ENGLISH

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**EQUIPMENT FOR RESISTANCE WELDING FOR INDUSTRIAL AND PROFESSIONAL USE.**
**Note: In the following text the term "spot welder" will be used.**

**1. GENERAL SAFETY RULES FOR RESISTANCE WELDING.**
**The operator must receive full instructions regarding safe use of the spot welder and must be informed of the risks related to resistance welding procedures, as well as the related safety measures and emergency procedures.**

- **Electrical installation must comply with health and safety legislations and standards.**
- **The spot welder must be connected only and exclusively to a power supply with the neutral conductor connected to earth.**
- **The power supply outlet must be correctly connected to the earth conductor.**
- **Do not use cables with worn insulation or loose connections.**
- **Use the spot welder in an ambient air temperature ranging from 5°C to 40°C, with relative humidity equal to 50% up to a temperature of 40°C, and 90% for temperatures up to 20°C.**
- **Do not use the spot welder in damp or wet conditions or under the rain.**
- **The connection of the welding cables and any routine maintenance operations on the arms and/or electrodes must be carried out with the spot welder switched off and disconnected from the electric and pneumatic (if present) power supply networks.**
  **The same procedure must be respected when connecting to the hydraulic network or a closed circuit cooling unit (water cooled spot welders) and whenever repairs (extraordinary maintenance) are carried out.**

- **It is forbidden to use the equipment in environments comprising areas classed as being at risk of explosion because of the presence of gas, dust or mist.**
- **Do not weld containers, receptacles or piping that contain or have contained flammable liquids or gases.**
- **Do not work on materials cleaned with chlorinated solvents or in the vicinity of such substances.**
- **Do not weld containers under pressure.**
- **Remove all flammable substances (e.g. wood, paper, rags etc.) from the working area.**
- **Allow newly-welded pieces to cool! Do not leave the piece near flammable substances.**
- **Make sure there is an adequate air exchange or means suitable for removing the welding smoke near the electrodes; a systematic approach for evaluating the welding smoke exposure limits according to composition, concentration and exposure duration is necessary.**

- **Always wear suitable protection glasses.**
- **Wear protection gloves and clothing that is suitable for working with resistance welding machines.**
- **Noise level: If particularly intensive welding operations lead to a daily personal noise exposure (LEP,d) of 85dB(A) or more, the use of suitable personal protection equipment is obligatory.**


- **The passage of the spot welding current generates electromagnetic fields (EMF) around the spot welding circuit.**

**The electromagnetic fields can interfere with some medical equipment (e.g. Pace-makers, respirators, metal prostheses, etc.).**
**Suitable measures must be taken to protect those who use this equipment. As an example, prohibit access to the spot welder use area.**
**This spot welder complies with the requirements of the technical standard for products to be used only and exclusively in industrial environments and for professional purposes. Correspondence with the basic limits regarding human exposure to electromagnetic fields in a domestic environment is not guaranteed.**

**The operator must follow the procedures given below in order to reduce exposure to electromagnetic fields:**
- **Fix the two spotting cables (if present) as near to each other as possible.**
- **Operators must keep their heads and trunks as far away as possible from the spotting circuit.**
- **Operators must never wind the spotting cables (if present) around their body.**
- **Operators must not spot weld with their body in the middle of the spotting circuit. Operators must keep both cables on the same side of their body.**
- **Connect the spot welding current return cable (if present) to the piece to be welded, as close as possible to the join being made.**
- **Never spot weld near, sitting on, or leaning against the spot welder (minimum distance: 50cm).**
- **Do not leave ferromagnetic objects near the spot welding circuit.**
- **Minimum distance:**
  - **d= 3cm, f= 50cm (Fig. G);**
  - **d= 3cm, f= 50cm (Fig. H);**
  - **d= 30cm (Fig. I);**
  - **d= 20cm (Fig. L) Studder.**

- **Class A equipment:**

**This spot welder complies with the requirements of the technical standard for products to be used only and exclusively in industrial environments and for professional purposes.**
**Correspondence with the electromagnetic compatibility in domestic buildings and in those directly connected to a low voltage power supply network that supplies buildings for domestic use is not guaranteed.**

