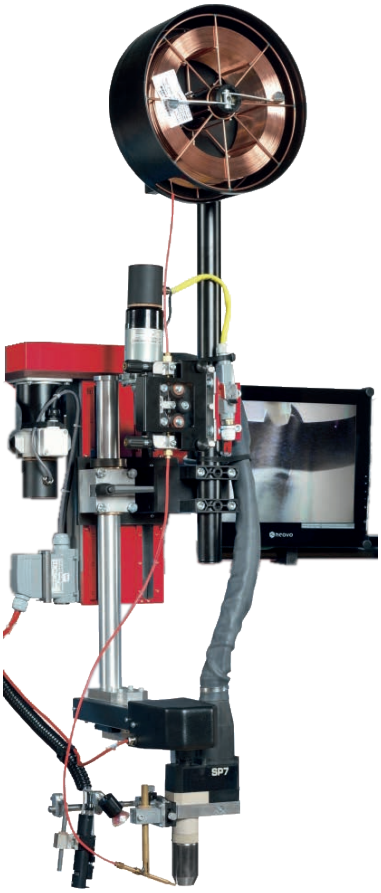
MACHINE

LINC-MASTER

SAFETY INSTRUCTIONS FOR OPERATING AND MAINTENANCE

No P93570101; P93570120
AS-WM-95575210; AS-WM-95575211; AS-WM-95575212; AS-WM-95575213
AS-WM-95575310; AS-WM-95575311; AS-WM-95575312; AS-WM-95575313



ISSUE	: EN	Assembly instructions	REF: 8695 5520
REVISION	: B		
DATE	: 03 - 2024		Original instructions

LINCOLN® ELECTRIC

Thank you very much for the trust you have shown by choosing this piece of equipment. It will give you trouble-free service if it is used and maintained as recommended.

Its design, component specifications and manufacturing are in accordance with applicable European directives.

Please refer to the CE declaration enclosed to identify the directives applicable to it.

The manufacturer shall not be liable for any combination of parts not recommended by it.

For your safety, please follow the non-limitative list of recommendations and obligations, a large part of which are included in the Labour Code.

Please inform your supplier if you find any error in this instruction manual.

Table of contents

INFORMATION

This technical literature is intended for the following machines or products:

- **LINC-MASTER** 10-metre installation
- **LINC-MASTER** 17-metre installation, including:
  - AS-WM-95575210 ☛ PLASMA pack
  - AS-WM-95575211 ☛ PLASMA pack + Disconnecting cabinet
  - AS-WM-95575212 ☛ PLASMA pack + Disconnecting cabinet + **VISIOARC**
  - AS-WM-95575213 ☛ PLASMA pack + Disconnecting cabinet + **VISIOARC** + Power-operated wire
- **LINC-MASTER** 22-metre installation, including:
  - AS-WM-95575310 ☛ PLASMA pack
  - AS-WM-95575311 ☛ PLASMA pack + Disconnecting cabinet
  - AS-WM-95575312 ☛ PLASMA pack + Disconnecting cabinet + **VISIOARC**
  - AS-WM-95575313 ☛ PLASMA pack + Disconnecting cabinet + **VISIOARC** + Power-operated wire
- **LINC-MASTER** 25-metre installation
- **LINC-MASTER** 30-metre installation

These instructions and the product covered by them refer to applicable standards.

Please read this document carefully before you install, use or maintain the machine. Keep this document in a safe place for future reference. This document must follow the machine described if there is a change in ownership of the machine and accompany it up to demolition.

Display and pressure gauge:

Measurement instruments or displays of voltage, intensity, speed, accuracy etc. are to be considered as indicators, whether they are analogue or digital.

For operating instructions, adjustments, troubleshooting and spare parts, please refer to the special instructions for safe operating and maintenance.

The installation is an assembly of several products. Please read all the sections of the literature before starting to use the machine, as they contain information about residual risks and the ways to protect yourself from all its components.

In spite of all the measures applied, invisible residual risks may still remain.
Residual risks can be reduced if the safety instructions are observed, the machine is used as recommended and general service instructions are followed.

REVISIONS

REVISION : B DATE : 03/24

DESCRIPTION	PAGE
Update	All

MEANING OF SYMBOLS

	Reading the manual/instructions is mandatory.		Indicates a hazard.
	Mandatory use of safety shoes.		Warning of an electricity risk or hazard.
	Mandatory use of hearing protection.		Warning of a risk or hazard due to an obstacle on the floor.
	Mandatory use of a safety helmet.		Warning of a risk or hazard of falling with a level change.
	Mandatory use of safety gloves.		Warning of a risk or hazard due to suspended loads.
	Mandatory use of safety glasses.		Warning of a risk or hazard due to a hot surface.
	Mandatory use of a safety visor.		Warning of a risk or hazard due to moving mechanical parts.
	Mandatory use of safety clothing.		Warning of a risk or hazard due to a closing movement of mechanical parts of a machine.
	Make sure you clean the working zone.		Warning of a risk or hazard due to laser radiation.
	Mandatory use of breathing protection.		Warning of a risk or hazard due to an obstacle at a height.
	Visual inspection required.		Warning of a risk or hazard due to the presence of a pointed part.
	Indicates a lubrication operation.		Wearers of pacemakers may not be admitted in the designated area.
	Requires maintenance action.		

A - IDENTIFICATION

The information below should be provided in all correspondence.

B - SAFETY INSTRUCTIONS

For general safety instructions, please refer to the specific manual supplied with the equipment.

Please refer to the layout drawing supplied with the machine (or installation).

HIGH-INTENSITY MAGNETIC FIELDS that could affect vital support systems.
Wearers of cardiac pacemakers, defibrillators and other vital assistance medical devices must not approach the inductor or inductors in the machine. If necessary, wearers of such devices must first seek medical advice before working in the vicinity of the machine.

1 - Limits of use of the machine or the installation

The limits of use of the machine (or installation) are provided in the different documents; please review them carefully before starting to use the machine (or installation).

For safety reasons, and in the light of our current knowledge of customer processes, the working area may be occupied only by one individual.

The machine (or installation) may only be operated by a single person above the age of 18 and trained in operating and use-related risks.

The machine (or installation) may only be used for welding applications; any other use of the machine is forbidden.

The machine (or installation) is designed for indoor use.
It may not be used outdoors.

The workshop must be adequately lit and ventilated.

The dimensions and weights of the workpieces must be appropriate for the machine (or installation).

Loading and unloading may only be carried out outside the welding cycle.

The energy supply must imperatively comply with recommendations.
The customer must supply and install a device for isolating each source of energy (electricity, air, gas and water). The devices must be clearly identified. They must be of the locking type.

The machine (or installation) is designed for professional use.

Before use, the operator must make sure that there is no risk of collision with personnel.

The use of Personal Protective Equipment (PPE) and work clothing covering the body is mandatory in the work area. Do not wear a tie and keep your hair tied back securely.

Make sure that no part of the machine can come within less than 500 mm from an obstacle.
Important: the operator passage way must absolutely be clear over a minimum width of 800 mm.
The floor should be marked out.

While accessing the marked area, a worker could be hit by a part of the installation.

For any extended absence, the operator must shut off the supply of utilities (electricity and fluids).

Maintenance may only be carried out by experienced personnel who are trained in machine-related risks.

Access to the machine (or installation) must be left free for maintenance (e.g. no workpiece etc.).

The frequency of such maintenance is indicated for production in one work shift per day (i.e. 8 hours a day).

Consumables must be changed based on their wear and tear.

Visually inspect the overall condition of the installation and the working area twice a shift, or with every change of production.

The maintenance schedule must absolutely be followed.
We recommend putting in place a traced system for tracking all your maintenance operations.

All maintenance must be carried out by specialised personnel who have read and understood these instructions.

Electricity technician
Qualified operator with the ability to work in normal conditions on electrical parts for regulation, maintenance and repair.

Mechanical technician
Specialised technician authorised to carry out complex and exceptional mechanical operations.

2 - Residual risks

Based on the results of the risk assessment, a few elements have emerged where there was no “technical” solution for eliminating risk or making it negligible.

In spite of all the care that has gone into the designing of our machines (or installations), some risk areas remain. To control these risks, the customer must pay particular attention to them, ensure that the instructions are applied and define any additional measures that may be necessary in view of its own internal operating procedures.

Therefore, you will find below a guidance list of residual risks.

Training of operators in safety and in the use of the machine from their operating position will better address these residual risks.

We recommend putting place workstation instructions that remind users of the presence or otherwise of residual risks in the working area.

2.1 - Residual risks - General

☛ **Environment risk - slipping and/or falling**

The working and safety area must be clear of all obstacles.

The working area must be kept clean and cleaned regularly.

The machine must undergo periodic maintenance (see maintenance instructions of each piece of equipment).

Waste consumables must be cleaned.

The operator must pay special attention to cables and rolling tracks on the ground.

The operator must use the necessary personal protective equipment (helmet, gloves, safety shoes, mask and work clothing).

Falling from heights:

In order to be protected from falling from heights and for access to high parts, the operator must use access means that comply with applicable standards.

For all work at heights, the use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs and harness) is indispensable.

For all work at heights, the operator must be trained in the use of means for accessing high locations.

☛ **Mechanical risk - Impacts, shearing, crushing**

The operator may not wear loose clothing or a tie, must have their hair tied back and use personal protective equipment (helmet, gloves, safety shoes, mask and work clothing).

The operator must make sure that nobody else is close to the machine before starting.

The operator’s working position is before the control console.

The machine safety areas must not be crossed.

The operator must be trained in the use of the machine, and all personnel must be aware of residual risks.

Catching between an obstacle and the machine - Access to a moving part.

The operator must use personal protective equipment, (helmet, gloves, safety shoes, mask and work clothing).

The operator’s working position is before the control console.

The operator must make sure nobody is present in the machine working area or safety area before using it.

The operator must make sure that all the machine guards are in place before using it.

The operator must be trained in the use of the machine, and all personnel must be aware of residual risks.

Anchoring failure of handling equipment

The machine may not be modified.

The machine is not designed for anchoring lifting equipment.

Any change in the machine location must be made by **LINCOLN ELECTRIC** or authorised personnel.

Presence of a person under the load

The operator must be trained and approved for the use of handling equipment.

The operator must be trained in the use of the machine, and all personnel must be aware of residual risks.

☛ **Mechanical risk - Puncturing or piercing**

The use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs) is indispensable.

The operator must be trained in the use of the machine and all personnel must be aware of residual risks.

2.2 - Residual risks - Process

☛ **Electrical risk - Splattering of molten particles**

Splattering of molten material on flammable materials or personnel:

The working area must be kept clean and cleaned regularly.

Put guards in place around the torches depending on the working environment.

The use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs, fire-resistant work clothing) is indispensable.

The operator must be trained in the use of the machine, and all personnel must be aware of residual risks.

☛ **Ergonomics risk - Fatigue**

Loading of heavy coils on coil carriers at a height:

The operator must use appropriate handling means.

The operator must be trained in the use of the machine, and all personnel must be aware of residual risks.

☛ **Material and product risks - Poisoning**

Fumes/gas discharged by the process:

Provide for the use of extraction equipment (to be supplied by the customer).

The use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs) is indispensable.

The operator must be trained in the use of the machine, and all personnel must be aware of residual risks.

☛ **Mechanical risk - Puncturing or piercing**

Contact between the end of the filler wire and a part of the body

The use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs) is indispensable.

The operator must be trained in the use of the machine and all personnel must be aware of residual risks.

☛ **Radiation risk - Eye and skin injuries**

Arc flash

Put guards in place around the torches depending on the working environment.

The use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs) is indispensable.

The operator must be trained in the use of the machine and all personnel must be aware of residual risks.

☛ **Thermal risk - Burns** 

Part of the body in contact with a hot part (torch/workpiece etc.)

The use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs) is indispensable.

The operator must be trained in the use of the machine and all personnel must be aware of residual risks.

☛ **Noise risk - Fatigue** 

Process noise

The use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs) is indispensable.

The operator must be trained in the use of the machine and all personnel must be aware of residual risks.

☛ **Mechanical risk - Crushing** 

Handling of gas cylinders and/or racks

Gas cylinders must be transported securely strapped to a truck.

Racks are to be transported with appropriate handling equipment (e.g. travelling crane, lift truck).

The operator must be trained and approved for the use of handling equipment.

The use of personal protective equipment (helmet, gloves, safety shoes, mask, ear muffs) is indispensable.

☛ **Material and product risk - Explosion**

Storage of gas cylinders and/or racks near the machine

Storage must be sufficiently distant from the welding area and other sources of heat, in a ventilated location.

Cylinders must be secured.

The operator must be trained and personnel must be aware of how gas is used.

1 - Description

1.1 TIG and PLASMA installation

The installation is made up of:

- a **POWERWAVE S500** power source,
- a **LINC-MASTER** automatic control unit
- a **PILOT UNIT** (for plasma welding),
- a **T/P CONTROLLER** welding control console,
- a **BRT** torch/high-frequency (HF) connection unit,
- installation bundles (available in several sizes, 10m,17m, 22m, 25m or 30m),
- a **MEC4** TIG torch (500A/100%),
- an **SP7** PLASMA torch (450A/100%),
- a gas controller unit,
- a cold or hot wire feed system,
- an arc voltage control system,
- a **POWERWAVE Advanced Module**,
- a movement control system,
- a video arc viewing system,
- a TIG arc magnetic deviation or oscillation system.

The supply of these components depends on the ordered options.

2 - Basic installation

It is made up of the following:

	Components	Part number
A	**T/P CONTROLLER** control console	W000377989
B	**BRT** unit	W000352133
C	Power source: • **POWERWAVE S500 UL-CSA** • **POWERWAVE S500 CE** • **POWERWAVE S500 CCC**	 K2904-1 K3168-1 K2904-2
D	**LINC-MASTER** automatic control unit	P93570101
E	**PILOT UNIT**	P93570120
F	**POWERWAVE Advanced Module**	K3685-1
	Bundle versions: • 10 metres or • 17 metres or • 22 metres or • 25 metres or • 30 metres	 P95577290 P95577291 P95577292 P95577293 P95577294

2.1 POWERWAVE S500 power source

Please refer to the document:

- **IM10456: POWER WAVE S500 UL-CSA; POWER WAVE S500 CE; POWER WAVE S500 CCC**

2.2 POWERWAVE Advanced Module

Please refer to the document:

- **IM10149: POWERWAVE Advanced Module**

2.3 T/P CONTROLLER

This control console is used for the complete management of the TIG or PLASMA welding cycle. An LCD display, buttons and an encoder make it possible to programme cycles, modify them during welding and display measurements.
For welding: cycle start and stop control, immediate cycle stop, gas purge, wire feeding selection and arc voltage control.

This module communicates with the **LINC-MASTER** automatic control unit through an optical link and can be moved to a remote location up to 30 metres.

2.4 BRT unit

This component acts as the interface between the welding bundle from the power source and the welding torch. It comprises HF (High Frequency) for striking the pilot arc for plasma processes and the welding arc for TIG.

2.5 LINC-MASTER *automatic control unit*

This unit is made up of the following:

- Base for distributing power supplies
- PC104 board (W000373162)
- Analogue board (W000377988) for analogue inputs/outputs
- Interface board (W000141596) for logical inputs/outputs
- Gateway board (AS-WS-C5703350)
- Mechanical and electrical pre-arrangement for receiving the variable drives that control the wire feed motors, arc voltage control and magnetic deviation.

2.6 PILOT UNIT

This unit is used for creating and maintaining the arc during the plasma process during and away from welding.
This unit is made up of a power base made up of a 25A auxiliary source.

2.7 Basic bundle

The basic installation bundle allows the use of TIG and/or PLASMA processes.
The installation may be delivered with bundles measuring 10, 17, 22, 25 or 30 metres.

3 - Supplements

3.1 Gas controller

Please refer to the document:

- **86955511: Supplemental gas controller**

The W000273158 controller can manage up to two types of gas (annular, trailing shield, backing etc.).

It is equipped as standard with a 10-38 l/min ball flow meter associated with a solenoid valve.

The second gas control function is provided by the auxiliary line W000273159 which is also fitted with a 10-38 l/min flow meter and a solenoid valve.

3.2 PLASMA RDM gas flow regulator

Please refer to the document:

- **86955535: PLASMA RDM**

This control system allows the fine adjustment of the plasmagenic gas from 0.1 to 10 l/min and perfect keyhole closure by gradually reducing the flow of plasmagenic gas at the end of welding.

3.3 OSCILLARC PLUS for TIG welding

Please refer to the document:

- **86955566: OSCILLARC PLUS**

Arc deviation:
This technique is used to electrically deviate the TIG arc forwards along the centre line of the weld and thus increase the speed by 30 to 50 % when the thickness is below 2 mm.

Arc oscillation:
Arc oscillation is used to deposit metal on areas that are less than 15 mm wide, to fill bevels or rebuild the surface coating.

3.4 FRIOJET 300w cooling unit

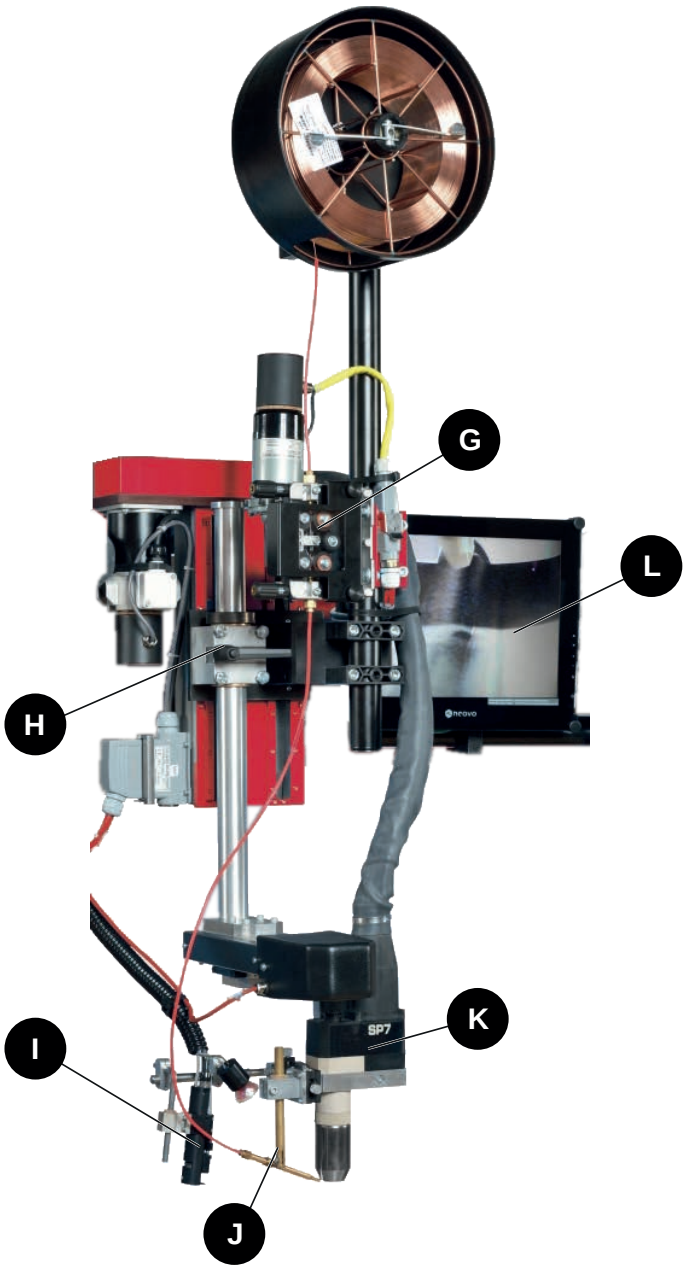
Please refer to the document:

- **86954939: FRIOJET 300w**

The **FRIOJET 300w** cooling unit is compact, with a constant supply of coolant in a closed circuit, to cool **SP7** or **MEC4** torches.

It is an indispensable element for the proper working of the torches.

3.5 Welding head supplement



	Components
G	Wire feed device
H	Arc voltage control
I	**VISIOARC VA2** video camera
J	Wire feed
K	Welding torch
L	**VISIOPRO MONITOR** screen

3.6 Welding torch

Please refer to the document:
- **86955502: SP7 torch**
- **86959007: MEC4 torch**

Water-cooled high-performance torches for process quality and equipment stability.
Torches with a quick connection system for easier replacement and maintenance.

SP7 torch:
This torch is designed for unconfined or keyhole **PLASMA** welding.
- 450A at 100%
- easy-to-replace self-centring standard electrode
- solid cooled tip for longer life of consumables.

Option:
- gas trailing shield to protect welds on sensitive metals.

MEC4 torch:
This torch is designed for **TIG** welding.
- 500A at 100%
- easy-to-replace standard electrode
- double high-frequency lighting for improved arc strike.

Option:
- gas trailing shield to protect welds on sensitive metals
- magnetic arc oscillation

3.7 Wire feed device

Please refer to the document:
- **86955507: Cold wire feed system**

Cold wire feed device:
It is often necessary to supply the weld pool with metal during the operation in order to avoid hollows in the weld, and while using mild steels with deoxidising elements, for multiple-pass welds.

	Specifications
Wires: • carbon steel • stainless steel • titanium	Ø 0.8/1.0/1.2 mm
Wires: • aluminium	Ø 1.2/1.6 mm
Maximum wire speed	6 m/min

3.8 Arc Voltage Control - AVC

Please refer to the document:
- **86955506: Arc voltage control**

Keeping a constant distance between the torch and the work piece is a key quality requirement, so that penetration and bead width remain consistent. Arc voltage control (AVC) maintains that distance by automatically regulating the arc voltage; the function is fully integrated into the **LINCOLN ELECTRIC** system and is made up of a 200 mm vertical electric slide.

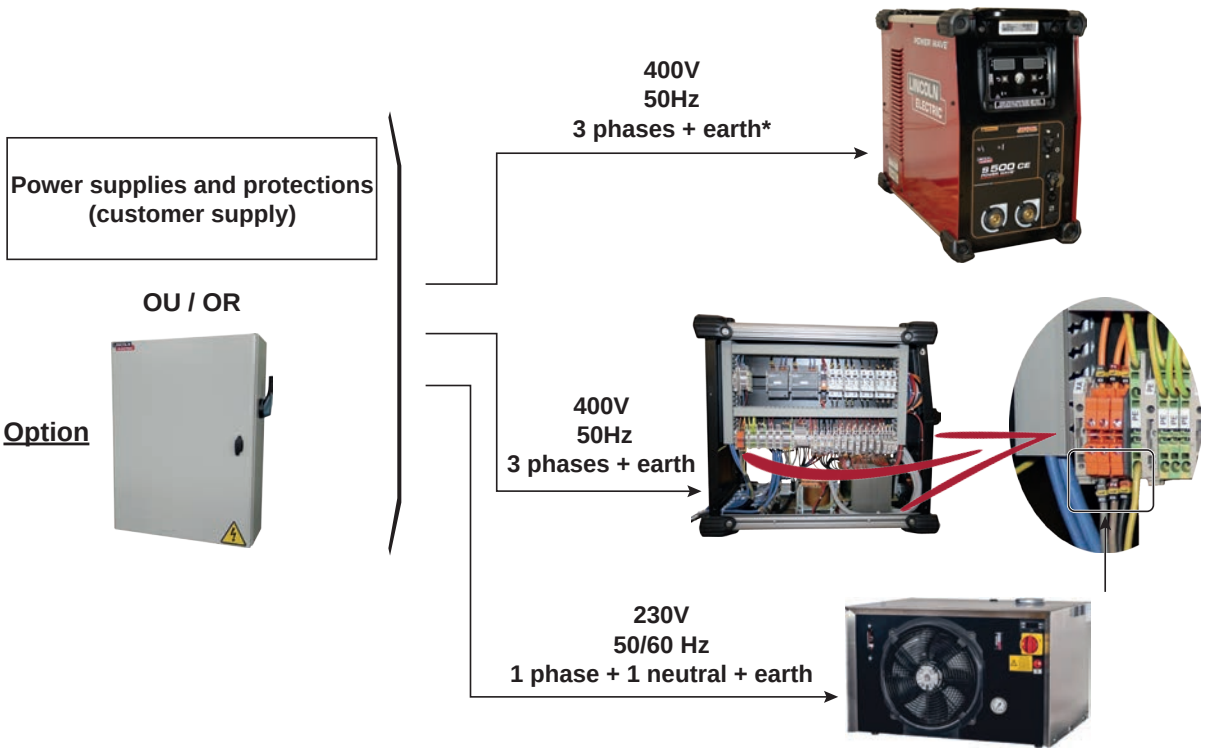
3.9 Video camera

Please refer to the document:
- **86955911: VISIOARC VA2**
- **86955899: VISIOPRO MONITOR**

The **TIG/PLASMA VISIOARC VA2** video system can be integrated easily.
It shows a considerably enlarged image on the **VISIOPRO MONITOR**, so that the welding torch can be positioned precisely. The operator can then work from a distance away from the welding head with greater ease, and improve the quality of welding operations.

