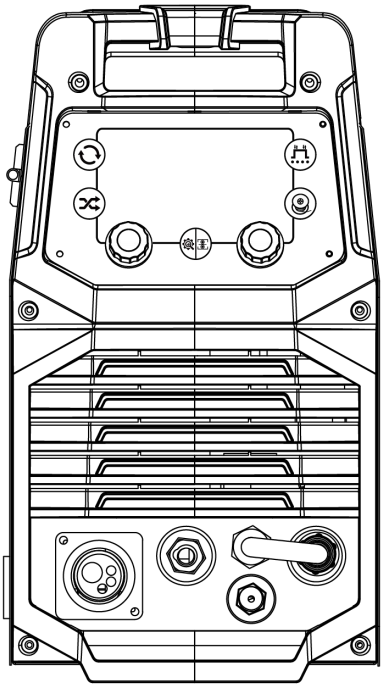
WARTER

MULTI 200 PRO



MIG-MAG (GMAW) | FLUX (FCAW) | ELETRODE (SMAW) | TIG (GTAW) | HF CUT (PLASMA)

MANUAL INSTRUCTION

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

ATTENTION

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.

Content of Instruction

1. SAFETY

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 fire fighting 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 hearing.

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, and 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.

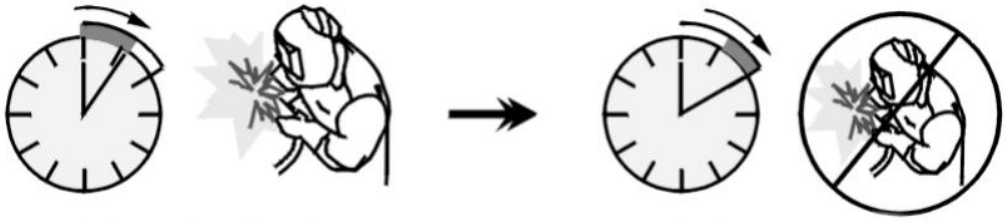
1.2.2 Overload is forbidden!

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 topple 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 air-flow and excellent ventilation

1.7 Other information about the machine

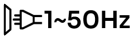
1.7.1 Cooling method: fan cooling.

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 CISPR Ⅱ.

1.7.4 Four functions: MIG/MAG, MMA, TIG, & PLASMA CUT

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_o	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 MIG-MAG AND FLUX, TIG, MMA WELDING FOR PROFESSIONAL AND INDUSTRIAL USE. Note: The term "welding machine" will be used in the text that follows.

General Safety Precautions Tips for Welders from Supplier

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 relative 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 (Tab. 1).

- 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 (Fig. R)

- 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 machine is a source of current for arc welding，made specially for MAG welding carbon steel or weak alloys with CO 2 protective gas or Argon/CO 2 mixes, using tubular full or core electrode wires. It is also ideal for MIG welding stainless steel with Argon gas containing + 1-2% oxygen and aluminum and CuSi3, CuAl8 (brazing) with Argon gas, using electrode wires that are suitable for the workpiece to be welded. Suitable core wires can be used without Flux protection gas, adapting torch polarity according to the indications of the wire producer.
It is particularly suitable for light metalwork fabrication and in body shops, for welding galvanized plates, high stress stainless steel and aluminum. SYNERGIC operation ensures fast and easy welding parameter setting, always guaranteeing high arc control and welding quality.

The machine can be used for TIG welding in direct current (DC), with arc striking upon contact (high frequency 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).

The machine can also be used for plasma cutting,Virtually any metal can be plasma cut including steel, stainless steel, aluminum, brass, copper, etc. Any thickness from 1mm through 36mm can be cut, depending on the power of the plasma cutter used.

2.1 MAIN CHARACTERISTICS

MIG-MAG

- Single Pulse
- Synergic or Manual Operation
- Wire speed, welding voltage and welding current shown on screen.
- Adjustment: Inductance regulation; Pre-Gas; slope wire feeding; Burn-Back; Pre-Gas; Spot; 2T/4T
- Polarity Change for gas MIG-MAG/ BRAZING Welding or NO GAS/ FLUX.

TIG

- HF TIG;
- Adjustment: Pre-Gas; Pre-Gas; Spot;2T/4T

CUT (only available in MULTI 200 PRO)

- HF CUT.

- Adjustment: Pre-Gas; Pre-Gas; Spot;2T/4T

MMA

- Adjustments: VRD, arc force, hot start and anti-stick devices;
- Welding Voltage and Welding current shown on screen.

2.2 PROTECTIONS

- Thermostatic safeguard;
- Protection against accidental short-circuits caused by conact between torch and earth;
- Protection against irregular voltage (power supply voltage too high or too low); VRD & Anti-stick (MMA)

2.3 STANDARD ACCESSORIES

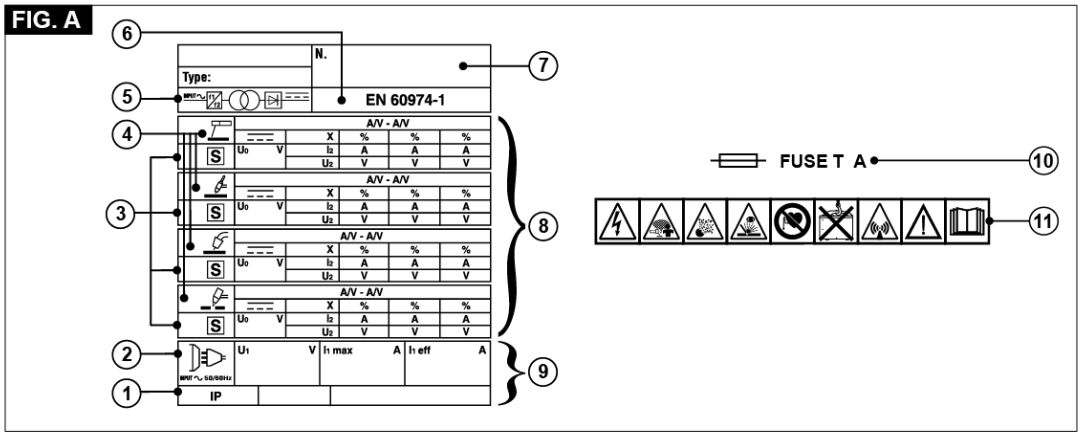
- MIG Torch;
- Return cable complete with earth clamp;
- Electrode Holder with cable

OPTIONAL ACCESSORIES

-Self darkening helmet; -MIG-MAG welding kit; -TIG welding kit; - Cutting 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- Degree of protection, for example IP21 or IP23.

2- SUPPLY CIRCUIT, number of phases (for example 1 or 3), symbol for alternating current and the rated frequency (for example 50 Hz or 60 Hz).

3- Mark for WELDING POWER SOURCES which are suitable for supplying power to welding operations carried out in an ENVIRONMENT WITH INCREASED RISK OF ELECTRIC SHOCK (if applicable).

4- Welding process symbol for example.

5- Single- or three-phase static frequency converter-transformer rectifier.

6- IEC standard of reference, for safety and construction of Arc welding equipment (Welding power sources).

7- Name and address of the manufacturer or distributor or importer and, optionally, a trademark

and the country of origin, if required.

8- Performance of the welding circuit:

- **U0... V** : RATED NO-LOAD VOLTAGE.

- **I2 :** Rated WELDING CURRENT symbol

- U2 : CONVENTIONAL LOAD VOLTAGE symbol.

- **X** : Values of the DUTY CYCLE at an ambient temperature of 40 ° C.

1) ... % : DUTY CYCLE at the RATED MAXIMUM WELDING CURRENT;

2) 60 % : DUTY CYCLE;

and

3) 100 % DUTY CYCLE as far as relevant.

... % shall not be used if the DUTY CYCLE for the RATED MAXIMUM WELDING CURRENT is 60 % or 100 %.

60 % shall not be used if the DUTY CYCLE at the RATED MAXIMUM WELDING CURRENT is 100 %.

Exegesis：duty cycle

X

SUPERSEDED: duty factor

ratio, for a given time interval, of the uninterrupted on-load duration to the total time

Note 1 to entry: This ratio, lying between 0 and 1, is expressed as a percentage.

Note 2 to entry: For the purposes of this document, the time period of one complete cycle is 10 min. For example,

in the case of a 60 % DUTY CYCLE, a continuous 6 min load period is followed by a no-load period of 4 min.

- **... A/... V to... A/... V** : Range of output, minimum WELDING CURRENT and its corresponding CONVENTIONAL LOAD VOLTAGE or less, maximum WELDING CURRENT and its corresponding CONVENTIONAL LOAD VOLTAGE or greater.

9- Technical specifications for power supply line:

- **U1**: RATED SUPPLY VOLTAGE (allowed limit ±10%):

- **I1max... A** : RATED MAXIMUM SUPPLY CURRENT.

- **I1eff... A** : MAXIMUM EFFECTIVE SUPPLY CURRENT

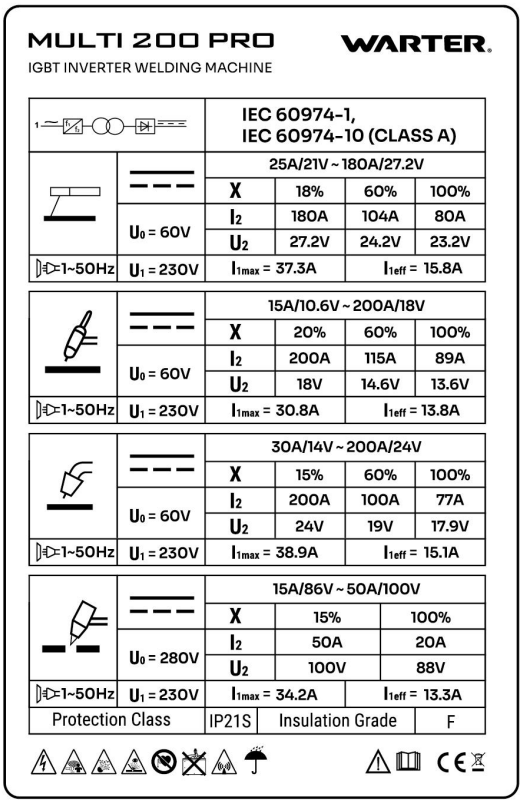
10-  : Size of delayed action fuses to be used to protect the power line.

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:

1- TECHNICAL DATA at 40°C according to IEC 60974-1:2012 Standard



MULTI 200 PRO — WARTER.
IGBT INVERTER WELDING MACHINE

		IEC 60974-1, IEC 60974-10 (CLASS A)			
		25A/21V ~ 180A/27.2V			
		X	18%	60%	100%
	U_0 = 60V	I_2	180A	104A	80A
		U_2	27.2V	24.2V	23.2V
1~50Hz	U_1 = 230V	I_{1max} = 37.3A		I_{1eff} = 15.8A	
		15A/10.6V ~ 200A/18V			
		X	20%	60%	100%
	U_0 = 60V	I_2	200A	115A	89A
		U_2	18V	14.6V	13.6V
1~50Hz	U_1 = 230V	I_{1max} = 30.8A		I_{1eff} = 13.8A	
		30A/14V ~ 200A/24V			
		X	15%	60%	100%
	U_0 = 60V	I_2	200A	100A	77A
		U_2	24V	19V	17.9V
1~50Hz	U_1 = 230V	I_{1max} = 38.9A		I_{1eff} = 15.1A	
		15A/86V ~ 50A/100V			
		X	15%		100%
	U_0 = 280V	I_2	50A		20A
		U_2	100V		88V
1~50Hz	U_1 = 230V	I_{1max} = 34.2A		I_{1eff} = 13.3A	
Protection Class		IP21S	Insulation Grade		F

⚠ 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) !!!