**INTENDED USE**
**The system must be used for spot welding one or more steel plates with a low carbon content, having a shape and size that varies according to the work to be carried out.**

**RESIDUAL RISKS**
**RISK OF CRUSHING THE UPPER LIMBS**
**DO NOT PLACE HANDS NEAR MOVING PARTS!**
**The spot welder operation mode and the variability of shape and size of the piece to be worked do not allow the realization of an integrated protection against the danger of crushing of the upper limbs (fingers, hands, forearms).**
**The risk must be reduced using suitable preventive measures:**
- **The operator must be an expert on or trained in resistance welding procedures using this type of equipment.**
- **A risk evaluation must be performed for each type of work to be carried out; it is necessary to use equipment and masks that support and guide the piece to be worked in order to distance hands from the electrode danger area.**
- **When using a portable spot welder: solidly grasp the clamp with both hands placed on the relative handles; always keep hands away from the electrodes.**
- **Whenever the shape of the piece allows it, adjust the electrode distance so that the stroke does not exceed 6 mm.**
- **Do not allow two or more people to work simultaneously with the same spot welder.**
- **People unconnected with the job must not be allowed in the working area.**
- **Do not leave the spot welder unattended: in this case it must be disconnected from the mains; with spot welders with pneumatic cylinder operation move the main switch to "O" and lock it with the supplied lock; the key must be removed and kept by the person in charge.**
- **Only use electrodes that are recommended for the machine (see spare parts list) without altering their shape.**

- **RISK OF BURNING**
  **Some of the spot welder parts (electrodes - arms and adjacent areas) can reach temperatures of above 65°C: suitable protective clothing must be worn.**
  **Allow newly-welded pieces to cool before touching them!**

- **RISK OF TOPPLING AND FALLS**
  - **Place the spot welder on a horizontal surface that can suitably support the mass; constrain the spot welder to the supporting surface (when indicated in the "INSTALLATION" section of this manual). In contrary cases, where the flooring is sloped or broken, or with mobile supporting surfaces, the danger of toppling exists.**
  - **It is forbidden to lift the spot welder, excluding where expressly indicated in the "INSTALLATION" section of this manual.**
  - **When using machines on wheels: disconnect the spot welder from the electric and pneumatic (if present) power supplies before moving the unit to another work area. Pay attention to obstacles and unevenness on the ground (for example cables and piping).**

- **UNINTENDED USE**
  **It is dangerous to use the spot welder for any purpose other than that for which it is intended (see INTENDED USE).**

**SAFEGUARDS AND SHIELDS**

**The safeguards and mobile parts of the spot welder casing must be in position, before connecting it to the power supply.**
**WARNING! Any manual intervention on the accessible mobile parts of the spot welder, for example:**
- **Replacement of or maintenance on the electrodes**
- **Adjustment of the arm or electrode positions**

**MUST BE CARRIED OUT WITH THE SPOT WELDER SWITCHED OFF AND DISCONNECTED FROM THE ELECTRIC AND PNEUMATIC (if present) POWER SUPPLY.**
**MAIN SWITCH LOCKED AT "O" WITH LOCK CLOSED AND KEY REMOVED in the models with PNEUMATIC CYLINDER movement).**

**STORAGE**
- **Place the machine and its accessories (with or without packaging) in closed areas.**
- **The relative humidity of the air must not exceed 80%.**
- **The environmental temperature must be between -15°C and 45°C.**

**If the machine has a water cooling unit and the environmental temperature is lower than 0°C: add the indicated antifreeze liquid or completely empty the hydraulic circuit and the water tank.**
**Always use suitable measures for protecting the machine from humidity, dirt and corrosion.**

## 2. INTRODUCTION AND GENERAL DESCRIPTION

### 2.1 INTRODUCTION

Portable spot-welder for resistance welding.
The series consists of 3 models:
- **5.8kA:**
  Portable spot-welder with electronic timer. Used for precision spot-welding with electronic control of spot-welding time, and electrode force adjustment. Spot welding capacity on low carbon steel sheet (standard arms) up to 1+1 mm thick.
- **6.9kA (230V):**
  Portable spot-welder with digital microprocessor control.
  The most important properties managed by the control panel are:
  - Selection of the thickness of the sheet to be spot-welded.
  - Correction of spot-welding time.
  - Possibility of enabling pulsed welding current.
  - Adjustment of spot-welding force.
  - Spot welding capacity on low carbon steel sheet (standard arms) up to 2+2 mm thick.
- **6.9kA (400V):**
  Portable spot-welder with digital microprocessor control.
  The same features as the 6.9kA (230V) model, but operating with a power supply voltage of 400V(380V-415V).

