PS 164-2 Power source

TIG - With or without Wire

Operating, maintenance and
programming manual
PN-0908073

POLYSOUDE
THE ART OF WELDING

Review of document

Rev. 0	Original document.
Rev. 1	Update following to review process.
Rev. 2	Addition of new graphic style guide FNCA 1009-012 + FNCA 1012-015 (PLE - 12/2010)
Rev. 3	Addition of information about coolant levels on page 64 (PLE - 07/2011)
Rev. 4	Addition of information about "R40 = Selection of wire feeder" on page 42 (PLE - 09/2011)
Rev. 5	Update for FNCA 1101-39 on page 18 + Shunt of coolant circuit on page 20 + FNCA 1201-013 (Remote control reference) + FNCA 1201-020 relay reference 12VDC on page 71 (PLE 02/2012)
Rev. 6	Addition Quick connector gas input 06/2012
Rev. 7	Update for FNCA 1208 026 pages 61-62 (09/2012)
Rev. 8	Update quick connector refrences FNCA 1211-071 (01/2013)
Rev. 9	Update «Servicing, maintenance and troubleshooting» 12/2014
Rev. 10	Update «Servicing, maintenance and troubleshooting» 09/2015
Rev. 11	Update : Chapters " Ulternating use of at two welding stations on the same workpiece"

Contents

1. Safety precautions

Note: Protect yourself and others from injury - read and follow these instructions

1. 1. Arc welding hazards

The following symbols are used in the text to draw your attention and to identify risks and dangers. When you see a symbol, **consult the safety rules in the Recommendations chapter hereafter.**
Installation, utilisation, maintenance and repair work on a power source is admitted only for qualified staff.
When using the equipment, keep away everybody who is not working with the installation.

1. 2. Meaning of symbols

Risk of electric shocks

Risk of severe injuries caused by moving parts

Risk of fume or gas inhalation

Risk of explosion

Risk of eye or skin burn caused by radiation

Risk caused by magnetic fields

Warning: hot parts – Risk of burn

Danger caused by noise

Risk of eye or skin burn caused by flying sparks

Read the instructions

Risk of overheating, fire

Eye protection mandatory

Foot protection mandatory

Helmet mandatory

Fall risk.

Consult the following recommendations and take necessary action to avoid dangerous situations.

1. 3. Recommendations

Risk of electric shocks

Live parts include the electrode, the weld circuit, the supply circuit and the internal circuits, the filler wire and metal parts in contact with it, the wire feeder unit and the wire feeding mechanism. Any contact with these parts can cause an electric shock if the installation is connected to the mains supply.
Circumstances increasing the risk of electric shocks: humid environment, work on a conducting surface, poor earth connection, installation in bad condition, unsafe work conditions.

To prevent risks:
- Avoid any contact with energised wire spools.
- Inspect water cooled torches regularly to detect leakage, pay attention to condensation phenomena.
- Do not wind the cables around your body.
- Make sure that the electrode is not energised when changing it.
- Before any maintenance, repair or pause, disconnect the equipment from the mains supply.
- Wear gloves, clothes, aprons and safety shoes that are dry and without holes.
- Carpets or other insulating materials must be used if the welder has to work on metallic surfaces or structures.
- The equipment must be installed and earthed as specified in the operating manual.
- The current return cable must be fixed correctly (clean surface, solid clamping as close as possible to the weld area).
- Cables that are damaged, worn or unsheathed, the wrong size must or wrongly assembled must not be used otherwise immediately.
- The power source must be properly earthed.
- Use a separate cable if the workpiece must be earthed.
- Appropriate connectors must be used.

Be careful to the open circuit voltage limited to 80 V efficient in alternating current or 113 V in direct current (necessary voltage for the arc ignition). Maximum power supply value for plasma cutting: 500 V.

Risk of fume or gas inhalation

During welding, fumes and gases are released which are dangerous to your health. Avoid inhaling fumes.
Origin of released fumes and gases: basic material, filler metal, weld coating (flux) with coated rod electrodes, shielding gas, solvents and materials covering the workpiece.

To prevent risks:
- Use breathing apparatus like filter masks, ventilated masks, air-supply masks, disposable masks.
- Avoid chlorinated solvents.
- Dry the workpieces thoroughly before welding.
- Do not work alone!
- Eliminate fumes and gases where they develop.
- Remove paint, oil and any other coatings from the surface.

Risk of eye or skin burn caused by radiation

The radiation from the arc causes eye and skin burns.
Risk identification: exposure to radiation from the arc emitting visible and invisible intense radiation (ultraviolet and infrared); radiation is reflected if welding metals like aluminium or stainless steel; flash burn, sparks, stings caused by the tungsten electrode tip.

To prevent risks:
- Wear gloves or leather gauntlets to protect hands and lower arms.
- Wear an apron or gaiters to protect the legs, knees and feet.
- Carry a mask (strapped to the head, handheld or electronic) or glasses equipped with an adequate filter.
- Use shielding curtains to protect staff working nearby.
- Wear a scarf around your neck and close the collar of your clothing.

Warning: hot parts – Risk of burn

- Do not touch welded or torch cut pieces. When handling hot workpieces, use adequate tools and/or wear thick and isolating welding gloves, avoiding any burn.
- Welded parts must cool down before handling or further weld operations.

Risk of eye or skin burn caused by flying sparks

- Wear gloves or leather gauntlets to protect hands and lower arms.
- Wear an apron or gaiters to protect the legs, knees and feet.
- Carry a mask (strapped to the head, handheld or electronic) or glasses equipped with an adequate filter
- Use shielding curtains to protect staff working nearby.
- Wear cotton or woollen clothes with long sleeves, without oil or lubricant marks - avoid synthetic fabrics.
- Wear a scarf around your neck and close the collar of your clothing.
- Wear safety boots made for welders.

Risk of overheating, fire

- Keep the installation in good condition, especially the supply cables and the current return cable.
- Keep a minimum distance of 6 m between the welding equipment and any greasy, explosive or dusty substance.
- Use shielding curtains to protect staff working nearby.

Risk of explosion

These risks are caused by using and handling gas bottles and flying sparks.

- Never use damaged gas bottles.
- Stock the gas bottles in a well-ventilated room, allowing access only to authorised staff.
- The temperature limit of 55 °C must be respected for the storage and use of gas bottles.
- Separate clearly marked empty gas bottles from new ones.
- Protect gas bottles from extreme temperatures (freezing, sun, sparks, etc.).
- Inspect connections and hoses periodically.
- Use shielding curtains.

Risk of severe injuries caused by moving parts

-
- Never place your hands near a fan or other moving parts.
- Keep all safety devices operational and in safety mode.

Risk caused by magnetic fields

The distance between the brain and the welding circuit is a very important parameter.

- Never wind cables around your body or, even worse, over your shoulders.
- Make it known if you have been fitted with a pacemaker. Possible interference must be prevented by special measures in co-ordination with a physician.

The operator must ensure that no one is exposed to dangerous areas

1. 4. Safety precautions related to power sources

Work or maintenance procedures described in this manual may be accompanied by dangers or risks. Such procedures are indicated by the following pictograms.

Risk or situation with danger of serious injuries or even deadly danger

At one side of the power source, a sticker indicates that it is necessary to read the operating manual.

1. 4. 1. Training of the operators

A copy of the operating and maintenance manual is delivered with the equipment. The different operators (welder, controller, maintenance staff, ...) must always have at least one spare copy (respect the copy right). The qualification needed for their work depends on the level of responsibility they take during their mission.

1. 4. 2. Maintenance and adjustment work

If maintenance or adjustment work has to be carried out on the upper parts of the equipment, a scaffold must be erected.

It is strictly forbidden to pull on cables or hoses to move welding heads or the power source or to push it by consoles or panels.

1. 4. 3. Ergonomics

◇ Signalisation

Elements used for the signalisation, especially safety-relevant parts (e.g. colours of push-buttons and signals, consult applicable standards) must not be modified in any case (inversion of the colours). Signals or buttons with indiscernible colours caused by aging or wear must be replaced imperatively.

◇ Sufficient illumination of work areas

Generally, welding equipment does not require the use of spot light, instead a medium environmental illumination is rather necessary (consult applicable standards). The operating company must fit out the workshop with a correct lighting system (avoiding shadow areas, glares) so that there will be no inconvenience or excessive tiredness of the operators.

1. 4. 4. Protection in case of breakdown or failure of the equipment

If no welding operations are carried out, the staff must protect themselves by activating appropriate separation devices.

1. 4. 5. Devices for the disconnection of energy sources

◇ Installation of disconnect or shut off devices

The presence of electric disconnect or shut off devices (electric, hydraulic, pneumatic, ...) is imposed by law. In case of mobile equipment or when Polysoude supplies only a part of the entire machine, the customer is responsible to install the necessary missing devices.

◇ Operation of disconnect or shut off devices

Conform to the instructions of the technical documentation of the manufacturer, before operating disconnect or shut off devices (separating a running equipment from its energy supply), the staff must convince themselves that anybody could be endangered.

1. 4. 6. Prevention of fire and explosions

Welding equipment must not be used on premises where inflammable, volatile or explosive products are present.

1. 4. 7. Extraction of gas and fumes

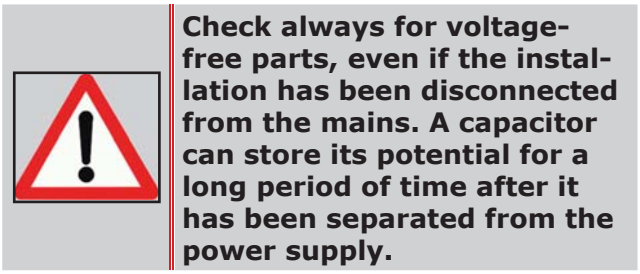
The operating company has to evaluate inconveniences or unhealthy conditions inside the workshop. It must finally adopt all necessary measures:

- To ventilate it and to extract gases and vapours.
- Protective equipment against the radiation emitted from the arc must be available and has to be used.
- Safety instructions and protective equipment must be conform with applicable standards.

1. 4. 8. Failure elimination

Only qualified electricians are allowed to inspect, check, adjust or repair the electric or electronic equipment of the welding machines.

Before any maintenance work can be carried out or an instrument is connected to a circuit, the disconnection of the mains supply must be ensured and a waiting period of 2 minutes must have been elapsed. These instructions are specified on the label at the right side of the generator.



Never shunt or eliminate safety devices or interlocks installed to protect the user or operator of the equipment.

Never stand on a wet or humid floor during interventions on electric or electronic devices. Avoid imperatively any leakage of liquids inside electric or electronic equipment.

Never use volatile solvents or flammable substances next to welding machinery. The electric arc could accidentally ignite the vapours or combustible liquids.

During repair and maintenance work on electric or electronic equipment, take off any jewellery (rings, watches, bracelets, etc.). Insulating shoes must be made available under the responsibility and on the expenses of the operating company, they must be worn by the concerned staff whenever it is necessary.

2. General information

Applicable directives

2004/108/EC	Electromagnetic compatibility
2006/95/EC	Electrical equipment designed for use certain voltage limits

3. Introduction

3. 1. The PS power sources

The power source PS 164-2 belongs to a versatile new family of universal and easy to use orbital TIG power sources. Special features are:

- Welding sequences entirely programmable in the language of the welder.
- Ease of use due to an intuitive programming.
- Integrated program library for quick welding parameter research.
- Real time monitoring system.
- Integrated printer for documentation of welds according to the ISO 9000 standard.
- Possibility of storing programs in the memory of the power source or on 3,5" disk.
- Modern inverter based power source technology.
- Mechanised welding with the ease and comfort of PS power sources.

With a weld current range between 1 A and 350 A and up to six programmable axes the PS power sources respond to a wide field of applications:

- Pulsed or continuous weld current.
- Travel speed and wire speed continuous or with pulsation synchronised to the weld current.
- With Arc Voltage Control AVC, the welding of several passes without interruption is possible (*).
- Oscillation (*).
- Programmable mass flowmeter for the shielding gas.

(*) Only power sources from PSxx6 type

PS 164-2 (Fig.3.1)
Portable 160 A power source.
Ideal for on site use.

PS 406-2 (Fig.3.2)
Power source 3.15 A.
Universality for all welding needs.
Design in three versions: 4, 5 or 6-axes.

Fig. 3.1 - PS 164-2

Fig. 3.2 - PS 406-2

3. 2. The orbital welding heads

The PS power sources support most of the Polysoude orbital welding heads.

3. 2. 1. The open welding heads

- MU IV type (Fig.3.3) for standard or special applications. Modular design. Weldhead designs to weld pipes, butt joint type, with or without filler wire.
- Polycar welding carriage to weld large diameter pipes.

3. 2. 2. The closed chamber welding heads

- MW (Fig.3.4) when high production rates are required. High duty cycle due to water cooling. Adaption kits for welding of accessories (elbows, flanges, valves, connections, etc.) available.
- Sentry UHP (Fig.3.5) for the demands of high purity industries. Welding head with closed chamber designs for the welding of thin pipes, butt joint type, close square prepared without filler wire. It ensures high quality welds and its compact design allows to use it in area with restricted access.
- HD when the access to the weld area is reduced.
- K to answer the demand of a very reliable shielding gas protection.

Fig. 3.3 - MU IV welding head

Fig. 3.4 - MW welding head

Fig. 3.5 - UHP welding head

3. 2. 3. The tube to tubesheet welding heads

TS welding heads with different features to meet all productivity and quality requirements.
The standard weldhead for tube to tubesheet applications.
Open weldhead for slightly protruding or flush tubes.

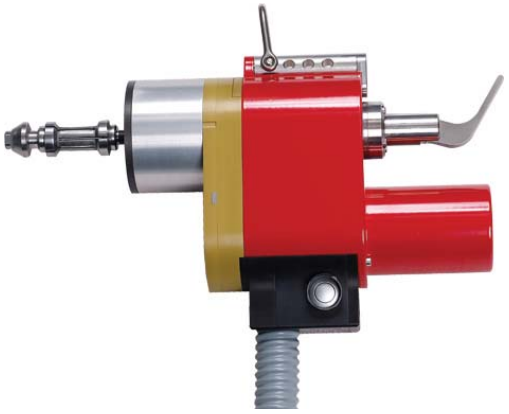


Fig.3.6 - TS welding head

3. 2. 4. Accessories

POLYFIL external wire feeder.
Wire feeder with four roll linear drive system to minimise wire deformation and surface distortion.

Fig. 3.7 - Polyfil wire feeder

3. 3. Technical specifications of the power source PS 164-2

3. 3. 1. Design features

The power source groups together the current source, the electronic control and the cooling for the torch. All connections are plugged on the connection panel co in front of the power source.

On the front face, there are a key board and a display for the programmation and the follow-up of the welding cycle, the card reader and the printer.

Fig. 3.8 - Description of power source PS 164-2

1	Screen	4	Memo card drive
2	Synoptic	5	Printer
3	Key board	6	Connection panel

3. 3. 2. The remote control pendant

This allows:

- The positioning of welding heads and wire feed units
- The starting and stopping of weld cycles
- The selection of the program to be executed
- The simulation of a cycle without welding
- Modifications to be made during a cycle
- The shielding gas to be tested
- The manual start of the cooling pump
- The stopping of a cycle in the case of an emergency

Fig. 3.9 - Remote control pendant

3. 4. Technical characteristics

Mains power input	Single phase + earth 220/230 V ± 10 % 50 or 60 Hz
Current rating	16 A
Open circuit voltage	60 V
Insulating class	F
Enclosure class	IP 23
Welding current range	Range 160 A: 4 to 160 A Range 50 A: 4 to 50 A
Regulation of intensity	± 1 % when I > 100 A and ± 1 A when I ≤ 100 A
Duty cycle	160 A to 40 % 100 A to 100 %
Range of pulsation	Range 160 A: 4 to 160 A Range 50 A: 4 to 50 A Time from 10 to 9999 ms
Motor controls	Torch rotation Wire feeder
Accuracy of movements	± 1 % for Vp ≥ 250 (Vp=programmed speed) ± 4 for Vp < 250
Gas controls	Torch gas, backing gas (option)
Power source cooling	Forced ventilation
Welding torch cooling	By cooling liquid in closed circuit with flow safety valve
Display of actual values during the weld cycle	Permanent display of the arc voltage and the welding current
Storage of "User's" programs	16 maximum
Presetting program library	60
Sectors per program	10 maximum
Storage and loading	Memo chip card
Dimensions	660 x 320 x 465 mm
Weight	34 kg
Standards	EN 60974-1 and EN 60974-10

4. Installation

4. 1. Preparation of the PS 164-2

The PS 164-2 is delivered in a transport protection case. You will find:

- The remote control pendant BP 1436 (Pos. 1).
- A ground cable 9 m in length (Pos. 2).
- A gas connection (two other ones in case of an optional second gas) (Pos. 3).
- This operating and maintenance manual (Pos.4).
- One memo card (Pos. 5).
- Devices for printer (Pos. 6)
- Two sets of keys (Pos. 7)

Fig. 4.1 - Accessories of the PS 164-2 power source

4. 2. Installation

4. 2. 1. Handling

The PS 164-2 comes with attached handles. Please use these handles when moving the PS 164-2. Never move it by pulling any cables or hoses.Movements should be horizontal without sudden shocks or movements. In case of using a truck, watch stability.

4. 2. 2. Installation

For safe work the PS 164-2 has to be placed horizontally, on a firm surface. In this case a shaft system ensures the stability of the machines.
If the equipment is used on a level which is not flat, be careful not to topple down the power source.
Openings are provided for ventilation of the power source. To ensure effective cooling of the system, a minimum distance of 30 cm (12") should be maintained between these openings and any surface.

4. 2. 3. Input power connection

All connections must be made by a qualified technician respecting the safety rules given by law or quoted in this manual.

General

The PS 164-2 is connected to the main power supply with a cable of 2 conductors + ground, which comes with the machine. It is essential to connect the ground cable correctly in order to ensure the safety of the operators.
Refer to the name plate of your power source for input power requirements. For example, to work with an input Voltage of 230 V, a 16 A fuse is required.

It is essential to connect the ground cable in order to ensure the safety of the operators.

If you use an extension lead, please respect the instructions below.

If you use an extension lead, the section of the lead should be:

up to	required section
20 m	3 x 2,5 mm²
50 m	3 x 4 mm².

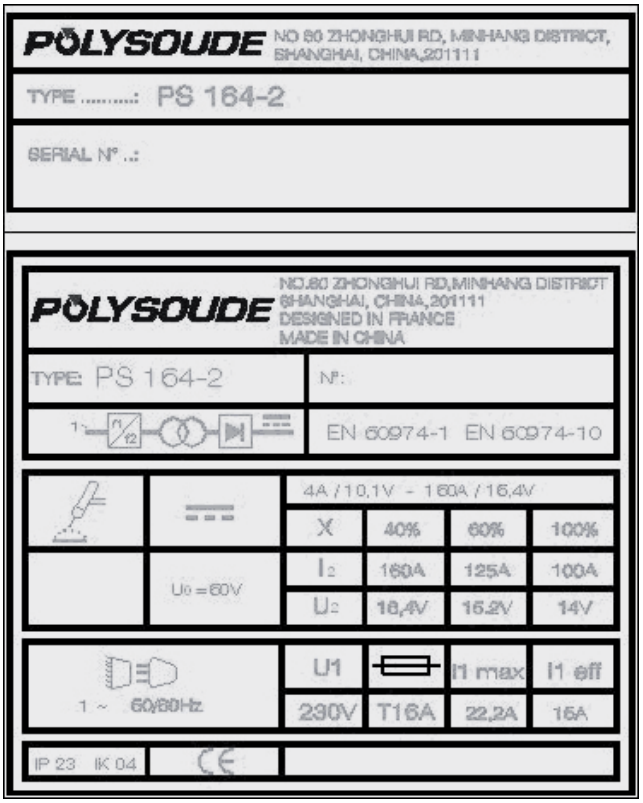


Fig. 4.2 - Name plate of the PS 164-2 power source

4. 2. 4. Connection with gas supply

Connection with the gas supply is made at the rear-side of the power source (Fig.4.3) with the appropriate fittings. Flow regulators should be used to adjust the power source inlet gas stream to the correct value (see appendix 4 - Spare parts). Before making any connections, briefly open the valves to drive out any impurities.

Fig.4.3, Fig.4.4 & Fig.4.5 - Pos 1	Gas 1
Fig.4.3, Fig.4.4 & Fig.4.5 - Pos 2	Gas 2

To ensure a successful welding cycle, please provide for a minimum of 2.5 L/min for Argon gas flow and 8 L/min for Helium flow.

Fig. 4.3 - Gas connections at the right side of the PS 164-2

- Gas fitting female - Part number 01514008 - Item 1.
- Ribbing bush - Part number 00692055 - Item 2.
- Copper seal 13.5x18x1.5. -No part number - Item 3.

Gas kit for UHP

This option integrated in the power source enables to keep a continuous gas flow when the UHP head is not welding.
Gas flow is controlled by:

- A valve integrated in the circuit if the gas used is the welding gas (see Fig.4.4). This valve (Fig.4.4 - Pos A) is adjusted manually.

- The flowmeter in the gas source (bottle or pipe) if the gas is different from the welding gas (see Fig.4.5). The connection is made at the rear side of the power source (inlet gas 2).

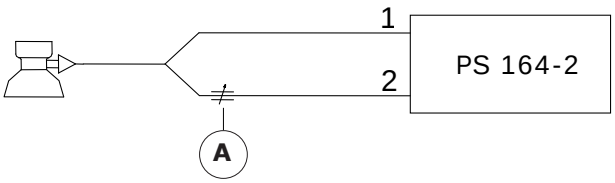


Fig. 4.4 - Diagram to use only one gas

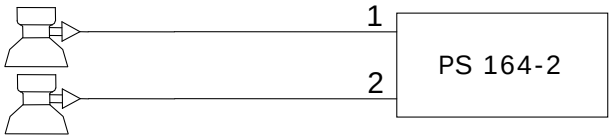


Fig. 4.5 - Diagram to use two different gas

How it works :

If a UHP head is connected, the gas flows as soon as the power source is switched on according to the flow rate pre-set adjusted by means of the valve or the flowmeter.

When the welding cycle is started (switch in set up or weld position), the welding gas flows automatically according to the flow controlled by the flowmeter until the post gas time has elapsed after welding. Afterwards the gas keeps on flowing with continuous flow.

Once the head is disconnected, continuous gas is stopped.

4. 3. Preparation for work

4. 3. 1. Connection of the remote control pendant

Connection of the remote control pendant is made with the plug on the right side of the PS 164-2 on the screw connector.Make sure the securing ring is tightened properly, otherwise the system may not function correctly. Warning: the power source will not work if the remote control pendant is not properly connected.

Fig. 4.6 - Connection of the remote control pendant with the PS 164-2

4. 3. 2. Connection of an MU welding head or a TP or TS tube/tube-plate welding head

◇ Connection of the electrode current cable

Connect the current cable on the "-" terminal with the quick connector, locking it by a short rotation to the right.

◇ Connection of the current return cable

Connect the current return conductor cable onto the "+" terminal marked by a red ring. Connection is made with a quick connector, by a short rotation to the right. Connect the other end of the cable to the workpiece, as close as possible to the joint to be welded, in an area free from grease and oxide.

◇ Connection of the rotation motor cable

Join the cable on the "Rotation" connector.

(symbol).
Make sure that the securing ring is properly tightened, otherwise the system may not function correctly.

◇ Connection of the torch shielding gas hose

Connection is made with a quick push-type self sealing coupling situated at the connection plate of the power source.

(symbol).

◇ Connection of the coolant circuit

Connection is made by 2 quick push type self sealing couplings on the front view.

(symbols and).

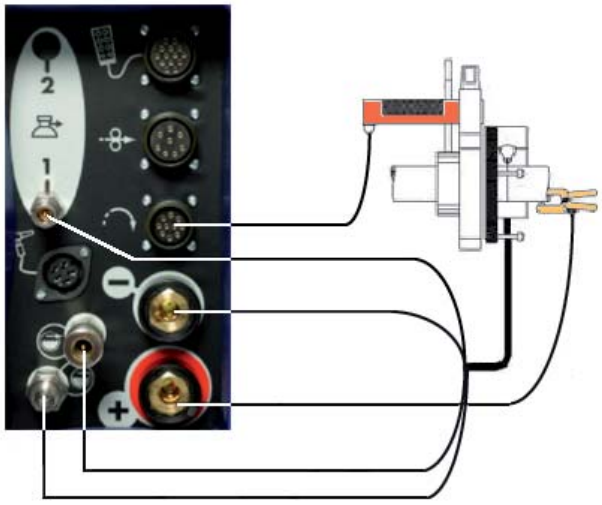


Fig. 4.7 - Connection of an MU welding head or a TP/TS welding head

4. 3. 3. Connection of an air cooled closed chamber welding head

This is the case for type H or UHP Polysoude closed welding heads.

◇ **Connection of the electrode current cable**

Connect the current cable on the "-" terminal with the quick connector, locking it by a short rotation to the right. This cable is not indicated.

◇ **Connection of the current return cable**

Connect the current return conductor cable onto the "+" terminal marked by a red ring. Connection is made with a quick connector by a short rotation to the right. This cable is indicated red.

◇ **Connection of the rotation motor cable**

Connect the cable on the "Rotation" module connector (symbol). Make sure that the securing ring is properly tightened, otherwise the system may not function correctly

◇ **Connection of the torch shielding gas hose**

Connection is made with a quickpush type self sealing coupling disconnect fitting situated at the bottom left hand corner of the front panel of the PS 164-2 (symbol 1).

◇ **Connection of a bipass plug for the coolant circuit security for use with air cooled welding heads.**

For UHP before 2003 and H welding heads, it is necessary to introduce the bipass plug to isolate the cooling circuit security in order to avoid a continuously detected fault.

