>
<tr>
<td>B</td>
<td>C</td>
<td>Robot</td>
<td>Robot</td>
</tr>
</tbody>
</table>

**Drive unit set-up for robots IRB 4400/6400**

The following drive unit set-up is available for robots IRB 4400/6400 with manipulator IRBP: See Figure 9.

<table>
<thead>
<tr>
<th>Position 0</th>
<th>Position 3</th>
<th>Position 2</th>
<th>Position 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Robot</td>
<td>Robot</td>
<td>Robot</td>
</tr>
</tbody>
</table>
3.4 Measurement system

Each axis computer has two measurement systems. A measurement system can handle up to 7 axes.

Serial measurement boards are connected to the measurement system. These include six nodes for connection of the resolvers.

3.4.1 Axis computer 1

Measurement system 1 (MS1) Serial measurement board for the robot
Measurement system 2 (MS2) Spare

![Figure 11 Axis computer 1](image-url)
3.4.2 Axis computer 2

Measurement system 1 (MS1) Spare
Measurement system 2 (MS2) Serial measurement board for manipulator/conveyor

Figure 12 Axis computer 2
3.4.3 Resolver connection

The robot's/manipulator's axes are equipped with a resolver integrated with respective motors to give exact positioning. See Figure 14

The resolvers are connected to the measurement channel for respective axis on the serial measurement boards.

Figure 13 Top cabinet - serial measurement card

Figure 14 Motor with resolver
3.5 Axis selector

Up to 6 axis for the robot carrier and/or the manipulator can be connected to the robot system.

The motor for these products can be connected to the robot system according to the following options:

1. Direct drive between the motors and the drive units.
   *Robot carrier, station switching unit and some IRBP positioners (for example, FlexArc Compact).*

2. Motors connected via the motor contactors to the drive units.
   *Normal connection of the work stations for the IRBP positioner.*

The drive unit can be used according to the following options:

1. Common drive unit. Two or more motors share a drive unit.

---

**Figure 15** Common drive unit
2 Individual drive unit, i.e. one drive unit per motor (axis).

**Individual Drive 3DU**

When direct connection is used, the connected axis follows the robot’s status with activation/deactivation.

The motor connectors included in the axis selector are activated/deactivated by signals from a digital I/O-card.
3.6 Positioner interface Type S (Fixed table) Single/double Station

Between the control system and the included positioner there is a modular based interface fitted on the left of the top cabinet’s rear panel.

![Diagram of interface](image)

1 Digital I/O card

2 Signal connection

This equipment is intended for installations with welding tables and therefore contains no drive or measurement systems to control the motor axes.

**Station indication (applies for FlexArc Compact C and S)**

In order for the correct production program to be initiated the station changer unit is equipped with limit switches, where applicable, that indicate which station is in the working mode for the robot.

The switches are cross-connected and actuate individual digital inputs in the control system. Respective inputs are set “high” when the station changer unit is at an end position.

3.7 Interface for conveyor type S (option)

Between the control system and the included manipulator there is a modular based interface fitted to the left of the cabinet’s rear panel.
1  Connection A0.2 Motor Positioner (fitted to output XS103) on the cabinet wall’s output side

2  Digital I/O card

3  Signal connection

4  Communication cable (MS2) connection

5  Serial measurement board
1 Rectifier with the drive unit, DC 4/U

Drive system
For this positioner the drive system consists of:

- Axis computer 2/connector card (DS2)
- Communications cable (DS2)
- Rectifier DC 4
- Drive unit U (included in the rectifier module)
- Motor connection cable

A thermal contact for temperature monitoring is fitted to the manipulator's motor to provide protection against overheating. This signal is connected to the control system's PTC-loop.

Measurement system
For this positioner the measurement system consists of:

- Axis computer 2/connector card
- Communication cable (MS2)
- Serial measurement board
- Resolver connection cable
Axis selector
The manipulator’s axle is permanently connected to the drive unit and consequently follows the operating status of the robot with activation/deactivation.

Connecting the manipulator
The motor and resolver signals are gathered in a common output XS103 on the control cabinet and the manipulator is connected to this output.

3.8 Reservdelsförteckning/Spare Parts List
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<th>Antal</th>
<th>Beställningsnummer/Ordering number</th>
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<th>Anmärkningar/Remarks</th>
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<td>Plate, compl.</td>
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<td></td>
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<td>Digitalt I/O-kort</td>
<td>Digital I/O-board</td>
<td></td>
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<td>Connector, CombiCon</td>
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## Control Cabinet

### Positioner interface

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Control Cabinet
Positioner interface
Control Cabinet

Positioner interface
3.9 Positioner interface type IRBP C/C Index

Between the control system and the included positioner there is a modular based interface fitted on the left of the top cabinet’s rear panel.

1. Connection X7, Motor - Positioner
2. Resolver connection
3. Digital I/O card
4. Signal connection
5. Motor connector K15
6. Brake relay
7. Adapter X4
8. Safety signals, connection TB2
9. Communication cable (MS2) connection
10. Serial measurement board
1 Rectifier with the drive unit, DC 4/U

**Drive system**

For this positioner the drive system consists of:

- Axis computer 2/connector card (DS2)
- Communications cable (DS2)
- Rectifier DC4
- Drive unit U (included in the rectifier module)
- Cables for connecting the motor

A thermal contact for temperature monitoring is fitted to the manipulator's motor to provide protection against overheating. This signal is connected to the control system's PTC-loop.

**Measurement system**

For this positioner the measurement system consists of:

- Axis computer 2/connector card
- Communication cable (MS2)
- Serial measurement board
- Resolver connection cable
Axis selector
A contactor that connects the drive unit voltage to the motor is used to activate the manipulator’s axle.

The contactor is operated using a 24V DC amplifier block, which is controlled by a digital output from the control system. The control voltage for the contact coil is 230V AC.

Activation signals
Activation/deactivation of the manipulator’s axle can be performed from the control program or by using the function button under the Jogging menu on the programming unit.

The contactor for the axis in question is operated via a digital output on activation. An acknowledgement signal is obtained and a brake release relay with a digital output is then activated.

When deactivating, the motor is stopped before the contactor cuts the drive unit voltage.

Station indication
In order for the correct production program to be initiated the station changer unit is equipped with limit switches, that indicate which station is in the working mode for the robot. The switches actuate individual digital inputs in the control system. Respective inputs are set "high" when the station changer unit is at an end position.

Connecting the manipulator
The motor and resolver signals are gathered in a common output XS101 on the control cabinet and the manipulator is connected to this output.

Safety
Due to reasons of safety the station changer cannot be set in the operating mode “MAN FS”. This interlock is integrated into the interface for operator communication and safety equipment.

Note! If, for some reason, this interface is omitted it is incumbent on the user to ensure this interlock is maintained.

Contactors and auxiliary contact blocks are of an approved redundant type in order to guarantee assured monitoring of the active motor axis. The operation of the contactors is monitored by the personal safety equipment.
3.10 Reservdelsförteckning/Spare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppgi typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehålles.

Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.

Rights to reserved to alter specifications without notice.

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<tr>
<th>Beställningsnummer Ordering number</th>
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<td>Housing</td>
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<td>6-mod A-F</td>
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### Control Cabinet

#### Positioner interface

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3.11 Positioner interface type IRBP L/T

Between the control system and the included positioner there is a modular based interface fitted to the left of the top cabinet’s rear panel.

1. Connection X6 (not used)
2. Connection X5 Motor Manipulator
3. Resolver connections
4. Digital I/O card
5. Signal connection
6. Motor contactors
7. Brake relay
8. Adapter X4
9. Connection TB2 safety signals
10. Communication cable (MS2) connection
11. Serial measurement board
1 Rectifier with drive unit DC 4/U

**Drive system**

For this positioner the drive system consists of:

- Axis computer 2/connector card (DS2)
- Communications cable (DS2)
- Rectifier DC4
- Drive unit U (included in the rectifier module)
- Cables and connectors for connecting the motors

A thermal contact for temperature monitoring is fitted to the manipulator's motors to provide protection against overheating. These signals are connected to the control system's PTC-loop.

**Measurement system**

For these positioners the measurement system consists of:

- Axis computer 2/connector card
- Communication cable (MS2)
- Serial measurement board
- Cables for connecting resolvers
Axis selector

A contactor that connects the drive unit voltage to the motor is used to activate respective manipulators’ axes. The contactor is operated using a 24V DC amplifier block, which is controlled by a digital output from the control system. The control voltage for the contact coil is 230V AC.

Activating/deactivating

Activation/deactivation of the manipulator’s axle can be performed from the control program or by using the function button under the Jogging menu on the programming unit.

The contactor for the axis in question is operated via a digital output on activation. An acknowledgement signal is obtained and a brake release relay with a digital output is then activated.

When deactivating, the motor is stopped before the contactor cuts the drive unit voltage.

Connecting the manipulator

The motor and resolver signals for respective manipulators are gathered in a common output on the control cabinet and the manipulator is connected to this output. The manipulator for station 1 is connected to output XS101 and the manipulator for station 2 is connected to output XS102.

Safety

Contactors and auxiliary contact blocks are of an approved redundant type in order to guarantee assured monitoring of the active motor axis. The function of the contactors is supervised by the safety equipment.

Options

IRBP 5000L

As an option there is a possibility to receive the axis selector with the cabling, dimensioned for the large “motor currents” that are demanded, in order to run this type of positioner.

3.12 Reservdelsförteckning/Spare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppge typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehållses.

Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.

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Control Cabinet

Positioner interface
Control Cabinet

Positioner interface
## Control Cabinet

### Positioner interface

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## Control Cabinet

### Positioner interface

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Control Cabinet

Positioner interface
3.13 Positioner interface types IRBP R/K/E/F

Between the control system and the included positioner there is a modular based interface fitted to the left of the top cabinet’s rear panel.

1. Connection X5 Motor Positioner
2. Connection X7 Motor Positioner
3. Connection X6 Motor Positioner
4. Resolver connection
5. Digital I/O card
6. Signal connection
7. Motor contactors
8. Brake relay
9. Connection X4
10. Connection TB2 safety signals
11. Communication cable (MS2) connection
12. Serial measurement board
Control Cabinet
Manipulator interface

1. Drive unit G/U
2. Communication cable (DS2) connection
3. Rectifier with drive unit DC 4/U

**Drive system**

For this positioner the drive system consists of:
- Axis computer 2/connector card (DS2)
- Communications cable (DS2)
- Rectifier DC4
- Drive unit U (included in the rectifier module)
- Drive unit G/U
- Cables and connectors for connecting the motors

A thermal contact for temperature monitoring is fitted to the positioners’ motors to provide protection against overheating. These signals are connected to the control system’s PTC-loop.

**Measurement system**

For this positioner the measurement system consists of:
- Axis computer 2/connector card
- Communication cable (MS2)
- Serial measurement board
- Resolver connection cables
**Axis selector**

A connector is used to activate one of the positioners’ work stations, this is connected to the drive unit voltage to the motor in question.

The contactor is operated using a 24V DC amplifier block, which is controlled by a digital output from the control system. The control voltage for the contact coil is 230V AC.

As standard only one axis can be active at any one time.

**Activating/deactivating**

Activating/deactivating of the positioner’s work stations can be performed from:

- the control program or
- by using the function key from the jogging menu on the programming unit.

The contactor for the axis in question is operated via a digital output on activation. An acknowledgement signal is obtained and a brake release relay with a digital output is then activated.

When deactivating, the motor is stopped before the contactor cuts the drive unit voltage.

**Station indication**

In order for the correct production program to be initiated the station changer unit is equipped with limit switches, that indicate which station is in the working mode for the robot. The switches set individual digital inputs in the control system. Respective inputs are set "high" when the station changer unit is at an end position.

**Connecting the positioner**

Motor and resolver signals for the positioner are separated into two outputs on the control cabinet, and the positioner is connected to these.

- The motors are connected to the output XS101 and
- The resolvers are connected to the output XS102.

**Safety**

Due to reasons of safety the station changer cannot be set in the operating mode “MAN FS”. This interlock is integrated into the interface for operator communication and safety equipment.

