

INTRODUCTION

Electrical arc welding is the procedure used to join two metal parts, taking advantage of the heat developed by the electric arc that forms between an electrode (metal filler) and the material to be welded. The welding arc may be powered by an alternating current generator machine (welder). This welding machine is basically a single-phase static transformer suitable for melting RUTILE (sliding) acid electrodes. Alkaline electrodes may also be melted by alternating current if the secondary open-circuit voltage is greater than 70 V.

The welding current is continuously regulated (magnetic dispersion) by turning the handwheel on the outside of the machine, which makes it possible to select the current value, indicated on a special graded scale, with the utmost precision. To prevent the service capacities from being exceeded, all of our machines are fitted with an automatic overload protection which cuts off the power supply (intermittent use) in the event of an overload. The operator must then wait for a few minutes before returning to work.

This welding machine must be used only for the purpose described in this manual.

Read the entire contents of this manual before installing, using or servicing the equipment, paying special attention to the chapter on safety precautions. Contact your distributor if you do not fully understand these instructions

EXPLANATION OF TECHNICAL SPECIFICATIONS

1~⊙~Single-phase transformer

∇ Downslope

 Suitable for covered electrode welding

Ø Usable electrode diameter

I_2 Welding current

U_0 Open-circuit voltage

1~ Single-phase power supply

U_1 Supply voltage

I_1 Current absorbed at the corresponding welding current I_2

IP21 Protection level of the housing.
Grade 1 as the second digit means that this equipment is not suitable for use outdoors in the rain.

PLACEMENT AND INSTALLATION

Dust, dirt or any other foreign matter that may enter the welder can jeopardize ventilation and thus correct operation.

All connections must be made in compliance with the following standards, and in full respect of current safety regulations (see standards CEI 26-10 CENELEC HD 427).

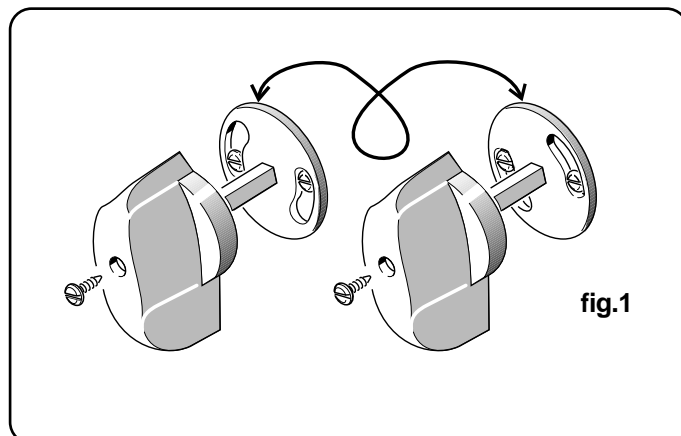
Make sure that the voltage and frequency of the power supply system correspond to the values given on the technical specifications plate.

The brown and blue wires of the power cable must be connected to the mains voltage, while the third yellow-green wire must be connected to an efficient earth socket.

If the welder is set up for two supply voltages:

- Set the selector switch knob to the position "0" (machine off).
- Remove the knob by unscrewing the holding screw.

- Position the voltage change disk so that the selector switch may be set only to the desired voltage shown on the panel (fig. 1).



- Replace the knob and tighten the screw.

PREPARING THE WELDING MASK

Prepare the mask (with CE approval marking) using colored glass (adiactive) and clear protective glass as shown in fig. 2:

- mount the protective glass (with CE marking) in the case provided, in the following order:

1 - the transparent glass **A** on the outside.

