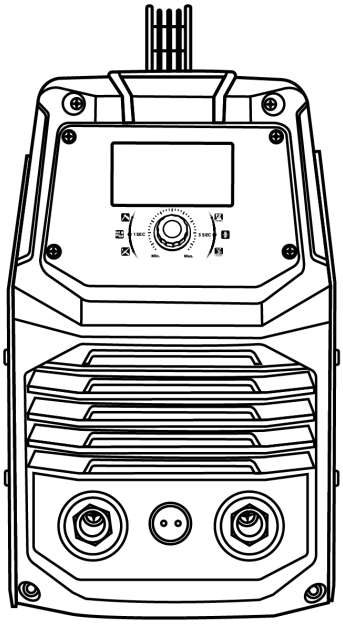
WARTER®

MIG 120 SE



FLUX (FCAW) ELETRODE (SMAW) TIG (GTAW)

MANUAL INSTRUCTION	ATTENTION
Keep this manual in a fresh and well-preserved place, and keep your proof of purchase . Only with this proof will your guarantee be valid if it comes to be needed. This document is important for the preservation of equipment, safety, assembly, welding tips about the product. If you need assistance, please contact our consultants through the website or e-mail office@cadabra.at	Avoid losing your warranty, read the guarantee term before the equipment is used.

V 2.0 - 01

FOR YOUR SAFETY

Read and understand this manual before use

Keep this manual for future reference

EXPLANATION OF DANGER, MANDATORY AND PROHIBITION SIGNS.

	DANGER OF ELECTRIC SHOCK		DANGER OF WELDING FUMES
	DANGER OF EXPLOSION		DANGER OF ULTRAVIOLET RADIATION FROM WELDING
	WEARING PROTECTIVE CLOTHING IS COMPULSORY		WEARING PROTECTIVE GLOVES IS COMPULSORY
	DANGER OF FIRE		DANGER OF BURNS
	WARNING: MOVING PARTS		WARNING: MIND YOUR HANDS, MOVING PARTS
	DANGER OF NON-IONISING RADIATION		GENERALHAZARD
	DO NOT USE THE HANDLE TO HANG THE WELDING MACHINE.		NO ENTRY FOR UNAUTHORISED PERSONNEL
	EYE PROTECTIONS MUST BE WORN		WEARING A PROTECTIVE MASK IS COMPULSORY
	USERS OF VITAL ELECTRICAL AND ELECTRONIC APPARATUS MUST NEVER USE THE MACHINE		PEOPLE WITH METAL PROSTHESES ARE NOT ALLOWED TO USE THE MACHINE
  	DO NOT WEAR OR CARRY METAL OBJECTS, WATCHES OR MAGNETISED CARDS		NOT TO BE USED BY UNAUTHORISED PERSON USE INTENDED ONLY FOR EXPERTS OR INSTRUCTED PERSONS
			Symbol indicating separation of electrical and electronic appliances for refuse collection. The user is not allowed to dispose of these appliances as solid, mixed urban refuse, and must do it through authorised refuse collection centres.

1. GENERAL SAFETY CONSIDERATIONS FOR ARC WELDING

The welding devices conform to international safety standards. Safety is an important issue in equipment design and manufacturing. There are, however, always certain hazards involved in using welding equipment. Therefore, to ensure your personal safety and the safety of your working environment, carefully read the safety instructions below and respect them.

1.1 General points of safety

 During the welding process, it may cause damage to you and others, please do well the protection. For the details, please refer to the safety protection guide to the operators that accord with the manufacturer accident prevention requirements.

Electric shock—it may cause death!

- In accordance with the application standard, install the grounding device well.
- When the skin is bare, wearing the wet gloves or wet clothes, contacting with live parts or electric welding rod is strictly prohibited.
- Make sure that there is insulation state between you and ground as well as workpiece.
- Make sure that your working position is in the safe state.
- Only connect the welding machine to an earthed electric network.
- Note the recommended mains fuse size.
- Do not take the welding machine inside a container, vehicle or similar work piece.
- Do not place the welding machine on a wet surface and do not work on a wet surface.
- Do not allow the mains cable to be directly exposed to water.
- Ensure cables or welding electrode holder are not squashed by heavy objects and that they are not exposed to sharp edges or a hot work piece.
- Make sure that faulty and damaged welding electrode holder are changed immediately as they can be lethal and may cause electrocution or fire.
- Remember that the cable, plugs and other electric devices may be installed or replaced only by an electrical contractor or engineer authorized to perform such operations.
- Turn off the welding machine when it is not in use.

Fume —— likely do harm to health!

- Keep head out of fume.
- Use ventilation or exhauster in arc welding process to avoid breathing in weld gas.
- Ensure proper ventilation and avoid inhaling the fumes.
- Ensure sufficient supply of fresh air, particularly in closed spaces. You can also ensure the supply of clean and sufficient breathing air by using a fresh-air mask.
- Take extra precautions when working on metals or surface-treated materials containing lead, cadmium, zinc, mercury or beryllium.

Arc ray radiation——likely to injure your eyes and burnt skin!

- Wear appropriate welding mask, filter glass and protective clothing to protect your eyes and body.
- Use proper face mask or screen to protect onlooker from injury.

Spatter and fire

- Welding spark may cause accidental fire, please make sure that there is no welding working position nearby the welding working position, equip with the fire extinguisher all around.

- Welding is always classified as hot work, so pay attention to fire safety regulations during welding and after it.
- Remember that fire can break out from sparks even several hours after the welding work is completed.
- Protect the environment from welding splatter. Remove flammable materials, such as flammable fluids, from the welding vicinity and supply the welding site with adequate firefighting equipment.
- In special welding jobs, be prepared for hazards such as fire or explosion when welding container type work pieces.
- Never direct the spark spray or cutting spray of a grinder toward the welding machine or flammable materials.
- Beware of hot objects or splatter falling on the machine when working above the machine.
- Welding in flammable or explosive sites is absolutely forbidden.

Noise —— excessive noise will do harm to hearing!

- Use ear shield or wear other hearing protection device to protect your ear.
- Warn the bystander that noise will cause potential damage to hear.

Trouble——ask for help from professional personnel when trouble occurs，please contact your supplier or Our company's service center immediately to seek for help from professional personnel.

- When encounter difficulty in installation and operation, please ask for help from professional personnel.

Warning ！

1. Install the leakage protection device when using the equipment!
2. Install a fuse or circuit-breaker when using the machine.
3. Non-operator (bystander) must be far away from the operation site for 5m, the operation site should be protected by enclosure.
4. It can’t be used as the cardiac pacing, air pipe welding, etc.
5. warning against the use of a welding power source for pipe thawing.

1.2 Key points of safety

This welding machine is furnished with overvoltage, overcurrent and overheating protection circuit. When electric grid voltage, output current and interior temperature exceed the setting standard, welding machine will stop automatically； but overuse(such as overvoltage) may damage welding machine, therefore, you should pay attention to the following points：

1.2.1 Ensure excellent ventilation!

This welding machine is of mini type welding machine. There is great working current passing through it when working, so natural ventilation could not satisfy the cooling requirement of welding machine, therefore, a built-in fan is provided to cool the welding machine effectively to make it work steadily.

The operator should ensure the ventilation not be covered or blocked, the distance from the welding machine to objects around it should not be less than 0.3m. User should always keep excellent ventilation which is vital to perfect working and long service life of welding machine.

1.2.2 Overload is forbidden!

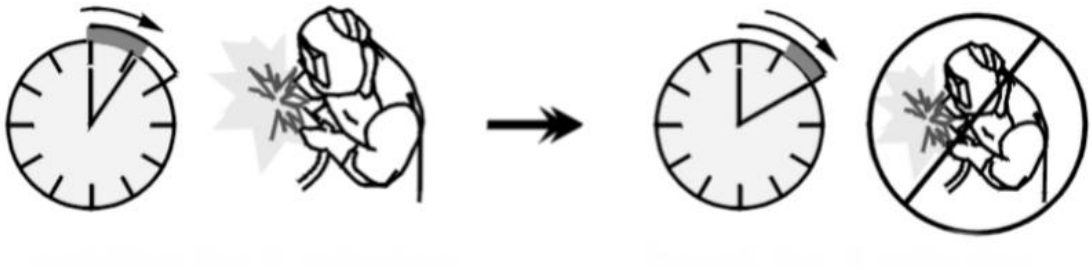
The operator shall observe and check the maximum allowable load current (relative to the selected duty cycle)

from time to time to ensure that the welding current does not exceed the maximum allowable load current.

Current overload may shorten the service life of welding machine remarkably even cause burnt of welding machine.

The duty cycle of a welding machine is the percentage of time in a 10-minute cycle at which the welder can operate the machine at rated welding current.

30% Duty Cycle



Welding for 3 minutes. Break for 7 minutes.

When the welder is working beyond the standard operating cycle, it may enter the protected mode and stop, which indicates that the welder has exceeded the standard operating cycle and excessive heat will activate the temperature detection switch, making the welder stop, at the same time, the indicator light on the front panel will be on. In this case, there is no need to unplug the power plug so that the cooling fan can operate continuously to cool the welding machine. When the light is off, the temperature has dropped to the standard range and can be resoldered.

⚠ Warning

When output exceed duty cycle grade, the temperature in equipment will rise up, at this moment, the protective circuit will work and disconnect the power source output, the equipment will not resume work until it cools to normal temperature.

Notice: Persistent overload may damage welding power source.

1.2.3 Overvoltage is forbidden!

The supply voltage is listed in "main performance parameter" table. In general, the automatic voltage compensation circuit in welding machine will ensure the welding current within the allowable range. When the power source voltage exceeds allowable value, the welding machine may be damaged. The operator should fully realize this instance and take corresponding preventive measures.

1.3 Use of personal protective equipment

1.3.1 The arc and its reflecting radiation damage unprotected eyes. Shield your eyes and face appropriately before you start welding or observe welding. Also note the different requirements for the darkness of the screen in the mask as the welding current changes.

1.3.2 The arc radiation and spatters burn unprotected skin. Always wear protective gloves, clothing and footwear when welding.

1.3.3 Always wear hearing protection if the ambient noise level exceeds the allowable limit (e.g., 85 dB(A)).

1.4 Other operating safety

1.4.1 Exercise caution when handling parts heated in welding. For example, the tip of the welding electrode holder, the end of the welding rod and the work piece will heat during gouging to a burning temperature.

1.4.2 Never wear the device on the shoulder during welding and never suspend it by the carrying strap during welding.

1.4.3 Do not expose the machine to high temperatures, as heat may cause damage to the machine.

1.4.4 Keep the electrode holder cable and earth cable as close to each other as possible throughout their length. Straighten any loops in the cables. This minimizes your exposure to harmful magnetic fields, which may interfere with a pacemaker, for example.

1.4.5 Do not wrap the cables around the body.

1.4.6 In environments classified as dangerous, only use S-marked welding devices with a safe idle voltage level. These work environments include, for example, humid, hot or small spaces where the user may be directly exposed to the surrounding conductive pieces.