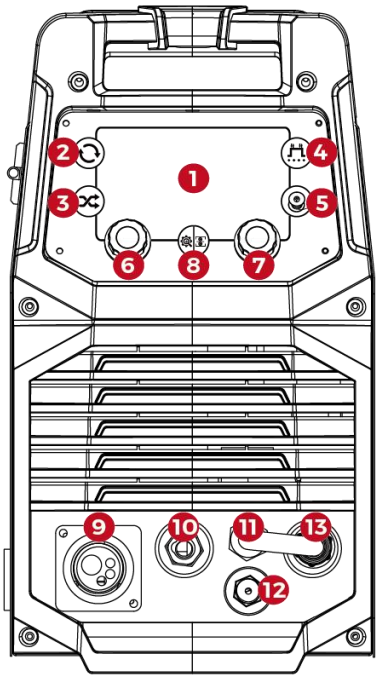
⚠ CAUTION

While welding above 85A, you need to change overcurrent protection for a 20A ~ 40A 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.

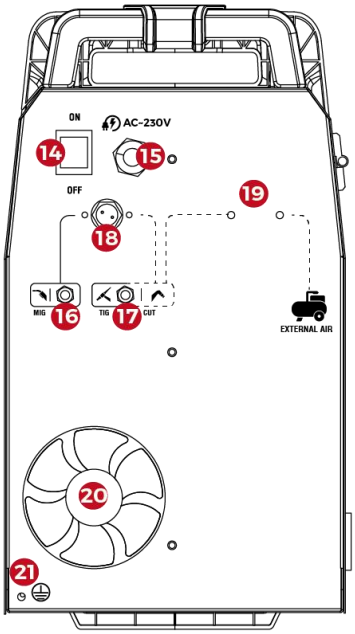
4.1.1 WELDING MACHINE (Fig. B)



FRONT PANEL （Fig.B）

1. Screen
2. Welding Process Button.
3. Welding Material & Gas Button
4. 2T,4T,Spot Button
5. Welding wire Dia. Button
6. Welding Current/Wire-feeding Speed Knob.
7. Welding Voltage/ ARC length Knob
8. Advanced Setting & Quick wire feeding Button.
9. EURO Connector for MIG torch.
10. Positive (+) Connector
11. Polarity inversion Cable & Plug
12. Connector for TIG /CUT torch
13. Negative (-) Connector

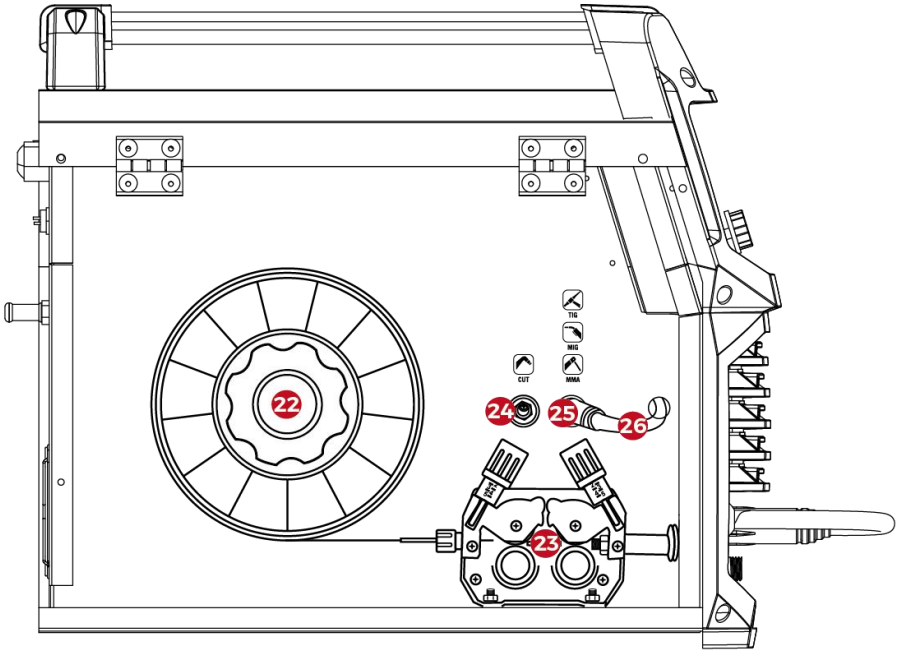
N.B.: Polarity inversion for FLUX welding (no gas).



REAR PANEL (Fig.B)

14. Power switch.
15. Power cable fixer
16. Gas inlet Connector for MIG welding.
17. Gas inlet Connector for TIG welding or Plasma Cutting.
18. TIG/CUT torch switch interface.
19. Pressure regulator
20. Fan cover
21. Grounding Terminal

Interior Layout (Fig.B)



22. SPOOL SUPPORTER
23. WIRE FEEDER
24. Cutting mode interface
25. MIG/TIG/MMA mode interface
26. Mode conversion connector

4.1.2 WELDING MACHINE CONTROL PANEL (Fig. C)

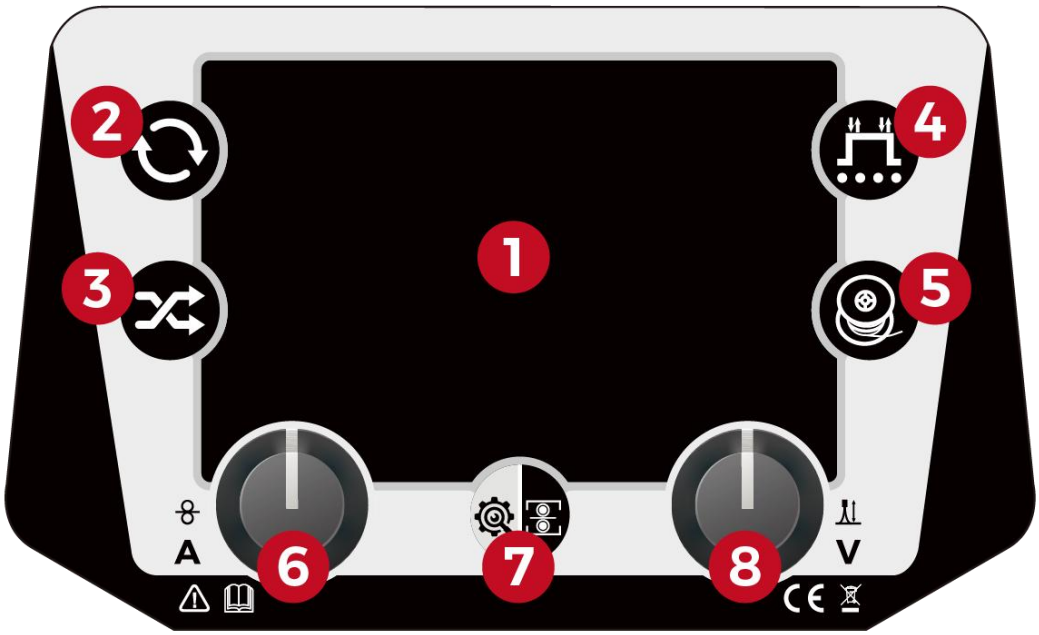


Fig.C-1

Displayer

All functions, process, and parameter values will be shown on the screen clearly.

Fig.C-2

Welding Process Button.

If pressed, it selects the MIG-MAG (PULSE or SYNERGY or MANUAL), MMA, HF TIG or HF CUT mode.

1)SYNERGIC MIG-MAG

Machine will calculate optimal settings based on your selected Wire/Gas/Material Thickness. When the parameters such as material, wire diameter, gas type have been defined by the user, the welding machine sets itself automatically in the best operation conditions established by the different synergy curves that are saved. The user only need to select the welding current to begin welding.

2)MANUAL MIG-MAG

Standard MIG controls, set your parameters by adjusting the wire speed and Voltage.

3)SINGLE PULSE MIG-MAG

It alternates between the Peak Current and Low Current

4)MMA

Machine will calculate optimal settings based on your selected Electrode/ Material Thickness.

5)HF CUT

Machines can perform plasma cutting on most metal.

6)HF TIG

TIG DC welding is suitable for all types of low-alloy and high carbon steel, and heavy metals such as copper, nickel, titanium and their alloys.

Fig.C-3

Welding Material & Gas Button.

If pressed, it select the Material and Gas of MIG-MAG (PULSE or SYNERGY or MANUAL)

PULSE	SYNERGIC	MANUAL
AlSi/Ar	AlSi/Ar	AlSi/Ar
AlMg/Ar	AlMg/Ar	AlMg/Ar
	Fe/CO2	Fe/CO2
	Fe/MIX	Fe/MIX
	FLUX/NO GAS	FLUX/NO GAS
	Ss/Ar	Ss/Ar

Fig.C-4

Operation Mode Button

If pressed, it select the Operation Mode: 2T, 4T,Spot

Mode	Avaiable Welding Process
2T	PULSE - SYNERGIC - MANUAL - HF CUT - HF TIG
4T	PULSE - SYNERGIC - MANUAL - HF CUT - HF TIG
Spot	SYNERGIC - MANUAL

Fig.C-5

Welding Wire Dia. Button.

If pressed, it Selects the welding wire diameter used for MIG-MAG (PULSE or SYNERGY or MANUAL)

1) Pulse MIG-MAG

Welding Wire Material	Wire Dia.	Current Range
AlSi/Ar	1.0 mm	28~200A
	1.2 mm	32~200A
AlMg/Ar	1.0 mm	30~200A
	1.2 mm	25~200A

2) Synergic / Manual MIG-MAG

Welding Wire Material	Wire Dia.	Current Range
Fe/CO2	0.6mm	30~200A
	0.8mm	30~200A
	0.9mm	60~200A
	1.0 mm	60~200A
Fe/MIX	0.6mm	30~200A
	0.8mm	40~200A
	0.9mm	60~200A
	1.0 mm	60~200A
Flux/NO GAS	0.8mm	35~200A
	0.9mm	58~200A

	1.0 mm	58~200A
Ss/Ar	0.8mm	30~200A
	0.9mm	60~200A
	1.0 mm	60~200A
AlSi/Ar	1.0 mm	50~200A
	1.2 mm	50~200A
AlMg/Ar	1.0 mm	50~200A
	1.2 mm	50~200A

Fig.C-6

Welding Current / Wire Feeding Speed Button.

If rotated, it can adjust the welding current or wire feeding speed or values.

1, In pulse, Synergy, MMA, HF CUT and HF TIG welding process, It can select the welding current or wire feeding speed in Manual mode.

2, In the Advanced Setting, it can adjust the values.

Fig.C-7

Advanced Setting Button.

1, If pressed, it allows accessing the setting menus of MIG-MAG (PULSE or SYNERGY or MANUAL), MMA ,TIG or CUT process.

2, Fast wire feed in Synergic / Manual / Pulse mode if held down.

Pulse / Synergic / Manual MIG-MAG

Setting	Values	Description
Inductance regulation	-10~10	Set how fast the current rises to reach the amps that have been selected when welding.
Pre-gas	0~2s	Set how long the pre-gas to flow before the arc start.
Wire ramp slope	0-10	Use to set the trailing wire starting ramp to prevent any initial accumulation in the welding seam.
Wire burn-back time	0~10	Set how far the wire will burn back once the torch trigger has been released.
Post-gas	0~2s	Set how long you would like your gas to flow after the arc ends

MMA:

Setting	Values	Description
VRD	ON/OFF	Set the VRD ON or OFF
ANTI-STICK	ON/OFF	Set the ANTI-STICK ON or OFF
HOT-START	0~10	Set the HOT-START value.
ARC-FORCE	0~10	Set the ARC-FORCE value.

HF CUT

Setting	Values	Description
Pre-gas	0.2~3s	Set how long the pre-gas to flow before the arc start.
Post-gas	2~5s	Set how long you would like your gas to flow after the arc ends

HF TIG

Setting	Values	Description
Pre-gas	0.2~3s	Set how long the pre-gas to flow before the arc start.
Post-gas	1~5s	Set how long you would like your gas to flow after the arc ends

Fig.C-8

Welding Voltage/ ARC length Knob.