2 - the colored glass (non-actinic) **B**, which must have a level of protection of:

DIN 10 if used with welding currents of up to 80 A,

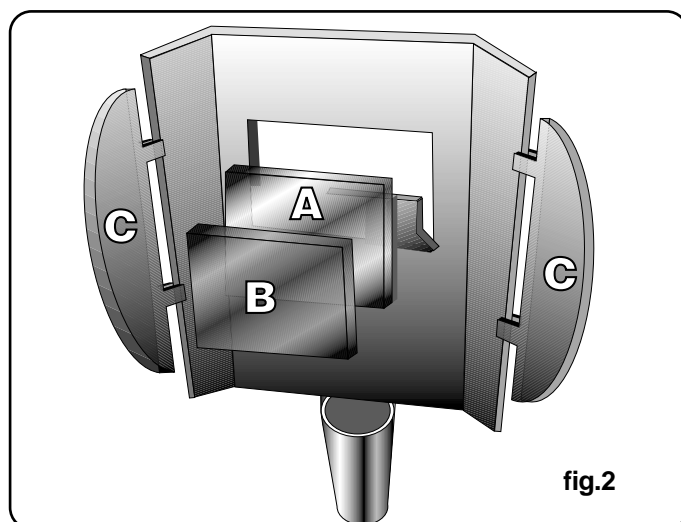
DIN 11 if used with welding currents of up to 175 A,

DIN 12 if used with welding currents of up to 300 A,

- tighten the screw;

- install the mask handle.

Some masks have supplementary appendices **C** to increase



the protection surface.

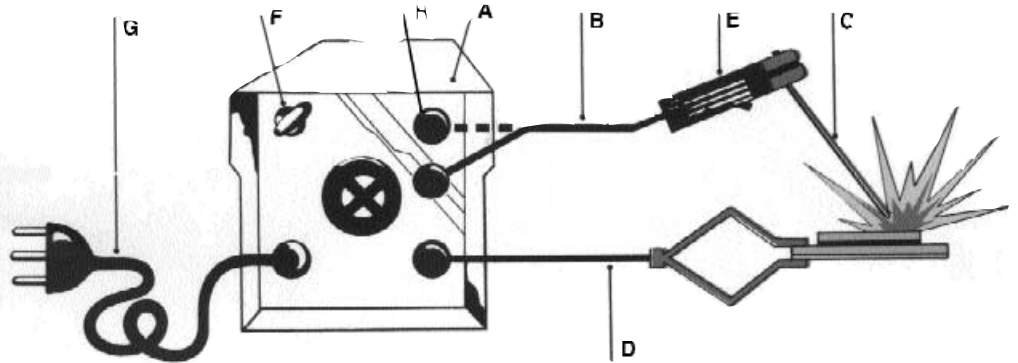
CONNECTING THE WELDING CIRCUIT (fig. 3)

Before using this welding machine, read the standards CEI 26/9 or CENELEC HD 407 and CE 26/11, or CENELEC HD 433 carefully; also make sure the cable insulation is intact.

The earth cable **D** and the electrode clip cable **B** are con-

fig.3

- A Welder
- B Electrode holder cable
- C Electrode
- D Earth cable
- E Electrode holder
- F Switch
- G Power cable
- H Clamp



nected to the welder by means of special clamps (tighten

firmly to prevent overheating), unless the welder is the type with pre-connected cables. To use alkaline electrodes for alternating current, use the clamp **H**.

The earth cable clamp is connected to the workpiece or support surface in such a way as to provide the best possible contact. It should therefore be free of rust, grease, paint, etc. The welding circuit must not be deliberately placed in direct or indirect contact with the protection wire except in the workpiece.

If the workpiece is deliberately grounded by means of the protection 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 should also be connected to the workpiece at the same point as the return wire, using a second earth clamp placed next to it. Install the electrode **C** in the housing of the electrode holder **E**, making sure it is tight enough.

Turn the setting handwheel and set the gauge to the position corresponding to the diameter of the electrode chosen for the type of welding to be performed (see table), and start the wel-

GUIDE TABLE FOR SELECTING THE ELECTRODE DIAMETER BASED ON THE THICKNESS TO BE WELDED FOR FLAT WELDING IN A SINGLE MOTION

THICKNESS in mm	ELECTRODE DIAM. in mm
< 2	1.5
2	2
3	2.5
4	2.5÷3.25
5	3.25÷4

der by turning on the switch.

