

THERMAL ARC



THERMAL ARC 180 AC/DC
THERMAL ARC 220 AC/DC
THERMAL ARC 250 AC/DC

USER'S MANUAL


The machine you have just acquired has taken advantages, in its production, of Thermal Arcs' wide experience in the manufacturing of welding machines, along with the latest technology strides in power electronics.

It will give you entire satisfaction for years if you respect all the operating and maintenance instructions given in this manual.

We strongly suggest you read very carefully chapters concerning safety and individual protection before using this machine.

We thank you in advance for your co-operation.

THERMADYNE INDUSTRIES reserve the right to make changes without previous notification. Illustrations, descriptions and characteristics are not contractually binding and do not engage the responsibility of the manufacturer.

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Thermal Arc 180 AC/DC, 220 AC/DC and 250 AC/DC units are guaranteed 24 months from date of invoice.

Defects caused by natural wear or accidental damage (wrong assembly, defective maintenance, abnormal use ...) or by modification of the product, which has not been accepted in writing by the manufacturer, are not included in the guarantee.

Guarantee covers free of charge replacement of parts, which have been admittedly defective (transport included).

Every part replaced under guarantee will be automatically invoiced after a period of 1 month in case of non-return of the defective part.

Labour executed by the distributor is entirely at their cost. However, if you request, labour can be performed free of charge by Thermadyne Industries, in its factory. In this case, transport to and from Thermadyne Industries will be at the distributor's costs.

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The equipment you have just acquired will give you entire satisfaction if you respect the operating and maintenance instructions.

Its design, the specification of the components and its manufacture are in accordance with the existing rules, French standards (NF), ISO and CEI international injunctions, EEC general lines and CEN/CENELEC standards.

In this chapter, you will find safety rules in the use of electric arc welding power sources with coated electrodes. We give you hereunder a list of recommendations and obligations you have to respect.

Safety rules must be observed, and particularly those relating to Decree 88.1056 dated November 14., 1988 concerning protective measures against electrical currents.

1. ELECTROMAGNETIC COMPATIBILITY

1.1. DECLARATION OF CONFORMITY

THERMADYNE Industries hereby declare that the machine object of this manual complies with the following European regulations :

Electromagnetic compatibility :

Rule 89/336-EEC of 3/05/89 modified by rules 92/31-EEC of 28/04/1992 and 93/68-EEC of 22/07/1993.

Low voltage :

Rule 73/23-EEC of 19/02/1973 modified by rule 93/68-EEC of 22/07/1993.

and with the national legislation transposing them.

THERMADYNE Industries also declare that following harmonised standards have been applied :

EN 60974-10 (2003) Electromagnetic compatibility (CEM) – Product norm for arc welding material.

EN 50060 (1990): Current source for arc manual welding with limited service.

EN 60974-1: Security rules for electric welding material. Part 1: welding current sources.


EN 50192 (1995): Arc welding material – plasma cutting systems.

1.2. INSTALLATION AND USE

The machine object of this manual complies with the European regulations about electromagnetic compatibility 89/336 CEE. It also complies with EN 60974-10 standard: Electromagnetic compatibility, product standard for welding machines.

The user is responsible for installing and using the arc welding equipment according to the manufacturer's instructions.

If electromagnetic disturbances are detected, then it shall be the responsibility of the user of the arc welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the welding circuit, see Note. In other cases it could involve

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constructing an electromagnetic screen enclosing the welding power source and the work complete with associated input filters. In all cases electromagnetic disturbances shall be reduced to the point, where they are no longer troublesome.

NOTE - The welding circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorised by a person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel welding current return paths, which may damage the earth circuits of other equipment.

Further guidance is given in IEC 62081 "Arc welding equipment - Installation and use" (under consideration).

1.2.1. ASSESSMENT OF AREA

Before installing arc welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account :

- a) Other supply cables, control cables, signalling and telephone cables, above, below and adjacent to the arc welding equipment;
- b) Radio and television transmitters and receivers;
- c) Computer and other control equipment;
- d) Safety critical equipment, e.g. guarding of industrial equipment,
- e) The health of the people around, e.g. the use of pacemakers and hearing aids;
- f) Equipment used for calibration or measurement;
- g) The immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;
- h) The time of day that welding or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

1.2.2. METHODS OF REDUCING EMISSIONS

1.2.2.1. Public supply system

Arc welding equipment should be connected to the public supply system according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the public supply system. Consideration should be given to shielding the supply cable of permanently installed arc welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

1.2.2.2. Maintenance of the arc welding equipment


The arc welding equipment should be routinely maintained according to the manufacturers recommendations. All access and service doors and covers should be closed and properly fastened when the arc welding equipment is in operation. The arc welding equipment should not be modified in any way, except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilising devices should be adjusted and maintained according to the manufacturer's recommendations.

1.2.2.3. Welding cables

The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

1.2.2.4. Equipotential bonding

Bonding of all metallic components in the welding installation and adjacent to it should be considered.

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However, metallic components bonded to the work piece will increase the risk that the operator could receive an electric shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

1.2.2.5. Earthing of the workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g. ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

1.2.2.6. Screening and shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.

2. ELECTRIC SAFETY

2.1. CONNECTION OF THE WELDING POWER SOURCE TO THE NETWORK

Before connecting your equipment, you must check that:

- The meter, the safety device against over-currents, and the electric installation are compatible with the maximum power and the supply voltage of the welding power source (refer to the instructions plates).
 - The connection, either single-phase, or three-phase with earth can be effected on a socket compatible with the welding power source cable plug.
- If the cable is connected to a fixed post, the earth, if provided, will never be cut by the safety device against electric shocks.
- The ON/OFF switch (if exists) situated on the welding power source, is turned off.


2.2. WORKING AREA

The use of arc welding implies a strict respect of safety conditions with regard to electric currents (Decree dated 14.12.1988).

It is necessary to check that no metal piece accessible to the operators and to their assistants can come into direct contact with a phase conductor and the neutral of the network. In case of uncertainty, this metal part will be connected to the earth with a conductor of at least equivalent section to the largest phase conductor.

Make sure that all metal pieces that the operator could touch with a non insulated part of his body (head, hands without gloves on, naked arms ...) is properly grounded with a conductor of at least equivalent section to the biggest supply cable of the ground clamp or welding torch. If more than one metal ground are concerned, they need to be all interlinked in one, which must be grounded in the same conditions.

Unless very special care have been taken, do not proceed to any arc welding or cutting in

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conductive enclosures, whether it is a confined space or the welding machine has to be left outside. Be even more prudent when welding in humid or non ventilated areas, and if the power source is placed inside (Decree dated 14.12.1988, Art. 4).

2.3. INTERVENING

- Before carrying out any internal checking or repair work, check that the power source has been separated from the electrical installation by locking and guard devices.
- The current plug has to be taken out. Provisions have to be taken to prevent an accidental connection of the plug to a socket.
- Cut-off through a fixed connecting device has to be omnipolar (phases and neutral). It is in the "OFF" position and cannot be accidentally put into operation.
- Maintenance works of electrical equipment must be entrusted to qualified people (Section VI, Art. 46).

2.4. MAINTENANCE

Check the good state, insulation and connection of all the equipment and electrical accessories: plugs and flexible supply cables, cables (NF A 32-510), conduits, connectors, extension cables (NF A 85-610 and CENELEC HD 433), sockets on the power source, ground and electrode-holder clamps (NF A 85-600).

These connections and mobile accessories are marked according to standards, if consistent with the safety rules. They can either be controlled by you or by accredited firms.

- Maintenance and repair works of conduits and liners have to be properly carried out (Section VI, Art. 47).
- Repair or replace all defective accessories
- Check periodically that the electrical connections are tightened and do not heat.

2.5. RISKS OF FIRE AND EXPLOSION

Welding can occur risks of fire or explosion. You have to pay attention to fire safety regulation

- Remove flammable or explosive materials from welding area.
- Always have sufficient fire fighting equipment
- Fire can break out from sparks even several hours after the welding work has been finished.

3. INDIVIDUAL PROTECTION

3.1. RISK OF EXTERNAL INJURIES


3.1.1. THE WHOLE BODY

Arc rays produce very bright ultra violet and infra red light. They will damage yours eyes and burn your skin if you are not properly protected

- The welder is dressed and protected according to the constraints his works impose him.
- Insulate yourself from the workpiece and the ground. Make sure that no metal piece, especially those connected to the network, can come into contact with the operator.
- The welder must always wear an individual insulating protection (decree of 14/12/1988, article 3-3).

Protective clothing : gloves, aprons, safety shoes offer the additional advantage to protect the operator against burns caused by hot pieces and spatter.

This protective equipment should be kept in good order and checked on a regular basis.

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3.1.2. FACE AND EYES

- It is absolutely necessary to protect your eyes against arc rays.
- Protect your hair and your face against sparks

The welding shield, with or without headset, is always equipped with a proper filter according to the arc welding current (NS S 77-104 / A 88-221 / A 88.222 standards).
 In order to protect shaded filter from impacts and sparks, you have to add a plain glass in front of the shield.
 The helmet provided with your equipment (if requested) is equipped with a protective filter. When you want to replace it, precise the reference and number of opacity degree of the filter. Use the shade of lens as recommended in the instruction manual (opacity graduation number)

Protect others in the work area from arc rays by using protective booths, UV protective goggles, and if necessary, a welding shield with appropriate protective filter on (NF S 77-104 - by A 1.5).

Opacity gradation numbers and recommended use for arc welding

Welding process or connected techniques	Current intensity in Amps																			
	0.5	2.5	10	20	40	80	125	175	225	275	350	450								
	1	5	15	30	60	100	150	200	250	300	400	500								
Coated electrodes													9	10	11	12	13	14		
MIG on heavy metals													10	11	12	13	14			
MIG on light alloys													10	11	12	13	14	15		
TIG on all metals													9	10	11	12	13	14		
MAG													10	11	12	13	14	15		
Air/Arc gouging													10	11	12	13	14	15		
Plasma cutting													9	10	11	12	13			

Depending on the conditions of use, the next highest or lowest category number may be used.
 The expression "heavy metals" covers steels, alloyed steels, copper and its alloys.
 The shaded areas represent applications where the welding processes are not normally used at present.