If rotated, it can adjust the Welding Voltage / ARC length Knob.

1) In Pulse, Synergy MIG-MAG welding process, It can adjust the arc length -3V ~ +3V.

2) In MANUAL MIG-MAG process, it can adjust the voltages.

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.

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.

- In order to satisfy the requirements of the EN 61000-3-11 (Flicker) standard we recommend connecting the welding machine to the interface points of the main power supply that have an impedance of less than Zmax = 0.24 ohm.
- 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%.

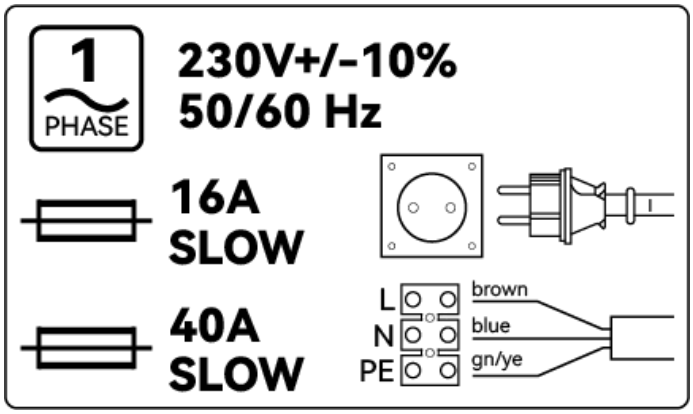
- Make sure the power available at the input connection is adequate for normal operation of the machine. The fuse rating and cable sizes are both indicated below:

MULTITEC 205F

For MIG-MAG

Fuse/Overcurrent protection type	Welding current [A]	DUTY CYCLE (X%) at **40° C**
D16 (16A - slow)	<100A	100%
D16 (16A - slow)	100~125A	60% (6mins)
D20 (20A - slow)	100~125A	100%
D16 (16A - slow)	200A	15% (1.5mins)
D40 (40A - slow)	200A	100%

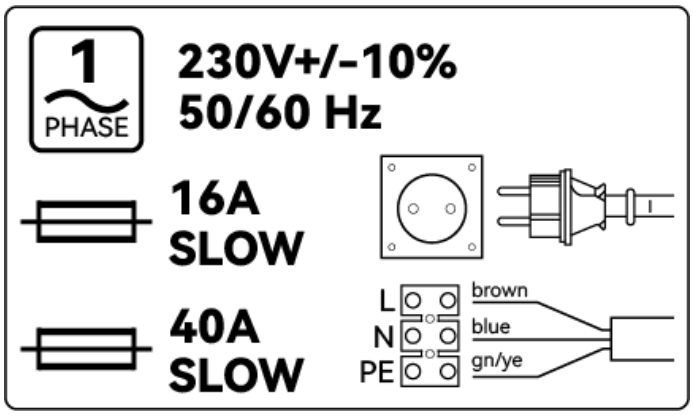
Caution: While welding above 100A, you need to change overcurrent protection for a 20A ~ 40A type D, and change for a proper input plug (or connect directly to power network).



For MMA

Fuse/Overcurrent protection type	Welding current [A]	DUTY CYCLE (X%) at **40° C**
D16 (16A - slow)	<80A	100%
D16 (16A - slow)	105A	60% (6mins)
D20 (20A - slow)	105A	100%
D16 (16A - slow)	200A	20% (1.5mins)
D40 (40A - slow)	200A	100%

Caution: While welding above 100A, you need to change overcurrent protection for a 20A ~ 40A type D, and change for a proper input plug (or connect directly to power network).

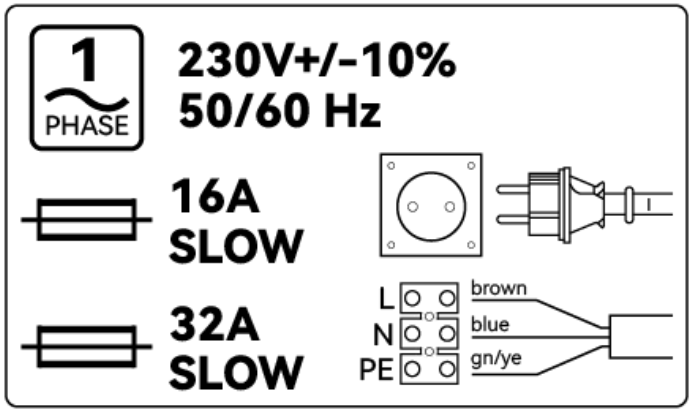


For TIG

Fuse/Overcurrent protection type	Welding current [A]	DUTY CYCLE (X%) at **40° C**
D16 (16A - slow)	<120A	100%
D16 (16A - slow)	150A	60% (6mins)
D20 (20A - slow)	150A	100%
D16 (16A - slow)	200A	30% (3mins)
D32 (32A - slow)	200A	100%

Caution: While welding above 100A, you need to change overcurrent protection for a 20A ~ 32A type D, and change for a proper input plug (or connect directly to power network).

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.

6.MIG-MAG WELDING GUIDE

6.1 MIG-MAG WELDING DESCRIPTION

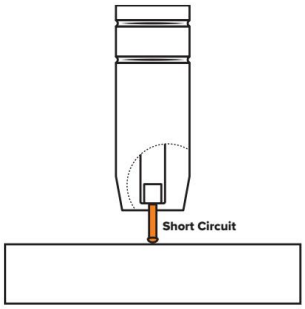
MIG (Metal Inert Gas) Welding

MIG (Metal Inert Gas) welding, also known as GMAW (Gas Metal Arc Welding) or MAG (Metal Active Gas Welding), is a semi-automatic arc welding process in which a consumable wire electrode and a shielding gas are fed through a welding gun. A constant voltage, direct current power source is most commonly used with MIG welding.

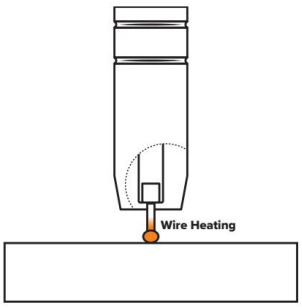
There are four primary methods of metal transfer in MIG welding. Short circuit (also known as dip transfer), globular transfer, spray transfer and pulse spray, each of which has distinct properties and corresponding advantages and limitations. To perform MIG welding, the necessary equipment is a welding gun, a wire feed unit, a welding power supply, an electrode wire, and a shielding gas supply.

Short Circuit Transfer

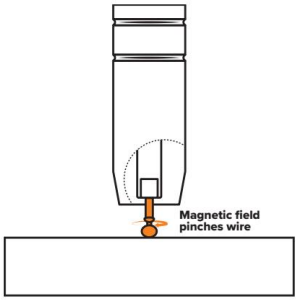
Short circuit transfer is the most commonly used method whereby the wire electrode is fed continuously down the welding torch through to and exiting the contact tip. The wire touches the workpiece and causes a short circuit the wire heats up and begins to form a molten bead, the bead separates from the end of the wire and forms a droplet that is transferred into the weld pool. This process is repeated about 100 times per second, making the arc appear constant to the human eye.



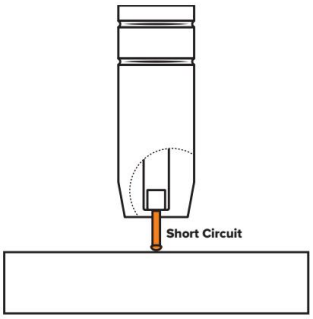
The wire approaches the workpiece and touches the work, creating a short circuit between the wire and the base metal, because there is no space between the wire and the base metal there is no arc and current flows through the wire.



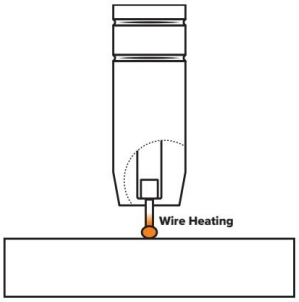
The wire cannot support all the current flow, resistance builds up and the wire becomes hot and weak and begins to melt.



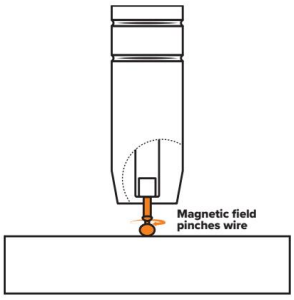
The current flow creates a magnetic field that begins to pinch the melting wire forming it into droplet.



The pinch causes the forming droplet to separate and fall towards the forming weld pool.



An arc is created at the separation of the droplet and the heat and force of the arc flattens out the droplet into the weld pool. The heat of the arc melts the end of the wire slightly as it feeds towards the base metal.



The wire feed speed overcomes the heat of the arc and the wire again approaches the work to short circuit and repeat the cycle.

Basic MIG Welding

Good weld quality and weld profile depend on gun angle, the direction of travel, electrode extension (stick out), travel speed, the thickness of base metal, wire feed speed (amperage) and arc voltage. To follow are some basic guides to assist with your setup.

Gun Position - Travel Direction & Work Angle

Gun position or technique usually refers to how the wire is directed at the base metal, the angle and travel direction chosen. Travel speed and work angle will determine the characteristic of the weld bead profile and degree of weld penetration.

Push Technique

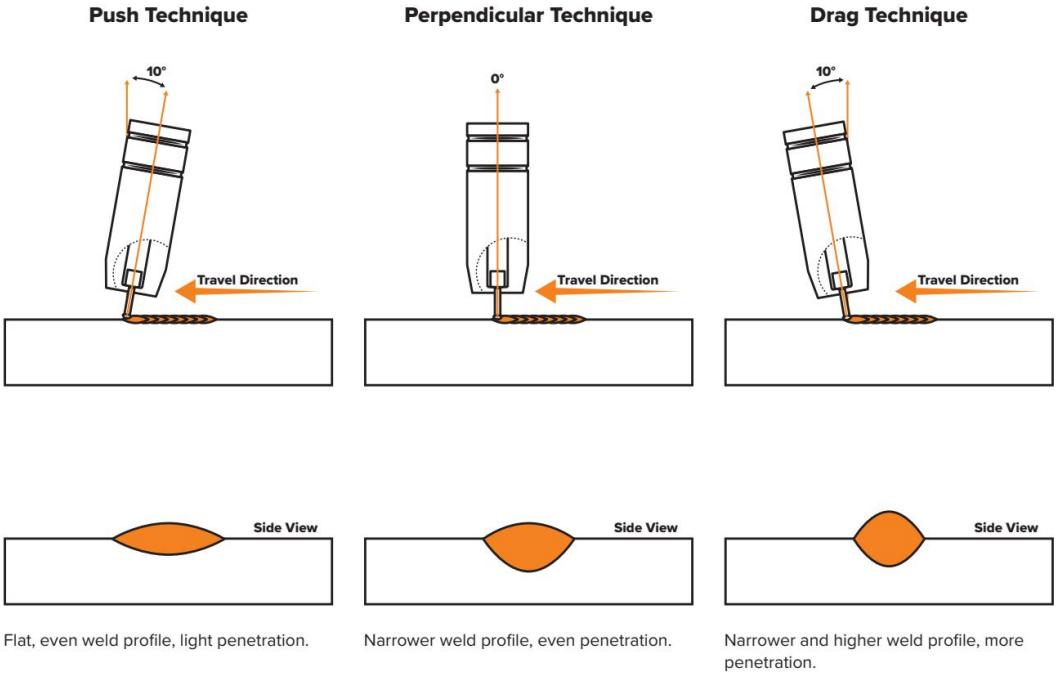
The wire is located at the leading edge of the weld pool and pushed towards the un-melted work surface. This technique offers a better view of the weld joint and direction of the wire into the weld joint. Push technique directs the heat away from the weld puddle, allowing faster travel speeds providing a flatter weld profile with light penetration - useful for welding thin materials. The welds are wider and flatter, allowing for minimal clean up / grinding time.