The mask should be used for all welding operations as a shield against the electric arc, which may cause eye inflammations that appear as an annoying sensation of having "sand" in the eye. Therefore, do not attempt to start the arc without a shield to try to see the operations better (fig. 4). You should also use a pair of gloves and leather apron to prevent drops of molten metal from causing burns.

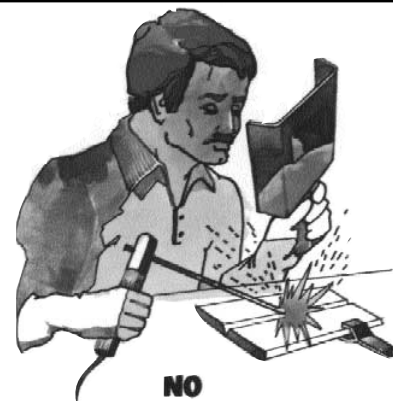
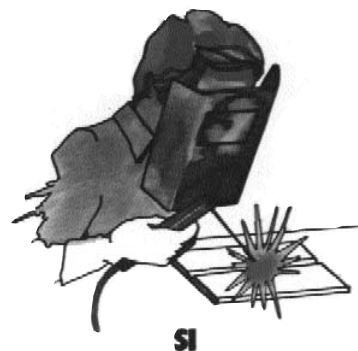


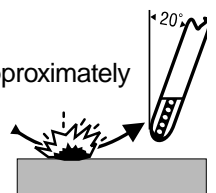
fig.4



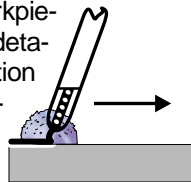
After welding, remove the slag deposited by the electrode coating. This may be done using a small hammer, with the work cool if possible and very carefully, especially if the operation must be repeated several times. This makes it possible to achieve a weld without sticking or inclusions. N.B. Use safety goggles during above operation.

BEGINNERS' GUIDE TO WELDING.

Start the arc by moving the electrode to approximately 10 mm away from the point to be welded, at an approximate angle of 70-80° in relation to the work surface. Take care not to accidentally touch the workpiece (to avoid arc rushes). Place the mask in front of your eyes, strike the electrode lightly against the workpiece, and move the electrode slightly away as soon as the arc forms. You may then begin welding, moving from left to right. It may occur that the electrode is not moved away quickly

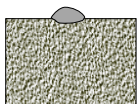


enough, and thus remains stuck to the workpiece; in this case, pull it sharply to the side to detach it. On the other hand, excessive separation may cause the arc to go out. For easy starting, the electrode is often pulled across the workpiece (not too quickly).



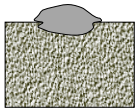
At this point, it is a good idea to carry out a few welding beads to gain experience and skill. We shall therefore attempt to analyze and correct any defects.

Appearance according to arc length.



Arc too short.

This irregularity causes irregular masses of weld metal, which are likely to include slag.

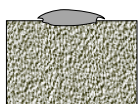


Arc too long.

This causes poor penetration, sticking, blowing and considerable spraying. The weld is also likely to be defective.

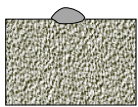
The optimal length corresponds approximately to the electrode diameter.

Appearance according to welding speed.



Too slow.

This causes a wide, thick and shorter than normal deposit. It wastes electrodes and time.

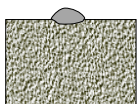


Too fast.

This causes poor penetration into the base material, a narrow, high bead, and makes it difficult to remove slag.

Appearance according to current intensity.

(40A x 1mm. thickness. Example: 2.5mm = 40x2.5 = 100A)



Current too low.

