Product Manual

Welding Equipment/S4Cplus

A140/A314i/A324iL

Flexible(LAW/RPA), ARCITEC(LRB/LRC)

ABB Flexible Automation
Welding Systems

ABB

List of Contents

1 General

This manual is made up of a safety section, technical description of the wire feed system A140/A314i/A324L, information on installation and operating the system and schematics. Another separate manual contains the spare parts list.

The manuals can either be purchased as freestanding documents or as optional sections to the *Product Manual* for the IRBP welding robot system.

Read all supplied manuals and safety directives carefully before unpacking and starting the installation.

2 Safety

2.1 General

The purchaser/user of ABB's robot welding equipment is responsible that the equipment is installed and used in the manner stated by the supplier. Also adhere to the standards and safety directives of respective countries.

Read carefully through all the manuals supplied, especially the section covering safety, before unpacking, setting up, or using the station.

This equipment is only intended for gas shielded arc welding, so-called MIG/MAG welding, and may only be used in accordance with the instructions set out in the documentation. With all other usage of the equipment we disclaim all responsibility and any claims for damages or warranty undertakings. Follow the directives of respective countries.

⚠ **The equipment is not intended for use in explosive environments.**

Save all manuals supplied!

2.2 Manufacturer's declaration

A manufacturer's declaration, as set out in the Machinery Directive 89/393/EEC, Annex II B is supplied with all deliveries to EU and EEA countries. See Figure 1.

		Declaration by the manufacturer					**3HEA 500005**		**B**
	ABB	Tillverkardeklaration							
		Standard		Type			Scale	Code	K1O
Year 1994	Week 52	Design checked by	Accepted for prod by	Drawing checked by	Drawn by TDM A.Ja	E	V indicates R_a in μm	Sheet 1 Cont	

Declaration by the manufacturer
as defined by machinery directive 89/392/EEC Annex II B

Herewith we declare that this product

manufactured by

ABB Welding Systems AB
S-695 82 LAXÅ / SWEDEN

with order number:

is intended to be incorporated into machinery or assembled with other machinery to constitute machinery covered by this directive and must not be put into service until the machinery, into which it is to be incorporated, has been declared in conformity with the provisions of the directive 93/68/EEC, amending directive 89/392/EEC.

Applied harmonised standards in particular:

EN 292-1	Safety of machinery. Basic terminology, methodology
EN 292-2	Safety of machinery. Technical principles and specifications
EN 294	Safety of machinery. Safety distances to prevent danger zones being reached by the upper limbs
EN 349	Safety of machinery. Minimum gaps to avoid crushing of parts of the human body
EN 418	Safety of machinery. Emergency stop equipment, functional aspects
EN 563	Safety of machinery. Temperatures of touchable surfaces
EN 614-1	Safety of machinery. Ergonomic design principles
EN 775	Manipulating industrial robots. Safety (ISO 10 218 with European modifications)
EN 60204	Electrical equipment of machines (IEC 204-1 with European modifications)

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(Development manager)

Alteration No.	Alteration	sign, year, month entered

Figure 1   Manufacturer's declaration.

502 572-502

2.3 Installation

- When unpacking, check that all the equipment has been supplied and that it has not been damaged during transportation. Damaged or broken equipment can mean a safety risk.

- Remove all packaging after unpacking to avoid the risk of fire. Leave suitable packaging for recycling.

- Ensure that the equipment, or parts of it, do not tip or fall over when unpacking or transporting.

- "Secure" the load before it is taken from the packaging.

- Make sure that cables do not rest against sharp edges. If possible run cables in cable trenches to prevent the risk of tripping.

- Welding fumes and any gases that may be formed or used when welding can be hazardous to inhale. It is the responsibility of the purchaser/user that satisfactory extraction devices are installed and used. Follow the directives of respective countries.

- The purchaser/user is also responsible that sufficient lighting is provided over the workplace. As a suggestion, lighting can be integrated in the fume extraction equipment.

- If possible use environment friendly shielding gas, for example, MISON (AGA) and environment friendly vegetable based oil for spatter cleaning.

2.4 Usage

All personnel working with the equipment must have sufficient training in its use and be well-conversed with applicable safety directives. Incorrect use can result in personal injury and damage to the equipment.

Ensure the working area is in order before the system is commissioned. If faults are discovered on or in system these should be rectified before start-up.

Call skilled personnel or the system manager if your own knowledge is insufficient to implement the requisite actions.

All protection and safety equipment must be fitted to the station before it is used. This should be especially observed in connection with maintenance and service routines.

Safe working methods must be employed to prevent injury. Safety equipment must not be disconnected, bypassed or in any other way modified so its protectiveness ceases.

Ensure that no one is within the risk area before resetting the safety equipment and before the station is started.

Use personal safety equipment, e.g. welding helmet with welding glass, protective clothing and gloves to protect the eyes and skin from injuries caused by rays and burning. Also protect others by setting up suitable screens and drapes.

Do not touch the welding gun's gas nozzle or the hot work piece directly after welding. Use protective gloves.

If possible, carry out spatter cleaning in a special area where welding spatter and oil can be collected. Welding spatter and oil on the floor brings about a risk of slipping.

2.5   Fire risk

There is a risk of fire in connection with welding. Ensure the area around the workplace is free from inflammable material. Clean the area regularly. Follow local directives for welding.

Make sure all connections in the welding current circuit are correctly tightened. Bad connections will result in an inferior welding result and the risk of fire. Cables that have not been dimensioned correctly, i.e. too light, can also bring about a fire risk due to overheating.

2.5.1   Fire fighting

Use carbon dioxide (CO_2) to extinguish equipment if it should start to burn.

Note that in the event of a fire there is a great risk of gas cylinders exploding. Follow local safety directives relating to the handling of gas cylinders.

2.6   Risk of electric shock

Do not mix up the phase and ground cables when connecting the equipment to the mains supply.

Do not touch "live" parts of the equipment with bare hands or with damp gloves or clothes.

Welding wire is connected to voltage during the welding process even before the arc is ignited.

Welding circuits should **not be grounded** bearing in mind the risk of the ground cable being damaged by prohibited welding current paths.

The welding circuit must not be broken while welding is in progress.

2.7   Maintenance and service

There is still a risk of injury even if the equipment's mains supply has been switched off.

Warning for a falling robot or falling load on the manipulator when the brakes are released.

Warning for protruding welding wire and welding spatter coming from the gun when servicing.

Do not look directly into the gun; use protective glasses.

3 Technical Description

The welding equipment A140/A314i/A324iL is adapted for the control of the IRB 140/1400/2400 robot with the S4Cplus control system. Together with the AW software of the robot and the PIB process interface the system gets the following characteristics:

- **Accuracy** - The transfer of information between the robot and the welding equipment is done in series in the form of numerical data by way of a CAN bus, guaranteeing great accuracy.

- **Programmability** - All programming of the welding process is done from the robot programming unit.

- **Safety** - The welding equipment is fitted with sensors for the supervision of the welding process. If an error occurs the welding process is interrupted and error messages are displayed on the robot programming unit.

- **Flexibility** - The transfer of programmable configuration data enables the adaptation to different power sources and feed units.

The welding equipment consists of the A140/A314i/A324iL-PIB wire feed unit and one of the following power sources:

- LAW350R/500R (not valid for A140, FlexArc Compact)
- RPA 400
- LRB 400, integrated in Control cabinet,- ARCITEC-system
- LRC 430 - ARCITEC-system (not valid for A140, FlexArc Compact)

The following options are available to the Welding equipment:

- welding gun set
- joint locator, "Smartac"
- torch cleaner "TC"
- wire cutter
- automatic TCP-gauging "BullsEye"
- TSC Torch Service Center consisting of:
  Torch cleaner "TC", Wire cutter and automatic TCP-gauging "BullsEye"

Robot Welding System

"Flexible Interface" for power sources RPA, LAW or optional power source.
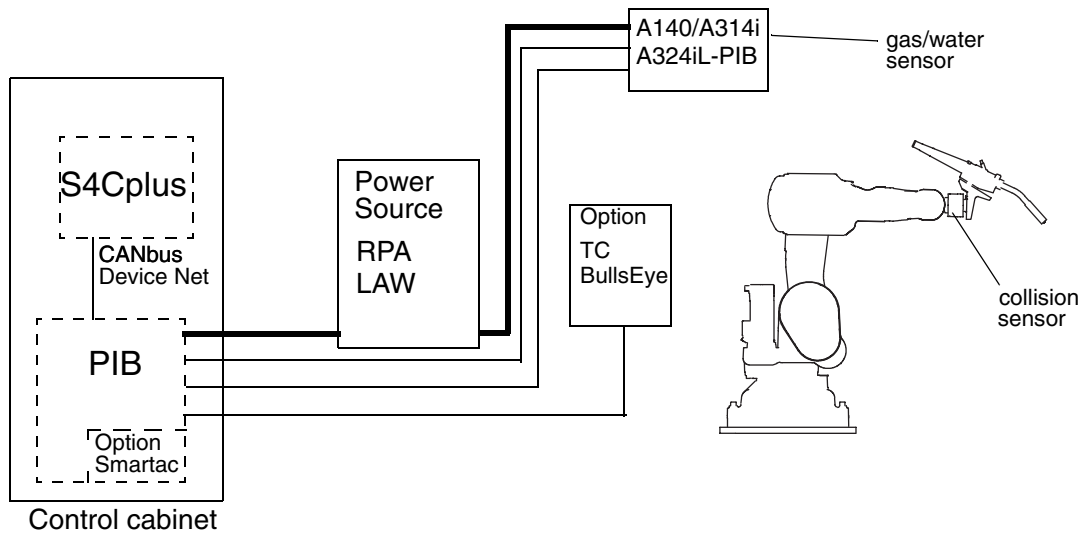
Figure 2   Survey of "Flexible Interface" connections.

"ARCITEC" with integrated power source LRB400, or separate LRC430
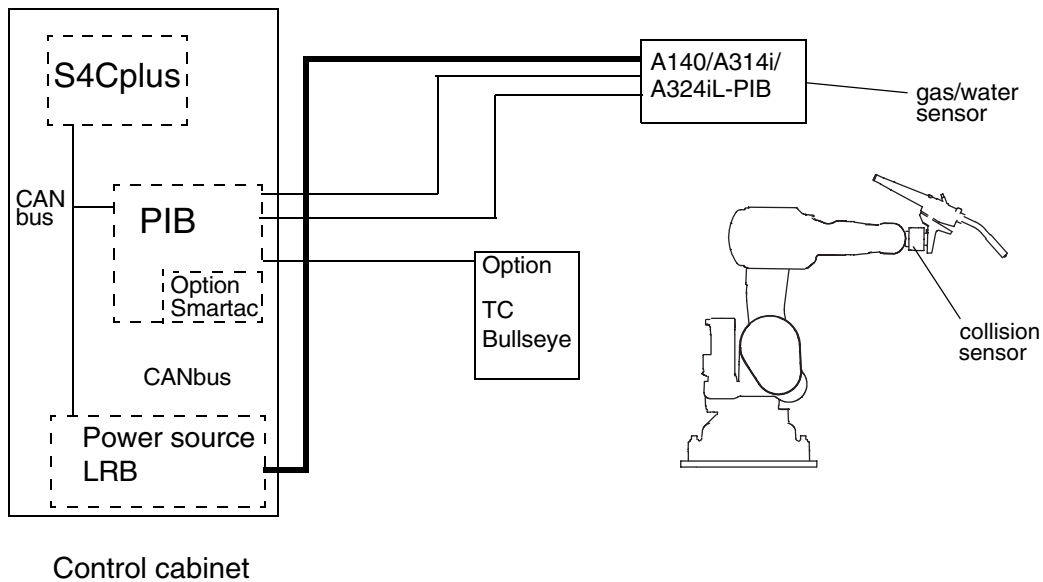
Figure 3   Survey of "ARCITEC" connections LRB.
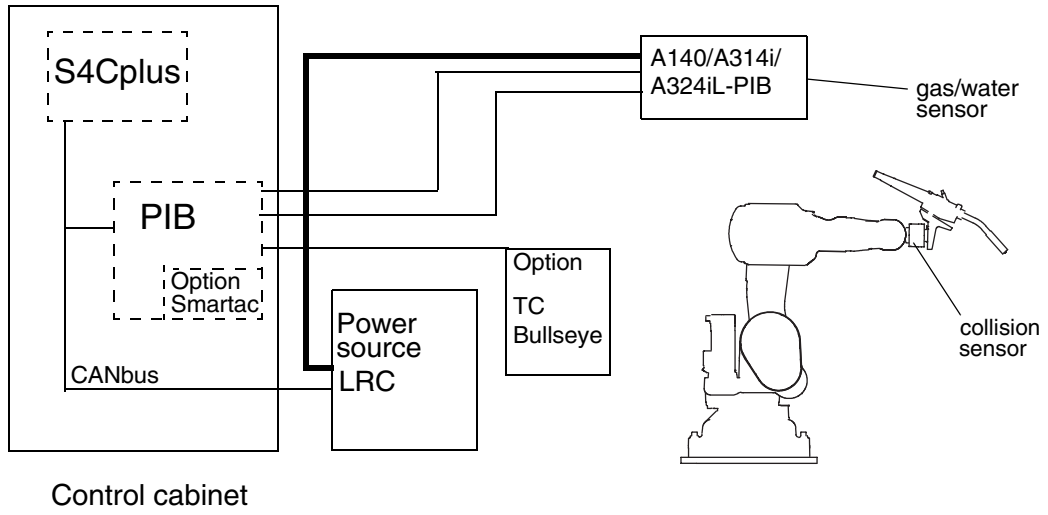
Figure 4   Survey of "ARCITEC" connections LRC.