### 2.2 STANDARD ACCESSORIES:

The standard spot-welder includes 120 mm arms and standard electrodes.

### 2.3 OPTIONAL ACCESSORIES

- Electrode arm pairs of different lengths and/or shapes, also in kits of several pairs.
- Trolley for arms: to carry the spot-welder and accessories.

## 3. TECHNICAL DATA

### 3.1 RATING PLATE (FIG. A)

The main data relating to use and performance of the spot-welder are summarised on the rating plate and have the following meanings:
1- Number of phases and frequency of power supply.
2- Power supply voltage.
3- Rated mains power with 50% duty cycle.
4- Mains power with permanent running (100%).
5- Maximum loadless voltage over electrodes.
6- Maximum current when electrodes are shorted.
7- Maximum electrode force:
8- Current to secondary when running permanently (100%).

Note: The rating plate shown is an example to show the meaning of the symbols and numbers; the exact values of the technical specifications for your spot-welder can be found on the rating plate of the spot-welder itself.

### 3.2 OTHER TECHNICAL DATA

**General specifications TAB. 1.**
**Weight of the spot-welder TAB. 7.**

## 4. DESCRIPTION OF THE SPOT-WELDER

### 4.1 PRINCIPAL COMPONENTS AND ADJUSTMENTS (FIG.B)

1- Electrode force adjustment screw.
2- Left/right hand positionable handgrip.
3- Hole for eyebolt if used.
4- Movable welding arm.
5- Fixed welding arm.
6- Power supply cable.
7- Rating plate.
8- Microswitch.
9- Spot-welding time adjustment (only on 5.8kA models (**FIG. B1**)) ; for 6.9kA models see 4.2: **CONTROL PANEL.**
10- Spot-welding lever.

### 4.2 CONTROL PANEL (only for 6.9kA models) (FIG. C)

**1- Key for correcting spot-welding time.**
adjusts spot-welding time with respect to the factory default setting.

**2- Key for selecting sheet thickness.**
selects the thickness of the sheet to be welded.

**3- Key for selecting spot-welding mode.**

: The welding current is pulsed.
Making this selection will improve spot-welding capacity on high yield point sheets or on sheets with special protective film. The length of the pulse is automatic and requires no regulation.

: Normal spot welding.

**4- LED's for indicating triggering of thermal safeguard.**
The two LED's flash alternately, the remaining LED's are off, indicating that the spot-welder is shut down due to overheating; reset is automatic when the temperature returns within the allowed limits.

## 5. INSTALLATION

**WARNING! CARRY OUT ALL INSTALLATION OPERATIONS AND ELECTRICAL AND PNEUMATIC CONNECTIONS WITH THE SPOT-WELDER COMPLETELY SWITCHED OFF AND DISCONNECTED FROM THE POWER SUPPLY OUTLET. THE ELECTRICAL AND PNEUMATIC CONNECTIONS MUST BE MADE ONLY AND EXCLUSIVELY BY AUTHORISED, SKILLED PERSONNEL.**

### 5.1 PRELIMINARY OPERATIONS

Unpack the spot-welder, assemble the separate parts included in the package.

### 5.2 LIFTING THE SPOT-WELDER

WARNING: None of the spot-welders described in this handbook have lifting devices; when required attach an eyebolt to suspend the spot-welder using the hole made for this purpose **(FIG. F (2)), take care to insert the threaded bolt to a depth of no more than 8mm**.

### 5.3 POSITION

The installation area must be sufficiently large and without obstacles, suitable for ensuring safe access to the control panel and to the work area (electrodes).
Ensure that there are no obstacles near the cooling air inlets and outlets and that no conductive dusts, corrosive vapour, humidity, etc. can be sucked in.
Position the spot welder on a flat surface of homogeneous and compact material that is suitable for supporting its weight (see "technical data") to avoid the danger of toppling or dangerous movements.