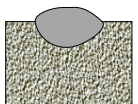
This causes poor penetration, sticking, a very irregular bead (narrow and tall), and slag is quite difficult to remove.



Current too high.

This creates a very wide bead which penetrates too far into the base material, sprays a great deal of molten metal and forms a deep crater. It may also cause tiny cracks in the material.

Top-quality welding.



With the correct arc length, welding speed, current setting and electrode angle, the bead is smooth with a fine grain; the weld is not porous and does not contain slag.

TYPES OF JOINTS AND WELDING POSITIONS

There are two basic types of joints in welding: butt joints and corner joints (outer corner, inner corner and overlapping).

Butt joints (fig. 5).

In butt joints up to 2 mm thick, the edges to be welded must

DISTANCE (D) IN mm BETWEEN EDGES TO BE JOINED

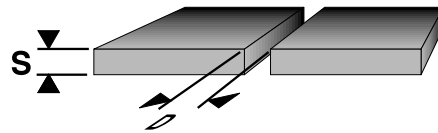


fig. 5

S mm	2 ÷ 3	3 ÷ 4	4 ÷ 5
horizontal	1 ÷ 1.5	1.5 ÷ 2.5	2 ÷ 3
vertical	1 ÷ 1.5	1.5 ÷ 2	2 ÷ 2.5
frontal	1 ÷ 1.5	1.5 ÷ 2.5	2 ÷ 3

be placed directly next to one another. For larger thicknesses, follow fig. 5.

Corner (fig. 6) and L - joints (fig. 7)

This is a very convenient joints to prepare, but only for thicknesses-

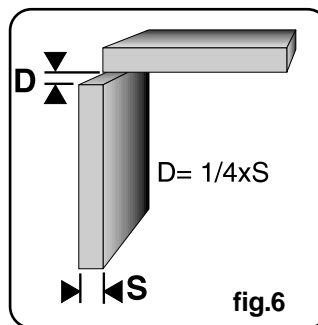


fig.6

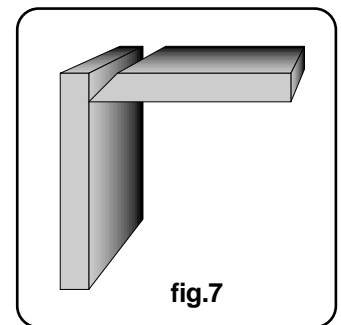


fig.7

ses of up to 10 mm. For larger thicknesses, it is best to use a joints as shown in fig. 7.

Inner corner joints (fig. 8)

This joints is very easy to prepare, and is carried out for thicknesses of up to 5 mm. The two pieces must be in touch.

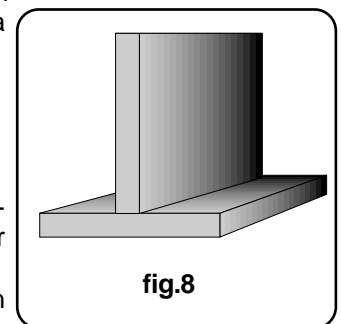


fig.8

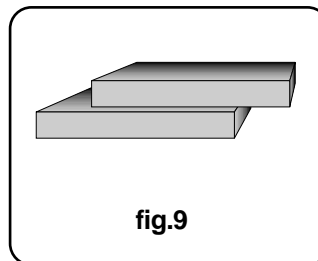


fig.9

Overlapping junctions (fig. 9)

The most common preparation is with straight edges, and the weld becomes a normal corner bead. The two workpieces must

be as close together as possible.

WELDING TECHNIQUES

Once the joints to be welded have been prepared, we must choose the most appropriate technique.

When it is possible to place the workpiece in a flat, horizontal position, the welding quality is better. In some cases this is not possible, and the workpiece must be arranged horizontally on a vertical plain, or even upside-down.

