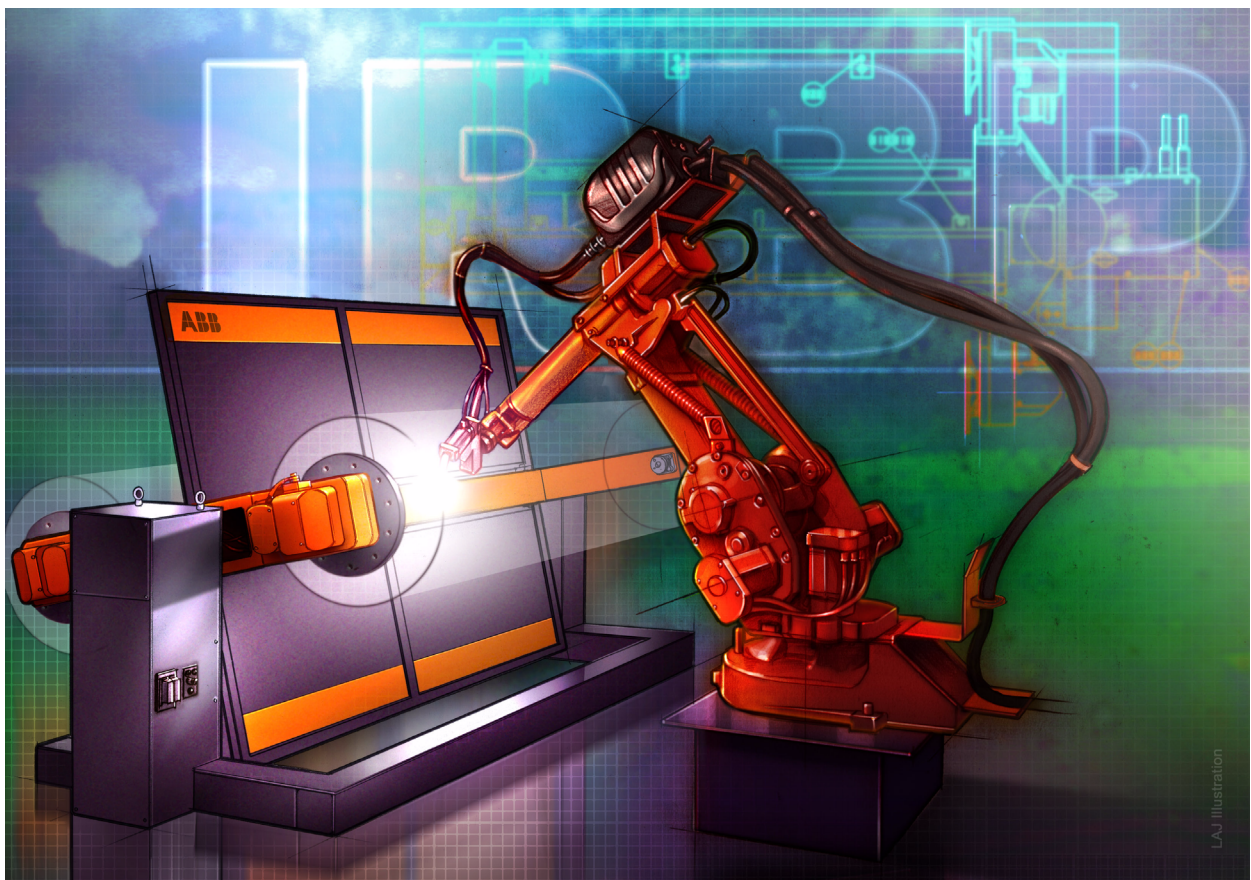


Product Manual

Welding Equipment A314E/A316E/A324E-L

IRC5 Design 2006

3HEA 802 347-002, Rev.- 2006-03



ABB

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Welding
Equipment
IRC5, Design
2006

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1 Introduction

1.1 General

About this manual

This manual provides information on:

- Welding equipment, including control equipment.
 - Mechanical/electrical installation.
 - Operation.
 - Repair/maintenance.
-

Operation

This manual is intended for use in conjunction with:

- Installation
 - Operation
 - Maintenance
 - Repairs
 - Training
-

Who should read this manual?

This manual is intended for:

- Operators
 - Installation personnel
 - Repair and maintenance personnel
-

Basic knowledge

Readers of this manual must be...

- familiar with industrial robots and the relevant terminology
- Familiar with the equipment.
- Skilled in mechanical and electrical installation/maintenance/repairs.

Introduction

Definitions

Reference documents

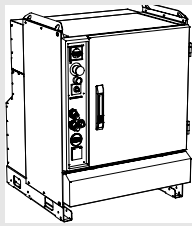

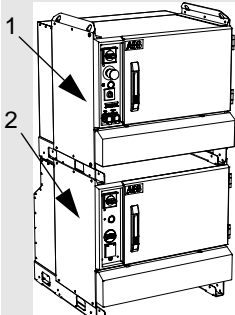

Document	Described in:
Robotics manuals	
System manual for arc welding robot systems	

1.2 Definitions

ABB IRC5 Controller

Control system **ABB IRC5 Controller** is available in two basic versions:

- Single cabinet and dual cabinet.

Designation	Description	Illustration
SCC, Single cabinet	On the single cabinet version, all components are located in a single cabinet.	
	In this manual, the single cabinet version is referred to as SCC.	<i>Figure 1 SCC</i>
DCC, Dual cabinet	On the dual cabinet version, components are located in two modules: 1. A control module 2. A drive module	
	In this manual, the dual cabinet version is referred to as DCC.	<i>Figure 2 DCC</i>

2 Safety instructions

A robot is quick and powerful. An interruption in service or a stop can be followed by quick and hazardous movement. Even if the robot's motion pattern is pre-determined, an external signal can influence the motion sequence and cause an unexpected movement. It is therefore important that all safety instructions are observed when entering a safety supervised area.

2.1 Description

Safety instructions can be found under tab 1 in the AW system manual for all steps that involve risk for personal injury or material damage. In addition, they are printed out by the instruction for each step.

General warnings where the intention is to avoid problems are only indicated at the pertinent instruction.



All personnel working with the welding robot system must have a full understanding of the applicable safety instructions.

Reference documents

Document	Described in:
Related safety instructions.	AW System manual, chapter introduction and safety.








Safety instructions

Warning symbols (signals)

2.2 Warning symbols (signals)

Symbol explanations

The different types of warnings are indicated in the following chapters according to the table below:

Symbol	Designation	Meaning
	Danger	Warning that serious or fatal personal injury and/or serious damage to the product will occur if the instructions are not followed.
	Warning!	Warns of the risk of personal injury or serious damage to the product. Always follow the instructions that accompany this symbol.
	Electric shock	Warns of possible electric shock that can cause serious or fatal personal injury. Always follow the instructions that accompany this symbol.
	Caution	Draws your attention to the fact that damage to the product may occur if an action is not performed or is performed incorrectly.
	Static electricity, ESD	The ESD symbol indicates a risk of static electricity that may cause serious damage to the product.
	Note:	Information about important parts.
	Tips	This symbol refers to an instruction providing further information on a particular topic.

The safety information in the document must not be considered as a guarantee from ABB that the equipment cannot cause accidents or injury, even if all the safety instructions have been observed.

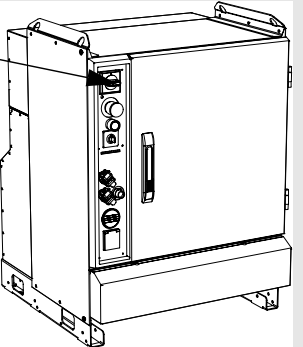
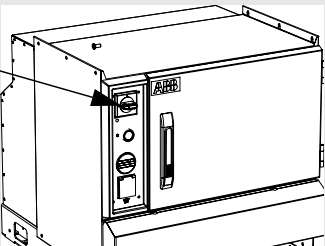
2.2.1 DANGER – Ensure that the main power switch is turned off.

Description

Work with high voltage installations entails a potentially lethal hazard. Persons subjected to high voltages can suffer heart failure, burns or other serious injuries. To avoid such injuries, never begin a job without first eliminating the risks to safety. How to eliminate safety risks is described below.

Elimination

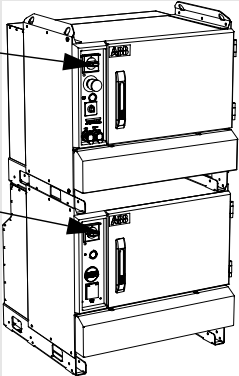
**SCC
(single cabinet)**

	Action	Info/Illustration
1.	SCC (single cabinet) Turn off the main power switch on the SCC (single cabinet). The main power switch turns off incoming power to the cabinet and operating power to all included drive modules.	1 
2.	DM (drive module) Turn off the main power switch (operating switch) on the respective drive modules to switch off incoming power.	2 

Safety instructions

DANGER – Ensure that the main power switch is turned off.

DCC (dual cabinet)

	Action	Info/Illustration
1.	<p>CM (control module)</p> <p>Turn off the main power switch at the control module.</p> <p>The main power switch on the control module turns off operating power to all included drive modules.</p>	 <p>All power is disconnected when the main power switch on the drive module (DM1) is turned off.</p>
2.	<p>DM (drive module)</p> <p>Turn off the main power switch (operating switch) on the respective drive modules to switch off incoming power.</p>	

2.2.2 WARNING – The unit is sensitive to ESD.

Description

ESD (Electrostatic Discharge) is the transfer of electrostatic charges between two objects with varying charges, either through direct contact or through an electrical field.

The discharge contains very little energy and is therefore not hazardous to humans, however, electronics can be damaged by the high voltages.

Elimination

	Action	Info/Illustration
1.	Use an ESD bracelet.	The bracelet must be regularly tested to ensure that it is undamaged and functioning properly.
2.	Use an ESD-protected floor mat.	The mat must be grounded through a voltage regulating resistor.
3.	Use an ESD-protected table mat.	The mat shall produce a controlled discharge of static electricity and must be grounded.

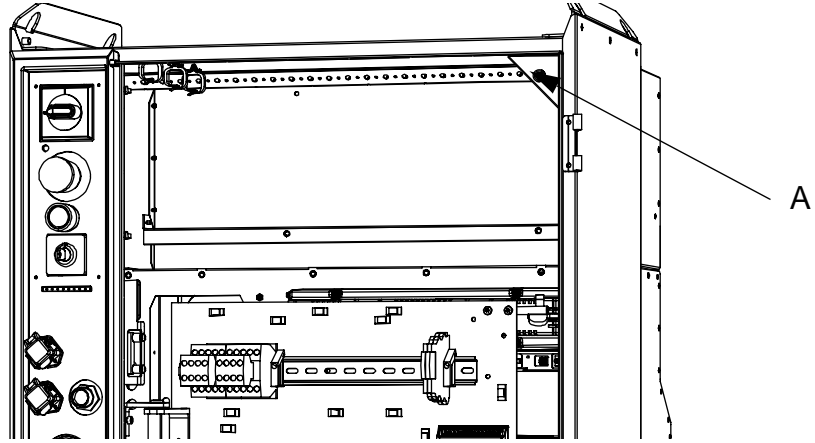
Safety instructions

WARNING – The unit is sensitive to ESD.

Location of attachment point for ESD bracelet

Single cabinet

Location in the SCC (single cabinet) is shown in the figure below.



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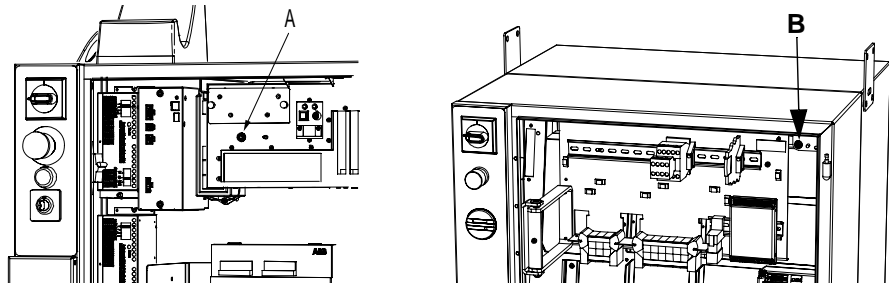
Figure 3 Location of attachment point for ESD bracelet

Pos.	Description
A	Attachment point for ESD bracelet in the SCC (single cabinet)

The attachment point (A/B) for the ESD bracelet is located on the computer unit in the SCC (single cabinet)/DCC (dual cabinet).

Dual cabinet

Location in the DCC (dual cabinet) is shown in the figure below.



x0400001061

Figure 4 Location of attachment point for ESD bracelet

Pos.	Description
A	Attachment point for ESD bracelet in the control module
B	Attachment point for ESD bracelet in the drive module

3 System Description

3.1 General

Welding equipment A314E/316E/324E (E for Extended range) is adapted for control of robot IRB1400/1600/2400, with control system IRC5.

Along with the robot's AW software and process control equipment, the system is characterized by;

Working area	With an optical pulse tachometer, with high frequency resolution in the wire feed unit, stable wire feed is attained throughout the speed range: 0.3 m/min – 30 m/min.
Accuracy	Transfer of information between robots and welding equipment is conducted in the form of numerical data, in serial via a CAN bus, which guarantees high accuracy.
Programmability	All programming of the welding process is conducted from the robot's FlexPendant.
Safety	The welding equipment is equipped with sensors for monitoring of the welding process. In the event of a fault, an error message is displayed on the robot's FlexPendant.
Flexibility	The transfer of programmable configuration data enables adaptation to various power sources and wire feed units.

System Description

Equipment

3.2 Equipment

Intended for

This equipment is only intended for gas metal-arc welding, also known as MIG/MAG welding, and may only be used in accordance with the instructions in the documentation.



The equipment may only be used for other purposes if specifically stated. With all other use of the equipment, ABB disclaims all responsibility and any compensation and warranty claims.



The equipment may not be used in environments where there is a risk of explosion and/or ones that are easily combustible.

Pressure sensors

Type	Description
Gas sensor	The pressure sensor incorporates an open contact that closes at high pressure. The sensor is pre-calibrated to 0.2 bar (corresponding to about 5 l/min). The sensor indicates when the gas supply is empty or if an object is obstructing the flow of gas.
Water sensor Option	A water sensor is chosen when a water-cooled welding torch is included.

3.3 Principal layout

The welding equipment consists of:

Components	Type
Wire feed system	<ul style="list-style-type: none"> • A314E (for robot IRB 1400) • A316E (for robot IRB 1600) • A324E-L_PIB (for robot IRB 2400)
Control equipment for process equipment	<ul style="list-style-type: none"> • PIB
Welding power source	<ul style="list-style-type: none"> • MigRob 500 • RPB 320/420/520
Accessories (process options)	<p>The following accessories can be purchased for the welding equipment:</p> <ul style="list-style-type: none"> • Welding torch kits (Dinse, Binzel) • Joint tracker • Spatter cleaning unit • Wire cutter • Automatic TCP measurement, BullsEye

System Description

Example of system solution

3.3.1 Example of system solution

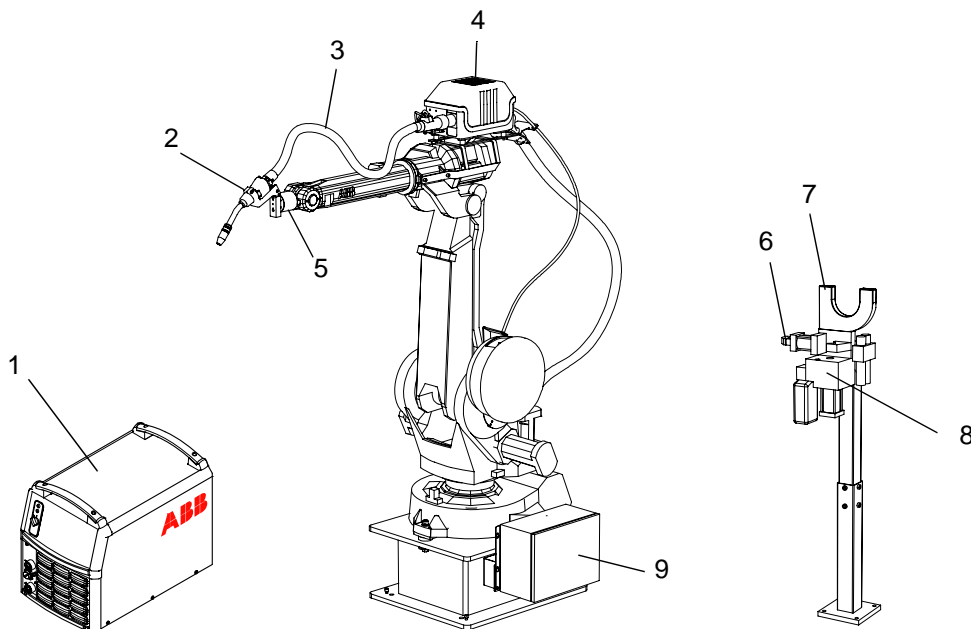


Figure 5 IRB 2400 with installed welding equipment

Pcs.	Description	Pcs.	Description
1	Welding power source	6	Wire cutter (process option)
2	Welding torch	7	BullsEye, TCP calibration unit (process option)
3	Hose bundle	8	Spatter cleaning unit (process option)
4	Wire feed equipment	9	Process control equipment
5	Insulator/Collision sensor (option)		

4 Components

4.1 General

The welding equipment consists of the following components:

- Wire feed unit installed on the robot arm and with connection for the torch
- Attachment for wire feed unit and wiring
- Hoses for gas, water and compressed air, and wiring for signal and power supply
- Cable for welding current
- Cable for welding power source
- Welding power source
- Control equipment for process equipment

Overview figure

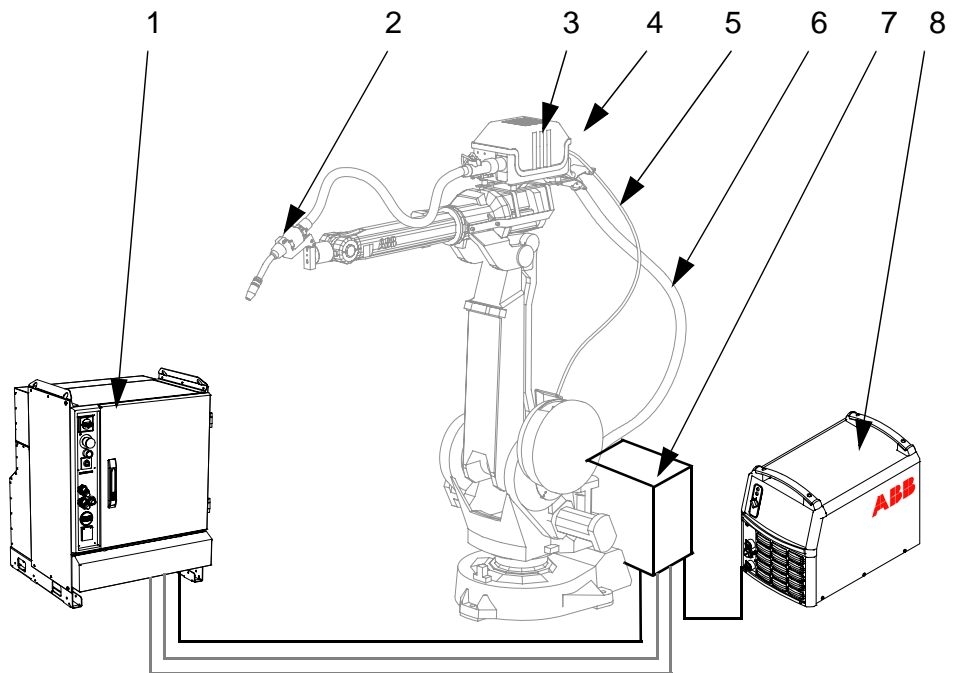


Figure 6 IRB 2400 with installed welding equipment

Pos.	Description	Pos.	Description
1	Single cabinet/Dual cabinet	5	Wire guide
2	Welding torch	6	Hoses/cable for welding power
3	Wire feed unit	7	Process control equipment
4	Gas/water sensor	8	Welding power source

Components

Wire feed system A314E/316E/324E

4.2 Wire feed system A314E/316E/324E

4.2.1 General

Two types of wire feed systems are available:

- With bobbin
- With Marathon Pac



The wire feed system is used for gas arc welding.

