

OPERATING INSTRUCTIONS

Welding Machine



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- ◆ **Number 1 in the prices**
- ◆ **Number 1 in Service**
- ◆ **Number 1 in the environmental compatibility**

More than 30,000 enthusiastic customers trust our equipment in the welding and plasma technology. They confirm the success of these trendsetting strategy. In addition to the stringent quality test and the test in the production, we subject the equipment a thorough inspection before delivery. We guarantee delivery of spare parts and repair of all equipment. The customer is served during and after the warranty period from us. In case of problems, call us, we are always available. You are also welcome to visit us. Highly qualified employees are dedicated to carrying out their various tasks with expertise and passion. Our motivated team will always find a positive solution for you. Everyone is welcome to test our equipment in detail under the guidance of our experts.

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For questions or suggestions, please contact us www.vector-welding.com



WARNINGS

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment. While The operating instructions provide an introduction to the safe use of the products.

- Read the operating instructions for all system components!
- Observe accident prevention regulations!
- Observe all local regulations!
- Confirm with a signature where appropriate.

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Record the following information for Warranty purposes:

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WARNING

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR. DO NOT LOSE THESE INSTRUCTIONS. READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

Welding products and welding processes can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices have developed from past experience in the use of welding and cutting. These practices must be learned through study and training before using this equipment. Some of these practices apply to equipment connected to power lines; other practices apply to engine driven equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld.

Safe practices are outlined in the European Standard EN60974-1 entitled: Safety in welding and allied processes Part 2: Electrical HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.

1.1 Arc Welding Damage



WARNING 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 machine internal circuits are also live when power is on. In semi-automatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lock input power disconnect switch open, or remove line fuses so power cannot be turned on accidentally.
5. Properly install and ground this equipment according to its Owner's Manual.



WARNING ARC RAYS can burn eyes and skin,
NOISE can damage hearing.

Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

1. Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching;
2. Wear approved safety glasses. Side shields recommended;
3. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc;
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection;
5. Use approved ear plugs or ear muffs if noise level is high;
6. Never wear contact lenses while welding.



WARNING FUMES AND GASES can be hazardous
to your health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breathe the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
5. 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.
6. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



WARNING WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The fly sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables far away from the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.

6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from travelling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.



WARNING

**FLYING SPARKS and HOT METAL
can cause injury.**

Chipping and grinding cause flying metal. As welds cool, they can throw off slag.

1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.



WARNING

CYLINDERS can explode if damaged.

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

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment.



WARNING

ENGINE FUEL can cause fire or explosion.

Engine fuel is highly flammable.

1. Stop engine before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Allow engine to cool before fuelling. If possible, check and add fuel to cold engine before beginning job.
4. Do not overfill tank — allow room for fuel to expand.
5. Do not spill fuel. If fuelling is spilled, clean up before starting engine.



WARNING

MOVING PARTS can cause injury.

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.



WARNING

SPARKS can cause battery gases to explode;
BATTERY ACID can burn eyes and skin.

Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. Do not use welder to charge batteries or jump start vehicles.
5. Observe correct polarity (+ and -) on batteries.



WARNING

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

The coolant in the radiator can be very hot and under pressure.

1. Do not remove radiator cap when engine is hot. Allow engine to cool.
2. Wear gloves and put a rag over cap area when removing cap.
3. Allow pressure to escape before completely removing cap.

NOTE

1.2 Effects Of Low Frequency Electric and Magnetic Fields

Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). The discuss on the effect of EMF is ongoing all the world. Up to now, no material evidences show that EMF may have effects on health. However, the research on damage of EMF is still ongoing. Before any conclusion, we should minimize exposure to EMF as few as possible.

To reduce magnetic fields in the workplace, use the following procedures.

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cable around the body.
4. Keep welding Power Source and cables as far away from body as practical.
5. The people with heart-pacemaker should be away from the welding area.

1.3 Symbol Chart

Note that only some of these symbols will appear on your model.

	ON		Single Phase		Wire Feed Function
	OFF		Three Phase		Wire Feed Towards Workpiece With Output Voltage OFF.
	Dangerous Voltage		Three Phase Static Frequency Converter-Transformer-Rectifier		Welding Gun
	Increase/Decrease		Remote		Purging Of Gas
	Circuit Breaker		Duty Cycle		Continuous Weld Mode
	AC Auxiliary Power		Percentage		Spot Weld Mode
	Fuse		Panel/Local		Spot Time
	Amperage		Shielded Metal Arc Welding (SMAW)		Prewlow Time
	Voltage		Gas Metal Arc Welding (GMAW)		Postflow Time
	Hertz (cycles/sec)		Gas Tungsten Arc Welding (GTAW)	2 Step Trigger Operation Press to initiate wirefeed and welding, release to stop.	
	Frequency		Air Carbon Arc Cutting (CAC-A)	4 Step Trigger Operation Press and hold for preflow, release to start arc. Press to stop arc, and hold for preflow.	
	Negative		Constant Current		Burnback Time
	Positive		Constant Voltage Or Constant Potential		Inches Per Minute
	Direct Current (DC)		High Temperature		Meters Per Minute
	Protective Earth (Ground)		Fault Indication		See Note
	Line		Arc Force		See Note
	Line Connection		Touch Start (GTAW)		Pulse Welding
	Auxiliary Power		Variable Inductance		
	115V 15A Receptacle Rating-Auxiliary Power		Voltage Input		

CHAPTER 1

AC/DC SERIES EQUIPMENT



1.1 Brief Introduction

TIG V1841 V241 V341 AC/DC welding machine adopts the latest pulse width modulation (PWM) technology and insulated gate bipolar transistor (IGBT) power module, which can change work frequency to medium frequency so as to replace the traditional hulking work frequency transformer with the cabinet medium frequency transformer. Thus, its characterized with portable, small size, light weight, low consumption and etc.

The parameters of TIG V1841 V241 V341 AC/DC on the front panel all can be adjusted continuously and steplessly, such as start current, crater arc current, welding current, base current, duty ratio, upslope time, downslope time, pre-gas, post-gas, pulse frequency, AC frequency, balance, hot start, arc force etc. When welding, it takes high frequency and high voltage for arc igniting to ensure the success ratio of igniting arc.

TIG V1841 V 241 V341 AC/DC Characteristics:

- ◆MCU control system, responds immediately to any changes.
- ◆High frequency and high voltage for arc igniting to ensure the success ratio of igniting arc, the reverse polarity ignition ensures good ignition behavior in TIG-AC welding.
- ◆Avoid AC arc-break with special means, even if arc-break occurs the HF will keep the arc stable.
- ◆Pedal control the welding current.
- ◆In DC TIG without HF operation, If the tungsten electrode touches the workpiece when welding, the current will drop to short-circuit current to protect tungsten.
- ◆Intelligent protection: over-current, over-heat, when the mentioned problems occurred, the alarm lamp on the front panel will be on and the output current will be cut off. It can self-protect and prolong the using life.
- ◆Double purposes: AC inverter TIG/MMA and DC inverter TIG/MMA, Excellent performance on AL-alloy, carbon steel, stainless steel, titanium.

According to choosing the front panel functions, the following five welding ways can be realized.

- DC MMA
- DC TIG
- DC Pulse TIG
- AC TIG
- AC Pulse TIG

1. For DC MMA, polarity connection can be chosen according to different electrodes;
2. For DC TIG, DCEP is used normally (workpiece connected to positive polarity, while torch connected to negative polarity). This connection has many characters, such as stable welding arc, low tungsten pole loss, more welding current, narrow and deep weld;
3. For AC TIG (rectangle wave), arc is more stable than Sine AC TIG. At the same time, you can not only obtain the max penetration and the min tungsten pole loss, but also obtain better clearance effect;
4. DC Pulsed TIG has the following characters:
 - 1) Pulse heating. Metal in Molten pool has short time on high temperature status and freezes quickly, which can reduce the possibility to produce hot crack of the materials with thermal sensitivity .
 - 2) The workpiece gets little heat. Arc energy is focused. Be suitable for thin sheet and super thin sheet welding.
 - 3) Exactly control heat input and the size of the molten pool. The depth of penetration is even. Be suitable for welding by one side and forming by two sides and all position welding for pipe.
 - 4) High frequency arc can make metal for microlite fabric, eliminate blowhole and improve the mechanical performance of the joint.
 - 5) High frequency arc is suitable for high welding speed to improve the productivity.

TIG V1841 V241 V341 AC/DC –series welding machines is suitable for all positions welding for various plates made of stainless steel, carbon steel, alloyed steel, titanium, magnesium, cuprum, etc, Which is also applied to pipe installment, mould mend, petrochemical, architecture, decoration, car repair, bicycle, handicraft and common manufacture.

MMA-----Manual Metal Arc Welding

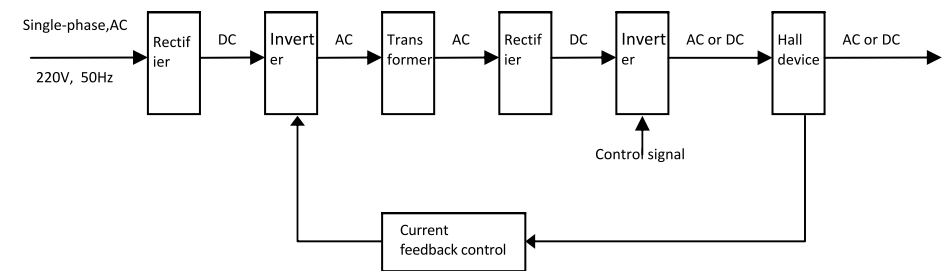
PWM-----Pulse-Width Modulation

IGBT-----Insulation Gate Bipolar Transistor

TIG-----Tungsten Insert Gas Welding

1.2 Working Principle

The working principle of TIG V1841 V241 V341 AC/DC welding machines is shown as the following figure. Single-phase 230V work frequency AC is rectified into DC (about 312V), then is converted to medium frequency AC (about 20-40KHz) by inverter device (IGBT module), after reducing voltage by medium transformer (the main transformer) and rectifying by medium frequency rectifier (fast recovery diodes), then is outputted DC or AC by selecting IGBT module. The circuit adopts current feedback control technology to insure current output stably. Meanwhile, the welding current parameter can be adjusted continuously and steplessly to meet with the requirements of welding craft.

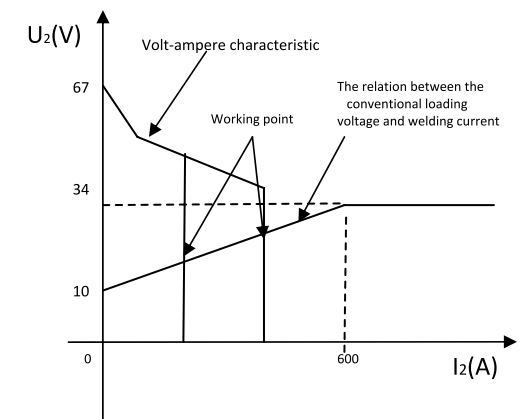


1.3 Volt- Ampere Characteristic

TIG V1841/ V241/ V341 AC/ DC welding machine has an excellent volt-ampere characteristic, whose graph is shown as the following figure. The relation between the conventional rated loading voltage U_2 and the conventional welding current I_2 is as follows:

When $I_2 \leq 600A$, $U_2 = 10 + 0.04I_2 (V)$;

When $I_2 > 600A$, $U_2 = 34 (V)$.



1.4 Specifications V1841/V241

Description	VECTOR DIGITAL V1841 AC/DC	VECTOR DIGITAL V241 AC/DC
Weight	10.9 kg	21.9 kg
Power Source Dimensions	H395mmxW180mmxD375mm	H525mmxW260mmxD445mm
Cooling	Fan Cooled	Fan Cooled
Welder Type	Inverter Power Source	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1	EN 60974-1 / IEC 60974-1
Number of Phases	1	1
Nominal Supply Voltage	230V +/- 15%	230V +/- 15%
Nominal Supply Frequency	50/60Hz	50/60Hz
Welding Current Range (DC STICK Mode)	10 - 170A	10 - 200A
Welding Current Range (DC TIG Mode)	10 - 180A	10 - 200A
Effective Input Current	20A	29.5A
Maximum Input Current	33.9A	41.7A
Single Phase Generator Requirement	11.7KVA	14.4kVA
STICK (MMA) Welding Output, 40°C, 10 min.	170A @ 35%, 26.8V 100A @ 100%, 24V	200A @ 50%, 28V 141A @ 100%, 25.6V
TIG (GTAW) Welding Output, 40°C, 10 min.	180A @ 35%, 17.2V 107A @ 100%, 14.3V	200A @ 50%, 18V 141A @ 100%, 15.6V
Open circuit voltage	66V DC	66V DC
Protection Class	IP23	IP23

NOTE

Note 1: The Effective Input Current should be used for the determination of cable size & supply requirements.

Note 2: Generator Requirements at the Maximum Output Duty Cycle.

Note 3: Motor start fuses or thermal circuit breakers are recommended for this application. Check local requirements for your situation in this regard.

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

1.5 Specifications V341

Description	VECTOR DIGITAL V341 AC/DC
Weight	26.4 kg
Power Source Dimensions	H525mmxW260mmxD445mm
Cooling	Fan Cooled
Welder Type	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1
Number of Phases	3
Nominal Supply Voltage	400V +/- 15%
Nominal Supply Frequency	50/60Hz
Welding Current Range (DC STICK Mode)	30 - 300A
Welding Current Range (DC TIG Mode)	10 - 300A
Effective Input Current	12.4A
Maximum Input Current	17.5A
Single Phase Generator Requirement	18.2KVA
STICK (MMA) Welding Output, 40°C, 10 min.	300A @ 50%, 32.0V 212A @ 100%, 28.5V
TIG (GTAW) Welding Output, 40°C, 10 min.	300A @ 50%, 22.0V 212A @ 100%, 18.5V
Open circuit voltage	66V DC
Protection Class	IP23

NOTE

Note 1: The Effective Input Current should be used for the determination of cable size & supply requirements.

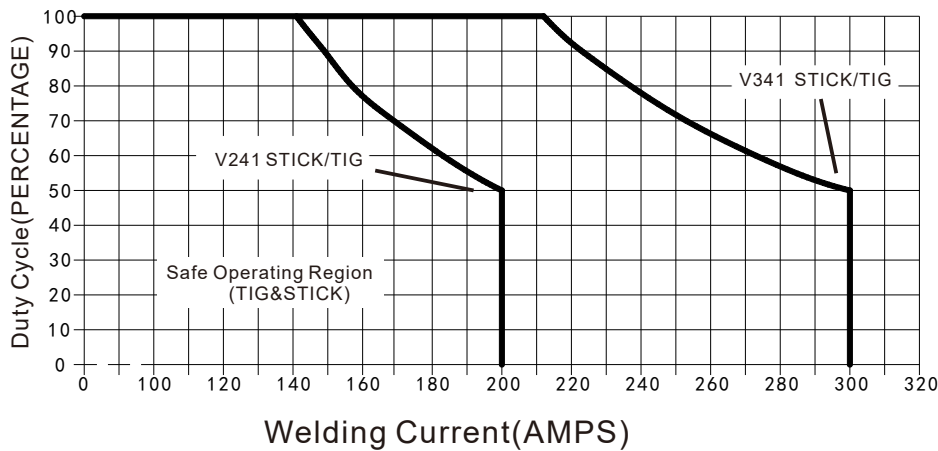
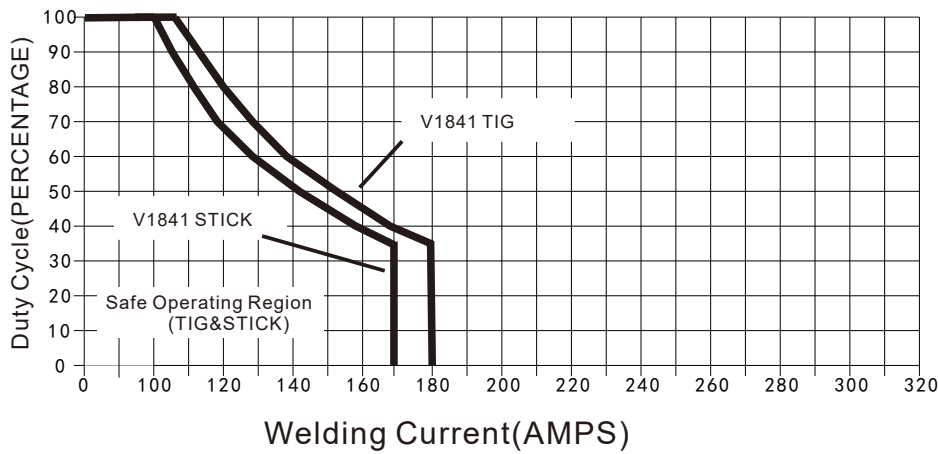
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Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

1.6 Duty Cycle

The rated duty cycle of a Welding Power Source, is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 50% duty cycle, 300 amperes at 32 volts. This means that it has been designed and built to provide the rated amperage (300A) for 5 minutes, i.e. arc welding time, out of every 10 minute period (50% of 10 minutes is 5 minutes). During the other 5 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool. The thermal cut out will operate if the duty cycle is exceeded.



1.7 Packaged Items

V1841/V241

- ◆ 3M Power cord
- ◆ 200 Amp electrode holder with 3M cable
- ◆ 200 Amp earth clamp with 3M cable
- ◆ 4M TIG Torch WP26
- ◆ 3M Gas Hose
- ◆ Operating Manual

V341

- ◆ 3M Power cord
- ◆ 300 Amp electrode holder with 3M cable
- ◆ 300 Amp earth clamp with 3M cable
- ◆ 4M TIG Torch WP18
- ◆ 3M Gas Hose
- ◆ Operating Manual

2.1 Layout For The Panel V1841



1. Digital Ammeter / Parameter meter

The digital Ammeter is used to display the actual output current of the power source. It is also used to display Parameters in Programming Mode. Depending on the Programming Parameter selected, the status indicator adjacent to the Ammeter will illuminate to show the units of the programming parameter. When welding, the Ammeter will display actual welding current.

2. Power ON Indicator

The POWER ON indicator illuminates when the ON/OFF switch is in the ON position and the correct mains voltage is present.

3. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

4. Arcforce/Hot Start/Hotstart current

Setting ranges

Arcforce: 1-100AMP Hot Start: 0.1-0.5S Hotstart current: 1-100 AMP

Change the selected weld functions mode from welding current to hotstart to start time to arc force from the digital display.

5. JOB and SAVE

You can press JOB to select the memory records that you have saved before from 1-9. For the new setting of present current Amps ,just press SAVE.

6. Mode Button

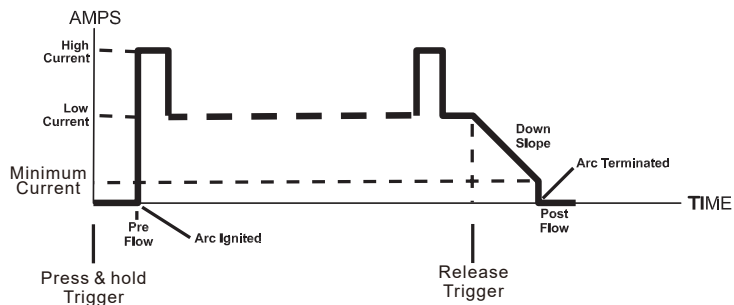
Press the MODE button to toggle AC and DC output in LIFT TIG, HF TIG.

7. Trigger Mode Control Button (HF TIG and LIFT TIG Mode only)

The trigger mode control is used to switch the functionality of the torch trigger between 2T and 4T.

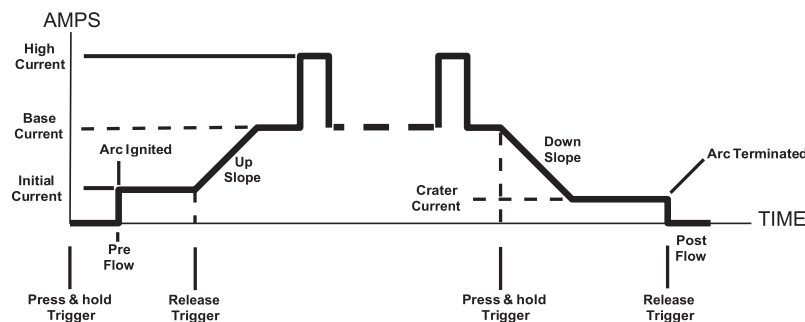
2T Normal Mode In this mode, the torch trigger must remain pressed for thewelding output to be active.

Press and hold the torch trigger to activate the power source (weld). Release the torch trigger switch to cease welding.



4T Latch mode this mode of welding is mainly used for long welding runs to reduce operator fatigue. In this mode the operator can press and release the torch trigger and the output will remain active. To deactivate the power source, the trigger switch must again be pressed and released, thus eliminating the need for the operator to hold the torch trigger.

Note: that when operating in GTAW (HF and LIFT TIG modes), the power source will remain activated until the selected down slope time has elapsed



8. Process Selection Button

The process selection control is used to select the desired welding mode. Two modes are available, GTAW (TIG), and MMA (Stick) modes.

9. Pulse Button

Press the PULSE button to toggle Pulse On and OFF.

CONVENTIONAL PULSED TIG	HIGH SPEED PULSED TIG
<p>Typically from 1 to 10 PPS. Provides a heating and cooling effect on the weld puddle and can reduce distortion by lowering the average amperage. This heating and cooling effect also produces a distinct ripple pattern in the weld bead. The relationship between pulse frequency and travel speed determines the distance between the ripples. Slow pulsing can also be coordinated with filler metal addition and increase overall control of the weld puddle</p>	<p>In excess of 40 PPS, Pulsed TIG becomes more audible than visible-causing increased puddle agitation for a better as-welded microstructure. Pulsing the weld current at high speeds-between a high Peak and a low Background amperage-can also constrict and focus the arc. This results in maximum arc stability, increased penetration and increased travel speeds(Common Range: 100-500 PPS). The Arc-Sharpening effects of high speed pulsing are expanded to new dimensions. The ability to pulse at 5,000PPS further enhances arc stability and concentration potential-which is extre mely beneficial to automation where maximum travel tspeeds are required.</p>

10. Programing Parameter Indicators

These indicator lights will illuminate when programming.

11. Positive Control

The Positive button is used to plus selected in Programming sequence.

12. Negative Control

The Negative button is used to minus selected in Programming sequence.

13. Selecting Function Button

This button can select different programming parameter from No. 10

14. Negative Welding Terminal

Negative Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

15. Shielding Gas Outlet

The Shielding Gas Outlet located on the front panel is a fast connection of a suitable TIG Torch.

16. 5 Pin Control Socket

The 5 pin receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry:

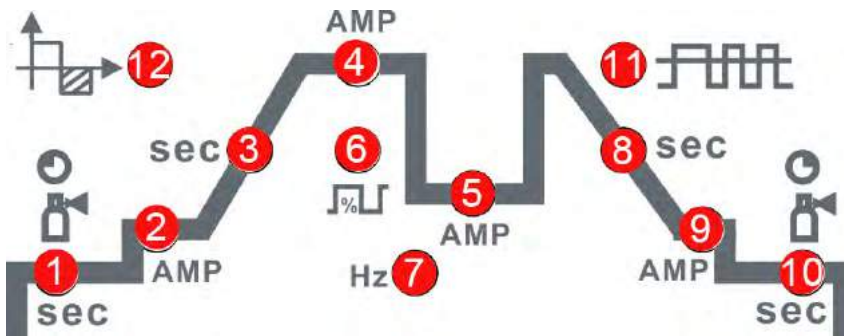
To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

17. Positive Welding Terminal

Positive Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

2.2 Control Panel**1. Gas Pre-Flow**

Absolute setting range 0.1s to 5s (0.1S increments)

This parameter operates in TIG modes only and is used to provide gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.

2. Initial Current

The main current Setting range 10AMP to 100AMP

This parameter operates in (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.

Note: The maximum initial current available will be limited to the set value of the base current.

3. Up Slope

Setting ranges :0.1S-10S (0.1S increments)

This parameter operates in (2T and 4T) TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from Initial Current to High or base current.

4. Peak Current

Setting ranges

V1841: 10-180A (DC TIG and AC HF TIG) , 10-170A (Stick mode)

This parameter sets the TIG WELD current. This parameter also sets the STICK weld current.

5. Base Current

Setting ranges

V1841: 10AMP to 180AMP (DC TIG mode), 10AMP to 180AMP (AC HF TIG mode)

Secondary current (TIG)/pulse pause current.

6. Pulse Width

Setting ranges 10%-90%

This parameter sets the percentage on time of the PULSE FREQUENCY for High weld current when the PULSE is ON.

7. Pulse Frequency

Setting ranges 1HZ -200HZ

This parameter sets the PULSE FREQUENCY when the PULSE is ON.

8. Down Slope

Setting ranges 0.1-10s

This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed to end current. This control is used to eliminate the crater that can form at the completion of a weld.

9. End Current

Setting ranges 10A-180A

This parameter operates in (4T) TIG modes only and is used to set the finish current for TIG. The end current remains ON until the torch trigger switch is released after it has been depressed.

Note: The maximum crater current available will be limited to the set value of the base current.

10. Post Flow

Setting ranges 1.0-10S

This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.

11. AC Frequency

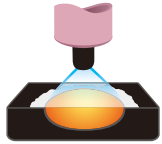
Setting ranges 50HZ-200HZ

This parameter operates in AC TIG mode only and is used to set the frequency for the AC weld current.

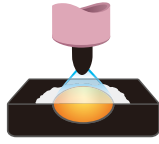
AC Frequency control

Controls the width of the arc cone. Increasing the AC frequency provides a more focused arc with increased directional control.

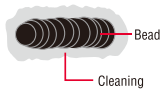
Note: Decreasing the AC Frequency softens the arc and broadens the weld puddle for a wider weld bead.



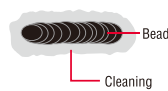
Wider bead, good penetration ideal for buildup work



Narrower bead for fillet welds and automated applications



Wider bead and cleaning acting



Narrower bead and cleaning acting



12. Wave Balance

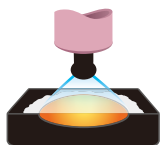
Setting arranges 10%-50%

This parameter operates in AC TIG mode and is used to set the penetration to cleaning action ratio for the AC weld current. Generally WAVE BALANCE is set to 50% for AC STICK welding. The WAVE BALANCE control changes the ratio of penetration to cleaning action of the AC TIG welding arc. Maximum weld penetration is achieved when the WAVE BALANCE control is set to 10%. Maximum cleaning of heavily oxidised aluminium or magnesium alloys is achieved when the WAVE BALANCE control is set to 50%

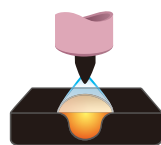
AC Balance Control

Controls arc cleaning action. Adjusting the % EN of the AC wave controls the width of the etching zone surrounding the weld.

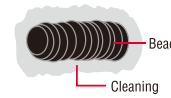
Note: Set the AC Balance control for adequate arc cleaning action at the sides and in front of the weld puddle. AC Balance should be fine tuned according to how heavy or thick the oxides are.



Wider bead, good penetration ideal for buildup work



Narrower Bead, Good Penetration Ideal For Buildup Work



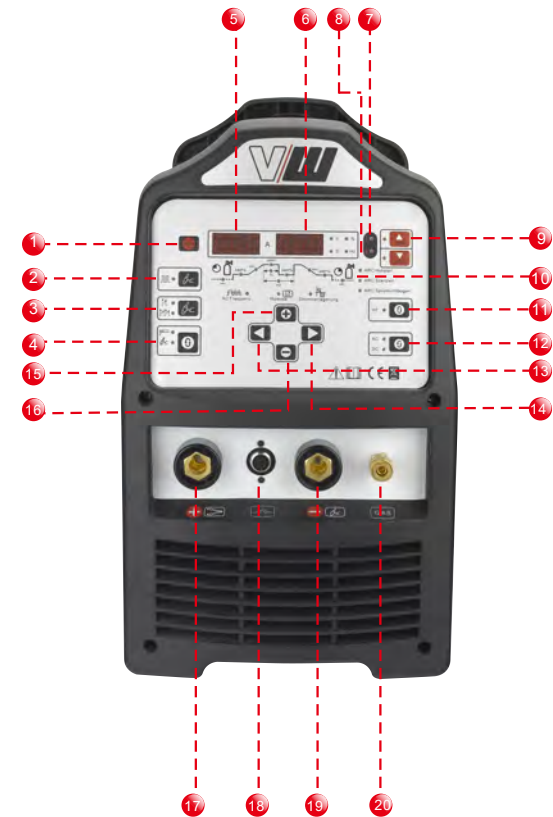
Wider bead and cleaning action



Narrower bead, with no visible cleaning



2.3 Layout For The Panel V241/V341



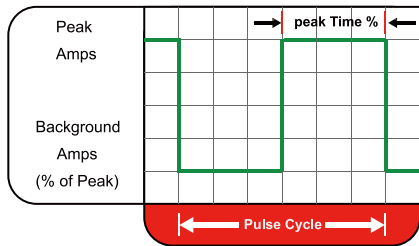
1. RESET Button

When software has problem please trigger RESET button.

