

INSTRUCTION MANUAL FOR ARC WELDING MACHINE

IMPORTANT: BEFORE STARTING THE EQUIPMENT, READ THE CONTENTS OF THIS MANUAL, WHICH MUST BE STORED IN A PLACE FAMILIAR TO ALL USERS FOR THE ENTIRE OPERATIVE LIFE-SPAN OF THE MACHINE. THIS EQUIPMENT MUST BE USED SOLELY FOR WELDING OPERATIONS.

1 SAFETY PRECAUTIONS

WELDING AND ARC CUTTING CAN BE HARMFUL TO YOURSELF AND OTHERS. The user must therefore be educated against the hazards, summarized below, deriving from welding operations. For more detailed information, order the manual code 3.300.758

ELECTRIC SHOCK - May be fatal.



- Install and earth the welding machine according to the applicable regulations.
- Do not touch live electrical parts or electrodes with bare skin, gloves or wet clothing.
- Isolate yourselves from both the earth and the workpiece.
- Make sure your working position is safe.

FUMES AND GASES - May be hazardous to your health.



- Keep your head away from fumes.
- Work in the presence of adequate ventilation, and use ventilators around the arc to prevent gases from forming in the work area.

ARC RAYS - May injure the eyes and burn the skin.



- Protect your eyes with welding masks fitted with filtered lenses, and protect your body with appropriate safety garments.
- Protect others by installing adequate shields or curtains.

RISK OF FIRE AND BURNS



- Sparks (sprays) may cause fires and burn the skin; you should therefore make sure there are no flammable materials in the area, and wear appropriate protective garments.

NOISE



This machine does not directly produce noise exceeding 80dB. The plasma cutting/welding procedure may produce noise levels beyond said limit; users must therefore implement all precautions required by law.

PACEMAKERS

- The magnetic fields created by high currents may affect the operation of pacemakers. Wearers of vital electronic equipment (pacemakers) should consult their physician before beginning any arc welding, cutting, gouging or spot welding operations.

EXPLOSIONS



- Do not weld in the vicinity of containers under pressure, or in the presence of explosive dust, gases or fumes.
- All cylinders and pressure regulators used in welding operations should be handled with care.


ELECTROMAGNETIC COMPATIBILITY


This machine is manufactured in compliance with the instructions contained in the harmonized standard EN50199, **and must be used solely for professional purposes in an industrial environment. There may be potential difficulties**

in ensuring electromagnetic compatibility in non-industrial environments.

IN CASE OF MALFUNCTIONS, REQUEST ASSISTANCE FROM QUALIFIED PERSONNEL.

2 GENERAL DESCRIPTIONS

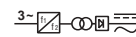
This welding machine is a direct current power source built using inverter technology, for MMA welding of all kinds of covered electrode, and TIG welding with strike starting and high frequency. Art. 343 delivers direct current, while Art. 349 delivers both direct and alternating current. By selecting TIG AC welding mode  you may weld aluminium, aluminium

alloys, brass and magnesium, while selecting TIG DC  allows you to weld stainless steel, iron and copper.

2.2 EXPLANATION OF TECHNICAL SPECIFICATIONS

IEC 60974.1 The welding machine is manufactured according to these international standards
EN 50199 Serial number. Must be indicated on any type of request regarding the welding machine.

N° Three-phase static frequency converter transformer-rectifier.
Drooping characteristic.



MMA Suitable for welding with covered electro-des.



TIG Suitable for TIG welding.

U0. Secondary open-circuit voltage.
X. Duty cycle percentage

The duty cycle expresses the percentage of 10 minutes during which the welding machine may run at a certain current without overheating.

I2. Welding current
U2. Secondary voltage with current I2


U1. Rated supply voltage
3~ 50/60Hz 50- or 60-Hz three-phase power supply

I1 Max Max. absorbed current at the corresponding current I2 and voltage U2.

I1 eff This is the maximum value of the actual current absorbed, considering the duty cycle. This value usually corresponds to the capacity of the fuse (delayed type) to be used as a protection for the equipment.

IP23 C. Protection rating for the housing.

Grade 3 as the second digit means that this equipment is suitable for use outdoors in the rain. The additional letter C means that the equipment is protected against access to the live parts of the power circuit by a tool (diameter 2.5 mm).

 Suitable for use in high-risk environments.

NOTE: The welding machine has also been designed for use in environments with a pollution rating of 3. (See IEC 664).