The system is intended for installation directly on the robot, which entails short hose bundles with good wire feed, and subsequently, lower demands on floor space.

Bobbin

If bobbin used, it may be necessary to adjust the brake hub. See [“Brake hub \(bobbin\) adjustment” on page 2 - 21](#).

Working area

The wire feed system complies with ABB Automation Technologies AB recommended layout arrangements.

This entails that the robot has a full working area within a sector of $\pm 150^\circ$ for A314E/316E/324E, around axis 1.



Considerable caution must be observed when, for example, programming outside the robot's working area so as not to damage the equipment.

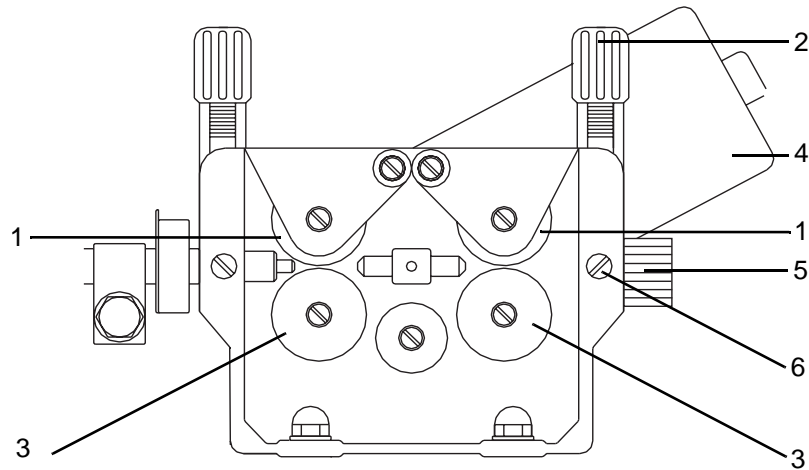
This especially applies to the IRB 1600 and the "bending backwards" movement.

Technical specifications and requirements

Type	Data
Wire diameter	0.8 mm - 1.6 mm
Max. wire feed speed	30 m/min
Permitted ambient temperature	0°C - +40°C

4.2.2 Wire feed unit

Overview figure



j5000841

Figure 7 Wire feed unit

Item	Description	Item	Description
1	Upper feed roller	4	Motor
2	Set screw	5	Inlet nozzle
3	Lower feed roller	6	Bolt

Feed rollers

The wire is conveyed by two pairs of feed rollers that are connected to one another. The two upper rollers (1) are spring loaded.

The power from the motor is transferred to the rollers via a drive on the motor shaft. The pressure between the upper and lower rollers can be individually adjusted with set screws (2).

All rollers have slide bearings.

The lower feed rollers (3) have recesses for two different wire diameters. The recesses are marked with the respective wire diameters.

Motor

The motor (4) is permanently magnetized and equipped with an optical pulse tachometer for accurate speed control.

When Marathon Pac is used

When a Marathon Pac is used, an inlet nozzle is fitted (5). The nozzle is secured with a screw (6).

When a bobbin is used

When a bobbin is used, the wire guide is installed directly in the wire feed unit and secured with a screw (6).

Components

Operating and indicating devices on the wire feeder unit

4.2.3 Operating and indicating devices on the wire feeder unit

Type	Description
WIRE FEED	Electrical switch for manual wire feed.
RESET (Option)	Electrical switch for resetting the collision sensor
AIR	Connection for air to welding torch.
IN	Connection for cooling water (blue hose). Applies to water-cooled welding torch.
OUT	Connection for cooling water (red hose). Applies to water-cooled welding torch.
Euro connector	Connection for welding torch

Overview figure

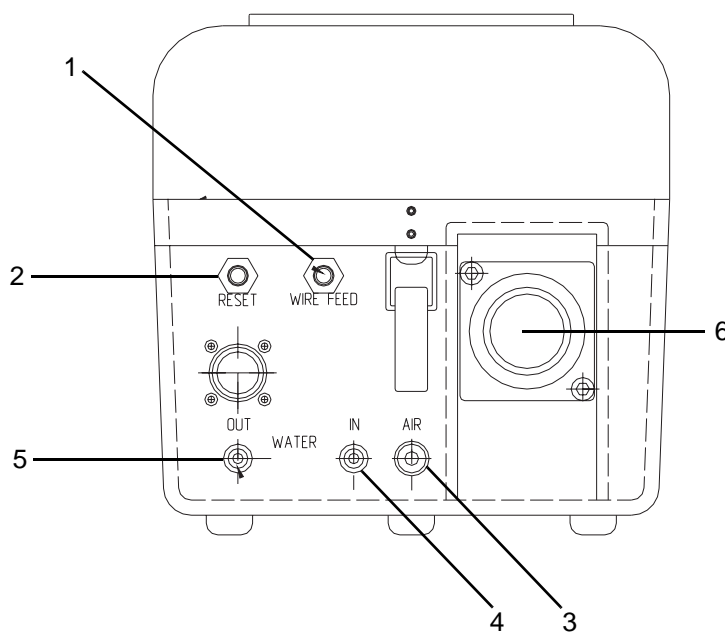


Figure 8 Side of wire feed unit

Pos.	Description	Pos.	Description
1	Electrical switch "WIRE FEED"	4	Connection "IN"
2	Electrical switch "RESET" option	5	Connection "OUT"
3	Connection "AIR"	6	Euro connector

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4.3 Process control equipment

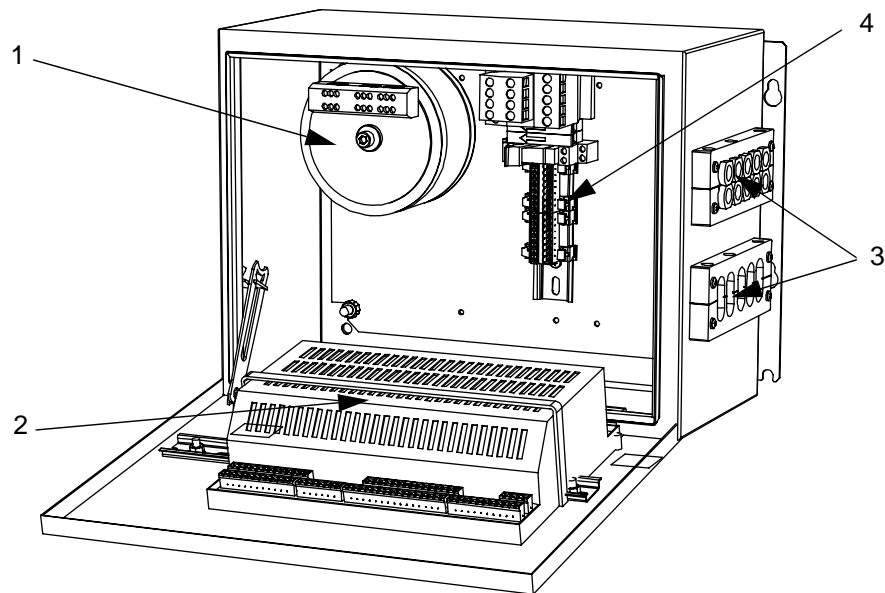
4.3.1 General

Between the IRC5 control system and the included welding equipment, there is a modularly designed PIB process unit. It is installed on the inside of the control equipment for the process equipment.

Example of how the process control equipment can be installed, see “[Example of system solution](#)” on page 1 - 12.

Overview figure

The figure below shows the inside of the control cabinet with units included in the control equipment for process control equipment.



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Figure 9 Process control equipment

Pos.	Description	Designation
1	Transformer, see “ Transformer ” on page 4 - 11	
2	Process unit PIB	A121
3	Cable entry for connection of welding equipment, see “ Cable entries on the control equipment for process equipment ” on page 1 - 19	
4	Interlock unit and terminals for welding equipment	

Components

Process unit (PIB)

4.3.2 Process unit (PIB)

General

The PIB is an I/O unit with an integrated wire feed regulator that communicates directly with ABB's IRC5 robot control system for control and monitoring of welding with robots. The process unit includes the hardware and software for control and regulation of the arc welding equipment.

Connections

The I/O connections on the PIB are grouped, see [“Process unit PIB” on page 4 - 1](#), for direct cable connection to:

- Welding power source
- Wire feed unit
- Torch cleaner
- Sensors, etc.

4.3.3 Connections on control equipment for process equipment

The components in the welding equipment are connected to jackable terminals installed inside the control equipment. Cable entries for cables are on the control equipment.

Location

The following figure shows the connections on the control equipment.

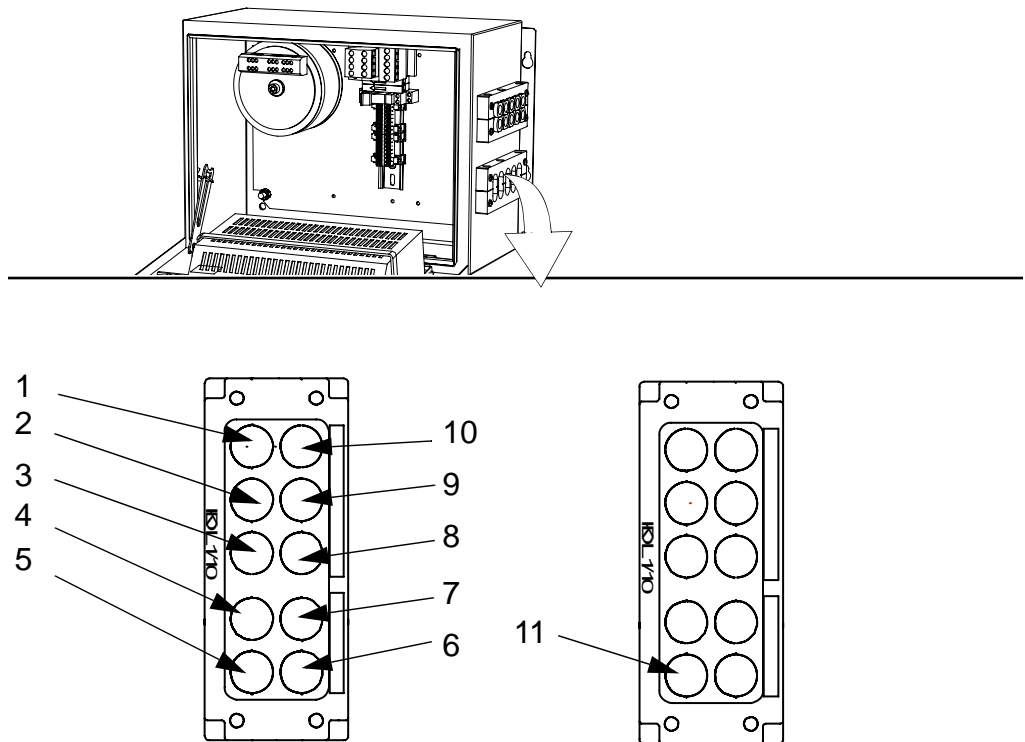


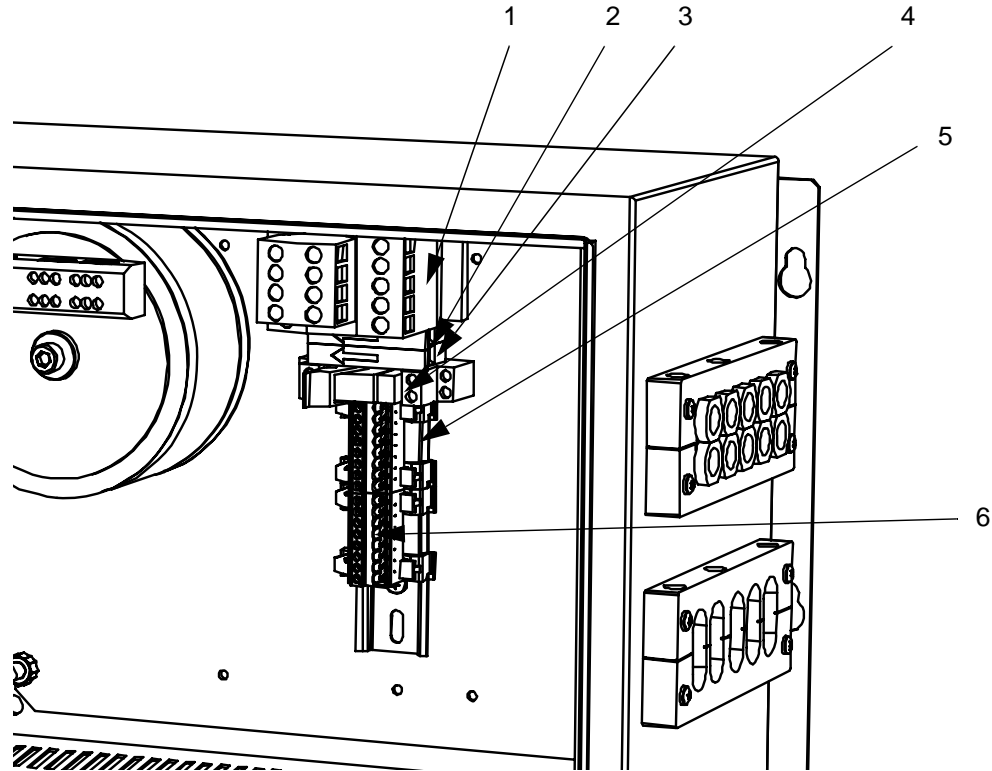
Figure 10 Cable entries on the control equipment for process equipment

Item	Description	Connected to
1	Welding power source	
2	Wire feed unit FEED 2	
3	CAN (in)	
4	Welding power source, CAN	
5	Cooling unit	A12.K11
6	Wire feed unit FEED 1	
7	MOTORS ON and feed from drive module	A12.X4
8	Safety signals (in)	
9	Spatter cleaning unit or BullsEye SA (stand-alone)	A12.X1
10	Safety signals (out)	
11	CAN (out)	

Components

Connections in control equipment for process equipment

4.3.4 Connections in control equipment for process equipment



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Figure 11 Connections in control equipment for process equipment

Item	Description	Item designation
1	Contactors	A12.K1
2	Fuse (3.15 A, 230 V) for power supply	F1
3	Fuse (3.15 A, 230 V) for power supply	F2
4	Safety relay	A12.K11
5	Motors on and feed from DM	A12.X4
6	Safety signals (in)	A12.X1

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1 Installation and set-up



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



Caution must be exercised. All work carried out on the system shall be done professionally and conform to applicable safety regulations.

1.1 Transport and unpacking



The safety instructions and other instructions must be studied carefully before moving and unpacking the welding equipment. These can be found under separate tabs in the system manual.

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

1.2 Lifting instructions

Lifting of the safety equipment may only be conducted:

- Using equipment that complies with applicable lifting standards.
 - By authorized personnel.
-



Always maintain a safe distance from suspended loads.

1.3 Installation of welding equipment and process options



For descriptions of the component products, see the manuals under the respective tabs in the system manual.

1.3.1 Example of system solution

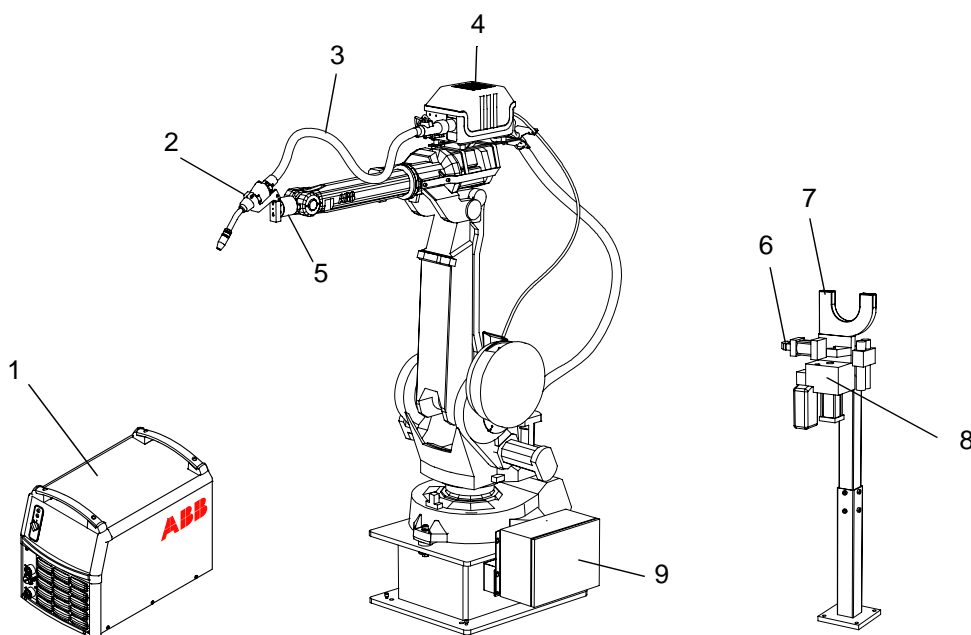


Figure 1 IRB 2400 with installed welding equipment

Pos	Description	Pos	Description
1	Welding power source	6	Wire cutter (process option)
2	Welding torch	7	BullsEye, TCP calibration unit (process option)
3	Hose bundle	8	Spatter cleaning unit (process option)
4	Wire feed equipment	9	Process control equipment
5	Insulator/Collision sensor (option)		

1.4 Installation of process control equipment

1.4.1 Example of system solution

Welding power source, MigRob 500/RPB

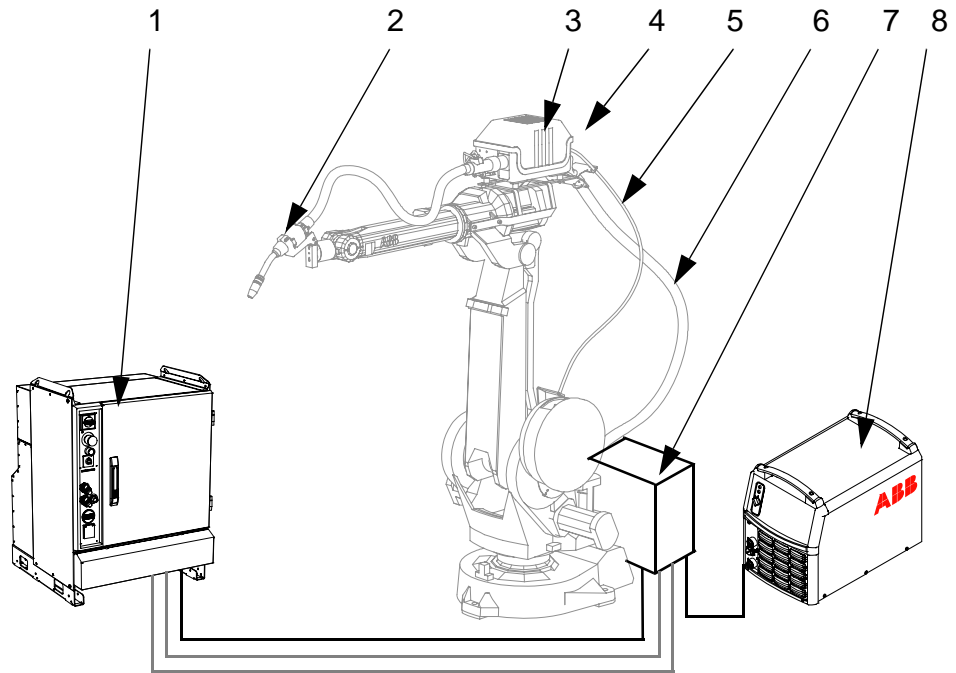


Figure 2 IRB 2400 with installed welding equipment

Pos.	Description	Pos.	Description
1	Single cabinet/Dual cabinet	5	Wire guide
2	Welding torch	6	Hoses/cable for welding power
3	Wire feed unit	7	Process control equipment
4	Gas/water sensor	8	Welding power source

