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**CONTINUOUS WIRE WELDING MACHINE FOR MIG-MAG AND FLUX, TIG, MMA WELDING FOR PROFESSIONAL AND INDUSTRIAL USE.**

Note: The term "welding machine" will be used in the text that follows.

**1. GENERAL SAFETY CONSIDERATIONS FOR ARC WELDING**

The operator should be properly trained to use the welding machine safely and should be informed about the risks related to arc welding procedures, the associated protection measures and emergency procedures.

(Please refer to the applicable standard "EN 60974-9: Arc welding equipment. Part 9: Installation and Use).



- Avoid direct contact with the welding circuit: the no-load voltage supplied by the welding machine can be dangerous under certain circumstances.
- When the welding cables are being connected or checks and repairs are carried out the welding machine should be switched off and disconnected from the power supply outlet.
- Switch off the welding machine and disconnect it from the power supply outlet before replacing consumable torch parts.
- Make the electrical connections and installation according to the safety rules and legislation in force.
- The welding machine should be connected only and exclusively to a power source with the neutral lead connected to earth.
- Make sure that the power supply plug is correctly connected to the earth protection outlet.
- Do not use the welding machine in damp or wet places and do not weld in the rain.
- Do not use cables with worn insulation or loose connections.



- Do not weld on containers or piping that contains or has contained flammable liquid or gaseous products.
- Do not operate on materials cleaned with chlorinated solvents or near such substances.
- Do not weld on containers under pressure.
- Remove all flammable materials (e.g. wood, paper, rags etc.) from the working area.
- Provide adequate ventilation or facilities for the removal of welding fumes near the arc; a systematic approach is needed in evaluating the exposure limits for the welding fumes, which will depend on their composition, concentration and the length of exposure itself.
- Keep the gas bottle (if used) away from heat sources, including direct sunlight.



- Use electric insulation that is suitable for the torch, the workpiece and any metal parts that may be placed on the ground and nearby (accessible). This can normally be done by wearing gloves, footwear, head protection and clothing that are suitable for the purpose and by using insulating boards or mats.
- Always protect your eyes with the relative filters, which must comply with UNI EN 169 or UNI EN 379, mounted on masks or use helmets that comply with UNI EN 175.

Use the relative fire-resistant clothing (compliant with UNI EN 11611) and welding gloves (compliant with UNI EN 12477) without exposing the skin to the ultraviolet and infrared rays produced by the arc; the protection must extend to other people who are near the arc by way of screens or non-reflective sheets.

- Noise: If the daily personal noise exposure (LEPd) is equal to or higher than 85 dB(A) because of particularly intensive welding operations, suitable personal protective means must be used (Tab. 1).



- The flow of the welding current generates electromagnetic fields (EMF) around the welding circuit.

Electromagnetic fields can interfere with certain medical equipment (e.g. Pace-makers, respiratory equipment, metallic prostheses etc.).

Adequate protective measures must be adopted for persons with these types of medical apparatus. For example, they must be forbidden access to the area in which welding machines are in operation.

This welding machine conforms to technical product standards for exclusive use in an industrial environment for professional purposes. It does not assure compliance with the basic limits relative to human exposure to electromagnetic fields in the domestic environment.

The operator must adopt the following procedures in order to reduce exposure to electromagnetic fields:

- Fasten the two welding cables as close together as possible.
- Keep head and trunk as far away as possible from the welding circuit.
- Never wind welding cables around the body.
- Avoid welding with the body within the welding circuit. Keep both cables on the same side of the body.
- Connect the welding current return cable to the piece being welded, as close as possible to the welding joint.
- Do not weld while close to, sitting on or leaning against the welding machine (keep at least 50 cm away from it).
- Do not leave objects in ferromagnetic material in proximity of the welding circuit.
- Minimum distance  $d = 20$  cm (Fig. U).



- Class A equipment:

This welding machine conforms to technical product standards for exclusive use in an industrial environment and for professional purposes. It does not assure compliance with electromagnetic compatibility in domestic dwellings and in premises directly connected to a low-voltage power supply system feeding buildings for domestic use.



**EXTRA PRECAUTIONS**

**- WELDING OPERATIONS:**

- In environments with increased risk of electric shock;
- In confined spaces;
- In the presence of flammable or explosive materials;
- MUST BE** evaluated in advance by an "Expert supervisor" and must always

be carried out in the presence of other people trained to intervene in emergencies.

All protective technical measures **MUST** be taken as provided in 7.10; A.8; A.10 of the applicable standard EN 60974-9: Arc welding equipment. Part 9: Installation and Use".

- Welding **MUST NOT** be allowed if the welding machine or wire feeder is supported by the operator (e.g. using belts).
- The operator **MUST NOT BE ALLOWED** to weld in raised positions unless safety platforms are used.
- **VOLTAGE BETWEEN ELECTRODE HOLDERS OR TORCHES:** working with more than one welding machine on a single piece or on pieces that are connected electrically may generate a dangerous accumulation of no-load voltage between two different electrode holders or torches, the value of which may reach double the allowed limit.  
An expert coordinator must be designated to measuring the apparatus to determine if any risks subsist and suitable protection measures can be adopted, as foreseen by section 7.9 of the applicable standard "EN 60974-9: Arc welding equipment. Part 9: Installation and Use".



#### RESIDUAL RISKS

- **OVERTURNING:** position the welding machine on a horizontal surface that is able to support the weight: otherwise (e.g. inclined or uneven floors etc.) there is danger of overturning.
- **IMPROPER USE:** it is hazardous to use the welding machine for any work other than that for which it was designed (e.g. de-icing mains water pipes).
- **IMPROPER USE:** the use the welding machine by more than one operator at the same time may be dangerous.
- **MOVING THE WELDING MACHINE:** Always secure the gas bottle, taking suitable precautions so that it cannot fall accidentally (if used).
- Do not use the handle to hang the welding machine.