CARE : Use a higher degree of filters if welding is performed in premises which are not well lighted.

3.2. RISK OF INTERNAL INJURIES

GASES AND FUMES

Gases fumes produced during the welding process can be dangerous and hazardous to your health. Arc welding works have to be carried out in suitable ventilated areas.

Ventilation must be adequate to remove gases and fumes during operation. All fumes produced during welding have to be removed as soon as they are given off, and as close as possible from the place they are produced to be the most efficient.

Vapors of chlorinated solvents can form the toxic gas phosgene when exposed to ultraviolet radiation from an electric arc.

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3.3. SAFETY IN THE USE OF GASES (WELDING WITH TIG OR MIG INERT GASES)

3.3.1. COMPRESSED GAS CYLINDERS

Compressed gas cylinders are potentially dangerous. Refer to suppliers for proper handling procedures.

- No impact: secure the cylinders and keep them away from impacts.
- No excess heat (over 50°C)

3.3.2. PRESSURE RELIEF VALVE

Check that the pressure relief screw is slackened off before connecting to the cylinder.

Check that the union is tight before opening the valve of the cylinder. Open it slowly a fraction of a turn.

If there is a leak, NEVER tighten a union which is under pressure, but first close the valve on the cylinder.

Always check that hoses are in good condition.

3.3.3. DETAILS ABOUT GASES

Gas and gaseous mixtures containing less than 20% of CO₂:

If these gases or mixtures take the place of the oxygen in the air, there is a danger of asphyxia. An atmosphere containing less than 17% oxygen is dangerous.

hydrogen and hydrogen-based combustible gaseous mixtures

These are very light gases. In the case of leaks, they collect under the ceiling.

Provide for ventilation at ceiling level.


These are also inflammable gases. The flame of hydrogen is almost invisible. There is therefore a risk of burns.

Air/hydrogen and oxygen/hydrogen mixtures are explosive in the following proportions:

- 4 to 74.5 % of hydrogen in air.
- 4 to 94 % of hydrogen in oxygen.

Store the bottles in the open or in a well-ventilated place.

Avoid any leakage by limiting the number of connections or couplings to a minimum.

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4. GENERAL CHARACTERISTICS

THERMAL ARC 180 AC/DC, 220 AC/DC and 250 AC/DC welding machines have been designed as integrated and portable units using the newest techniques in power electronics, based on an **inverter process with IGBT**, which enables the following :

- a considerable reduction of weight and volume
- the dynamic control of the welding current
- the specific protection of power components
- a high power in a small space at a very low power consumption

With their innovative design, these machines are both robust (plastic front and back panel, new internal conception) and ergonomic.

The THERMAL ARC 180 and 220 AC/DC units must be connected to a single phase power supply, and the THERMAL ARC 250 AC/DC units to a three phase power supply.

THERMAL ARC 180 and 220 AC/DC units have built-in **over voltage protection**.
THERMAL ARC 250 AC/DC units detect **lack of one phase** on the supply.
These 2 machines can be supplied by **engine driven generators**.

They offer a very high quality of welding in :

1- stick welding

Exceptional arc characteristics with a microprocessor that ensures regulation and perfect **blade appearance** and **spatter control**.

Maximum user's comfort strengthened by **arc force** and **anti stick**.

2- TIG welding

Ignition of the arc can be made with **high frequency** or using a **lift arc** technique, either in **2 stroke** or in **4 stroke** modes.

Welding with **DC or AC current**

Integrated pulse current, totally controlled through the microprocessor.

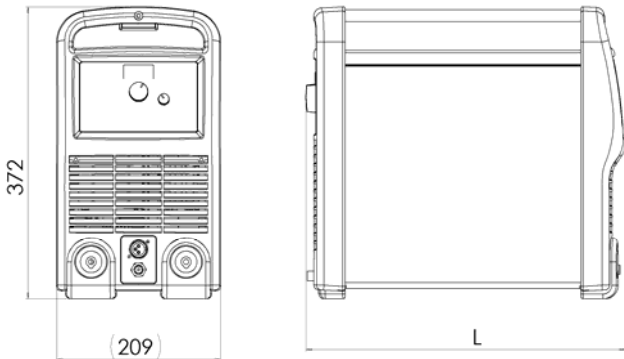
Powerful and direct H.F

Female socket on the back side for a **direct connection to a cooling unit**

These power sources are perfectly suited to welding in :


- TIG DC for high alloyed steels, stainless steels, copper and copper alloys, titanium ...
- TIG AC for aluminium and its alloys, magnesium.
- Stick welding with coated electrodes of all types in positive or negative polarity.

5. TECHNICAL CHARACTERISTICS




THERMAL ARC 180 and 220 AC/DC L = 407 mm
THERMAL ARC 250 AC/DC L = 457 mm

DIMENSIONS (in mm)

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Ces caractéristiques sont données pour une température ambiante de 40°C

		180 AC/DC	220 AC/DC	250 AC/DC
PRIMARY				
Power supply	V	Single phase : 230 V (+/- 13%)		Three phase : 400 V (+/- 10%)
Frequency	Hz	50/60		
MMA (stick) welding				
Maximum primary current	A	29.5	33.8	12.7
Maximum power consumption	kVA	6.8	7.8	8.8
Main supply protection	A	25	25	16
TIG welding				
Maximum primary current	A	18.6	25	10
Maximum power consumption	kVA	4.2	5.7	6.9
Main supply protection	A	16		
Power factor (cos Ø)		0,98		
SECONDARY				
Off load voltage	V	50 / 60		
Minimum secondary current	A	3		
MMA (stick) welding				
Welding current range	A	3 to 180	3 to 200	3 to 220
Welding current at 40 %	A	-		220
Welding current at 45 %	A	-		200
Welding current at 50 %	A	180	-	
Welding current at 60 %	A	160	170	190
Welding current at 100 %	A	140	150	170
TIG welding				
Welding current range	A	3 to 180	3 to 220	3 to 250
Welding current at 30 %	A	-		220
Welding current at 50 %	A	180	-	
Welding current at 60 %	A	160	170	210
Welding current at 100 %	A	140	150	180
Courant alternatif / AC current				
Frequency	Hz	From 20 to 250		
Waves form		square waves		
Balance cleaning/penetration		Cleaning from 20% (penetration.80%) to 60% (penetration.40%)		
Pulse current				
low current	A	From 3 to welding current		
Frequency	Hz	From 0.2 to 99.9		
Cycle ratio	%	From 20 to 80		
Protection degree				
Protection degree		IP 23		
Insulation class				
Insulation class		H		
Standards				
Standards		EN 60974-1/EN 60974-10		
Weight	kg	19		21.1
Dimensions L x W x H	mm	407 x 209 x 372		457 x 209 x 372

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6. CONNECTION TO THE MAIN SUPPLY

The power source THERMAL ARC 180 and 220 AC/DC must be connected to a single-phase 230V - 50 Hz/60 Hz mains + ground with a tolerance of +/- 13%.

The power source THERMAL ARC 250 AC/DC must be connected to a three-phase 400V - 50 Hz/60 Hz mains + ground with a tolerance of +/- 10%.

It has built-in over voltage protection which allows engine driven generator supply

Main supply must be protected by fuses or circuit-breaker according to the value $I_{1\text{eff}}$ written on the specifications of the power source.

It is strongly suggested to use a differential protection for the operator's safety.

7. CONNECTION TO THE GROUND

For the operator's protection, the power source must be correctly grounded (according to the International Protections Norms).

It is absolutely necessary to provide a good ground connection installation with the green/yellow lead of the power cable. This will avoid discharges caused by accidental contacts with grounded pieces.

If no earth connection has been set, a high risk of electric shock through the chassis of the unit remains possible.

8. PRELIMINARY PRECAUTIONS

For the good operation of your welding power source, make sure that the air flow produced by the fan inside the unit is not obstructed.

Also try to operate in a non-dusty area.

Avoid all impacts, exposure to damp areas or excessive temperatures.