4 - Energies required for the installation

4.1 Electrical system



*** Refer to document IM10456: POWER WAVE S500 UL-CSA; POWER WAVE S500 CE; POWER WAVE S500 CCC as power supply alternatives.**

4.2 Fluid

Energy	Description	Quantity
Demineralised water or Freezcool Red	**FRIOJET 300w**	minimum = 5 l/min

4.3 Gas

Energy		Description	Quantity
Gas	Central **PLASMA**	Pure argon, pressure reduced to 3 bar	maximum = 10 l/min
	Annular shield, backing and trailing shield gas for **TIG** or **PLASMA**	Depending on material to weld, pressure reduced to 3 bar	15 to 25 l/min

5 - Dimensions of the equipment of the basic installation

5.1 POWERWAVE S500 power source

Please refer to the document:

- **IM10456: POWER WAVE S500 UL-CSA; POWER WAVE S500 CE; POWER WAVE S500 CCC**

5.2 POWERWAVE Advanced Module

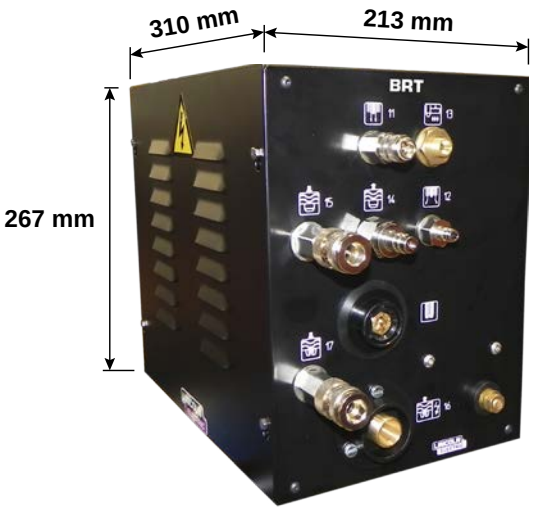
Please refer to the document:

- **IM10149: POWERWAVE Advanced Module**

5.3 T/P CONTROLLER

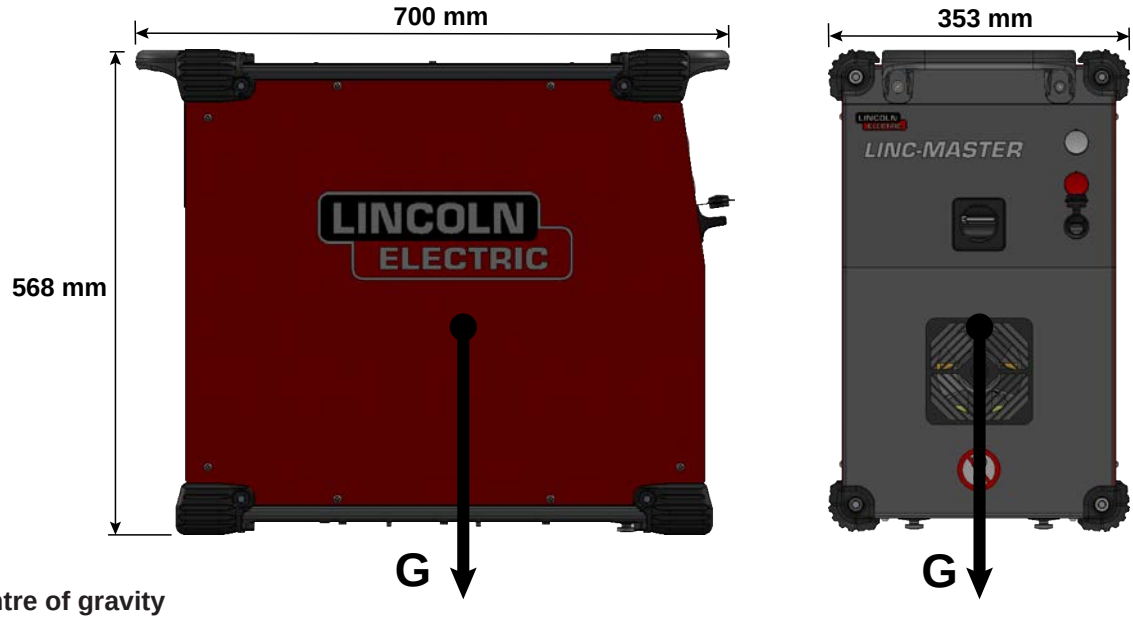
Weight: 6 daN

5.4 BRT unit



Weight: 11 daN

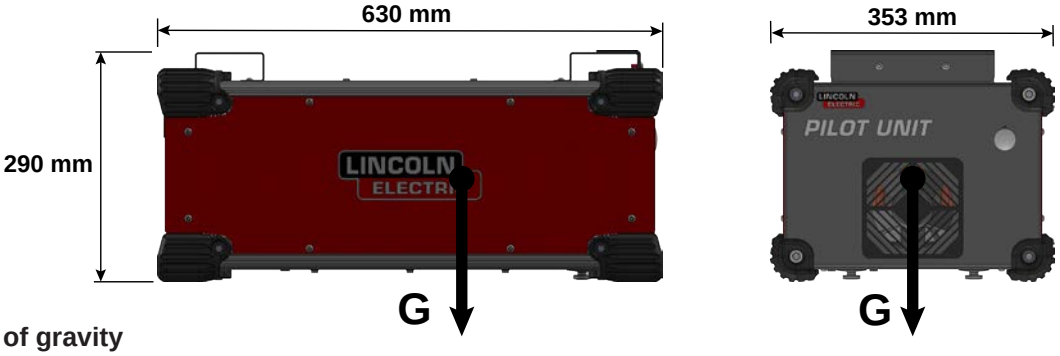
5.5 LINC-MASTER *automatic control unit*



L: Centre of gravity

Weight: 75 daN

5.6 PILOT UNIT



L: Centre of gravity

Weight: 35 daN

The customer must supply and install a device on each source for isolating it.
The devices must be clearly identified. They must be of the locking type.

For compliance with European safety standards, the connection to the electricity system must be via a wall-mounted cabinet comprising a disconnector with individual protections rated appropriately for the electricity system and the consumption of devices

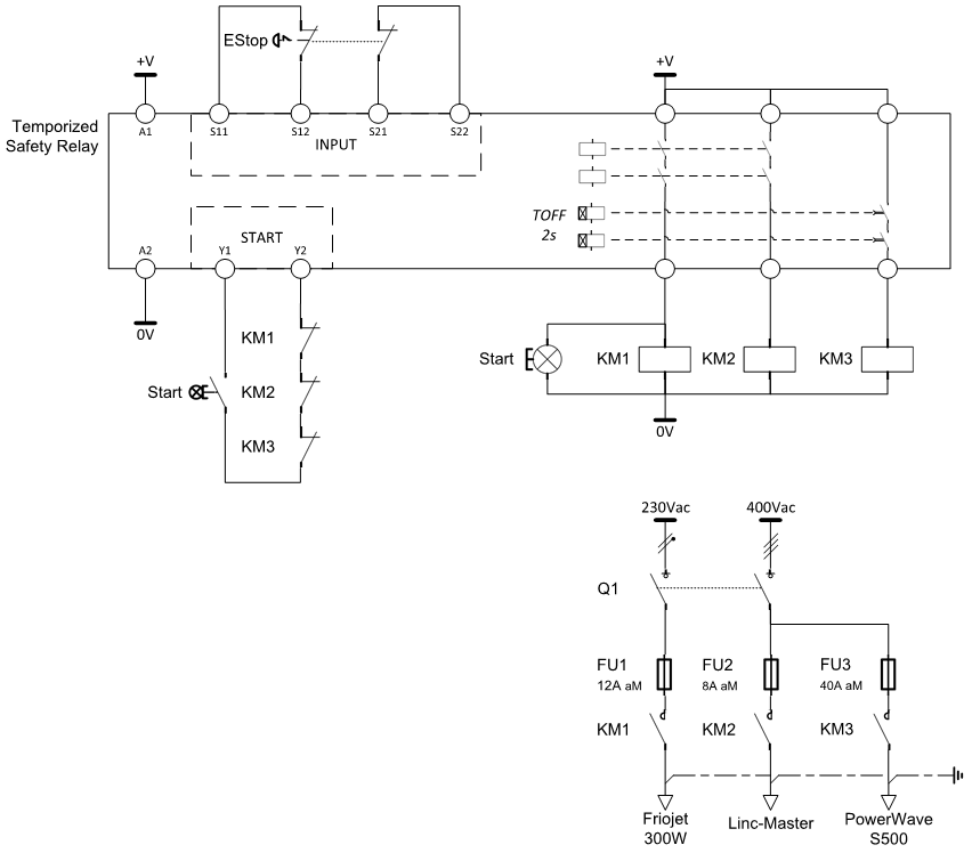
The cabinet must also contain a power circuit comprising protection from overloads and short circuits, and a disconnecting device with an emergency stop button close to the operating position.

That emergency stop device must switch off the power supplies of the LINC-MASTER, cooling unit and POWERWAVE S500 (delayed*) cabinets with PLc (performance Level c) as a minimum.

We market a cabinet that meet the criteria set out (please enquire).

*: the power supply to the **POWERWAVE S500** must be switched off with a two-second delay after that to the **LINC-MASTER** cabinet in order to avoid the sudden switching off of power during the welding cycle.

Example of power and safety circuit to put in place in the absence of an optional disconnecting cabinet (case with **FRIOJET 300w** cooling unit):



Such a circuit can be put in place with, for instance, a Schneider Electric XPSUAT13A3AP safety relay as follows:

- START=1
- FUNCTION=4
- DELAY FACTOR=3
- DELAY BASE=6

D - ASSEMBLY AND INSTALLATION

Refer to the layout drawing.

If the LINC-MASTER installation is mounted on a machine (with a platform) that could be in motion, the installation must absolutely be fastened to the platform in order to avoid the risk of it tipping over.
That is why a machine equipped with a LINC-MASTER installation *may never be used* if the installation is not securely fastened to the platform. The risk of instability would not be covered in such a case.

1 - Slinging of installation components

Assembled units *may never be transported*. Transport must be carried out unit after unit.

Units may *necessarily only be transported*:
- **by 2 workers or,**
- **with 2 straps accompanied by appropriate lifting equipment and trained personnel. The straps must be routed below the cabinets.**

LINC-MASTER and PILOT UNIT may not be handled by placing straps on the handles.

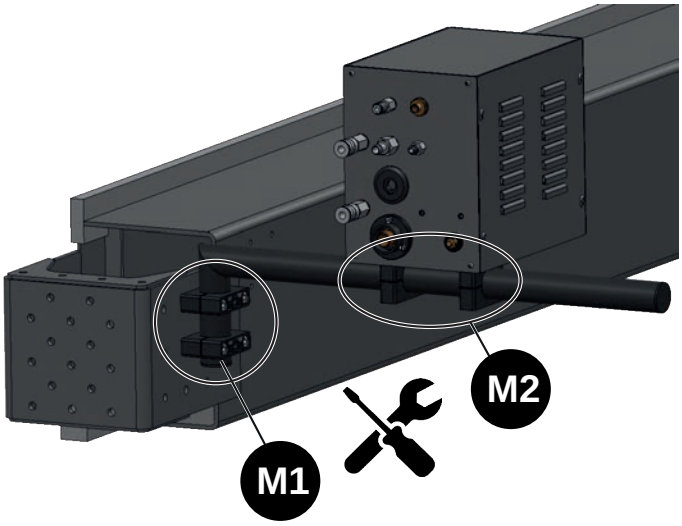
Please note that falling equipment could result in injuries.
Please, therefore:
- **Use lifting devices with capacity that is appropriate for the weight of the equipment,**
- **Make sure that the machine is stable before lifting it,**
- **Do not use the machine when it is suspended or being lifted.**

2 - POWERWAVE S500/Advanced Module assembly

3 - LINC-MASTER/PILOT UNIT assembly

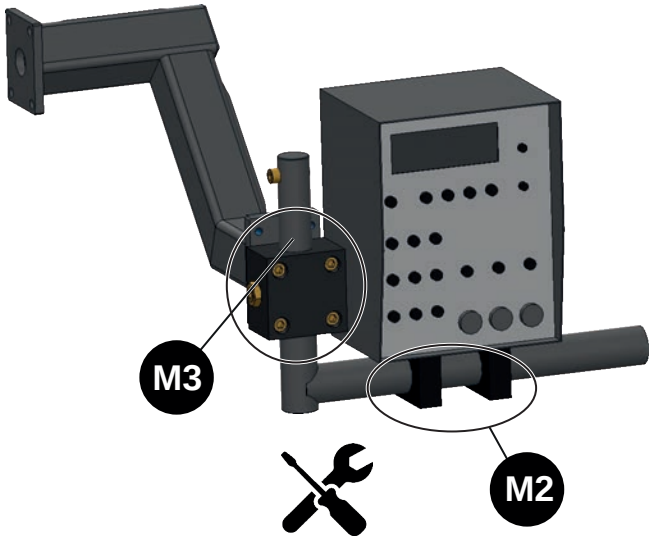
4 - BRT unit assembly

Fasten the **M1** support tube of the **BRT** unit near the torch (depending on the length of the torch bundle).
Fasten the **BRT** unit to the support tube using the **M2** clamps.



5 - Assembly of the T/P CONTROLLER

Fasten the **M3** support tube of the **T/P CONTROLLER** within the operator's reach.
Fasten the **M2** support clamps on the rear or underside of the console.
Fasten the console to the support tube using the **M2** clamps.



6 - Assembly of installation supplements

Please refer to the corresponding manual.

7 - Connection of the POWERWAVE S500 power source and LINC-MASTER box

Please refer to the document:

- **IM10456: POWER WAVE S500 UL-CSA; POWER WAVE S500 CE; POWER WAVE S500 CCC**

Refer to the electrical diagram:

- **95577043 => Electrical diagram for standalone LINC-MASTER installation**

This welding installation operates with a three-phase AC power supply.

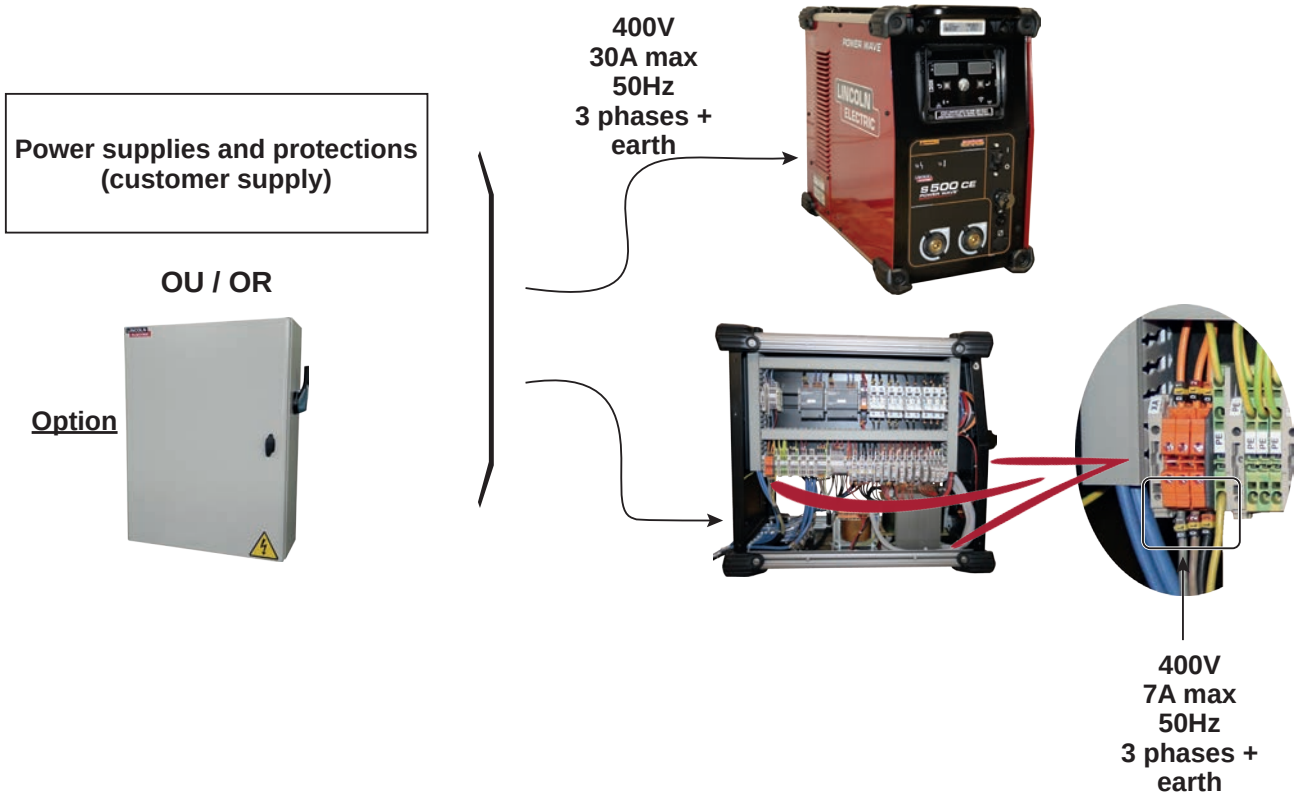
The installation is wired for a 400V system.
The **POWERWAVE S500** power source is supplied with three-phase 400V by the disconnecting cabinet.
The **LINC-MASTER** unit is powered with three-phase 400V by the disconnecting unit.

Before any connections, make sure that all the primary power inputs of the machine have been switched off at the main switch (Off).

The customer must make sure that the power supply will comply with the recommendations. The customer must supply and install a device for isolating and protecting each source of energy. It must be clearly identified and lockable.

LINCOLN ELECTRIC offers a disconnecting unit as an option.
That option is mandatory for installations with:

- wire impact adjusting electric slides,
- optional movement 1.



7.1 Emergency stop line connection

The emergency stop and safety lines must be interlocked and tested in accordance with the electrical diagram of the machine.

8 - Gas connection

Please refer to the corresponding charts.

9 - Coolant unit connection

Please refer to the document:

- **86954939: FRIOJET 300w**

10 - Connection of installation components

Refer to the electrical diagram:

- **95577043 => Electrical diagram for standalone LINC-MASTER installation**
- **95577042 => LINC-MASTER interface connection**
- **93570112 => LINC-MASTER electrical box diagram**
- **93570130 => PILOT UNIT electrical diagram**

Regardless of the type or dimensions of the element supporting the installation:

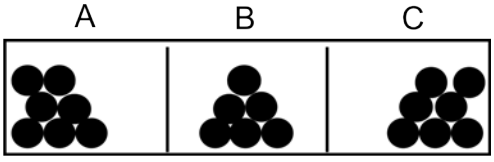
- Welding bench (e.g. **SEAM-MATIC**)
- Welding boom (e.g. **LINC-MATIC**)
- Special machine

Each element of the welding head should always be connected first, and then the cable or bundle should be placed in the provided supports in order to determine each connection near the power source.
This method is used to absorb a short excess length of each conduit (approximately 1 m).
If the excess length is greater than 1m, the length must be adjusted. In all cases, take all the precautions required to replace the identification tags.

All the connections must be classified into three types of conduit:

- power cable, pilot arc
- gas and water fluids pipe
- motor and limit switch control cable

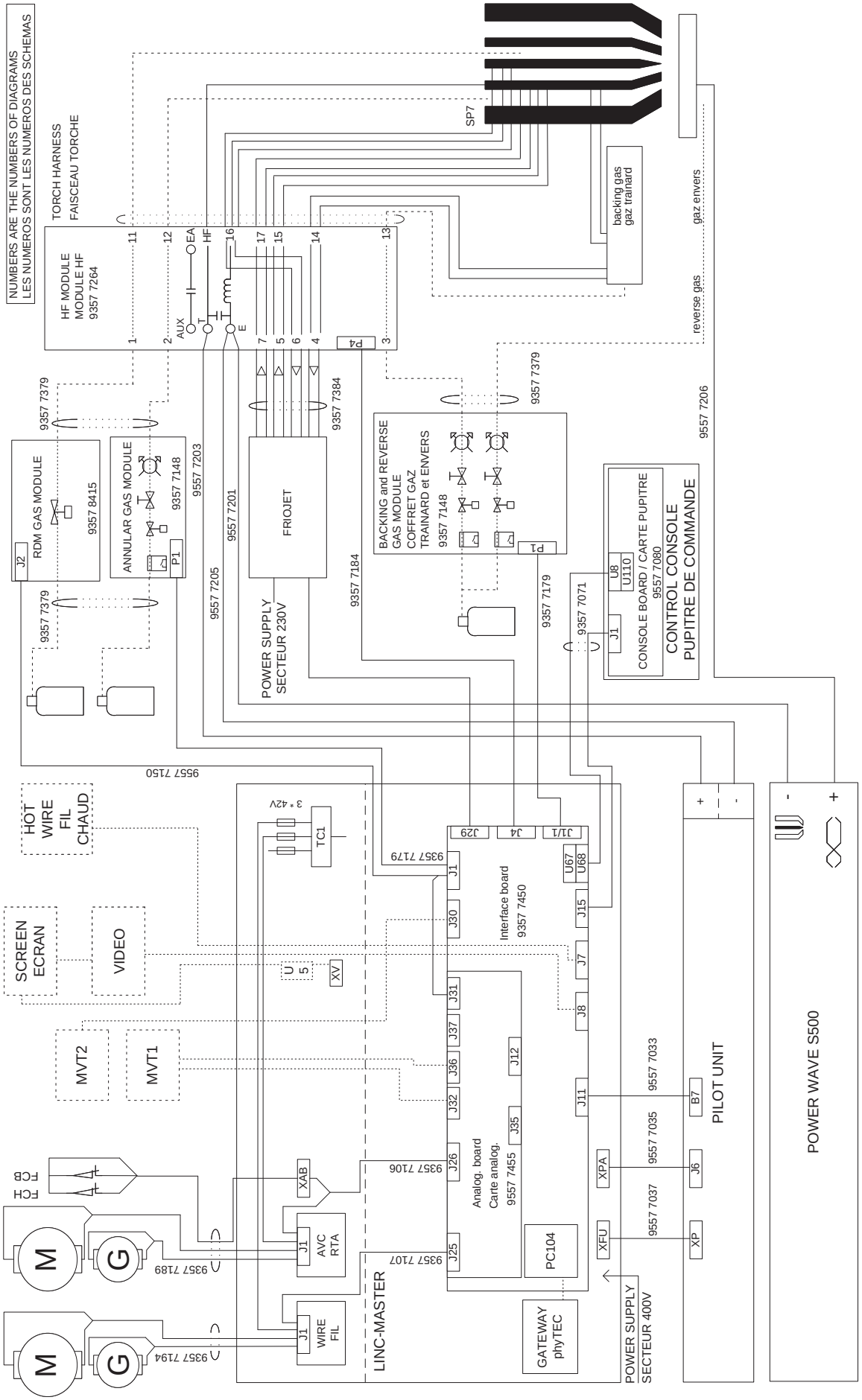
Over the entire path of the bundle or over its largest possible part, the limit switch and motor control cables should be placed away from power cables, which could lead to interference by induction.



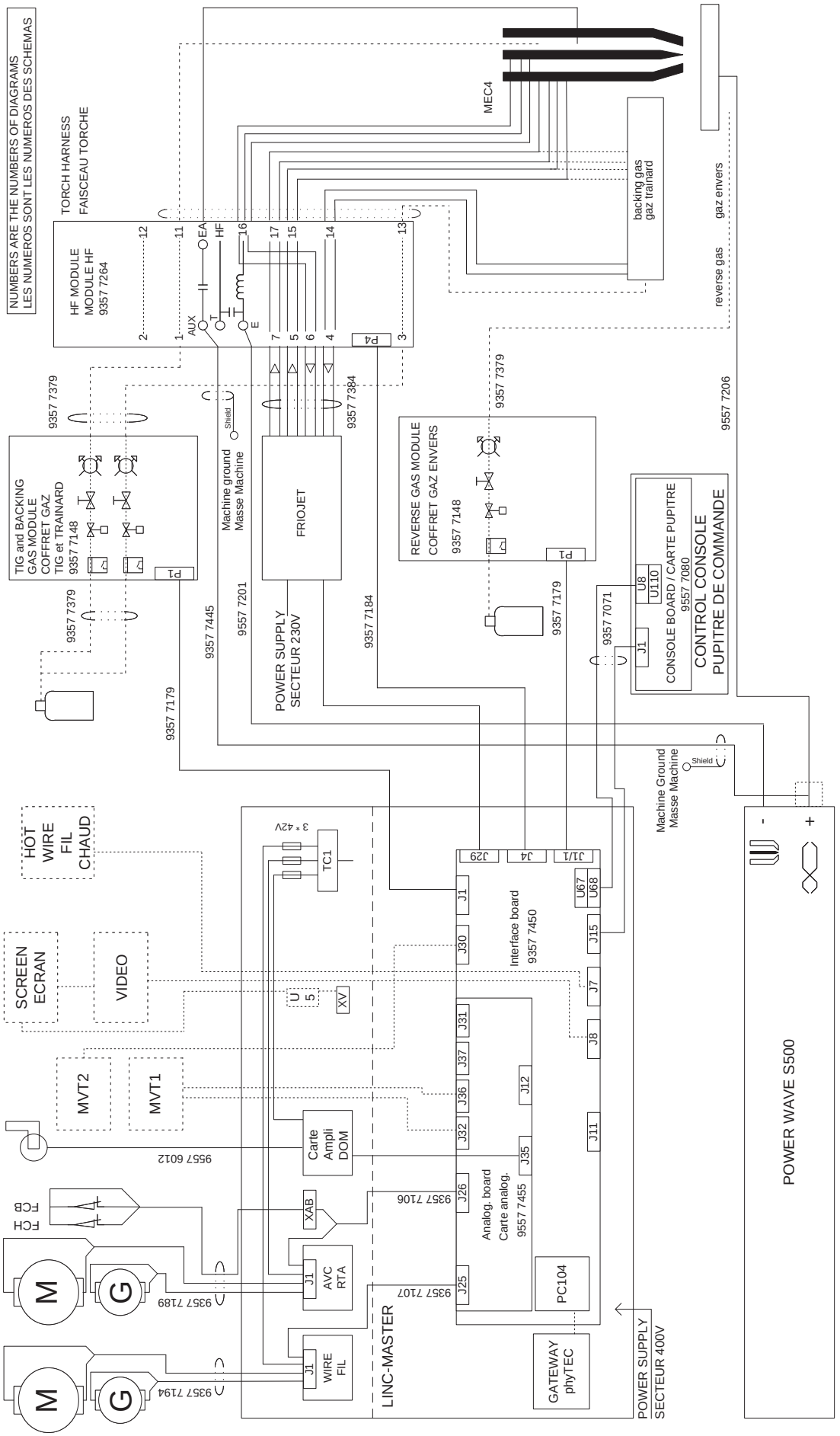
A: power cables
B: gas and water pipes
C: control cables, motor and limit switch cables

Important: The length of the bundle between the welding head and power source is 10m, 17m, 22m, 25m or 30m