1.5 Connection of welding equipment

1.5.1 Block diagram

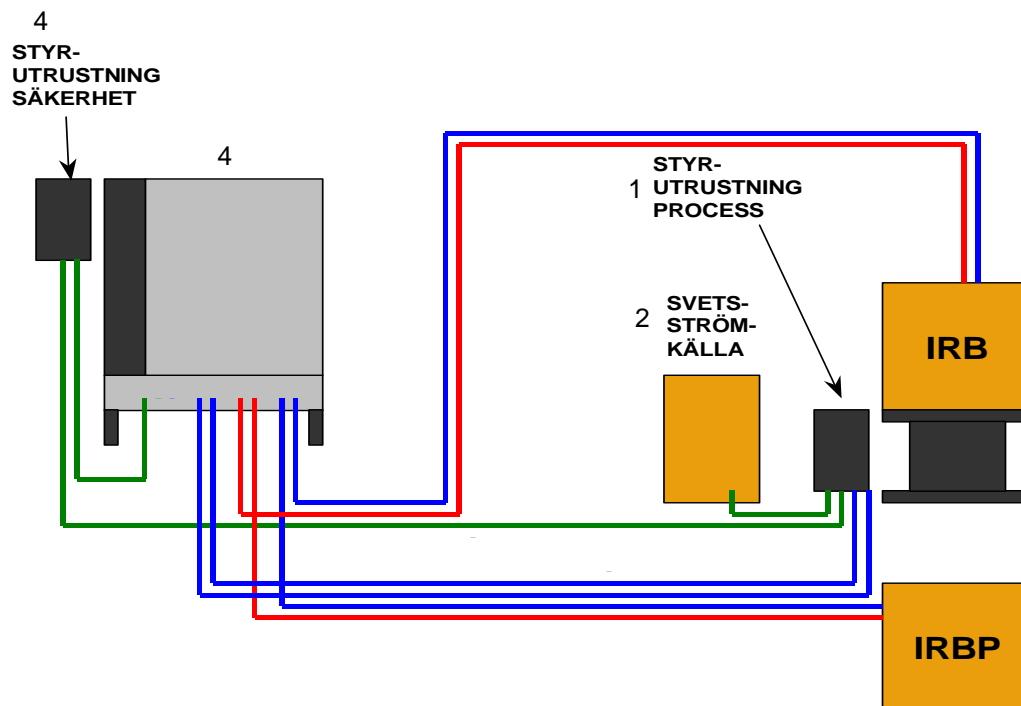


Figure 3 Block diagram, safety equipment

Pos.	Description	Pos.	Description
1	Process control equipment	5	Cooling unit
2	Welding power source	6	BullsEye/TC
3	Wire feed system	7	Safety control equipment
4	Single/Dual cabinet with control equipment for positioners		

1.5.2 Process control equipment

Location

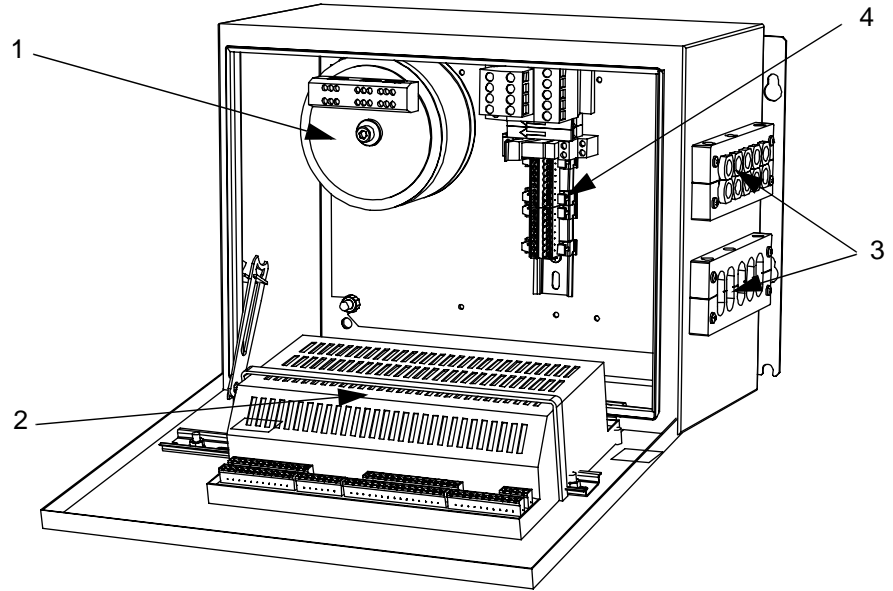


Figure 4 Process control equipment

Pos.	Description	Designation
1	Transformer, see “Transformer” on page 4 - 11	
2	Process unit PIB	A121
3	Cable entry for process equipment, see “Cable entries on the control equipment for process equipment” on page 2 - 6	
4	Interlock unit and jackable terminals for process equipment, see “Connections in control equipment for process equipment” on page 2 - 7	

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Cable entries

The following figure shows the cable entries for the control equipment.

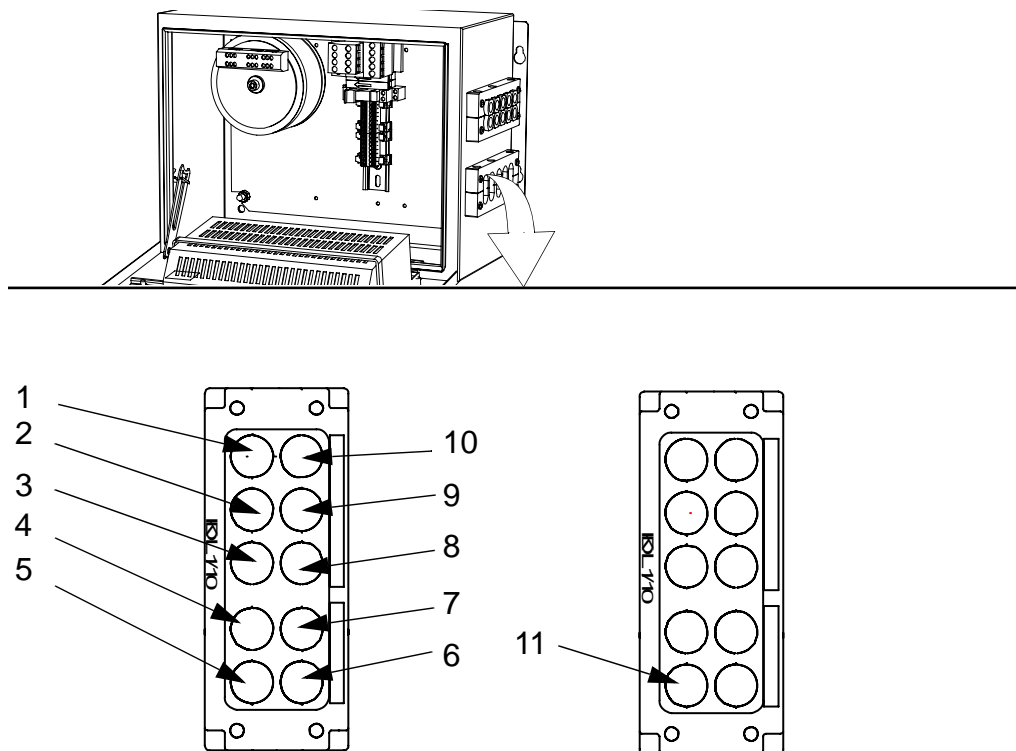


Figure 5 Cable entries on the control equipment for process equipment

Item	Description	Connected to
1 4	Welding power source	
2 6	Wire feed unit FEED 2	
3	CAN (in)	
4	Welding power source, CAN	
5	Cooling unit	A12.K11
6 2	Wire feed unit FEED 1	
7	MOTORS ON and feed from drive module	A12.X4
8	Safety signals (in)	
9	Spatter cleaning unit or BullsEye SA (stand-alone)	A12.X1
10	Safety signals (out)	
11	CAN (out)	

Connections in control equipment for process equipment

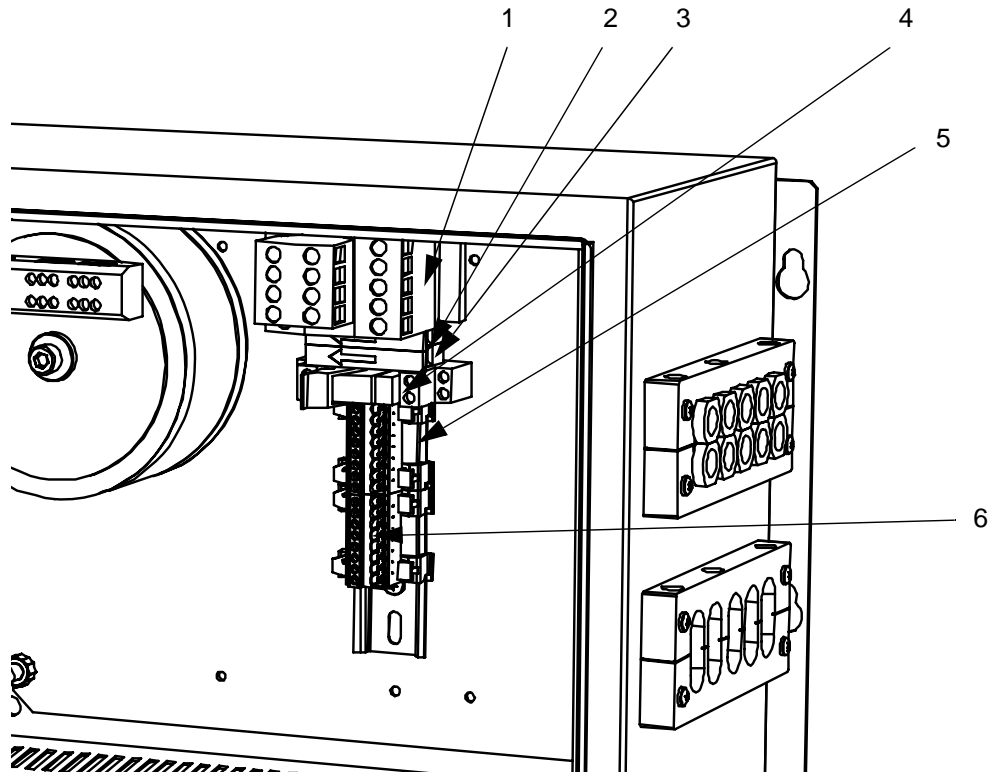


Figure 6 Connections in control equipment for process equipment

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Item	Description	Item designation
1	Contactor	A12.K1
2	Fuse (3.15 A, 230 V) for power source	F1
3	Fuse (3.15 A, 230 V) for power source	F2
4	Safety relay	A12.K11
5	Motors on and feed from DM	A12.X4
6	Safety signals (in)	A12.X1

Process unit PIB

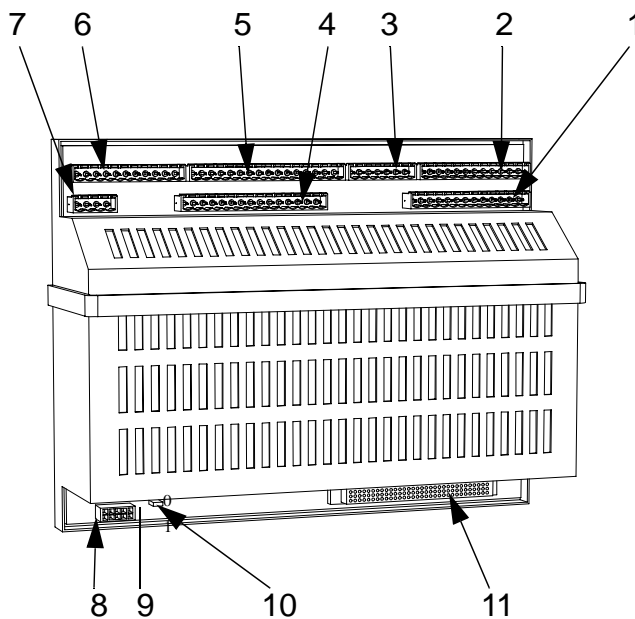


Figure 7 Outlet designations on PIB

PIB.wmf

Item	Description	Item designation
1	Outlet for power source and interlocking	A121.TB1
2	Outlet for CAN bus/DeviceNet	A121.TB2
3	Outlet for welding torch accessories	A121.TB4
4	Outlet for wire feed unit (signal)	A121.TB6
5	Outlet for wire feed unit (motor)	A121.TB5
6	Outlet for welding power source	A121.TB3
7	Outlet	A121.TB11
8	Outlet for program loading	
9	Jumper	A121.TB9
10	Switch for program loading	
11	Euro connector add-on board for joint tracking	

1.5.3 Wire feed system type A314E/316E/324E

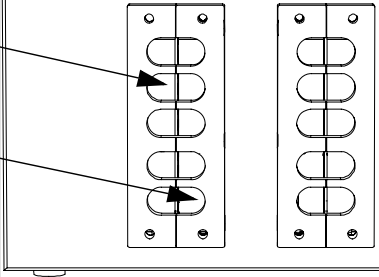
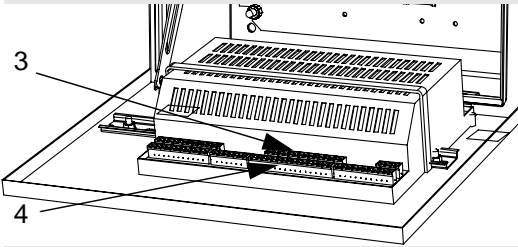
Action	Info/Illustration
<p>1. Signal cable, FEED 2 (1)</p> <ul style="list-style-type: none"> • Prepare cable entry in the panel on the process control equipment. 	
<p>2. Motor cable, FEED 1 (2)</p> <ul style="list-style-type: none"> • Prepare cable entry in the panel on the process control equipment. 	
<p>3. Signal cable, FEED 2</p> <p>Connect wire feed unit (signal) to outlet TB6 on PIB.</p> <p>Signal cable with 23-pole connector at robot base.</p>	
<p>4. Motor cable, FEED 1</p> <p>Connect wire feed unit (motor) to outlet TB5 on PIB.</p> <p>Motor cable with 12-pole connector at robot base.</p>	

Figure 8 Panel for cable entry

Figure 9 Connections on PIB

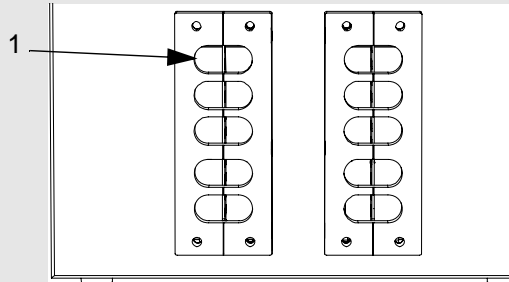
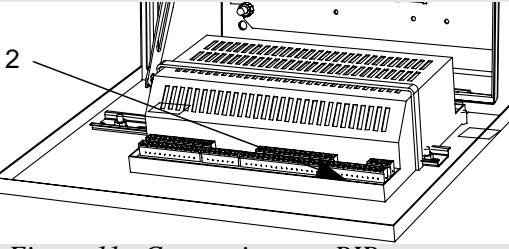
1.6 Connection of welding power source

1.6.1 Welding power source, MigRob 500

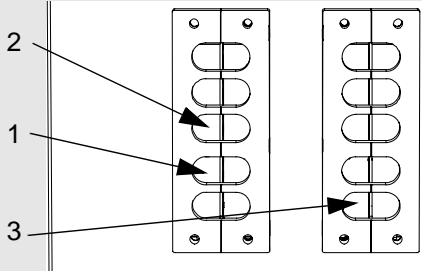


See the separate manual under the tab "Power source" in the system manual for a description of included welding power sources.

Connection of welding power source, MigRob

Action	Info/Illustration
<p>1. Cable to welding power source:</p> <ul style="list-style-type: none">• Prepare cable entry in the panel on the process control equipment:	 <p>Figure 10 Panel for cable entry</p>
<p>2. Connect the cable to outlet TB3 on PIB in the process control equipment.</p>	 <p>Figure 11 Connections on PIB</p>

Connection of CAN bus/DeviceNet

Action	Info/Illustration
1. CAN drop out (1) to MigRob <ul style="list-style-type: none"> Prepare cable entry in the panel on the process control equipment: 	 <p>Figure 12 Panel for cable entry</p>
2. CAN IN (2) from SCC/DCC or safety control equipment <ul style="list-style-type: none"> Prepare cable entry in the panel on the process control equipment: 	
3. CAN out (3) <ul style="list-style-type: none"> Prepare cable entry in the panel on the process control equipment: 	
4. The connection cable to PIB shall be fitted with a termination resistor, 120Ω.	

Block diagram

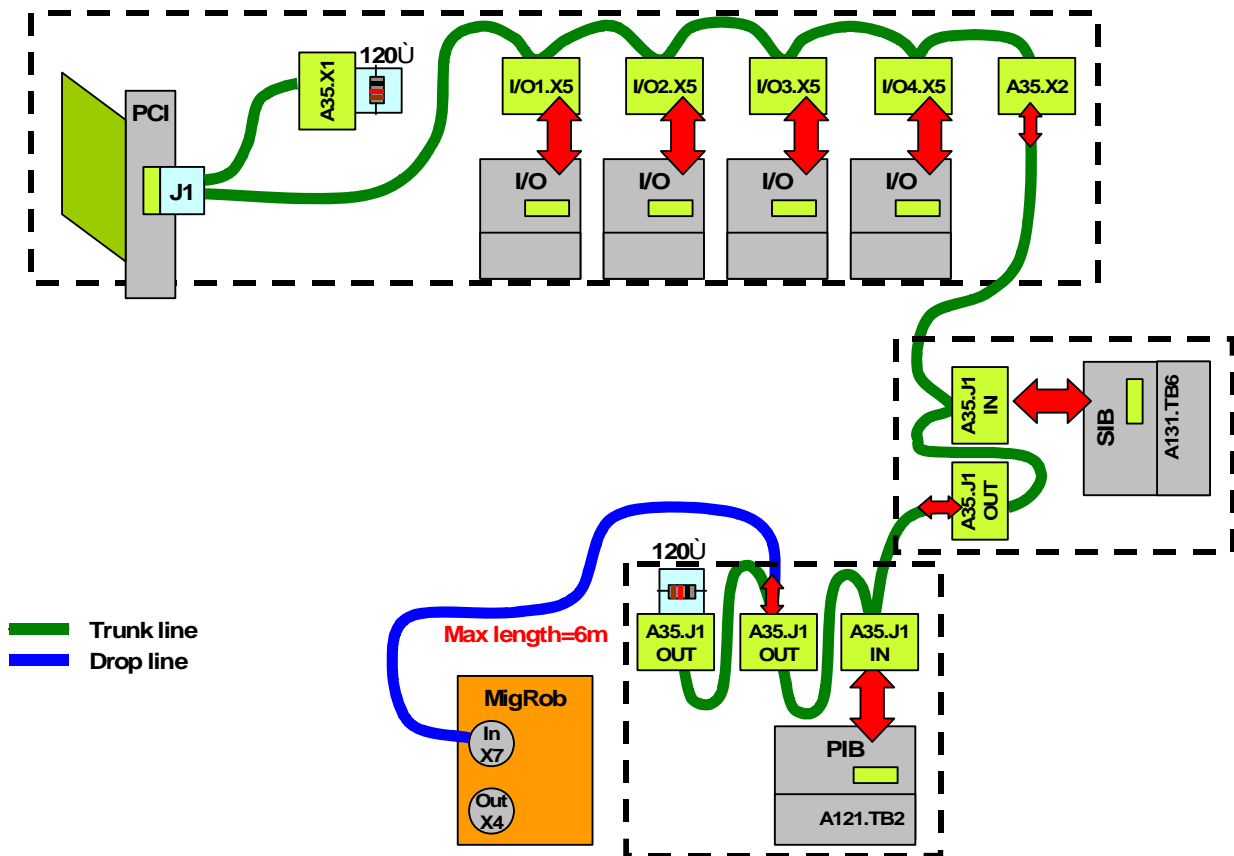


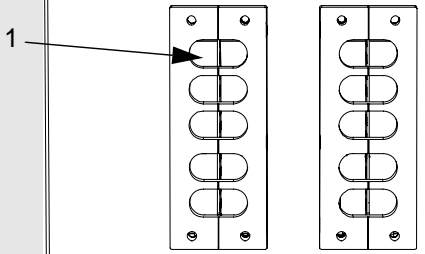
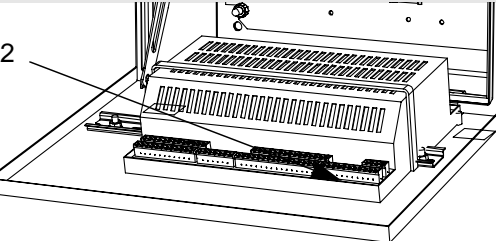
Figure 13 CAN bus/DeviceNet for single arc with MigRob

1.6.2 Welding power source, RPB

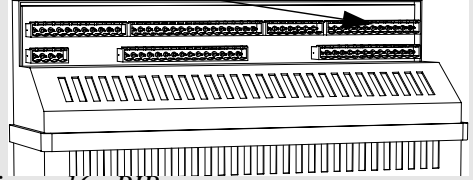


See the separate manual in the section “Power source” for a description of included welding power sources.