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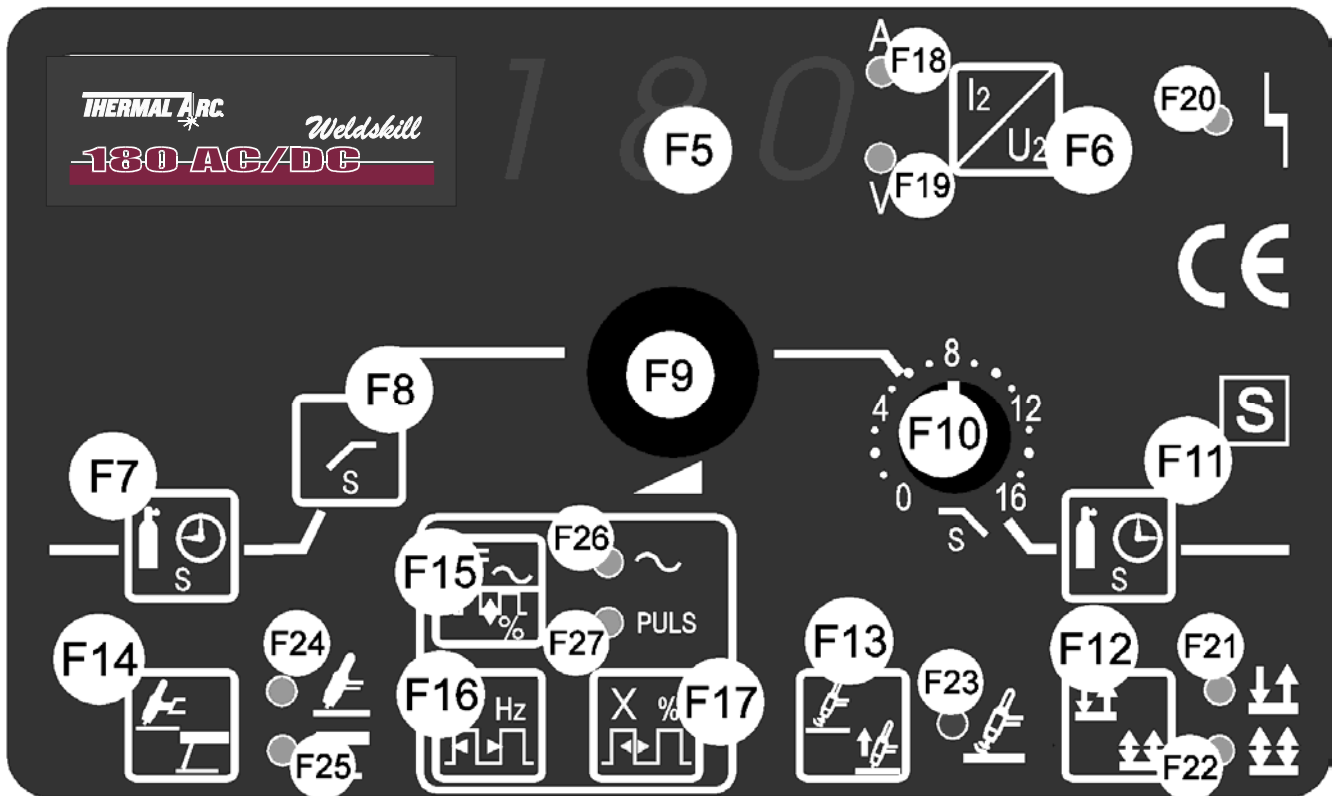
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9. DESCRIPTION OF THE FRONT PANEL




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ITEM	DESCRIPTION
F1	Female socket for torch's signals connection
F2	Gas output
F3	Power terminal – (torche)
F4	Power terminal +
F5	Digital display
F6	« voltage/intensity displayed » setting key
F7	« pre gas time » setting key
F8	« up slope time » setting key
F9	Welding current and other parameters knob
F10	Knob for arc down slope time adjustment
F11	« post gas time » setting key
F12	« 2 stroke / 4 stroke » setting key
F13	« HF or PAE ignition » setting key
F14	Welding mode « TIG / Stick » setting key
F15	Welding mode « TIG DC, pulse TIG DC, TIG AC, pulse TIG AC » setting key « pulse low current » setting key
F16	« pulse frequency » setting key « AC current frequency » setting key
F17	« pulse cycle ratio » setting key Balance « cleaning/penetration » setting key
F18	« current in Amps displayed » indicator
F19	« voltage displayed (in Volts) » indicator
F20	Warning indicator
F21	« 2 stroke » indicator
F22	« 4 stroke » indicator
F23	H.F ignition indicator
F24	« TIG welding » indicator
F25	« Stick welding » indicator
F26	« AC current » indicator
F27	« pulse current » indicator

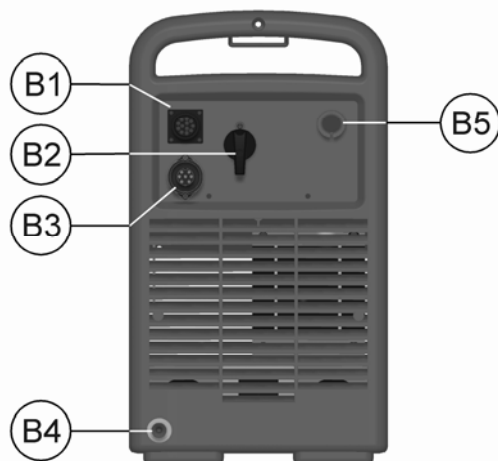
PINOUT OF THE FEMALE SOCKET F1

You can use the power source with a torch with potentiometer (optional). Potentiometer's value has to be 10K ohms. The connection is centralised to the female socket F1 as described below :

PINS	CONNECTION
1	Torch trigger
2	Torch trigger
3	Minimum of the torch potentiometer
4	Cursor of the torch potentiometer
5	Maximum of the torch potentiometer

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10. DESCRIPTION OF THE BACK PANEL



ITEM	DESCRIPTION
B1	Female socket for remote control
B2	ON/OFF main switch
B3	Female socket for connexion to cooler unit
B4	Gas input
B5	Input cable

11. MMA (STICK) WELDING

Connect the power source to the main supply and the ground as explained in the chapter « Setting up » (as para 6 and 7).

Connect the ground cable and the electrode-holder to the appropriate power connections + (**F4**) and – (**F3**) according to the electrode polarity being used (refer to the electrodes manufacturer's datasheets). Start up the power source with the main switch ON/OFF (**B2**).

When you start the machine, the orange indicator (**F20**) illuminates during 2s and then goes out if no failure has been found.

Select MMA(stick) welding mode with setting key **F14**, the indicator **F25** illuminates.

Adjust welding current with potentiometer **F9**.

Digital display **F5** shows the selected current in Amps (indicator **F18** illuminates)..

Place the electrode on the workpiece in order to strike the arc.

NOTE

The welding current of ELEKTROTIG 220 AC/DC in **MMA** welding mode could be adjusted from 3 to **200A** (in TIG welding mode, from 3 to 220A)

The welding current of ELEKTROTIG 250 AC/DC in **MMA** welding mode could be adjusted from 3 to **220A** (in TIG welding mode, from 3 to 250A)

Arc force control

Arc force control is not adjustable, but it is optimised for welding with a large range of rutile and basic electrodes.

Hot start time

The Hot start is an over current of 20% higher than the welding current chosen.

The hot start time pre-adjusted is 0s (no over current) but it is possible to adjust it until 5s (see **chapter. 16**).

Using remote control RC01 or RC04

The unit recognises the remote control as soon as you plug it in female socket **B1**.

IMPORTANT : using the potentiometer of the remote control, you can adjust the welding current from 3A to the current selected with the main potentiometer **F9** of the power source. This value is displayed on **F5** when the potentiometer of the remote control is on “maximum”.
 This allows you to set the welding current with fine adjustment directly on the remote control

Reading the parameters when welding

When welding, digital display **F5** shows welding current in Amps measured by the machine.
 It is possible to read the welding voltage when pressing the setting key **F6**. The value is displayed in Volts (indicator **F18** goes out and **F19** illuminates). Press setting key **F6** in order to display current's value again.

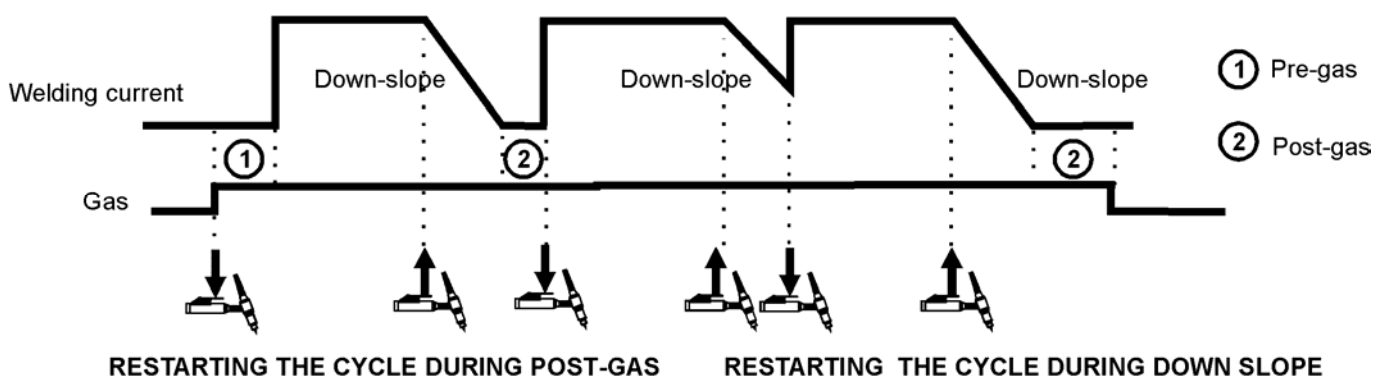
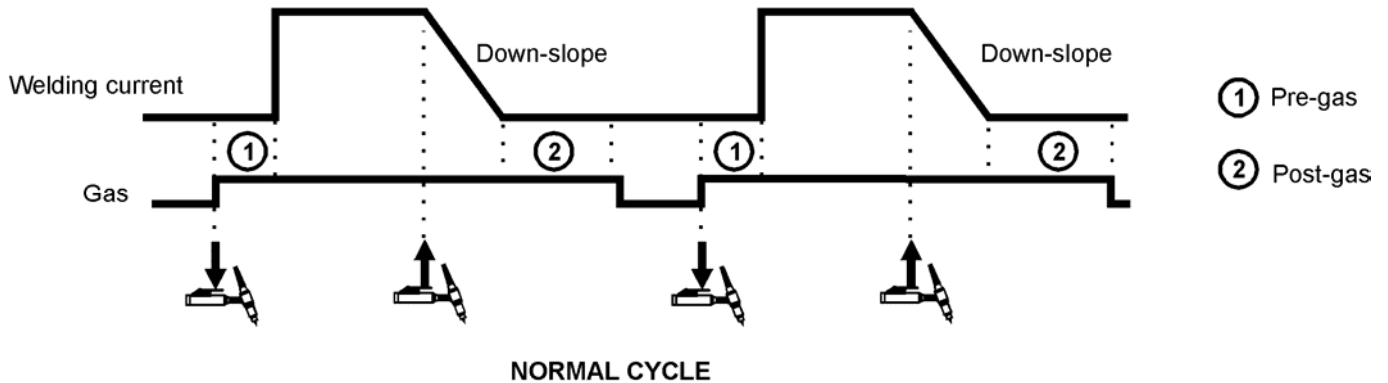
Ventilation in MMA (stick) welding


Fan allows the cooling of electronic components.
 Ventilation is permanent.
 Fan speed changes according to the components' temperature.
 This method is a good solution between cooling and protection from dust circulation in the machine.