**Note! If, for some reason, this interface is omitted it is incumbent on the user to ensure this interlock is maintained.**

Contactors and auxiliary contact blocks are of an approved redundant type in order to guarantee assured monitoring of the active motor axis. The operation of the contactors is monitored by the safety equipment.
### 3.14 Reservdelsförteckning/Spare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppgi typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehålls.

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### Control Cabinet

#### Manipulator interface

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## Control Cabinet

### Manipulator interface

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Control Cabinet

Manipulator interface
3.15 Positioner interface types IRBP B/D

Between the control system and the included positioner there is a modular based interface fitted to the left of the top cabinet’s rear panel.

1. Connection X7 Motor Positioner
2. Connection X6 Motor Positioner
3. Connection X5 Motor Positioner
4. Resolver connection
5. Digital I/O card
6. Signal connection
7. Motor contactors
8. Brake relay
9. Connection X4
10. Connection TB2 safety signals
11. Communication cable (MS2) connection
12. Serial measurement board
Drive system
For this positioner the drive system consists of:
- Axis computer 2 connector card (DS2)
- Communications cable (DS2)
- Rectifier DC4
- Drive unit U (included in the rectifier module)
- Drive unit G/U
- Cables and connectors for connecting the motors

A thermal contact for temperature monitoring is fitted to the positioners' motors to provide protection against overheating. These signals are connected to the control system's PTC-loop.

Measurement system
For this positioner the measurement system consists of:
- Axis computer 2 connector card
- Communication cable (MS2)
- Serial measurement board
- Resolver connection cables
Axis selector

Contactors are used to activate one of the positioners’ work stations, these are connected to the drive unit voltage to the motors in question.

The contactors are operated using a 24V DC amplifier block, which is controlled by a digital output from the control system. The control voltage for the contact coils is 230V AC.

As standard only one axis can be active at any one time.

Activating/deactivating

Activating/deactivating of the positioner’s work stations can be performed from:

- the control program or
- by using the function key from the jogging menu on the programming unit.

The contactors for the mechanical unit in question are operated via a digital output on activation. An acknowledgement signal is obtained and a brake release relay with a digital output is then activated.

When deactivating, the motor is stopped before the contactor cuts the drive unit voltage.

Station indication

In order for the correct production program to be initiated the station changer unit is equipped with limit switches, that indicate which station is in the working mode for the robot. The switches set individual digital inputs in the control system. Respective inputs are set “high” when the station changer unit is at an end position.

Connecting the positioner

Motor and resolver signals for the positioner are separated into two outputs on the control cabinet, and the positioner is connected to these.

- The motors are connected to the output XS101 and
- the resolvers are connected to the output XS102.

Safety

Due to reasons of safety the station changer cannot be set in the operating mode “MAN FS”. This interlock is integrated into the interface for operator communication and safety equipment.

Note! If, for some reason, this interface is omitted it is incumbent on the user to ensure this interlock is maintained.

Contactors and auxiliary contact blocks are of an approved redundant type in order to guarantee assured monitoring of the active motor axis. The operation of the contactors is monitored by the safety equipment.
### 3.16 Reservdelsförteckning/Spare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppgie typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehålls.

*Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.*

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Control Cabinet

Positioner interface
### Control Cabinet

### Positioner interface

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## Control Cabinet

### Positioner interface

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Control Cabinet

Positioner interface
3.17 Positioner interface types IRBP A

Between the control system and the included positioner there is a modular based interface fitted to the left of the top cabinet’s rear panel.

1. Connection X6 Motor Manipulator
2. Connection X5 Motor Manipulator (arm)
3. Connection X7 (not used)
4. Resolver connections
5. Digital I/O card
6. Signal connection
7. Motor contactors
8. Brake relay
9. Adapter X4
10. Connection TB2 safety signals
11. Communication cable (MS2) connection
12. Serial measurement board
1 Drive unit G/U
2 Communication cable (DS2) connection
3 Rectifier with drive unit DC 4/U

**Drive system**

For this positioner the drive system consists of:

- Axis computer 2/connector card (DS2)
- Communications cable (DS2)
- Rectifier DC4
- Drive unit U (included in the rectifier module)
- Drive unit G/U
- Cables and connectors for connecting the motors

A thermal contact for temperature monitoring is fitted to the manipulator's motor to provide protection against overheating. This signal is connected to the control system's PTC-loop.

**Measurement system**

For these positioners the measurement system consists of:

- Axis computer 2/connector card (MS2)
- Communication cable (MS2)
- Serial measurement board
- Cables for connecting resolvers
Axis selector

Two contactors that connect the drive unit voltage to the motors are used to activate respective manipulators’ axes. Each contactor is operated using a 24V DC amplifier block, which is controlled by a digital output from the control system. The control voltage for the contact coil is 230V AC.

Activating/deactivating

Activating/deactivating of the positioner’s respective axes can be performed from
- the control program or
- by using the function key from the jogging menu on the programming unit.

The contactors for the axes in question are operated via a digital output on activation. After the ready signal on the acknowledgement input, the brake release relay is activated by a digital output.

When deactivating, the motors are stopped before the contactors cut the drive unit voltage.

Connecting the manipulator

The motor and resolver signals for respective manipulators’ motors are gathered in a common output on the control cabinet and the manipulator is connected to this output.
- Positioner for station 1 is connected to the output XS101 and
- positioner for station 2 is connected to the output XS102.

Safety

Contactors and auxiliary contact blocks are of an approved redundant type in order to guarantee assured monitoring of the active motor axes. The function of the contactors is supervised by the safety equipment.

Working area demarcation

A working area demarcation of the positioner’s arm is made in software. This is done to protect the cable harness to external motor from accumulated torsional stress.

3.18 Reservdelsförteckning/Spare Parts List

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Control Cabinet

Positioner interface
4 Interface for process equipment

4.1 General

**Software**

Connection of process equipment for arc welding requires a control cabinet ordered with one of the software options 551/552, ARCW/ARCWAREplus.

**Welding equipment**

For robots IRB140/1400/2400 there is fully prepared welding equipment available adapted for connection to the system:

Some welding equipment with the wire-feed unit mounted on the robot’s upper arm utilise the internal cable harness in the robot for connection of signals. In these cases the robot must be ordered with option 042 "Integrated wire-feed unit cables".

**Accessories**

The system is prepared for the easy connection of different accessories to the process equipment such as:

- Mechanical gun cleaner
- Calibration equipment
- Joint location equipment
- Joint tracking equipment
4.2 System design

4.2.1 Free-standing welding power source

There is a process control card for communication with the robot’s control system for control and supervision of the welding power source, wire-feed system and connected accessories. This is mounted on a module together with other components for control of the process equipment in the control cabinet.

A process control card with integrated motor regulator is used for welding equipment from the standard range.

Communication between the process control card and the control system takes place via a CAN-bus.

This system also makes it possible to control some welding power sources from other OEM-brands.

Connection of an OEM power source requires you to be fully conversant with the
- operation of the power source,
- how signal transfer should be handled and
- how configuration
of the power source in question should be carried out in the control system.
4.2.2 Welding power source integrated with the control cabinet

Communication with the control system takes place directly via the CAN-bus for this type of welding power source.

The welding power source is available in two designs, integrated with the control cabinet or free-standing.

A process control card is used for communication with the robot’s control system for control and supervision of the wire-feed system and connected accessories.
4.3 Connection

The cable harness to external equipment is connected to the output on the left-hand side of the top cabinet or to jackable terminals mounted internally by the two-piece cable gland.

![Diagram of Control Cabinet Interface for process equipment](image)

*Figure 17  Connection*

1. Wire feed unit motor  
2. Wire feed unit - signal  
3. Power source  
4. Wire feed unit ALU 40 kg  
5. TCP tool / Cooling unit  
6. Mechanical cleaner  
7. Spare / Power source LRC  
8. Wire feed unit ALU 40 kg
4.4 No process equipment - Jumper device NO AW

The welding equipment’s interface is replaced by an assembly plate on installations without welding equipment. All requisite jumper settings, etc for internal cabling included in the top cabinet are fitted on this.

The assembly plate is fitted on the right-hand side, inside the top cabinet and can be used as spare space for other customer specific equipment.

1 Power supply. A202-X3
2 Jumper device emergency stop. A202-X3
3 Jumper device run chain. A202-X3
4 Termination CAN bus. A202-X3

Power supply

The following voltages are available on the jackable terminal A202-X3:

- 24V DC (24V I/O)
- 115V AC
- 230V AC
4.4.1 Control

Interlocks
The following run chain signals are available on the jackable terminal A202-X2:
- Auto stop
- General stop
- External motors on
- External motors on contactor control

The following emergency stop signals are available on the jackable terminal A202-X1:
- External push button
- Emergency stop out
- External limit switches

CAN-bus
The terminated CAN bus channel A202-TB2 can be used, e.g. for the connection of extra I/O cards.
4.5 Spare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppmätta typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehålles.

*Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.*

*Rights to reserved to alter specifications without notice.*
### Control Cabinet

#### Interface for process equipment

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4.6 Power source LAW/RPA/OEM

There is a modular based interface between the control system and component welding equipment fitted on the right-hand side, inside the top cabinet.

1 PIB
2 Main contactor
3 Interlock relays
4 Signal connection
5 Transformer

The interface is fitted with internal wiring for connection to the robot control system.
External connection

The cable harness to external equipment is connected to the output on the left-hand side of the top cabinet or to jackable terminals mounted internally by the two-piece cable gland.

1. Wire feed unit motor
2. Wire feed unit - signal
3. Power source
4. TCP tool
5. Mechanical cleaner

Power supply

The voltage supply consists of a ring core transformer with double secondary windings 230/42(28)/28V AC (see technical specification for PIB).

This feeds the motor regulator part on the process control card with 42V AC and the rectifier part on the process control card with 28V AC.
4.6.1 OPERATION and CONNECTIONS

Emergency stop

1. Motors on
2. Emergency stop
3. Operating mode selector
4. Running time meter

All emergency stop buttons included in the system are as standard connected in series and directly affect the control system’s emergency stop loop.

There is a possibility of connecting this in series with the other push buttons in the system if the process equipment is fitted with emergency stop push button.

The equipment is normally interlocked via the emergency stop relay on the control system’s panel card A81.

The "Extended emergency stop function" option gives the possibility of supplementing the equipment with components. Optional redundant auxiliary relays can then be easily connected for this purpose.
Figure 18 and Figure 19 below show the theory behind how the emergency stop loop is used to control connected equipment.

For detailed information about the design of the emergency stop loop refer to the "The robot's User's Manual"
4.6.2 Interlocks

Operating stop loop

Figure 20 below shows the theory behind how the operating stop loop is used to control connected equipment.

For detailed information about the design of the operating stop loop refer to the "The robot’s User’s Manual"

![Operating stop loop diagram]

Figure 20  Operating stop loop

Two channel break up of the operating stop loop on the process control card.

In order to run the wire feed motor and welding equipment in all operating modes requires:

- all safety loops to be intact and
- that the system has been started (MOTORS_ON).

In order to run the wire feed motor at a limited speed requires:

- the emergency stop loop to be intact
- operating mode "MAN" and the system set to "MOTORS OFF"
Control Cabinet

Interface for process equipment

**CAN bus**

**CAN-bus Connection LAW/RPA**

- Connection of the process control card is made to the control system’s CAN-bus channel CAN1.2, output X6 on the contact card A82.
- The connection cable should be fitted with a termination resistance, 120Ω

**Process control card**

The control card houses the hardware and software for control and regulation of the arc welding equipment.

- See the Product Manual for the welding equipment/S4Cplus.
4.6.3 Connections for external equipment

Welding power source

1. Welding power sources type LAW/RPA are connected to output XS107.
   - A detailed account of available signals is given in the separate manual for the process control card in the section “Process equipment” chapter PIB.

2. Power sources from other manufacturer's can be connected to this output under the condition that they comply with the specifications described in the manual "Welding equipment" in the section "Process equipment" chapter PIB.

3. If another type/configuration of the output is required, the cable W240 can be replaced by another internal cable.

4. If the welding power supply is fitted with an emergency stop it can be connected to the jackable terminal A202-X1.
   - See the separate manual in the section “Power Source” for a description of included welding power sources.

