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.

2 GENERAL DESCRIPTIONS

2.1 SPECIFICATIONS

This welding machine is a constant current power source built using INVERTER technology, designed to weld covered electrodes (not including cellulosic) and for TIG procedures, with contact starting and high frequency. IT MUST NOT BE USED TO DEFROST PIPES.

2.2 EXPLANATION OF THE TECHNICAL SPECIFICATIONS LISTED ON THE MACHINE PLATE.

N°. Serial number, which must be indicated on any type of request regarding the welding machine.
- Three phase static transformer-rectifier frequency converter.
- Drooping-characteristic.
- MMA Suitable for welding with covered electrodes.
- TIG Suitable for TIG welding.
- U0. Secondary open-circuit voltage
- X. Duty cycle 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
- The machine has an automatic supply voltage selector.
- 3~ 50/60Hz  50- or 60-Hz three-phase power supply
- I1 max. This is the maximum value of the absorbed current.
- I1 eff. This is the maximum value of the actual current absorbed, considering the duty cycle.
- IP23C Protection grade of the housing, approving the equipment as suitable for use outdoors in the rain.
- C: 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 hazardous environments.

NOTES: 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 machine is protected by a temperature probe, which prevents the machine from operating if the allowable temperatures are exceeded. Under these conditions the fan keeps running and the LED M lights.
2.3.2 - Block protection art. 338

This welding machine is equipped with various safety devices that stop the machine before it can suffer damage. The welding machine may operate within the following voltage ranges:

For rated voltage 208/220/230V, from 175 to 270V
For rated voltage 400/440V, from 340 to 490V

Caution: if the supply voltage does not fall between the above values, no LED will light and the fan is powered.

If the phases are not properly connected, 3 light points will appear (steadily lit) on the display P when the machine is started.

If, with the machine on, the voltage falls below 175 V (U1 = 230V) or 340 V (U1 = 400V), the display P will show the abbreviation E3.

If, with the machine on, the voltage rises above 275 V (U1 = 230V) or 490 V (U1 = 400V), the display P shows the abbreviation E4.

In this case turn off the machine, restore the proper voltage and restart. If the problem has been corrected, the welding machine will begin operating again.

If, with the machine on, the display P shows the message E2 or E1, check the supply voltage of the machine; if it is correct, the machine requires technical service.

If a low water level is detected for the cooling unit the abbreviation H2O flashes on the display P.

3 INSTALLATION

Make sure that the supply voltage matches the voltage indicated on the specifications plate of the welding machine. When mounting a plug, make sure it has an adequate capacity, and that the yellow/green conductor of the power supply cable is connected to the earth pin.

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.

WARNING! Extension cords of up to 30m must have a cross-section of at least 2.5 mm².

3.1 START-UP

Only skilled personnel should install the machine. All connections must be carried out according to current regulations, and in full observance of safety laws.

3.2 DESCRIPTION OF THE EQUIPMENT

AL - Process selector switch
This button is used to choose the welding process (MMA or TIG). The selection changes each time it is pressed. The LEDs light alongside the various symbols to display your choice.

B - MMA welding LED
This machine can weld all types of coated electrodes except cellulotic. With this process the current is adjusted using the knob O, and it is possible to adjust the "arc force" (LED AN) and "hot start" function (LED AM).

AH - Continuous TIG welding LED

AJ - Pulsed TIG welding LED
The pulse frequency is adjustable from 0.16 to 500Hz (LED T), the peak current and the base current may be activated via the LEDs X and W, respectively, and are adjustable using the knob O.
From a pulse frequency of 0.16 to 1.1 Hz, the display P alternates displaying the peak current (main) and the base current. The LEDs X and W light alternately; beyond 1.1 Hz the display P displays the mean of the two currents and the LEDs X and W both remain lit.

A - Mode selector switch
The selection changes each time it is pressed, and is displayed by lighting the LED C or D together with other LEDs displaying the welding mode.

C - Arc starting without high frequency LED.
To light the arc, press the torch trigger, touch the workpiece with the tungsten electrode, and lift it again. This move must be quick and decisive.

D - Arc starting with high frequency LED.
To light the arc, press the torch trigger: a high voltage/frequency pilot spark will light the arc.