Incorporated components A140

1   Wire feed mechanism mounted and fitted with a Euro-socket for connecting the welding gun.

2   Connections for media.

3   Cable for the power source - control cabinet, *valid for separate power source*.

4   Separate power source

5   Power source, integrated in separate cabinet, placed under the control cabinet (not in picture).

6   Welding gun
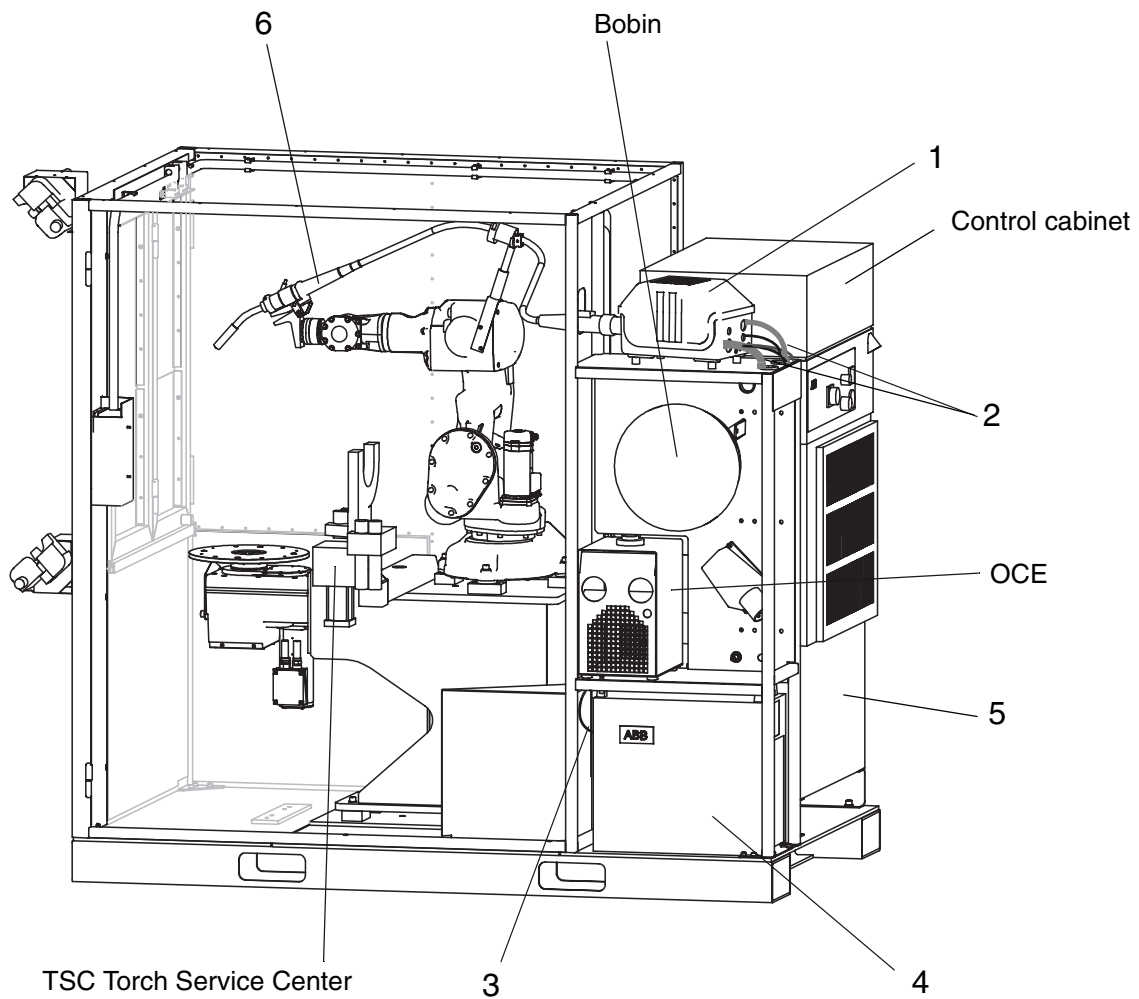
Figur 5   Robot Welding System with separate power source.

Incorporated components A314i/A324iL

1   Wire feed mechanism mounted on the robot arm and fitted with a Euro-socket for connecting the welding gun.

2   Attachment for the wire feed mechanism and cables.

3   Hoses for gas, water and compressed air, as well as cables for signal and power supplies.

4   Cable for the welding current.

5   Cable for the power source - control cabinet, *valid for separate power source.*

6   Separate power source (with Flexible Interface).

7   Power source, integrated in cabinet.
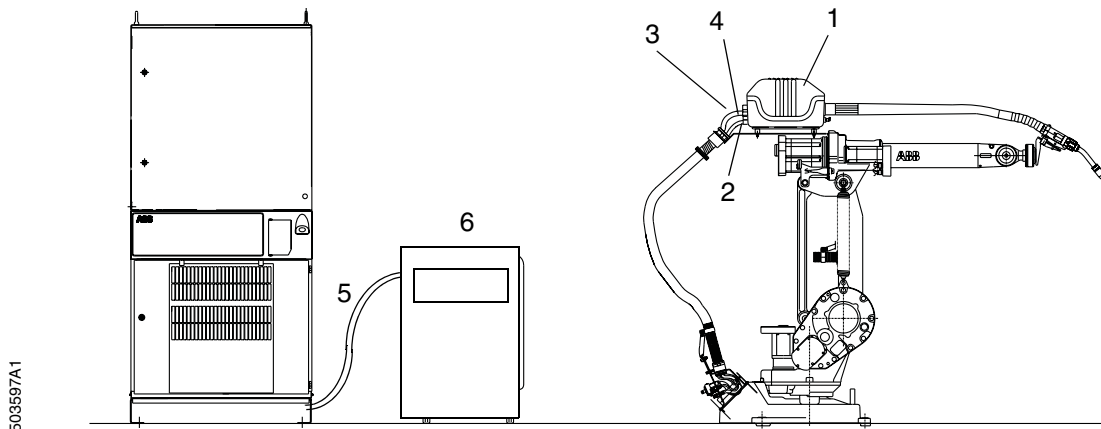
Figure 6   Robot Welding System with separate power source.
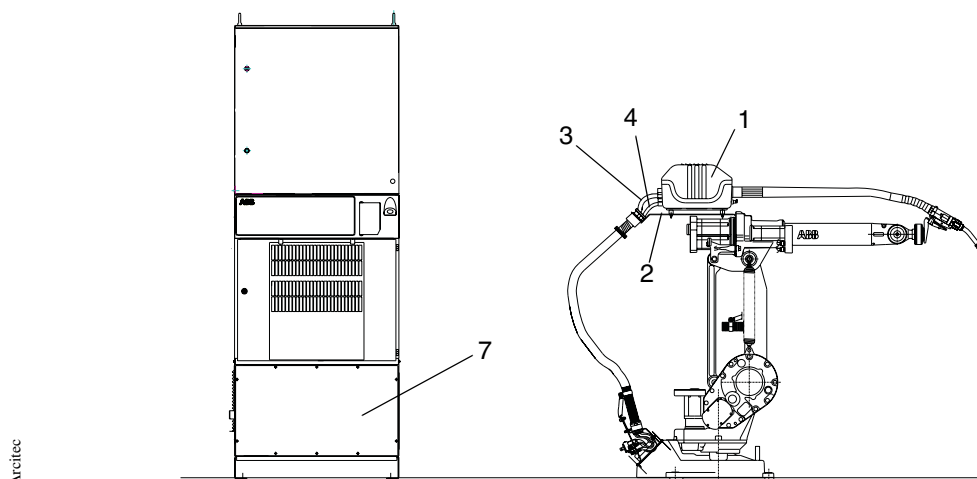
Figure 7   Robot Welding System with integrated power source.

3.1   Wire feed system A140/A314i/A324iL

There are two options of wire feed systems: bobbin or marathon pac.

A314i/A324iL should be used for gas arc welding.

3.2   Wire feed system 314i/A324iL

The wire feed system A314i/A324iL meets *Welding System's* recommended layout setup. This means the robot has a full working area within a section of ±150° for A314i/A324iL, around axle 1. Great care should be exercised outside of this sector, e.g. when programming otherwise the welding equipment can be damaged.

It is intended to be mounted directly on the robot IRB 1400/IRB 2400L, which results in a short cable bundle and a good wire feed, furthermore, a smaller floor area is required.

3.2.1 Wire feed unit

Wire is fed using two pairs of feed rollers, see Figure 8, which are linked to each other. The power from the motor is transferred to the rollers via a pinion on the motor shaft. The two upper rollers (**1**) are spring-loaded.

The pressure between the upper and lower rollers can be adjusted individually using an adjuster screw (**2**).

All rollers are fitted with sleeve bearings.

The lower feed rollers (**3**) have grooves for two different wire diameters. The rollers are turned so that the marking for the required wire diameter is facing forwards.

The motor (**4**) is of a permanent magnetised type and is equipped with a tachometer generator.

An inlet guide (**5**) is fitted when the marathon pac is used. The nozzle is locked using the screw (**6**).

When the bobbin is used, the wire liner is fitted directly to the feed mechanism and is locked by screw (**6**). The wire can roll off of the bobbin when the feed mechanism stops at a high wire feed speed. To rectify this, the preset value on the brake hub is changed to 5 kpcm (= 0,5 Nm), by turning the knob until the arrows align with each other (locked bobbin position). The springs on each side of the knob are turned synchronously inwards to increase the braking effect. If the wire feed speed is too high so that the adjustment has no effect then the marathon pac ought to be used.
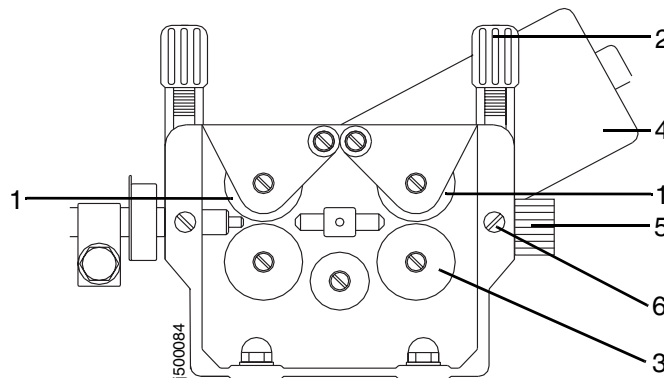
Figure 8   Wire feed unit.

To guarantee proper wire feed the grooves in the feed rollers must be cleaned at regular intervals. The wire used should be as clean as possible as filth can give rise to slippage.

Replacement - Repair

When refitting the drive motor in the event of replacement or repair of the motor the motor shaft must be centered in relation to the two feed rollers, using the centering device (art. no. 500 332-001) in order to avoid wear as regards teeth and bearings.

Dismantling

1   Remove the two drive rollers.

2   Dismount the driving gear and the three Allen screws. The drive motor can now be lifted out.
    The remounting is performed in the reverse order, excepted the use of the-centering device.

3.2.2   Control and indicating devices on the wire feed unit

1   **WIRE FEED** switch for manual wire feed.

2   **RESET** switch for resetting the gun collision sensor.

3   **AIR** connection to the welding gun.

4   Connection **IN** for water (blue hose). Applies to water cooled guns.

5   Connection **OUT** for water (red hose). Applies to water cooled guns.

6   Euro-socket for the welding gun.
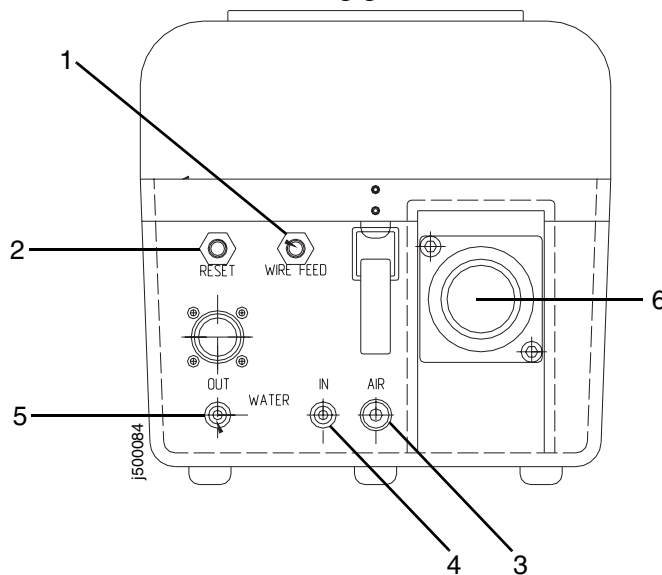
Figure 9   Side of the wire feed unit.

3.2.3 Main data

Wire diameters	0.8 mm - 1.6 mm
Max. wire feed unit	30 m/min.
Permitted ambient temperature	0ºC - +40ºC

3.3 PIB Process Interface Board

The PIB is an I/O unit particularly adapted for welding robot systems and handles the communication between the robot control system and the welding equipment.

The PIB is described in detail in chapter 6 of this manual.

4 Installation

4.1 Configuration of Welding Equipment

4.1.1 Flexible Interface/ ARCITEC (LRB/LRC)

On delivery the equipment is configuered according to applicable configuration data which are stored on the disk that comes with the delivery. The data can be read and modified by way of the robot programming unit. See chapter *6.5*.

For the definition of configuration data, see chapter *6.14.3*.