2.3 DESCRIPTION OF PROTECTIVE DEVICES

2.3.1 Thermal protection

This device is protected by a thermostat. When the thermostat is tripped, the machine stops delivering current but the fan continues to run. The LED AM on the control panel lights to indicate that the thermostat has been tripped.

2.3.2 Block protection

This protection is signaled by the LED **AN** on the control panel, and lights along with an error code indicated on the display **Y**.

2.3.3 Low liquid pressure

If the coolant pressure is too low, the message H2O will flash on the display **Y**.

3 INSTALLATION

3.1 PLACEMENT

The welding machine must be placed in a sufficiently ventilated, non-dusty area, taking care not to obstruct the air entering or leaving the cooling slots.

WARNING: REDUCED AIR FLOW causes the internal parts to overheat and may damage them.

- Keep at least 200 mm of free space all around the machine.
- Never connect any filtering device to the air intake passages of this welding machine.

Use of any type of filtering device shall immediately void the warranty.

3.2 START-UP

Only skilled personnel should install the machine. Connections must be carried out according to current regulations, and in full observance of safety laws (standard CEI 26-10 - CENELEC HD 427)

3.3 DESCRIPTION OF THE EQUIPMENT (pict. 1-1a)

A) **Negative output terminal (-).**

B) **Positive output terminal (+).**

Note: during the welding, an alternated voltage is present on the terminals **A** and **B** of art. 350.

C) **Connector for the TIG torch trigger, foot control or cooling unit.**

The torch pushbutton wires must be connected to pins 1 and 9

D) **Fitting (1/4 gas).**

This is where the gas hose of the TIG welding torch is to be connected.

E) **Main switch.**

F) **Tank cap.**

G) **Power cord.**

H) **Gas supply fitting.**

I) **Hot water inlet fitting**
(use only for TIG torches).

L) **Cold water outlet fitting**
(use only for TIG torches).

M) **Slot for fluid level check.**

N-O) **Fittings for MIG torches**
(there must not be any short-circuits).

3.4 DESCRIPTION OF THE PANELS

The Art. 343 comes complete with control panel Art.216.

The Art. 349 comes complete with control panel Art.220.

See drawings from page 86 to page 87

Process key A.



When selected, one of the following LEDs lights: D, E, F, or G.