1.4.7 You should pay attention to prevent it's toppled over if the welding power placed in inclined plane.

1.4.8 Forbid use the welding power to unfreeze pipeline.

1.4.9 Insulate yourself from the welding circuit by using dry and undamaged protective clothing.

1.4.10 Never touch the work piece and welding rod, welding electrode or contact tip at the same time.

1.4.11 Do not put the electrode holder or ground cable on the welding machine or other electric equipment.

1.5 Transportation, lifting and suspension

1.5.1 Never pull or lift the machine by the electrode holder or other cables. Always use the lift points or handles designed for that purpose.

1.5.2 Only use a transportation platform designed for the equipment.

1.5.3 Try to transport the machine in an upright position, if possible.

1.5.4 Never use a welding machine when suspended

1.5.5 Do not exceed the maximum allowed load of suspension booms or the transportation trolley of welding equipment.

1.6 Environment

1.6.1 When the operator's action is limited by environment (such as: only can work on bended knees, on foot or lay), it must avoid directly contacting the current-carrying part on equipment with body.

1.6.2 Don't use the machine in the event the operating environmental space is very narrow and small which make the operator unable to step aside the current-carrying conductor.

1.6.3 Don't use the machine in humid environment, where the operators easy to sweat which make them in great electric shock risks

1.6.4 Don't conduct the welding in the dust area or under the environment of corrosive gas.

1.6.5 Don't conduct the gas shielded welding work under the environment of stronger air flow.

1.6.6 Inclination between placement of welding machine and horizontal plane is ≤10°.

1.6.7 The welding power source is not suitable for use in rain or snow, although it can be used and stored outdoors. Protect the equipment against rain, water and strong sunlight.

1.6.8 Always store the machine in a dry and clean space. Shield it from rain, and in temperatures exceeding +25 °C from direct exposure to sun.

1.6.9 Protect the machine from sand and dust during use and in storage.

1.6.10 Place the machine so that it is not exposed to hot surfaces, sparks or spatters.

1.6.11 Make sure the airflow to and from the machine is unrestricted.

1.6.12 EMC classification of this product is class A in accordance with electromagnetic compatibility standards EN 60974-10, and therefore the product is designed to be used in industrial environment only.

1.6.13 Arc welding equipment always cause electromagnetic disturbance. To minimize the harmful effects of this, use the equipment strictly according to the operating manual and other recommendations.

⚠ WARNING: This class A equipment is not intended for use in residential locations where the electrical power is provided by a public low-voltage supply system. In those locations it may be difficult to ensure the electromagnetic compatibility due to conducted and radiated disturbances.

Ensure the welding machine is placed according to the following instructions:

- range of the temperature of the ambient air: during operation: –10 °C to +40 °C; after transport and storage at: –20 °C to +55 °C;
- relative humidity of the air: up to 50 % at 40 °C; up to 90 % at 20 °C;
- ambient air, free from abnormal amounts of dust, acids, corrosive gases or substances, etc. other than those generated by the welding process.
- altitude above sea level up to 1 000 m;
- Without oil sludge, water vapor and corrosive gas.
- No vibration and strike
- In rainproof and shade place
- More than 300mm to wall to ensure smooth cooling airflow and excellent ventilation

1.7 Other information about the machine

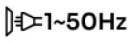
1.7.1 Cooling method: fan cooling.

1.7.2 Characteristics of welding machine: flat characteristic for MIG function; drop characteristic for MMA function.

1.7.3 EMC is Class A according to IEC 60974-10.

1.7.4 Three functions: MIG, TIG, MMA.

1.8 GRAPHIC SYMBOLS AND INDICATIONS

	Warning in operation
	Read this operation manual carefully before use
	It's forbidden to dispose electric waste with other ordinary waste. Please take care of our environment.
	Do not use outdoors
F	Insulation class
	Symbol of argon arc welding
	Symbol of Metal inert and active gas welding
	Symbol of Manual metal arc welding with covered electrodes
	Plasma cutting
	Single-phase static frequency converter-transformer rectifier
	Symbol of single-phase AC power supply and rated frequency
	Can be used in the environment which has high risk of electric shock.
IP	Degree of protection, such as IP21S
U_1	Rated AV input voltage (with tolerance ±10%)

I_{1max}	Rated maximum input current
I_{1eff}	Maximum effective input current
A / V-A / V	range of current regulation and corresponding load voltage.
X	Duty cycle The ratio of given duration time/the full-cycle time Note1: This ratio shall be within 0~1, and can be indicated by percentage. Note2: In this standard, the full-cycle time is 10min. For example, if the duty cycle is 60%, the load-applying time shall be 6min and the following no-load time shall be 4min.
U_0	No-load voltage, Open circuit voltage of secondary winding.
U_2	Load voltage Output voltage of rated load:U2= (14+0.05I2) V For MIG function Output voltage of rated load: U2= (10+0.04I2) V For TIG function Output voltage of rated load: U2= (20+0.04I2) V For MMA function

CONTINUOUS WIRE WELDING MACHINE FOR FLUX, TIG, MMA WELDING.

Note: The term “welding machine” will be used in the text that follows.

GENERAL SAFETY CONSIDERATIONS FOR ARC WELDING

The operator should be properly trained to use the welding machine safely and should be informed about the risks related to arc welding procedures, the associated protection measures and emergency procedures. (Please refer to the applicable standard” EN 60974-9: Arc welding equipment. Part 9: Installation and Use).

- Avoid direct contact with the welding circuit: the no-load voltage supplied by the welding machine can be dangerous under certain circumstances.
- When the welding cables are being connected or checks and repairs are carried out the welding machine should be switched off and disconnected from the power supply outlet.
- Switch off the welding machine and disconnect it from the power supply outlet before replacing consumable torch parts.
- Make the electrical connections and installation according to the safety rules and legislation in force.
- The welding machine should be connected only and exclusively to a power source with the neutral lead connected to earth.
- Make sure that the power supply plug is correctly connected to the earth protection outlet.
- Do not use the welding machine in damp or wet places and do not weld in the rain.

- Do not weld on containers or piping that contains or has contained liquid or gaseous products.
- Do not operate on materials cleaned with chlorinated solvents or near such substances.
- Do not weld on containers under pressure.
- Remove all materials (e.g. wood, paper, rags etc.) from the working area.
- Provide adequate ventilation or facilities for the removal of welding fumes near the arc; a systematic approach is needed in evaluating the exposure limits for the welding fumes, which will depend on their composition, concentration and the length of exposure itself.
- Keep the gas bottle (if used) away from heat sources, including direct sunlight.

- Use electric insulation that is suitable for the torch, the workpiece and any metal parts that may be placed on the ground and nearby (accessible). This can normally be done by wearing gloves, footwear, head protection and clothing that are suitable for the purpose and by using insulating boards or mats.
- Always protect your eyes with the lens which must comply with UNI EN 169 or UNI EN 379, mounted on masks or use helmets that comply with UNI EN 175.
- Use the relative fire-resistant clothing (compliant with UNI EN 11611) and welding gloves (compliant with UNI EN 12477) without exposing the skin to the ultraviolet and infrared rays produced by the arc; the protection must extend to other people who are near the arc by way of screens or sheets.
- Noise: If the daily personal noise exposure (LEPd) is equal to or higher than 85 dB(A) because of particularly intensive welding operations, suitable personal protective means must be used.

- The of the welding current generates electromagnetic (EMF) around the welding circuit.
Electromagnetic can interfere with certain medical equipment (e.g. Pacemakers, respiratory equipment, metallic prostheses etc.). Adequate protective measures must be adopted for persons with these types of medical apparatus. For example, they must be forbidden access to the area in which welding machines are in operation.

This welding machine conforms to technical product standards for exclusive use in an industrial environment for professional purposes. It does not assure compliance with the basic limits relative to human exposure to electromagnetic field in the domestic environment.

The operator must adopt the following procedures in order to reduce exposure to electromagnetic fields.
- Fasten the two welding cables as close together as possible.
- Keep head and trunk as far away as possible from the welding circuit.
- Never wind welding cables around the body.
- Avoid welding with the body within the welding circuit. Keep both cables on the same side of the body.
- Connect the welding current return cable to the piece being welded, as close as possible to the welding joint.
- Do not weld while close to, sitting on or leaning against the welding machine (keep at least 50 cm away from it).
- Do not leave objects in ferromagnetic material in proximity of the welding circuit.
- Minimum distance d= 20 cm.

- Class A equipment:
This welding machine conforms to technical product standards for exclusive use in an industrial environment and for professional purposes. It does not assure compliance with electromagnetic compatibility in domestic dwellings and in premises directly connected to a low-voltage power supply system feeding buildings for domestic use.

⚠ EXTRA PRECAUTIONS

- WELDING OPERATIONS:
- In environments with increased risk of electric shock;
- In spaces;
- In the presence of or explosive materials; MUST BE evaluated in advance by an “Expert supervisor” and must always be carried out in the presence of other people trained to intervene in emergencies.
- All protective technical measures MUST be taken as provided in 7.10; A.8; A.10 of the applicable standard EN 60974-9: Arc welding equipment. Part 9: Installation and Use”.
- Welding **MUST NOT** be allowed if the welding machine or wire feeder is supported by the operator.
- The operator MUST NOT BE ALLOWED to weld in raised positions unless safety platforms are used.
- VOLTAGE BETWEEN ELECTRODE HOLDERS OR TORCHES: working with more than one welding machine on a single piece or on pieces that are connected electrically may generate a dangerous accumulation of no-load voltage between two different electrode holders or torches, the value of which may reach double the allowed limit. An expert coordinator must be designated to measuring the apparatus to determine if any risks subsist and suitable protection measures can be adopted, as foreseen by section 7.9 of the applicable standard” EN 60974-9: Arc welding equipment. Part 9: Installation and Use”.

⚠ RESIDUAL RISKS

OVERTURNING: position the welding machine on a horizontal surface that is able to support the weight: otherwise (e.g. inclined or uneven etc.) there is danger of overturning.
- IMPROPER USE: it is hazardous to use the welding machine for any work other than that for which it was designed
(e.g. de-icing mains water pipes).
- IMPROPER USE: the use the welding machine by more than one operator at the same time may be dangerous.
- MOVING THE WELDING MACHINE: Always secure the gas bottle, taking suitable precautions so that it cannot fall
accidentally (if used).
- Do not use the handle to hang the welding machine.

The safety guards and moving parts of the covering of the welding machine and of the wire feeder should be in their proper positions before connecting the welding machine to the power supply.

 **WARNING!**

Any manual operation carried out on the moving parts of the wire feeder, for example:
- Replacing rollers and/or the wire guide;
- Inserting wire in the rollers;
- Loading the wire reel;
- Cleaning the rollers, the gears and the area underneath them;
- Lubricating the gears.

SHOULD BE CARRIED OUT WITH THE WELDING MACHINE SWITCHED OFF AND DISCONNECTED FROM THE POWER SUPPLY OUTLET.

WARNING! BEFORE USING THE WELDING MACHINE READ THE INSTRUCTION MANUAL CAREFULLY.

2. INTRODUCTION AND GENERAL DESCRIPTION

This welding machine is suitable for core wires, can be used without FLUX protection gas, adapting torch polarity according to the indications of the wire producer. It’s particularly suitable for light metalwork fabrication and in body shops.

The welding machine can be used for TIG welding in direct current (DC), with arc striking upon contact (LIFT ARC mode). It welds all types of steel (carbon, Low- and high-alloy) and heavy metals (copper, nickel, titanium and their alloys) with a gas shield of pure (99.9%) Argon or, for special uses, with an Argon/Helium mix. It can also be used for MMA electrode welding in direct current (DC) using coated electrodes (Rutile, Acid, Basic).