Perpendicular Technique

The wire is fed directly into the weld. This technique is used primarily for automated situations or when conditions make it necessary. The weld profile is generally higher, and deeper penetration is achieved.

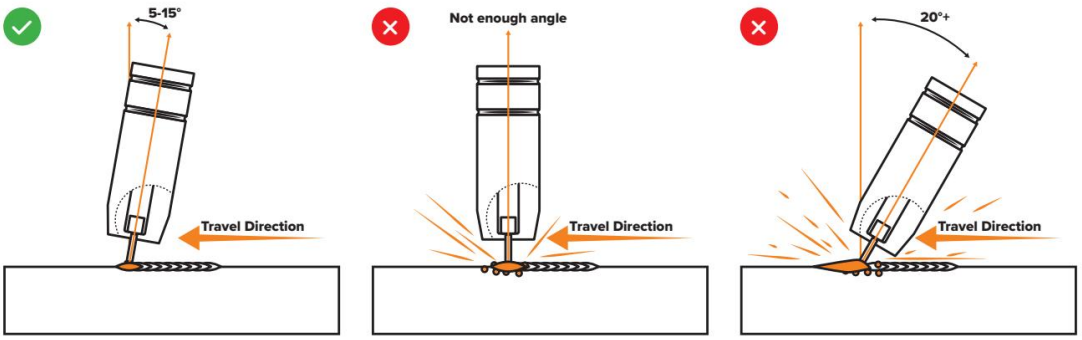
Pull/Drag Technique

The gun and wire are dragged away from the weld bead. The arc and heat are concentrated on the weld pool. The base metal receives more heat, deeper melting, more penetration and the weld profile is higher with more buildup.



Travel Angle

The travel angle is the right to left, relative to the direction of welding. A travel angle of 5°- 15° is ideal and produces the right level of control over the weld pool. A travel angle higher than 20° will give an unstable arc condition with poor weld metal transfer, less penetration, high levels of spatter, weak gas shielding and a poor quality finished weld.



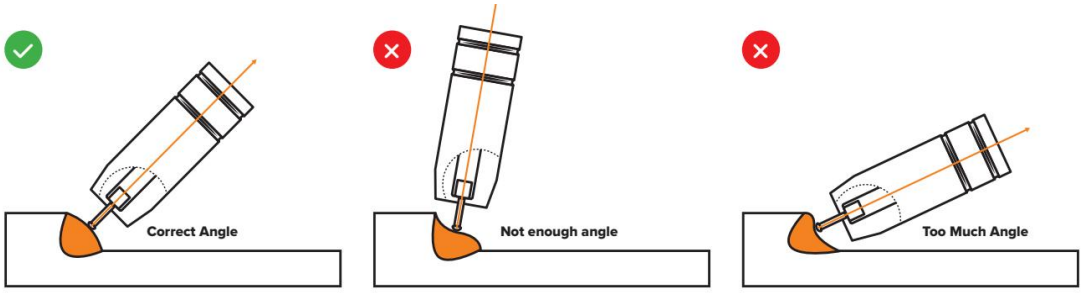
Good level of control over the weld pool, even flat weld.

Less control over the weld pool, more spatter.

Poor control, unstable arc, less penetration, lots of spatter.

Work Angle

The work angle is the up and down angle of the gun relative to the workpiece. The correct work angle provides good bead shape, prevents undercut, uneven penetration, weak gas shielding and a poor-quality finished weld.



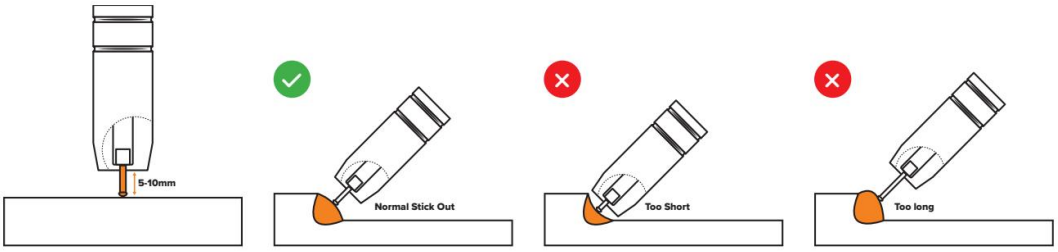
Good level of control over the weld pool, even flat weld.

Less control over the weld pool, more spatter.

Poor control, unstable arc, less penetration, lots of spatter.

Stick Out

Stick out is the length of the unmelted wire protruding from the end of the contact tip.A constant, even stick out of 5-10mm will produce a stable arc and an even current flow providing good penetration and even fusion. Too short a stick out will cause an unstable weld pool, produce spatter and overheat the contact tip. Too long stick out will cause an unstable arc, lack of penetration, lack of fusion, and increase spatter.



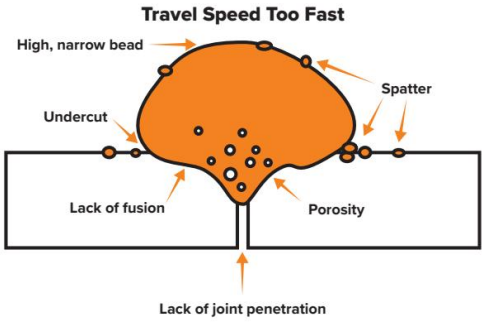
Even arc, good penetration even fusion, good finish.

Unstable arc, spatter, over heat contact tip.

Unstable arc, spatter, poor penetration and fusion.

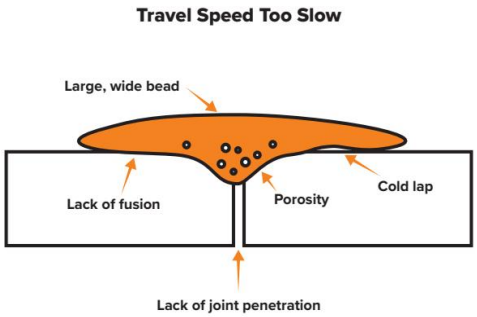
Travel Speed

Travel speed is the rate that the gun is moved along the weld joint and is usually measured in mm per minute. Travel speeds can vary depending on conditions and the welder's skill and is limited to the welder's ability to control the weld pool. The push technique allows faster travel speeds than the drag technique. The gas flow must also correspond with the travel speed, increasing with faster travel speed and decreasing at a slower speed. Travel speed needs to match the amperage and will decrease as the material thickness and amperage increase.



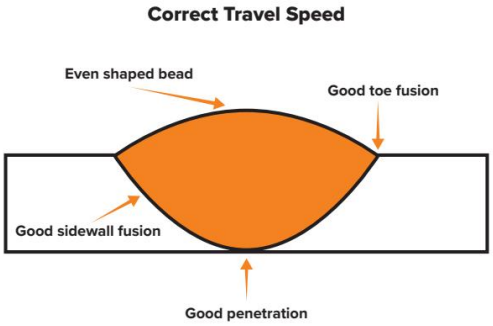
Travel Speed Too Fast

Too fast a travel speed produces too little heat per mm of travel resulting in less penetration and reduced weld fusion. The weld bead solidifies very quickly, trapping gases inside the weld metal and causing porosity. Undercutting of the base metal can also occur, and an unfilled groove in the base metal is created when the travel speed is too fast to allow molten metal to flow into the weld crater created by the arc heat.



Travel Speed Too Slow

Too slow a travel speed produces a large weld with a lack of penetration and fusion. The energy from the arc dwells on top of the weld pool rather than penetrating the base metal. This produces a wider weld bead with more deposited weld metal per mm than is required, resulting in a weld deposit of poor quality.



Correct Travel Speed

The correct travel speed keeps the arc at the leading edge of the weld pool, allowing the base metal to melt sufficiently to create good penetration, fusion and wetting out of the weld pool producing a weld deposit of good quality.

Wire Types and Sizes

Use the correct wire type for the base metal being welded. Use stainless steel wire for stainless steel, aluminium wires for aluminium and steel wires for steel.

Using poor quality milled wire can result in poor performance and appearance. To ensure optimal performance when welding, use standards approved wire.

Use a smaller diameter wire for thin base metals. For thicker materials use a larger wire diameter and larger machine. Check the recommended welding capability of your machine.

As a guide, refer to the "Welding Wire Thickness Chart" below.

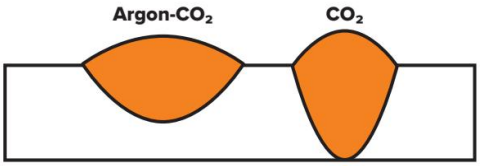
Material Type	Wire Type	Wire Size	Drive Roller	Polarity	Shielding Gas	Gas Flow Rate	Material Thickness	1mm	2mm	3mm	4mm	6mm	8mm	10mm
Steel	ER70S-6	0.8mm	V Groove	DCEP+	$ArCO_2$	8-12L/min	Voltage (V)	17.5	19.7	24.5	25.5	26.5	28.5	
							Wire Speed (m/min)	8.5	10	14.5	15.5	16.5	18	
	ER70S-6	0.9mm	V Groove	DCEP+	$ArCO_2$	8-12L/min	Voltage (V)		21	25	26	26.7	29	31
							Wire Speed (m/min)		12.4	15	16	16.4	16.9	17.6
	E71T-11	0.8mm	F Groove (Knurled)	DCEN-			Voltage (V)	13.2	14.2	15.5	17.3	19.3	21.4	
							Wire Speed (m/min)	1.8	2	3.4	4.8	6.6	8.3	
	E71T-11	0.9mm	F Groove (Knurled)	DCEN-			Voltage (V)		15	15.3	17.6	18	22	26
							Wire Speed (m/min)		2.5	3.5	4.9	5.8	9	11.5
Stainless Steel	316LSi	0.8mm	V Groove	DCEP+	$ArCO_2$	8-12L/min	Voltage (V)	17.5	19.7	24.5	25.5	26.5	28.5	
							Wire Speed (m/min)	8.5	10	14.5	15.5	16.5	18	
	316LSi	0.9mm	V Groove	DCEP+	$ArCO_2$	8-12L/min	Voltage (V)		21	25	26	26.7	29	31
							Wire Speed (m/min)		12.4	15	16	16.4	16.9	17.6
Aluminium	5356	1.0mm	U Groove	DCEP+	Ar	8-12L/min	Voltage (V)		11	12	13	17	18	
							Wire Speed (m/min)		9	10	11	14	16	

Gas Selection

The purpose of the gas in the MIG process is to shield the wire, the arc and the molten weld metal from the atmosphere. Most metals when heated to a molten state will react with the air in the atmosphere, without the protection of the shielding gas the weld produced would contain defects like porosity, lack of fusion and slag inclusions. Additionally, some of the gas becomes ionised (electrically charged) and helps the current flow smoothly.

The correct gas flow is critical in protecting the welding zone from the atmosphere.**Too low** a flow will give inadequate coverage and result in weld defects and unstable arc conditions.**Too high** a flow can cause air to be drawn into the gas column and contaminate the weld zone.

Use the correct shielding gas. CO2 is suitable for steel and offers good penetration characteristics; the weld profile is narrower and slightly more raised than the weld profile obtained from Argon CO2 mixed gas. Argon CO2 mix gas offers better weld ability for thin metals and has a wider range of setting tolerance on the machine. Argon 80% / CO2 20% is a good all-round mix suitable for most applications.



Drive Roller Selection

The importance of smooth, consistent wire feeding during MIG welding cannot be emphasised enough. The smoother the wire feed, the better the welding will be. Feed rollers or drive rollers are used to feed the wire mechanically along the length of the welding gun.