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

Rpa_Fhp.cfg   Explanation: Configuration data for power source RPA and wire feed unit A140/A314i/A324iL-PIB

Law_Fhp.cfg   Explanation: Configuration data for power source LAW and wire feed unit A140/A314i/A324iL-PIB

Lrb_Fhp.cfg   Explanation: Configuration data for power source LRB/LRC and wire feed unit A140/A314i/A324iL-PIB

In case these configuration data must be reloaded, proceed in one of the following ways:

- **Reboot the robot**: The original configuration will be restored.

- **Manual loading using the programming unit**: Print out the configuration data from the disk supplied. This can be done using an ordinary PC and a word processing program (for example Notepad in Windows). If required, the configuration data can now be adjusted according to the printout by way of the programming unit.

- **Loading from the configuration disk**: Executed by way of the robot instruction **System Parameters\IO Signals\File**⟹ **"Add or Replace Parameters\ "file"**

Important!

As the disk is unique for the equipment supplied it should be stored in a safe place. The program number indicated on the disk corresponds to the configuration in question, and should be referred to in case of service matters regarding the function of the welding equipment.

4.2 Installation of the wire feed system

The cables are connected as follows (see Figure 10):

1 **Feeder cable 1, A140,** Feed unit - Control cabinet
23-pole connection at both ends
Feeder cable 1, A314i/A324iL, Foot of the robot - Control cabinet
23-pole connection at both ends

2 **Feeder cable 2, A140** Feed unit - Control cabinet
12-pole connection at Wire feed unit and 19-pole connection
at Control cabinet.
Feeder cable 2, A314i/A324iL Foot of the robot - Control cabinet
12-pole connection at foot of the robot and 19-pole connection
at Control cabinet.

3 Gas (red hose). Connected to the central gas supply or to the gas cylinder. The pressure guard functions as an **open contact device,** which means it makes with a rising pressure. The guard is precalibrated to 0.2 bar (equivalent to approx. 5 l/min.). The guard indicates when the gas is finished or if an object prevents the gas flow.

4 Connection **OUT** for water (red hose).

5 Connection **IN** for water (blue hose).

6 Air in (PVC hose **D14/8**). Connected to the compressed air supply, system pressure, approx., 6 bar.

7 Welding cable 95 m^2.

8 Wire guide input for bobbin and Marathon Pac.

Finally connect the current cable from the wire feed unit to the power source.

Figure 10

MAN. WIRE FEED

SAFETY SWITCH RESET

WATER FLOW SENSOR

GASFLOW SENSOR

ADM Tacho (+)

ADM Tacho (-)

0 VDC

AUXILIARY MOTOR

+24V(ROBOT SYSTEM)

MOTOR TACHO

MOTOR TEMPERATURE

GUN SAFETY SWITCH

CURRENT SENSOR

FEEDER MOTOR

ARC VOLTAGE SENSOOR

SMARTAC SENSOR

42 VAC

0V(42VAC)

GAS

PNEUM. SPATTERCLEANING

Option

ADM-Tacho

WATER FLOW SENSOR OPTION

GAS PRESSURE SENSOR

Svart/black

Rod/Red

Option

Svart/Black

Rod/Red

CURRENT SENSOR

NOTE 1: BRIDGE BY1 MUST BE REMOVED WHEN WATER FLOW SENSOR IS USED
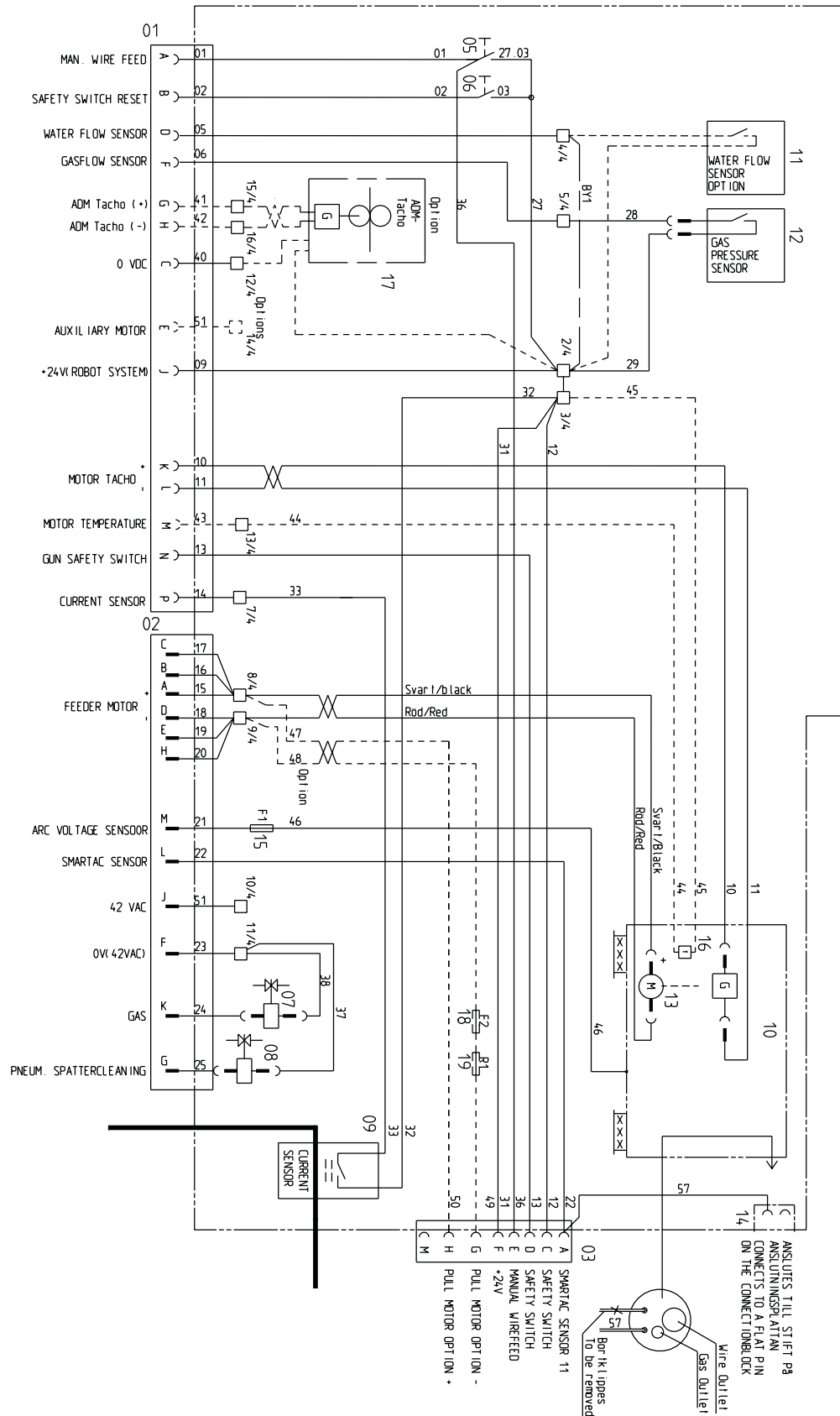
Monteringsritning: 501711
Assembly Drawing: 501711

BY1

SMARTAC SENSOR 11
SAFETY SWITCH
SAFETY SWITCH
+24V
MANUAL WIREFEED
PULL MOTOR OPTION -
PULL MOTOR OPTION +

ANSLUTES TILL STIFT P4
ANSLUTNINGSPLATTAN
CONNECTS TO A FLAT PIN
ON THE CONNECTIONBLOCK

Bortklippes
To be removed

Wire Outlet

Gas Outlet

501708B1

Figure 11   Circuit diagram, Wire feed unit

Kopplingstabell kablar/ Connection table, cables
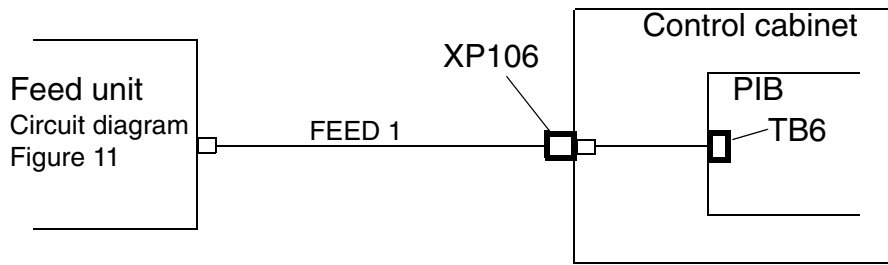
Feeder Cable 1, A140/A314i/A324iL

Signalbeskrivning/ Signal Description	A	B	Färg	Colour
Gun Reset	1	B	Vit	White
Gun Crash Sensor	2	N	Brun	Brown
Current Sensor	3	P	Grön	Green
Water Flow Sensor	4	D	Gul	Yellow
Gas Flow Sensor	5	F	Grå	Gray
Tacho +	6	K	Rosa	Rose
Tacho - (Encoder Tacho input)	7	L	Blå	Blue
Manual Wire Feed	8	A	Röd	Red
24 VDC Supply	9	J	Svart	Black
0 VDC (24 VDC) / Encoder Tacho Common	10	C	Violett	Violet
Motor Temperature	11	M	Grå/Rosa	Grey/Rose
Auxiliary Motor	12	E	Röd/Blå	Red/Blue
ADM Tacho (+) Encoder Tacho input	13	G	Vit/Grön	White/Green
ADM Tacho (-)	14	H	Brun/Grön	Brown/Green
+5V Encoder Tacho	15	R	Vit/Gul	White/Yellow
Spare (not used)	NC	O	Gul/Brun	Yellow/Brown
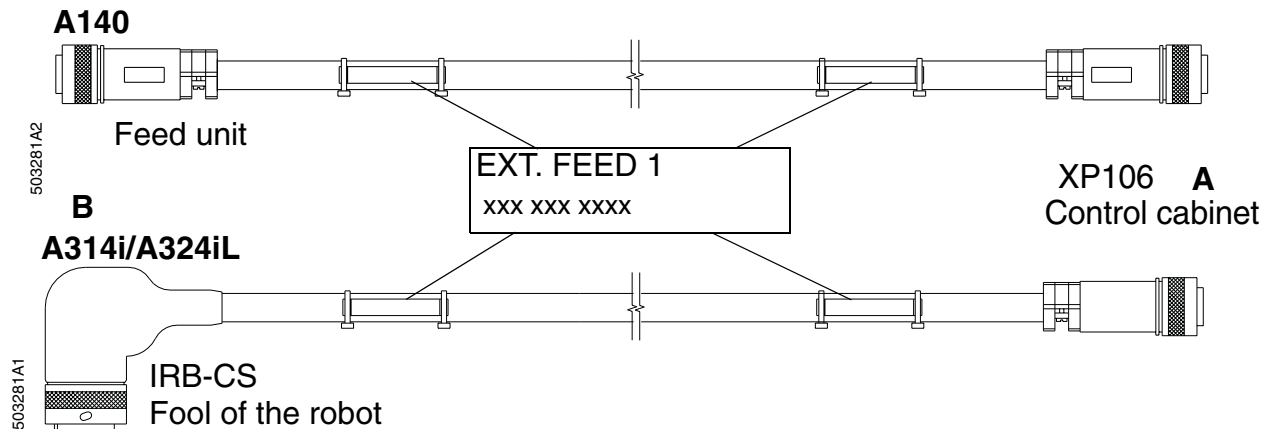
Figure 12   Feeder cable 1 A140/A314i/A324iL.
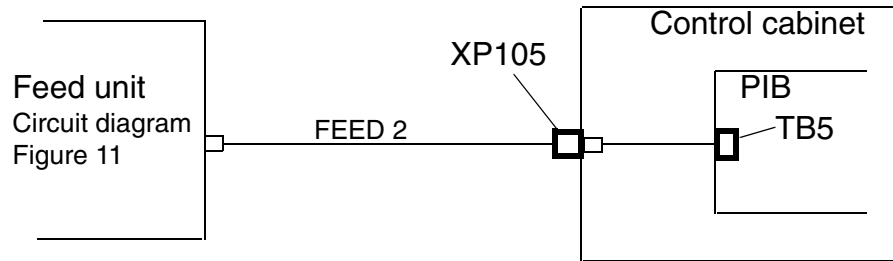
Feeder Cable 2, A314i

Signalbeskrivning/ Signal Description	A	B	Färg	Colour
Motor +	1	A	Vit	White
Motor +	1	B	Brun	Brown
Motor +	1	C	Grön	Green
Motor -	2	D	Gul	Yellow
Motor -	2	E	Grå	Gray
Motor -	2	H	Rosa	Rose
PneumaticSpatter Cleaning (42/115VAC)	3	G	Blå	Blue
Gas Valve (42/115 VAC)	4	K	Röd	Red
Arc Voltage Gun	5	M	Svart	Black
Smartac 1	6	L	Violett	Violet
Aux Motor Supply (42/115 VAC phase)	7	J	Grå/Rosa	Grey/Rose
Aux Motor Supply (42/115 VAC common)	8	F	Röd/Blå	Red/Blue
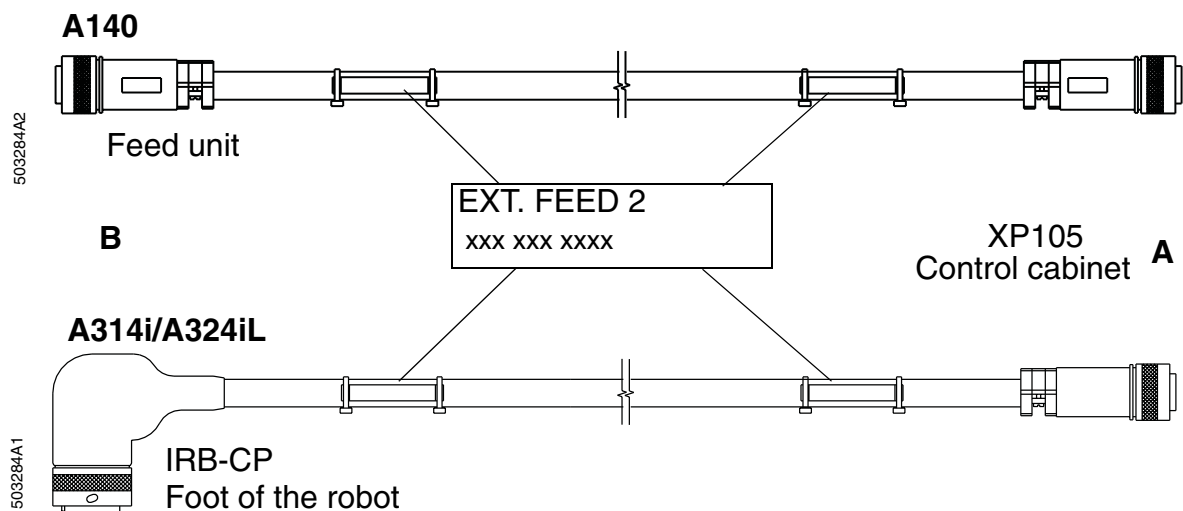
Figure 13   Feeder cable 2, A140/A314i/A324iL.