### 5.4 CONNECTION TO THE MAIN POWER SUPPLY

#### 5.4.1 Warnings

- Before making any electrical connection, check the rating plate data on the spot welder to make sure they correspond to the voltage and frequency of the available power supply where the machine is to be installed.
- The spot welder must be connected only and exclusively to a power supply with the neutral conductor connected to earth.
- To guarantee protection against any direct contact always use the differential switches indicated below:
  - Type A ( ) for single-phase machines;
  - Type B ( ) for three-phase machines;
- In order to satisfy the requirements of the EN 61000-3-11 (Flicker) standard we recommend connecting the spot welder to interface points of the main power supply that have an impedance of less than Zmax = 0.179 ohm.
- The spot welder does not fall within the requisites of IEC/EN 61000-3-12 standard. Should it be connected to a public mains system, it is the installer's responsibility to verify that the spot welding machine itself is suitable for connecting to it (if necessary, consult the distribution network company).

#### 5.4.2 Plug and socket

Connect a normalized plug to the power cable (3P+T: only 2 poles are used for the 400V INTERPHASE SYSTEM connection; 2P+T: 230V INTERPHASE connection) of appropriate capacity and prepare a power supply outlet 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.
**The power supply connection and the number of poles on the plug, which depend on the distribution system and the power supply voltage of your spot-welder, should correspond with the indications given in the tables (TAB. 2; 3; 4; 5).**
The capacity of the plug and specifications of the fuses and circuit-breaker are given in the tables TAB. 1 and TAB. 7.
Should more than one spot-welder be installed, distribute the power cyclically among the three phases in order to obtain amore balanced load; e.g.

**230V spot-welders:**
Spot-welder 1: power supply L1-N.
Spot-welder 2: power supply L2-N.
Spot-welder 3: power supply L3-N.
etc.

**400V spot-welders:**
Spot-welder 1: power supply L1-L2.
Spot-welder 2: power supply L2-L3.
Spot-welder 3: power supply L3-L1.
etc.

**WARNING! Failure to observe the rules given above will invalidate the (class I) safety system provided by the manufacturer causing serious risks to people (e.g. electric shock) and objects (e.g. fire).**

## 6. (SPOT) WELDING

### 6.1 PRELIMINARY OPERATIONS

Before carrying out any spot-welding operation, it is necessary to carry out a series of checks and tests with the spot-welder disconnected from the main power supply.
1- Ensure that the electrical connections are correct, in accordance with the above instructions.
2- Electrode force and alignment
   - lock the lower electrode securely in the most suitable position for the job to be done,
   - loosen the fastening screw on the top electrode so that it is able to slide in the hole in the arm,
   - between the electrodes place a shim with the same thickness as the sheets to be spot-welded,
   - **FIG. D** close lever 2 until the arms are parallel and the electrode tips coincide; insert screw 3 (d.M6) which is supplied into hole 1 and tighten it to lock the lever in a suitable position for adjusting the electrode force,
   - lock the top electrode in the correct position, tightening the screw securely,
   - regulate the force exerted by the electrodes during spot-welding FIG.E, by adjusting the screw (1) fitted for this purpose using the key supplied; the value of the setting, according to the position of the indicator on the graduated scale, is shown in **FIG. F**. **TAB. 6** shows the value of the force that can be obtained with different arm lengths.
     Turn it clockwise to increase the force in proportion to the increase in sheet thickness but make the adjustment so that the clamp is able to close, and trigger the corresponding microswitch, with very little effort.

**6.2 ADJUSTING THE PARAMETERS**

**6.2.1 6.9kA Models**

- Select the thickness of the sheet to be spot-welded using the key (2 - FIG. C) on the spot-welder control panel.
- Select the type of spot-welding (continuous or pulsed) using the key (3 - FIG. C). When necessary it is possible to correct the default spot-welding time upwards or downwards using key (1- FIG: C).