12. TIG WELDING

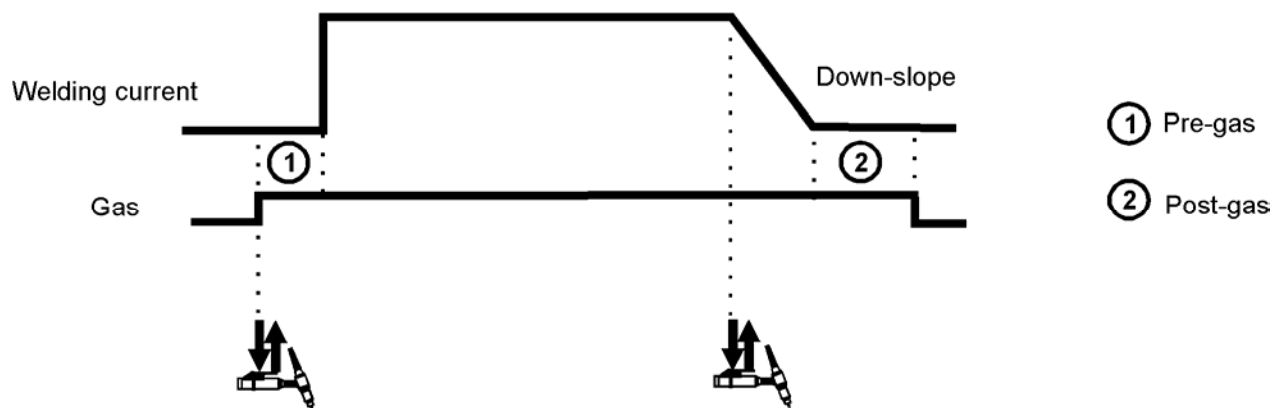
12.1. 2 STROKE & 4 STROKE MODE

2 STROKE MODE



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4 STROKE MODE



12.2. BEFORE WELDING


- connect the power source to the main supply and the ground as explained in the chapter « Setting up » (as para 6 and 7).
- connect the ground cable to the power connection + (**F4**) and the torch to the – (**F3**).
- start up the power source with the main switch ON/OFF (**B2**).
- select the TIG welding mode with the key **F14**, to light indicator **F24**. Check that the indicators **F26** and **F27** are extinguished. If not, press the setting key **F15** to extinguish them.
- select the « 2 stroke or 4 stroke » welding mode with the key **F12**.
 If the mode « 4 stroke » is selected, the indicator **F22** illuminates.
 If the mode « 2 stroke » is selected, the indicator **F21** illuminates.
- select the ignition mode with the key **F13**. If « HF ignition » is selected, the indicator **F23** illuminates.
- set the TIG cycle parameters :
 During their adjustment, the parameter's value is displayed by digital display **F5**. When adjusting a current, the indicator **F18** illuminates (A - Amps). In the other case, it is OFF. Then, the unit of the value displayed is written on the setting key.

① Pre-gas :

Press the setting key **F7**, adjust the pre-gas time with the potentiometer **F9**.
 When the potentiometer is at the minimum, the pre-gas time is 0.1s, and at the maximum, the pre-gas time is 5s.
 The value can be read on the display **F5** (The indicator **F18** or **F19** goes out).
 The pre-adjusted value is 0.5s.
 Release the key when your setting is finished.

② Up slope time

Press the setting key **F8**, adjust the up-slope time with the potentiometer **F9**.
 When the potentiometer is at the minimum, the up-slope time is 0s, and at the maximum, the up-slope time is 10s.

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The value can be read on the display **F5** (The indicator **F18** or **F19** goes out).
The pre-adjusted value is 1.0s.
Release the key when your setting is finished.

③ Down-slope time

Adjust the down-slope time between 0s to 16s with the potentiometer **F10**.

④ Post-gas :

Press the setting key **F11**, adjust the post-gas time with the potentiometer **F9**.

When the potentiometer is at the minimum, the pre-gas time is 3s, and at the maximum, the pre-gas time is 25s.

The value can be read on the display **F5** (The indicator **F18** or **F19** goes out).

The pre-adjusted value is 5.0s.

Release the key when your setting is finished.

⑤ Welding current :

Set the welding current from 3A to maximum value with potentiometer **F9**.

The value can be read on the display **F5** and indicator **F18** illuminates.

12.3. WELDING

Select tungsten electrode

Place on the torch a tungsten electrode thoriated 2% or 4%, or even better, electrode DLZ (Itrium Lanthane Zirconium) or lanthane, not so radioactive.

Grid electrode's head at 60° or 90°.

See advised electrode's diameter adapted to welding current.

Electrode's diameter	mm	1	1.6	2.0	2.4	3.0	4.0
Welding DC current	A	<75	50 - 120	90 - 190	130 - 250	170 - 300	250 - 400

H.F ignition

Place the tungsten electrode a few mm away from the workpiece.

Press the trigger on.

After the selected pre-gas time, the arc strikes. The high frequency stops.

The welding current increases during the up-slope time between the value of initial current and the value of welding current chosen.

The value of the initial current (**I_d**) is pre-adjusted at 50% of the value of welding current chosen but it is possible to adjust (see **chapter 16**).

At the end of the weld, the arc fades away during the down-slope time and the welding current reduces from the welding current chosen to the final current.

The final current (**I_f**) is pre-adjusted to 3A but it is possible to adjust it (see **chapter 16**).


The arc goes out. The gas flows according to the post-gas time to ensure the protection of the tungsten as well as of the weld pool.

PAE ignition

Put the tungsten electrode in direct contact with the workpiece. Push on the trigger.

Raise the torch slowly. The arc strikes. The welding cycle will then be the same as described above.

NOTE : This type of ignition is especially useful when welding in surroundings sensitive to radioelectric disturbances (next to computers or digital controlled equipments).

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12.4. USING REMOTE CONTROL

CAUTION : Do not connect at the same time remote control to socket **B1** and torch with potentiometer to socket **F1**.

Using remote control RC01 or RC04

The unit recognises the remote control **RC01** as soon as you plug it in female socket **B1**.

The unit recognises the foot pedal remote control **RC04** as soon as you plug it in female socket **F1**.

Using torch with potentiometer

The generator is equipped to work with all torches with potentiometer of 10kΩ. The connection is centralised on the female socket **F1** as described in **chapter 9**.

The unit recognises the torch with remote control as soon as you plug it in female socket **F1**.

IMPORTANT : using the potentiometer of remote control or torch, you can adjust the welding current from 3A to the current selected with the main potentiometer **F9** of the power source. This value is displayed on **F5** when the potentiometer of the remote control is on “maximum”.
This allow you to set the welding current with fine adjustment directly on the remote control.

12.5. CONNECTION OF A COOLING UNIT

Connect directly the cooling unit to the female socket **B3**.

Use a water cooled torch. Connect the water plug to the cooling unit according to the water circulation. The machine starts the cooling unit automatically when necessary. Lack of water or water circuit blocked create a default.

12.6. READING PARAMETERS WHEN WELDING

When welding, digital display **F5** shows welding current in Amps measured by the machine.

It is possible to read the welding voltage when pressing the setting key **F6**. The value is displayed in Volts (indicator **F18** goes out and **F19** illuminates).

12.7. VENTILATION IN TIG WELDING

Fan allows the cooling of electronic components.

In TIG welding, ventilation doesn't start systematically.

When welding, the component's temperature rise starts the ventilation and fixes the fan's speed which will change according to temperature.

This method is a good solution between cooling and protection from dust's circulation in the machine.

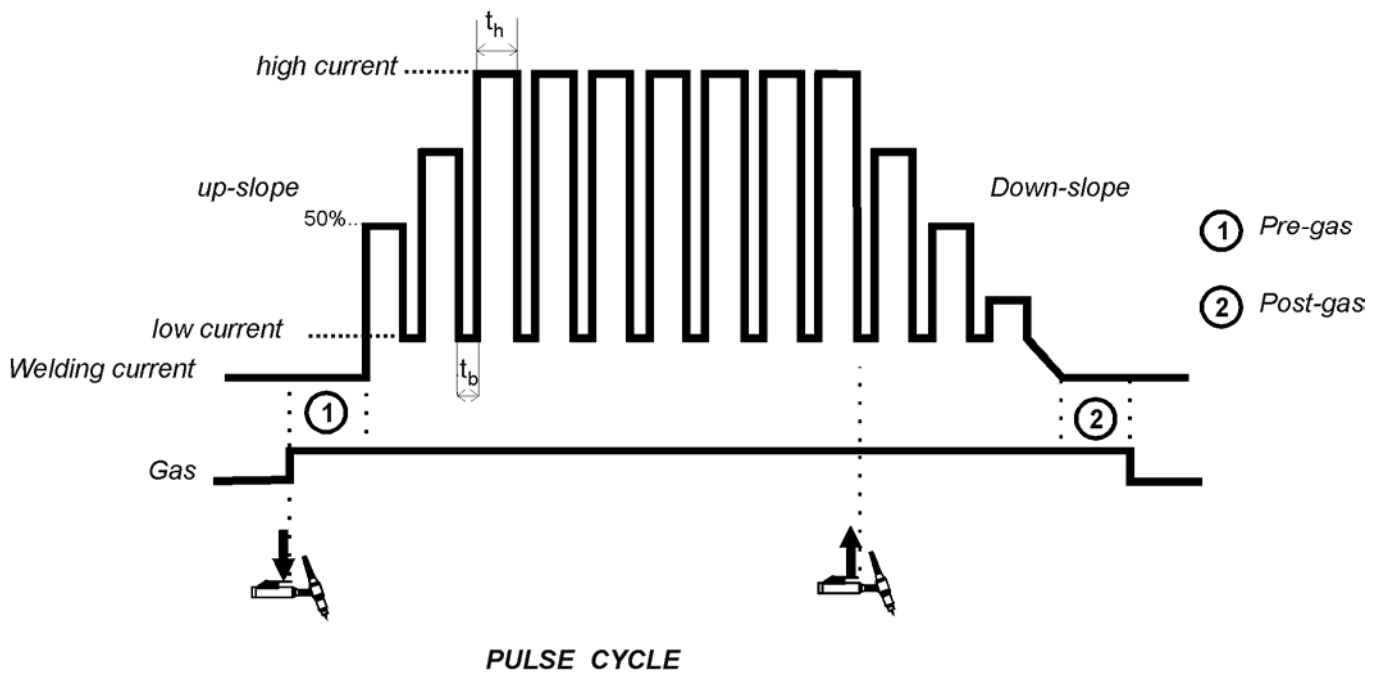
NOTE : When ambient temperature is high, the fan can operate for a short period even if you are not welding.