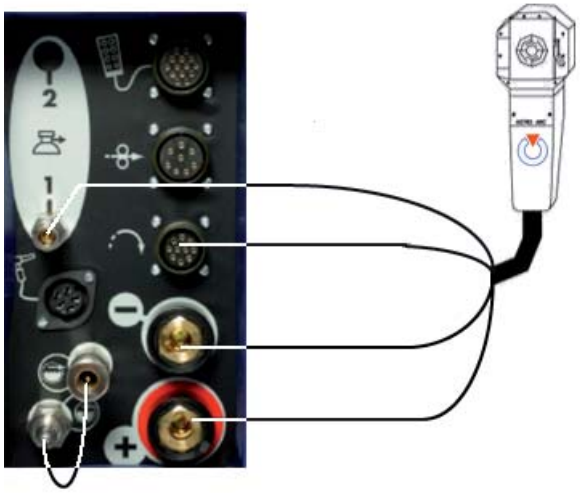


Fig. 4.8 - Connection of an air cooled closed chamber welding head

4. 3. 4. Connection of a liquid cooled closed chamber welding head

This is the case for type K and MW Polysoude closed welding heads.

◇ **Connection of the electrode current cable**

Connect the current cable on the "-" terminal with the quick connector, locking it by a short rotation to the right.

◇ **Connection of the current return cable**

Connect the current return conductor cable to the "+" terminal with the quick connector, locking it by a short rotation to the right. This cable is indicated red.

◇ **Connection of the rotation motor cable**

Join the cable to the "Rotation" connector (symbol). Make sure that the securing ring is tight otherwise the system may not function correctly.

◇ **Connection of the manual command cable on the head (MW heads)**

Connect the manual commands cable on the FA 5 terminal (Fig. 2.12) on the connection plate.

◇ **Connection of the coolant circuit**

Connection is made by 2 quick push type self sealing couplings on the cooling unit RC 200 (symbols and).

◇ **Connection of the torch shielding gas**

Connection is made with a quick disconnect fitting situated at the connection panel of the PS 164-2 (symbol 1).

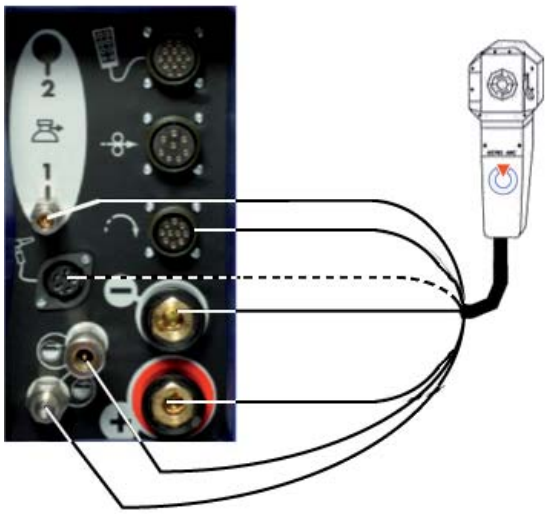


Fig. 4.9 - Connection of a liquid cooled closed chamber welding head (---- for heads with integrated commands)

4. 3. 5. Connection of a wire feed unit

The wire feed unit is connected at the connection panel of the PS 164-2 (symbol).

Make sure that the securing ring is tight otherwise the system may not function correctly.

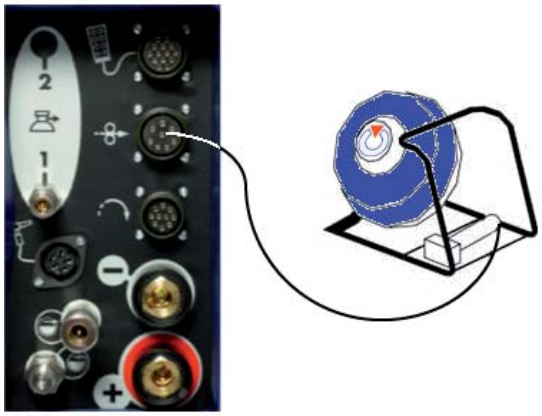


Fig. 4.10 - Connection of a wire feeder

4. 3. 6. Connectionofamanualtorchwithdoublecommand

◇ **Connection of the electrode current cable**

Connect the current cable on the "**-**" terminal with the quick connector, locking it by a short rotation to the right.

◇ **Connection of the ground cable**

Connect the ground cable to the "**+**" terminal surrounded by a red ring. Connection is made with a quick connector, with right hand locking. Connect the other end of the cable to the workpiece, as close as possible to the joint to be welded, in an area free from grease and oxide.

◇ **Connection of the command cable**

The command cable of the manual torch has to be joined to the socket FA 5 (Fig. 2.12).
Connection of the coolant circuit
Connection is made by 2 quick push type self sealing couplings on the front panel (symbols and).

◇ **Connection of the torch shielding gas hose**

Connection is made with a quick push-type coupling located on the connection plate of the power source (symbol).

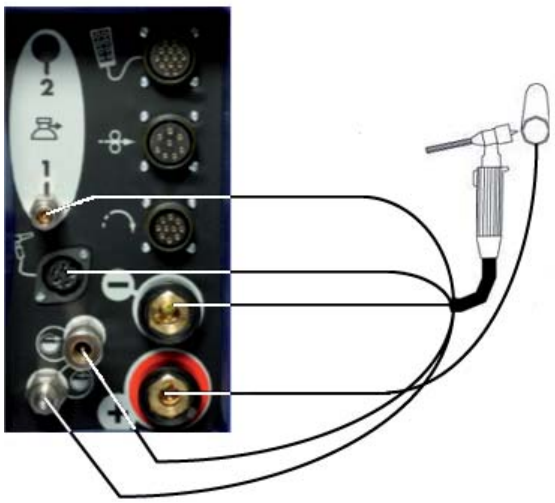


Fig. 4.11 - Connection of a manual torch

4. 4. Controls

4. 4. 1. Front panel

FA 2 Connection for the remote control pendant cable.

FA 3 Connection for the rotation motor cable.

FA 4 Connection for the wire feed unit cable.

FA 5 Connection for manual torch commands or for manual commands for MW heads.

FA 7 Connection for a second gas [backing gas] (option).

FA 9 Connection for the torch shielding gas (Female quick gas connector 01514008)

FA 10 Connection for the ground cable.

FA 11 Connection for the electrode cable.

FA 12 Coolant outlet (Female quick water connector 01514007)

FA 13 Coolant return (Male quick water connector 01514009)

4. 4. 2. Back panel

FA 1 On/off switch.

FA 6 Connection of a second gas inlet [backing gas] (option).

FA 8 Connection of the torch shielding gas inlet.

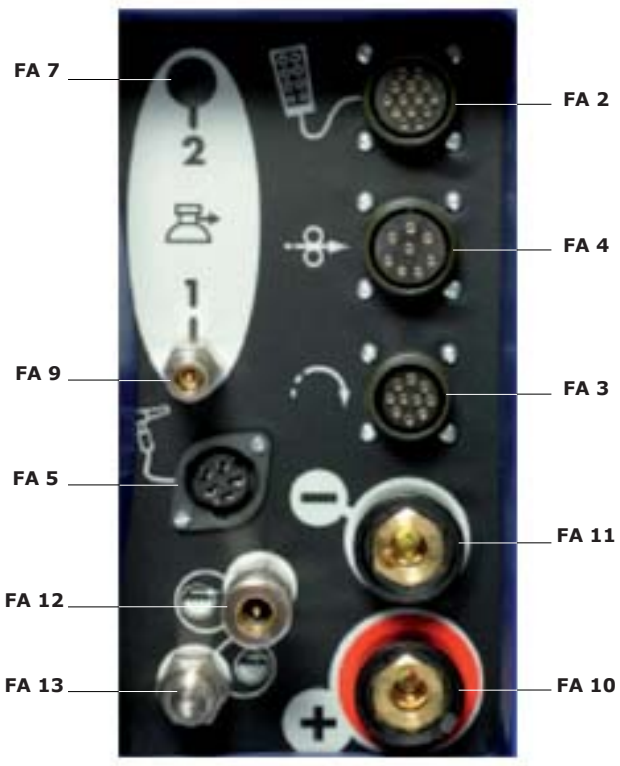


Fig. 4.12 - Front panel

Fig. 4.13 - Back panel

4. 4. 3. Synopsis

SY 1 Indicator "Printer mode".

SY 2 Indicator "Print report when weld cycle is finished".

SY 3 Indicator "Current mode".

SY 4 Indicator "With pulsed current".

SY 5 Indicator "Forward rotation".

SY 6 Indicator 'Reverse rotation"

SY 7 Indicator "Rotation mode".

SY 8 Indicator "Pulsed rotation speed".

SY 9 Indicator "With wire ".

SY 10 Indicator "Wire pushing mode".

SY 11 Indicator "Pulsed wire speed".

SY 12 Print a program key and indicator "Printing in process".

SY 13 Loading a program from the memo card key and indicator "Loading in process".

SY 14 Saving a program on the memo card key and indicator "Saving in process".

SY 15 Key to program sector positioning or for entering the date and time.

SY 16 Key to choose basic programs from the machine memory.

SY 17 Key for moving inside the synoptic.

SY 18 Key for moving inside the synoptic.

SY 19 Key for moving inside the synoptic.

SY 20 Key for moving inside the synoptic.

SY 21 Key for increasing parameter values.

SY 22 Key for decreasing parameter values.

SY 23 Enter key.

SY 24 Key for deleting programs or sectors (dust-bin).

SY 25 Display.

SY 26 Key operated switch "Modification permitted or not".

SY 27 Port for memo card.

SY 28 Printer.

SY 29 Paper advance / reprint weld cycle report.

SY 30 Keyswitch to choose the current range (50 A / 160 A)

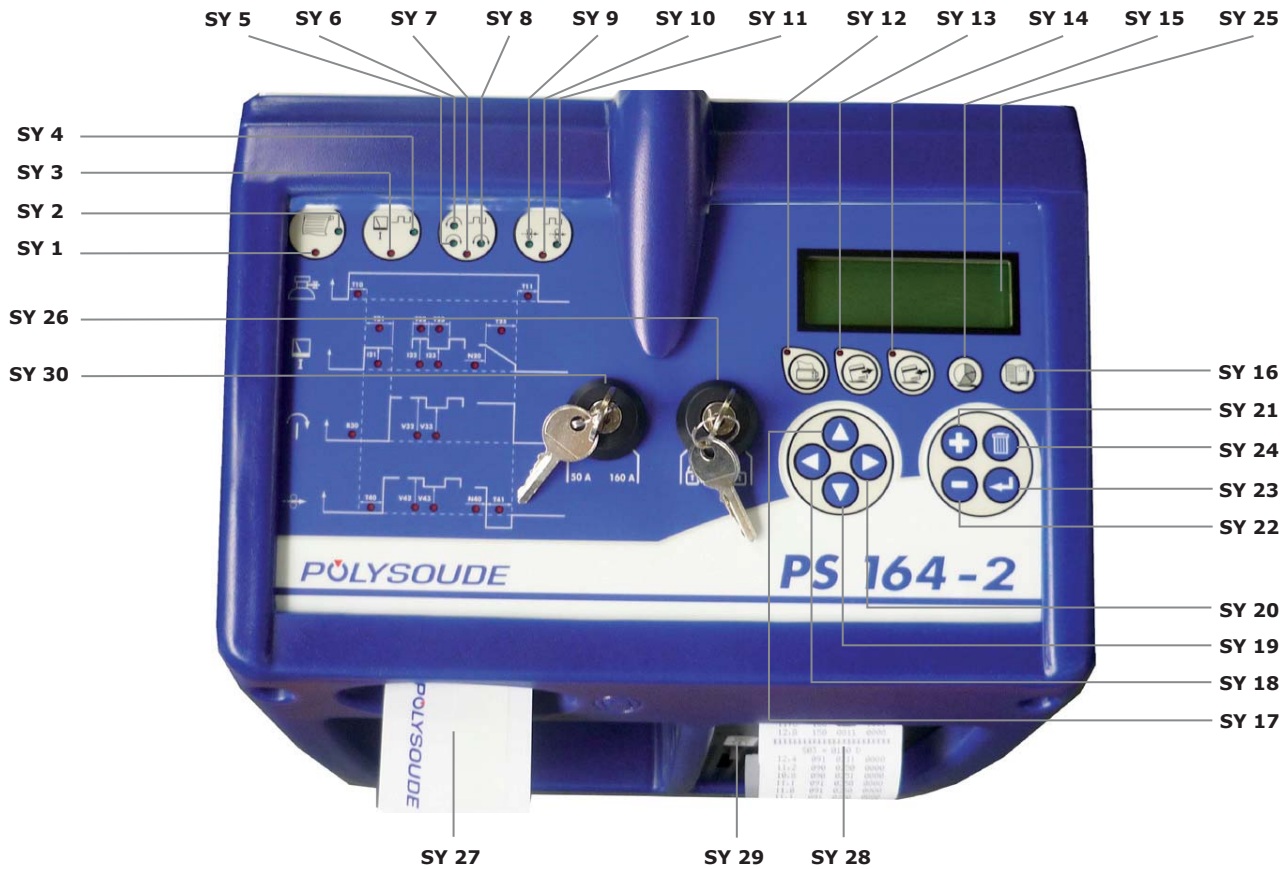


Fig. 4.14 - Synopsis

4. 4. 4. The remote control pendant

BT 1 Selection switch - "Set up / weld".

BT 2 Emergency stop button.

BT 3 Indicator
Illuminated: Cycle in process.
Flashing: Fault detected.

BT 4 Switch for selecting the number of a user program.

BT 5 Push button "Start cycle".

BT 6 Push button "Stop cycle with downslope".

BT 7 Push button "Stop cycle immediately".

BT 8 Push button "Increase pulse current (+)" if pulsed current used.

BT 9 Push button "Decrease pulse current (-)" if pulsed current used.

BT 10 Push button with two functions:
Out of weld cycle: Forward rotation.
During weld cycle: Increase rotation speed (high) if pulsed rotation used.

BT 11 Push button with two functions:
Out of weld cycle: Backward rotation.
During weld cycle: Decrease rotation speed (high) if pulsed rotation used.

BT 12 Wire start "Automatic / Manual".

BT 13 Push button with two functions:
Out of weld cycle: Wire forward.
During weld cycle: Increase wire speed (high) if pulsed wire used.

BT 14 Push button with two functions:
Out of weld cycle: Wire reverse.
During weld cycle: Decrease wire speed (high) if pulsed wire used.

BT 15 Push button to start the cooling pump "Test cooling circuit".

BT 16 Push button "Gas test".

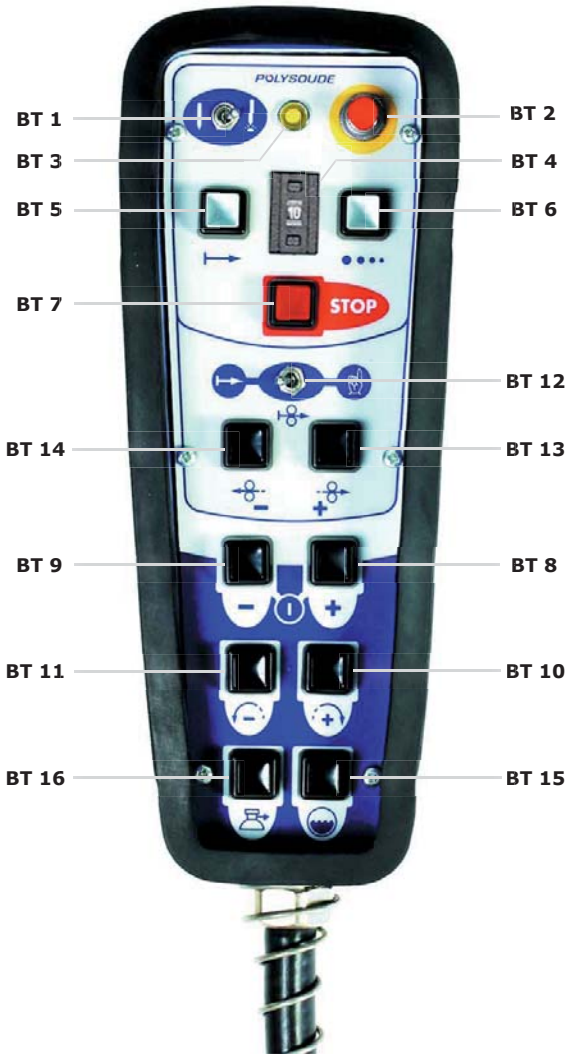


Fig. 4.15 - The remote control pendant

5. Operation of the PS 164-2

5. 1. Fundamental procedures

5. 1. 1. Switching on

With the installation properly connected (see chapter 4), turn the switch **FA 1** to the position 1. After a short period the power source is ready to be used, the screen should be lit.
Note: The remote control must be connected to the PS 164-2 in order to make the power source work.
If a problem should occur, please refer to Chapter 6.2.2 "Maintenance and Troubleshooting".

5. 1. 2. Positioning the welding head on the workpiece

Please read the manual supplied with each welding head before positioning a POLYSOUDE welding head on a workpiece. Once the welding head is positioned, you can drive the electrode exactly where you want the cycle to start by using the head rotation buttons **BT 10** and **BT 11** on the remote control pendant.

With some closed welding heads, the cycle can only be started with the electrode in home position.

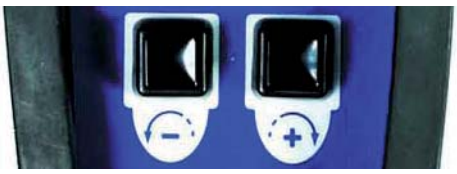


Fig. 5.1 - Buttons for manual rotation of the welding head on the remote control pendant

This action is comprised of two stages: during the first two seconds the rotation speed is reduced to 20 % of the maximum speed, afterwards the rotation speed becomes 100 %. This allows both quick and accurate positioning of the electrode.
In the case of welding heads fitted with a home position contact, the manual rotation stops when the head is in the "open" position. By releasing the button and pressing it again the rotation can be continued. This command is very useful because a closed welding head can only start in the "open" position.

5. 1. 3. Wire setting

Combined with the "Auto / Manual Wire" switch (**BT 12**), the two buttons **BT 13** and **BT 14** on the remote control pendant permit precise positioning of the wire.

If the switch **BT 12** is in the "Auto" position, pressing one of these buttons advances (**BT 13**) or retracts (**BT 14**) the wire. This action is comprised of 2 speeds: during the first 2 seconds the wire moves at a reduced speed of 20 % of the maximum speed, afterwards it moves at 100 %. This allows both rapid and precise positioning of the wire.
If the switch is in the "Manual" position, the function of the wire retract button **BT 14** remains as stated above. However, by pressing the wire advance button for a first time the wire is advanced at a high speed, a second pressing of the button causes the wire to stop. This function is particularly useful when loading the wire into the wire guide sheath.

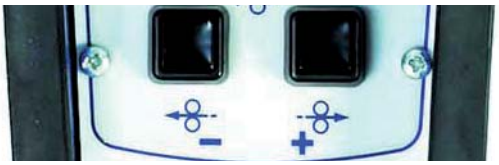


Fig. 5.2 - Buttons for wire positioning on the remote control pendant

5. 1. 4. Adjustment of the gas flow

The gas flow has to be adjusted with a flowmeter at the gas source. The push button **BT 16** energises the gas valve.

Fig. 5.3 - Gas test button

5. 1. 5. Manual cooling system start

After changing a welding head, and particularly if you use an extension cable, it is possible that the coolant system contains some air. After the start of a cycle a fault in the cooling system can be detected (11 is the number of this error code). With the button **BT 15** you can switch on the cooling circuit pump to replenish the system before starting the next cycle.

Fig. 5.4 - Push button "cooling circuit" - Start pump "cooling circuit"

5. 2. Programmation surface

General explanation of the functions

◇ Updating the date and time

The time and date can be entered into the memory of the PS 164-2. Both the time and the date then appear on any printed weld cycle report.

◇ Entering your company name

The name of the company can be stored in the PS 164-2. This name also appears on any printed weld cycle report. However, it is not stored on the memo card.

◇ Entering the program name

The switch **BT 4** on the remote control pendant is used to select a program allocation. Furthermore, each time a program is created it can be given a name. This makes it easier later on to look for a specific program.

Before the name of a program is input, the range of current must be chosen with the SY 30 selector

The name of the program can consist of up to 8 characters. A character can be any letter of the alphabet, any number, a space, a full stop or a comma. The name is shown on the display of the power source after a program is selected, it is printed on the program lists and the weld cycle reports, and it is saved on the corresponding memo card.

◇ Making a program

There are two different ways to make a welding program. You can make a copy of a built-in program which already exists in the machine memory and modify it, or you can create a completely new program.

◇ Copy and modification of an existing program

The power source PS 164-2 comes with more than 60 built-in programs already stored in the machine memory. These programs correspond to the most often faced orbital welding problems. Knowing the tube material, diameter and wall thickness, you can choose a program which is similar to your application, copy it in one of the 16 user programs and modify it exactly to your requirements. A list of the 60 stored built-in programs is given in Appendix 5.1.

◇ Creating a new program

When creating a program, the dialogue will guide you by indicating when to introduce parameter values. Proposed values correspond to most regularly encountered ones in orbital welding. For a program to be created, the proposed parameters are for example:

- Forward rotation without pulsation.
- Pulsed current.
- Wire without pulsation, if the selected range of current is 160 A.
- Without wire, if the selected range of current is 50 A

For a list of the proposed parameter values, please refer to chapter 5.3.11. You are not obliged to enter all the choices if some of the parameters and conditions already correspond to what you require.

◇ Modifying a program

Outside of a weld cycle you can modify every program present in the power source's memory using the synopsis. The operating mode is the same as that for creating a program.

◇ Saving a program in the power source memory

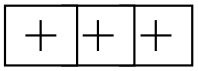
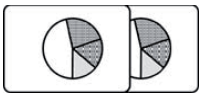
The creation and modification of programs in the memory of a PS 164-2 is only possible if the key operated switch "Modification authorised or not" is in the position "Modification authorised" (symbol). You can protect your programs by positioning the key operated switch in the "Modification not authorised" position (symbol) and remove the key.

5. 3. Programming

The titles of the following chapters are:

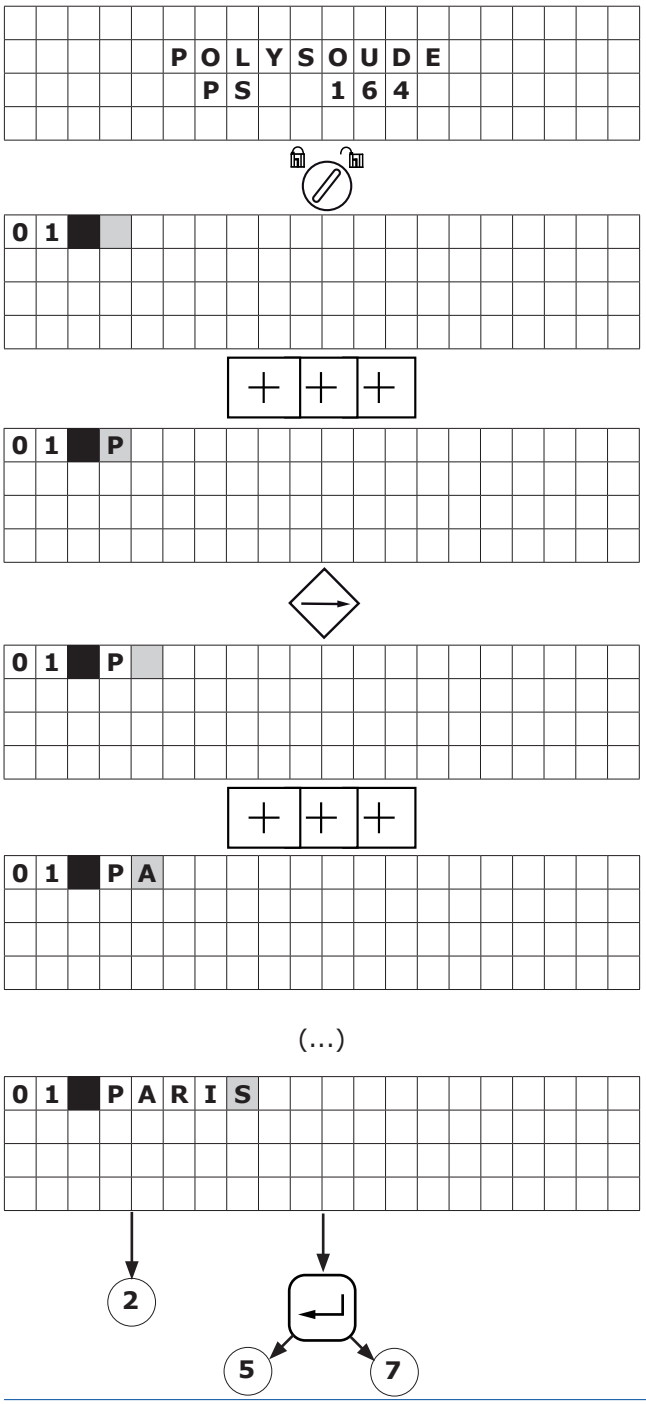
- 3.3.1 Entering the program name.
- 3.3.2 Modifying the program name.
- 3.3.3 Choice of a built-in program.
- 3.3.4 Programming and modifying the welding parameters:
  - Configuration.
  - Gas.
  - Current.
  - Rotation.
  - Wire.
- 3.3.5 Programming of sectors:
  - Creation of a sector.
  - Modification of sector start position.
  - Deleting a sector.
- 3.3.6 Deleting a program from the source memory.
- 3.3.7 Entering the time and date.
- 3.3.8 Entering/modifying the company name.
- 3.3.9 Saving, loading a program
  - Saving a program.
  - Loading a program.
- 3.3.10 Printing a program.
- 3.3.11 Programmable parameters

Explanation of symbols used

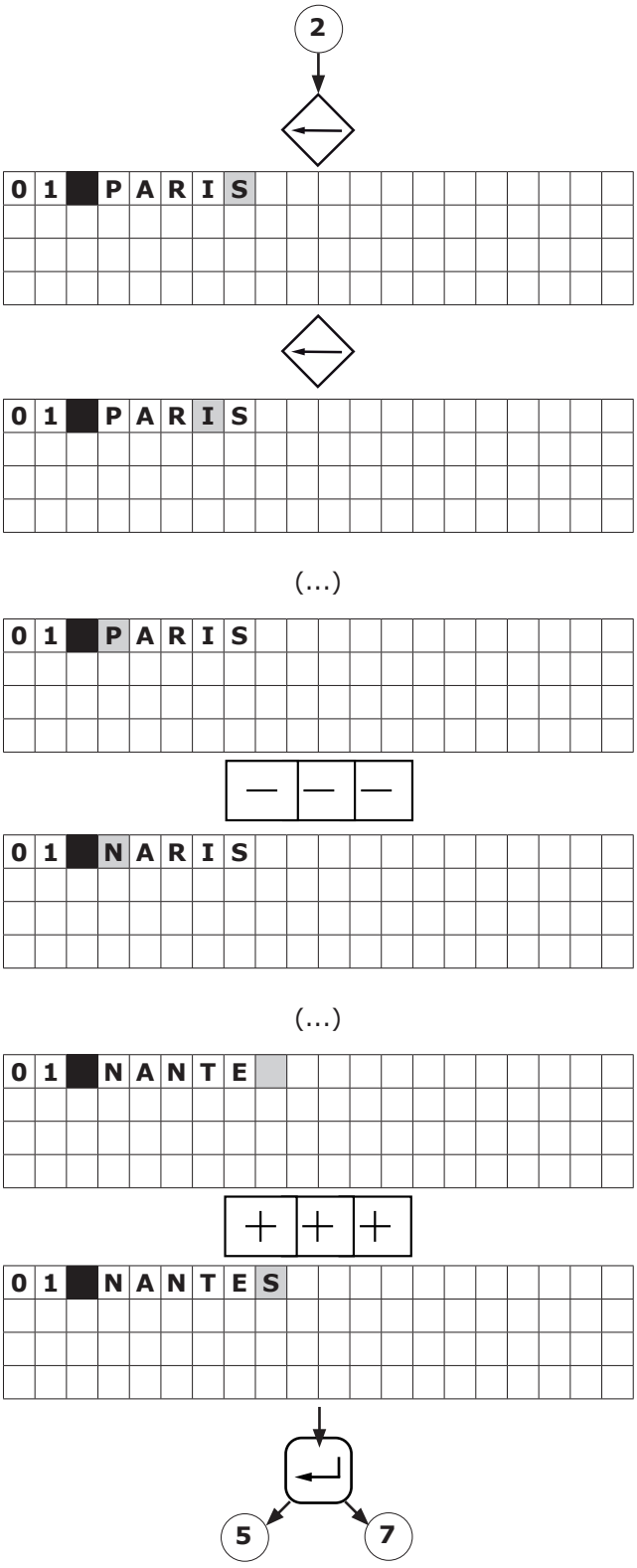
SYMBOL	MEANING
	Press once to increase
	Press and hold to increase
	Press once to decrease
	Press and hold to decrease
	Press once
	Press and hold for at least 2 seconds
	Indicator not illuminated
	Indicator flashing
	Indicator illuminated

5. 3. 1. Entering the program name

To choose the number of the program, the switch of the remote control pendant has to be used.
The current range (50A/160A) is set with the key operated switch on the front panel of the power source.
The key operated switch **SY 26** for choosing the "modification permitted or not" mode of the machine has to be in the "modification permitted" position (symbol).
For program version L633 5.0 onwards, if the last character (the eigth) of the program name consists of a dollar symbol ($), no modification of the welding parameters by the remote control pendant is possible.