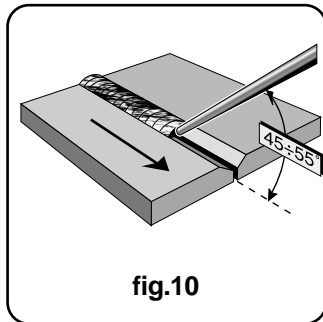


fig.10

Flat end welding (fig. 10)

The operator must attempt to weld without excessive or insufficient penetration. The following factors affect the welding execution: the current, the distance between the edges, the angle and diameter of the

electrode.

Keep the electrode at a 45/55° angle in relation to the horizontal surface, and vertically aligned with the welding axis.

An increased electrode angle increases penetration, and vice-versa. To prevent or reduce the effects of deformities that occur when the material solidifies, where possible the workpieces should be arranged appropriately, in the opposite direction to that in which the material shrinks (fig. 11).

Avoid stiffening the welded structure, to prevent the weld from breaking. This may be done by welding in two opposite motions. In this case the electrode should be kept at a

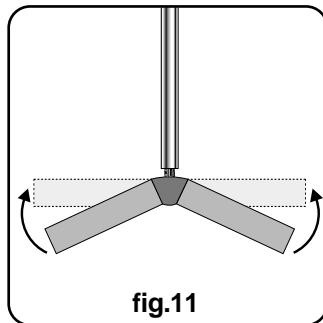


fig.11

50-70° vertical angle from the joints axis, moving smoothly with a slight horizontal oscillation.

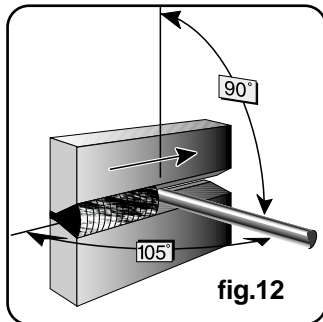


fig.12

Front end welding (fig. 12)

Up to 4 mm, the edges must not be bevelled, and the weld must be carried out with the electrode angled as shown in figure 12. The current should

be adjusted as for flat welding.

Vertical end welding (fig. 13)

For thicknesses of up to 4 mm, the junction need not be bevelled. The welding technique may be downward, used for small thicknesses, or upward for general use.

Keep the electrode on a plane perpendicular to the joints axis and at an angle of approximately 90°-120°, and move it in a U-shape with an emphasis at the end. If the bath is too hot, move upwards a few times. The welding current must generally be set approxima-

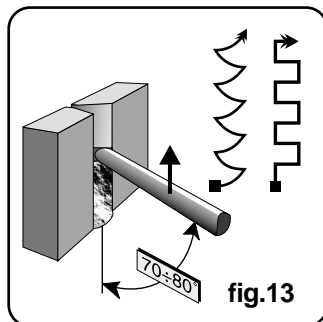


fig.13

tely ~10÷15% lower than for flat welding. For good penetration and correct welding, the weld must be repeated on the back.

Upside-down end welding (fig. 14)

It is essential that the current be adjusted so as to avoid a bath that is too liquid, but must still ensure good penetration. The arc must be very short, and perform a few forward strokes if necessary to give the bath time to solidify.

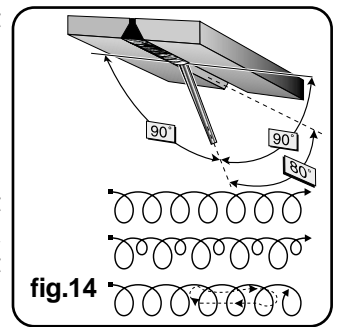


fig.14

CORNER WELDING

Flat welding (figs. 15-16)

When the workpiece may be handled, it should be arranged as shown in figure 15.

