UNIMIG VIPER

ARC160

U11605 | Operating Manual

Contents

1. Safety

Welding equipment can be dangerous to both the operator and people in or near the surrounding working area if the equipment is not correctly operated. Equipment must only be used under the strict and comprehensive observance of all relevant safety regulations.

Read and understand this instruction manual carefully for all system components, especially the safety instructions and warning notices before the installation and operation of this equipment.

Product specifications and features are subject to change without notice. While every effort has been made to provide accurate and current information at the time of publication, this manual is intended as a general guide and is not exhaustive regarding safety, welding, or the operation and maintenance of this unit. Due to the many variables in the welding field and the evolving nature of both the field and the UNIMIG product line, Welding Guns of Australia Pty Ltd. does not guarantee the accuracy, completeness, authority, or authenticity of the information in this manual or provided by any UNIMIG employee during conversations or business dealings. The product owner assumes all liability for its use and maintenance. Welding Guns of Australia Pty Ltd. does not warrant this product or this document for fitness for any particular purpose, performance, accuracy, or suitability of application. Furthermore, Welding Guns of Australia Pty Ltd. accepts no liability for injury or damages, whether consequential or incidental, resulting from the use of this product or from the content of this document, nor does it accept third-party claims of such liability.

Note:

- Observe the accident prevention regulations and any regional regulations.
- Safety and warning labels on the machine indicate any possible risks.
- Keep these labels clean and legible at all times.
- Technical changes due to further development in machine technology may lead to different welding behaviour.

Items in the manual that require particular attention in order to minimise damage and harm are indicated with the below symbols. Read these sections carefully and follow their instructions.

Note: Gives the user a useful piece of information.

Caution: Describes a situation that may result in damage to the equipment or system.

Warning: Describes a potentially dangerous situation. If not avoided, it will result in personal damage or fatal injury.

Machine Operating Safety

- Do not switch the function modes while the machine is operating. Switching of the function modes during welding can damage the machine. Damage caused in this manner will not be covered under warranty.
- Disconnect the electrode holder cable from the machine before switching on the machine to avoid arcing should the electrode be in contact with the workpiece.
- Only qualified persons should install, operate, maintain, and repair this equipment.
- During operation, keep everyone, especially children, away.

Electric Shock

Electric shock can kill. Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and internal machine circuits are also live when power is on. In MIG/MAG welding, the wire, drive rollers, wire feed housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is dangerous.

- Connect the primary input cable according to Australian and New Zealand standards and regulations.
- Avoid all contact with live electrical parts of the welding circuit, such as sockets, tungstens and electrodes with bare hands.
- The operator must wear dry, hole-free welding gloves and body protection while they perform the welding task.
- The operator should keep the workpiece insulated from themselves.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cable for wear and tear, and replace the cable immediately if damaged. Bare wiring is dangerous and can kill.
- Do not use damaged, undersized, or badly joined cables.
- Do not weld in the rain or in wet, moist, or damp areas.
- Do not drape cables over your body.
- Disconnect power source before servicing or maintaining this equipment.
- We recommend an RCD safety switch is used with this equipment to detect any leakage of current to earth.

DC voltage remains in the inverter power source after the removal of input power.

Arc Rays

Arc rays are harmful to your eyes and skin. Arc rays from the welding process produce intense visible and invisible ultraviolet and infrared rays that can burn eyes and skin.

- Always wear an approved welding helmet with the correct shade of filter lens and suitable protective clothing, including welding gloves, while the welding operation is performed.

Recommended filter shades for arc welding

Less than 150A	Shade 10*
150A to 250A	Shade 11*
250A to 300A	Shade 12
300A to 350A	Shade 13
Over 350A	Shade 14

**Use one shade darker for aluminium.*

- Wear safety glasses under your helmet.
- Measures should be taken to protect people in or near the surrounding working area. Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.
- Wear proper PPE and body protection made from durable, flame-resistant materials like leather.

Electro Magnetic Fields (EMF)

Magnetic fields can affect Implanted Medical Devices.

- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near any arc welding.

Fire Hazard

Welding on closed containers, such as tanks, drums, or pipes, can cause them to explode. Flying sparks from the welding arc, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of the electrode with metal objects can cause sparks, explosions, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove any flammable materials well away from the working area. Cover flammable materials and containers with approved covers if they cannot be moved from the area.
- Do not weld on closed containers or containers that have held combustible materials, such as tanks, drums, or pipes, unless they are correctly prepared according to the required Safety Standards to ensure that flammable or toxic vapours and substances are totally removed, these can cause an explosion even though the vessel has been “cleaned”.
- Vent hollow castings or containers before welding. They may explode.
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapours (such as petrol).
- Have a fire extinguisher nearby and know how to use it.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause a fire on the hidden side.
- Avoid welding on tire rims or wheels, as heating can cause tires to explode and repaired rims may fail.
- Attach the earth clamp as close as possible to the welding area to minimise the risk of electric shock, sparks, and fire hazards caused by the welding current travelling through long or unknown paths.
- When not in use, ensure the MMA electrode is removed from its holder.
- Before welding, remove any combustible items, like butane lighters or matches, from your person.
- Post welding, thoroughly inspect the area to ensure there are no lingering sparks, glowing embers, or flames.
- Always use the correct fuses or circuit breakers, and don’t oversize or bypass them.
- Wear proper PPE and body protection made from durable, flame-resistant materials like leather.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer’s instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.

Hot Parts

Hot parts can burn. Items being welded can generate and hold high heat and can cause severe burns.

- Do not touch hot parts with bare hands.
- Allow a cooling period before working on the welding equipment.
- Use the proper tools and insulated welding gloves and clothing to handle hot parts and prevent burns.

Noise Hazards

The noise from some processes or equipment can damage hearing.

- Wear approved ear protection if the noise level is high.

Gas Cylinders

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Because gas cylinders are usually part of the welding process, be sure to treat them carefully.

- Protect gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Ensure cylinders are secured upright to prevent tipping or falling over.
- Never allow the welding electrode, earth clamp, or electrical circuit to touch the gas cylinder, and don't drape welding cables over the cylinder.
- Never weld on a pressurised gas cylinder, it will explode and kill you.
- Open the cylinder valve slowly and turn your face away from the cylinder outlet valve and gas regulator. Stand to the side of the cylinder when opening the valve.
- Only use the correct gas, regulators, hoses, and fittings for your application and keep them in good condition.
- Keep full and empty cylinders separate.
- Keep ammonia-based leak detection solutions, oil and grease away from cylinders and valves.
- Never use force when opening or closing valves.
- Don't repaint or disguise markings and damage. If damaged, return cylinders immediately.
- When working with cylinders or operating cylinder valves, ensure that you wear appropriate protective clothing – gloves, boots and safety glasses.

Fumes & Gases

Fumes and gases are dangerous. Welding produces fumes and gases and breathing these fumes and gases can be hazardous to your health.

- Do not breathe the smoke and gas generated while welding. Keep your head out of the fumes.
- Keep the working area well-ventilated and use fume extraction or ventilation to remove welding fumes and gases.
- In confined or heavy fume environments, always wear an approved air-supplied respirator.
- Welding fumes and gases can displace air and lower the oxygen level, causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapours to form highly toxic and irritating gases.
- Materials such as galvanised, lead, or cadmium-plated steel contain elements that can give off toxic fumes when welded. Do not weld these materials unless the coating is removed, or the area is very well-ventilated and/or you are wearing an air-supplied respirator.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.

Gas Buildup

The build-up of gas can cause a toxic environment and deplete the oxygen content in the air resulting in death or injury. Many gases used in welding are invisible and odourless.

- Shut off the shielding gas supply when not in use.
- Always ventilate confined spaces or use an approved air-supplied respirator.

PLEASE NOTE that under no circumstances should any equipment or parts be altered or changed in any way from the standard specification without written permission given by UNIMIG.

To do so will void the warranty.

2. Input Power Requirements

UNIMIG welding machines are designed and manufactured to conform to **IEC 60974** or **AS 60974** standards. This Standard covers the safety and performance requirements of welding power sources and plasma cutting systems. This includes the **machine**, the **input cable**, and the **plug** requirements like the size of the plug that should be used.

Maximum effective supply current (I_{1eff}) according to AS 60974.1

$$I_{1eff} = \sqrt{I_1^2 \times X + I_0^2(1-X)}$$

I_0 Rated no-load supply current

I_1 Rated supply current

X Rated duty cycle

The I_{1eff} identifies the appropriate plug, input cable, and input current necessary for each device.

	Min-Max Cable Size
I_{1eff} ≤ **10A**	1.5-2.5mm²
I_{1eff} ≤ **15A**	1.5-4.0mm²
I_{1eff} ≤ **25A**	2.5-6.0mm²
I_{1eff} ≤ **32A**	4.0-10.0mm²

Don't risk damage to your machine or cause tripping and/or fire by using the wrong input current, cable or plug. Don't tamper with the plugs or file down earth pins. Doing so will void your warranty.

For your safety, UNIMIG meets the AS/NZS Standards for safe electrical compliance

All UNIMIG machines undergo an independent certification process to meet Australian and New Zealand regulations regarding electrical safety.

The triangle-circle-tick (RCM) symbol signifies that UNIMIG has taken the necessary steps to have the product comply with the electrical safety and/or electromagnetic compatibility (EMC) legislative requirements as specified by the Electrical Regulatory Authorities Council (ERAC). For your safety, please check for this symbol before buying any welding machine in Australia and New Zealand.

Depending on the specific machine, it may be necessary for UNIMIG to use a 32A single-phase plug. This is to make sure that the input supply plug and lead remain cool and do not overheat when the machine operates at its maximum capacity.