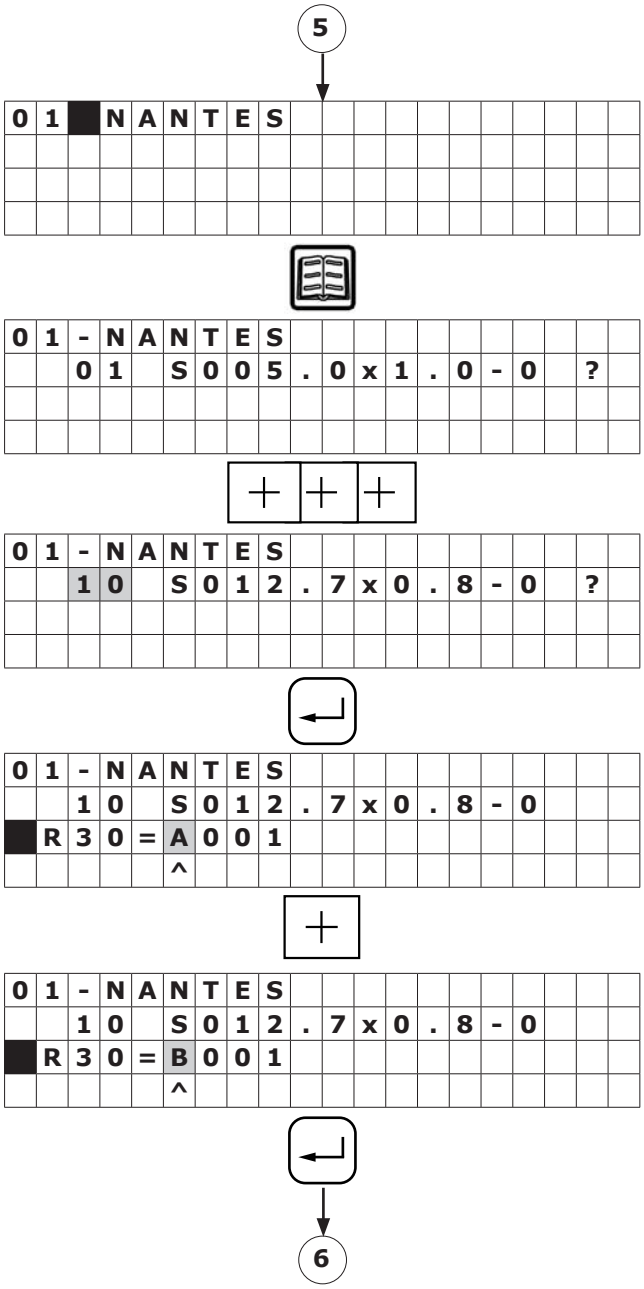
5. 3. 2. Modifying the program name

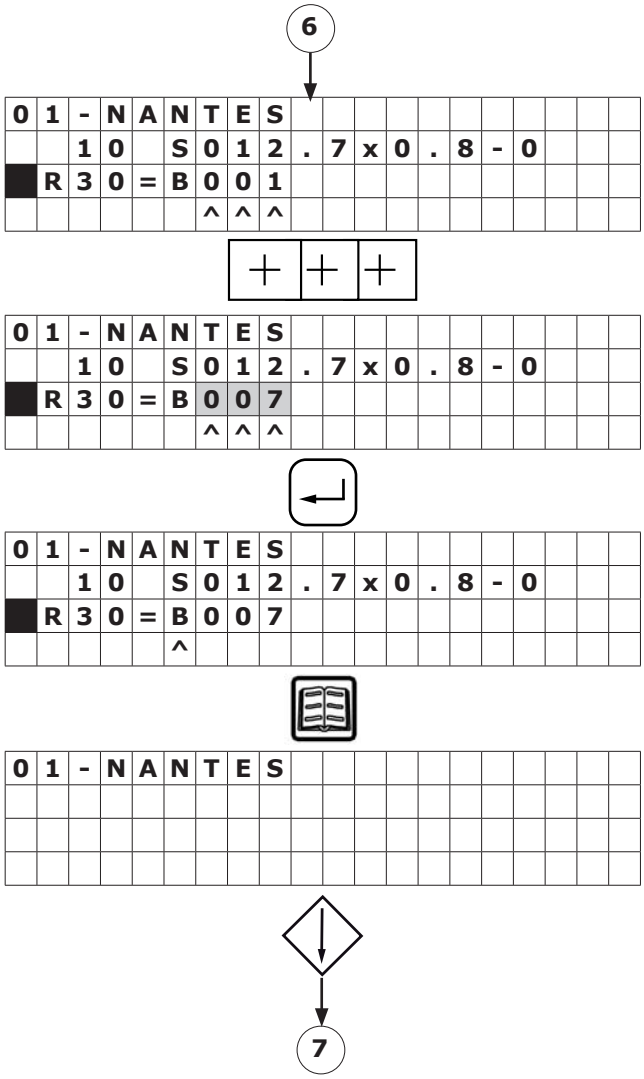


5. 3. 3. Choice of a built-in program

The choice of a basic program is only possible after a program name is entered.

After a basic program is chosen, the reference number of a welding head must be entered to allow the machine to calculate the travel speed.



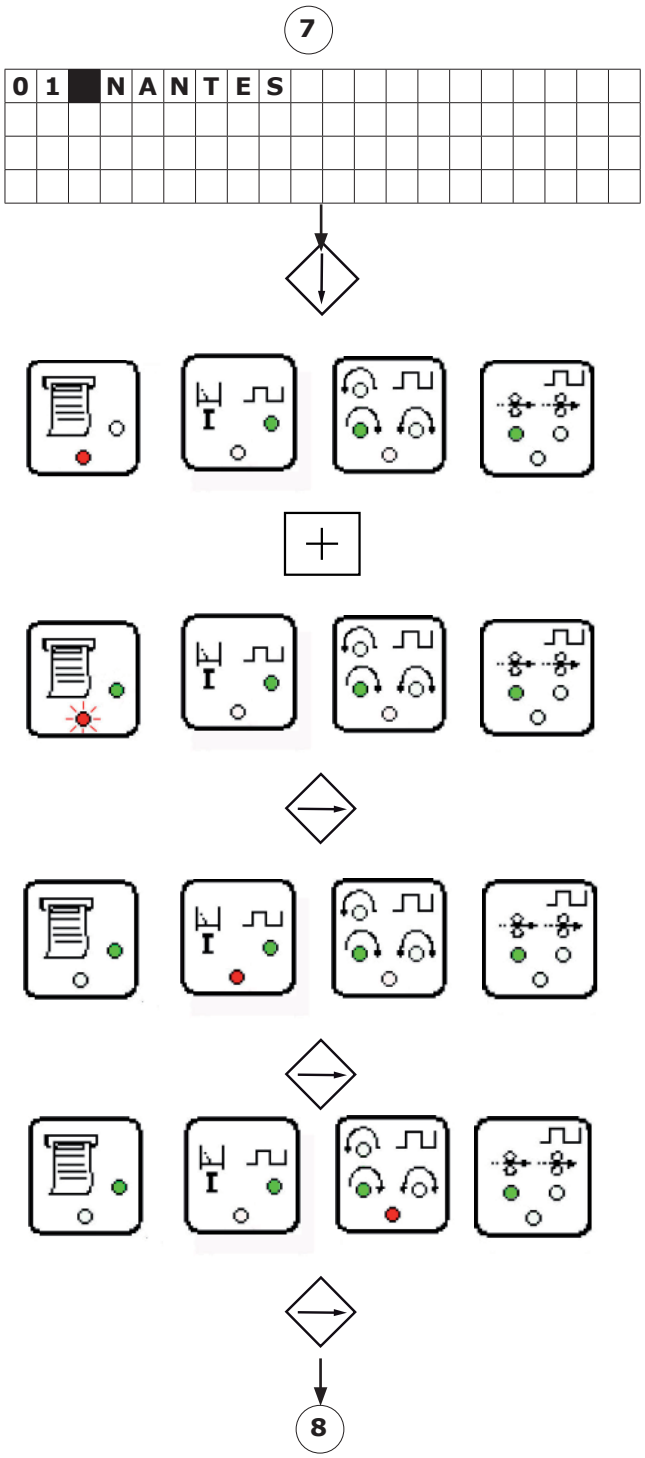


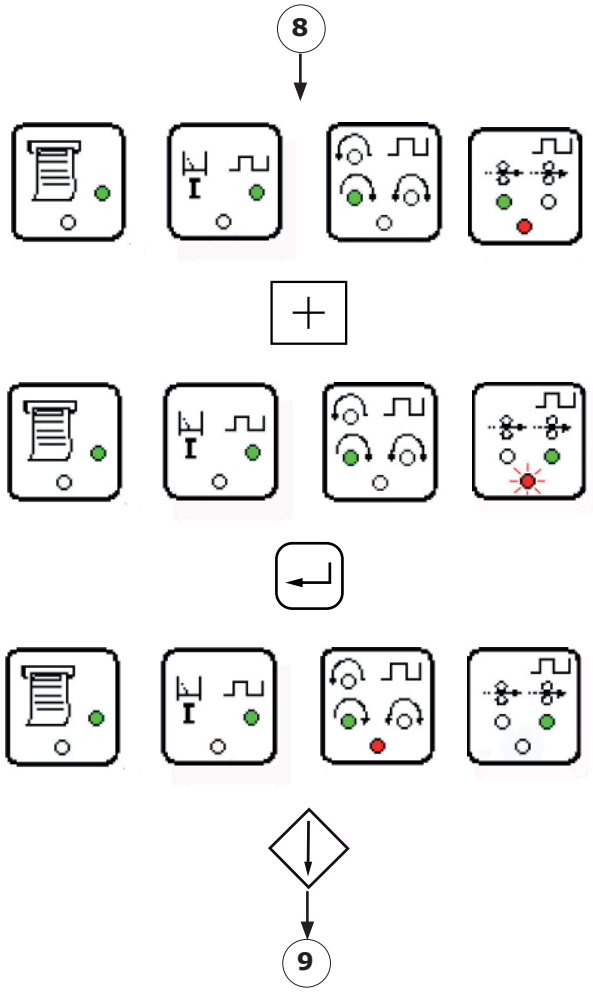
5. 3. 4. *Programming and modifying the welding parameters*

Symbols appearing on the front panel:

	No ticket at the end of the welding cycle
	Printout of a ticket at the end of the welding cycle
	Welding current : non pulsed
	Welding current : pulsed
	Unpulsed rotation during cycle - rotation forward
	Unpulsed rotation during cycle - rotation backward
	Pulsed rotation during cycle - rotation forward
	Pulsed rotation during cycle - rotation backward
	No wire feeder
	Unpulsed wire
	Pulsed wire

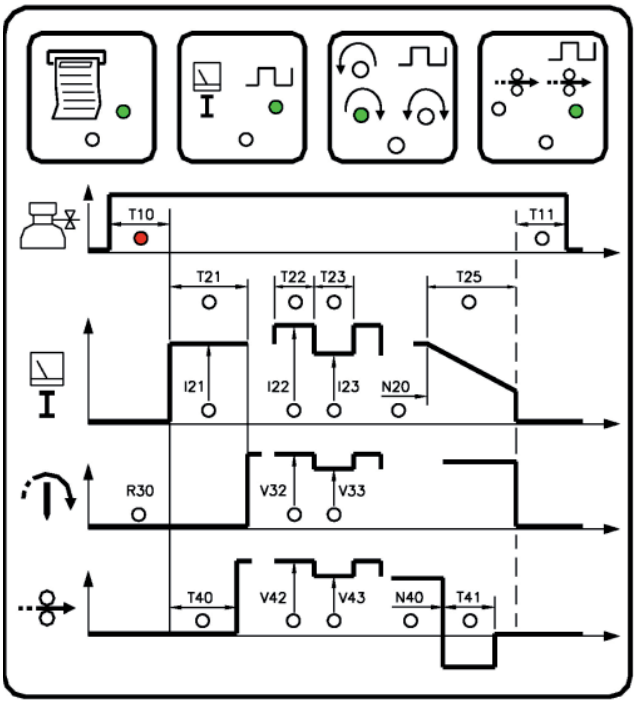
5. 3. 4. 1. Configuration



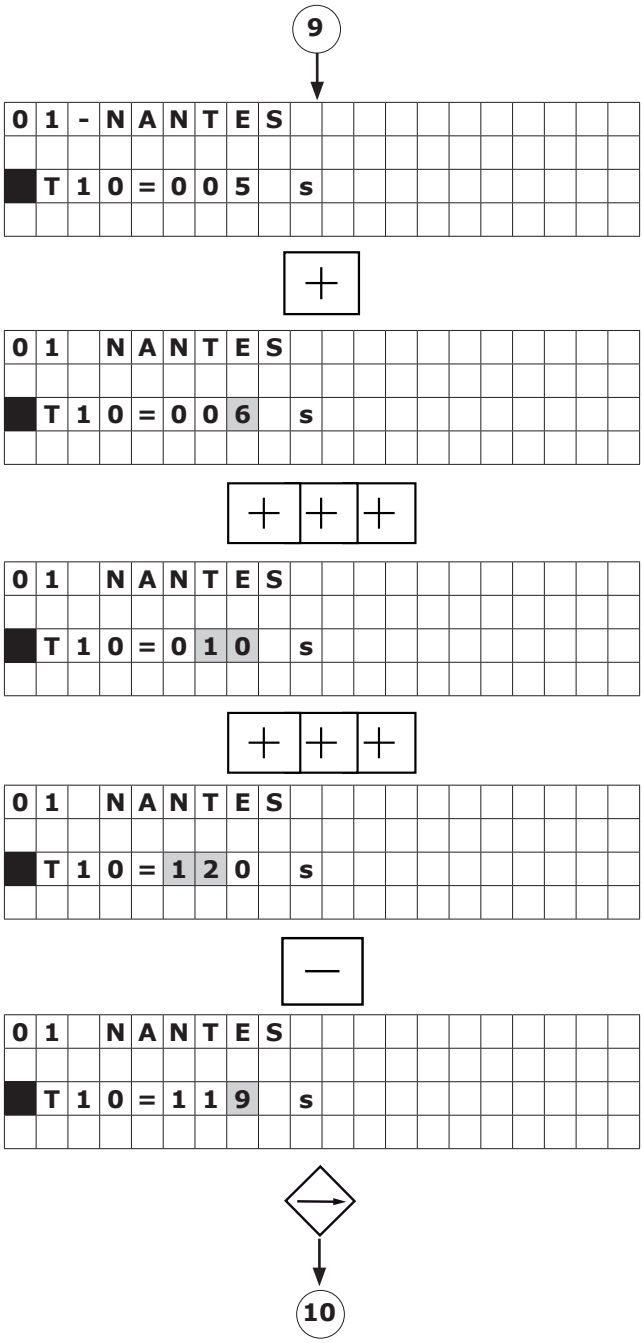


5. 3. 4. 2. Gas

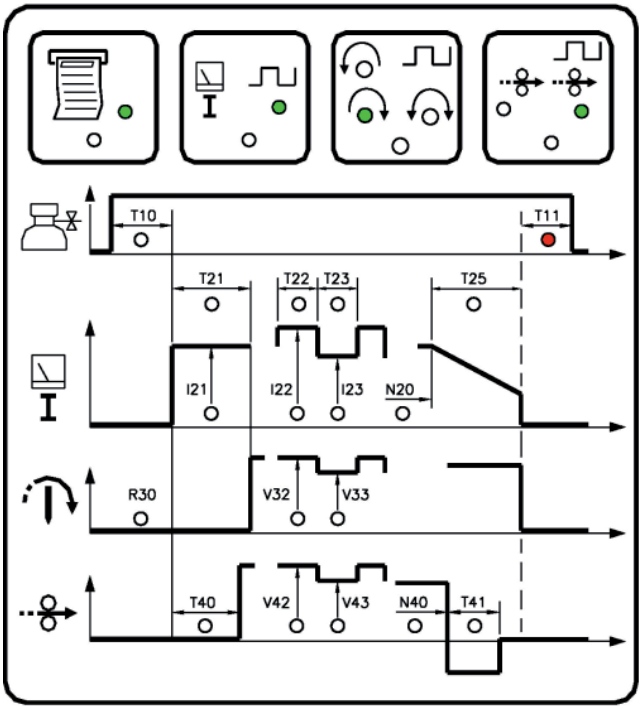
T10 = pregas time
A short press of the key (less than one second) increases the value of a parameter by one increment.

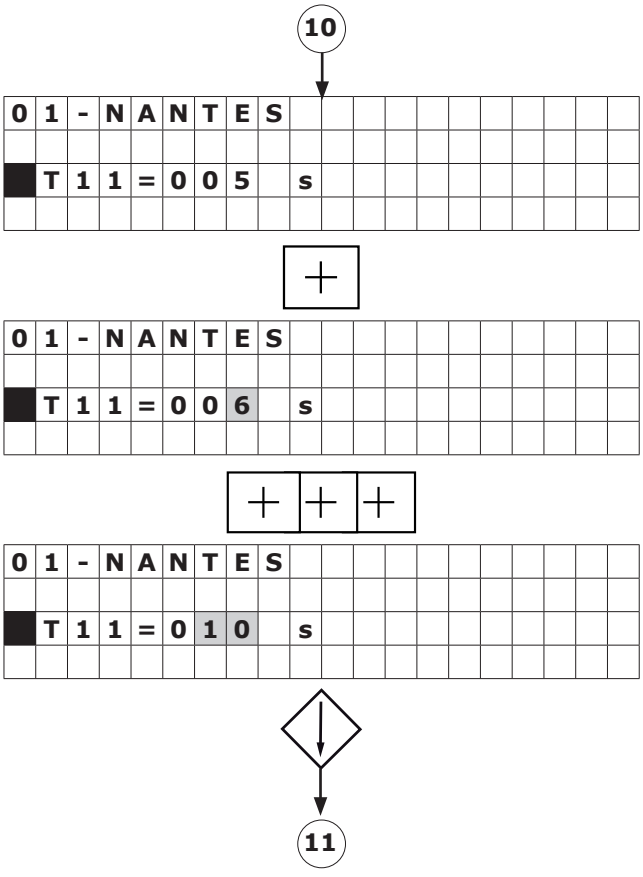


A maintened press of the key increases the value of a parameter by one increment, then after one second the value continues to rise automatically until the key is released. The value rises by one increment until the value 9 is reached, at which point it begins to rise in units of ten and afterwards in units of hundred.



T11 = postgas time



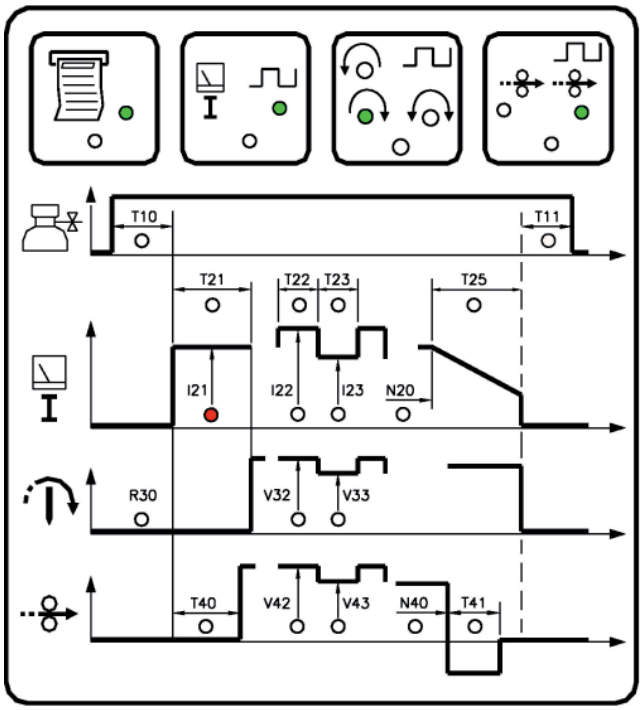


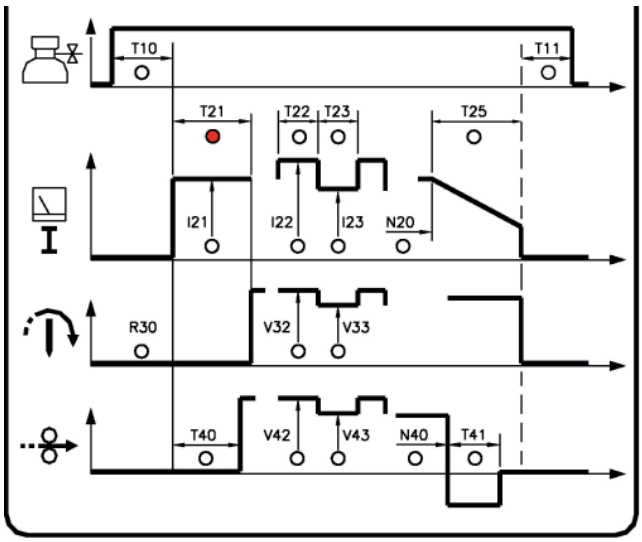
5. 3. 4. 3. Current

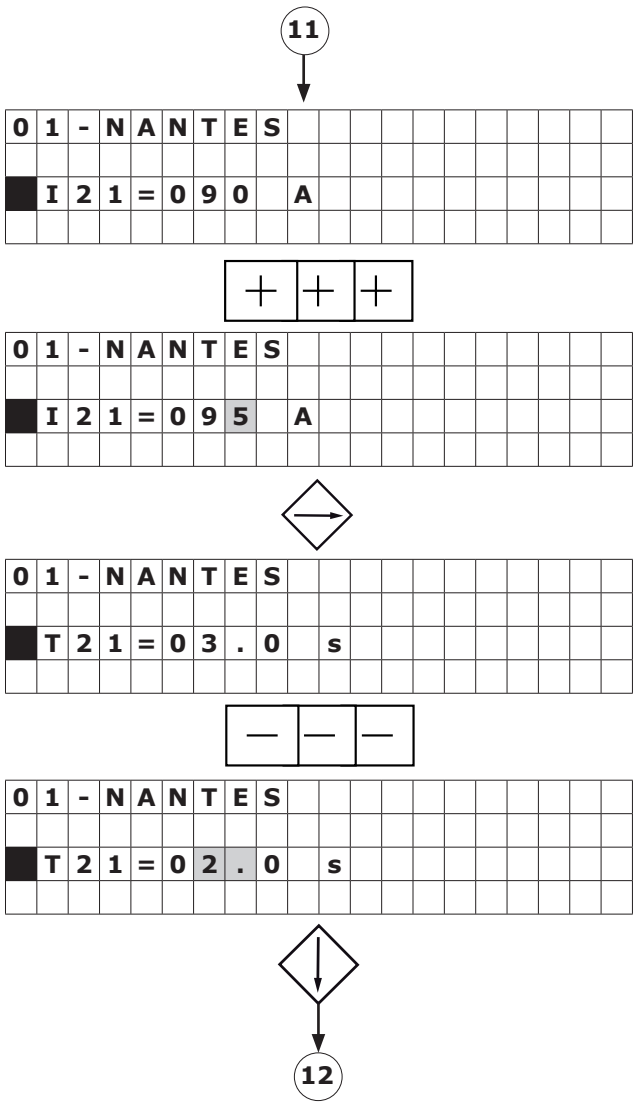
◇ Prefusion

I21 = prefusion current
T21 = time of prefusion current.
A maintained press of the key increases the value of a parameter by one increment, then after one second the value continues to rise automatically until the key is released. The value rises by one increment until the value 9 is reached, at which point it begins to rise in units of ten and afterwards in units of hundred.

