

INSTRUCTION MANUAL FOR PLASMA CUTTER

IMPORTANT

Before using this device all people authorized to use, repair or control, should read the following instructions of safety and use.

Remember: **YOUR SAFETY DEPENDS ON YOU!!!**

Follow all safety rules and instructions.

It is your job to protect yourselves and others against the risks related to cutting.

Operator is responsible for his own safety and the safety of others in the work area. He must know all safety rules and obey them.

NOTHING CAN REPLACE GOOD COMMON SENSE!!!

Always use original spare parts so as to ensure the safety of unit and torch.

BASIC SAFETY PRECAUTIONS



ELECTRIC SHOCK

Electric shock can kill. All electric shocks are potentially fatal.

This plasma cutter requires high voltages for arc spark starting (approx. 250 | 300 V). The following safety rules must be therefore observed when using the unit:

- Do not touch live parts.
- Insulate yourselves from the piece to be cut and from earth by wearing insulating gloves and clothing
- Keep your clothing (gloves, shoes, hats, dresses) and body dry
- Do not work in humid or wet areas
- Avoid touching or holding by hand the piece to be cut
- Always arrange for a proper insulation against electric shock. Should you work close to or in a dangerous area use all possible precautions.
- If you feel even the slightest electric shock sensation, stop cutting at once. Do not use the machine until the problem is identified and solved.
- Always fit an automatic wall switch with adequate power, if possible close to the machine so as to immediately switch the unit off in an emergency event.
- Check often mains cable, torch cable, earth cable and torch. Never use the unit when one of them is damaged. Replace them immediately.
- Disconnect mains cable from mains before replacing cables or before removing unit covers.
- Always switch the unit off or disconnect it before replacing nozzle, swirl ring, electrode or nozzle holder.
- Do not use the unit without protecting covers.
- Always replace any damaged parts of the unit, torch and cables with original material.
- Never remove torch or unit safety devices.
- Make sure that the supply mains line is equipped with an efficient earth plug.
- Make sure that the work table is connected to an efficient earth plug.
- Any maintenance should be only carried out by qualified personnel aware of the risks due to dangerous voltages necessary to make the unit work.

ATTENTION: Never screw nozzle holder D (see picture 11) to torch body E without fitting consumables electrode A, diffuser B, nozzle C.



RADIATIONS

Ultraviolet radiations created by the arc may damage your eyes and burn your skin. Then:

- Wear proper cloth and helmets.
- Do not use contact lenses!! The intense heat coming from the arc may stick them on the cornea.
- Use masks with grade DIN 7 or 8 safety lenses, at least.
- Protect people surrounding the cutting area.

Remember: the arc may dazzle or damage your eyes. It is considered dangerous up to a distance of 50 feet.

Never look at the arc with the naked eye!

- Prepare cutting area so as to reduce reflection and transmission of ultraviolet radiations: paint walls and surfaces exposed, in black to reduce reflection, install sheathings or curtains to reduce ultraviolet transmissions.
- Replace mask lenses whenever they are damaged or broken.



FUMES

Cutting operations give off fumes and harmful metal dusts which may damage health, therefore:

- Do not work in areas without proper ventilation.
- Keep your head out of fumes.
- In closed rooms use suitable exhaust fans, placed under the cutting area, if possible.
- If ventilation is not enough, use breathing sets approved for this procedure.
- Clean the material to be cut off solvents or halogen degreasers giving rise to toxic gases when cutting: some chlorine solvents may decompose with radiations emitted by the arc and create phosgene gas.
- Do not cut plated metals or metals containing lead, graphite, cadmium, zinc, chrome, quicksilver or beryllium unless you have a proper breathing set.
- The electric arc creates ozone. After long exposure to high concentrations of ozone you may have headache, nose, throat and eyes irritation as well as serious congestion and breast pains.

IMPORTANT: DO NOT USE OXYGEN FOR VENTILATION.



FIRE

- Avoid producing fire because of sparks, hot metal or pieces.

- Make sure that suitable fireproof devices are available close to cutting area.
- Remove from cutting area and surrounding area (33 feet at least) all inflammable and combustible material.
- Do not cut containers of combustible or lubricating material, even when empty. These should be carefully cleaned before being cut.
- Let the material cut cool down before touching it or putting it in contact with combustible or inflammable material.
- Do not cut parts with hollow spaces including inflammable material.
- Do not work under conditions of high concentration of combustible vapours, gases or inflammable dust.
- Always check the work area half an hour after cutting so as to make sure that no fire is starting to burn.