Led D



Led E



Led F

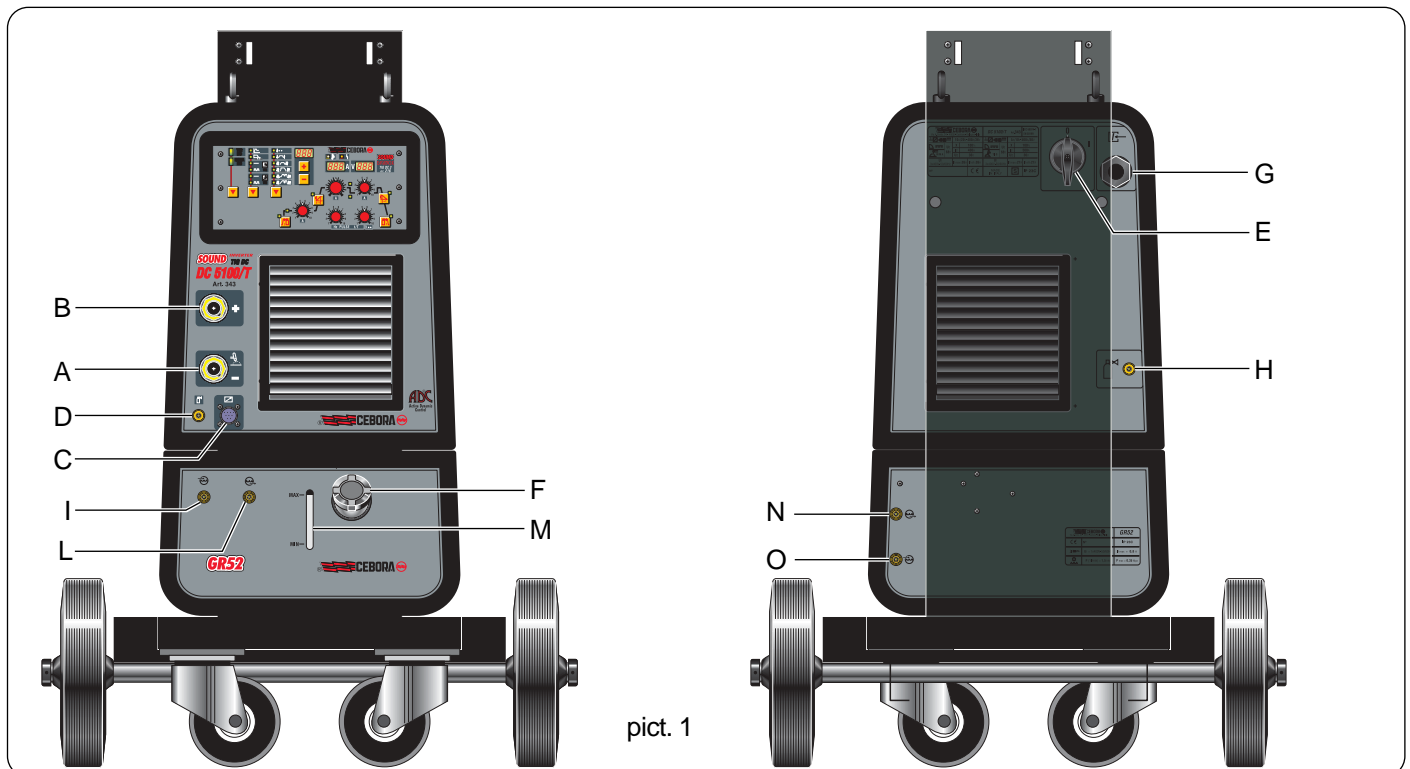


Led G

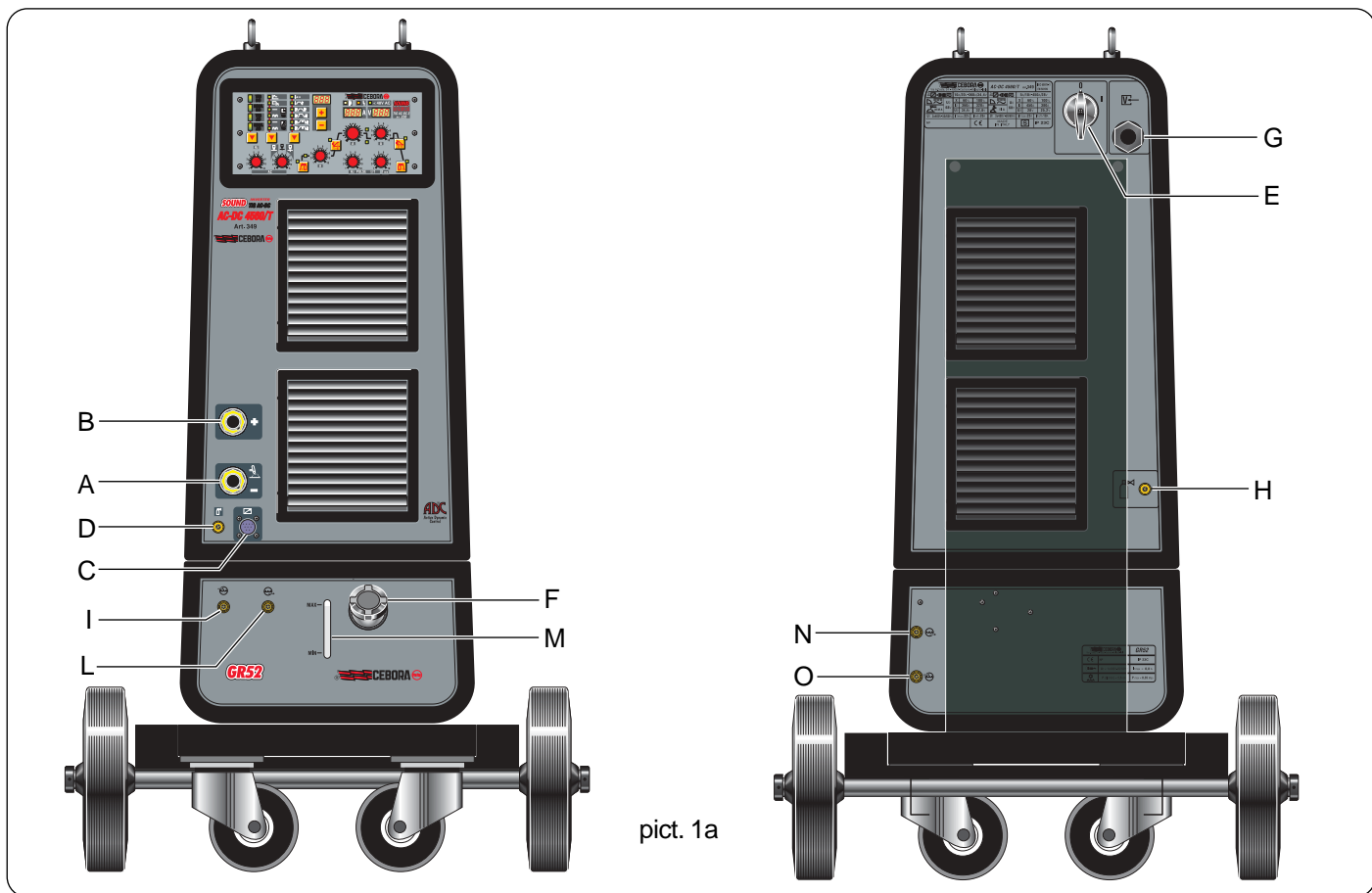
Mode key B.



