IMPORTANT!!!
READ THIS MANUAL CAREFULLY BEFORE INSTALLING, USING, OR PERFORMING ANY MAINTENANCE ON THE MACHINE. PAY SPECIAL ATTENTION TO THE CHAPTER ON “SAFETY PRECAUTIONS”. CONTACT YOUR DISTRIBUTOR IF YOU DO NOT FULLY UNDERSTAND THESE INSTRUCTIONS.

1 GENERAL DESCRIPTIONS

1.1 SPECIFICATIONS
This manual has been prepared for the purpose of educating personnel assigned to install, operate and service the welding machine.
This equipment is a constant-voltage generator, suitable for MIG/MAG and OPEN-ARC welding.
Upon receiving the machine, make sure there are no broken or damaged parts.
The purchaser should address any complaints for losses or damage to the vector. Please indicate the article and serial number whenever requesting information about the welding machine.

1.2 EXPLANATION OF TECHNICAL SPECIFICATIONS
EN50199 The welding machine is manufactured according to these international standards.
EN60974.1 Serial number, which must be indicated on any type of request regarding the welding machine.
N° three-phase transformer-rectifier.

Flat characteristic.
Duwnslope
Suitable for continuous electrode welding.
Suitable for TIG welding.
Suitable for MMA welding.

I2 MAX Unconventional welding current. This value represents the maximum limit available during welding.
U0 Secondary open-circuit voltage (peak value).
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 welding current I2.
U1 Rated supply voltage.
3~ 50/60Hz 50- or 60-Hz three-phase power supply.
I1 Absorbed current at the corresponding welding current I2.
IP21 Protection rating for the housing. Grade 1 as the second digit means that this equipment is suitable for use outdoors in the rain.
Suitable for use in high-risk environments.

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

2 INSTALLATION

2.1 PLACEMENT
Dust, dirt, and any other foreign matter entering the welding machine can interfere with ventilation and thus with smooth operation.
Mount the handle, the 2 cylinder supports, the extension support and pivot support.
Mount the 2 fixed wheels on the wheel support located on top of the welder. remove the Styrofoam buffer from under the bottom, at the back of the welding machine. Insert the wheel support on the bottom, fastening it in place with the screws provided.

2.2 START-UP

• Only qualified personnel should install this welding machine.
• Connect a plug suitable for the absorbed current to the power supply cable.
• Connect the yellow-green wire of the machine mains to an efficient grounding socket.
• Never use water pipes as a grounding conductor.

2.2.1 Connecting the mass clip.

• Connect the power cable terminal to socket AA on the machine.
• Connect the mass cable clip to the workpiece.
• Make sure the cable is firmly attached to the mass terminal; check periodically to make sure these connections are tight.
A loose coupling may cause drops in the welding current,
overheating of the cable and mass terminal, leading to a risk of burns caused by accidental contact.

- 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.

2.2.2 Connecting the gas hose.
- Connect the gas hose leaving the rear of the machine, only after positioning the cylinder.

2.2.3 Connecting the generator and wire feeder.
This generator accepts the wire feeder TR4.
To connect the generator and wire feeder, use the extension Art. 1182 (5 meters), 1182.20 (10 meters), or 1182.10 (1.3 meters). Performance and operation options are described in the instructions enclosed with the wire feeder.

3 DESCRIPTION OF CONTROLS

3.1 CONTROLS ON THE FRONT PANEL.

MODE KEY A.
When the A key is pressed, LED B or C lights for welding in synergic mode, and LED D or E for welding in manual mode. After selecting the type of material, type of gas and wire diameter, synergic mode provides a series of pre-set voltage values (using the knobs B and C on the remote control of the wire feeder), expressed in VOLTS, and wire speeds expressed in METERS / MINUTE, suitable for welding.

LED B
2-stage synergic mode.
The machine begins welding when the trigger is pressed, and stops when it is released.