The safety guards and moving parts of the covering of the welding machine and of the wire feeder should be in their proper positions before connecting the welding machine to the power supply.



**WARNING!** Any manual operation carried out on the moving parts of the wire feeder, for example:

- Replacing rollers and/or the wire guide;
- Inserting wire in the rollers;
- Loading the wire reel;
- Cleaning the rollers, the gears and the area underneath them;
- Lubricating the gears.

**SHOULD BE CARRIED OUT WITH THE WELDING MACHINE SWITCHED OFF AND DISCONNECTED FROM THE POWER SUPPLY OUTLET.**

## 2. INTRODUCTION AND GENERAL DESCRIPTION

This welding machine is a source of current for arc welding, made specifically for MAG welding carbon steel or weak alloys with CO<sub>2</sub> protective gas or Argon/CO<sub>2</sub> mixes, using tubular full or core electrode wires.

It is also ideal for MIG welding stainless steel with Argon gas containing + 1-2% oxygen and aluminium and CuSi3, CuAl8 (brazing) with Argon gas, using electrode wires that are suitable for the workpiece to be welded.

Suitable core wires can be used without Flux protection gas, adapting torch polarity according to the indications of the wire producer (versions 180A and 200A only).

It is particularly suitable for light metalwork fabrication and in body shops, for welding galvanized plates, high stress stainless steel and aluminium. SYNERGIC operation ensures fast and easy welding parameter setting, always guaranteeing high arc control and welding quality (OneTouch Technology).

The welding machine, where available (see Tab. 1), can be used for TIG welding in direct current (DC), with arc striking upon contact (LIFT ARC mode). It welds all types of steel (carbon, low- and high-alloy) and heavy metals (copper, nickel, titanium and their alloys) with a gas shield of pure (99.9%) Ar or, for special uses, with an Argon/Helium mix. It can also be used for MMA electrode welding in direct current (DC) using coated electrodes (rutile, acid, basic).

### 2.1 MAIN CHARACTERISTICS

#### MIG-MAG

- Synergic (automatic) or manual operation;
- Pre-set synergic curves;
- Wire speed, welding voltage and welding current shown on an LCD screen;
- 2T, 4T and spot operation selection;
- Adjustments: wire up slope, electronic reactance, wire burn-back time, post gas;
- Polarity change for GAS MIG-MAG/BRAZING welding or NO GAS/FLUX (versions 180A and 200A only).
- Setting the metric or UK system.

#### TIG (see table 1)

- Start LIFT;
- Wire speed and welding current shown on an LCD screen.

#### MMA (see table 1)

- Arc force adjustment, hot start.
- VRD device.
- Anti-stick protection.
- Indication of recommended electrode diameter based on welding current;
- Wire speed and welding current shown on an LCD screen.

#### PROTECTION

- Thermostatic safeguard;
- Protection against accidental short-circuits caused by contact between torch and earth;
- Protection against irregular voltage (power supply voltage too high or too low);
- Anti-stick (MMA).

## 2.2 STANDARD ACCESSORIES

- Torch;
- Return cable complete with earth clamp;
- Torch holder support (where available).

## 2.3 OPTIONAL ACCESSORIES


- Argon bottle adapter;
- Trolley (versions 180A and 200A only);
- Self darkening helmet;
- MIG MAG welding kit;
- MMA welding kit;
- TIG welding kit.

## 3. TECHNICAL DATA

### 3.1 DATA PLATE

The most important data regarding use and performance of the welding machine are summarised on the rating plate and have the following meaning:

Fig. A

- 1- EUROPEAN standard of reference, for safety and construction of arc welding machines.
  - 2- Symbol for internal structure of the welding machine.
  - 3- Symbol for welding procedure provided.
  - 4- Symbol **S**: indicates that welding operations may be carried out in environments with heightened risk of electric shock (e.g. very close to large metallic volumes).
  - 5- Symbol for power supply line:
    - 1~ : single phase alternating voltage;
    - 3~ : 3-phase alternating voltage.
  - 6- Protection rating of the covering.
  - 7- Technical specifications for power supply line:
    - **U<sub>1</sub>** : Alternating voltage and power supply frequency of welding machine (allowed limit  $\pm 10\%$ ).
    - **I<sub>1 max</sub>** : Maximum current absorbed by the line.
    - **I<sub>1 eff</sub>** : effective current supplied.
  - 8- Performance of the welding circuit:
    - **U<sub>0</sub>** : maximum no-load voltage (open welding circuit).
    - **I<sub>0</sub>/U<sub>2</sub>** : current and corresponding normalised voltage that the welding machine can supply during welding.
    - **X** : Duty cycle: indicates the time for which the welding machine can supply the corresponding current (same column). It is expressed as %, based on a 10 min. cycle (e.g. 60% = 6 minutes working, 4 minutes pause, and so on).  
If the usage factors (on the plate, referring to a 40°C environment) are exceeded, the thermal safeguard will trigger (the welding machine will remain in standby until its temperature returns within the allowed limits).
    - **A/V-A/V** : shows the range of adjustment for the welding current (minimum maximum) at the corresponding arc voltage.
  - 9- Manufacturer's serial number for welding machine identification (indispensable for technical assistance, requesting spare parts, discovering product origin).
  - 10-  : Size of delayed action fuses to be used to protect the power line.
  - 11- Symbols referring to safety regulations, whose meaning is given in chapter 1 "General safety considerations for arc welding".
- Note: The data plate shown above is an example to give the meaning of the symbols and numbers; the exact values of technical data for the welding machine in your possession must be checked directly on the data plate of the welding machine itself.