When selected, one of the following LEDs lights: **H, I, L, M, N, or O**:



pict. 1





pict. 1a



Led **H** "HOT START":



Active in MMA and TIG AC welding.

This selection allows you to adjust the "HOT START" value for easier starting, using the **W**  and **W1**  keys.

In TIG AC we recommend setting the value between 0 and 30 for electrodes with a diameter of 1.6 mm, from 25 to 50 for electrodes with a diameter of 2.4 mm, 30 to 60 for electrodes with a diameter of 3.2 mm, and between 50 and 99 for electrodes with a diameter greater than 3.2.



Led **I** "ARC FORCE":

- In MMA mode, this selection allows the operator to adjust the surge current values to more easily transfer the drops of molten metal, using the keys **W**  and **W1** . This value is expressed as a percentage, and appears on the display **V**.



Led **L**:
CONTINUOUS TIG welding, started by means of a high voltage/frequency device.



Led **M**:
PULSE TIG welding, started by means of a high voltage/frequency device.



Led **N**:
CONTINUOUS TIG welding with contact starting (striking).



Led **O**:
PULSE TIG welding with contact starting (striking).

Program key **C**.



When selected, one of the following LEDs lights: **P Q, R, S, T, or U**.



Led **P**:

MANUAL TIG spot-welding. In this position the operator presses the torch trigger: the arc starts, and then shuts off automatically after an interval of between 10 milliseconds and 3 seconds. This time may be adjusted using the knob **AF**. The arc shuts off before the set time if the operator releases the trigger. In any case, the operator must release the trigger and press it again between spots. The current value must be adjusted using the knob **AC**.



Led **Q**:

This position allows 2-stage TIG welding. When the torch trigger is pressed, the current begins to increase over the previously set "SLOPE UP" time, until it reaches the value set by means of the knob **AC**. When the trigger is released, the current begins to drop over the previously set "SLOPE DOWN" time, until it returns to zero.



Led **R** (4-stage TIG):

This program differs from the previous one in that the arc is both started and shut off by pressing and releasing the torch trigger.



Led S:

To start the arc, press the torch trigger. Current begins to increase at a fixed rate. If the trigger is released, the current automatically rises to the maximum value set by means of the knob **AC**. To stop welding, press the torch trigger again. The current begins to decrease at a fixed rate. The current immediately returns to zero if the trigger is released.



Led T:

Press the torch trigger.

The welding current sets itself to the value set by means of the knob **AB**, and the LED **AP** lights. The operator may maintain this current for as long as desired (for instance, until the workpiece heats up). **By pressing and immediately releasing the torch trigger**, the current switches to the value set using the knob **AC** within the time interval selected by means of the key **AH**. The LED **AQ** lights when the maximum welding current is reached. Should it be necessary to reduce the current while welding, without shutting off the arc (for example when the welding material changes, the working position changes, such as from horizontal to upright, etc.), press and immediately release the torch trigger. The current will switch to the value selected via the knob **AD**, the LED **AR** lights and **AQ** goes off. To return to the previous maximum current, press and release the torch trigger once again. The LED **AQ** will light, and the LED **AR** will go off. To stop welding at any time, simply hold down the torch trigger **for more than 0.7 seconds**, then release. The current begins to fall to zero within the time interval set via the key **AI**.