Connection of external welding power source

	Action	Info/Illustration
1.	Cable for communications with PIB to welding power source <ul style="list-style-type: none">• Prepare cable entry in the panel on the process control equipment:	 <p data-bbox="938 987 1332 1025"><i>Figure 14 Panel for cable entry</i></p>
2.	Connect the cable to outlet TB3 on PIB in the process control equipment.	 <p data-bbox="938 1288 1316 1314"><i>Figure 15 Connections on PIB</i></p>

Connection of CAN bus

Action	Info/Illustration
1. Connection of the process control card is made to the control system's CAN bus outlet A121.TB2.	 <p>Figure 16 PIB</p>
2. The connection cable shall be fitted with termination resistance, 120Ω	

Block diagram

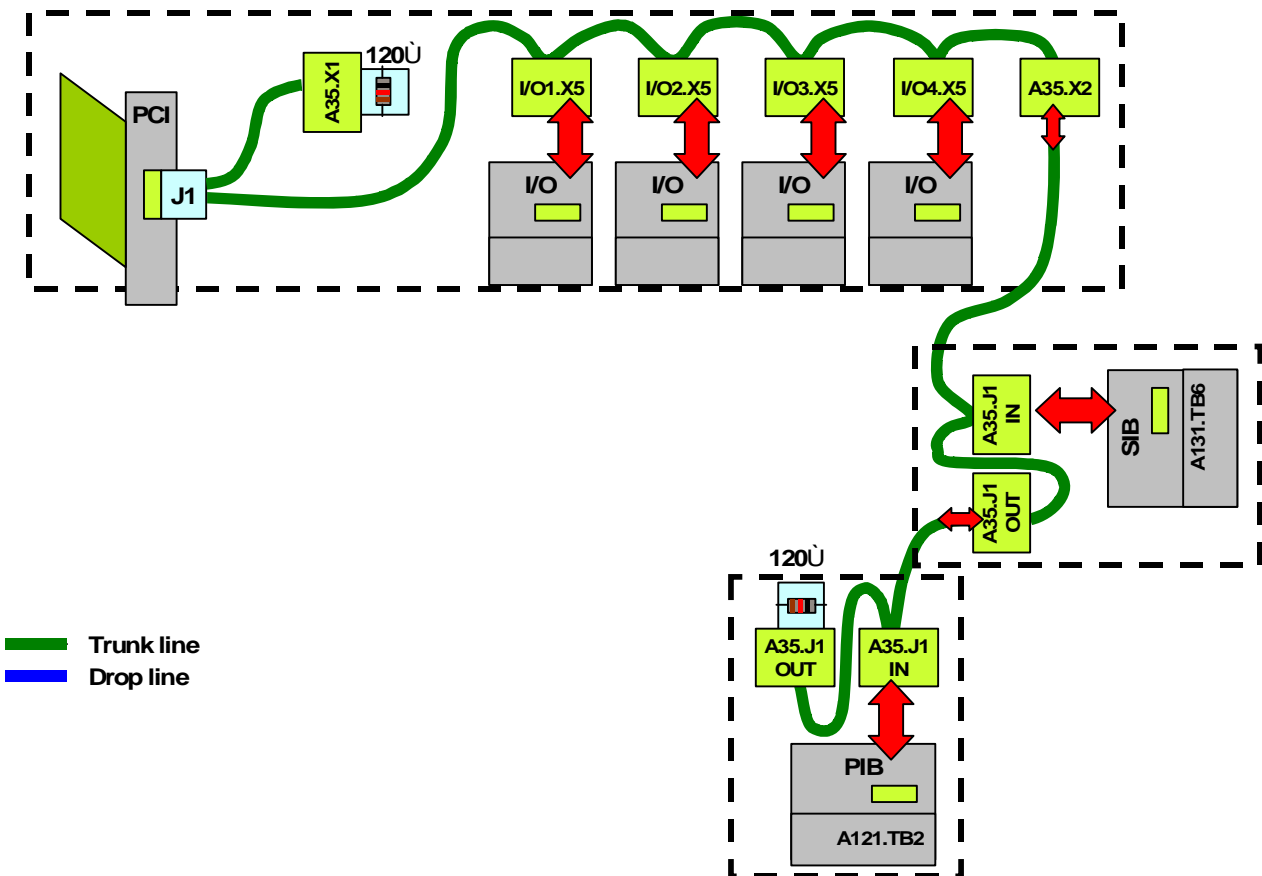


Figure 17 CAN bus/DeviceNet for single arc with RPB

RPB_1_Slide4.wmf

1.7 Accessory connections

1.7.1 Welding torch



See separate manual, under the “Welding torch” tab, for description of the included product.



A cooling unit is required if a water-cooled welding torch is included

Connection of hose bundle

Cables and hoses in the hose bundle can be supplied connected according to the following description. See Figure 20

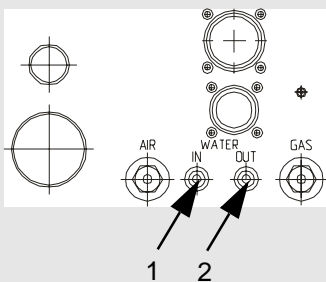
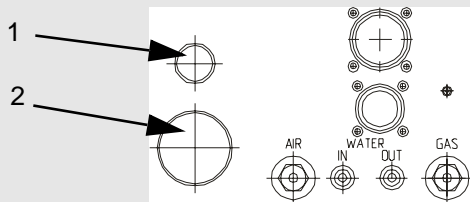
Cable/hose	Type	Connection
Gas	Red hose	Connected to central gas supply or tank.
Cooling water	Blue hose (1) Red hose (2)	IN OUT 
Air in	PVC hose D14/8	Connected to compressed air supply, system pressure approx. 6 bar.
Wire guide input (1)	For bobbin For Marathon Pac	
Welding cable (2)	95 m ²	
Power cable		Connect to last power cable from wire feed unit to welding power source.

Figure 18 Wire feed unit

Figure 19 Wire feed unit

Overview figure

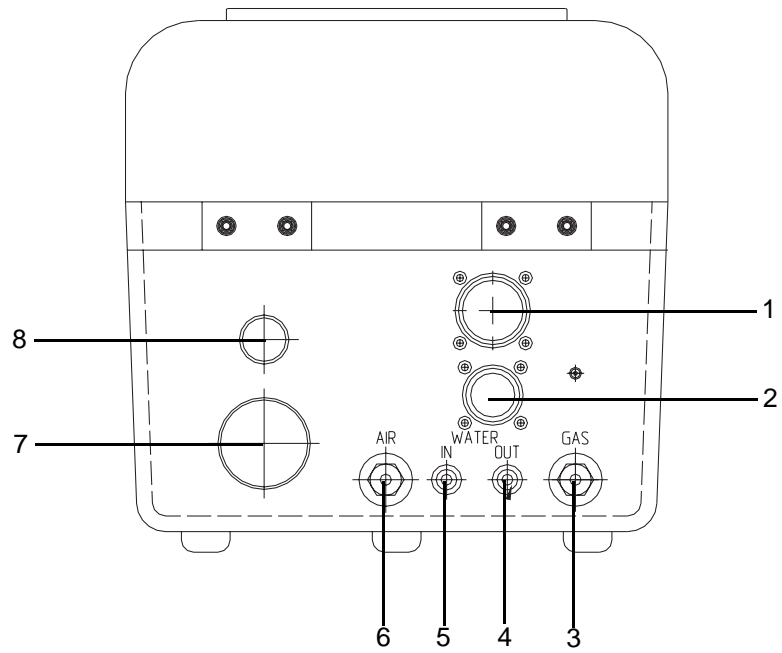


Figure 20 Connections on wire feed unit

Item	Designation	Item	Designation
1	Wire feed cable	5	Water hose IN (blue)
2	Wire feed cable 1	6	Air hose
3	Gas hose (red)	7	Welding cable
4	Water hose OUT (red)	8	Bolt

j5000843

1.7.2 Cooling unit, OCE 2



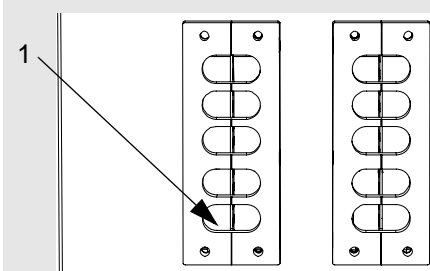
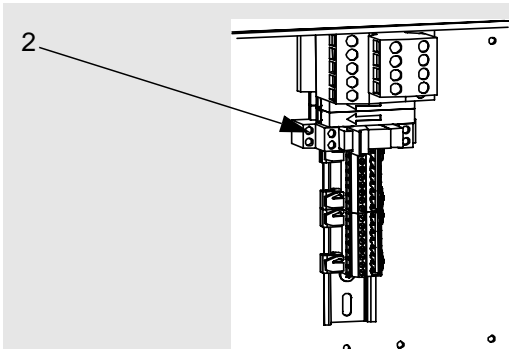
The cooling unit is included in the welding torch kits PKI 500R and Binzel WH 455D.

Connection of cooling unit's power cable

The cooling unit's power cable is connected as follows:

Type	Connection
RPB	The power cable is connected to the welding power source.
MigRob	The power cable is connected to terminal A12.K11 in the process control equipment.


MigRob

Action	Info/Illustration
1. Prepare cable entry in the panel on the process control equipment.	 <p>Figure 21 Panel for cable entry</p>
2. Connect the cable from the cooling unit to relay A12.K11 on the inside of the process control equipment.	 <p>Figure 22 Connections in control equipment</p>

Fill cooling water



For detailed information, see the manual for OCE 2.

	Action
1.	Fill the cooling unit with water, and if appropriate, anti-freeze.
	 Distilled water is recommended.
2.	Check the flow in the welding torch by opening the cooling unit's return hose IN until water runs out.
3.	<p>If the water sensor is ordered afterwards, the jumper in the wire feed unit must be removed before the water sensor can be used.</p> <p>This is done as follows:</p> <ul style="list-style-type: none"> • Unscrew the jumper By1 on the terminal in the wire feed unit between terminals 2 and 4.

1.7.3 Process options

Process options block diagram

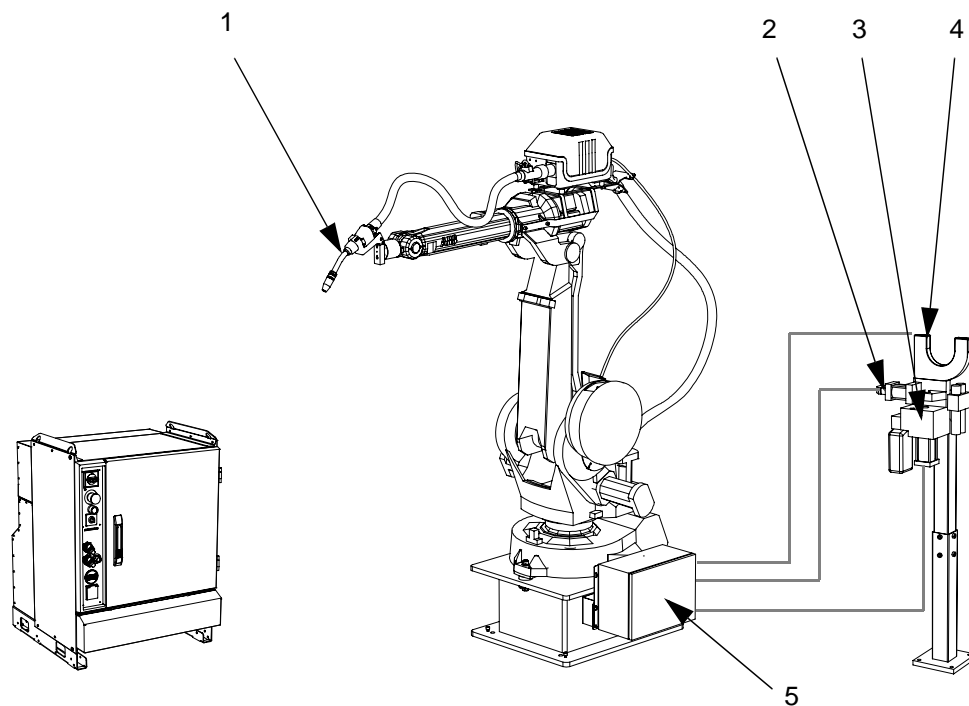
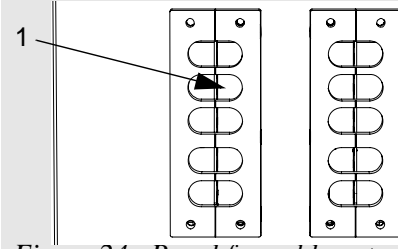
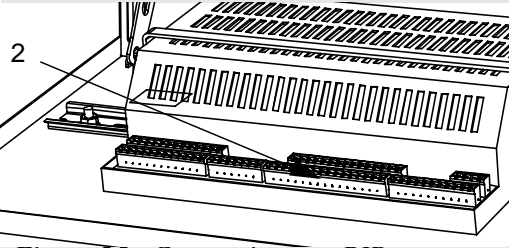


Figure 23 Process options block diagram

Pos.	Description	Pos.	Description
1	Welding torch	4	BullsEye, TCP calibration unit (process option)
2	Wire cutter (process option)	5	Process control equipment
3	Spatter cleaning unit (process option)		

Connection of spatter cleaning unit and BullsEye

Action	Info/Illustration
1. Prepare cable entry in the panel on the process control equipment:	 <p data-bbox="965 728 1364 750"><i>Figure 24 Panel for cable entry</i></p>
2. Connect the cable to output TB4 on PIB in the control equipment for process	 <p data-bbox="965 1019 1476 1041"><i>Figure 25 Connections on PIB</i></p>



See the separate manual for mechanical spatter cleaning unit and BullsEye for a description of component products.

1.8 Configuration of welding equipment

1.8.1 General

Upon delivery, the welding equipment is configured with the data that applies for the pertinent equipment and this data is on the configuration floppy disk that accompanies delivery.

The data can be read and modified from the robot's FlexPendant. *For more information, see “Configuration” on page 4 - 15.*

1.8.2 Installation floppy disk



Store the floppy disk in a safe place; it may be unique for the delivered equipment. The program number that is printed on the disk corresponds to the pertinent configuration and shall be referenced in service matters that concern function of the welding equipment.

The following files on the installation disk contain configuration data for the welding equipment:

File	Configuration for:
RPB_FhpE.cfg	<ul style="list-style-type: none">• Welding power source RPB 320/420/520• Wire feed unit A314E/316E/324E_PIB
MigRob_FhpE.cfg	<ul style="list-style-type: none">• Welding power source, MigRob 500• Wire feed unit A314E/316E/324E_PIB

1.8.3 Reload configuration data

In the event that configuration data must be reloaded, this can be conducted in accordance with the following alternatives:

Alternative	Description
The robot is restarted	The original configuration is restored.
Input via the FlexPendant	In the event that a few parameters need to be modified from the original configuration.
Loading of new configuration file	(EIO:CFG) With the robot instruction: System parameters\File\Add or change parameters\ "file".cfg.\. <i>“Loading of configuration file” on page 4 - 34</i>

1.9 Brake hub (bobbin) adjustment

If the bobbin is used, it may be necessary to adjust the brake hub.



With high speeds and when the bobbin is new, the wire can roll off when the wire feed unit stops. To prevent this, the brake hub's preset value of 5 kpcm (0.5 Nm) is adjusted.

Action	Info/Illustration
<p>1. Locate the brake hub (1).</p>	
<p>2. Turn the knob (2) on the brake hub until the arrows are aligned with one another (locked bobbin position).</p>	
<p>3. The springs (3) that are on each side of the knob are turned inwards at the same time to increase braking.</p>	



If the wire feed speed is so high that adjustment has no effect, the Marathon Pac should be used.

Installation and set-up

Brake hub (bobbin) adjustment

Installation and operation

2 Operation

2.1 Inspection before start-up



All protection and all safety equipment must be installed before the station is put in service. This should be especially noted in connection with maintenance and service.




Keep the door to the control equipment closed to prevent the entry of dust and dirt.

Inspection

	Action
1.	Check that no tools have been forgotten.
2.	Check that the fixture and workpiece are well secured.
3.	Check that all parts and protections are in place and that they are well secured.
4.	Check that all functions are correct.
5.	Check that no emergency stop buttons are actuated.
6.	Check that: <ul style="list-style-type: none"> • The right program has been loaded into the system. • The cursor is at the instruction where the program is to start. Do this in the teach pendant window; <i>see the operator's manual for the robot.</i>

2.2 Start-up

All requisite system software is installed on delivery.

	Action	Info/Illustration
1.	Throw the main power switch on the single/dual cabinet and the main power switch on the welding power source if fitted.	The main power switch on the single/dual cabinet normally controls power supply to all component units in the cabinet.
	 Note: Some welding power sources provide the process control card with external reference voltage, which is why parts of the control cabinet can be energized even when the main power switch is in the "OFF" position.	
2.	The robot conducts a self-test of both the hardware and software.	This test takes about one minute.
3.	Wait until the message "Welcome to..." appears on the teach pendant's display.	The system is now ready for use.

2.3 Wire feed

2.3.1 Operating mode

Operating mode selector

The operating mode selector has three positions:



“Manual full speed 100%” is not included in certain deliveries, and the operating mode selector then has just two positions.

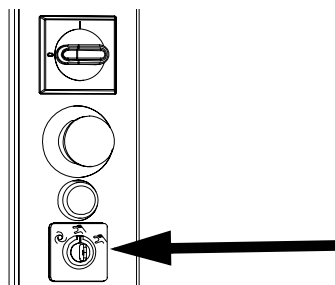


Figure 26 Operating mode selector

Mode	Description
	Auto
	Manual reduced speed (<250 mm/s)
	Manual full speed (100%)

2.3.2 Wire feed motor operation in all operating modes

To operate the wire feed motor and welding equipment in all operating modes, the following are required:

Action
1. All safety loops are intact
2. The system is in operating mode MOTORS ON

Operation

Manual wire feed

2.3.3 Manual wire feed

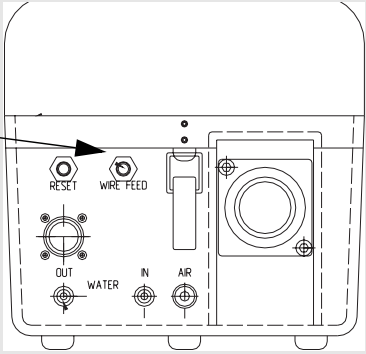
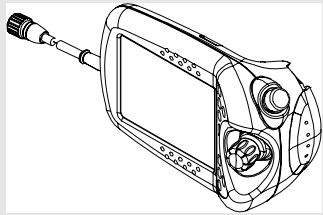
Wire feed motor operation at restricted speed

To operate the wire feed motor at restricted speed, the following is required:

	Action
1.	The emergency stop loop is intact
2.	The system is in operating mode MANUAL
3.	The system is in operating mode MOTORS OFF

Methods

Manual wire feed can be conducted with three different methods:

Action	Info/Illustration
1. By pressing the non-locking pushbutton for manual wire feed on the welding torch or on the front of the wire feed unit.	 <p><i>Figure 27 Manual wire feed at the front of the wire feed unit</i></p>
2. By activating the function Manual wire feed from the robot's FlexPendant in test mode under: Program window\Arcweld\Manual wirefeed.	 <p><i>Figure 28 FlexPendant</i></p>
3. By activating the robot output doFEED in combination with setting of a speed reference in aoFEED_REF under the I/O window.	