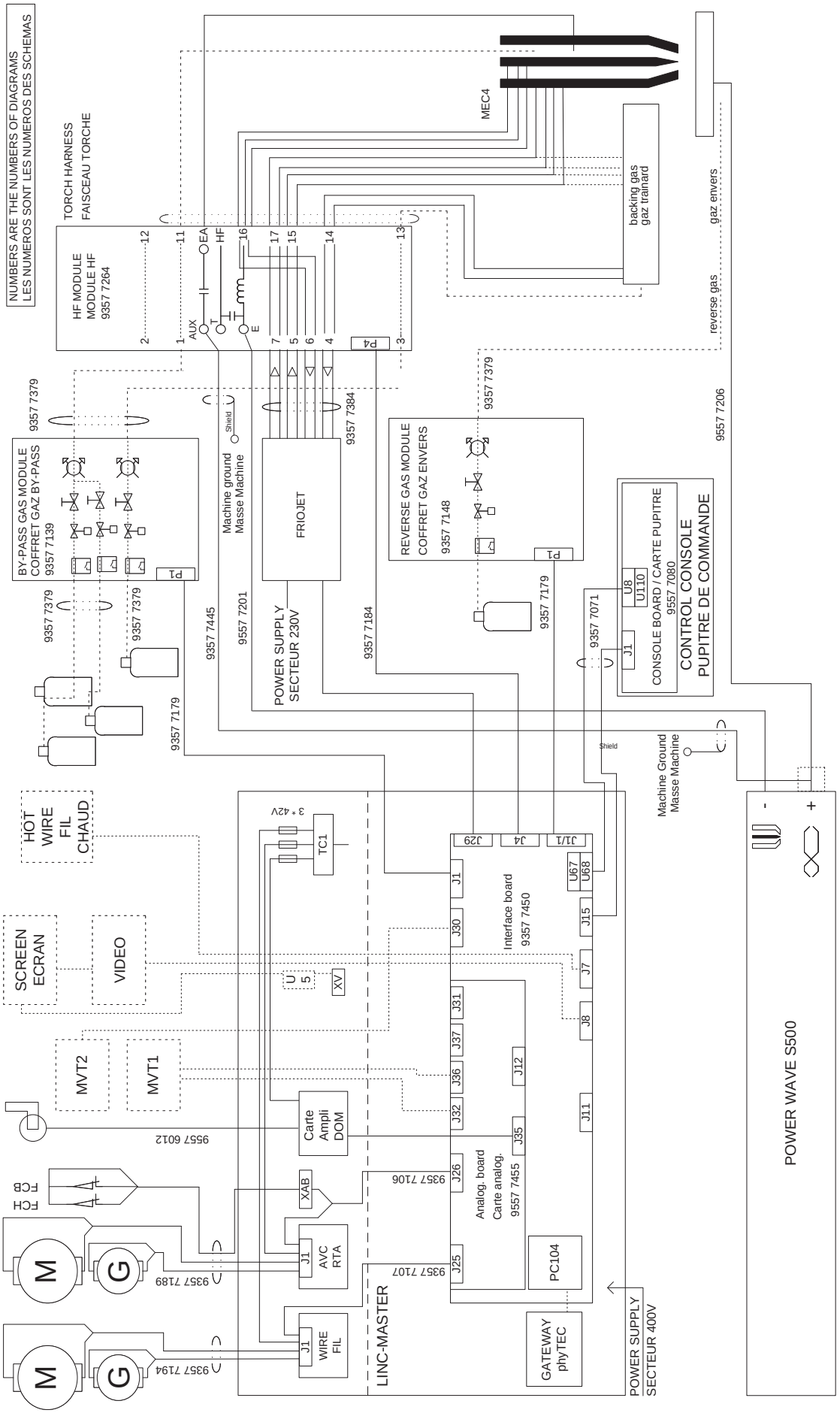
10.1 PLASMA RDM or double-flow TIG installation



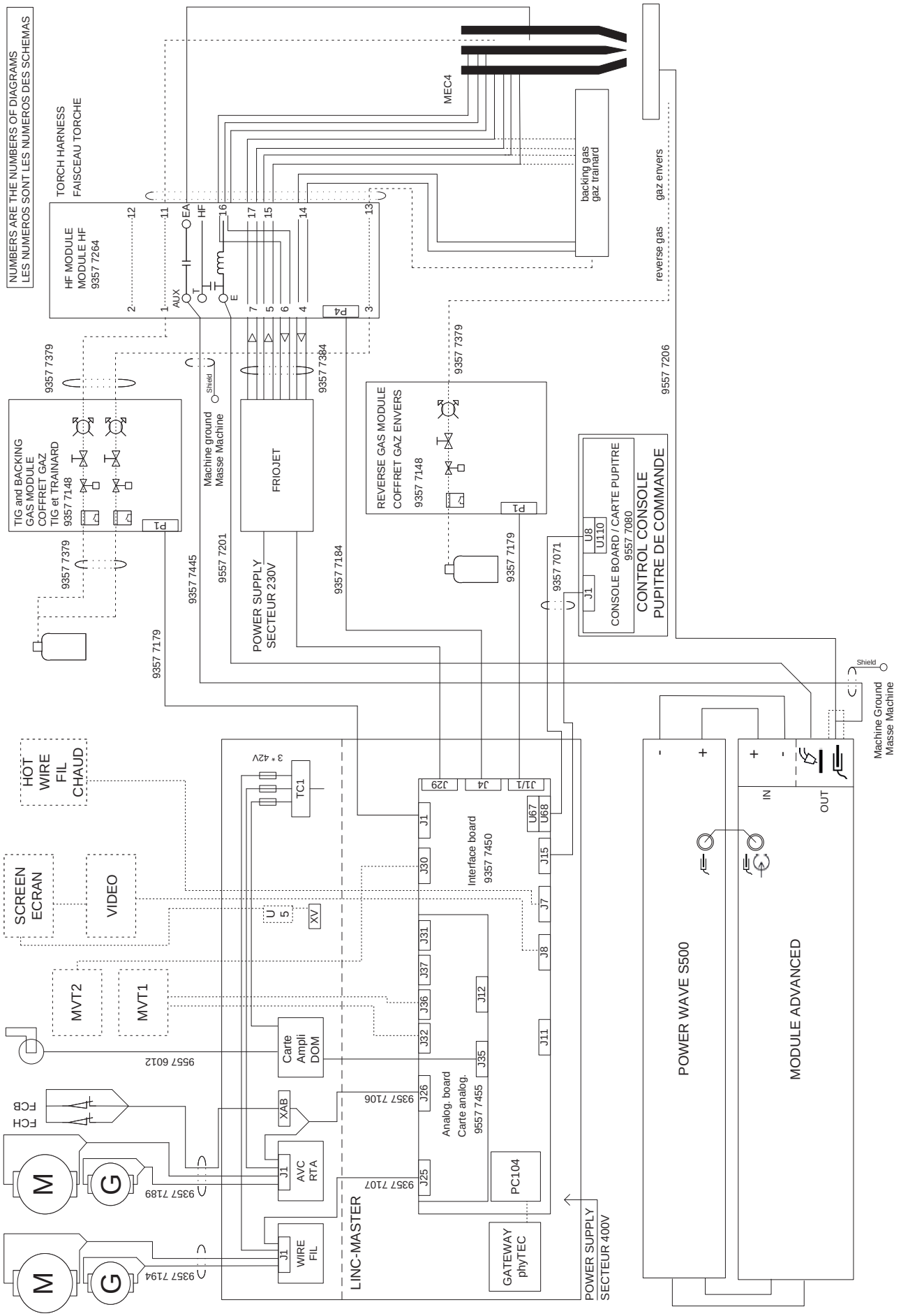
10.2 Simple TIG installation



10.3 Bypass TIG installation



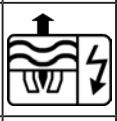
10.4 TIG/Advanced Module *installation*

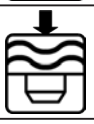
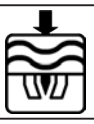


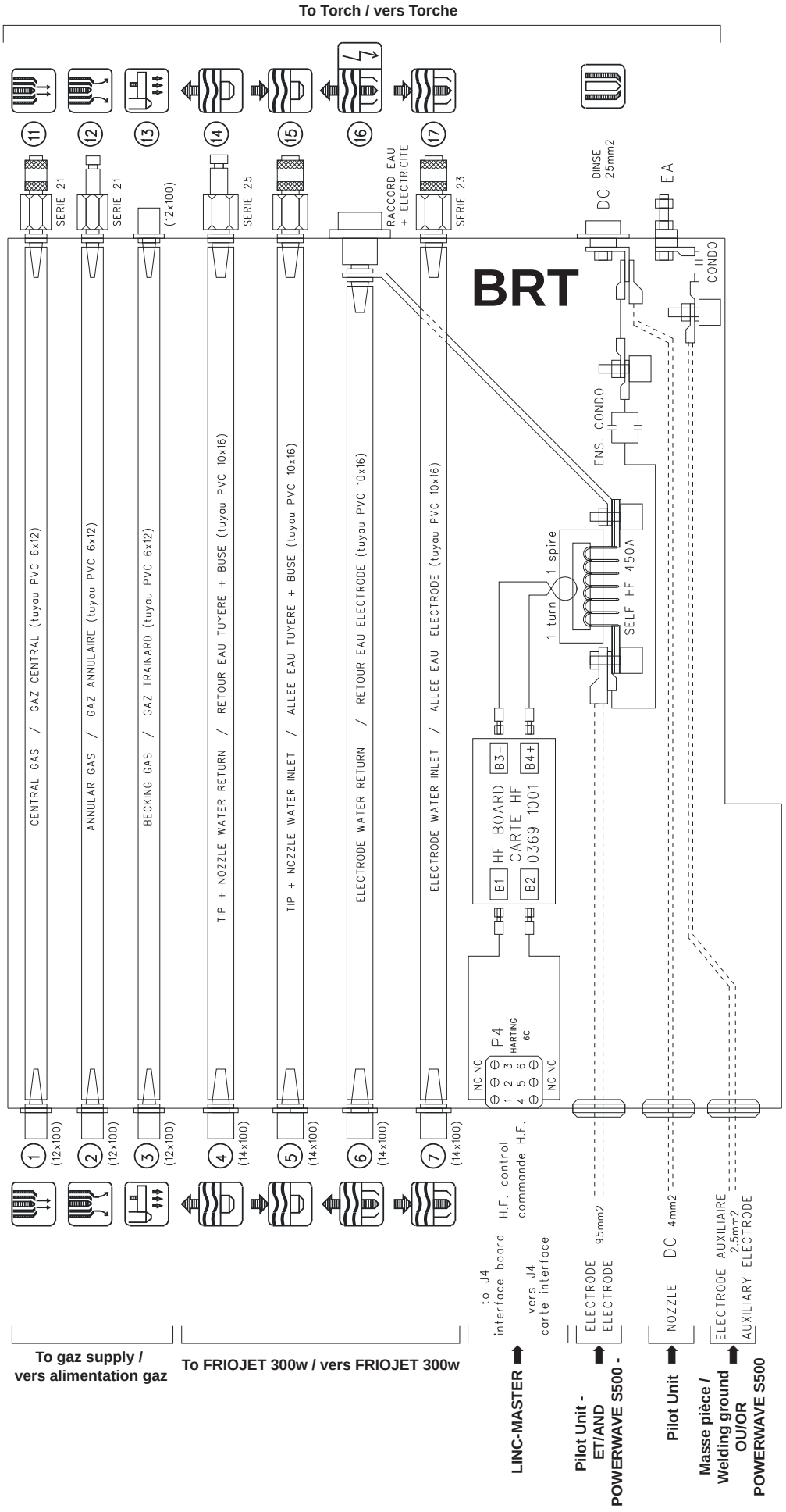
10.5 BRT connection

Connection near the torch

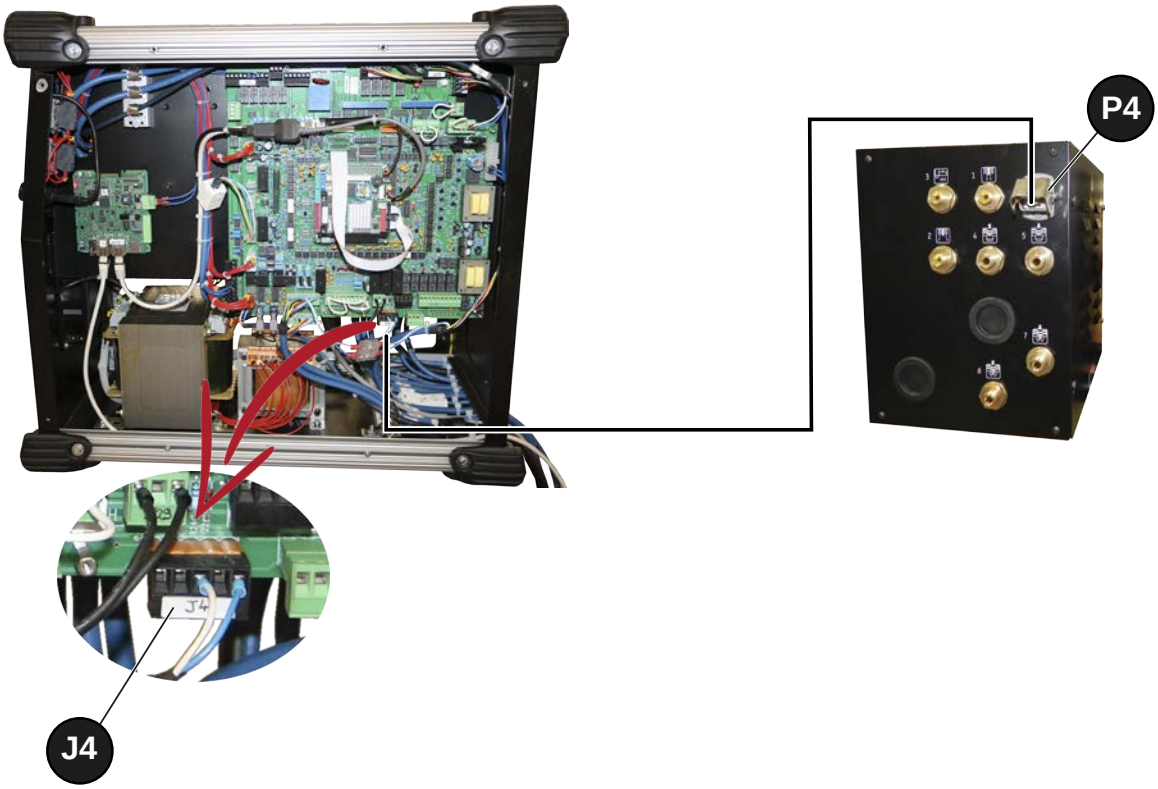
Connection near the power source

11		Central gas
12		Annular gas
13		Trailing shield gas
14		Nozzle water inlet + tip
15		Nozzle water return + tip
16		Electrode water inlet
17		Electrode water return
		Nozzle for **PLASMA**
EA		Auxiliary electrode for **TIG**

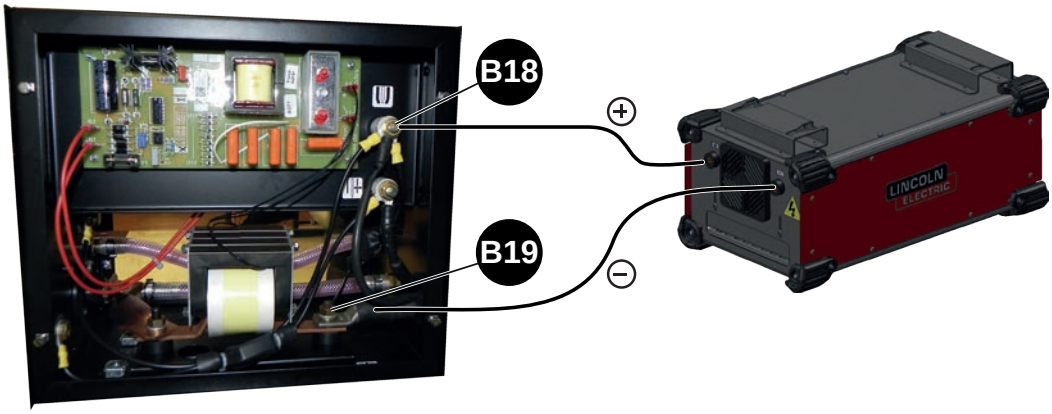
1		Central gas
2		Annular gas
3		Trailing shield gas
4		Cooling unit return 1 (hot water)
5		Cooling unit inlet 1 (cold water)
6		Cooling unit return 2 (hot water)
7		Cooling unit inlet 2 (cold water)
P4		Harting connector of control bundle


To Torch / vers Torche
BRT
CENTRAL GAS / GAZ CENTRAL (tuyau PVC 6x12)
ANNULAR GAS / GAZ ANNULAIRE (tuyau PVC 6x12)
BECKING GAS / GAZ TRAINARD (tuyau PVC 6x12)
TIP + NOZZLE WATER RETURN / RETOUR EAU TUYERE + BUSE (tuyau PVC 10x16)
TIP + NOZZLE WATER INLET / ALLEE EAU TUYERE + BUSE (tuyau PVC 10x16)
ELECTRODE WATER RETURN / RETOUR EAU ELECTRODE (tuyau PVC 10x16)
ELECTRODE WATER INLET / ALLEE EAU ELECTRODE (tuyau PVC 10x16)
SERIE 21
SERIE 21
(12x100)
SERIE 25
RACCORD EAU + ELECTRICITE
SERIE 23
DC DINSE 25mm2
EA
CONDO
ENS. CONDO
SELF HF 450A
1 spire
1 turn
HF BOARD
CARTE HF
0369 1001
B1
B2
B3-
B4+
P4
HARTING 6C
NC NC
to J4 interface board
vers J4 carte interface
H.F. control
commande H.F.
ELECTRODE 95mm2
ELECTRODE
NOZZLE DC 4mm2
ELECTRODE AUXILIAIRE 2.5mm2
AUXILIARY ELECTRODE
To gaz supply / vers alimentation gaz
To FRIOJET 300w / vers FRIOJET 300w
LINC-MASTER
Pilot Unit - ET/AND POWERWAVE S500 -
Pilot Unit
Masse pièce / Welding ground OU/OR POWERWAVE S500

Connect the HF high-frequency control cable to the interface board of the **LINC-MASTER** unit at **J4** and connector **P4** to the **BRT** unit.



For **PLASMA**: connect the electrode cable to the pin **B19** and the nozzle cable to the pin **B18**.



For **TIG** welding: connect the auxiliary electrode cable between the **POWERWAVE S500 (+)** or the workpiece ground and **B20** (coaxial cable with shield connection on both sides).

For **TIG** welding with the **Advanced Module**: connect the auxiliary electrode cable between the **Advanced Module** (ground) or the workpiece ground and **B20** (coaxial cable with shield connection on both sides).

10.6 Connection of power source secondary

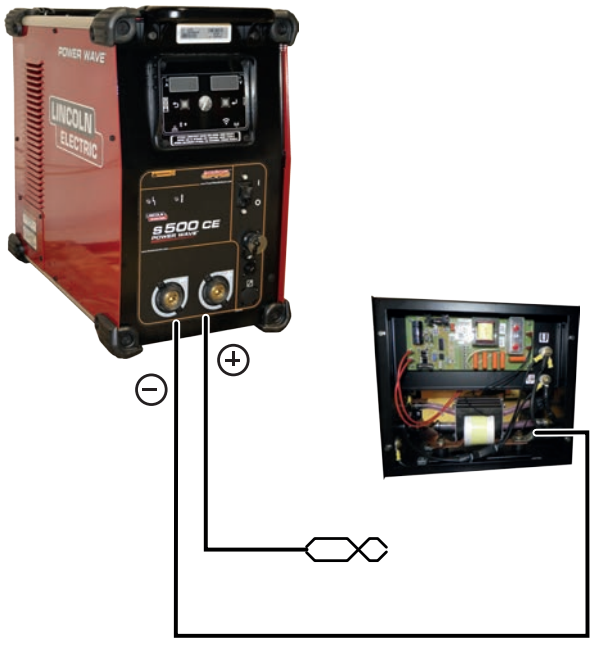
Before any connection to the outlet terminals, make sure that all the primary power inputs of the machine have been switched off at the main switch (Off).

Please refer to the document:
- **IM10456: POWER WAVE S500 UL-CSA; POWER WAVE S500 CE; POWER WAVE S500 CCC**
- **IM10149: POWERWAVE Advanced Module**

Refer to the electrical diagram:
- **95577043 => Electrical diagram for standalone LINC-MASTER installation**
- **95577042 => Connection of LINC-MASTER interface**
- **93570112 => Electrical diagram of LINC-MASTER unit**
- **93570130 => Electrical diagram of PILOT UNIT**

With Advanced Module

Without Advanced Module

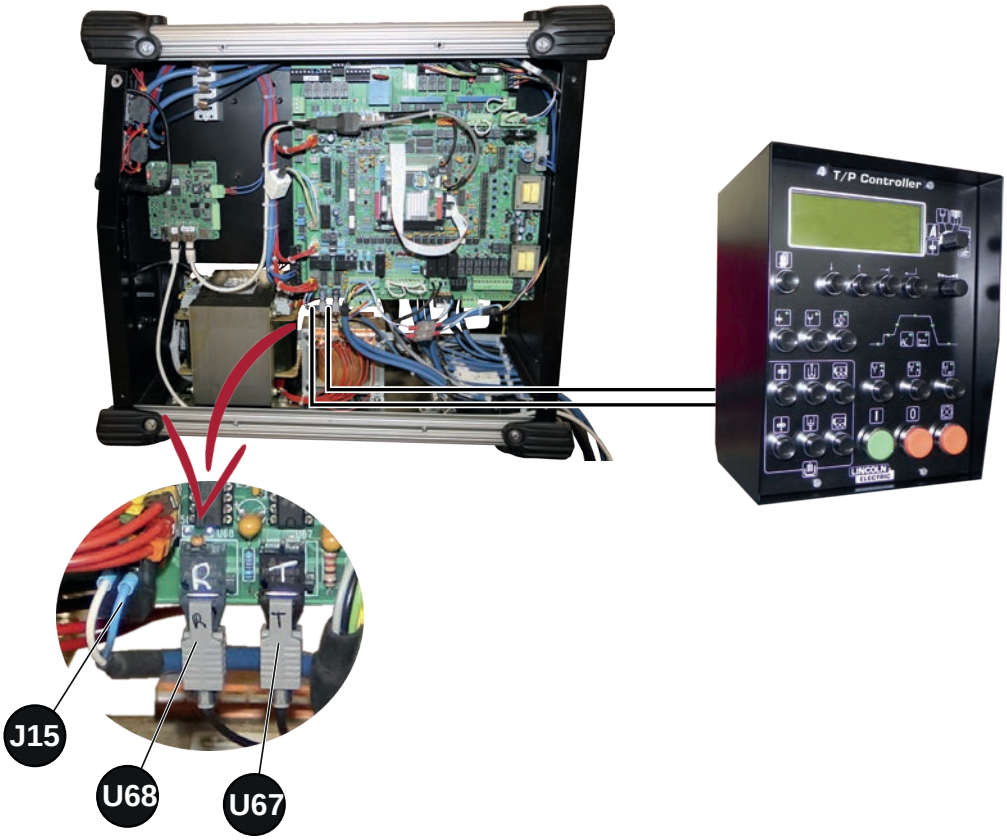


10.7 Console connection

Do not shorten the optical fibres and the cable of the T/P CONTROLLER.

Connect the following to the interface board of the **LINC-MASTER** unit:

- The wire to **J15**
- The optical fibre marked **T** to **U67**
- The optical fibre marked **R** to **U68**



1 - Front of LINC-MASTER unit and PILOT UNIT

1	**LINC-MASTER** unit On indicator
2	Fault indicator
3	USB port
4	**LINC-MASTER** installation main switch
5	**PILOT UNIT** On indicator

2 - Starting up and shutting down the LINC-MASTER installation

Powering up:

- Set the disconnector **ref 4** to the position **I**; indicators **ref 1** and **ref 5** light up.
- Start up the **POWERWAVE S500** source.
- Start up the **FRIOJET 300w** cooling unit.

To execute movements and/or welding cycles, refer to the "Welding cycle" section in this manual.

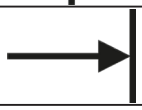
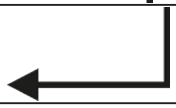
Powering down:

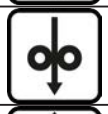
- Set the disconnector **ref 4** to position **0**; indicators **ref 1** and **ref 5** go off.
- Shut down the **POWERWAVE S500** source.
- Power down the **FRIOJET 300w** cooling unit.