E - 2-stage TIG welding LED (manual)
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 O. When the trigger is released, the current begins to drop over the previously set "SLOPE DOWN" time, until it returns to zero.
In this position, you may connect the pedal control accessory ART. 193.

**F - 4-stage TIG welding LED (automatic)**

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

**G - four-stage TIG welding LED with dual current level, (automatic).**

Set the two current levels before lighting the arc:
First level: press the R key until the LED X lights, and adjust the main current using the knob O. Second level: press the R key until the LED W lights, and adjust the main current using the knob O.

When the torch trigger is pressed, the current begins to increase over the previously set "slope up" time (led S lit), until it reaches the value set by means of the knob O. The LED X lights and appears on the display P. Should it be necessary to reduce the current during welding, without shutting of the arc (for instance when changing the welding material or working position, moving from horizontal to upright, etc...), press and immediately release the torch trigger: the current will switch to the second value selected, the LED W will light and X will go off.

To return to the previous main current, press and release the torch trigger once again. The LED X will light, and the LED W 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 previously set "slope down" time interval (LED U lit). If you press and immediately release the torch trigger during the "slope down" phase, you will return to "slope up" if it is set greater than zero, or to the lesser current value of those set.

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

**H - four-stage TIG welding LED with three levels of current (automatic).**

To set the three minimum welding currents, proceed as follows:
Press the selector switch R until the LED X lights, then adjust the maximum current value using the knob O. Press the selector switch R until the LED W lights, then adjust the intermediate current value using the knob O. Press the selector switch R until the LED AP lights, then adjust the starting current value using the knob O.

The operating logic is the same as previously described for welding with dual current level (LED G).

**I - special program LED**

To light the arc, press the torch trigger and hold it down; the current begins to increase at a fixed rate. If the torch trigger is released, the current immediately rises to the welding value (LED X). To stop welding, press the torch trigger and hold it down; the current begins to drop at a fixed rate. The current immediately returns to zero if the trigger is released.

**L - spot-welding LED (Manual).**

After selecting the welding current (LED X) and the spot welding time (LED T) using the selector switch R, set the values using the knob O.

This welding mode is to be used only if start-up with high frequency is selected (LED D lit). In this welding mode, the operator presses the torch trigger, the arc lights, and after the set spot welding time the arc shuts off automatically. To do the next spot, you must therefore release the torch trigger and press it again.

**M - LED - THERMAL PROTECTION**

Lights when the operator exceeds the duty cycle or percentage intermittence admissible for the machine, and simultaneously blocks the current output.

**Note:** In this condition the fan continues cooling the power source.

**O - Knob**

Normally adjusts the welding current.

Also, if you select a function with the selector switch R, this knob adjusts its size.

**P - Display**

Displays the welding current and the settings selected by means of the push-button R and adjusted via the knob O.

In the machine blocking procedures (see 2.3.2), it displays: Three flashing or steadily lit points

The abbreviations E1 E2 E3 E4

The abbreviation H20

**N - Display**

Normally displays the arc voltage in relation to the current welding process.

When setting the cooling unit operation, it displays the status of the unit.

**Q - SELECTOR**

Selects and saves programs.

The welding machine can save nine welding programs P01.....P09, and call them up using this button. A working program PL is also available.

**Selecting**

When this push-button is pressed briefly, the display P shows the next program number after the one being worked on. If it has not been saved the message will flash, otherwise it will remain steady.

**Saving**

Once the program has been selected, hold for more than 3 seconds to save the data. In confirmation, the program number on the display P will stop flashing.

**R - SELECTOR**

When this button is pressed, the LEDs light in succession:

**Warning:** only those LEDs that refer to the chosen welding mode will light; i.e., in continuous TIG welding the LED T, representing the pulse frequency, will not light.

Each LED indicates the parameter that may be adjusted by means of the knob O while the LED itself is lit. Five seconds after the last variation, the LED involved will shut off; the main welding current will be displayed, and the corresponding LED X lights.

**AO - Pre-gas LED**

Adjustment 0.05-2.5 seconds. Gas output time before starting welding.
AP - Welding start current LED.
Welding start current. This is a percentage of the welding current (LED X).