BURNS

- Wear fire-proof clothes all over your body to protect your skin against burns caused by ultraviolet radiations from the arc, from sparks and hot metal.
- Wear no turn-up trousers to prevent sparks and metal to deposit in them.
- Wait for the torch to be cooled down and then switch the unit off before touching the front side of the torch.
- Torch is provided with a pilot arc, then as soon as you press the button, the plasma spark starts even if earth cable is not connected. Avoid directing jet towards your own body or towards other people surrounding the cutting area.
- To prevent spark to starts by chance, always switch the unit off before putting down your torch.
- Do not carry combustible material, such as lighters or matches in pocket.



EXPLOSIONS

- Do not cut above or near containers under pressure.
 - Do not cut in environments containing explosive dusts, gases or vapours.
- This plasma cutter uses compressed air to work; should you use compressed air bottles follow suitable precautions:

A) BOTTLES

- Do not directly connect bottle to reducing unit without a pressure regulator; pressure might exceed the reducing unit capacity making it explode.
- Feeding pressure must not exceed 120 PSI (8bar/KPa x100)
- Handle or use pressure bottles in conformity with the existing rules.
- Do not use leaking or damaged bottles.
- Do not use not well fixed bottles.
- Do not carry bottles whose content is not clearly identified.
- Never lubricate bottle valves with oil or grease.
- Do not put electrically in contact bottle with plasma arc.
- Do not expose bottles to excessive heat, sparks, hot metal or flames.
- Do not tamper bottle valves.
- Do not try to loosen all tight valves by means of hammers, keys or something else.

B) PRESSURE REGULATORS

- Keep pressure regulators in good conditions. Damaged regulators may give rise to damage or accidents; they should only be repaired by skilled personnel.
- Do not use regulators for gases other than those they are manufactured for.
- Never use a leaking or damaged regulator.
- Never lubricate regulators with oil or grease.

C) AIR HOSES

- Replace air hoses if damaged.
- Keep hoses unwound so as to avoid from bending.
- Keep the exceeding hose wound and keep it out of the working area so as to avoid any damage.

NOISE

The noise caused by the arc may damage your hearing; wear suitable headsets.

SAFETY DEVICES

This unit is provided with the following safety devices:

- Thermic:** located on the power transformer windings to avoid overloads and signalled by indicator light G on (see picture 1).
- Pneumatic:** located on the torch feed line to avoid insufficient air pressure and signalled by indicator light L (see picture 1).
- Electric:** located on torch body to avoid dangerous voltages while replacing nozzle, diffuser, electrode or nozzle holder.
- Do not remove or short-circuit the unit safety devices.
- Only use original spares.
- Always replace any damaged part of the unit or torch with original material.
- Do not use any torches other than the original one.
- Do not let the unit work without covers. This would be dangerous for operator and for those who are surrounding the work area and would prevent the unit from cooling efficiently.

DESCRIPTION OF UNIT DEVICES (see picture 1)

- A) Feed cable
- B) Compressed air fitting (1/4" female gas thread)
- C) Mains switch
- D) Mains pilot light
- E) Air pressure reducing unit
- F) Gauge
- G) Light signalling thermostat is open
- H) Earth terminal
- I) Water trap
- L) Light signalling air pressure is not enough
- M) Cutting power adjusting switch (only for version 50A)

ASSEMBLY AND ARRANGEMENT

Unpack the unit, fit wheels, stand and handle following the instructions of picture 2. Place the unit in properly ventilated if possible undusty room making sure that the air inlet and outlet from cooling slots are not obstructed.

SETTING AT WORK

The unit must be installed by skilled personnel. All fittings must be in conformity with the existing rules and in full compliance with safety regulations.

Connect the air feed to fitting **B** making sure that pressure is 88PSI (6bar or KPa X100) at least with a minimal capacity of 255 CFH (120 liters/min.)

Should air feed come from a pressure reducing unit of a compressor or of a centralized plant, the reducing unit should be adjusted at the highest output pressure which should not exceed 120 PSI (8bar or KPa x100). Should air feed come from a compressed air bottle, this should be provided with a pressure regulator; **never connect compressed air bottles directly to the reducing unit! Pressure may exceed the reducing unit capacity and then explode!**

Lift handle **E** of reducing unit and adjust pressure as indicated by gauge **F** at about 80 ÷ 88 PSI (5.5 ÷ 6 bar/ KPaX100).

If the unit is preset to work with more than one voltage, arrange for the voltage changing disk placed beneath the handle of switch **C**, for line voltage as shown by picture 3.