Feed mechanism system

Feed mechanism system types A140E, A314E resp. A324E-L are connected to outputs XS105 and XS106.
   - See the separate manual in the section “Process equipment” chapter PIB for a description of included feed mechanism systems.

Other accessories

1. The equipment is prepared for the connection of, e.g. mechanical cleaners and calibration tools.

2. Cabling from the welding gun equipment is inserted through the two-piece cover and is connected to the jackable terminal X108 located on the left-hand side, inside the top cabinet.

3. See the separate manual under section "Cooling unit" and "Gun service unit" for a description of component products.
### 4.7 Spare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig upprätta typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specificeringar utan aviserings förbehålles.

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### Control Cabinet

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<td>Cable, BullsEye/TC</td>
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Control Cabinet

Interface for process equipment
4.8 MILLER

There is a modular based interface between the control system and component welding equipment fitted on the right-hand side, inside the top cabinet.

1. PIB
2. Main contactor
3. Interlock relays
4. Signal connection
5. Transformer

- The interface is fitted with internal wiring for connection to the robot control system.
- The cable harness to external equipment is connected to the output on the left-hand side of the top cabinet or to jackable terminals mounted internally by the two-piece cable gland.

1. Positioner
2. Conveyor motor/resolver
3. Operator’s panel
4. Wire feed unit motor
5. Wire feed unit - signal
6. Power source
7. Wire cutter
8. TCP tool
9. Mechanical cleaner
10. Timer reset stn 2
11. Timer resetting stn 1
12. Light barrier 2
13. Light barrier 1
14. Gate switch
15. Gate reset
16. Activation unit work area 2/Home Sensor 2
17. Activation unit work area 1/Home Sensor 1
18. Limit switch for conveyor
19. Position indicator for conveyor
20. Spare
Power supply

The voltage supply consists of a ring core transformer with double secondary windings 230/115/28V AC (see technical specification for PIB).

This feeds the motor regulator part on the process control card with 115V AC and the rectifier part on the process control card with 28V AC.

4.8.1 OPERATION and CONNECTIONS

Emergency stop

1 Motors on
2 Emergency stop
3 Operating mode selector
4 Running time meter

All emergency stop buttons included in the system are as standard connected in series and directly affect the control system’s emergency stop loop.

There is a possibility of connecting this in series with the other push buttons in the system if the process equipment is fitted with emergency stop push button.

The equipment is normally interlocked via the emergency stop relay on the control system’s panel card A81.

The "Extended emergency stop function" option gives the possibility of supplementing the equipment with components. Optional redundant auxiliary relays can then be easily connected for this purpose.
Figure 21 and Figure 22 below show the theory behind how the emergency stop loop is used to control connected equipment.

For detailed information about the design of the emergency stop loop refer to the "The robot's User's Manual"
4.8.2 Interlocks

Operating stop loop

Figure 23 below shows the theory behind how the operating stop loop is used to control connected equipment.

For detailed information about the design of the operating stop loop refer to the "The robot’s User’s Manual"

![Diagram of operating stop loop]

**Figure 23  Operating stop loop**

Two channel break up of the operating stop loop on the process control card.

In order to run the wire feed motor and welding equipment in all operating modes requires:

- all safety loops to be intact and
- that the system has been started (MOTORS_ON).

In order to run the wire feed motor at a limited speed requires:

- the emergency stop loop to be intact
- operating mode "MAN" and the system set to "MOTORS OFF"
- Connection of the process control card is made to the control system’s CAN-bus channel CAN1.2, output X6 on the contact card A82.
- The connection cable should be fitted with a termination resistance, 120Ω
Process control card

The control card houses the hardware and software for control and regulation of the arc welding equipment.

See the Product Manual for the welding equipment/S4Cplus.

4.8.3 Connections for external equipment

Welding power source

1. Welding power sources type Miller are connected to output XS107.
   - A detailed account of available signals is given in the separate manual for the process control card in the section “Process equipment” chapter PIB.

2. Power sources from other manufacturer's can be connected to this output under the condition that they comply with the specifications described in the manual "Welding equipment" in the section "Process equipment" chapter PIB.

3. If another type/configuration of the output is required, the cable W240 can be replaced by another internal cable.

4. If the welding power supply is fitted with an emergency stop it can be connected to the jackable terminal A202-X1.
Feed mechanism system

Feed mechanism systems type A140E, A314E and A324E-L are connected to outputs XS105 and XS106.

- See the separate manual in the section “Process equipment” chapter PIB for a description of included feed mechanism systems.

Other accessories

1. The equipment is prepared for the connection of, e.g. mechanical cleaners and calibration tools.

2. Cabling from the welding gun equipment is inserted through the two-piece cover and is connected to the jackable terminal X108 located on the left-hand side, inside the top cabinet.

3. See the separate manual under section "Cooling unit" and "Gun service unit" for a description of component products.
4.9 Spare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid
beställning var vänlig uppgi typ och tillverkningsnummer samt benämningar och
beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan avisering förbehålles.

*Spare parts are to be ordered from ABB Automation Technology Products AB.*
*Kindly indicate type of unit, serial number, denominations and ordering number
according to the spare parts list.*

*Rights to reserved to alter specifications without notice.*
### Control Cabinet

**Interface for process equipment**

<table>
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<th>Positionsnummer</th>
<th>Antal Quantity</th>
<th>Beställningsnummer</th>
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### Control Cabinet

**Interface for process equipment**

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</table>
4.10 Power source ARCITEC-LRB

There is a modular based interface between the control system and component welding equipment fitted on the right-hand side, inside the top cabinet.

1  PIB
2  Main contactor
3  Interlock relays
4  Signal connection
5  Auxiliary fan, cooling unit
6  Transformer
   - The interface is fitted with internal wiring for connection to the robot control system.
The cable harness to external equipment is connected to the output on the left-hand side of the top cabinet or to jackable terminals mounted internally by the two-piece cable gland. Internal cables for control signals to the welding power source are also connected here.

4. Wire feed unit motor
5. Wire feed unit - signal
8. TCP tool
9. Mechanical cleaner
20. Spare

**Power supply**

The voltage supply consists of a ring core transformer with double secondary windings 230/42(28)/28V AC (see technical specification for PIB).

This feeds the motor regulator part on the process control card with 42V AC and the rectifier part on the process control card with 28V AC.
4.10.1 OPERATION and CONNECTIONS

Emergency stop

1 Motors on
2 Emergency stop
3 Operating mode selector
4 Running time meter

All emergency stop buttons included in the system are as standard connected in series and directly affect the control system’s emergency stop loop.

There is a possibility of connecting this in series with the other push buttons in the system if the process equipment is fitted with emergency stop push button.

The equipment is normally interlocked via the emergency stop relay on the control system’s panel card A81.

The "Extended emergency stop function" option gives the possibility of supplementing the equipment with components. Optional redundant auxiliary relays can then be easily connected for this purpose.
Figure 25 and Figure 26 below show the theory behind how the emergency stop loop is used to control connected equipment.

For detailed information about the design of the emergency stop loop refer to the "The robot's User's Manual"

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**Figure 25**  Emergency stop loop

**Figure 26**  Emergency stop loop with the addition "Extended emergency stop function"
4.10.2 Interlocks

Operating stop loop

Figure 27 below shows the theory behind how the operating stop loop is used to control connected equipment.

For detailed information about the design of the operating stop loop refer to the "The robot’s User’s Manual"

Two channel break up of the operating stop loop on the process control card.

In order to run the wire feed motor and welding equipment in all operating modes requires:

- all safety loops to be intact and
- that the system has been started (MOTORS_ON).

In order to run the wire feed motor at a limited speed requires:

- the emergency stop loop to be intact
- operating mode "MAN" and the system set to "MOTORS OFF"
- The welding power source is connected to the control system’s CAN-bus channel CAN1.2, output X6 on contact card A82, using a branch cable.

- The process control card’s connection cable is connected to the same CAN-bus channel via output X6B on this branch cable.

- The connection cable should be fitted with a termination resistance, 120Ω.
Process control card

The control card houses the hardware and software for control and regulation of the arc welding equipment.

See the Product Manual for the welding equipment/S4Cplus.

4.10.3 Connecting integrated welding power sources

1. The cables for the supply voltage are connected to the control cabinet’s main power switch.

2. Connections for communication with the control cabinet’s CAN-bus are made to output X6 on contact card A82.

3. Cables for control signals to welding power sources type LRB are connected to the jackable terminal X202.

4. See the separate manual in the section “Power Source” for a description of included welding power sources.

4.10.4 Connections for external equipment

Feed mechanism system

Feed mechanism system types A140E, A314E resp. A324E-L are connected to outputs XS105 and XS106.

- See the separate manual in the section “Process equipment” chapter PIB for a description of included feed mechanism systems.
Other accessories

1 The equipment is prepared for the connection of, e.g. mechanical cleaners and calibration tools.

2 Cabling from the welding gun equipment is inserted through the two-piece cover and is connected to the jackable terminal X108 located on the left-hand side, inside the top cabinet
   - See the separate manual under section "Cooling unit" and "Gun service unit" for a description of component products.

3 A cooling unit is required if a water cooled gun is included.
   - The cable from the cooling unit is inserted through the two-piece cover and is connected to the jackable terminal X202 located on the left-hand side, inside the top cabinet.
   - See the separate manual under section "Cooling unit" for a description of the cooling unit.
4.11  **Spare Parts List**

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppge typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan avisering förbehålls.

*Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.*

*Rights to reserved to alter specifications without notice.*
### Control Cabinet

**Interface for process equipment**

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Control Cabinet

Interface for process equipment
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<td>Kabel, BullsEye/TC</td>
<td>Cable, BullsEye/TC</td>
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</tbody>
</table>

**Control Cabinet**

**Interface for process equipment**
4.12 Power source ARCITEC-LRC

There is a modular based interface between the control system and component welding equipment fitted on the right-hand side, inside the top cabinet.

- The interface is fitted with internal wiring for connection to the robot control system.

1 PIB

2 Main contactor

3 Interlock relays

4 Signal connection

5 Auxiliary fan, cooling unit

6 Transformer
- The cable harness to external equipment is connected to the output on the left-hand side of the top cabinet or to jackable terminals mounted internally by the two-piece cable gland. External cables for control signals to the welding power source are also connected here.

1. Positioner
2. Conveyor motor/resolver
3. Operator's panel
4. Wire feed unit motor
5. Wire feed unit - signal
6. Power source
7. Wire cutter
8. TCP tool
9. Mechanical cleaner
10. Timer reset stn 2
11. Timer resetting stn 1
12. Light barrier 2
13. Light barrier 1
14. Gate switch
15. Gate reset
16. Activation unit work area 2/Home Sensor 2
17. Activation unit work area 1/Home Sensor 1
18. Limit switch for conveyor
19. Position indicator for conveyor
20. Spare
Power supply
The voltage supply consists of a ring core transformer with double secondary windings 230/42(28)/28V AC (see technical specification for PIB).
This feeds the motor regulator part on the process control card with 42V AC and the rectifier part on the process control card with 28V AC.

4.12.1 OPERATION and CONNECTIONS

Emergency stop

1 Motors on
2 Emergency stop
3 Operating mode selector
4 Running time meter

All emergency stop buttons included in the system are as standard connected in series and directly affect the control system's emergency stop loop.

There is a possibility of connecting this in series with the other push buttons in the system if the process equipment is fitted with emergency stop push button.

The equipment is normally interlocked via the emergency stop relay on the control system’s panel card A81.

The "Extended emergency stop function" option gives the possibility of supplementing the equipment with components. Optional redundant auxiliary relays can then be easily connected for this purpose.
Figure 29 and Figure 30 below show the theory behind how the emergency stop loop is used to control connected equipment.

For detailed information about the design of the emergency stop loop refer to the "The robot's User's Manual"
4.12.2 Interlocks

Operating stop loop

Figure 31 below shows the theory behind how the operating stop loop is used to control connected equipment.

For detailed information about the design of the operating stop loop refer to the "The robot’s User’s Manual"

Two channel break up of the operating stop loop on the process control card.