In MMA (stick) mode, ventilation is permanent

13. WELDING WITH PULSE DC CURRENT

The THERMAL ARC 180 AC/DC, 220 AC/DC and 250 AC/DC units have got a pulse current function built in.

To set the pulse current, press the setting key **F15**. The indicator **F27** illuminates (indicator **F26** OFF). To remove the pulse current, press the setting key **F15** until indicator **F27** fade out.



① Adjustment of the pulse high current

Adjust the high current with the potentiometer **F9**.
The value can be read on display **F5**.

② Adjustment of the pulse low current

When **F26** OFF and **F27** ON, press the setting key **F15** for 3 s. Maintain the key pressed and adjust the low current's value with the potentiometer **F9**.
The value can be read on the display **F5**.
When the potentiometer is at the minimum, the current is 3A, and at the maximum, it is high pulse current value.
The low current is pre-adjusted at 30A.
Release the key when your setting is finished.

③ Adjustment of the frequency

The frequency is the number of pulses per second. $F_{pulse} = 1/(t_h + t_b)$ in Hz
When **F26** OFF and **F27** ON, press the setting key **F16** and adjust the frequency with the potentiometer **F9**.
The value (in Hz) can be read on the display **F5**.
When the potentiometer is at the minimum, the frequency is 0.2 Hz, and at the maximum, the frequency is 99.9 Hz
The frequency is pre-adjusted at 20 Hz.
Release the key when your setting is finished.

④ Cycle ratio

The cycle ratio is the ratio between the time of high current (warm time - t_h) and the total time ($t_h + t_b$) of the pulse (in %)
i.e $R = t_h / (t_h + t_b)$.

When **F26** OFF and **F27** ON, press the setting key **F17**, adjust the cycle ratio with the potentiometer **F9**.

The value (in %) can be read on the display **F5**.

When the potentiometer is at the minimum, the ratio is of 20%, and when it is at the maximum, it is of 80%.

The ratio pre-adjusted is 50%

Release the key when your setting is finished.

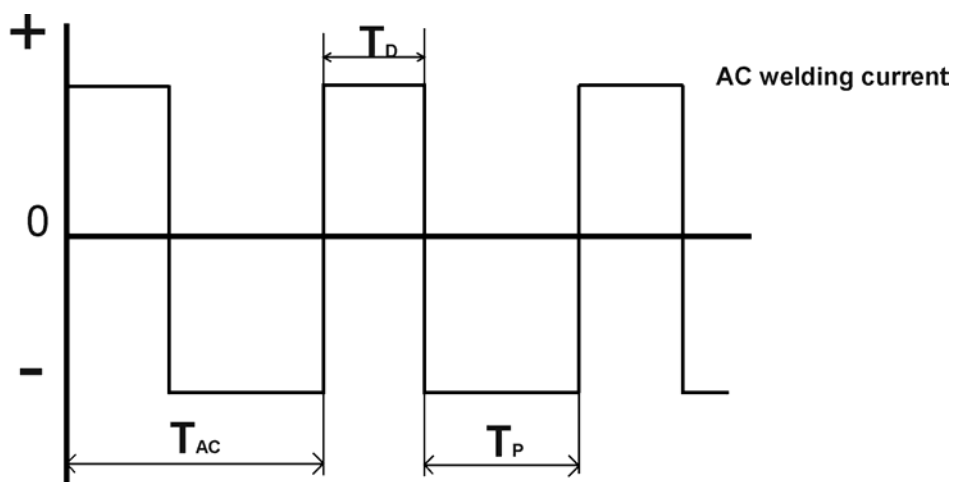
For welding, see indications in **chapter 12**.

NOTE

When welding, you can read alternately, on the display **F5**, values of high and low current.
Only the value of high current can be adjusted with remote control.

14. AC CURRENT TIG WELDING**① Select of « TIG AC current » welding mode**


- Select « TIG welding » with the setting key **F14**, the indicator **F24** illuminates.
- Press 2 times the setting key **F15** in order to select « AC current », the indicator **F26** illuminates (indicator **F27** OFF).

② Set « AC current » parameters**Frequency adjustment**

The frequency is the number of periods per second. $T_{AC} = T_D + T_P$. $F_{AC} = 1 / T_{AC}$ in Hz.

When **F26** ON and **F27** OFF, press the setting key **F16**, adjust the frequency with the potentiometer **F9**.

The value (in Hz) can be read on the display **F5**.

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When the potentiometer is at the minimum, the frequency is 20 Hz, and at the maximum, the frequency is 250 Hz.

High frequencies allow arc concentration and reduce the area affected by the arc on the workpiece.

The frequency is pre-adjusted at 100 Hz.

Release the key when your setting is finished.

Balance adjustment

This adjustment has an effect upon the proportion of positive current in the arc.

The balance is $T_D / (T_D + T_P)$ in %.

Penetration : The negative halfcycle (T_P) is longer than the positive (T_D). You need a lower welding current which allows :

- less heating of the tungsten electrode, which allows longer time between electrode grinding.
- reduction of the affected area on the workpiece

Use for clean workpiece only.

Cleaning : The positive alternating (T_D) is longer than the negative one (T_P), which heat the tungsten electrode and means :

- higher welding current
- more important tungsten electrode diameter
- electrode's rounded so the arc is less directional
- larger affected area on the workpiece

Use for dirty workpiece only.

When **F26** ON and **F27** OFF, press the setting key **F17**, adjust the balance with the potentiometer **F9**.

The value (in % of cleaning ratio) can be read on the display **F5**.

Release the key when your setting is finished.

50% of balance means that the 2 alternating positive and negative are equal.

Balance can be adjusted from 20% to 60% (cleaning).

In order to maintain a sharp tungsten it is better to use a shorter cleaning time

The balance is pre-adjusted to 40% (cleaning 40% - penetration 60%), which is a good solution between the 2 modes and allow aluminium welding in almost all the cases.

⑤ Select tungsten electrode

Place a tungsten electrode pure or DLZ (Itrium Lanthane Zirconium) or lanthane, without radiation.


For low current, use the smallest diameter possible.

For very low current (3A to 15A), use only grinded tungsten electrode

<i>Electrode's diameter</i>	mm	1	1.6	2.0	2.4	3.0	4.0	5.0
<i>Welding AC current</i>	A	<50	40 - 80	60 - 110	70 - 140	90 - 180	160 - 240	230 - 340

④ Welding

For the adjustment of other parameters and for welding, see instructions given in **chapter 12 : DC Current TIG welding**

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15. TIG WELDING IN PULSE AC CURRENT

The selection of « TIG in AC current » welding mode is made in 4 stages :

❶ Select TIG welding mode

Press the setting key **F14** to choose « TIG welding mode », the indicator **F24** illuminates.
 To adjust the parameters, see instructions given in **chapter 12 : DC Current TIG welding**

❷ Select « pulse DC current» welding mode

Press the setting key **F15** one time to choose « pulse DC current welding mode », the indicator **F27** illuminates (indicator **F26** OFF).
 To adjust the parameters, see instructions given in **chapter 13 : TIG welding in pulse DC current**

❸ Select « AC current » welding mode

Press the setting key **F15** one time to choose « pulse current welding mode », the indicator **F26** illuminates (indicator **F27** dies out).
 To adjust the parameters, see instructions given in **chapter 14 : AC current TIG welding**

❹ Select « pulse AC current » welding mode

Press the setting key **F15** one time to choose « pulse AC current welding mode », the indicators **F26** and **F27** illuminate.

NOTE :

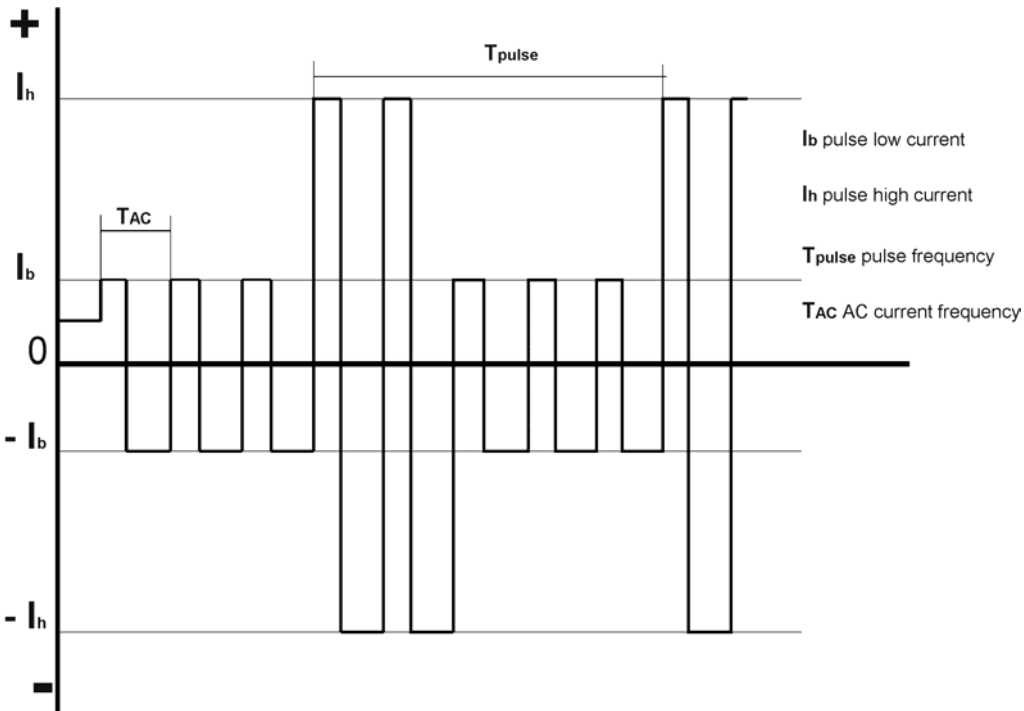
In this case (indicators **F26** and **F27** ON), you could not make any more adjustments, that the reason why you have to do them in previous stages.