LED C
4-stage synergic mode.
To begin welding, press the torch trigger; you may release the trigger once the procedure has begun. Press and release the trigger again to stop welding. This setting is suitable for long-term welding, where the welder may tire of holding down the torch trigger.

LED D
2-stage manual mode
The same operating principle as the 2-stage synergic mode.

LED E
4-stage manual mode
The same operating principle as the 4-stage synergic mode.

MATERIAL KEY F (active only in 2-stage or 4-stage synergic mode)
The LED for the selected material lights whenever this key is pressed
LED G for iron welding.
LED H for stainless steel welding.
LED I for welding 5% magnesium aluminum.

WIRE KEY L (active only in 2-stage or 4-stage synergic mode)
The LED for the selected wire diameter lights whenever this key is pressed
LED M for wire ø 0.8mm.
LED N for wire ø 1mm.
LED O for wire ø 1.2mm.
LED AB for wire ø 1.6mm Art. 508 only).

GAS KEY P (active only in 2-stage or 4-stage synergic mode)
The LED for the selected gas lights whenever this key is pressed.
LED Q for ARGON gas.
LED R for CO2 gas.
LED S for ARGON + 2% O2 gas.
LED T for ARGON + 5% CO2 gas.
LED U for ARGON + 18.25% CO2 gas.
**Caution** not all combinations are available, only those set in the programs.

- If aluminum is selected as the material, you may select only diameters 1-1.2-1.6 and only Argon gas.
- If stainless steel is selected as the material, you may select only diameters 0.8-1-1.2-1.6 and only Ar + 2% CO₂ gas.
- If iron is selected as the material, you may choose among diameters 0.8-1-1.2-1.6 and among the gases CO₂, Ar + 5% CO₂ and Ar + 18.25% CO₂.

**KEIS FOR BUILDING ONE OR MORE SYNERGIC CURVES V E W.**

As specified previously, the programmed synergic curves do not include all of the wires or gases used. As specified previously, the programmed synergic curves do not include all of the wires or gases used in welding. If the operator wishes to create a customized curve for a wire type or gas other than those programmed, he can do so by following the instructions below. This function is enabled only in synergic mode, and a maximum of 5 curves may be memorized. The first time the program button V is pressed, the LED 1 begins flashing (this is the first free program). To save the synergic curve to memory, proceed as follows:

- use the knobs on the remote control of the wire feeder to find the voltage and meters per minute values suitable for welding
- press the memory key W to save this initial condition, and at the same time save 3 other pairs of values
- after saving the 4 pairs of values, LED 1 remains steadily lit, without flashing.

Once the synergic curve has been programmed, to use it simply set the voltage knob C on the remote control of the wire feeder to 0, and adjust the parameters using the m/min. knob B on the wire feeder remote control. Follow the same procedure to save the other 4 programs available.

To delete a program, select the synergic curve to be deleted and hold the memory key W down for at least 10 seconds. After this time has elapsed, the LED will begin flashing again, and a new program may be stored in this memory position. It is also possible to save a single voltage/current pair by pressing the W key 4 times. **NOTE:** The welding machine will accept no other commands until the memory procedure has been completed.

**INSTRUMENT K (Welding voltage)**

This instrument displays the voltage during welding. In manual mode, the voltage can be adjusted before welding by turning the potentiometer C on the wire feeder remote control, and displayed by the instrument. The Volt meter shows the exact working voltage while welding; when the operator finishes welding, the last voltage value remains in the instrument memory until new parameters or functions are selected.

In synergic mode, the instrument automatically displays the programmed voltage.

The last welding voltage is always saved, as in manual mode.

**INSTRUMENT X (Welding current/meters per minute)**

This instrument displays the welding current and the welding electrode speed in meters per minute.

Before beginning welding in manual mode, the instrument shows the meters per minute set on the knob B on the wire feeder remote control; during welding it displays the current. This remains in the instrument memory after welding, until new parameters or functions are selected.

In synergic mode, the instrument automatically shows the programmed meters per minute before welding; it shows the current during welding, which remains in the instrument’s memory until new parameters or functions are selected.