4.3   Connection of Power Sources

LAW

Power source LAW is connected to terminal **XP107** on the Control cabinet.
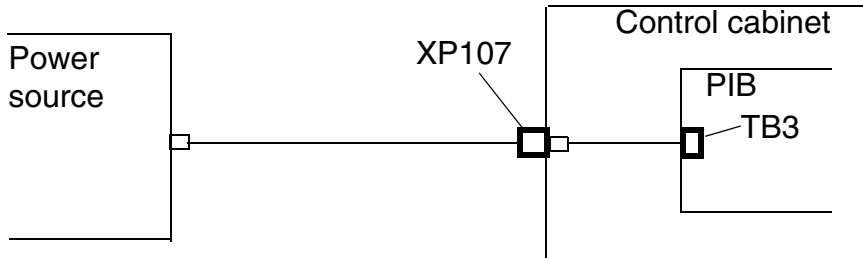
Control cable LAW

Signalbeskrivning/ Signal Denomination	Part/Core	A	B
42V AC	1	1	B
Start PS	2	2	F
Ref.	3	3	K
0V	4	4	L
		5	
Weld Object	5	6	N
Arc Voltage Gun	6	7	H
		8	
		9	
		10	
		11	
	PE	NC	NC
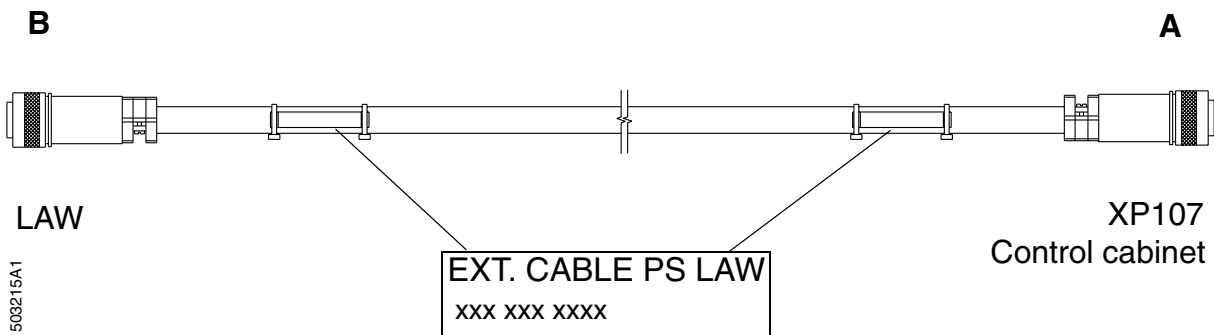
Figure 14   Control cable LAW

RPA

Power source RPA is connected to terminal **XP107** on the Control cabinet.
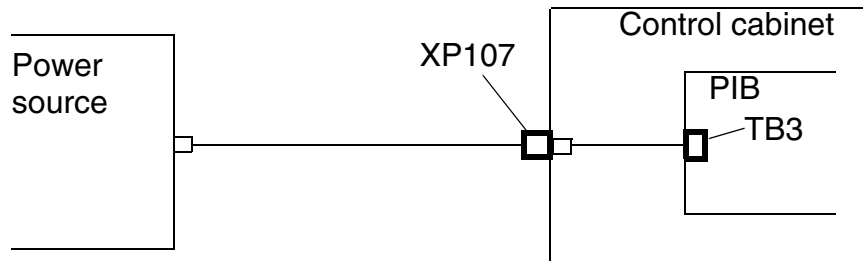
Control cable RPA

Signalbeskrivning/ Signal Denomination	Part/Core	A	B
0 V	wh (par/pair 1)	B	B
Start PS	bu (par/pair 1)	C	E
Ref.	wh (par/pair 2)	A byglas med D/ A bridged with D	-
0V	or (par/pair 2)	D byglas med A/ D bridged with A	A
		5	
		6	
		7	
		8	
		9	
		10	
		11	

Figure 15   Control cable RPA-PIB.

LRC

Power source LRC is connected to terminal **XP107** on the Control cabinet.
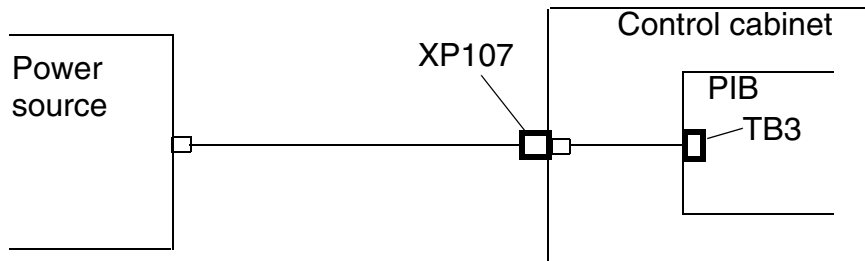
Control cableLRC

Signalbeskrivning/ Signal Denomination	Part/Core	A	B
Spare	1	1	D
Spare	2	2	E
Ext. enable	3	3	F
Ext. enable	4	4	C
Welding minus (OKC)	5	5	M
Welding measure - (Ext.)	6	6	J
Welding measure + (Ext.)	7	7	H
	SH	PE	SH
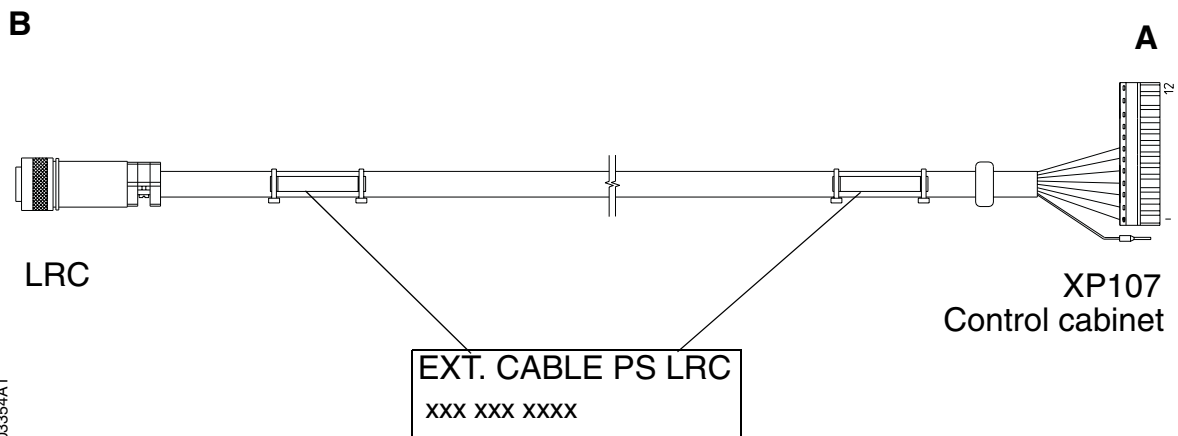
Figur 16   Control cable LRC

4.4 Installation of accessories

4.4.1 Cooling unit OCE 2

(included in welding gun set PKI 500R and Binzel WH 455D)

1 Connect the cable bundle to the cooling unit as follows:

- Red water hose to the cooling unit's return connection **IN**.

- Blue water hose to the cooling unit's feed connection **OUT**.

- Air hose to the compressed air supply.

- Gas hose to the gas cylinder.

2 Connect the cooling unit's mains cable as follows:

- For LAW, RPA: The mains cable is connected to terminal **A202X3:5,6** in the control cabinet.

- For LRB, LRC: The mains cable is connected to terminal **A204:X202:10,11** in the control cabinet.

3 Fill the cooling unit with water and any anti-freeze (for detailed information refer to the OCE 2 manual). Check the flow in the welding gun by opening the cooling unit's return hose connection **IN** until water comes in.

4 If the water guard is ordered afterwards, the strap in the wire feed unit must be removed before the guard can be used. This is done as follows:

- Unscrew the strap **By1** on the terminal in the wire feed unit between connections **2** and **4**.

4.4.2 Torch Cleaner TC

For LAW, RPA, ARCITEC: Mechanical torch cleaner TC is connected to terminal XP108 on the control cabinet.
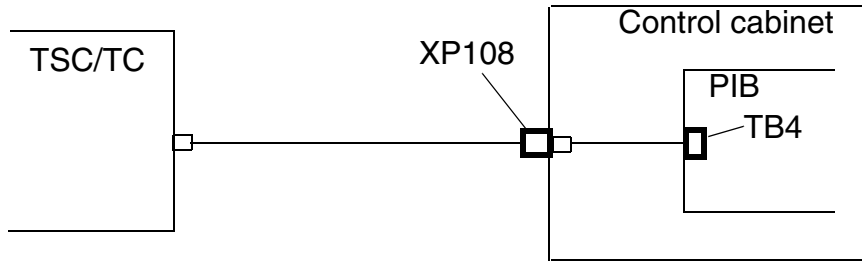
Cable -Torch cleaner

Signalbeskrivning/ Signal Denomination	Färg	Colour	A	B (TC96)	B(BINZEL)
24V DC	Vit	White	1	4	1
0V DC	Brun	Brown	2	2 & 8	3 & 4
Lubrication	Grön	Green	3	11	7
Cleaning	Gul	Yellow	4	10	6
Wirecutter	Grå	Grey	5	NC	NC
Cleaning Finished	Rosa	Rose	6	7	2
Bullseye	Blå	Blue	7	16	10
Shield	SC	SC	PE	NC	NC
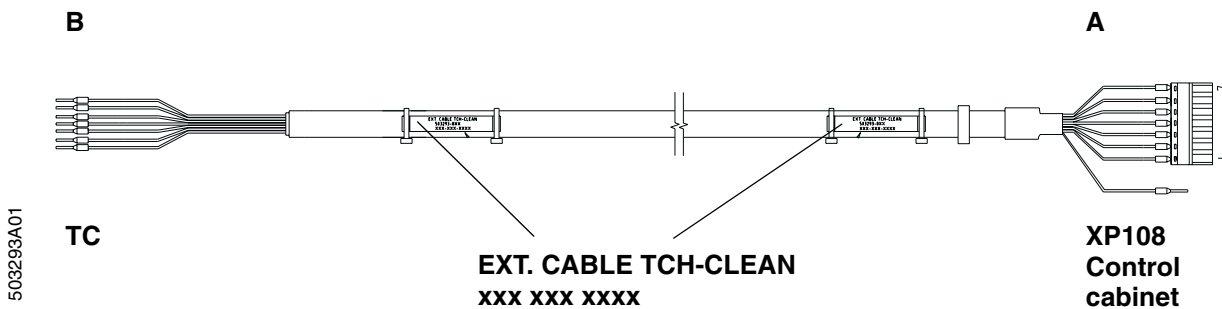
Figure 17   Cable - Torch Cleaner

5 Maintenance

Disconnect the mains supply and (if possible) secure the switch before starting work on the equipment.

In some cases however, it is necessary to work with the mains supply switched on, special care and safe working methods must be used.

5.0.1 Wire feed unit

Make a visual inspection of the equipment and correct errors, if any, for reliable operation.

1   Purge the inside of the feed unit as necessary by compressed air at reduced pressure.

2   Clean the grooves in the feed rollers and the bore of the outlet nozzle.

3   The wire conduit should always be purged by compressed air when changing the wire and as necessary. When worn out change the wire conduit.

4   Use filler wire free of impurities.

5   The bearings of the motor and the gear box are permanently lubricated - maintenance-free.

After maintenance (also installation and service) on the equipment, check the following before starting up:

•   that no tools have been forgotten

•   that fixtures and work piece are secured well

•   that all parts and guards are replaced

•   that functions are correct.

Note! Only use genuine spare parts and extra accessories recommended by ABB.

7 PIB Process Interface Board

7.1 General

The PIB is an I/O unit with integrated wire feed regulator communicating directly with the ABB robot control system S4Cplus for control and monitoring of the robot welding.

The configuration is done in the same way as for a standard I/O unit.