2. Pulse Button

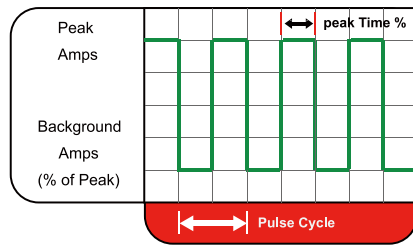
Press the PULSE button to toggle Pulse On and OFF.

CONVENTIONAL PULSED TIG



Typically from 1 to 10 PPS. Provides a heating and cooling effect on the weld puddle and can reduce distortion by lowering the average amperage. This heating and cooling effect also produces a distinct ripple pattern in the weld bead. The relationship between pulse frequency and travel speed determines the distance between the ripples. Slow pulsing can also be coordinated with filler metal addition and increase overall control of the weld puddle

HIGH SPEED PULSED TIG



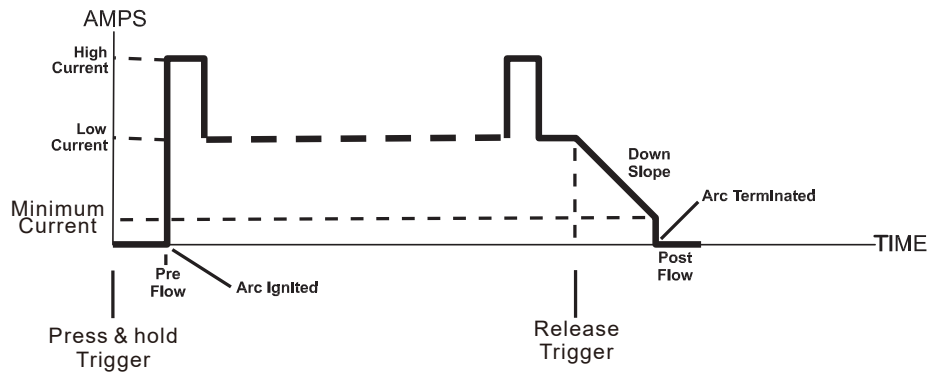
In excess of 40 PPS, Pulsed TIG becomes more audible than visible-causing increased puddle agitation for a better as-welded microstructure. Pulsing the weld current at high speeds-between a high Peak and a low Background amperage-can also constrict and focus the arc. This results in maximum arc stability, increased penetration and increased travel speeds(Common Range: 100-500 PPS). The Arc-Sharpening effects of high speed pulsing are expanded to new dimensions. The ability to pulse at 5,000PPS further enhances arc stability and concentration potential-which is extremely beneficial to automation where maximum travel speeds are required.

3. Trigger Mode Control Button (HF TIG and LIFT TIG Mode only)

The trigger mode control is used to switch the functionality of the torch trigger between 2T and 4T.

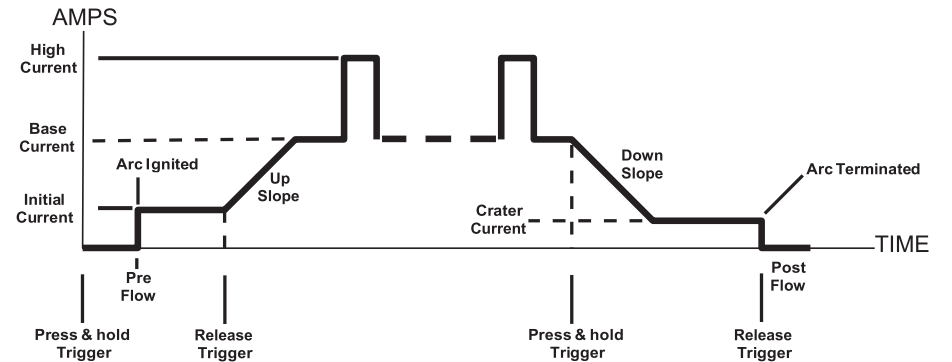
2T Normal Mode In this mode, the torch trigger must remain pressed for the welding output to be active.

Press and hold the torch trigger to activate the power source (weld). Release the torch trigger switch to cease welding.



4T Latch mode this mode of welding is mainly used for long welding runs to reduce operator fatigue. In this mode the operator can press and release the torch trigger and the output will remain active. To deactivate the power source, the trigger switch must again be pressed and released, thus eliminating the need for the operator to hold the torch trigger.

Note: that when operating in GTAW (HF and LIFT TIG modes), the power source will remain activated until the selected down slope time has elapsed



4. Process Selection Button

The process selection control is used to select the desired welding mode. Two modes are available, GTAW (TIG), and MMA (Stick) modes.

5. Digital Ammeter

The digital amperage meter is used to display both the pre-set current and actual output current of the power source.

At times of non-welding, the amperage meter will display a pre-set (preview) amperage value. This value can be adjusted by varying the multifunction control when the Programming Parameter Indicator light shows BASE CURRENT.

6. Digital Voltmeter / Parameter Meter

The digital volt meter is used to display the actual output voltage of the power source. It is also used to display Parameters in Programming Mode.

Depending on the Programming Parameter selected, the status indicator adjacent to the volt meter will illuminate to show the units of the programming parameter.

When welding, the volt meter will display actual welding voltage.

7. Power ON Indicator

The POWER ON indicator illuminates when the ON/OFF switch is in the ON position and the correct mains voltage is present.

8. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

9. JOB and SAVE

You can press JOB to select the memory records that you have saved before from 1-9. For the new setting of present base current Amps ,just press SAVE.

10. Programming Parameter Indicators

These indicator lights will illuminate when programming.

11. HF Button

Press and hold the HF button to purge the gas line in LIFT TIG and HF TIG modes. To HF the shielding gas line in LIFT TIG and HF TIG modes press the HF button and release.

12. Mode Button

Press the MODE button to toggle AC and DC output in LIFT TIG, HF TIG and STICK.

13. Forward Programming Button

Pressing this button will advance to the next step in the programming sequence.

14. Back Programming Button

Pressing this button will go back to the previous step in the programming sequence.

15. Positive Control

The Positive button is used to plus selected in Programming sequence..

16. Negative Control

The Negative button is used to minus selected in Programming sequence..

17. Positive Welding Terminal

Positive Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

18. 5 Pin Control Socket

The 5 pin receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry:
To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

19. Negative Welding Terminal

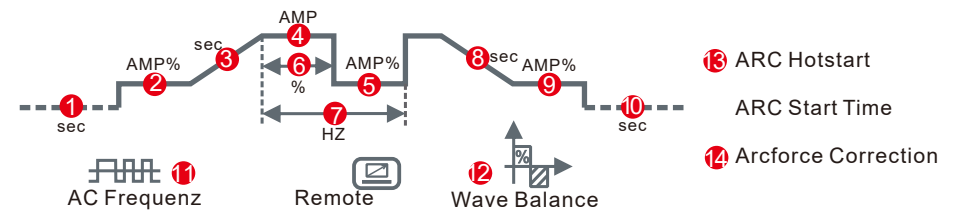
Negative Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

20. Shielding Gas Outlet

The Shielding Gas Outlet located on the front panel is a fast connection of a suitable TIG Torch.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

2.4 Control Panel**1. Gas Pre-Flow**

V241: Absolute setting range 0.1s to 20s (0.1S increments)

V341: Absolute setting range 0.1s to 20s (0.1S increments)

This parameter operates in TIG modes only and is used to provide gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.

2. Initial Current

V241: The main current Setting range 10AMP to 200AMP

V341: The main current Setting range 10AMP to 300AMP

This parameter operates in (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.

Note: The maximum initial current available will be limited to the set value of the base current.

3. Up Slope

Setting ranges :0.1S-10S (0.1S increments)

This parameter operates in (2T and 4T) TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from Initial Current to High or base current.

4. Peak Current

Setting ranges

V241:10-200A (DC TIG and AC HF TIG) , 10-200A (Stick mode)

V341:10-300A (DC TIG and AC HF TIG) , 30-300A (Stick mode)

This parameter sets the TIG WELD current. This parameter also sets the STICK weld current.

5. Base Current

Setting ranges

V241:10AMP to 200AMP (DC TIG mode), 10AMP to 200AMP (AC HF TIG mode)

V341:10AMP to 300AMP (DC TIG mode), 10AMP to 300AMP (AC HF TIG mode)

Secondary current (TIG)/pulse pause current.

6. Pulse Width

Setting ranges 10%-90%

This parameter sets the percentage on time of the PULSE FREQUENCY for High weld current when the PULSE is ON.

7. Pulse Frequency

Setting ranges 1HZ -200HZ

This parameter sets the PULSE FREQUENCY when the PULSE is ON.

8. Down Slope

Setting ranges 0.1-10s

This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed to end current. This control is used to eliminate the crater that can form at the completion of a weld.

9. End current

V241: Setting ranges 10A-200A

V341: Setting ranges 10A-300A

This parameter operates in (4T) TIG modes only and is used to set the finish current for TIG. The end current remains ON until the torch trigger switch is released after it has been depressed.

Note: The maximum crater current available will be limited to the set value of the base current.

10. Post Flow

V241: Setting ranges 1-20S

V341: Setting ranges 1-20S

This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.

11. AC Frequency

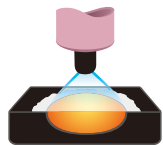
Setting ranges 50HZ-200HZ

This parameter operates in AC TIG mode only and is used to set the frequency for the AC weld current.

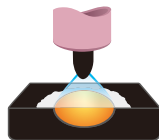
AC Frequency control

Controls the width of the arc cone. Increasing the AC frequency provides a more focused arc with increased directional control.

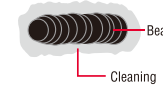
Note: Decreasing the AC Frequency softens the arc and broadens the weld puddle for a wider weld bead.



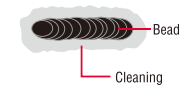
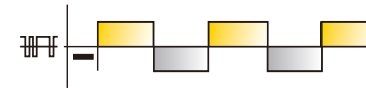
Wider bead, good penetration ideal for buildup work



Narrower bead for fillet welds and automated applications



Wider bead and cleaning acting



Narrower bead and cleaning acting



12. Wave Balance

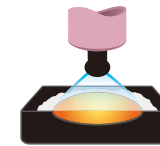
Setting arranges 10%-50%

This parameter operates in AC TIG mode and is used to set the penetration to cleaning action ratio for the AC weld current. Generally WAVE BALANCE is set to 50% for AC STICK welding. The WAVE BALANCE control changes the ratio of penetration to cleaning action of the AC TIG welding arc. Maximum weld penetration is achieved when the WAVE BALANCE control is set to 10%. Maximum cleaning of heavily oxidised aluminium or magnesium alloys is achieved when the WAVE BALANCE control is set to 50%

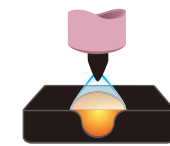
AC Balance Control

Controls arc cleaning action. Adjusting the % EN of the AC wave controls the width of the etching zone surrounding the weld.

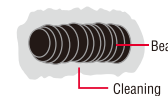
Note: Set the AC Balance control for adequate arc cleaning action at the sides and in front of the weld puddle. AC Balance should be fine tuned according to how heavy or thick the oxides are.



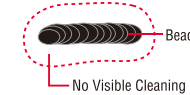
Wider bead, good penetration ideal for buildup work



Narrower Bead, Good Penetration Ideal For Buildup Work



Wider bead and cleaning action

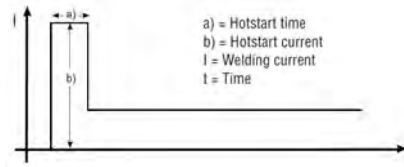


Narrower bead, with no visible cleaning



13. Hot Start

Hot Start Function reliably ignites the electrode and melts perfectly to ensure the best quality even at the start of the seam. this solution makes lack of fusion and cold welds a thing of the past and significantly reduces weld reinforcement. Adjust the hot start current here and the time here.

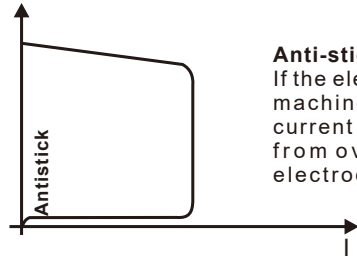


14. Arcforce Correction

During the welding process, arcforce prevents the electrode sticking in the weld pool with increases in current. this makes it easier to weld large-drop melting electrode types at low current strengths with a short arc in particular.



Antistick
U



Anti-stick prevents the electrode from annealing. If the electrode sticks in spite of the arcforce device, the machine automatically switches over to the minimum current within about 1 second to prevent the electrode from overheating. In order to easily separate the electrode and electrode holder to protect the welder.

2.5 Setup For STICK (MMA) Welding

For Alkaline Electrode, connect the electrode holder to the positive welding terminal and connect the work lead to the negative welding terminal, while for the Acid Electrode, please connect the electrode holder to the negative welding terminal and connect the work lead to the positive welding terminal. If in doubt consult the electrode manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection. Select STICK mode with the process selection control.



WARNING

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the mains power supply is switched off.



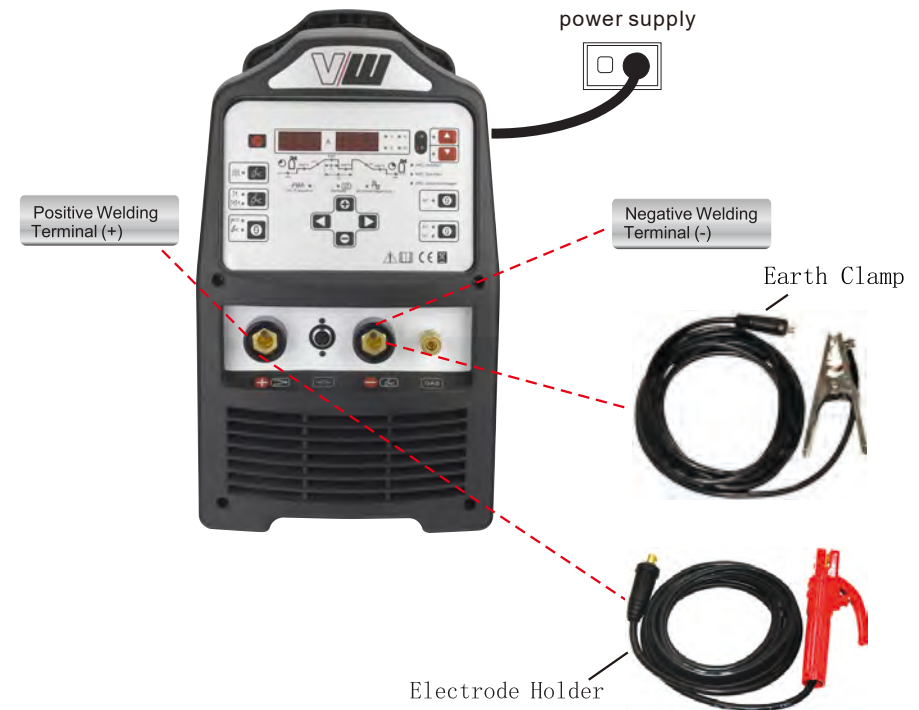
CAUTION

Remove any packaging material prior to use. Do not block the air vents at the front or rear of the Welding Power Source.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.



2.6 Set-up For LIFT TIG (GTAW) Welding



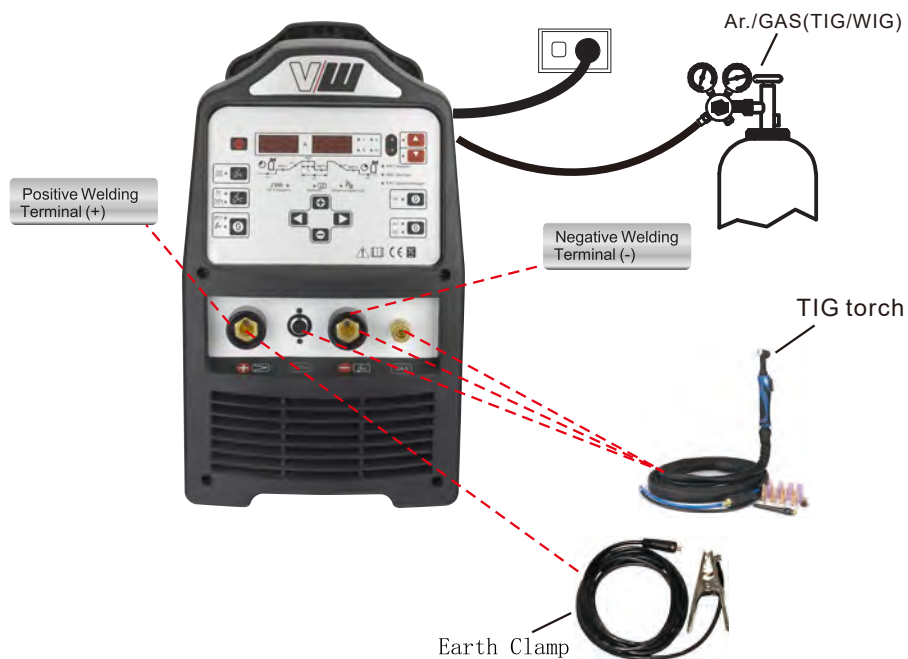
WARNING

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

NOTE

The following set up is known as Straight Polarity or DC electrode positive. This is commonly used for DC LIFT TIG welding on most materials such as steel and stainless steel.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Connect the work lead cable to the positive output terminal, and the LIFT TIG Torch cable to the negative output terminal.
3. Connect the gas line/hose to the proper shielding gas source.
4. Slowly open the Argon Cylinder Valve to the fully open position.
5. Connect the work lead clamp to your work piece.
6. The tungsten must be ground to a blunt point (similar to a pencil) in order to achieve optimum welding results. See illustration. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning. Grind at a 30 degree angle and never to a sharp point.
7. Install the tungsten with approximately 1.6mm to 3.2mm sticking out from the gas cup, ensuring you have correct sized collet.
8. Tighten the back cap.
9. Turn the switch to the "ON" position. The power L.E.D. light should illuminate.
10. Set the welding process to LIFT TIG.
11. Set the Weld Current Control Knob to the desired amperage.
12. You are now ready to begin LIFT TIG Welding power supply

**2.7 Operation Environment**

- ◆ Height above sea level is below 1000m.
- ◆ Operation temperature range: $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$.
- ◆ Relative humidity is below 90% (20°C).
- ◆ Preferably site the machine some angles above the floor level, the maximum angle does not exceed 15° .
- ◆ The content of dust, acid, corrosive gas in the surrounding air or substance can not exceed normal standard.
- ◆ Take care that there is sufficient ventilation during welding. There is at least 30cm free distance between the machine and wall.

2.8 Operation Notices

- ◆ Read safety instruction and Chapter 1 carefully before attempting to use this equipment.
- ◆ Connect the ground wire the machine directly
- ◆ In case closing the power switch, no-load voltage may be exported. Do not touch the output electrode with any part of your body.
- ◆ Before operation, no concerned people should be left, Do not watch the arc in unprotected eyes.
- ◆ Ensure good ventilation of the machine to improve duty ratio.
- ◆ Turn off the engine when the operation finished to economize energy source.
- ◆ When power switch shuts off protectively because of failure. Don't restart it until until problem is resolved. Otherwise, the range of problem will be extended.

3.1 Troubleshooting

- ◆ Before arc welding machines are dispatched from the factory, they have already been debugged accurately. So forbid anyone who is not authorized by us to do any change to the equipment!
- ◆ Maintenance course must be operated carefully. If any wire becomes flexible or is misplaced, it maybe potential danger to user!
- ◆ Only professional maintenance personal who is authorized by us could overhaul the machine!
- ◆ Guarantee to shut off the arc welding machine's power before turn on the outline of the equipment!
- ◆ If there is any problem and has no the authorized professional maintenance personal, please contact local agent or the branch company!
If there are some simple troubles of V-series welding machine, you can consult the following overhauling chart:

Nr.	Troubles	Reasons	Solution
1	Turn on the power source, power indicator is lit, fan is not working.	Fan is broken	Change fan
		There is something in the fan	Clean it
		The start capacitor of fan damaged	Change capacitor
2	Turn on the power source, fan is working, power indicator is not lit	The power light damaged or connection is not good	Change the power light
		The power board is broken	Change it
		Display panel is broken	Change it
3	Turn on the power source, fan is not working ,power indicator is not lit	The power cable connected not good	Connect correctly
		The power cable is broken	Repair or change it
		Power on switch is damaged	Change it
		The light of the power indicator is broken and the problems mentioned in Nr. 2	Change the light of the power indicator or refer to the solution in Nr. 2
4	Turn on the power source, power indicator is lit, fan is working, there is no welding output.	Control board is broken	Change it
		1 st inverter circuit damaged	Replace it
		2 nd feedback circuit is fault	Change it
5	The number of the display is not intact	The display panel is damaged	Change the display panel
		Digital tube is broken	Change it

Nr.	Troubles	Reasons	Solution		
6	No no-load voltage output (MMA)	If the overheat indicator is on	Wait a few minutes, the machine can be operated normal		
		The main circuit is broken	Check and repair		
		The machine is broken	Consult the dealer or the manufacturer		
7	Arc can not be ignited (TIG) , there is spark on the HF igniting board	The welding cable is not connected with the two output if the welder	Connect the welding cable to the welder's output		
		The welding cable is damaged	Repair or change it		
		The earth cable connected unstably	Check the earth cable		
		The welding cable is too long	Use an appropriate welding cable		
		There is oil or dust on the workpiece	Check and remove it		
		The distance between tungsten electrode and workpiece is too long	Reduce the distance (about 3mm ,less than 5mm)		
		There is no Argon flow or the connection is poor	Check and reconnect		
Input voltage not stable	Check the power supply				
8	Arc can not be ignited (TIG) , there is no spark on the HF igniting board	The HF igniting board does not work	Repair or change it		
		The distance between discharger is too short or too long	Adjust the distance (about 0.8mm)		
		The malfunction of the welding gun switch	Check the welding torch switch, control cable and aero socket.		
		No argon gas flow or the air tube connect not good	Check and reconnect		
		9	Turn on the power source, everything is normal , but no HF igniting	Check if the function selected MMA	Change the function to TIG
				Check the HF funtion is selected	Select the HF funtion
HF board is broken	Repair or change it				
Earth clamp connect not stable	Check the earth clamp				
10	No gas flow (TIG)	No argon gas flow or the air tube connect not good	Check and reconnect		
		Gas cylinder is close or gas pressure is low	Open or change the gas cylinder		
		Something is in the valve	Remove it		
		Electromagnetic valve is damaged	Change it		
		Air tube is brocken	Change it		
11	Gas always flows	Pressure too high or air regulator is broken	Check gas		
		Something is in the valve	Remove it		
		Electromagnetic valve is damaged	Change it		

Nr.	Troubles	Reasons	Solution
12	The welding current cannot be adjusted	Checking if the electrode stick to the work piece that the anti-stick function is on	Separate the electrode and work piece
		Control board is broken	Repair or change it
		Shut off the power when changing the torch	
13	No AC output while selecting "AC"	The power board is broken	Repair or change it
		The AC drive board damaged	Change it
		The AC IGBT/IGBT module damaged	Change it
		Control board is broken	Repair or change it
14	The welding current displayed isn't accordant with the actual value	The min value displayed isn't accordant with the actual value	Adjust potentiometer Imin on the control board
		The max value displayed isn't accordant with the actual value	Adjust potentiometer Imin on the control board
15	The penetration of molten pool is not enough	The welding current is adjusted too low	Increase the welding current
		The arc is too long in the welding process	Adjust the distance from torch to work piece
		The power cable or the welding cable is too long	Use the suitable length from manufacturer
		AC Width adjustment is not correct	Change to suitable setting
16	Thermal overload indicator light is on	Over-heat protection ,too much welding current	Reduce the welding current
		Over-heat protection ,working too much time	Reduce the welding time
		Over-current protection, current in the main circuit is out of control	Check and repair main circuit and drive board
		Input voltage is too low	Check the power supply
		Fan is broken	Change the fan
17	Tig electrode melts when welding	Tig torch is connected to the positive terminal	Connect the tig torch to negative terminal
18	Arc flutters during Tig welding	Tungsten electrode is too big for the welding current	Select the correct size of tungsten electrode
		Check the earth clamp position on the work piece	Adjust the position of earth clamp

CHAPTER 2

STICK SERIES EQUIPMENT



1.1 Brief Introduction

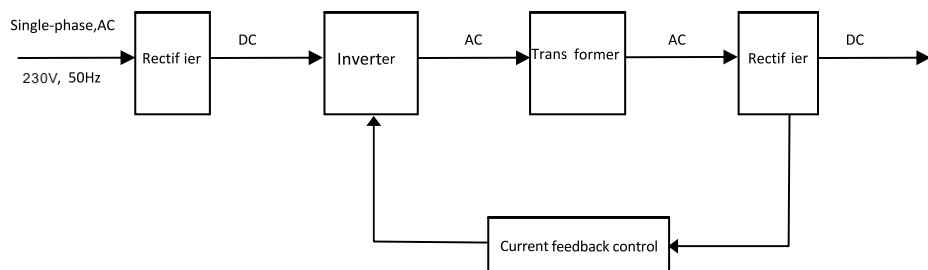
E161, E201, E221, E301, E401 welding machines adopts the latest pulse width modulation (PWM) technology and insulated gate bipolar transistor (IGBT) power module, which can change work frequency to medium frequency so as to replace the traditional hulking work frequency transformer with the cabinet medium frequency transformer. Thus, its characterized with portable, small size, light weight, low consumption and etc.

E161, E201, E221, E301, E401 STICK machines Characteristics:

- ◆MCU control system, responds immediately to any changes.
- ◆high voltage for arc igniting to ensure the success ratio of igniting arc.
- ◆Lift TIG operation, If the tungsten electrode touches the workpiece when welding, the current will drop to short-circuit current to protect tungsten.
- ◆Pedal control the welding current.
- ◆IN DC TIG operation electrode touches the workpiece when welding, the current will drop to short-circuit current to protect tungsten.
- ◆Intelligent protection: over-current, over-heat, when the mentioned problems occurred, the alarm lamp on the front panel will be on and the output current will be cut off. It can self-protect and prolong the using life.
- ◆Anti-Stick function automatically appeared when the electrode stick to the work piece more than 2 seconds, thus the output current come down to around 20A in order to easily separate the electrode and electrode holder to protect the welder .

1.2 Working Principle

The working principle of E161/E201/E221/E301/E401 welding machines is shown as the following figure. Single-phase 230V work frequency AC is rectified into DC (about 312 V), then is converted to medium frequency AC (about 20-40KHz) by inverter device (IGBT module), after reducing voltage by medium transformer (the main transformer) and rectifying by medium frequency rectifier (fast recovery diodes), then is outputted DC. The circuit adopts current feedback control technology to insure current output stably. Meanwhile, the welding current parameter can be adjusted continuously and steplessly to meet the requirements of welding craft.