Prefusion current will be non pulsed if selected choice is within configuration.
Prefusion current will be pulsed if selected choice is within configuration and background current is within the limits: (I21.I23)/I22.

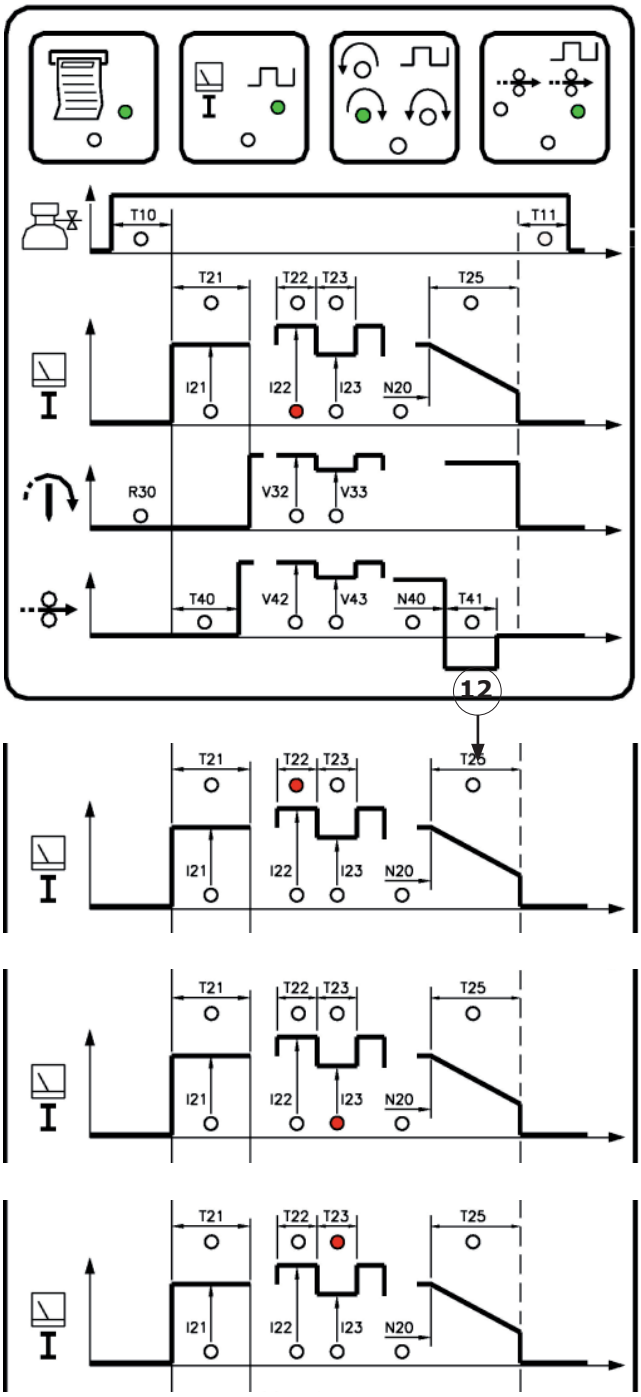


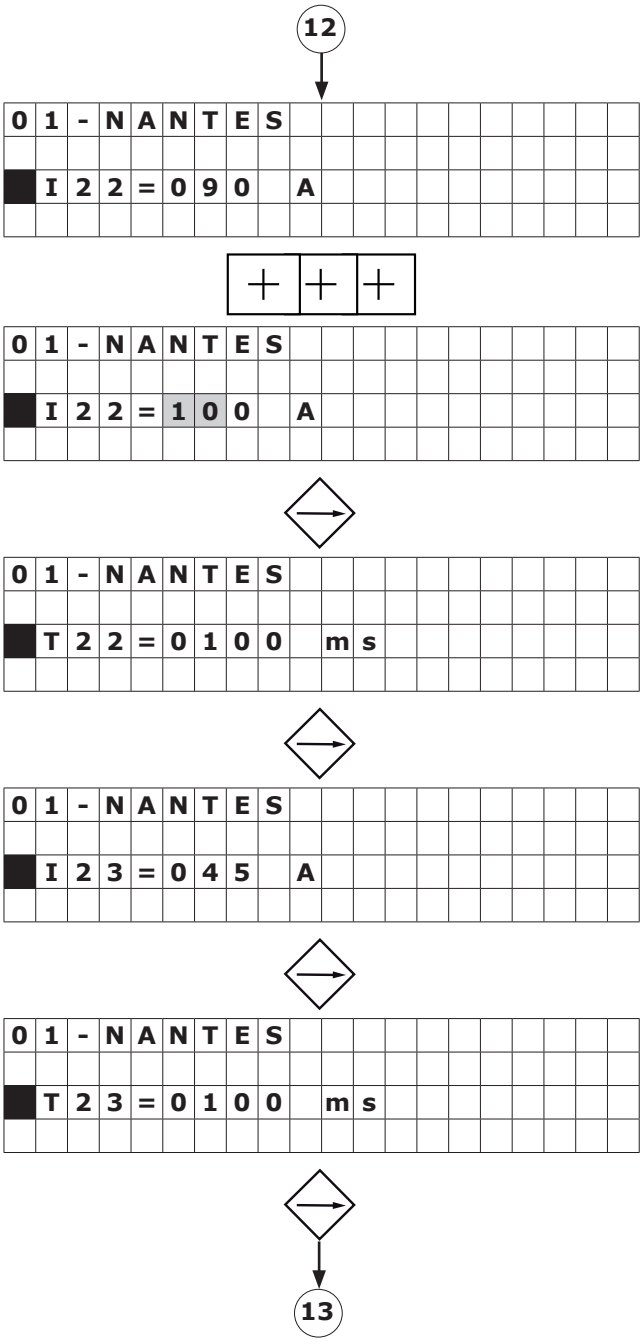




◇ Current

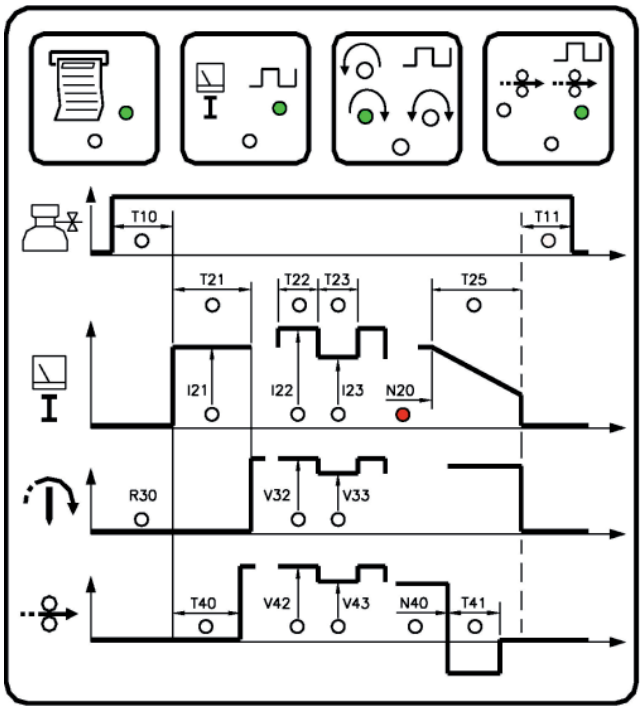
I22 = high current
T22 = time of high current
I23 = low current
T23 = time of low current

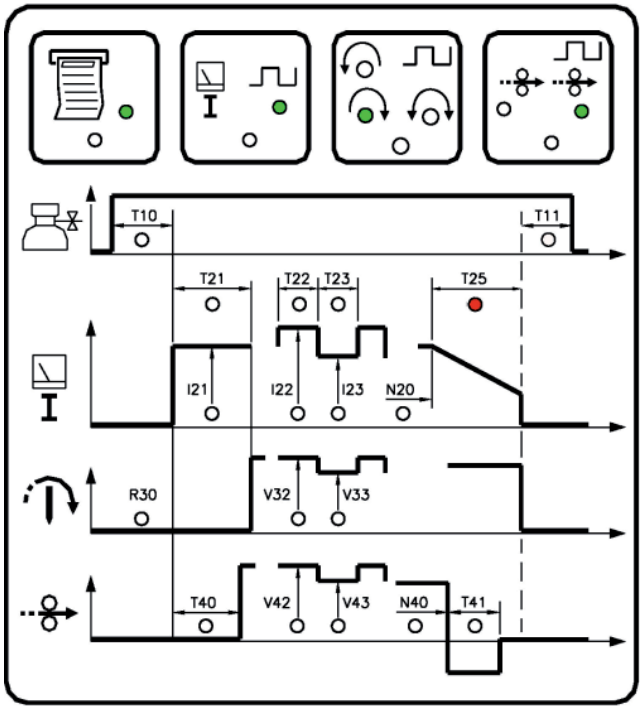


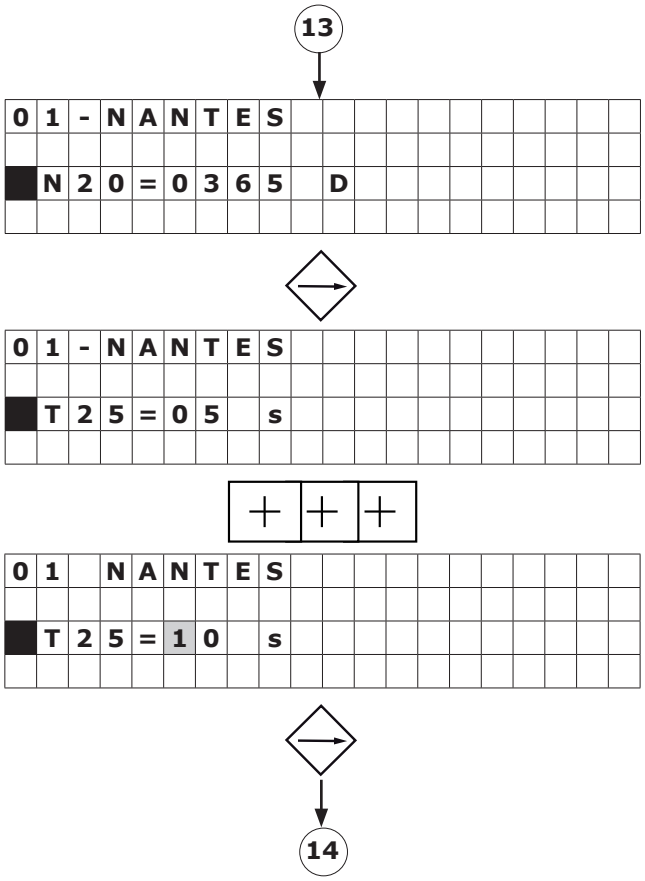


◇ Downslope

N20 = start of downslope
T25 = time of downslope







5. 3. 4. 4. Rotation

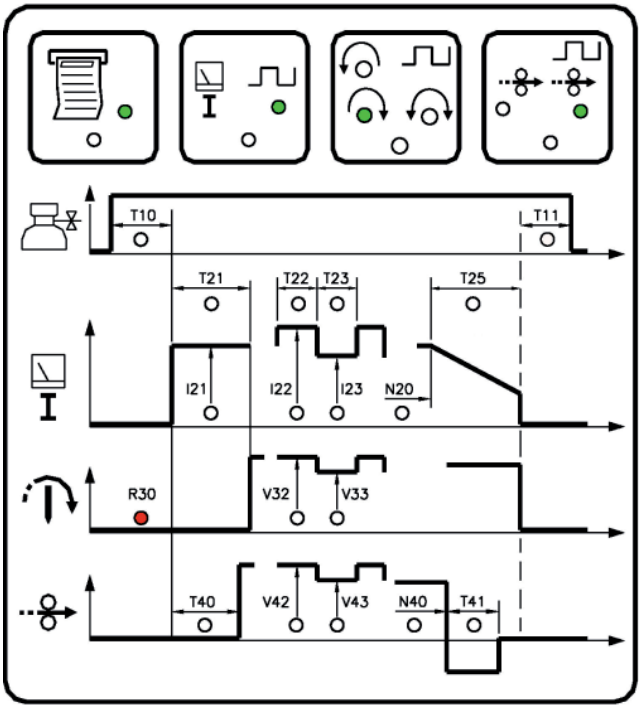
◇ Calculation of the value to program to get a required linear travel speed

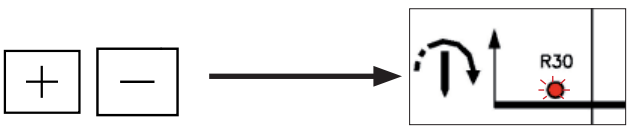
The table give a reference number R30 for the identification of every standard welding head. The reference number contains a letter and a three digit number. It has to be correctly introduced during programming to assure the proper functioning of the movements.
In order to get a required linear travel speed VL for a tube diameter D, the value to program VP (V32 for single travel speed, V33 for step pulse travel speed) has to be calculated with the formula:

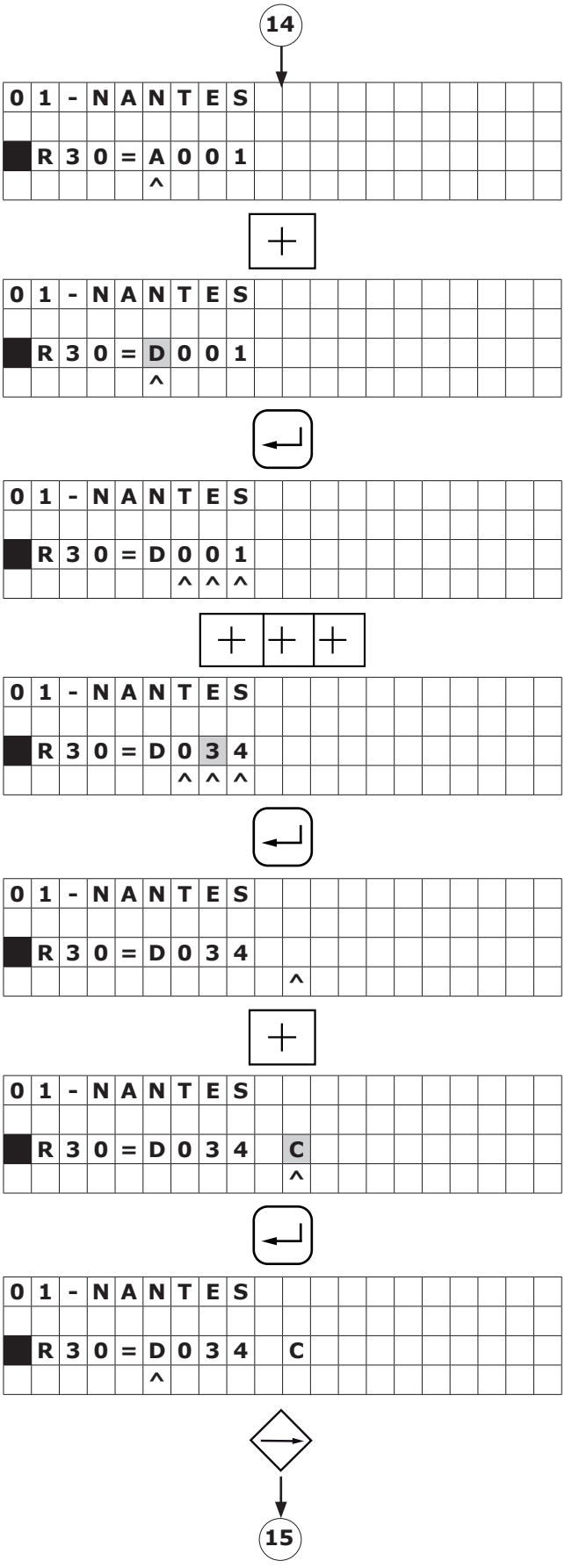
- VP = C x VL/D

C is a factor due to every type of welding head and given in the last column of the tables.
Example :
Welding head MW 65: C = 60 (see table enclosed welding heads).
Required linear travel speed VL = 152.5 mm/min (6 IPM).
Tube OD = 25.4 mm (1").
VP = 60 x 152,5 mm/min / 25.4 mm (6 IPM/1").
VP = 360 = V32.

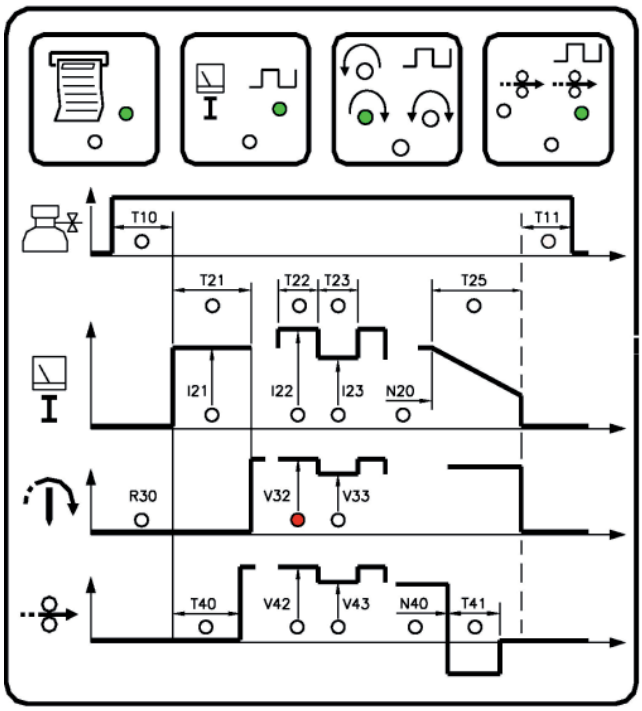
R30 = Reference number of the welding head

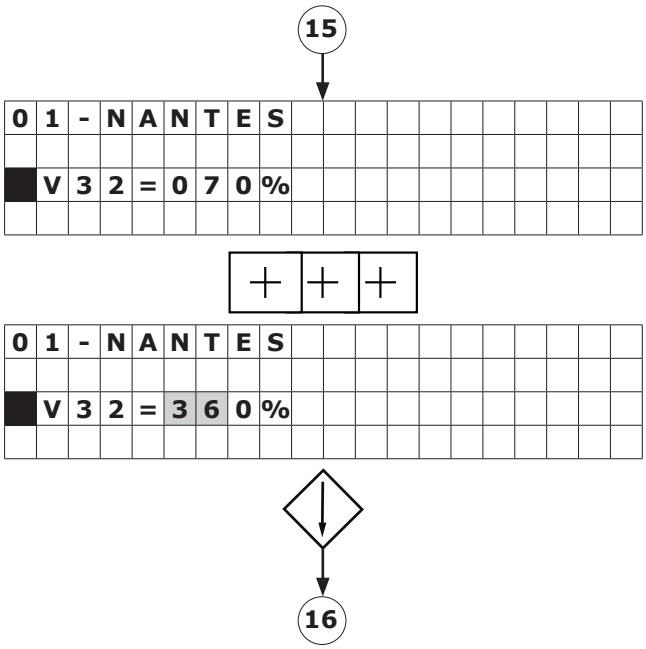






V32 = Smooth welding speed or during **T22** if pulsed rotation
V33 = Welding speed during background current period if pulsed rotation





◇ Characteristics of the welding heads

Open welding heads MU III and MU IV

Welding head type	Minimum diameter (mm)	Maximum diameter (mm)	Reference number (R30)	Number of impulses per revolution	Factor C (VP=C.VL/D)
MU III 16	4	16	A014	357	24
MU III 25	8	26	A028	357	48
MU III 34	20	34	A033	364	58
MU III 8/34	8	34	A033	364	58
MU III 51	25	51	A086	361	150
MU III 20/80	20	80	A073	360	127
MU III 80	32	80	A073	360	127
MU III S 80	32	80	A073	360	127
MU III 114	70	114	A100	360	174
MU III 30/114	30	114	A100	360	174
MU III S 115	17	114	A100	360	174
MU III 170	76	170	A183	359	317
MU III S 170	60	170	A183	359	317
MU III 220	102	220	A322	360	559
MU III 370	150	370	A360	360	625
MU IV 28	8	28	A024	358	41
MU IV 38	8	38	A028	357	48
MU IV 64	14	64	A040	360	69
MU IV 80	19	80	A051	361	89
MU IV 104	19	104	A062	361	108
MU IV 115	25	115	A069	362	120
MU IV 128	25	128	A082	360	142
MU IV 195	76	195	A137	360	238
MU IV 245	101.6	245	A200	360	347
MU IV 275	114	275	A197	360	342

Positioners Polyturn

Welding head type	Minimum diameter (mm)	Maximum diameter (mm)	Reference number (R30)	Number of impulses per revolution	Factor C (VP=C.VL/D)
Polyturn 11	3	180	A017	354	29
Polyturn 50	10	600	A038	356	65
Polyturn 175	35	1000	A132	360	229

Closed chamber welding heads with impulse power source

Welding head type	Minimum diameter (mm)	Maximum diameter (mm)	Reference number (R30)	Number of impulses per revolution	Factor C (VP=C.VL/D)
H 500A	3.17	12.7	B007	366	12
HD 500 P	3.17	12.7	B007	366	12
HD 750 P	4.75	19.05	B009	369	16
HD 1500 P	6	38.1	B015	364	26
K 375 a	1.6	9.5	B009	341	15
K 375 n	1.6	9.5	A016	357	28
K 875 a	3.17	22.2	B010	354	17
K 875 n	3.17	22.2	A018	367	32
K 1500	6.35	38.1	B025	362	44
K 2000	12.7	50.8	B025	356	43
K 2500	12.7	63.5	B028	360	49
K 3000	25.4	76.2	B031	363	54
K 4000	38.1	101.6	B038	359	66
K 6000-T	50.8	152.4	A110	358	190
K 7000	76.2	177.8	A200	360	347
MW40	6	40	D023 C	360	40
MW65	12	65	D034 C	365	60
MW115	25	115	D073 C	358	126
MW170	80	170	C103 C	359	178
MW1250	6	33.4	C017	369	30
MW2500	9.5	63.5	C047	358	81
MW4500	25	114.3	A119	359	206
UHP 250	1.6	6.35	D006	384	11
UHP 500	3.0	12.7	D009	360	16
UHP 1500	6.0	38.1	D023	360	40

a: previous
n: new

Max.diam of tube which can be welded with the offset electrode holder

	Electrode offset type 1 - 5 mm	Electrode offset type 2 - 11 mm	Electrode offset type 3 - 8,4 mm
MW 40	33,7	19,05	
MW 65	60,3	42,4	
MW 115	114,3	101,6	
MW 170			168,3

Welding heads TS-TP for tube to tubesheet welding

Reference number R30 :

Axxx →	Welding heads without switch to detect the home position.
Hxxx →	Welding heads with switch to return to the home position after the end of the weld cycle, using the shortest way.
Jxxx →	Welding heads return to the home position after the end of the weld cycle, in the opposite direction of the welding.

Welding head type	Minimum diameter (mm)	Maximum diameter (mm)	Reference number (R30)	Number of impulses per revolution	Factor C (VP=C.VL/D)
TS 25	6	25	A014 (H014,J014)	359	24
TS 34	7,5	33,7	A024C (H024C, J024C)	364	42
TS 73	8,5	60	A044 (H044,J044)	364	77
TS – TP 60	8,5	60	A044 (H044,J044)	364	77
TS 2000	10	60	A032 (H032,J032)	357	55
SCK	20	20	C021	365	37

Control of an external speed variator

It is possible to control an external speed variator. There are two possibilities to program the reference number R30:
For a time base of 1/10 seconds the letter I followed by 0,1 s has to be introduced (R30 = I0,1s).
For a time base of seconds the letter I followed by 1 s has to be introduced (R30 = I1s).
The weld cycle is now controlled by time (1/10 seconds or seconds) and not by the position of the welding head (impulse control). The internal clock of the power source is generating the impulse signals.
To command the external speed variator, an interface (signal generation for start and direction of rotation) has to be connected to the rotation plug **FA 3** of the power source.