If the torch trigger is pressed and released immediately during the "slope down" stage, it returns to "slope up" if the latter is set to greater than zero, or to the lesser current between those set via the knobs **AB** and **AD**.

NOTE: The expression "PRESS AND IMMEDIATELY RELEASE" refers to a maximum time of 0.5 seconds.



Led U:

This cycle differs from the previous one in that there is no initial welding temperature set by means of the knob **AB**.

Setting keys.

Keys W / W1.



These keys are used to adjust all parameters for the currently active selection key.

The selected values will appear on the display **V**.

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Selection keys.

The key is active when its corresponding LED is lit.

AG Key.



Pre-gas time (0-10 sec.) - Time gas escapes before welding begins.

AH Key.



Slope-up (0 - 10 sec.) Time required to reach the maximum set welding current.

AI Key.



Slope-down (0 - 10 sec.) Time required for the welding current to return to zero.

AL Key.



Post-gas time (0 - 30 sec.) - Time gas escapes after welding ends.

The corresponding LEDs light whenever the keys **AG**, **AH**, **AI**, or **AL** are pressed.

The values may be adjusted during welding, while the above keys are active, by means of the keys **W** and **W1**.

Setting knobs.

Knob X.

Adjusts the current frequency in AC TIG welding (50 - 120 Hz)

Knob AA.



Balance control

Adjusts the half cycles of the square wave when working in TIG AC mode to weld aluminum.

Turn the knob clockwise to increase penetration. For a cleaner weld and less penetration, turn the knob counter-clockwise.

THIS FUNCTION IS ACTIVE ONLY WHEN AC TIG WELDING IS SELECTED.

Knob AB.

Adjusts the welding start current. This current is always a percentage of the value set via the knob **AC**.

Knob AC.

Adjusts the primary or peak welding current.

Knob AD.

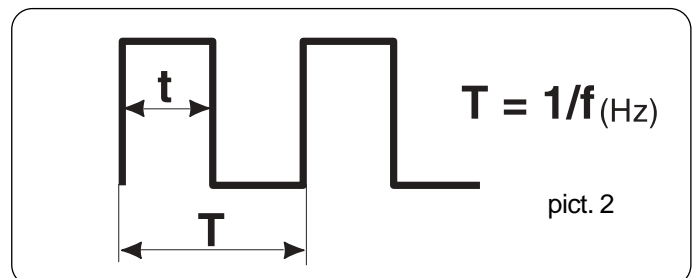
Adjusts the pause or base current. This knob adjusts the pause current when the machine is set for CONTINUOUS TIG welding, or the base current if it is set up for PULSE TIG welding. It is always a percentage of the value set via the knob **AC**.

Knob AE.

Adjusts the pulse frequency from 0.1 to 500 Hz when the machine is set for PULSE TIG welding.

Knob AF.

Adjusts the t/T ratio (0 - 1, see fig. 2) , or adjusts the spot-welding time.



Indicator LEDs.



LED AM:

Thermostat LED. Lights when the operator exceeds the allowed duty cycle, and when the pressure switch indicates low water pressure if the cooling unit is connected. In these circumstances, the machine stops delivering currents and the keys **A**, **B** and **C** are not enabled.



LED AN:

Block LED.

Lights when an error condition is detected; the error code flashes simultaneously on the display **V**.



LED AO:

LED indicating that the device to reduce the risk of electric shock is in good working order.

LED AP:

This LED lights when the machine is delivering the current set via the knob **AB**, or when setting up the welding parameters.

LED AQ:

This LED lights when the machine is delivering the current set via the knob **AC**, or while setting up the welding parameters.

LED AR:

This LED lights when the machine is delivering the current set via the knob **AD**, or while setting up the welding parameters.

Display Y:

Indicates: 1) the welding start current set by means of the knob **AB** when the LED **AP** is lit;
2) the welding current set by means of the knob **AC** when the LED **AQ** is lit;
3) the pause welding current set by means of the knob **AD** when the LED **AR** is lit.

Display Z:

Indicates the voltage at the welding terminals.

Display V:

Indicates the values set by means of the keys **W** and **W1**.

3.4.1 Settings/checks

Press the **AH** and **AI** keys simultaneously: The indication begins flashing on the display **V**. In this condition you may set or simply check all values for those parameters that may be adjusted for the selected process, simply by pressing the torch trigger.