### 3.2 OTHER TECHNICAL DATA:

- **WELDING MACHINE:** see table 1 (TAB. 1)
  - **MIG TORCH:** see table 2 (TAB. 2)
  - **TIG TORCH:** see table 3 (TAB. 3)
  - **ELECTRODE-HOLDER CLAMP:** see table 4 (TAB. 4)
- The weight of the welding machine is given in table 1 (TAB. 1).

## 4. WELDING MACHINE DESCRIPTION

### 4.1 CONTROL, ADJUSTMENT AND CONNECTING DEVICES.

#### 4.1.1 WELDING MACHINE (Fig. B, B1, B2, B3)

##### At the front:

- 1- Control panel.
- 2- Welding cable and torch.
- 3- Earth return cable and clamp.
- 4- Torch coupling.
- 5- Positive (+) fast coupling for connecting the welding cable.
- 6- Negative (-) fast coupling for connecting the welding cable.
- 7- Fast coupling plug connected to the torch coupling.
- 8- Touch coupling (T2).
- 9- SPOOL GUN torch coupling.
- 10- SPOOL GUN control cable connector.
- 11- Welding cable and torch (T2).
- 12- SPOOL GUN (optional).

##### At the back:


- 13- Main ON/OFF switch.
- 14- Hose connector for protective gas.
- 15- Power cable.
- 16- Hose connector for torch T2 protective gas.
- 17- Hose connector for SPOOL GUN torch protective gas.

##### On the reel area (where available):

- 18- Positive clamp (+).
- 19- Negative clamp (-).

**NB: Polarity inversion for FLUX welding (no gas).**

#### 4.1.2 WELDING MACHINE CONTROL PANEL (Fig. C)

- 1- selection, if pressed, of MIG-MAG welding (SYNERGIC or MANUAL), TIG or MMA  
**SYNERGIC MIG-MAG:**
  - Adjustment of welding power.**MANUAL MIG-MAG:**
  - Adjustment of wire feed speed.**TIG (where available):**
  - Adjustment of welding current.**MMA (where available):**
  - Adjustment of welding current.
- 2- If pressed  it allows access to preset machine programs.

### SYNERGIC MIG-MAG:

- Adjustment of the welding seam (arc length)

### MANUAL MIG-MAG:

- Adjustment of the welding seam (welding voltage)

### TIG:

- Not enabled.

### MMA:

- Not enabled

3- LCD display

4- selection, if pressed of the SPOOL GUN

5- LED torch setting indicator T1, T2 and SPOOL GUN

## 5. INSTALLATION



**ATTENTION! THE WELDING MACHINE MUST BE TURNED OFF AND DISCONNECTED FROM THE MAINS BEFORE COMMENCING ANY INSTALLATION AND POWER CONNECTION OPERATIONS. THE ELECTRICAL CONNECTIONS MUST ONLY BE CARRIED OUT BY EXPERT OR QUALIFIED TECHNICIANS.**

Fig. D (270A version)  
Fig. D1, D2 (double torch version)

Unpack the welding machine and assemble the separate parts included in the package.

### Assembling the return cable-clamp

Fig. E

### Assembling the welding cable-electrode-holder clamp

FIG. F

### Assembling the torch holder hook (where available)

FIG. G



## 5.1 POSITIONING THE WELDING MACHINE

Choose the place where the welding machine is to be installed so that there are no obstructions to the cooling air inlets and outlets; at the same time make sure that conductive dust, corrosive vapours, humidity etc. cannot be drawn into the machine. Leave at least 250 mm of free space all around the welding machine.



**WARNING! Position the welding machine on a level surface with sufficient load-bearing capacity, so that it cannot be tipped over or shift dangerously.**

## 5.2 CONNECTION TO THE MAIN POWER SUPPLY

- Before making any electrical connection, check the rating plate data on the welding machine to make sure they correspond to the voltage and frequency of the available power supply where the machine is to be installed.
- The welding machine must be connected only and exclusively to a power supply with the neutral conductor connected to earth.
- To guarantee protection against indirect contact use the following types of residual current devices:
  - Type A (  ) for single-phase machines.
  - Type B (  ) for 3-phase machines.
- In order to satisfy the requirements of the EN 61000-3-11 (Flicker) standard we recommend connecting the welding machine to the interface points of the main power supply that have an impedance of less than  $Z_{max} = 0.24 \text{ ohm}$ .
- The IEC/EN 61000-3-12 Standard does not apply to the welding machine. If the welding machine is connected to an electrical grid, the installer or user must make sure that the machine can indeed be connected (if necessary, consult the company that manages the electrical grid).

### 5.2.1 Plug and outlet

(1~)

Connect the power supply plug to a mains socket fitted with fuses or an automatic circuit-breaker; the corresponding earth terminal should be connected to the (yellow-green) earth conductor of the power supply.

(3~)

Connect a normalised plug (3P + P.E) - having sufficient capacity- to the power cable and prepare a mains outlet fitted with fuses or an automatic circuit-breaker; the special earth terminal should be connected to the earth conductor (yellow-green) of the power supply line.

Table (TAB. 1) shows the recommended delayed fuse sizes in amps, chosen according to the max. nominal current supplied by the welding machine, and the nominal voltage of the main power supply.