1.3 Specifications E161/E201

Description	VECTOR DIGITALE161 STICK	VECTOR DIGITAL E201 STICK
Weight	9.6kg	10 kg
Power Source Dimensions	H390mmxW180mmxD390mm	H390mmxW180mmxD390mm
Cooling	Fan Cooled	Fan Cooled
Welder Type	Inverter Power Source	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1	EN 60974-1 / IEC 60974-1
Number of Phases	1	1
Nominal Supply Voltage	230V +/- 15%	230V +/- 15%
Nominal Supply Frequency	50/60Hz	50/60Hz
Welding Current Range (STICK Mode)	10 - 160A	20 - 200A
Effective Input Current	19.8A	22.8A
Maximum Input Current	31.4A	41.7A
Single Phase Generator Requirement	10.8KVA	14.4kVA
STICK (MMA) Welding Output, 40°C, 10 min.	160A @ 40%, 26.4V 101A @ 100%, 24V	200A @ 30%, 28V 110A @ 100%, 24.4V
Open circuit voltage	66V DC	66V DC
Protection Class	IP23	IP23

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

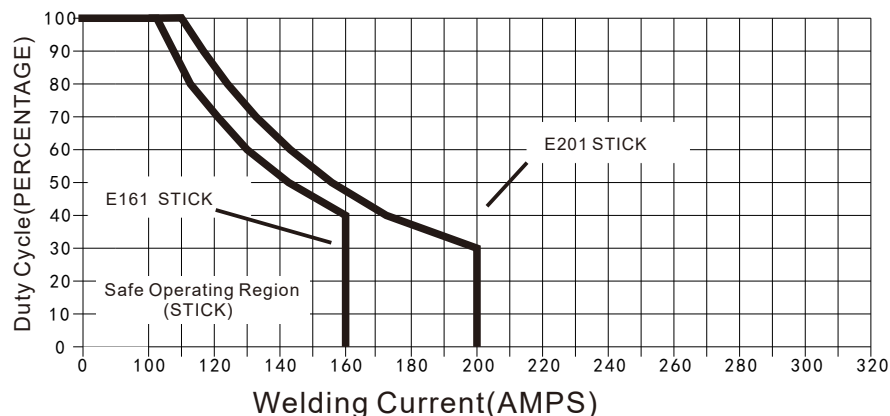
1.4 Packaged Items

E161/E201

- ◆200 Amp electrode holder with 3M cable
- ◆200 Amp earth clamp with 3M cable
- ◆3M Power cable
- ◆Operating Manual

1.5 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 200 amperes at 28 volts. This means that it has been designed and built to provide the rated amperage (200A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



1.6 Specifications E221

Description	VECTOR DIGITAL E221 STICK
Weight	10.59 kg
Power Source Dimensions	H390mmxW180mmxD390mm
Cooling	Fan Cooled
Welder Type	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1
Number of Phases	1
Nominal Supply Voltage	230V +/- 15%
Nominal Supply Frequency	50/60Hz
Welding Current Range (STICK/ TIG Mode)	10 - 200A/5-170A
Effective Input Current	26.3A
Maximum Input Current	41.7 A
Single Phase Generator Requirement	14.4KVA
Welding Output, 40°C, 10 min. STICK (MMA)	200A @ 40%, 28V 126A @ 100%, 25V
Welding Output, 40°C, 10 min. TIG	200A @ 40%, 18V 126A @ 100%, 15V
Open circuit voltage	66V DC
Protection Class	IP23

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

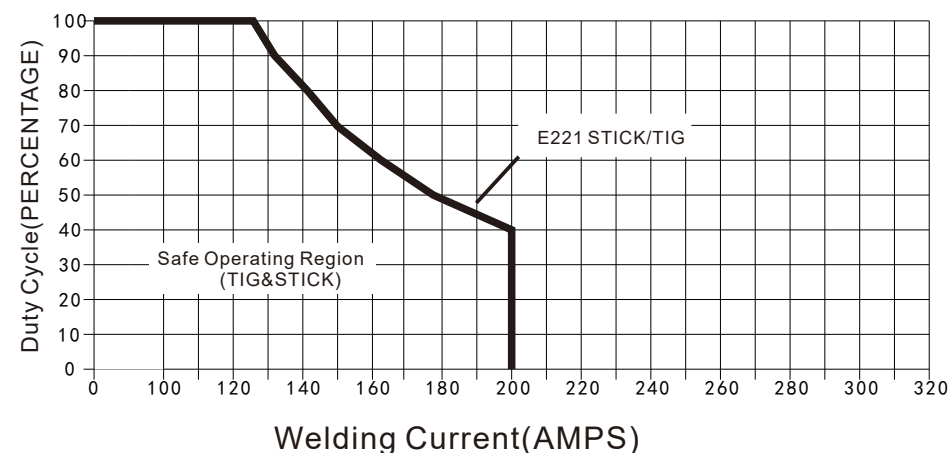
1.7 Packaged Items

E221

- ◆ 200 A electrode holder with 3M cable.
- ◆ 200 A earth clamp with 3M cable
- ◆ 4M TIG Torch WP26
- ◆ 3M Power cable
- ◆ Operating Manual

1.8 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 200 amperes at 28 volts. This means that it has been designed and built to provide the rated amperage (200A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



1.9 Specifications E301/E401

Description	VECTOR DIGITAL E301 STICK	VECTOR DIGITAL E401 STICK
Weight	19.2 kg	26.3 kg
Power Source Dimensions	H515mmxW224mmxD375mm	H540mmxW235mmxD445mm
Cooling	Fan Cooled	Fan Cooled
Welder Type	Inverter Power Source	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1	EN 60974-1 / IEC 60974-1
Number of Phases	3	3
Nominal Supply Voltage	400V +/- 15%	400V +/- 15%
Nominal Supply Frequency	50/60Hz	50/60Hz
Welding Current Range (STICK Mode)	30 - 300A	30 - 400A
Effective Input Current	13.6A	20.4A
Maximum Input Current	17.5 A	26.3A
Single Phase Generator Requirement	18.2KVA	27.3kVA
STICK (MMA) Welding Output, 40°C, 10 min.	300A @ 60%, 32V 232A @ 100%, 29.3V	400A @ 60%, 36V 310A @ 100%, 32.4V
Open circuit voltage	66V DC	66V DC
Protection Class	IP23	IP23

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

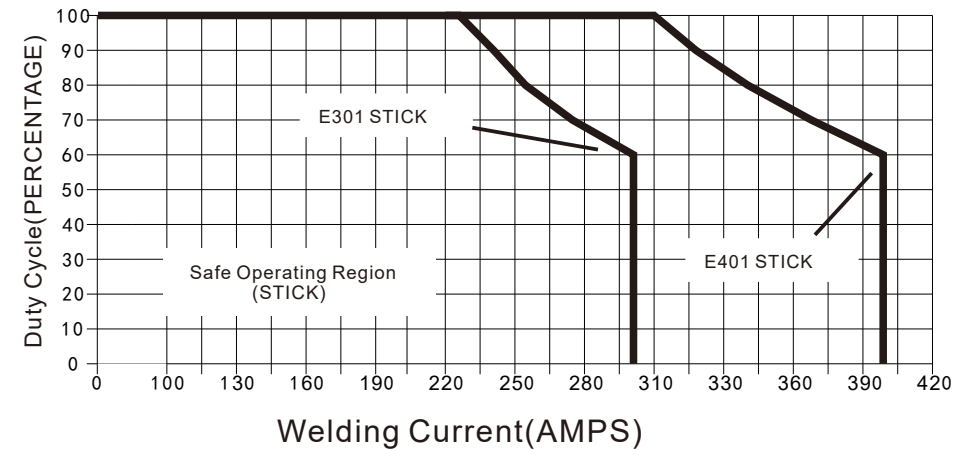
1.10 Packaged Items

E301 / E401

- ◆ 300 A electrode holder with 3M cable
- ◆ 300 A earth clamp with 3M cable
- ◆ 3M Power cable
- ◆ Operating Manual

1.11 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 60% duty cycle, 400 amperes at 36 volts. This means that it has been designed and built to provide the rated amperage (400A) for 6 minutes, i.e. arc welding time, out of every 10 minute period (60% of 10 minutes is 6 minutes). During the other 4 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



2.1 Layout For The Panel E161 / E201



**WARNING**

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

2. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

3. Digital Display

The digital meter is used to display the pre-set (preview) amperage for welding, the preset parameters in Hot start, start time and Arc force and actual welding amperage of the power source when welding.

4. Selecting Function Button**Setting ranges**

Arcforce: 1-100AMP Hot Start: 0.1-0.5S Hotstart current: 1-100 AMP

Press and release this button to change the selected weld functions mode from welding current to hotstart to start time to ARC Force from the digital display.

5. Positive Control

The positive control is used to plus setting parameter for selected function from 4.

6. Negative Control

The negative control is used to minus setting parameter for selected function from 4.

7. Negative Welding Output Terminal

The negative welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as electrode holder. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

8. Positive Welding Output Terminal

The positive welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as earth clamp. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.

2.2 Layout For The Panel E221**WARNING**

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

2. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

3. Weld Process Selection Button

Press and release this button to change the selected weld process mode from LIFT TIG to STICK. The weld process will change to the next process in the sequence each time the button is pressed and released. The green indicators next to the button will illuminate to identify LIFT TIG or STICK process mode.

4. Digital Display

The digital meter is used to display the pre-set (preview) amperage for welding, the preset parameters in Hot start, start time and Arc force and actual welding amperage of the power source when welding.

5. Negative Control

The negative control is used to minus setting parameter for selected function from 6.

6. Selecting Function Button

Press and release this button to change the selected weld functions mode from welding current to hotstart to start time to ARC Force from the digital display.

7. Positive Control

The positive control is used to plus setting parameter for selected function from 6.

8. Negative Welding Output Terminal

The negative welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as electrode holder. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

9. Shielding Gas Outlet

The Shielding Gas Outlet located on the front panel is a fast connection of a suitable TIG Torch.

10. 5 Pin Control Socket

The 5 pin receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry.

To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

11. Positive Welding Output Terminal

The positive welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as earth clamp. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.

2.3 Layout For The Panel E301/E401



WARNING

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

2. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

3. Prevent Electric Shock

The VRD button on the front panel is illuminated when pressing the VRD indicator, at the same time the no-load voltage is lower than 15V and the output terminal is not harmful to the human body. When the button is pressed again, the VRD indicator light goes out, and the output is now at 71V.

4. Selecting Function Button

Press and release this button to change the selected weld functions mode from welding current to hotstart to start time to ARC Force from the digital display.

5. Digital Display

The digital meter is used to display the pre-set (preview) amperage for welding, the preset parameters in Hot start, start time and Arc force and actual welding amperage of the power source when welding.

6. Negative Control

The negative control is used to minus setting parameter for selected function from 4.

7. Positive Control

The positive control is used to plus setting parameter for selected function from 4.

8. Positive Welding Output Terminal

The positive welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as earth clamp. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

9. Negative Welding Output Terminal

The positive welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as electrode holder. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

10. 5 Pin Control Socket

The 5 pin receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry.

To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.

2.4 Set-up For LIFT TIG (GTAW) Welding (only for E221)**CAUTION**

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

NOTE

The following steps will assume that you have already set up the proper shielding gas as outlined in Sub Section

NOTE

The following set up is known as Straight Polarity or DC Electrode Positive. This is commonly used for DC LIFT TIG welding on most materials such as steel and stainless steel.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Connect the work earth clamp to the positive output terminal, and the LIFT TIG Torch cable to the negative output terminal. Refer to Figure 5-02.
3. Connect the gas line/hose to the proper shielding gas source and connect the aviation plug for trigger switch to 5 pin control socket Refer to Figure 5-02.
4. Slowly open the Argon Cylinder Valve to the fully open position.
5. Connect the work earth clamp to your work piece.
6. The tungsten must be ground to a blunt point (similar to a pencil) in order to achieve optimum welding results. (Refer to Figure: 5-01). It is critical to grind the tungsten electrode in the direction the grinding wheel is turning. Grind at a 30 degree angle and never to a sharp point.

2 to 2-1/2 Times Electrode Diameter

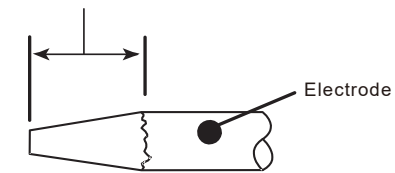


Figure:5-01

7. Install the tungsten with approximately 1.6mm to 3.2mm sticking out from the gas cup, ensuring you have correct sized collet.
8. Tighten the back cap.
9. Turn the switch to the "ON" position. The power L.E.D. light should illuminate.
10. Set the welding process to LIFT TIG.
11. Set the Weld Current from the positive and negative control to the required amperage.
12. You are now ready to begin LIFT TIG Welding.

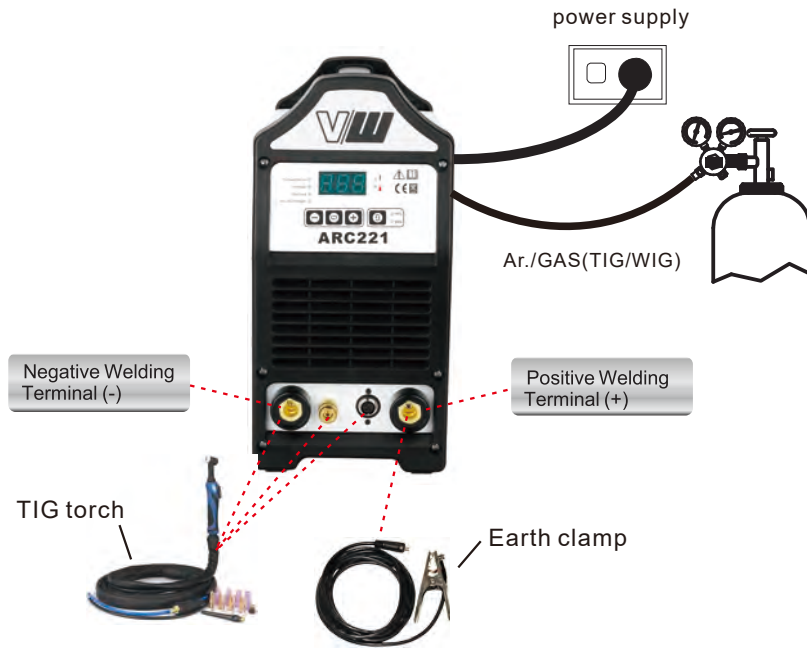


Figure:5-02

2.5 Setup For STICK (MMA) Welding



WARNING

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

NOTE

The following set up is known as DC Electrode Positive or reverse polarity. Please consult with the STICK electrode manufacturer for specific polarity recommendations.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Attach the STICK and work earth clamp as shown in Refer to Figure 5-03
3. Set the welding process to STICK.
4. Set the welding current from the positive and negative control to the desired amperage. Set the different requirements for the hot start ,start time and arc force too.
5. Install a STICK electrode in the electrode holder.
6. You are now ready to begin STICK Welding.

NOTE

To weld, gently strike the electrode on the work piece to generate a welding arc, and slowly move along the work piece while holding a consistent arc length above base metal.

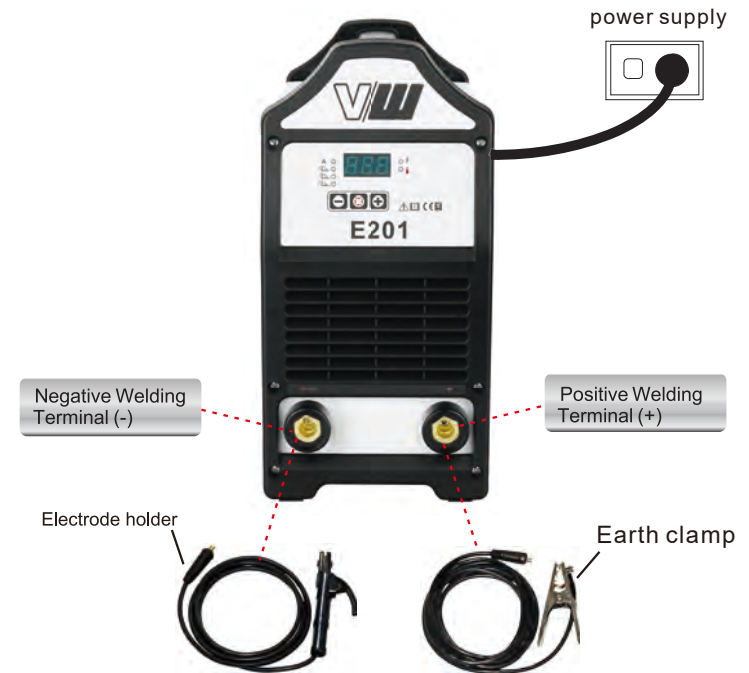


Figure:5-03

3.1 Troubleshooting



WARNING

There are extremely dangerous voltage and power levels present inside this product. Do not attempt to open or repair unless you are a qualified electrical tradesperson and you have had training in power measurements and troubleshooting techniques.

If major complex subassemblies are faulty, then the Welding Power Source must be returned to an accredited reseller for repair. The basic level of troubleshooting is that which can be performed without special equipment or knowledge. Refer also to section 6.01-6.02 for solving welding problems.

Nr.	Troubles	Reasons	Solution
1	Turn on the power source, power indicator is lit, fan is not working.	Fan is broken	Change fan
		There is something in the fan	Clean it
		The start capacitor of fan damaged	Change capacitor
2	Turn on the power source, fan is working, power indicator is not lit	The power light damaged or connection is not good	Change the power light
		The power board is broken	Change it
		Display panel is broken	Change it
3	Turn on the power source, fan is not working, power indicator is not lit	The power cable connected not good	Connect correctly
		The power cable is broken	Repair or change it
		Power on switch is damaged	Change it
		The light of the power indicator is broken and the problems mentioned in Nr. 2	Change the light of the power indicator or refer to the solution in Nr. 2
4	Turn on the power source, power indicator is lit, fan is working, there is no welding output.	The power board is broken	Change it
		1 st inverter circuit damaged	Replace it
5	The number of the display is not intact	The display panel is damaged	Change the display panel
		Digital tube is broken	Change it
6	No no-load voltage output (MMA)	If the overheat indicator is on	Wait a few minutes, the machine can be operated normal
		The main circuit is broken	Check and repair
		The machine is broken	Consult the dealer or the manufacturer
7	No gas flow (TIG for E221)	Gas cylinder is close or gas pressure is low	Open or change the gas cylinder
		Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it
		Air tube is broken	Change it
		Pressure too high or air regulator is broken	Check gas
8	Gas always flows	Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it
9	The welding current cannot be adjusted	Checking if the electrode stick to the work piece that the anti-stick function is on	Separate the electrode and work piece
		Control board is broken	Repair or change it
		Shut off the power when changing the torch	
10	The welding current displayed isn't accordant with the actual value	The min value displayed isn't accordant with the actual value	Adjust potentiometer Imin on the control board
		The max value displayed isn't accordant with the actual value	Adjust potentiometer Imax on the control board

Nr.	Troubles	Reasons	Solution
11	The penetration of molten pool is not enough	The welding current is adjusted too low	Increase the welding current
		The arc is too long in the welding process	Adjust the distance from torch to work piece
		The power cable or the welding cable is too long	Use the suitable length from manufacturer
12	Thermal overload indicator light is on	Over-heat protection, too much welding current	Reduce the welding current
		Over-heat protection, working too much time	Reduce the welding time
		Over-current protection, current in the main circuit is out of control	Check and repair main circuit and drive board
		Input voltage is too low	Check the power supply
		Fan is broken	Change the fan
13	Tig electrode melts when welding	Tig torch is connected to the positive terminal	Connect the tig torch to negative terminal
14	Arc flutters during Tig welding	Tungsten electrode is too big for the welding current	Select the correct size of tungsten electrode
		Check the earth clamp position on the work piece	Adjust the position of earth clamp

CHAPTER 3

CUTTING SERIES EQUIPMENT



1.1 Brief Introduction

C41, C71 and C101 plasma cutting machines adopts the latest pulse width modulation (PWM) technology and insulated gate bipolar transistor (IGBT) power module, which can change work frequency to medium frequency so as to replace the traditional hulking work frequency transformer with the cabinet medium frequency transformer. Thus, its characterized with portable, small size, light weight, low consumption and etc.

C41, C71 and C101 plasma cutting machines Characteristics:

- ◆ IGBT technology
- ◆ With EMI filter to minimize the pollution of the electrified net
- ◆ High mains voltage tolerance $\pm 15\%$ to maintain stable work.
- ◆ MCU control system, responds immediately to any changes.
- ◆ Excellent cutting capability.
- ◆ Pilot arc controller, can cut grid workpiece
- ◆ Intelligent protection: over-current, over-heat, when the mentioned problems occurred, the alarm lamp on the front panel will be on and the output current will be cut off. It can self-protect and prolong the using life.

1.2 Specifications C41

Description	VECTOR DIGITAL C41 CUT
Weight	11 kg
Power Source Dimensions	H395mmxW180mmxD370mm
Cooling	Fan Cooled
Welder Type	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1
Number of Phases	1
Nominal Supply Voltage	230V +/- 15%
Nominal Supply Frequency	50/60Hz
Welding Current Range (CUT)	20 - 40A
Effective Input Current	18A
Maximum Input Current	28.5A
Single Phase Generator Requirement	9.9kVA
(CUT) Welding Output, 40°C, 10 min.	40A @ 40%, 96V 25A @ 100%, 90V
Open circuit voltage	330V DC
Protection Class	IP23

NOTE

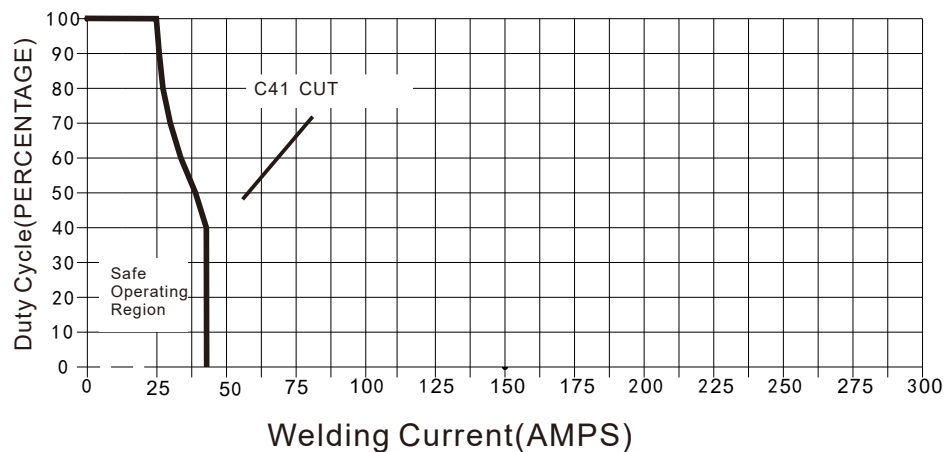
Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service

1.3 Packaged Items**C41**

- ◆ Plasma Torch 6m S45
- ◆ 200 A earth clamp with 3M cable
- ◆ 3M Power cable
- ◆ 3M Gas Hose 8x13.5
- ◆ Operating Manual

1.4 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 40 amperes at 96 volts. This means that it has been designed and built to provide the rated amperage (40A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.

**1.5 Specifications C71**

Description	VECTOR DIGITAL C71 CUT
Weight	18.8 kg
Power Source Dimensions	H515mmxW224mmxD375mm
Cooling	Fan Cooled
Welder Type	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1
Number of Phases	3
Nominal Supply Voltage	400V +/- 15%
Nominal Supply Frequency	50/60Hz
Welding Current Range (CUT)	20 - 70A
Effective Input Current	10.7A
Maximum Input Current	13.8A
Single Phase Generator Requirement	14.3kVA
Welding Output, 40°C, 10 min.	70A @ 60%, 108V 54A @ 100%, 101.6V
Open circuit voltage	300V DC
Protection Class	IP23

NOTE

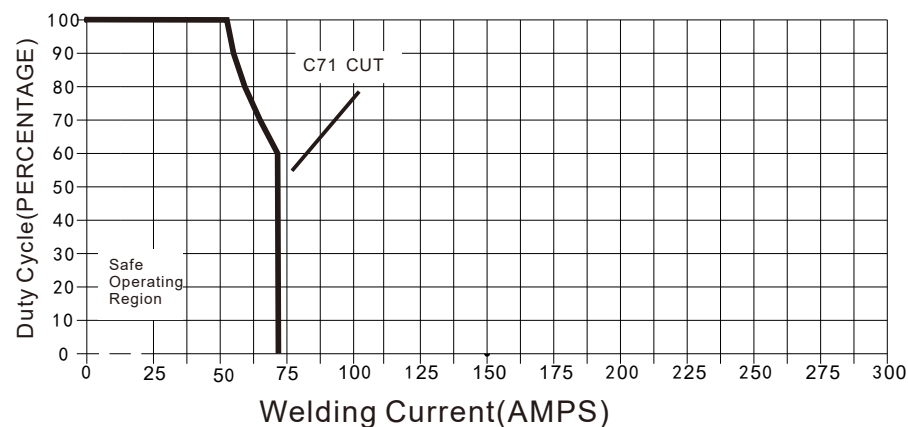
Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service

1.6 Packaged Items**C71**

- ◆ Plasma Torch 6m PT80
- ◆ 200 A earth clamp with 3M cable
- ◆ 3M Power cable
- ◆ 3M Gas Hose 8x13.5
- ◆ Air Regulator
- ◆ Operating Manual

1.7 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 60% duty cycle, 70 amperes at 108 volts. This means that it has been designed and built to provide the rated amperage (70A) for 6 minutes, i.e. arc welding time, out of every 10 minute period (60% of 10 minutes is 6 minutes). During the other 4 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



1.8 Specifications C101

Description	VECTOR DIGITAL C101 CUT
Weight	27.6 kg
Power Source Dimensions	H545mmxW250mmxD450mm
Cooling	Fan Cooled
Welder Type	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1
Number of Phases	3
Nominal Supply Voltage	400V +/- 15%
Nominal Supply Frequency	50/60Hz
Welding Current Range (CUT)	20 - 100A
Effective Input Current	17A
Maximum Input Current	21.9A
Single Phase Generator Requirement	22.8kVA
Welding Output, 40°C, 10 min.	100A @ 60%, 120V 77.5A @ 100%, 111V
Open circuit voltage	300V DC
Protection Class	IP23

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service

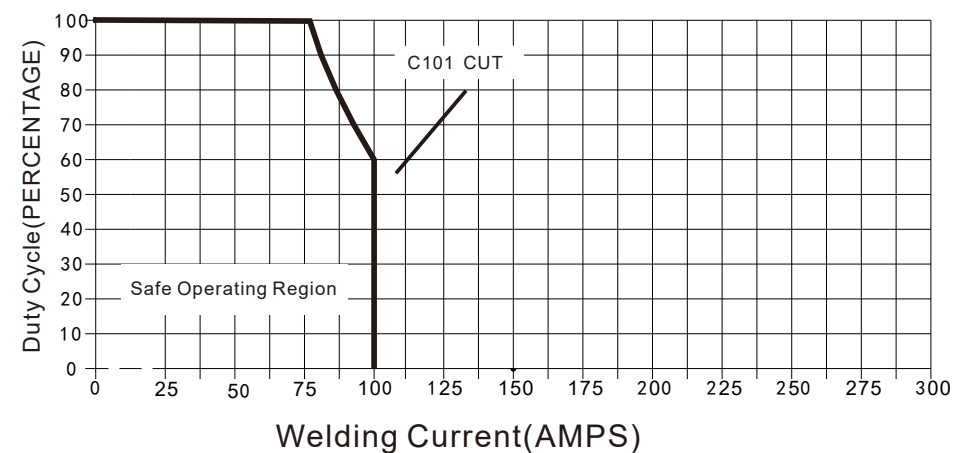
1.9 Packaged Items

C101

- ◆ Plasma Torch 6m PT100
- ◆ 300 A earth clamp with 3M cable
- ◆ 3M Power cable
- ◆ Operating Manual

1.10 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 60% duty cycle, 100 amperes at 120 volts. This means that it has been designed and built to provide the rated amperage (100A) for 6 minutes, i.e. arc welding time, out of every 10 minute period (60% of 10 minutes is 6 minutes). During the other 4 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



2.1 Layout For The Panel C41

**WARNING**

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Digital Display

The digital meter is used to display the pre-set (preview) amperage for cutting and the actual cutting current.

2. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

3. Work Indicator

Turn on the switch of the cutting gun, generate the voltage, the lamp on.

4. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

5. Plasma Torch Faulty Indicator

Cutting gun improper installation alarm.

6. Air pressure Faulty Indicator

Air pressure low alarm.

7. Positive Control

The positive control is used to plus current.

8. Negative Control

The negative control is used to minus current.

9. Barometer

The barometer shows the present air pressure.

10. Positive Welding Output Terminal

The positive cutting terminal is used to connect the cutting output of the power source to the appropriate welding accessory such as earth clamp. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

11. Plasma Torch Connector

Plasma torch insert in to connect with the machine. It's necessary to be sure that the plug is correctly and tightly connected to maintain the electricity and gas supply.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.

2.2 Layout For The Panel C71



**WARNING**

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Digital Display

The digital meter is used to display the pre-set (preview) amperage for cutting and the actual cutting current.

2. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

3. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

4. Air Pressure/ Cutting Torch Faulty Indicator

Cutting torch improper installation and air pressure low alarm.

5. Work Indicator

Turn on the switch of the cutting gun, generate the voltage, the lamp on.

6. Grid Cut Indicator

Press and release button from 8 to change the selected cutting functions mode, light on, the function is selected.

7. Normal Cut Indicator

Press and release button from 8 to change the selected cutting functions mode, light on, the function is selected.

8. Cut function Select Button

Press and release this button to change the selected cutting functions mode.

9. Negative Control

The negative control is used to minus current.

10. Positive Control

The positive control is used to plus current.

11. Positive Welding Output Terminal

The positive cutting terminal is used to connect the cutting output of the power source to the appropriate welding accessory such as earth clamp. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

12. Plasma Torch Connector

Plasma torch insert in to connect with the machine. It's necessary to be sure that the plug is correctly and tightly connected to maintain the electricity and gas supply.

2.3 Layout For The Panel C101**WARNING**

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Barometer

The barometer shows the present air pressure.

2. Digital Display

The digital meter is used to display the pre-set (preview) amperage for cutting and the actual cutting current.

3. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

4. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

5. Air Pressure/Cutting Torch Faulty Indicator

Cutting Torch improper installation and air pressure low alarm.

6. Work Indicator

Turn on the switch of the cutting gun, generate the voltage, the lamp on.

7. Grid Cut Indicator

Press and release button from 8 to change the selected cutting functions mode, light on, the function is selected.

8. Normal Cut Indicator

Press and release button from 8 to change the selected cutting functions mode, light on, the function is selected.

9. Cut function Select Button

Press and release this button to change the selected cutting functions mode.

10. Positive Control

The positive control is used to plus current.

11. Negative Control

The negative control is used to minus current.

12. Positive Welding Output Terminal

The positive cutting terminal is used to connect the cutting output of the power source to the appropriate welding accessory such as earth clamp. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

13. Plasma Torch Connector

Plasma torch insert in to connect with the machine. It's necessary to be sure that the plug is correctly and tightly connected to maintain the electricity and gas supply.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.

2.4 Steel Cutting Capability (Thickness to scale.)

	C41	C71	C101
Capacity	Thickness	Thickness	Thickness
Quality Cutting Thickness (500mm/min)	Cutting	Cutting	Cutting
	10mm	20mm	30mm
Maximum Cutting Capacity	20mm	30mm	50mm

2.5 Installation Instructions

In order for the unit to function correctly, it must be installed properly. Follow the procedure given below for correct installation:

1. Read the safety rules given in this manual carefully.
2. Check on receiving the unit that there are no defective parts or parts damaged during transportation.
3. Attach air regulator as show in picture Air Regulator Installation only for C71.
4. Set your unit up in an area which is adequately ventilated and make sure that the air vents are not obstructed.
5. Connect the power supply cable to a socket located as near as possible to the work area, so that the unit can be switched off quickly in case of emergency.
6. Your machine has a 16 amp plug fitted, before use check that the green/yellow earth is connected to the earth pin socket of fitted plug.
7. Make sure that the mains supply switch and any fuses have a value which $\pm 15\%$ the maximum current absorbed by the unit. All fuses should be the slow-blow type.
8. Any extensions of power supply cable should have the same cross-section as the power supply cable. The extension leads, however, should only be used when absolutely necessary. It is important to note that any extension of mains cables or torch cables will possibly affect the cutting performance of this cutting equipment, due to the fact that the resistance of the cable will reduce voltage input, which is determined by the length of the cable. The supplied length of main cables and torch cables is recommended.
9. Fasten the earth clamp to the piece to be cut, If the surface of the piece to be cut is painted, rusty or covered with insulating material, clean the surface so that satisfactory contact between the piece and the earth clamp can be obtained.
10. Make sure that the torch has been assembled with the correct components and that the cutting tip is suitable for the cutting current.
11. Connect air to regulator and adjust regulator to deliver 5-6 bar 90ltr/min
12. Switch the unit on using the main switch located on the back side.
13. press the cutting torch to achieve a pilot from the copper tip, when this pilot is up to the work piece, cutting operation begins.
14. Once cutting is over, release the torch button to put out the arc. A period of post-flow time 45 to 75 seconds (required for torch cooling) will follow. Do not disconnect air until this cooling period has been completed. Failure to do this will result in torch head damage.



CAUTION

Do not point the torch jet at foreign bodies.



CAUTION

Avoid unnecessary lighting of the pilot arc to prevent excessive consumption of the electrode and nozzle.



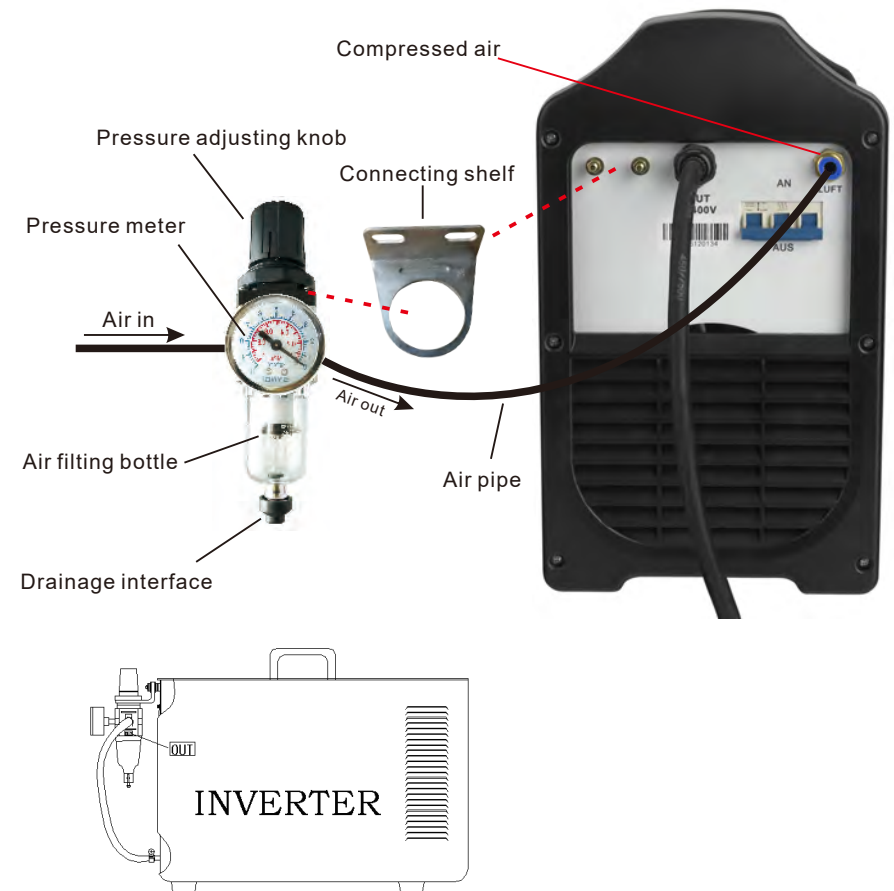
CAUTION

During cutting the speed of the torch movement should be in accordance with the thickness of the piece to be cut. Excessive speed causes a return of incandescent towards the torch which shortens the life of the parts of the torch most subject to wear and tear. The metal fouling on the nozzle should be removed as soon as possible.



Air regulator installation and operation

1. Firmly tight and seal the copper air hole at IN and OUT terminal by high pressure rubber tube.
2. Tight and seal the meter with meter face rubber tube.
3. Fix the connecting shelf with screw as the regulator position.
4. Get down the plastic screw and fix the regulator on the shelf.
5. Turn on the air valve, turn up the pressure adjusting knob, turn the pressure volume (meter inside shows kg), and then put down the knob. (+ means increasing pressure, -- means decreasing pressure.)
6. Scale of the meter is as follow. The volume in the picture is 6 kg.
7. If the water in the gas filtering bottle is too much, please turn on the water valve to let the water go out.



3.1 Troubleshooting

- ◆ Before arc welding machines are dispatched from the factory, they have already been debugged accurately. So forbid anyone who is not authorized by us to do any change to the equipment!
- ◆ Maintenance course must be operated carefully. If any wire becomes flexible or is misplaced, it maybe potential danger to user!
- ◆ Only professional maintenance personal who is authorized by us could overhaul the machine!
- ◆ Guarantee to shut off the arc welding machine's power before turn on the outline of the equipment!
- ◆ If there is any problem and has no the authorized professional maintenance personal, please contact local agent or the branch company!
If there are some simple troubles of WSME-series welding machine, you can consult the following overhauling chart:

Nr.	Troubles	Reasons	Solution
1	Turn on the power source, power indicator is lit, fan and air control valve are not working	Fan is broken and the control board broken	Change fan and control board
		There is something in the fan and the control board broken	Clean it and change the control board
		The start capacitor of fan damaged and the control board broken	Change capacitor and control board
		The input lines not corretly connected	Connect correctly
2	Turn on the power source, fan is working, power indicator is not lit	The power light damaged or connection is not good	Change the power light
		The power board is broken	Change it
		Display panel is broken	Change it
3	Turn on the power source, fan is not working, power indicator is not lit	The power cable connected not good	Connect correctly
		The power cable is broken	Repair or change it
		Power on switch is damaged	Change it
		The light of the power indicator is broken and the problems mentioned in Nr. 2	Change the light of the power indicator or refer to the solution in Nr. 2
		The power board is broken	Change it
4	Turn on the power source, Torch/Gas indicator is on	The shield cup is unfitted installation	Install and screw properly
		The tip or electrode is unfitted installation	Install and screw properly
		Gas pressure too low	Adjust the gas pressure to 65psi/4.5 bar,the barometer indicate up to 0.4Mpa or 60psi.
		Cutting torch is broken or mistake	Check and change
5	The over-heat alarm is on after a few minutes cutting	The input or output of the air flow around the machine is blocked	Correct the condition
		Fan blocked	Check and correct it
		Over-heat appear	let meachine cool down 5 minutes and make sure the duty cycle is not exceeded
		Input voltage is not correct	Choose the proper voltage
		Faulty components in the machine	Consult the dealer or manufacturer to repair

Nr.	Troubles	Reasons	Solution
6	When torch is pressed the torch failed to ignite the arc	Torch parts broken	Inspect torch parts and replace if necessary
		Gas pressure too low or too high	Adjust it to proper rate
		Faulty components in the machine	Consult the dealer or manufacturer to repair
		Input voltage is not correct	Choose the proper voltage
7	When torch is pressed the torch is difficult to ignite	The gas distributor is uninstalled	Install it
		Torch parts are worn	Check and change the torch parts
		Machine is in trouble	Consult the dealer or manufacturer to repair
		Gas pressure too low or too high	Adjust it to proper rate
8	After triggering the torch ,the pilot arc cannot change to the cutting pilot	The connection between cutting torch and machine is not correct o r the connection is poor	Check the torch leads are properly connect to the machine
		Earth clamp not correctly connect to the work piece	Make sure the earth clamp has a proper connection to a clean and dry area of the workpiece
		The cutting torch is broken	Change or repair it
		Power supply is overheated	let meachine cool down 5 minutes and make sure the duty cycle is not exceeded
9	Arc shuts off during operation and it will not restart when torch is triggered	Gas pressure too low , the torch/gas indicator is on when torch switch is pressed	Check and adjust the gas setting at least 65psi/4.5 bar
		Torch consumbles are worn	Check and replace
		Faulty components in the machine	Consult the dealer or manufacturer to repair
		Gas pipe not connected or pressure is too low	Check the gas connection, adjust the proper setting
10	The power indicator is on ,fan is working but no gas flow , gas indicator is on	Faulty components in the machine	Consult the dealer or manufacturer to repair
		Air regulator is broken	Change it
		Incorrect setting of cutting current	Check and adjust the cutting current
11	low cutting output	Faulty components in the machine	Consult the dealer or manufacturer to repair
		Cutting current is too low	Increase the cutting current
12	Torch can cut but the quality is poor	The movement of torch is too fast	Reduce cutting speed
		Excessive oil or moisture in torch	Do not directly start to cut before cleaning the torch
		lack of air pressure	Check the air pressure and air flow

CHAPTER 4

DC PULSE SERIES EQUIPMENT



EN



1.1 Brief Introduction

T231/T331 welding machine adopts the latest pulse width modulation (PWM) technology and insulated gate bipolar transistor (IGBT) power module, which can change work frequency to medium frequency so as to replace the traditional hulking work frequency transformer with the cabinet medium frequency transformer. Thus, its characterized with portable, small size, light weight, low consumption and etc.

The parameters of T231/T331 on the front panel all can be adjusted continuously and steplessly, such as start current, crater arc current, welding current, base current, duty ratio, upslope time, downslope time, pre-gas, post-gas, pulse frequency, hot start, arc force and length etc. When welding, it takes high frequency and high voltage for arc igniting to ensure the success ratio of igniting arc.

T231/T331 Characteristics:

- ◆MCU control system, responds immediately to any changes.
- ◆High frequency and high voltage for arc igniting to ensure the success ratio of igniting arc.
- ◆ With special means, even if arc-break occurs the HF will keep the arc stable.
- ◆Pedal control the welding current.
- ◆In DC TIG without HFoperation, If the tungsten electrode touches the workpiece when welding, the current will drop to short-circuit current to protect tungsten.
- ◆ Intelligent protection: over-current, over-heat, when the mentioned problems occurred, the alarm lamp on the front panel will be on and the output current will be cut off. It can self-protect and prolong the using life.
- ◆purposes: DC inverter TIG, Excellent performance on carbon steel, stainless steel, titanium etc.

According to choosing the front panel functions, the following four welding ways can be realized.

DC MMA

DC TIG

DC Pulse TIG

1. For DC MMA, polarity connection can be chosen according to different electrodes;
2. For DC TIG, DCEP is used normally (workpiece connected to positive polarity, while torch connected to negative polarity). This connection has many characters, such as stable welding arc, low tungsten pole loss, more welding current, narrow and deep weld;
3. DC Pulsed TIG has the following characters:
 - 1) Pulse heating. Metal in Molten pool has short time on high temperature status and freezes quickly, which can reduce the possibility to produce hot crack of the materials with thermal sensitivity .

- 2) The workpiece gets little heat. Arc energy is focused. Be suitable for thin sheet and super thin sheet welding.
- 3) Exactly control heat input and the size of the molten pool. The depth of penetration is even. Be suitable for welding by one side and forming by two sides and all position welding for pipe.
- 4) High frequency arc can make metal for microliter fabric, eliminate blowhole and improve the mechanical performance of the joint.
- 5) High frequency arc is suitable for high welding speed to improve the productivity.

T231/T331 –series welding machines is suitable for all positions welding for various plates made of stainless steel, carbon steel, alloyed steel, titanium, magnesium, cuprum, etc, Which is also applied to pipe installment, mould mend, petrochemical, architecture, decoration, car repair, bicycle, handicraft and common manufacture.

MMA-----Manual Metal Arc Welding

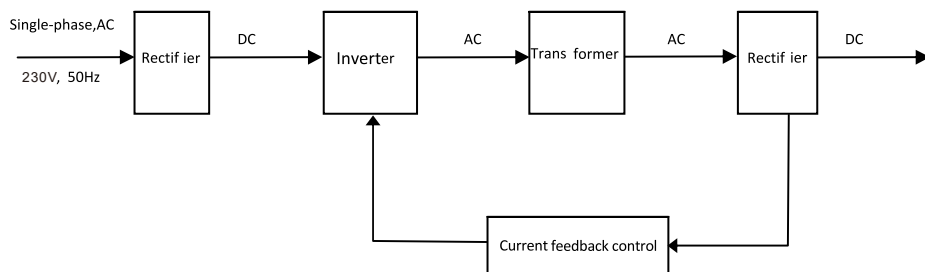
PWM-----Pulse-Width Modulation

IGBT-----Insulation Gate Bipolar Transistor

TIG-----Tungsten Insert Gas Welding

1.2 Working Principle

The working principle of T231/T331 welding machines is shown as the following figure. Single-phase 230V work frequency AC is rectified into DC (about 312 V), then is converted to medium frequency AC (about 20-40KHz) by inverter device (IGBT module), after reducing voltage by medium transformer (the main transformer) and rectifying by medium frequency rectifier (fast recovery diodes), then is outputted DC. The circuit adopts current feedback control technology to insure current output stably. Meanwhile, the welding current parameter can be adjusted continuously and steplessly to meet the requirements of welding craft.

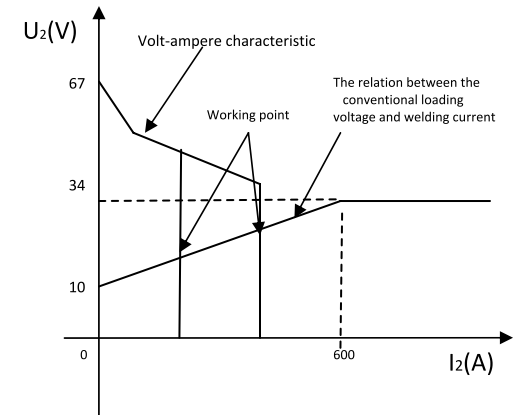


1.3 Volt- Ampere Characteristic

T231/T331 welding machine has an excellent volt-ampere characteristic, whose graph is shown as the following figure. The relation between the conventional rated loading voltage U_2 and the conventional welding current I_2 is as follows:

When $I_2 \leq 600A$, $U_2 = 10 + 0.04I_2 (V)$;

When $I_2 > 600A$, $U_2 = 34 (V)$.



1.4 Specifications T231/T331

Description	T231	T331
Weight	10.9 kg	19.6 kg
Power Source Dimensions	H395mmxW180mmxD370mm	H515mmxW220mmxD380mm
Cooling	Fan Cooled	Fan Cooled
Welder Type	Inverter Power Source	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1	EN 60974-1 / IEC 60974-1
Number of Phases	1	3
Nominal Supply Voltage	230V +/- 15%	400V +/- 15%
Nominal Supply Frequency	50/60Hz	50/60Hz
Welding Current Range (DC STICK Mode)	5 - 200A	30 - 250A
Welding Current Range (DC TIG Mode)	5 - 200A	10 - 300A
Effective Input Current	32.3A	8.6A
Maximum Input Current	41.7A	13.7A
Single Phase Generator Requirement	14.4kVA	14.2KVA
STICK (MMA) Welding Output, 40°C, 10 min.	200A @ 60%, 28V 110A @ 100%, 24.4V	250A @ 40%, 30V 158A @ 100%, 26.3V
TIG (GTAW) Welding Output, 40°C, 10 min.	200A @ 60%, 18V 155A @ 100%, 16.2V	300A @ 40%, 22V 190A @ 100%, 17.6V
Open circuit voltage	66V DC	66V DC
Protection Class	IP23	IP23

NOTE

Note 1: The Effective Input Current should be used for the determination of cable size & supply requirements.

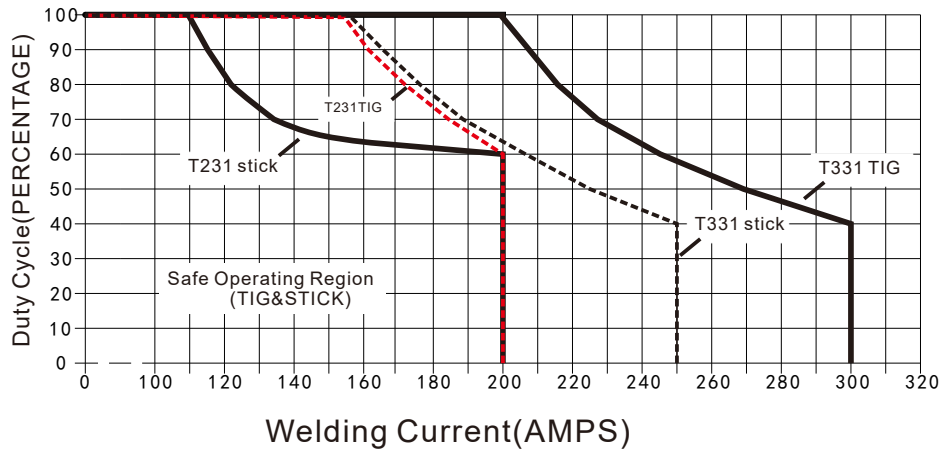
Note 2: Generator Requirements at the Maximum Output Duty Cycle.

Note 3: Motor start fuses or thermal circuit breakers are recommended for this application. Check local requirements for your situation in this regard.

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

1.5 Duty Cycle

The rated duty cycle of a Welding Power Source, is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 300 amperes at 22 volts. This means that it has been designed and built to provide the rated amperage (300A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool. The thermal cut out will operate if the duty cycle is exceeded.



1.6 Packaged Items

T231

- ◆ 3M Power cable
- ◆ 200 Amp electrode holder with 3M cable
- ◆ 200 Amp earth clamp with 3M cable
- ◆ 4M TIG Torch WP26
- ◆ 3M Gas Hose
- ◆ Operating Manual

T331

- ◆ 3M Power cable
- ◆ 300 Amp electrode holder with 3M cable
- ◆ 300 Amp earth clamp with 3M cable
- ◆ 4M TIG Torch WP18
- ◆ 3M Gas Hose
- ◆ Operating Manual

2.1 Layout For The Panel T231/T331



1. Power ON Indicator

The POWER ON indicator illuminates when the ON/OFF switch is in the ON position and the correct mains voltage is present.

Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

2. Process Selection Button

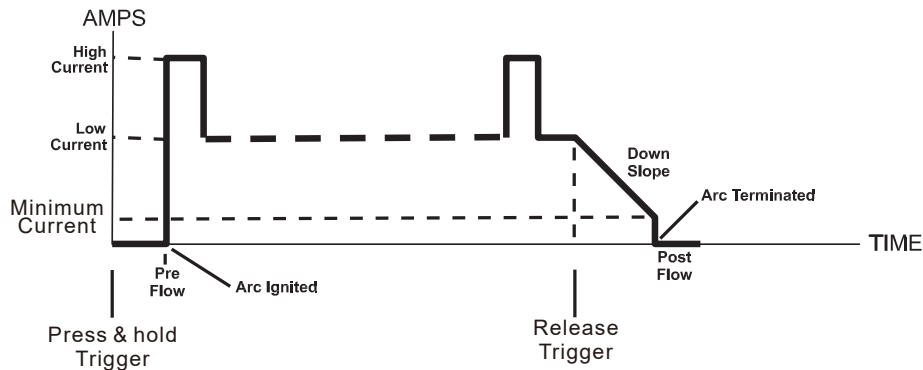
The process selection control is used to select the desired welding mode. Two modes are available, GTAW (TIG) and MMA (Stick) modes.

3. Trigger Mode Control Button (HF TIG and LIFT TIG Mode only)

The trigger mode control is used to switch the functionality of the torch trigger between 2T and 4T.

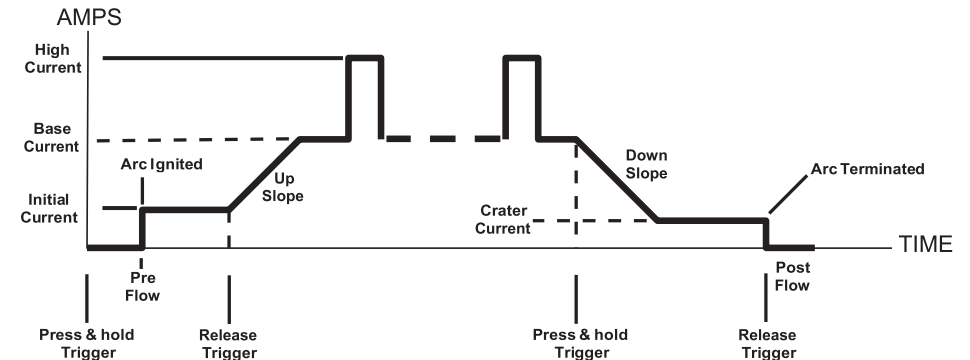
2T Normal Mode In this mode, the torch trigger must remain pressed for the welding output to be active.

Press and hold the torch trigger to activate the power source (weld). Release the torch trigger switch to cease welding.



4T Latch mode this mode of welding is mainly used for long welding runs to reduce operator fatigue. In this mode the operator can press and release the torch trigger and the output will remain active. To deactivate the power source, the trigger switch must again be pressed and released, thus eliminating the need for the operator to hold the torch trigger.

Note: that when operating in GTAW (HF and LIFT TIG modes), the power source will remain activated until the selected down slope time has elapsed



4. Pulse Button

Press the PULSE button to toggle Pulse On and OFF.

CONVENTIONAL PULSED TIG	HIGH SPEED PULSED TIG
<p>Typically from 1 to 10 PPS. Provides a heating and cooling effect on the weld puddle and can reduce distortion by lowering the average amperage. This heating and cooling effect also produces a distinct ripple pattern in the weld bead. The relationship between pulse frequency and travel speed determines the distance between the ripples. Slow pulsing can also be coordinated with filler metal addition and increase overall control of the weld puddle</p>	<p>In excess of 40 PPS, Pulsed TIG becomes more audible than visible-causing increased puddle agitation for a better as-welded microstructure. Pulsing the weld current at high speeds-between a high Peak and a low Background amperage-can also constrict and focus the arc. This results in maximum arc stability, increased penetration and increased travel speeds(Common Range: 100-500 PPS). The Arc-Sharpening effects of high speed pulsing are expanded to new dimensions. The ability to pulse at 5,000PPS further enhances arc stability and concentration potential-which is extremely beneficial to automation where maximum travel speeds are required.</p>

5. Negative Control

The Negative button is used to minus selected in Programming sequence..

Positive Control

The Positive button is used to plus selected in Programming sequence..

Selecting Function Button

This button can select different programming parameter

6. Digital Ammeter / Parameter meter

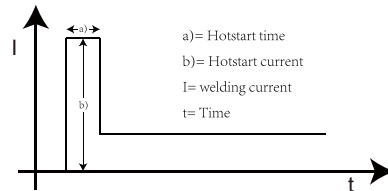
The digital Ammeter is used to display the actual output current of the power source. It is also used to display Parameters in Programming Mode.

Depending on the Programming Parameter selected, the status indicator adjacent to the Ammeter will illuminate to show the units of the programming parameter.

When welding, the Ammeter will display actual welding current.

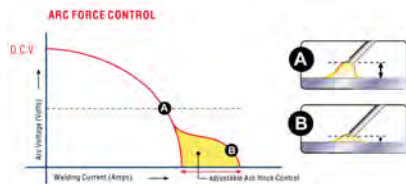
7. Hot Start

Hot Start Function reliably ignites the electrode and melts perfectly to ensure the best quality even at the start of the seam. this solution makes lack of fusion and cold welds a thing of the past and significantly reduces weld reinforcement. Adjust the hot start current here and the time here.



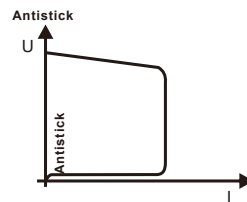
Arcforce Correction

During the welding process, arcforce prevents the electrode sticking in the weld pool with increases in current. this makes it easier to weld large-drop melting electrode types at low current strengths with a short arc in particular.



Anti-stick prevents the electrode from annealing.

If the electrode sticks in spite of the arcforce device, the machine automatically switches over to the minimum current within about 1 second to prevent the electrode from overheating. In order to easily separate the electrode and electrode holder to protect the welder.



8. JOB and SAVE

You can press JOB to select the memory records that you have saved before from 1-9. For the new setting of present current Amps ,just press SAVE.

9. Negative Welding Terminal

Negative Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

10. Positive Welding Terminal

Positive Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

11. Shielding Gas Outlet

The Shielding Gas Outlet located on the front panel is a fast connection of a suitable TIG Torch.

12. 5 Pin Control Socket

The 5 pin receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry:

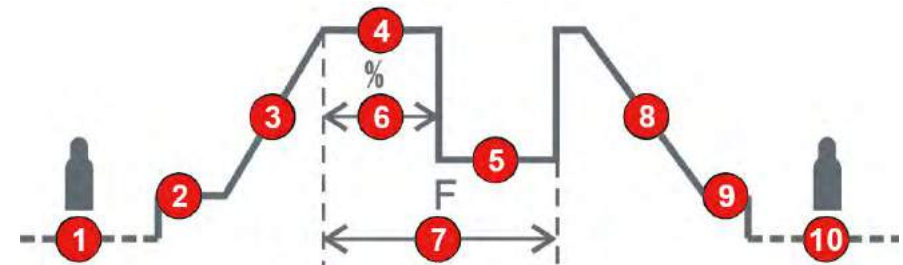
To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

2.2 Control Panel



1. Gas Pre-Flow

T231: Absolute setting range 0.1s to 5s (0.1S increments)

T331: Absolute setting range 0.1s to 20s (0.1S increments)

This parameter operates in TIG modes only and is used to provide gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.