Feed rollers are designed to be used for certain types of welding wire, and they have different types of grooves machined in them to accommodate the different types of wire. The wire is held in the groove by the top roller of the wire drive unit and is referred to as the pressure roller. Pressure is applied by a tension arm that can be adjusted to increase or decrease the pressure as required. The type of wire will determine how much pressure can be applied and what type of drive roller is best

suited to obtain optimum wire feed.

Solid Hard Wire (V Groove)

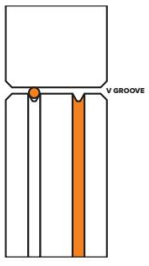
Steel or stainless steel require a drive roller with a V shape groove for optimum grip and drive capability. Solid wires can have more tension applied to the wire from the top pressure roller that holds the wire in the groove, and the V shape groove is more suited for this. Solid wires are more forgiving to feed due to their higher cross-sectional column strength. They are stiffer and don't bend so easily.

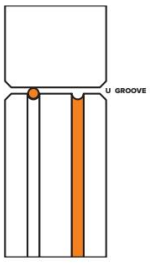
Aluminum (U Groove)

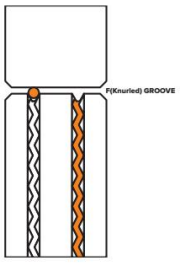
Aluminum requires a U shape groove. Aluminum wire has a lot less column strength, can bend easily and is, therefore, more difficult to feed. Soft wires can easily buckle at the wire feeder where the wire is fed into inlet guide tube of the torch. The U-shaped roller offers more surface area grip and traction to help feed the softer wire. Softer wires also require less tension from the top pressure roller to avoid deforming the shape of the wire, too much tension will push the wire out of shape and cause it to catch in the contact tip.

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 MIG-MAG GAS-SHIELD (If used)

1) Connect the mode conversion connector(Fig.B-24) to the MIG/TIG/MMA mode interface (FIG.B-23) (Only required in MULTI 200 PRO)

2) Connect the (Fig.B-11) Polarity inversion Cable & Plug to the (Fib.B-9) positive (+) connector, then twist tighten to lock in place.

3) Connect the earth clamp to the negative (-) connector (Fig.B-13), twist tighten to lock in place.

4) Connect the MIG torch to the (Fig.B-9) Euro connector and twist end to secure in place.

5) Connect the Power plug, then switch the machine ON.

6) Pull down the roller tension knob to release the wire drive.

7) Unscrew both roller caps.

8) Ensure you have V Groove drive rollers installed. If not, fit correct rollers and replace the roller covers.

9) Unscrew the roller cap.

10) Place 5kg wire spool onto the spool holder.

11) Tighten spool retaining nut.

12) Feed wire through the inlet guide tube through to the outlet guide tube. Ensure that the wire passes through the roller.

13) Lift roller tension knob to lock wire in place. Twist to tighten.

14) Remove front end consumables from the MIG torch.

15) Replace front end consumables on the MIG torch.

16) Hold the torch trigger until the wire came out. Release the torch trigger then hold trigger again immediately to feed wire through to the torch. If the wire slips or stops you will need to adjust the roller tension knob.

17) Connect the earth clamp to your workpiece

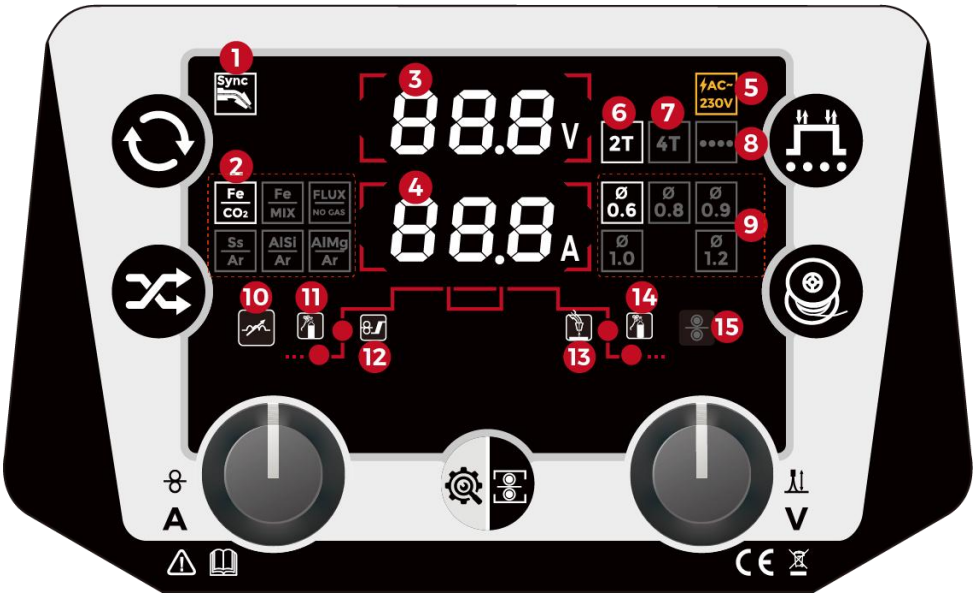
18) Connect gas hose to the gas inlet on the rear of the machine.

19) Adjust the gas flow.

Now the user can start welding.

6.2.1 MIG-MAG SCREEN DISPLAY

A. SYNERGY MIG-MAG WELDING WITH SHIELDING GAS



1) Synergy MIG-MAG welding process setting.

2) Welding Material /Gas selection.

3) Welding voltage display (Automatically matching with welding current).

4) Welding current display.

5) It's activated when the power on.

6) 2T operate mode.

7) 4T operate mode.

8) Spot Welding mode setting (if necessary).

9) Welding wire Diameter selection.

10) Inductance Setting (If necessary).

11) Pre-Gas time setting (if necessary).

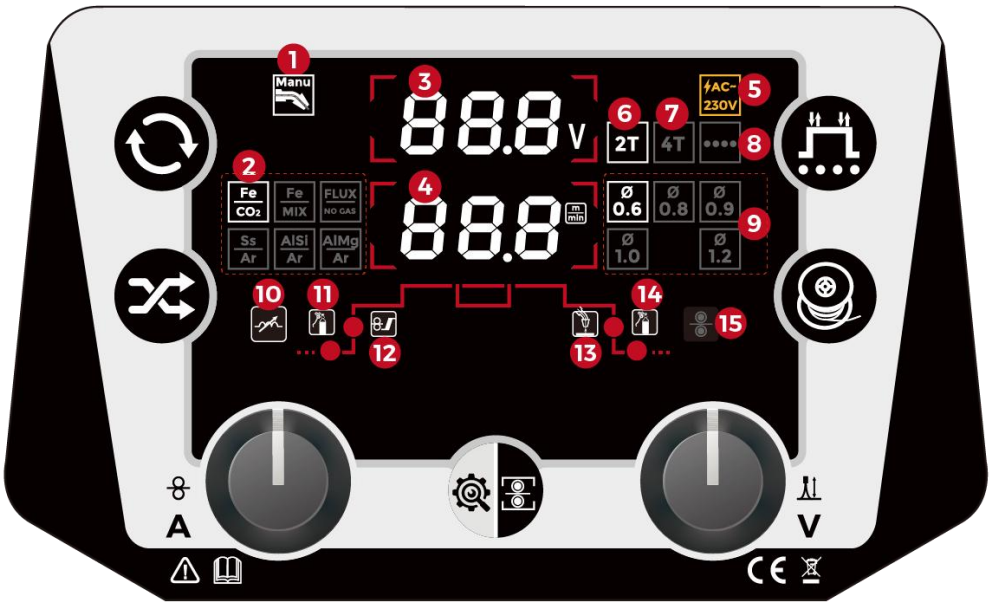
12) Slope wire feeding setting (if necessary).

13) Burn-Back time setting (if necessary).

14) Post-gas setting (if necessary).

15) Quick wire feeding.

B. MANUAL MIG-MAG SCREEN DISPLAY (WITH SHEILDING GAS)



1) Manual MIG-MAG welding process setting.

2) Welding Material /Gas selection.

3) Welding voltage display (Automatically matching with wire feeding speed).

4) Wire feeding speed display.

5) It's activated when the power on.

6) 2T operate mode.

7) 4T operate mode.

8) Spot Welding mode setting (if necessary).

9) Welding wire Diameter selection.

10) Inductance Setting (If necessary).

11) Pre-Gas time setting (if necessary).

12) Slope wire feeding setting (if necessary).

13) Burn-Back time setting (if necessary).

14) Post-gas setting (if necessary).

15) Quick wire feeding.

6.3 SETUP FOR FLUX CORED WIRE WELDING WITHOUT GAS

1) Connect the mode conversion connector(Fig.B-24) to the MIG/TIG/MMA mode interface (FIG.B-23) (Only required in MULTI 200 PRO)

2) Connect the (Fig.B-11) Polarity inversion Cable & Plug to the (Fig.B-13) the negative (-) connector, then twist tighten to lock in place.

3) Connect the earth clamp to (Fig.B-10) positive (+) connector, twist tighten to lock in place.

4) Connect the MIG torch to the(Fig.B-9) Euro connector and twist end to secure in place.

5) Connect the plug , then switch the machine ON.

6) Pull down the roller tension knob to release the wire drive.

7) Unscrew roller caps.

8) Ensure you have Knurled Groove drive rollers installed. If not, fit correct rollers and replace the roller covers.

9) Unscrew the roller cap.

10) Place 5kg wire spool onto the spool holder.

11) Tighten spool retaining nut.

12) Feed wire through the inlet guide tube through to the outlet guide tube. Ensure that the wire passes through the roller.

13) Lift roller tension knob to lock wire in place. Twist to tighten.

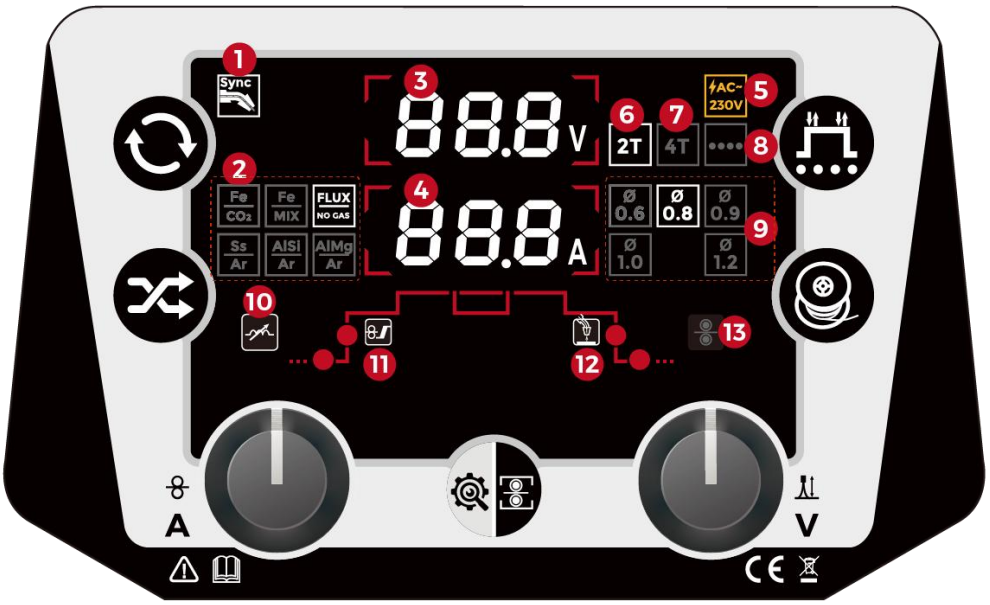
14) Remove front end consumables from the MIG torch.

15) Hold the torch trigger until the wire came out. Release the torch trigger then hold trigger again immediately to feed wire through to the torch. If the wire slips or stops you will need to adjust the roller tension knob.

16) Replace front end consumables on the MIG torch.

Now the user can start welding.