The PIB characteristics are determined by the transfer of configuration parameters for power sources and feed units, which gives a high degree of flexibility.

The communication with the robot computer is serial and is maintained by way of a CAN bus, which means considerably simplified wiring and less dependence on the location.

The PIB I/O connections are grouped together for direct cable connection to units such as power sources, wire feed units, gun cleaners, sensors, etc. See Figure 17.
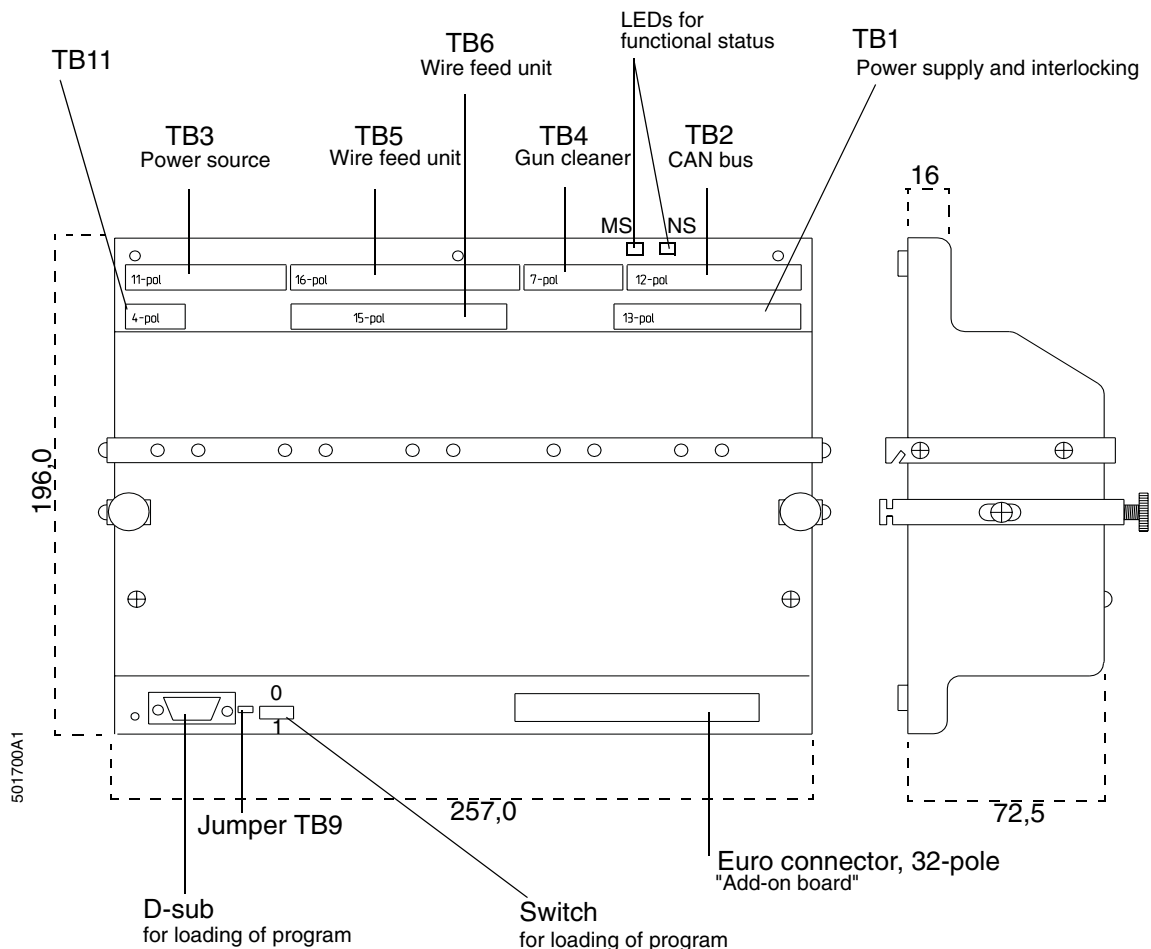
Figure 17   Dimensions and Terminal Designations.

7.2 Voltage Version - Power Supply - Article Number

PIB is available in two voltage versions:

- for feed units with voltage supply to the final stage of the feed unit regulator of max. 42V AC/ 10A, article no. 501 700-880.

- for feed units with voltage supply to the final stage of the feed unit regulator of max. 115V AC/ 3.5A, article no. 501700-881.

They are marked Low voltage or High voltage. See Figure 18.

Warning! Connecting 115V AC to the low-voltage version of PIB will destroy the PC board.

Personal safety

The high-voltage version:
A protective earth conductor (min. 2.5 mm2) shall be connected between the upper PIB metal bar and the protective earth bar of the robot cabinet before the unit is switched on.

There are transformers available for the particular voltage. They are to be connected to terminal XT21 for 230V AC/ 3.15A in the robot cubicle.

See the section *Transformers on page 56*.

7.3 Program Versions

PIB includes two program versions. Which program version is active is determined by the TB9 jumper. See Figure 19.

1 For robot systems from **S4Cplus** with Flexible (see section 7.5) and ARCI-TEC-LRB/LRC **the TB9 jumper shall be open** (removed or parked on one of the pins).

The jumper in this position supports:
- The transfer of configuration data from the robot programming unit.
- Automatic transfer of configuration data from the robot when
    changing PIB.

2 For the robot system S4C with ARCITEC/LRA the TB9 jumper must be closed.
- The transfer of configuration data according to point **1** is not supported.
- The configuration for ARCITEC/LRA is done on delivery.

Note:
When a complete system is delivered the TB9 position is determined.

All PIB equipment delivered separately or as spare part are pre-configuered for ARCITEC/LRA and wire feeder A314 (jumper TB9 closed) on delivery.

*For use together with **S4Cplus** the jumper is removed and the parameter transfer takes place according to point **1**.*

7.4 Marking and Version Handling

Figure 18 shows the location and disposition of the article and manufacturing numbers. This marking indicates the hardware version of PIB – not the software one.

The software version is indicated under the configuration menu in the programming unit of the robot as a non-editable three-digit number. (Software revision, see section 7.14.3.) The number is automatically updated when the software version is changed.

The software version is also indicated when using the simulation program (BF). See the section *Service and Programming Aids on page 40*. Then the software version is indicated in the form of a letter and a two-digit number.
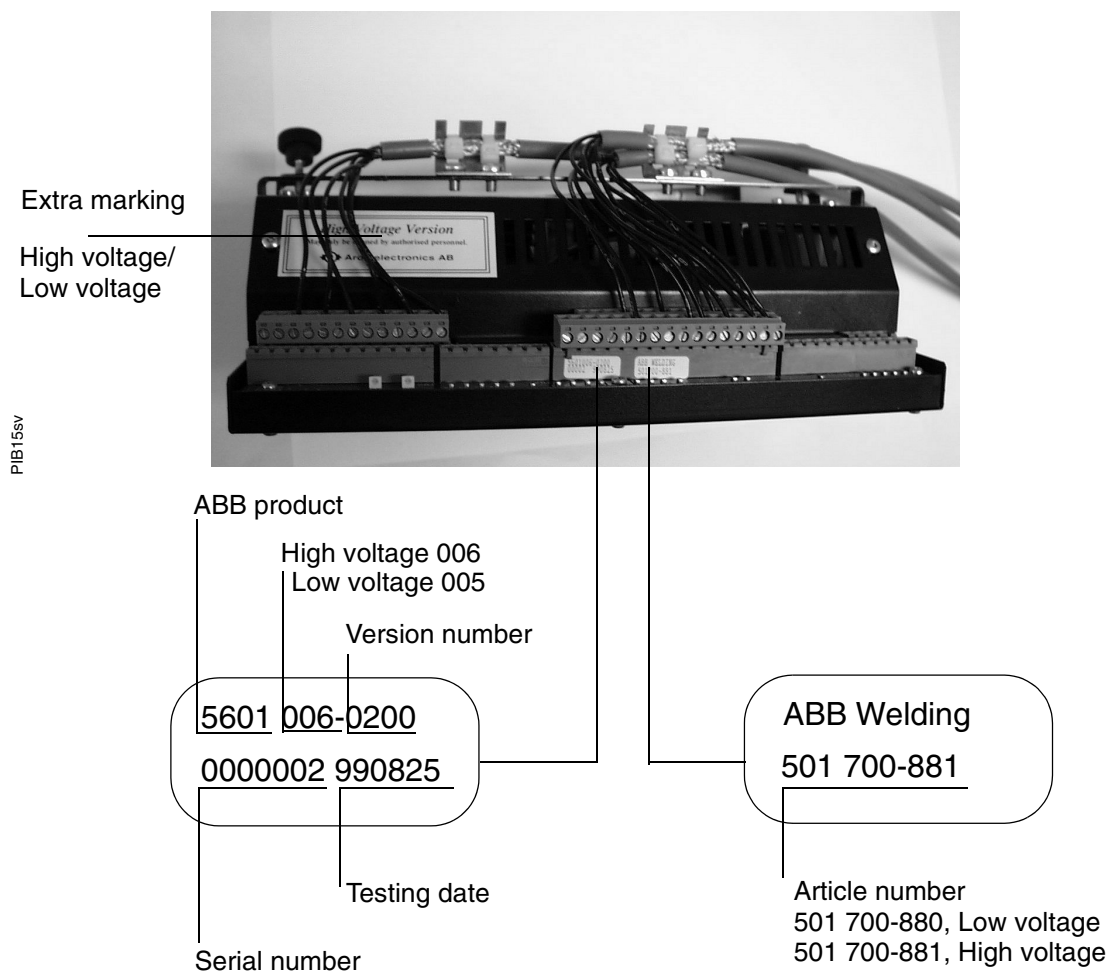
Figure 18   Marking and Version Handling.

7.5 Configuration

Programmable parameters enable the adaptation to different types of welding equipment. The configuration parameters determine:

- the control properties
- the scale factors
- the offset values
- the max. and min. values, etc.

Flexible

- A manual standard power source enabling remote control by way of analogue references and with the ON/OFF function (for example LAW 350R/500R, RPA 400, Miller Delta Weld).

- A wire feeder of the DC type with AC/DC tachometer as speed feed-back.

ARCITEC

- A wire feeder of the DC type with AC/DC tachometer as speed feed-back.

These factors are listed and their values can be edited under the menu: **Misc\System\Parameters\IO signals\Types⇒Units\PIB-name (=configuered IO-name)** on the programming unit of the robot. Modified values are automatically transferred to the PIB board when starting the robot.

When changing the PIB, previously configuration parameters stored in the robot will automatically be transferred to the new PIB card when the voltage is switched on.

Configuration data for ABB's standard welding equipment are included in the AW system configuration diskettes, which can be ordered according to the price list for standard products.

See the *Table - Configuration Parameters on page 53* where all the parameters are listed and defined.

7.6 Options for Increased Functionality

PIB is prepared for connection of a supplementary board increasing the functionality. The board is to be connected to a 32-pole connector of the Euro type. See Figure 17 on page 35.

Smartac (joint search and tracking device):

See section 7.17.

7.7   Software Maintenance

By way of a PC, the loader program DosFlash and a cable connected between the serial port of the PC and the programming terminal of PIB new software can be transferred to the PIB program memory.

The cable shall be a 9-pole D-sub extension cable of the pin-pin connection type with socket contacts.

PIB is set to programming position

- by setting the programming switches to position 0 which is the loading position (all switches).

After the download the switches must be reset to position 1 (all switches).

See Figure 19.

The loader program with description and revised software can be ordered free of cost.
To obtain the cable, please apply to a supplier of data equipment.
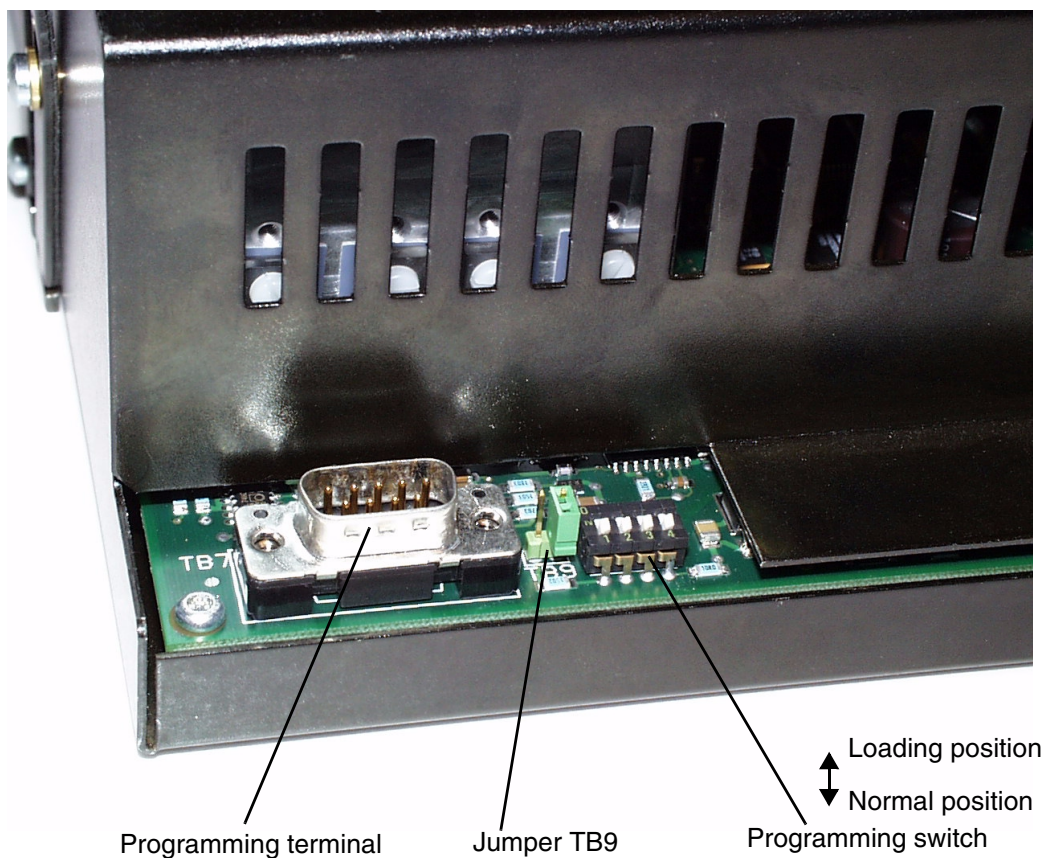
Figure 19   Jumper.