2.Initial Current

T231: The main current Setting range 5AMP to 200AMP

T331: The main current Setting range 10AMP to 300AMP

This parameter operates in (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.

Note: The maximum initial current available will be limited to the set value of the base current.

3. Up Slope**Setting ranges :0.1S-10S (0.1S increments)**

This parameter operates in (2T and 4T) TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from Initial Current to High or base current.

4. Peak Current**Setting ranges**

T231:5AMP to 200AMP (DC TIG) , 5-200A (Stick mode)

T331:10AMP to 300AMP (DC TIG) , 30-250A (Stick mode)

This parameter sets the TIG WELD current. This parameter also sets the STICK weld current.

5. Base Current**Setting ranges**

T231:5AMP to 200AMP (DC TIG mode), 5AMP to 200AMP (STICK mode)

T331:10AMP to 300AMP (DC TIG mode), 10AMP to 300AMP (STICK mode)

Secondary current (TIG)/pulse pause current.

6. Pulse Width**Setting ranges 10%-90%**

This parameter sets the percentage on time of the PULSE FREQUENCY for High weld current when the PULSE is ON.

7. Pulse Frequency**Setting ranges 1HZ -200HZ**

This parameter sets the PULSE FREQUENCY when the PULSE is ON.

8. Down Slope**Setting ranges 0.1-10s**

This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed to end current. This control is used to eliminate the crater that can form at the completion of a weld.

9. End Current

T231:Setting ranges 5A-200A

T331:Setting ranges 10A-100A

This parameter operates in (4T) TIG modes only and is used to set the finish current for TIG. The end current remains ON until the torch trigger switch is released after it has been depressed.

Note: The maximum crater current available will be limited to the set value of the base current.

10. Post Flow

T231: Setting ranges 1-10S

T331: Setting ranges 1-20S

This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.

2.3 Setup For STICK (MMA) Welding

For Alkaline Electrode, connect the electrode holder to the positive welding terminal and connect the work lead to the negative welding terminal, while for the Acid Electrode, please connect the electrode holder to the negative welding terminal and connect the work lead to the positive welding terminal. If in doubt consult the electrode manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection. Select STICK mode with the process selection control.

**WARNING**

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the mains power supply is switched off.

**CAUTION**

Remove any packaging material prior to use. Do not block the air vents at the front or rear of the Welding Power Source.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.



2.4 Set-up For LIFT TIG (GTAW) Welding



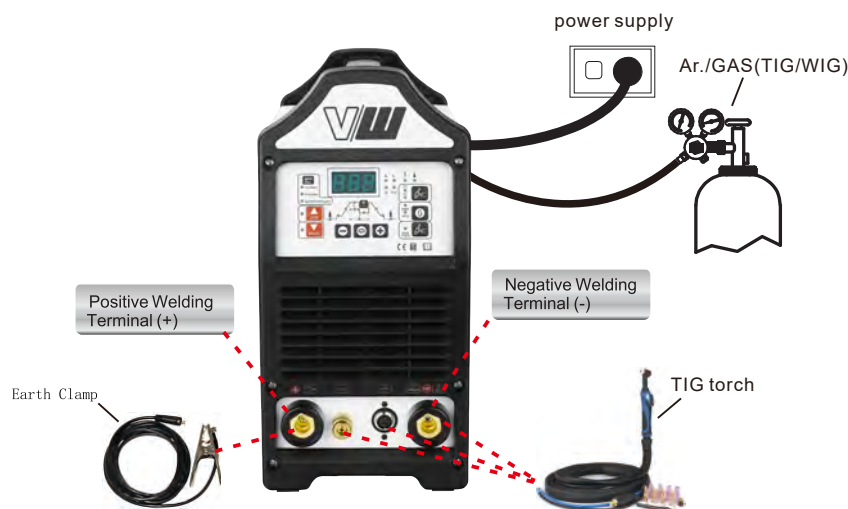
WARNING

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

NOTE

The following set up is known as Straight Polarity or DC electrode positive. This is commonly used for DC LIFT TIG welding on most materials such as steel and stainless steel.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Connect the work lead cable to the positive output terminal, and the LIFT TIG Torch cable to the negative output terminal.
3. Connect the gas line/hose to the proper shielding gas source.
4. Slowly open the Argon Cylinder Valve to the fully open position.
5. Connect the work lead clamp to your work piece.
6. The tungsten must be ground to a blunt point (similar to a pencil) in order to achieve optimum welding results. See illustration. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning. Grind at a 30 degree angle and never to a sharp point.
7. Install the tungsten with approximately 1.6mm to 3.2mm sticking out from the gas cup, ensuring you have correct sized collet.
8. Tighten the back cap.
9. Turn the switch to the "ON" position. The power L.E.D. light should illuminate.
10. Set the welding process to LIFT TIG.
11. Set the Weld Current Control Knob to the desired amperage.
12. You are now ready to begin LIFT TIG Welding power supply



2.5 Operation Environment

- ◆ Height above sea level is below 1000m.
- ◆ Operation temperature range: $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$.
- ◆ Relative humidity is below 90% (20°C).
- ◆ Preferably site the machine some angles above the floor level, the maximum angle does not exceed 15° .
- ◆ The content of dust, acid, corrosive gas in the surrounding air or substance can not exceed normal standard.
- ◆ Take care that there is sufficient ventilation during welding. There is at least 30cm free distance between the machine and wall.

2.6 Operation Notices

- ◆ Read safety instruction and Chapter 1 carefully before attempting to use this equipment.
- ◆ Connect the ground wire the machine directly
- ◆ In case closing the power switch, no-load voltage may be exported. Do not touch the output electrode with any part of your body.
- ◆ Before operation, no concerned people should be left, Do not watch the arc in unprotected eyes.
- ◆ Ensure good ventilation of the machine to improve duty ratio.
- ◆ Turn off the engine when the operation finished to economize energy source.
- ◆ When power switch shuts off protectively because of failure. Don't restart it until problem is resolved. Otherwise, the range of problem will be extended.

3.1 Troubleshooting

- ◆ Before arc welding machines are dispatched from the factory, they have already been debugged accurately. So forbid anyone who is not authorized by us to do any change to the equipment!
- ◆ Maintenance course must be operated carefully. If any wire becomes flexible or is misplaced, it maybe potential danger to user!
- ◆ Only professional maintenance personal who is authorized by us could overhaul the machine!
- ◆ Guarantee to shut off the arc welding machine's power before turn on the outline of the equipment!
- ◆ If there is any problem and has no the authorized professional maintenance personal, please contact local agent or the branch company!
If there are some simple troubles of WSME-series welding machine, you can consult the following overhauling chart:

Nr.	Troubles	Reasons	Solution
1	Turn on the power source, power indicator is lit, fan is not working.	Fan is broken	Change fan
		There is something in the fan	Clean it
		The start capacitor of fan damaged	Change capacitor
2	Turn on the power source, fan is working, power indicator is not lit	The power light damaged or connection is not good	Change the power light
		The power board is broken	Change it
		Display panel is broken	Change it
3	Turn on the power source, fan is not working ,power indicator is not lit	The power cable connected not good	Connect correctly
		The power cable is broken	Repair or change it
		Power on switch is damaged	Change it
		The light of the power indicator is broken and the problems mentioned in Nr. 2	Change the light of the power indicator or refer to the solution in Nr. 2
		The power board is broken	Change it
4	Turn on the power source, power indicator is lit, fan is working, there is no welding output.	Control board is broken	Change it
		1 st inverter circuit damaged	Replace it
		2 nd feedback circuit is fault	Change it
5	The number of the display is not intact	The display panel is damaged	Change the display panel
		Digital tube is broken	Change it

Nr.	Troubles	Reasons	Solution
6	No no-load voltage output (MMA)	If the overheat indicator is on	Wait a few minutes, the machine can be operated normal
		The main circuit is broken	Check and repair
		The machine is broken	Consult the dealer or the manufacturer
7	Arc can not be ignited (TIG) , there is spark on the HF igniting board	The welding cable is not connected with the two output if the welder	Connect the welding cable to the welder's output
		The welding cable is damaged	Repair or change it
		The earth cable connected unstably	Check the earth cable
		The welding cable is too long	Use an appropriate welding cable
		There is oil or dust on the workpiece	Check and remove it
		The distance between tungsten electrode and workpiece is too long	Reduce the distance (about 3mm ,less than 5mm)
		There is no Argon flow or the connection is poor	Check and reconnect
		Input voltage not stable	Check the power supply
8	Arc can not be ignited (TIG) , there is no spark on the HF igniting board	The HF igniting board does not work	Repair or change it
		The distance between discharger is too short or too long	Adjust the distance (about 0.8mm)
		The malfunction of the welding gun switch	Check the welding torch switch, control cable and aero socket.
		No argon gas flow or the air tube connect not good	Check and reconnect
9	Turn on the power source, everything is normal , but no HF igniting	Check if the function selected MMA	Change the function to TIG
		Check the HF funtion is selected	Select the HF funtion
		HF board is broken	Repair or change it
		Earth clamp connect not stable	Check the earth clamp
		No argon gas flow or the air tube connect not good	Check and reconnect
10	No gas flow (TIG)	Gas cylinder is close or gas pressure is low	Open or change the gas cylinder
		Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it
		Air tube is brocken	Change it
		Pressure too high or air regulator is broken	Check gas
11	Gas always flows	Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it

Nr.	Troubles	Reasons	Solution
12	The welding current cannot be adjusted	Checking if the electrode stick to the work piece that the anti-stick function is on	Separate the electrode and work piece
		Control board is broken	Repair or change it
		Shut off the power when changing the torch	
13	The welding current displayed isn't accordant with the actual value	The min value displayed isn't accordant with the actual value	Adjust potentiometer Imin on the control board
		The max value displayed isn't accordant with the actual value	Adjust potentiometer Imin on the control board
14	The penetration of molten pool is not enough	The welding current is adjusted too low	Increase the welding current
		The arc is too long in the welding process	Adjust the distance from torch to work piece
		The power cable or the welding cable is too long	Use the suitable length from manufacturer
15	Arc flutters during Tig welding	Tungsten electrode is too big for the welding current	Select the correct size of tungsten electrode
		Check the earth clamp position on the work piece	Adjust the position of earth clamp
16	Thermal overload indicator light is on	Over-heat protection ,too much welding current	Reduce the welding current
		Over-heat protection ,working too much time	Reduce the welding time
		Over-current protection, current in the main circuit is out of control	Check and repair main circuit and drive board
		Input voltage is too low	Check the power supply
		Fan is broken	Change the fan
17	Tig electrode melts when welding	Tig torch is connected to the positive terminal	Connect the tig torch to negative terminal

CHAPTER 5

MULTIFUNCTION SERIES EQUIPMENT



1.1 Brief Introduction

O241, O251 welding machines adopts the latest pulse width modulation (PWM) technology and insulated gate bipolar transistor (IGBT) power module, which can change work frequency to medium frequency so as to replace the traditional hulking ork frequency transformer with the cabinet medium frequency transformer. Thus, its characterized with portable, small size, light weight, low consumption and etc.

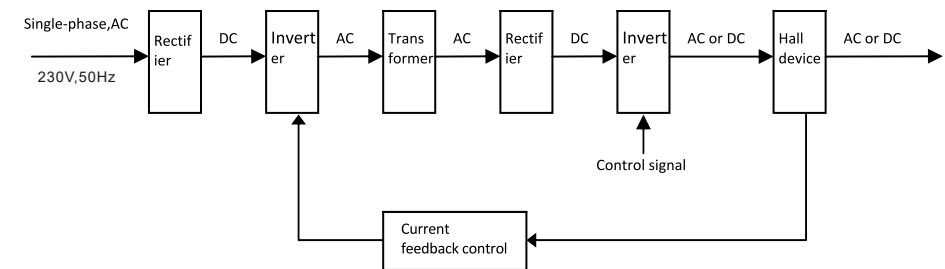
The parameters of on the front panel all can be adjusted continuously and steplessly, such as start current, crater arc current, welding current, base current, duty ratio, upslope time, downslope time, pre-gas, post-gas, pulse frequency, AC frequency, balance, hot start, arc force and length etc. When welding, it takes high frequency and high voltage for arc igniting to ensure the success ratio of igniting arc.

O241 O251 machines Characteristics::

- ◆MCU control system, responds immediately to any changes.
- ◆High frequency and high voltage for arc igniting to ensure the success ratio of igniting arc, the reverse polarity ignition ensures good ignition behavior in TIG-AC welding.
- ◆Avoid AC arc-break with special means, even if arc-break occurs the HF will keep the arc stable.
- ◆Pedal control the welding current.
- ◆In DC TIG without HFoperation, If the tungsten electrode touches the workpiece when welding, the current will drop to short-circuit current to protect tungsten.
- ◆Intelligent protection: over-current, over-heat, when the mentioned problems occurred, the alarm lamp on the front panel will be on and the output current will be cut off. It can self-protect and prolong the using life.
- ◆Double purposes: AC inverter TIG and DC inverter TIG/MMA, Excellent performance on AL-alloy, carbon steel, stainless steel, titanium.

1.2 Working Principle

The working principle of O241/O251 welding machines is shown as the following figure. Single-phase 230V AC is rectified into DC (about 312 V), then is converted to medium frequency AC (about 20-40KHz) by inverter device (IGBT module), after reducing voltage by medium transformer (the main transformer) and rectifying by medium frequency rectifier (fast recovery diodes), then is outputted DC or AC by selecting IGBT module. The circuit adopts current feedback control technology to insure current output stably. Meanwhile, the welding current parameter can be adjusted continuously and steplessly to meet with the requirements of welding craft.



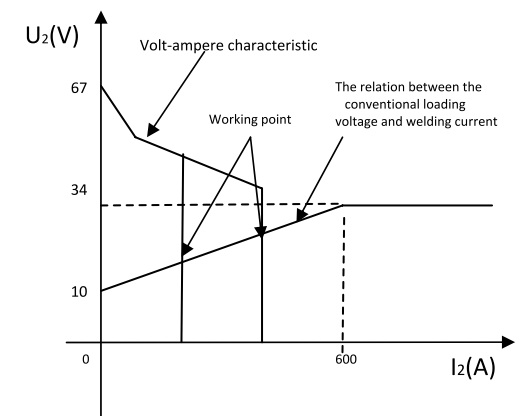
1.3 Volt-Ampere Characteristic

O241/O251 welding machine has an excellent volt-ampere characteristic, whose graph is shown as the following figure. The relation between the conventional rated loading voltage U_2 and the conventional welding current I_2 is as follows:

TIG
 When $I_2 \leq 600A$, $U_2 = 10 + 0.04I_2 (V)$;
 When $I_2 > 600A$, $U_2 = 34 (V)$.

MMA
 When $I_2 \leq 600A$, $U_2 = 20 + 0.04I_2 (V)$;
 When $I_2 > 600A$, $U_2 = 44 (V)$.

CUT
 When $I_2 \leq 600A$, $U_2 = 80 + 0.4I_2 (V)$;



1.4 Specifications O241/O251

Description	O241	O251
Weight	20.9 kg	31 kg
Power Source Dimensions	H395mmxW180mmxD370mm	H540mmxW270mmxD450mm
Cooling	Fan Cooled	Fan Cooled
Welder Type	Inverter Power Source	Inverter Power Source
European Standards	EN 60974-1 / IEC 60974-1	EN 60974-1 / IEC 60974-1
Number of Phases	1	1
Nominal Supply Voltage	230V +/- 15%	230V +/- 15%
Nominal Supply Frequency	50/60Hz	50/60Hz
Welding Current Range (DC STICK Mode)	10 - 170A	10 - 200A
Welding Current Range (DC TIG Mode)	10 - 170A	10 - 200A
Welding Current Range (CUT Mode)	15 - 40A	20 - 40A
Effective Input Current	26.2A	29.5A
Maximum Input Current	33.9A	41.7A
Single Phase Generator Requirement	11.7kVA	14.4KVA
STICK (MMA) Welding Output, 40°C, 10 min.	170A @ 60%, 26.8V 132A @ 100%, 25.3V	200A @ 50%, 28V 141A @ 100%, 25.6V
TIG (GTAW) Welding Output, 40°C, 10 min.	170A @ 60%, 16.8V 124A @ 100%, 15V	200A @ 50%, 18V 141A @ 100%, 15.6V
CUT Welding Output, 40°C, 10 min.	40A @ 60%, 96V 31A @ 100%, 92.4V	40A @ 60%, 96V 31A @ 100%, 92.4V
Open circuit voltage (MMA/TIG)	66V DC	66V DC
Open circuit voltage (CUT)	236V DC	270V DC
Protection Class	IP23	IP23

NOTE

Note 1: The Effective Input Current should be used for the determination of cable size & supply requirements.

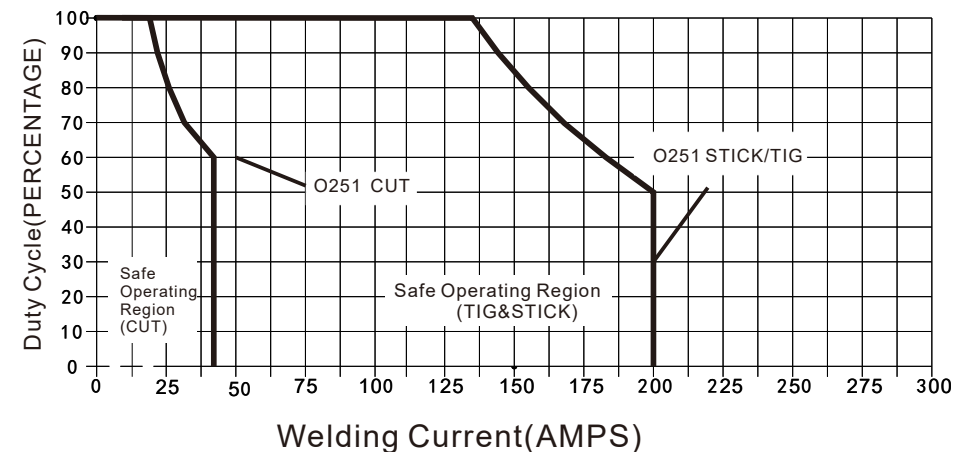
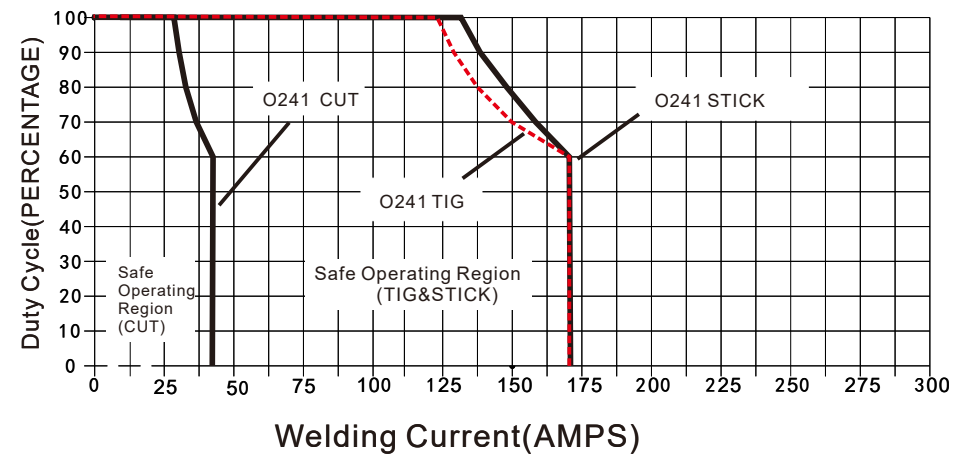
Note 2: Generator Requirements at the Maximum Output Duty Cycle.

Note 3: Motor start fuses or thermal circuit breakers are recommended for this application. Check local requirements for your situation in this regard.

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

1.5 Duty Cycle

The rated duty cycle of a Welding Power Source, is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 50% duty cycle, 200 amperes at 28 volts. This means that it has been designed and built to provide the rated amperage (200A) for 5 minutes, i.e. arc welding time, out of every 10 minute period (50% of 10 minutes is 5 minutes). During the other 5 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool. The thermal cut out will operate if the duty cycle is exceeded.



1.6 Packaged Items

O241/O251

- ◆ 3M Power cable
- ◆ 200 Amp Electrode Holder With 3M cable
- ◆ 200 Amp earth Clamp With 3M cable
- ◆ 4M TIG Torch WP26
- ◆ Plasma Torch 4.5m AG60
- ◆ Air Regulator
- ◆ 3.5M Gas Hose
- ◆ Operating Manual

2.1 Layout For The Panel O241



1. Digital Ammeter / Parameter meter

The digital Ammeter is used to display the actual output current of the power source. It is also used to display Parameters in Programming Mode. Depending on the Programming Parameter selected, the status indicator adjacent to the Ammeter will illuminate to show the units of the programming parameter. When welding, the Ammeter will display actual welding current.

2. Current Indicator

When setting programm in the peak current, base current, ending current and rem , this current indicator will be on.

3. Percentage Indicator (%)

Percentage indicator, when setting programm in pulse duty cycle , this indicator will be on .

4. Power ON Indicator

The POWER ON indicator illuminates when the ON/OFF switch is in the ON position and the correct mains voltage is present.

5. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

6. Time Indicator (s)

Time indicator , when setting programm in gas pre-flow, up slope, down slope and gas post-flow, this indicator will be on.

7. Frequency Indicator (Hz)

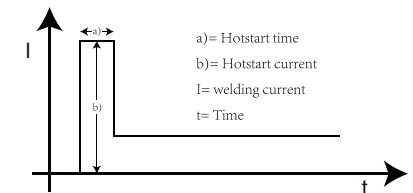
Frequency indicator, when the setting programm in pulse frequency ,this indicator will be on.

8. Programming Parameter Indicators

These indicator lights will illuminate when programming.

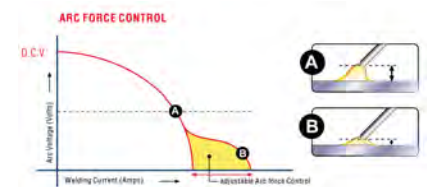
9. Hot Start

Hot Start Function reliably ignites the electrode and melts perfectly to ensure the best quality even at the start of the seam. this solution makes lack of fusion and cold welds a thing of the past and significantly reduces weld reinforcement. Adjust the hot start current here and the time here.

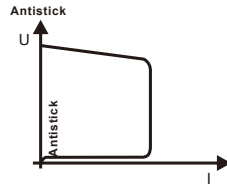


Arcforce Correction

During the welding process, arcforce prevents the electrode sticking in the weld pool with increases in current. this makes it easier to weld large-drop melting electrode types at low current strengths with a short arc in particular.



Anti-stick prevents the electrode from annealing.
If the electrode sticks in spite of the arc force device, the machine automatically switches over to the minimum current within about 1 second to prevent the electrode from overheating. In order to easily separate the electrode and electrode holder to protect the welder.



10. JOB

You can press JOB to select the memory records that you have saved before from 1-9.

11. SAVE

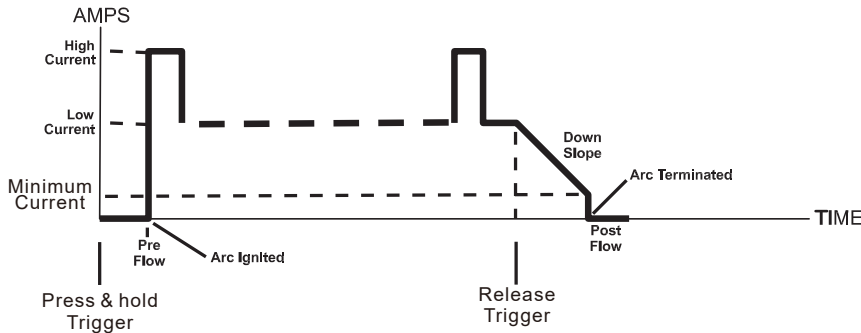
Store welding function and parameters, can store 1-9 groups.

12. Trigger Mode Control Button (HF TIG and LIFT TIG Mode only)

The trigger mode control is used to switch the functionality of the torch trigger between 2T and 4T.

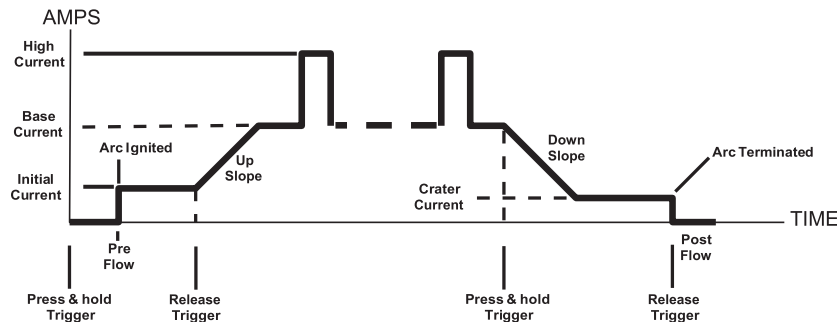
2T Normal Mode In this mode, the torch trigger must remain pressed for the welding output to be active.

Press and hold the torch trigger to activate the power source (weld). Release the torch trigger switch to cease welding.



4T Latch mode this mode of welding is mainly used for long welding runs to reduce operator fatigue. In this mode the operator can press and release the torch trigger and the output will remain active. To deactivate the power source, the trigger switch must again be pressed and released, thus eliminating the need for the operator to hold the torch trigger.

Note: that when operating in GTAW (HF and LIFT TIG modes), the power source will remain activated until the selected down slope time has elapsed



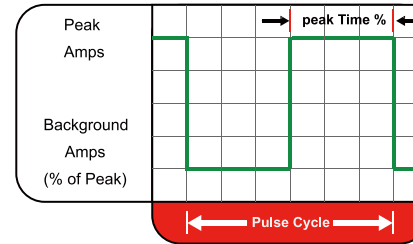
13. Process Selection Button

The process selection control is used to select the desired welding mode. Three modes are available, MMA (Stick), GTAW (TIG) and CUT modes.

14. Pulse Button

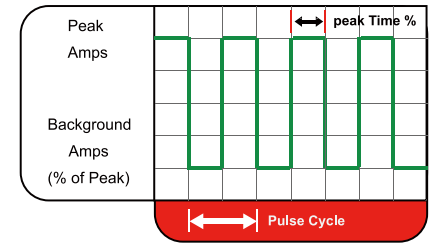
Press the PULSE button to toggle Pulse On and OFF.

CONVENTIONAL PULSED TIG



Typically from 1 to 10 PPS. Provides a heating and cooling effect on the weld puddle and can reduce distortion by lowering the average amperage. This heating and cooling effect also produces a distinct ripple pattern in the weld bead. The relationship between pulse frequency and travel speed determines the distance between the ripples. Slow pulsing can also be coordinated with filler metal addition and increase overall control of the weld puddle

HIGH SPEED PULSED TIG



In excess of 40 PPS, Pulsed TIG becomes more audible than visible-causing increased puddle agitation for a better as-welded microstructure.

Pulsing the weld current at high speeds-between a high Peak and a low Background amperage-can also constrict and focus the arc. This results in maximum arc stability, increased penetration and increased travel speeds (Common Range: 100-500 PPS).

The Arc-Sharpener effects of high speed pulsing are expanded to new dimensions. The ability to pulse at 5,000PPS further enhances arc stability and concentration potential-which is extremely beneficial to automation where maximum travel speeds are required.

15. Negative Control

The negative control is used to minus setting parameter for selected function from 8.

16. Positive Control

The positive control is used to plus setting parameter for selected function from 8.