**WARNING! Non-compliance with the above regulations renders the manufacturer's safety system (class I) inefficient, with resulting serious risks to people (e.g. electric shock) and things (e.g. fire).**

## 5.3 WELDING CIRCUIT CONNECTION

### 5.3.1 Recommendations



**ATTENTION! BEFORE CARRYING OUT THE FOLLOWING CONNECTIONS, MAKE SURE THE WELDING MACHINE IS OFF AND DISCONNECTED FROM THE MAINS.**

Table 1 (TAB. 1) gives the recommended values for welding cables (in mm<sup>2</sup>) according to the maximum energy supplied by the welding machine.

In addition:

- Fully rotate the welding cable connectors in the quick couplings (if present), to guarantee perfect electric contact; if this is not the case the connectors will overheat with consequent fast deterioration and loss of efficiency.
- Use the shortest welding cables possible.
- Do not use metal structures that are not part of the workpiece to replace the welding

current return cable; this can endanger safety and give unsatisfactory welding results.

## 5.3.2 WELDING CIRCUIT CONNECTIONS IN MIG-MAG MODE

### 5.3.2.1 Gas cylinder connection (if used)

- Loadable gas cylinder on the support surface of the trolley: max 30kg (where available).
- Screw the pressure reducer (\*) onto the cylinder gas valve, inserting the specific reduction supplied as an accessory, when Argon gas or an Argon/CO<sub>2</sub> mix is used.
- Connect the input hose of the gas reducer and tighten with the strip.
- Loosen the adjustment ring nut of the pressure reducer before opening the cylinder valve.

(\*) Accessory to purchase separately if not supplied with the product.

### 5.3.2.2 Connecting the welding current return cable

Connect the cable to the piece to be welded or the metal bench on which the workpiece is placed, as close as possible to the joint being worked.

### 5.3.2.3 Torch

Prepare the torch to receive the wire for the first time, removing the nozzle and the contact pipe, to make exiting easier.

### 5.3.2.4 Internal polarity change (where available)

Fig. B

- Open the reel area door.
- MIG/MAG welding (gas):
  - Connect the torch cable to the red clamp (+) (Fig. B-18)
  - Connect the clamp return cable to the negative fast coupling (-) (Fig. B-19)
- FLUX welding (no gas):
  - Connect the torch cable to the black clamp (-) (Fig. B-19).
  - Connect the clamp return cable to the positive fast coupling (+) (Fig. B-18).
- Close the reel area door.

### 5.3.2.5 External polarity change (where available)

Fig. B

- MIG/MAG welding (gas):
  - Connect the torch cable to the torch coupling (Fig. B-4).
  - Connect the fast coupling plug (Fig. B-7) to the positive coupling plug (+) (Fig. B-5).
  - Connect the clamp return cable to the negative fast coupling (-) (Fig. B-6).
- FLUX welding (no gas):
  - Connect the torch cable to the torch coupling (Fig. B-4).
  - Connect the fast coupling plug (Fig. B-7) to the negative coupling (-) (Fig. B-6).
  - Connect the clamp return cable to the positive fast coupling (+) (Fig. B-5).

## 5.3 WELDING CIRCUIT CONNECTION IN TIG MODE

### 5.3.3.1 Connecting the gas bottle

- Screw the pressure reducer onto the gas bottle valve, placing the relative reduction supplied as an accessory between them;
- Connect the gas input hose to the pressure reducing valve and tighten the supplied strip.
- Loosen the adjustment ring nut of the pressure reducing valve before opening the gas bottle valve.
- Open the gas bottle and adjust the quantity of gas (l/min.) according to the recommended usage data, see table (TAB. 5); the gas flow can be adjusted while welding, always using the ring nut of the pressure reducer. Check the seal of the hoses and connections.



**ATTENTION! Always close the gas bottle valve when you have finished working.**

### 5.3.3.2 Connecting the welding current return cable

- Connect the cable to the piece to be welded or the metal bench on which the workpiece is placed, as close as possible to the joint being worked. Connect this cable to the clamp with the symbol (+) (Fig. B-5).

### 5.3.3.3 Torch

- Insert the current cable in the specific fast clamp (-) (Fig. B-6). Connect the gas hose of the torch to the cylinder.

## 5.3.4 WELDING CIRCUIT CONNECTIONS IN MMA MODE

Almost all the coated electrodes should be connected to the positive pole (+) of the generator; an exception is the negative pole (-) for electrodes with acid coating.

### 5.3.4.1 Connection of the electrode-holder clamp welding cable

Bring a special clamp on the clamp used to tighten the exposed part of the electrode. Connect this cable to the clamp with the symbol (+) (Fig. B-5).

### 5.3.4.2 Connecting the welding current return cable

- Connect the cable to the piece to be welded or the metal bench on which the workpiece is placed, as close as possible to the joint being worked. Connect this cable to the clamp with the symbol (-) (Fig. B-6).

## 5.4 LOADING THE WIRE SPOOL (Fig. H, H1, H2)



**WARNING! BEFORE STARTING THE OPERATIONS TO LOAD THE WIRE MAKE SURE THE WELDING MACHINE IS SWITCHED OFF AND DISCONNECTED FROM THE MAIN POWER SUPPLY OUTLET.**

MAKE SURE THAT THE WIRE FEEDER ROLLERS, THE WIRE GUIDE HOSE AND THE CONTACT TIP OF THE TORCH MATCH THE DIAMETER AND TYPE OF WIRE TO BE USED AND MAKE SURE THAT THESE ARE FITTED CORRECTLY. WHEN INSERTING AND THREADING THE WIRE DO NOT WEAR PROTECTIVE GLOVES.