6.3.1 FLUX CORED WIRE WELDING SCREEN DISPLAY



1) Synergy MIG-MAG welding process setting.

2) Welding Material /Gas selection.

3) Welding voltage display (Automatically matching with welding current).

4) Welding current display.

5) It's activated when the power on.

6) 2T operate mode.

7) 4T operate mode.

8) Spot Welding mode setting (if necessary).

9) Welding wire Diameter selection.

10) Inductance Setting (If necessary).

11) Slope wire feeding setting (if necessary).

12) Burn-Back time setting (if necessary).

13) Quick wire feeding.

6.4 SETUP FOR MIG ALUMINUM WIRE WELDING

- **MIG Torch Liner Changing for Aluminum Wire Welding**

1) Remove MIG torch front end parts.

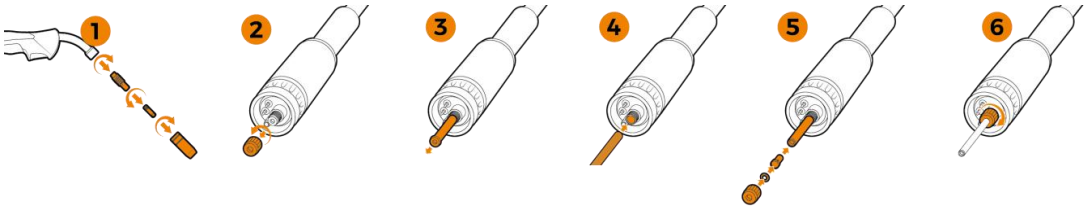
2) Remove the liner retaining nut.

3) Carefully pull out and completely remove the existing liner. Ensure MIG torch is completely unraveled until setup is completed.

4) Fit the neck spring to front end of the aluminum liner.

5) Feed liner and neck spring through the torch, then fit liner collect, liner O-ring and liner retaining nut.

6) Push the liner firmly into the torch lead and tighten the liner retaining nut.



- **Aluminum Wire Welding Setup**

1) Connect the mode conversion connector(Fig.B-24) to the MIG/TIG/MMA mode interface (FIG.B-23)(Only required in MULTI 200 PRO).

2) Connect the (Fig.B-11) Polarity inversion Cable & Plug to the (Fig.B-10) positive (+) connector, then twist tighten to lock in place.

3) Connect the earth clamp to (Fig.B-13) the negative (-) connector, twist tighten to lock in place.

4) Pull down the roller tension knob to release the wire drive.

5) Connect the plug, then switch the machine ON.

6) Loosen the inlet guide tube retaining screw.

7) Remove the inlet guide tube using long nose pliers.

8) Install a U groove drive roller of the correct size for the diameter wire being used.

9) Feed liner through Euro Connection and connect the tighten the torch.

10) Take the extended aluminum liner all the way up and over the drive roller.

11) Cut the extended aluminum liner with as sharp knife just in front of the driven roller.

12) Place 5kg wire spool onto the spool holder.

13) Tighten spool retaining nut.

14) Feed wire through the inlet guide tube through to the aluminum liner tube. Ensure that the wire passes through the roller.

15) Lift roller tension knob to lock wire in place. Don't twist too tight.

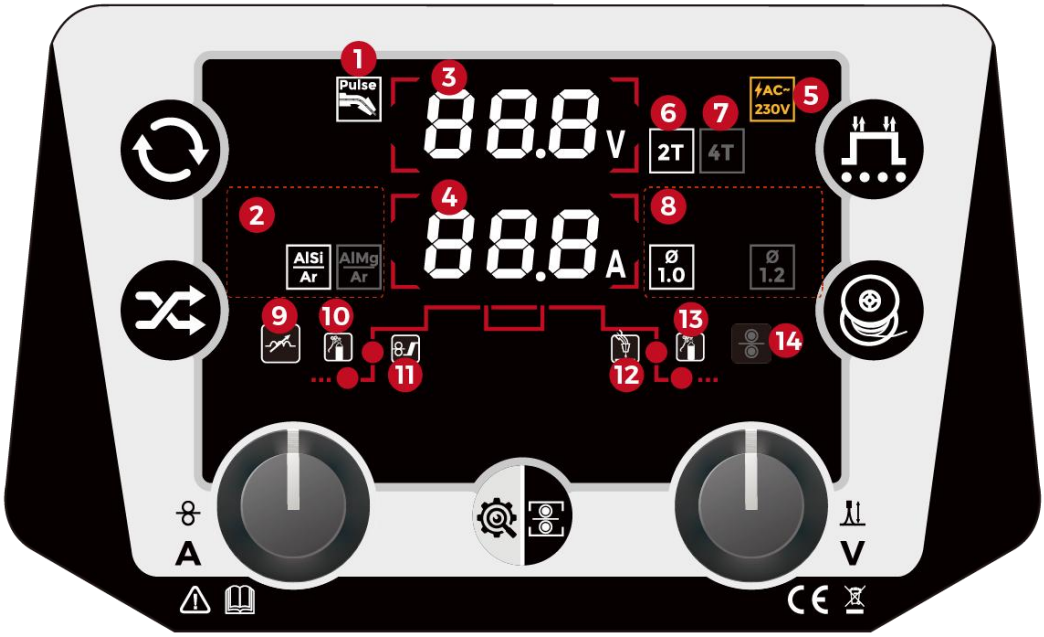
16) Replace the front tips to Aluminum Wire Tips.

17) Setup front end consumables from the MIG torch.

18) Connect the earth clamp to your workpiece.

Now the user can start welding.

6.4.1 ALUMINUM PULSE MIG SCREEN DISPLAY



1) PULSE MIG-MAG welding process setting.
2) Welding Material /Gas selection.
3) Welding voltage display (Automatically matching with wire feeding speed).
4) Welding current display.
5) It's activated when the power on.
6) 2T operate mode.
7) 4T operate mode.
8) Welding wire Diameter selection.
9) Inductance Setting (If necessary).
10) Pre-Gas time setting (if necessary).
11) Slope wire feeding setting (if necessary).
12) Burn-Back time setting (if necessary).
13) Post-gas setting (if necessary).
14) Quick wire feeding.

6.5 LOADING THE WIRE REEL

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 anti-clockwise 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.

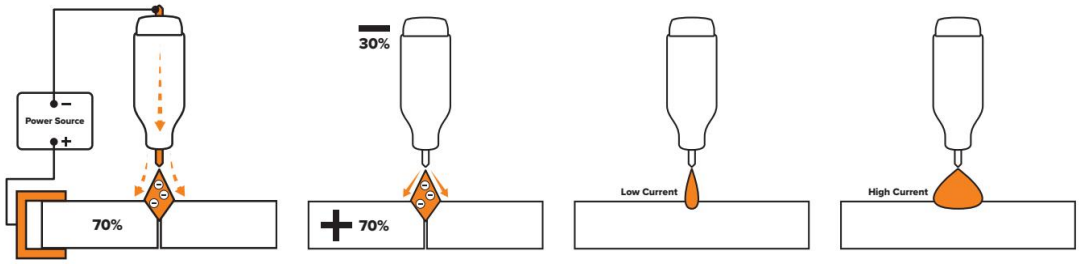
7.TIG DC WELDING GUIDE

7.1 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.

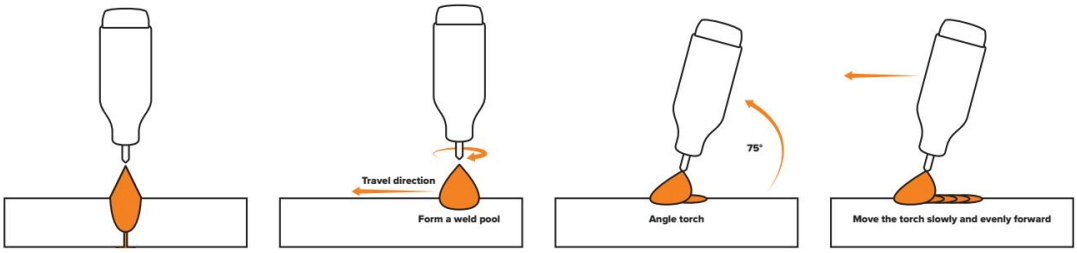
The intensity of the arc is proportional to the current that flows from the tungsten. The welder regulates the welding current to adjust the power of the arc. Typically thin material requires a less powerful arc with less heat to melt the material, so less current (amps) is required. Thicker material 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.

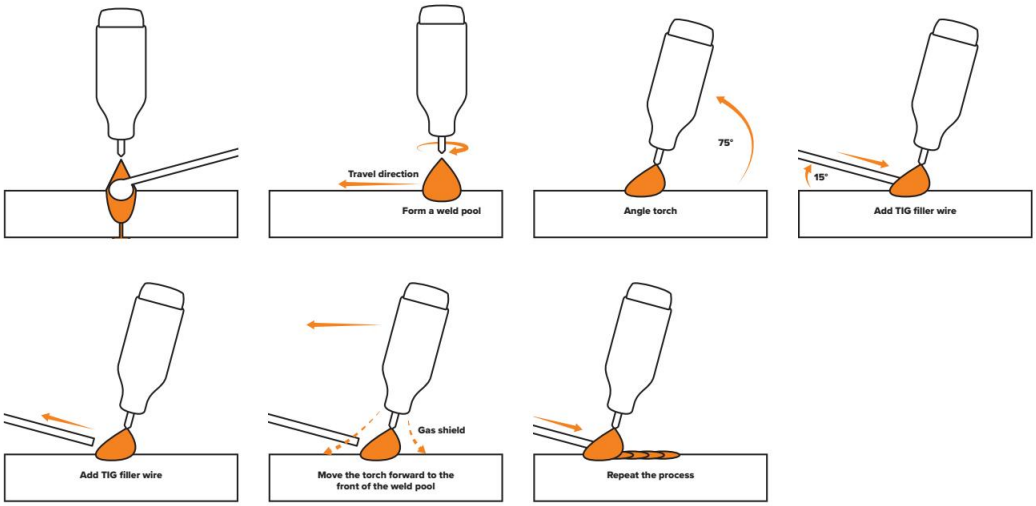
Once the arc is started, the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist in creating a weld pool of the desired size. Once the weld pool is established, tilt the torch at about a 75° angle and move smoothly and evenly along the joint while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

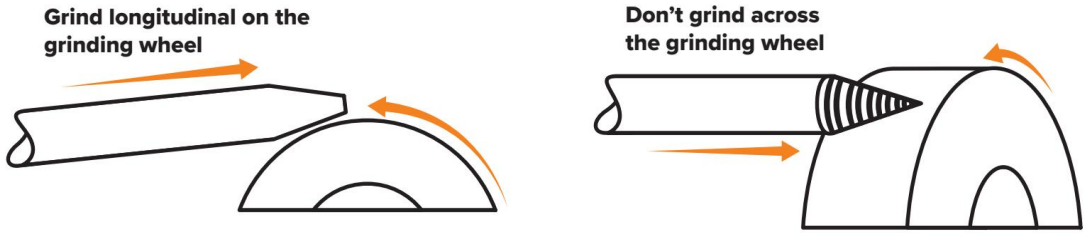
Tungsten Electrodes Rating for Welding Currents

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.

7.2 SETUP FOR TIG

1) Connect the mode conversion connector(Fig.B-24) to the MIG/TIG/MMA mode interface (FIG.B-23).