17. Selecting Function Button

This button can select different programming parameter from No. 8

18. Positive Welding Terminal

Positive Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

19. Negative Welding Terminal

Negative Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

20. 5 Pin Control Socket

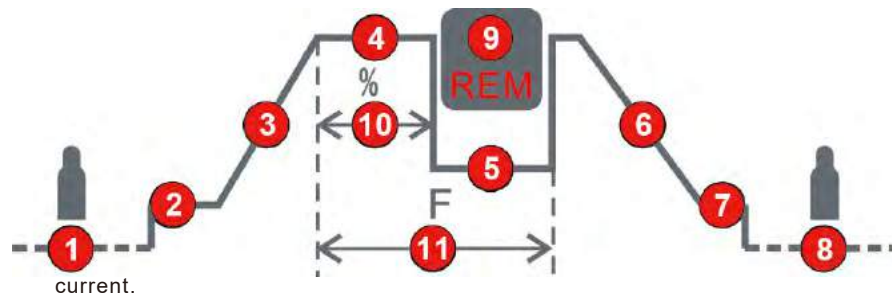
The 5 pin receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry:
To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

21. Shielding Gas Outlet

The Shielding Gas Outlet located on the front panel is a fast connection of a suitable TIG Torch.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

2.2 Control Panel**1. Gas Pre-Flow**

Absolute setting range 0.1s to 5s (0.1S increments)

This parameter operates in TIG modes only and is used to provide gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.

2. Initial Current

The main current Setting range 10AMP to 170AMP

This parameter operates in (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.

Note: The maximum initial current available will be limited to the set value of the base

3. Up Slope

Setting ranges :0.1S-10S (0.1S increments)

This parameter operates in (2T and 4T) TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from Initial Current to High or base current.

4. Peak Current

Setting ranges

O241:10AMP to 170AMP (DC TIG mode), 10 to 170A (AC HF TIG mode)

This parameter sets the TIG WELD current. This parameter also sets the STICK weld current.

5. Base Current

Setting ranges

O241:10AMP to 170AMP (DC TIG mode), 10AMP to 170AMP (AC HF TIG mode)

Secondary current (TIG)/pulse pause current.

6. Down Slope

Setting ranges 0.1-10s

This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed to end current. This control is used to eliminate the crater that can form at the completion of a weld.

7. End current

Setting ranges 10A-170A

This parameter operates in (4T) TIG modes only and is used to set the finish current for TIG. The end Current remains ON until the torch trigger switch is released after it has been depressed.

Note: The maximum crater current available will be limited to the set value of the base current.

8. Post Flow

Setting ranges 1-10S

This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.

9. Remote Control

The system independently identifies the remote control, and when the indicator light is on, the welding current can be adjusted by remote (foot or welding gun).

10. Pulse Width

Setting ranges 10%-90%

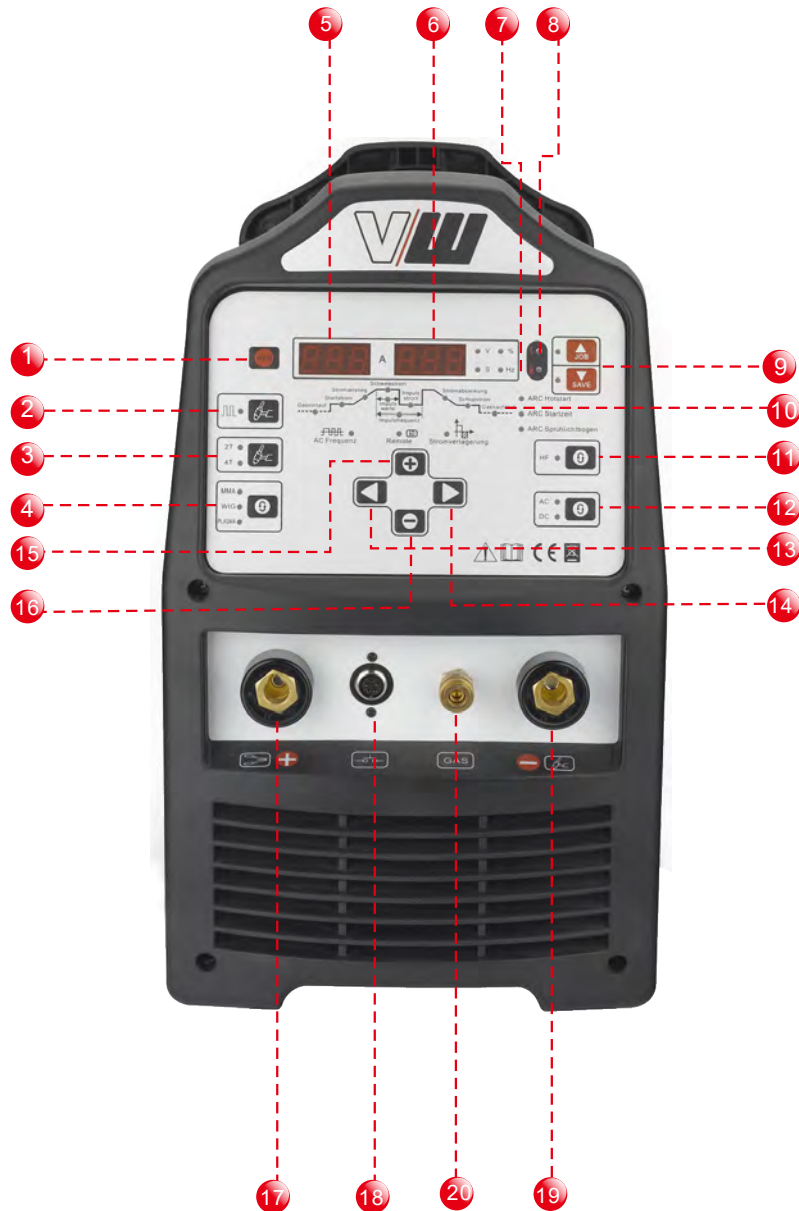
This parameter sets the percentage on time of the PULSE FREQUENCY for High weld current when the PULSE is ON.

11. Pulse Frequency

Setting ranges 1HZ -200HZ

This parameter sets the PULSE FREQUENCY when the PULSE is ON.

2.3 Layout For The Panel O251



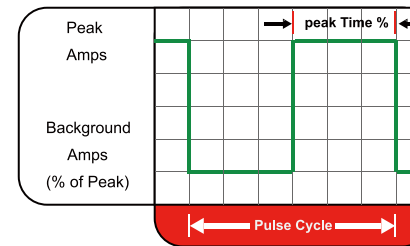
1. RESET button

When software has problem please trigger RESET button.

2. Pulse Button

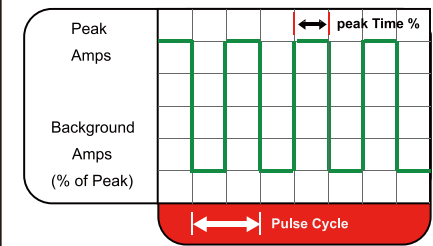
Press the PULSE button to toggle Pulse On and OFF.

CONVENTIONAL PULSED TIG



Typically from 1 to 10 PPS. Provides a heating and cooling effect on the weld puddle and can reduce distortion by lowering the average amperage. This heating and cooling effect also produces a distinct ripple pattern in the weld bead. The relationship between pulse frequency and travel speed determines the distance between the ripples. Slow pulsing can also be coordinated with filler metal addition and increase overall control of the weld puddle

HIGH SPEED PULSED TIG



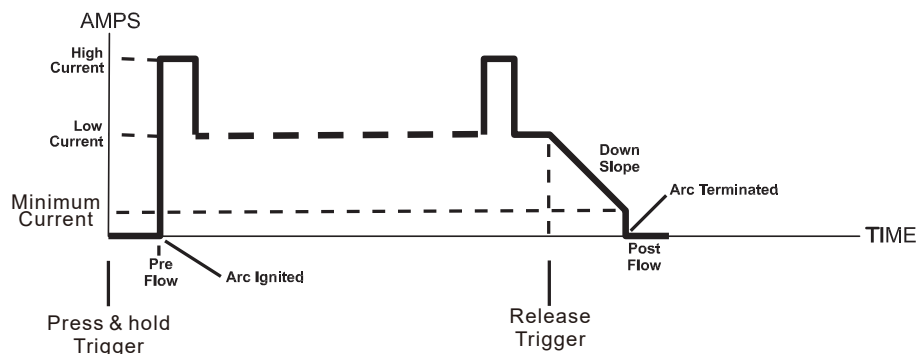
In excess of 40 PPS, Pulsed TIG becomes more audible than visible-causing increased puddle agitation for a better as-welded microstructure. Pulsing the weld current at high speeds-between a high Peak and a low Background amperage-can also constrict and focus the arc. This results in maximum arc stability, increased penetration and increased travel speeds(Common Range: 100-500 PPS). The Arc-Sharpening effects of high speed pulsing are expanded to new dimensions. The ability to pulse at 5,000PPS further enhances arc stability and concentration potential-which is extremely beneficial to automation where maximum travel speeds are required.

3. Trigger Mode Control Button (HF TIG and LIFT TIG Mode only)

The trigger mode control is used to switch the functionality of the torch trigger between 2T and 4T.

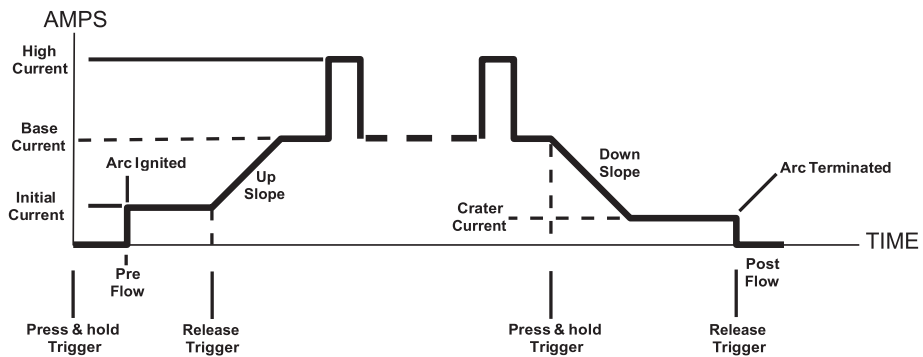
2T Normal Mode In this mode, the torch trigger must remain pressed for thewelding output to be active.

Press and hold the torch trigger to activate the power source (weld). Release the torch trigger switch to cease welding.



4T Latch mode this mode of welding is mainly used for long welding runs to reduce operator fatigue. In this mode the operator can press and release the torch trigger and the output will remain active. To deactivate the power source, the trigger switch must again be pressed and released, thus eliminating the need for the operator to hold the torch trigger.

Note: that when operating in GTAW (HF and LIFT TIG modes), the power source will remain activated until the selected down slope time has elapsed



4. Process Selection Button

The process selection control is used to select the desired welding mode. Three modes are available, GTAW (TIG), MMA (Stick) and CUT modes.

5. Digital Ammeter

The digital amperage meter is used to display both the pre-set current and actual output current of the power source.

At times of non-welding, the amperage meter will display a pre-set (preview) amperage value. This value can be adjusted by varying the multifunction control when the Programming Parameter Indicator light shows BASE CURRENT.

6. Digital Voltmeter / Parameter Meter

The digital volt meter is used to display the actual output voltage of the power source. It is also used to display Parameters in Programming Mode. Depending on the Programming Parameter selected, the status indicator adjacent to the volt meter will illuminate to show the units of the programming parameter. When welding, the volt meter will display actual welding voltage.

7. Power ON Indicator

The POWER ON indicator illuminates when the ON/OFF switch is in the ON position and the correct mains voltage is present.

8. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

9. JOB and SAVE

You can press JOB to select the memory records that you have saved before from 1-9. For the new setting of present base current Amps ,just press SAVE.

10. Programming Parameter Indicators

These indicator lights will illuminate when programming.

11. HF Button

Press and hold the HF button to purge the gas line in LIFT TIG and HF TIG modes. To HF the shielding gas line in LIFT TIG and HF TIG modes press the HF button and release.

12. Mode Button

Press the MODE button to toggle AC and DC output in LIFT TIG, HF TIG and STICK.

13. Forward Programming Button

Pressing this button will advance to the next step in the programming sequence.

14. Back Programming Button

Pressing this button will go back to the previous step in the programming sequence.

15. Positive Control

The positive control is used to plus setting parameter for selected function from 10.

16. Negative Control

The negative control is used to minus setting parameter for selected function from 10.

17. Positive Welding Terminal

Positive Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

18. 5 Pin Control Socket

The 5 pin receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry:

To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

19. Negative Welding Terminal

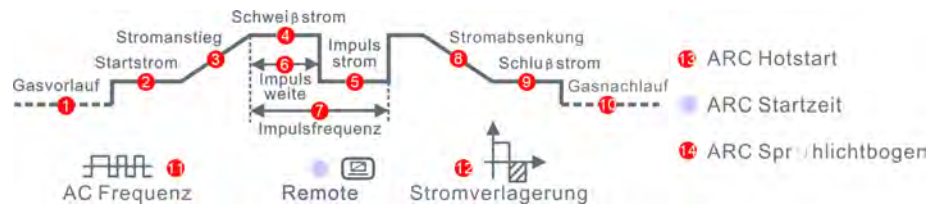
Negative Welding Terminal. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

20. Shielding Gas Outlet

The Shielding Gas Outlet located on the front panel is a fast connection of a suitable TIG Torch.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

2.4 Control Panel**1. Gas Pre-Flow**

Absolute setting range 0.1s to 20s (0.1S increments)

This parameter operates in TIG modes only and is used to provide gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.

2. Initial Current

The main current Setting range 10AMP to 200AMP

This parameter operates in (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.

Note: The maximum initial current available will be limited to the set value of the base current.

3. Up Slope

Setting ranges :0.1S-10S (0.1S increments)

This parameter operates in (2T and 4T) TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from Initial Current to High or base current.

4. Peak Current

Setting ranges

O251:10AMP to 200AMP (DC TIG and AC HF TIG), 10-200A (Stick mode)

This parameter sets the TIG WELD current. This parameter also sets the STICK weld current.

5. Base Current

Setting ranges

O251:10AMP to 200AMP (DC TIG mode), 10AMP to 200AMP (AC HF TIG mode)
Secondary current (TIG)/pulse pause current.

6. Pulse Width

Setting ranges 10%-90%

This parameter sets the percentage on time of the PULSE FREQUENCY for High weld current when the PULSE is ON.

7. Pulse Frequency

Setting ranges 1HZ -200HZ

This parameter sets the PULSE FREQUENCY when the PULSE is ON.

8. Down Slope

Setting ranges 0.1-10s

This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed to end current. This control is used to eliminate the crater that can form at the completion of a weld.

9. End current

Setting ranges 10A-200A

This parameter operates in (4T) TIG modes only and is used to set the finish current for TIG. The end current remains ON until the torch trigger switch is released after it has been depressed.

Note: The maximum crater current available will be limited to the set value of the base current.

10. Post Flow

Setting ranges 1-20S

This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.

11. AC Frequency

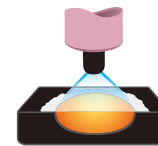
Setting ranges 50HZ-200HZ

This parameter operates in AC TIG mode only and is used to set the frequency for the AC weld current.

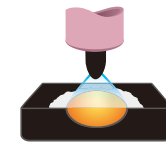
AC Frequency control

Controls the width of the arc cone. Increasing the AC frequency provides a more focused arc with increased directional control.

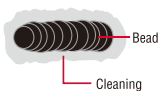
Note: Decreasing the AC Frequency softens the arc and broadens the weld puddle for a wider weld bead.



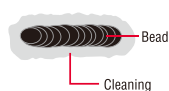
Wider bead, good penetration
ideal for buildup work



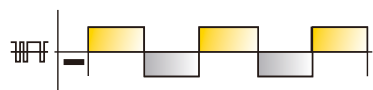
Narrower bead for fillet welds and
automated applications



Wider bead and cleaning acting



Narrower bead and cleaning acting



12. Wave Balance

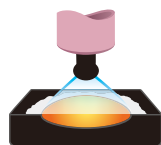
Setting arranges 10%-50%

This parameter operates in AC TIG mode and is used to set the penetration to cleaning action ratio for the AC weld current. Generally WAVE BALANCE is set to 50% for AC STICK welding. The WAVE BALANCE control changes the ratio of penetration to cleaning action of the AC TIG welding arc. Maximum weld penetration is achieved when the WAVE BALANCE control is set to 10%. Maximum cleaning of heavily oxidised aluminium or magnesium alloys is achieved when the WAVE BALANCE control is set to 50%

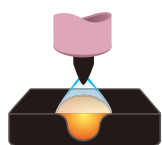
AC Balance Control

Controls arc cleaning action. Adjusting the % EN of the AC wave controls the width of the etching zone surrounding the weld.

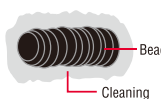
Note: Set the AC Balance control for adequate arc cleaning action at the sides and in front of the weld puddle. AC Balance should be fine tuned according to how heavy or thick the oxides are.



Wider bead, good penetration ideal for buildup work



Narrower Bead, Good Penetration Ideal For Buildup Work



Wider bead and cleaning action

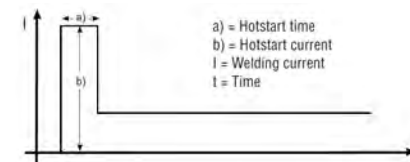


Narrower bead, with no visible cleaning



13. Hot Start

Hot Start Function reliably ignites the electrode and melts perfectly to ensure the best quality even at the start of the seam. this solution makes lack of fusion and cold welds a thing of the past and significantly reduces weld reinforcement. Adjust the hot start current here and the time here.

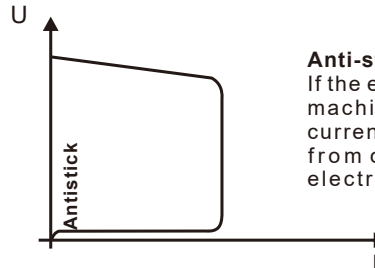


14. Arcforce Correction

During the welding process, arcforce prevents the electrode sticking in the weld pool with increases in current. this makes it easier to weld large-drop melting electrode types at low current strengths with a short arc in particular.



Antistick



Anti-stick prevents the electrode from annealing. If the electrode sticks in spite of the arcforce device, the machine automatically switches over to the minimum current within about 1 second to prevent the electrode from overheating. In order to easily separate the electrode and electrode holder to protect the welder.

2.5 Setup For STICK (MMA) Welding O241

For Alkaline Electrode, connect the electrode holder to the positive welding terminal and connect the work lead to the negative welding terminal, while for the Acid Electrode, please connect the electrode holder to the negative welding terminal and connect the work lead to the positive welding terminal. If in doubt consult the electrode manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection. Select STICK mode with the process selection control.



WARNING

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the mains power supply is switched off.



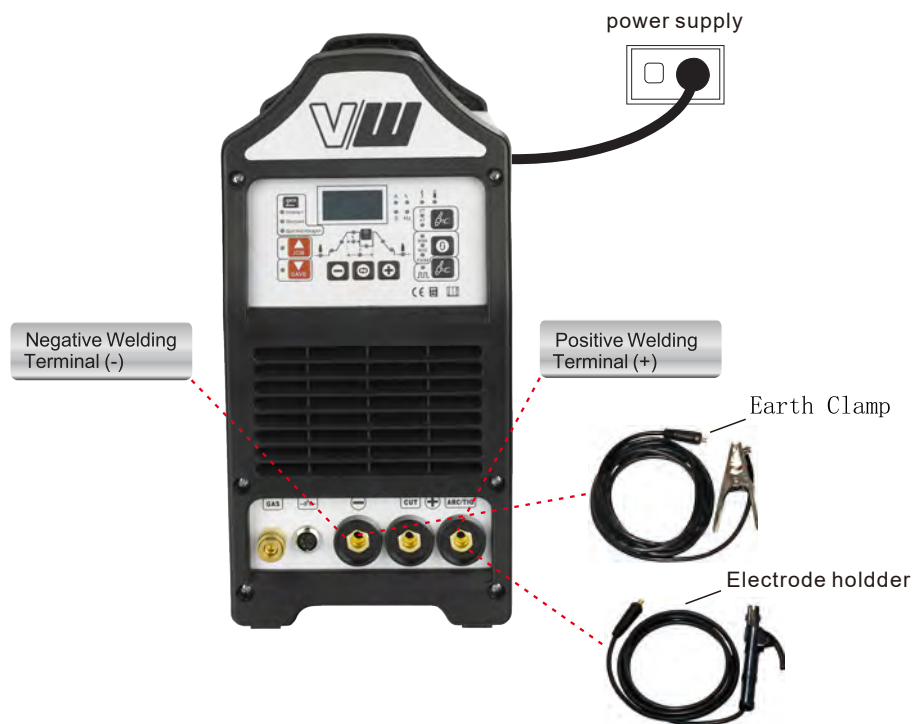
CAUTION

Remove any packaging material prior to use. Do not block the air vents at the front or rear of the Welding Power Source.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.



2.6 Set-up For LIFT TIG (GTAW) Welding O241



WARNING

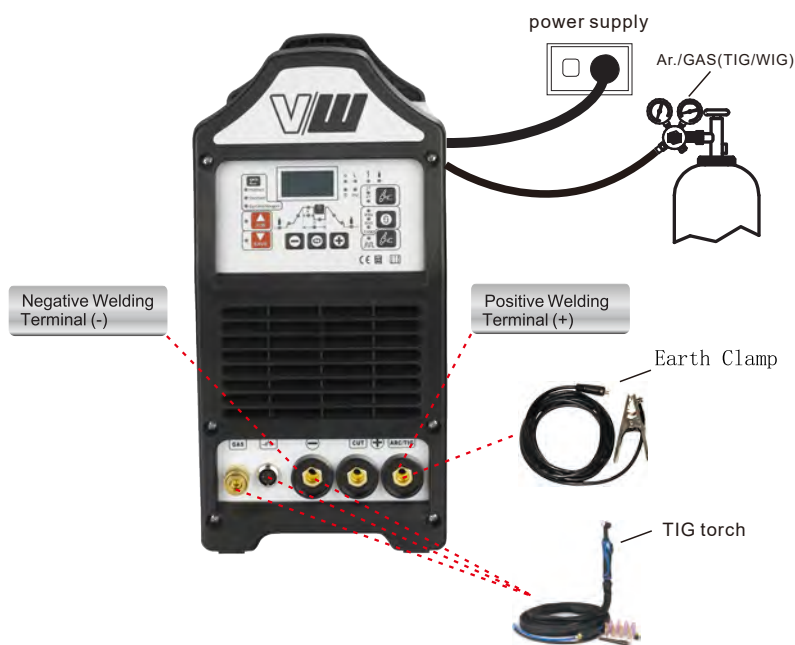
Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

NOTE

The following set up is known as Straight Polarity or DC electrode positive. This is commonly used for DC LIFT TIG welding on most materials such as steel and stainless steel.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Connect the work lead cable to the positive output terminal, and the LIFT TIG Torch cable to the negative output terminal.
3. Connect the gas line/hose to the proper shielding gas source.
4. Slowly open the Argon Cylinder Valve to the fully open position.
5. Connect the work lead clamp to your work piece.

6. The tungsten must be ground to a blunt point (similar to a pencil) in order to achieve optimum welding results. See illustration. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning. Grind at a 30 degree angle and never to a sharp point.
7. Install the tungsten with approximately 1.6mm to 3.2mm sticking out from the gas cup, ensuring you have correct sized collet.
8. Tighten the back cap.
9. Turn the switch to the "ON" position. The power L.E.D. light should illuminate.
10. Set the welding process to LIFT TIG.
11. Set the Weld Current Control Knob to the desired amperage.
12. You are now ready to begin LIFT TIG Welding.



2.7 Setup For Cutting (CUT) O241

In order for the unit to function correctly, it must be installed properly. Follow the procedure given below for correct installation:

1. Read the safety rules given in this manual carefully.
2. Check on receiving the unit that there are no defective parts or parts damaged during transportation.

3. Attach air regulator as show in picture Air Regulator Installation only for O241.
4. Set your unit up in an area which is adequately ventilated and make sure that the air vents are not obstructed.
5. Connect the power supply cable to a socket located as near as possible to the work area, so that the unit can be switched off quickly in case of emergency.
6. Your machine has a 16 amp plug fitted, before use check that the green/yellow earth is connected to the earth pin socket of fitted plug.
7. Make sure that the mains supply switch and any fuses have a value which $\pm 15\%$ the maximum current absorbed by the unit. All fuses should be the slow-blow type.
8. Any extensions of power supply cable should have the same cross-section as the power supply cable. The extension leads, however, should only be used when absolutely necessary. It is important to note that any extension of mains cables or torch cables will possibly affect the cutting performance of this cutting equipment, due to the fact that the resistance of the cable will reduce voltage input, which is determined by the length of the cable. The supplied length of main cables and torch cables is recommended.
9. Fasten the earth clamp to the piece to be cut, If the surface of the piece to be cut is painted, rusty or covered with insulating material, clean the surface so that satisfactory contact between the piece and the earth clamp can be obtained.
10. Make sure that the torch has been assembled with the correct components and that the cutting tip is suitable for the cutting current.
11. Connect air to regulator and adjust regulator to deliver 5-6 bar 90ltr/min
12. Switch the unit on using the main switch located on the back side.
13. Contact the copper tip of the torch to the work piece, press the button of the torch until the arc-starting and raise the cutting torch about 1mm above the work piece, and perform the cutting operation.
14. Once cutting is over, release the torch button to put out the arc. A period of post-flow time 45 to 75 seconds (required for torch cooling) will follow. Do not disconnect air until this cooling period has been completed. Failure to do this will result in torch head damage.

**CAUTION**

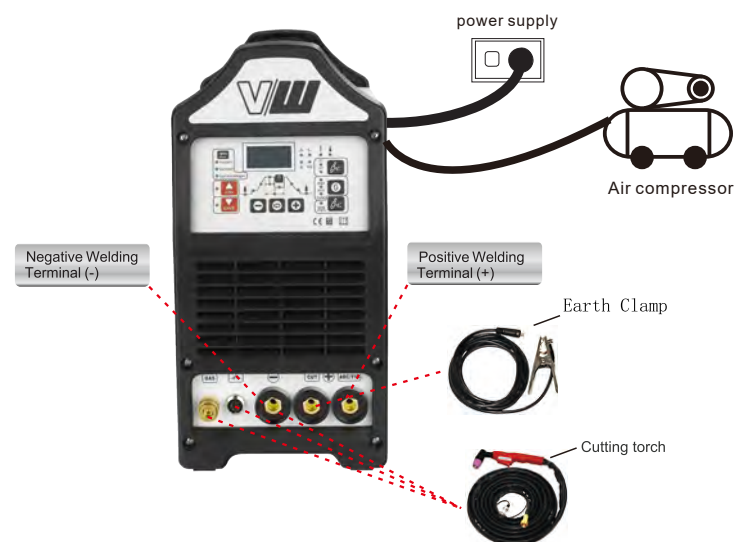
Do not point the torch jet at foreign bodies.

**CAUTION**

Avoid unnecessary lighting of the pilot arc to prevent excessive consumption of the electrode and nozzle.

**CAUTION**

During cutting the speed of the torch movement should be in accordance with the thickness of the piece to be cut. Excessive speed causes a return of incandescent towards the torch which shortens the life of the parts of the torch most subject to wear and tear. The metal fouling on the nozzle should be removed as soon as possible.

**2.8 Setup For STICK (MMA) Welding O251**

For Alkaline Electrode, connect the electrode holder to the positive welding terminal and connect the work lead to the negative welding terminal, while for the Acid Electrode, please connect the electrode holder to the negative welding terminal and connect the work lead to the positive welding terminal. If in doubt consult the electrode manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection. Select STICK mode with the process selection control.

**WARNING**

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the mains power supply is switched off.

**CAUTION**

Remove any packaging material prior to use. Do not block the air vents at the front or rear of the Welding Power Source.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.