In these conditions the machine does not deliver current, does not produce HF and does not open the gas valve

After you have finished setting or checking the parameters, press the keys **AH** and **AI** again: the display **V** stops flashing and the machine is once again ready to begin the selected welding cycle.

3.4.2 Cooling unit management

The power sources Art. 343 and 349 are supplied complete

with cooling unit fastened to the lower part of the power source itself.

The operation of the unit is managed by means of the power source control panel:

- Simultaneously press the keys **AH** and **AI** to enter a sub-menu (the message *PrE* appears on the display **Y**).
- Hold down the **AI** key until the message H2O appears on the display **Y**
- Press the keys **W** (+) and **W1** (-) to select one of the possible options (shown on the display **Z**):

- OFF = unit inactive
- Cont = unit always running
- Aut = unit in automatic mode:

When the power source is started, the cooling unit runs for 30 seconds to allow the coolant to begin circulating in the hoses of the torch. Thereafter, every time the torch trigger is pressed, the unit starts running and continues for the three minutes after the button is released.

3.5 ERROR CODES

- flashing H2O: insufficient coolant .
(Add fluid).
- flashing OFF: The equipment has been turned off and back on too quickly.
(Shut off and wait at least 5 seconds before turning back on).
(Contact technical service).
- 0÷50
-52 Button pressed when the equipment is switched on.
(Release).
- 53 Button pressed when the thermostat is reset.
(Release).
- 61÷66 Problem on the power supply
(check)

3.6 GENERAL NOTES

Before using this welding machine, carefully read the standards CEI 26/9 - CENELEC HD 407 and CEI 26.11 - CENELEC HD 433. Also make sure the insulation of the cables, electrode clamps, sockets and plugs are intact, and that the size and length of the welding cables are compatible with the current used.

3.7 WELDING

- The welding circuit must never be deliberately placed in direct or indirect contact with the safety conductor except on the workpiece.
- If the workpiece is deliberately grounded by means of the safety wire, the connection must be as direct as possible, and made using a wire having a cross-section at least equal to that of the welding current return wire. It must also be connected to the workpiece at the same point as the return wire, using the return wire clamp or a second earth clamp placed immediately adjacent to it.
- Every precaution must be taken to avoid welding current leakage.

	D.C.	A.C. (frequency 50 Hz)					
		Pos. Max Penetration		Pos. Balanced zero		Pos. Max Cleaning	
Electrode Type ▶ Ø ▼	Tungsten Thorium 2% Red	Tungsten Pure Green	Tungsten Zr 0,8% White	Tungsten Pure Green	Tungsten Zr 0,8% White	Tungsten Pure Green	Tungsten Zr 0,8% White
1,6	70A ÷ 150A	50A ÷ 100A	70A ÷ 150A	30A ÷ 60A	50A ÷ 80A	20A ÷ 40A	30A ÷ 60A
2,4	150A ÷ 250A	100A ÷ 160A	140A ÷ 235A	60A ÷ 120A	80A ÷ 140A	40A ÷ 100A	60A ÷ 120A
3,2	200A ÷ 350A	150A ÷ 210A	225A ÷ 325A	80A ÷ 160A	100A ÷ 180A	60A ÷ 140A	80A ÷ 160A
4	300A ÷ 400A	200A ÷ 275A	300A ÷ 400A	100A ÷ 240A	150A ÷ 280A	80A ÷ 200A	150A ÷ 250A
4,8	300A ÷ 500A	-	-	200A ÷ 300A	250A ÷ 400A	-	-
6,4	400A ÷ 650A	-	-	275A ÷ 400A	300A ÷ 500A	-	-

Table A



3.7.1 MMA welding

- Use electrode clamps in compliance with current safety regulations, and without protruding screws.
- Make sure that the main switch is set to **0**, and that the power cable plug is not inserted in the power socket. Then connect the welding cables, observing the polarity required by the manufacturer of the electrodes you are using.
- Make sure that the supply voltage matches the voltage indicated on the specifications plate of the welding machine.
- Connect the power cable, making sure that the brown, black and blue wires correspond to the three phases, and that the yellow-green wire corresponds to the earth terminal of the system
- The capacity of the overload cutout switch or fuses installed in series with the power supply must be equivalent to the absorbed current I1 of the machine.
- The absorbed current I1 can be determined by reading the technical specifications indicated on the machine, in regards to the supply voltage U1 available.
- Any extension cords must be sized appropriately for the absorbed current I1 .
- Turn the machine on using the main switch **E**.
- Do NOT touch the torch or electrode clamp simultaneously with the mass terminal.