To make any modification, change the welding mode with the setting key **F15** :

Indicator **F26** ON and indicator **F27** OFF : modification of « AC current » parameters

Indicator **F27** ON and indicator **F26** OFF : modification of « pulse current » parameters

At the end of modifications, come back to « pulse AC current » welding mode : indicators **F26** and **F27** ON.



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16. HIDDEN WELDING PARAMETERS

Some welding parameters are not directly adjustable :

- Pre-heat time at ignition in TIG AC welding mode
- initial current
- final current
- Hot start time

To adjust these parameters, press in the same time setting keys **F7** and **F14**, then release. The indicator **F18** (A) goes out.

Turn potentiometer **F9** until value :

33 for adjustment of pre-heat time at ignition in TIG AC welding mode

40 for adjustment of initial current

41 for adjustment of final current

42 for adjustment of Hot start time

238 for return of pre-adjusted values (factory settings)

Press any key to finish selection

Adjustment of pre-heat time at ignition in TIG AC welding mode

This time is the duration of the first positive alternating at the ignition in TIG AC welding mode. Chosen a long time gives a better ignition. Unfortunately, it damages grinded electrode's head.

Adjust the time with potentiometer **F9**. The value can be read on display **F5**.

The time can be adjusted from 0.1s to 1.0s.

It is pre adjusted to 0.1s.

Adjustment of initial current (I_d)

Adjust the current with potentiometer **F9**. The value can be read on display **F5**.

The initial current can be adjusted between 3A and maximum current of the machine (180A for THERMAL ARC 180 AC/DC – 220A for the THERMAL ARC 220 AC/DC and 250A for THERMAL ARC 250 AC/DC).

If initial current is less than 3A, the machine will automatically adjust the initial current to the pre-adjusted value i.e 50% of welding current.

If initial current is more than welding current, the machine will automatically adjust the initial current to welding current.

Adjustment of final current (I_f)

Adjust the current with potentiometer **F9**. The value can be read on display **F5**.

The final current can be adjusted between 3A and maximum current of the machine (180A for THERMAL ARC 180 AC/DC – 220A for the THERMAL ARC 220 AC/DC and 250A for THERMAL ARC 250 AC/DC).

If final current chosen is more than welding current, the machine will automatically adjust the final current to welding current.

If initial current is more than welding current, the machine will automatically adjust the initial current to welding current.


Adjustment of Hot start time : Stick welding

Adjust the Hot start time with the potentiometer **F9**. The value can be read on the display **F5**.

Time can be adjusted between 0.0s and 5.0s.

The pre-adjusted value is 0.0s.

The over current at ignition is 20%.

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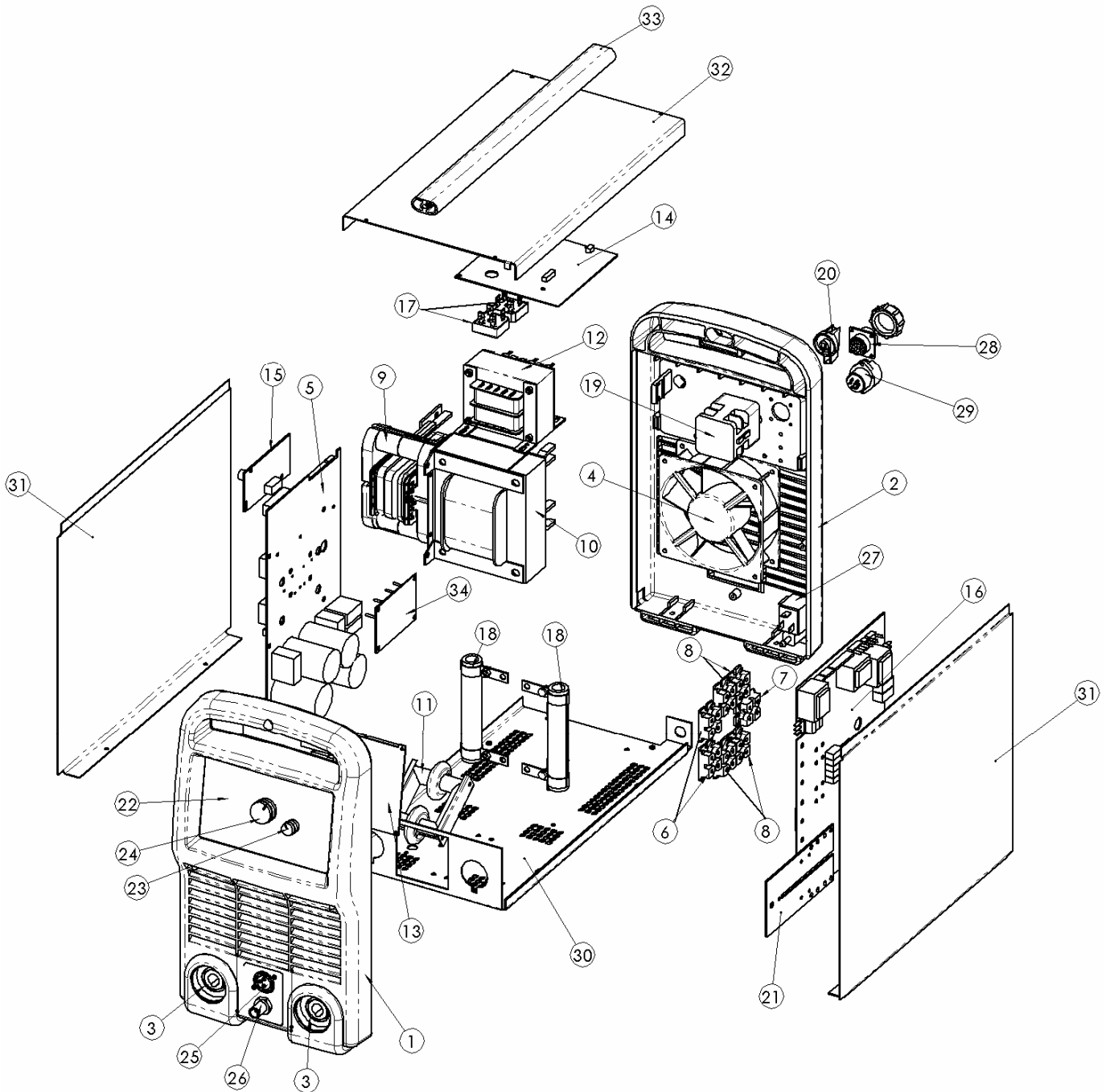
17. MAINTENANCE

CAUTION : BEFORE OPENING the unit, disconnect the power source from the mains. Voltages are high and dangerous inside the machine.

In spite of their robustness, THERMAL ARC power sources require some regular maintenance. Once every 6 months (more often in dusty surroundings) :

- the machine must be blown through with dry, oilfree compressed air
- check all connections for electrical continuity.
- Checkall cable connections, including ribbon cables.

18. SPARE PARTS





THERMAL ARC
180 – 220 - 250 AC/DC


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ITEM	REFERENCE	DESCRIPTION
1	I05911	Black front frame
2	I05921	Black back frame
3	060153	Power terminal 35/50 mm ²
4	V01002	Fan 12V _{DC} for THERMAL ARC 180 and 220 AC/DC
	V01008	Fan 12V _{DC} for THERMAL ARC 250 AC/DC
5+34	E11210/SMI/VE	MAIN PCB without heat sinks for THERMAL ARC 180-220 AC/DC
	E32408/SMI/VE	MAIN PCB without heat sinks for THERMAL ARC 250 AC/DC
6	S07011	Diode BYV 255 V200
7	S07015	Diode STTB 12006
8	S10015	IGBT GA200SA60S
9	T18703	Transformer for THERMAL ARC 180 and 220 AC/DC
	T18704	Transformer for THERMAL ARC 250 AC/DC
10	T28303	Inductor
11	E10011	Complete ferrite
12	T02013	Auxiliary transformer 80VA
13	L93021	Front face PCB CI 302
14	L93101	Filter PCB CI 310 for THERMAL ARC 180 and 220 AC/DC
	L93191	Filter PCB CI 319 for THERMAL ARC 250 AC/DC
15	L93072	Regulation PCB CI 307
16	L93121	Secondary block PCB CI 312
17	S01051	Single phase rectifier bridge 35A for 180 and 220 AC/DC
	S01053	Three phase rectifier bridge 35A for THERMAL ARC 250 AC/DC
18	P02100	Resistor 120W 100 ohms
19+20	G02010	Commutator for THERMAL ARC 180 and 220 AC/DC
	G02011	Commutator for THERMAL ARC 250 AC/DC
21	I05977	Shunt
22	B00009/TH	Front fascia
23	B01060	Knob diam 14
24	B01062	Knob diam 23
25	C02025	Female socket 5 pins
	C04025	Male plug 5 pins for C02025
26	F12004-1	Gas output 3/8 BSP
27	F04002	Gas valve 220V
	F18008	Gas valve output F12/100 – M3/8 BSP
28	C02612	12 pins Female socket without pins
	C02613	10 female pins for C02612
	C02614	Cover for C02612 (in option)
29	C02107	Female socket 7 pins
30	I05901	Chassis for THERMAL ARC 180 and 220 AC/DC
	I05902	Chassis for THERMAL ARC 250 AC/DC
31	I05933	Panel for THERMAL ARC 180 and 220 AC/DC
	I05935	Panel for THERMAL ARC 250 AC/DC
32	I05932	Cover for THERMAL ARC 180 and 220 AC/DC
	I05934	Cover for THERMAL ARC 250 AC/DC
33	J15021-2	Handle for THERMAL ARC 180 and 220 AC/DC
	J15021-3	Handle for THERMAL ARC 250 AC/DC
	I05919	Bottom of the front face
	B04038	Thermistor CTN 47K
	T03005	Ferrite for THERMAL ARC 250 AC/DC