2.9 Set-up For LIFT TIG (GTAW) Welding O251

**WARNING**

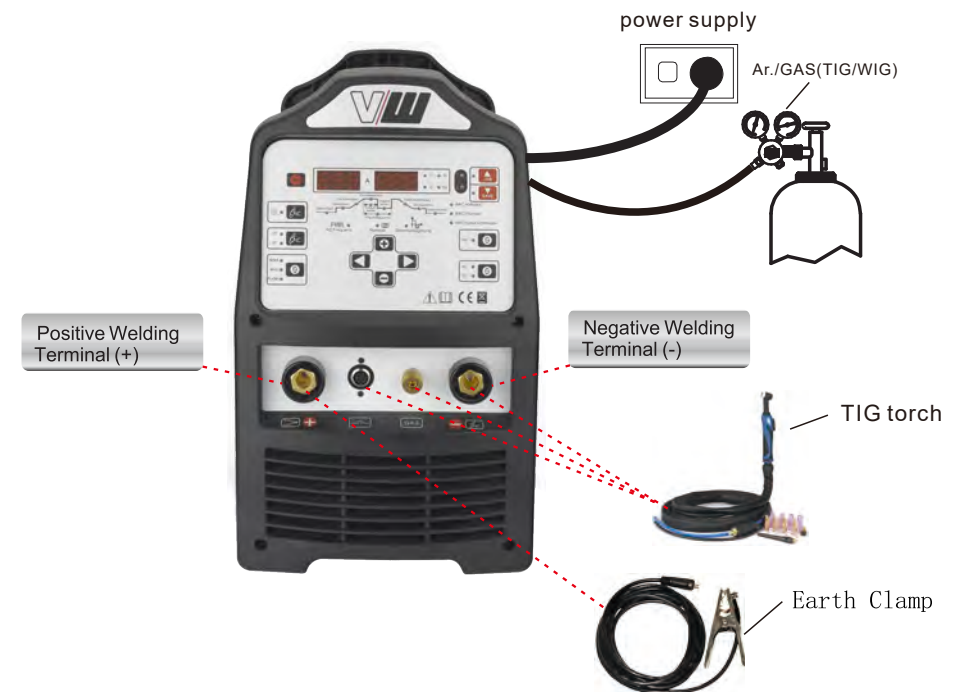
Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

NOTE

The following set up is known as straight polarity or DC electrode positive. This is commonly used for DC LIFT TIG welding on most materials such as steel and stainless steel.

1. Switch the ON/OFF switch (located on the rear panel) to OFF.
2. Connect the work lead cable to the positive output terminal, and the LIFT TIG torch cable to the negative output terminal.
3. Connect the gas line/hose to the proper shielding gas source.
4. Slowly open the Argon cylinder valve to the fully open position.

5. Connect the work lead clamp to your work piece.
6. The tungsten must be ground to a blunt point (similar to a pencil) in order to achieve optimum welding results. See illustration. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning. Grind at a 30 degree angle and never to a sharp point.
7. Install the tungsten with approximately 1.6mm to 3.2mm sticking out from the gas cup, ensuring you have correct sized collet.
8. Tighten the back cap.
9. Turn the switch to the "ON" position. The power L.E.D. light should illuminate.
10. Set the welding process to LIFT TIG.
11. Set the Weld Current Control Knob to the desired amperage.
12. You are now ready to begin LIFT TIG Welding.



2.10 Setup For Cutting (CUT) O251

In order for the unit to function correctly, it must be installed properly. Follow the procedure given below for correct installation:

1. Read the safety rules given in this manual carefully.
2. Check on receiving the unit that there are no defective parts or parts damaged during transportation.
3. Attach air regulator as show in picture Air Regulator Installation only for O251.

4. Set your unit up in an area which is adequately ventilated and make sure that the air vents are not obstructed.
5. Connect the power supply cable to a socket located as near as possible to the work area, so that the unit can be switched off quickly in case of emergency.
6. Your machine has a 16 amp plug fitted, before use check that the green/yellow earth is connected to the earth pin socket of fitted plug.
7. Make sure that the mains supply switch and any fuses have a value which $\pm 15\%$ the maximum current absorbed by the unit. All fuses should be the slow-blow type.
8. Any extensions of power supply cable should have the same cross-section as the power supply cable. The extension leads, however, should only be used when absolutely necessary. It is important to note that any extension of mains cables or torch cables will possibly affect the cutting performance of this cutting equipment, due to the fact that the resistance of the cable will reduce voltage input, which is determined by the length of the cable. The supplied length of main cables and torch cables is recommended.
9. Fasten the earth clamp to the piece to be cut, If the surface of the piece to be cut is painted, rusty or covered with insulating material, clean the surface so that satisfactory contact between the piece and the earth clamp can be obtained.
10. Make sure that the torch has been assembled with the correct components and that the cutting tip is suitable for the cutting current.
11. Connect air to regulator and adjust regulator to deliver 5-6 bar 90ltr/min
12. Switch the unit on using the main switch located on the back side.
13. Contact the copper tip of the torch to the work piece, press the button of the torch until the arc-starting and raise the cutting torch about 1mm above the work piece, and perform the cutting operation.
14. Once cutting is over, release the torch button to put out the arc. A period of post-flow time 45 to 75 seconds (required for torch cooling) will follow. Do not disconnect air until this cooling period has been completed. Failure to do this will result in torch head damage.

**CAUTION**

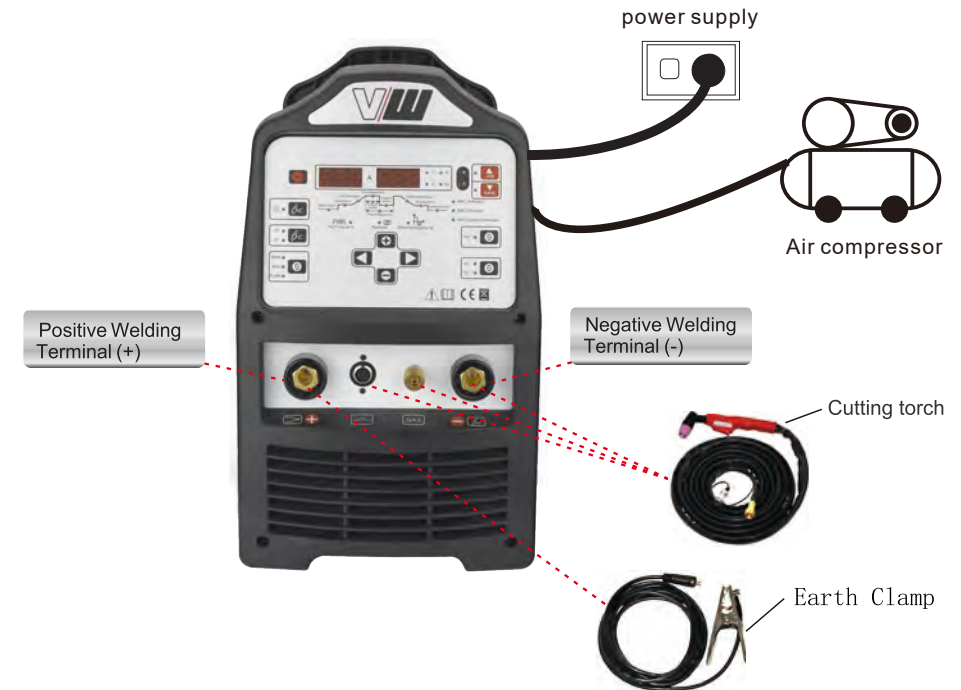
Do not point the torch jet at foreign bodies.

**CAUTION**

Avoid unnecessary lighting of the pilot arc to prevent excessive consumption of the electrode and nozzle.

**CAUTION**

During cutting the speed of the torch movement should be in accordance with the thickness of the piece to be cut. Excessive speed causes a return of incandescent towards the torch which shortens the life of the parts of the torch most subject to wear and tear. The metal fouling on the nozzle should be removed as soon as possible.

**2.11 Operation Environment**

- ◆ Height above sea level is below 1000m.
- ◆ Operation temperature range: $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$.
- ◆ Relative humidity is below 90% (20°C).
- ◆ Preferably site the machine some angles above the floor level, the maximum angle does not exceed 15° .
- ◆ The content of dust, acid, corrosive gas in the surrounding air or substance can not exceed normal standard.
- ◆ Take care that there is sufficient ventilation during welding. There is at least 30cm free distance between the machine and wall.

2.12 Operation Notices

- ◆ Read safety instruction and Chapter 1 carefully before attempting to use this equipment.
- ◆ Connect the ground wire the machine directly
- ◆ In case closing the power switch, no-load voltage may be exported. Do not touch the output electrode with any part of your body.
- ◆ Before operation, no concerned people should be left, Do not watch the arc in unprotected eyes.
- ◆ Ensure good ventilation of the machine to improve duty ratio.
- ◆ Turn off the engine when the operation finished to economize energy source.
- ◆ When power switch shuts off protectively because of failure. Don't restart it until until problem is resolved.
Otherwise, the range of problem will be extended.

3.1 Troubleshooting

- ◆ Before arc welding machines are dispatched from the factory, they have already been debugged accurately. So forbid anyone who is not authorized by us to do any change to the equipment!
- ◆ Maintenance course must be operated carefully. If any wire becomes flexible or is misplaced, it maybe potential danger to user!
- ◆ Only professional maintenance personal who is authorized by us could overhaul the machine!
- ◆ Guarantee to shut off the arc welding machine's power before turn on the outline of the equipment!
- ◆ If there is any problem and has no the authorized professional maintenance personal, please contact local agent or the branch company!
If there are some simple troubles of WSME-series welding machine, you can consult the following overhauling chart:

Nr.	Troubles	Reasons	Solution
1	Turn on the power source, power indicator is lit, fan is not working.	Fan is broken	Change fan
		There is something in the fan	Clean it
		The start capacitor of fan damaged	Change capacitor
2	Turn on the power source, fan is working, power indicator is not lit	The power light damaged or connection is not good	Change the power light
		The power board is broken	Change it
		Display panel is broken	Change it
3	Turn on the power source, power indicator is lit, fan is working, there is no welding output.	Control board is broken	Change it
		1 st inverter circuit damaged	Replace it
		2 nd feedback circuit is fault	Change it

Nr.	Troubles	Reasons	Solution
4	Turn on the power source, fan is not working, power indicator is not lit	The power cable connected not good	Connect correctly
		The power cable is broken	Repair or change it
		Power on switch is damaged	Change it
		The light of the power indicator is broken and the problems mentioned in Nr. 2	Change the light of the power indicator or refer to the solution in Nr. 2
5	The number of the display is not intact	The display panel is damaged	Change the display panel
		Digital tube is broken	Change it
6	No no-load voltage output (MMA)	If the overheat indicator is on	Wait a few minutes, the machine can be operated normal
		The main circuit is broken	Check and repair
		The machine is broken	Consult the dealer or the manufacturer
7	Arc can not be ignited (TIG) , there is spark on the HF igniting board	The welding cable is not connected with the two output if the welder	Connect the welding cable to the welder's output
		The welding cable is damaged	Repair or change it
		The earth cable connected unstably	Check the earth cable
		The welding cable is too long	Use an appropriate welding cable
		There is oil or dust on the workpiece	Check and remove it
		The distance between tungsten electrode and workpiece is too long	Reduce the distance (about 3mm ,less than 5mm)
		There is no Argon flow or the connection is poor	Check and reconnect
8	Arc can not be ignited (TIG) , there is no spark on the HF igniting board	Input voltage not stable	Check the power supply
		The HF igniting board does not work	Repair or change it
		The distance between discharger is too short or too long	Adjust the distance (about 0.8mm)
		The malfunction of the welding gun switch	Check the welding torch switch, control cable and aero socket.
9	Turn on the power source, everything is normal , but no HF igniting	No argon gas flow or the air tube connect not good	Check and reconnect
		Check if the function selected MMA	Change the function to TIG
		Check the HF funtion is selected	Select the HF funtion
		HF board is broken	Repair or change it
		Earth clamp connect not stable	Check the earth clamp
10	Gas always flows	No argon gas flow or the air tube connect not good	Check and reconnect
		Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it

Nr.	Troubles	Reasons	Solution
10	No gas flow (TIG)	Gas cylinder is close or gas pressure is low	Open or change the gas cylinder
		Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it
		Air tube is broken	Change it
		Pressure too high or air regulator is broken	Check gas
12	The welding current cannot be adjusted	Checking if the electrode stick to the work piece that the anti-stick function is on	Separate the electrode and work piece
		Control board is broken	Repair or change it
		Shut off the power when changing the torch	
13	No AC output while selecting "AC" for O251	The power board is broken	Repair or change it
		The AC drive board damaged	Change it
		The AC IGBT/IGBT module damaged	Change it
		Control board is broken	Repair or change it
14	The welding current displayed isn't accordant with the actual value	The min value displayed isn't accordant with the actual value	Adjust potentiometer Imin on the control board
		The max value displayed isn't accordant with the actual value	Adjust potentiometer Imax on the control board
15	The penetration of molten pool is not enough	The welding current is adjusted too low	Increase the welding current
		The arc is too long in the welding process	Adjust the distance from torch to work piece
		The power cable or the welding cable is too long	Use the suitable length from manufacturer
		AC Width adjustment is not correct	Change to suitable setting
16	Thermal overload indicator light is on	Over-heat protection ,too much welding current	Reduce the welding current
		Over-heat protection ,working too much time	Reduce the welding time
		Over-current protection, current in the main circuit is out of control	Check and repair main circuit and drive board
		Input voltage is too low	Check the power supply
		Fan is broken	Change the fan
17	Tig electrode melts when welding	Tig torch is connected to the positive terminal	Connect the tig torch to negative terminal
18	Arc flutters during Tig welding	Tungsten electrode is too big for the welding current	Select the correct size of tungsten electrode
		Check the earth clamp position on the work piece	Adjust the position of earth clamp
19	When Cut function is selected ,there is HF but cannot cutting	Check the welding circuit is correct, for example the earth clamp is connected to work piece	Connect the circuit correctly
		Air flow is not correctly connected	Check the air flows
		Machine is broken	Consult the dealer or the manufacturer

CHAPTER 6

MIG SERIES EQUIPMENT



1.1 Brief Introduction

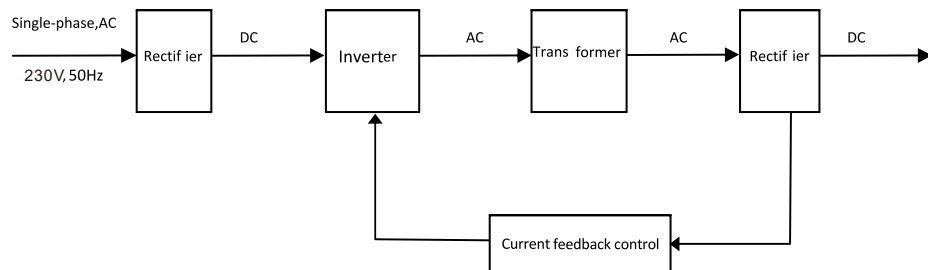
R221,R231,R251,R311 MIG welding machines adopts the latest pulse width modulation (PWM) technology and insulated gate bipolar transistor (IGBT) power module, which can change work frequency to medium frequency so as to replace the traditional hulking work frequency transformer with the cabinet medium frequency transformer. Thus, its characterized with portable, small size, light weight, low consumption and etc.

R221, R231, R251,R311 MIG machines Characteristics:

- ◆MCU control system, responds immediately to any changes.
- ◆High frequency and high voltage for arc igniting to ensure the success ratio of igniting arc.
- ◆Lift TIG operation, If the tungsten electrode touches the workpiece when welding, the current will drop to short-circuit current to protect tungsten.
- ◆Simple select material/wire diameter and the stored know-how controls the welding process automatically
- ◆Intelligent protection: over-current, over-heat, when the mentioned problems occurred, the alarm lamp on the front panel will be on and the output current will be cut off. It can self-protect and prolong the using life.

1.2 Working Principle

The working principle of R221/R231/R251/R311 welding machines is shown as the following figure. Single-phase 230V work frequency AC is rectified into DC (about 312 V), then is converted to medium frequency AC (about 20-40KHz) by inverter device (IGBT module), after reducing voltage by medium transformer (the main transformer) and rectifying by medium frequency rectifier (fast recovery diodes), then is outputted DC. The circuit adopts current feedback control technology to insure current output stably. Meanwhile, the welding current parameter can be adjusted continuously and steplessly to meet the requirements of welding craft.



1.3 Specifications R221

Description	R221
Dimensions	490X225X380mm
Weight	15.9kg
Cooling	Fan Cooled
Welder Type	Multi Process Inverter Power Source
European Standards	EN 60974-1 / IEC60974-1
Number of Phases	1
Nominal Supply Voltage	230VAC ± 15%
Nominal Supply Frequency	50/60Hz
Open Circuit Voltage	66V
Output Voltage Range	10-25 V
Wirefeeder Speed Range	2.5-18
Wire roll weight	5kg
Wire roll diameter	0.6/0.8/1.0
Protection Class	IP23
Insulation Class	F
Thickness of material	Up to 0.8mm
Efficiency	80%
Power Factor	0.73
Welding Current Range (MIG Mode)	25-200 A
Welding Current Range (STICK Mode)	30-170 A
Effective Input Current	22.6 A
Maximum Input Current	35.7 A
Single Phase Generator Requirement	12.3KVA
Duty cycle, 40°C, 10 min(MIG)	200A@ 40%24V 155A@ 100%20.3V
Duty cycle, 40°C, 10 min(MMA)	170A@ 40%26.8V 107A@ 100%24.2V
Gas Follow	3s

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

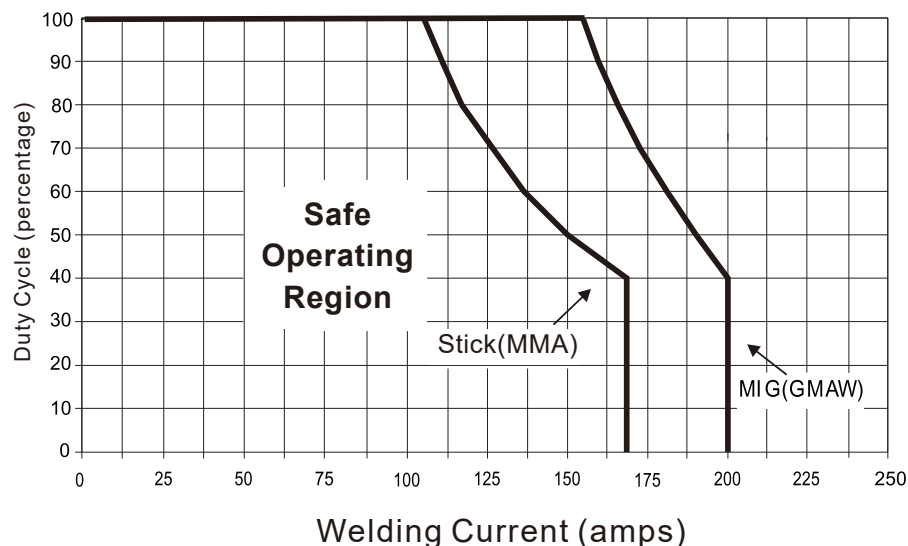
1.4 Packaged Items

R221

- ◆ 3M MB-15 MIG Gun – 16M2
- ◆ Contact tip•1.0mm Fitted•0.8mm Fitted
- ◆ 3M Gas Hose 8*13.5
- ◆ 200 A electrode holder with 3M cable.
- ◆ 200 A earth clamp with 3M cable
- ◆ 3M Power cable
- ◆ Drive Rolls
- ◆ Operating Manual

1.5 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 200 amperes at 24 volts. This means that it has been designed and built to provide the rated amperage (200A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



1.6 Specifications R231

Description	R231
Dimensions	490X225X380mm
Weight	16.2kg
Cooling	Fan Cooled
Welder Type	Multi Process Inverter Power Source
European Standards	EN 60974-1 / IEC60974-1
Number of Phases	1
Nominal Supply Voltage	230VAC \pm 15%
Nominal Supply Frequency	50/60Hz
Open Circuit Voltage	66 V
Output Voltage Range	10-25 V
Wirefeeder Speed Range	2.5-18
Wire roll weight	5kg
Wire roll diameter	0.6/0.8/1.0
Protection Class	IP23
Insulation Class	F
Thickness of material	Up to 0.8mm
Efficiency	80%
Power Factor	0.73
Welding Current Range (MIG Mode)	25-200 A
Welding Current Range (STICK Mode)	30-170 A
Welding Current Range (TIG Mode)	10-200A
Effective Input Current	22.6A
Maximum Input Current	35.7 A
Single Phase Generator Requirement	12.3KVA
Duty cycle, 40°C, 10 min(MIG)	200A@ 40%24V 126A@ 100%20.3V
Duty cycle, 40°C, 10 min(MMA)	170A@ 40%26.8V 107A@ 100%24.2V
Duty cycle, 40°C, 10 min(TIG)	200A@ 40%18V 126A@ 100%15V
Gas Follow	3s

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

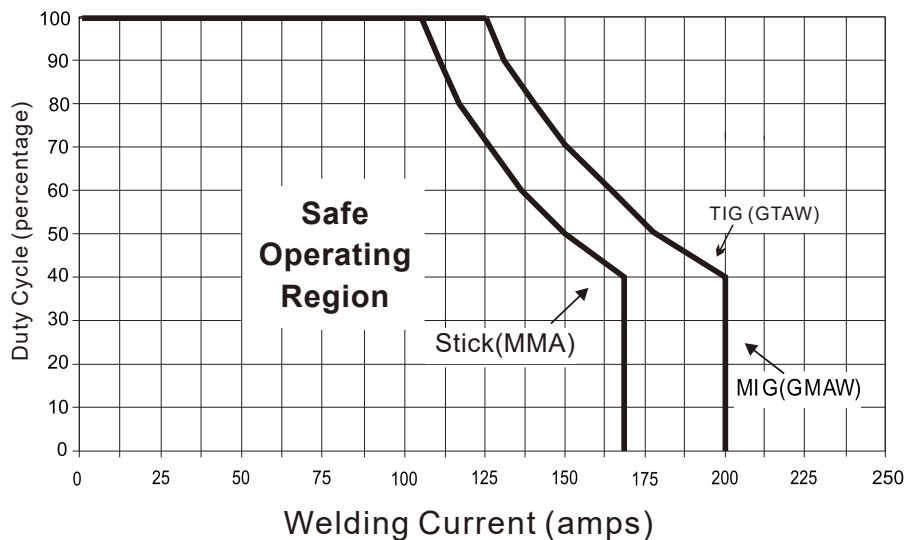
1.7 Packaged Items

R231

- ◆ 3M MB-15 MIG Gun – 16M2
- ◆ Contact tip•1.0mm Fitted0.8mm Fitted
- ◆ 4M Wp-26 Tig Torch
- ◆ 3M Gas Hose 8*13.5
- ◆ 200 A electrode holder with 3M cable.
- ◆ 200 A earth clamp with 3M cable
- ◆ 3M Power cable
- ◆ Drive Rolls:
- ◆ Operating Manual

1.8 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 200 amperes at 24 volts. This means that it has been designed and built to provide the rated amperage (200A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



1.9 Specifications R251/R311

Description	R251	R311
Dimensions	590x240x450mm	590x240x450mm
Weight	23.6kg	24.8kg
Cooling	Fan Cooled	Fan Cooled
Welder Type	Single Function	Single Function
European Standards	EN 60974-1 / IEC60974-1	EN 60974-1 / IEC60974-1
Number of Phases	3	3
Nominal Supply Voltage	400VAC ± 15%	400VAC ± 15%
Nominal Supply Frequency	50/60Hz	50/60Hz
Open Circuit Voltage	66 V	66 V
Output Voltage Range	13-30 V	13-30 V
Wirefeeder Speed Range	1.4-18	1.4-18
Wire roll weight	5-15kg	5-15kg
Wire roll diameter	0.8/1.0	0.8/1.0
Protection Class	IP23	IP23
Insulation Class	F	F
Thickness of material	Up to 0.8mm	Up to 0.8mm
Efficiency	85%	85%
Power Factor	0.93	0.93
Welding Current Range (MIG Mode)	30-250 A	30-300 A
Effective Input Current	9.3 A	8.7 A
Maximum Input Current	12.1 A	15.9 A
Single Phase Generator Requirement	12.6KVA	16.5KVA
Duty cycle, 40°C, 10 min.	250A@ 60%26.5V 193A@ 100%23.6V	300A@ 30%29V 232A@ 60%25.6V 164A@ 100%22.2V
Gas Follow	3s	5s

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

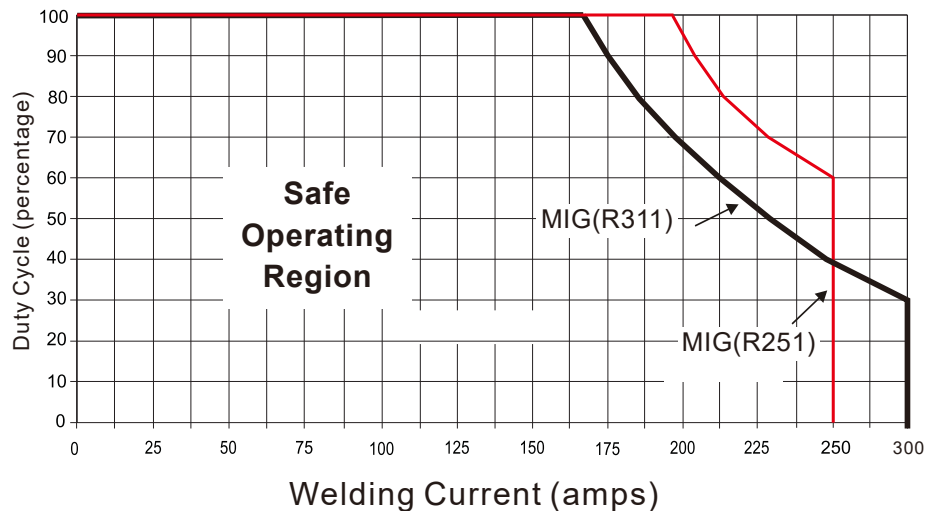
1.10 Packaged Items

R251/R311

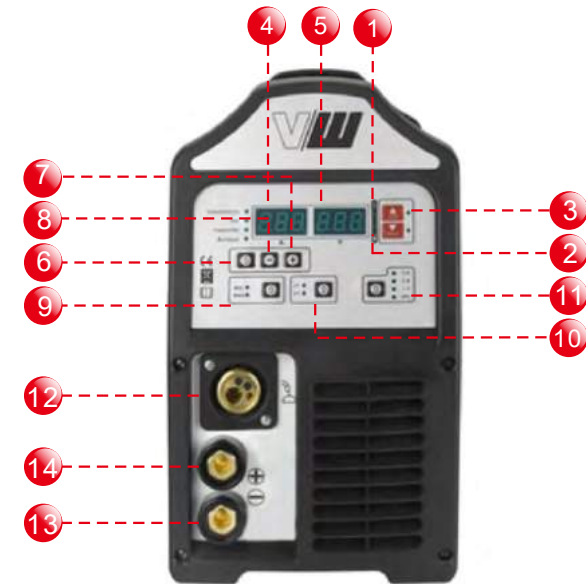
- ◆ 4M MB-24 MIG Gun – 25M2
- ◆ Contact tip • 1.0mm Fitted 0.8mm Fitted
- ◆ 3M Gas Hose 8*13.5
- ◆ 300 A earth clamp with 3M cable
- ◆ 3M Power cable
- ◆ Drive Rolls
- ◆ Operating Manual

1.11 Duty Cycle

The rated duty cycle of a Welding Power Source is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 30% duty cycle, 300 amperes at 29 volts. This means that it has been designed and built to provide the rated amperage (300 A) for 3 minutes, i.e. arc welding time, out of every 10 minute period (30% of 10 minutes is 3 minutes). During the other 7 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool.



2.1 Layout For The Panel R221



WARNING

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

2. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

3. JOB and SAVE

You can press JOB to select the memory records that you have saved before from 1-9. For the new setting of present base current Amps, just press SAVE.

4. Digital Ammeter

The digital meter is used to display the pre-set (preview) amperage in STICK / Mig modes and actual welding amperage of the power source when welding, it is also used to display parameters from selecting function button 6.

5. Digital Voltmeter

The digital meter is used to display the pre-set (preview) Voltage in Mig modes and actual welding Voltage of the power source when welding. This digital meter is used to display the Welding Output Terminal Voltage in STICK modes during non-welding or welding.

6. Selecting function Button

Press and release this button to change the selected weld functions mode from welding current to inductance to Volt to Burnback .

7. Positive Control

The positive control is used to plus selected function from 6.

8. Negative Control

The negative control is used to minus selected function from 6.

9. Weld Process Selection Button

Press and release this button to change the selected weld process mode from mig to tig to stick. The weld process will change to the next process in the sequence each time the button is pressed and released. The green indicators next to the button will illuminate to identify mig to tig to stick process mode.

10. 2T - 4T Trigger Latch Button

Press and release the button to change the selected operating mode of the trigger. The selected mode can be either "2T" (unlatched) or "4T" (latched) operation. The green indicator next to the button will illuminate to identify which mode is selected (2T or 4T). In the 4T mode once the weld has been started you can release the trigger and continue welding until the trigger is activated again or the welding arc is broken to stop the welding arc.

11. 0.6/0.8/1.0/SPL

Press this button to choose the welding materials diameter, SPL is stainless steel.