**LED Y**

This LED lights when the thermostat interrupts welding machine operation when the cooling unit is in use and is turned off, or the pressure switch signals that coolant fluid is low, or when the mobile panel of the wire feeder is opened.

**LED Z**

This LED indicates that the machine is on.

**SELECTOR SWITCH J**

Turns the machine on and off, and serves to change the supply voltage. To change the voltage, turn the disc located under the knob, see Fig. Always make sure that the supply voltage matches the one shown on the front panel of the machine.

**SOCKET AA**

Socket for connecting the mass cable terminal.

**3.2 CONTROLS ON THE REAR PANEL.**

**SOCKETSAC**

Sockets for connecting the generator/wire feeder connection. To maximize carbon steel welding, we recommend using the central outlet of the impedance (230V).

To maximize stainless steel welding, we recommend using the third impedance outlet (380V).

To maximize aluminum welding, we recommend using the third impedance outlet (500V).

**CONNECTOR AD**

This connects to the 14-pin connector on the extension lead between the power source and the wire feeder art 1444 or 1447.

**SOCKET AE**

This socket connects to the safety device on the cooling unit.

**SOCKET AF (230V)**

This socket connects to the cooling unit. Maximum available power 440W.

**KNOB AG**

This knob regulates the length of the wire that sticks out of the torch after welding is finished: "BURN-BACK".

**CONNECTOR AH**

This connects to the 10-pin connector on the extension lead between the power source and the wire feeder art 1447.
4 WELDING

4.1 THE MACHINE IS READY TO WELD

• Connect the ground terminal to the part to be welded.
• Put the switch J sulla tensione prescelta.
• Extract the conic gas nozzle by rotating it clockwise.
• Unscrew the current nozzle.
• Press the torch trigger to feed the wire until it comes out from the torch.

WARNING: Keep your face away from the terminal nozzle while the wire comes out.
• Screw the current nozzle again, making sure that the hole diameter be the same as that the wire used.
• Insert the welding conic gas nozzle by rotating it clockwise.
• Open the gas cylinder and adjust flowmeter at 8,10 l/min.

WARNING: Check that the gas used is compatible with the material to be welded.

4.2 WELDING CARBON STEELS.

To weld carbon steels the following things are necessary:
1) The use of a binary shielding gas which is most commonly Argon and Carbon dioxide, in a ratio of 75,80 % Argon and 25,20% Carbon dioxide. Some applications, however, may require a mix of three gases: Argon, Carbon dioxide (CO₂), and oxide (O₂). These gas mixtures generate heat during welding and as a result the weld bead will be well filleted and neat in appearance. The penetration, however, will not be deep. The use of Carbon dioxide as the shield gas results in a narrow weld bead with deep penetration but the ionization of the gas will have an influence on arc stability.
2) The use of a filler wire of the same quality as the steel to be welded. It is recommended that high quality wires be used and that welding with rusted wires be avoided because they can give rise to defects in the weld bead. Generally, the current range within which a wire can be used is calculated in the following manner:

Ø of wire x 100= minimum number of Amperes.
Ø of wire x 200= maximum number of Amperes.
Practical example: 1.2 Ø wire= 120 Amps minimum and 240 Amps maximum. These amperages are based on the use of an Argon/CO₂mixture as the shield gas and welding in the Short Arc transfer mode.

3) Avoid welding on rusted work pieces or work having spots of oil and grease present on the surface.
4) The use of a welding torch suitable to the welding currents that are going to be used.
5) Periodically check that the two handles making up the ground clamp are not damaged and that the welding cables (torch cable and the work return lead) do not have any cuts or burn marks that would reduce their efficiency.

4.3 WELDING STAINLESS STEEL

Welding stainless steels in the 300 series (the austenitic series) must be done using a shield gas mixture of predominantly Argon with a small percentage of O₂ added to stabilize the arc. The recommended mixture is AR/O₂ in the ratio of 98/2. Do not use CO₂ or AR/CO₂mixtures as the shield gas.
Do not touch the welding wire with your bare hands. The filler metal (the wire) must be of a higher quality than the work to be welded and the weld area must be clean.