In order to run the wire feed motor and welding equipment in all operating modes requires:
- all safety loops to be intact and
- that the system has been started (MOTORS_ON).

In order to run the wire feed motor at a limited speed requires:
- the emergency stop loop to be intact
- operating mode "MAN" and the system set to "MOTORS OFF"
- The CAN-bus cable to the welding power source is connected to output X107. This output is internally connected to the control system’s CAN-bus channel CAN1.2, output X6 on contact card A82, using a branch cable.

- The process control card’s connection cable is connected to the same CAN-bus channel via output X6B on this branch cable.

- The connection cable should be fitted with a termination resistance, 120Ω.
Process control card

The control card houses the hardware and software for control and regulation of the arc welding equipment.

See the Product Manual for the welding equipment/S4Cplus.

4.12.3 Connecting integrated welding power sources

1. Connections for communication with the control cabinet’s CAN-bus are made to output X107 on the control cabinet.

2. Cables for control signals to welding power sources type LRB are connected to the jackable terminal X202.

3. See the separate manual in the section “Power Source” for a description of included welding power sources.

4.12.4 Connections for external equipment

Feed mechanism system

Feed mechanism system types A140E, A314E resp. A324E-L are connected to outputs XS105 and XS106.

- See the separate manual in the section “Process equipment” chapter PIB for a description of included feed mechanism systems.
Other accessories

1. The equipment is prepared for the connection of, e.g. mechanical cleaners and calibration tools.

2. Cabling from the welding gun equipment is inserted through the two-piece cover and is connected to the jackable terminal X108 located on the left-hand side, inside the top cabinet.

3. See the separate manual under section "Cooling unit" and "Gun service unit" for a description of component products.
   - A cooling unit is required if a water cooled gun is included.
   - The cable from the cooling unit is inserted through the two-piece cover and is connected to the jackable terminal X202 located on the left-hand side, inside the top cabinet.
   - See the separate manual under section "Cooling unit" for a description of the cooling unit.
4.13  **Spare Parts List**

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppge typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehålls.

*Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.*

*Rights to reserved to alter specifications without notice.*
## Control Cabinet

### Interface for process equipment

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<th>Positionsnr</th>
<th>Antal</th>
<th>Beställningsnummer</th>
<th>Benämning</th>
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Control Cabinet

Interface for process equipment
### Control Cabinet

### Interface for process equipment

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Control Cabinet

Interface for process equipment
4.14 Power source ARCITEC-LRB ALUMINIUM

There is a modular based interface between the control system and component welding equipment fitted on the right-hand side, inside the top cabinet.

1 PIB
2 Main contactor
3 Interlock relays
4 Signal connection
5 Auxiliary fan, cooling unit
6 Transformer

- The interface is fitted with internal wiring for connection to the robot control system.
- The cable harness to external equipment is connected to the output on the left-hand side of the top cabinet or to jackable terminals mounted internally by the two-piece cable gland. Internal cables for control signals to the welding power source are also connected here.

1. Positioner
2. Conveyor motor/resolver
3. Operator's panel
4. Wire feed unit motor
5. Wire feed unit - signal
6. Power source
7. Wire cutter
8. TCP tool
9. Mechanical cleaner
10. Timer reset stn 2
11. Timer resetting stn 1
12. Light barrier 2
13. Light barrier 1
14. Gate switch
15. Gate reset
16. Activation unit work area 2/Home Sensor 2
17. Activation unit work area 1/Home Sensor 1
18. Limit switch for conveyor
19. Position indicator for conveyor
20. Spare
Power supply

The voltage supply consists of a ring core transformer with double secondary windings 230/(42) 28/28V AC (see technical specification for PIB).

This feeds the motor regulator part on the process control card with 115V AC and the rectifier part on the process control card with 28V AC.

4.14.1 OPERATION and CONNECTIONS

Emergency stop

1. Motors on
2. Emergency stop
3. Operating mode selector
4. Running time meter

All emergency stop buttons included in the system are as standard connected in series and directly affect the control system’s emergency stop loop.

There is a possibility of connecting this in series with the other push buttons in the system if the process equipment is fitted with emergency stop push button.

The equipment is normally interlocked via the emergency stop relay on the control system’s panel card A81.

The "Extended emergency stop function" option gives the possibility of supplementing the equipment with components. Optional redundant auxiliary relays can then be easily connected for this purpose.
Figure 33 and Figure 34 below show the theory behind how the emergency stop loop is used to control connected equipment.

For detailed information about the design of the emergency stop loop refer to the "The robot's User's Manual".

**Figure 33   Emergency stop loop**

**Figure 34   Emergency stop loop with the addition "Extended emergency stop function"**
4.14.2 Interlocks

Operating stop loop

Figure 35 below shows the theory behind how the operating stop loop is used to control connected equipment.

For detailed information about the design of the operating stop loop refer to the "The robot’s User’s Manual"

Two channel break up of the operating stop loop on the process control card.

In order to run the wire feed motor and welding equipment in all operating modes requires:

- all safety loops to be intact and
- that the system has been started (MOTORS_ON).

In order to run the wire feed motor at a limited speed requires:

- the emergency stop loop to be intact
- operating mode "MAN" and the system set to "MOTORS OFF"
- The welding power source is connected to the control system’s CAN-bus channel CAN1.2, output X6 on contact card A82, using a branch cable.
- The process control card’s connection cable is connected to the same CAN-bus channel via output X6B on this branch cable.
- The connection cable should be fitted with a termination resistance, 120Ω.
Process control card

The control card houses the hardware and software for control and regulation of the arc welding equipment.

See the Product Manual for the welding equipment/S4Cplus.

4.14.3 Connecting integrated welding power sources

1. The cables for the supply voltage are connected to the control cabinet’s main power switch.

2. Connections for communication with the control cabinet’s CAN-bus are made to output X6 on contact card A82.

3. Cables for control signals to welding power sources type LRB are connected to the jackable terminal X202.

4. See the separate manual in the section “Power Source” for a description of included welding power sources.

4.14.4 Connections for external equipment

Feed mechanism system

Feed mechanism system types A314E, A324E-L resp. A314i ALU and A324iL ALU are connected to outputs XS105 and XS106.

- See the separate manual in the section “Process equipment” chapter PIB for a description of included feed mechanism systems.
Other accessories

1. The equipment is prepared for the connection of, e.g. mechanical cleaners and calibration tools.

2. Cabling from the welding gun equipment is inserted through the two-piece cover and is connected to the jackable terminal X108 located on the left-hand side, inside the top cabinet.

3. See the separate manual under section "Cooling unit" and "Gun service unit" for a description of component products.

4. A cooling unit is required if a water cooled gun is included.
   - The cable from the cooling unit is inserted through the two-piece cover and is connected to the jackable terminal X202 located on the left-hand side, inside the top cabinet.
   - See the separate manual under section "Cooling unit" for a description of the cooling unit.
4.15 Spare Parts List

Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.

Rights to reserved to alter specifications without notice.
## Control cabinet

### Interface for process equipment

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## Control cabinet
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**Control cabinet**

**Interface for process equipment**

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<th>Beställningsnummer</th>
<th>Benämning</th>
<th>Denomination</th>
<th>Anmärkningar</th>
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<td><strong>Quantity</strong></td>
<td><strong>Ordering number</strong></td>
<td><strong>Description</strong></td>
<td><strong>Denomination</strong></td>
<td><strong>Remarks</strong></td>
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<td>Process equipment, Aluminium</td>
<td>40 kg</td>
<td>see earlier page</td>
</tr>
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<td>Proc. equ. ALUMINIUM 7kg</td>
<td>7kg</td>
<td>6 pol</td>
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<td>Connector, CombiCon</td>
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<td>7</td>
<td>212 601-103</td>
<td>Mutter</td>
<td>Nut</td>
<td>M3</td>
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<td>8</td>
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<td>Kabelm internt. OPT:ALU</td>
<td>Cable, internal. OPT:ALU</td>
<td>W247</td>
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</tr>
</tbody>
</table>
Control cabinet

Interface for process equipment
5 Interface for operator communications and safety

5.1 General

There is complete equipment available for operator communications and safety supervision adapted to the system for station solutions where the layout follows standard layout principles.

Through the addition of different accessories for this equipment, handling can be adapted to meet special requirements.

Operator communication

Communication between the operator and the control system takes place via a panel with push-buttons and status lamps.

Operations and acknowledgements are converted to digital input and output signals.

5.1.1 Safety functions

Emergency stop loop

All emergency stop buttons included in the station are usually connected to the control system’s emergency stop loop. If one of these push-buttons is activated all dangerous machine movement is stopped immediately and the system is set in "Motors off mode".

Operating stop loop

Connected safety supervision equipment normally works with the control system’s operating stop loop. If something unpermitted occurs either the general stop or auto stop is tripped depending on the incident.

This results in dangerous machine movement being stopped immediately and the system being set in "Motors off mode".

For further information about the design of the safety system refer to the robot’s "User Guide".

Note! Connected safety functions must not be overridden under any circumstances. This can result in serious personal injury.

Read the instructions in the System Manual, chapter 1 "Introduction and Safety" before the station is used.
5.1.2 Accessories

The system is prepared for the connection of different accessories in order to optimise handling as required, these are:

- Operator panel
- Light barriers
- Gate supervision
- Timer resetting
- Home position/transport position indication
- Station indication with the service position
- Activation from extended programming area
- Roller door (FlexArc)

For further information about the safety equipment, refer to the Product Manual for the "Safety equipment"
5.2 System solutions

Continuous status supervision of safety components, operator communications and moving machine parts is required in order to prevent personal danger when entering supervised areas.

This is provided by a circuit card for safety supervision, located in the top cabinet. The circuit card includes functions to immediately cut the control system’s operating loop when a course of events occur that can result in personal danger.

Examples of events are:

- hardware failure in safety equipment
- incorrect operation
- carelessness
- machine fault

Safety equipment is designed according to category 4 described in EN 954-1, doubled and self-supervision.

The equipment can be adapted for optimal handling in each individual case by connecting different accessories to the circuit board.

5.2.1 Traditional welding robot station

![Diagram of Traditional welding robot station]

*Figure 37  Traditional welding robot station*

| 1 | Robot |
| 2 | Positioner |
| 3 | Operator panel |
| 4 | Light barriers |
| 5 | Supervised area station 1 |
| 6 | Supervised area station 2 |
| 7 | Supervised programming area |
| 8 | Barrier |
| 9 | Service door |
5.2.2 FlexArc

FlexArc is a complete welding robot station built on a base plate including walls. The total solution gives easy connection and rapid start-up.

FlexArc always incorporates safety with a light barrier or roller door.

![FlexArc diagram]

**Figure 38 FlexArc 250R with light barriers**

<table>
<thead>
<tr>
<th>1</th>
<th>Robot</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Positioner</td>
</tr>
<tr>
<td>3</td>
<td>Operator panel</td>
</tr>
<tr>
<td>4</td>
<td>Light barriers</td>
</tr>
<tr>
<td>5</td>
<td>Supervised area</td>
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<tr>
<td>6</td>
<td>Supervised programming area</td>
</tr>
<tr>
<td>7</td>
<td>Barrier</td>
</tr>
<tr>
<td>8</td>
<td>Service door</td>
</tr>
</tbody>
</table>
5.3 Connections

The cable harness to external equipment is connected to the output on the left-hand side of the top cabinet or to jackable terminals mounted internally by the two-piece cable gland.

5.3.1 General

![Diagram of connections]

Figure 39 General connections

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Gate switch</td>
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<tr>
<td>2</td>
<td>Gate reset</td>
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<tr>
<td>3</td>
<td>Home position/transport indicator</td>
</tr>
<tr>
<td>4</td>
<td>Position indicator for robot/travel track</td>
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<tr>
<td>5</td>
<td>Roller door station 1</td>
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<tr>
<td>6</td>
<td>Roller door station 2</td>
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<tr>
<td>7</td>
<td>Operator panel</td>
</tr>
<tr>
<td>8</td>
<td>Activation unit working area 2</td>
</tr>
<tr>
<td>9</td>
<td>Timer resetting station 2/ Light curtain station 2</td>
</tr>
<tr>
<td>10</td>
<td>Light curtain (återställnings-skydd) station 2</td>
</tr>
<tr>
<td>11</td>
<td>Light barrier 2</td>
</tr>
<tr>
<td>12</td>
<td>Activation unit working area 1</td>
</tr>
<tr>
<td>13</td>
<td>Timer resetting station 1/ Light curtain station 1</td>
</tr>
<tr>
<td>14</td>
<td>Light curtain (återställnings-skydd) station 1</td>
</tr>
<tr>
<td>15</td>
<td>Light barrier 1</td>
</tr>
</tbody>
</table>
5.4 Operator communications for positioner types C/R/K

There is a modular based interface fitted to the left of the top cabinet’s rear panel for operator communications and safety equipment.