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19. PCB'S CONNECTORS

PCBs in THE MACHINE THERMAL ARC 180 AC/DC:and 220 AC/DC

L92861 : 286 PCB for primary block E11208/SMI
 L93051 : 600V IGBT module PCB
 L93072 : 307 PCB : regulator
 L93021 : 302 front panel PCB
 L93101 : 310 PCB main supply and filter
 L93121 : 313 PCB HF, gas and secondary blockPCB

PCBs in THE MACHINE THERMAL ARC 250 AC/DC

L92863 : 286 PCB for primary block E11208/SMI
 L93052 : 1200V IGBT module PCB
 L93072 : 307 PCB : regulator
 L93021 : 302 front panel PCB
 L93191 : 319 PCB main supply and filter
 L93121 : 312 PCB HF, gas and secondary blockPCB


PCB L92861 : primary block PCB (THERMAL ARC 180 -220 AC/DC)

Connector J1 :

Pin 1 : duty cycle limitation input (image of primary inverter current)
 Pin 2 : +15V DC
 Pin 3 : PWM1 output for IGBT1 control
 Pin 4 : electronic ground
 Pin 5 : ENABLE input for inverter start/stop (0-4V)
 Pin 6 : electronic ground
 Pin 7 : +20V DC
 Pin 8 : current control input (0-3.4V)
 Pin 9 : PWM2 output for IGBT2 control
 Pin 10 : -20V DC
 Pin 11 : striked arc information (0V when striked, +5V when not striked)
 Pin 12 : Arc force control input (not used on 160TE)
 Pin 13 : Positive polarity of shunt (same as positive output of generator).
 Pin 14 : not used
 Pin 15 : Negative polarity of shunt
 Pin 16 : Negative output of generator

Connector J2 :

Pin 1 : electronic ground
 Pin 2 : open drain for thermal default led on/off
 Pin 3 : +15V DC
 Pin 4 : current control input (0-3.4V)
 Pin 5 : Arc force control output
 Pin 6 : ENABLE output for inverter start/stop (0-5V)
 Pin 7 : +20V DC
 Pin 8 : -20V DC
 Pin 9 : NTC thermistor return (0-5V) for primary temperature measurement
 Pin 10 : striked arc information (0V when striked, +5V when not striked)
 Pin 11 : Fan control (PWM from front panel).
 Pin 12 : 15V AC signal
 Pin 13 : Positive polarity of shunt (same as positive output of generator).
 Pin 14 : Negative polarity of shunt
 Pin 15 : Negative output of generator

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Connector J3 :

- Pin 1 & 2 : thermostat loop 1
- Pin 3 & 4 : thermostat loop 2
- Pin 5 & 7 : 18VAC supplies
- Pin 6 : electronic ground
- Pin 8 & 9 : shunt information
- Pin 10 : - polarity of welding output

Connector J4 :

- Pin 1 & 2 : not used
- Pin 3 & 4 : 12VDC fan

Connector J6 & J8 : primary connections of main transformer

Connector J7 : - of inverter

Connector J9 : + of inverter


PCB L92863 : primary block PCB (THERMAL ARC 250 AC/DC)

Connector J1 :

- Pin 1 : duty cycle limitation input (image of primary inverter current)
- Pin 2 : +15V DC
- Pin 3 : PWM1 output for IGBT1 control
- Pin 4 : electronic ground
- Pin 5 : ENABLE input for inverter start/stop (0-4V)
- Pin 6 : electronic ground
- Pin 7 : +20V DC
- Pin 8 : current control input (0-3.4V)
- Pin 9 : PWM2 output for IGBT2 control
- Pin 10 : -20V DC
- Pin 11 : striked arc information (0V when striked, +5V when not striked)
- Pin 12 : Arc force control input (not used on 160TE)
- Pin 13 : Positive polarity of shunt (same as positive output of generator).
- Pin 14 : not used
- Pin 15 : Negative polarity of shunt
- Pin 16 : Negative output of generator

Connector J2 :

- Pin 1 : electronic ground
- Pin 2 : open drain for thermal default led on/off
- Pin 3 : +15V DC
- Pin 4 : current control input (0-3.4V)
- Pin 5 : Arc force control output
- Pin 6 : ENABLE output for inverter start/stop (0-5V)
- Pin 7 : +20V DC
- Pin 8 : -20V DC
- Pin 9 : NTC thermistor return (0-5V) for primary temperature measurement
- Pin 10 : striked arc information (0V when striked, +5V when not striked)
- Pin 11 : Fan control (PWM from front panel).
- Pin 12 : 15V AC signal
- Pin 13 : Positive polarity of shunt (same as positive output of generator).
- Pin 14 : Negative polarity of shunt

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Pin 15 : Negative output of generator

Connector J3 :

- Pin 1 & 2 : thermostat loop 1
- Pin 3 & 4 : thermostat loop 2
- Pin 5 & 7 : 18VAC supplies
- Pin 6 : electronic ground
- Pin 8 & 9 : shunt information
- Pin 10 : - polarity of welding output

Connector J4 :

- Pin 1 & 2 : not used
- Pin 3 & 4 : 12VDC fan

Connector J6 & J8 : primary connections of main transformer

Connector J7 : - of inverter

Connector J9 : + of inverter

PCB L93021 : Front panel PCB (THERMAL ARC 180 – 220 and 250 AC/DC)

Connector J1 : multiplexed datas to/from front panel keyboard


Connector J2 :

- Pin 1 : -20V DC
- Pin 2 : +20V DC
- Pin 3 : overvoltage AC fault return
- Pin 4 : AC + IGBT control
- Pin 5 : AC – IGBT control
- Pin 6 : remote control or torch's potentiometer value
- Pin 7 : 15V AC signal (used for torch trigger detection)
- Pin 8 : Open drain for HF ON /OFF control
- Pin 9 : input of torch trigger detection
- Pin 10 : Open drain for gas ON /OFF control
- Pin 11 : Open drain for cooler pump ON /OFF control
- Pin 12 : Cooling default input (+20V when default)
- Pin 13 : Over voltage protection or phase missing input
- Pin 14 : NTC thermistor return (0-5V) for primary temperature measurement
- Pin 15 : electronic ground

Connector J3, J4 : options, not used

Connector J5 : matches with J2 of L92861 PCB

- Pin 1 : electronic ground
- Pin 2 : open drain for thermal default led on/off
- Pin 3 : +15V DC
- Pin 4 : current control input (0-3.4V)
- Pin 5 : Arc force control output
- Pin 6 : ENABLE output for inverter start/stop (0-5V)
- Pin 7 : +20V DC
- Pin 8 : -20V DC

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- Pin 9 : NTC thermistor return (0-5V) for primary temperature measurement
- Pin 10 : striked arc information (0V when striked, +5V when not striked)
- Pin 11 : Fan control (PWM from front panel).
- Pin 12 : 15V AC signal
- Pin 13 : Positive polarity of shunt (same as positive output of generator).
- Pin 14 : Negative polarity of shunt
- Pin 15 : Negative output of generator

PCB L93072 : Regulator PCB (THERMAL ARC 180 -220 and 250 AC/DC)

Connector J1 :

- Pin 1 : duty cycle limitation input (image of primary inverter current)
- Pin 2 : +15V DC
- Pin 3 : PWM1 output for IGBT1 control
- Pin 4 : electronic ground
- Pin 5 : ENABLE input for inverter start/stop (0-4V)
- Pin 6 : electronic ground
- Pin 7 : +20V DC
- Pin 8 : current control input (0-3.4V)
- Pin 9 : PWM2 output for IGBT2 control
- Pin 10 : -20V DC
- Pin 11 : striked arc information (0V when striked, +5V when not striked)
- Pin 12 : Arc force control input (not used on 160TE)
- Pin 13 : Positive polarity of shunt (same as positive output of generator).
- Pin 14 : not used
- Pin 15 : Negative polarity of shunt
- Pin 16 : Negative output of generator

PCB L93101 : main supply and filter PCB (THERMAL ARC 180 – 220 AC/DC)

Connector J1 & J2 : 230VAC secured main supply

Connector J3 & J4 : 230VAC main supply

Connector J5 : +5V auxiliary supply (only when overvoltage mode is active)

Connector J6 :


- Pin 1 : to pin 1 of cooling socket when used
- Pin 2 : to pin 5 of cooling socket when used
- Pin 3 & 5 : 230VAC to primary coil of auxiliary transformer
- Pin 4 : not used
- Pin 6 : to pin 4 of cooling socket when used

Connector J7 & J8 : protective earth

PCB L93191 : main supply and filter PCB (THERMAL ARC 250 AC/DC)

Connector J1, J2, J3 : 3x400V AC input

Connector J4, J6, J7 & J8 : Protective Earth

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Connector J5 : Phase fault (phase missing) information