3 Diagnostics, fault handling

3.1 LEDs on PIB process unit

The PIB is equipped with two LEDs according to the DeviceNet specification.

LED	Description
NS	(Network Status), indicates function of CAN bus
MS	(Module Status), indicates function of PIB

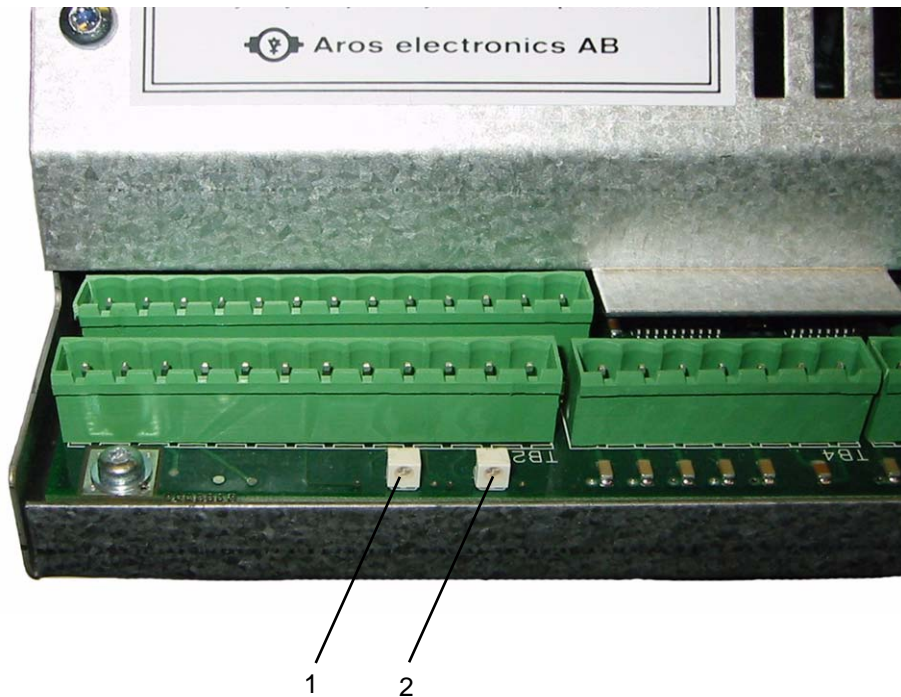


Figure 29 LEDs on PIB

Pos.	Description	Pos.	Description
1	MS, Module Status	2	NS, Network Status

Fault indication

Indication	Description
Green	Indicates correct function
Red	Indicates incorrect function
Blinking green	During the initiation phase, which can take a few seconds, the LED blinks until initiation is complete.

3.2 Upon fault in PIB

Error message If a fault occurs in the PIB, an error message is displayed on the robot's FlexPendant to indicate that corrective actions are necessary. See “[Error message](#)” on page 2 - 28.



The welding process is not stopped but actions are necessary.

3.2.1 Acknowledgement of error messages

	Action
1.	Press the OK button on the FlexPendant to acknowledge an error message.

3.2.2 Error message

From PIBs with version numbers -503. -0702 and from -1100 and higher, the number of error messages is limited to the following:

Error message	Description
80001 2 PIB error, warning	Analog outputs outside limits <ul style="list-style-type: none">• Check the limits in ctrl.conf.part motor max/min Speed and max Volt.
80001 4 PIB error, warning	Digital Output overloaded in PIB, fatal error <ul style="list-style-type: none">• Check the output connections.• Reset with power switch.¹
80001 11 PIB error, warning	source voltage 24 Volt on PIB too low <ul style="list-style-type: none">• Check incoming power source.

1. The overloaded (short-circuited) output is turned off by its overcurrent protection. The welding process is only stopped if the process monitor is actuated. The function recovers after switching on the power source to the PIB after the power source to the PIB is initially switched off and the overload removed.

3.3 Collision sensors

General

The PIB is designed for use by a welding torch equipped with a collision sensor.

3.3.1 Error messages during program operation

During program execution, an error message is displayed that expressly states that the collision sensor has been activated.

Message	Description
Message 1: PIB error, warning	Welding torch has collided. If torch still in collision state, reset from wire feed. <ul style="list-style-type: none"> • Move robot with joystick; program may not be restarted. Message 1 is displayed with G-stop (general stop) when a welding torch remains out of position.
Message 2: PIB error, warning	Weld torch has been reset.
Message 3: PIB information	Torch has returned to normal position.

Messages 2 and 3 in the specified order will be displayed after restarts. If the collision is brief, so that the welding torch is only momentarily out of position and springs back, message 1 will not be displayed. However, messages 2 and 3 will be displayed.

Diagnostics, fault handling

Error messages during program operation

Tab 3: Maintenance

1 Maintenance	1
1.1 General	1
1.2 Wire feed unit	1
1.2.1 Regular checks	2
1.3 Control equipment for welding equipment	3
1.3.1 Regular checks	3
2 Repairs	5
2.1 General	5
2.2 Wire feed unit	6
2.2.1 Drive motor replacement	6
2.3 Process control equipment	8
2.3.1 Process unit PIB	8
2.3.2 Transformer for PIB	12
2.3.3 Before putting in service	14



1 Maintenance

1.1 General



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



Turn off the mains voltage and (if possible) lock the circuit breaker before starting work on the equipment.

In some cases however, work must be done with the mains voltage switched on; special care and safe working methods must then be exercised.



NOTE: Use only extra equipment and original spare parts recommended by ABB.

1.2 Wire feed unit

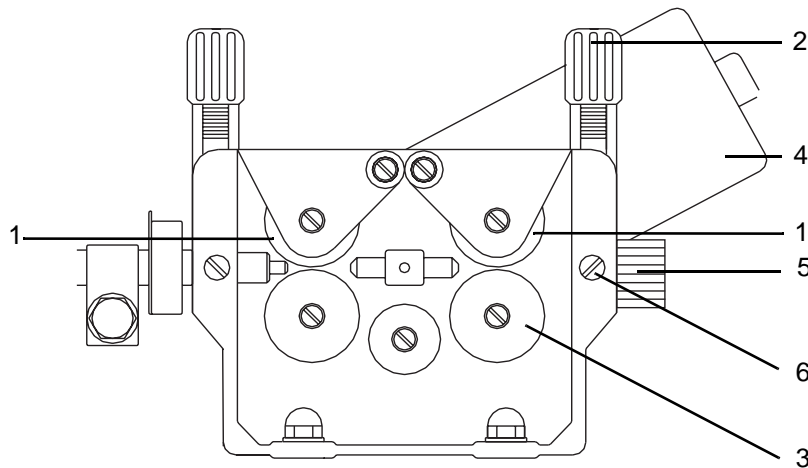



Figure 1 Wire feed unit

j5000841

Item	Description	Item	Description
1	Upper feed roller	4	Motor
2	Set screw	5	Inlet nozzle
3	Lower feed roller	6	Screw

1.2.1 Regular checks

	Action	Info/Illustration
1.	 DANGER: Before beginning any work on the IRC5 control/drive modules, please see the safety information in section “DANGER – Ensure that the main power switch is turned off.” on page 1 - 5	
2.	Perform a visual inspection of the equipment. <ul style="list-style-type: none"> • Correct any faults. 	
3.	As necessary, clean the wire feed unit with dry compressed air at reduced pressure.	
4.	Clean the recesses on the feed rollers and nozzle openings.	To ensure good wire feed, the recesses on the feed rollers should be periodically cleaned.
5.	Clean the wire guide with compressed air each time the wire is changed or as required. <ul style="list-style-type: none"> • Replace worn wire guides 	
6.	Using welding wire that is as clean and free from grime as possible	Grime can cause slippage.

Wire replacement

There are two recesses on the feed rollers, one for each wire diameter. To change recesses, the rollers are turned so that the marking for the desired wire diameter faces outwards.



The bearings for the motor and gearing do not require lubrication – maintenance-free

1.3 Control equipment for welding equipment

General

Certain routine checks and preventive maintenance tasks must be performed at certain specified intervals.



DANGER:

Before beginning any work on the IRC5 control/drive modules, please observe the safety information in the section "Warning – Ensure that the main switch is turned off" on page 5.



WARNING!

The unit is sensitive to ESD; before beginning any task involving the unit, please see the safety information in section

"WARNING – The unit is sensitive to ESD" on page 6.

1.3.1 Regular checks

	Action	Info/Illustration
1.	<p>The control system is fully enclosed, and the electronics are thereby protected in a normal workshop environment.</p> <p>In environments with significant levels of dust and airborne particles, the inside of the cabinet should be regularly inspected.</p> <ul style="list-style-type: none"> • If necessary, use a vacuum cleaner. • Clean filters, if fitted. 	
2.	<p>Check that the sealing strips and cable entries are properly sealed so that dirt is not drawn into the process control equipment.</p> <ul style="list-style-type: none"> • If necessary, use a vacuum cleaner. 	
3.	<p>Check that the cables/connectors are not damaged.</p> <ul style="list-style-type: none"> • Damaged components must be replaced immediately. 	

Maintenance

Regular checks

Maintenance

2 Repairs

2.1 General

Certain routine checks and preventive maintenance tasks must be performed at certain specified intervals.



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



Turn off the mains voltage and (if possible) lock the circuit breaker before starting work on the equipment.

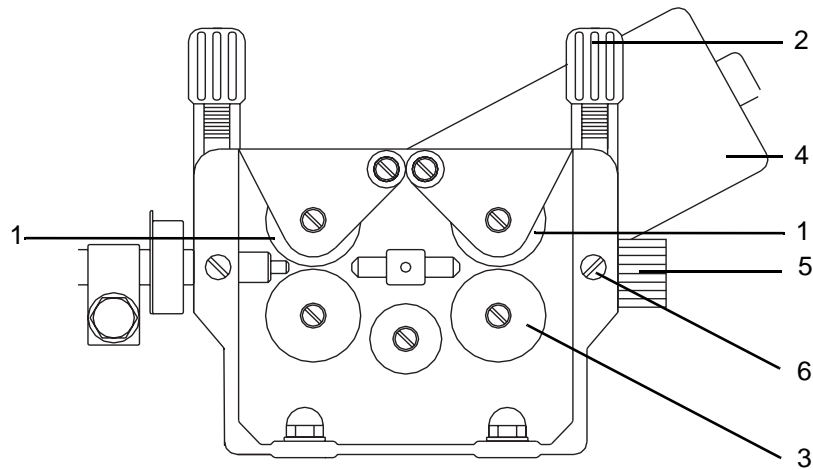
In some cases however, work must be done with the mains voltage switched on; special care and safe working methods must then be exercised.



NOTE: Use only extra equipment and original spare parts recommended by ABB.

2.2 Wire feed unit

2.2.1 Drive motor replacement




J5000841

Figure 2 Wire feed unit

Item	Description	Item	Description
1	Upper feed roller	4	Motor
2	Set screw	5	Inlet nozzle
3	Lower feed roller	6	Screw

Maintenance

Dismantling

	Action
1.	DANGER:  Before beginning any work on the IRC5 control/drive modules, please see the safety information in section “DANGER – Ensure that the main power switch is turned off.” on page 1 - 5
2.	Remove both feed rollers.
3.	Remove the drive wheel and the three socket head cap screws.
4.	Lift out the motor.

Installation



Upon replacement or repair of a drive motor, the drive motor shaft during re-installation must be centered in relation to both feed rollers with a centering unit, so as to avoid gear tooth and bearing wear.

	Action
1.	Fit the new motor.
2.	Center the motor's drive shaft in relation to both feed rollers using the centering unit.
3.	Fit the drive wheel and the three socket head cap screws.
4.	Fit both drive rollers.

Centering unit

Designation	Order number
Centering unit	500 332-001

Repairs

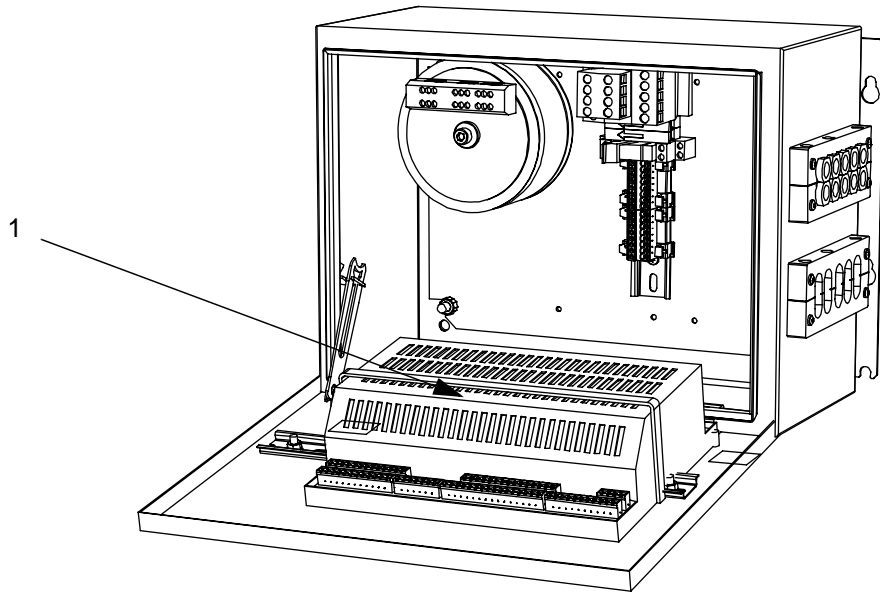
Process control equipment

2.3 Process control equipment

2.3.1 Process unit PIB

Location The PIB is located in the process control equipment according to *Figure 3*.

Location



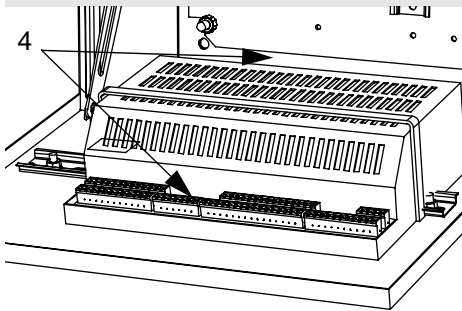
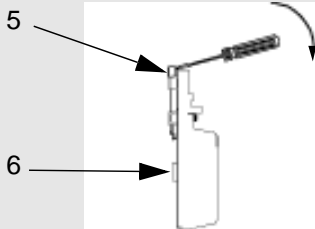


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Figure 3 Process control equipment

Pos.	Description	Designation
1	Process unit PIB	A121

Dismantling

	Step	Illustration
1.	DANGER:  Before beginning any work on the IRC5 control/drive modules, please see the safety information in section “ DANGER – Ensure that the main power switch is turned off. ” on page 1 - 5	
2.	WARNING!  The unit is sensitive to ESD; before beginning any task involving the unit, please see the safety information in section “ WARNING – The unit is sensitive to ESD. ” on page 1 - 7	
3.	Open the process control equipment.	
4.	Disconnect all cables from the PIB.	 <i>Figure 4 PIB</i>
5.	Remove the locking fixture with a screwdriver.	 <i>Figure 5 Locking fixture</i>
6.	Tip the PIB unit away from the installation bar and remove it.	

Adaptation of process unit PIB to control system IRC5

General

The PIB contains two program versions. The correct program version is dependent on the control system used. Which program version is active is determined by jumper TB9.

Repairs

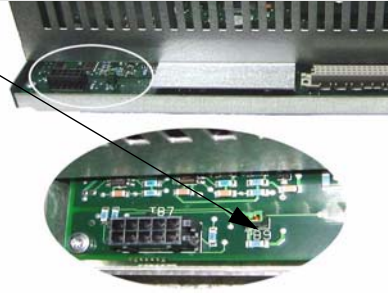
Process unit PIB

Upon delivery



All PIBs delivered as spare parts or components are preconfigured for ARCITEC/LRA and wire feed unit A314 upon delivery. This means that jumper TB9 is closed.

IRC5

	Action	Info/Illustration
1.	Remove the jumper TB9	



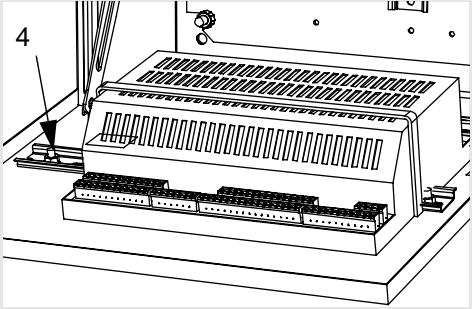
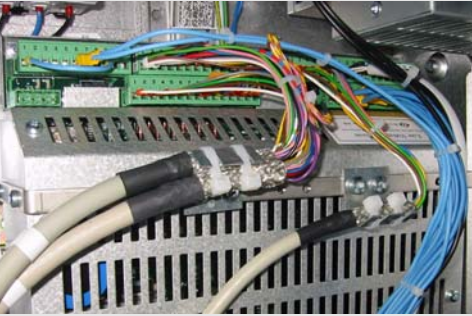

Upon change of PIB

Previously stored configuration parameters in the robot are automatically transferred at power-up to the new PIB board.
Configuration data for ABB's standard equipment is included on the configuration floppy disks for the AW system.
“[Configuration parameters](#)” on page 4 - 29, where all parameters are listed and defined.



When changing a PIB, the unit must be restarted twice.

Installation

	Step	Illustration
1. 	DANGER: Before beginning any work on the IRC5 control/drive modules, please see the safety information in section “DANGER – Ensure that the main power switch is turned off.” on page 1 - 5	
2. 	WARNING! The unit is sensitive to ESD; before beginning any task involving the unit, please see the safety information in section “WARNING – The unit is sensitive to ESD.” on page 1 - 7	
3.	Open the process control equipment.	
4.	Place the PIB unit on the installation bar and clamp it in place.	 <p data-bbox="1002 1361 1476 1429"><i>Figure 6 Process unit in process control equipment</i></p>
5.	Connect the cables on the PIB unit.	
6.	Shielding connection of cables <ul style="list-style-type: none"> • Tighten the clamps with firm pressure against the metal bar. The metal bar on the top of the PIB has holes for installation of two shield clamps that accompany the PIB upon delivery.	 <p data-bbox="1002 1783 1476 1816"><i>Figure 7 Cable shielding</i></p>
	It is important for the function of the PIB that the shielding connection is made with the greatest possible care. This primarily applies to the two cables from the wire feed unit. If possible, they should be run so that there is space between them.	
7.	Open the process control equipment.	