- Open the reel compartment door.
- Position the wire reel on the spindle, holding the end of the wire upwards; make sure the tab for pulling the spindle is correctly seated in its hole (1a).
- Release the pressure counter-roller(s) and move them away from the lower roller(s) (2a);
- Make sure that the towing roller(s) is suited to the wire used (2b).
- Free the end of the wire and remove the distorted end with a clean cut and no burr; turn the reel anti-clockwise and thread the end of the wire into the wire-guide infeed, pushing it 50-100mm into the wire guide of the torch fitting (2c).
- Re-position the counter-roller(s), adjusting the pressure to an intermediate value, and



- make sure that the wire is correctly positioned in the groove of the lower roller(s) (3)
- Remove the nozzle and contact tip (4a).
  - Insert the welding machine plug in the power supply outlet, switch on the welding machine, press the torch button and wait for the end of the wire to pass through the whole of the wire guide hose and protrude by 10-15 cm from the front part of the torch, release the button.



**WARNING! During these operations the wire is live and subject to mechanical stress; therefore if adequate precautions are not taken the wire could cause hazardous electric shock, injury and striking of electric arcs:**

- Do not direct the mouthpiece of the torch towards parts of the body.
- Keep the torch away from the gas bottle.
- Re-fit the contact tip and the nozzle onto the torch (4b).
- Check that wire feed is regular; set the roller and spindle braking pressure to the minimum possible values making sure that the wire does not slide in the groove and when feed is halted the loops of wire are not loosened by excessive reel inertia.
- Cut the end of the wire so that 10-15 mm protrude from the nozzle.
- Close the reel compartment door.

## 5.5 LOADING THE WIRE SPOOL ONTO THE SPOOL GUN (Fig. I)



**ATTENTION! BEFORE LOADING THE WIRE, MAKE SURE THE WELDING MACHINE IS OFF AND DISCONNECTED FROM THE MAINS.**

MAKE SURE THE WIRE FEEDERS, THE WIRE GUIDE HOSE AND THE TORCH CONTACT PIPE CORRESPOND WITH THE DIAMETER AND NATURE OF THE WIRE TO BE USED AND THAT THEY ARE CORRECTLY MOUNTED. DO NOT WEAR PROTECTIVE GLOVES WHEN THREADING THE WIRE.

- Remove the cover by unscrewing the relative screw (1).
- Position the wire coil onto the reel.
- Release the pressure counter-roller and distance it from the lower roller (2).
- Free the wire end, cut off the misshaped end by cutting it cleanly and without leaving a burr; rotate the reel counter-clockwise and position the wire end into the wire feed input, pushing it by 50-100 mm into the torch swan neck (2).
- Reposition the counter-roller, adjusting the pressure at an intermediate value, make sure the wire is positioned correctly in the hollow of the lower roller (3).
- Gently stop the reel, using the relative adjustment screw.
- With the **SPOOL GUN** connected, insert the welding machine plug into the mains socket, switch on the welding machine, press the spool gun push-button and wait for the end of the wire which is running along the whole wire feed casing, to exit by 100-50mm from the front of the torch, then release the torch push-button.

## 6. MIG-MAG WELDING: PROCESS DESCRIPTION

### 6.1 SHORT ARC

Wire welding and detachment of the drop takes place via subsequent short-circuits of the wire tip and weld pool (up to 200 times per second). The stick-out length of the wire is normally between 5 and 12mm.

#### Carbon, low-alloy steel

- Usable wire diameter: 0.6 - 0.8 - 1.0 mm (1.2 mm version 270A only)
- Usable gas: CO<sub>2</sub> or Ar/CO<sub>2</sub> mixtures

#### Stainless steel

- Usable wire diameter: 0.8 - 1.0 mm (1.2 mm version 270A only)
- Usable gas: Ar/O<sub>2</sub> or Ar/CO<sub>2</sub> mixtures (1-2%)

#### Aluminium and CuSi/CuAl

- Usable wire diameter: 0.8 - 1.0 mm (1.2 mm version 270A only)
- Usable gas: Ar

#### Core wire



- Usable wire diameter: 0.8 - 0.9 - 1.2mm
- Usable gas: None

### 6.2 PROTECTION GAS

The protective gas flow rate must be 8-14 l/min.

## 7. MIG-MAG OPERATION MODES

### 7.1 SYNERGIC operating mode **SYN**


Defined by the user, the parameters such as material, wire diameter , gas type , the welding machine is automatically set in optimal operating conditions

established by the various synergic curves saved. The user only has to select the material thickness to begin welding (OneTouch Technology).

#### 7.1.1 LCD display in SYNERGIC mode (Fig. L)

NB: All the values which be displayed and selected depend on the type of set welding.

- 1- Synergic operating mode **SYN**;
- 2- Material to weld. Types available: Fe (steel), Ss (stainless steel), AlMg<sub>5</sub> AISi<sub>2</sub> (aluminium), CuSi/CuAl (zinc-plated sheet metal - brazing), Flux (core wire - NO GAS welding);
- 3- Diameter of wire to use;
- 4- Recommended safety gas;
- 5- Thickness of material to weld;
- 6- Graphic indicator of thickness of material;
- 7- Graphic indicator of welding seam shape;
- 8- Welding values:

 wire feed speed;

 welding voltage;

 welding current.

- 9- ATC (Advanced Thermal Control).

#### 7.1.2 Parameters setting

Pressing button C-2 for at least 1 second, you can access the preset programs on the machine.


Turning the knob C-2 you can slide all the programs (PRG 01, 02, etc.). Select the program chosen by pressing and releasing the same knob. The welding machine sets itself automatically in the best operation conditions established by the different synergy curves that are saved. The user only has to select the material thickness using knob C-1 to begin welding. The welding voltage and current is shown on the display only during welding.

### 7.1.3 Adjustment of the welding seam shape


Adjustment of the shape of the seam takes place using the knob (Fig. C-2) that regulates the arc length thereby establishing the greater or lesser welding temperature input.