2) Connect the TIG torch's gas-electric integrated interface to the connector, twist to lock in place. (Fig. B-12)(Only required in MULTI 200 PRO)

3) Connect the TIG torch switch to connector (Fig. B-18)

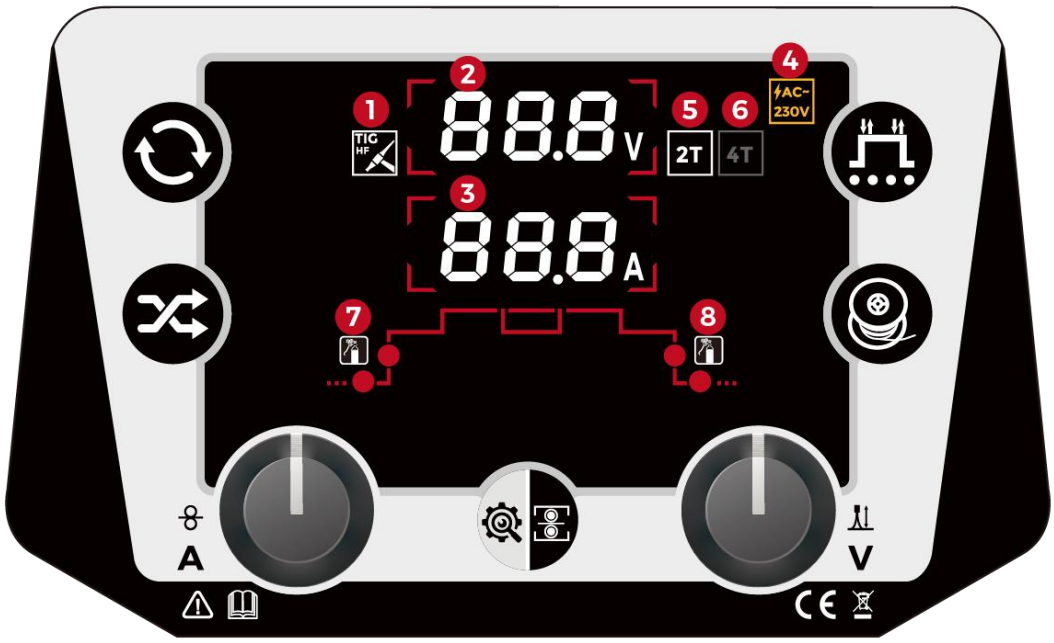
4) Connect the earth clamp to the positive (+) connector, twist to lock in place. (Fig. B-10)

5) Connect the gas bottle (Fig. B-17)

6) Open the gas bottle and adjust the quantity of gas (l/min.) according to the recommended usage data.

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

7.3 HF TIG SCREEN DISPLAY



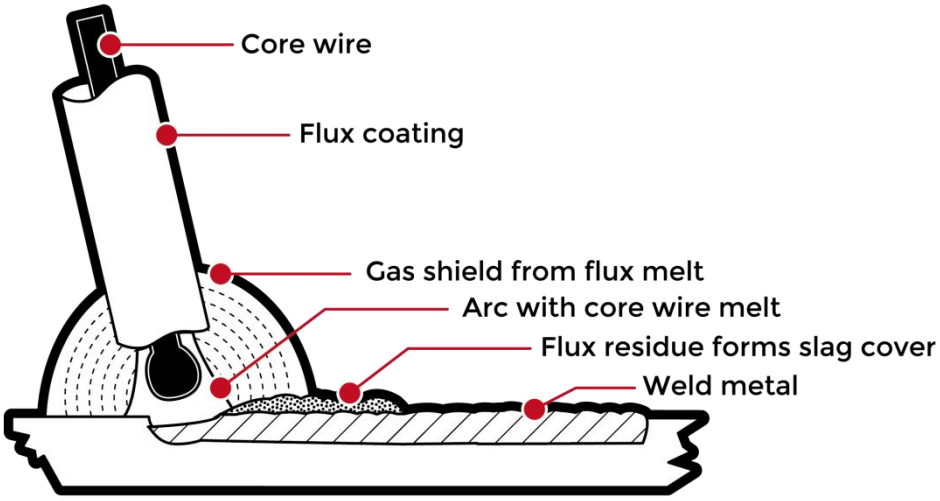
1) HF TIG welding process setting.
2) Welding voltage display .
3) Welding current display.
4) It's activated when the power on.
5) 2T operate mode.
6) 4T operate mode.
7) Pre-Gas time setting (if necessary).
8) Post-gas setting (if necessary).

8. MMA WELDING GUIDE

8.1 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.

8.2 WELDING CIRCUIT CONNECTION IN MMA MODE

Almost all the coated electrodes are connected to the positive pole (+) of the welder, with an exception for acid coated electrodes, which must be connected to the negative pole (-).

8.2.1 SETUP FOR MMA WLEDING.

1) Connect the mode conversion connector(Fig.B-24) to the MIG/TIG/MMA mode interface (FIG.B-23)(Only required in MULTI 200 PRO).

2) For DC+ electrodes, connect the earth clamp to the negative(-) connector (Fig.B-13), and electrode holder to the positive (+) connector (Fig.B-10).

3) For DC– electrodes, connect earth clamp to the positive (+) connector (Fig.B-10), and electrode holder to negative (-) connector (Fig.B-13).

4) Connect the plug to power source, the switch the machine ON.

5) Set weld process to MMA.

6) Set weld parameters through button and knob.

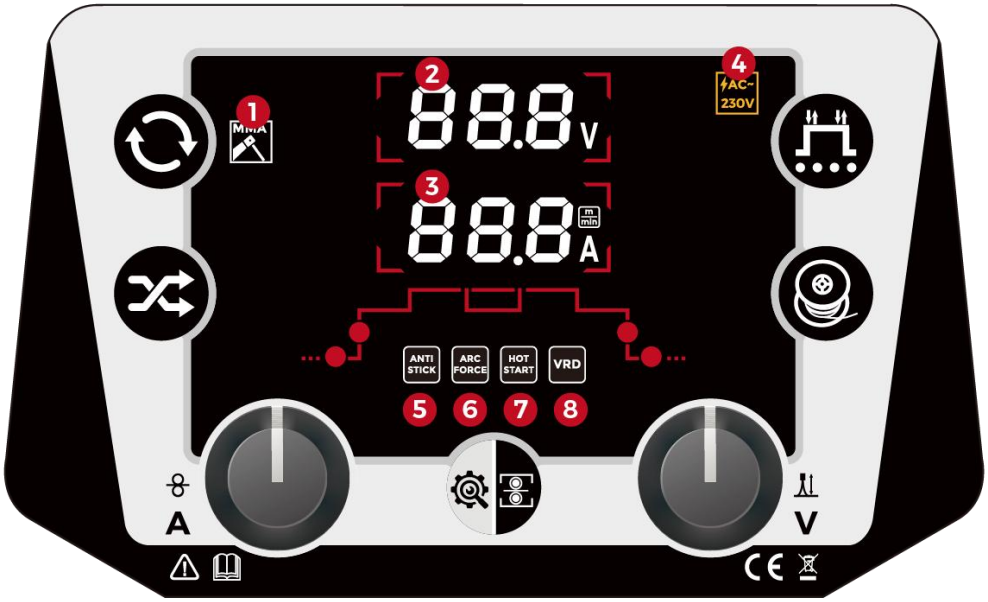
7) Place the electrode into electrode holder.

8) Connect earth clamp to your workpiece.

9) Strike electrode against workpiece to initiate arc.

10) Drag along workpiece to weld. Pull the electrode away from the workpiece to finish weld.

8.3 MMA SCREEN DISPLAY



1) MMA welding process setting.
2) Welding voltage display.
3) Welding current display.
4) It's activated when the power on.
5) ANTI-STICK ON/OFF selection
6) ARC-FORCE (0-10) setting (if necessary)
7) HOT-START (0-10) setting (if necessary)
8) VRD ON/OFF selection

8.4 PROCEDURE

- Hold the mask IN FRONT OF THE FACE, then lightly scratch the electrode tip on the piece to be welded as if you were trying to strike a match; this is the correct way of striking the arc.

⚠ **DO NOT TAP** the electrode against the piece; this can damage the coating and make it difficult to strike the arc.

- As soon as the arc is struck, try to maintain a distance from the piece which is equivalent to the diameter of the electrode being used, and try to maintain this distance as constant as possible during the welding operations; remember that the angle of the electrode as it moves forwards should be about 20-30 degrees.

At the end of the welding seam, move the electrode tip backwards slightly, above the crater, and fill it in; Now quickly lift the electrode from the weld pool to extinguish the arc (Examples of welding seams.

9. PLASMA CUTTING GUIDE

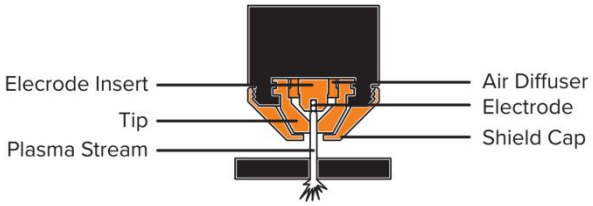
9.1 GENERAL DESCRIPTIONS

Basic plasma cutters use electricity to super heat air into plasma (the 4th state of matter), which is then blown through the metal to be cut. Plasma cutters require a compressed air supply and AC

power to operate.Plasma cutters provide the best combination of accuracy, speed, and affordability for producing a variety of flat metal shapes. They can cut much finer and faster than oxyacetylene torches.

Operation:

1. When the trigger is squeezed, DC current flows through the torch lead into the tip.
2. Next, compressed air flows through the torch head, through the air diffuser that spirals the airflow around the electrode and through the hole of the cutting tip.
3. A fixed gap is established between the electrode and the tip. (The power supply increases voltage in order to maintain a constant current through the joint.) Electrons arc across the gap, ionizing and superheating the air creating a plasma stream.
4. Finally, the regulated DC current is switched so that it no longer flows to the tip but instead flows from the electrode to the work-piece. Current and airflow continue until cutting is stopped.



Amperage

The standard rule of thumb is the thicker the material, the more amperage required. On thick material, set the machine to full output and vary your travel speed. On thinner material, you need to turn down the amperage and change to a lower-amperage tip to maintain a narrow kerf. The kerf is the width of the cut material that is removed during cutting.

Speed

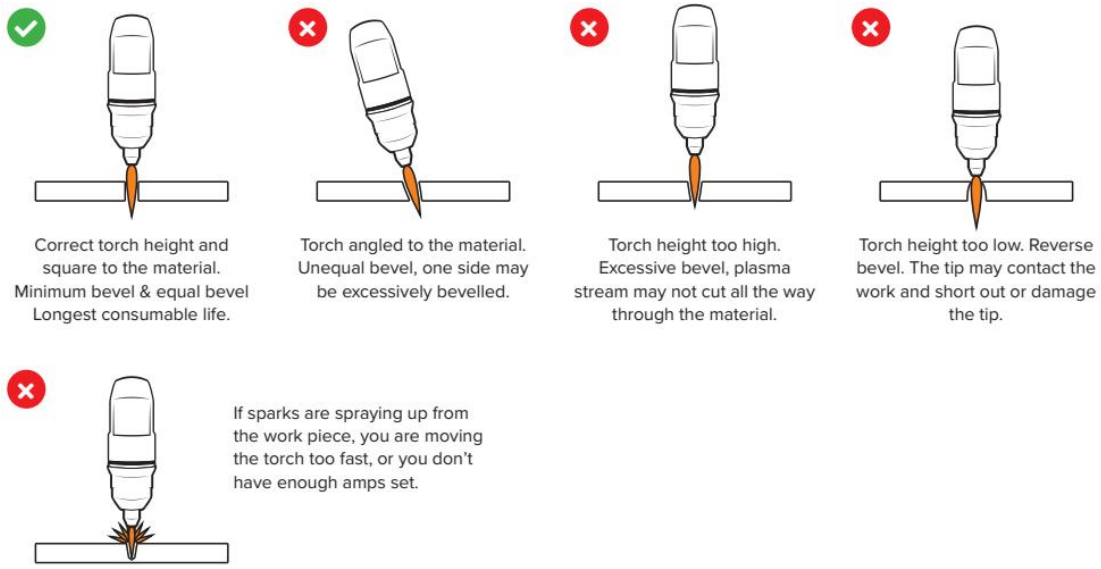
Amperage and speed are critical to producing a good quality cut. The faster you move (especially on aluminum), the cleaner your cut will be. To determine if you're going too fast or too slow, visually follow the arc that is coming from the bottom of the cut. The arc should exit the material at a slight angle away from the direction of travel. If it's going straight down, that means you're going too slow, and you'll have an unnecessary build-up of dross or slag. If you go too fast, it will start spraying back onto the surface of the material without cutting all the way through. Because the arc trails at an angle, at the end of a cut, slow your cutting speed and angle the torch in to cut through the last bit of metal.