Connect supply cable **A**: the yellow-green wire of cable should be connected to an efficient earth plug of the system, the remaining wires should be connected to the feed line by means of the switch placed, if possible, close to the cutting area so as to switch the unit off quickly if necessary.

The magnetothermic switch capacity or of fuses in series with switch should be equal or above the current I_1 absorbed by the unit.

Current I_1 absorbed is known by reading the technical specifications on the unit i.e. feed voltage U_1 available.

Any extensions should have adequate sections for current absorbed I_1 .

USE

Switch the unit on by turnign knob **C** of the mains switch to the desired voltage; this is shown by light **D** which is on.

By pressing for a second the torch button, the compressed air flow is opened. Check that, under this condition, the pressure shown on gauge **F** is about 70 PSI (4.6 bar or KPaX100), otherwise adjust it by means of knob **E** of reducing unit, then lock this knob by pressing it down.

Connect earth terminal **H** to the piece to be cut.

(Only for version 50A) place the knob of commutator **M** to 1 or 2 according to the thickness of the piece to be cut following roughly the instructions below:

Iron and stainless steel

Pos 1 up to 3/8" (4.5 mm)

Pos 2 up to 1/2" (12 mm)

Aluminium

Pos 1 up to 1/8" (3.5 mm)

Pos 2 up to 5/16" (8 mm)

Clean the work piece to ensure good electrical contact of the earth clamp.

Do not connect earth terminal to the material to be removed.

Press torch button to start pilot light. Put torch close to the piece and cut keeping nozzle in contact without pressing.

When possible, the torch should be pulled. Pulling is easier than pushing.

Keep torch in vertical position when cutting.

Once cutting is over and after releasing button, air continues to flow out of the torch for about 50 seconds so it enables torch to cool down. It is recommended not to turn the unit off before that time.

Should holes be drilled or should the piece be cut starting from its center, torch should be tilted and then slowly straighten to prevent molten metal from being spread on nozzle (see picture 4). This operation should be carried out with material thickness above 1/8" (3 mm). If you have to cut near angles or recesses (see picture 5) it is recommended to use extended electrodes and nozzles (part nos 48 and 49 of the exploded view of spares).

Should circular cut be done it is recommended to use caliper (supplied on request).

N.B. : Avoid keeping pilot arc uselessly on, in air to avoid electrode, diffuser and nozzle consumption.

When you have finished working, turn off the machine and hang the torch on the hook provided.

DUTY CYCLE

(See plate of technical data on the unit).

The duty cycle **X** sets the work time (cut) as a percentage of a period of repeating time of 10 minutes with a preset cutting power I_2 .

Ex. : Should generator have:

Duty cycle : **X** = 50% with $I_2 = 50A$

X = 100% with $I_2 = 30 A$

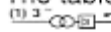
this means that with 50A it is possible to cut 50% of 10 minutes, i.e. 5 minutes every 10 and with 30A it is possible to cut 100% of 10 minutes, i.e. continuously.


Observe the duty cycle of the unit!

TECHNICAL SPECIFICATIONS

These may be read on the table of the unit.

The table symbols mean as follows:

 Three or single-phase transformer with rectifier

 External static feature of transformer (falling)

P.A.C. Plasma cutter

U_0 No load voltage on torch

X Percentage operational factor

I_2 Cutting power

U_2 Voltage on torch while cutting

3 ~ 50 Hz Three-phase feed with 50 Hz frequency

1 ~ 60 Hz Single-phase feed with 60 Hz frequency etc...

U_1 Input voltage of unit

I_1 Rated power absorbed by the unit at the corresponding current while cutting.

IP21 Protection grade of casing.

ATTENTION! The protection grade IP21 does not allow to use the unit when it rains.

CUTTING TROUBLE

1) Insufficient penetration

This may be due to:

- high speed. Always make sure that arc thoroughly passes through the piece to be cut and that it is not tilted, when going forward, by a percentage above 10° (see picture 6). It is thus avoided to wear nozzle (see picture 7) out and to burn the nozzle holder (see picture 8).

- Excessive thickness of piece (see graph of cutting speed and thicknesses)

- Low input voltage

- Earth terminal **H** not properly in electric contact with piece

- Worn nozzle and electrode

- (only for version 50A) Knob **M** (picture 1) pos. 1 instead of 2

N.B. : When the unit does not thoroughly pass through, nozzle is clogged by scumms.

2) Cutting arc switches off

This may be due to:

- worn nozzle, electrode or diffuser

- too high air pressure

- too low feed voltage

3) Tilted cutting

When cutting is tilted (see picture 9) switch the unit off, loosen nozzle holder **D** and turn nozzle **C** by a quarter turn, then lock and try again.