2.1 MAIN CHARACTERISTICS

FLUX
- FCAW - NO GAS - 0.8mm
- FCAW - NO GAS - 1.0mm

TIG
- LIFT strike

MMA
- Welding current adjust
- Arc Force - 0 ~ 10
- Hot Start - 0 ~ 10

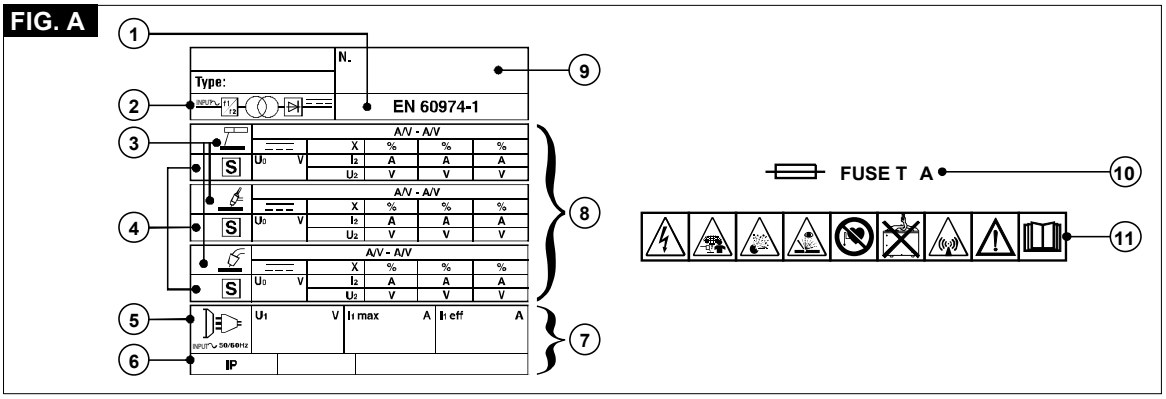
PROTECTIONS
- Thermostatic safeguard.
- Protection against accidental short-circuits caused by connect between torch and earth;
- Protection against irregular voltage (power supply voltage too high or too low)

2.2 STANDARD ACCESSORIES
- MIG Torch;
- Earth clamp;
- Electrode Holder with cable

2.3 OPTIONAL ACCESSORIES
- Self darkening helmet;
- FLUX welding kit;
- TIG welding kit;

3. TECHNICAL DATA

FIG. A



3.1 DATE PLATE

The most important data regarding use and performance of the welding are summarized on the rating plate and have the following meaning:

1 - European standard of reference, for safety and construction of arc welding machines

2- Symbol for internal structure of the welding machine.

3- Symbol for welding procedure provided.

4- Symbol S: indicates that welding operations may be carried out in environments with heightened risk of electric shock

(e.g. very close to large metallic volumes).

5- Symbol for power supply line:

1~ : single phase alternating voltage; 3~ : 3-phase alternating voltage.

6- Protection rating of the covering.

7- Technical specifications for power supply.

- U1 : Alternating voltage and power supply frequency of welding machine (allowed limit ±10%).

- I1 max : Maximum current absorbed by the line.

- I1eff : effective current supplied.

8- Performance of the welding circuit:

- U0 : maximum no-load voltage (open welding circuit).

- I2/U2 : current and corresponding normalized voltage that the welding machine can supply during welding.

- X : Duty cycle: indicates the time for which the welding machine can supply the corresponding current (same column).

It is expressed as %, based on a 10 min. cycle (e.g. 60% = 6 minutes working, 4 minutes pause, and so on).

If the usage factors (on the plate, referring to a 40°C environment) are exceeded, the thermal safeguard will trigger

(the welding machine will remain in standby until its temperature returns within the allowed limits).

- A/V-A/V: shows the range of adjustment for the welding current at the corresponding arc voltage.

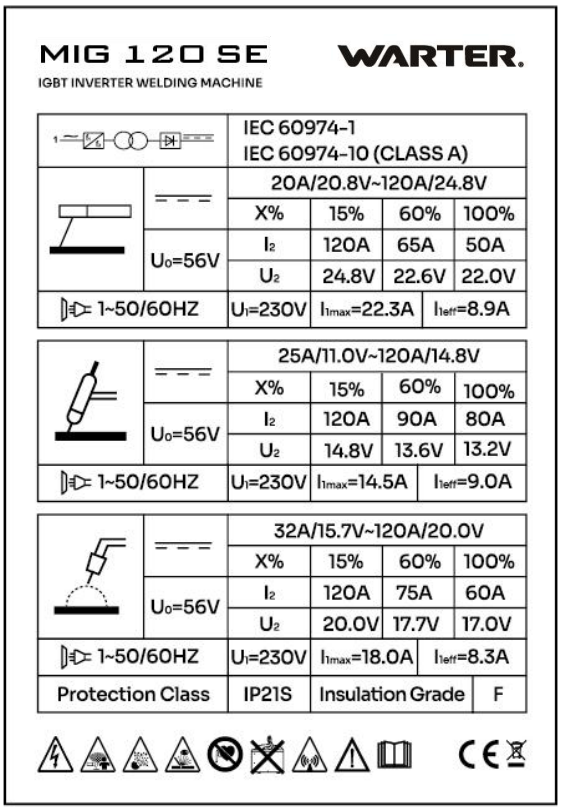
9- Manufacture’s serial number for welding machine identification (indispensable for technical assistance, requesting spare parts, discovering product origin).

10- : Size of delayed action fuses to be used to protect the power line.

11- Symbols referring to safety regulations, whose meaning is given in chapter 1 “General safety considerations for arc welding”.

Note: The data plate shown above is an example to give the meaning of the symbols and numbers; the exact values of technical data for the welding machine in your possession must be checked directly on the data plate of the welding machine itself.

3.2 WELDING MACHINE TECHNICAL DATA:



ATTENTION!

The duty cycle is tested under 40°C according to the IEC 60974-1, IEC 60974-10(CLASS A).

Normally, if you weld in an environment below 40°C, the actual duty cycle rate of the machine will be higher than the data indicated on the nameplate. To ensure your safety, we strongly recommend that you select the fuse with the highest specification (Fuse > I1max) !!!

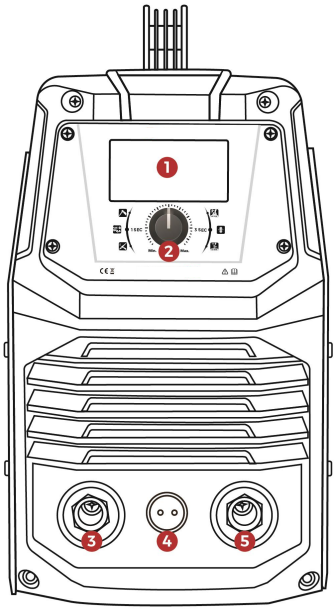
CAUTION

While welding above 110A，
you need to change
overcurrent protection for a 32A type D, and change for a proper input plug (or connect directly to power network).

4. WELDING MACHINE DESCRIPTION

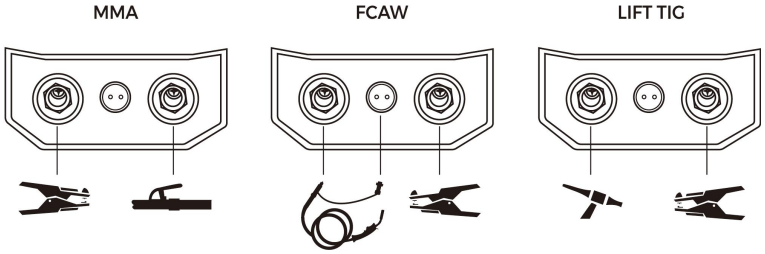
4.1 CONTROL, ADJUSTMENT AND CONNECTING DEVICES.

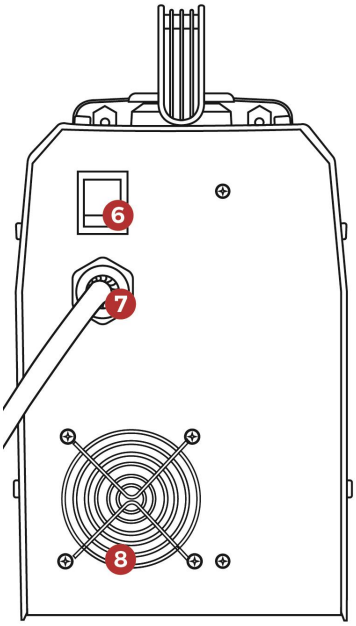
4.1.1 WELDING MACHINE (Fig. B)



FRONT PANEL (Fig.B)

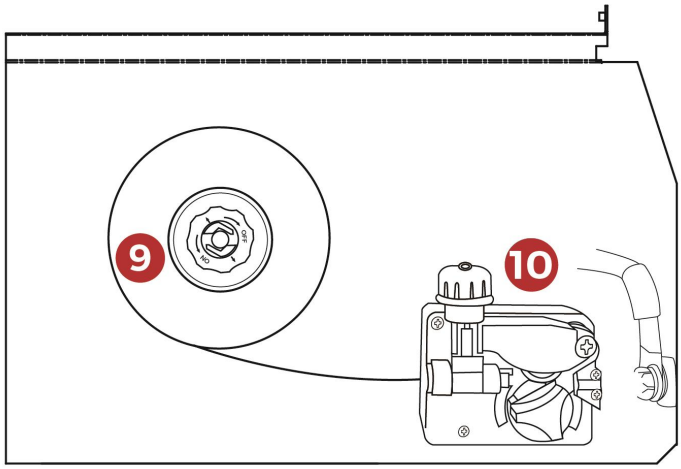
1. Screen
2. Welding Process Button. /Welding Current Knob.
3. Connector (Fig B-1)





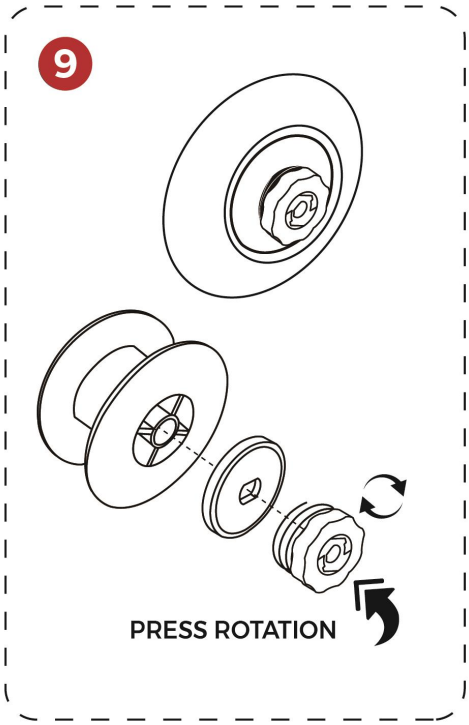
REAR PANEL (Fig.B)

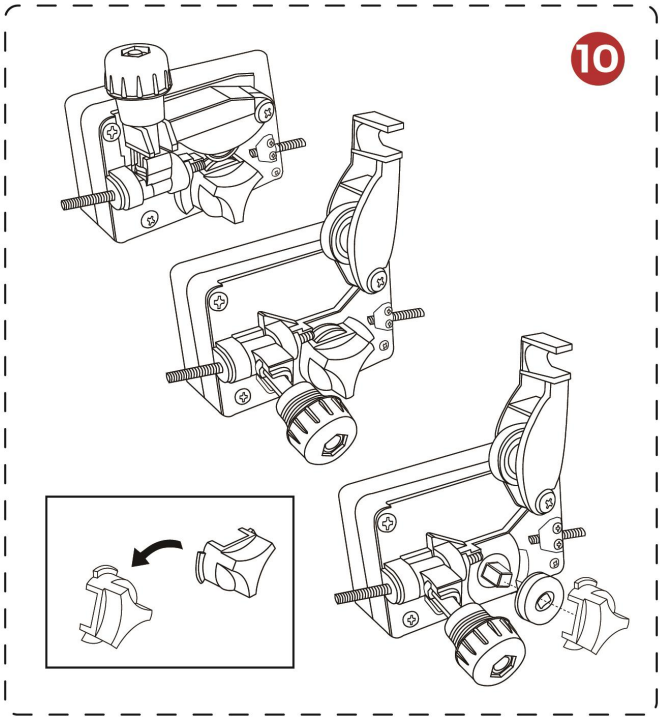
7. Power core.
6. Power Switch.
8. Fan Cover.