If the workpiece cannot be rotated, eliminate the horizontal

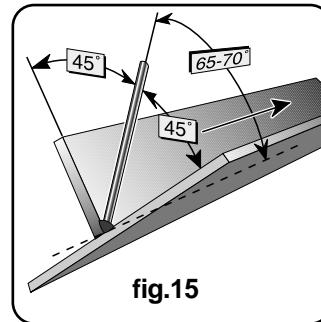


fig.15

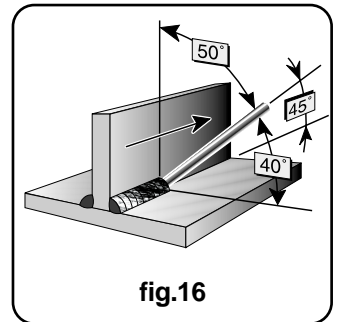


fig.16

movement while welding, and hold the electrode at a 40÷50° angle in the movement direction and a 40° angle from the horizontal plane (fig. 16).

Vertical joints. (fig. 17)

For angle joints in the vertical position, the rules described for vertical welding of head joints are valid. The welding current must be increased by approximately 10% with respect to the corresponding value of the head joints.

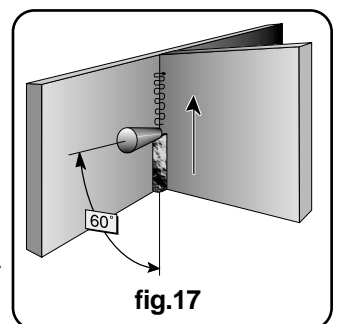


fig.17

GENERAL PRECAUTIONS

Fire



- Avoid causing fires due to sparks, slag, hot metal and spatter which are produced during normal welding operations.

- Make sure that a suitable fire-extinguisher is located near the welding sight.
- Remove all flammable material within 30 feet of the welding area.
- Do not weld containers (tanks or drums) containing flammable material, even when empty. These must be carefully cleaned before being welded.
- Allow the welded metal to cool down before touching it or

putting it into contact with flammable material.

- Do not weld structures with hollow spaces containing flammable substances.
- Do not work in conditions where there are high concentrations of combustible vapours, gases, or flammable dust.
- Always check the work area half an hour after welding so as to make sure that no fire has started.
- Do not keep any flammable material such as lighters or matches in your pockets while using this equipment.
- The welding cables must not be used for current loads which exceed their rated capacity. If the cables draw current in excess of the rated capacity, overheating can occur which will cause the rapid deterioration of the insulation which covers the cables.
- Always weld with adequately insulated.
- The connections between cables must be well tightened and properly insulated.
- Frequently inspect the cables and repair any cuts or tears that might be found.
- Keep all connections well tightened.

Burns

- Protect your entire body by wearing fire-proof clothing. This will protect your skin against burns caused by: ultra-violet radiation given off by the arc, sparks and molten slag.
- The protective clothing should include: gloves, a hat, and high shoes. Your shirt collar and pocket flaps should be buttoned, and cuff-less trousers should be worn to prevent contact with sparks and molten slag.
- Wear a helmet equipped with the appropriate lens shade and a clear glass cover plate. This is imperative when welding, cutting, and chipping to protect your eyes from ultra-violet arc rays and molten spatter. Replace the glass cover plate when cracked or covered with spatter etc.
- Do not wear clothing spotted with oil or grease as a spark may set them on fire.
- Hot metal, electrode stubs and workpieces, should never be handled without gloves.
- First-aid equipment and a qualified first-aid person should always be available when welding, unless medical facilities are in the immediate vicinity, to treat flash burns of the eyes and skin burns.
- Ear plugs should be worn when working in the overhead position or in confined spaces. A hard hat should be worn when others are working overhead.
- Flammable hair sprays and gels should not be used by those persons intending to weld.

Fumes



Welding operations produce harmful fumes and metal dusts which may be hazardous to your health, therefore:

- Work in well-ventilated areas.
- Keep your head out of the fumes.
- In closed areas, use a fume exhaust system, preferably placed under the welding area if possible.
- If ventilation is inadequate, use an approved respirator set.
- Clean the metal to be welded of any solvents or halogen degreasers which give rise to toxic gases. During some welding operations chlorine solvents may be decomposed by arc radiation thus creating phosgene gas.
- Do not weld coated metals or those containing lead,

graphite, cadmium, zinc, chrome, quicksilver, or mercury unless you have an approved respirator set.