Repeat until cutting is straight (see picture 10).

4) Excessive wear of consumable parts

This may be due to :

- a) too low air pressure with respect to the recommended one

- b) excessive burns on the end part of nozzle holder **D**

PRACTICAL RECOMMENDATIONS

- If the system air contains much humidity and oil it is required to use a drying filter to avoid excessive oxidation and wear of

consumable parts, to avoid torch damage or to reduce speed and quality of cutting.

- Impurities of air favour oxidation of electrode and nozzle and make it difficult to start pilot arc. If this occurs, clean the end part of electrode and inside the nozzle with fine abrasive paper.

- Make sure that new electrode and nozzle to fit are clean and degreased.

- To avoid damage of torch always use original spares.

TORCH MAINTENANCE

Always disconnect the unit before any repair of torch.

1) Replace wear parts (picture 11)

The parts subject to wear are electrode **A**, diffuser **B** and nozzle **C**.

Either part may be only replaced after loosening nozzle holder **D**.

Electrode **A** should be replaced when a 1/16" (1.5 mm) deep crater is created in the middle (see picture 12).

Nozzle **C** should be replaced when its central hole is damaged or enlarged with respect to the new part (see picture 13).

Use of worn electrode quickly wears out the nozzle.

Excessive use of electrode causes overheating and reduces the life of diffuser **B**.

Make sure that after replacing it, nozzle **D** is narrow enough.

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the unit but they are not the only ones.

Fan (15) and windings, both primary and secondary, of service transformer.

transformer (8) are protected by fuses: in event of failure first check fuses.

The service transformer is provided with two secondary windings with the following functions:

- 0 - 20V feeding torch button and thermostat pilot light.
- 0 - 27V feeding instruments (contactor, solenoid valves, high-voltage card, control circuit, light indicating air pressure is not sufficient).

A) If by pressing button no air flows out of the torch, check the following:

- the feeding system has sufficient air pressure (the light indicating pressure is not enough, as well as gauge may be damaged)
- button, safety contacts and torch cables are in good conditions.
- solenoid valve (11) works properly on air circuit
- the service transformer (8) is in good condition as well as the control circuit (22).
- electric circuits are interrupted.

B) If by pressing button air flows out of the torch but pilot arc is not started, check the following:

- air pressure is enough
- pressure switch is in good condition (12)
- contactor (4) is enough and properly fed
- thermostats (24) on power transformer (29) are not temporarily open because of overload or they are interrupted because of failure (the thermostat pilot light may not be working)
- high voltage card, control circuit, filter circuit, rectifier and power transformer are in good conditions.
- Electric circuits are interrupted.

Only for single-phase version 35A:

- condensers (23) are connected and no abnormal swelling occurs.
- impedance (45) is not short-circuited.

C) If arc only starts when torch is in contact with the piece to be cut, check the following:

- resistance (19) is not interrupted
- electric circuits are not interrupted (including red cable of torch)
- (version 50A) resistances (19) and (58) are not interrupted.

D) Too worn parts.

If the trouble is not listed in pos.4 of chapter CUTTING TROUBLE check the following:

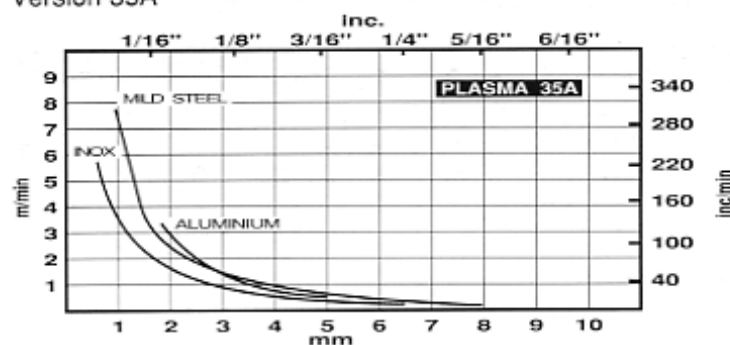
- solenoid valve (56) is in good conditions
- electric circuit of solenoid valve feed is not interrupted.

E) Cutting power is not enough, if the trouble is not listed in pos. 1 of chapter CUTTING TROUBLE check the following:

- (Single-phase version 35A) one of condensers (23) is not connected or some abnormal swelling occurs
- (version 50A) commutator (59) is in good conditions

CUTTING SPEED SCHEMES

Version 35A



Version 50A