Control of the power source by manual plug welding head (FA5)

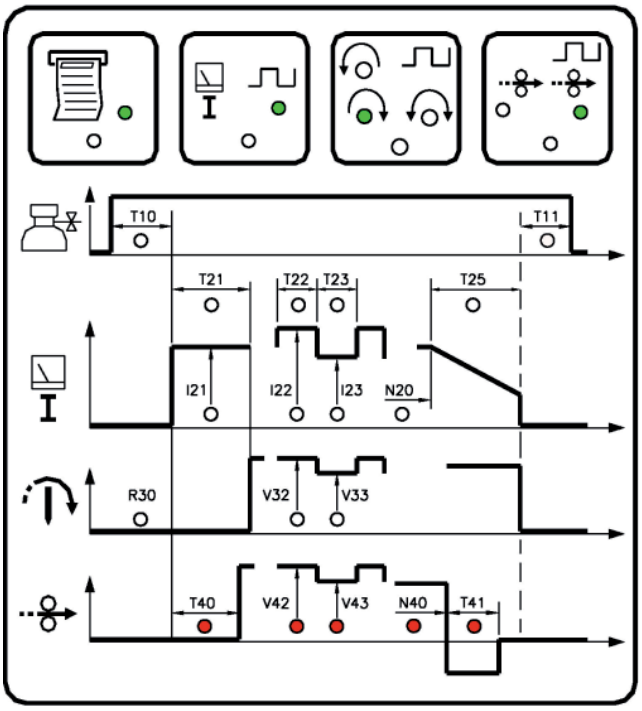
Use of a manual torch
- R30=yyyy
- Working cycle without movements and pulsing
- Downslope
- End of cycle

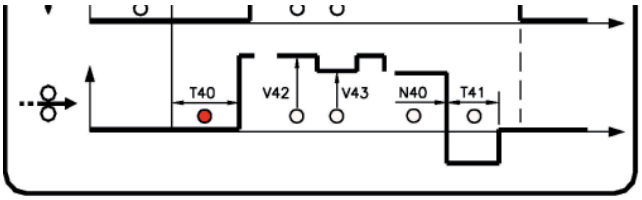
Use of a welding head
- R30=yyyy **C** (MW40, MW65, MW115 and MW170)
- Rotation of the head
- Test gas and cooling agent
- Starting cycle without considering the open position of the welding head but with the head going back to the open position at the end of the cycle
- Downslope
- End of cycle

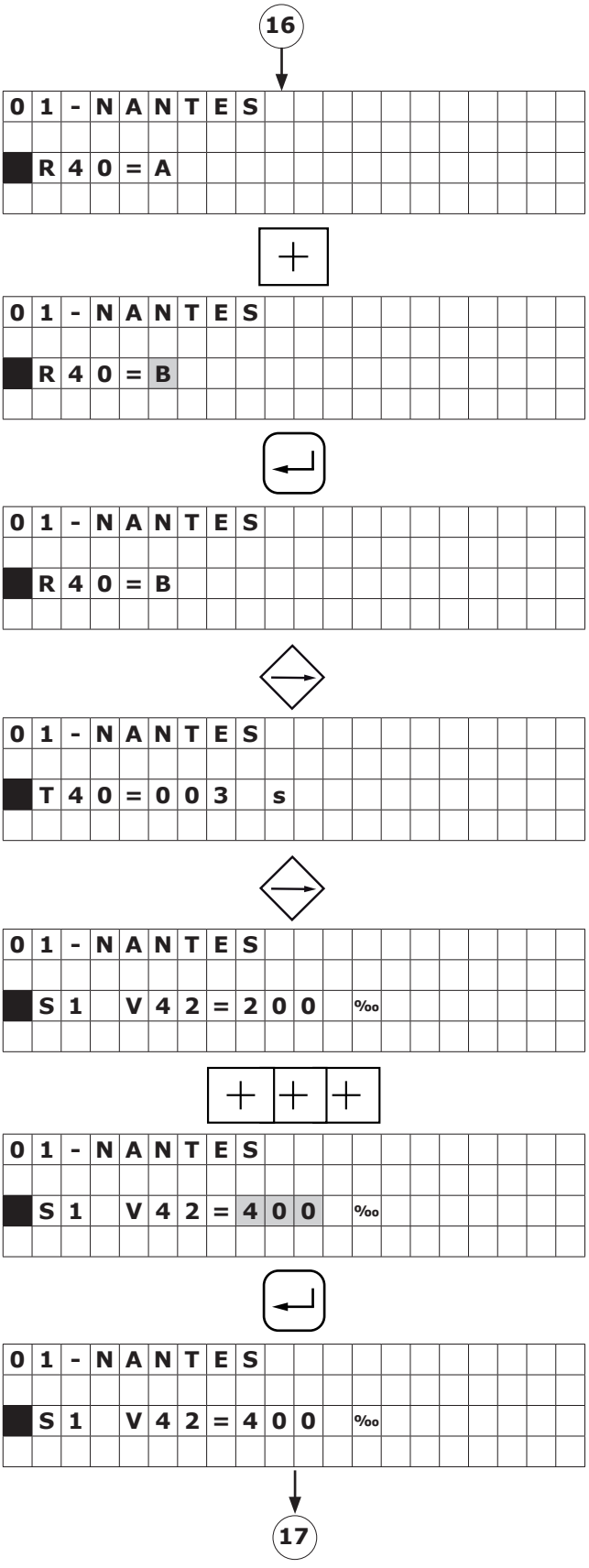
Use of other heads
- R30=yyyy **X**
- Rotation of the head
- Test gas and cooling agent
- Starting cycle considering the open position of the head and with the head going back to the open position at the end of the cycle
- Downslope
- End of cycle

5. 3. 4. 5. Wire

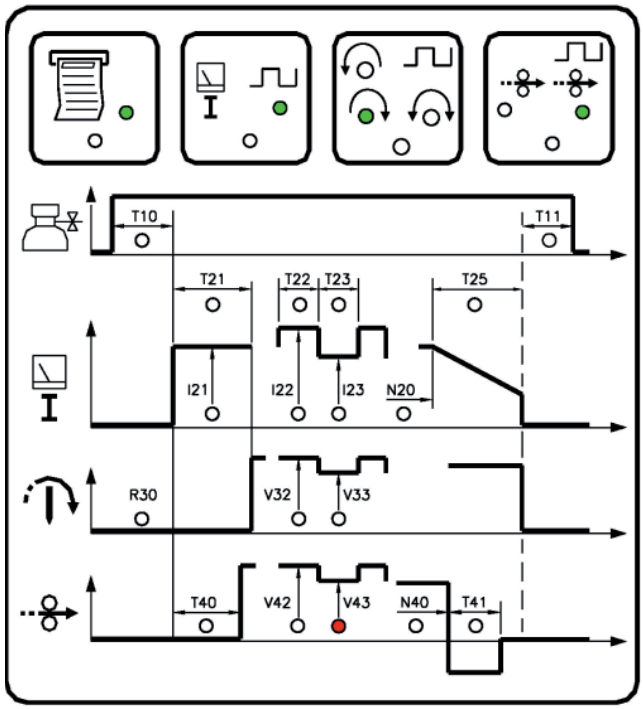
R40 = Selection of wire feeder
A = Polyfil B
B = Polyfil 2 and Polyfil-3
T40 = Wire start
V42 = Wire speed with unpulsed wire feeding or wire speed during **T22** pulse current period

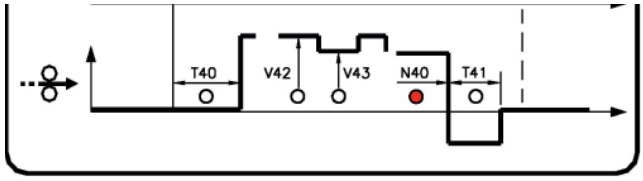


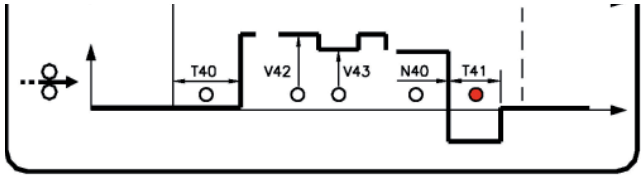


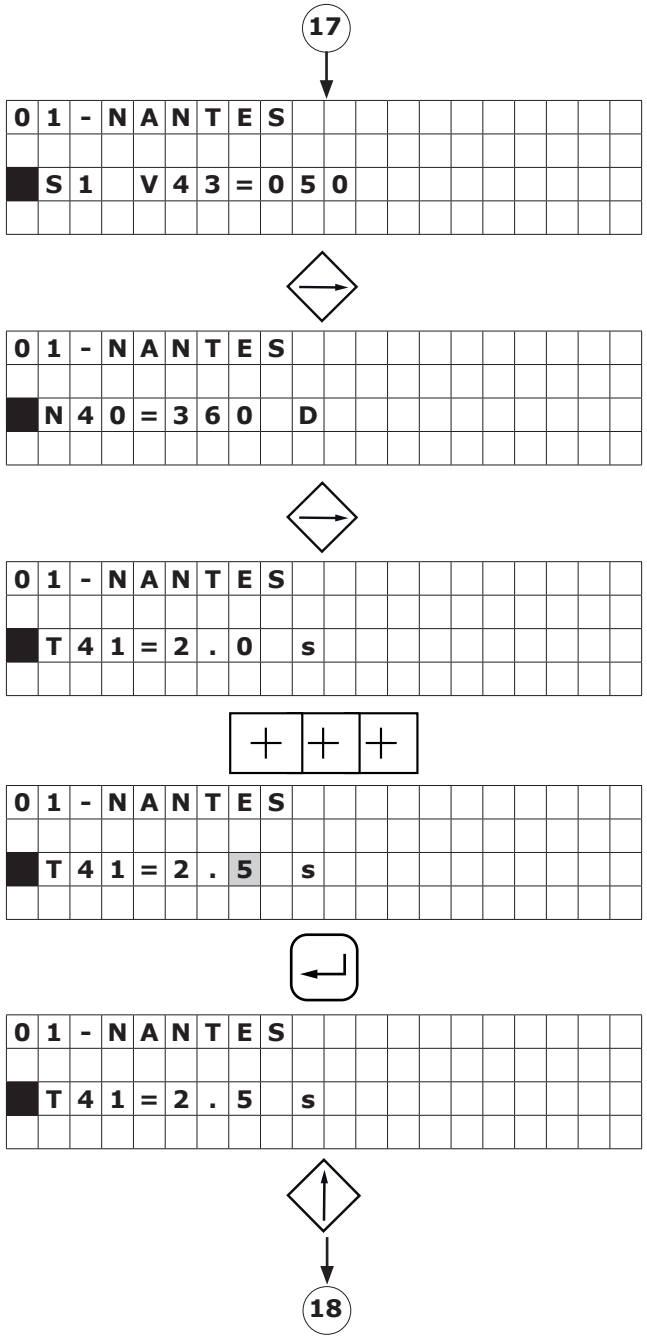


V43 = Wire speed during background current period if pulsed wire.
N40 = Wire stop.
T41 = Wire retract.







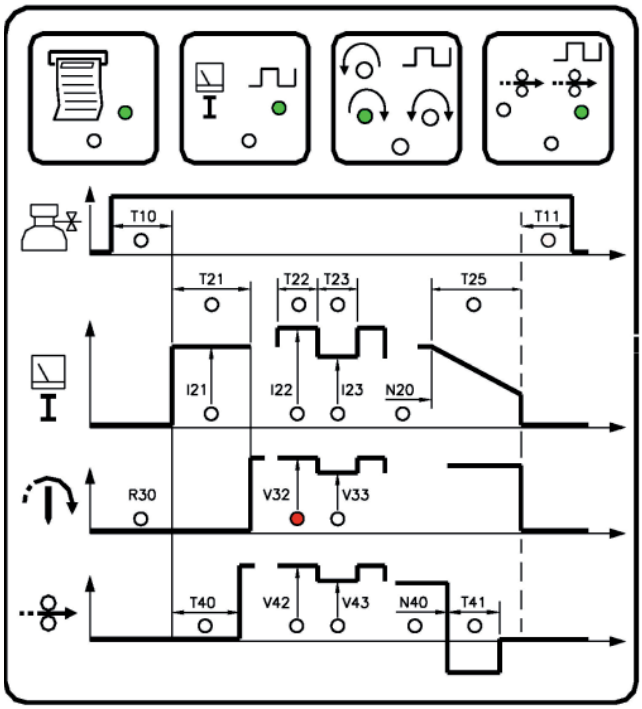


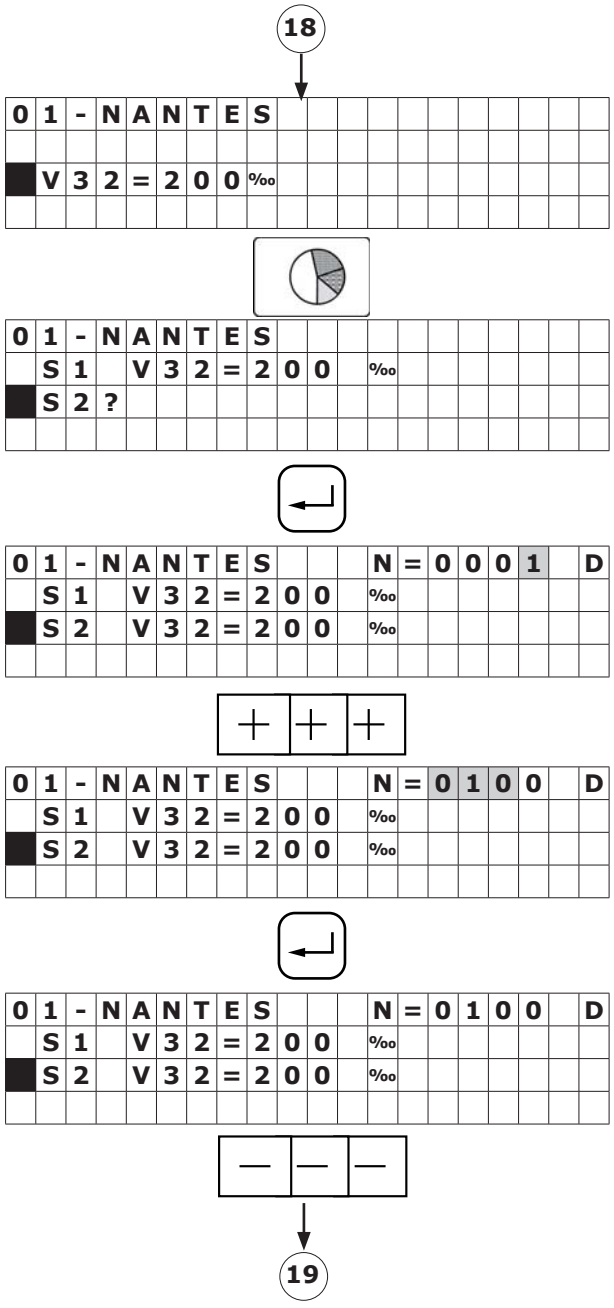
5. 3. 5. Programming of sectors

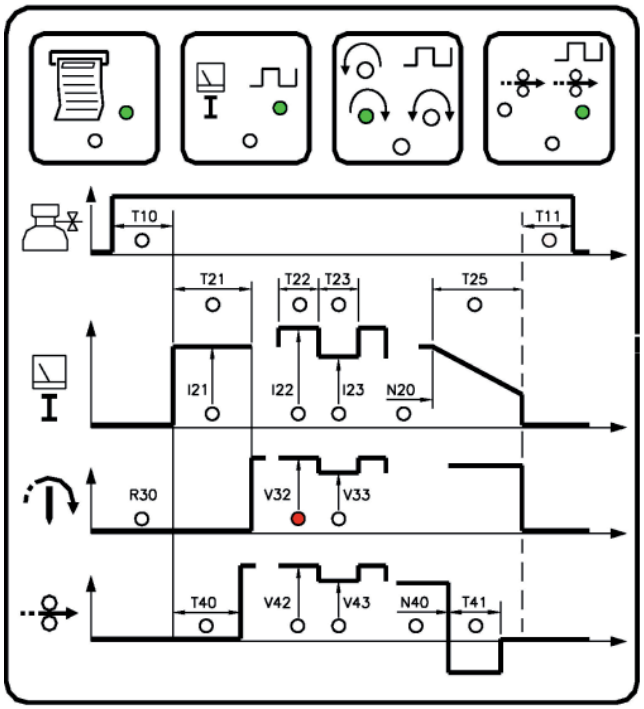
5. 3. 5. 1. Creation of a sector

A sector is characterized by its number (**S**) and the value (**N**) indicating the sector start position.
If a sector is created, the actual values of the weld parameters are automatically transfered (that's why the programming of a sector should be completely finished before the next one is created).

The value of the parameter "**N**" for the actual sector must be higher than the value of the preceeding sector and lower than the value "**N20**" (start of the downslope). If this is not the case, the value will not be accepted.







19

0	1	-	N	A	N	T	E	S				N	=	0	1	0	0		D
	S	1		V	3	2	=	2	0	0		‰							
■	S	2		V	3	2	=	1	8	0		‰							

0	1	-	N	A	N	T	E	S				N	=	0	1	0	0		D
	S	1		V	3	2	=	2	0	0		‰							
■	S	2		V	3	2	=	1	8	0		‰							

0	1	-	N	A	N	T	E	S				N	=	0	1	0	0		D
	S	1		V	3	2	=	2	0	0		‰							
	S	2		V	3	2	=	1	8	0		‰							
■	S	3		?															

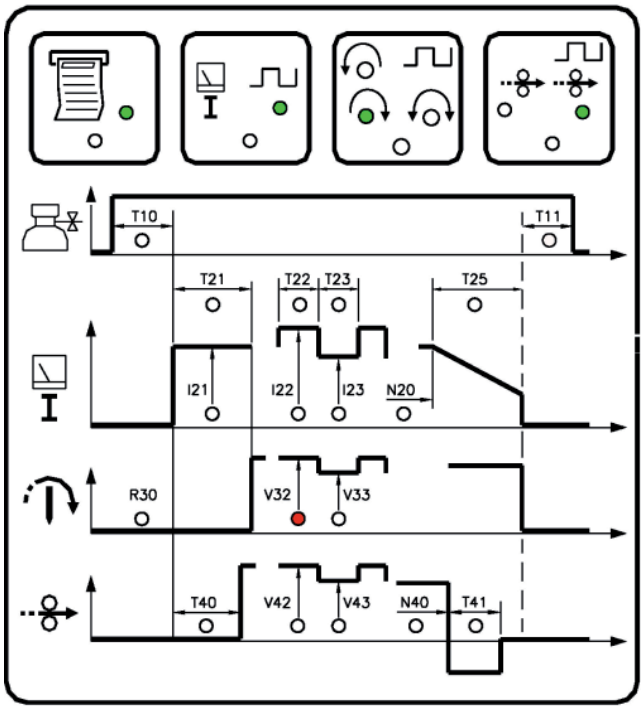
0	1	-	N	A	N	T	E	S				N	=	0	1	0	0		D
	S	1		V	3	2	=	2	0	0		‰							
	S	2		V	3	2	=	1	8	0		‰							
■	S	3		V	3	2	=	1	8	0		‰							

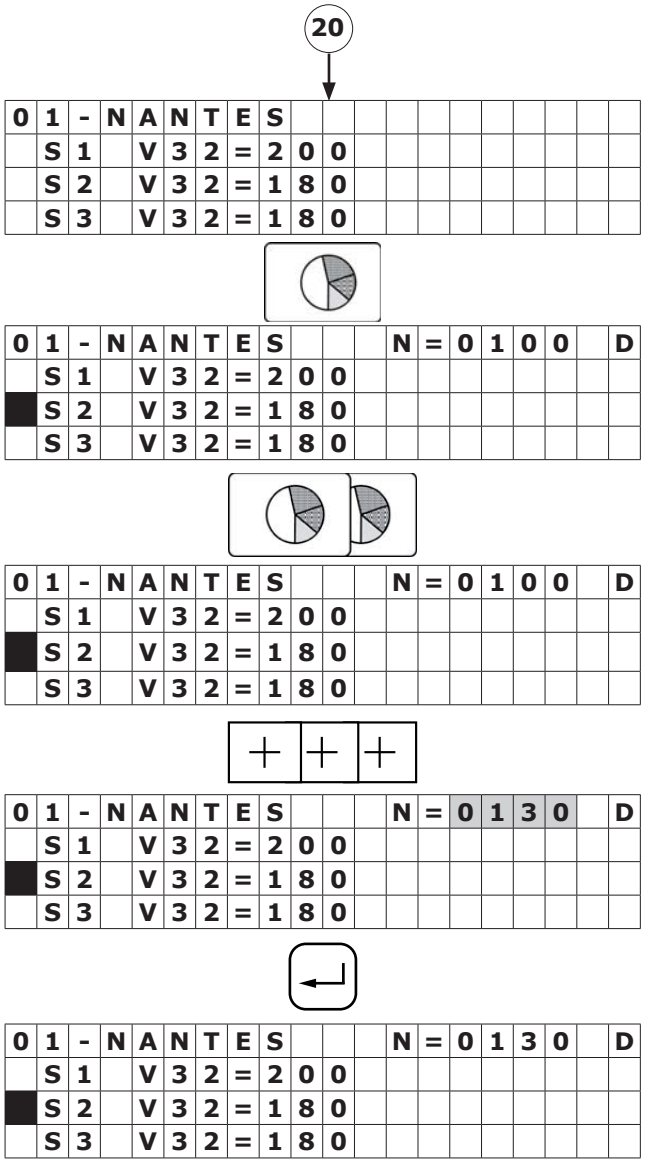
0	1	-	N	A	N	T	E	S				N	=	0	1	5	0		D
	S	1		V	3	2	=	2	0	0		‰							
	S	2		V	3	2	=	1	8	0		‰							
■	S	3		V	3	2	=	1	8	0		‰							

20

5. 3. 5. 2. Modification of sector start position

During modification, the value of parameter "N" must be between the values of the preceeding and the following sector. If this is not the case, the value will not be accepted.





5. 3. 5. 3. Deleting a sector

C	1	-	N	A	N	T	E	S				N	=	0	1	3	0		D
	S	1		I	2	2	=	1	0	0		A							
■	S	2		I	2	2	=	1	0	5		A							
	S	3		I	2	2	=	1	2	0		A							

0	1	-	N	A	N	T	E	S				N	=	0	1	3	0		D
	S	1		I	2	2	=	1	0	0		A							
■	S	2		I	2	2	=	1	0	5		A	?						
	S	3		I	2	2	=	1	2	0		A							

0	1	-	N	A	N	T	E	S				N	=	0	1	5	0		D
	S	1		I	2	2	=	1	0	0		A							
■	S	2		I	2	2	=	1	2	0		A							
	S	3		I	2	2	=	1	2	5		A							

Other key

0	1		N	A	N	T	E	S				N	=	0	1	3	0		D
	S	1		I	2	2	=	1	0	0		A							
■	S	2		I	2	2	=	1	0	5		A							
	S	3		I	2	2	=	1	2	0		A							

5. 3. 6. Deleting a program from the source memory

To select the program to be deleted, enter the program number with the remote control pendant.

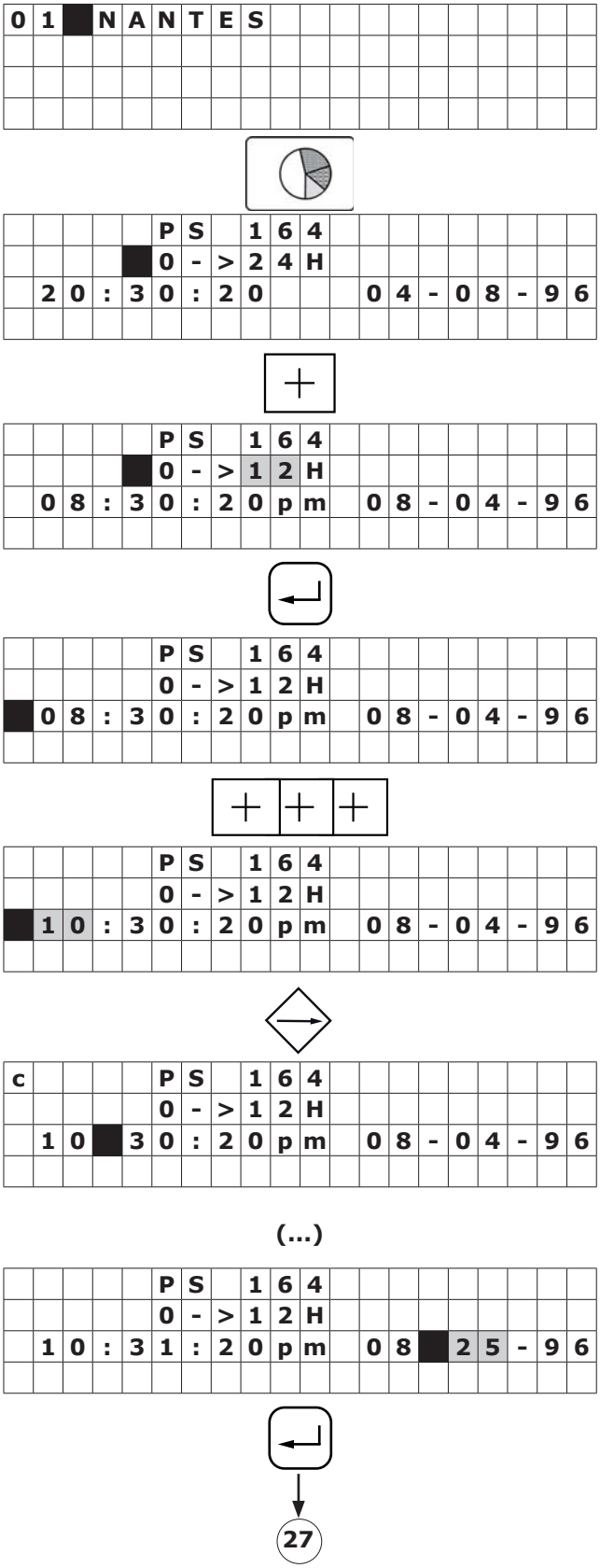
0	0	■	P	A	R	I	S												

0	0	■	P	A	R	I	S				?								

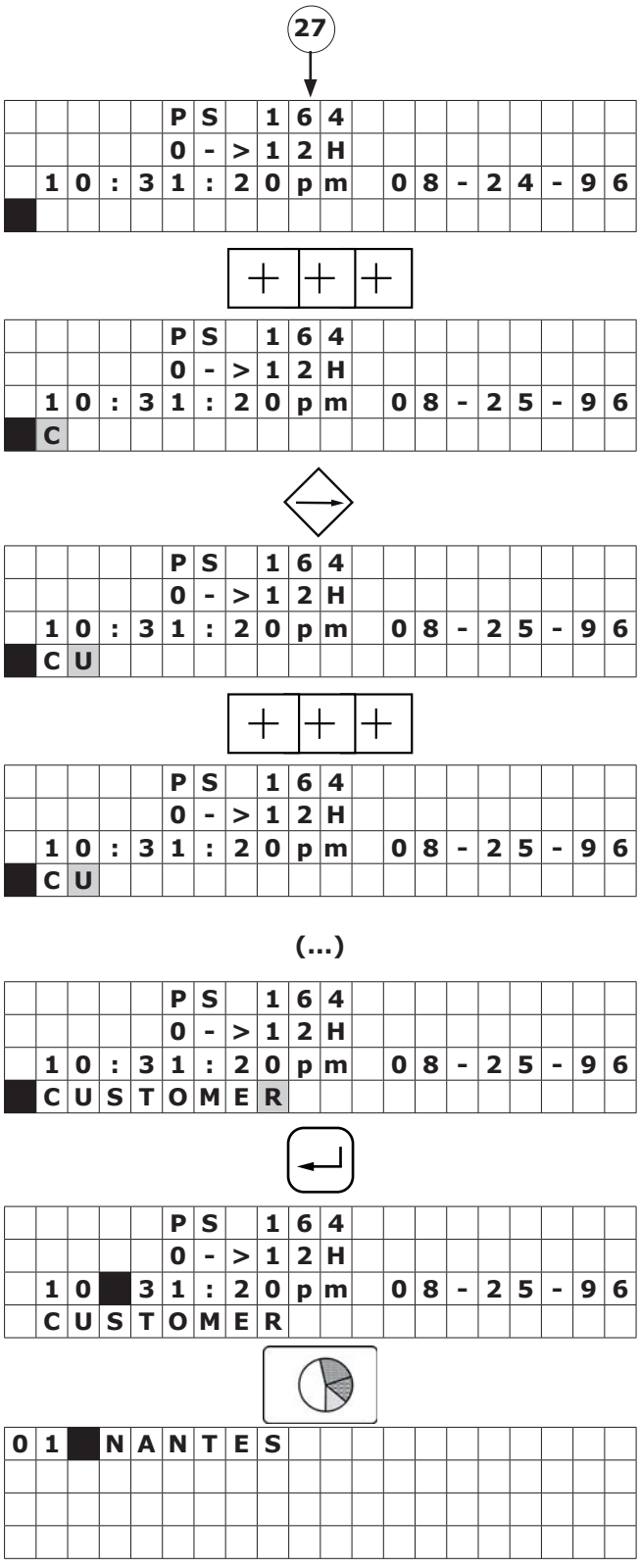
0	0	■																	
					P	O	L	Y	S	O	U	D	E						
						P	S		1	6	4								

5. 3. 7. Entering the time and date

With the key switch in the open position, and when creating or modifying the name of a program, you can also access the mode for entering or modifying the time, the date and the company name by pressing the "sector" key.
By pressing the "enter" key you can change between the displays for the time, the date and the company name. You can exit this mode by pressing the "sector" key.