4.4 WELDING ALUMINIUM

The following is required for aluminium welding:
1) 100% Argon as welding protection gas.
2) A torch wire of composition suitable for the basic material to be welded.
For ALUMAN welding wire 3.5% silicon.
For ANTICORODAL welding wire 3.5% silicon.
For PERALUMAN welding wire 5% magnesium.
For ERGAL welding wire 5% magnesium.
3) A torch prepared for aluminium welding.
If you only have a torch for steel wires, the same shall be modified in the following way:
- Make sure that length of torch cable does not exceed 118 inches (it is advisable not to use longer torches).
- Remove the brass sheath-holding nut, the gas and the current nozzles, then slip the sheath off.
- Insert the teflon sheath for aluminium and ensure it protrudes from both ends.
- Screw the current nozzle so that the hole diameter be the same as that the wire used.
- Slip the brass tube on the sheath and insert both into the adapter (after removing the iron tube which was fitted inside the adaptor).
- Cut the sheath diagonally so that it stays as close as possible to the wire slide roller.
- Cut the sheath diagonally so that it stays as close as possible to the wire slide roller.
- Use drive rolls that are suitable for aluminium wire. The drive rolls, when being installed, must be tightened as tight as possible.
- Use contact tips that are suitable for aluminium wire and not for steel wires. It is advisable not to use longer torches.
- Use abrasive grinders and tool brushes specifically designed for aluminium. Never use these tools on other materials.
- Periodically check that the two handles making up the ground clamp are not damaged and that the welding cables (torch cable and the work return lead) do not have any cuts or burn marks that would reduce their efficiency.

5 WELDING DEFECTS

1- DEFECT- Porosity (in, or on the surface of the weld bead)

CAUSES  • Bad wire (rust on the surface).
• Insufficient gas shielding due to:
  - Inadequate gas flow due to a block in the gas line.
  - Defective flowmeter.
  - Gas regulator covered with frost because a gas heater was not used to heat the CO₂ shielding gas.
  - Failure of gas valve solenoid.
  - Gas nozzle plugged up with spatter.
  - Gas flow holes plugged up.
  - Air drafts in the welding area.
2- DEFECT - Shrinkage Cracks
CAUSES
• Welding wire or work to be welded dirty or rusty.
• Weld bead too small.
• Weld bead too concave.
• Too much weld bead penetration.
3- DEFECT - Lateral cracking
CAUSES
• Welding speed too fast.
• Low current and high arc voltages.
4- DEFECT - Too much Spatter
CAUSES
• Voltage too high
• Insufficient impedance
• No gas heater used for CO₂ shielding gas.

6 MACHINE MAINTENANCE

Gas nozzle. Periodically clean the nozzle of all weld spatter that may have accumulated during welding operations. If the nozzle should become distorted or oval in shape then it must be replaced.

Contact tip. A good contact between the contact tip and the wire ensures a stable arc and optimal current output. Therefore, following steps must be followed:
A) The contact tip hole must be kept free of dirt or oxidation.
B) After lengthy welds, spatter can easily accumulate on the contact tip and prevent the wire from being fed. The contact tip must be cleaned regularly and if necessary it must be replaced.
C) The contact tip must always be screwed tightly on to the body of the torch. The thermal cycles which the torch undergoes during operation may loosen the contact tip which, in turn, may cause the torch body and nozzle to overheat or cause unsteady wire feed.

The Wire Liner is an important part that must often be checked since, during normal operations, the wire can deposit copper dust or tiny metal shavings in the wire liners. Periodically clean the liner and the gas line with a jet of dry, compressed air. Wire liners are exposed to continual wear and therefore they must be replaced after a certain period of time.

Wire feed motor. Periodically clean the wire feed assembly and the drive rolls from any rust or metal shavings due to the feeding of the wire. A periodic check of all the components of the wire feed assembly, spool holder, drive rolls, wire liner and the contact tip is recommended.