7.8 Service and Programming Aids

A simulation tool in PC Windows environment has been developed for the PIB. The designation of the program is BF, version 2.2.

- Configuration parameters can be loaded into or read from the PIB.
- All inputs and outputs can be activated as well as the functions of the power source and the wire feed unit.
- The functions of PIB and other connected units can be tested. The CAN bus cable between the PIB and the robot is connected to the tool instead of the robot.

To use the simulation program a PC CAN interface is required, consisting of a PCMCIA board with dongle.

The BF program is supplied on request free of cost. With the delivery you get information from us about supplier and type of CAN bus tool.

7.9 Diagnostics – Error Handling

The PIB is provided with two light-emitting diodes according to the DeviceNet specification. See Figure 17 on page 35.
One of the diodes has the designation NS (Network Status) and indicates the function of the CAN bus. The other one has the designation MS (Module Status) and indicates the PIB function.

Correct function is indicated by a green light coming on and incorrect function by a red one. During the phase of initiation, which can last for a couple of seconds, the light of the diodes changes.

All other error indications are in the form of messages sent to the robot programming unit.

The PIB is checked for registered errors only in the course of running.

The errors are categorised as **Warning** errors and **Stop** errors. A text comes up to explain the error and to recommend action.

When an error of the **Stop** category occurs, PIB stops the wire feed unit and the gas flow. By way of the monitoring of the process (welding current and gas) welding errors are registered in Arc Supervision. When using standard welding power sources. See the section *Configuration on page 38*.

Error messages are acknowledged by pressing OK.

When starting the computer only the last error occurred is displayed. When the error is remedied a message comes up to confirm the correction. If two or more errors are eliminated at the same time only the last one is confirmed. Remaining error, if any, is displayed next time the program is started.

The main heading of the errors is 80001 and is stored in the robot error log under the heading of User defined.

Table of Error Messages:

2 PIB error, warning:
Analog output outside limits.
Check the limits in PIB ctrl. conf. part motor max/min Speed and max Volt.

3 PIB error, warning:
Long diff. betwee req. actual Motor Speed.

4 PIB error, warning:
Digital Output overloaded in PIB, fatal error.
Check the Output connections. Reset with Power switch.

5 PIB error, stop:
Motor Overtemperature in PIB.
Check friction in wire conduit and the Motor TempLimit in PIB ctrl.conf.

6 PIB error, stop:
PowerSource reference output overloaded.
Check connections.

7 PIB error, stop:
Motor overloaded.
Check motor connections, friction in wire conduit, MotorCurrentLimit.

8 PIB error, stop:
Motor Supply error in PIB
Check AC supply for PIB from transformer. Reset unit with Power Switch.

9 PIB error stop, stop:
Motor drive transistors overtemp, in PIB.
Check friction in wire conduit.

11 PIB error, warning:
Supply voltage 24 Volt on PIB too low.
Check incoming power supply. Reset unit with Power Switch.

13 PIB error error, stop:
Power Source supply 24 Volt on PIB too low.
Check power supply. Reset with Power Switch.

15 PIB error, stop:
AC supply logic 28 volt has been down.
Check incoming power supply to PIB. Reset unit with Power Switch.

7.10 Assembly - Enclosure

The PIB is provided with a fastening device to be fitted against a DIN rail, TS 35x15. The PIB is protected against mechanical damage and electronic discharge (ESD) by its enclosure, which **must not** be removed in order to try locating errors. In the event of complaint or repair the PIB is to be returned complete in the enclosure.

When installing PIB in the robot cabinet, it should be mounted where adequate cooling is provided.

If the PIB is not to be installed into the robot cabinet, a cabinet of the corresponding enclosure class (IP54) and with a volume that gives proper cooling should be used.

The PIB is designed for operation in **max. 70oC** ambient temperature.

See the section *Environmental Data on page 55*.

7.11 Connecting Cable Shields

The metal bar on the upper side of the PIB is provided with holes for the fitting of 2 cable clamps coming with the delivery of the PIB. The clamps are to be screwed tightly onto the metal bar.

For proper function of the PIB the shield connection must be accurately done. See Figure 20. This mainly applies to the cables from the wire feed unit. If possible, they should be laid at some distance from each other.
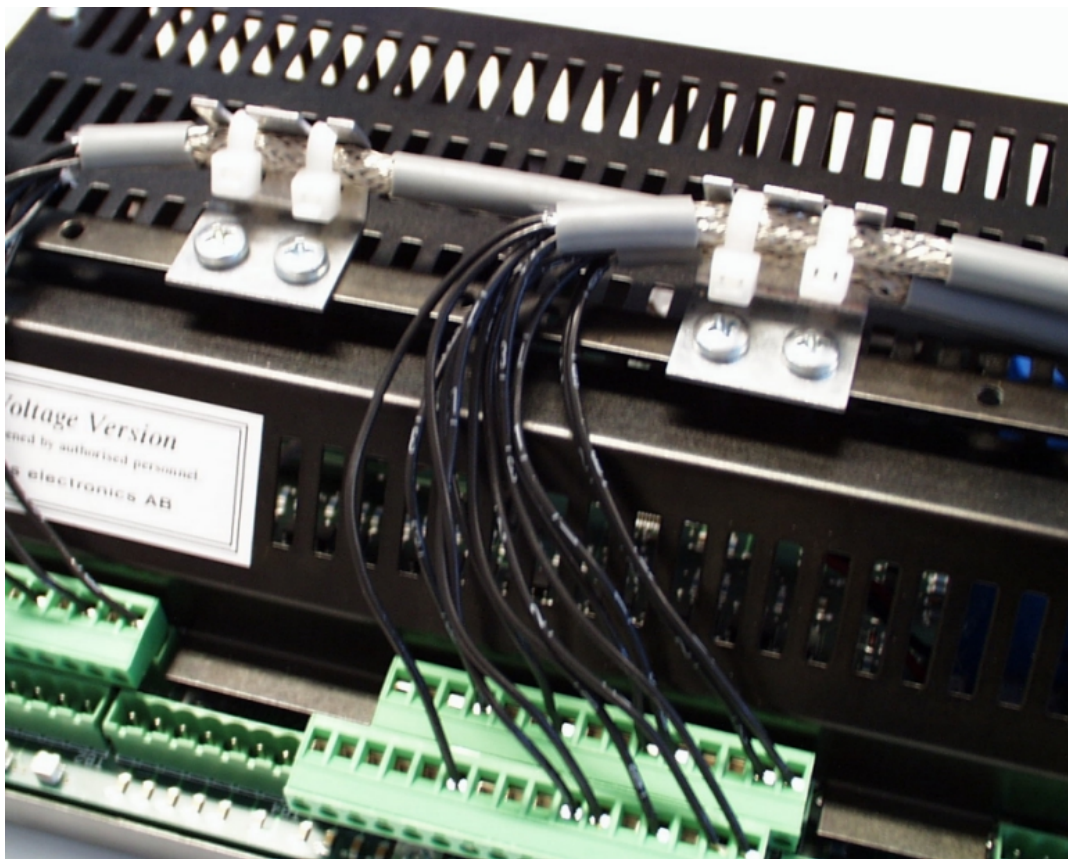
Figure 20   Shielding.

7.12 Safety

7.12.1 Personal Safety

Moving parts which according to the EU machinery directives might cause personal injury are interlocked via the robot holding device and emergency circuit. Such functions are manual wire feed and mechanical cleaning of the gun.

Figure 21 on page 51 shows the build-up of the PIB interlocking system.

If national regulations require that also the power source shall be interlocked, the interlocking system can be completed by a relay opening the control circuit of the power source.

On manual wire feed via the welding gun or the push-button of the feed unit, the wire can be fed without holding down the holding device up to max. 6 metres per minute. The speed will increase as long as the push-button is activated. For speeds higher than 6 m/min the holding device must be held down. For ARCITEC/LRA the speed is constant - 5 m/min.

7.12.2 Machine Safety - Collision Sensor

The PIB is designed to be used with a welding gun with collision sensor.

In normal status the sensor is to supply 24V DC to the PIB input TB6.2.

The collision sensor controls the Run Chain relay in the PIB. The relay is of the two-pole type and is integrated in the general stop chain (G-stop) of the robot. In normal status the relay is active.

When the collision sensor is activated the Run Chain relay opens, resulting in opened G-stop chain, leading to quick-stop of the motion due to the fact that the robot goes from operation mode to stand-by mode. The error message **G-stop** comes up on the robot programming unit. The message remains until it has been acknowledged by way of the OK button.

To enable putting the robot into operation again the G-stop chain must first be closed.

If the gun has occasionally been out of position but has sprung back again, the G-stop chain closes and the robot is fit for use again.

If the gun remains in the wrong position, for example after having collided with the weld object, the fixture, etc., the robot must be moved in order to make the gun spring back. On the front of the ABB wire feed units A-314 there is a spring-back push-button (reset) for this purpose.

Reset Function

When the collision sensor is reset the PIB microprocessor activates the Run Chain relay and closes the G-stop chain. It is then possible to put the robot into service again, by using the robot joystick to manoeuvre the robot to make the gun spring back, resetting the collision sensor in closed position. The reset function is automatically acknowledged.

The start of the running of the program is blocked until acknowledged. Trying to start before acknowledgement will result in the Run Chain relay opening and the

G-stop chain breaking. The reset procedure must then be repeated.

To prevent the PIB remaining in the reset function - due to circuit interruption, for example - and to ensure that a further collision will stop the robot, the reset time is limited to **1 minute**. After that the G-stop is interrupted again and the reset procedure must be repeated.

What is said above applies both to manual running of the robot and to running by way of the program. When running the robot by way of the program there appears an additional error message, expressly indicating that the collision sensor has been activated.

The error messages are:

Message 1:   PIB error, warning:
                 WeldingGun has crashed. If gun still crashed, reset from wire feed.
                 Move robot with joystick. Not allowed to start prg.

Message 1 comes up in combination with a G-stop with the welding gun remaining in the wrong position.

Message 2:   PIB error, warning:
                 WeldingGun has been reset.

Message 3:   PIB information:
                 Gun back to normal position after being down.

Messages 2 and 3 will come up after restart in this order. If the collision is of short duration and the gun breaks only momentarily and springs back again, message 1 will not be displayed. Messages 2 and 3 will be displayed, however.

7.12.3   Machine Safety - Electronics

PIB is designed to be proof against short-circuiting of the outputs and overheating of the drive electronics for the motor regulator.

Also units connected to the PIB are protected by the fact that max. and min. data can be configuered, for example max. reference for the power source, max. speed or temperature of the wire feed unit connected.

As appears from the section *Diagnostics – Error Handling on page 40* an error message is displayed indicating the degree of action taken by the PIB - a message of warning only, or a stop message announcing stop of the ongoing process.

The stop message comes up when the error can lead to permanent damage, for example through overheating.

When an output is short-circuited it will be disconnected, and only a message of warning is displayed.

In both cases the function goes back to normal status when the temperature has gone down or the short-circuit has been eliminated and PIB restarted.

7.13 Signal Connections

See also Figure 17 on page 35 and Figure 21 on page 51.

TB stands for Terminal Block.

7.13.1 Table - Signal Connections

TB1 - Power Supply and Interlocking

	Designation	Function, Voltage	Out	In	Explanation
1	Motor Supply	AC			Power supply for the motor regulator, interlocked 42V max. for PIB 501700-880 115V max. for PIB 501700-881
2	Motor Supply Common	AC			Zero, power supply
3	Supply solenoid valves	AC			Power supply not interlocked for solenoid valves and push feed unit
4	Logic supply	28V AC			Power supply for logic circuits
5	Logic supply common	0V AC			Zero, power supply for logic circuits
6	Ground	0V DC			Ground, screen
7	I/O 24 VS	DC		x	Interlocked 24V DC
8	Manual Wirefeed out	24V DC	x		Control signal for closing the interlocking contactor
9	Run Chain A1	Relay contact			Run Chain A
10	Run Chaiu 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 (see Figure 21 on page 51)

TB2 - CAN bus Connection

	Designation	Function, Voltage	Out	In	Explanation
1	Sys 0V	DC			System 0 (=Robot I/O noll)
2	CAN Low	Serial comm.			CAN Low [*]
3	Ground	DC			Ground, screen
4	CAN High	Serial comm.			CAN High *
5	Sys 24V	DC		x	System 24 V (=Robot I/O 24V)
6	0V	DC			0V for adressing
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	Linkage, NC=active			Binary addressing, not connected to TB2: 6=32

*. Terminator resistor 120 Ohm to be fitted between TB2/2 and TB2/4 if PIB is the farthest off I/O unit in the system. See recommendations regarding the connection of terminator resistance in the robot product manual.