Check the rating plate on your machine

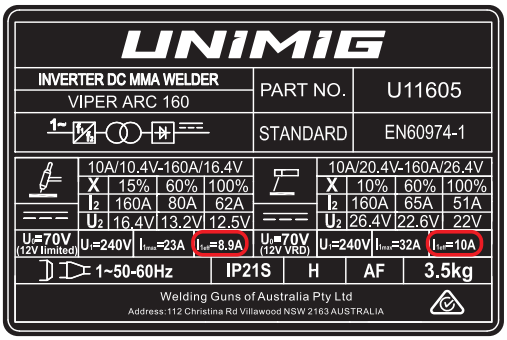
All welding machines that comply with **IEC 60974** or **AS 60974** must have a data plate similar to the one shown.

Welding machines draw some current when not welding, a higher current when welding, and a surge current when initiating an arc.

The effective rated primary current (I_{1eff}) combines the conductor heating due to these levels of current. I_{1eff} is the maximum rated effective supply current that determines the minimum plug and input cable rating as well as the minimum capacity of the input circuit that the machine gets plugged into to safely operate the machine.

Look for the I_{1eff} on the welding machine's rating plate and ensure that you have the correct input circuit to support this power draw.

Example: *If the I_{1eff} rating on your machine is 27A then you must use a 32A plug, as a 15A plug is undersized for the welding current being used and may cause the cable to overheat.*



How important is the correct input cable and plug on a welding machine?

The size of the plug depends on the above formula, which uses the maximum current draw as well as the duty cycle of the power source. The use of any welding power source will not only cause the machine itself to heat up but the input cable, plug, and mains power as well.

That's why it's important to understand input and output currents and to make sure that the input circuit is correctly rated to supply the required input draw. This allows the machine to operate at or near maximum output and protects the circuit board from tripping, overheating and/or catching fire.

What if I don't have a 240volt 15amp or 32amp outlet?

If you don't have a suitable power outlet, you should contact a qualified electrician to advise whether the wiring in your building will cater for a 15amp or 32amp outlet. You may also need to upgrade your circuit breakers and possibly switchboard to suit. Failure to do this may cause an electrical fire in the building which may void insurances.

Make sure you:

- ✓ Use the correct input current cable and plug in accordance with **AS 60974.1** for your safety and to get the maximum performance from your welding machine.
- ✓ Inspect cables and plugs regularly.
- ✓ Contact a qualified electrician for advice and/or upgrade and, if needed, to replace any damaged plugs or cables.

2.1 Circuit Breaker Recommendation

The maximum input current (I_{max}) will determine the size of the circuit breaker that should be installed in order to run the machine continuously without risk of voltage drops from the circuit breaker to the plug outlet.

The recommended circuit breaker for this machine is 32A.

This recommendation is distinct from the effective current (I_{1eff}), which dictates the size of the input plug.

2.2 Welding Cable Leads Recommendation

Welding cables are crucial electrical conductors for the welding current. The appropriate thickness of the welding cable is dictated by the machine's maximum amperage and the length of cable needed. It is essential that both the earth clamp and the electrode holder are equipped with adequately sized welding cable leads to maintain effective operation.

Current (A)	Duty Cycle (%)	Lead thickness (mm^2) based off combined lengths of electrode and earth cable				
		Up to 15m	16-30m	31-45m	46-60m	61-75m
125	30	10	16	25	35	50
150	40	10	16	25	35	50
180	30	25	25	35	50	50
200	60	35	35	35	50	50
225	30	25	25	50	50	50
250	30	25	25	50	50	50
275	60	50	50	50	70	95
300	60	50	50	70	70	95
350	60	50	50	70	95	120
400	100	70	70	95	95	120
500	100	70	95	95	95	120

2.3 Extension Cord Data

See the table below as a guide based on the minimum necessary input power (in this case, 20A):

Cord thickness/Cable size (mm^2)	Maximum length of cord (m)
2.5	30
4.0	50

Using an extension lead that is too small, or using it over a longer distance than recommended, will lead to voltage drops and cause problems with power supply.

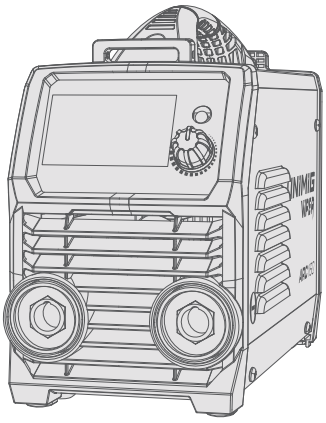
⚠ **Not following these recommendations can cause insufficient power, which can lead to unstable arc behaviour, reduced penetration, and poor weld quality.**

2.4 Generator Power Data

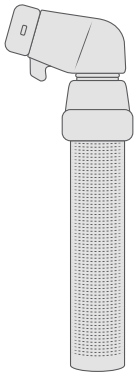
Operate this unit only with clean power generators that provide a surge capacity of 10,000 watts or more. The generator should limit Total Harmonic Distortion (THD) to 5% or below, as this level of THD is deemed ‘clean’ and comparable to conventional shop power. Usage of generators that don’t meet the clean power standard (5% or lower THD) is not recommended.

⚠ **Not following these recommendations can cause insufficient power, which can lead to unstable arc behaviour, reduced penetration, and poor weld quality. In some instances it can also cause damage to your equipment.**

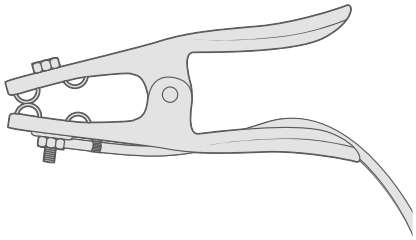
3. Package Contents



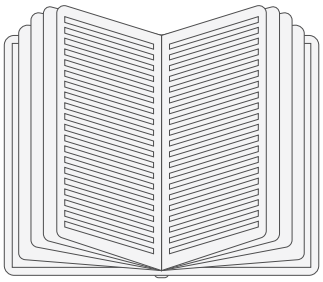
VIPER ARC 160 Welder



400A Electrode Holder



200A Earth Clamp



Manual

4. Technical Specifications

4.1 Machine Specifications

Technical Data

Parameter	Values
SKU	U11605
Primary Input Voltage	240V Single Phase 50/60Hz
Supply Plug	10A
Ieff (A)	10
Imax (A)	32
Rated Output	10-160A
No Load Voltage (V)	70.0
Protection Class	IP21S
Insulation Class	H
Minimum Generator (kVA)	10
Dinse Connector	35/50
Standard	AS 60974.1
Welds	**MMA:** Mild Steel, Stainless Steel, Cast Iron **TIG:** Mild Steel, Stainless Steel, Copper, Silicon Bronze, Titanium
Warranty (Years)	3

MMA Specifications

Parameter	Values
STICK Welding Current Range	10-160A
STICK Duty Cycle @ 40°C	10% @ 160A 60% @ 65A 100% @ 51A
STICK Electrode Range	2.5-4.0mm
STICK Welding Thickness Range	2-10mm

TIG Specifications

Parameter	Values
TIG Function Type	DC Lift Arc TIG
TIG Welding Current Range	10-160A
TIG Duty Cycle @ 40°C	15% @ 160A 60% @ 80A 100% @ 62A
TIG Welding Thickness Range	1-6mm

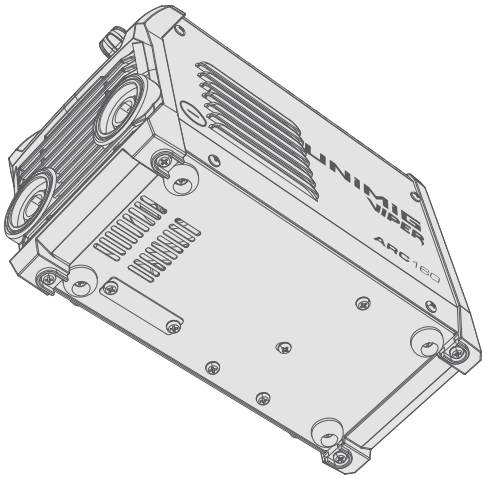
Size & Weight

Parameter	Values
Dimensions (mm)	265x125x215mm
Weight (kg)	3.5kg

4.2 Equipment Identification

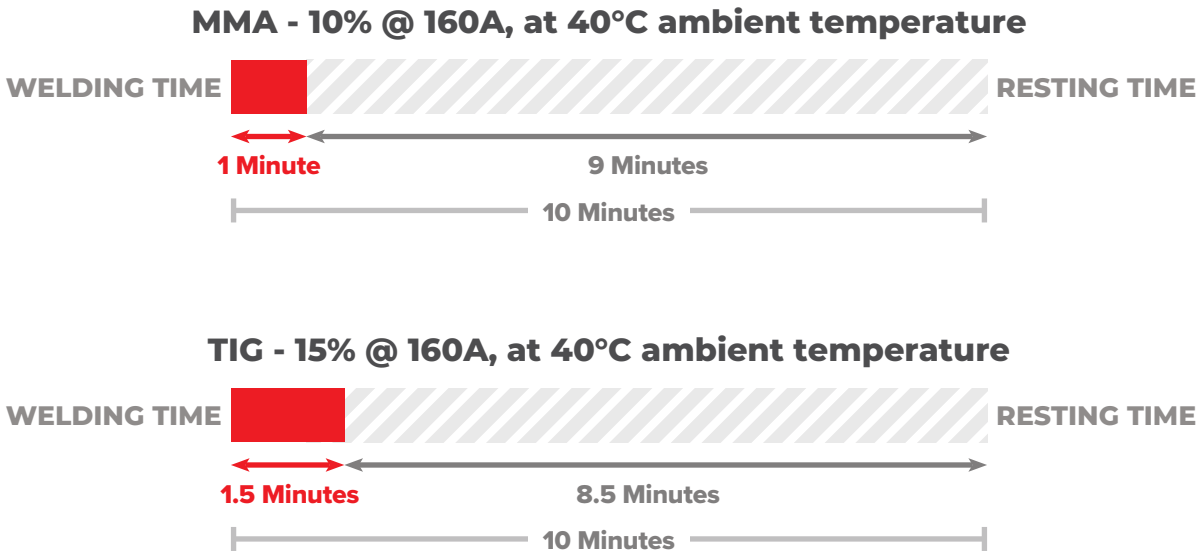
Serial Number

The serial number of the device is marked below the data plate on the bottom of the machine. It is important to make correct reference to the serial number of the product when ordering spare parts or making repairs, for example.