S - Slope up LED.
This is the time in which the current, starting from the minimum, reaches the set current value. (0-10 sec.)

X - Main welding current LED.

W - Second level of welding or base current LED.
This current is always a percentage of the main current.

T - Pulse frequency LED (0.16-550 Hz).
The peak and base times are equal. When spot-welding is selected (LED L) this LED lights to indicate that the display H displays the spot welding time that may be adjusted using the knob O from 0.1 to 3 seconds.

U - Slope down LED.
This is the time in which the current reaches the minimum value and the arc shuts off. (0-10 sec.)

V - Post gas LED.
Adjusts the time gas flows after welding ends. (0-30 sec.)

AM - Hot-Start LED
May be selected via the button R only if MMA welding is selected (LED B).
This LED lights to indicate that the display P displays the time, expressed in seconds, during which the welding machine delivers an overcurrent to improve electrode starting. It may be adjusted using the knob O.

AN - Arc-force LED
May be selected via the button R only if MMA welding is selected (LED B).
It is a percentage of the welding current. The display P displays its value, and the knob O adjusts it. This overcurrent essentially aids in the transfer of drops of molten metal.

Y - 10-pin connector
This connector is connected to the remote controls described in paragraph 4.
A clean contact is available between pins 3 and 6 to signal when the arc is lit (5A 230V).

Z - 1/4 GAS FITTING
This is where the gas hose of the TIG welding torch is to be connected.

AA - Negative output terminal (-)

AB - Positive output terminal (+)

AC - switch
Turns the machine on and off

AD - Gas intake fitting

AE - Socket
To which to connect the cooling unit Art. 1341
Caution: Max. power: 360VA - Amps: 1.6.
Do not connect tools such as polishers or similar.

AF - Connector
Three-pin connector to which to connect the wire of the cooling unit pressure switch.
3.3 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.

3.4 MMA WELDING (MANUAL METAL ARC)

- This welding machine is suitable for welding all types of electrodes, with the exception of cellulosic (AWS 6010)*.
- Make sure that the switch AC is in position 0, then connect the welding cables, observing the polarity required by the manufacturer of the electrodes you will be using; also connect the clamp of the ground cable to the workpiece, as close to the weld as possible, making sure that there is good electrical contact.
- Do NOT touch the torch or electrode clamp simultaneously with the earth clamp.
- Turn the machine on using the switch AC.
- Select the MMA procedure by pressing the button A: LED B lit.
- Adjust the current based on the diameter of the electrode, the welding position and the type of joint to be made.
- Always remember to shut off the machine and remove the electrode from the clamp after welding.

If you wish to adjust the Hot-start (LED AM) and Arc force functions (LED AN), see the previous paragraph.

3.5 TIG WELDING

This welding machine is suitable for welding stainless steel, iron, or copper using the TIG procedure.

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.

Connect the power connector of the TIG torch to the negative pole (-) of the welding machine.

Connect the torch connector to the welding machine connector Y.

Connect the torch gas hose fitting to the fitting Z on the machine, and the gas hose from the cylinder pressure regulator to the gas fitting AD on the rear panel.

Cooling unit

If using a water-cooled torch, use the cooling unit Art 1341. The trolley Art. 1432 is required to position and transport the welding machine together with the cooling unit.

After filling the tank with coolant, connect the plug of the mains cable to the socket AE of the welding machine, then connect the 3-pin male patch connector to the connector AF. Turn on the machine. To select the operating mode of the cooling unit, proceed as follows:

1. Select any TIG welding mode.
2. Press the key Q and, while holding it down, press the key R. Keep them pressed until the abbreviation H2O appears on the display P.
3. Select the operating mode using the knob O, keeping in mind that the numbers that appear on the display N have the following meaning:
   
   1 = Unit off,
   2 = Continuous operation,
   3 = Automatic operation.

To exit selection, briefly press the key Q.

Note: "Automatic mode" means that the cooling unit starts approximately 2 minutes after the torch button is pressed and stops running approximately 2 minutes after the torch button is released.

Warning! If MMA electrode welding is selected, cooling is not on and may not be selected. It is normal for the machine display P to display, on start-up, the flashing abbreviation H2O.