Interior Layout (Fig.B)

9. SPOOL SUPPORTER (Installation see following disassembly diagram)
10. WIRE FEEDER (Installation see following disassembly diagram)





4.1.2 WELDING MACHINE CONTROL PANEL（Fig.C）

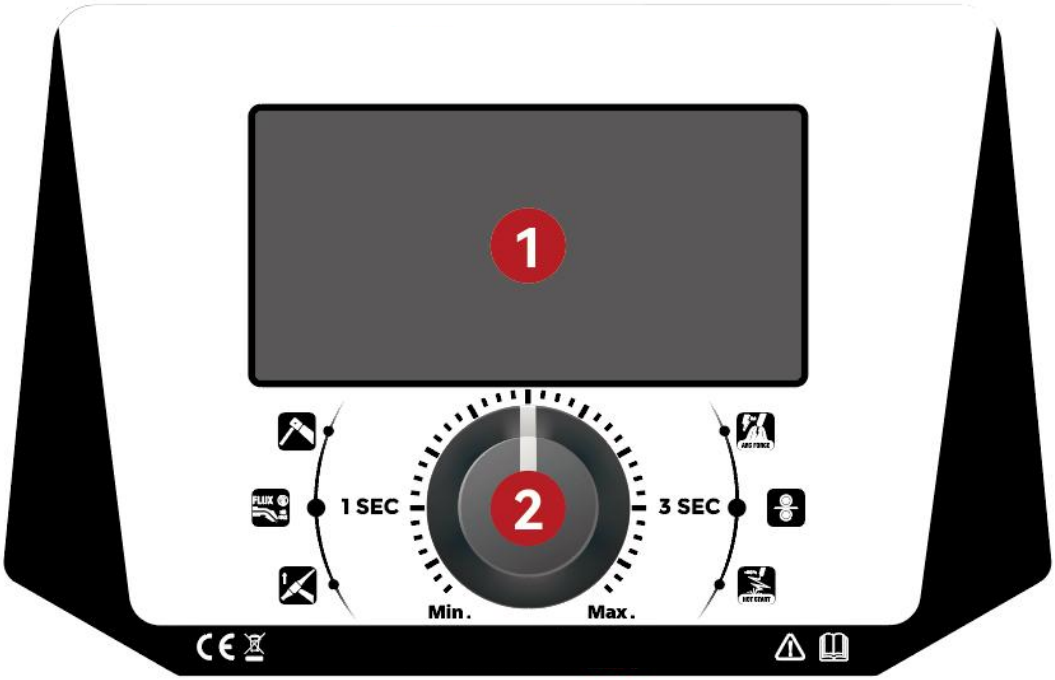


FIG C - 1 Screen
All welding functions, process, and parameter values will be shown on the screen clearly
- Adjusts the welding current

FIG C - 2 Welding Adjust Button.
-Pressed 1 second, it selects the FLUX 0.8mm, FLUX 1.0mm, MMA or LIFT TIG welding mode.
-Pressed 3 seconds (MMA mode), it adjusts subfunctions: Arc Force - 0 ~ 10 / Hot Start - 0 ~ 10.
-Rotate to adjust current and MMA's subfunction values.

5. INSTALLATION

WARNING!

ALL INSTALLATION OPERATIONS AND ELECTRICAL CONNECTIONS MUST ALWAYS BE CARRIED OUT WITH THE WELDING MACHINE SWITCHED OFF AND DISCONNECTED FROM THE POWER SUPPLY. THE ELECTRIC CONNECTIONS MUST ONLY BE CARRIED OUT BY EXPERT OR QUALIFIED TECHNICIANS.

ASSEMBLY

Please refer to Fig B-1

5.1 POSITIONING THE WELDING MACHINE

Choose the place where the welding machine is to be installed so that there are no obstructions to the cooling air inlets and outlets; at the same time make sure that conductive dust, corrosive vapors, humidity etc. cannot be drawn into the machine. Leave at least 250 mm of free space all around the welding machine.

WARNING!

Position the welding machine on a level surface with sufficient load-bearing capacity, so that it cannot be tipped over or shift dangerously.

5.2 CONNECTION TO THE MAIN POWER SUPPLY

Check the input voltage, phase, and frequency supplied to this machine before turning it on. The allowable input voltage is indicated in the technical specification section of this manual and on the rating plate of the machine. Be sure that the machine is grounded.

- The welding machine must be connected only and exclusively to a power supply with the neutral conductor connected to earth.
- To ensure protection against indirect contact use residual current devices of the following types:

* Type A () for single-phase machines; * Type B () for 3-phase machines.

- To comply with the requirements of the EN 61000-3-11 (Flicker) standard we recommend connecting the welding machine to interface points of the power supply that have an impedance of less than:

Zmax = 0.47 ohm (80A).
Zmax = 0.29 ohm (130A).
Zmax = 0.25 ohm (150A).
Zmax = 0.23 ohm (160A).
Zmax = 0.17 ohm (200A).

- The welding machine 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 welding machine itself is suitable for connecting to it (if necessary, consult the distribution network company).

- Unless otherwise specified (MPGE), the welding machines are compatible with power generating sets for voltage oscillations up to ± 15%.
- Make sure the power available at the input connection is adequate for normal operation of the machine. The fuse rating and cable sizes are both indicated below:

FOR EXAMPLE:
MIG 120 SE
For MIG

Fuse/Overcurrent protection type	Welding current [A]	DUTY CYCLE (X%) at **40°C**
D16 (16A - slow)	<60A	100% (10mins)
D16 (16A - slow)	<75A	60% (6mins)
D16 (16A - slow)	120A	15% (10mins)
D20 (20A - slow)	120A	60% (6mins)

Caution: While welding above 100A, you need to change overcurrent protection for a 20A type D, and change for a proper input plug (or connect directly to power network).

For MMA

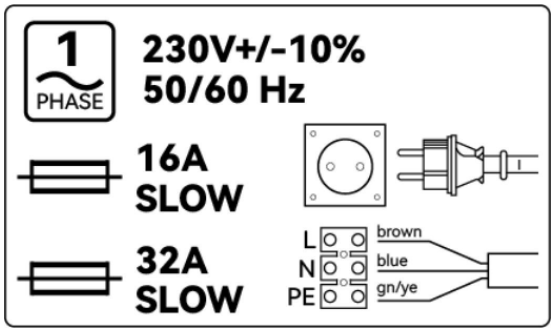
Fuse/Overcurrent protection type	Welding current [A]	DUTY CYCLE (X%) at **40°C**
D16 (16A - slow)	<50A	100% (10mins)
D16 (16A - slow)	<65A	60% (6mins)
D32 (32A - slow)	120A	15% (10mins)

Caution: While welding above 110A, you need to change overcurrent protection for a 32A type D, and change for a proper input plug (or connect directly to power network).

For TIG

Fuse/Overcurrent protection type	Welding current [A]	DUTY CYCLE (X%) at **40°C**
D16 (16A - slow)	<80A	100% (10mins)
D16 (16A - slow)	<90A	60% (6mins)
D16 (16A - slow)	120A	15% (10mins)

For Example:



Warning ! **The duty cycle is tested under 40°C according to the EN IEC 60974-1:2012.**
Normally, if you weld in an environment below 40°C, the actual duty cycle rate of the machine will be higher than the data indicated on the nameplate. To ensure your safety, we strongly recommend that you replace the fuse with the highest specification (Fuse > I1max) !!!

WARNING!

Failure to observe the above rules will make the (Class 1) safety system installed by the manufacturer ineffective

with consequent serious risks to persons (e.g. electric shock) and objects (e.g. µre).

Before connecting the welding cables, make sure the welder is turned off and disconnected from the power outlet.

5.3 Plug and outlet

- **The 230V model** is fitted at the factory with a power supply cable and normalized plug, (2P + T) 10A/250V .
It can therefore be connected to a mains outlet fitted with fuses or an automatic circuit-breaker; the special earth terminal should be connected to the earth conductor (yellow-green) of the power supply line.

- **For welding machines without a plug(115/230Vmodels)**, connect a normalized plug (2P + T) - having sufficient capacity- to the power cable and prepare a mains outlet fitted with fuses or an automatic circuit-breaker; the special earth terminal should be connected to the earth conductor (yellow-green) of the power supply line.

WARNING!

Failure to observe the above rules will make the (Class 1) safety system installed by the manufacturer ineffective with consequent serious risks to persons (e.g. electric shock) and objects (e.g. µre).

CONNECTION OF THE WELDING CABLES

BEFORE MAKING THE FOLLOWING CONNECTIONS MAKE SURE THE WELDING MACHINE IS SWITCHED OFF AND DISCONNECTED FROM THE POWER SUPPLY OUTLET.

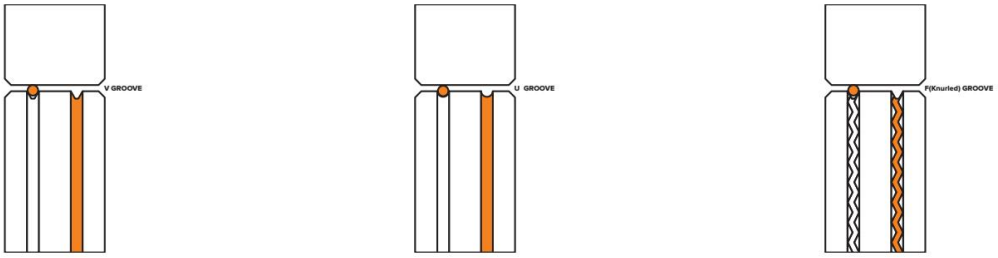
6. FLUX MIG WELDING GUIDE

6.1 GENERAL DESCRIPTIONS

Flux-cored arc welding (FCAW) is a semi-automatic or automatic arc welding process. FCAW requires a continuously fed consumable tubular electrode containing a flux and a constant-voltage or, less commonly, a constant-current welding power supply. An externally supplied shielding gas is sometimes used, but often the flux itself is relied upon to generate the necessary protection from the atmosphere, producing both gaseous protection and liquid slag protecting the weld.