4.3 Duty Cycle & Overheating

The duty cycle is how long a machine can continuously weld at a selected amperage over a 10-minute period before the thermal overload protection kicks in.



5. Machine Overview

5.1 Key Features

Lightweight & Portable

Weighing just 3.5kg, the VIPER ARC 160 is ready to go anywhere you need it.

Smart Fan

Smart Fan diminishes noise, saves power, helps reduce energy costs, and minimises the number of contaminants being pulled through the machine.

Generator Compatible

Going off the grid? The VIPER ARC 160 can be connected to a generator, we recommend one with at least 10kVA.

IP21S Rating

Rated IP21S, so it's protected from touch by fingers and objects greater than 12mm, and water spray from a vertical direction.

DC Lift Arc Start TIG

Lift Arc ignition allows the arc to be started easily in DC TIG by simply touching the tungsten to the workpiece and lifting it up to start the arc. This stops the tungsten tip sticking to the workpiece and breaking the tip from the tungsten electrode.

5.2 MMA Features

Pulse MMA

Pulse MMA welding helps reduce spatter, improves heat control and allows for an easier removal of slag. It also improves the speed and efficiency of vertical up welds by eliminating the use of the "Christmas Tree" technique, while still maintaining root fusion.

Hot Start

The Hot Start feature gives a boost of current at the beginning of your weld, stabilising your ignition and eliminating any issues with striking an arc, especially on difficult electrodes.

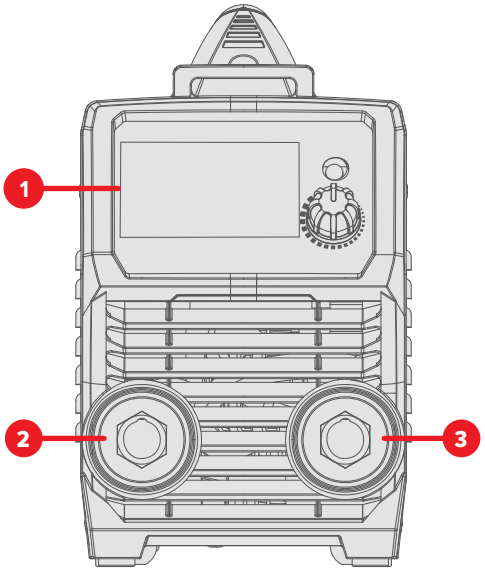
Arc Force

The Arc Force feature helps to keep the arc stabilised throughout the weld, by increasing or decreasing the peak current to compensate for your arc length, preventing the arc from cutting out or the electrode from sticking.

Anti Stick

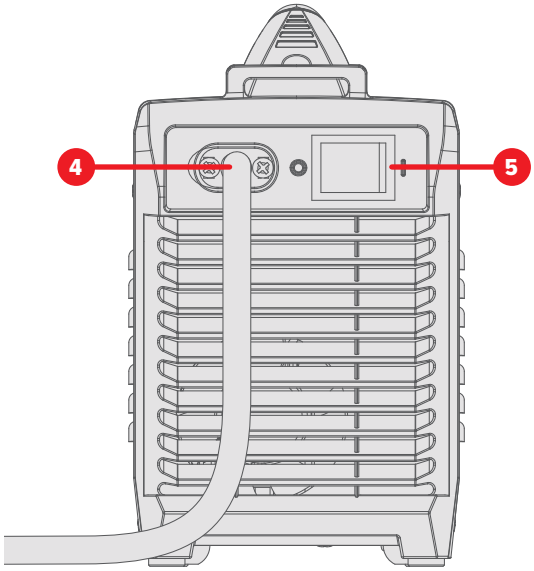
The Anti Stick feature, which is always on, prevents your electrode from sticking to your workpiece. When the machine detects sticking, the current will drop significantly, so the electrode can be removed.

5.3 Machine Layout



Front Panel Layout

1. Display Panel
2. Positive Dinse Connector (+)
3. Negative Dinse Connector (-)



Back Panel Layout

4. Power Cable
5. Power Switch

6. Installation

⚠ **Don’t connect the equipment to the wall socket/mains supply before the installation is complete.**

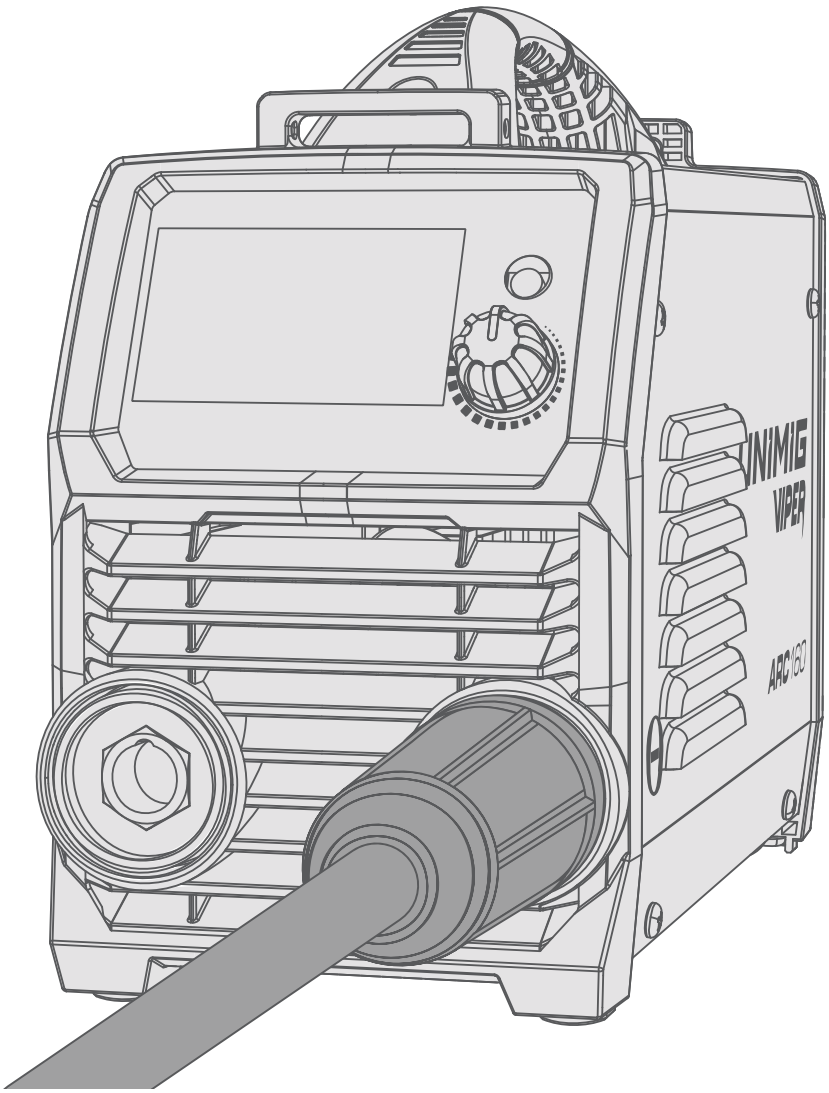
⚠ **Don’t modify the equipment in any way except for the changes and adjustments covered in the manufacturer’s instructions.**

ⓘ **Place the machine on a horizontal, stable and clean ground. Check that there is enough space for cooling air circulation in the machine’s vicinity. Don’t cover the machine’s ventilation as it could overheat.**