Direction

It is easier to pull the torch towards you than push it. The plasma stream swirls as it exits the tip, biting one side and finishing off on the other, leaving a bevelled edge and a straight edge. The bevel cut effect is more noticeable on thicker material and needs to be taken into consideration before starting your cut as you want the straight side of the cut to be on the finished piece you keep.

Torch tip height & position

The distance and position of the plasma torch cutting tip affect the quality of the cut and the extent of the bevel of the cut. The easiest way to reduce bevel is by cutting at the proper speed and height for the material and amperage that is being cut.



9.2 SETUP FOR CUTTING.

1) Connect the mode conversion connector(Fig.B-24) to the CUT mode interface (FIG.B-22) (only available in MULTI 200 PRO)

2) Connect the plasma torch's gas-electric integrated interface to the connector, twist to lock in place. (Fig. B-12)

3) Connect the plasma torch's switch to connector (Fig. B-18)

4) Connect the earth clamp to the positive (+) connector, twist to lock in place. (Fig. B-10).

5) Install Pressure regulator(Fig. B-19)

6) Connecting the gas bottle (Fig. B-17)

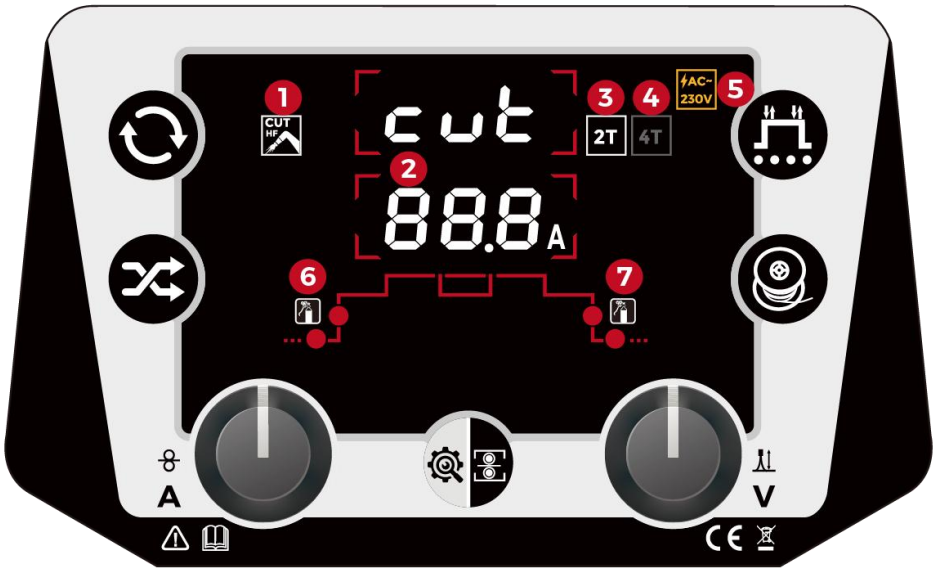
7) Select the torch control mode 2T or 4T

8) Adjust the cutting current according to your needs.

9) Adjust the post-gas blowing time as to your needs.

Now the user can start cutting.

9.3 HF CUT SCREEN DISPLAY



1) HF CUTTING process setting.
2) Welding current display.
3) 2T operate mode.
4) 4T operate mode.
5) It's activated when the power on.
6) Pre-Gas time setting (if necessary).
7) Post-gas setting (if necessary).

Tip size and condition

The tip orifices focus the plasma stream to the workpiece. It is essential to use the correct size tip for the amperage being used, for example, a tip with a 1.0mm orifice is suitable for 0-40 amps whereas a 1.2mm orifice is better for 40-80 amps. The low-amp tip has a smaller orifice which maintains a narrow plasma stream at lower settings for use on thin-gauge material. Using a 25 amp tip at a 60 amp setting will blow out and distort the tip orifice and require replacement. Conversely, using an 80-amp tip on the lower settings will not allow you to focus the plasma stream as well and creates a wide kerf. The condition of the tip orifice is critical to the quality of the cut result, a worn or damaged tip orifice will produce a distorted plasma stream resulting in poor cut quality.

Electrode condition

A fixed gap is established between the electrode and the inside of the cutting tip — electrons arc across the gap, ionizing and superheating the air creating the plasma stream. The electrode contains an insert at the end made of a highly conductive material called hafnium. This insert erodes with use and develops a pit at the end of the electrode when the pit becomes too much poor-quality cuts will result and necessitate replacement of the electrode.

Air pressure and volume

Air pressure, flow rate and air quality are critical to quality plasma cutting and consumable life span.

The required air pressure and volume can vary from model to model, and the manufacturer will provide the specs.

A compressor with a L/min rating slightly higher than the plasma would be more than adequate. If you are doing a lot of cutting, cutting thick plate (same air consumption but slower cut speeds = longer cut time), then choose a compressor at 1.5 to 2 times the plasma system requirement.

Air quality

Good, dry air is essential to quality plasma cutting and consumable life span.

Compressors take in air at atmospheric pressure and increase the pressure and store it in a tank. Humidity in the air is condensed in the tank and the airlines producing water, more so in humid environments. Moisture that forms in airlines tends to condense into larger drops when the air pressure decreases as it is entering the plasma torch. When these droplets enter into the high temperatures (as much as 11,000°C) in the plenum of the torch, they immediately break down into oxygen and hydrogen, which alters the regular chemical content of the air in the torch. These elements will then dramatically change the plasma arc which causes the torch consumable parts to wear very quickly, alters the shape of the nozzle orifice, dramatically affecting cut quality in terms of edge squareness, dross formation, and edge smoothness.

Minimizing the moisture in the air supply is absolutely critical to quality plasma cuts and longevity of consumable parts. As a minimum be sure to drain the receiver (tank) on the air compressor at least daily.

Most air plasma systems from reputable manufacturers have an onboard particulate filter and or a coalescing filter with an auto drain that will remove some moisture from the air supply. For home workshop and light industrial users, the onboard air filter is adequate. Most situations, however, will require additional filtration to prevent moisture from affecting the quality of the plasma cutter and in most cases, it is recommended to install a submicronic particulate filter that is designed to trap water through absorption. This style of filter has a replaceable filter cartridge that absorbs water and must be changed after it is near saturation; it should be installed close as possible to the air intake of the plasma cutter.

General Tips

- It is easier to pull the torch through the cut than to push it.
- To cut thin material, reduce the amperage until you get the best quality cut.
- Use the correct size tip orifice for the amperage being used.
- For straight cuts use a straight edge or cutting buggy as a guide. For circles, use a template or circle cutting attachment.
- Check that the front end consumable parts of the plasma cutting torch are in good condition.

10. 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.

10.1 Error Code Explanation

ERROR 1 Overcurrent protection

ERROR 2 Overheat protection

ERROR 3 Overcurrent protection + Overheat protection

ERROR 4 Undervoltage protection

ERROR 6 Overheat protection + Undervoltage protection

11. MAINTENANCE

WARNING! BEFORE CARRYING OUT MAINTENANCE OPERATIONS MAKE SURE THE WELDING MACHINE IS SWITCHED OFF AND DISCONNECTED FROM THE MAIN POWER SUPPLY. ROUTINE MAINTENANCE OPERATIONS CAN BE CARRIED OUT BY THE OPERATOR.

11.1 TORCH

- Do not put the torch or its cable on hot pieces; this would cause the insulating materials to melt, making the torch unusable after a very short time.
- Make regular checks on the gas pipe and connector seals.
- Accurately match collet and collet body with the selected electrode diameter in order to avoid overheating, bad gas diffusion and poor performance.
- At least once a day check the terminal parts of the torch for wear and make sure they are assembled correctly: nozzle, electrode, electrode-holder clamp, gas diffuser.
- Before using the welding machine, always check the terminal parts of the torch for wear and make sure they are assembled correctly: nozzle, electrode, electrode holder clamp, gas diffuser.

11.2 WIRE FEEDER

- Make frequent checks on the state of wear of the wire feeder rollers, regularly remove the metal dust deposited in the feeder area (rollers and wire-guide infeed and outfeed).

11.3 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

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

-Wrong gas: Check that the correct gas is being used.

-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. Protect the welding zone from wind and drafts.

-Moisture on the base metal: Remove all moisture from base metal before welding.

-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.

-Gas nozzle clogged with spatter, worn or out of shape: Clean or replace the gas nozzle.

-Missing or damaged gas diffuser: Replace the gas diffuser.

-MIG torch Euro connect O-ring missing or damaged: Check and replace the O-ring.

3) 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.

4) 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.

5) 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.

6) 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.

7) No wire feed

- Wrong mode selected: Check that the TIG/MMA/MIG selector switch is set to MIG position.

8) 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.

TIG TROUBLESHOOTING

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.

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.

PLASMA CUTTING TROUBLESHOOTING

1. Power lamp and temperature lamp on.

• Airflow blocked, check for blocked airflow around the unit and correct condition.

• Fan blocked, check and correct condition.

• Unit is overheated, let the unit cool down for at least 5 minutes. Make sure the unit has not been operated beyond Duty Cycle limit.

• Faulty components in the unit, return for repair or have qualified technician repair per Service Manual.

2. Torch fails to ignite the arc when the torch switch is activated or difficult to start

• The system is in SET mode, change to RUN mode.

• Faulty torch parts, remove and inspect torch shield cup, tip and electrode. Replace electrode or tip if worn; replace shield cup if excessive spatter adheres to it.

• Gas pressure too high or too low, adjust to the proper pressure.

• Faulty components in the unit, return for repair or have qualified technician repair per Service Manual.

3. No cutting output; Torch activated, power source on; Gas flows; Fan operates

• Torch not correctly connected to the machine, check that torch leads are correctly connected to the machine.

• Work cable not connected to the work-piece, or connection is weak, make sure that work cable has a proper connection to a clean, dry area of the work-piece.

• Faulty components in the unit, return for repair or have qualified technician repair per Service Manual.

• Faulty torch, return for repair or have qualified technician repair.

4. Low cutting output

• Incorrect setting of CURRENT (A) control, check and adjust to the proper setting.

• Faulty components in the unit, return for repair or have qualified technician repair.

5. Arc shuts off during operation; arc will not restart when the torch switch is activated.

• Power Supply is overheated, let the unit cool down for at least 5 minutes. Make sure the unit has not

been operated beyond Duty Cycle limit. Refer to 3.1 for duty cycle specifications.

• Gas pressure too low, check the source for at least 4bar/60psi; adjust as needed. It is needed to open the machine cover.

• Torch consumables worn, check torch shield cup, tip, starter element, and electrode; replace as needed.

• Faulty components in the unit, return for repair or have qualified technician repair per Service Manual.

6. No gas flow; the power lamp on; Fan operates

• Gas not connected or pressure too low, check gas connections. Adjust gas pressure to the proper setting

7. Torch cuts but low quality

• Current (A) control set too low, increase the current setting.

• The torch is being moved too fast across the workpiece, reduce cutting speed.

• Excessive oil or moisture in torch, hold torch 1/8 inch (3mm) from a clean surface while purging and observe oil or moisture build-up (do not activate torch). If there are contaminants in the gas, additional filtering may be needed

DECLARATION OF CONFORMITY

Cadabra GmbH

Declares that the welding machines:

MULTI 200 PRO

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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AUSTRIA)