7 TROUBLESHOOTING

Note: All repair work must be done by qualified personnel.
Disconnect the power input cable from the mains supply before replacing cables or before removing the unit covers.
The machine is equipped with a thermostat that shuts the machine down when the power source overheats. After the thermostat intervenes, let the power source cool down for several minutes before resuming welding operations.
The troubleshooting table lists troubles, causes and remedies for those troubles that occur most commonly.

<table>
<thead>
<tr>
<th>TROUBLE</th>
<th>PROBABLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited electric output.</td>
<td>A phase is missing.</td>
<td>Check the phase of the feed line and/or the remote control switch contacts.</td>
</tr>
<tr>
<td>A line fuse is burnt.</td>
<td>Replace it.</td>
<td></td>
</tr>
<tr>
<td>Loose or missing torch or ground connections.</td>
<td>Tighten all connections.</td>
<td></td>
</tr>
<tr>
<td>Transformer wire interrupted on the commutator</td>
<td>Un-screw the commutator contact, remove the wire insulation and put it under the contact.</td>
<td></td>
</tr>
<tr>
<td>Welding with a lot of metal spatter</td>
<td>Wrong adjustment of the welding parameters.</td>
<td>Select the correct parameters through the welding-voltage switch and the wire-speed adjustment potentiometer.</td>
</tr>
<tr>
<td>Insufficient grounding.</td>
<td>Check grounding connections.</td>
<td></td>
</tr>
<tr>
<td>Wire not advancing properly</td>
<td>Wire advancing improperly.</td>
<td>Uncorrect sheath diam.</td>
</tr>
<tr>
<td>Wire roller with too wide groove.</td>
<td>Replace roller.</td>
<td></td>
</tr>
<tr>
<td>Obstructed or clogged liner.</td>
<td>Extract it and clean.</td>
<td></td>
</tr>
<tr>
<td>Loose wire pressing roller.</td>
<td>Tighten it.</td>
<td></td>
</tr>
<tr>
<td>Coil wire friction too tight.</td>
<td>Loosen and adjust it.</td>
<td></td>
</tr>
<tr>
<td>The wire jams or entangles between the drive rolls and the torch infeed wire guide.</td>
<td>Current nozzle clogged.</td>
<td>Replace it.</td>
</tr>
<tr>
<td>Wrong current nozzle diameter.</td>
<td>Replace it.</td>
<td></td>
</tr>
<tr>
<td>Wrong roller groove alignment.</td>
<td>Align it.</td>
<td></td>
</tr>
<tr>
<td>Obstructed or clogged sheath.</td>
<td>Remove and clean.</td>
<td></td>
</tr>
</tbody>
</table>

8 WELDING MACHINE SERVICING

Experience has shown that many fatal accidents originated from servicing improperly executed. For this reason, a careful and thorough inspection on a serviced welding machine is just as important as one carried out on a new welding machine.
Furthermore, in this way producers can be protected from being held responsible for defects stemming from repairs not carried out by the manufacturer.

8.1 Prescriptions to follow for servicing
● After rewinding the transformer or the inductance, the welding machine must pass the applied-voltage test in accordance with indications in table 2 of 6.1.3 of the EN 60974.1 standard (CEI 26.13). Conformity must be checked as specified in 6.1.3.
● If no rewinding is done, a welding machine which has been cleaned and/or reconditioned must pass an applied-voltage test with voltage values equal to 50% of the values given in table 2 of 6.1.3. Conformity must be checked as specified in 6.1.3.
● After rewinding and/or the replacement the no-load voltage shall not exceed the values given in 10.1 of EN 60974.1.
● If the servicing is not done by the manufacturers, the repaired welding machines which underwent replacements or modifications of any component, shall be marked in a way such that the identity of the person having serviced it is clear.
● After making repairs, take care to re-order the cables so that there is sure to be insulation between the primary and secondary sides of the machine. Make sure that the wires cannot come into contact with moving parts or parts that
9 SAFETY PRECAUTIONS