Flux Cored / Gasless Wire (Knurled/F Groove)

These wires are made up of a thin metal sheath that has fluxing, and metal compounds layered onto it and then rolled into a cylinder to form the finished wire. The wire cannot take too much pressure from the top roller as it can be crushed and deformed if too much pressure is applied. A Knurled/F groove drive roller has been developed, and it has small serrations in the groove. The serrations grip the wire and assist in driving it without too much pressure from the top roller. The downside to the knurled wire feed roller on flux-cored wire is it will slowly over time bit by bit eat away at the surface of the welding wire, and these small pieces will eventually go down into the liner. This will cause clogging in the liner and added friction that will lead to welding wire feed problems. A U groove wire can also be used for flux core wire without the wire particles coming off the wire surface. However, it is considered that the knurled roller will give a more positive feed of flux core wire without any deformation of the wire shape.

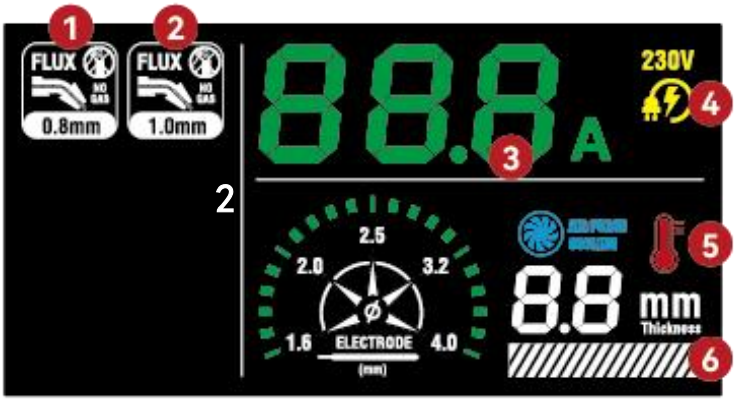


6.2 SET UP FOR FLUX MIG WELDING

1) Properly connect the grounding clamp and MIG gun according to FIG B-1 (FCAW).
2) Connect the Power plug, then switch the machine ON.
3) Install the correct wire feed roll refer to FIG B - 10 (K Roller 0.8/1.0mm)
4) Place 1kg wire spool onto the spool holder refer to FIG B-9
5) Feed wire through the inlet guide tube through to the outlet guide tube. Ensure that the wire passes through the roller.
6) Lift roller tension knob to lock wire in place. Twist to tighten.
7) Remove front end consumables from the MIG torch.
8) Hold the torch trigger to feed wire through to the torch. If the wire slips or stops you will need to adjust the roller tension knob.
9) Replace front end consumables on the MIG torch.
10) Connect the earth clamp to your workpiece.

Now the user can start welding.

6.2.1 FCAW MIG WELDING SCREEN DISPLAY



1) FLUX (0.8mm diameter welding wire) welding process setting
2) FLUX (1.0mm diameter welding wire) welding process setting
3) Welding Current display (Adjustable by knob FIG C-2.
4) It's activated when the power on.
5) The Icon will be activated when the machine is on overheat and overload.
6) Recommended work piece thickness.

⚠ WARNING! BEFORE STARTING THE OPERATIONS TO LOAD THE WIRE.

MAKE SURE THE WELDING MACHINE IS SWITCHED OFF AND DISCONNECTED FROM THE MAIN POWER SUPPLY OUTLET.

MAKE SURE THAT THE WIRE FEEDER ROLLERS, THE WIRE GUIDE HOSE AND THE CONTACT TIP OF THE TORCH MATCH THE DIAMETER AND TYPE OF WIRE TO BE USED AND MAKE SURE THAT THESE ARE FITTED CORRECTLY. WHEN INSERTING AND THREADING THE WIRE DO NOT WEAR PROTECTIVE GLOVES.

- Open the reel compartment door.
- Position the wire reel on the spindle, holding the end of the wire upwards; make sure the tab

for pulling the spindle is correctly seated in its hole.

- Release the pressure counter-roller(s) and move them away from the lower roller(s);
- Make sure that the towing roller(s) is suited to the wire used.
- Free the end of the wire and remove the distorted end with a clean cut and no burr; turn the reel anticlockwise and thread the end of the wire into the wire-guide infeed, .
- Re-position the counter-roller(s), adjusting the pressure to an intermediate value, and make sure that the wire is correctly positioned in the groove of the lower roller(s)
- Remove the nozzle and contact tip.
- Insert the welding machine plug in the power supply outlet, switch on the welding machine, press the torch button and wait for the end of the wire to pass through the whole of the wire guide hose and protrude by 10-15 cm from the front part of the torch, release the button.

⚠**WARNING! During these operations the wire is live and subject to mechanical stress;**

therefore, if adequate precautions are not taken the wire could cause hazardous electric shock, injury and striking of electric arcs:

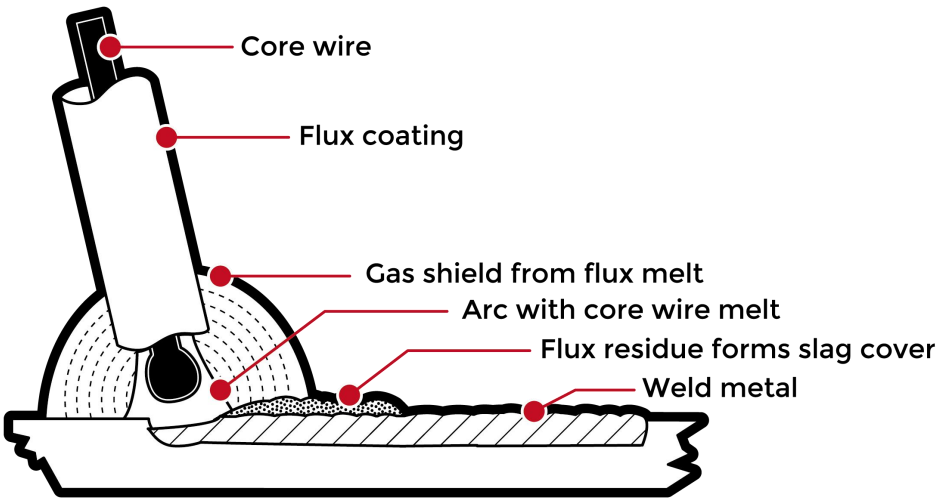
- Do not direct the mouthpiece of the torch towards parts of the body.
- Keep the torch away from the gas bottle.
- Re-fit the contact tip and the nozzle onto the torch.
- Check that wire feed is regular; set the roller and spindle braking pressure to the minimum possible values making sure that the wire does not slide in the groove and when feed is halted the loops of wire are not loosened by excessive reel inertia.
- Cut the end of the wire so that 10-15 mm protrude from the nozzle.
- Close the reel compartment door.

7. MMA WELDING GUIDE

7.1 GENERAL DESCRIPTIONS

Manual Metal Arc (STICK) Welding

One of the most common types of arc welding is Manual Metal Arc welding, also known as MMA welding. An electric current is used to strike an arc between the base material and a consumable electrode rod or ‘stick’. The electrode rod is made of a material that is compatible with the base material being welded. They are covered with a flux that gives off gaseous vapors that serve as a shielding gas and provide a layer of slag, both of which protect the weld area from atmospheric contamination. The electrode core itself acts as filler material. The residue from the flux that forms a slag covering over the weld metal must be chipped away after welding.



- The arc is initiated by momentarily touching the electrode to the base metal.
- The heat of the arc melts the surface of the base metal to form a molten pool at the end of the electrode.
- The melted electrode metal is transferred across the arc into the molten pool and becomes the deposited weld metal.
- The deposit is covered and protected by a slag which comes from the electrode coating.
- The arc and the immediate area are enveloped by an atmosphere of protective gas.

Manual Metal Arc (stick) electrodes have a solid metal wire core and a flux coating. These electrodes are identified by the wire diameter and by a series of letters and numbers. The letters and numbers identify the metal alloy and the intended use of the electrode.

The metal wire core works as a conductor of the current that maintains the arc. The core wire melts and is deposited into the welding pool.

The covering on a shielded metal arc welding electrode is called flux. The flux on the electrode performs many different functions.
These include:
• Producing a protective gas around the weld area
• Providing fluxing elements and de-oxidisers
• Creating a protective slag coating over the weld as it cools
• Establishing arc characteristics
• Adding alloying elements.
Covered electrodes serve many purposes in addition to adding filler metal to the molten pool. These additional functions are provided mainly by the covering on the electrode.

Electrode Selection

As a general rule, the selection of an electrode is straight forward, in that it is only a matter of selecting an electrode of similar composition to the parent metal. However, for some metals, there is a choice of several electrodes, each of which has particular properties to suit specific classes of work.

The size of the electrode generally depends on the thickness of the section being welded, and the thicker the section, the larger the electrode required. The table gives the maximum size of electrodes that may be used for various thicknesses of section based on using a general-purpose type 6013 electrode.

Correct current selection for a particular job is an important factor in arc welding. With the current set too low, it is difficult to strike and maintain a stable arc. The penetration is reduced and beads with a distinct rounded profile will be deposited. Too high a current is accompanied by overheating of the electrode, resulting in undercut, burning through of the base metal and producing excessive spatter. Normal current for a particular job may be considered as the maximum, which can be used without burning through the work, over-heating the electrode or producing a rough spattered surface. The table shows current ranges generally recommended for a general-purpose type 6013 electrode.

Electrode(mm)	Welding current(A)	
	Min.	Max
1.6	25	50
2.0	40	80
2.5	60	110
3.2	80	150
4.0	140	200
5.0	180	250
6.0	240	270

Arc Length

To strike the arc, the electrode should be gently scraped on the work until the arc is established. An arc too long reduces penetration, produces spatter and gives a rough surface finish to the weld. An excessively short arc will cause sticking of the electrode and result in poor quality welds. The general rule of thumb for down hand welding is to have an arc length no greater than the diameter of the core wire.

Electrode Angle

The angle that the electrode makes with the work is important to ensure a smooth, even transfer of metal. When welding in down hand, fillet, horizontal or overhead, the angle of the electrode is generally between 5 and 15 degrees towards the direction of travel. When vertical up welding, the angle of the electrode should be between 80 and 90 degrees to the workpiece.

Travel Speed

The electrode should be moved along in the direction of the joint being welded at a speed that will give the size of run required. At the same time, the electrode is fed downwards to keep the correct arc length at all times. Excessive travel speeds lead to poor fusion, lack of penetration, etc., while too slow a rate of travel will frequently lead to arc instability, slag inclusions and poor mechanical properties.

Material and Joint Preparation

The material to be welded should be clean and free of any moisture, paint, oil, grease, mill scale, rust or any other material that will hinder the arc and contaminate the weld material. Joint preparation will depend on the method used include sawing, punching, shearing, machining, flame cutting and others. In all cases, edges should be clean and free of any contaminates. The chosen application will determine the type of joint.

WARNING:

Instability of the arc due to the composition of the electrode can occur, depending on the brand, type and thickness of the electrode coatings.