TB3 - Connection to Power Source

	Designation	Function, Voltage	Out	In	Explanation
1	Start Power Source A	Closing contact	x		Control relay for power source (or cooling fan, ARCITEC)
2	Start Power Source B	Closing contact	x		Control relay for power source (or. cooling fan, ARCITEC)
3	Weld ref.	Analog 0-15 V	x		Reference for welding voltage
4	Ref. Common	Analog common	x		Reference zero
5	Induct. Ref	Analog 0-15 V	x		Reference for setting of the inductance
6	Weld Object	Analog		x	Sensing the welding voltage on weld object*
7	Arc Voltage Gun	Analog	x		Return the welding voltage to power source
8	Arc Voltage object	Analog			Sensing the welding voltage on weld object for PDM**
9	24 V Ext	Supply voltage	x		For external relay
10	0 V	Supply voltage	x		For external relay
11	NC				Not connected

TB4 - Connection to gun cleaner and TCP detector

	Designation	Function, Voltage	Out	In	Explanation
1	24V DC	Supply	x		
2	0V DC	Supply, zero	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		Cutting the wire
6	Cleaning finished	Digital 24V DC		x	Cleaning finished
7	Bulls Eye	Digital 24V DC		x	TCP search stop

* Common connection to the welding object and the power source, negative pole for Smartac/PIB.

** PDM=Process Data Monitoring

TB5 - Connection 1 to Wire Feed Unit

	Designation	Function, Voltage	Out	In	Explanation
1	Motor +	0-60/0-170V DC	x		Motor voltage
2	Motor -		x		Motor voltage
3	Pneum Spatter Cleaning	42V AC	x		To solenoid valve for Pneumatic spattercleaning
4	Gas Valve	42V AC	x		To solenoid valve for shielding gas
5	Arc Voltage Gun	0-70V DC		x	Arc voltage feed-back**
6	Smartac 1	40V DC	x		Search voltage for Smartac Sensor 1
7	42V AC	Phase	x		Supply voltage for Push feed unit
8	42V AC Common	Zero	x		Supply voltage for Push feed unit
9	Smartac 2	40V DC	x		Search voltage for Smartac Sensor 2**
10	Spatter Cleaning A	Closing contact			Alternative parallel function for TB5:3*
11	Spatter Cleaning B	Closing contact			Alternative parallel function for TB5:3*
12	Gas Valve A	Closing contact			Alternative parallel function for TB5:4*
13	Gas Valve B	Closing contact			Alternative parallel function for TB5:4*
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

* Adapted contact protector required.

** When using the Smartac sensor 2 TB5:5 and TB5:9 shall be bridged.
See section 7.17.2

TB6 - Connection 2 to Wire Feed Unit

	Designation	Function, Voltage	Out	In	Explanation
1	Gun reset	24V DC		x	Resetting the collision sensor
2	Gun Crash	24V DC		x	Collision sensor
3	Current Sense	24V DC		x	Welding current sensor
4	Water Flow	24V DC		x	Water flow sensor
5	Gas Flow	24V DC		x	Gas flow sensor
6	Tacho +	AC/DC		x	DC- or AC-tacho
7	Tacho -	AC/DC		x	DC- or AC-tacho/input for encoder tacho
8	Man. Wire Feed	24/DC		x	Manual wire feed
9	+ 24 V	Supply voltage	x		Supply voltage
10	0 V	Supply voltage	x		Supply voltage/ common for encoder tacho
11	Temp PTC	Analog		x	Temperature sensor in wire fed unit
12	Aux Motor	24V DC	x		Control signal for Push feed unit
13	PDM Tacho +	AC/DC		x	Tacho for Process data monitoring
14	PDM Tacho -	AC/DC		x	Tacho for Process data monitoring
15	+ 5V alt + 15V	DC	x		Supply voltage for encoder tacho

TB11

	Designation	Function, Voltage	Out	In	Explanation
1	Weld Current A	Analog		x	Shunt connection for PDM
2	Weld Current A	Analog		x	Shunt connection for PDM
3	HF Ignition	24V DC		x	Indication of HF ignition, Option
4	Smartac sense detect	24V DC	x		Alternative for sens. detect. via CAN-bus

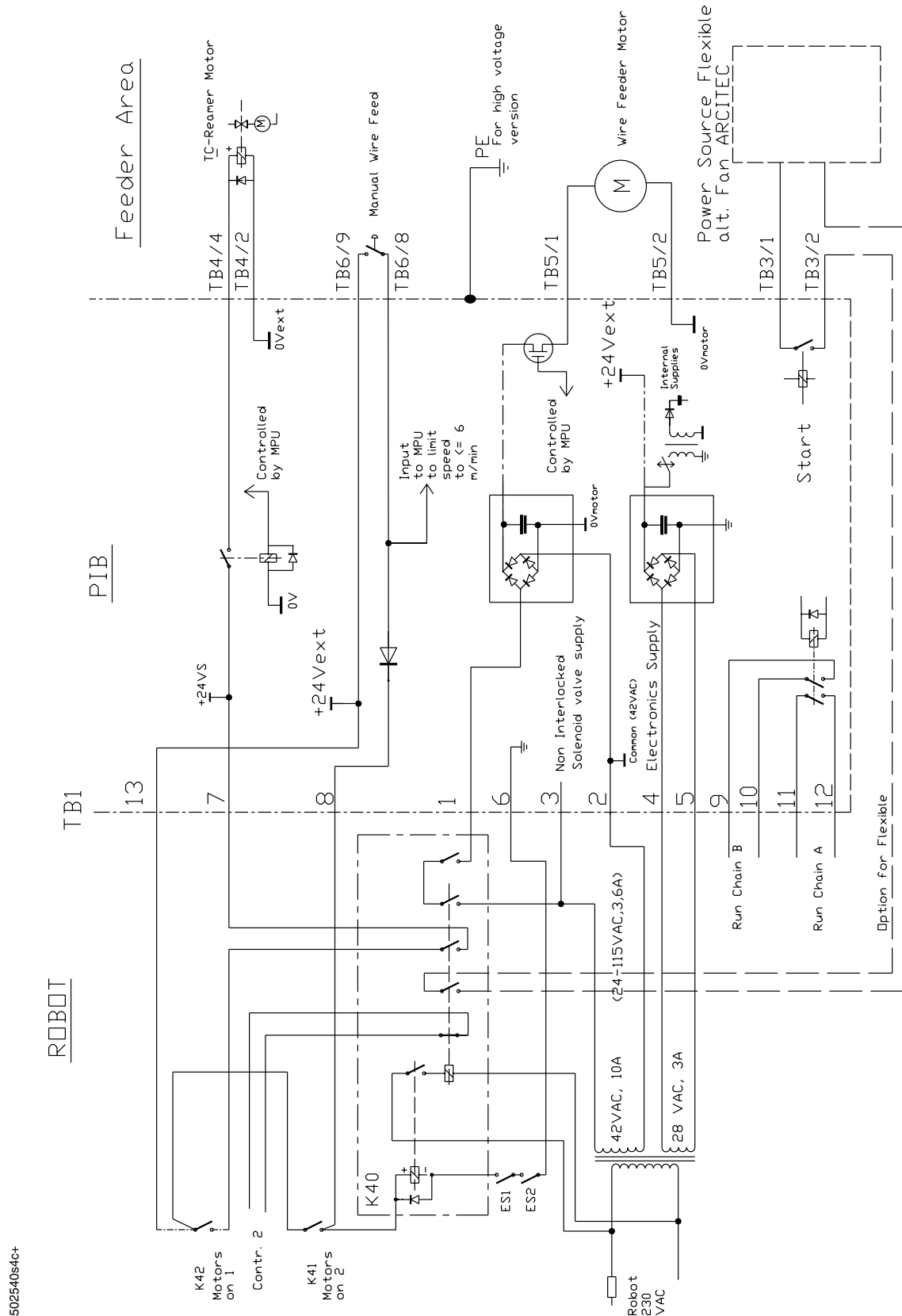## 7.13.2 Elementary Diagram - Power Supply and Interlocking

Figure 21   Elementary Diagram, Power Supply, Safety and Interlocking.

7.14 Configuration Parameters

The configuration parameters are to meet 3 requirements:

1 The parameter value must be an integer in order to facilitate the handling in the PIB microprocessor.

2 The value of the integer must be high enough to secure the desired accuracy and resolution.

3 When programming from the robot actual quantities shall be used, for example 21.4 m/min for the wire feed speed, 32.2V for the welding voltage, etc. A multiplier of 10, 10^2 or more is required in many cases.

7.14.1 Conversion Factor for Feed Units with AC tacho

The conversion factor is derived from:

$k_0 = g \times n \times 100/(\pi \times D)$ [Hz/m/min], where

- k_0 is the conversion factor of tacho type 0
- g = Gear ratio factor
- n = Number of tacho periods/ motor turn
- D = The diameter of the feed rollers in metres
- 100 is the multiplier

If the calculation results in $k_0 > 65535$, the tacho type 2 is to be configuered as well as the conversion value $k2 = k_0/2$.

Max. permissible tacho frequency is 27000Hz, which reduces the max. feed speed to Vmax=$\pi \times D \times 60 \times 27000/(g \times n)$, where Vmax (m/min) is the max. permissible wire feed speed of the wire feed unit in question.

7.14.2 Regulation Parameters

The regulation parameters are:
- the Feed Forward Factor
- the Motor Regulator P-factor
- the Motor Regulator I-factor.

These parameters are tried out for the standard wire feed units supplied and should not be adjusted. Modifications can lead to wrong speed and instability.

If adjustments are necessary this should be done in consultation with the supplier.

7.14.3 Table - Configuration Parameters

Parameter name	Parameter name in teach pendant	Parameter behavior	Parameter range/denomination
Software Revision	SoftwareRevison	Current software revison (readonly).	-
Motor Max Voltage	MotorMaxVoltage	Maximum allowed voltage for the DC-motor connected.	{0...110} V
Motor Current Limit	MotorCurrentLim	Maximum allowed current for the DC-motor connected.	{0...100} 0.1 A
Motor Max Speed	MotorMaxSpeed	Maximum allowed setting for motor speed in motor speed quantity units.	{0...500} 0.1
Motor Min Speed	MotorMinSpeed	Minimum allowed setting for motor speed in motor speed quantity units.	{0...500} 0.1
Motor Regulator P-factor	MotorRegPFactor	Proportional factor of the motor speed PI regulator.	{0...100} %
Motor Regulator I-factor	MotorRegIFactor	Integrating factor of the motor speed PI regulator.	{0...100} %
Motor Regulator Feedforward-factor	MotorFeedForward	Feedforward factor of the motor speed PI regulator.	{0...100} %
Motor Temp Limit	MotorTempLimit	Maximum allowed temperature for the motor.	{0...255} °C
Motor Brake Ratio	MotorBreakRatio	Defines the duty cycle of the brake transistor.	{0...255} 0 = No brake. 255 = Full brake
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
Motor Tacho Conversion Factor	MotorTachoConv	For AC: 100 Frequency in Hz for 1 motor speed quantity. For DC: 10000 Voltage in V for 1 motor speed quantity.	{0...65535} AC (tacho type 0) : 0.01 Hz / motor speed quantity AC fast (tacho type 2): 0.02 Hz / motor speed quantity DC (tacho yype 1): e-4 V / motor speed quantity.
Motor Tacho Type	MotorTachoType	Determines type of tacho 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)
Motor DC Offset	MotorTachoDCOffset	Motor speed offset for DC-tacho connected	{-1000...1000} 0.01 m/min (Or r/min, l/min)

Process Equipment Reference Conversion	ProcEquipRefConv	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	ProcEquipRefOffset	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 tacho 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
Sensor Detection Sensitivity	SensorDetectionSens	Defines the search voltage drop for detection of contact with workpiece	{0...255} 1/10 V
Sensor Search Voltage Valid Limit	SensorSearchVoltValidLim	Defines the lowest allowed search voltage for start of search.	{0...100} V
System Definision	SystemDefinition	Defines the PIB system configuration	(0,1) 0 (Flexible) 1 (Arcitec)
Machine Identification code	MotorMachineID	The motor machine identification for the wirefeed range of the current wirefeed motor. Only valid for Arcitec system	{0..255} According to wirefeed 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

7.15 Technical Specification

7.15.1 Mechanical Data

Dimensions: 257x196x72.5 mm

Weight: 2.1 kg

Enclosure class: IP 20

7.15.2 Electrical Data

Power supply: See Figure 22 on page 56 - Transformers.

Digital outputs: Continuous load/output: max. 350 mA.
Total output load: max. 1.6 A, < 70°C.
Tripping of overload protection per output: 370 mA.

Remark: Regarding capacitive load > 0.05 uF a temporary overload can arise at the start causing the overload protection to trip. If this occurs a current-limiting resistor must be connected in series with the connected load.

Digital inputs 24V DC: Incoming voltage, switch on: 15 to 35V.
Incoming voltage, switch off: -35 to +5V.
Incoming impedance, 4 kohm, resistive.

42V AC outputs: Max. current: 1A at < 70°C.

Relay outputs: Max. voltage: 250V AC.
Max. current: 10 A.
Note: Sparc protection has to be externally connected.

Analog outputs: Outgoing voltage: 0 - 15 V, < = 100 mA, < = 70°C.