Please refer to the document:

- **IM10456: POWER WAVE S500 UL-CSA; POWER WAVE S500 CE; POWER WAVE S500 CCC**
- **86954939: FRIOJET 300w**


P3
P2
P4
P20
P21
P22
P1
PDC
T/P Controller
P23
P6
P5
P24
P25
P7
P8
P26
P9
P10
PH3
PH4
PH5
PH2
PH1
PH6
P18
P19
P17
P12
P16
P13
P15

Ref.	Symbol	Meaning
P1		4 x 20 character screen
P23		Selection of wire feed speed during the cycle for modification with **P22**.
		Selection of welding intensity during the cycle for modification with **P22**
		Selection of arc voltage during the cycle for modification with **P22**
		Selection of plasma gas flow for modification with **P22**
		Selection of welding movement speed for modification with **P22**
		Selection of magnetic arc oscillation deviation during TIG for modification with **P22**.
P3		Access to the different menus and escape key
P2		Downward movement of cursor on the screen
P4		Upward movement of cursor on the screen
P20		Movement to the right of cursor on the screen (next cursor)
P21		Confirm selection
P22		Edit setting
P5		Wire feed selection
P6		Feeling selection
P18		Welding mode with variable polarity selected
P19		Pulsating welding mode selected
P12		Gas + water test (for plasma gas: pilot gas flow)
P16		Gas + water test (for plasma gas: welding gas flow)

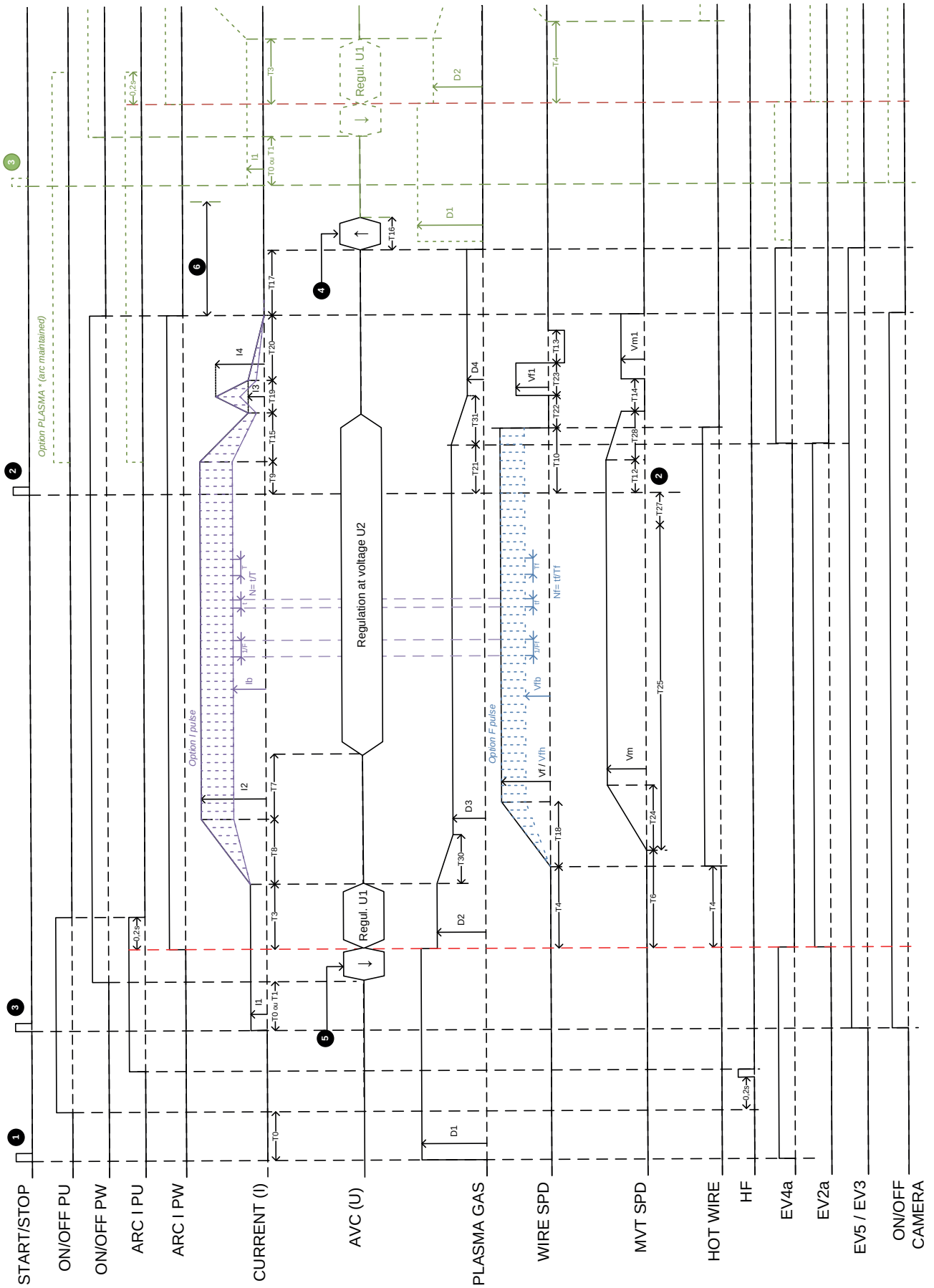
P17		HF high frequency test
P13		Welding cycle start
P14		Welding cycle stop
P15		Immediate cycle stop (without fading)
P7		Manual wire lift
P9		Manual wire feed
P8		Manual torch up
P10		Manual torch down
P24		Enabling/disabling high speed for the following movements: welding movement 1; torch; wire
P25		Welding movement 1, plus direction
P26		Welding movement 1, minus direction
PH1		Pre-gas phase indicator
PH2		Pre-welding phase indicator
PH3		Intensity rise phase indicator
PH4		Welding phase indicator
PH5		Fade phase indicator
PH6		Post-gas phase indicator

4.1 Welding settings

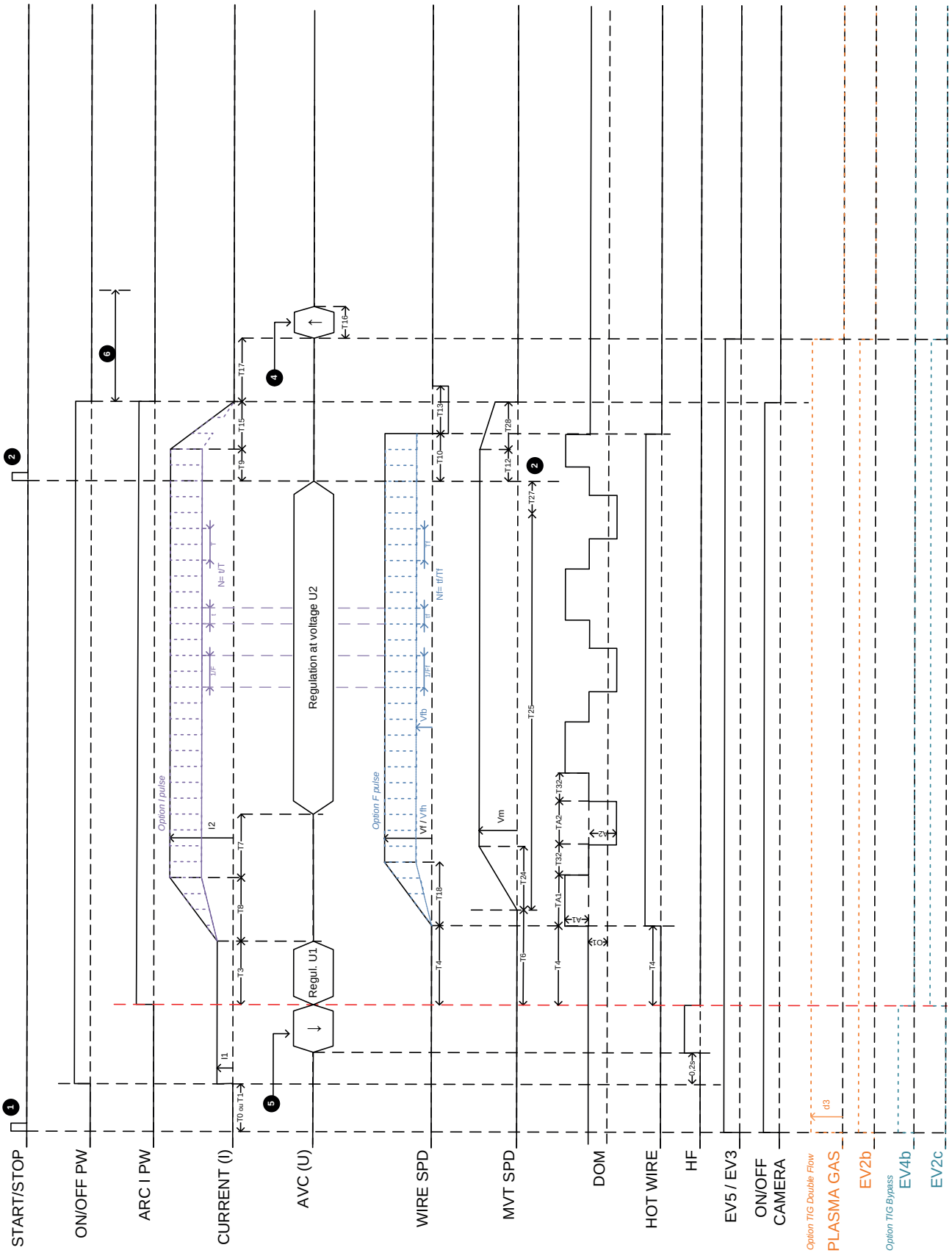
❶	Cycle start
❷	Cycle stop
❸	Request for transfer
❹	AVC up
❺	AVC down
❻	Post-water
Start/Stop	Controls
SA On/Off	SA On/Off
SP On/Off	SP On/Off
SA IR	Pilot arc On
SP IR	Welding arc On
Current (I)	I power source (setpoint)
Voltage (U)	U sensing
AVC On/Off	AVC control
PLASMA gas	PLASMA gas
Wire Spd	Wire speed
Wire On/Off	Wire control
Movement On/Off	Welding movement 1
Mvt sped	Analogue welding movement 1
MDO/Hot Wire	MDO/Hot wire
HF	HF
EV4a	EV4 (strike plasma)
EV4b	EV4 (argon annular)
EV2a	EV2 (welding plasma)
EV2b	EV2 (double flow)
EV2c	EV2 (helium annular)
EV5/EV3	EV5 (annular/trailing) EV3 (backing)
Camera On/Off	Camera control
MDO	TIG welding arc magnetic oscillation deviation
T0	Torch pre-gas time
T1	Backing pre-gas time
T3	Pre-welding time
T4	MDO or wire start delay time
T6	Movement start delay time
T7	Welding sensing delay time
T8	Intensity rise time
T9	Welding intensity hold time
T10	MDO or wire stop delay time
T12	Movement stop delay time
T13	Wire retract time
T14	Movement resumption delay time
T15	Current fade time
T16	AVC clearance time

T17	Post-gas time
T18	Wire up time
T19	Current peak time
T20	PLASMA current fade time
T21	PLASMA gas hold time after a cycle stop
T22	Wire stop time before start of peak
T23	Wire feed time during peak
T24	Time for reaching welding movement speed
T25	Welding cycle time
T26	Movement time
T27	Overlap welding time
T28	Welding movement fade time
T30	D1 to D2 passage time
T31	Gas fade time (keyhole closing)
T32	Oscillation pause time (MDO synchronisation for welding voltage measurement)
I1	Pre-welding intensity
I2	Welding intensity
I3	Current at start of plasma peak
I4	Current at top of peak
Ib	Pulsed DC low intensity
Id	AC stripping intensity
Ih+	Pulsed AC high intensity
Ih-	Pulsed AC low intensity
F	Pulsed DC frequency
N	Pulsed DC duty cycle
Fac	AC polarity frequency
Nac	AC duty cycle
Pac	AC gradient
SC	Switching limit
U1	Pre-welding voltage
U2	Welding voltage
Vf	Wire feed speed
Vf1	Wire feed time during peak
Vfh	Pulsed wire upper wire feed speed
Vfb	Pulsed wire lower wire feed speed
Ff	Pulsed wire frequency
Nf	Pulsed wire duty cycle
P1	Case of pulsed wire
D1	Pilot arc gas flow rate
D2	Pre-welding gas flow rate
D3	Welding gas flow rate
D4	Residual gas flow rate
TA1	Arc deviation time in positive direction
TA2	Arc deviation time in the negative direction
A1	Arc deviation amplitude in positive direction
A2	Arc deviation amplitude in the negative direction
O1	Arc deviation offset (deviation centring)

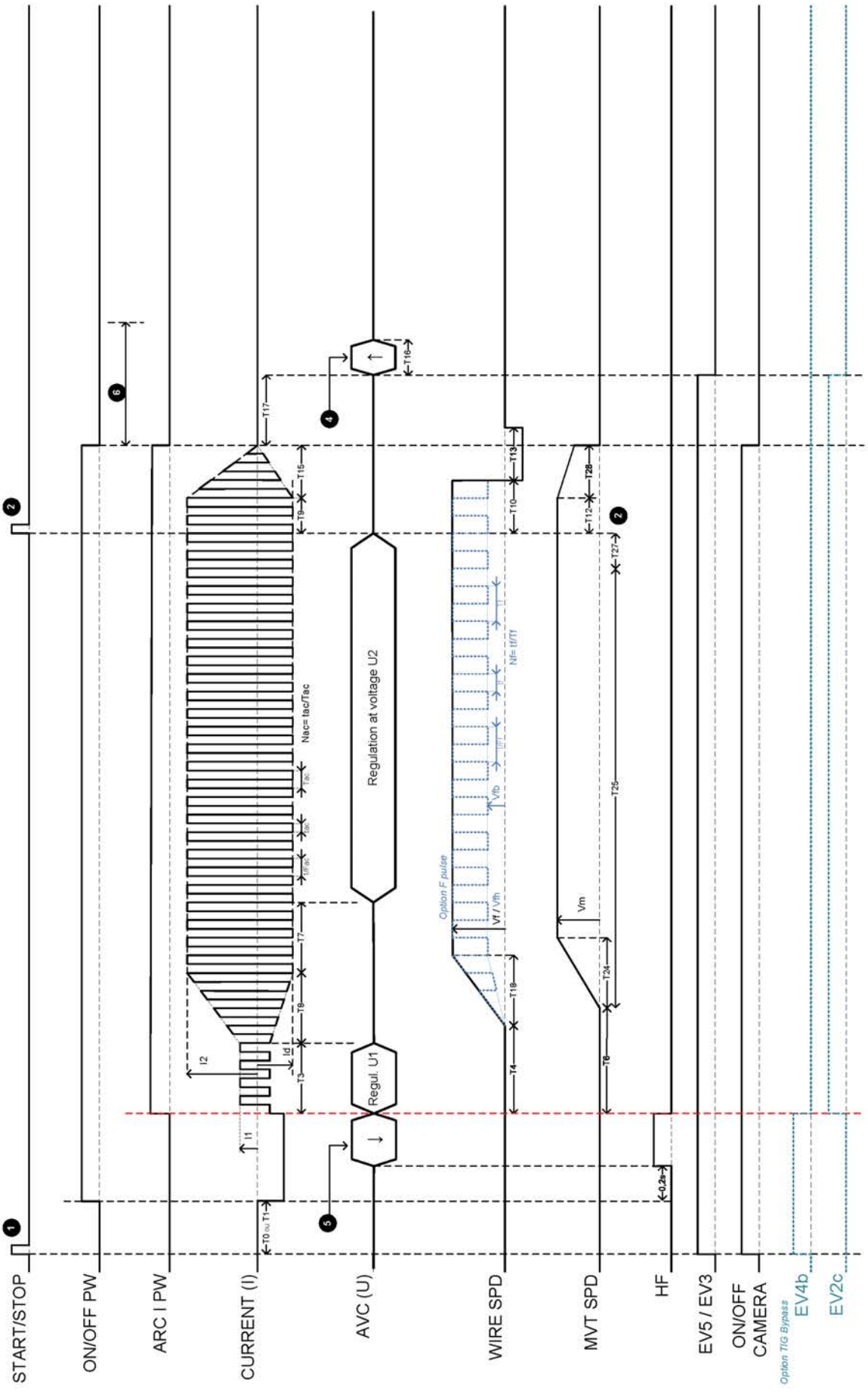
4.2 DC PLASMA timing chart



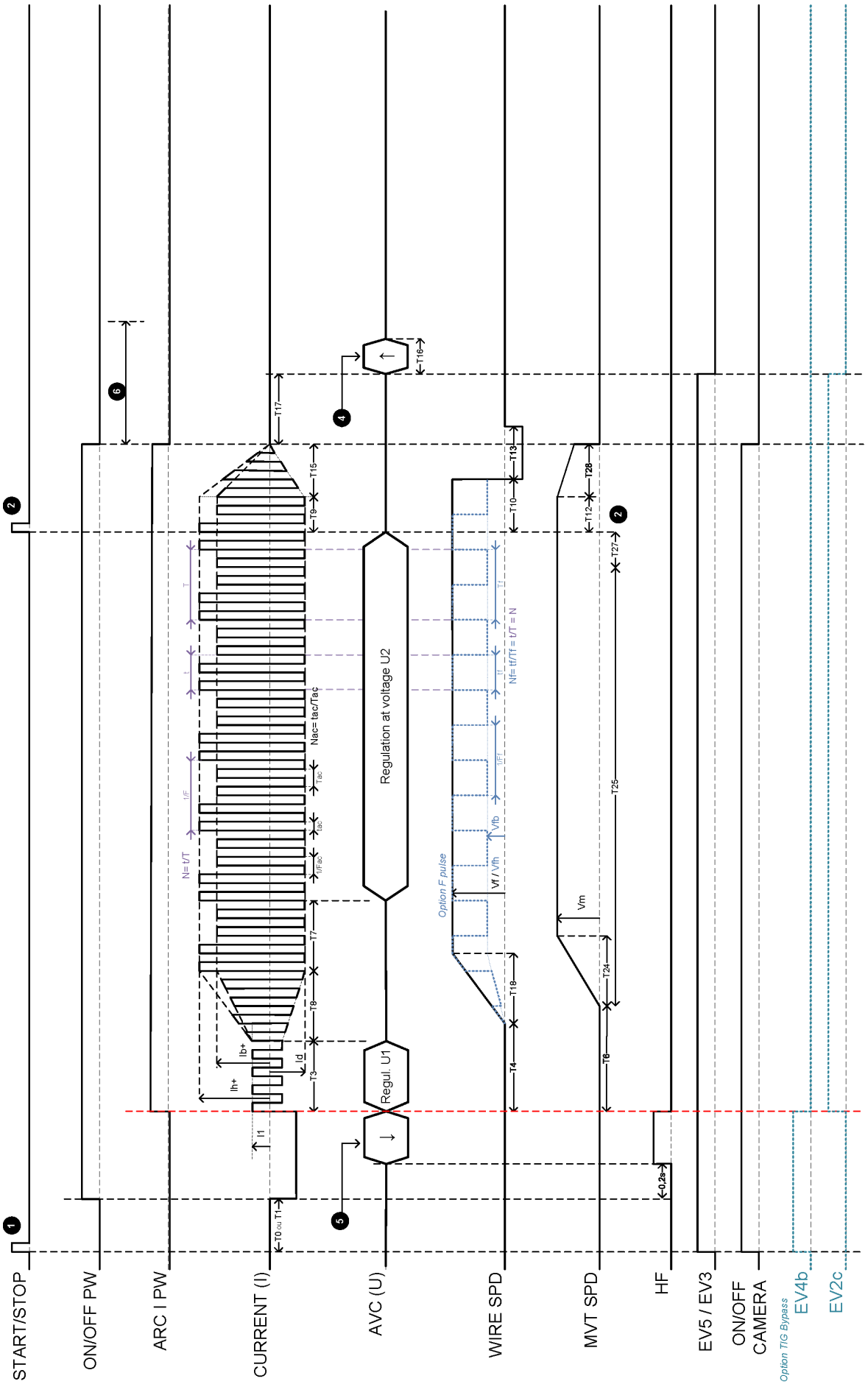
4.3 DC TIG timing chart

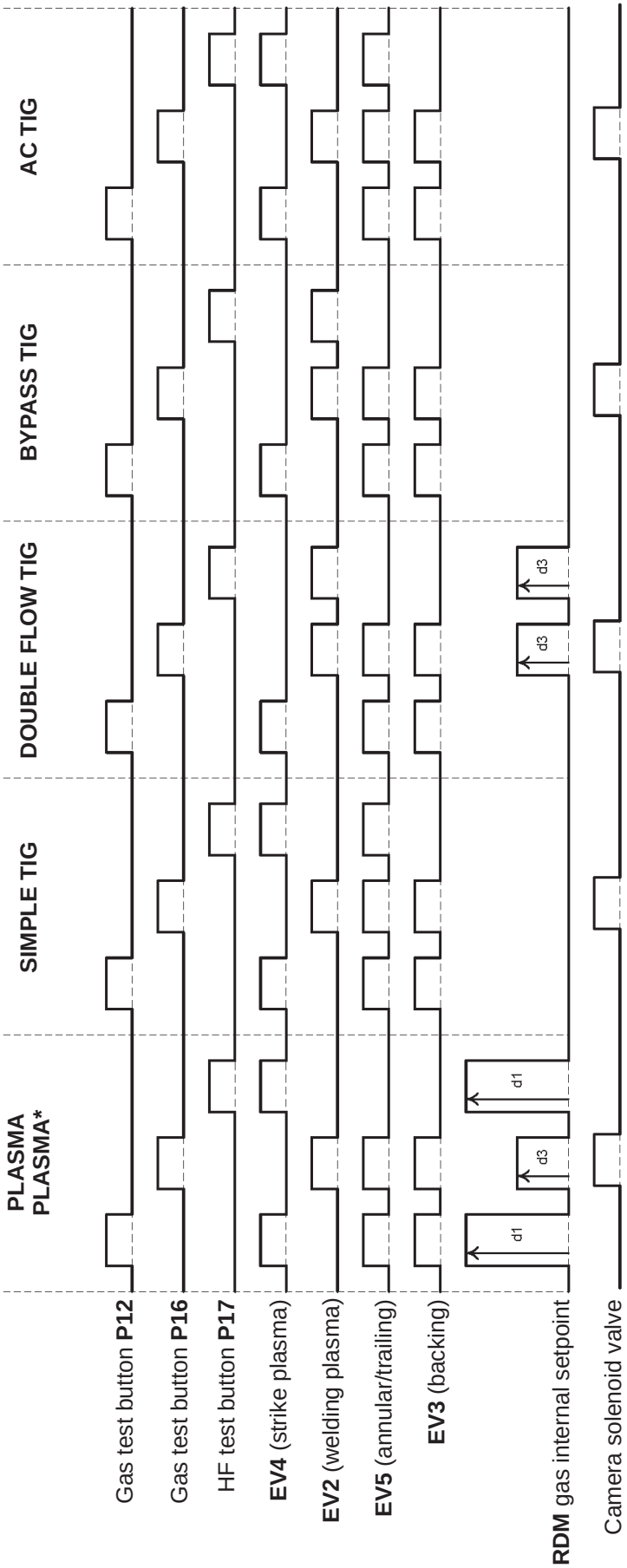


4.4 AC TIG timing chart



4.5 Pulsed AC TIG timing chart




PLASMA
PLASMA*
SIMPLE TIG
DOUBLE FLOW TIG
BYPASS TIG
AC TIG
Gas test button P12
Gas test button P16
HF test button P17
EV4 (strike plasma)
EV2 (welding plasma)
EV5 (annular/trailing)
EV3 (backing)
RDM gas internal setpoint
Camera solenoid valve
d1
d3
d1
d3
d3

This section addresses the possibilities offered by the **T/P CONTROLLER** control console.

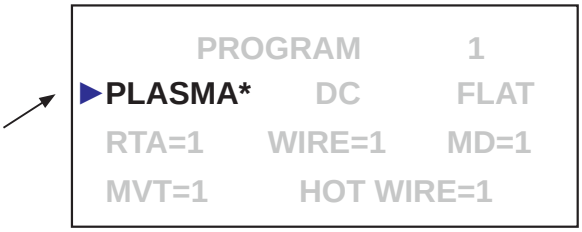
- Setup of your installation
- Welding cycle programming
- Copy program
- Delete program
- Backup all programs and configuration
- Restore all programs and configuration

When the machine is first started up, you need to carry out the **OVERALL CONFIGURATION** and then programme one or more welding cycles.

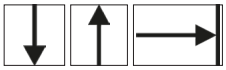
After that, you can enter, save or restore other programs (99 max.)

This key is used for accessing the three main menus, **PROGRAM**, **EDIT**, **CONFIGURATION** in a closed loop. In the sub-menus, it is also used for not confirming the previous choice (Escape key).

The selected setting is identified by a cursor.



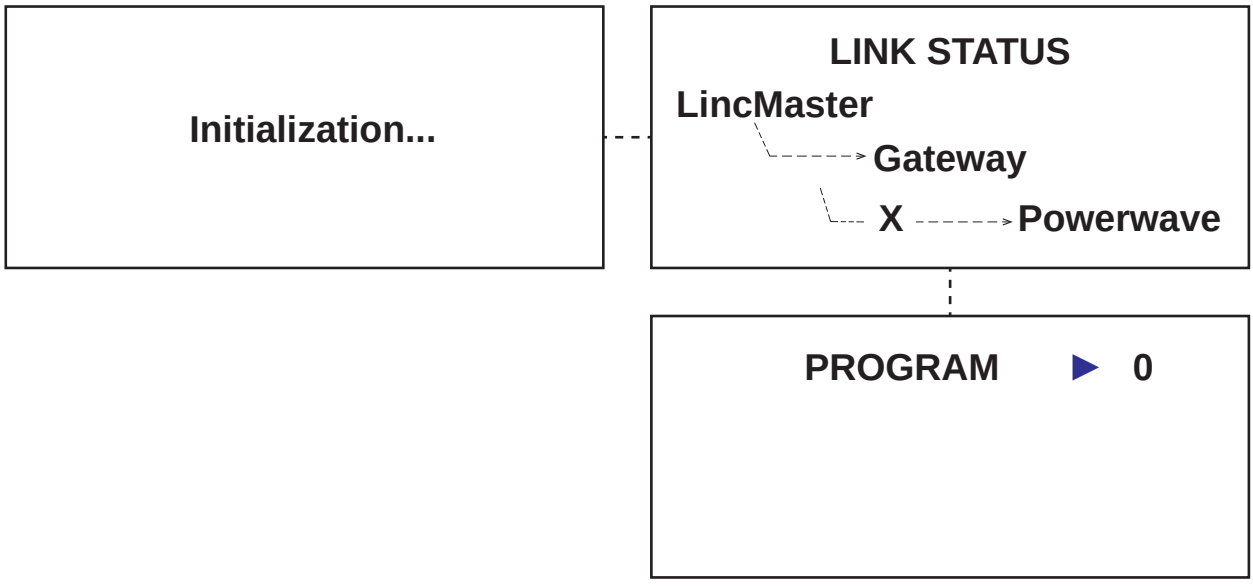
☛Cursor movement key



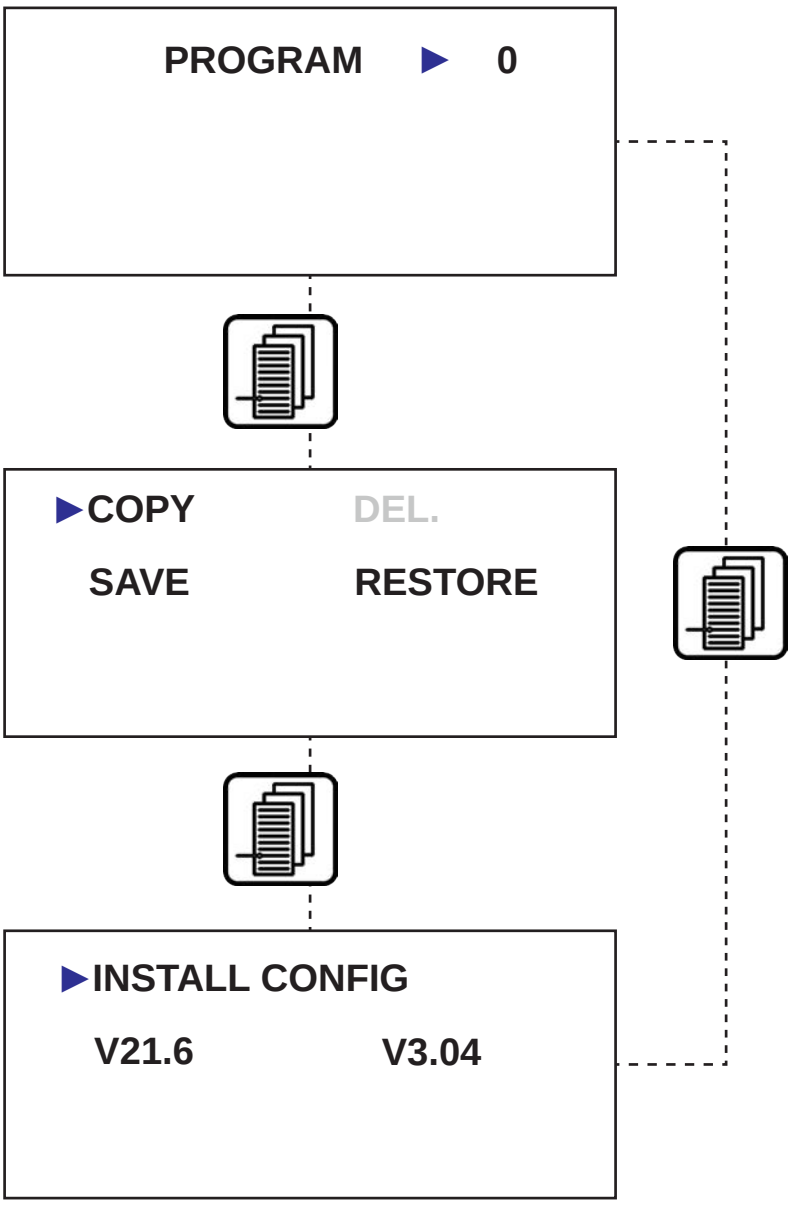
☛Value change key

5.1 Starting up

The following screens are displayed upon powering up.