The interface includes:

- a circuit card for safety supervision
- a cabling harness prepared for connection of external safety components.
Connections

External safety components are connected to the jackable terminal blocks fitted internally by the two-piece cable glands on the left-hand side of the top cabinet. Any included standard components are connected according to Figure 40.

**Figure 40  Connections**

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>Gate switch</td>
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<td>2</td>
<td>Gate reset</td>
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<td>3</td>
<td>Spare</td>
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<td>4</td>
<td>Roller door station 1</td>
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<tr>
<td>5</td>
<td>Operator panel</td>
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<tr>
<td>6</td>
<td>Light barrier 1</td>
</tr>
<tr>
<td>7</td>
<td>Light curtain station 1</td>
</tr>
<tr>
<td>8</td>
<td>Timer resetting station 1/ Light curtain station 1</td>
</tr>
</tbody>
</table>

**Power supply**

The safety equipment is fed with 24V DC from an internal supply unit (24V I/O). The supply to external safety components is fuse protected internally on the circuit card for safety supervision and may be loaded with max. 1.5 A continuously.
5.4.1 OPERATION and CONNECTIONS

Emergency stop

1. Motors on
2. Emergency stop
3. Operating mode selector
4. Running time meter

All emergency stop buttons included in the system are as standard connected in series and directly affect the control system's emergency stop loop.

Included on external safety equipment, available in the standard range, are:
- an emergency stop button on the operator’s panel
- an emergency stop button on the equipment cabinet for the roller door.

The "Extended emergency stop function" option gives the possibility of supplementing equipment with components for, e.g. gate interlocking via the emergency stop of fixtures.

Optional redundant auxiliary relays can then be easily connected for this purpose.
The following two figures show the theory behind how the emergency stop loop is used to control the connected equipment.

For detailed information about the design of the emergency stop loop refer to the "The robot's User's Manual".

---

**Figure 41** Emergency stop loop

**Figure 42** Emergency stop loop with the addition "Extended emergency stop function"
5.4.2 Interlocks

**Operating stop loop**

The figure below shows the theory behind how the operating stop loop is used to control connected equipment.

For detailed information about the design of the operating stop loop refer to the "The robot’s User’s Manual"

![Figure 43 Operating stop loop](image)

Two channel break up of the operating stop loops takes place using the circuit card for safety supervision and the gate switch.

The safety functions on the circuit card are connected to the:

- "GENERAL STOP"

The gate switch is connected to the:

- "AUTO STOP".

In order to run the robot and positioner in the "AUTO" operating mode requires:

- all safety loops to be intact and
- that the system has been started (MOTORS_ON).

Operation of the positioner's station switching unit and work station in the supervised area is not permitted in the MAN FS (Mode MANUAL - Full speed) operating mode.
**Circuit board for supervision**

The circuit card includes functions for the supervision of:

- entry protection (light barriers, roller door)
- station mode (limit switch)
- activated positioner axes (engaging and disengaging the motors)

---

**Figur 44** Safety module with option card.

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>Safety module</td>
</tr>
<tr>
<td>2</td>
<td>Option card</td>
</tr>
<tr>
<td>3</td>
<td>Connection</td>
</tr>
<tr>
<td>4</td>
<td>Enclosure</td>
</tr>
</tbody>
</table>
The functions are built up of safety components, where the function and status of these are supervised via the CAN bus by the control system.

![Diagram of control cabinet](image)

**Figure 45  Module for safety surveillance.**

The safety functions can be expanded using different option cards connected to the circuit card depending on the selected station solution.

### 5.5 Connection instructions

#### 5.5.1 Connection of the supply voltage

*The SIB V* module safety circuits are fed with a 24V DC voltage.

- The supply is connected to the jackable terminal TB7.

If necessary, the 0 V level on the supply voltage can be assured by

- connecting a potential equalising conductor to the earth potential in the environment where the SIB V module is located.
Normally the supply is connected to the control cabinet’s voltage supply to the I/O system (24V I/O, 0V I/O), but the safety system can also be connected to its own power supply.

The **SIB V** module’s CAN bus system is galvanically isolated from the other circuits and receives its supply via the control system’s CAN-bus loop on the jackable terminal TB6.

The outgoing voltage supply to the connected safety components is fuse protected internally on the **SIB V** module and may be loaded with max 1.5 A continuously.

The voltage can be accessed on the jackable terminal TB3.

In Figure 46 - Figure 49 some different connection options to TB7 and TB3 are shown.

---

**Figure 46**  Internal voltage supply of the safety module **SIB V**

**Figure 47**  External voltage supply of the safety module **SIB V**
Figure 48  Supply to External safety components <1.5A

Figure 49  Supply to External safety components >1.5 A
5.5.2 Entry protection

The SIB V module can be configured for the connection of entry protection with numerous safety output variants. This can be done without adding any extra components.

Entry protection can consist of:

- light barrier
- light curtain
- door/roller door with safety limit switch
- door/roller door with safety magnetic switch
- pressure mat
- zone detector

The safety outputs can be of the type:

- double NC (normally closed) relay contacts or safety switch contacts
- one NC and one NO (normally open) relay contact or safety switch contact
- double PNP transistor outputs
- one PNP transistor output and one NPN transistor output
- one PNP transistor output and an INVERTED PNP transistor output

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

Connection

Connection/configuration of the entry protection is done on a jackable terminal located on the top left inside wall of the cabinet.

- Equipment for area 1 is connected to X41
- Equipment for area 2 to X42.

Cable entry can easily be made through the two-piece cover.
The output signals are distributed from the jackable terminals on the entry protection to the *SIB V* module as set out in the example in Figure 51.

**Note!** Input A (24V) must be made at the same time or before input B (0V) in solutions according to Figure 56 in order to permit resetting of the safety circuit.

*Figure 50 Entry protection with relay outputs. The status shown with active protection.*
Figure 51  Entry protection with limit switch. The status shown with active protection.

*) DEPENDING ON BOARD TYPE, SEE ACTUAL SERVICE DIAGRAM
Figure 52  Entry protection with double PNP-outputs

*) DEPENDING ON BOARD TYPE,
SEE ACTUAL SERVICE DIAGRAM
Figure 53   Entry protection with one PNP-output and one NPN-output

*) DEPENDING ON BOARD TYPE, SEE ACTUAL SERVICE DIAGRAM
Figure 54  Entry protection with one PNP-output and one INVERTED PNP-output

*) DEPENDING ON BOARD TYPE, SEE ACTUAL SERVICE DIAGRAM
Figure 55 Entry protection with one NC and one NO-output. The status shown with active protection (relay or limit switch)

*) DEPENDING ON BOARD TYPE, SEE ACTUAL SERVICE DIAGRAM
Figure 56  Entry protection - principle for connection of a roller door
Resetting

The entry protection is connected to the safety inputs on the SIB V module.

These input circuits are doubled and supervised as well as protected against short circuiting or hardware failure if connection of the entry protection is carried out as shown in the example.

The input circuits are normally reset using a push-button, located outside of the risk zone, when the selected entry protection can be passed.

Automatic resetting can be used on protection where this is acceptable from a safety standpoint.

*) ONLY WHEN BOARD TYPE B3

Figur 57  Manual resetting of entry protection.
Testing

If more protected outputs are required than those available on the SIB V module, extra relays can be connected in parallel with the relays in the safety circuits on the SIB V module.

The relays must be approved for safety applications, with positive closing contacts. The outputs on the SIB V module are fed with 24V DC/0V DC and can be loaded with max 100 mA.

The operation of the relays can be tested using a NC contact connected to the resetting circuit for entry protection as set out in the examples in Figure 58 and Figure 59.

![Figure 58](image1.png)  
*Figure 58  Connection and testing of the extra safety relay for entry protection.  
Applies to safety module SIB-V, type 1/2.*

![Figure 59](image2.png)  
*Figure 59  Connection and testing of the extra safety relay for entry protection.  
Applies to safety module SIB-V, type 3.*

Resetting of the protected outputs on the SIB V module will fail if a fault occurs on any of the relays.
5.5.3 Limit switch for the service door

Interlocking of the service door can, depending on the station solution, be performed with manual or automatically resetting.

**Automatic resetting**

Automatic resetting is selected when the control cabinet is placed in the immediate vicinity of the service door so that the operator has a view of the programming area during the start of the production run.

In this case the limit switch circuits are connected directly to the control cabinet’s auto-stop-loops.

The auto-stop-loop is reset when:

1. the operator closes the door, for example, after program adjustment and
2. the control system is reset to production mode using:
   - the operating mode selector on the control cabinet.
   - motors in operation.

The limit switch should be approved
   - with double, positive closing and positive opening NC contacts.
Connection example

The circuit breaker is connected to the:

- jackable terminal X92, located on the top left inside wall of the cabinet.

Principle for connection of the limit switch in the safety system is shown in Figure 60.

*Figure 60  Service door with automatic resetting of the protection*
Manual resetting

Manual resetting must be used when the control cabinet’s placement means that the operator cannot be sure whether someone has passed through the service door after the operator has left the programming area and moved to the control cabinet to start the production run.

*In this case the SIB V* module is supplemented with a safety function that resets the auto-stop-loops once

- the door is closed and
- the safety functions are reset using a push-button placed on the outside of the programming area by the service door.

If anyone passes through the door, the operator is not allowed to switch to production mode before the safety function has been reset again.

Resetting and testing

The safety function consists of an option card, which is connected to the *SIB V* module. The safety circuit is doubled and supervised.

The input from the push-button is protected against short-circuiting as this must be both closed and opened in order for the safety circuits’ outputs to be reset.
Connection example

Limit switch and resetting push-button are connected to
- jackable terminals X92 and X91.

The connection principle for the function is shown in Figure 61.

*) DEPENDING ON BOARD TYPE,
SEE ACTUAL SERVICE DIAGRAM

Figure 61  Service door with the limit switch - manual resetting of the protection
5.5.4 Timer resetting protection

The timer resetting protection is used to prevent anyone remaining in the risk zone when the entry protection is reset and the ready for start of a new cycle signal is given to the control system.

This interlock can, for example, be designed as a time function or as a sensing function.

The offered timer resetting unit consists of

- an option card connected directly to the SIB V module as well as
- an activation push-button, which should be placed within respective risk zones.

Resetting and testing

The safety function consists of an option card, which is connected to the SIB V module. The safety circuit is doubled and supervised.

The input from the push-button is protected against short-circuiting as this must be both closed and opened in order for the safety circuits’ outputs to be reset.
Connection example

Connection of the timer resetting protection is done on a jackable terminal located on the top left inside wall of the cabinet.

- Equipment for area 1 is connected to X81
- Equipment for area 2 to X82.

Cable entry can easily be made through the two-piece cover.

The activation signal is distributed from the jackable terminals to the SIB V module as set out in the figure below.

*) DEPENDING ON BOARD TYPE, SEE ACTUAL SERVICE DIAGRAM

Figure 62 Activation push-button for the timer resetting unit
If some form of sensing unit is used instead of timer resetting protection, a safe output from this unit must be connected to the SIB V module as set out in the example in Figure 63.

Figure 63  Timer resetting protection with optional safety unit

The connected sensing unit should be designed to comply with category 4 in accordance with EN 954-1.
5.5.5 Movement/station indication for the positioner side

The main functions of the safety switches are

- to detect non-permitted movement on the positioner’s station switching unit.

Some signals are also used by the I/O system

- to indicate which station side is in position by the robot.

The limit switches are placed in the station switching unit.