• The electric arc creates ozone. Long exposures to high ozone concentrations may cause headaches; nasal, throat and eye irritation; as well as congestion and chest pains. **WARNING: NEVER USE OXYGEN FOR VENTILATION.**

- Gas leaks in confined spaces should be avoided. Leaked gas in large quantities can dangerously alter oxygen levels in the air surrounding the weld sight. Do not place gas cylinders in confined spaces.
- **DO NOT WELD** where solvent vapors can be drawn into the welding shield atmosphere or where arc rays can come into contact with even minute quantities of trichloroethylene or perchloroethylene.

Explosions



- Do not weld above or near containers under pressure.
- Do not weld in environments containing explosive dusts, gases or vapours.

Radiation



Ultra-violet radiation emitted by arc rays may damage your eyes and burn your skin. Therefore:

- Wear proper clothing and helmet.
 - Do not use contact lenses!! The intense heat created by the arc may cause them to stick to the cornea.
 - Use a mask or helmet equipped with lens shades that have a minimum DIN rating of 10
 - Warn people in the area surrounding the welding sight that you are going to be welding.
- Remember: the arc may dazzle or damage the eyes. It is considered dangerous up to a distance of 15 meters (50 feet). Never look at an arc with the naked eye.
- Prepare the welding area so as to reduce the reflection and transmission of ultra-violet radiation: paint walls and exposed surfaces in black to reduce reflection, install shielding systems or curtains to reduce the transmission of ultra-violet rays.
 - Replace protective lenses whenever damaged or broken.

Electric shock



Electric shocks are hazardous and potentially fatal!!!

- Do not touch live electrical parts.
- Insulate yourself from the workpiece and the ground by wearing insulated gloves and clothing.
- Keep garments (gloves, shoes, hats, clothing) and body dry.
- Do not work in humid or wet areas.
- If you are welding near a body of water take precautions to ensure that the machine cannot fall into the water.
- Avoid touching or holding the workpiece by hand.
- Should you work in a dangerous area or close to one, use all possible precautions.
- Stop welding immediately if you should feel even the slightest sensation of electric shock. Do not use the machine until the problem is identified and corrected.
- Often inspect the mains input cable.
- Disconnect the power input cable from the mains supply before replacing cables or before removing the unit covers.
- Do not use the unit without protection covers.
- Always replace any damaged parts with GENUINECEBORA SPARE PARTS.

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- Never disconnect any of the unit's safety devices.
 - Make sure that the mains power supply line is equipped with a good electrical ground.
 - Make sure that the workbench and the workpiece are connected to a good electrical ground.
 - Servicing of the machine must be done by qualified personnel who are aware of the risks involved with the high voltage levels necessary to make the machine operate.

Pacemaker

Magnetic fields created by the high currents in the weld circuit can affect pacemaker operation. Persons wearing electronic life support equipment (pacemakers) should consult their doctor before going near any arc welding, gouging, cutting, or spot welding equipment in operation.

Noise



These power sources alone do not produce noise levels exceeding 80 dB. The cutting procedure, however, may produce noise levels in excess of 80 dB in which case the operator must take the necessary safety precautions as prescribed by the national safety regulations.

MAINTENANCE

Simple and sturdy, your welding unit practically requires no maintenance. You only have to:

- Keep conductive surfaces clean (oxide and dirt may reduce machine output); avoid accumulation of dust and filings inside the machine. Take good care of the cables (they have to be crack-free).
- Avoid introducing metal parts inside the machine for they could cause short circuits.
- Clean the machine from time to time with compressed air, after disconnecting it from the mains.