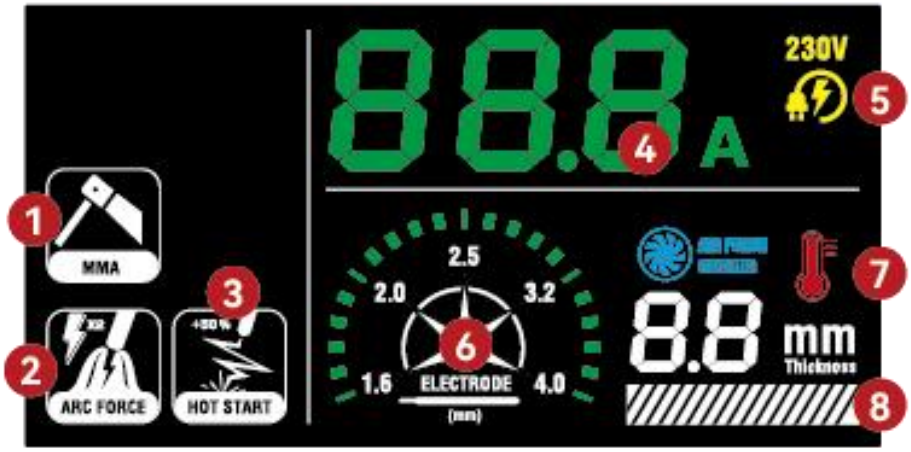
7.2 WELDING CIRCUIT CONNECTION IN MMA MODE

Please refer to Figure B-1

7.2.1 SETUP FOR MMA WLEDING.

1)Connect the plug to power source, the switch the machine ON.
2)Set weld process to MMA.
3)Set weld parameters through button and knob.
4)Place the electrode into electrode holder.
5)Connect earth clamp to your workpiece.
6)Strike electrode against workpiece to initiate arc.

7.3 MMA SCREEN DISPLAY



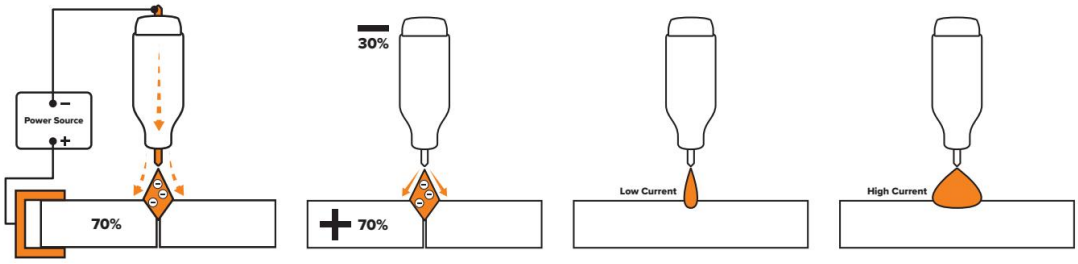
1) MMA welding process setting.
2) ARC-FORCE (0-10) setting (if necessary)
3) HOT-START (0-10) setting (if necessary)
4) Welding Current display (Adjustable by knob Fig.C-2)
5) It's activated when the power on
6) Recommended electrode diameter
7) The Icon will be activated when the machine is on overheat and overload.
8) Recommended work piece thickness

8. TIG DC WELDING GUIDE

8.1 GENERAL DESCRIPTION

The DC power source uses what is known as DC (direct current) in which the main electrical component known as electrons flow in only one direction from the negative pole (terminal) to the positive pole (terminal). In the DC electrical circuit, there is an electrical principle at work which should always be taken into account when using any DC circuit. With a DC circuit, 70% of the energy (heat) is always on the positive side. This needs to be understood because it determines what terminal the TIG torch will be connected to (this rule applies to all the other forms of DC welding as well).

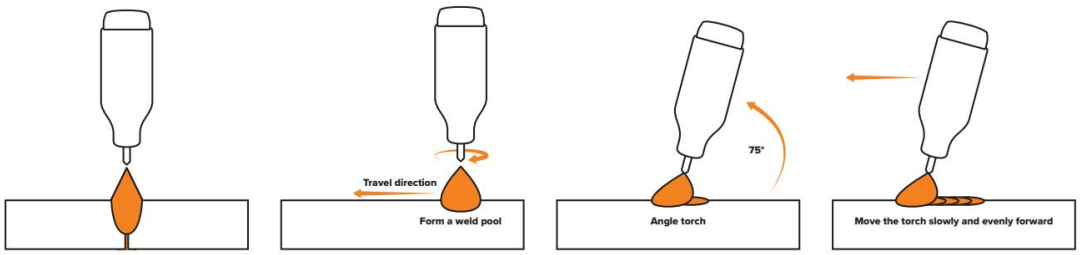
DC TIG welding is a process in which an arc is struck between a tungsten electrode and the metal workpiece. The weld area is shielded by an inert gas flow to prevent contamination of the tungsten, molten pool and weld area. When the TIG arc is struck, the inert gas is ionized and superheated, changing its molecular structure, which converts it into a plasma stream. This plasma stream flowing between the tungsten and the workpiece is the TIG arc and can be as hot as 19,000°C. It is a very pure and concentrated arc which provides the controlled melting of most metals into a weld pool. TIG welding offers the user the highest amount of flexibility to weld the widest range of material thickness and types. DC TIG welding is also the cleanest weld with no sparks or spatter.
The intensity of the arc is proportional to the current that flows from the tungsten. The welder regulates the welding current to adjust the power of the arc. Typically thin material requires a less powerful arc with less heat to melt the material, so less current (amps) is required. Thicker material requires a more powerful arc with more heat, so more current (amps) are necessary to melt the material.



TIG Welding Fusion Technique

Manual TIG welding is often considered the most difficult of all the welding processes. Because the welder must maintain a short arc length, great care and skill are required to prevent contact between the electrode and the workpiece. Similar to Oxygen Acetylene torch welding, TIG welding typically requires two hands and in most instances requires the welder to manually feed a filler wire into the weld pool with one hand while manipulating the welding torch in the other. However, some welds combining thin materials can be accomplished without filler metal, such as edge, corner, and butt joints. This is known as Fusion welding where the edges of the metal pieces are melted together using only the heat and arc force generated by the TIG arc.

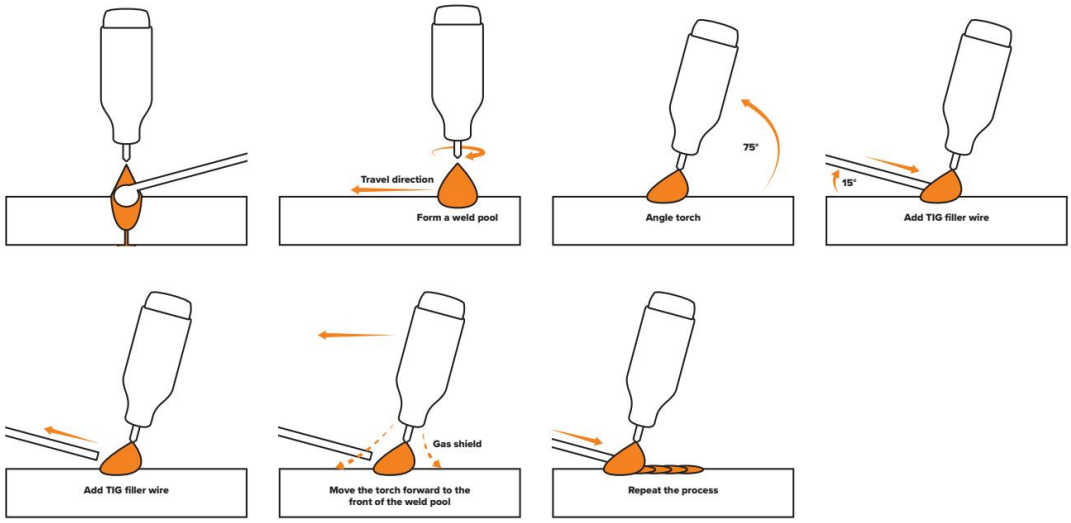
Once the arc is started, the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist in creating a weld pool of the desired size. Once the weld pool is established, tilt the torch at about a 75° angle and move smoothly and evenly along the joint while fusing the materials together.



TIG Welding with Filler Wire Technique

It is necessary for many situations with TIG welding to add a filler wire into the weld pool to build up weld reinforcement and create a strong weld. Once the arc is started, the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist in creating a weld pool of the desired size.

Once the weld pool is established, tilt the torch at about a 75° angle and move smoothly and evenly along the joint. The filler metal is introduced to the leading edge of the weld pool. The filler wire is usually held at about a 15° angle and fed into the leading edge of the molten pool. The arc will melt the filler wire into the weld pool as the torch is moved forward. Also, a dabbing technique can be used to control the amount of filler wire added. The wire is fed into the molten pool and retracted in a repeating sequence as the torch is moved slowly and evenly forward. It is essential during the welding to keep the molten end of the filler wire inside the gas shield as this protects the end of the wire from being oxidised and contaminating the weld pool.



Tungsten Electrodes

- Tungsten is a rare metallic element used for manufacturing TIG welding electrodes. The TIG process relies on tungsten's hardness and high-temperature resistance to carry the welding current to the arc. Tungsten has the highest melting point of any metal, 3,410 degrees Celsius.
- Tungsten electrodes are non-consumable and come in a variety of sizes. They are made from pure tungsten or

an alloy of tungsten and other rare earth elements. Choosing the correct tungsten depends on the material being welded, the number of amps required and whether you are using AC or DC welding current.

- Tungsten electrodes are color-coded at the end for easy identification.

Thoriated (Color Code: Red)

- Thoriated tungsten electrodes (AWS classification EWTh-2) contain a minimum of 97.30 % tungsten and 1.70 to 2.20 % thorium and are called 2 % thoriated. They are the most commonly used electrodes today and are preferred for their longevity and ease of use. Thorium, however, is a low-level radioactive hazard and many users have switched to other alternatives. Regarding the radioactivity, thorium is an alpha emitter, but when it is enclosed in a tungsten matrix, the risks are negligible. Thoriated tungsten should not get in contact with open cuts or wounds. The more significant danger to welders can occur when thorium oxide gets into the lungs. This can happen from the exposure to vapours during welding or ingestion of material/dust in the grinding of the tungsten. Follow the manufacturer's warnings, instructions, and the Material Safety Data Sheet (MSDS) for its use.

Rare Earth (Color Code: Purple)

- Rare Earth tungsten electrodes (AWS classification EWG) contain a minimum of 98% % tungsten and up to 1.5% Lanthanum and small percentages of zirconium and yttrium they are called Rare Earth tungsten. Rare Earth tungsten electrodes provide conductivity similar to that of thoriated electrodes. Typically, this means that Rare Earth tungsten electrodes are exchangeable with thoriated electrodes without requiring significant welding process changes. Rare Earth delivers superior arc starting, electrode lifetime, and overall cost-effectiveness.

- When Rare Earth tungsten electrodes are compared with 2% thoriated tungsten, Rare Earth requires fewer re-grinds and provides a longer overall lifetime. Tests have shown that ignition delay with Rare Earth tungsten electrodes improve over time, while 2% thoriated tungsten starts to deteriorate after only 25 starts. At equivalent energy output, Rare Earth tungsten electrodes run cooler than 2% thoriated tungsten, thereby extending overall tip lifetime. Rare Earth tungsten electrodes work well on AC or DC. They can be used DC electrode positive or negative with a pointed end, or balled for use with AC power sources.