Figure 64 Example of station indication on a positioner with a station switching unit and two stations.

Connection

This function is only included on SIB V module types 1 and 2.

Signals from limit switch on the positioner are pre-routed to a jackable terminal on the safety module.

The terminal can be connected directly to the SIB V module on output TB2. The signals are utilised by the safety circuits, which activate the control system’s operating loop.
Principle solutions for different positioner types are shown in Figure 65 and Figure 66.

Note! The input circuits on the safety switches are
- galvanically isolated from the other safety circuits on the SIB V-module and
- are fed from the positioner's positioner interface.

This must be considered when a possible supplement to the safety system is made so that safety functions are not bypassed due to mixed voltage supplies.

*Figure 65  Supervision of the positioner’s movement and station indication with a 2-station solution*
"NOTE!

Equipment used to monitor positioner movement and to indicate the station side (inputs A - D in the figures above), should be designed so it cannot switch on the safety inputs on the SIB V module in the event of a fault arising."

Resetting

The signals from the safety switch are connected to double supervised safety inputs on the SIB V module.

These input circuits are doubled and supervised as well as protected against short circuiting or hardware failure if connection is carried out as shown in the example.

Testing

The safety circuit is designed so that:

- the limit switch and the input circuits are checked and reset automatically with station switching before a new working cycle is started.
5.5.6 Station indication for the robot/conveyor

This function is used to
- supervise in which working area the robot is in during production operations.

![Diagram of station indication on the robot with two work stations.](image1)

Figure 67 Example station indication on the robot with two work stations.

When the limit switches are mounted on the base of the robot these are activated by a common cam rod.

The switch function results in:
- station indication
- a supervised service position, where the robot can be set, for example, for cleaning the tool. This area is permanently linked to the 0-position for the robot's axis 1 and permits a movement of ±7°.

![Diagram of service position for a robot with two work stations.](image2)

Figure 68 Example service position for a robot with two work stations.
If the function for an installation with the conveyor is used, the safety switches can instead be mounted on the conveyor’s carriage and are then actuated by individual cam rods. A service position between work stations is not permitted with this solution.

![Diagram of conveyor system](image)

*Figure 69  Example 3 Station indication on the conveyor for the robot with two work stations.*

Depending on the selected station solution, the switches can also be mounted on the base of the robot when a conveyor is included.
Connection

The switches are connected to jackable terminal X100, located on the top left inside wall of the cabinet.

Cable entry can easily be made through the two-piece cover.

The output signals from the switches are distributed from the jackable terminals to the *SIB V* module as set out in Figure 70.

![Figure 70 Stations supervision IRB/RTT with the limit switch](image)

Resetting and testing

The safety functions for station indication and service position are included as standard on the *SIB V* module type 3.

The safety circuit is doubled and supervised and protect against short-circuiting or hardware failure.

The safety circuit is designed so that

- the limit switch and the input circuits are checked and reset automatically with movement between station sides, or station side and the service position, before a new working cycle is started.
5.5.7 Indication for the home position/transport position

This function is used to

- to supervise that the robot, under production operations, is in a defined safety area when the selected station solution so demands.

Figure 71  Example home position for the robot with one work station

Figure 72  Example transport position for the robot.

Safety switches are mounted on the base of the robot. They are actuated by an adjustable cam rod that permits a movement of the robot’s axis 1 by ±20° in the safe position.

The area can be adjusted by 30° interval around the robot’s axis 1.
Connection

The switch is connected to

- the jackable terminal X111 located on the top left inside wall of the cabinet.

Cable entry can easily be made through the two-piece cover.

The output signals from the switches are distributed from the jackable terminals to the SIB V module as set out in Figure 73.

![Diagram showing connection and distribution](image)

Figure 73  Supervision of the home position/transport position with the limit switch

Resetting and testing

The safety function consists of an option card, which is connected to the SIB V module.

Note! This function only works with the SIB V module type 3.

The safety circuit is doubled and supervised and protects against short-circuiting or hardware failure.

The safety circuit is designed so that

- the limit switch and the input circuits are checked and reset automatically with movement to and from the home position/transport position before a new working cycle is started.
5.5.8 Activation unit

An activation unit is used when there is a need to activate the activate work station from the operator's area, for example, programming, fixture replacement, etc.

Activation is performed using a separate push-button, which is located inside the supervised area. Activation can only be done in manual operating mode.

- MANUAL REDUCED SPEED (<250 mm/s)
- MANUAL FULL SPEED 100%

The SIB V module type 3 is equipped with the input circuits for reception of the activation signal. This can be done without adding any extra components.

Resetting

The activation unit is connected to the supervised safety inputs on the SIB V module.

The input circuits are normally reset with

- a push-button that is located inside the entry protection and out of the reach from the outside of the activated entry protection.

The input from the push-button is protected against short-circuiting as this must be both closed and opened in order for the safety circuits' outputs to be reset.
Connection example

Connection of the activation push-button is done on a jackable terminal located on the top left inside wall of the cabinet.

- Equipment for area 1 is connected to X93
- Equipment for area 2 to X94.

Cable entry can easily be made through the two-piece cover.

The activation signals are distributed from the respective push-buttons via the jackable terminals to the SIB V module as set out in the example in Figure 74.

![Activation Unit - Programming from Operator Area Diagram](image)

*Figure 74 The activation push-button for programming from the operator’s area*
5.5.9 Operating loop, operating principles and connection possibilities

The SIB V module’s supervision circuits are connected to the control system’s operating loop with doubled and supervised safety outputs. Depending on the safety function these outputs are activated:

- operating loop’s auto stop or
- general stop level.

The operating loop is connected to the SIB V module on the jackable terminal TB1 according to Figure 75.

Figure 75 The operating loop’s connection to the safety system
The operating principle for the protection function’s activation of the auto stop and general stop level are shown in Figure 76 and Figure 77.

Figure 76  The safety function’s design for the safety module SIB-V type 1/2

Figure 77  The safety function’s design for the safety module SIB-V type 3
In addition to the SIB V-module’s safety functions it is possible to connect further external safety functions to the break-out points in the supervision circuits. This permits the station solution to be adapted to satisfy a customer’s wishes.

The connected safety function should be designed to comply with category 4 in accordance with EN 954-1.

In Figure 78 the break-out points are shown on the jackable terminals TB32 and TB34 for SIB V-module type 1/2 and some examples of how these can be used are also shown.

**Note!** The break-out points are normally strapped on delivery.

![Figure 78](image_url)  
*The break-out points for the operating loop safety module SIB-V type 1/2*

In Figure 79 the break-out points are shown on the jackable terminals TB32 and TB34 for SIB V-module type 3 and some examples of how these can be used are also shown.

![Figure 79](image_url)  
*The break-out points for the operating loop safety module SIB-V type 3*
Figure 80 illustrates connection examples of the protection between the programming area, for example, inner light beam (status shown with active protection) for safety module SIB-V type 1/2. Note! safety outputs for e.g. fixture interlocking are used!

**GUARD EQUIPM. e.g. LIGHT BEAM**  
**CAT. 4 ACC. TO EN 954-1**

**Figure 80  Examples of connecting the entry protection between the programming area.**
Figure 81 illustrates connection examples of entry protection between the operator area 1 and operator area 2; the status is shown with active protection, for safety module *SIB-V typ 3.*

Bypass passage is only permitted in operating mode MAN/ MAN FS.

Note! safety outputs for e.g. fixture interlocking are used!

*Figure 81  Examples of connecting entry protection between operator area 1 and operator area 2.*
5.5.10 Safety outputs for customer connections

The SIB V module contains a number of free safety outputs that can be used to safely control and supervise your own equipment.

Jackable terminal TB4: Acknowledgement outputs activated process/resetting entry protection.

- The outputs can be utilised for signals, for example, PLC and may be loaded with max. 24V DC, 50mA.

Jackable terminal TB5: These outputs can be used, for example, in the design of safety circuits for fixture control.

- Each output can be loaded with a maximum of 24V DC, 2A.

In Figure 82 - Figure 86 some examples of how the outputs, as set out above, can be used for different station solutions are shown.

Note! Some applications demand that the signal interface is supplemented with the option “extended emergency stop”.

Figure 82 Safety outputs for acknowledgement of entry protection resetting, max. 50 mA

Figure 83 Safety outputs for safety module SIB-V type 1/2, max. 2 A

*) ONLY WHEN BOARD TYPE B2
Control Cabinet

Interface for operator communications

Figure 84  Safety outputs for safety module SIB-V type 3, max. 2 A

Figure 85  Example of the fixture interlock principle with safety module SIB-V type 1
Figure 86  Example of the fixture interlock principle with safety module SIB-V type 3
### 5.6 Reservdelsförteckning/Spare Parts List

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppgör typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehålls.

_Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list._

_Rights to reserved to alter specifications without notice._

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_Kable harness_
Control Cabinet

Interface for operator communications
Control Cabinet

Interface for operator communications
5.7 Operator communication for positioner types A/L/S

There is a modular based interface fitted to the right of the cabinet’s rear panel for operator communications and safety equipment.

The interface includes:

- a circuit card for safety supervision
- a cabling harness prepared for connection of external safety components.

The interface can be used for supervision of one or two work stations without further modification depending on the selected station solution.

Figure 87

1 Circuit card for safety supervision SIB
Connections

External safety components are connected to the jackable terminal blocks fitted internally by the two-piece cable glands on the left-hand side of the top cabinet. Any included standard components are connected according to Figure 88.

Power supply

The safety equipment is fed with 24V DC from an internal supply unit (24V I/O). The supply to external safety components is fuse protected internally on the circuit card for safety supervision and may be loaded with max. 1.5 A continuously.
5.7.1 OPERATION and CONNECTIONS

Emergency stop

1 Motors on
2 Emergency stop
3 Operating mode selector
4 Running time meter

All emergency stop buttons included in the system are as standard connected in series and directly affect the control system's emergency stop loop.

Included on external safety equipment, available in the standard range, are:
- an emergency stop button on the operator’s panel
- an emergency stop button on the equipment cabinet for the roller door.

The "Extended emergency stop function" option gives the possibility of supplementing equipment with components for, e.g. gate interlocking via the emergency stop of fixtures.

Optional redundant auxiliary relays can then be easily connected for this purpose.
The following two figures show the theory behind how the emergency stop loop is used to control the connected equipment.

For detailed information about the design of the emergency stop loop refer to the "The robot's User's Manual"
5.7.2 Interlocks

Operating stop loop

The figure below shows the theory behind how the operating stop loop is used to control connected equipment.

For detailed information about the design of the operating stop loop refer to the "The robot’s User’s Manual"

Two channel break up of the operating stop loops takes place using the circuit card for safety supervision and the gate switch.

The safety functions on the circuit card are connected to the:

- "GENERAL STOP"

The gate switch is connected to the:

- "AUTO STOP".

In order to run the robot and positioner in the "AUTO" operating mode requires:

- all safety loops to be intact and
- that the system has been started (MOTORS_ON).

Operation of the positioner’s station switching unit and work station in the supervised area is not permitted in the MAN FS (Mode MANUAL - Full speed) operating mode.

Figure 91 Operating stop loop
Circuit board for supervision

The circuit card includes functions for the supervision of:
- entry protection (light barriers, roller door)
- station mode (limit switch)
- activated positioner axes (engaging and disengaging the motors)

Figur 92  Safety module with option card.

<table>
<thead>
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<tr>
<td>1</td>
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<td>2</td>
<td>Option card</td>
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<td>3</td>
<td>Connection</td>
</tr>
<tr>
<td>4</td>
<td>Enclosure</td>
</tr>
</tbody>
</table>
The functions are built up of safety components, where the function and status of these are supervised via the CAN bus by the control system.

![Module for safety surveillance.](image)

**Figure 93  Module for safety surveillance.**

<p>| | | | | | |</p>
<table>
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<td>External connections</td>
<td>8</td>
<td>CAN-processor</td>
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</tbody>
</table>

The safety functions can be expanded using different option cards connected to the circuit card depending on the selected station solution.

### 5.8 Connection instructions

#### 5.8.1 Connection of the supply voltage

*The SIB V* module safety circuits are fed with a 24V DC voltage.