**6.2.2 Model 5.8kA**

Regulate the spot-welding time using the potentiometer (9 - FIG.B1) on the back of the spot-welder; using the lowest possible values compatible with correct execution of the spot-weld (see 6.3 PROCEDURE).

**6.3 PROCEDURE**

To make a spot-weld, power the spot-welder then follow the instructions below:

- place the bottom electrode on the sheet to be spot-welded;
- pull the clamp lever to the end of its stroke, and hence until the microswitch is pressed (8 - FIG.B) so that:
  a) the sheets close between the electrodes with the preset force;
  b) the welding current passes for the preset time.
- release the clamp lever shortly afterwards. This delay (holding) improves the mechanical properties of the spot-weld.

When specific experience is lacking we recommend carrying out a number of test welds using sheet of the same thickness and quality as that of the workpiece.
The spot-welding operation is deemed correct when a tensile test causes the spot-welding core to come out of one of the two sheets.

**WARNING! The spot welder is equipped with a protective conductor that connects the welding circuit directly to earth.**
**Weld only if the plates to be joined are insulated against earth!**
**If they are not, immediately interrupt welding and get a technician who is expert or qualified on this subject to check the system and spot welder protective conductor.**

**7. MAINTENANCE**

**WARNING! BEFORE CARRYING OUT MAINTENANCE, MAKE SURE THE SPOT WELDER IS OFF AND DISCONNECTED FROM THE MAINS AND THE PNEUMATIC SUPPLY SOURCE (if present).**
**With versions operated with pneumatic cylinder, the main switch must be locked at "O" using the supplied lock.**

**7.1 ROUTINE MAINTENANCE**

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

- electrode tip diameter and profile adaptation/restoration;
- electrode alignment check;
- spring load check (electrode strength);
- spot welder and clamp power cable integrity check
- electrode and arm replacement;

**7.2 SPECIAL MAINTENANCE**

**SPECIAL MAINTENANCE MUST ONLY BE CARRIED OUT BY TECHNICIANS WHO ARE EXPERT OR QUALIFIED IN AN ELECTRIC-MECHANICAL FIELD.**

**WARNING! BEFORE REMOVING THE SPOT WELDER PANELS AND LOOKING INSIDE IT, MAKE SURE THE SPOT WELDER IS OFF AND DISCONNECTED FROM THE ELECTRIC AND PNEUMATIC (if present) POWER SUPPLIES.**
**If checks are carried out while the inside of the spot welder is live this could cause serious electric shock due to direct contact with live parts and/or injury due to direct contact with moving parts.**
Periodically and as frequently as required by the use and environmental conditions, inspect inside the spot welder and remove the dust and metal particles that have deposited on the transformer, thyristor module, diode module, power terminal board, etc. using a blast of dry compressed air (max. 5 bar).
**Do not direct the jet of compressed air onto the electronic circuit board;** if necessary clean them with a very soft brush or suitable solvents.
At the same time:

- make sure the wiring does not show signs of insulation damage or loose - oxidised connections.
- lubricate the joints and the pins.
- make sure the screws that connect the transformer secondary with the cast arm-holders are tight and that there are no signs of oxidation or overheating; do the same for the arm locking and electrode-holder screws.
- make sure the screws that connect the transformer secondary with the output bars / wires are tight and that there are no signs of oxidation or overheating.
- check machine earthing circuit continuity with the welding circuit (electrodes).
- make sure the transformer secondary screws (if present) are tight and that there are no signs of oxidation or overheating.
- 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 primary high voltage connections separate from the secondary low voltage ones.
  Use all the original washers and screws when re-closing the structural work.

**7.3 TROUBLESHOOTING**

**SHOULD MACHINE OPERATION NOT BE SATISFACTORY, AND BEFORE CARRYING OUT MORE SYSTEMATIC CHECKS OR CONTACTING YOUR TECHNICAL ASSISTANCE CENTRE, MAKE SURE THAT:**

- When the welding lever is activated the microswitch is effectively pressed, giving the control board permission to weld.
- The heat protections have not cut in.
- The elements that are part of the secondary circuit (cast arm-holders – arms – electrode holders – cables) are not inefficient because of loose screws or oxidation.
- The welding parameters (electrode strength and diameter, welding time) are suitable for the work being carried out.