5. 3. 8. Entering / modifiying the company name



5. 3. 9. Saving, loading a program

5. 3. 9. 1. Saving a program on a memo card

Each program can be saved on a memo card, 16 programs per card is possible. The procedure is described in the programming manual. A brief summary is given below.

2 possibilities:

◇ **Saving a single program**

Check that the key switch **SY 26** is in the position "Modification authorised".
Insert the memo card.
Choose the number of the program to be saved with the switch **BT 4** on the remote control pendant.
Press the transfer button to save the information on the memo card (symbol).

If the name of the program to be saved already exists on the memo card, the name of this program is displayed with a question mark.
If you validate the saving with the button **SY 23**, the program which has been stored on the memo card will be replaced by the new one. The indicator corresponding to the saving function will illuminate. Wait for the indicator to extinguish before removing the memo card.

If the memo card is full, the error code **! 77 !** is shown on the display **SY 25**.

◇ **Saving several programs**

Check that the key switch **SY 26** is in the position "Modification authorised".
Insert the memo card.
Press the transfer button to save the information on the memo card (symbol).
Press the button "plus" (symbol [+]), the characters 0 -> 15 ? are shown on the display. The button "minus" (symbol [−]) enables to come back to the loading function of a single program.
If you validate the saving with the button **SY 23**, all the programs which are in the memory of the power source will be saved and the indicator corresponding to the saving will illuminate. Wait for the indicator to extinguish before removing the memo card.

If, during the transfer, a fault is detected, the operation is stopped and an error code is shown on the display of the PS 164-2. Refer to Appendix 3 and Chapter 10.5 for the error codes and corrections to be made.
The program name is stored on the memo card together with the program. However, the number under which it is stored in the PS 164-2 is not saved. You can load the program under a new number or in another power source. A label on each card allows you to write manually any information which you deem to be useful.

Fig. 5.5 - Port for memo card

5. 3. 9. 2. Loading a program from a memo card

To load a program from a memo card, the procedure is as follows:

2 possibilities :

◇ **Loading of a single program**

- Insert the memo card.
- Choose the number you wish to give to the program with the switch **BT 4** on the remote control pendant. This number cannot already be attributed to another program, but can correspond to a program that you wish to replace.
- Press the button to load a program from the memo card (symbol).

The first program stored on the memo card is indicated on the display **SY 25**.
The keys **SY 17** and **SY 19** are used to scroll up or down the programs.

- Validate the transfer by pressing . The corresponding indicator will illuminate.

Wait for the indicator to extinguish before removing the card.

If the program that is registered in the card is not compatible with the SY 30 selected range of current, it will not be loaded up and ! 75 ! error code is displayed on the display.

◇ **Loading of all the programs**

- Insert the memo card.
- Press the button to load a program from the memo card (symbol).
- Press the button " plus " (symbol [+]), the characters 0 -> 15 ? are shown on the display. The button " minus " (symbol [−]) enables to come back to the loading function of a single program.
- Validate by pressing the button . The corresponding indicator will illuminate.

Wait for the indicator to extinguish before removing the memo card.

5. 3. 9. 3. Deleting a program from the memo card

- Check that the key switch **SY 26** is in the position " Modification authorised ".
- Choose any existing program in the source memory.
- Insert the memo card.
- Press the transfer button (symbol ).
- Press the button " trash " (symbol ), the name of the first program stored on the memo card is shown on the display.

The keys **SY 17** and **SY 19** are used to scroll up and down the program you wish to delete.

- Validate the transfer by pressing  . The corresponding indicator will illuminate.

You can cancel the suppression of a programme by pressing again the button " trash ".

5. 3. 10. Printing a program

To print a program from a memo card, the procedure is as follows:

- With the switch **BT 4** on the remote control pendant, choose the number of the program to print.
- Press the print button (symbol ).
- Validate. The printing indicator is illuminated.
- After the printing is finished, this indicator will extinguish.

5. 3. 11. Functioning modes

Modifications of the values of weld parameters can be done in two different modes, one during devlopment of a weld procedure and the second in production.

◇ **Modifying the parameters before starting a program**

To select this mode, turn the key operated switch **SY 26** to the "Modification authorised" position (symbol ). The key can be removed afterwards.
In this mode you can increase (+) or decrease (-) during the weld cycle the values of the I22, V32 (for no-pulsed speed rotation), V33 (for pulsed speed rotation) or V42 parameters with the "Delta" buttons.
The modification values of the delta buttons cannot be changed by the user. It depends on the value of the parameter which is being acted upon. The table below gives the relationship between the parameter value and the correction made by each press of the delta button.
When a delta button is used, the value of the parameter concerned is displayed during 5 seconds on the front face of the PS 164-2.

Wire feeder rotation speed :

Value of parameter	Delta
≤ 99	1
100 - 199	2
200 – 299	3
300 – 399	4
400 – 499	5
500 – 599	6
600 – 699	7
700 – 799	8
800 – 899	9
900 – 999	10

Welding current :
Current range 160 A :

Value of I22 or I23	Position
≤99	1
100-160	2

Current range 50 A : Deltas I = 0,1 A

All actions on the delta buttons are taken into account (within the parameter limits) and stored in the memory of the relevant sector. After moving from one sector to another, the corrections made in the preceding one are carried through to the next. The modifications are not forgotten or lost. The number of deltas in this mode is not limited.
Modifications made during the weld cycle.
To access the production mode, the key operated switch **SY 26** has to be turned to the "Program modification not authorised" position (symbol ). The key can be removed afterwards to avoid unauthorised modifications being made to the programs.
This mode includes two differences:

- The number of deltas per parameter is limited to 10 (10 increments or 10 decrements)
- The modifications are not stored in the memory.

◇ **Fault detecting during cycle**

During every welding cycle, important parameter values are monitored periodically at different delicate points. When a fault is detected, an immediate stop or a stop with downslope is initiated depending on the seriousness of the fault. The fault is indicated by a flashing light on the remote control pendant. An error code will also appear on the display of the PS 164-2. Appendix 7.2 gives the error codes, their meaning and their consequences. We advise you to take careful notice as to which error code is shown. This can make maintenance or repair work easier and highly efficient.

5. 3. 12. Programmable parameters

For each parameter, the following table shows:

- The synoptic reference (REF.).
- The corresponding name.
- The maximum value programmable.
- The minimum value programmable.
- The increment value that will be added or taken away when the buttons " + " or " - " are pressed on the synoptic.
- The default value proposed during the creation of a new program.
- The units used.

In this column, the abbreviations stand for:

A	*Amperage.*
V	*Voltage.*
D	*Movement.*
/M	*A thousandth of the maximum value.*
s	*A second.*
ms	*A millisecond.*

	REF	DESIGNATION	MAX.	MIN.	UNIT	INCREMENT	DEFAULT VALUE
Gas	T10	Pre-gas time	320	1	s	1	5
	T11	Post-gas time	320	1	s	1	10 15*
Current	I21	Prefusion current	160 100 50*	4 4*	A	1 0,1*	90 10*
	T21	Prefusion time	30	0,1	S	0,1	3
	I22	High current	160 100 50*	4 4*	A	1 0,1	90 10*
	T22	High current time	9999	10	Ms	1	100
	I23	Low current	160 100 50*	4 4*	A	1 0,1	45 5*
	T23	Low current time	9999	10	Ms	1	100
	N20	Downslope	9999	1	D	1	365
	T25	Downslope time	60	1	S	1	5
Rotation	R30	Welding head reference	See pages 38 to 41				
	V32	Rotation speed (high)	999	50 then 0	/M	1	70
	V33	Rotation speed (base)	999	50 then 0	/M	1	50
Wire	R40	Type of wire feeder	A or B	See page 42			
	T40	Wire start	40	0	S	1	3
	V42	Wire speed (high)	999	50 (a) then 0	/M	1	200
	V43	Wire speed (base)	999	50 (a) then 0	/M	1	200
	N40	Wire stop	9999	1	D	1	360
	T41	Delay for wire retract	9,9	0	S	0,1	2

Take care : 50*, 10*, 15*, 5*,4* et 0,1* = values for 50 A range
(a) At 0, a pulsed speed can lead to a cumulated error because of the overrun at each stop. In this case, it will be necessary via programming to add a correction factor due to overrun of the pulsing frequency and the value of high speed.

5. 4. Execution of a weld program

5. 4. 1. Safety precautions

Before starting any manipulation on the equipment please refer to chapter 1 "Safety precautions".

5. 4. 2. Choosing the program to be executed

The program to be executed is selected with the switch **BT 4** on the remote control pendant. You can check the name of the program on the display of the PS 164-2. If only "POLYSOUDE PS 164-2" appears, you have selected the number of a user program place where nothing is stored in the memory of the PS 164-2. If **! 75 !** is displayed on the screen, the right range of current is not selected.

5. 4. 3. Simulation

After the correct program has been selected, you can run a simulation without affecting the workpiece to be welded. In this case, all the functions of the selected program are carried out except those concerning the arc and the coolant circuit.
The gas controls are executed but the flow rates are not considered. So it is possible to check flow adjustment or reduce gas consumption during the simulation.
The choice between a simulated or a real weld cycle is made with the switch **BT 1** on the remote control pendant.

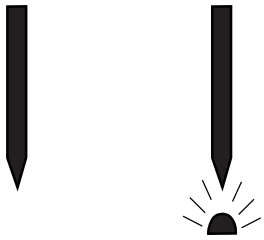


Fig. 5.6 - "Set up / weld" selector switch

5. 4. 4. Weld cycle

5. 4. 4. 1. Starting the weld cycle

The weld cycle is initiated by pressing the button **BT 5** on the remote control pendant. The indicator **BT 3** becomes illuminated when the cycle starts. If for the selected number a program does not exist in the memory of the PS 164-2, no cycle will be started and the indicator will flash. The flashing can be turned off by pressing any button on the remote control pendant.

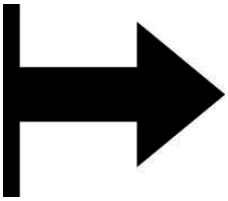


Fig. 5.7 - "Start cycle" button

5. 4. 4. 2. Modification of a weld cycle

Parameter values can be modified during the weld cycle with the remote control pendant. The values of the modifiable parameters in each sector are:

- The current or maximum current in the case of pulsed current (**I22**).
- The rotation speed (**V32**) or low rotation speed in case of pulsed rotation (**V33**).
- The wire speed or the high wire speed in the case of pulsed wire (**V42**).

Fig. 5.8 - "Delta" buttons for modifications of parameter values

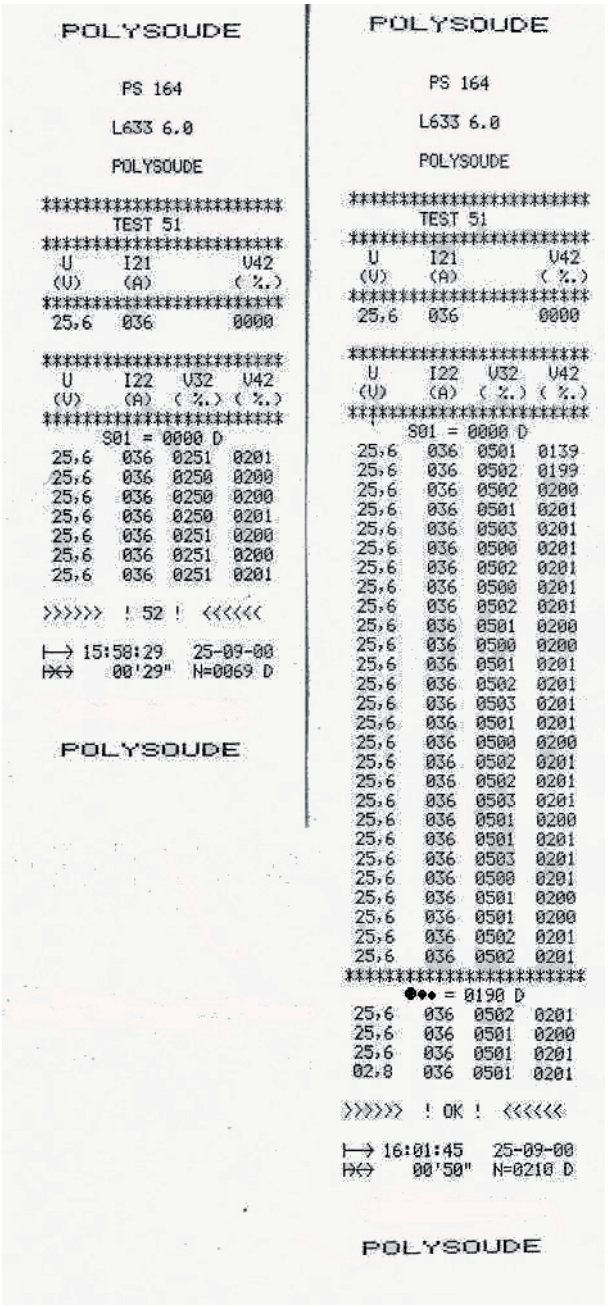


Fig. 5.9 - Example of a weld cycle report with manual downslope, denoted by error code >>>> ! 52 ! <<<

Fig. 5.10 - Example of a weld cycle report with a normal cycle end, denoted by >>>> ! OK ! <<<<

5. 4. 5. End of welding cycle

5. 4. 5. 1. Normal end of welding cycle

In the case of a normal end of the welding cycle, the indicator on the remote control pendant extinguishes. The power source is now ready to start a new cycle.

N.B.: welding head that is fitted out with an "open head" position sensor will be automatically positioned in this way at the regular end of a cycle.

5. 4. 5. 2. Weld cycle report

At the end of every weld, you can print a weld cycle report indicating periodically the real values of the main weld parameters. This listing is provided automatically if preprogrammed. After a weld cycle in simulation mode, no weld report can be given.
The weld cycle report consists of:

- The name of your company.
- The program name.
- Values of periodically taken measurements of the voltage, amperage, rotation speed and wire speed during the cycle.
- Reason for stop ("OK" for a normal cycle end, if not, error code).
- Time of cycle start.
- Date of weld.
- Length of cycle.
- Tungsten location.

5. 4. 5. 3. Reprint of a weld cycle report

If the printout of a weld cycle report fails, for example because of a lack of paper, it is possible to restart it by pushing the switch **SY 29** situated at the right of the printer upwards.

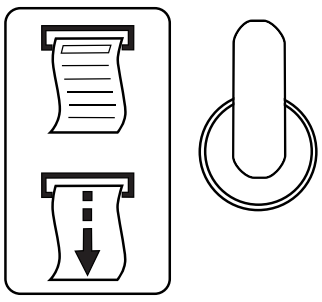


Fig. 5.11 - Printer switch

5. 4. 6. Manual weld cycle stop

5. 4. 6. 1. Manual weld cycle stop with downslope

The manual downslope button **BT 6** on the remote control pendant starts the programmed downslope sequence. This function provides the workpiece as much as possible from being damaged. The indicator will flash because this is not a regular cycle end.

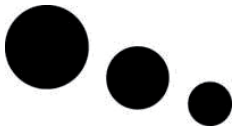


Fig. 5.12 - Manual downslope button

5. 4. 6. 2. Immediate cycle stop

When the stop button **BT 7** of the remote control pendant is pressed, the arc and all movements are stopped immediately. The shielding gas is maintained during the programmed post gas period **T25**. The indicator will flash because this is not a regular cycle end.

Fig. 5.13 - Immediate manual stop button

5. 4. 6. 3. Emergency stop

The remote control pendant is fitted with an emergency button **BT 2**. By pressing this button, the PS 164-2 is immediately disconnected from the mains power supply. The weld, the movements and the gas flow are stopped suddenly.

This function may cause serious damages to the workpiece and equipment. Polysoude advises you, if possible, to choose a stop with the downslope button or with the immediate stop button.

Fig. 5.14 - Emergency stop button

5. 4. 6. 4. Using a manual welding torch

You should introduce a short program with both a high and a low current when welding with a manual torch as described in paragraph 4.3.6.

The arc is struck by pressing the manual command button. The weld current value is equal to the programmed ignition current. If you release this button, the high current value **I22** is applied. If you press this button again, the low current **I23** will be used. The next release restarts the high current and so on. The cycle stop is made either by pressing on the downslope button, or for an immediate cycle stop, by pressing on both ends of the manual command button.

5. 5. Iternating use of at two welding stations on the same workpiece

In the case of alternating use of at least two welding stations on the same workpiece, make sure the welding head motor covers do not come into contact with the workpiece potential.
These parts of the head are connected to metal earth by the shielding of the auxiliary cables.
Neglecting to connect the earthing cable (+) on certain manual stations can lead to destruction of the welding head motor control cable.

6. Servicing, maintenance and troubleshooting

Polysoude recommends regular maintenance and calibration (once a year minimum) of the power source, either by a Polysoude technician or by a technician approved by Polysoude. During the guarantee period the Polysoude contractual guarantee shall not apply if the equipment has not received maintenance and calibration at least once a year, either by a Polysoude technician or by a technician approved by Polysoude

6. 1. Adjustments

◇ General

The expression calibration is defined by regulating standards and is used when the power source has to meet special requirements, for example Quality Assurance or ISO 9000 quality system. Calibration needs specific testing equipment and procedures: we can perform it on special request, in your company or in our workshop.
Following informations concern routine adjustment that you can perform, outside these cases, as frequently as you think it advisable, for example as it is said further.

◇ Exchange of cards or the inverter unit

The 21700633 sequencer card and the 21700634 synoptic card are pre-adjusted in the factory. In case of a standard exchange of these cards, no further adjustments are necessary. However, further adjustments are necessary in case of replacement of the 2021700750 card or the source.

◇ How to adjust?

Before carrying out a regulation check, leave the power source switched on for approximately 15 minutes. This will allow the power source to reach its normal working temperature. If this is not done, the adjustments that you make will be altered because of the rise in temperature during a normal cycle. To access the cards, remove the front panel of the power source. It will also be necessary to bypass the short circuit security of the inverter unit. To do this, put the switch S3/2 of the 21700633 card and the switch S1/4 of the 21700634 synoptic card to the CLOSED position.

After the adjustments have been made put the switches to the "OPEN" position, otherwise the short circuit security system of the power source will not work properly.

6. 2. Coolant

Please make sure that the coolant level in the reservoir of the power source is always maintained. We advise you to change the coolant once a year. Pump out the used liquid by connecting a hose to the coolant outlet (symbol) and press the button BT 15 (symbol)on the remote control pendant. Pure, clean water should be used for rinsing the cooling circuit. The refilling of the coolant reservoir (about 2 l) is made by the top of the power source.
NOTE : Only use coolant recommended by Polysoude. The use of any other coolant will void any warranty commitment.

Fig. 6.1 - Coolant inlet

6. 3. Printer

6. 3. 1. Loading paper to the printer

The paper has to be loaded with the power source turned on. To change the paper roll, you have to open the cover (unscrew the 2 screws). Take out the empty roll and insert the end of the new paper roll into the printer. The paper advances by pushing the printer switch SY 29 downwards. Insert the paper into the slot of the cover before closing it.

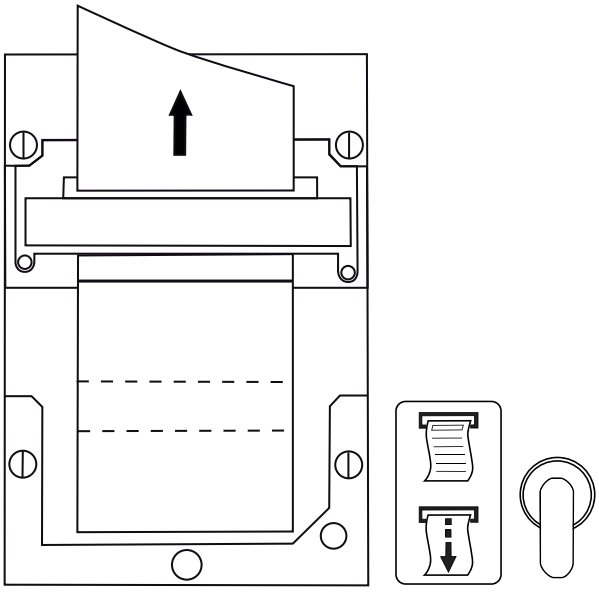


Fig. 6.2 - Change of paper roll

6. 3. 2. Change of ribbon

To change the ribbon in the printer, you have to open the cover (unscrew the 2 screws). The ribbon is situated below the printer block. Press on "PUSH" to take it out. To insert a new ribbon, push it slightly to the top when inserting it. Insert the paper into the slot of the cover before closing it.

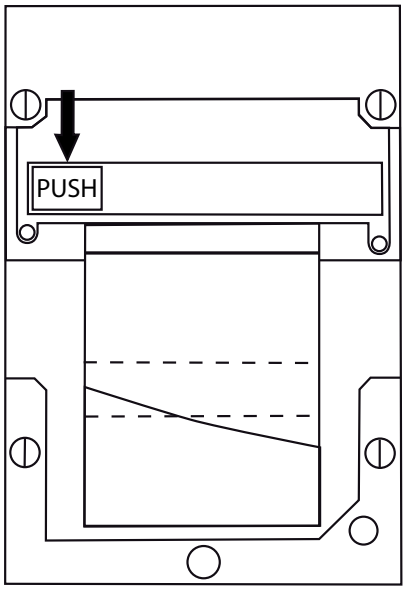


Fig. 6.3 - Change of ribbon cartridge

6. 4. Replacing fuses

A fuse blowing out indicates in most cases a problem somewhere in the electrical installation. You must resolve the problem before replacing the fuse. Be careful when switching on the machine after you change a fuse.

The fuses are situated in two areas:
- On the DC power supply +5 V(*).
- On the fuse rack.

(*) Depending on card models, fuse could be welded on. Please contact the After Sales Department to have more information about it.

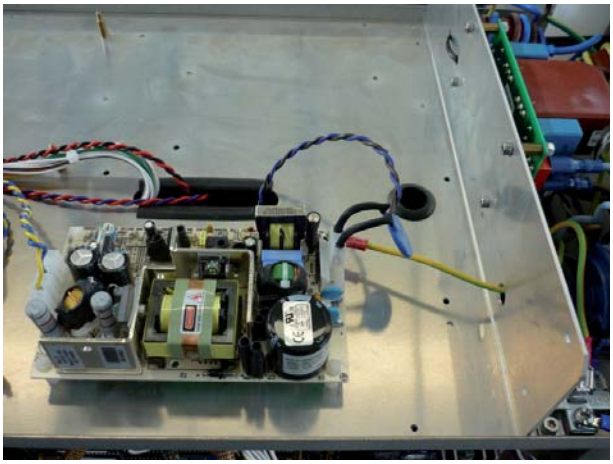


Fig. 6.4 - Location of the fuse on the DC power supply +5 V

Fig. 6.5 - Fuse bank

6. 5. Filter of the cooling circuit

A filter in built in the cooling circuit. We recommend to check the cleanliness of the filter every 6 months.

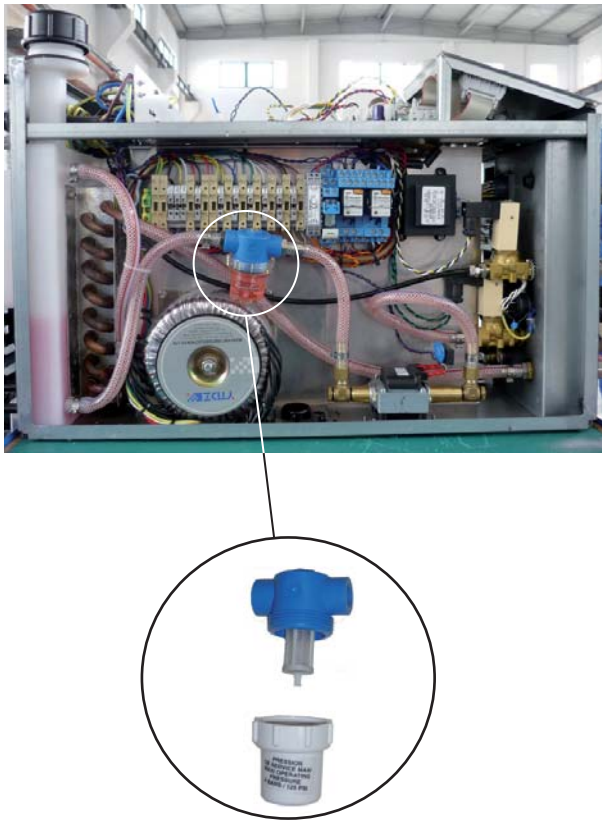


Fig. 6.6 - Location of the filter of the cooling circuit

Put a container under the filter. Unscrew the tank to have access to the filter.