6.1 Connecting the MMA Electrode Holder

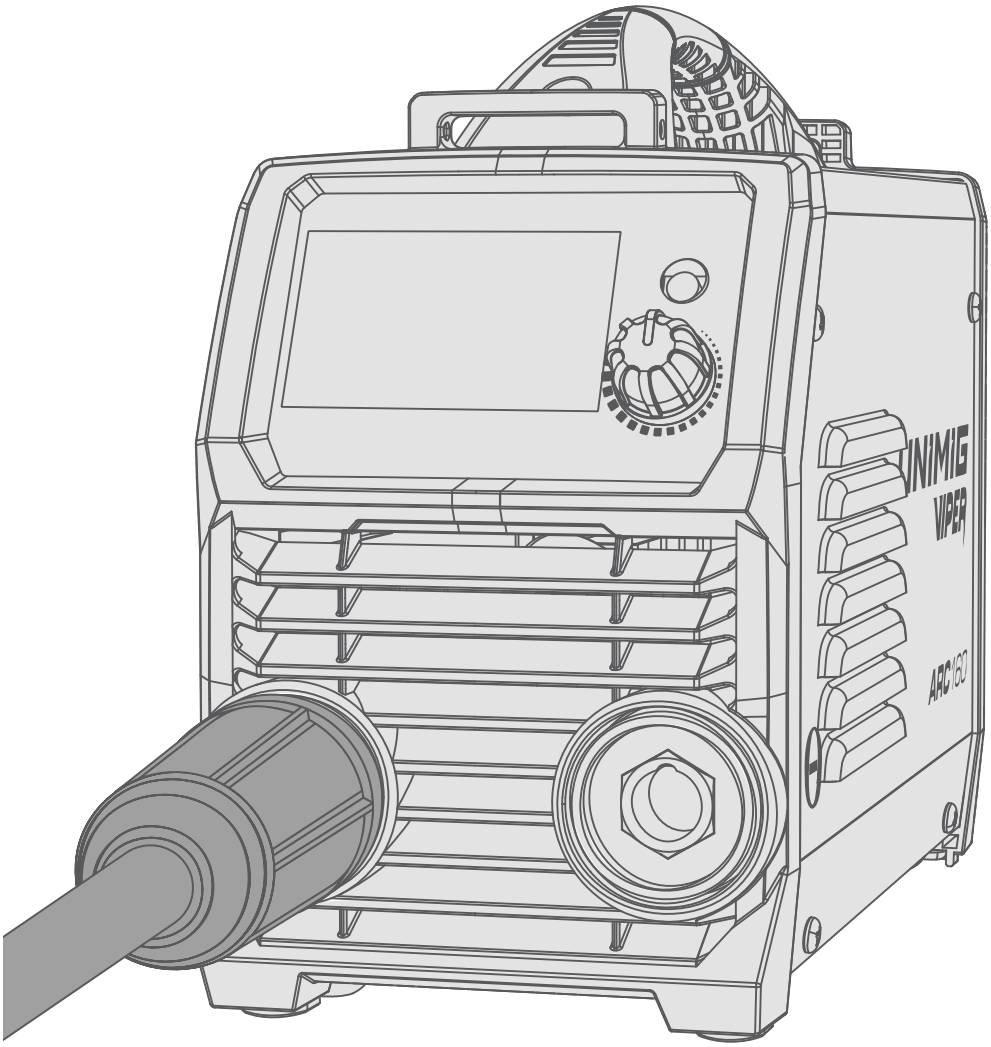
DCEN

For DC- electrodes, connect the electrode holder to the negative (-) dinse connection, and twist to lock it in place.



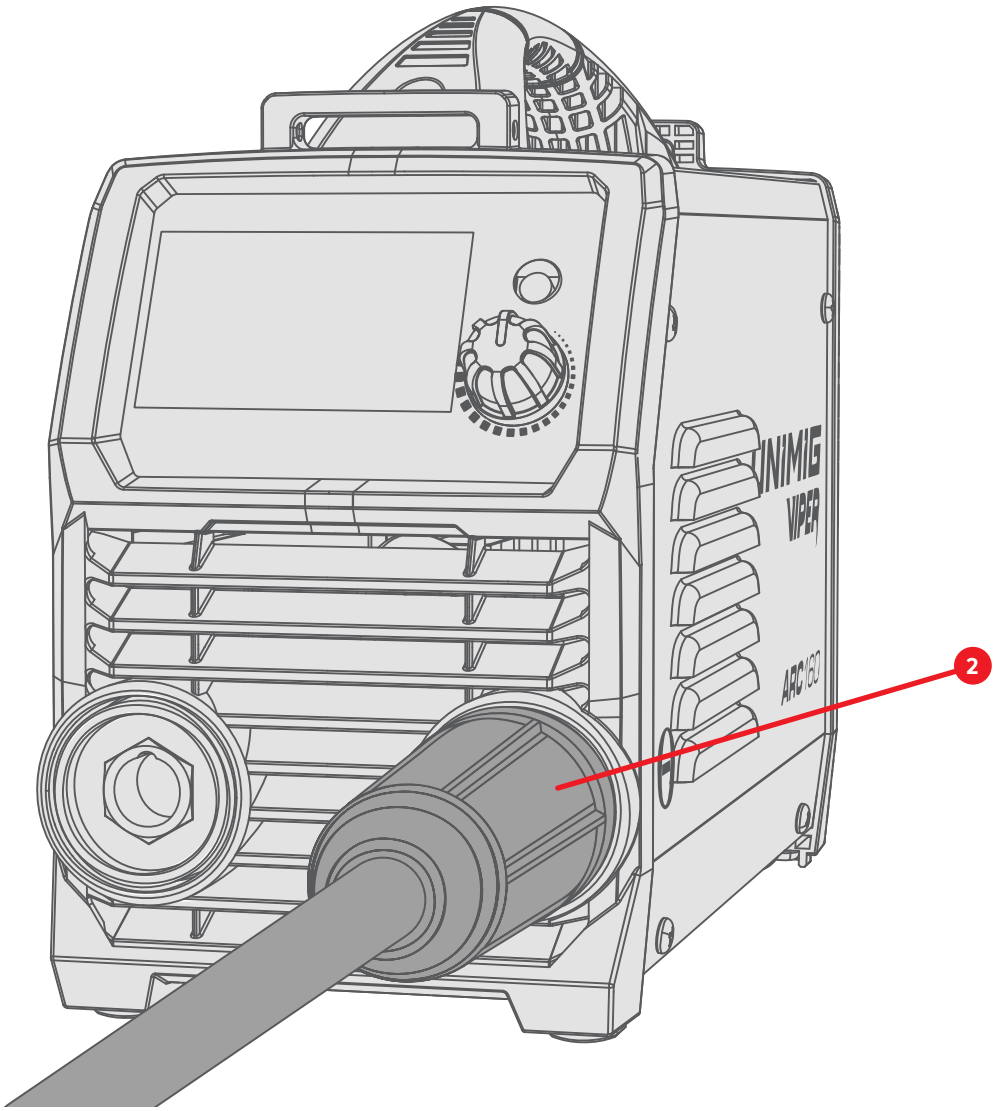
DCEP

For DC+ electrodes, connect the electrode holder to the positive (+) dinse connection, and twist to lock it in place.



6.2 Connecting the TIG Torch

1. Assemble the TIG torch.
2. Connect the TIG torch to the negative (-) dinse connection, and twist to lock it in place.

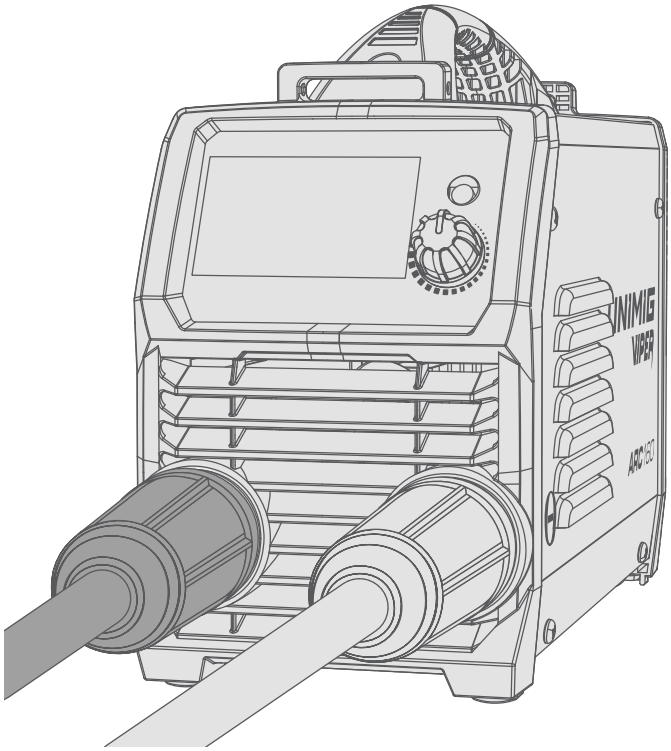


6.3 Connecting the Earth Clamp

MMA

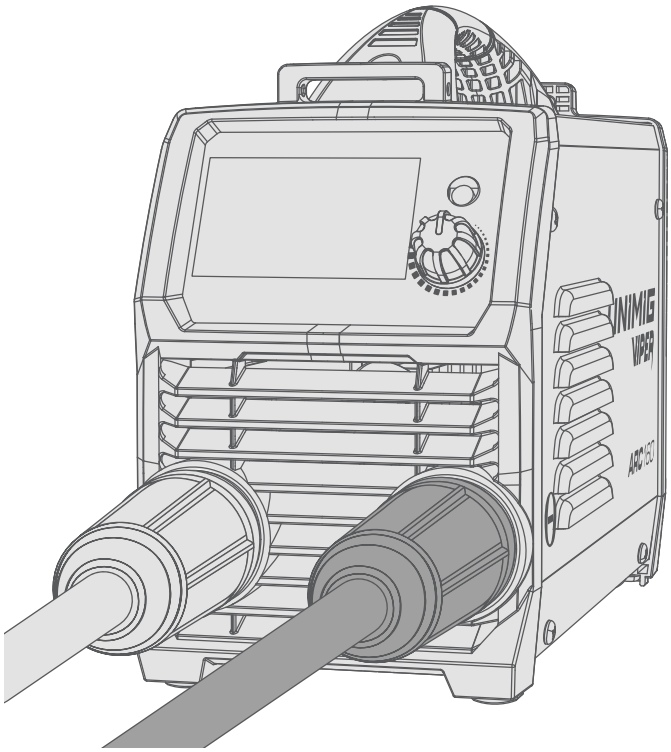
DCEN

For DC- MMA electrodes, connect the earth clamp to the postive (+) dinse connection, and twist to lock it in place.