Connector J9 :

Pin 1 & 3 : 400VAC to auxiliary transformer

Connector J13 :

Pin 1 & 3 : 400VAC to pin 4 & 6 of cooling unit socket

PCB L93121 : Secondary block PCB (THERMAL ARC 180 -220 and 250 AC/DC)

Connector J1 :

Pin 1 & 2: - welding output (compares to the electronic ground, which is the +)
Pin 3 : earth protection

Connector J2 :

Pin 1 & 3: connections for the 200 Ohm – 200W discharge resistors
Pin 2 : not used

Connector J3 :

Pin 1 & 3: connections for the HF transformer primary coil
Pin 2 : not used

Connector J4 :


Pin 1 & 2: torch trigger
Pin 3 : minimum of the torch potentiometer
Pin 4 : cursor of the torch potentiometer
Pin 5 : maximum of the torch potentiometer

Connector J5 :

Pin 1 & 2: torch trigger
Pin 3 : +20V
Pin 4 : minimum of the torch potentiometer
Pin 5 : cursor of the torch potentiometer
Pin 6 : maximum of the torch potentiometer

Connector J6 :

Pin 1 : -20V DC
Pin 2 : +20V DC
Pin 3 : overvoltage AC fault return
Pin 4 : AC + IGBT control
Pin 5 : AC – IGBT control
Pin 6 : remote control or torch's potentiometer value
Pin 7 : 15V AC signal (used for torch trigger detection)
Pin 8 : Open drain for HF ON /OFF control
Pin 9 : input of torch trigger detection
Pin 10 : Open drain for gas ON /OFF control
Pin 11 : Open drain for cooler pump ON /OFF control

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- Pin 12 : Cooling default input (+20V when default)
- Pin 13 : Over voltage protection or phase missing input
- Pin 14 : NTC thermistor return (0-5V) for secondary temperature measurement
- Pin 15 : electronic ground

Connector J7 :

- Pin 1 & 3 : electronic ground
- Pin 2 : NTC thermistor return (0-5V) for secondary temperature measurement
- Pin 4 : Main supply overvoltage information (+5V)

Connector J8 :

- Pin 1 & 2 : gas solenoid connections (230VAC)

Connector J9 :

- Pin 1 & 3 : insulated 230VAC input (from the auxiliary transformer)

Connector J10 :

- Pin 1 : cooling unit ON/OFF control (open drain)
- Pin 2 : cooling unit flow warning return (optocouplor input)
- Pin 3 & 4 : common point for cooling unit control



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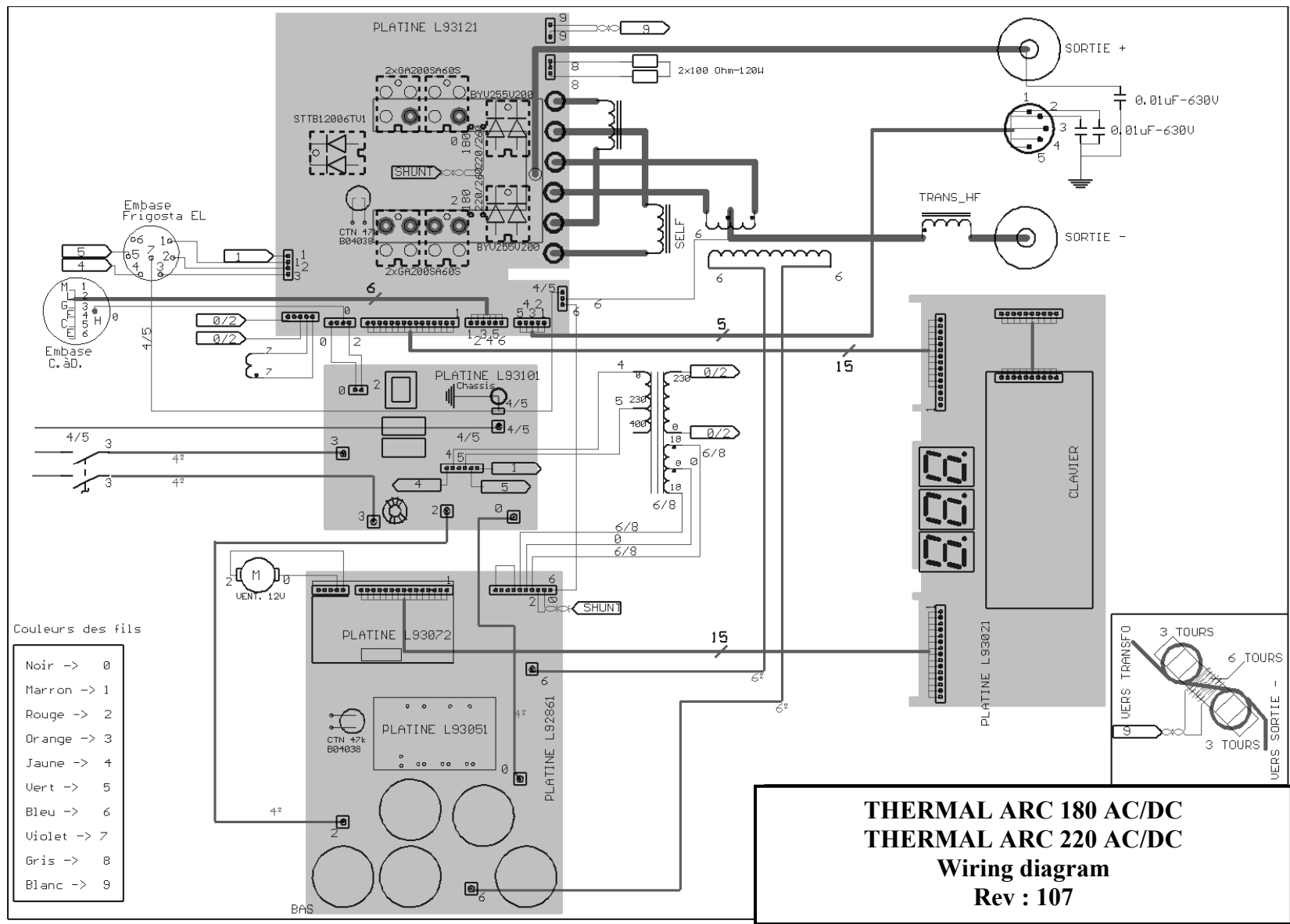
Date : 18/12/07

20. TROUBLE SHOOTING

BEWARE : BEFORE ANY INTERNAL INTERVENTION, disconnect the power source from the power supply. Internal voltages are high and dangerous

POSSIBLE CAUSES	CHECKING / REMEDY
DIGITAL DISPLAY AND ORANGE INDICATOR F20 OFF = NO SUPPLY	
ON/OFF main switch is OFF	Put the switch ON
Power supply cable is cut	Check cable and connections
No main supply	Check circuit breaker and fuses
Defective ON/OFF main switch	Replace the switch
DIGITAL DISPLAY OFF AND ORANGE INDICATOR F20 ON = INPUT VOLTAGE OVER RATED LIMIT	
THERMAL ARC 180 AC/DC – 220 AC/DC	
Input voltage > 260 V	Check supply voltage
Power source supplied between 2 phases (400V)	Connect the machine to proper line voltage (230V)
THERMAL ARC 250 AC/DC	
Lack of one phase	Check the supply
DIGITAL DISPLAY SHOW « tH » AND ORANGE INDICATOR F20 ON = WARMING UP	
Duty cycle over rated (particularly if ambient t° is > 25°C)	Let the machine cool, it will automatically start again
Insufficient cooling air	Clean the air inlets
Very dusty machine	Open the machine and blow it through
Fan doesn't start	Replace the fan
DIGITAL DISPLAY SHOW « CO » AND ORANGE INDICATOR F20 ON = COOLING UNIT DEFAULT (if a cooling unit is connected)	
Lack of water	Check the water level
Water circuit blocked up	Check the torch
DIGITAL DISPLAY SHOW « AC » AND ORANGE INDICATOR F20 ON =AC SECONDARY CIRCUIT DEFAULT	
AC current frequency too high	Reduce AC current frequency
Torch length too long	Reduce torch length
Stop the machine and restart it	
IMPROPER WELDING	
Wrong electrode polarity	Use the right polarity according to the indications of electrode's manufacturer
IGNITION FAILURE	
Wrong polarity	Check the connection Torch to power terminal – Ground to power terminal +
Pre gas time selected	You must wait for the end of the pre gas flow or cancel it
No gas arrives to the machine	Check the gas supply
No gas goes out of the machine	Check the gas valve
Initial current too low	Check the value of initial current (see chapter 14)
In pulse current welding, arc is on and off = low current too low	Check the low current value

21. WIRING DIAGRAMS



**THERMAL ARC 180 AC/DC
THERMAL ARC 220 AC/DC
Wiring diagram
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22. APPENDICE : ADJUSTABLE VALUES FOR WELDING PARAMETERS

	Units	THERMAL ARC 180 AC/DC	THERMAL ARC 220 AC/DC	THERMAL ARC 250 AC/DC	Factory settings
MMA (Stick) welding					
Hot start time	s	0.0 – 5.0			0.0
TIG welding					
Pre gas time	s	0.1 – 5.0			0.5
Post gas time	s	3 - 25			5
Up-slope time	s	0.0 – 10.0			1.0
Down-slope time	s	0 - 16			-
Hot start time	s	0.0 – 5.0			0.0
Pre heat time at ignition (TIG AC)	s	0.1 – 1.0			0.1
Initial current	A	3 - 180	3 - 220	3 - 250	50% welding current
Final current	A	3 - 180	3 - 220	3 - 250	3
Pulse frequency	Hz	0.2 – 99.9			20
Pulse cycle ratio	%	20 - 80			50
Pulse low current	A	3 – welding current			30
AC current frequency	Hz	20 - 250			100
Balance cleaning/penetration	%	20 - 60			40



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