The settings scale varies from -10 ÷ 0 ÷ +10; in most cases, the knob in the intermediate position (0, ) has an optimal base setting (the value is shown on the LCD display

on the left of the graphic symbol of the welding seam and disappears after a set time). Using the knob (Fig. C-2), the graphic indication on the display of the shape of the welding changes showing a more convex, flat or concave result.

**Convex shape.**  It means there is a low thermal load, therefore welding is "cold",

with little penetration; therefore, turning the knob clockwise you obtain more thermal load with the effect of welding with greater melting.

**Concave shape.**  It means there is a high thermal load, therefore welding is too

"hot", with excessive penetration; then, turn the knob anti-clockwise to obtain greater melting.

### 7.1.4 ATC Mode (Advanced Thermal Control)

This is enabled automatically when the thickness selected is less or equal to 1.5mm.

**Description:** the particular instantaneous control of the welding arc and the ultra rapid correcting of parameters minimize current spikes, something that is characteristic of Short Arc transfer procedures, to the advantage of a low thermal load on the piece to be welded. The result, on the one hand, is reduced deformation of materials and, on the other, a fluid and accurate transfer of the weld material and the creation of a welding seam that is easy to model.

#### Advantages:

- easy welding of thin materials;
- decreased deformation of material;
- stable arc even when working with low currents;
- rapid and accurate spot welding;
- easier coupling of spaced sheets.

### 7.1.5 Using the spool gun (where available)

All the settings procedures (material, wire diameter, gas type) are described above. The spool gun knob (Fig. I-5) adjusts the wire speed (and the welding current and thickness simultaneously). The user only has to adjust the arc voltage via the display (if necessary).

### 7.1.6 Advanced parameter setting: MENU 1 (Fig. M)

Press the knobs (Fig. C1) and (Fig. C2) for at least 1 second and release to access the advanced parameter settings menu. When MENU 1 appears, again press. Each parameter can be set to the desired value by rotating/pressing the knob (Fig. C2) until you exit the menu.



**trailing wire ramp correction (Fig. M-1)**

Use to correct the trailing wire starting ramp to prevent any initial accumulation in the welding seam. Settings from - 10 % to + 10 %. Factory value: 0 %



**electronic reactance correction (Fig. M-2)**

A higher value determines a hotter welding bath. Settings from - 10 % (low reactance machines) to + 10 % (high reactance machines). Factory value: 0 %



**burn-back correction. (Fig. M-3)**

Use to adjust the wire burn-back time when welding is stopped. Settings from - 10 % to + 10 %. Factory value: 0 %



**Post gas. (Fig. M-4)**

Use to adapt the protective gas outflow starting from when welding is stopped. Settings from 0 to 10 seconds. Factory value: 1 sec.


## 7.2 MANUAL operating mode **MAN**

The user can customise all the welding parameters.

### 7.2.1 LCD display in MANUAL mode (Fig. N)

1- MANUAL operating mode **MAN**;

2- Welding values:

 wire feed speed;

 welding voltage;

 welding current.

### 7.2.2 Parameters setting

In manual mode, the wire feeding speed and the welding voltage are adjusted separately. The knob (Fig. C-1) adjusts the wire speed, the knob (Fig. C-2) adjusts the welding voltage (which determines the welding power and influences the seam shape). The welding current is shown on the display (Fig. N-2) only during welding.

### 7.2.3 Setting of spool gun parameters (where available)

In manual mode, the wire feeding speed and the welding voltage are adjusted separately. The spool gun knob (Fig. L-5) adjusts the wire speed, whilst the welding voltage is adjusted via the display.

### 7.2.4 Advanced parameter setting: MENU 1 (Fig. M)

Press the knobs (Fig. C1) and (Fig. C2) for at least 1 second and release to access the advanced parameter settings menu. When MENU 1 appears, again press. Each parameter can be set to the desired value by rotating/pressing the knob (Fig. C2) until you exit the menu.



**Trailing wire ramp (Fig. M-1).**

Use to adjust wire feed rate as welding starts, in order to optimise arc strike. Settings from 20 to 100 % (start in % of full capacity speed). Factory value: 50 %



**Electronic reactance (Fig. M-2)**

A higher value determines a hotter welding bath. Settings from 10 % (low reactance

machines) to 100 % (high reactance machines). Factory value: 50 %



**: Burn-back. (Fig. M-3)**

Use to adjust the wire burn-back time when welding is stopped. Settings from 0 to 1 sec. Factory value: 0.08 sec.



**: Post gas. (Fig. M-4)**

Use to adapt the protective gas outflow starting from when welding is stopped. Settings from 0 to 10 seconds. Factory value: 1 sec.

**7.2.5 T1, T2 and SPOOL GUN torch settings (where available)**

The T1, T2, SPOOL GUN torch settings can be edited in two different ways:

- press the button on the control panel (Fig. C-4) where the corresponding LED will come on;
- press and release, after at least one second, the button for the torch to be used until the corresponding LED comes on.

**8. CONTROLLING THE TORCH PUSH-BUTTON**

**8.1 Setting the torch push-button control mode (Fig. O)**

Both in manual and synergic mode to access the menu, simultaneously press the knobs (Fig. C1) and (Fig. C2) for at least 1 second and release them. Turn the knob (Fig. C2) until menu 2 appears. Confirm selection by pressing the knob again.

**8.2 Torch push-button control mode**

It is possible to set 3 different torch push-button control modes:



welding begins when the torch push-button is pressed and ends when the push-button is released.



welding begins when the torch push-button is pressed and released, and ends only when the torch push-button is pressed and released a second time. This mode is useful for long welding operations.