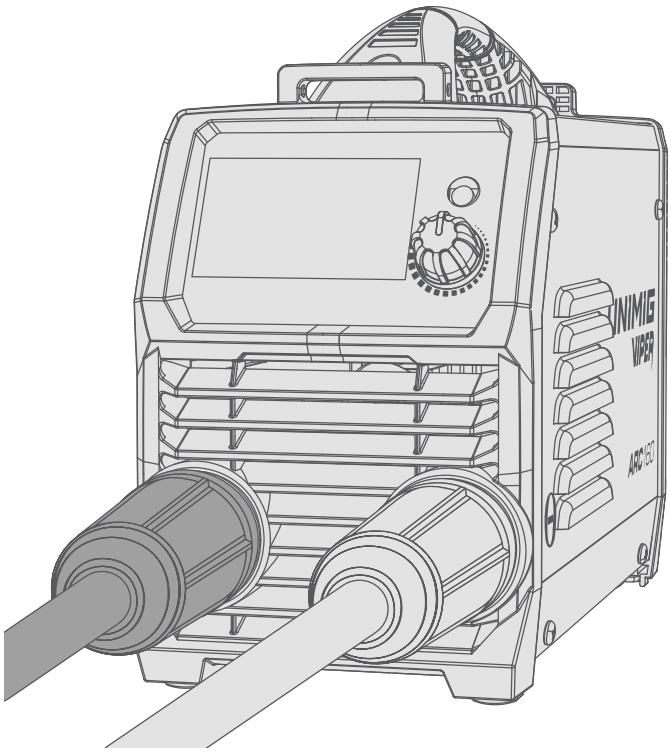
DCEP

For DC+ MMA electrodes, connect the earth clamp to the negative (-) dinse connection, and twist to lock it in place.



TIG

For TIG, connect the earth clamp to the positive (+) dinse connection, and twist to lock it in place.



7. Operation

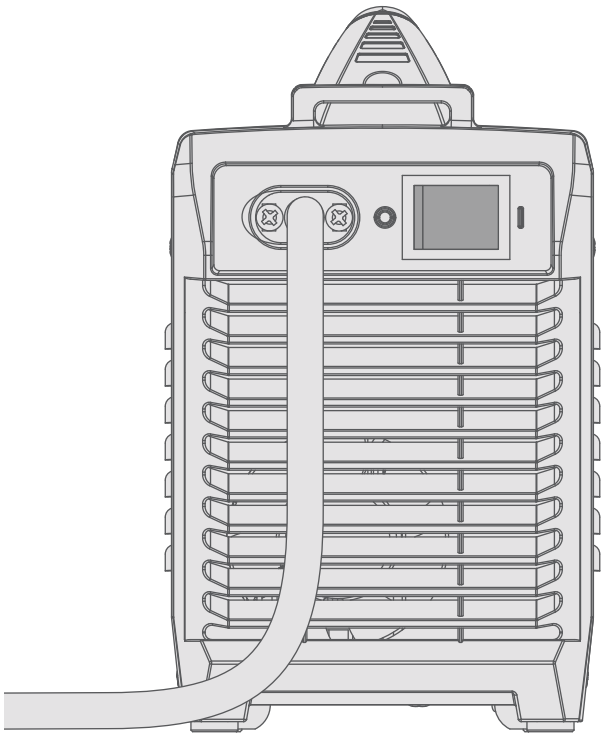
7.1 Preparing for Operation

Before using the equipment, ensure that all the necessary installation actions have been completed according to your equipment setup and instructions.

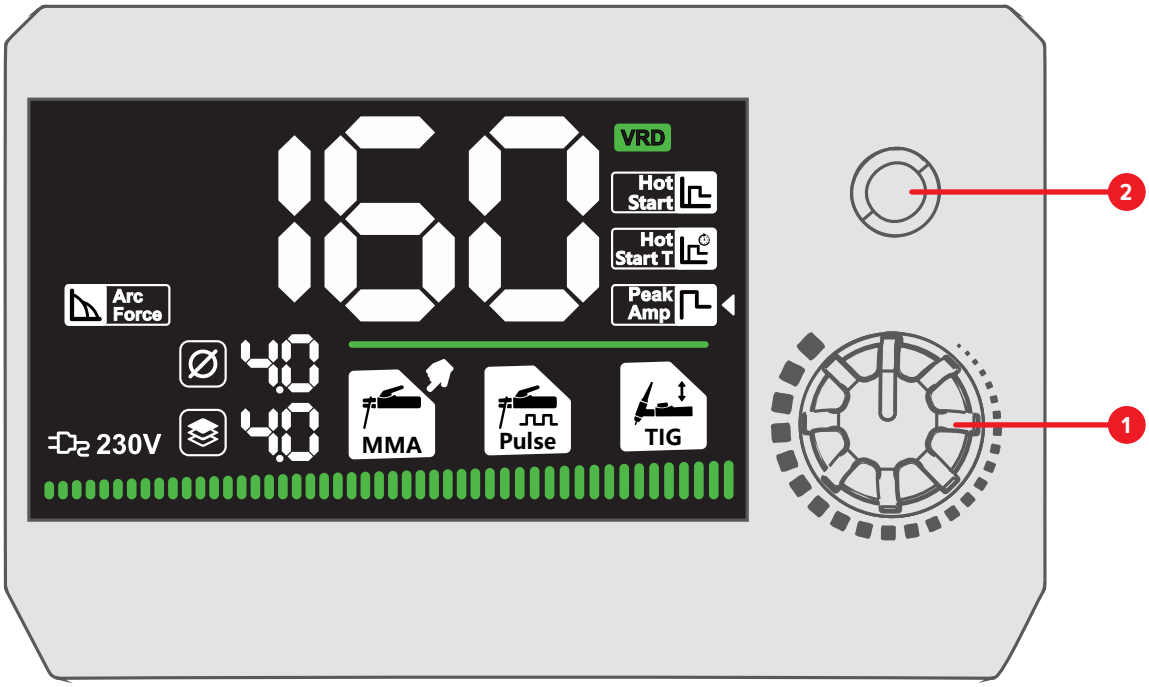
Industry standards typically dictate the minimum and maximum welding capacity and are influenced by practical considerations for both single-pass and multi-pass welds to secure the best possible quality. The material thicknesses indicated on this machine are subject to these standards and best practices for the weld being performed.

Always check before use that the torch cable, shielding gas hose, earth cable/clamp and power cable are in serviceable condition. Ensure that the connectors are correctly fastened. Loose connectors can impair welding performance and damage connectors.

Connect the plug into the mains socket, then switch the machine ON.



7.2 Control Panel Layout & Operation



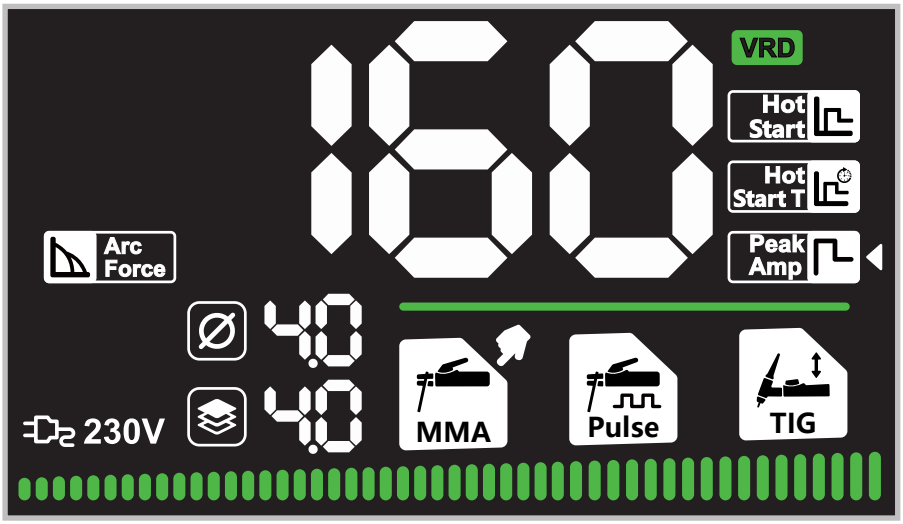
1. **Control knob**

   ☞ **Press** this knob to cycle through the parameters. When a parameter is active, 🔄 **turning** this knob will adjust the item value.

2. **Select button**

   ☞ **Press** the select button to cycle between weld modes.

7.3 MMA Mode

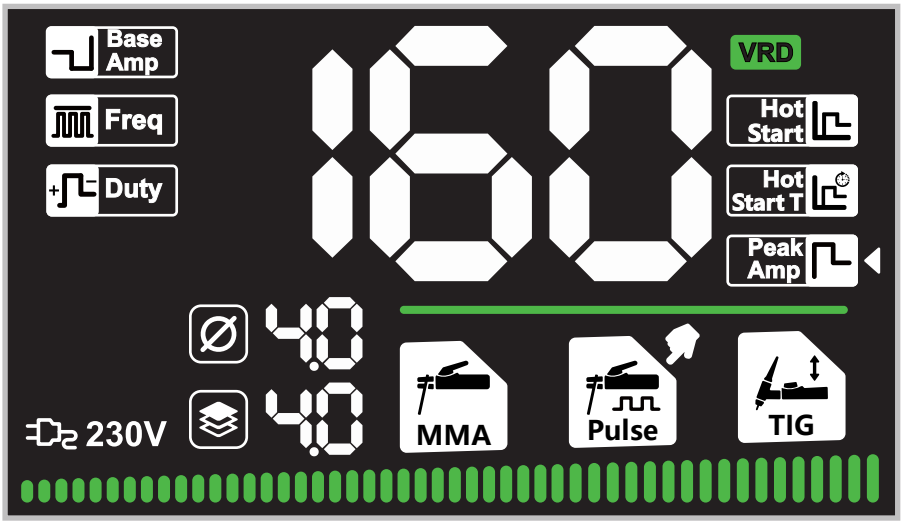


1. **Press** the select button to select MMA Mode.
2. **Press** the control knob to cycle between Hot Start, Hot Start T, Peak Amp and Arc Force.
3. **Turn** the control knob to adjust a parameter.

Welding Parameters

Parameter	Value	Description
Hot Start	1 - 10	Hot Start boosts the initial welding current for a short duration to ensure a reliable arc start.
Hot Start T	0.5s - 5.0s	The time that the Hot Start current runs for.
Peak Amp	10A - 160A	Sets the maximum current level while welding.
Arc Force	1 - 10	The level of current boost when the machine senses voltage drops, improving arc stability and preventing electrode sticking.