Ceriated (Color Code: Orange)

- Ceriated tungsten electrodes (AWS classification EWCe-2) contain a minimum of 97.30% tungsten and 1.80 to 2.20% cerium and are referred to as 2% ceriated. Ceriated tungstens perform best in DC welding at low current settings. They have excellent arc starts at low amperages and become popular in such applications as orbital tube welding and thin sheet metal work. They are best used to weld carbon steel, stainless steel, nickel alloys, and titanium. In some cases, it can replace 2% thoriated electrodes. Ceriated tungsten is best suited for lower amperages it should last longer than a Thoriated tungsten. Higher amperage applications are best left to Thoriated or Lanthanated tungstens.

Lanthanated (Color Code: Gold)

- Lanthanated tungsten electrodes (AWS classification EWLa-1.5) contain a minimum of 97.80 % tungsten and 1.30 % to 1.70 % lanthanum and are known as 1.5 % lanthanated. These electrodes have excellent arc starting, a low burn-off rate, good arc stability, and excellent re-ignition characteristics. Lanthanated tungstens also share the conductivity characteristics of 2 % thoriated tungsten. Lanthanated tungsten electrodes are ideal if you want to optimise your welding capabilities. They work well on AC or DC electrode negative with a pointed end, or they can be balled for use with AC sine wave power sources. Lanthanated tungsten maintains

a sharpened point well, which is an advantage for welding steel and stainless steel on DC or AC from square wave power sources.

Zirconiated (Colour Code: White)

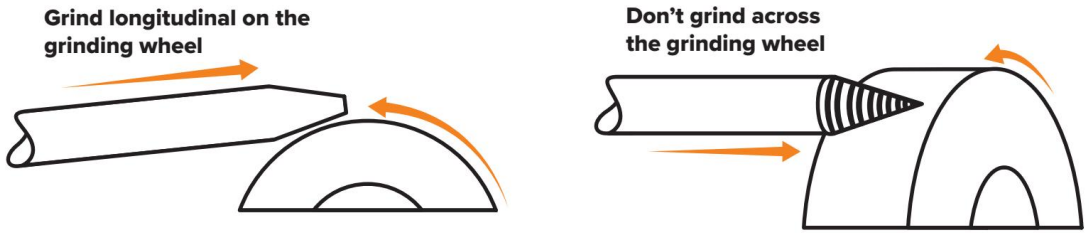
- Zirconiated tungsten electrodes (AWS classification EWZr-1) contain a minimum of 99.10 % tungsten and 0.15 to 0.40 % zirconium. Most commonly used for AC welding, Zirconiated tungsten produces a very stable arc and is resistant to tungsten spitting. It is ideal for AC welding because it retains a balled tip and has a high resistance to contamination. Its current-carrying capacity is equal to or greater than that of thoriated tungsten. Zirconiated tungsten is not recommended for DC welding.

Tungsten Electrodes Rating for Welding Currents

Tungsten Diameter (mm)	Diameter at the Tip (mm)	Constant Included Angle (°)	Current Range (Amps)	Current Range (Pulsed Amps)
1.0mm	0.25	20	5 - 30	5 - 60
1.6mm	0.5	25	8 - 50	5 - 100
1.6mm	0.8	30	10 - 70	10 - 140
2.4mm	0.8	35	12 - 90	12 - 180
2.4mm	1.1	45	15 - 150	15 - 250
3.2mm	1.1	60	20 - 200	20 - 300
3.2mm	1.5	90	25 - 250	25 - 350

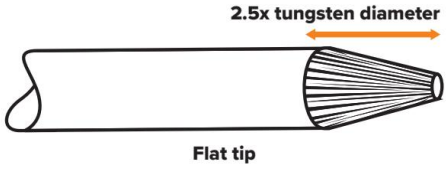
Tungsten Preparation

- Always use DIAMOND wheels when grinding and cutting. While tungsten is a tough material, the surface of a diamond wheel is harder, and this makes for smooth grinding. Grinding without diamond wheels, such as aluminum oxide wheels, can lead to jagged edges, imperfections, or poor surface finishes not visible to the eye that will contribute to weld inconsistency and weld defects. Always ensure to grind the tungsten in a longitudinal direction on the grinding wheel. Tungsten electrodes are manufactured with the molecular structure of the grain running lengthwise and thus grinding crosswise is "grinding against the grain." If electrodes are ground crosswise, the electrons have to jump across the grinding marks, and the arc can start before the tip and wander. Grinding longitudinally with the grain causes the electrons to flow steadily and easily to the end of the tungsten tip. The arc starts straight and remains narrow, concentrated, and stable.



Electrode Tip/Flat

- The shape of the tungsten electrode tip is an important process variable in precision arc welding. A good selection of tip/flat size will balance the need for several advantages. The bigger the flat, the more likely arc wander will occur and the more difficult it will be to arc start. However, increasing the flat to the maximum level that still allows arc starts and eliminates arc wander will improve the weld penetration and increase the electrode life. Some welders still grind electrodes to a sharp point, which makes arc starting easier. However, they risk decreased welding performance from melting at the tip and the possibility of the point falling off into the weld pool.



Electrode Included Angle/Taper - DC

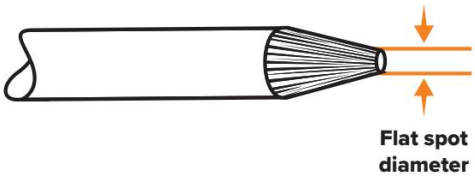
◆ Tungsten electrodes for DC welding should be ground longitudinally and concentrically with diamond wheels to a specific included angle in conjunction with the tip/flat preparation. Different angles produce different arc shapes and offer different weld penetration capabilities. In general, blunter electrodes that have a larger included angle provide the following benefits:

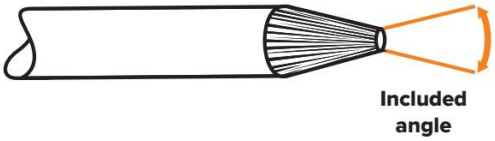
- Last longer
- Have better weld penetration
- Have a narrower arc shape
- Can handle more amperage without eroding

Sharper electrodes with a smaller included angle provides:

- Offer less arc weld
- Have a wider arc
- Have a more consistent arc

The included angle determines the weld bead shape and size. Generally, as the included angle increases, penetration increases and bead width decreases.





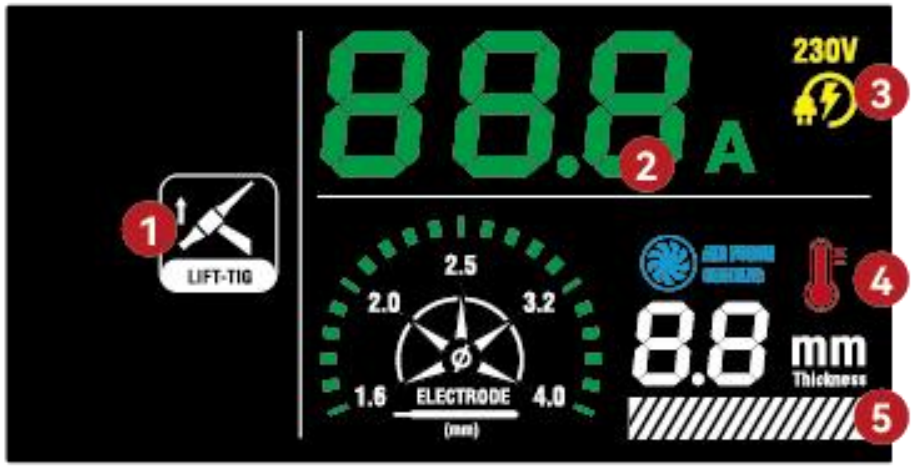
8.2 WELDING CIRCUIT CONNECTION IN TIG MODE

8.2.1 Setup for TIG

1) Connect the TIG torch to the connector (Refer to FIG B-1 (LIFT TIG)), twist to lock in place.
2) Connect the earth clamp to the connector (Refer to FIG B-1 (LIFT TIG)), twist to lock in place.
3) Connecting the gas bottle
4) Screw the pressure reducer onto the gas bottle valve, placing the relative reduction supplied as an accessory between them.
5) Connect the gas input hose to the pressure reducing valve and tighten the supplied strip.
6) Loosen the adjustment ring nut of the pressure reducing valve before opening the gas bottle valve.
7) Open the gas bottle and adjust the quantity of gas (l/min.) according to the recommended usage data.
8) The gas flow can be adjusted while welding, always using the ring nut of the pressure reducer. Check the seal of the hoses and connections.
9) Connect the gas hose of the torch to the gas bottle.
10)Connect earth clamp to your workpiece

ATTENTION! Always close the gas bottle valve when you have finished working.

8.3 LIFT TIG SCREEN DISPLAY



1) LIFT TIG welding process setting.
2) Welding Current display.
3) It's activated when the power on
4) The Icon will be activated when the machine is on overheat and overload.
5) Recommended workpiece thickness

PROCEDURE (LIFT STRIKE)

- Use the knob to adjust the welding current at the required value. Adjust the current during welding to the true thermal ratio that is required.
- Make sure the gas is flowing correctly. The arc ignites through contact, distancing the tungsten electrode from the workpiece. Igniting in this manner causes less electric-irradiated disturbances and reduces tungsten inclusions and electrode wear to a minimum.
- Place the tip of the electrode on the workpiece, pressing gently.
- Immediately lift the electrode by 2-3 mm to obtain the ark strike. The welding machine initially supplies reduced current. After a few seconds, the set welding current is issued.
- Quickly lift the electrode from the workpiece to interrupt welding.

9. ALARM WARNINGS

Reset is automatic when the reason for alarm activation stops. Alarm messages that can appear on the display:

Welding thermal switch has tripped. Operations come to a halt unit the machine has cooled down sufficiently.

10. Error Code

ERROR 1 overload protection

ERROR 2 Overheat protection

ERROR 4 Abnormal power supply voltage

11. MAINTENANCE

WARNING! BEFORE CARRYING OUT MAINTENANCE OPERATIONS MAKE SURE THE WELDING MACHINE IS SWITCHED OFF AND DISCONNECTED FROM THE MAIN POWER SUPPLY.

EXTRAORDINARY MAINTENANCE

EXTRAORDINARY MAINTENANCE MUST ONLY BE CARRIED OUT BY TECHNICIANS WHO ARE EXPERT OR QUALIFIED IN THE ELECTRICMECHANICAL FIELD, AND IN FULL RESPECT OF THE IEC/EN 60974-4 TECHNICAL DIRECTIVE.

WARNING! BEFORE REMOVING THE WELDING MACHINE PANELS AND

WORKING INSIDE THE MACHINE MAKE SURE THE WELDING MACHINE IS SWITCHED OFF AND DISCONNECTED FROM THE MAIN POWER SUPPLY OUTLET.

If checks are made inside the welding machine while it is live, this may cause serious electric shock due to direct contact with live parts and/or injury due to direct contact with moving parts.