Turn on the machine.

Do not touch live parts and output terminals while the machine is powered.

The first time the machine is turned on, select the mode using the push-button A and the welding parameters by means of the key R and the knob O as described in paragraph 3.2.

The flow of inert gas must be set to a value (in liters per minute) approximately 6 times the diameter of the electrode.

If you are using gas-lens type accessories, the gas throughput may be reduced to approximately 3 times the diameter of the electrode. The diameter of the ceramic nozzle must be 4 to 6 times the diameter of the electrode.

The most commonly used gas is normally ARGON, because it is less costly than other inert gases, but you may also use blends of ARGON with a maximum of 2% HYDROGEN for welding stainless steel, and HELIUM or ARGON-HELUM blends for welding copper. These blends increase the heat of the arc while welding, but are much more expensive.

If you are using HELIUM gas, increase the liters per minute to 10 times the diameter of the electrode (Ex. diameter 1.6 x10= 16 lt./min of Helium).

Use D.I.N. 10 protective glasses for up to 75A, and D.I.N. 11 from 75A up.

3.6 SAVING

You may save parameters only after welding. Pressing the push-button Q briefly makes a selection; held down for more than 3 seconds, it saves the data. Each time it is turned on, the machine always shows the last welding condition used.

3.6.1 Saving data from the PL program

Using the machine for the first time

When the machine is turned on, the display shows the symbol PL; this disappears after 5 seconds, and a working current is displayed. Follow the instructions in paragraphs 3.2 and 3.5, then proceed as follows to save the data in the program P01:

- Briefly press the push-button Q (mem+mem-) the message P01 will appear flashing.
- Press push-button Q for more than 3 seconds, until the symbol P01 stops flashing: at this point, the data have been saved.

Obviously, if you wish to save in a program other than P01, you should briefly press the push-button Q as many times as necessary to display the desired program. P01 will be displayed the next time the machine is turned on.

Pressing the Q push-button briefly makes a selection, while holding it down for more than 3 seconds saves the data.
3.6.2. Save from a free program
The operator may edit and save a selected program by proceeding as follows:
- Press the push-button Q briefly and select the desired program number.
- The symbol of free programs is flashing.
- Press the button AL and choose the welding procedure, press the torch trigger A to select the mode (paragraph 3.1).
- Turn the knob O and set the welding current.
- If the TIG procedure has been selected, activate the LED V (post gas) by means of the push-button R, and set the desired value via the knob O (paragraph 3.1.)
- If you wish to adjust the "slope" times or other parameters, after making these adjustments which are necessary in order to weld, follow the steps described in paragraph 3.1.
- Weld, even briefly, and decide where to save
  - To save in the previously selected program, press the button Q for more than 3 seconds, until the number stops flashing.
  - To save in a different program, make your selection by briefly pressing the push-button Q, then hold down the push-button Q for more than 3 seconds.

3.6.3 Save from a saved program
Beginning with a previously saved program, the operator may edit the data in memory to update the program itself, or to find new parameters to save in another program.

3.6.3.1 Update
- After turning on the machine, select the parameters to be edited and edit them.
- Weld, even briefly.
- Hold down the Q button for more than 3 seconds, until the save is confirmed (program symbol changes from flashing to steady).

3.6.3.2 Save in a new program
- After turning on the machine, select the parameters to be edited and edit them.
- Weld, even briefly.
- Briefly press the selector Q until the desired program is displayed.
- Hold down the Q button until the save is confirmed (program symbol changes from flashing to steady).

4 REMOTE CONTROLS
The following remote controls may be connected to adjust the welding current for this welding machine:
Art. 1270 TIG torch button only (air-cooling)
Art. 1273 TIG torch button only (water-cooling)
Art. 1266 TIG torch UP/DOWN (air-cooling)
Art. 1274 TIG torch UP/DOWN (water-cooling)
ART. 193 may be used in any TIG welding mode with this accessory.
Remote controls that include a potentiometer regulate the welding current from the minimum to the maximum current set via the knob O.
Remote controls with UP/DOWN logic regulate the welding current from the minimum to the maximum.
The remote control settings are always active in the PL program, while they are not active in a saved program.