7.4 Pulse MMA Mode

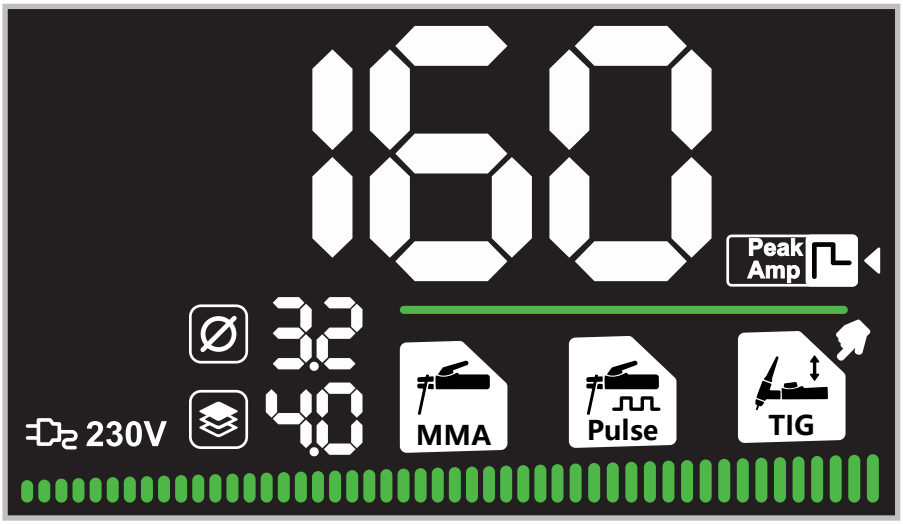


1. **Press** the select button to select Pulse MMA Mode.
2. **Press** the control knob to cycle between Hot Start, Hot Start T, Peak Amp, Base Amp, Freq and Duty.
3. **Turn** the control knob to adjust a parameter.

Welding Parameters

Parameter	Value	Description
Hot Start	1 - 10	Hot Start boosts the initial welding current for a short duration to ensure a reliable arc start.
Hot Start T	0.5s - 5.0s	The time that the Hot Start current runs for.
Peak Amp	10A - 160A	Sets the maximum current level while welding.
Base Amp	10A - 160A	The lower current level in the pulse cycle.
Freq	0.5PPS - 400PPS	The number of pulse cycles every second.
Duty	5% - 95%	Sets the time the arc stays at its peak amperage during the pulse cycle.

7.5 Lift TIG Mode



1. **Press** the select button to select TIG Mode.
2. **Turn** the control knob to adjust the Peak Amp.

Welding Parameters

Parameter	Value	Description
Peak Amp	10A - 160A	Sets the maximum current level while welding.

8. Maintenance

How often the machine is used and the working environment it is in should both be considered when planning the frequency of maintenance. In severe conditions, maintenance should occur more frequently.

Proper operation of the machine and regular preventive maintenance will help avoid equipment failure, increase the life-span of the machine and ensure problem-free welding.

⚠ **Turn the machine off and unplug it from the mains before beginning any maintenance.**

Before each use, check your gas hose, earth clamp and cable, and power cable are in good condition. Check that all connections are properly fastened. Any loose connections can inhibit welding performance and cause damage.

- Check that all covers and components are intact.
- Check all electrical cables and connections every 6 months.
- Clean any oxidised connections and tighten them.
- Clean dirt and dust from the outside and inside of the unit with a vacuum cleaner and soft brush.

ⓘ **Do not use any pressure-washing devices. Do not use compressed air, the pressure may pack the dirt even more tightly into components.**

⚠ **Only authorised electricians or service repair agents should carry out repairs and internal servicing.**

For repairs, contact UNIMIG at unimig.com.au or contact your local dealer.

9. Troubleshooting

The issues and potential reasons outlined are not exhaustive but indicate common scenarios that might arise with regular use of the machine.

9.1 Machine Troubleshooting

Problem	Recommended Actions
The machine does not power up	• Check that the power cable is plugged in properly. • Check that the mains switch of the power source is at the ON position. • Check that the mains power distribution is on. • Check the mains fuse and/or the circuit breaker.
The machine stops working	• The torch may have overheated. Wait for it to cool down. • Check that none of the cables are loose. • The power source may have overheated. Wait for it to cool down and see that the cooling fans work properly and the air flow is unobstructed.

9.2 MMA Troubleshooting

Problem	Recommended Actions
No arc	• Check the earth lead and all connections are tight. • Check that the machine is switched on and has a power supply. • Check that the weld mode is set to the MMA position.
Porosity	• The arc length may be too long, move the electrode closer to the workpiece. • Remove materials like paint, grease, oil, and dirt, including mill scale, from the base metal. • Only use dry electrodes.
Excessive spatter	• The amperage may be too high, reduce the amperage. • The arc length may be too long, move the electrode closer to the workpiece.
Lack of fusion	• The amperage may be too low, increase the amperage. • Remove materials like paint, grease, oil, and dirt, including mill scale, from the base metal. • Use the correct welding technique *(See "13. MMA Welding Guide" on page 30)*.
Lack of penetration	• The amperage may be too low, increase the amperage. • Use the correct welding technique *(See "13. MMA Welding Guide" on page 30)*. • Check the joint design and fit up is correct and the material isn't too thick.
Excessive penetration/Burnthrough	• The amperage may be too high, reduce the amperage. • Increase the travel speed.
Uneven weld appearance	• Use two hands where possible to hold the electrode steady. • Use the correct welding technique *(See "13. MMA Welding Guide" on page 30)*.
Distortion	• The amperage may be too high, reduce the amperage. • Use the correct welding technique *(See "13. MMA Welding Guide" on page 30)*. • Check the joint design and fit up is correct and the material isn't too thick.
Unusual or poor arc characteristics	• The polarity may be wrong, check the polarity *(See "6.6 Connecting the MMA Electrode Holder" on page 15)*.

9.3 TIG Troubleshooting

Problem	Recommended Actions
Tungsten burning away quickly	• Check that the correct gas is being used. • Check the gas is connected, check hoses, gas valve and torch are not restricted or leaking. Set the gas flow to the recommended flow rate. • Check the back cap is fitted correctly and that the O-ring is inside the torch body. • The polarity may be wrong, check the polarity *(see "6.3 Connecting the TIG Torch" on page 17)*. • Check the right tungsten is being used and change the tungsten type if necessary. • Keep the shielding gas flowing 10-15 seconds after arc stoppage to prevent tungsten oxidation.
Contaminated tungsten	• Don't let the tungsten touch the weld pool. Raise the torch so that the tungsten is off the workpiece 2-5mm. • Don't let filler rod touch the tungsten during welding. Feed the filler rod into the leading edge of the weld pool in front of the tungsten.
Porosity	• Check that the correct gas is being used. • Check the gas is connected, check hoses, gas valve and torch are not restricted or leaking. Set the gas flow to the recommended flow rate. • Remove materials like paint, grease, oil, and dirt, including mill scale, from the base metal & filler rod. • Check the filler rod is correct and change if necessary.
Yellowish residue/smoke on the ceramic cup & discoloured tungsten	• Check that the correct gas is being used. • Check the gas is connected, check hoses, gas valve and torch are not restricted or leaking. Set the gas flow to the recommended flow rate. • The cup size may be too small, use a bigger cup size.
Unstable arc while welding	• The polarity may be wrong, check the polarity *(see "6.3 Connecting the TIG Torch" on page 17)*. • Remove materials like paint, grease, oil, and dirt, including mill scale, from the base metal. • The tungsten may be contaminated, remove 10mm of the contaminated tungsten and re-grind the tungsten. • The arc length may be too long, lower the torch so that the tungsten is off the workpiece 2-5mm.
Arc wandering while welding	• Check the gas is connected, check hoses, gas valve and torch are not restricted or leaking. Set the gas flow to the recommended flow rate. • The amperage may be too low, increase the amperage. • The arc length may be too long, lower the torch so that the tungsten is off the workpiece 2-5mm. • Check that correct type of tungsten is being used and it's not contaminated. Remove 10mm of the contaminated tungsten and re-grind the tungsten. • The tungsten may be poorly prepared. Grind marks should run lengthwise with tungsten, not circular. • Remove materials like paint, grease, oil, and dirt, including mill scale, from the base metal & filler rod.
Arc difficult to start or won't start	• Check the machine set up is correct. • Check that the correct gas is being used. • Check the gas is connected, check hoses, gas valve and torch are not restricted or leaking. • Check the right type & size tungsten is being used and change the tungsten type if necessary. • Check all the connections are tight. • Connect the earth clamp directly to the workpiece.

9.4 Error Codes

Error Code	Name	Description	Potential Action
E01	Hot Protect	The welder is overheating.	Check the fan is operating, wait for the welder to cool down. If the problem persists, contact UNIMIG customer service.
E02	Hot Protect	The welder is overheating.	Check the fan is operating, wait for the welder to cool down. If the problem persists, contact UNIMIG customer service.
E09	Over Time of Continously Welding	The welder has reached its duty cycle.	Wait for the welder to cool down.

10. General Welding Information

10.1 Metal Preparation

Proper preparation of the metal surface is crucial for achieving a good quality weld and cannot be overstated. Each type of metal may require slightly different approaches, especially in terms of cleaning and edge preparation, to adapt to its specific properties and behavior during welding.

Mild Steel

- **Cleaning:** Start by removing any rust, paint, oil, or grease from the surface. Use a wire brush or grinder to clean the metal. It's essential to start with a clean surface to avoid contamination of the weld pool.
- **Degreasing:** Wipe down the surface with a solvent such as acetone or a commercial degreaser to remove any residual oils or contaminants that might interfere with the welding process.
- **Edge Preparation:** If welding thicker pieces, bevel the edges to allow the weld to fully penetrate the joint. The angle and depth of the bevel depend on the thickness of the metal.
- **Fit up:** Ensure that the pieces to be welded fit together well without large gaps. A good fitup helps achieve a strong and uniform weld.