- Inspect the welding machine regularly, with a frequency depending on use and the dustiness of the environment, and remove the dust deposited on the transformer, reactance and rectifier using a jet of dry compressed air (mar. 10 Bar)
- Do not direct the jet of compressed air on the electronic boards; these can be cleaned with a very soft brush or suitable solvents.
- At the same time make sure the electrical connections are tight and check the wiring for damage to the insulation.
- At the end of these operations re-assemble the panels of the welding machine and screw the fastening screws right down.
- Never, ever carry out welding operations while the welding machine is open.
- 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 high voltage connections of the primary transformer separate from the low voltage ones of the secondary transformer.
- Use all the original washers and screws when closing the casing

12. TROUBLESHOOTING

IN CASE OF UNSATISFACTORY FUNCTIONING, BEFORE SERVICING MACHINE OR REQUESTING ASSISTANCE, CARRY OUT THE FOLLOWING CHECK:

- Check that when general switch is ON the relative lamp is ON. If this is not the case then the problem is located on the mains (cables, plugs, outlets, fuses, etc.)
- There is no alarm signaling intervention of the thermostat safeguard, over or undervoltage or short-circuit.
- Check that the nominal intermittence ratio is correct. In case there is a thermal protection interruption, wait for the machine to cool down, check that the fan is working properly.
- Check the mains voltage: if the value is too high or too low the welding machine will be stopped.
- Check that there is no short-circuit at the output of the machine: if this is the case eliminate the inconvenience.
- Check that all connections of the welding circuit are correct, particularly that the work clamp is well attached to the workpiece, with no interfering material or surface coverings (i.e.. Paint).
- Protective gas must be of appropriate type and quantity.

12.1 MIG TROUBLESHOOTING

1) Excessive Spatter

- Wire feed speed set too high: Select lower wire feed speed.
- Voltage too high: Select a lower voltage setting.
- Wrong polarity set: Select the correct polarity for the wire being used - see machine setup guide.
- Stick out too long: Bring the torch closer to the work.
- Contaminated base metal: Remove materials like paint, grease, oil, and dirt, including mill scale from
- base metal.
- Contaminated MIG wire: Use clean, dry, rust-free wire. Do not lubricate the wire with oil, grease etc.

Inadequate gas flow or too much gas flow: Check the gas is connected, check hoses, gas valve and torch are not

restricted. Set the gas flow between 8-12L/min flow rate. Check hoses and fittings for holes, leaks etc.

2) Wire stubbing during welding

-Holding the torch too far away: Bring the torch closer to the work and maintain stick out of 5-10mm.
-Welding voltage set too low: Increase the voltage.
-Wire feed speed set too high: Decrease the wire feed speed.

3) Lack of fusion - Failure of weld metal to fuse completely with base metal or a proceeding weld bead

- Contaminated base metal: Remove materials like paint, grease, oil, and dirt, including mill scale from base metal.
- Not enough heat input: Select a higher voltage range and/or adjust the wire speed to suit.
- Improper welding technique: Keep the arc at the leading edge of the weld pool. Gun angle to work should be between 5° & 15°. Direct the arc at the weld joint. Adjust work angle or widen groove to access bottom during welding. Momentarily hold arc on side walls if using weaving technique.

4) Excessive penetration - Weld metal melting through base metal

- Too much heat: Select a lower voltage range and/or adjust the wire speed to suit. Increase travel speed.

5) Lack of penetration - Shallow fusion between weld metal and base metal

- Poor or incorrect joint preparation: Material too thick. Joint preparation and design needs to allow access to bottom of groove while maintaining proper welding wire extension and arc characteristics. Keep the arc at the leading edge of the weld pool and maintain the gun angle at 5° & 15° keeping the stick out between 5-10mm.
- Not enough heat input: Select a higher voltage range and/or adjust the wire speed to suit. Reduce travel speed.
- Contaminated base metal: Remove materials like paint, grease, oil, and dirt, including mill scale, from base metal.

6) No wire feed

- Wrong mode selected: Check that the TIG/MMA/MIG selector switch is set to MIG position.
- Wrong torch selector switch: Check that the STANDARD/SPOOL GUN selector switch is set to STANDARD position for MIG welding and SPOOL GUN when using the spool gun.

7) Inconsistent/interrupted wire feed

- Adjusting wrong dial: Be sure to adjust the WIRE FEED and VOLTAGE dials for MIG welding. The AMPERAGE dial is for STICK and TIG welding mode.
- Wrong polarity selected: Select the correct polarity for the wire being used - see machine setup guide.
- Incorrect wire speed setting: Adjust the wire feed speed.
- Voltage setting incorrect: Adjust the voltage setting.
- MIG torch lead too long: Small diameter wires and soft wires like aluminum don’t feed well through long torch leads - replace the torch with a lesser length torch.
- MIG torch lead kinked or too sharp angle being held: Remove the kink, reduce the angle or bend.
- Contact tip worn, wrong size, wrong type: Replace the tip with correct size and type.
- Liner worn or clogged (the most common causes of bad feeding): Try to clear the liner by blowing out with compressed air as a temporary cure. It is recommended to replace the liner.
- Wrong size liner: Install the correct size liner.
- Blocked or worn inlet guide tube: Clear or replace the inlet guide tube.
- Wire misaligned in drive roller groove: Locate the wire into the groove of the drive roller.

- Incorrect drive roller size: Fit the correct size drive roller e.g. 0.8mm wire requires 0.8mm drive roller.
- Wrong type of drive roller selected: Fit the correct type roller (e.g. knurled rollers needed for flux cored wires).
- Worn drive rollers: Replace the drive rollers.
- Drive roller pressure too high: Can flatten the wire electrode causing it to lodge in the contact tip - reduce the drive roller pressure.
- Too much tension on wire spool hub: Reduce the spool hub brake tension.
- Wire crossed over on the spool or tangled: Remove the spool, untangle the wire or replace the wire.
- Contaminated MIG wire: Use clean, dry, rust-free wire. Do not lubricate the wire with oil, grease etc.

12.2 MMA (STICK) TROUBLESHOOTING

1. No arc

- Incomplete welding circuit: Check earth lead is connected. Check all cable connections.
- Wrong mode selected: Check the MMA selector switch is selected.
- No power supply: Check that the machine is switched on and has a power supply.

2. Porosity - Small cavities or holes resulting from gas pockets in weld metal

- Arc length too long: Shorten the arc length.
- Work piece dirty, contaminated or moisture: Remove moisture and materials like paint, grease, oil, and dirt, including mill scale, from base metal.
- Damp electrodes: Use only dry electrodes.

3. Excessive Spatter

- Amperage too high: Decrease the amperage or choose a larger electrode.
- Arc length too long: Shorten the arc length.

4. Weld sits on top, lack of fusion

• Insufficient heat input: Increase the amperage or choose a larger electrode.
• Work piece dirty, contaminated or moisture: Remove moisture and materials like paint, grease, oil, and dirt, including mill scale, from base metal.
• Poor welding technique: Use the correct welding technique or seek assistance for the correct technique.

5. Lack of penetration

• Insufficient heat input: Increase the amperage or choose a larger electrode.
• Poor welding technique: Use the correct welding technique or seek assistance for the correct technique.
• Poor joint preparation: Check the joint design and fit up, make sure the material is not too thick. Seek assistance for the correct joint design and fit up.

6. Excessive penetration - Burn through

• Excessive heat input: Reduce the amperage or use a smaller electrode.
• Incorrect travel speed: Try increasing the weld travel speed.

7. Uneven weld appearance

• Unsteady hand, wavering hand: Use two hands where possible to steady up, practice your technique.

8. Distortion - Movement of base metal during welding

• Excessive heat input: Reduce the amperage or use a smaller electrode.
• Poor welding technique: Use the correct welding technique or seek assistance for the correct technique.
• Poor joint preparation and or joint design: Check the joint design and fit up, make sure the material is not too thick. Seek assistance for the correct joint design and fit up.

9. Electrode welds with different or unusual arc characteristic
• Incorrect polarity: Change the polarity, check the electrode manufacturer for correct polarity

12.3 TIG TROUBLE SHOOTING

1. Tungsten burning away quickly
- Incorrect gas or no gas: Use pure argon. Check cylinder has gas is connected, turned on and torch valve is open.
- Inadequate gas flow: Check the gas is connected, check hoses, gas valve and torch are not restricted.
- Back cap not fitted correctly: Make sure the torch back cap is fitted so that the O-ring is inside the torch body.
- Torch connected to DC+: Connect the torch to the DC- output terminal.
- Incorrect tungsten being used: Check and change the tungsten type if necessary.
- Tungsten being oxidised after weld is finished: Keep shielding gas flowing 10-15 seconds after arc stoppage. 1 second for each 10 amps of weld current.

2. Contaminated tungsten
- Touching tungsten into the weld pool: Keep tungsten from contacting weld puddle. Raise the torch so that the tungsten is off of the work piece 2-5mm.
- Touching the filler wire to the tungsten: Keep the filler wire from touching the tungsten during welding, feed the filler wire into the leading edge of the weld pool in front of the tungsten.

3. Porosity - Poor weld appearance and color
- Wrong gas / poor gas flow / gas leaks: Use pure argon. Gas is connected, check hoses, gas valve and torch are not restricted. Set the gas flow between 6-10L/min. Check hoses and fittings for holes, leaks etc.
- Contaminated base metal: Remove moisture and materials like paint, grease, oil, and dirt from base metal.
- Contaminated filler wire: Remove all grease, oil, or moisture from filler metal.
- Incorrect filler wire: Check the filler wire and change if necessary.

4. Yellowish residue/smoke on the alumina nozzle & discolored tungsten
- Incorrect gas: Use pure argon gas.
- Inadequate gas flow: Set the gas flow between 6-10L/min flow rate.
- Alumina gas nozzle too small: Increase the size of the alumina gas nozzle.

5. Unstable arc during DC welding
- Torch connected to DC+: Connect the torch to the DC- output terminal.
- Contaminated base metal: Remove materials like paint, grease, oil, and dirt, including mill scale from base metal.
- Tungsten is contaminated: Remove 10mm of contaminated tungsten and re-grind the tungsten.
- Arc length too long: Lower torch so that the tungsten is off of the work piece 2-5mm.

6. Arc wanders during DC welding

- Poor gas flow: Check and set the gas flow between 6-10L/min flow rate.
- Incorrect arc length: Lower torch so that the tungsten is off of the work piece 2-5mm.
- Tungsten incorrect or in poor condition: Check that correct type of tungsten is being used. Remove 10mm from the weld end of the tungsten and re-sharpen the tungsten.
- Poorly prepared tungsten: Grind marks should run lengthwise with tungsten, not circular. Use proper grinding method and wheel.
- Contaminated base metal or filler wire: Remove contaminating materials like paint, grease, oil, and dirt, including mill scale, from base metal. Remove all grease, oil, or moisture from filler metal.

7. Arc difficult to start or will not start DC welding

- Incorrect machine set up: Check machine set up is correct.
- No gas, incorrect gas flow: Check the gas is connected and cylinder valve open, check hoses, gas valve and torch are not restricted. Set the gas flow between 6-10L/min flow rate.
- Incorrect tungsten size or type: Check and change the size and or the tungsten if required.
- Loose connection: Check all connectors and tighten.
- Earth clamp not connected to work: Connect the earth clamp directly to the workpiece wherever possible.

DECLARATION OF CONFORMITY

Cadabra GmbH

Declares that the welding machines:

MIG 120 SE

Conforms to the following directives:
2014/35EU, 2014/30/EU

And has been designed in compliance with the following standards:
EN 60974-1:2012, EN 60974-10:2021

(Signature)

20.07.2025
(Cadabra GmbH)
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