9.1 ELECTRIC SHOCK

- Disconnect the power cord from the mains before working on the cables or opening the machine.
- Never touch live parts.
- Never use the machine without the safety guards.
- Insulate yourself from the part to be cut/welded and from the earth by wearing insulating gloves and clothing.
- Keep all clothing (gloves, shoes, headgear) and your body dry at all times.
- Do not work in damp or humid environments.
- Should you notice even the slightest sensation of electric shock, stop cutting/welding immediately. Do not use the equipment again until the problem has been identified and resolved.
- Include an automatic wall switch of adequate capacity placed near the equipment, to allow it to be shut off immediately in case of emergency.
- Inspect the power cord, torch cable, grounding cable and the torch itself often. Never use the machine if any of these parts are damaged.
- Make sure the power supply line is fitted with an efficient grounding socket.
- Plasma cutting equipment requires dangerous voltages to strike the arc (approximately 250/350 V DC). It is therefore recommended to take the following precautions during use.
- Never disable the safety devices on the torch and machine.
- If using the system for plasma cutting, always turn off the machine before replacing the nozzle, isolating diffuser, electrode or nozzle holder.
- Only screw the nozzle holder onto the head with the electrode, the isolating diffuser and the nozzle mounted. If these parts are not present, the machine will not function properly and operator safety will be endangered.

9.2 RADIATION

- The ultraviolet radiation emitted by the arc may harm eyes and burn the skin; it is therefore recommended to wear the appropriate safety garments and masks.
- Protect anyone around the cutting/welding area. The arc is hazardous to a distance of up to 15 meters.
- Never look at the arc with your bare eyes!
- Prepare the cutting/welding area to reduce the reflection and transmission of ultraviolet radiation by painting the walls and other exposed surfaces black to decrease reflections, and installing protective screens or curtains to reduce transmitting ultraviolet rays.
- Do not wear contact lenses! The intense heat issued by the arc could melt them to the cornea.

9.3 FUMES

Cutting and welding produce hazardous fumes and metal dust that may be hazardous to your health. Therefore:

- Work only in adequately ventilated areas.
- Keep your head away from fumes.
- Use adequate ventilation systems in closed areas.
- Use approved respirators if the ventilation is not deemed adequate.
- Clean the material to be cut/welded if any solvents or halogen degreasers are present that may create toxic gases during cutting/welding. Some chlorinated solvents may decompose in the presence of the radiation emitted by the arc, and generate phosgene gases.
- Never cut/weld where solvent fumes are present or if the radiant energy can penetrate atmospheres containing even the slightest traces of trichloroethylene or perchloroethylene.
- Never cut/weld coated metals or those containing lead, graphite, cadmium, zinc, chrome, mercury or beryllium if you are not using an adequate respirator.
- The electric arc generates ozone. Prolonged exposure to atmospheres containing high concentrations of ozone may cause headaches, nasal, throat, and eye irritation, serious congestion and chest pains.

<table>
<thead>
<tr>
<th>Arc process</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Manual metal arc welding</td>
<td>9</td>
</tr>
<tr>
<td>MIG (heavy metal*)</td>
<td>10</td>
</tr>
<tr>
<td>MIG (light metal)</td>
<td>10</td>
</tr>
<tr>
<td>TIG</td>
<td>9</td>
</tr>
<tr>
<td>MAG</td>
<td>10</td>
</tr>
<tr>
<td>Arc gouging</td>
<td>10</td>
</tr>
<tr>
<td>Plasma cutting</td>
<td>11</td>
</tr>
<tr>
<td>Plasma welding</td>
<td>4</td>
</tr>
</tbody>
</table>

* The term "heavy metal" covers e.g. stainless steel and copper alloys.
• IMPORTANT: NEVER USE OXYGEN FOR VENTILATION PURPOSES.