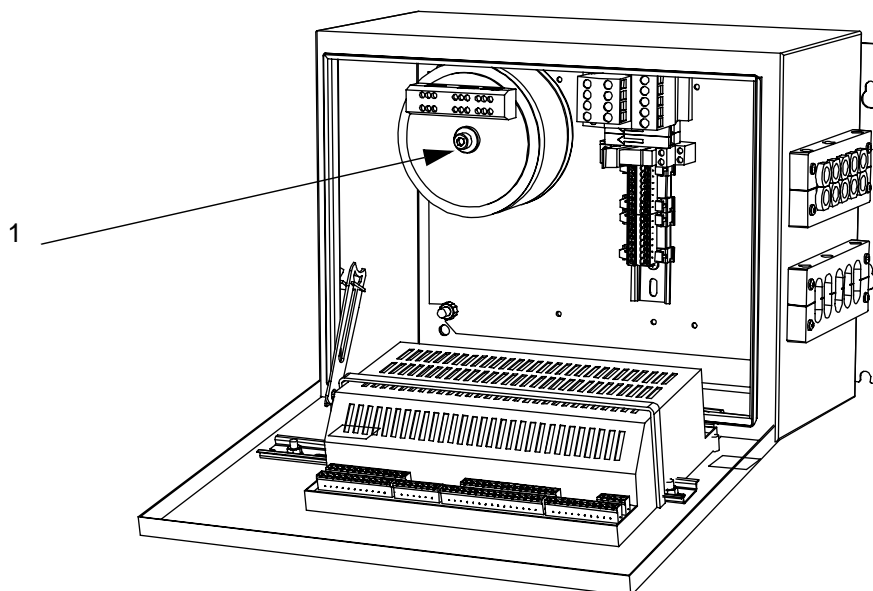
Repairs

Transformer for PIB

2.3.2 Transformer for PIB

Location

The transformer for the PIB is located in the process control equipment according to *Figure 8*.


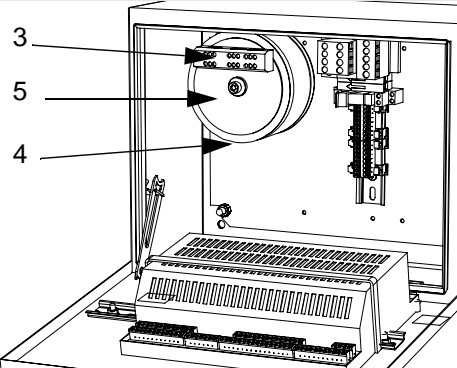


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Figure 8 Transformer for PIB in process control equipment

Item	Description	Item designation
1	Transformer for PIB (42 VAC)	T12


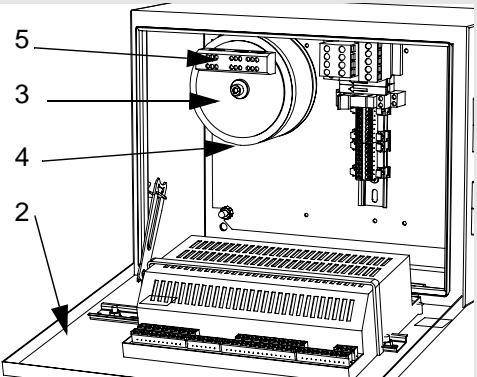
Dismantling

	Step	Illustration
<p>1.</p> 	<p>DANGER: Before beginning any work on the IRC5 control/drive modules, please see the safety information in section “DANGER – Ensure that the main power switch is turned off.” on page 1 - 5</p>	
<p>2.</p>	<p>Open the door to the process control equipment.</p>	
<p>3.</p>	<p>Disconnect the cable to the transformer</p>	
<p>4.</p>	<p>Remove the retaining screws.</p>	
<p>5.</p>	<p>Remove the transformer.</p>	 <p>Figure 9 Safety equipment with transformer</p>

Repairs

Before putting in service

Installation

	Step	Illustration
1.	 DANGER: Before beginning any work on the IRC5 control/drive modules, please see the safety information in section “DANGER – Ensure that the main power switch is turned off.” on page 1 - 5	
2.	Open process control equipment	
3.	Position the transformer.	
4.	Fit the retaining screws.	
5.	Connect cabling to terminal in accordance with diagram.	 <p><i>Figure 10 Safety equipment with transformer</i></p>
6.	Close process control equipment.	

2.3.3 Before putting in service



All protection and all safety equipment must be in place before the station is put in service. This should be especially noted in connection with maintenance and service.

Inspection

Before commissioning, the following should be checked:

	Action
1	Check that no tools have been forgotten.
2	Check that the fixture and workpiece are well secured.
3	Check that all parts and protections are in place and that they are well secured.
4	Check that all functions are correct.

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1 Process control equipment

1.1 Process unit PIB

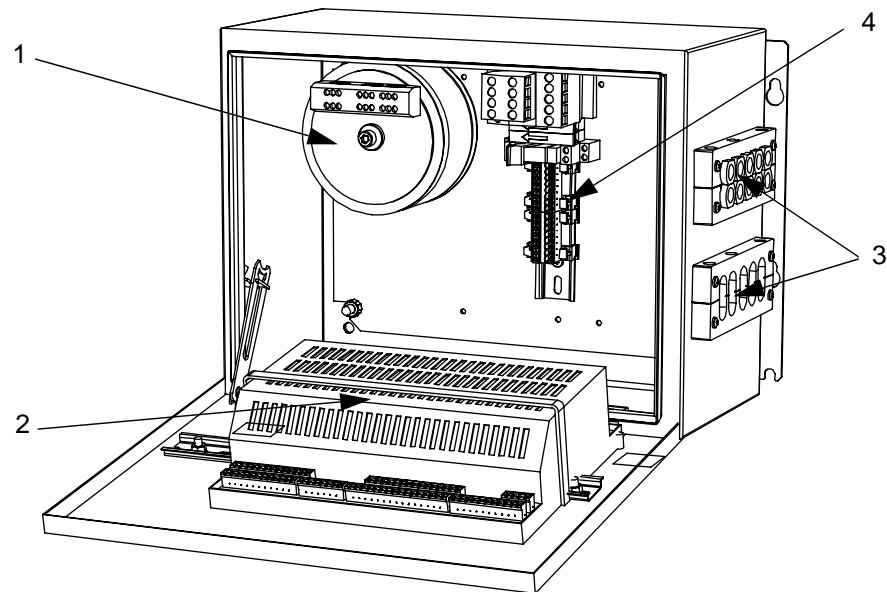
1.1.1 General

The PIB is an I/O unit with an integrated wire feed regulator that communicates directly with ABB's IRC5 robot control system. It is used for control and monitoring of robot welding.

Configuration is conducted in a manner corresponding to a standard I/O unit, The PIB's properties are determined through transfer of configuration parameters for power sources and wire feed units. Communications with the robot computer are via serial communications on a CAN bus.

The I/O connections on the PIB are grouped, *see Figure 2*, for direct cable connection.

Location



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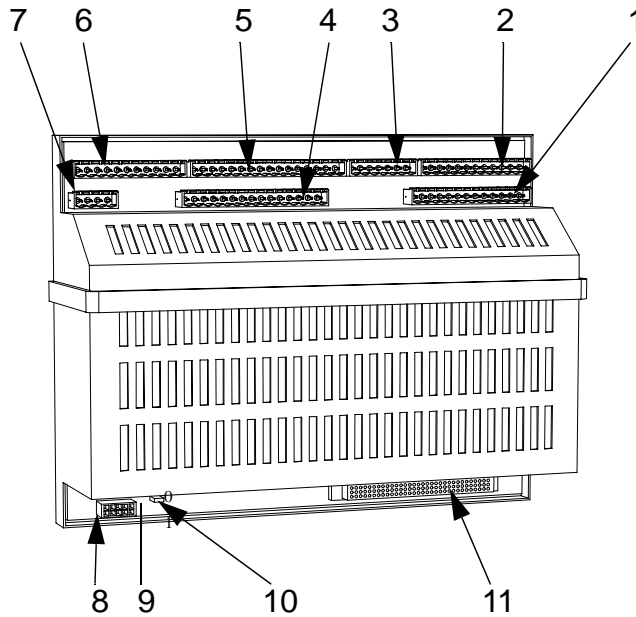
Figure 1 Process control equipment

Pos.	Description	Designation
1	Transformer, see "Transformer" on page 4 - 11	
2	Process unit PIB	A121
3	Cable entry for process equipment, see "Cable entries on the control equipment for process equipment" on page 1 - 19	
4	Interlock unit and jackable terminals for process equipment, see "Connections in control equipment for process equipment" on page 2 - 7	

Process control equipment

General

Process unit PIB



PIB.wmf

Figure 2 Outlet designations on PIB


Item	Description	Item designation
1	Outlet for power supply and interlocking	A121.TB1
2	Outlet for CAN bus/DeviceNet	A121.TB2
3	Outlet for welding torch accessories	A121.TB4
4	Outlet for wire feed unit (signal)	A121.TB6
5	Outlet for wire feed unit (motor)	A121.TB5
6	Outlet for welding power source	A121.TB3
7	Outlet	A121.TB11
8	Outlet for program loading	
9	Jumper	A121.TB9
10	Switch for program loading	
11	Euro connector add-on board for joint tracking	

2 Technical specification

2.1 Mechanical data

Type	Data
Dimensions:	257x196x72.5 mm
Weight:	2.1 kg
Enclosure class:	IP 20

2.2 Electrical data

Type	Description	Data
Power supply:	"Transformer" on page 4 - 12 -Transformer	
	Continual load/output:	Max. 350 mA
	Total load, outputs:	Max. 1.6 A, < 70°C
	Actuation of overload protection per output:	370 mA
Digital inputs, 24V DC:	Input voltage, connection:	15 to 35V
	Input voltage, disconnection:	-35 to +5V
	Input impedance	4 kohm, resistive
42V AC outputs:	Max. current:	1A at < 70°C
Relay outputs:	Max. voltage:	250V AC
	Max. current: Notes: Contact protestation must be connected externally	10 A
Analog outputs:	Output voltage range:	0 - 15 V, <= 100 mA, <= 70°C.

Technical specification

Environmental data

2.3 Environmental data

Temperature data:	At standstill	During operation	In compliance with:
Cold:	-40°C, 16 hrs.	+5°C, 2 hrs.	IEC 68-2-1
Heat:	+70°C, 16 hrs.	+70°C, 2 hrs.	IEC 68-2-2
Change:	-40°C/+ 70°C 2 cycles		IEC 68-2-14
Vibration:			EC 68-2-6
EMC: (Electro Magnetic Compatibility)			EN 50199
LVD: (Low Voltage Directive)			EN 60204

3 Safety

3.1 Personal safety

Moving functions that are stipulated by the EU's machine directory as able to cause personal injury, are interlocked via the robot's continuous pressure device and emergency stop circuitry.

Such functions are:

- Manual wire feed
- Torch cleaning

3.1.1 Interlocking

Where national legislation requires that welding power sources also be interlocked, the interlocking system can be complemented with a relay that opens the welding power source control circuit.

3.1.2 Manual wire feed

For manual wire feed that is conducted from the welding torch or wire feed unit's pushbutton, wire can be fed without actuation of the continuous pressure device for a maximum of 6 m/minute.

The longer the button is held down, the higher the speed.



Manual wire feed: See [“Manual wire feed with PIB and IRC5”](#) on page 4 - 27

3.2 Machine safety

3.2.1 Collision detection

The robot function for collision detection is defined as standard for A314E/316E/324E systems.

Important:

The mechanical collision sensor function in the PIB must be deactivated through a connection of +24V to PIB input TB 6.2.

The absence of this signal will otherwise be interpreted by the PIB as a collision and the wire feed unit will be blocked.

Jumper By2 in the wire feed unit is already prepared for this and at delivery is wired in the closed position when no collision sensor is installed. [See note 2. "Circuit diagram, wire feed unit A314E/316E/324E" on page 4 - 26](#)



3.2.2 Collision sensor (option)

The mechanical collision sensor is ordered as an option

Important:

Jumper By2 must be in the open position when collision sensor is installed.

[See note 2. "Circuit diagram, wire feed unit A314E/316E/324E" on page 4 - 26](#)



The following description ["Collision sensors" on page 4 - 7](#) applies when a collision sensor is installed.

3.3 Collision sensors

3.3.1 General

The PIB is designed for use by a welding torch equipped with a collision sensor. Normally, the sensor shall provide 24V DC to the PIB's input TB6.2.

The collision sensor controls the "run chain" relay in the PIB. The relay has two poles and is included in the robot's G-stop chain (general stop). Normally, the relay is activated.

3.3.2 Upon activation of a collision sensor

When a collision sensor is activated, the run chain relay is deactivated and the G-stop loop opens, which entails a rapid stop caused by the robot leaving the operating mode and entering the standby mode. The message **G-stop** (general stop) is displayed on the robot's FlexPendant. The message remains until it is acknowledged with the OK button.

Return to service after collision

For the robot to be put in service again, the G-stop chain must first be re-closed.

If the torch has been temporarily out of position but springs back, the G-stop chain is closed and the robot can be returned to service.

If the torch remains in the wrong position, for example, when a collision state with a weld object, fixture, etc., remains, the robot must be moved so that the torch springs back. On ABB's wire feed unit A-314, there is a spring-back pushbutton (reset) on the front of the wire feed unit for this purpose.

3.3.3 Reset

Return to service after collision

Upon reset of the collision sensor, the microprocessor in the PIB activates the run chain relay and closes the G-stop chain. The robot can be returned to service, and with the robot's joystick, the robot can be moved so that the torch springs back and resets the collision sensor in the closed position. The reset function is then automatically acknowledged.

Program start

Program execution start is blocked until acknowledgement is made. Attempts to start the program prior to acknowledgement cause the run chain relay to deactivate and the G-stop chain to open again, necessitating a repeat of the reset procedure.

Reset limitation

To prevent the PIB (for example, because of an open circuit) from remaining at the reset function and a new collision not being able to stop the robot, the time for reset is limited to **1 minute**. Thereafter, the G-stop (general stop) chain is opened again and the reset procedure must be repeated.

The above applies both to manual control of the robot and program execution.

During program execution

3.3.4 During program execution

During program execution, an error message is displayed that expressly states that the collision sensor has been activated.

Error messages

Message	Description
Message 1: PIB error, warning	Welding torch has collided. If torch still in collision state, reset from wire feed. <ul style="list-style-type: none">• Move robot with joystick; program may not be restarted. Message 1 is displayed with G-stop (general stop) when a welding torch remains out of position.
Message 2: PIB error, warning	Weld torch has been reset.
Message 3: PIB information	Torch has returned to normal position.

Messages 2 and 3 in the specified order will be displayed after restart. If the collision is brief, so that the welding torch is only momentarily out of position and springs back, message 1 will not be displayed. However, messages 2 and 3 will be displayed.

3.4 Electronics

Design	<p>The PIB is designed to withstand short-circuiting of outputs and overloading of the motor regulator.</p> <p>Overloaded outputs are deactivated. The function recovers after switching on the power after the power supply to the PIB is switched off and the overload removed.</p>
Motor regulator	<p>The motor regulator is protected by current limiting in the final stage.</p>
Other units	<p>Other units connected to the PIB are also protected through maximum and minimum data being configured, such as maximum reference for a welding power source, maximum speed for the connected wire feed unit.</p>
Error message	<p>As described in chapter “Diagnostics, fault handling” on page 2 - 27, an error message is generated to indicate a proposed action. The welding process is not stopped.</p>

3.5 Versions and options

3.5.1 Voltage versions

The PIB is available in two voltage versions; see the table below and “[Marking and version management.](#)” on page 4 - 13 for additional information.

Voltage version	Description	Part number
005-Low voltage	Wire feed unit with power supply to the wire feed unit regulator's final stage at max. 42V AC/10A.	501 700-880
006-High voltage	Wire feed unit with power supply to the wire feed unit regulator's final stage at max. 115V AC/3.5A.	501 700-881



A connection of 115V AC to the low voltage version of the PIB results in destruction of the circuit board.



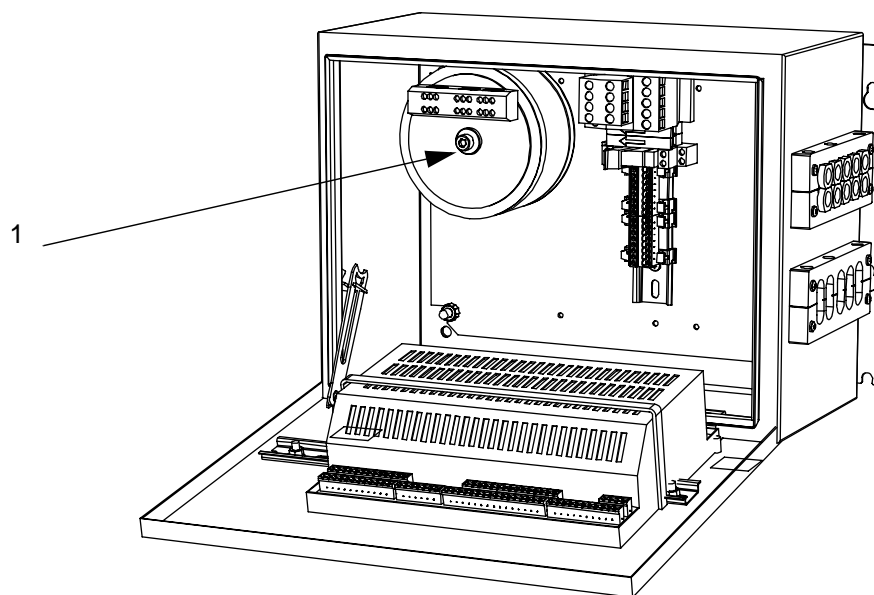
High voltage version:

A protective ground cable (min. 2.5 mm²) shall be connected, *prior to turning on the power*, between the PIB's holed metal bar and the control equipment's protective ground bar.

3.5.2 Transformer

The transformer supplies the motor regulator part on the process control board with 42V (28V) AC and the rectifier part on the process control board with 28V AC. The transformer is located in the rear section of the process control equipment.

Location



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Figure 3 Transformer for PIB in process control equipment

Item	Description	Item designation
1	Transformer for PIB (42 VAC)	T12

220 V supply to process control equipment

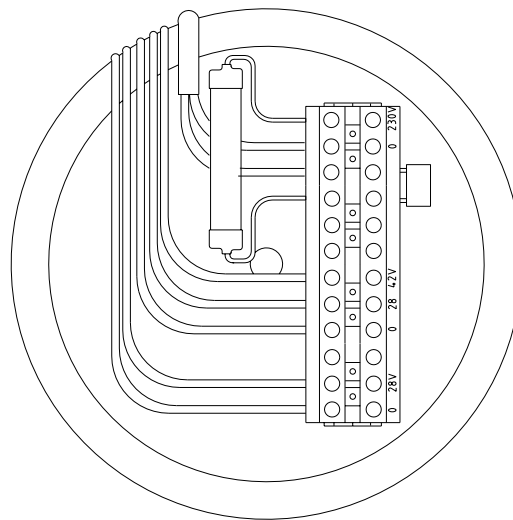
SCC (single cabinet)	220 V from terminals X16.1 and X16.2 in SCC.
DCC (dual cabinet)	220 V from fuse F2/2 and K 41 in drive module for DCC.

Safety

Transformer

Versions

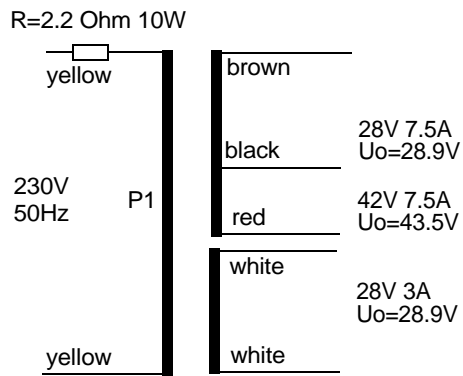
Version	Part number
Low voltage (LV)	501 714-001
High voltage (HV)	501 714-002



Marking

0-230V	0-230V
0-28V	0-28V
0-28 42V	0-28V
0-28V	0-115V
LV	HV
-001	-002

Low Voltage



High Voltage

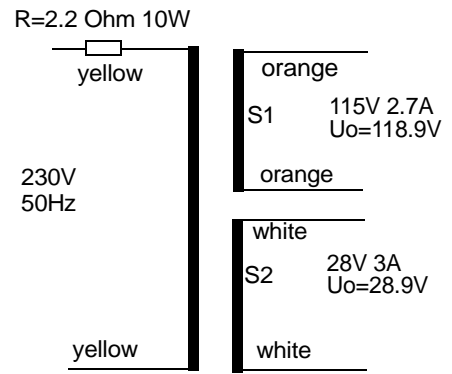


Figure 4 Transformer

501714c1

3.6 Marking and version management

3.6.1 Hardware version

Location and disposition of article number and serial number. This marking shows the PIB's hardware version, not the program version.