6. 5. 1. Trouble shooting

6. 5. 1. 1. Noted defect when operating

Observed defect	Possible causes	What to do
The power source cannot be turned on	• F2 or F3 fuse defect • Mains connection cable or plug defect • Remote control pendant BP 1436 defect (emergency stop clamped) • K1 relay defect or disconnected from its place • On/off switch defect • Wrong mains voltage selections • + 5 V power card defect • Synoptic card 21700634 defect	• Change (chap. 6.2.1) • Change • Check and correct or change • Check and correct or change • Check and replace • Correct and check fuses • Replace • Replace
The circuit breaker (outside the power source) releases when switching on	• Unsuitable circuit breaker	• Use a 20 A circuit breaker with D graph
The welding cycle or an axis (rotation, wire, gas or cooling) is self starting	• Power source is not grounded • Remote control pendant defect • Screening of remote pendant cable deteriored • Synoptic card 21700634 defect	• Correct • Check and repair or change • Change the cable • Replace
Some push buttons of the remote pendant are inoperative	• Remote control pendant defect • Synoptic card 21700634 defect	• Check and repair or change • Replace
The screened programme number is not similar to the selected one on the remote pendant	• Remote control pendant defect • Synoptic card 21700634 defect	• Check and repair or change • Replace
Some programmes are deleted from the power source memory	• Wrong operating (deleting of the programmes with SY 24 button) • The 21700633 card has been changed • RAM memory of 21700633 card defect	• Reintroduce the programmes • Load again the programmes • Replace the memory
Value of some parameters of the card is changed	• Memory card defect	• Record a new memory card
Value of parameters cannot be changed ("+" and "-" push buttons are inoperative)	• SY26 switch key is in position "Modification non authorised"	• Change the position
Some push buttons of the programming panel are inoperative	• Programming synoptic defect • Synoptic card 21700634 defect	• Call After Sales Service • Replace
No display	• +5 V power defect • Ram memory of 21700633 card defect • FU1 and FU2 defect	• Check its fuse and change • Replace the memory of the card.
It is impossible to start a weld cycle (the indicator of the control panel is flashing)	• There is no program with the number you have chosen on the power source	• Check the program number (§ 5.4.2)

Observed defect	Possible causes	What to do
No cycle start with a manual torch	• The plug of the torch is badly connected or laid • 21700633 defect	• Check and correct • Replace
Display is vanishing when arc is setting up	• +5 V power card defect	• Replace
Gas flow too low	• Gas pipe is blocked in the welding head • Gas safety defect • Gas electric valve defect	• Check, clean • Have a skilled electrician to check and replace, if necessary
No rotation of the welding head or the wire feed unit, without any error display	• Pin broken on the head or the wire feed.	• Change the pin (read the manual of the welding head or the wire feed unit)

6. 5. 1. 2. Display of an error code

Error code	Possible causes	What to do
10	- Gas cylinder empty or gas valve is closed - The quick coupling of the welding head is not correctly connected - Electric valve defect Check, change or open	- Check - Have a skilled electrician to check and replace, if necessary
11	- Level of coolant liquid too low - Cooling circuit dirty - Coolant liquid circuit shunt not connected when using an air-cooled head - The quick couplings of the welding head are not properly connected - Fuse defect - Pump defect - Silicon hose defect (MU welding head)	- Check and fill up - Check, empty and clean the circuit and the filter, fill up with new cooling liquid - Check and correct the connections (§ 4.3.3) - Check and correct - Check and change (§ 6.2.1) - Have a skilled electrician to check and replace, if necessary - Replace
22	- Bad mains voltage - Current cable improperly connected or damaged - Ground connection placed on an improper place - Electrode dirty or wrong distance electrode work piece - Silicon hose defect (MU welding head) - Ignition device not set up or incorrectly placed (MU, TP, TS…welding heads) - Unsuitable gas, gas output non adapted - Power source out of order - Power source defect (DC3.9 card)	- Check and correct - Check or change - Have the ground connection on a right place (§ 2.3.2 or 2.3.6) - See Operating manual of the welding head for electrode settings - Replace - Change the position - Try with argon gas - Call After Sales Service - Call After Sales Service
23	- Tip of the electrode deteriorated or incorrectly grounded - Unsuitable distance electrode/work piece - Inefficient gas protection - Programmed welding current too low - Ignition device placed too near from the torch (MU, TP, TS … welding heads)	- See Operating manual of the welding head for electrode settings - Correct - Check the flow, the gas lens, clean, correct - Correct - Move
24	- Electrode is in contact to the work piece - Electrode is in contact to the filler wire - Ignition device is in contact to the torch (MU, TP, TS … welding heads) - Bad insulation between wire guide support and torch - Synoptic card 21700633 defect - Power source defect	- Correct - Change the position of the wire inlet move - Move - Check and correct - Replace - Call After Sales Service
27	- Poor air circulation - Maximum power of the source exceeded - Fan defect	- Respect minimum distance of openings to other objects (§ 2.2.2), allow power source to cool down - Modify conditions of use - Have a skilled electrician to check and replace, if necessary

Error code	Possible causes	What to do
29	- Mains voltage too low - Bad coupling to the mains - Silicon hose defect (MU welding head) - Wrong position of S3/1 switch of 21700633 card - Power source out of order - Power source defect	- Correct or change the connection - Change (§ 4.2.3) - Replace - Place in "CLOSED" position - Call After Sales Service - Call After Sales Service
30	- R30 parameter value unsuitable to used welding head	- Correct
30 or 40	- Problem due to friction or blocked gears in the welding head or the wire feeder	- Clean the mechanisms - Check there is no hindrance against right operating of welding head or wire feed unit
31 or 41	- Problem due to friction or blocked gears in the welding head or the wire feeder - FU4 fuse defect - 21700633 card defect	- Clean the mechanisms - Check there is no hindrance against right operating of welding head or wire feed unit - Change - Replace
32 or 42	- The pulse emitter of the welding head or the wire feeder is damaged - Connecting cable to the power source is damaged - FU7 fuse defect - 21700633 sequencer card defect	- Replace - Have a skilled electronician to replace - Replace - Replace
51	- Power source is not grounded - Remote control pendant defect - Synoptic card 21700634 defect - Screening of remote pendant cable deteriorated	- Correct - Check and repair or change - Replace - Change the cable
52	- Remote control pendant defect - 21700633 or 21700634 card defect	- Replace - Replace
53	- Temporary break down of the mains - 21700633 card defect	- Check and start again - Replace
54	A) MW or H closed welding heads - The welding head is not in open position - Switch for open position checking is out of order or defect B) Other welding heads - D and E terminals of the plug of rotation cable are not connected together C) Any welding head - 21700633 card defect	 - Modify the start position of the welding head - Check and correct or change - Correct - Replace
56	- Memory card is inside out introduced in the port SY27 - Flat cable between 21700633 and 21700634 cards defect or badly connected - 21700633 or 21700634 defect - Wrong position of S1/1 switch of 21700634 card	- Insert the card in the right position - Correct or change - Replace - Check and call the After Sales Service
60	- Printer defect - 21700634 card defect	- Replace - Replace

Error code	Possible causes	What to do
62	- Power source was switched off after the last weld - The selected program (XX) is not the same as the one (YY) that was used to do the last weld	- Do a weld again - Select the (YY) program and print again a ticket with SY 29 switch
70	- No memory card in the SY 27 port - Memory card is incorrectly introduced in the port	- Introduce a memory card - Put out the card and introduce
71	- Memory card was put out too early when program was saving.	- Start saving operation again
72	- 21700633 card was changed	- Have all programs (from 0 to 15) to run with BT 4 coder switch on the control pendant
73	- No recorded program on the memory card - Memory card is reverse introduced in the SY27 port	- Introduce a recorded memory card - Put out the card and introduce it again rightly
74	- Withdraw of memory card before reading message or print error	
75* *When reading a memory card	- SY 30 key switch (50 A / 160 A) is not in the same position as in creating the program - Recorded program on the memory card is not suitable with PS 164-2 power source - Wrong position of S3/1 switch of 21700633 card - Wrong position of S3/4 switch of 21700633 card	- Turn the switch and introduce the program again - Use a suitable program - Place in "CLOSED" position - Check
77	- Memo card full	- Delete a program or use an empty card

6. 5. 2. Spare parts

Designation	Position	Reference
Relay 48 V_{AC}	1	00544027
Relay 12 V_{DC} (emergency stop)	2	9000544034
Rectifier	3	00320042
Coolant filter	4	00699017
Water filtering element	5	00699016
Toric transformer	6	2040410145
Memory circuit interface	7	21700680
Gas safety valve	8	00629085
Water safety valve	9	00629084
Water pump 230V/50Hz Water pump 230V/60Hz	10	00629073 00629074

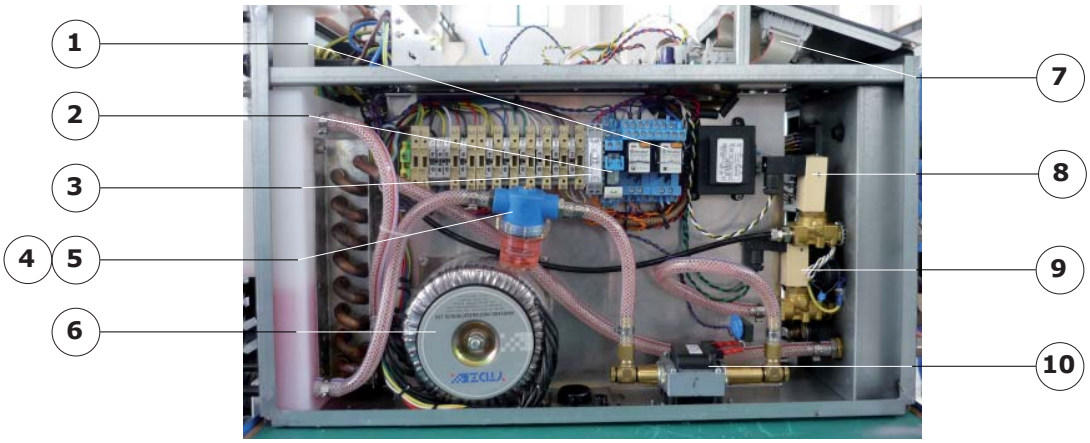


Fig. 6.12 - View left side

Designation	Position	Reference
Source interface card	12	2021700750
Sequencer card	13	21700633

Fig. 6.13 - View right side

Designation	Position	Reference
Gas solenoid valve	14	75301335
Single mains filter 16A/230V	15	00629098
Power supply card+5V	16	00629076
Synoptic card	17	21700634
Display	18	00503026
Key switch	19	00545112
Synoptic	20	2017005299
White cover	-	2017005240
Front cover blue	-	2017005280
Rear cover blue	-	2017005290

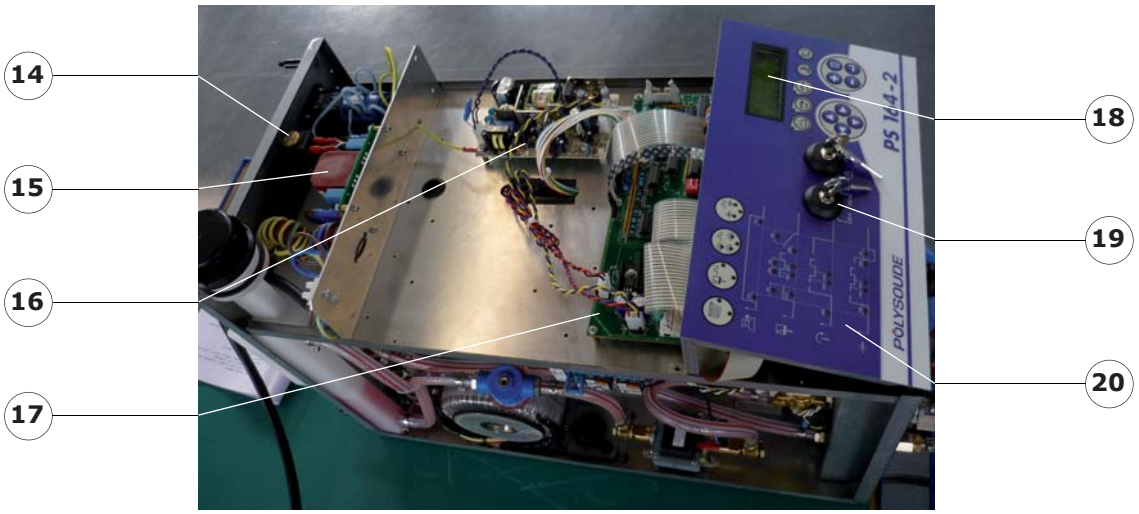


Fig. 6.14 - Topview

Designation	Position	Reference
Power switch	21	00545111
Fan 230V/50-60Hz	22	00629091
Mains power outlet connection cable	23	00629120

Fig. 6.15 - Rearview

Designation	Position	Reference
Ribbon for printer	24	00590064
Printer	25	00629078
Paper for printer	26	00590066

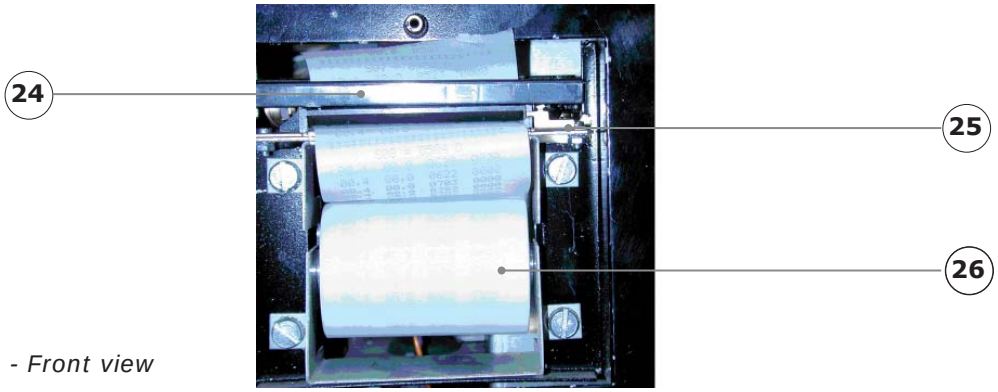


Fig. 6.16 - Front view

Designation	Position	Reference
Remote control pendant		14360000
Remote control pendant plug	27	00563085
Complete cable of the remote control pendant (with plug)	28	14369999
Toggle switch for pendant	29	00542000
Grey remote control pendant button	30	00549067
Red remote control pendant button	31	00549065
Black remote control pendant button	32	00549066
Emergency stop button	33	00542070
Red cover for emergency stop button	34	00542071
Coding wheel	35	00543016
Interconnection card	36	21700627
Rubber housing for remote control pendant	37	17375299

Fig. 6.17 - Remote control

Designation	Reference
Memory card (16 programs)	00629119
Source 160 A	2017640200
Ground cable	64599801
Flowmeter Argon France	75501002
Flowmeter Argon Export	71701418
Flowmeter Argon/Hydrogen	71701421
Cooling liquid	75110071
Fuses	17000004

6. 5. 3. Circuit description

◇ Remark

The following information refers to the wiring scheme of the PS 164-2 (Ref. 1700XXXX) and the remote control pendant (Ref. 1436XXXX) as well as to the sequencer card (Ref. 21700633), the synoptic card (Ref. 21700634), the source interface card 2021700750 and the memory circuit interface card (Ref. 21700680).
The signals are described by an abbreviated name corresponding to their function. It is useful to recognise that a signal preceded by a bar "/"signifies that it is active at the low level (0 V).
The numbers inscribed at the bottom right of the synoptic blocks relate to the folio numbers of the corresponding dossiers. For example, the number 08 in the block "Gas control" of the sequencer card corresponds to folio 08 of dossier number 21700633.

◇ General presentation and wiring diagram

The functioning of the PS 164-2 is principally controlled by 2 cards: the 21700633 sequencer card and the 21700634 synoptic card. These two cards are linked together by a data bus I²C. This connection is built up via the memory circuit interface card 21700680.
The sequencer card ensures the correct follow up of weld cycles by the power source. It is linked to the power supply, the rotation motor, the wire feed motor, and watches for the correct functioning of the gas valves and the cooling circuit. The microchip is also found on this card.
The synoptic card, controlled by the sequencer card, controls the peripheral units (keyboard, indicators and display screen), the memo card, the remote control pendant and the printer.

◇ The power switch

The power switch consists of a self holding switch K2. When the power is turned on, the K2 switch is activated. It then remains in this state until the power is turned off (K1 is activated). K1 is directly linked to the emergency stop button via the synoptic card (folio 21700634). The loss of voltage or the pressing of the emergency stop button activates K1, which immediately cuts off the power supply. To restart the weld cycle you must turn on the machine again with the power switch. This system has been designed for safety reasons.

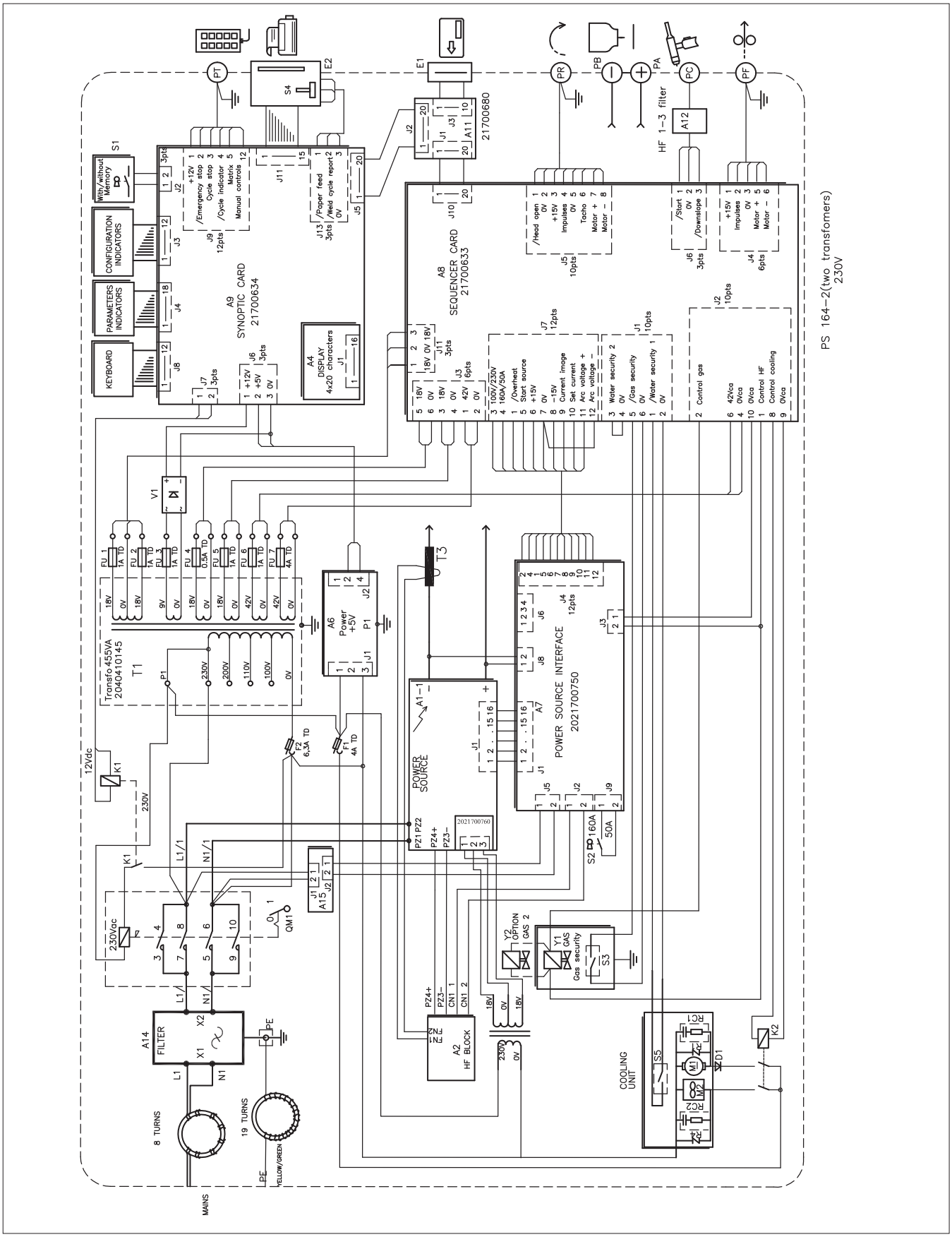


Fig. 6.18 - Wiring diagram of PS 164-2 power sources with serial number from 08P89015 to 08P89026

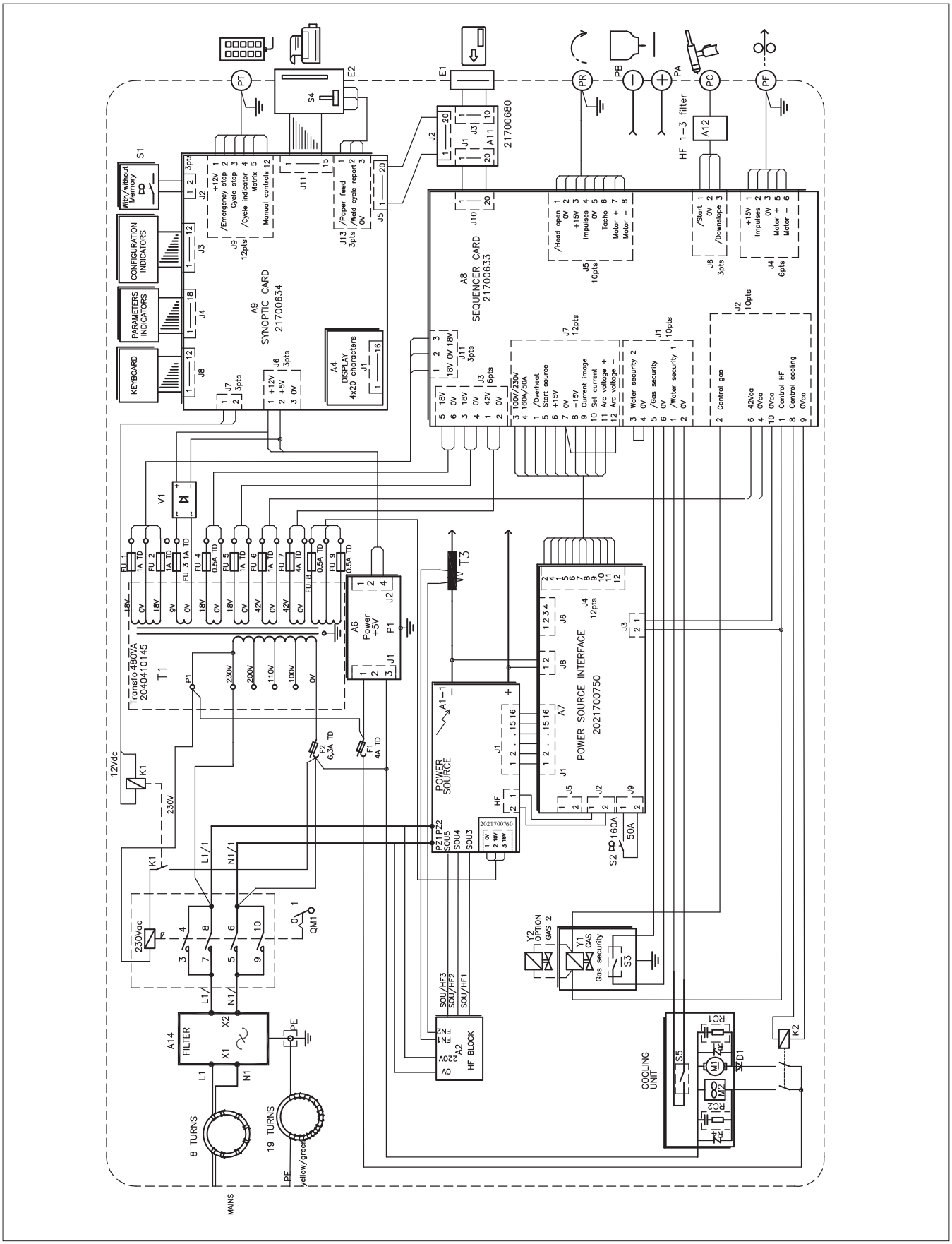


Fig. 6.19 - Wiring diagram of PS 164-2 power sources with serial number from 08P89027

◇ The sequencer card (21700633)

The sequencer card includes several block functions:

- Central program unit (CPU) composed principally of the microchip and the memory.
- Power source control.
- Rotation motor control, based on the principle of PWM (Pulse Width Modulation).
- Wire motor control, identical to the control of the rotation motor.
- Shielding gas control.
- Coolant control.
- Interface with the manual torch
- Interface with the I²C bus for the external links and especially with the synoptic card.
- Power supplies.

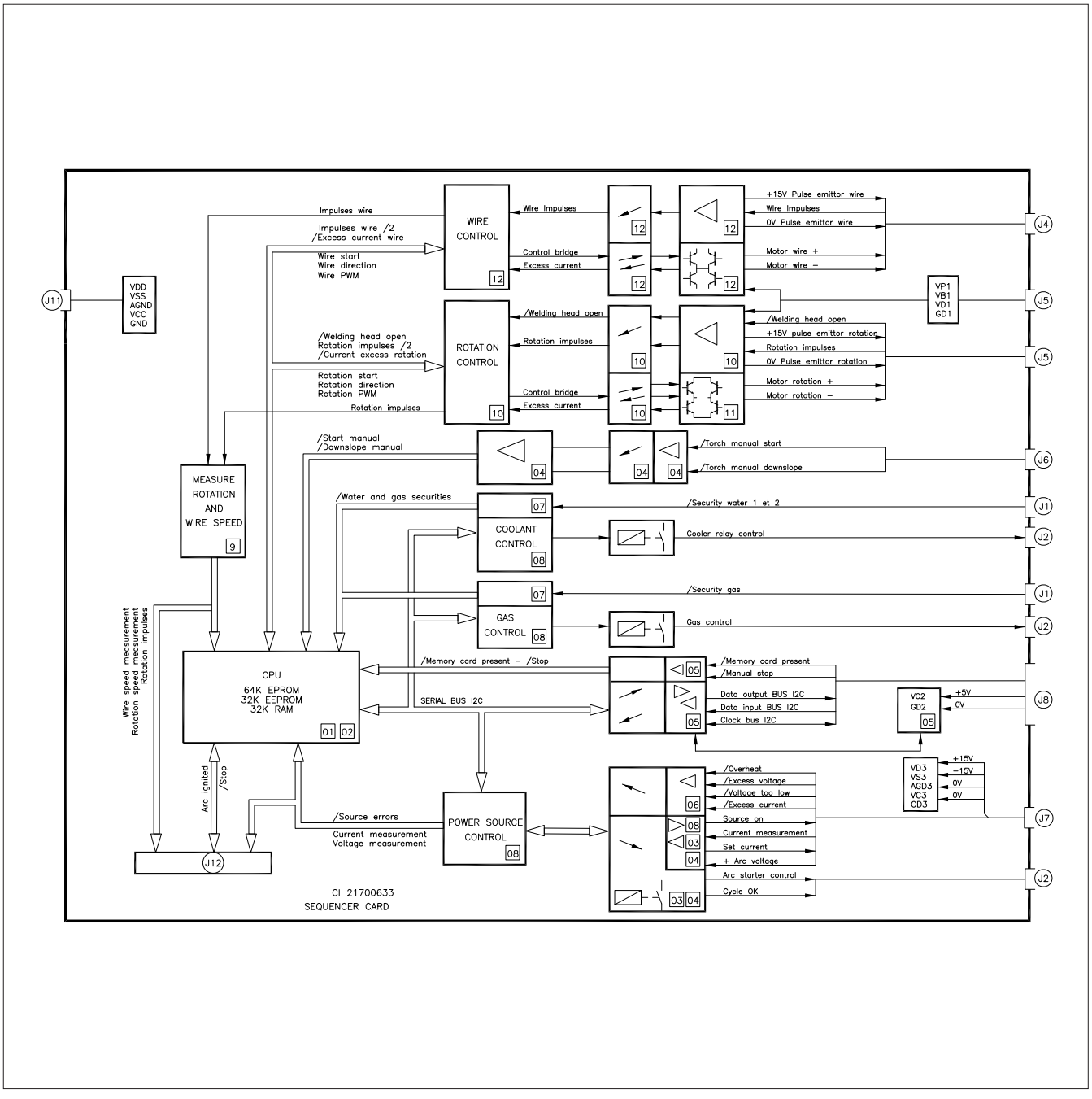


Fig. 6.20 - Sequencer card

◇ The synoptic card (21700634)

The synoptic card interfaces with the following peripheral units:

- Remote control pendant.
- Programming keyboard.
- Synoptic on the front panel.
- Display on the front panel.
- Printer.
- Memo card.