Select MMA on the control panel using the push-button **A**, and adjust the current by means of the knob **AC**.

Always remember to shut off the machine and remove the electrode from the clamp after welding.

3.7.2 TIG welding

By selecting TIG AC welding mode  you may weld aluminium, aluminium alloys, brass and magnesium, while selecting TIG DC  allows you to weld stainless steel, iron and copper.

- Connect the earth cable connector to the positive pole (+) of the welding machine, and the clamp to the workpiece as close as possible to the welding point, making sure there is good electrical contact.
- Use a TIG torch appropriate for the welding current, and connect the power connector to the negative pole (-) of the welding machine.
- Connect the torch connector to the welding machine connector **C**.
- Connect the torch gas hose fitting to the fitting **D** on the machine, and the gas hose from the cylinder pressure regu-

lator to the gas fitting on the rear panel.

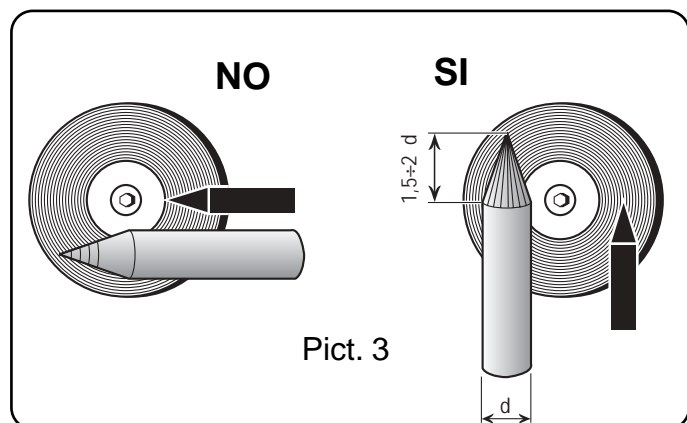
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- Any extension cords must be sized appropriately for the absorbed current I1 .
- Turn the machine on using the main switch **E**.
- Do NOT touch the torch or electrode clamp simultaneously with the earth clamp.

The type and diameter of the electrode to be used must be selected according to table A.

• Remember to shut off the machine and close the gas cylinder valve when you have finished welding.

3.7.2.1 Preparing the electrode

Be especially careful when preparing the electrode tip. Grind it so that it has vertical grooves as shown in pict.3.



WARNING: LOOSE HOT METAL PARTICLES may injure personnel, cause fires and damage equipment; **TUNGSTEN CONTAMINATION** may lower the quality of the weld.

- Use only a grinder equipped with suitable safety guards to profile the tungsten electrode, and always wear protective gear for the face, hands and body.
- To profile the tungsten, use a hard, fine-grained abrasive grinding wheel used solely for this purpose.
- Grind the end of the tungsten electrode into a tapered shape, for a length equivalent to approximately 1.5-2 times the electrode diameter. (pict. 3)

4 ACCESSORIES

4.1 REMOTE CONTROLS

This equipment may be used with the foot control Art. 193. If you wish to adjust the current using the pedal and the arc ignition using the torch, you must use the connection Art. 1180.

This equipment may also be used with the remote control Art. 187 together with the extension cable Art. 1192.

When the MMA mode is selected, the 10 pole connector of the extension must be connected to the C connector of the machine.

When the TIG mode is selected, you must use the connector Art. 1180.

CAUTION! These steps must be carried out in the sequence described in order for the machine to recognize the remote control.

5 MAINTENANCE AND CHECKS

Note: All repair work must be done by qualified personnel.

5.1 GENERAL NOTES

- Do not touch live electrical parts.
- Shut off the welding machine and unplug the power cord from the socket before all checks and maintenance operations.

MOVING PARTS can cause serious injury.

HOT SURFACES can cause serious burns.

- Let the welding machine cool before performing maintenance.

5.2 PRECAUTIONS AFTER REPAIRS.

After making repairs, take care to organize the wiring so that there is secure insulation between the primary and secondary sides of the machine. Do not allow the wires to come into contact with moving parts or those that heat up during operation. Reassemble all clamps as they were on the original machine, to prevent a connection from occurring between the primary and secondary circuits should a wire accidentally break or be disconnected.

Also mount the screws with geared washers as on the original machine.