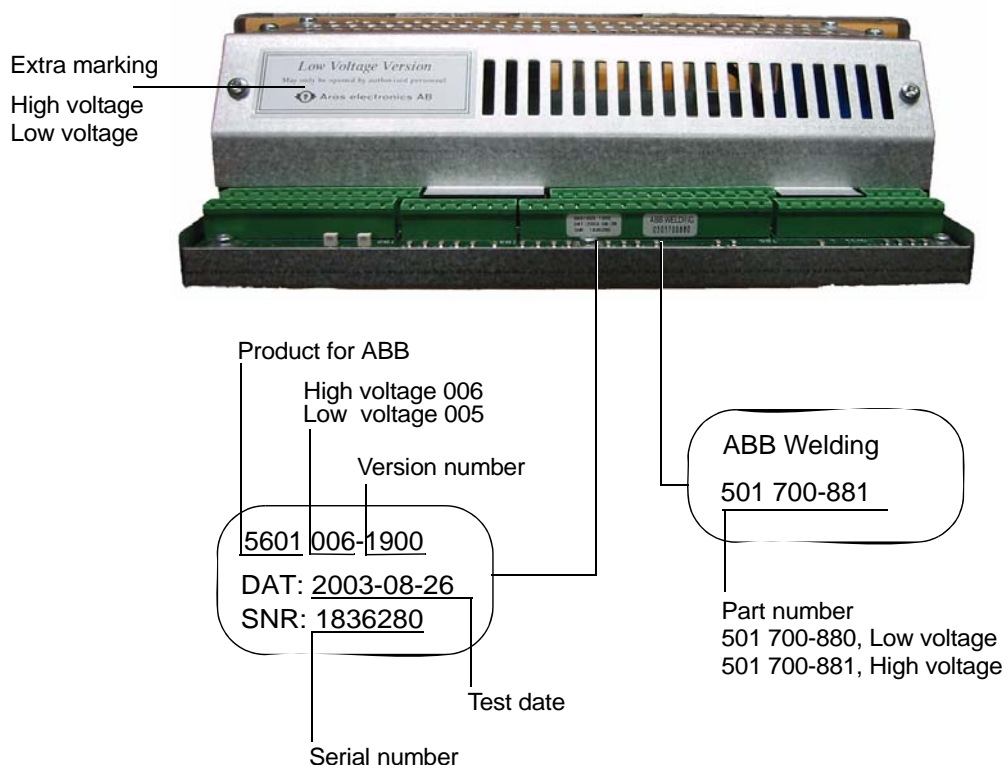


Figure 5 Marking and version management.

3.6.2 Program version

The program version is shown under the menu for configuration in the robot's FlexPendant, and is a non-editable four-digit number. It is updated automatically upon change of program version.

3.7 Options

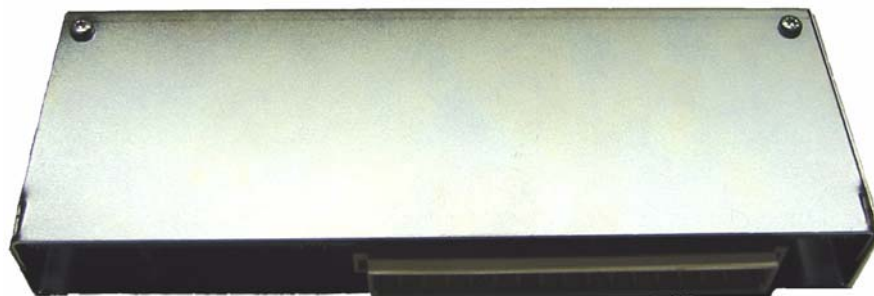
3.7.1 Smartac

The PIB is equipped for connection of an optional board that provides increased functionality. This is connected in the 32-pole Euro unit.



smartac på PIB.jpg

Figure 6 Smartac fitted on PIB



smartac.jpg

Figure 7 Smartac

4 Configuration

4.1 General

Through programmable parameters, adaptations can be made to different types of welding equipment.

Configuration parameters determine:

- Regulation properties
- Scaling factors
- Offset values
- Maximum and minimum values, etc.

4.2 Configuration parameters

The configuration parameters are listed and their values can be edited on the robot's FlexPendant under the menu:

```
Misc\System\Parameters\IO signals\Types?Units\PIB-name  
(configured IO name)
```



Change values are automatically transferred to the PIB when the robot is started.

4.2.1 Upon change of PIB

Configuration of previously stored configuration parameters in the robot are automatically transferred at power-up to the new PIB board (*for exceptions, see chapter “Adaptation of process unit PIB to control system IRC5” on page 4 - 17*).

Configuration data for ABB's standard equipment is included on the configuration floppy disks for the AW system.

See “[Configuration parameters](#)” on page 4 - 29, where all parameters are listed and defined.



When changing a PIB, the unit must be restarted twice.

Configuration

Upon change of PIB

5 Installation

5.1 Adaptation of process unit PIB to control system IRC5

5.1.1 General

The PIB contains two program versions. This is because different program versions are needed, depending on which control system is used. The active program version determined by jumper TB9.

5.1.2 IRC5

For IRC5 robot systems, jumper TB9 must be open (removed or secured to a single pin).

With the jumper in this position, the following are supported:

- Transfer of configuration data from the robot's FlexPendant.
- Automatic transfer of configuration data from the robot upon replacement of a PIB.

See description in [“Configuration parameters”](#) on page 4 - 15.

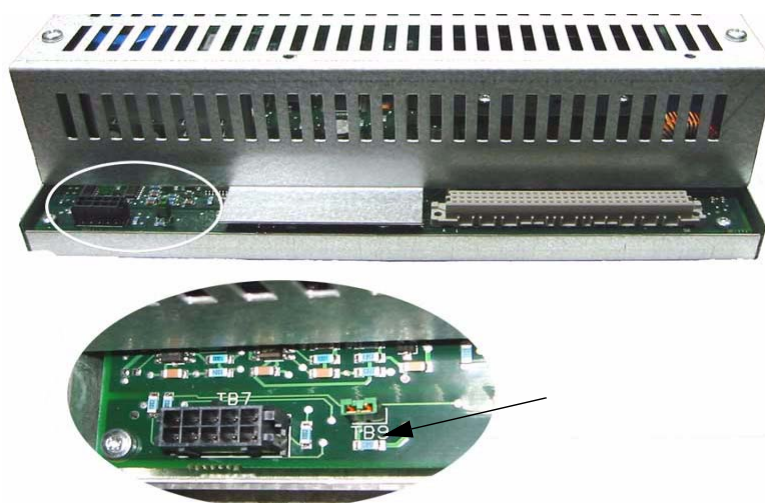


Figure 8 PIB, jumper TB9.

Bygging_TB9_överblick.jpg

5.1.3 Upon delivery



All PIBs delivered as spare parts or components are preconfigured for ARCITEC/LRA and wire feed unit A314 upon delivery. This means that jumper TB9 is closed.

Type of delivery	Description
Complete system	Upon delivery of a complete system, TB9's position is predetermined.
Spare part or component	For use with an IRC5, the jumper must be removed and the parameter transfer can be conducted as described in chapter.

6 Operation and connections

6.1 Emergency stop

All emergency stop buttons in the system are connected in series by default and directly affect the control system's emergency stop loop.

On welding equipment belonging to the standard assortment, emergency buttons are included on:

- Single cabinet/dual cabinet/external operator panel IRC5

Emergency stop on welding power source

If the process equipment is fitted with emergency stop buttons, they can be connected in series with other buttons in the system.

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

Example

The following figure shows in principle how the emergency stop loop is used for control of connected equipment.



For more detailed information on the emergency stop loop's design, please refer to the product manual for the *robot controller IRC5*.

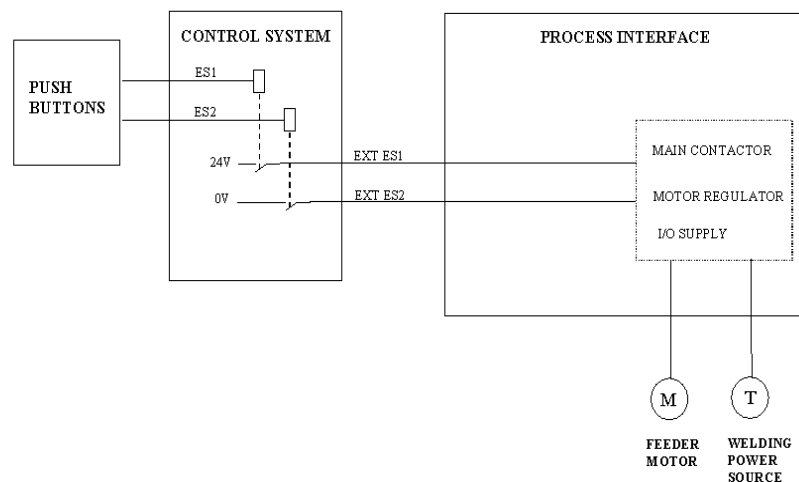


Figure 9 Emergency stop loop

6.2 Extended emergency stop function (option)

The option for extended emergency stop function provides the capability to supplement the equipment with components. Optional redundant auxiliary relays can then be easily connected for this purpose.

The following figure shows in principle how the emergency stop loop with the optional extended emergency stop function is used for control of connected equipment.



For more detailed information on the emergency stop loop's design, please refer to the product manual for the *robot controller IRC5*.

Example

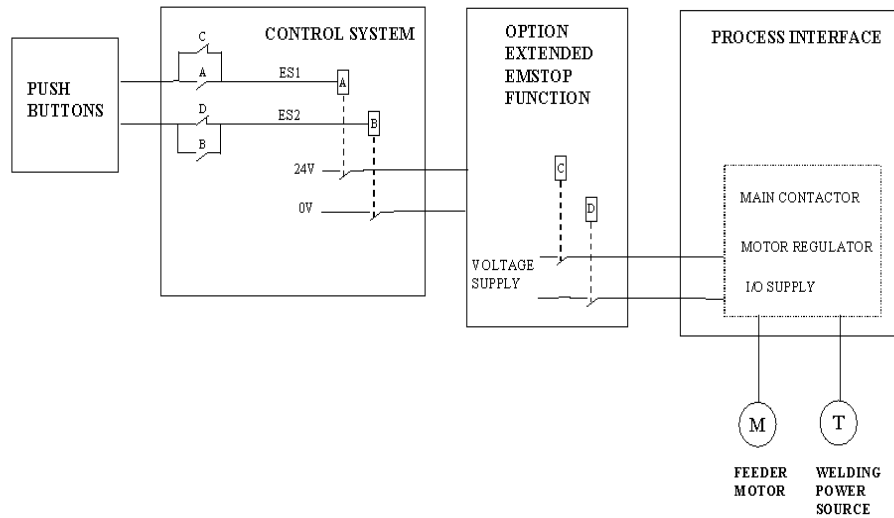


Figure 10 Emergency stop loop with the option for extended emergency stop function

6.3 Emergency stop loop

The following figure shows in principle how the emergency stop loop is used for control of connected equipment,



For more detailed information on the emergency stop loop's design, please refer to the product manual for the *robot controller IRC5*.

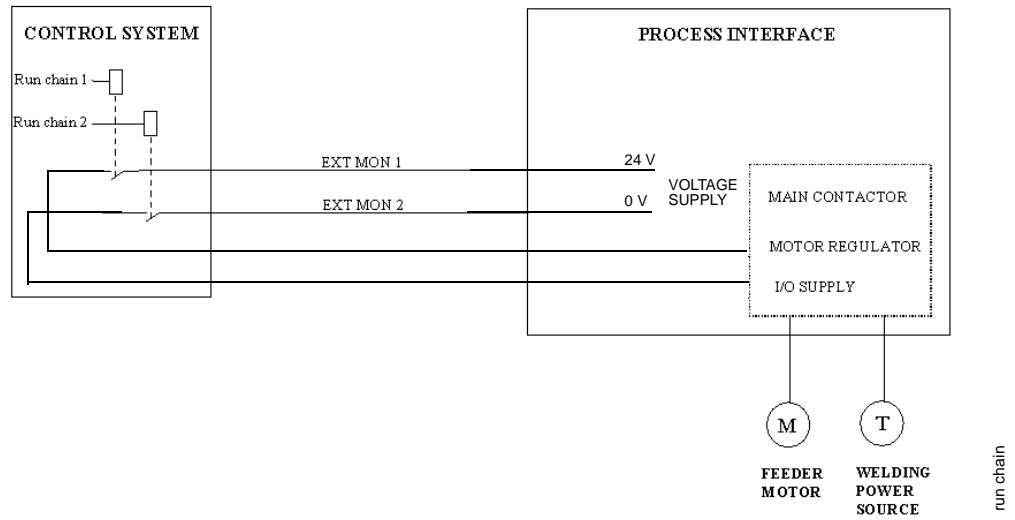


Figure 11 Operating stop loop

Two-channel interruption of operating stop loops on the process control board.

Wire feed motor operation in all operating modes

To operate the wire feed motor and welding equipment in all operating modes, the following are required:

	Action
1.	All safety loops are intact
2.	The system is in operating mode MOTORS ON

Wire feed motor operation at restricted speed

To operate the wire feed motor at restricted speed, the following is required:

	Action
1.	The emergency stop loop is intact
2.	The system is in operating mode MANUAL
3.	The system is in operating mode MOTORS OFF

6.4 Signal connections

For more information [“Outlet designations on PIB” on page 4 - 2.](#)



TB is an abbreviation for Terminal Block

6.4.1 TB1, Power supply and interlocking

	Designation	Type, voltage	Out	In	Explanation
1	Motor supply	AC			Power supply to motor regulator, interlocked 42V max., for PIB 501700-880 115V max., for PIB 501700-881
2	Motor supply common	AC			Zero power supply
3	Ext. supply	AC			Power supply non-interlocked for magnetic valves and push feed units
4	Logic supply	28V AC			Power supply for logic circuits
5	Logic supply common	0V AC			Zero power supply for logic circuits
6	Ground plane	0V DC			Ground plane
7	I/O 24, VS	DC		x	Non-interlocked 24V DC
8	Manual wire feed out	24V DC	x		Control signal for closing of interlock contactor
9	Run chain A1	Relay contact			Run chain A
10	Run chain A2	Relay contact			Run chain A
11	Run chain B1	Relay contact			Run chain B
12	Run chain B2	Relay contact			Run chain B
13	24V ext	24V DC	x		24V DC

6.4.2 TB2, CAN bus connection

	Designation	Type, voltage	Out	In	Explanation
1	V-	DC			System 0 (from robot)
2	CAN_L	Serial com.			CAN low ¹
3	DRAIN	DC			Ground, shield
4	CAN -H	Serial com.			CAN high ¹
5	V+	DC		x	System 24 V (from robot)
6	GND	DC			0 V for addressing
7	NA 0	Jumper, NC: active			Binary addressing, not connected to TB2:6=1
8	NA 1	Jumper, NC: active			Binary addressing, not connected to TB2:6=2
9	NA 2	Jumper, NC: active			Binary addressing, not connected to TB2:6=4
10	NA 3	Jumper, NC: active			Binary addressing, not connected to TB2:6=8
11	NA 4	Jumper, NC: active			Binary addressing, not connected to TB2:6=16
12	NA 5	Jumper, NC: active			Binary addressing, not connected to TB2:6=32

1. Termination resistance of 120 ohms is installed between TB2/2 and TB2/4 if the PIB is the outer (distance) I/O unit in the system.

See recommendations for connection of termination in the robot's product manual.

6.4.3 TB3 Connection to welding power source

	Designation	Type, voltage	Out	In	Explanation
1	Start power source A	Closing contact	x		Control relay for welding power source (or cooling fan ARCITEC)
2	Start power source B	Closing contact	x		Control relay for welding power source (or cooling fan ARCITEC)
3	Weld ref.	Analog 0-15 V	x		Reference for welding voltage
4	PS Ref. gnd	Analog common	x		Reference zero
5	Induct. Ref	Analog 0-15 V	x		Reference for inductance setting
6	Weld object	Analog		x	Detection of welding voltage on welding object ¹
7	Arc voltage gun	Analog	x		Return of welding power to welding power source
8	Arc voltage object	Analog			Detection of welding voltage on welding object for PDM. ²
9	24V ext	Supply voltage +24V DC	x		For external relay
10	Ground plane	Supply voltage +0V DC	x		For external relay
11	NC				Not connected

1. Common connection to welding object and welding power source, and negative pole for Smartac/PIB.
2. PDM: Process Data Monitoring

Operation and connections

TB4 Connection to torch cleaner and TCP detector

6.4.4 TB4 Connection to torch cleaner and TCP detector

	Designation	Type, voltage	Out	In	Explanation
1	24V ext	Supply 24V DC	x		
2	Ground plane	Supply zero 0V DC	x		
3	Lubrication	Digital 24V DC	x		Lubrication for cleaning reamer
4	Cleaning	Digital 24V DC	x		Cleaning reamer
5	Wire cutter	Digital 24V DC	x		Wire cutter
6	Cleaning finished	Digital 24V DC		x	Cleaning finished
7	Bulls Eye	Digital 24V DC		x	Detection stop, TCP detector

6.4.5 TB5 Connection 1 to wire feed unit

	Designation	Type, voltage	Out	In	Explanation
1	Motor +	0-60/0-170V DC	x		Motor voltage
2	Motor -		x		Motor voltage
3	Pneumatic spatter cleaning	42V AC	x		To magnetic valve for pneumatic spatter cleaning
4	Gas valve	42V AC	x		To magnetic valve for protective gas
5	Arc voltage gun	0-70V DC		x	Arc voltage return ²
6	Smartac 1	40V DC	x		Search voltage for Smartac sensor 1
7	Ext. Supply	Phase 28/42V AC	x		Supply voltage to push feed unit
8	Ext. Supply common	Zero 28/42V AC	x		Supply voltage to push feed unit
9	Smartac 2	40V DC	x		Search voltage for Smartac sensor 2 ¹
10	Spatter cleaning A	Closing contact			Alternative parallel function for TB5:3 ²
11	Spatter cleaning B	Closing contact			Alternative parallel function for TB5:3 ²
12	Gas valve A	Closing contact			Alternative parallel function for TB5:4 ²
13	Gas valve B	Closing contact			Alternative parallel function for TB5:4 ²
14	Tig mode	24V DC	x		Option
15	Feed reverse	24V DC	x		Control signal for motor reversing
16	HF ignition	24V DC	x		Option

1. When using Smartac sensor 2, TB5:5 and TB5:9 are jumpered; see Smartac manual.
2. Appropriate contact protection required