Menu selection:



PROGRAM

For programming up to 99 welding cycles

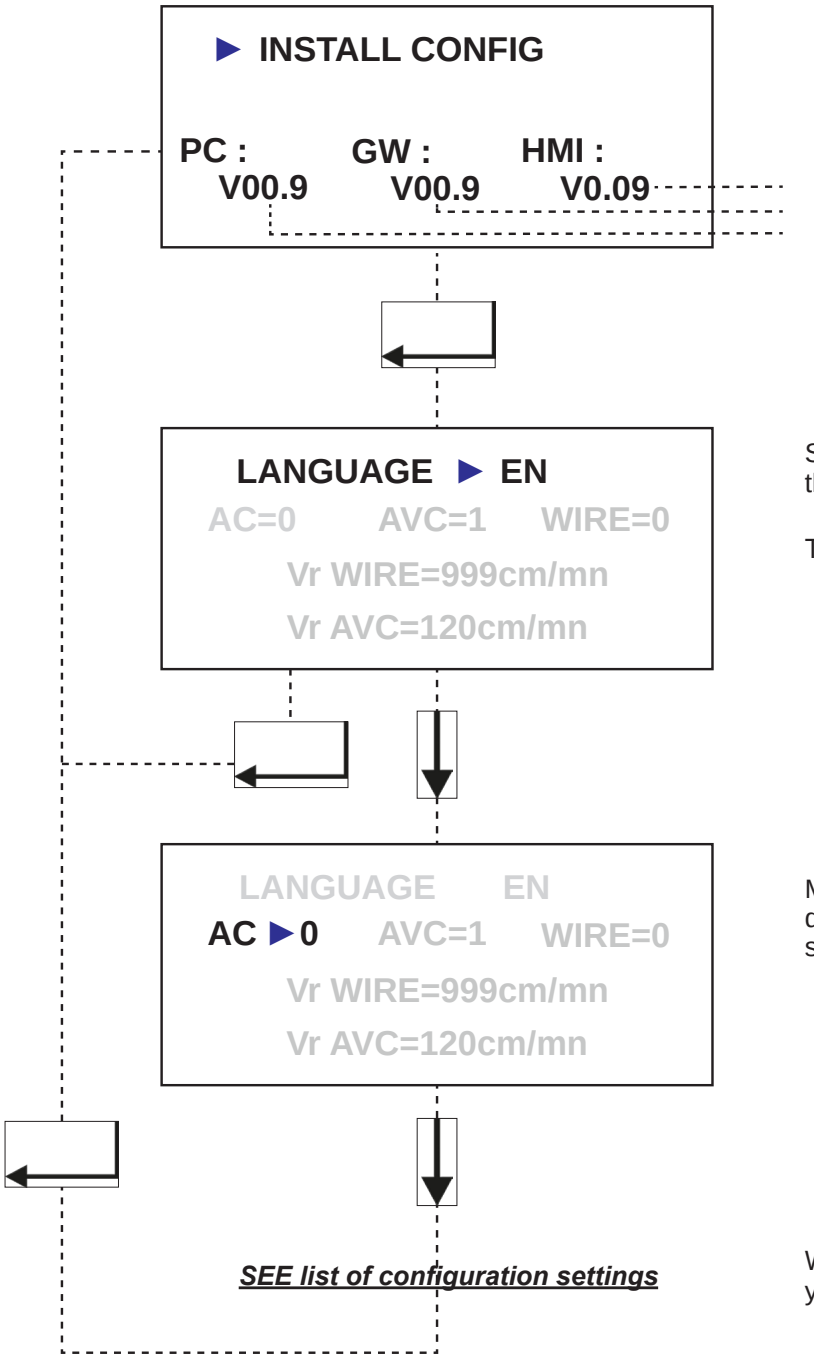
Program 0 does not exist as a program.

EDIT

For copying, saving, printing and restoring programs.

CONFIGURATION

For configuring the installation depending on the selected options.



CONFIGURATION OF THE INSTALLATION

Console software version
Gateway version
PC104 software version

Select your language using the button:

Then confirm using:

All the menus are now available in your language.

Move the cursor and make all the settings depending on your installation. (the screen scrolls)

See the list of configuration settings on the following page.

When you are done, confirm your choice using the key:

CONFIGURATION SETTINGS

L	A	N	G	U	A	G	E				**01**	E	N						
A	C	**02**	0				A	V	C	**03**	1		W	I	R	E	**04**	6	
V	r		W	I	R	E			**05**	0	6	0	0	c	m	/	m	i	n
V	r		A	V	C				**06**	0	1	2	0	c	m	/	m	i	n
M	D				**07**	0													
I	N	T	E	R	N	A	L		M	D							**115**	1	
S	Y	N	C	H	R	O		M	D					**116**	0	.	1	0	s
H	O	T		W	I	R	E			**08**	0								
M	V	T	1	**09**	+	/	-	1	0	V		:		c	m	/	m	i	n
M	V	T		M	A	X		R	E	F				**100**	1	0	.	0	V
M	V	T		M	A	X		**101**	E	1	0	0	0	c	m	/	m	i	n
M	V	T		M	A	X		M	E	A	S			**102**	1	0	.	0	V
M	A	X		M	E	A	S	**103**	E	1	0	0	0	c	m	/	m	i	n
L	O	W		S	P	D			**104**	0	3	0	%						
H	I	G	H		S	P	D		**105**	0	3	0	%						
A	U	T	O		S	P	D		**106**	1	0	0	%						
P	A	R	K	I	N	G			**107**	<	L	S	1						
M	V	T	2	**10**	O	N	/	O	F	F									
R	E	V	E	R	S	E		G	A	S							**11**	0	
B	Y	P	A	S	S		G	A	S								**12**	0	
D	O	U	B	L	E		G	A	S		F	L	O	W			**13**	0	
P	L	C	**27**	0				S	T	A	R	T		D	I	S	**14**	0	
I	N	T	E	R	N	A	L		R	D	M		U	N	I	T	**28**	1	
C	O	R	R	E	C		R	D	M			A	**117**	+	1	.	0	0	0
C	O	R	R	E	C		R	D	M			B	**118**	+	0	.	0	0	0
A	V	C		K	p				**124**	1	.	4							
A	V	C		K	i				**125**	0	.	2							
A	V	C		K	p		(	F	<	5	H	z	)	**126**	0	.	4		
A	V	C		K	i		(	F	<	5	H	z	)	**127**	0	.	1		
A	V	C		K	p		A	C						**128**	1	.	0		
A	V	C		K	i		A	C						**129**	0	.	2		
P	W		H	I	B	E	R	N		T		**130**	0	0	2	0	m	i	n
P	W		A	R	C		T	I	M	E	O	U	T		**131**	0	0	5	s
P	A	S	S	W	O	R	D							**15**			0		
A	c	c	e	s	s									**16**	1	0	0	%	

Cursor position

Reference of the cursor position	Setting	Meaning			Value		
01	LANGUAGE	Choice of settings display language			FR - GB - DE IT - PT - ES NL - PL		
02	AC	Indicates whether the power source has an AC module			0=no	1=yes	
03	AVC	Indicates if the installation has the AVC option			0=no	1=yes	
04	YARN	Indicates if the installation has the WIRE option			0= 0m/min	6= 6m/min	10= 10m/min
05	WIRE Hs	High speed manual wire feed or retract (if pushbutton P24 active)			0 to 600 cm/min		
					0 to 1000 cm/min		
06	AVC Hs	High speed manual torch up or down (if pushbutton P24 active)			0 to 250 cm/min		
07	MOD	Indicates if the installation has a TIG arc deviation or oscillation option			0=no	1=yes	
08	HOT WIRE	Indicates if the installation has the HOT WIRE option			0=no	1=yes	
09	MVT1	Indicates if the installation has the movement 1 option.	0	No movement.			
			ON/OFF	Movement on/off control.			
			0/10V: cm/min	Displacement type axis: Analogue command 0V/+10V and 2 logical direction commands.			
			0/10V: rpm	Rotation type axis: Analogue command 0V/+10V and 2 logical direction commands.			
			+/-10V: cm/min	Displacement type axis: Analogue command -10V/+10V and unlocking.			
			+/-10V: rpm	Rotation type axis: Analogue command -10V/+10V and unlocking.			
10	MVT2	Indicates if the installation has the movement 2 option	0	No movement.			
			ON/OFF	Movement on/off control.			
11	BACKING GAS	Indicates if the installation has the BACKING GAS option			0=no	1=yes	
12	BYPASS GAS	Indicates if the installation has the BYPASS GAS option (for TIG)			0=no	1=yes	

13	DOUBLE FLOW GAS	Indicates if the installation has the DOUBLE FLOW GAS option (for TIG)	0=no	1=yes
14	SCY DISABLE	Indicates if the cycle start and stop button of the console is active or inactive	0=active	1=inactive
15	CODE	Operator accessibility password	1 to 999	
16	ACCESS	% accessibility by operator to welding setting during the cycle (U,I,Wire) 100%=max. access, 0%=block	0 to 100	
27	PLC	Indicates if the installation is in inactive or active Opened PLC mode. As standard, the Opened PLC mode is inactive.	0=inactive	1=active
28	INTERNAL RDM	Indicates if the plasma gas valve is managed internally within the power source or via the RDM console	0=via RDM console	1=internal to power source
100	MVT U MAX CONS	Maximum analogue voltage corresponding to the maximum speed of the axis defined in the setting 101.	1V to 10V	
101	MVT MAX	Axis speed when it receives the maximum voltage setpoint defined by the setting 100	1cm/min to 1000cm/min	
			0.100rpm to 60,000rpm	
102	MES U MAX MVT	Measurement voltage adjusted by the potentiometer R85 and corresponding to the maximum measured speed of the axis.	1V to 10V	
103	MES MAX	Speed corresponding to the setting 102	1cm/min to 1000cm/min	
			0.100rpm to 60,000rpm	
104	SLOW SPD	Slow speed in manual control of movement 1 as a percentage of the maximum speed defined in setting 101	1% to 100%	
105	HIGH SPD	High speed in manual control of movement 1 as a percentage of the maximum speed defined in setting 101	1% to 100%	
106	AUTO SPD	Automatic speed in manual control of movement 1 as a percentage of the maximum speed defined in setting 101	1% to 100%	
107	PARKING	Locates the parking position of the machine defined by FDC3	<FDC1	>FDC2
115	INTERNAL MDO	Indicates if MDO is internal or external	0=external	1=internal
116	MDO SYNC	Indicates the oscillation pause time (MDO synchronisation)	0.01 to 2.00s	
117	RDM CORRECT A	RDM calibration setting	By default: 1.000	
118	RDM CORRECT B	RDM calibration setting	By default: 0.000	

124	AVC Kp	Proportional gain of the arc voltage regulator for smooth or pulsed DC welding>=5Hz	0.1 to 9.9 (default: 1.4)
125	AVC Ki	Integral gain of the arc voltage regulator for smooth or pulsed DC welding>=5Hz	0.1 to 9.9 (default: 0.2)
126	AVC Kp (F<5Hz	Proportional gain of arc voltage control for pulsed<5Hz	0.1 to 9.9 (default: 0.4)
127	AVC Ki (F<5Hz)	Integrator gain of arc voltage control for pulsed<5Hz	0.1 to 9.9 (default: 0.1)
128	AVC Kp AC	Proportional gain of the arc voltage regulator for smooth or pulsed AC welding>=5Hz	0.1 to 9.9 (default: 1.0)
129	AVC Ki AC	Integral gain of the arc voltage regulator for smooth or pulsed AC welding>=5Hz	0.1 to 9.9 (default: 0.2)
130	PW T STAND-BY	Inactive time before the power source is switched to standby	OFF to 1275 minutes (default: 20)
131	PW T ARC STRIKE	Maximum time permitted before arc strike/transfer	OFF to 60 seconds (default: 5)

If the installation requires an adjustment for the setpoint or return of the analogue movement 1 measurement, here is the procedure to follow:

In the configuration menu:

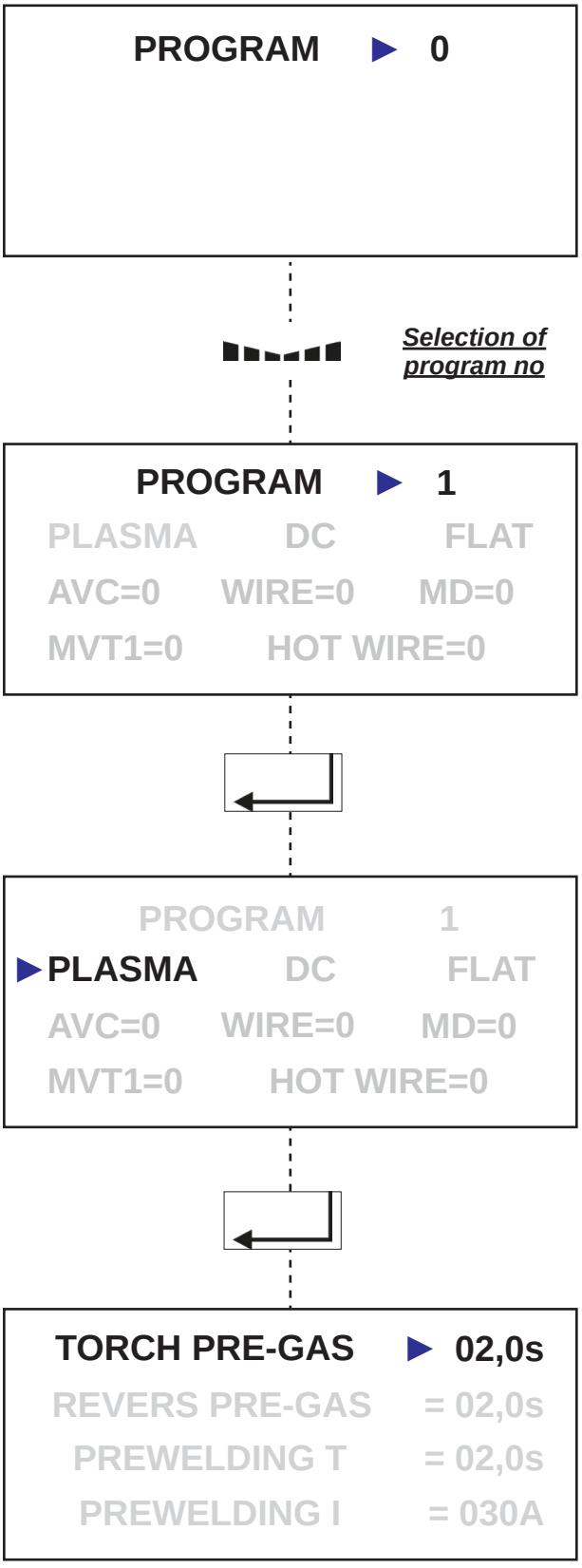
- setting **100**: enter 10V as the setpoint
- setting **101**: enter the feed speed of the axis for a variable drive setpoint of 10V
- setting **102**: enter 10V as the measurement (identical to setting **100**)
- setting **103**: enter the maximum measurement (identical to setting **101**)
- setting **105**: for the high speed, enter 80%

In the program config menu:

- carry out a high speed movement
- observe the movement speed value displayed on the console, modify potentiometer **R85** of the analogue board of the **LINC-MASTER** unit if necessary so that the measurement return is 80% of the maximum speed (setting **101**).

5.3 Menu: Programming

Modification of program 1:



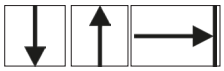
A program is made up of two main parts:

- Setup of the process and options used
- Setup of the welding cycle

Select program 1 which is already set up. The process and options setup is displayed first

Select your setup for the process and options.

☛Cursor movement key

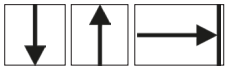


☛Value change key

Then confirm to access the setup of the welding cycle using:

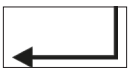
Edit your welding settings.

☛Cursor movement key



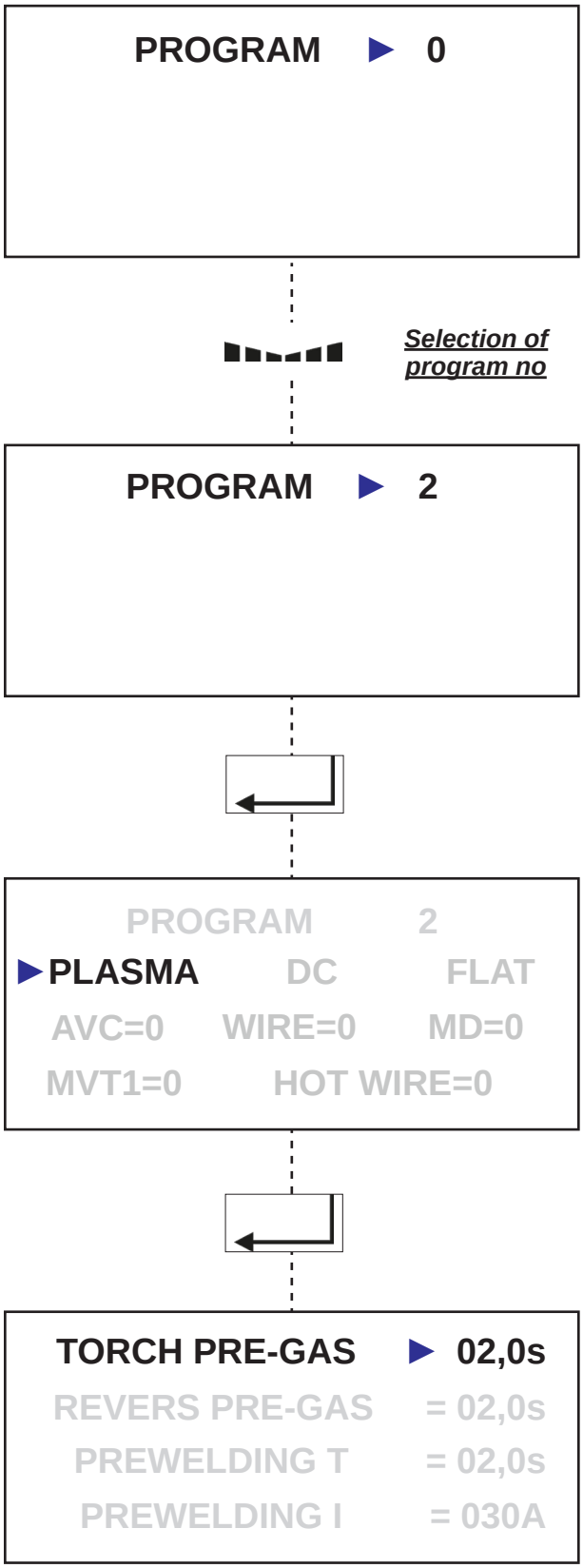
☛Value change key

Then confirm when all the values of the settings are correct:



Max.: 29 possibilities; the software only displays the settings relevant to your configuration.

Program creation:



Select the program no (2 in this case) that you want to create.

Then confirm using:

Your new program is then pre-configured. Carry out the same operations as while EDITING PROGRAM 1.

See the list of settings on the following page

CONFIGURATION SETTINGS

				P	R	O	G	R	A	M			**17**		1				
18	P	L	A	S	M	A	*	**19**		D	C	**20**		F	L	A	T		
	A	V	C	**21**	1		W	I	R	E	**22**	1			M	D		**23**	1
24	M	V	T	1	**25**	0			H	O	T		W	I	R	E		**26**	0

■ Cursor position

Reference of the cursor position	Setting	Meaning	Value		
17	PROGRAM	Choice of program no (all the subsequent settings are related to that program)	1 to 99		
18	PLASMA*	Choice of welding process	• PLASMA (pilot arc not held) • PLASMA* (pilot arc held) • TIG • BP TIG (bypass) • DF TIG (double flow)		
19	DC	Current polarity	DC	AC	
20	SMOOTH	Pulsating current or not	SMOOTH	PULSED	
21	AVC	Use of arc voltage control	0=no	1=yes	
22	YARN	Use of wire feed	0 =no	1 =yes	2 =pulsed
23	MOD	Use of TIG arc oscillation or deviation	0=no	1=yes	
24	MVT	Choice of welding movement, MVT1 or MVT2.	MVT1	MVT2	
25	=	Choice of type of welding movement	See Type of welding movement		
26	HOT WIRE	Use of HOT WIRE option	0=no	1=yes	

5.4 Type of welding movement

Cycle without movement:

0 ☛ No welding movement

Cycle with infinite movement:

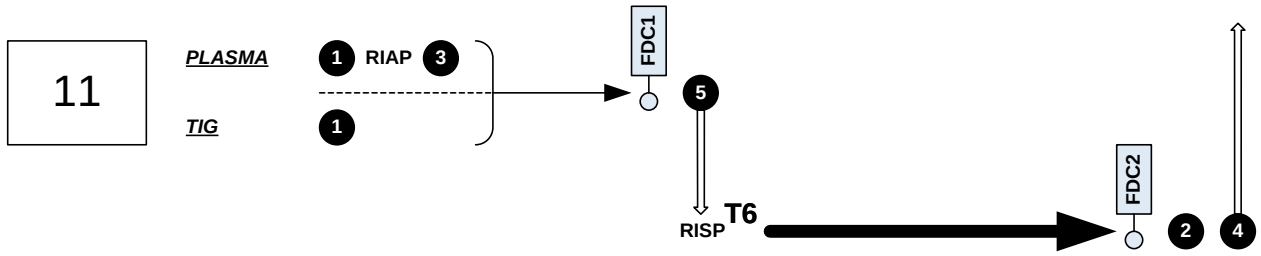
1 ☛ The welding movement stops when the cycle stops

Cycle with timed movement:

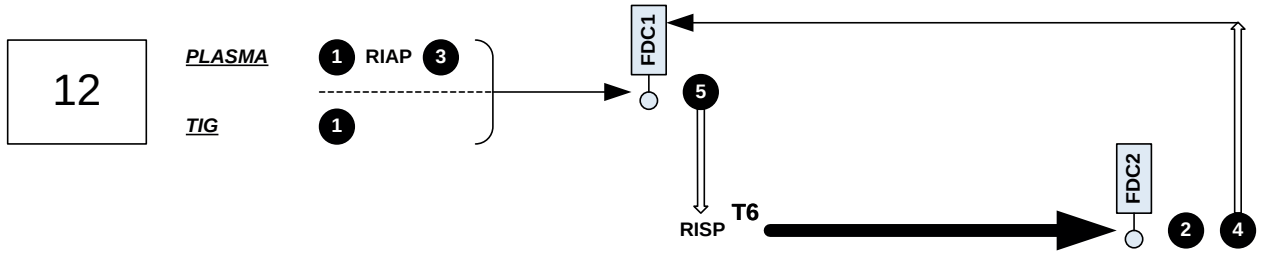
2 ☛ The cycle stops automatically when the setting (**T25**) has elapsed

❶	1st cycle start
❷	Cycle stop
❸	2nd cycle start
❹	AVC clearing (**T16**)
❺	RTA down
RIAP	Pilot arc active
RISP	Welding arc active
T6	Movement start time
T25	Welding time
T26	Movement time
NB	Total number of rotations
n	Number of current rotations
⟶	Movement in + direction with continuous welding at MVT SPD
→	Movement without welding at AUTO SPD (**106**)
⇨	AVC movement
FDC1	Limit switch 1
FDC2	Limit switch 2
FDC3	Limit switch 3

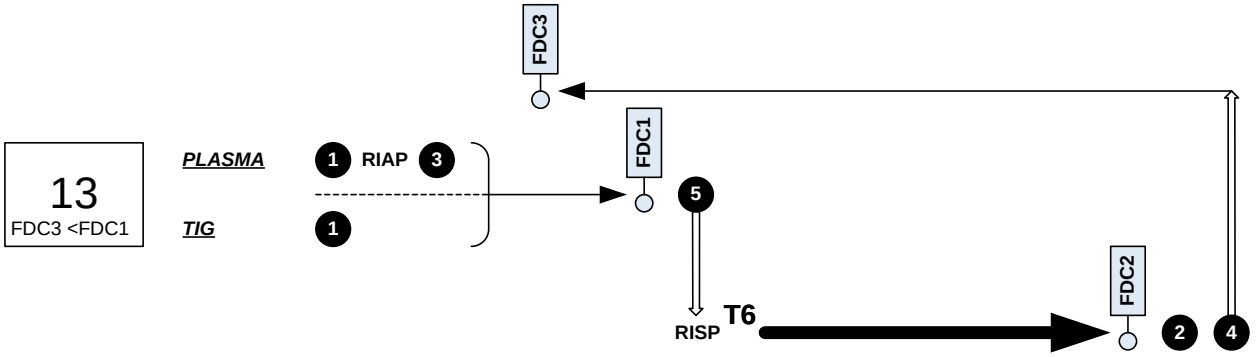
Displacement cycle 1, continuous length

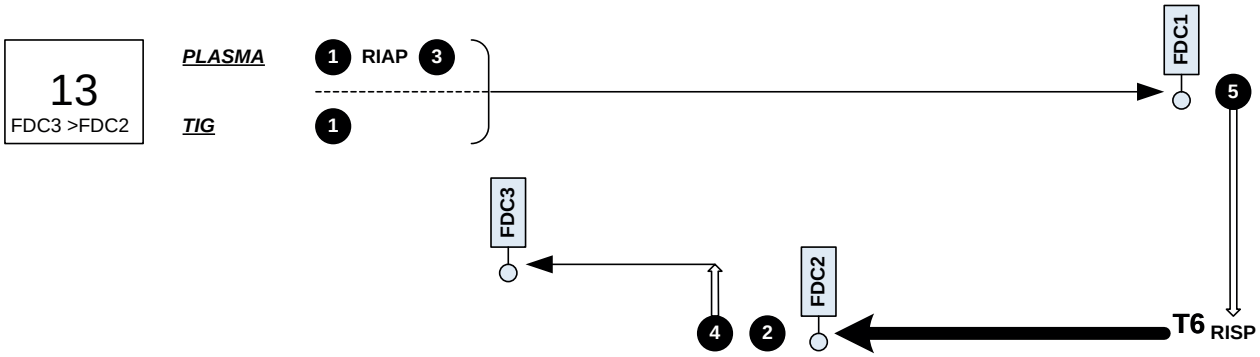


Displacement cycle 1, continuous length and return to home position

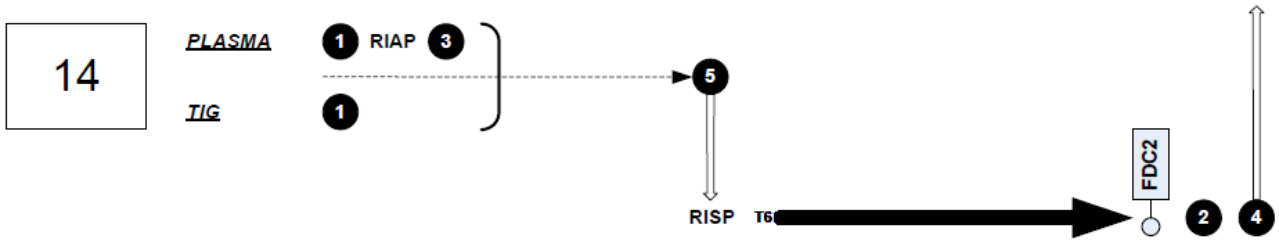


Displacement cycle 1, continuous length and return to home position on parking track