Stainless Steel

- **Cleaning:** Similar to mild steel, all surfaces must be cleaned of any contaminants. Use a stainless steel wire brush (one dedicated to stainless steel to avoid cross-contamination with other metals) to remove any surface debris.
- **Degreasing:** Clean the surface with a high-purity solvent like acetone to remove any oils or residues. This step is crucial for stainless steel to prevent any interference with the weld quality.
- **Edge Preparation:** Bevel the edges if necessary, especially for thicker pieces. Stainless steel requires precise edge alignment to ensure a quality weld, so take extra care during this step.
- **Avoiding Contamination:** Use dedicated tools for stainless steel to avoid iron contamination from regular steel tools. This can lead to rust and corrosion.

10.2 Bevelling

The standard bevel for pipe and plate in welding is primarily determined by the thickness of the materials and the type of weld joint being prepared. Bevelling is done to ensure that the weld can fully penetrate the joint, which is crucial for the structural integrity of the weld. It is primarily used to prepare butt joints for welding.

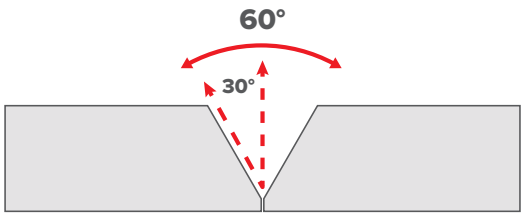
Here's a general breakdown of typical bevels used for both pipes and plates:

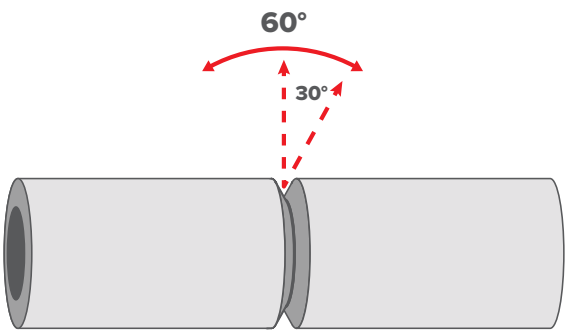
Thickness below 3mm: Typically, no bevelling is required for material thinner than 3mm. A square butt joint is usually sufficient as the weld can penetrate through the entire thickness.

Thickness 3mm to 12mm: A single-V bevel is often used. The angle might start from about 30° for thinner sections up to about 37.5° for closer to 12mm thick material.

Thickness above 12mm: Double-V bevels become more common as the thickness increases, reducing the amount of filler material needed and ensuring better weld penetration.

The specific bevel angle and type also depend on the welding standards being followed (such as AWS, ASME, etc.), the welding process used, and the requirements of the specific project or industry. For precise applications, always refer to the welding specification or consult a welding engineer to determine the most appropriate bevel for a given situation.



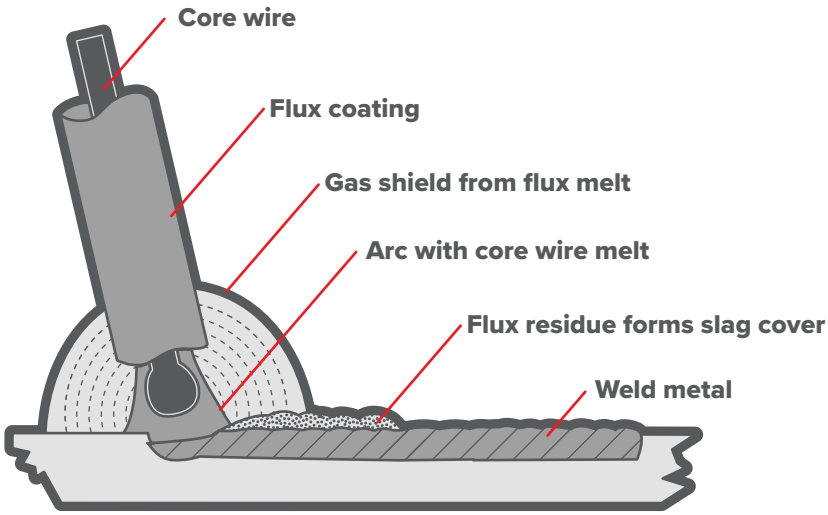


11. MMA Welding Guide

What is MMA Welding?

Manual Metal Arc (MMA) welding is an arc welding process in which an arc is formed between a flux-covered electrode and the base metal. The arc melts the electrode into the workpiece, forming the weld.

MMA is also referred to as Shielded Metal Arc Welding (SMAW), but it's most commonly known as 'stick' welding.



How MMA Welding Works

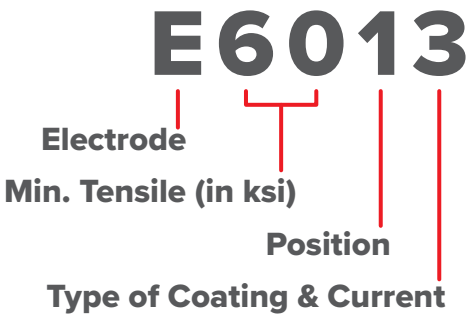
You can MMA weld two different ways: with alternating current (AC) or direct current (DC). Both need to be run on a constant-current power source to work. The electrode is tapped or struck against the base metal, which ignites the arc between the two. The electrodes used in MMA welding are consumable electrodes, as they melt into the base metal to form the weld.

An external gas isn't needed as the outer flux coating on each electrode works to shield the weld as it melts. The flux coating melts with the metal, releasing gases from within which bubble to the surface.

These internal gases protect the weld from outside contaminants until the puddle begins to cool. The flux coating, once melted, forms a layer of slag over the final weld, which needs to be chipped off to achieve a clean, finished weld.

Electrode Selection

There is a range of different electrodes available for MMA welding. Each is stamped with its own classification code, which details the properties of each electrode. For mild steel electrodes, there is an 'E' followed by a 4-digit code, for example, E6013.



You'll need to select an electrode with a similar composition to the base metal. Generally speaking, the most common electrodes used for mild steel are E6010, E6011, E6013, E7016, E7018 and E7024. Stainless steel electrodes are marked with their metal grade, e.g., 309L.

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.

Average Thickness of Material	Maximum Recommended Electrode Diameter
3-6mm	2.6mm
6-12mm	3.2mm
12-20mm	4.0mm
20mm+	5.0mm

The amperage you'll need is dependent on the electrode size and base metal thickness.

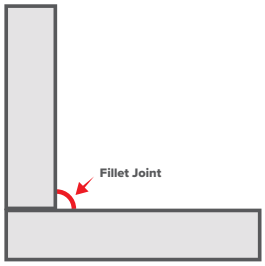
With the amperage set too low, it's difficult to strike and maintain a stable arc. The penetration is reduced and beads with a distinct rounded profile will be deposited. Too high an amperage is accompanied by overheating of the electrode, resulting in undercut, burning through of the base metal and producing excessive spatter.

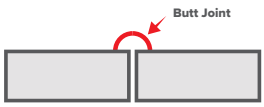
Electrodes will usually come with a recommended amperage rating. The table shows current ranges generally recommended for a general-purpose type 6013 electrode.

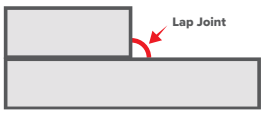
Electrode Size	Current Range
3-6mm	60-100A
6-12mm	100-130A
12-20mm	130-165A
20mm+	165-260A

Work Angle

The work angle is the up and down of the electrode in relation to the angle of the joint. There are a few different joint types, and several positions these joints can be found.



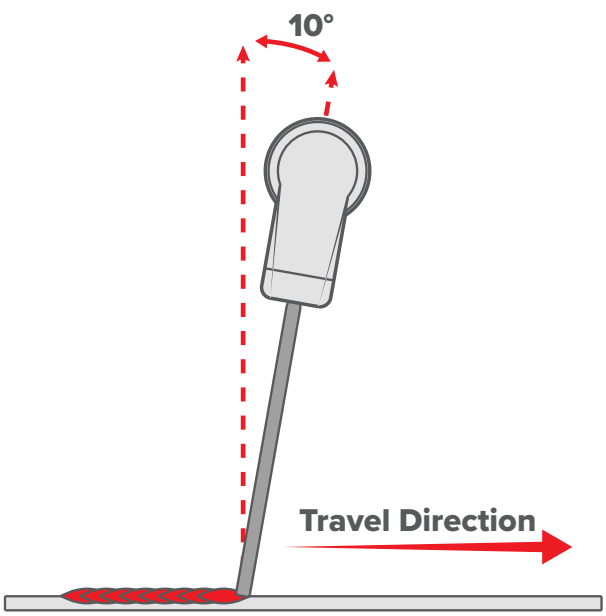


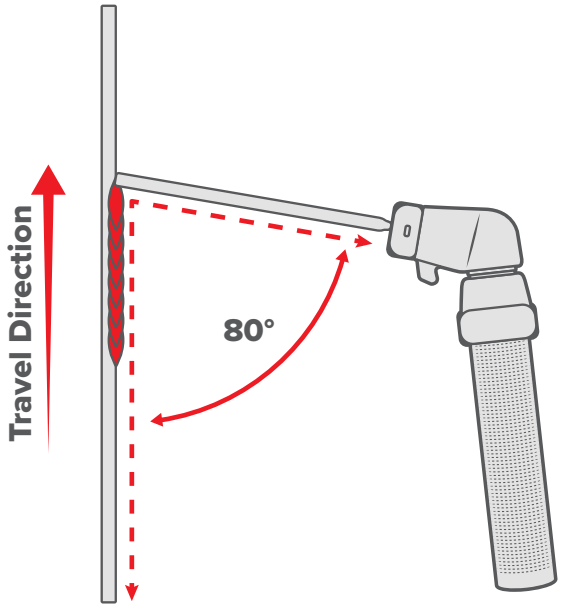


Fillet Joint (T-Joint)	Butt Joint	Lap Joint
90° joint angle	180° joint angle	90° joint angle
45° work angle	90° work angle	60-70° work angle

Travel Direction & Angle

When MMA welding, you only want to drag (pull) your weld. If you use a push angle, you risk having slag trapped in the weld pool and contaminating the weld. To drag your weld, place your electrode into the joint then tilt it slightly sideways by 10° to 15°. Your torch should hover over where you're going to be welding, rather than hovering over where you've already welded. When welding vertical up, the electrode should sit in the joint at roughly an 80° angle.