- The supply is connected to the jackable terminal TB7.

If necessary, the 0 V level on the supply voltage can be assured by

- connecting a potential equalising conductor to the earth potential in the environment where the *SIB V* module is located.
Normally the supply is connected to the control cabinet’s voltage supply to the I/O system (24V I/O, 0V I/O), but the safety system can also be connected to its own power supply.

The SIB V module’s CAN bus system is galvanically isolated from the other circuits and receives its supply via the control system’s CAN-bus loop on the jackable terminal TB6.

The outgoing voltage supply to the connected safety components is fuse protected internally on the SIB V module and may be loaded with max 1.5 A continuously.

The voltage can be accessed on the jackable terminal TB3.

In Figure 94 - Figure 97 some different connection options to TB7 and TB3 are shown.
Figure 96  Supply to External safety components <1.5A

Figure 97  Supply to External safety components >1.5 A
5.8.2 Entry protection

The SIB V module can be configured for the connection of entry protection with numerous safety output variants. This can be done without adding any extra components.

Entry protection can consist of:
- light barrier
- light curtain
- door/roller door with safety limit switch
- door/roller door with safety magnetic switch
- pressure mat
- zone detector

The safety outputs can be of the type:
- double NC (normally closed) relay contacts or safety switch contacts
- one NC and one NO (normally open) relay contact or safety switch contact
- double PNP transistor outputs
- one PNP transistor output and one NPN transistor output
- one PNP transistor output and an INVERTED PNP transistor output

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

Connection

Connection/configuration of the entry protection is done on a jackable terminal located on the top left inside wall of the cabinet.
- Equipment for area 1 is connected to X41
- Equipment for area 2 to X42.

Cable entry can easily be made through the two-piece cover.
The output signals are distributed from the jackable terminals on the entry protection to the *SIB V* module as set out in the example in Figure 99.

**Note!** Input A (24V) must be made at the same time or before input B (0V) in solutions according to Figure 104 in order to permit resetting of the safety circuit.

---

**Figure 98** Entry protection with relay outputs. The status shown with active protection.
Figure 99  Entry protection with limit switch. The status shown with active protection.
Figure 100  Entry protection with double PNP-outputs

*) DEPENDING ON BOARD TYPE, SEE ACTUAL SERVICE DIAGRAM
**Figure 101**  Entry protection with one PNP-output and one NPN-output
Figure 102  Entry protection with one PNP-output and one INVERTED PNP-output

*) DEPENDING ON BOARD TYPE, SEE ACTUAL SERVICE DIAGRAM
Figure 103 Entry protection with one NC and one NO-output. The status shown with active protection
(relay or limit switch)

*) DEPENDING ON BOARD TYPE,
SEE ACTUAL SERVICE DIAGRAM
Figure 104  Entry protection - principle for connection of a roller door
Resetting

The entry protection is connected to the safety inputs on the SIB V module.

These input circuits are doubled and supervised as well as protected against short circuiting or hardware failure if connection of the entry protection is carried out as shown in the example.

The input circuits are normally reset using a push-button, located outside of the risk zone, when the selected entry protection can be passed.

Automatic resetting can be used on protection where this is acceptable from a safety standpoint.

Figur 105  Manual resetting of entry protection.
Testing
If more protected outputs are required than those available on the SIB V module, extra relays can be connected in parallel with the relays in the safety circuits on the SIB V module.

The relays must be approved for safety applications, with positive closing contacts.

The outputs on the SIB V module are fed with 24V DC/0V DC and can be loaded with max 100 mA.

The operation of the relays can be tested using a NC contact connected to the resetting circuit for entry protection as set out in the examples in Figure 106 and Figure 107.

Figure 106  Connection and testing of the extra safety relay for entry protection.
Applies to safety module SIB-V, type 1/2.

Figure 107  Connection and testing of the extra safety relay for entry protection.
Applies to safety module SIB-V, type 3.

Resetting of the protected outputs on the SIB V module will fail if a fault occurs on any of the relays.
5.8.3 Limit switch for the service door

Interlocking of the service door can, depending on the station solution, be performed with manual or automatically resetting.

Automatic resetting

Automatic resetting is selected when the control cabinet is placed in the immediate vicinity of the service door so that the operator has a view of the programming area during the start of the production run.

In this case the limit switch circuits are connected directly to the control cabinet’s auto-stop-loops.

The auto-stop-loop is reset when:

1. the operator closes the door, for example, after program adjustment and
2. the control system is reset to production mode using:
   - the operating mode selector on the control cabinet.
   - motors in operation.

The limit switch should be approved
   - with double, positive closing and positive opening NC contacts.
Connection example

The circuit breaker is connected to the:

- jackable terminal X92, located on the top left inside wall of the cabinet.

Principle for connection of the limit switch in the safety system is shown in Figure 108.

Figure 108  Service door with automatic resetting of the protection
Manual resetting

Manual resetting must be used when the control cabinet’s placement means that the operator cannot be sure whether someone has passed through the service door after the operator has left the programming area and moved to the control cabinet to start the production run. 

In this case the SIB V module is supplemented with a safety function that resets the auto-stop-loops once
- the door is closed and
- the safety functions are reset using a push-button placed on the outside of the programming area by the service door.

If anyone passes through the door, the operator is not allowed to switch to production mode before the safety function has been reset again.

Resetting and testing

The safety function consists of an option card, which is connected to the SIB V module. The safety circuit is doubled and supervised.

The input from the push-button is protected against short-circuiting as this must be both closed and opened in order for the safety circuits’ outputs to be reset.
Connection example

Limit switch and resetting push-button are connected to
- jackable terminals X92 and X91.

The connection principle for the function is shown in Figure 109.

*) DEPENDING ON BOARD TYPE,
SEE ACTUAL SERVICE DIAGRAM

Figure 109  Service door with the limit switch - manual resetting of the protection
5.8.4 Timer resetting protection

The timer resetting protection is used to prevent anyone remaining in the risk zone when the entry protection is reset and the ready for start of a new cycle signal is given to the control system.

This interlock can, for example, be designed as a time function or as a sensing function.

The offered timer resetting unit consists of

- an option card connected directly to the SIB V module as well as
- an activation push-button, which should be placed within respective risk zones.

Resetting and testing

The safety function consists of an option card, which is connected to the SIB V module. The safety circuit is doubled and supervised.

The input from the push-button is protected against short-circuiting as this must be both closed and opened in order for the safety circuits’ outputs to be reset.
Connection example

Connection of the timer resetting protection is done on a jackable terminal located on the top left inside wall of the cabinet.

- Equipment for area 1 is connected to X81
- Equipment for area 2 to X82.

Cable entry can easily be made through the two-piece cover.

The activation signal is distributed from the jackable terminals to the SIB V module as set out in the figure below.

*DEPENDING ON BOARD TYPE, SEE ACTUAL SERVICE DIAGRAM*

Figure 110 Activation push-button for the timer resetting unit
If some form of sensing unit is used instead of timer resetting protection, a safe output from this unit must be connected to the *SIB V* module as set out in the example in Figure 111.

**RESET PROTECTION - SAFETY DEVICE e.g. LIGHT CURTAIN CAT. 4 ACC. TO EN 954-1**

*Fig. 111 Timer resetting protection with optional safety unit*

The connected sensing unit should be designed to comply with category 4 in accordance with EN 954-1.
5.8.5 Movement/station indication for the positioner side

The main functions of the safety switches are

- to detect non-permitted movement on the positioner’s station switching unit.

Some signals are also used by the I/O system

- to indicate which station side is in position by the robot.

The limit switches are placed in the station switching unit.

Figure 112 Example of station indication on a positioner with a station switching unit and two stations.

Connection

This function is only included on SIB V module types 1 and 2.

Signals from limit switch on the positioner are pre-routed to a jackable terminal on the safety module.

The terminal can be connected directly to the SIB V module on output TB2. The signals are utilised by the safety circuits, which activate the control system’s operating loop.
Principle solutions for different positioner types are shown in Figure 113 and Figure 114.

Note! The input circuits on the safety switches are
- galvanically isolated from the other safety circuits on the SIB V-module and
- are fed from the positioner's positioner interface.

This must be considered when a possible supplement to the safety system is made so that safety functions are not bypassed due to mixed voltage supplies.

*Figure 113  Supervision of the positioner's movement and station indication with a 2-station solution*
"NOTE!

Equipment used to monitor positioner movement and to indicate the station side (inputs A - D in the figures above), should be designed so it cannot switch on the safety inputs on the SIB V module in the event of a fault arising."

**Resetting**

The signals from the safety switch are connected to double supervised safety inputs on the *SIB V* module.

These input circuits are doubled and supervised as well as protected against short circuiting or hardware failure if connection is carried out as shown in the example.

**Testing**

The safety circuit is designed so that:

- the limit switch and the input circuits are checked and reset automatically with station switching before a new working cycle is started.

*Figure 114  Supervision of the positioner’s movement and station indication with a 3/4-station solution*
5.8.6 Station indication for the robot/conveyor

This function is used to

- supervise in which working area the robot is in during production operations.

When the limit switches are mounted on the base of the robot these are activated by a common cam rod.

The switch function results in:

- station indication

- a supervised service position, where the robot can be set, for example, for cleaning the tool. This area is permanently linked to the 0-position for the robot’s axis 1 and permits a movement of ±7°.
If the function for an installation with the conveyor is used, the safety switches can instead be mounted on the conveyor’s carriage and are then actuated by individual cam rods. A service position between work stations is not permitted with this solution.

*Figure 117  Example 3 Station indication on the conveyor for the robot with two work stations.*

Depending on the selected station solution, the switches can also be mounted on the base of the robot when a conveyor is included.
Connection

The switches are connected to jackable terminal X100, located on the top left inside wall of the cabinet.

Cable entry can easily be made through the two-piece cover.

The output signals from the switches are distributed from the jackable terminals to the SIB V module as set out in Figure 118.

![Diagram of Station Indication with Service Position](image)

Figure 118  Stations supervision IRB/RTT with the limit switch

Resetting and testing

The safety functions for station indication and service position are included as standard on the SIB V module type 3.

The safety circuit is doubled and supervised and protect against short-circuiting or hardware failure.

The safety circuit is designed so that

- the limit switch and the input circuits are checked and reset automatically with movement between station sides, or station side and the service position, before a new working cycle is started.
5.8.7 Indication for the home position/transport position

This function is used to

- to supervise that the robot, under production operations, is in a defined safety area when the selected station solution so demands.

Figure 119  Example home position for the robot with one work station

Safety switches are mounted on the base of the robot. They are actuated by an adjustable cam rod that permits a movement of the robot’s axis 1 by ±20° in the safe position.

The area can be adjusted by 30° interval around the robot’s axis 1.

Figure 120  Example transport position for the robot.
Connection

The switch is connected to
- the jackable terminal X111 located on the top left inside wall of the cabinet.

Cable entry can easily be made through the two-piece cover.

The output signals from the switches are distributed from the jackable terminals to the SIB V module as set out in Figure 121.

![Diagram](image)

**Figure 121  Supervision of the home position/transport position with the limit switch**

**Resetting and testing**

The safety function consists of an option card, which is connected to the SIB V module.

**Note!** This function only works with the SIB V module type 3.

The safety circuit is doubled and supervised and protects against short-circuiting or hardware failure.

The safety circuit is designed so that
- the limit switch and the input circuits are checked and reset automatically with movement to and from the home position/transport position before a new working cycle is started.
5.8.8 Activation unit

An activation unit is used when there is a need to activate the activate work station from the operator's area, for example, programming, fixture replacement, etc.

Activation is performed using a separate push-button, which is located inside the supervised area. Activation can only be done in manual operating mode.

- MANUAL REDUCED SPEED (<250 mm/s)
- MANUAL FULL SPEED 100%

The SIB V module type 3 is equipped with the input circuits for reception of the activation signal. This can be done without adding any extra components.

Resetting

The activation unit is connected to the supervised safety inputs on the SIB V module.

The input circuits are normally reset with

- a push-button that is located inside the entry protection and out of the reach from the outside of the activated entry protection.