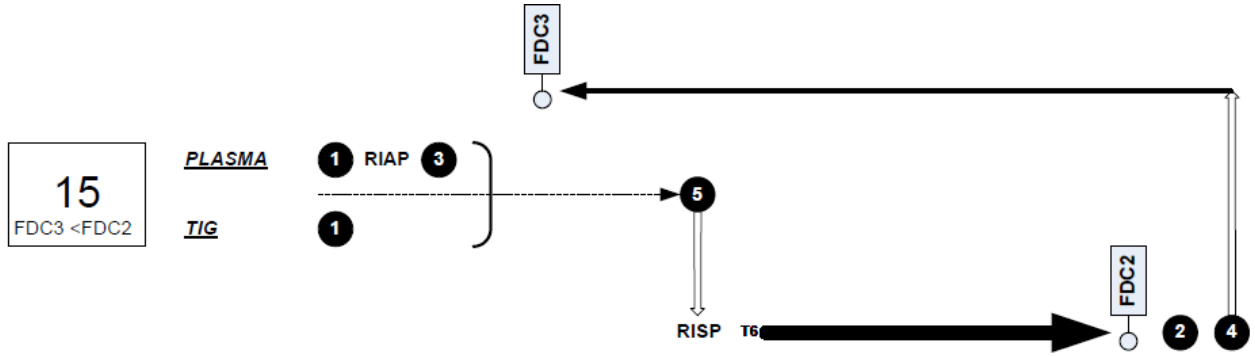


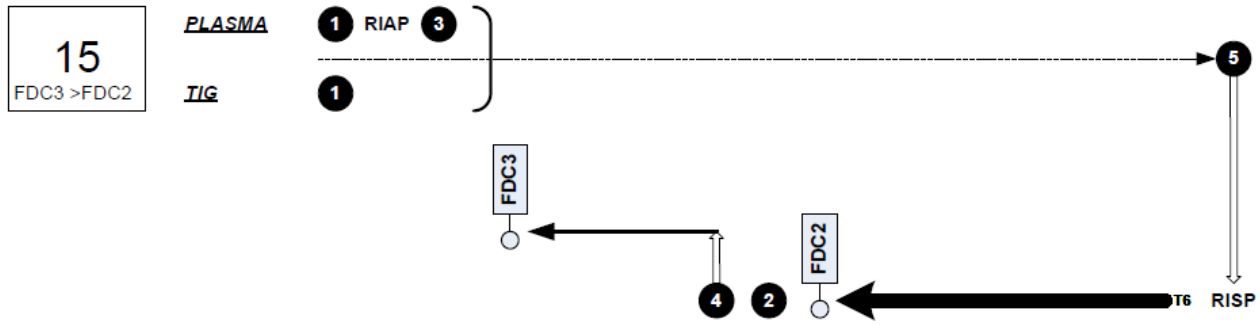


Displacement cycle 1, continuous length

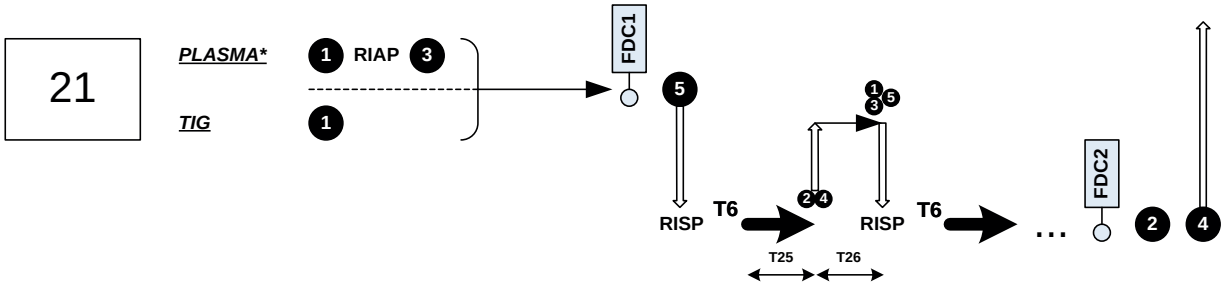


Displacement cycle 1, continuous length and return on parking track

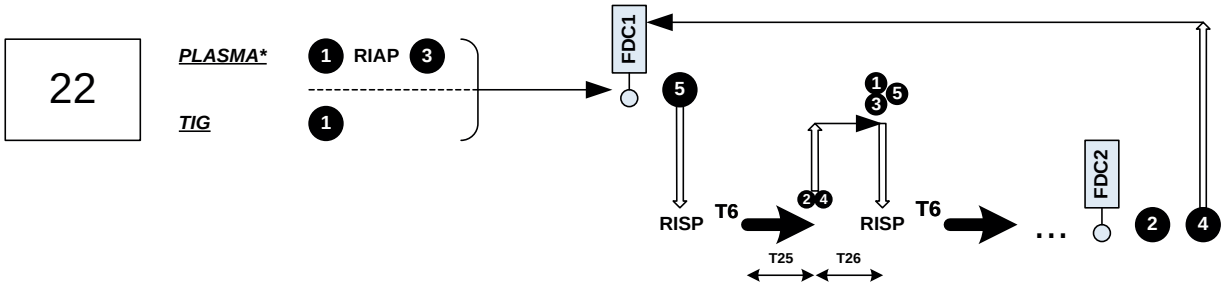




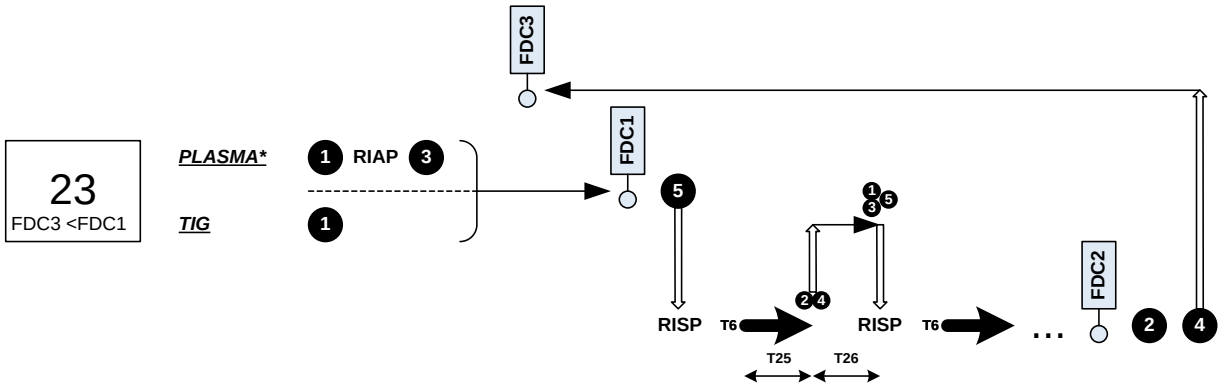
Displacement cycle 1, discontinuous

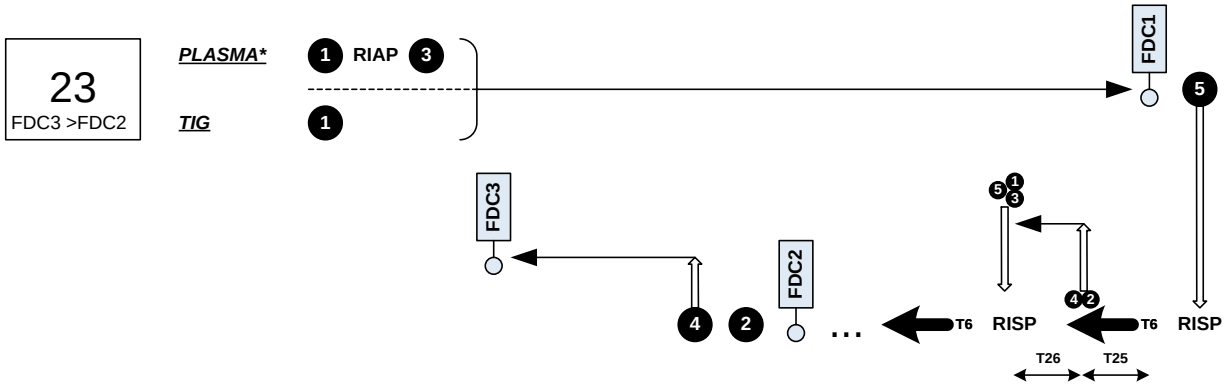


Displacement cycle 1, discontinuous and return to home position

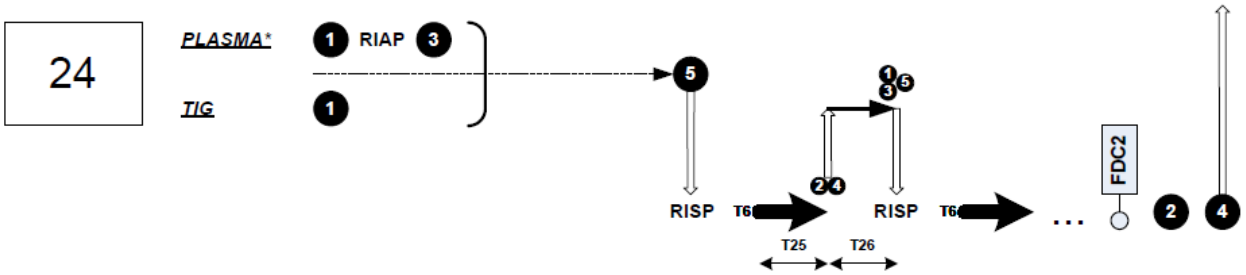


Displacement cycle 1, discontinuous length and return to parking in home position

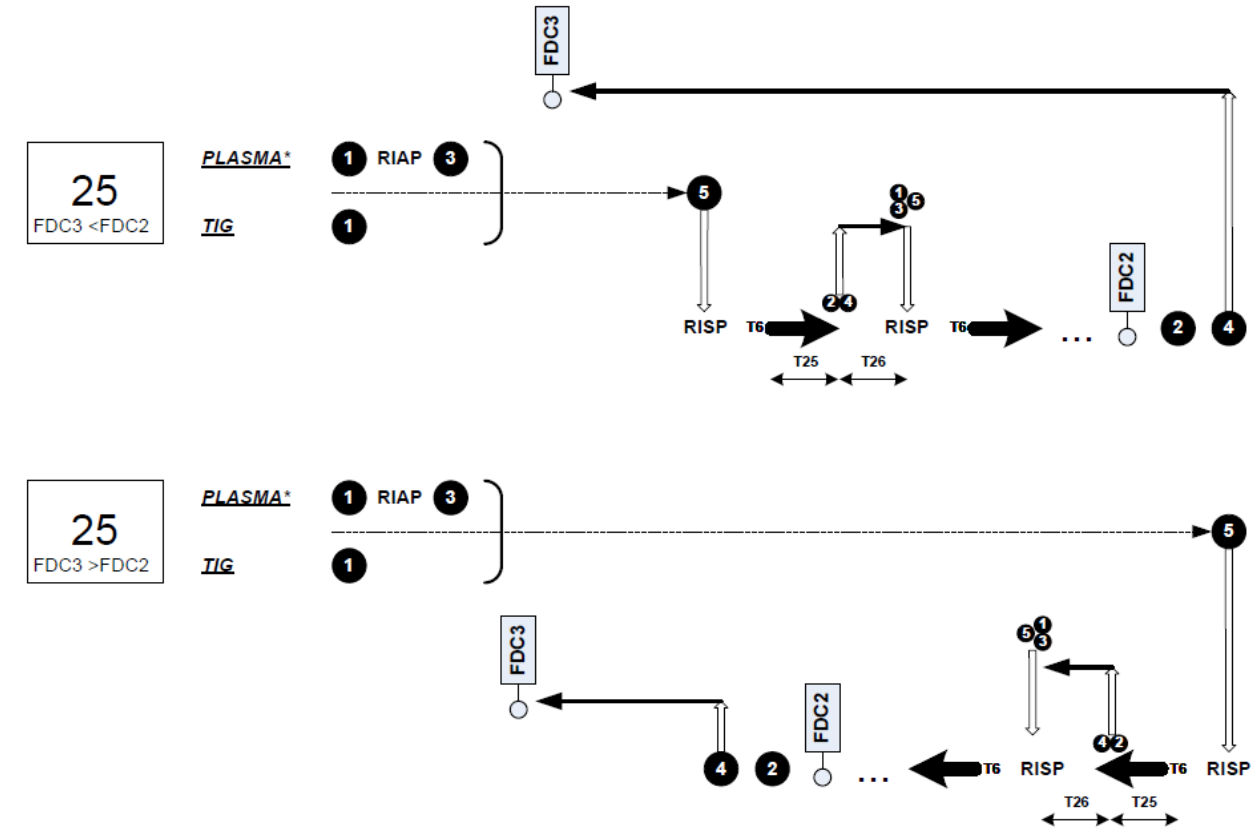




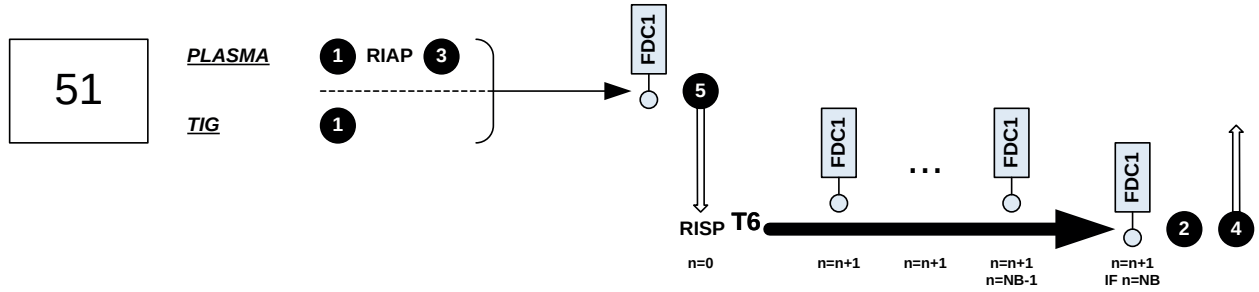
Displacement cycle 1, discontinuous



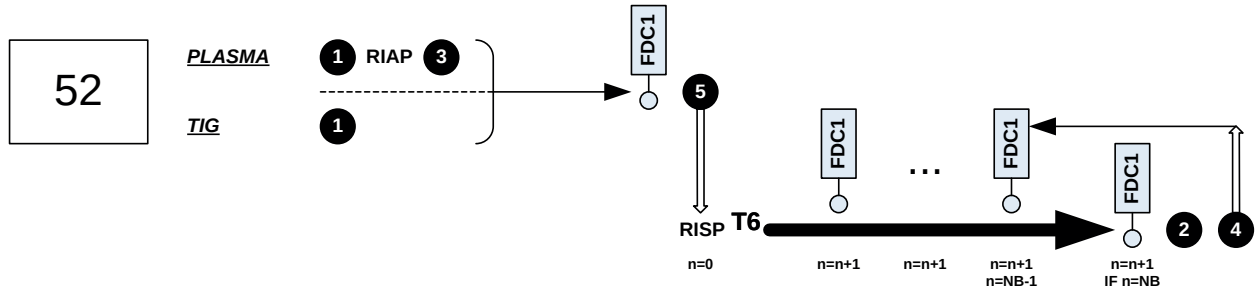
Displacement cycle 1, discontinuous length and return on parking track



Rotation cycle, continuous no of rotations



Rotation cycle, continuous no of rotations and return to home position

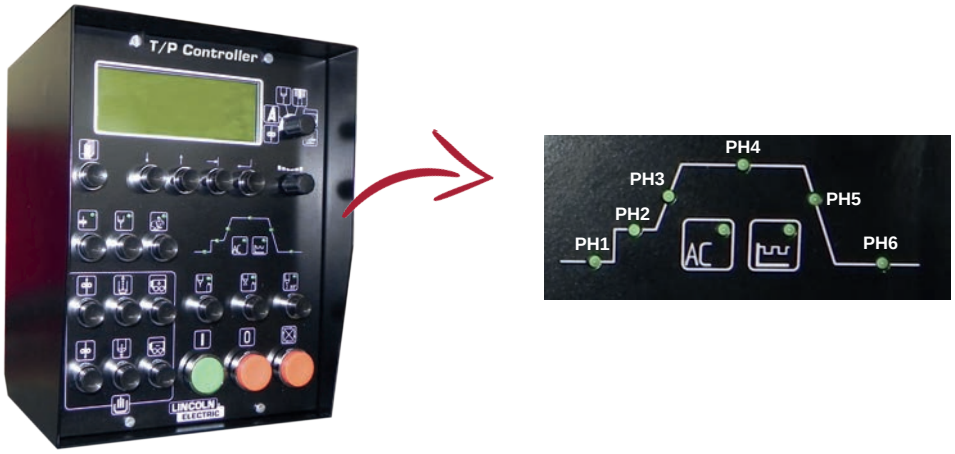


5.5 Possibility for setting up the welding cycle

References in cycle diagrams → | **References of console front indicators** →

T0	T	O	R	C	H		P	R	E	-	G	A	S		**30**	0	5	.	0	s	
T1	R	E	V	E	R	S		P	R	E	-	G	A	S	**31**	0	2	.	0	s	PH1
D1	P	I	L	O	T		F				**83**	0	4	.	0	I	/	m	i	n	
T3	P	R	E	W	E	L	D	I	N	G		U			**32**	0	2	.	0	s	
I1	P	R	E	W	E	L	D	I	N	G		I			**33**	0	5	0	A		
U1	P	R	E	W	E	L	D	I	N	G		T			**34**	2	2	.	5	V	
D2	P	R	E	W	E	L	D		F		**84**	0	1	.	5	I	/	m	i	n	PH2
T4	W	I	R	E		S	T	A	R	T		T			**35**	0	2	.	0	s	
T4	M	D		S	T	A	R	T		T					**36**	0	2	.	0	s	
T6	M	V	T		S	T	A	R	T		T				**37**	0	2	.	0	s	
T7	A	V	C		S	T	A	R	T		T				**38**	0	0	.	1	s	
T8	I		I	N	C	R	E	M	E	N	T		T		**39**	0	2	.	0	s	
T30	W	E	L	D		G	A	S		T					**85**	0	2	.	0	s	PH3
T18	T		W	I	R	E		S	L	O	P	E			**63**	0	2	.	0	s	
T24	T		M	V	T		S	L	O	P	E		U	P	**86**	0	0	.	1	s	
I2	I														**40**	1	0	0	A		
Ib	I	b													**45**	0	8	0	A		
Is;Id	I	w			**46**	1	6	0	A		I	c			**47**	0	9	0	A		
Ih ; Ib	I	h	+		**80**	1	8	0	A		I	l	+		**81**	1	4	0	A		
Id	I	c			**47**	0	1	0	A												
F ; N	F				**43**	0	0	2	.	0	H	z		N			**44**	5	0	%	
Fac ; Nac	F	a	c		**48**	0	6	0			H	z		N	a	c	**49**	5	0	%	
U2	U														**41**	2	2	.	0	V	
Vf	W	f	s								**42**	1	0	0	c	m	/	m	i	n	
D3	W	E	L	D		F					**87**	0	2	.	0	I	/	m	i	n	
D3	C	E	N	T	R	A	L		G	F	**88**	0	2	.	0	I	/	m	i	n	
Vfh	H	I	G	H		W				**69**	0	1	0	0	c	m	/	m	i	n	
Vfb	L	O	W		W	S				**70**	0	0	6	0	c	m	/	m	i	n	
Ff	F		W	I	R	E								**71**	0	2	.	0	H	z	PH4
Nf	R		W	I	R	E								**72**	5	0	%				
A1	M	D		A	1										**119**		0	5	0	%	
A2	M	D		A	2										**120**		0	5	0	%	
TA1	M	D		T	A	1									**121**	0	.	1	0	s	
TA2	M	D		T	A	2									**122**	0	.	1	0	s	
O1	M	D		O	F	F	S	E	T						**123**	+/-	0	0	0	%	
	M	V	T		D	I	R	E	C	T	I	O	N					**89**		+	
	D	I	A	M	E	T	E	R					**90**	0	0	5	0	0	m	m	
Vm	S	P	D							**91**	0	0	3	0	c	M	/	m	i	n	
T25	W	E	L	D	I	N	G		T	I	M	E			**92**	0	0	0	0	s	
NB	N	B	R		O	F		T	U	R	N	S			**93**	0	0	0			
T26	M	V	T		T	I	M	E							**94**	0	0	.	0	s	
T27	O	V	E	R	L	A	P		T	I	M	E			**95**	0	2	.	0	s	

T9	I		K	E	E	P		T							**54**	0	2	.	0	s	
T21	G	A	S		S	T	O	P		T					**77**	0	2	.	0	s	
T10	W	I	R	E		S	T	O	P		T				**55**	0	2	.	0	s	
T10	M	D		S	T	O	P		T						**56**	0	2	.	0	s	
T12	M	V	T		S	T	O	P		T					**57**	0	2	.	0	s	
T15	I		D	E	C	R	E	M	E	N	T		T		**60**	0	2	.	0	s	
I3	I		D	E	C	R	E	M	E	N	T				**73**	0	3	0	A		
T28	T		M	V	T		S	L	O	P	E		D	N	**96**	0	0	.	1	s	
T19	P	E	A	K		T									**74**	0	2	.	0	s	
I4	P	E	A	K		I									**75**	0	5	0	A		PH5
T20	I		D	E	C	R	E	M	E	N	2		T		**76**	0	2	.	0	s	
T31	D	O	W	N		G	A	S		T					**97**	0	1	.	0	s	
D4	P	O	S	T		F					**98**	0	1	.	5	l	/	m	i	n	
T22	W	I	R	E		P	A	U	S	E		T			**78**	0	2	.	0	s	
Vf1	E	N	D		S	P	E			**79**	0	0	5	0	c	m	/	m	i	n	
T23	E	N	D		S	P	E		T						**82**	0	2	.	0	s	
T13	W	I	R	E		R	E	T	R	A	C		T		**58**	0	2	.	0	s	
T14	M	V	T		R	E	S	T	A	R	T		T		**59**	0	2	.	0	s	
Vm1	E	N	D		S	P	D			**99**	0	0	2	5	c	m	/	m	i	n	
T17	P	O	S	T	-	G	A	S		T					**62**	0	8	.	0	s	PH6
T16	A	V	C		R	E	L	I	E	F		T			**61**	0	0	.	5	s	



References in cycle diagrams

References of console front indicators

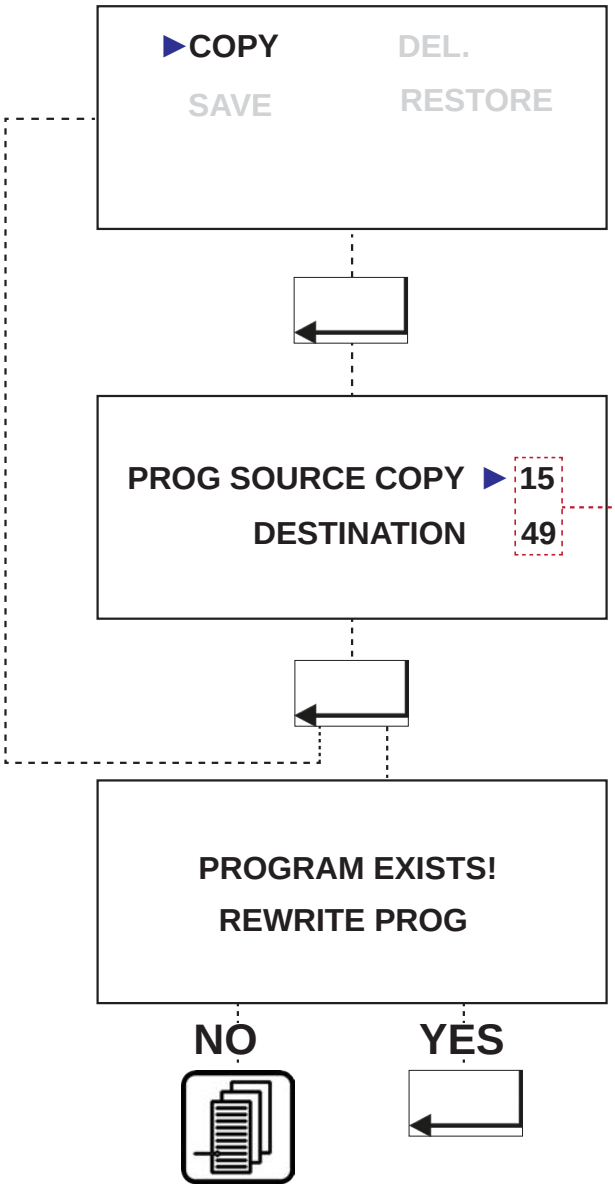
	Settings	Meaning	Value			
			Min	Fault		Max
				TIG	PLASMA	
30	TORCH PRE-GAS	Torch pre-gas time	0.1s	5s		99.9s
31	BACKING PRE-GAS	Backing pre-gas time	0.1s	2s		99.9s
32	PRE-WELDING T	Pre-welding time	0.1s	2s		99.9s
33	PRE-WELDING I	Pre-welding intensity	5 A	50 A		460 A
34	PRE-WELDING U	Pre-welding voltage	5.3V	15V	22.5V	51.1V
35	WIRE START TIME	Wire start delay time	0.1s	2s		99.9s
36	MDO START TIME	MDO start delay time	0.1s	2s		99.9s
37	MVT START TIME	Movement start time	0.1s	2s		99.9s
38	AVC START TIME	Welding sensing delay time	0.1s	0.1s		99.9s
39	I RISE TIME	Intensity rise time	0.1s	2s		99.9s