6.4.6 TB6 connection 2 to wire feed unit

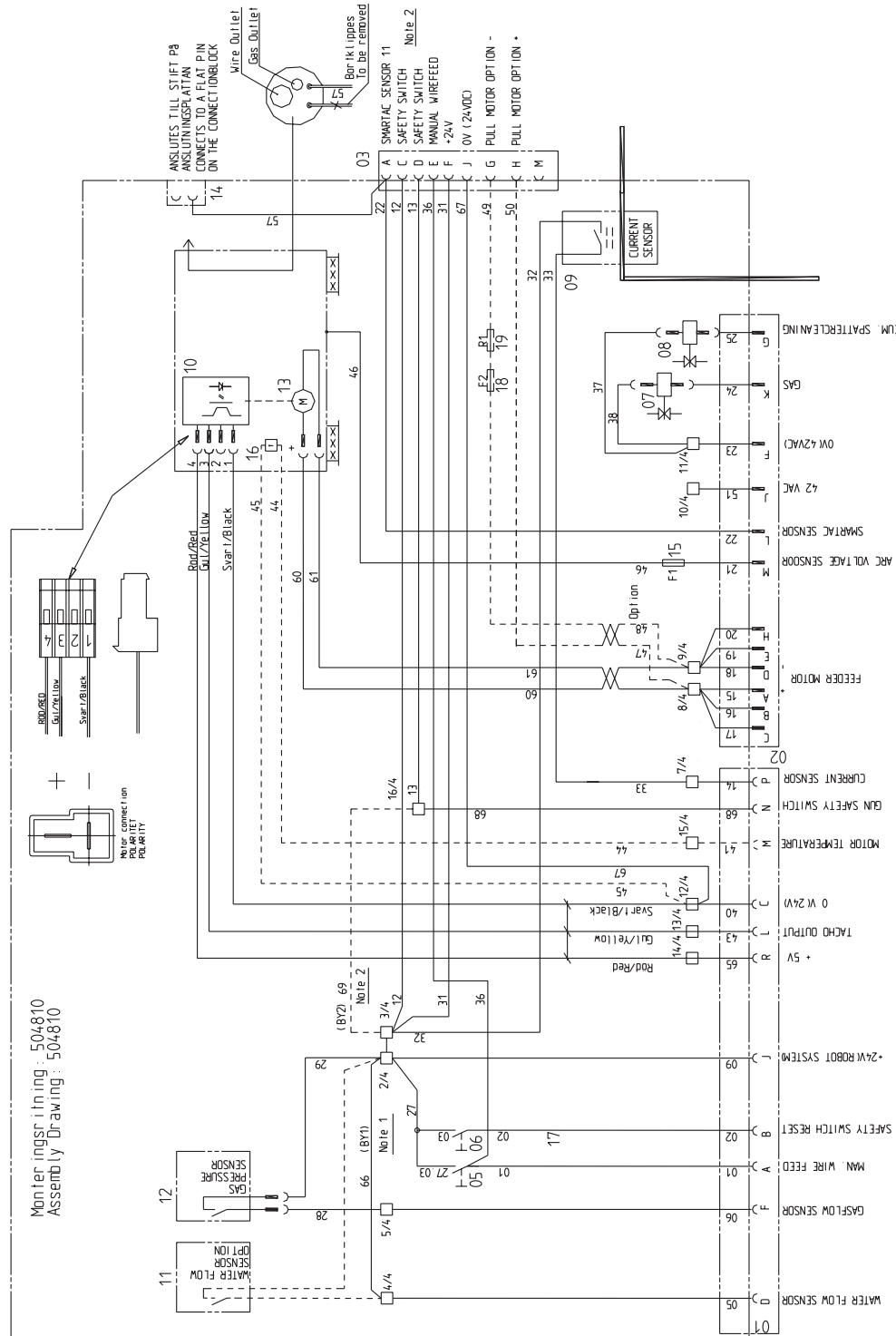
	Designation	Type, voltage	Out	In	Explanation
1	Torch reset	24V DC		x	Reset of collision sensor
2	Torch collision sensor	24V DC		x	Collision sensor
3	Current sensor	24V DC		x	Welding power sensor
4	Water flow sensor	24V DC		x	Water flow sensor
5	Gas flow sensor	24V DC		x	Gas flow sensor
6	0V	NC			Jumper for TB 6/10
7	Tach input	DC pulse		x	DC or AC tach/input for encoder tach
8	Man. Wire feed	24/DC		x	Manual wire feed
9	+24V	Supply voltage	x		Supply voltage
10	0V	Supply voltage	x		Supply voltage/common for encoder tach
11	Motor temp.	Analog		x	Temperature sensor in wire feed unit
12	Auxiliary motor	24V DC	x		Control signal for push feed unit
13	PDM tach +	AC/DC		x	Tachometer for process data monitoring
14	PDM tach -	AC/DC		x	Tachometer for process data monitoring
15	+5V encoder tach ¹⁾	DC	x		Supply voltage for encoder tach

1. PIB high voltage

6.4.7 TB11

	Designation	Type, voltage	Out	In	Explanation
1	Weld current A	Analog		x	Shut connection for PDM
2	Weld current A	Analog		x	Shut connection for PDM
3	HF ignition	24V DC		x	Indication, HF ignition option
4	Smartac sensor detect.	24V DC	x		Alternative to sensor detect. Via CAN bus

6.5 Circuit diagram, wire feed unit A314E/316E/324E



100908P05

Figure 12 Circuit diagram, wire feed unit A314E/316E/324E

6.6 Manual wire feed with PIB and IRC5

6.6.1 Capabilities and limitations

Manual wire feed can be conducted with three different methods:

- By pressing the spring-back button for manual wire feed located on the welding torch or on the front of the wire feed unit.
- By activating the function `Manual wire feed` from the robot's FlexPendant in test mode under: `Program window\Arcweld\Manual wire feed`.
- By activating the robot output `aoFEED` in combination with setting of a speed reference in `aoFEED_REF` under the I/O window.

Methods

Properties and differences

The table below shows properties and differences between the methods.



See note 3 below concerning limitation of functionality for method 3

Method	Speed ¹	Ramping function	Continuous pressure switch pressed	Setting of reference
1	Max. 6m/min	Yes	No	Automatic
2	Max. 9m/min	Yes	Yes	Automatic
3	Full speed range	No	Yes	Manual Limited validity ²

1. If the speed range is limited by the configuration parameters `MotorMaxSpeed` or `MotorMinSpeed`, the limitation is in effect.
For ARCITEC: If the speed range is limited by the configuration parameter `MotorMachineID`, the limitation is in effect.
2. **Note:** The reference is valid only as long as `aoFEED` is not changed by any other function: Methods 1 and 2 or execution of a program with another value. After use of method 1 or 2, the reference is reset to zero.

Explanation

The table below explains differences between the methods:

Method	Explanation
1	Arc welding function for manual wire feed in the robot is called from the PIB. The robot input <code>diMAN_WF</code> is activated. The robot activates the input <code>doFEED</code> with a reference in <code>aoFEED</code> , which increases as a function of time when the wire feed button is depressed. The function is active as long as the button is depressed. The speed is limited to max. 6 m/min by the PIB. ¹
2	The arc welding function for manual wire feed is called from the robot's FlexPendant. The robot input <code>diMAN_WF</code> is activated. The robot activates the input <code>doFEED</code> with a reference in <code>aoFEED</code> , which increases as a function of time when the manual wire feed button is depressed. The function is active as long as the button is depressed.
3	The reference range is expressed as 0 - 0.5 m/s (0 - 30 m/min). The function is active as long as <code>doFEED</code> is set to 1.

1. Limitation for reasons of personal safety.

Appendix A:

A - 1: Configuration parameters

The configuration parameters are defined for three requirements:

1. They shall be whole numbers so as to facilitate handing in the PIB's microprocessor.
2. The whole numbers shall be sufficiently large for the desired accuracy and resolution to be obtained.
3. Programming from the robot shall be possible to express in actual quantities, for example, 24.4 m/min for wire speed, 32.2 V for welding voltage, etc. A multiplier with one or more factors is necessary in several cases:

In the column "Parameter range/denomination" in "Configuration parameters table" on page 4 - 31 the setting range for the parameter is indicated and a number that defines what the configuration value shall be multiplied by to express the actual relationship.

Example:

If "MotorCurrentLim" is indicated as the value **80**, the definition means "Motor Current Limit {0 ... 100}0.1 A" that the maximum permitted current is **8 A**.
If "ProcEquipRefConv" is indicated as the value **8260**, the definition means {1000 ... 30000}E⁻³ that the relationship output voltage/reference is **8.260**, etc.

The conversion factor for feed units with AC tachometer:

The conversion factor is obtained from:

$$k_0 = g \times n \times 100 / (\pi \times D \times 60) \text{ [Hz/m/min} \times 100],$$

where:

k_0	is the conversion factor for tachometer type 0
g	is the gear's gear ratio
n	is total tachometer periods/motor revolutions
D	is the feed rollers' diameter in meters
100	is the multiple.

If k_0 was >65535 , Tachometer type 2 would be configured, and at the same time, the conversion value shall be set to $k_2 = k_0/2$.

The maximum permitted tachometer frequency is 27000 Hz, which limits the maximum theoretical wire feed speed to $V_{\max} = (\pi \times D \times 60 \times 27000) / (g \times n)$ [m/min]

Regulation parameters for wire feed unit

Regulation parameters are:

- Feed Forward factor
- Motor Regulator P-factor
- Motor Regulator I-factor

These parameters have been tested for the wire feed units delivered as standard and adjustment should be avoided. Changes can result in incorrect speeds or instability. Adjustment should only be conducted in consultation with service personnel from ABB Automation Technologies AB.

Transfer of parameters between robot and PIB

The configuration parameters are sent from the robot's system parameter memory to the PIB each time the system is powered up. If the parameters are the same as what is already in the PIB, no new entries are made in the PIB.

If the parameters in the PIB differ from those that come from the robot (for example, after changing the PIB) the deviating parameters are entered in the PIB, which results in the new PIB obtaining the same configuration as the previous¹.



For the new parameters to apply, the system must be restarted twice.

System definition

If the parameter "*System definition*" is changed, which entails a change of the I/O type for the PIB, the parameter transfer is made in two steps. Redefinition is first conducted for the new I/O unit in the robot, which requires a restart.

At the next start, the transfer to the PIB is executed, and for the new parameter to apply for the PIB, an additional restart of the robot is necessary. Consequently, in this case, the robot must be restarted twice. For the second start, it is enough to perform a "warm start" of the system.

1. Note that jumper TB9 shall be open.

A - 2: Configuration parameters table

The table lists all parameters that are defined for the PIB. They can be viewed and edited from the robot's FlexPendant.

Not all parameters are implemented as standard. Parameters that are implemented and must have correct values for correct function are indicated with an asterisk and in bold font.

Parameter name	Parameter name in FlexPendant	Parameter behavior	Parameter range/denomination
Software Revision	SoftwareRevison	Current software revision (read-only)	-
Motor Max Voltage	MotorMaxVoltage	Maximum allowed voltage for the DC motor connected.	{0...110} V 60 (Used as standard value)
Motor Current Limit	MotorCurrentLim	Maximum allowed voltage for the DC motor connected.	{0...100} 0.1 A 100 (Used as standard value)
*Motor Max Speed	MotorMaxSpeed	Maximum allowed setting for motor speed in motor speed quantity units	{0...500} 0.1 300 (Used as standard value)
*Motor Max Speed	MotorMinSpeed	Minimum allowed setting for motor speed in motor speed quantity units	{0...500} 0.1 5 (Used as standard value)
*Motor Regulator P-factor	MotorRegPFactor	Proportional factor of the motor speed PI regulator.	{0...100}% 18 (Used as standard value)
*Motor Regulator I-factor	MotorRegIFactor	Integrating factor of the motor speed PI regulator.	{0...100}% 25 (Used as standard value)
*Motor Regulator Feedforward factor	MotorFeedForward	Feedforward factor of the motor speed PI regulator.	{0...100}% 10 (Used as standard value)
Motor Temp Limit	MotorTempLimit	Maximum allowed temperature for the motor.	{0...255} °C
*Motor Brake Ratio	MotorBrakeRatio	Defines the duty cycle of the brake transistor.	{0...255} 0 = No brake. 255 = Full brake 255 (Used as standard value)
Motor Control Error Time Limit	MotorCtrlErrTimeLim	Defines the maximum allowed time for difference between motor speed set value and actual value before setting the alarm	{0...255} 1/10 s

Parameter name	Parameter name in FlexPendant	Parameter behavior	Parameter range/denomination
*Motor Tacho Conversion Factor	MotorTachoConv	For AC: 100 Frequency in Hz for 1 motor speed quantity. For DC: 10000 Frequency in Hz for 1 motor speed quantity.	{0...65535} 20650 (Used as standard value) AC (tacho type 0): 0.01 Hz/motor speed quantity AC fast (tacho type 2): 0.02 Hz/motor speed quantity DC (tacho type 1): e-4 V/motor speed quantity
*Motor Tacho Type	MotorTachoType	Determines type of tachometer connected and used by the motor speed regulator of the PIB. Valid types are AC tacho and DC tacho	{0,1} 0 (AC tacho) 1 (DC tacho) 2 (Fast AC tacho) 0 (Used as standard value)
Motor DC Offset	MotorTachoDCOffset	Motor speed offset for DC tachometer connected	{-1000...1000} 0.01 m/min. (Or r/min, l/min)
*Process Equipment Reference Convers., Flexible	ProcEquipRef Conv	Conversion factor between the process quantity in the set value and the reference voltage	{1000...30000}e-3 Process quantity/Vref
*Process Equipment Reference Offset, Flx.	ProcEquipRef Offset	Offset value for the process. Given in process quantity units.	{0...1000} 0.1 V
*Process Equipment Max Reference Voltage	ProcEquipMaxRef	Maximum allowed reference voltage.	{0...1000} 0.1 V
Process Data Monitoring Speed Conversion Factor	PdmSpeedConv	For AC: 100 Frequency in Hz for 1 motor speed quantity motor speed. For DC: 10000 Voltage in V for 1 motor speed quantity motor speed	{0...65535} AC: 0.01 Hz/motor speed quantity DC: e-4 V/motor speed quantity
Process Data Monitoring Tacho Type	PdmTachoType	Type of tachometer used for true process quantity measurement	{0,1} 0 (AC tacho)
Process Data Monitoring Tacho DC Offset	PdmTachoDCOffset	PDM DC tacho offset	{-1000...1000} 0.01 motor speed quantity
Process Data Monitoring Current Shunt Conversion	PdmShuntConv	Scale factor for the shunt used in PDM.	{0...65535} e-5 mV/A 15000
Process Data Monitoring Shunt Offset	PdmShuntOffset	PDM Shunt offset	{-32000...32000} mA

Parameter name	Parameter name in FlexPendant	Parameter behavior	Parameter range/denomination
*Sensor Detection Sensitivity, Smartac	SensorDetectionSens	Defines the search voltage drop for detection of contact with workpiece	{0...255} 1/10 V
*Sensor Search Voltage Valid Limit, Smartac	SensorSearchVoltValid-Lim	Defines the lowest allowed search voltage for start of search.	{0...40} V
*System Definition	SystemDefinition	Defines the PIB system configuration	(0,1) 0 = (Flexible) 1 = Not in use (Arcitec S4CPlus) 2 = Integrated Power source IRC5
*Machine Identification code, ARCITEC	MotorMachineID	The motor machine identification for the wire feed range of the current wire feed motor. Only valid for Arcitec system	{0..255} According to wire feed motor cable
Inductance Reference conversion	OptProcEquipRefConv	Conversion factor between the process quantity in the set value and the reference voltage	{1000...30000}e-3 Process quantity/Vref
Inductance Reference Offset	OpProcEquipRefOffs	Offset value for the process. Given in process quantity units.	{0...1000} 0.1 V

A - 3: Loading of configuration file

```
#####  
#  
#   (c) ABB Automation Technologies AB,  
#   Arc Welding Products  
#  
#   File: ESABMig_FhpE.cfg  
#   Description:  
#       ArcWeld PIB EIO parameter configuration for PowerSource  
#       ESABMig 400t/500t and WireFeeder A314E/A324E  
#       with DC Pulsed Tachometer.  
#       Speed range 0.5 to 30 m/min.  
#   Created:  
#   Written by:  
#   Version 1.0  
#           1.0 LOJ  
#           Initial Release  
#  
#####
```

Installation

If you have received a configuration file on a CD, in accordance with the example above, you can install it as follows:

1. Copy the `CFG file` to a floppy disk, or use a PC/laptop and the Ethernet/Service outlet; use the FTP program to move the file manually between the PC and the robot memory.
This is done in the same way as in the file manager or in Windows Explorer.
2. With the System parameter window open on the FlexPendant, select:
`File\Add or change parameters\`
3. Select the `CFG file` from the floppy disk or the folder where it was moved to.
4. Restart.

For more information, see the User's Manual.

Appendix B:

B - 1: System accuracy: Verification and adjustment options

Wire feed: Wire feed unit A314E/316E/324E

Inspection

The wire feed unit's accuracy should be checked by measuring the motor tachometer's pulse frequency and not by measurement of the amount of fed wire and measurement of time so as to avoid errors due to wire slippage and errors in starting and stopping.

Correct speed requires that the friction in the wire feed system is sufficiently low, so that the wire feed unit regulator does not reach the current limit (10A).

The frequency signal is available at the terminal TB6: 7 (5 V pulse) and 10 (0 V) at PIB, or between the terminals 13/4 (5V pulse) and 12/4 (0V) in the wire feed unit.

Equipment

A suitable tool for measurement is a multimeter with frequency measurement, such as a Fluke 87 or equivalent instrument. If problems arise because of switching interference from the motor current, a capacitor, maximum 0,02 μ F, can be connected across the measurement probes.

If an oscilloscope is used, it should be galvanically isolated from the ground so as to avoid interference with the tachometer signal, which can influence wire feed function.

- Wire feed unit's configuration factor: 20650.
- Wire feed unit's pulse amplitude: 4.5 – 5V
- $f = v \times G \times N / (\pi \times D \times 60)$

where:

f	Frequency, Hz
v	Wire speed, m/min.
G=24	Gear's gear ratio
N=60	Total periods per motor revolution
D=0.037 m	Wire feed wheel diameter (contact diameter for welding wire)

Relation between frequency and wire speed

m/min	Hz	m/min	Hz	m/min	Hz
0,5	103	10,5	2168	20,5	4233
1,0	206	11,0	2271	21,0	4336
1,5	310	11,5	2374	21,5	4439
2,0	413	12,0	2478	22,0	4542
2,5	516	12,5	2581	22,5	4646
3,0	619	13,0	2684	23,0	4749
3,5	723	13,5	2787	23,5	4852
4,0	826	14,0	2891	24,0	4955
4,5	929	14,5	2994	24,5	5059
5,0	1032	15,0	3097	25,0	5162
5,5	1136	15,5	3200	25,5	5265
6,0	1239	16,0	3304	26,0	5368
6,5	1342	16,5	3407	26,5	5471
7,0	1445	17,0	3510	27,0	5575
7,5	1549	17,5	3613	27,5	5678
8,0	1652	18,0	3716	28,0	5781
8,5	1755	18,5	3820	28,5	5884
9,0	1858	19,0	3923	29,0	5988
9,5	1961	19,5	4026	29,5	6091
10,0	2065	20,0	4129	30,0	6194

Power sources

General

When using the PIB for control of power sources with analog reference (Flexible Mode), the reference properties are determined by the parameters:

- `ProcEquipRefConv` (amplification)
- `ProcEquipRefOffset` (offset)
- `ProcEquipMaxRef` (Max.)

When replacing a PIB or power source, welding results can deviate from previous results because of tolerances in the analog circuits in the PIB and welding power source.

By adjusting one or both of the two first-mentioned parameters above, it is possible to eliminate the difference and avoid extensive changes in the welding program.

If a power source has no base voltage (the reference is linear from 0 V), for example, a MigRob, the amplification is adjusted with `ProcEquipRefConv`.

For a grounded power source that has a base voltage (output voltage at ref. 0 V), for example, an RPB, adjustment of both parameters may be required. With a few iterations, where **Offset** is adjusted at the lowest pertinent welding value and the **amplification** is adjusted at the highest pertinent welding value, welding results are adjusted to an acceptable level, similar to the results before replacement.

Adjustment

The adjustments are best made in small steps.

If the welding voltage is assessed as being 5% too low, the configuration value is **reduced** by a value that is < 5%.

If the welding voltage is too high, the configuration value is **increased** by < 5%, etc. Note the inverse relationships.

The procedure is repeated until the desired results are achieved.

The procedure is suitable if uniformity between several power sources is desired.



If the standard configuration is not used, it is advisable that the changes be noted for the PIB or the welding power source that necessitated the change.