The input from the push-button is protected against short-circuiting as this must be both closed and opened in order for the safety circuits' outputs to be reset.
**Connection example**

Connection of the activation push-button is done on a jackable terminal located on the top left inside wall of the cabinet.

- Equipment for area 1 is connected to X93
- Equipment for area 2 to X94.

Cable entry can easily be made through the two-piece cover.

The activation signals are distributed from the respective push-buttons via the jackable terminals to the *SIB V* module as set out in the example in Figure 122.

*Figure 122  The activation push-button for programming from the operator’s area*
5.8.9 Operating loop, operating principles and connection possibilities

The SIB V module’s supervision circuits are connected to the control system’s operating loop with doubled and supervised safety outputs.

Depending on the safety function these outputs are activated:

- operating loop’s auto stop or
- general stop level.

The operating loop is connected to the SIB V module on the jackable terminal TB1 according to Figure 123.

![Figure 123 The operating loop’s connection to the safety system](image-url)
The operating principle for the protection function’s activation of the auto stop and general stop level are shown in Figure 124 and Figure 125.

Figure 124  The safety function’s design for the safety module SIB-V type 1/2

Figure 125  The safety function’s design for the safety module SIB-V type 3
In addition to the SIB V-module’s safety functions it is possible to connect further external safety functions to the break-out points in the supervision circuits. This permits the station solution to be adapted to satisfy a customer’s wishes.

The connected safety function should be designed to comply with category 4 in accordance with EN 954-1.

In Figure 126 the break-out points are shown on the jackable terminals TB32 and TB34 for SIB V module type 1/2 and some examples of how these can be used are also shown.

**Note!** The break-out points are normally strapped on delivery.

![Figure 126](image)

In Figure 127 the break-out points are shown on the jackable terminals TB32 and TB34 for SIB V-module type 3 and some examples of how these can be used are also shown.

![Figure 127](image)
Figure 128 illustrates connection examples of the protection between the programming area, for example, inner light beam (status shown with active protection) for safety module SIB-V type 1/2.
Note! safety outputs for e.g. fixture interlocking are used!

**GUARD EQUIPM. e.g. LIGHT BEAM**
**CAT. 4 ACC. TO EN 954-1**

![Diagram showing connection examples of entry protection between the programming area.](image)

*Figure 128  Examples of connecting the entry protection between the programming area.*
Figure 129 illustrates connection examples of entry protection between the operator area 1 and operator area 2; the status is shown with active protection, for safety module SIB-V typ 3.

Bypass passage is only permitted in operating mode MAN/ MAN FS.

Note! safety outputs for e.g. fixture interlocking are used!

Figure 129  Examples of connecting entry protection between operator area 1 and operator area 2.
5.8.10 Safety outputs for customer connections

The SIB V module contains a number of free safety outputs that can be used to safely control and supervise your own equipment.

**Jackable terminal TB4**: Acknowledgement outputs activated process/resetting entry protection.

- The outputs can be utilised for signals, for example, PLC and may be loaded with max. 24V DC, **50mA**.

**Jackable terminal TB5**: These outputs can be used, for example, in the design of safety circuits for fixture control.

- Each output can be loaded with a maximum of 24V DC, 2A.

In Figure 130 - Figure 134 some examples of how the outputs, as set out above, can be used for different station solutions are shown.

**Note!** Some applications demand that the signal interface is supplemented with the option “extended emergency stop”.

![Diagram](image1)

*Figure 130  Safety outputs for acknowledgement of entry protection resetting, max. 50 mA*

![Diagram](image2)

*Figure 131  Safety outputs for safety module SIB-V type 1/2, max. 2 A*

*) ONLY WHEN BOARD TYPE B2
Figure 132  Safety outputs for safety module **SIB-V type 3**, max. 2 A

Figure 133  Example of the fixture interlock principle with safety module **SIB-V type 1**
Figure 134  Example of the fixture interlock principle with safety module SIB-V type 3
5.9 **Spare Parts List**

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig upple typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehålles.

*Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.*

*Rights to reserved to alter specifications without notice.*
### Control Cabinet

**Interface for operator communications**

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Control Cabinet

Interface for operator communications

[Diagram of control cabinet with labels 11, 15, 17, 18, 20, 41]
Control Cabinet

Interface for operator communications
5.10 No safety equipment

On installations without safety equipment the interface is replaced by an assembly plate for operator communications. All requisite jumper settings, etc for internal cabling included in the top cabinet are fitted on the assembly plate.

The assembly plate is fitted on the right-hand side, inside the top cabinet and can be used as spare space for other customer specific equipment.

5.10.1 Operator communication

A connection cable with an interface to operator communication is supplied. The interface is equipped the same irrespective of the type of positioner.

Free space on the assembly plate can be used, for example, to install customer specific equipment.

1 Power supply (A203-TB7)
2 Jumper device emergency stop (Fitted in socket X104 on the left of the cabinet)
3 Jumper device operating stop chain (A203-TB1)
4 Connection cabling for the Operator's panel

Power supply
The following voltages are available on the jackable terminal A203-TB7:

- 24V DC (24V I/O)
5.10.2 OPERATION and CONNECTIONS

Emergency stop

1 Motors on
2 Emergency stop
3 Operating mode selector
4 Running time meter

All emergency stop buttons included in the system are as standard connected in series and directly affect the control system’s emergency stop loop.

Included on external safety equipment, available in the standard range, are:

- an emergency stop button on the operator’s panel
- an emergency stop button on the equipment cabinet for the roller door.

The "Extended emergency stop function" option gives the possibility of supplementing equipment with components for, e.g. gate interlocking via the emergency stop of fixtures.

Optional redundant auxiliary relays can then be easily connected for this purpose.
Figure 135 and Figure 136 below show the theory behind how the emergency stop loop is used to control connected equipment.

For detailed information about the design of the emergency stop loop refer to the "The robot’s User’s Manual".
5.10.3 Interlocks

Operating stop loop

Figure 137 shows below the theory behind how the operating stop loop is used to control connected equipment.

For detailed information about the design of the operating stop loop refer to the "The robot's User's Manual"

The following voltages are available on the jackable terminal A203-TB1:

- Auto stop
- General stop
5.11 **Reservdelsförteckning/Spare Parts List**

Reservdelar beställs genom ABB Automation Technology Products AB. Vid beställning var vänlig uppgi typ och tillverkningsnummer samt benämningar och beställningsnummer enligt reservdelsförteckningen.

Rätt till ändring av specifikationer utan aviserings förbehålls.

*Spare parts are to be ordered from ABB Automation Technology Products AB. Kindly indicate type of unit, serial number, denominations and ordering number according to the spare parts list.*

*Rights to reserved to alter specifications without notice.*
### Interface for operator communications

<table>
<thead>
<tr>
<th>Positions-nummer</th>
<th>Antal Quantity</th>
<th>Beställningsnummer</th>
<th>Benämning</th>
<th>Denomination</th>
<th>Anmärkningar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position number</td>
<td></td>
<td>Ordering number</td>
<td></td>
<td></td>
<td>Remarks</td>
</tr>
<tr>
<td>11</td>
<td>504 774-880</td>
<td>Byblingsdon, OP.COM</td>
<td>Jumper OPCOM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>504 949-880</td>
<td>Plåt, kompl.</td>
<td>Plate, compl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>504 979-880</td>
<td>Kabelstam</td>
<td>Cable harness</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Control Cabinet

Interface for operator communications
6 Technical Data

Also refer to the Product Manual for the robot

Weight
280kg (without welding power source)
380kg (with welding power source)
Additional 20kg top cabinet 820 mm
Additional 20kg pivot frame
Additional 30kg welding power source with transformer

Dimensions (WxHxD), top cabinet 820mm in brackets
800x1570(1770)x623mm (without welding power source)
800x2010(2210)x623mm (with welding power source)

Environmental demands
Transport temperature
Min –25°C
Max +42°C
Max +70°C

Operating temperature (ambient)
Min +5°C
Max +45°C

Relative humidity
Max 95% at constant temperature

Electrical data (incl. control cabinet):
Mains voltage 3x200 – 600V AC, +10%,-15%
Frequency 48.5 – 61.Hz
Fuse protection 16A slow burn (400V)

The following applies for the control cabinet with welding power source LRB400:

<table>
<thead>
<tr>
<th>Nätspänning/ Mains voltage (V)</th>
<th>Säkring (Trög) / Fuse (Slow-blow) 2) (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>80</td>
</tr>
<tr>
<td>220</td>
<td>80</td>
</tr>
<tr>
<td>400</td>
<td>32 ( 35 )</td>
</tr>
<tr>
<td>440</td>
<td>40 ( 50 )</td>
</tr>
<tr>
<td>475</td>
<td>40 ( 35 )</td>
</tr>
<tr>
<td>500</td>
<td>32 ( 35 )</td>
</tr>
<tr>
<td>525</td>
<td>32 ( 35 )</td>
</tr>
<tr>
<td>600</td>
<td>32 ( 35 )</td>
</tr>
<tr>
<td>Description</td>
<td>Values</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>1) 400V without power source transformer.</td>
<td></td>
</tr>
<tr>
<td>2) Fuses in brackets can be used if the recommended</td>
<td></td>
</tr>
<tr>
<td>fuse is not available.</td>
<td></td>
</tr>
<tr>
<td>Rated power (without/with ext. axes)</td>
<td>4.5/7.8kVA without welding power source</td>
</tr>
<tr>
<td></td>
<td>17.5/20.8kVA with welding power source</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP54</td>
</tr>
<tr>
<td></td>
<td>IP21 welding power source LRB400</td>
</tr>
</tbody>
</table>
7 Installation and set-up

This work may only be carried out by persons trained in the use of the complete equipment and who are aware of the special risks involved with these different parts.

7.1 Transport and unpacking

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

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

7.2 Lifting instructions

The control cabinet is fitted with lifting eyes to allow easy lifting.

Lifting of the manipulator may only:

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

Do not walk under a suspended load!
7.3 Mechanical installation

7.3.1 Function pack and FlexArc

The base of the control cabinet has fastening holes for secure mounting to the floor.

- NOTE! Install the control cabinet according to the instructions in the *Robot’s Product Manual*.

7.4 Connections

7.4.1 Mains connection

*The main connection must be carried out by qualified personnel.*

Data for the supply voltage, fuse protection, etc. can be found in chapter “Technical Data” på sidan 279.

**Function pack**

- Install the control cabinet according to the instructions in the *Robot’s Product Manual*.
- The mains voltage is connected to the control cabinet's main power switch as set out in the diagram.

**FlexArc**

In weld cells of the type FlexArc the connection cable is routed to a 63A IEC inlet, placed on the cell wall for easy mains connection.

7.5 Check before start up

NOTE! Keep the doors to the control cabinet and top cabinet closed to prevent dust and dirt from entering.

Before switching on the voltage check that the following has been done:

- Check that all component equipment is connected correctly.
- The main voltage is according to the identification plate on the control cabinet.
- The programming unit is connected.
- If external safety equipment is used. Check that it is installed:
  - **The operating mode selector** on the control cabinet's control panel is in the
    - MANUAL position.
7.6 Start up

All requisite system software is installed on delivery.

- Switch on the main power switch on the control cabinet and the main power switch on the welding power source if fitted. The main power switch on the control cabinet normally controls the power supply to all component modules in the cabinet.

**Note! Some power sources supply the process control card with an external reference voltage, which is why some parts of the control cabinet can be voltage fed even when the main power switch is in the "OFF" position.**

- The robot makes a self-test on the hardware and software. This test takes about 1 minute.
- Wait until the message “Welcome to....” is shown on the programming unit’s display.

The system is now ready for use.
8 Maintenance

The wrist strap, provided in the cabinet, must be worn when handling the circuit cards and other electronics in the control cabinet to prevent ESD damage.

- The control system is fully enclosed and the electronics are thereby protected in a normal workshop environment. In very dusty and powdery environments the cabinet should, however, be checked regularly internally. If necessary use a vacuum cleaner.
- Clean any filters according to the instructions in the robot's Product Manual as well as in the power source's Product Manual.
- Check that the cables/connectors are not damaged. Damaged components must be replaced immediately.

If safety equipment is included:

- this should be tested preferably at the start of each shift.