40	I	Welding intensity with smooth current or high I with pulsed DC	5 A	100 A		450 A	**I2**
41	U	Welding voltage	5.3V	12.5V	22V	51.1V	**U2**
42	Vfil	Wire feed speed	0	100cm/min		600 cm/min 1000 cm/min	**Vf**
43	F	Pulsed DC frequency in pulsed current (if smooth wire)	1Hz	2Hz		100Hz	**F**
		Pulsed DC frequency (if pulsed wire and current)	1Hz	2Hz		10Hz	
44	N	Pulsed DC duty cycle	10%	50%		90%	**N**
45	Ib	Pulsed DC low intensity	5 A	80 A		450 A	**Ib**
46	Is	AC welding intensity	5 A	160 A		300 A	**Is**
47	Id	AC stripping intensity	5 A	90 A		300 A	**Id**
48	Fac	AC polarity frequency	50Hz	60Hz		200Hz	**Fac**
49	Nac	AC duty cycle	50%	50%		90%	**Nac**
50	AC GRADIENT	AC gradient time in welding phase	0ms	0.1ms		2ms	**Pac**
54	HOLD T	Welding intensity hold time	0.1s	2s		99.9s	**T9**
55	HOLD T HOLD TIME	Wire stop delay time	0.1s	2s		99.9s	**T10**
56	HOLD T HOLD TIME	MDO stop delay time	0.1s	2s		99.9s	**T10**
57	HOLD T MVT	Movement stop delay time	0.1s	2s		99.9s	**T12**
58	WIRE RETRACT TIME	Wire retract time	0.1s	2s		99.9s	**T13**
59	MVT PAUSE TIME	Movement resumption delay time	0.1s	2s		99.9s	**T14**
60	FADE TIME I	TIG current fade time. Time between end of welding and start of peak in PLASMA.	0.1s	2s		99.9s	**T15**
61	AVC AVC	AVC clearance time	0.1s	2s		99.9s	**T16**
62	POST GAS TIME	Post-gas time	0.1s	8s		99.9s	**T17**
63	WIRE RAISING TIME	Wire raising time	0.1s	2s		99.9s	**T18**
69	VfilH	Pulsed wire upper wire feed speed	0	100cm/min		600 cm/min 1000 cm/min	**Vfh**
70	VfilB	Pulsed wire lower wire feed speed	0	60cm/min		600 cm/min 1000 cm/min	**Vfb**
71	Ffil	Wire pulse frequency in pulsed wire mode	0.1Hz	2Hz		10Hz	**Ff**
		Wire pulse frequency (if pulsed wire and current)	1Hz	2Hz		10Hz	
72	Nfil	Pulsed wire duty cycle	50%	50%		90%	**Nf**
73	FADE 1 I	Current at start of peak in PLASMA	5 A		30 A	450 A	**I3**
74	PEAK TIME	Current peak time	0.1s		2s	99.9s	**T19**
75	PEAK I	Current at top of peak	5 A		50 A	450 A	**I4**
76	T I FINISH	Current fade time in PLASMA	0.1s		2s	99.9s	**T20**
77	GAS HOLD TIME	PLASMA gas hold time after a cycle stop	0.1s		2s	99.9s	**T21**
78	WIRE PAUSE TIME	Wire stop time before start of peak	0.1s		2s	99.9s	**T22**
79	Vfil FIN	Wire speed during peak	0		50 cm/min	600 cm/min 1000 cm/min	**Vf1**
80	Ih+	High intensity in pulsed AC	5 A	180 A		300 A	**Ih+**
81	Ib+	Low intensity in pulsed AC	5 A	140 A		300 A	**Ihb**

82	T Vfil FIN	Wire feed time during peak	0.1s	2s		99.9s	**T23**
83	PILOT F	Pilot gas flow	1.0 l/ min		4.0	10.0 l/min	**D1**
84	PRE-WELD F	Pre-welding flow	1.0 l/ min		1.5 l/min	10.0 l/min	**D2**
85	GAS RISE TIME	PLASMA gas rise time	0.1s		1.0s	100.0s	**T30**
86	MVT RISE TIME	Time for reaching welding movement speed	0.1s	0.1		99.9s	**T24**
87	PLASMA FLOW	Welding plasma gas flow	1.0 l/min		2.0 l/min	10.0 l/min	**D3**
88	CENT GAS FLOW	Central gas flow (if double flow TIG)	1.0 l/min	2.0 l/min		10.0 l/min	**D3**
89	MVT DIRECTION	Welding movement direction	+	+		-	
90	DIAMETER	Work piece diameter for rotation welding	0 mm	500 mm		60000 mm	
91	MVT SPD	Welding movement speed	0 cm/min	30 cm/min		1000 cm/min	**Vm**
92	WELDING TIME	Welding cycle time (if cycle in time)	0s	0s		9999 s	**T25**
93	ROTATIONS	Number of rotations to weld (if rotation movement)	1	1		200	
94	DISPLACEMENT TIME	Displacement time (if discontinuous welding)	0.1s	0.1s		99.9s	
95	OVERLAP TIME	Overlap welding time (if rotation movement)	0s	2.0s		999s	**T27**
96	MVT FADE TIME	Welding movement fade time	0.1s	0		99.9s	**T28**
97	GAS FADE TIME	PLASMA gas fade time.	0.1s		1.0s	99.9s	**T31**
98	END F	PLASMA gas flow after fading	1.0 l/min		1.5 l/min	10.0 l/min	**D4**
99	END MVT SPD	Welding movement speed	0 cm/min	25 cm/min		1000 cm/min	**Vm1**
119	A1 MDO	Arc deviation amplitude during the positive phase	0	50%		100%	**A1**
120	A2 MDO	Arc deviation amplitude during the negative phase	0	50%		100%	**A2**
121	TA1 MDO	Arc deviation time during the positive phase (if equal to 0, the next synchronisation pause time **116** will not be executed)	0	0.10s		2.00s	**TA1**
122	TA2 MDO	Arc deviation time during the negative phase (if equal to 0, the next synchronisation pause time **116** will not be executed)	0	0.10s		2.00s	**TA2**
123	MDO OFFSET	Continuous component added to the arc deviation amplitude. If the 2 settings **121** and **122** are 0, this setting will be used for deviating the arc.	-100%	0%		+100%	**O1**
128	Im	Measurement of average intensity of welding current	0			450 A	**Im**

5.6 Menu: Edit

Copy program:



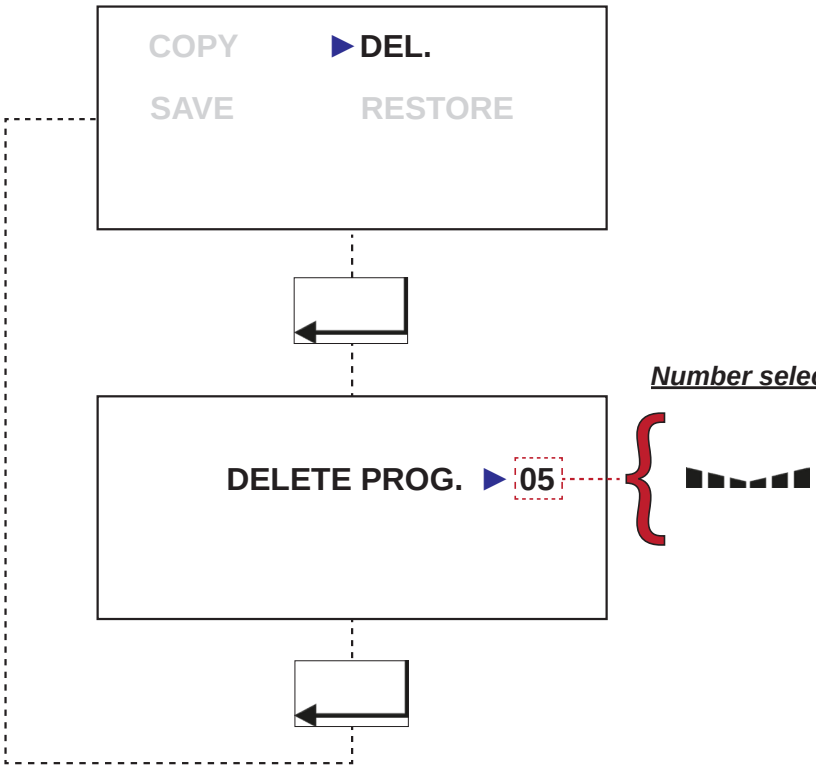
Place the cursor as indicated.

Number selection

Select the number of the program to copy and that in which you want to copy it

If the target program is not empty, the software will ask for confirmation

Delete program:



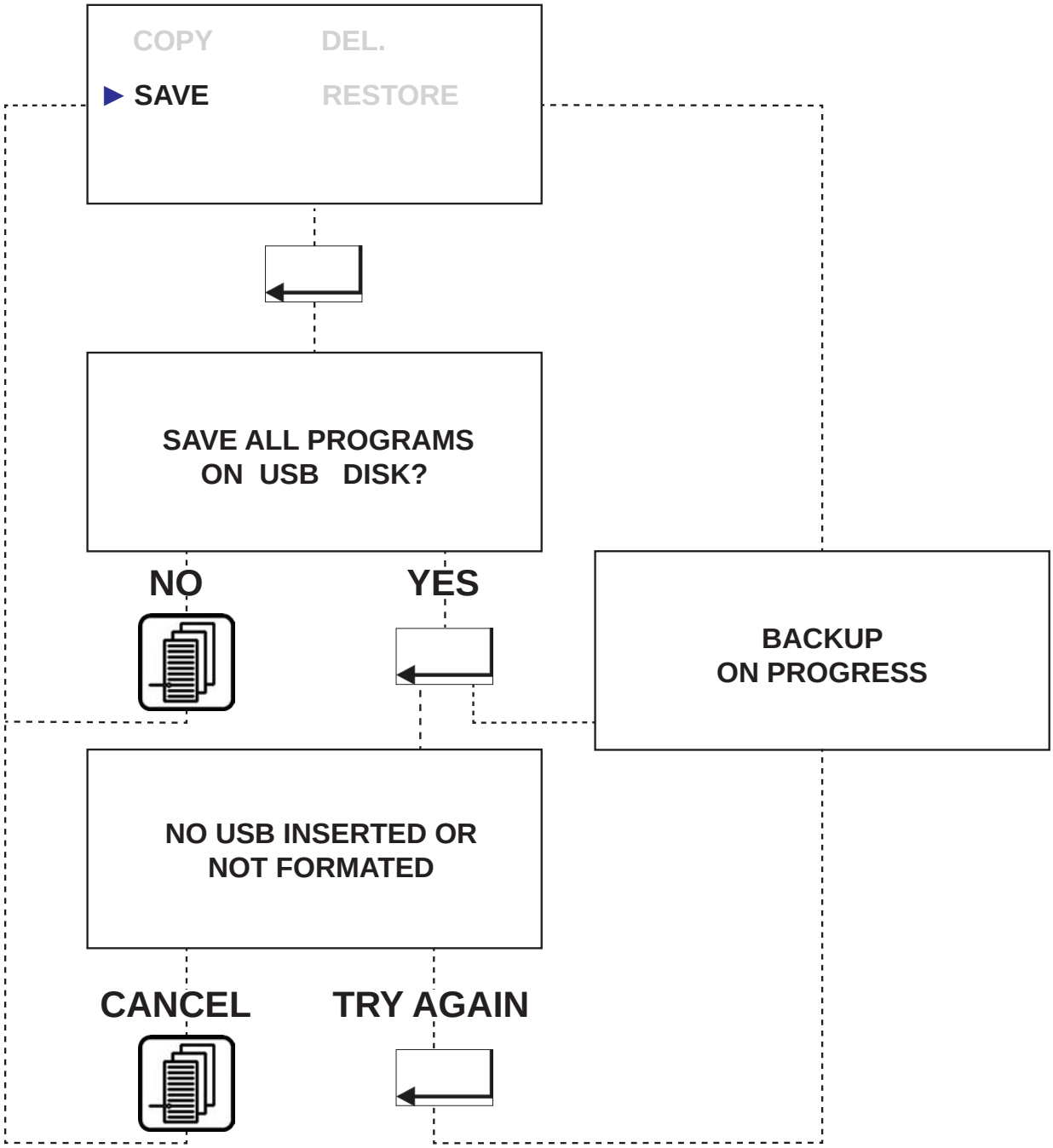
Place the cursor as indicated.

Number selection

Select the number of the program to delete and confirm.

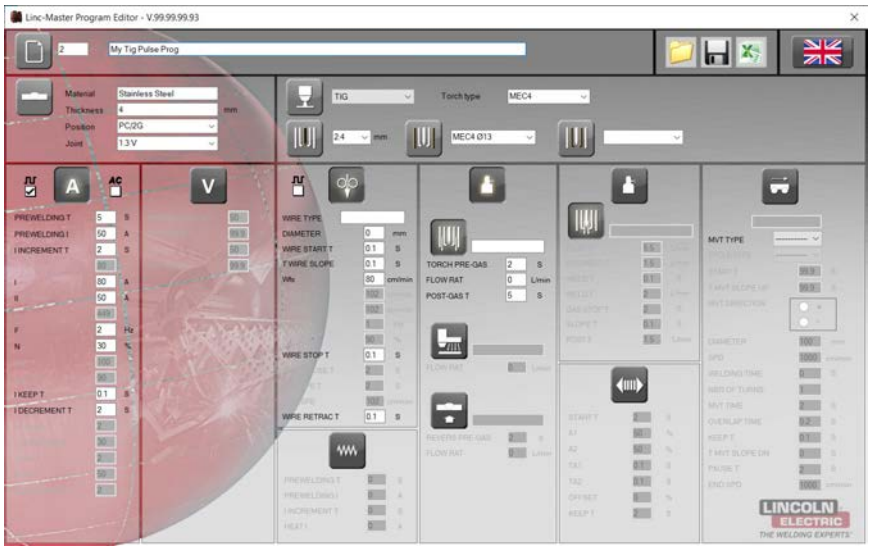
Save program:

This menu allows you to save all the programs and the configuration to a USB drive.
Place the cursor as indicated in the first screen.

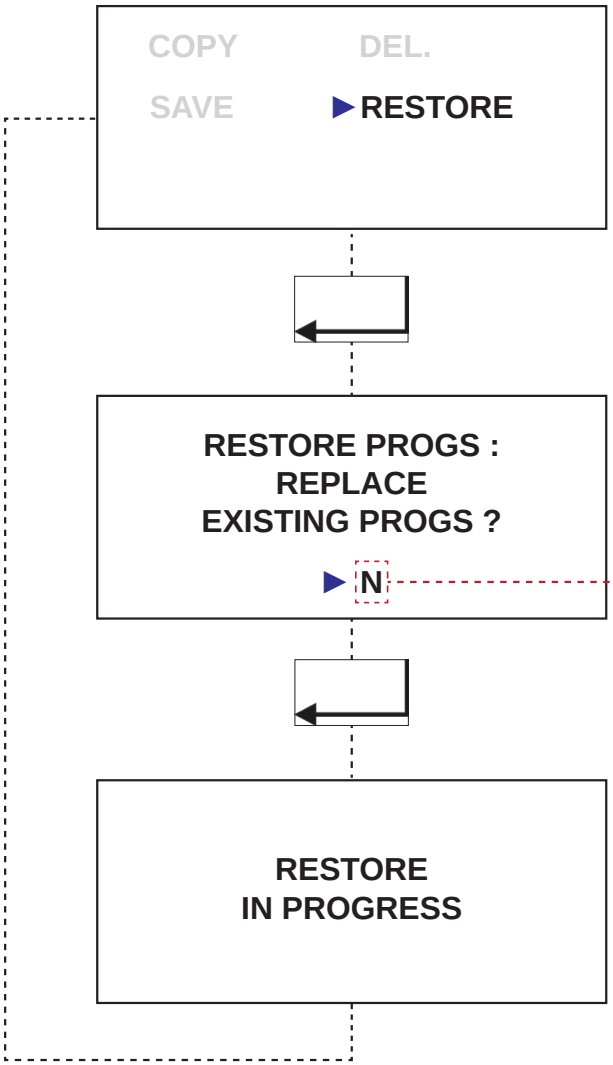


The USB drive may only be connected or disconnected when the power source is powered down.
Saving is very important, because you could lose data in case of a machine failure.

Once the data are backed up on the USB drive, they can be edited on a computer using xxxx.Nerta450.editor software.



Restore program:



Place the cursor as indicated.

Select 0

Select Yes (No by default) to start restoring the data

This menu allows you to replace all the programs on the **T/P CONTROLLER** control console with those on the USB drive, along with the installation configuration

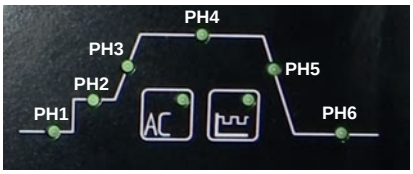
5.7 Display during a cycle

Press Cycle start to start the cycle. The following screen is displayed:

TIG	PLASMA
Arc on...	**Pilot arc...**

Press Cycle start once again to start plasma welding.

PH1 ➜ PH2 ➜ PH3 ➜ PH4 ➜ PH5 ➜ PH6



Once you reach the welding stage (indicator **PH4** on), you can access the welding settings, I, U or Vfil. The cursor is positioned on the screen according to position **P23**:

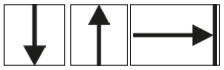
65.

63

64.

108

Positions 66 , 67 , 68 are obtained by the keys:



Smooth DC:

0	1					I	**40**	2	0	0	A								
	U	**41**	2	0	.	2	V					I	m	**128**	1	9	9	A	

The plasma flow rate display will only be available in position **RDM**.

Pulsed DC:

0	1			I	**40**	2	0	0	A				I	b	**45**	1	0	0	A
				F	**43**	0	9	0	.	0	H	z		N	**44**	5	0	%	
	U	**41**	2	0	.	2	V					I	m	**128**	1	5	0	A	

The plasma flow rate display will only be available in position **RDM**.

Smooth AC:

0	1				I	w	**40**	2	0	0	A		I	c	**47**	2	0	0	A
		F	a	c	**48**	0	5	0	H	z		N	a	c	**49**	6	0	%	
	U	**41**	1	2	.	3	V					I	m	**128**	1	9	9	A	

The plasma flow rate display will only be available in position **RDM**.

Pulsed AC:

0	1			I	h	+	**80**	2	0	0	A		I	c	**47**	2	0	0	A
		I	I	+	**81**	1	5	0	H	z		I	m	**128**	1	8	9	A	
		F	a	c	**48**	0	5	0	H	z		N	a	c	**49**	6	0	%	
				F	**43**	0	0	5	.	0	H	z		N	**44**	5	0	%	

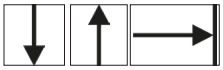
The plasma flow rate display will only be available in position **RDM**.

Position of **P23** at **87**

0	1				I	**40**	2	0	0	A								
	U	**41**	2	0	.	2	V		F	**87**	1	0	.	0	l	/	m	i	n
			W	f	s		**42**		9	0	c	m	/	m	i	n		

Position of **P23** at **109**

Positions **110**, **111**, **87**, **113** are obtained by keys:



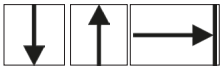
0	1				I	**40**	2	0	0	A		**114**	0	1	2	0	s		
	S	P	D			**91**	0	0	3	5	c	m	/	m	i	n		
	U	**41**	2	0	.	2	V		F	**87**	1	0	.	0	l	/	m	i	n
			W	f	s		**42**		9	0	c	m	/	m	i	n		

114:

- Setting **25** = S: indicates the remaining time
- Setting **25** = 51 or 52: indicates the number of rotations remaining

Position of **P23** at **123**

Positions **119**, **120**, **121**, **122** are obtained by keys:



0	1		M	D		O	F	F	S	E	T			**123**	+	0	1	0	%
	A	1		**119**		0	5	0	%		A	2		**120**		0	5	0	%
	T	A	1	**121**	0	.	2	0	s		T	A	2	**122**	0	.	2	0	s

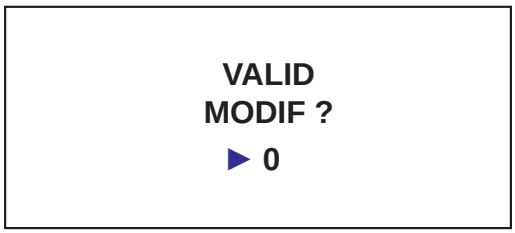
If the password is active and the accessibility % (A) is not zero.
The operator may then vary the initial value by +/- A/2.

The password is active when this symbol is under the program number.

Example:

accessibility % = 50% ➜ A/2 = 25%
I = welding current = 100A
The operator may vary the current
from 75A (100x0.75) to 125A (100x1.25)

At the end of the cycle, if you have modified the welding settings, the **T/P CONTROLLER** control console will ask if you want to save the changes.



If the password is active, the **T/P CONTROLLER** control console will not offer to save the changes

The password is active when this symbol is under the program number.

5.8 Warning message

The following messages may appear to remedy the problem; refer to the Maintenance section.

Once the problem has been solved, erase the error message (if the fault is not resolved, the message will not be erased).

Fault erasing key.

SECURITY FAULT EXTERNAL 1	**SECURITY FAULT EXTERNAL 2**
External safety device 1 of your installation is active.	External safety device 2 of your installation is active during a cycle.

SECURITY FAULT GAS	**SECURITY FAULT WATER**
The gas cylinder is empty or closed or Failure or adjustment of pressure contact of gas unit.	No water supply One of the safety devices of the cooling system is active (flow, temperature) or the unit is not operating.
SECURITY FAULT TEMPERATURE	**SECURITY FAULT AC SWITCH**
Power source error; refer to the POWERWAVE manual for the meaning of code xxx	Power source error; refer to the POWERWAVE manual for the meaning of code xxx
SECURITY FAULT FAN	**Emercency stop**
Power source ventilation inadequate (fan blade contact open.). Check that the main fan is operating or that the dust filters are not too dirty.	Stopping due to key **P15** (Immediate cycle stop) Immediately stops welding and shifts to post gas (no holding of current or drop in intensity).
ARC CUT OFF	**INPUT FAULT EXTERNAL**
Welding arc break	External inputs 5 and 6 of **J24** are not connected or are not valid

RAM ERROR!!!	**CONFIG FAULT**
RAM faulty	Displayed if setting Vfil is greater than what the feeder can supply. or If the power source version is not compatible with the console version.
SECURITY FAULT MVT1 FAULT	**SECURITY FAULT LIMIT SWITCH**
The variable drive output for movement 1 is active.	The plus or minus limit switch of movement 1 is active
SECURITY FAULT POSITIONNING	**Transmit error !**
During an automatic movement in a cycle, an unexpected limit switch (1, 2 or 3) is active.	Communication fault between console and power source. Check that the optical fibre link is not damaged. Check that LED **D87** of the basic interface board is on and check that the ATX power supply fan on the right-hand side of the power source is operating.
Initialization...	
If this message is displayed for more than 5 minutes, check that LED D87 of the basic interface board is on and make sure that ATX power supply fan on the right-hand side of the power source is operating.	

FAULT SECURITY
PW FAULT

Power source error; refer to the **POWERWAVE** manual for the meaning of code xxx

CONFIG FAULT
INVALI PW WELDSET

The weld set configuration of the power source is not appropriate for the **LINC-MASTER**; check the weld set of the power source and the options of the **LINC-MASTER** (AC present) and the “I LIM PLASMA”.

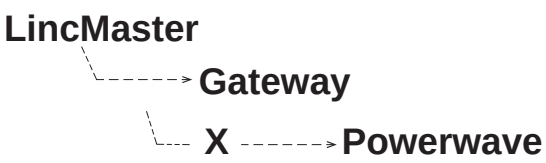
CONFIG FAULT
GW INVALID COMMAND

Communication error between PC104 and the gateway; check program versions.

SECURITY FAULT
ARC IGNIT. TIMEOUT

Pilot arc strike time out; move closer to the piece to strike on time or change the Arc Start Timeout setting in the configuration

LINK STATUS



Communication lost; a chart is displayed with the status of communication between **LINC-MASTER (PC104) <-> Gateway <-> POWERWAVE**.
The chart shows the connection of the link:

- A continuous arrow ———► shows that the link is established
- An arrow with a cross ─ **X** ─► indicates that the link is broken
- An arrow with a star ─ ✳ ─► indicates that the link is being initialised

This screen is displayed while starting (then disappears automatically when all the links are established).
Then it is displayed as soon as a communication fault occurs.

POWERWAVE HIBERNATION	POWERWAVE WAKING UP...
In order to save power, the **POWERWAVE** goes into hibernation mode after a configurable inactive period of the power source.	If a cycle is started when the power source is not yet operational, the “Waking...” fault is displayed.

The following faults can be hidden by pressing the menu button.

- Communication status
- Hibernation
- Waking...
- PW weld set error

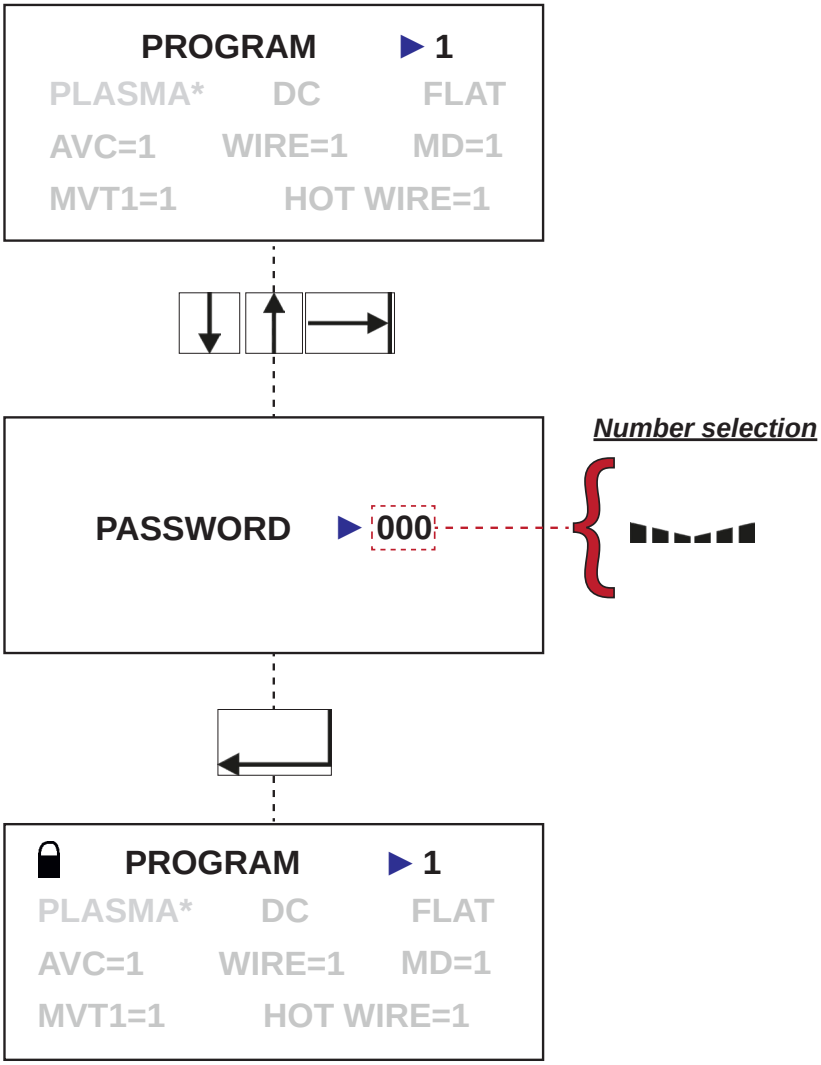
Fault hiding key

The presence of the fault is showed by a symbol at the top right of the screen. During that time, you can manipulate the installation (move the axes, change settings etc.) but not start a cycle.