9.4 FIRE

Avoid producing fire due to sparks and hot scraps or incandescent pieces.
• Make sure that appropriate fire-fighting devices are available near the cutting/welding area.
• Remove all flammable and combustible materials from the cutting/welding area and its vicinity (at least 10 meters).
• Do not cut/weld on fuel and lubricate containers, even if empty. They must be cleaned thoroughly before being cut/welded.
• Let the cut/welded material cool before touching it or placing it in contact with combustible or flammable material.
• Do not operate in atmospheres having high concentrations of combustible fumes or flammable gases and dusts.
• Always check the work area half an hour after cutting to make sure no fires have started.
• Never keep combustible items such as cigarette lighters or matches in your pocket.

9.5 BURNS

• Protect your skin against burns from the ultraviolet radiation emitted by the arc, sparks and scraps of molten metal by wearing fireproof clothing that covers all exposed body surfaces.
• Wear protective welder's garments/gloves, headgear and high-top shoes with reinforced toes. Button your shirt collar and pocket flaps, and wear trousers without cuffs to prevent creases and snag clothing.
• Avoid oily or greasy garments. A single spark could set them on fire.
• Incandescent metal parts such as pieces of electrode and the workpiece must always be handled with gloves.
• First aid equipment and a qualified person must be available for each working shift, unless there are health facilities nearby for the emergency treatment of eye or skin burns.
• Use earplugs when working overhead or in a small space. Use a helmet when others are working above you.
• People getting ready to weld/cut must not use flammable hair products.
• Wait for the torch to cool, then turn the machine off before touching the front part of the torch.
• Plasma cutting machines have a pilot arc, thus the arc strikes as soon as the torch trigger is pressed, even when the earth cable is disconnected. You must therefore avoid aiming the jet towards your body or towards the people present in the cutting area.
• When you are finished cutting, always hang the torch on the hook provided and turn off the machine to avoid accidentally striking the plasma arc.

9.6 EXPLOSIONS

• Never cut/weld above or near containers under pressure.
• Never cut/weld in atmospheres containing explosive dust, gases or fumes.
• Plasma cutting machines run on compressed air. Take the appropriate precautions if the air is drawn from cylinders. Welding/cutting machines use gases such as CO2, ARGON, or blends of ARGON + CO2 to protect the arc; you must therefore take the utmost care with:

9.6.1 Cylinders

• Large gas leaks may dangerously affect the concentration of oxygen.
• Never connect the cylinder directly to the machine: use a pressure regulator.
• The intake pressure must never exceed 6 bar (0.6 MPa) for plasma cutting machines, and 4 bar (0.4 MPa) for cutting/welding machines.
• Always observe current regulations when handling or using cylinders under pressure.
• Never use cylinders that leak or have been physically damaged.
• Always fasten the cylinders in place.
• Never move cylinders without protecting the valve.
• Use only cylinders whose contents have been clearly identified.
• Never use oil or grease to lubricate cylinder valves.
• Never place the plasma or welding arc in electrical contact with the cylinder.
• Never expose the cylinders to excessive heat (greater than 50°C), sparks, molten scraps or flames.
• Never tamper with the cylinder valves.
• Never try to release jammed valves with hammers, wrenches or other means.
• Never erase or alter the name, number or other markings on the cylinders. This is both illegal and dangerous.
• Never lift the cylinders off the ground by grasping the valve or cap, or by using chains, harnesses or magnets.
• Refill the cylinders at authorized centers only.
• The cylinder fittings must never be changed or switched.

9.6.2 Pressure regulators

• Keep pressure regulators in good condition.
• Never use a regulator that leaks or appears physically damaged.
• Never use oil or grease to lubricate a regulator.

9.6.3 Air/gas hoses

• Replace any hoses that appear damaged.
• Keep hoses stretched taut to avoid creasing.
• Keep any excess hose coiled and away from the work area to prevent it from being damaged.