It is controlled by the sequencer card via an I²C link.
The interface with the remote control pendant is made by constantly checking the state of the buttons with a line and column system. By successively activating the different lines and testing the columns it is determined which buttons or switches have been activated.
The stop command **BT 7** is linked directly to the sequencer card, without passing via the I²C bus. The emergency stop button **BT 2** on the remote control pendant is linked also to the power on/off switch. This ensures the safety of the users in the case of a cycle stop or an emergency stop.
The programming keyboard is based on the same principle. Only the key switch "Modification authorised or not" has a direct link.
The interface with the synoptic indicators is made by multiplexing. The indicators are not permanently supplied with power, but instead by a signal (multiplexing supply) which has a frequency of several hundred Hertz.
The contrast and brightness of the screen is controlled by the synoptic card. The procedure for their adjustment is given in paragraph 6.1.1.
The memo cards used with the PS 164-2 are compatible with the databus I²C. The presence of a signal "Memo card engaged", resulting from a contact in the connector, authorises all other connections, including the 5 V power supply. The card is thus protected from overloads during its insertion and its removal.

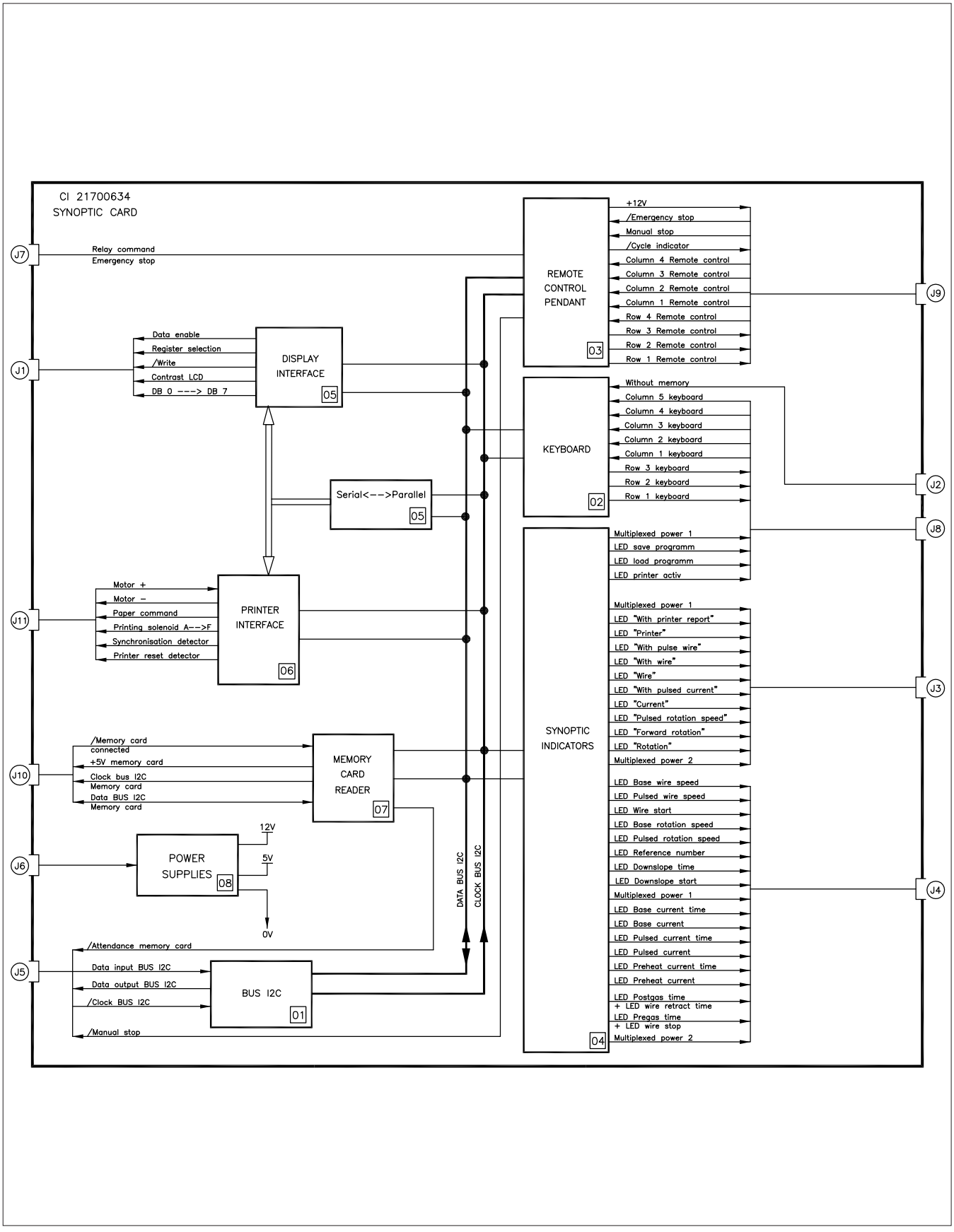


Fig. 6.21 - Synoptic card

◇ The source

The power command, generated by the sequencer card, is an analogical signal 0 to 10 V. At 10 V, it corresponds to 160 A, and at 0 V it corresponds to the minimum current of the source, 4 A, for the 160 A range; at 10 V it corresponds 50 A, and at 0 V it corresponds 4 A, for the 50 A range.
A logic order active at high level (15 V) controls the running of the source.
The source sends a signal indicating that it is overheated. The signal is released by the sequencer card to stop the weld cycle and display the code of the detected fault (27).
The high frequency power source is controlled by a signal emitted from the sequencer card. A relay contact ensures that this action occurs. The other pole of contact is linked to an alternative voltage of 42 V.

◇ The remote control pendant

The buttons on the control pendant are controlled by the synoptic card (21700634). Most of the buttons are tested by the line and column method: A high level signal is placed on a line and the columns are tested. If a column is at a high level, this shows that the button associated with this line and column has been pressed. The next line is tested afterwards, and so on. Only the two safety buttons are directly linked.
The In cycle indicator is a light emitting diode LED.

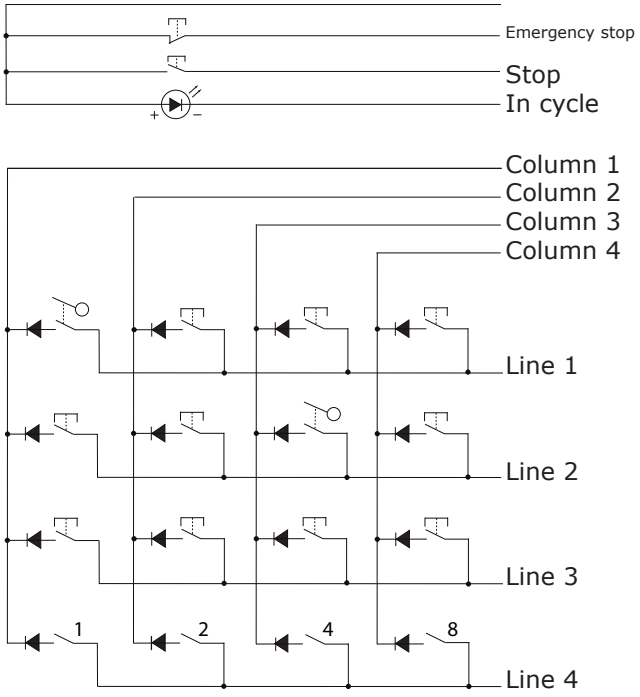


Fig. 6.22 - Remote control pendant logic

LINE	COLUMN	BUTTON
1	1	BT 1
1	2	BT 16
1	3	BT 11
1	4	BT 14
2	1	BT 5
2	2	BT 15
2	3	BT 12
2	4	BT 9
3	1	BT 6
3	2	BT 10
3	3	BT 13
3	4	BT 8
4	1	BT 4 (1)
4	2	BT 4 (2)
4	3	BT 4 (4)
4	4	BT 4 (8)

NOTES

7. Appendix

7. 1. Built-in programs

The Polysoude weld lab developed these programs for mild steel and stainless steel tubes. Starting from frequent applications they represent the base to work out rapidly your own weld programs. Please look for a program close to your application in order to modify it. Before you can use such a built-in program you have to copy it in one of the 16 user program places in the memory of the power source (for detailed information, see Programming Manual). Afterwards you can modify the program to fit your special application.
All built-in programs are created to use Argon as shielding gas. The programs are listed in function of the welding head (closed chamber, MU III, or TS/TP), the material (mild steel or stainless steel), the diameter and the wall thickness of the tubes to be welded. In case of tube to tube-plate welds, a difference is made between "flush" and "protruding" tubes.

Warning - If multipass welding is necessary, the parameter values for the passes are given in the tables without repeating diameter and thickness of the tubes.

If filler wire is used, its diameter is always 0.8 mm. The set-up of some parameters not programmable influence considerably its result. The value of these parameters, choosen when each program has been created, are given in the following tables. These parameters are :

1:	Tube end preparation.
2:	Electrode diameter.
3:	Tip angle.
4:	Flat.
5:	Distance electrode-workpiece.
6:	Diameter of filler wire.
7:	Angle between wire and workpiece.
8:	Start position of the weld.
9:	Start position of the weld.
10:	Weld preparation angle.
11:	Thickness of land.
12:	Length of the land (for J preparation).

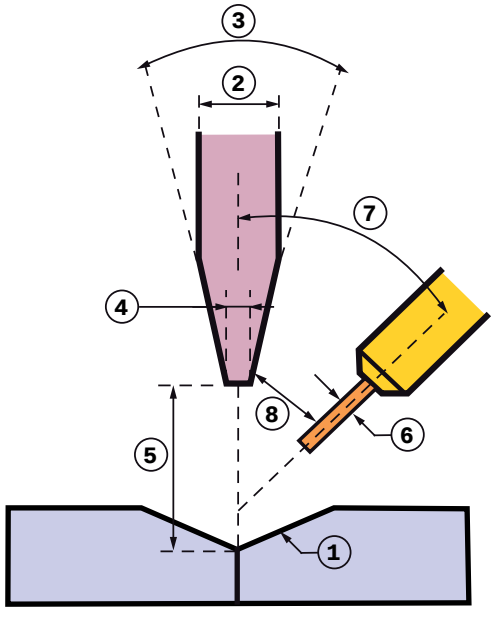
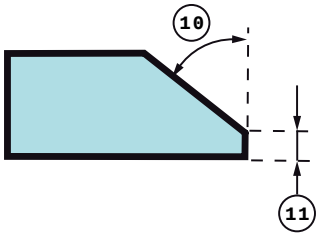
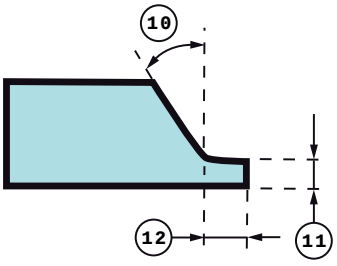


Fig. 7.1 - Parameters not programmable



Preparation for V-butt weld



Preparation for J-butt weld

Fig. 7.2 - Weld preparation

7. 1. 1. Closedchamberweldingheadsor MUheadswithout filler wire

To use these programs for enclosed welding heads, a square-butt preparation is necessary.
The programs which are valid for MU III welding heads are indicated by a star in the appropriate column.

Tubes to be welded			Parameters not programmable						Range		Linear speed
Material	Ø OD	Wall thickness	Ø electrode	Tip angle	Nose	Distance electrode/ workpiece	Number of built-in program	Also valid for MU III welding heads	50 A	160 A	
	mm	mm	mm	degree	mm	mm			230 V		mm/min
Stainless	5	1	1.6	20	0.2	0.8	1		X	X	100
Stainless	6	0.6	1.6	20	0.1	0.8	2		X	X	97
Stainless	6.35	0.9	1.6	20	0.2	0.8	3	*	X	X	120
Stainless	8	1	1	20	01	0.8	4	*	X	X	95
Stainless	9.52	1.65	1.6	15	0.1	0.8	5			X	100
Stainless	10	1.55	1.6	20	0.1	1	6	*	X	X	100
Stainless	10.5	0.4	1.6	20	0.1	0.8	7	*	X	X	115
Stainless	11	0.2	1.6	15	/	0.35	8		X	X	243
Stainless	12	1	1.6	20	0.1	0.8	9	*	X	X	100
Stainless	12.7	0.8	1.6	20	0.1	0.8	10	*	X	X	120
Stainless	15.8	0.2	1.6	15	/	0.4	11		X	X	200
Stainless	16	0.8	1.6	20	0.1	0.8	12		X	X	160
Stainless	16	2.25	2.4	20	0.2	0.8	13	*		X	100
Stainless	17.2	2.3	2.4	30	0.2	0.8	14	*		X	100
Stainless	22	1.25	2.4	30	0.2	1	15	*		X	100
Stainless	25	1	2.4	30	0.2	1	16	*		X	90
Stainless	25	1.2	2.4	30	0.2	1	17	*		X	90
Stainless	25	2.5	2.4	30	0.2	1.2	18	*		X	80
Stainless	26.9	3.6	2.4	30	0.2	1.2	19	*		X	0/110
Stainless	38	1.2	2.4	30	0.2	1	20	*		X	90
Stainless	40.5	0.4	2.4	20	0.1	0.6	21	*	X	X	115
Stainless	48.7	2	2.4	30	0.2	1.2	22	*		X	75
Stainless	51	1.2	2.4	30	0.2	1	23	*		X	90
Stainless	51	1.8	2.4	30	0.2	1.2	24	*		X	90
Stainless	63.5	0.7	2.4	20	0.2	0.9	25	*	X	X	120
Stainless	63.5	1.5	2.4	30	0.2	1.2	26	*		X	90
Stainless	88.9	1.6	2.4	30	0.2	1.2	27	*		X	90
Stainless	88.9	2	2.4	30	0.2	1.4	28	*		X	75
Stainless	88.9	3	2.4	30	0.2	1.6	29	*		X	0/110
Stainless	114.3	3	2.4	30	0.2	1.6	30	*		X	0/110

7. 1. 2. MU open welding heads with filler wire

Warning - For some welds the distance electrode-workpiece has to be modified at the end of the cycle .These programs are marked with a star in the column named "Adjust at the end of cycle"

Tubes to be welded			Set-up before welding											Range		Linear speed
Material	Ø OD	Wall thickness	Preparation	Ø Electrode	Tip angle	Nose	Distance electrode/workpiece	Wire angle	Distance electrode/wire	Start position	Layer number	Built-in program number	Adjust at the end of cycle	50 A	160 A	
	mm	mm		mm	degrees	mm	mm	degrees	mm					230 V		mm/min
Stainless	33.7	3.2	V 37.5° 0.4 mm nose	2.4	40	0.3	2.5	25	3	12 H		41	*		X	70
Stainless	51	1.8	Square-butt	2.4	40	0.3	2.5	20	3	12 H		43			X	70
Stainless	51	3	V 37.5° 0.2 mm nose	2.4	40	0.3	2.5	25	3	10H30		44	*		X	65
Stainless	60.3	2.5	Square-butt	2.4	40	0.3	2	20	2.5	10H30		46	*		X	55
Stainless	60.3	4	J 30° 0.9 mm nose 1.5 mm land	2.4	40	0.3	2	25	3	10H30		47	*		X	50
				2.4	40	0.3	3	20	3.5	12 H	2	48			X	42
Stainless	114.3	2.5	Square-butt	2.4	40	0.3	2.5	20	3	12 H		51	*		X	72
Stainless	114.3	3	Square-butt	2.4	30	0.3	2	25	2.5	10H30		52	*		X	70
Stainless	168	4									1	53				
											2	54				
Mild steel	25	3.2	V 37.5° 0.2 mm nose	2.4	40	0.2	2	25	2	10H30		56	*		X	42
Mild steel	38	3	V 37.5° 0.2 mm nose	2.4	40	0.2	2	20	2.5	10H30	1	57	*			60
				2.4	40	0.2	2.5	20	3	12 H	2	58				60
Mild steel	51	3	V 37.5° 0.2 mm nose	2.4	40	0.2	2	15	2.5	10H30		59	*			25
Mild steel	51	4	J 30° 1.4 mm nose 1.5mm land	2.4	40	0.2	2	30	2	10H30	1	61	*			50
				2.4	40	0.2	2.5	20	3	12 H	2	62				60
Mild steel	60.3	3	V 37.5° 0.2 mm nose	2.4	40	0.2	1.5	25	2.5	10H30	1	63	*			62
				2.4	40	0.2	2.5	20	3	12 H	2	64				62
Mild steel	88.9	4	J 30° 1 mm nose 1.5 mm land	2.4	40	0.4	2	35	1.5	10H30	1	65				50
				2.4	40	0.2	2	10	2.5	12H	2	66				60
Mild steel	114.3	3.9	V 37.5° 0.2 mm nose	2.4	40	0.2	1.5	25	2	10H30	1	67	*			50
				2.4	40	0.2	3	10	3.5	12 H	2	68				75

7. 1. 3. TS/TP welding heads for welding of tubes to tubesheet

Tube to tubesheet welds may have two geometrical shapes : flushing or protruding tubes. For welds of flushing tubes, one pass is required. For welds of protruding tubes, make two passes (one with wire and one without wire).

In this case a welding bevel is needed on the workpiece (angle = 45 °, height: 1.5 mm). For leak resistant welds of protruding tubes, make one pass (without a bevel) and then a second pass corresponding to the tube to be welded.

Tubes to be welded			**Set-up before welding**											**Range**		**Linear speed**
Material	Ø OD	Wall thickness	Tube protruding/ flushing	Angle of torch	Distance électrode/plaque	Distance electrode/work piece	Distance electrode/wire	Ø Electrode	Tip angle	Nose	Ø wire	N° of layer	Built-in program number	50 A	160 A	
	mm	mm			mm	mm	mm	mm	degrees	mm				230 V		mm/ min
Stainless	25	2	Flushing	0°	2.5	1	2	2.4	30°	0.2	0.8	1/1	81		X	65
Stainless	25	2	Protruding	15°	0.5	1.2		2.4	30°	0.2		1/2	83		X	113.6
				15°	2	2	1.2	2.4	30°	0.2	0.8	2/2	84		X	113.6
Stainless	26.7	1.5	Flushing	0°	3	1	2.2	2.4	30°	0.2	0.8	1/1	85		X	69
Stainless	26.7	1.5	Protruding	15°	0.5	1.2		2.4	30°	0.2		1/2	87		X	113.6
				15°	2	2	1.2	2.4	30°	0.2	0.8	2/2	88		X	121.4
Mild steel	25	2.5	Flushing	30°	2	2	1.2	2.4	30°	0.2	0.8	1/1	90		X	69
Mild steel	25	2.5	Protruding	30°	0.5	1.2	0.5	2.4	30°	0.2		1/2	91		X	71
				30°	2	2.2	1.2	2.4	30°	0.2	0.8	2/2	92		X	114
Mild steel	25	3	Flushing	0°	2	1	1.2	2.4	30°	0.2	0.8	1/1	93		X	65
Mild steel	25	3	Protruding	15°	0.5	1.2		2.4	30°	0.2	0.8	1/2	95		X	113.6
				15°	2	2	1.2	2.4	30°	0.2	0.8	2/2	96		X	121.4

7. 2. Error codes

Number	Origin	Fault	Consequence
10	Gas	Lack of gas	Immediate stop
11	Coolant	Coolant circuit n°1 failure	Forced downslope
20	Current	Main voltage fault	Cycle blocked
22	Current	No ignition	Immediate stop
23	Current	Loss of arc	Immediate stop
24	Current	Short circuit electrode workpiece	Immediate stop
27	Current	Over heating	Immediate stop
29	Current	Source regulation fault	Immediate stop
30	Rotation	Rotation speed regulation fault	Immediate stop
31	Rotation	Rotation motor blocked	Immediate stop
32	Rotation	Rotation pulse emitter fault	Immediate stop
40	Wire	Wirefeeder speed regulation fault	Forced downslope
41	Wire	Wirefeeder motor blocked	Immediate stop
42	Wire	Wirefeeder pulse emitter fault	Immediate stop
51	Sequencer	Manual downslope	Forced downslope
52	Sequencer	Manual stop	Immediate stop
53	Sequencer	Processor reset	Reboot
54	Sequencer	Start position fault	Immediate stop
56	Sequencer	I2C bus fault	Immediate stop
60	Printer	Printer fault	No printout
61	Printer	Program absent	No printout
62	Printer	No corresponding data	No printout
70	Saving	Memo card absent	No saving
71	Saving	Error during saving	No saving
72	Saving	Program damaged	No saving
73	Loading	Card empty	No loading
74	Loading	Loading fault	No loading
75	Loading	Max. or min. current of the source exceeded Wrong selection of current range	No loading
77	Saving	Card full	No saving

7. 3. Factory settings of DIPS

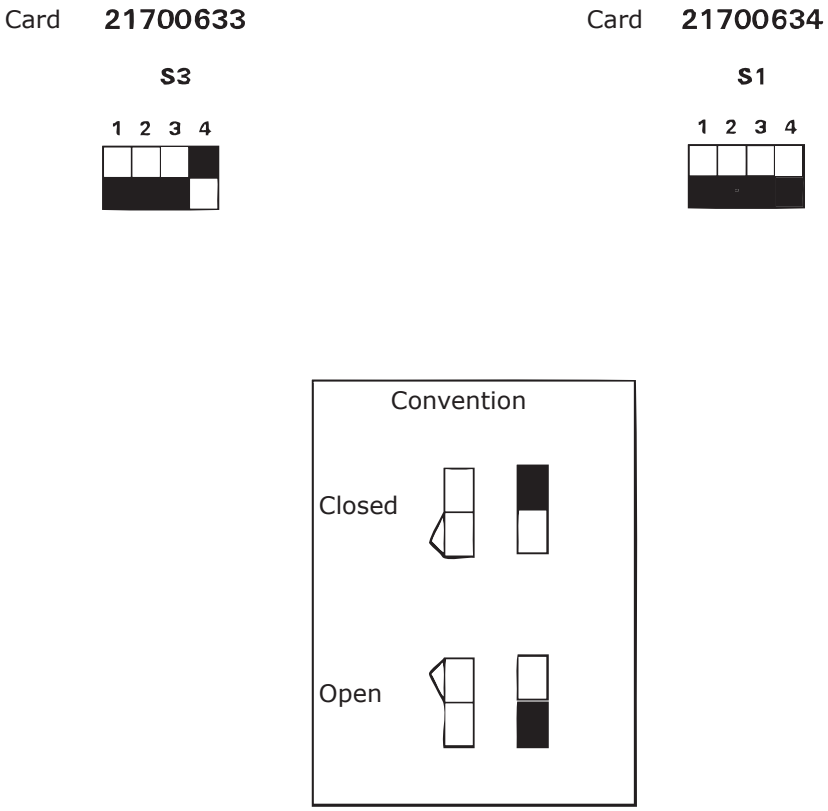


Fig. 7.3 - Position of switches on DIPS

8. End of life, recycling the machine

Our machines incorporate electrical and electronic components which must be recycled in accordance with EC Directive 2002/96/CE. Any item of equipment which is declared obsolete or out of service must be sent to approved recycling companies in order to reduce the amount of ultimate waste disposal. A number of solutions may be deployed, including:

- Re-use,
- Recycling,
- Any other form of recovery (including energy recovery) of WEEE (Waste from Electrical and Electronic Equipment).

RETURN OF EQUIPMENT

Référence du document : PDS_FOR_032_Retour matériel_EN
Révision : 04
Date d'application :
Nom du rédacteur : ERO

Please fill out and join this sheet when returning equipment to POLYSOUDE

Reseller / Person in charge : .....

Customer / Person in charge / Tel. : .....

1. EQUIPMENT RETURNED :

❑ Power source Type : ..... Serial number : .....

❑ Welding head Type : ..... Serial number : .....

❑ Wire feeder Type : ..... Serial number : .....

❑ Other (*specify designation*) : .....

↳ taken from :

- ❑ Power source Type : ..... Serial number : .....
- ❑ Welding head Type : ..... Serial number : .....
- ❑ Wire feeder Type : ..... Serial number : .....
- ❑ Other(*to be specified*) : ..... Serial number : .....

1. REASON FOR RETURN :

❑ Return of loan equipment
❑ Return of demonstration / fair equipment
❑ Return of hired equipment
❑ Return after exchange
❑ Deficient delivery / incorrect order
❑ Return for modification (*to be specified*) : .....
❑ Return for revision
❑ Return for calibration

❑ Return for repair
(*to be specified*) :
- ❑ systematically occurring error
- ❑ occasionally occurring error

Description of breakdown :

.....

.....

.....

❑ Other issue *(to be specified)* : .....

Date : ..... Signature: .....

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Table of illustrations

Printed in France.
Published by Polysoude, Nantes, Fr

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