5.9 Password

Once all the required programs are configured and edited, access to the program settings and other menus by the operator can be blocked. Access to settings can also be limited during the welding cycle. The Access setting in the Installation configuration is used for defining access to the setting.

Operator locking can only be activated after the code number is modified in the Installation configuration (000 by default)



Go to the program mode.

Simultaneously press keys **P2**, **P4**, **P5**.

Display the code number and confirm.

If the password is identical to the code of the installation configuration and ≠ 0 then a padlock appears at the top left of the screen.

Repeat the operation to unlock.

If the password is lost in locked mode, please contact us.

1 - Care

For a long and trouble-free life, the machine requires a minimum level of care and maintenance.

The frequency of such maintenance is indicated for production in one work shift per day, or maximum 2 hours of daily running for each movement axis. For higher production rates, increase the maintenance frequencies accordingly.

Your maintenance department could photocopy these pages to track maintenance frequencies and times and the operations completed (tick the appropriate box).

Before working on the machine, it is ***MANDATORY*** to lock out all the supplies of utilities to the machine (electricity, air, gas etc.).
Locking an emergency stop button is not sufficient.

CAUTION: All work at heights (maintenance, troubleshooting etc.) must be carried out with appropriate personnel lifting equipment.

For operating instructions, adjustments, troubleshooting and spare parts, please refer to the special instructions for safe operating and maintenance.

1.1 Maintenance schedule

This schedule must <u>absolutely</u> be followed.
We recommend putting in place a traced system for tracking all your maintenance operations.

Sub -assembly	Component	Type of inspection	Action	Frequency			Time (in hours)	Step
				1 month	6 months	1 year	8	
LINC-MASTER			Blowing	X				A
			Tightening		X			B
PILOT UNIT			Blowing	X				C
			Tightening		X			D
Bundle		Visual						E
Installation			Blowing				X	F

Step	Operation	OK	NOK
A	**<u>LINC-MASTER box</u>**	✔	✘
	Open the casings of the **LINC-MASTER** unit and blow on the inside. Also blow on the unit inlet and outlet filters.		

Step	Operation	OK	NOK
B	**LINC-MASTER unit**	✔	✘
	Open the casings of the **LINC-MASTER** unit and check the tightening of connectors.		

Step	Operation	OK	NOK
C	**PILOT UNIT**	✔	✘
	Open the casings of the **PILOT UNIT** and blow on the inside of the unit. Also blow on the unit inlet and outlet filters.		

Step	Operation	OK	NOK
D	**PILOT UNIT**	✔	✘
	Open the casings of the **LINC-MASTER** unit and check the tightening of connectors.		

Step	Operation	OK	NOK
E	**Bundle**	✔	✘
	Check the condition of bundles. Change them if damaged or worn. Check the connectors of each bundle.		

Step	Operation	OK	NOK
F	**LINC-MASTER installation**	✔	✘
	Blow the outside of each box		

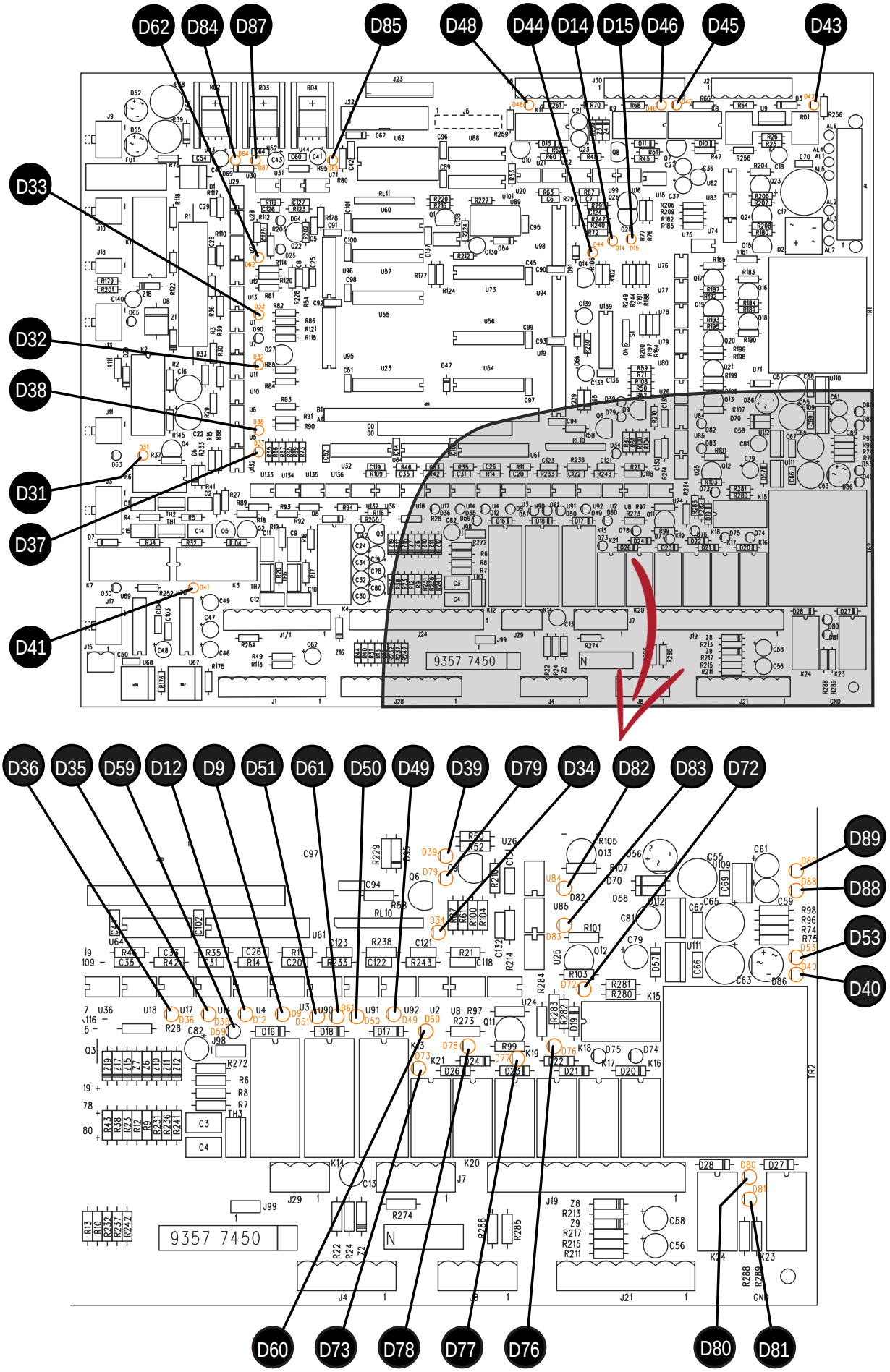
Possible symptom	Probable causes	Possible remedies
No pilot arc in plasma	**PILOT UNIT** failure	Check the fuses and power supply of the **PILOT UNIT**
	No HF	Check if the continuity of the welding cable is correct (serial HF)
No TIG strike	No power output from **POWERWAVE S500**	Check the continuity of the welding cable
	No HF	Check if the continuity of the welding cable is correct (serial HF)
The arc is transferred and immediately broken	Arc break	Check the welding ground connection on the piece to weld
The cycle stops immediately after the cycle start is pressed and the message “Immediate stop” is displayed	External Immediate stop input active and not strapped	Check that there is a strap between 1 and 6, or 2 and 6 of J24 (if an outside contact is connected, check that contact)
The pilot arc does not go off after the cycle stop	The PLASMA mode with the pilot arc held (PLASMA*) is selected in the program configuration.	Change the PLASMA mode in the program configuration
The console display does not display any character.	The system may have frozen	Switch off the power source and switch it back on; everything should be as normal after that.

2.1 Troubleshooting chart

Refer to the electrical diagram:

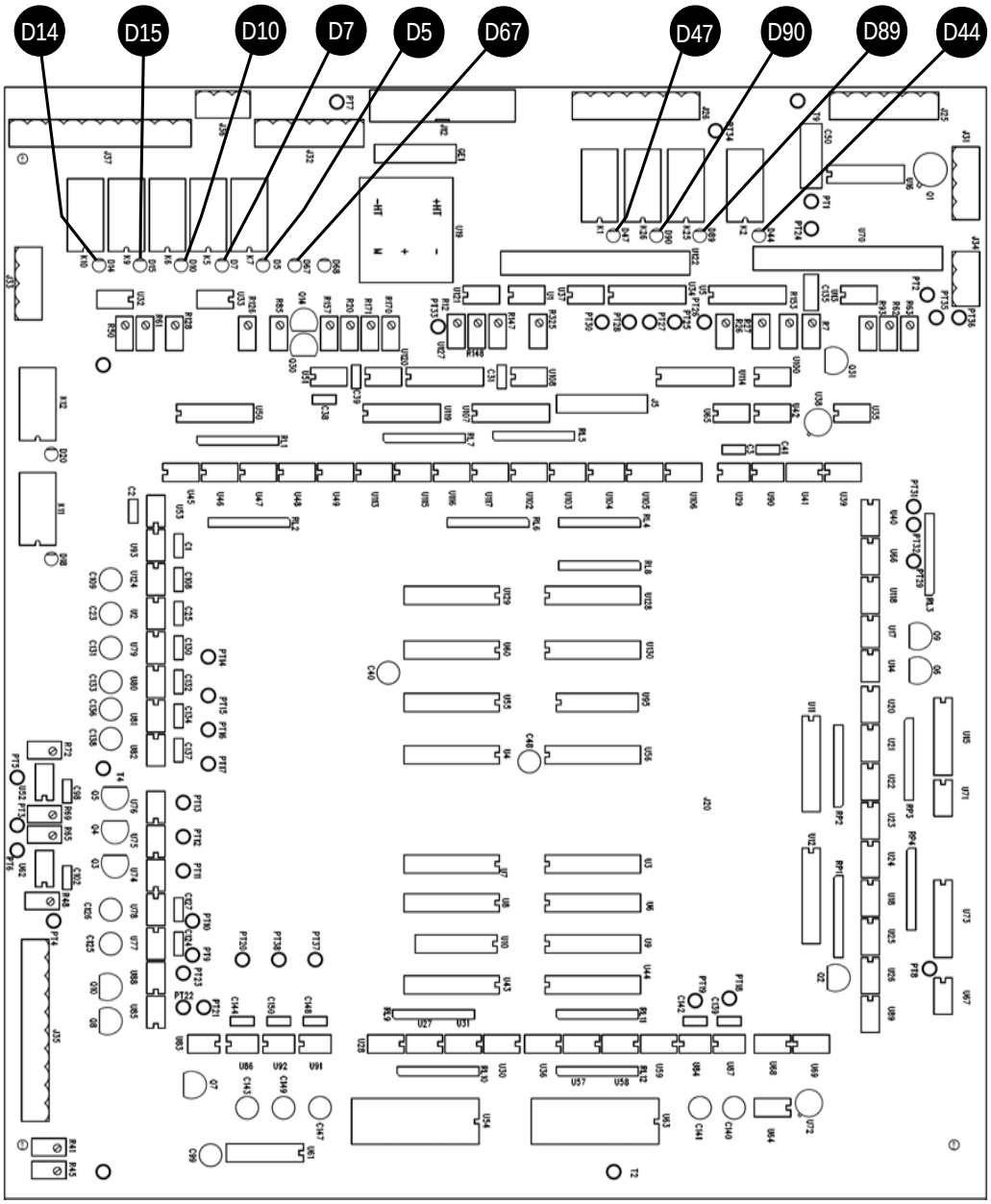
- **95577043 => Electrical diagram for standalone LINC-MASTER installation**
- **95577042 => Connection of LINC-MASTER interface**
- **93570112 => Electrical diagram of LINC-MASTER unit**
- **93570130 => Electrical diagram of PILOT UNIT**

2.2 Basic interface board



D9	Immediate external stop	**D50**	External pilot arc control
D12	External front disabling	**D51**	External welding control
D14	Movement 1 safety	**D53**	- 15 V AVC
D15	Movement 2 safety	**D59**	HF control
D31	Fault	**D60**	Hot wire control
D32	Cooling unit control	**D61**	Video cache control
D33	Ventilation control	**D62**	External source control
D34	Water solenoid valve control	**D72**	Pilot arc RI
D35	External feeling up	**D73**	Process fault
D36	External feeling down	**D76**	In cycle
D37	EV5 control	**D77**	Power source fault
D38	EV3 control	**D78**	Process OK
D39	Water safety	**D79**	Gas safety
D40	AVC +15V	**D80**	Additional output 1
D41	EV2 control	**D81**	Additional output 2
D42	EV4 control	**D82**	Additional input 1
D43	+ 24 V inputs/outputs	**D83**	Additional input 2
D44	External safety	**D84**	Chopper +15 V
D45	Movement 1 control	**D85**	Chopper - 15 V
D46	Movement 2 control	**D87**	Power supply
D48	Magnetic oscillation/deviation control	**D88**	Wire speed +15V
D49	External chaining	**D89**	- Wire speed - 15 V

2.3 Analogue interface board



D5	Movement 1 locking	**D44**	Wire lock
D7	Movement 1 control in + direction	**D47**	AVC lock
D10	Movement 1 control in - direction	**D67**	Thermal safety device
D14	Movement 1 limit switch in + direction	**D89**	Upper limit switch
D15	Movement 1 limit switch in - direction	**D90**	Lower limit switch

Do not upset the potentiometers; they are factory set

Ordering procedure:

Almost all the parts of a machine or installation are referenced in the photographs and sketches.

The descriptive tables contain three types of item:

- items normally held in stock: ✔
- items not held in stock: ✘
- articles upon request: no reference

(For such parts, please complete the list of parts page and send us a copy. In the Order column, state the number of parts required and indicate the type and number of your equipment.)

For items referenced in the photographs or sketches but not included in the tables, please send us a copy of the relevant page and highlight the relevant reference.

Example:

✔	normally held in stock.
✘	not in stock
	upon request.

Ref.	Part no	Stock	Order	Description
E1	W000XXXXXX	✔		Machine interface board
G2	W000XXXXXX	✘		Flow meter
A3	P9357XXXX			Printed front plates

- While ordering parts, please indicate the quantity and note the number of your machine in the box above.

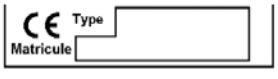
TYPE:
Number:


P3
P2
P4
P20
P21
P22
T/P Controller
PDC
P23
P6
P5
P24
P25
P7
P8
P26
P9
P10
P17
P12
P16
P13
P15

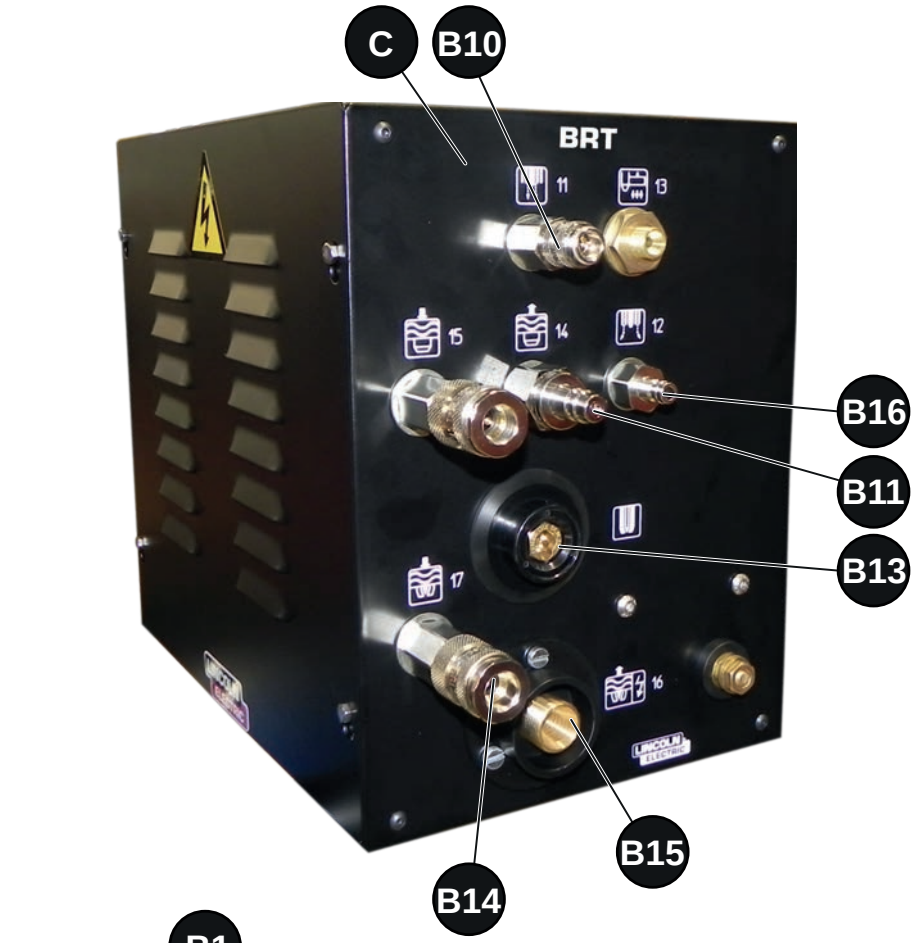
✔	normally held in stock.
✘	not in stock
	upon request.

Ref.	Part no	Stock	Order	Description
CC	AS-WS-95577171	✔		Complete **T/P CONTROLLER** control console
	W000352130	✘		HF filter
P14 **P15**	W000365793	✘		Protruding red pushbutton
P13	W000137821	✔		Green pushbutton
P2 **P3** **P4** **P5** **P6** **P7** **P8** **P9** **P10** **P12** **P16** **P17** **P20** **P21** **P24** **P25** **P26**	W000366050	✔		Black cap
P22 **P23**	W000366162	✔		Potentiometer button

- While ordering parts, please indicate the quantity and note the number of your machine in the box above.



TYPE:
Number:


C
B10
BRT
11
13
15
14
12
B16
B11
B13
17
16
B15
B14


B1

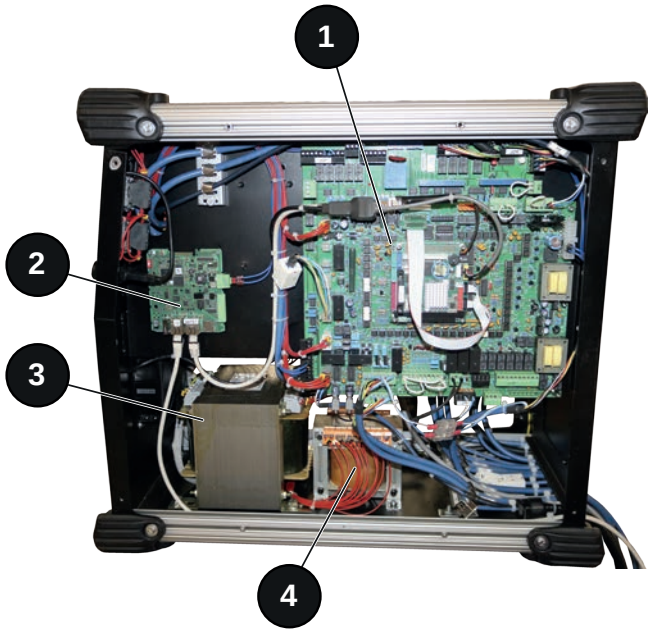
✔	normally held in stock.
✘	not in stock
	upon request.

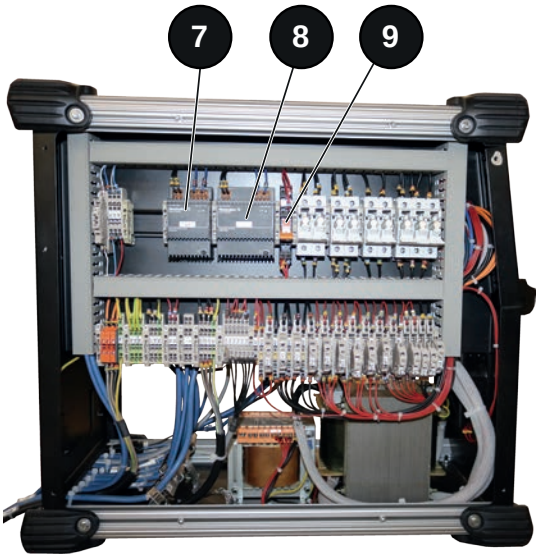
Ref.	Part no	Stock	Order	Description
C	W000352133	✔		**BRT** unit
B1	W000147583	✔		HF interface board
B13	W000384710	✔		Torch connector, 10-25mm²
B10 **B11** **B12** **B14** **B16**	W000352131	✘		Water + gas fitting assembly
B15	W000352132	✘		Complete power connector

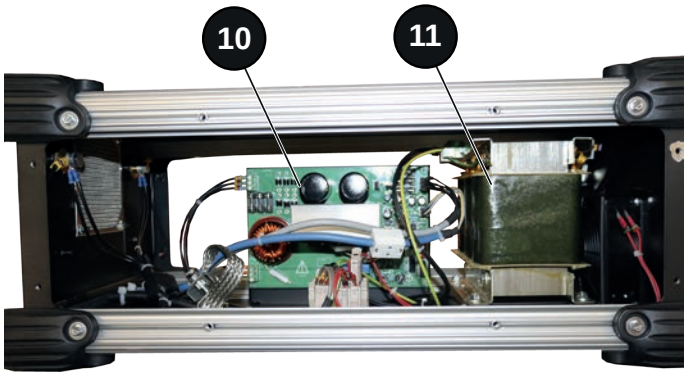
- While ordering parts, please indicate the quantity and note the number of your machine in the box above.

TYPE:
Number:


LINCOLN ELECTRIC
LINC-MASTER
PILOT UNIT
D
E
5
6


1
2
3
4


7
8
9


10
11

✔	normally held in stock.
✘	not in stock
	upon request.

Ref.	Part no	Stock	Order	Description
D	AS-WS-93570101			**LINC-MASTER** unit
1	W000377994	✔		Set of boards
	W000141596	✔		Inputs outputs interface board
	W000377988	✔		Analogue board
	W000373162	✔		PC104 board + console EPROM
2	AS-WS-C5703350			PC104-PW S500 communication gateway
3	PC5706105			Transformer, 230+400V - 3x42V - 1260VA
4	90000353P			Transformer, M19 - 318VA
5	PC5702587			Sectioning switch, 3P - 25A
6	PC5703288			USB connector
7	PC5706238			Power supply, 230V - 5VDC - 6A
8	PC5706238			Power supply, 230V - 12VDC - 2.6A
9	PC5701744			Relay + connector, 24VAC - 2RT - 8A
E	AS-WS-93570120			**PILOT UNIT**
10	W000140149			Auxiliary source board
11	PC5706237			Transformer, 3x400V - 3x75V - 1000VA + 24V
	AS-WS-95577130			**LINC-MASTER** software pack

- While ordering parts, please indicate the quantity and note the number of your machine in the box above.

TYPE:
Number:

3.4 Basic bundle

✔	normally held in stock.
✘	not in stock
	upon request.

Ref.	Part no	Stock	Order	Description
J25	AS-WS-93577106			**LINC-MASTER** AVC control power source bundle
J26	AS-WS-93577107			**LINC-MASTER** wire/movement control power source bundle
	AS-WS-95577036			**PILOT UNIT** power supply bundle
J7-J11	AS-WS-95577032			**PILOT UNIT** measurement bundle
J6	P95577034			**PILOT UNIT** control power supply bundle

- While ordering parts, please indicate the quantity and note the number of your machine in the box above.

TYPE:
Number:

Connection subassembly **LINC-MASTER**	**10 metres**	**17 metres**	**22 metres**	**25 metres**	**30 metres**
	AS-WS-9577290	AS-WS-95577291	AS-WS-95577292	AS-WS-95577293	AS-WS-95577294
Console bundle	AS-WS-95577231	AS-WS-95577232	AS-WS-95577233	AS-WS-95577234	AS-WS-95577235
Gas controller bundle	AS-WS-93577175	AS-WS-93577176	AS-WS-93577177	AS-WS-93577552	AS-WS-95577178
BRT unit bundle	AS-WS-93577180	W000366096	AS-WS-93577182	W000366100	AS-WS-95577183
Auxiliary electrode bundle	AS-WS-95577209	AS-WS-95577207	AS-WS-95577210	AS-WS-95577211	AS-WS-95577212
Gas pipe bundle (x2)	AS-WS-93577375	AS-WS-93577376	AS-WS-93577377	AS-WS-93577555	AS-WS-95577378
Water pipe bundle (x2)	AS-WS-93577380	AS-WS-93577381	AS-WS-93577382	AS-WS-93577556	AS-WS-95577383
Electrode cable bundle	AS-WS-95577213	AS-WS-95577200	AS-WS-95577214	AS-WS-95577215	AS-WS-95577216
Gas pipe bundle, 6M	AS-WS-93577098	AS-WS-93577098	AS-WS-93577098	AS-WS-93577098	AS-WS-93577098
Power source ground cable bundle	AS-WS-95577206	AS-WS-95577206	AS-WS-95577206	AS-WS-95577206	AS-WS-95577206

With version **PLASMA** - **PILOT UNIT**	**10 metres**	**17 metres**	**22 metres**	**25 metres**	**30 metres**
Nozzle cable bundle	AS-WS-95577217	AS-WS-95577202	AS-WS-95577218	AS-WS-95577219	AS-WS-95577220
Electrode nozzle cable bundle	AS-WS-95577221	AS-WS-95577204	AS-WS-95577222	AS-WS-95577223	AS-WS-95577224

PERSONAL NOTES

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