9.7 MOVING PARTS

• Moving parts such as the fan may cut fingers and hands and snag clothing.
• Only qualified personnel may remove guards and coverings for maintenance, after first disconnecting the power cable.
• Replace all coverings and guards and close the doors when the task is complete, and before starting the machine.

9.8 NOISE

This machine does not in itself produce noise above 80 dB. The plasma cutting/welding procedure may produce noise levels above that limit; users must therefore take all precautions required by law.

9.9 PACEMAKERS

Magnetic fields caused by high currents may affect the operation of pacemakers. Wearers of any vital electronic equipment (pacemakers) must consult their physician before performing arc welding, cutting, desearing or spot welding.
9.10 ELECTROMAGNETIC COMPATIBILITY

9.10.1 General notes
This machine has been built in conformity with the instructions of harmonized standard EN50199.
In this standard, the limits for electromagnetic emissions are based on practical experience. However, the machine's ability to function compatibly with other radio and electronic systems depends largely on how it is used. The limits set forth in the above standard may not be adequate to fully eliminate interference when a receiving apparatus is located in the immediate vicinity, or is highly sensitive. In these cases it may be necessary to adopt special measures to further reduce interference.
This machine must be used solely for professional purposes in an industrial environment. Keep in mind that it is potentially difficult to ensure electromagnetic compatibility in non-industrial environments.

9.10.2 Installation and use
The user is responsible for installing and using the cutting/welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected, then it shall be the responsibility of the user of the cutting/welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as grounding the cutting/welding circuit, (see NOTE). In other cases, it could involve constructing an electromagnetic screen enclosing the cutting/welding power source and the work complete with associated input filters. In all cases, electromagnetic disturbances shall be reduced to the point where they are no longer troublesome.
Note: The cutting/welding circuit may or may not be grounded for safety reasons. Changing the grounding arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel cutting/welding current return paths which may damage the grounding circuits of other equipment. Further guidance is given in IEC 974-13 "Arc welding equipment - Installation and use" (under preparation).

9.10.3 Assessing the area
Before installing cutting/welding equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:
- other supply cables, control cables, signaling and telephone cables located above, below and adjacent to the cutting/welding equipment.
- radio and television transmitters and receivers.
- computer and other control equipment.
- safety critical equipment, e.g. guarding of industrial equipment.
- the health of the people around, e.g. the use of pacemakers and hearing aids.
- equipment used for calibration or measurement.
- the immunity of other equipment in the environment.
- the time of day that cutting/welding or other activities are to be carried out.
The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

9.10.4 Methods of reducing emissions
- Mains power supply
The machine must be connected to the mains power supply according to the manufacturer's instructions. If interference occurs, it may be necessary to take additional precautions such as filtering the mains power supply. Consideration should also be given to shielding the supply cable in a metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding must be connected to the cutting/welding power source so that good electrical contact is maintained between the conduit and the cutting/welding power source enclosure.

- Maintenance of the cutting/welding equipment
The cutting/welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened while the machine is in operation. The cutting/welding machine should not be modified in any way, except for those changes and adjustments described in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

- Welding and cutting cables
The cutting/welding cables must be kept as short as possible and should be positioned close together, running at or close to floor level.

- Equipotential bonding
Bonding of all metallic components in and adjacent to the cutting/welding installation should be considered. However, metallic components bonded to the workpiece will increase the operator’s risk of electric shock by touching these metallic components and the electrode at the same time. The operator should therefore be insulated from all such bounded metallic components.

- Grounding the workpiece
If the workpiece is not grounded for electrical safety or due to its size and position (for example, ship hulls or building steel-work), a connection bonding the workpiece to earth may reduce emissions in some but not all instances. Care should be taken to prevent the grounding of the workpiece from increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the workpiece must be grounded by means of a direct connection, while in some countries where direct connections are not permitted, the bonding may be achieved by suitable capacitance selected according to national regulations.

- Shielding
Selective shielding of other cables and equipment present in the surrounding area may alleviate problems of interference. You may consider shielding the entire cutting/welding installation for special applications.