**Spot welding mode:**

used for MIG/MAG spot welding with control of welding duration.

**9. UNIT OF MEASUREMENT MENU (Fig. O)**

Both in manual and synergic mode to access the menu, simultaneously press the knobs (Fig. C1) and (Fig. C2) for at least 1 second and release them. Turn the knob (Fig. C2) until menu 3 appears. Confirm selection by pressing the knob again. Now you can set the metric or imperial units of measurement. Pressing knob C-2 again, you return to manual (or synergic) mode.

**10. INFO MENU (Fig. O)**

Both in manual and synergic mode to access the menu, simultaneously press the knobs (Fig. C1) and (Fig. C2) for at least 1 second and release them. Turn the knob (Fig. C2) until menu 4 appears. Confirm selection by pressing the knob again; turning the knob C-2 you can obtain information on the software installed. Pressing knob C-2 again, you return to manual (or synergic) mode.

**11. TIG DC WELDING: PROCESS DESCRIPTION**

**11.1 GENERAL PRINCIPLES**

TIG DC welding is suitable for all types of low-alloy and high carbon steel, and heavy metals such as copper, nickel, titanium and their alloys (FIG. P). An electrode with 2% Cerium (grey band) is normally used for TIG DC welding with electrode at the (-) pole. The tungsten electrode must be axially sharpened using a grinding wheel, see FIG. Q; make sure the tip is perfectly concentric to prevent arc deviation. The electrode must be ground along its length. This operation must be repeated periodically according to the use and wear state of the electrode, or when the electrode itself has been accidentally contaminated, oxidised or used incorrectly. For the welding to be good, the exact diameter of the electrode must be used with the exact current, see table (TAB. 5). The electrode normally projects from the ceramic nozzle by 2-3 mm, but can reach 8 mm for welding edges.

The weld is created by the edges that melt. Filler metal is not needed when welding suitably prepared thin material (up to about 1 mm) (FIG. R). A greater thickness requires rods made from the same material as the basic material and with a suitable diameter, with edges that have been suitably prepared (FIG. S). For welding to be successful, the pieces must be carefully cleaned and free from oxide, grease, oil, solvent, etc.

**11.2 PROCEDURE (LIFT STRIKE)**

- Use the knob C-1 to adjust the welding current at the required value; Adjust the current during welding to the true thermal ratio that is required.
- Make sure the gas is flowing correctly. The arc ignites through contact, distancing the tungsten electrode from the workpiece. Igniting in this manner causes less electric-irradiated disturbances and reduces tungsten inclusions and electrode wear to a minimum.
- Place the tip of the electrode on the workpiece, pressing gently.
- Immediately lift the electrode by 2-3 mm to obtain the ark strike. The welding machine initially supplies reduced current. After a few seconds, the set welding current is issued.
- Quickly lift the electrode from the workpiece to interrupt welding.

**11.3 LCD DISPLAY IN TIG MODE (Fig. C)**

- TIG operation mode;

- Welding values;
- welding voltage;
  - welding current.

**12. MMA WELDING: PROCESS DESCRIPTION**

**12.1 GENERAL PRINCIPLES**

- It is essential to follow the recommendations provided by the manufacturer on the electrode packaging which indicates the correct electrode polarity and relative rated current.
- Welding current is regulated to suit the diameter of the electrode being used and the

type of soldering to be performed; an example of the currents used for the various electrode diameters can be seen below:

Ø Electrode (mm)	Welding current (A)	
	Min.	Max.
1.6	25	50
2.0	40	80
2.5	60	110
3.2	80	150
4.0	140	200
5.0	180	250
6.0	240	270

- One can see that for the same diameter electrode, high levels of current will be used for flat welding, whilst lower current levels will be used for vertical or overhead welding.
- The mechanical characteristics of the welded joint are determined by the intensity of the selected current and also other welding parameters such as the length of the arc, the operating speed and position, the diameter and quality of the electrodes (to ensure correct conservation, use special packaging or containers to store and protect the electrodes against humidity).



**WARNING:**

Instability of the arc due to the composition of the electrode can occur, depending on the brand, type and thickness of the electrode coatings.

**12.2 Procedure**

- Hold the mask IN FRONT OF THE FACE, then lightly scratch the electrode tip on the piece to be welded as if you were trying to strike a match; this is the correct way of striking the arc. **WARNING: DO NOT TAP** the electrode against the piece; this can damage the coating and make it difficult to strike the arc.
- A soon as the arc is struck, try to maintain a distance from the piece which is equivalent to the diameter of the electrode being used, and try to maintain this distance as constant as possible during the welding operations; remember that the angle of the electrode as it moves forwards should be about 20-30 degrees.
- At the end of the welding seam, move the electrode tip backwards slightly, above the crater, and fill it in; now quickly lift the electrode from the weld pool to extinguish the arc (Examples of welding seams - FIG. T).

**12.3 LCD DISPLAY IN MMA MODE (Fig. C)**

- MMA operation mode;
- Welding values;
  - welding voltage;
  - welding current;
- recommended electrode diameter.

Press the knobs (Fig. C1) and (Fig. C2) for at least 1 second and release to access the advanced parameter settings menu. Each parameter can be set to the desired value by rotating/pressing the knob (Fig. C2) until you exit the menu.

**Hot**

: this is the initial "HOT START" overcurrent, the display shows the percentage increase as to the value of the selected welding current. Settings from 0 to 100%. Factory value: 50%.