7.15.3 Environmental Data

Temperature data:

Storage	Operation	According to
Cold 40° C, 16h	+5° C, 2 h	IEC 68-2-1
Heat +70° C, 16 h	+70° C, 2 h	IEC 68-2-2
Change – 40° C / +70° C, 2 cycles		IEC 68-2-14

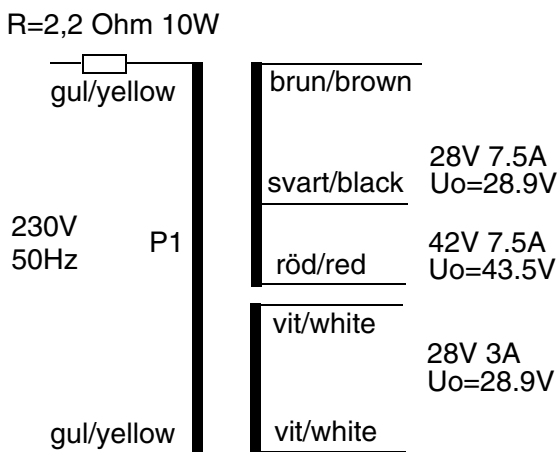**EMC**: (Electro Magnetic Compatibility) According to standard EN 50199.

LVD: (Low Voltage Directive) According to LVD standard EN 60204.

7.16   Transformers

Article No. 501 714-001/-002

Markning

	0-230V	0-230V
0-28V	0-28-42V	0-28V
		0-115V
	L V	H V
	-001	-002
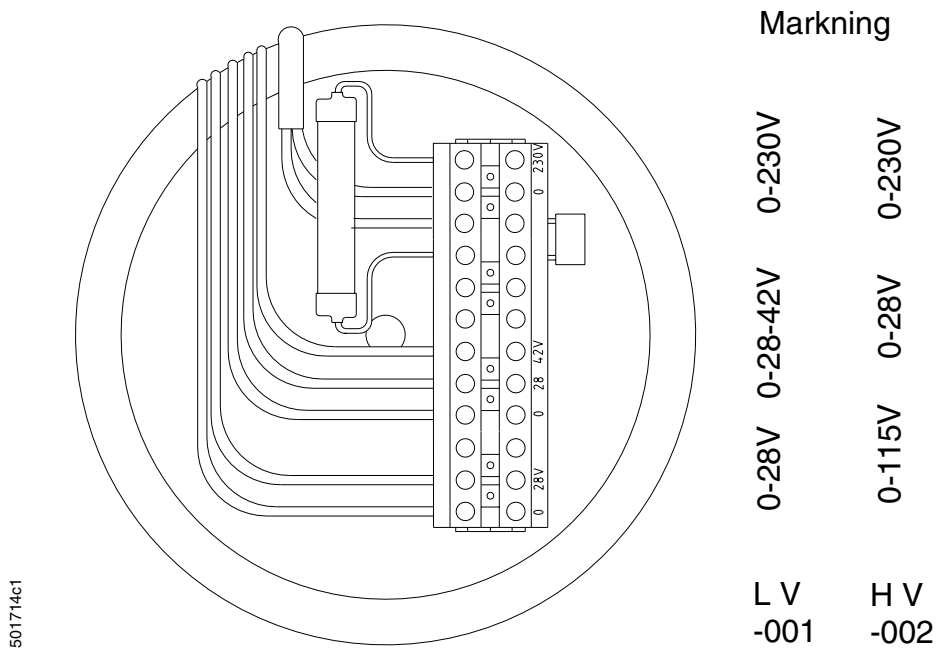
Low Voltage   **High Voltage**

R=2,2 Ohm 10W   R=2,2 Ohm 10W

gul/yellow   gul/yellow

brun/brown   orange

230V   S1   115V 2.7A
50Hz   P1   Uo=118.9V
       svart/black   28V 7.5A
                     Uo=28.9V   orange

       röd/red   42V 7.5A   230V
                     Uo=43.5V   50Hz

       vit/white
                     28V 3A   S2   28V 3A
                     Uo=28.9V   Uo=28.9V

gul/yellow   vit/white   gul/yellow   vit/white
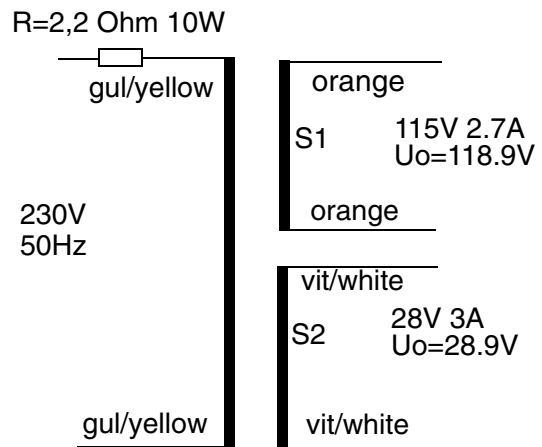
Figure 22   Transformers.
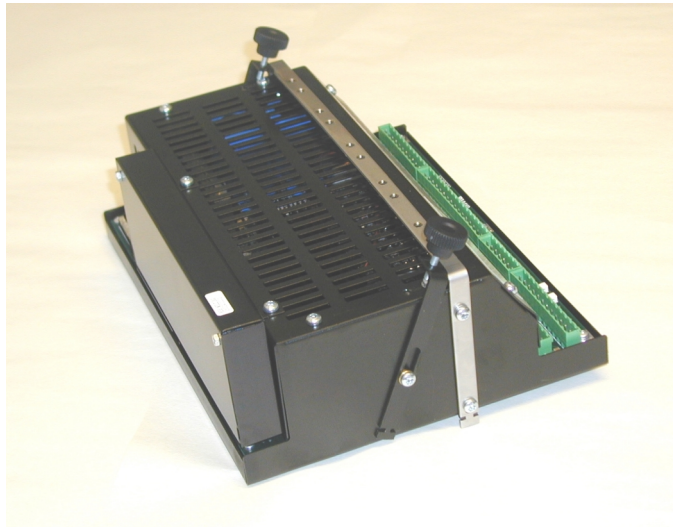
7.17 SmartacPIB

7.17.1 General

Smartac/PIB is a further development of the ABB joint search device Smartac. Mechanically and electrically it is integrated with the ABB welding interface PIB (Process Interface Board).

The unit has two sensor inputs, which can be activated one at a time or simultaneously.

The unit is a so-called "Add-on" unit and is connected to the PIB by way of a 32-pole connector of the Euro type, see Figure 30.

smartac
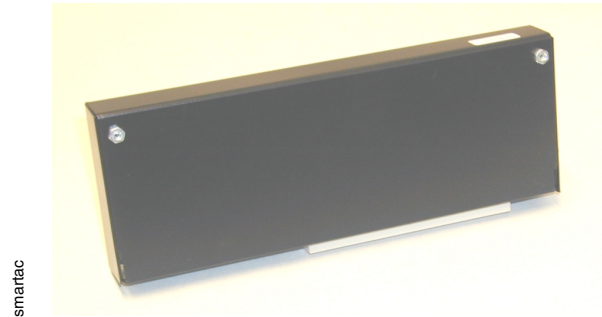
Figure 23

smartac-pib

Figure 24

The search properties of Smartac/PIB are determined by two of the adjustable parameters, Voltage Valid Limit and Sensor Detection Sensitivity. They are transferred from the robot together with other PIB configuration data. See point 6.14 Configuration Parameters.

The search properties can thereby be adapted to the existing circumstances of the search circuit.

7.17.2 Sensors

In the welding system A314/A324 containing PIB, the input for sensor 1 is connected to the gas cup of the welding gun, whereas sensor input 2 is connected to the welding nozzle for searching by way of the welding wire.

Using sensor 2 it is usually necessary to disconnect the welding circuit to avoid current diversion through the power source resulting in too low search voltage.

Searching with sensor 2 is only used for special applications.

7.17.3 Function Description - Searching

The search of the joint is usually done using a search routine in the robot program. The following description assumes that the ABB Flexible Automation signal names and robot configuration apply.

In deliveries containing Smartac, programs for the search routine and configuration parameters are pre-loaded. When Smartac is delivered as an option, a diskette containing the corresponding data comes with the delivery.

Note.
The configuration parameters for Smartac usually must be modified to fit the application in question.

In the event the configuration parameters must be modified, the same conditions apply as for PIB. See the section Configuration.

Activating the Sensor (Sensor 1)

The sensor is activated by a message from the robot to the PIB, doSE1_SEL=1, applying the search voltage to the gas cup of the welding gun.

The search voltage connected between the gas cup and the object to be searched is generated by a voltage source galvanically separated from other current circuits.

Checking the Sensor (Voltage Valid Limit)

When a sensor is activated the search voltage will depend on the insulating properties of the open search circuit.

Low insulation value between the sensor and the parts having electrical contact with the object to be searched will reduce the search voltage, due to for example the passage of current through the water when a water-cooled welding gun is used, soot formation, etc.

Increased contact resistance due to oxide layers, oil film, soot, etc. in combination with decreased search voltage makes it more difficult to achieve reliable contact between the sensor and the search object.

Using the adjustable parameter Voltage Valid Limit a level can be set under which the search shall not continue.

Configuration range: 0 – 100V in steps of 1V.

If the present search voltage is higher than the Voltage Valid Limit, the message diSe_Valid=1 will be sent from the PIB to the robot giving the robot the signal for carrying on the search.

Sensitivity (Sensor Detection Sensitivity)

The adjustable parameter Sensor Detection Sens determines the sensitivity of the sensor. Configuration range: 0-10V in steps of 0.1V.

The Smartac trigger level is locked by the message doSE_REF=1 from the robot according to the following:
Trigger level = the present search voltage - the Sensor Detection Sens value.

Under normal conditions reliable search is achieved using values > = 1V.

Detection

When during the search the gas cup gets into contact with the search object the sensor input is exposed to voltage drop.

If the voltage drops below the trigger level the PIB will send the search stop message diSE1_DET=1 to the robot, and the co-ordinates of the search object can be registered.

7.17.4 Delivery

Smartac is delivered as Smartac complete, article no. 503500-880, consisting of:

- Smartac unit

- Software, contained in the system diskette when a complete system is delivered, and in a separate diskette when Smartac is delivered separately

- User's Guide with program description and examples.

7.17.5 Technical Data

Accuracy: Max. deviation ± 0.25 mm at a search speed of 20 mm/sec.

Marking: See Figure 25.

Mechanical Data

Weight: 0.220 kg
Dimensions: 22x65x185 mm (see Figure 25)
Enclosure class: IP 20.

Electrical Data:

Max. serach voltage: 40V
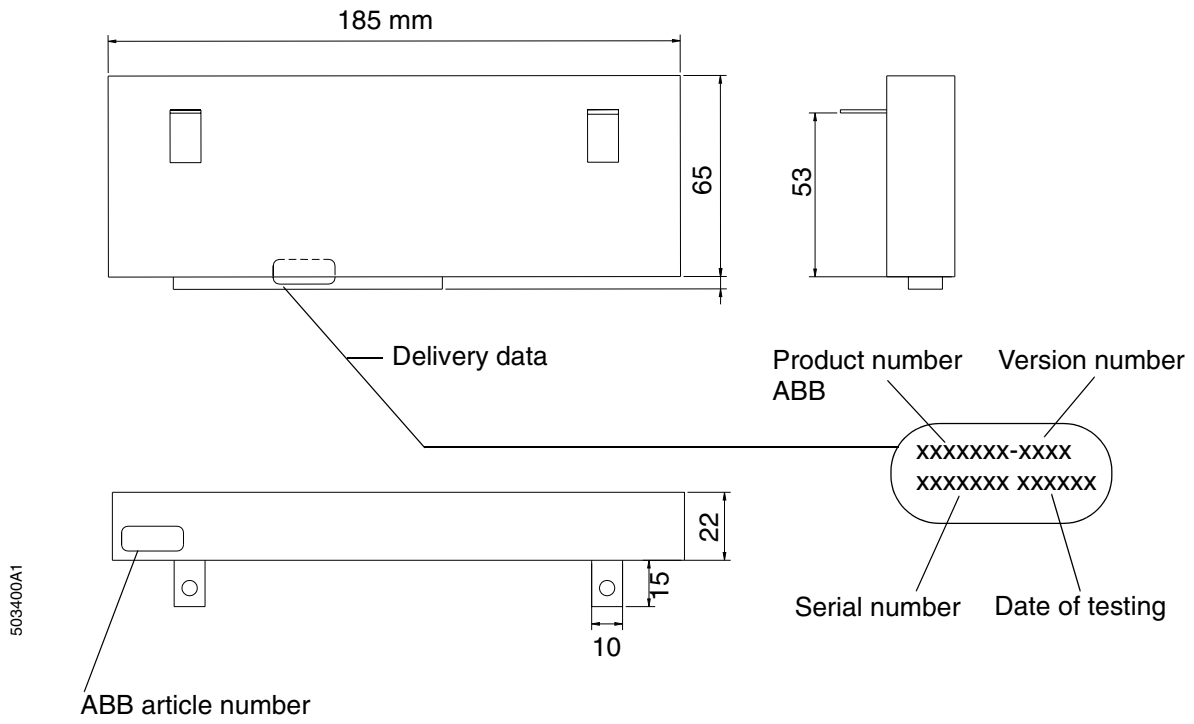Max. search current: 4.3 mA.

Environmental data: See point 6.16.3

185 mm

65

53

503400A1

Delivery data

Product number
ABB

Version number

xxxxxx-xxxx
xxxxxx xxxxxx

22

15

10

Serial number

Date of testing

ABB article number

Figure 25

ABB