Arc Length

To strike the arc, the electrode should be gently scraped on the work until the arc is established. When welding, keep the arc length short. A good rule of thumb is that your arc length shouldn't be longer than your electrode diameter.

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.

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.

Travelling too fast will lead to poor fusion and a lack of penetration, while travelling too slow will frequently lead to arc instability, slag inclusions and burnthrough.

12. Welding Processes & Features Glossary

A

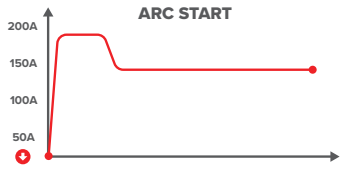
Arc Force - The level of current boost when the machine senses voltage drops, improving arc stability and preventing electrode sticking. A higher value gives a more forceful arc, especially useful in vertical or overhead positions.

D

Duty (Pulse Width) - The time the arc stays at its peak amperage during the pulse cycle. Wider widths mean more penetration, while narrower widths offer more heat control.

H

Hot Start Current - Hot Start boosts the initial welding current for a short duration to ensure a reliable arc start.



Hot Start Time - The time that the Hot Start current runs for.

L

Lift TIG - Lift Arc TIG is an arc ignition mode that initiates the arc by making brief contact between the tungsten and the workpiece. Once lifted, the arc continues without touching.

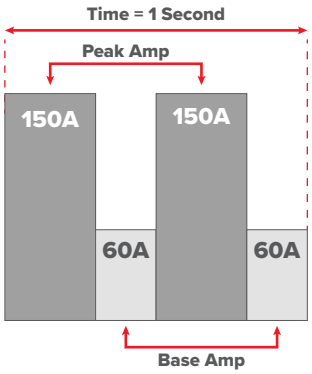
M

MMA - Manual Metal Arc (MMA) welding is an arc welding process in which an arc is formed between a flux-covered electrode and the base metal. The flux covering acts as a protective layer for the weld.

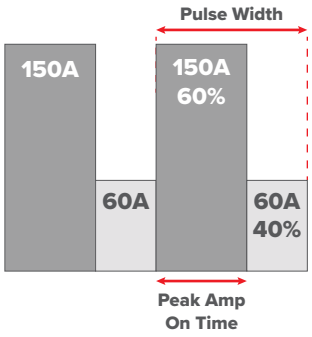
P

Peak Amp - The maximum current level during the weld. This also sets the peak in pulse cycle.

Pulse - Alternates the welding current between a high and low value to aid in heat control and improve weld quality.



Pulse Frequency - The number of pulse cycles every second. Higher frequencies result in a more focused arc, while lower frequencies create a wider arc with more spread-out heat.



Pulse MMA - Welding with a pulsing welding current that alternates between a high and low value to aid in heat control and improve weld quality. It is used for out-of-position welding of steel pipes or when welding thin sheets.

V

VRD - A Voltage Reduction Device is a safety device that reduces the open-circuit voltage of a welding machine. This minimises the risk of electric shock, especially in hazardous areas like enclosed or moist environments.

13. Recommended Accessories

17 Series Valve TIG Torch

17V-4MCP25 (4m)
17V-8MCP25 (8m)

APEX Series Starter Kit

U42009

MMA Welding Electrodes

U63028	HYPERARC NI 55 CAST IRON ELECTRODES 2.6MM 1KG
U63029	HYPERARC NI 55 CAST IRON ELECTRODES 3.2MM 1KG
U63026	HYPERARC NI 98 CAST IRON ELECTRODES 2.6MM 1KG
U63027	HYPERARC NI 98 CAST IRON ELECTRODES 3.2MM 1KG
U63025	HYPERARC 531 HARDFACING ELECTRODES 3.2MM 1KG
U63014	HYPERARC 309L STAINLESS STEEL ELECTRODES 2.6MM 2KG
U63015	HYPERARC 309L STAINLESS STEEL ELECTRODES 3.2MM 2KG
U63017	HYPERARC 312L STAINLESS STEEL ELECTRODES 2.6MM 1KG
U63019	HYPERARC 312L STAINLESS STEEL ELECTRODES 2.6MM 2KG
U63018	HYPERARC 312L STAINLESS STEEL ELECTRODES 3.2MM 1KG
U63020	HYPERARC 312L STAINLESS STEEL ELECTRODES 3.2MM 2KG
U63021	HYPERARC 316L STAINLESS STEEL ELECTRODES 2.6MM 1KG
U63023	HYPERARC 316L STAINLESS STEEL ELECTRODES 2.6MM 2KG
U63022	HYPERARC 316L STAINLESS STEEL ELECTRODES 3.2MM 1KG
U63024	HYPERARC 316L STAINLESS STEEL ELECTRODES 3.2MM 2KG
U63006	HYPERARC 16 TWIN COAT LOW-HYDROGEN ELECTRODES 2.6MM 1KG
U63008	HYPERARC 16 TWIN COAT LOW-HYDROGEN ELECTRODES 2.6MM 2KG
U63007	HYPERARC 16 TWIN COAT LOW-HYDROGEN ELECTRODES 3.2MM 1KG
U63009	HYPERARC 16 TWIN COAT LOW-HYDROGEN ELECTRODES 3.2MM 2KG
U63010	HYPERARC 16 TWIN COAT LOW-HYDROGEN ELECTRODES 4.0MM 2KG
U63002	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 3.2MM 1KG
U63030	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 2.0MM 1KG
U63031	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 2.0MM 2.5KG
U63001	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 2.6MM 1KG
U63032	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 2.6MM 2.5KG
U63003	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 2.6MM 5KG
U63033	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 3.2MM 2.5KG
U63004	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 3.2MM 5KG
U63005	HYPERARC 6013 GENERAL PURPOSE ELECTRODES 4.0MM 5KG
U63011	HYPERARC 7018 LOW-HYDROGEN ELECTRODES 2.6MM 2KG
U63012	HYPERARC 7018 LOW-HYDROGEN ELECTRODES 3.2MM 2KG
U63013	HYPERARC 7018 LOW-HYDROGEN ELECTRODES 4.0MM 2KG

TIG Tungsten Electrodes

PTR0003-10	CERIATED TUNGSTEN GREY 1.0MM QTY 10
PTR0003-16	CERIATED TUNGSTEN GREY 1.6MM QTY 10
PTR0003-24	CERIATED TUNGSTEN GREY 2.4MM QTY 10
PTR0003-32	CERIATED TUNGSTEN GREY 3.2MM QTY 10
PTR0002-16	LANTHANATED TUNGSTEN GOLD 1.6MM QTY 10
PTR0002-24	LANTHANATED TUNGSTEN GOLD 2.4MM QTY 10
PTR0002-32	LANTHANATED TUNGSTEN GOLD 3.2MM QTY 10
PTR0005-16	RARE EARTH TUNGSTEN PURPLE 1.6MM QTY 10
PTR0005-24	RARE EARTH TUNGSTEN PURPLE 2.4MM QTY 10
PTR0005-32	RARE EARTH TUNGSTEN PURPLE 3.2MM QTY 10
PTR0004-10	THORIATED TUNGSTEN RED 1.0MM QTY 10
PTR0004-16	THORIATED TUNGSTEN RED 1.6MM QTY 10
PTR0004-24	THORIATED TUNGSTEN RED 2.4MM QTY 10
PTR0004-32	THORIATED TUNGSTEN RED 3.2MM QTY 10

TIG Welding Rods

TG102ER70S-2-1.6	ER70S-2-TIG FILLER ROD 1.6MM 5KG TRIPLE DEOXIDISED
TG102ER70S-2-2.4	ER70S-2-TIG FILLER ROD 2.4MM 5KG TRIPLE DEOXIDISED
TG4ER70S-4-1.6	ER70S-4-TIG FILLER ROD 1.6MM 5KG DOUBLE DEOXIDISED
TG4ER70S-4-2.4	ER70S-4-TIG FILLER ROD 2.4MM 5KG DOUBLE DEOXIDISED
TG2ER70S-6-1.6	ER70S-6-TIG FILLER ROD 1.6MM 5KG
TG2ER70S-6-2.4	ER70S-6-TIG FILLER ROD 2.4MM 5KG
TI308L-1.6	308L TIG FILLER ROD 1.6MM 5KG
TI308L-2.4	308L TIG FILLER ROD 2.4MM 5KG
TI309L-1.6	309L TIG FILLER ROD 1.6MM 5KG
TI309L-2.4	309L TIG FILLER ROD 2.4MM 5KG
TI316L-1.2	316L TIG FILLER ROD 1.2MM 5KG
TI316L-1.6-1	316L TIG FILLER ROD 1.6MM 1KG
TI316L-1.6	316L TIG FILLER ROD 1.6MM 5KG
TI316L-2.4-1	316L TIG FILLER ROD 2.4MM 1KG
TI316L-2.4	316L TIG FILLER ROD 2.4MM 5KG
TI316L-3.2	316L TIG FILLER ROD 3.2MM 5KG

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