**Arc**

: this is the dynamic "ARC-FORCE" overcurrent, the display shows the percentage increase as to the value of the pre-selected welding current. This adjustment improves welding fluidity, prevents the electrode from adhering to the workpiece and makes it possible to use different types of electrodes. Settings from 0 to 100%. Factory value: 50%.

**Urd**

: ON/OFF; this enables or disables the device that reduces the loadless output voltage (ON or OFF setting). Factory value: OFF. With the VRD enabled, operator safety increases when the welding machine is on but not in the welding mode.

**13. RESET FACTORY SETTINGS**

The welding machine can be taken back to the factory settings by keeping the two knobs (Fig.C-1) and (Fig.C-2) pressed during starting operation.

**14. ALARM WARNINGS**

Reset is automatic when the reason for alarm activation stops. Alarm messages that can appear on the display:

- **ALARM 01** and "🔥": Welding primary thermal switch has tripped. Operations come to a halt until the machine has cooled down sufficiently.
- **ALARM 02** and "🔥": Welding secondary thermal switch has tripped. Operations come to a halt until the machine has cooled down sufficiently.
- **ALARM 03**: overvoltage switch has tripped. Check the power supply voltage.
- **ALARM 04**: undervoltage switch has tripped. Check the power supply voltage.
- **ALARM 10**: welding circuit overcurrent switch has tripped. Make sure the feeder speed and/or welding current are not too high.
- **ALARM 11**: torch and earthing short-circuit switch has tripped. Make sure the welding circuit has not short-circuited.
- **ALARM 13**: no internal communication switch has tripped. If the alarm continues, contact an authorised repair centre.
- **ALARM 18**: auxiliary voltage alarm switch has tripped. If the alarm continues, contact an authorised repair centre.

**When the welding machine is switched off, the signal ALARM 04 may appear for a few seconds.**

**15. MAINTENANCE**



**WARNING! BEFORE CARRYING OUT MAINTENANCE OPERATIONS MAKE SURE THE WELDING MACHINE IS SWITCHED OFF AND DISCONNECTED**

**FROM THE MAIN POWER SUPPLY.**

**15.1 ROUTINE MAINTENANCE:**

**ROUTINE MAINTENANCE OPERATIONS CAN BE CARRIED OUT BY THE OPERATOR.**

**15.1.1 Torch**

- Do not put the torch or its cable on hot pieces; this would cause the insulating materials to melt, making the torch unusable after a very short time.
- Make regular checks on the gas pipe and connector seals.
- Accurately match collet and collet body with the selected electrode diameter in order to avoid overheating, bad gas diffusion and poor performance.
- At least once a day check the terminal parts of the torch for wear and make sure they are assembled correctly: nozzle, electrode, electrode-holder clamp, gas diffuser.
- Before using the welding machine, always check the terminal parts of the torch for wear and make sure they are assembled correctly: nozzle, electrode, electrode-holder clamp, gas diffuser.

**15.1.2 Wire feeder**

- Make frequent checks on the state of wear of the wire feeder rollers, regularly remove the metal dust deposited in the feeder area (rollers and wire-guide infeed and outfeed).

**15.2 EXTRAORDINARY MAINTENANCE**

**EXTRAORDINARY MAINTENANCE MUST ONLY BE CARRIED OUT BY TECHNICIANS WHO ARE EXPERT OR QUALIFIED IN THE ELECTRIC-MECHANICAL FIELD, AND IN FULL RESPECT OF THE IEC/EN 60974-4 TECHNICAL DIRECTIVE.**



**WARNING! BEFORE REMOVING THE WELDING MACHINE PANELS AND WORKING INSIDE THE MACHINE MAKE SURE THE WELDING MACHINE IS SWITCHED OFF AND DISCONNECTED FROM THE MAIN POWER SUPPLY OUTLET.**

**If checks are made inside the welding machine while it is live, this may cause serious electric shock due to direct contact with live parts and/or injury due to direct contact with moving parts.**

- Inspect the welding machine regularly, with a frequency depending on use and the dustiness of the environment, and remove the dust deposited on the transformer, reactance and rectifier using a jet of dry compressed air (max. 10 bar).
  - Do not direct the jet of compressed air on the electronic boards; these can be cleaned with a very soft brush or suitable solvents.
  - At the same time make sure the electrical connections are tight and check the wiring for damage to the insulation.
  - At the end of these operations re-assemble the panels of the welding machine and screw the fastening screws right down.
  - Never, ever carry out welding operations while the welding machine is open.
  - After having carried out maintenance or repairs, restore the connections and wiring as they were before, making sure they do not come into contact with moving parts or parts that can reach high temperatures. Tie all the wires as they were before, being careful to keep the high voltage connections of the primary transformer separate from the low voltage ones of the secondary transformer.
- Use all the original washers and screws when closing the casing.

**16. TROUBLESHOOTING**

**IN CASE OF UNSATISFACTORY FUNCTIONING, BEFORE SERVICING MACHINE OR REQUESTING ASSISTANCE, CARRY OUT THE FOLLOWING CHECK:**

- Check that when general switch is ON the relative lamp is ON. If this is not the case then the problem is located on the mains (cables, plugs, outlets, fuses, etc.)
- There is no alarm signalling intervention of the thermostat safeguard, over or undervoltage or short-circuit.
- Check that the nominal intermittance ratio is correct. In case there is a thermal protection interruption, wait for the machine to cool down, check that the fan is working properly.
- Check the mains voltage: if the value is too high or too low the welding machine will be stopped.
- Check that there is no short-circuit at the output of the machine: if this is the case eliminate the inconvenience.
- Check that all connections of the welding circuit are correct, particularly that the work clamp is well attached to the workpiece, with no interfering material or surface-coverings (ie. Paint).
- Protective gas must be of appropriate type and quantity.