12. MIG Torch Connecting

The MIG Torch Adapter is the connection point for the MIG Torch. Press the MIG Torch in and secure by turning the locking ring to the right (clockwise)

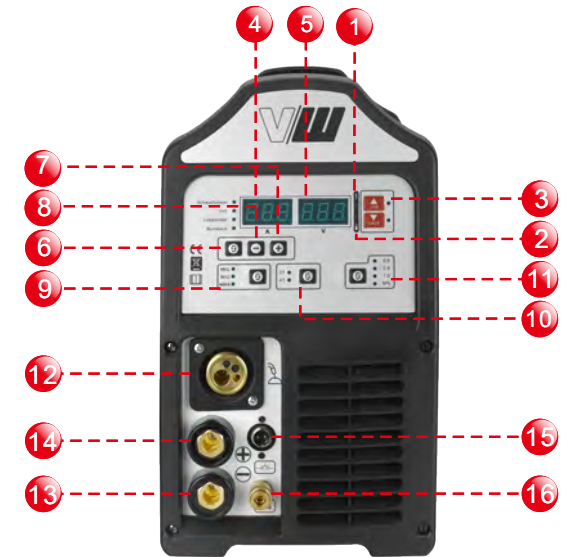
13. Negative Welding Output Terminal

The negative welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as the earth clamp (for Mig function) or electrode holder (for Stick function). Negative welding current flows to the power source via this heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

14. Positive Welding Output Terminal

The positive welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as the MIG Gun (via the MIG Gun polarity lead) or ground clamp (for Stick function). Positive welding current flows from the power source via this heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

2.2 Layout For The Panel R231



WARNING

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

2. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

3. JOB and SAVE

You can press JOB to select the memory records that you have saved before from 1-9. For the new setting of present base current Amps, just press SAVE.

4. Digital Ammeter

The digital meter is used to display the pre-set (preview) amperage in STICK / Mig modes and actual welding amperage of the power source when welding, it is also used to display parameters from selecting function button 6.

5. Digital Voltmeter

The digital meter is used to display the pre-set (preview) Voltage in Mig modes and actual welding Voltage of the power source when welding. This digital meter is used to display the Welding Output Terminal Voltage in STICK modes during non-welding or welding.

6. Selecting function Button

Press and release this button to change the selected weld functions mode from welding current to inductance to Volt to Burnback.

7. Positive Control

The positive control is used to plus selected function from 6.

8. Negative Control

The negative control is used to minus selected function from 6.

9. Weld Process Selection Button

Press and release this button to change the selected weld process mode from mig to tig to stick. The weld process will change to the next process in the sequence each time the button is pressed and released. The green indicators next to the button will illuminate to identify mig to tig to stick process mode.

10. 2T - 4T Trigger Latch Button

Press and release the button to change the selected operating mode of the trigger. The selected mode can be either "2T" (unlatched) or "4T" (latched) operation. The green indicator next to the button will illuminate to identify which mode is selected (2T or 4T). In the 4T mode once the weld has been started you can release the trigger and continue welding until the trigger is activated again or the welding arc is broken to stop the welding arc.

11. 0.6/0.8/1.0/SPL

Press this button to choose the welding materials diameter, SPL is stainless steel.

12. MIG Torch Connecting

The MIG Torch Adapter is the connection point for the MIG Torch. Press the MIG Torch in and secure by turning the locking ring to the right (clockwise)

13. Negative Welding Output Terminal

The negative welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as the earth clamp (for Mig function) or electrode holder (for Stick function). Negative welding current flows to the power source via this heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

14. Positive Welding Output Terminal

The positive welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as the MIG Gun (via the MIG Gun polarity lead) or ground clamp (for Stick function). Positive welding current flows from the power source via this heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

15. Remote Control Switch

Remote Control Switch receptacle is used to connect a trigger switch or remote control to the welding Power Source circuitry:
To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise. The socket information is included in the event the supplied cable is not suitable and it is necessary to wire a plug or cable to interface with the receptacle.

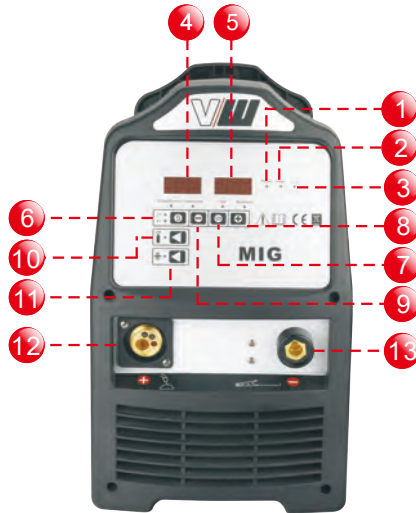
16. Shielding Gas Outlet

The Shielding Gas Outlet located on the front panel is a fast connection of a suitable TIG Torch.

2.3 MIG Gun Polarity Lead

The polarity lead is used to connect the MIG Gun to the appropriate positive or negative output terminal (allowing polarity reversal for different welding applications). In general, the polarity lead should be connected in to the positive welding terminal (+) when using steel, stainless steel or aluminum electrode wire. When using gasless wire, the polarity lead is generally connected to the negative welding terminal (-). If in doubt, consult the manufacturer of the electrode wire for the correct polarity. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

2.4 Layout For The Panel R311



WARNING

DO NOT TOUCH the electrode wire while it is being fed through the system. The electrode wire will be at welding voltage potential.

1. Power Indicator

The green power indicator will be illuminated when the welder is turned ON and indicates the presence of power.

2. Work Indicator

The indicator shows the machine is in working situation.

3. Thermal Overload Indicator Light

This welding power source is protected by a self resetting thermostat. The indicator will illuminate if the duty cycle of the power source has been exceeded. Should the thermal overload indicator illuminate the output of the power source will be disabled. Once the power source cools down this light will go OFF and the over temperature condition will automatically reset. Note that the mains power switch should remain in the on position such that the fan continues to operate thus allowing the unit to cool sufficiently. Do not switch the unit off should a thermal overload condition be present.

4. Digital Ammeter

The digital meter is used to display inductance in Mig modes and actual welding amperage of the power source when welding.

5. Digital Voltmeter

The digital meter is used to display the pre-set (preview) Voltage and burn back in Mig modes and actual welding Voltage of the power source when welding. This digital meter is used to display the Welding Output Terminal Voltage in STICK modes during non-welding or welding.

6. 2T - 4T Trigger Latch Button

Press and release the button to change the selected operating mode of the trigger. The selected mode can be either "2T" (unlatched) or "4T" (latched) operation. The red indicator next to the button will illuminate to identify which mode is selected (2T or 4T). In the 4T mode once the weld has been started you can release the trigger and continue welding until the trigger is activated again or the welding arc is broken to stop the welding arc.

7. Selecting function Button

Press and release this button to change the selected weld functions mode from welding current to inductance in left display or from Volt to Burnback from the right digital display.

8. Positive Control

The positive control is used to plus selected function from 7.

9. Negative Control

The negative control is used to minus selected function from 7. components are at Mains voltage potential.

10. Gas checking

Press this button to check the flow of the gas, repress the button will cause the close the flow of gas.

11. Wire checking

Press this button to check the wires coming from the welding rolls

12. MIG Torch Connecting

The MIG Torch Adapter is the connection point for the MIG Torch. Press the MIG Torch in and secure by turning the locking ring to the right (clockwise)

13. Negative Welding Output Terminal

The negative welding terminal is used to connect the welding output of the power source to the appropriate welding accessory such as the earth clamp. Negative welding current shows to the power source via this heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.

2.5 Installing a 5 kg Spool 200mm Diameter (For R221,R231)

In order to install a 5 kg / 200mm diameter spool, assemble the wire into the spool hub and replace the wire spool hub cover.

Installation of wire spool.

1. Remove Wire Spool hub cover.
2. Place Wire Spool onto the hub, put back the hub cover back, turn securely to keep the wire spool stable on the hub.

**CAUTION**

Use care in handling the spooled wire as it will tend to “unravel” when loosened from the spool. Grasp the end of the wire firmly and don't let go of it.

2.6 Installing a 15 kg Spool 300mm Diameter (Suitable For R251 And R311)

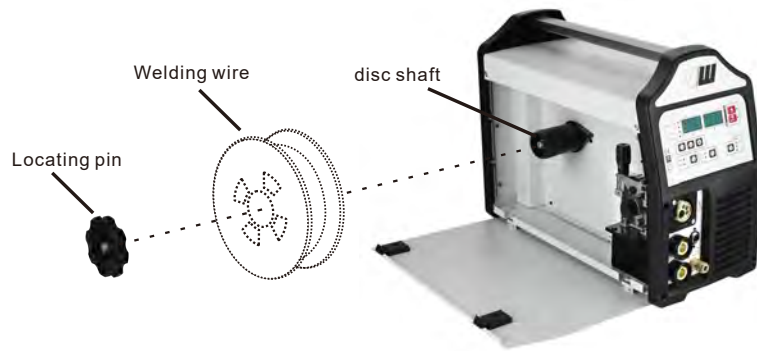
In order to install a 15 kg / 300mm diameter spool, assemble the wire into the spool hub and replace the wire spool hub cover.

Installation of wire spool.

1. Remove Wire Spool hub cover.
2. Place Wire Spool onto the hub, put back the hub cover back, turn securely to keep the wire spool stable on the hub.

**CAUTION**

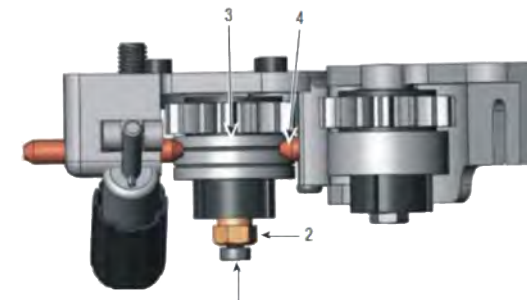
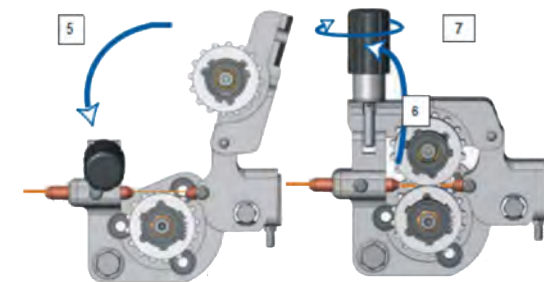
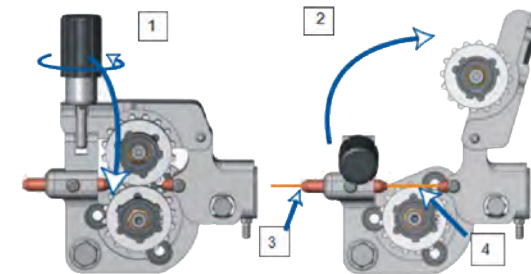
Use care in handling the spooled wire as it will tend to “unravel” when loosened from the spool. Grasp the end of the wire firmly and don't let go of it.

**2.7 Inserting Wire Into The Feed Mechanism****WARNING**

ELECTRIC SHOCK CAN KILL! Make certain the input power is disconnected from the power source before proceeding. DO NOT reattach the input power until told to do so in these instructions.

1. Loosen the Spring Pressure Adjusting Knob if needed and swing it down (See part 1) .
2. Move the Pressure (top) Roller Arm by swinging it to the right. (See part 2) .
3. Make sure the end of the wire is free of any burrs and is straight. Pass the end of wire through the Inlet Wire Guide and over the Feed roll. Make certain the proper groove is being used.(See part 2) .

4. Pass the MIG wire over the drive roll groove, through the outlet guide and out past the MIG Torch Adaptor. Then fit the MIG Torch to ensure the MIG wire passes into the MIG Torch liner of the MIG Torch.
5. Close the Pressure Roller Arm.
6. Swing the Spring Pressure Adjusting Knob back into place.
7. Use the Spring Pressure Adjusting Knob to create a “snug” condition. (Clockwise to Tighten and Counter Clockwise to loosen).
8. Last picture shows the result with wire installed. Continue to the next section for proper setting of tension.



2.8 Feed Roller Pressure Adjustment

The roller on the swing arm applies pressure to the grooved roller via an adjustable tension devise. The Tension Adjuster should be set to a minimum pressure that will provide satisfactory wire feed without slippage. If slipping occurs, and inspection of the wire out of the MIG Gun reveals no deformation or wear, the conduit liner should be checked for kinks or clogging from metal flakes. If this is not the cause of slipping, the feed roll pressure can be increased by rotating the Tension Adjusting knob clockwise. The use of excessive pressure may cause rapid wear of the feed roller, motor shaft and motor bearings.

NOTE

Genuine contact tips and liners should be used. Many non-genuine liners use inferior materials which can cause wire feed problems.

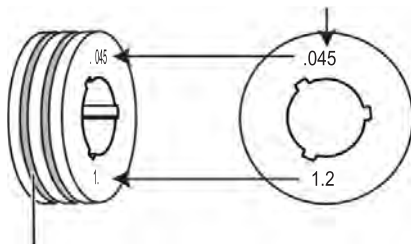
2.9 Changing The Feed Roll

NOTE

Feed rolls often come with a rust prohibitive coating that needs to be cleaned off before installation. A Feed roll consists of four different sized grooves. As delivered from the factory the drive roll is installed for 0.6 / 0.8 mm .

The stamped marking on the feed roll refers to the groove furthest from the stamped marking. When mounted, that will be the groove closest to the motor and the one to thread.

To ensure proper wire feed, the groove closest to the motor must match the electrode wire size being used.



1.2mm (.045") Groove

The size that is visible when fitting the feedroll is the groove size in use.

NOTE

All grooved feed rolls have their wire size or range stamped on the side of the roll. On rolls with different size grooves, the outer (visible when installed) stamped wire size indicates the groove in use.

Refer to feed roll kit in the Appendix for the proper selection and ordering of feed roll kits. Kit includes drive rolls, an input wire guide and an output wire guide for a specific wire type and size.

Feed rolls are removed by twisting the feed roll retainer cap and aligning the retaining knob splines/tabs with the drive gear splines. Feed rolls are installed by putting the feed roll onto the drive gear splines and twisting the feed roll retainer cap so that the splines/tabs rest against the face of the feed roll where they will click into place.



WARNING

The welding wire is electrically Hot if it is fed by depressing MIG Gun switch. Electrode contact to work piece will cause an arc with MIG Gun switch depressed.

2.10 Shielding Gas Regulator Operating Instructions



WARNING

This equipment is designed for use with welding grade (Inert) shielding gases only.

NOTE

Shielding Gas is not required if the unit is used with self shielded FCAW (flux cored arc welding) wires

Shielding Gas Regulator Safety

Gas regulators are designed to reduce and control high pressure gas from a cylinder or pipeline to the working pressure required for the equipment using it. If the equipment is improperly used, hazardous conditions are created that may cause accidents. It is the users responsibility to prevent such conditions. Before handling or using the equipment, understand and comply at all times with the safe practices prescribed in the manufacturer's instructions. SPECIFIC PROCEDURES for the use of regulators are listed below.

1. NEVER subject the regulator to inlet pressure greater than its rated inlet pressure.
2. NEVER pressurize a regulator that has loose or damaged parts or is in a questionable condition. NEVER loosen a connection or attempt to remove any part of a regulator until the gas pressure has been relieved. Under pressure, gas can dangerously propel a loose part.
3. Do NOT remove the regulator from a cylinder without first closing the cylinder valve and releasing gas in the regulator high and low pressure chambers.
4. Do NOT use the regulator as a control valve. When downstream equipment is not in use for extended periods of time, shut OFF the gas at the cylinder valve and release the gas from the equipment.
5. OPEN the cylinder valve SLOWLY. Close after use.

User Responsibilities

This equipment will perform safely and reliable only when installed, operated and maintained, and repaired in accordance with the instructions provided. Equipment must be checked periodically and repaired, replaced, or reset as necessary for continued safe and reliable performance. Defective equipment should not be used. Parts that are broken, missing, obviously worn, distorted, or contaminated should be replaced immediately.

The user of this equipment will generally have the sole responsibility for any malfunction, which results from improper use, faulty maintenance, or by repair by anyone other than an accredited repairer.

**CAUTION**

Match regulator to cylinder. NEVER CONNECT a regulator designed for a particular gas or gases to a cylinder containing any other gas.

**NOTE**

The regulator/ow meters used with argon based and carbon dioxide shielding gases are different. A suitable regulator/ow meter will need to be fitted.

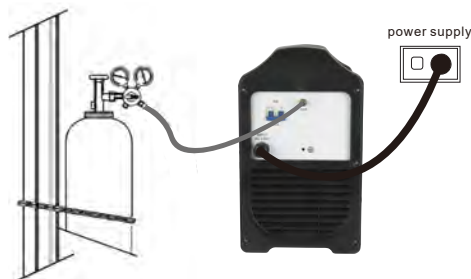
NOTE

All valves downstream of the regulator must be opened to obtain a true ow rate reading on the outlet gauge. (Welding power source must be triggered) Close the valves after the pressure has been set.

Installation

1. Remove cylinder valve plastic dust seal. Clean the cylinder valve outlet of impurities that may clog orifices and damage seats before connecting the regulator. Crack the valve (open then close) momentarily, pointing the outlet away from people and sources of ignition. Wipe with a clean lint free cloth.
2. Match regulator to cylinder. Before connecting, check that the regulator label and cylinder marking agree and that the regulator inlet and cylinder outlet match. NEVER CONNECT a regulator designed for a particular gas or gases to a cylinder containing any other gas.
3. Connect the regulator inlet connection to cylinder or pipeline and Tighten it firmly but not excessively, with a suitable spanner.
4. Attach supplied gas line between the regulator output and the desired input at the rear of the power source.

Ensure that the gas cylinder is secured to a building pillar, wall bracket or otherwise securely fixed in an upright position.



5. To protect sensitive down-stream equipment a separate safety device may be necessary if the regulator is not fitted with a pressure relief device.

Operation

With the regulator connected to cylinder or pipeline, and the adjustment screw/knob fully disengaged, pressurize as follows:

1. Stand to one side of regulator and slowly open the cylinder valve. If opened quickly, a sudden pressure surge may damage internal regulator parts.
2. With valves on downstream equipment closed, adjust regulator to approximate working pressure. It is recommended that testing for leaks at the regulator connection points be carried out using a suitable leak detection solution or soapy water.
3. Purge air or other unwanted welding grade shielding gas from equipment connected to the regulator by individually opening then closing the equipment control valves. Complete purging may take up to ten seconds or more, depending upon the length and size of the hose being purged.

Adjusting Flow Rate

With the regulator ready for operation, adjust working ow rate as follows:

1. Slowly turn adjusting screw/knob in (clockwise) direction until the outlet gauge indicates the required ow rate.

NOTE

It may be necessary to re-check the shielding gas regulator ow rate following the first weld sequence due to back pressure present within shielding gas hose assembly.

2. To reduce ow rate, allow the welding grade shielding gas to discharge from regulator by opening the down- stream valve. Bleed welding grade shielding gas into a well ventilated area and away from any ignition source. Turn adjusting screw counterclockwise, until the required ow rate is indicated on the gauge. Close downstream valve.
3. Adjust regulator pressure adjusting screw to the required ow rate, indicated on gauge dial. The gas ow rate should be adequate to cover the weld zone to stop weld porosity. Excessive gas ow rates may cause turbulence and weld porosity.

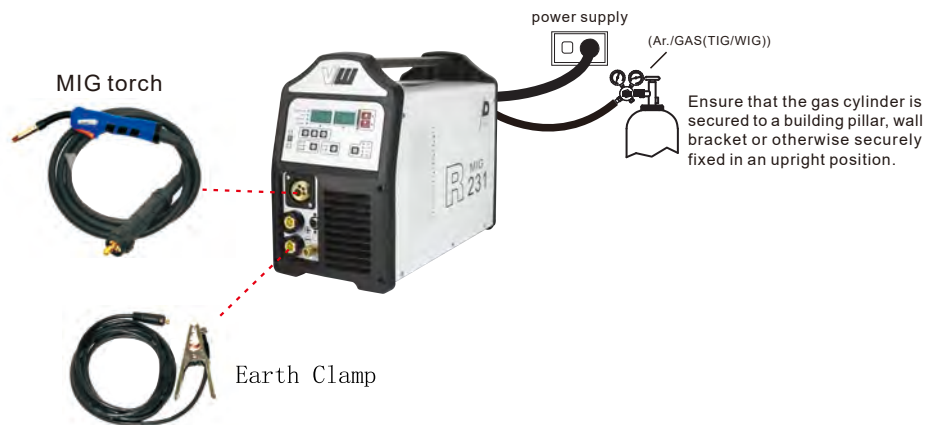
Shutdown

Close cylinder valve whenever the regulator is not in use. To shut down for extended periods (more than 30 minutes).

1. Close cylinder or upstream valve tightly.
2. Open downstream equipment valves to drain the lines. Bleed gas into a well ventilated area and away from any ignition source.
3. After gas is drained completely, disengage adjusting screw and close downstream equipment valves.
4. Before transporting cylinders that are not secured on a cart designed for such purposes, remove regulators.

2.11 Set-up MIG (GMAW) Welding With Gas Shielded MIG Wire

When using a non shielded wire, you need to have an external gas source attached to the unit. For most Non Shielded Wire, connect the Work Lead to the negative - terminal and connect the MIG Gun polarity lead to the positive + terminal. If in doubt, consult the MIG electrode wire manufacturer.



1. Turn the Main ON/OFF switch OFF (located on the rear panel).
2. Check that the MIG wire size, contact tip, MIG Gun liner and drive roll groove are all the same size before fitting the MIG wire into the Power Source.
3. Connect the MIG Gun Polarity Lead to the positive welding terminal (+). If in doubt, consult the MIG electrode wire manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
4. Fit the MIG wire spool and MIG Gun to the machine.
5. Connect the work lead to the negative welding terminal (-). If in doubt, consult the MIG electrode wire manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

6. Fit the welding grade shielding gas regulator/ ow gauge to the shielding gas cylinder then connect the shielding gas hose from the rear of machine to the regulator/ow gauge outlet.
7. Turn the Main ON/OFF switch ON (located on the rear panel).
8. Select MIG mode with the process selection control.
9. Remove the MIG Gun nozzle and contact tip.
10. Depress MIG Gun trigger to feed the MIG wire out through the MIG Gun gas diffuser then fit the contact tip on the MIG wire and securely fasten it to the MIG Gun then fit the nozzle in place.
11. Refer to the Weld Guide located on the inside of the wire feed compartment door for further information on Voltage/Wirespeed settings.



WARNING

Before connecting the work clamp to the work make sure the mains power supply is switched OFF.

Secure the welding grade shielding gas cylinder in an upright position by chaining it to a suitable stationary support to prevent falling or tipping.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

Remove any packaging material prior to use. DO NOT block the air vents at the front or rear of the Welding Power Source.

NOTE

Depending on the type of wire you will be using the MIG Gun polarity may need to be switched. Follow the wire manufacturers recommendation.

2.12 Set-up for MIG (FCAW) Welding with Gasless MIG Wire

When using a gasless flux cored wire, you do not need to have an external gas source attached to the unit. For most Self Shielded Flux Cored Wire, connect the Work Lead to the positive + terminal and connect the MIG Torch polarity lead to MIG torch connector. If in doubt, consult the Flux Cored electrode wire manufacturer.



1. Turn the Main ON/OFF switch OFF (located on the rear panel).
2. Check that the MIG wire size, contact tip, MIG Gun liner and drive roll groove are all the same size before fitting the MIG wire into the Power Source.
3. Connect the MIG Gun Polarity Lead to mig torch connector. If in doubt, consult the MIG electrode wire manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
4. Fit the MIG (FCAW) wire spool and MIG Gun to the machine.
5. Connect the work lead to the positive welding terminal (+). If in doubt, consult the MIG electrode wire manufacturer. Welding current flows from the Power Source via heavy duty bayonet type terminals. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
6. If gasless MIG (FCAW) wire is fitted then shielding gas is not required for welding. Otherwise fit the welding grade shielding gas regulator/flow gauge to the shielding gas cylinder then connect the shielding gas hose from the rear of the machine to the regulator/flow gauge outlet.
7. Turn the Main ON/OFF switch ON (located on the rear panel).
8. Select MIG mode with the process selection control.
9. Remove the MIG Gun nozzle and contact tip.
10. Depress MIG Gun trigger to feed the MIG wire out through the MIG Gun gas diffuser then fit the contact tip on the MIG wire and securely fasten it to the MIG Gun then fit the nozzle in place.
11. Refer to the Weld Guide located on the inside of the wire feed compartment door for further information on Voltage/Wirespeed settings.

**WARNING**

Before connecting the work clamp to the work make sure the mains power supply is switched OFF.

**CAUTION**

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

Remove any packaging material prior to use. DO NOT block the air vents at the front or rear of the Welding Power Source.

NOTE

Depending on the type of wire you will be using the MIG Gun polarity may need to be switched. Follow the wire manufacturers recommendation.

2.13 Set-up For LIFT TIG (GTAW) Welding (only for R231)**WARNING**

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment

NOTE

The following steps will assume that you have already set up the proper shielding gas.

NOTE

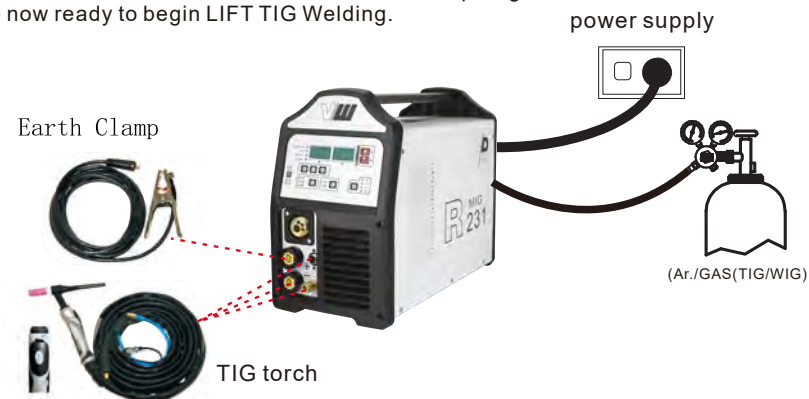
The following set up is known as Straight Polarity or DC Electrode Positive. This is commonly used for DC LIFT TIG welding on most materials such as steel and stainless steel.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Connect the work earth clamp to the positive output terminal, and the LIFT TIG Torch cable to the negative output terminal. Refer to Figure 5-02.
3. Connect the gas line/hose to the proper shielding gas source, and connect the aviation plug for trigger switch to 5 pin control socket Refer to Figure 5-02.
4. Slowly open the Argon Cylinder Valve to the fully open position.
5. Connect the work earth clamp to your work piece.
6. The tungsten must be ground to a blunt point (similar to a pencil) in order to achieve optimum welding results. (Refer to Figure: 5-01). It is critical to grind the tungsten electrode in the direction the grinding wheel is turning. Grind at a 30 degree angle and never to a sharp point.

2 to 2-1/2 Times Electrode Diameter



7. Install the tungsten with approximately 1.0mm to 3.2mm sticking out from the gas cup, ensuring you have correct sized collet.
8. Tighten the back cap.
9. Turn the switch to the "ON" position. The power L.E.D. light should illuminate.
10. Set the welding process to LIFT TIG.
11. Set the Weld Current Control Knob to the desired amperage.
12. You are now ready to begin LIFT TIG Welding.



2.14 Set-up For STICK Metal Arc Welding (MMA)



WARNING

Before any welding is to begin, be sure to wear all appropriate and recommended safety equipment.

NOTE

The following set up is known as DC Electrode Positive or reverse polarity. Please consult with the STICK electrode manufacturer for specific polarity recommendations.

1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Attach the STICK and Work Leads, connection as picture.



3. Set the welding process to STICK.
4. Set the Weld Current Control Knob to the desired amperage.
5. Install a STICK electrode in the electrode holder.
6. You are now ready to begin STICK Welding.

NOTE

To weld, gently strike the electrode on the work piece to generate a welding arc, and slowly move along the work piece while holding a consistent arc length above base metal.

3.1 Troubleshooting



WARNING

There are extremely dangerous voltage and power levels present inside this product. Do not attempt to open or repair unless you are a qualified electrical tradesperson and you have had training in power measurements and troubleshooting techniques.

If major complex subassemblies are faulty, then the Welding Power Source must be returned to an accredited reseller for repair. The basic level of troubleshooting is that which can be performed without special equipment or knowledge.

Nr.	Troubles	Reasons	Solution
1	Turn on the power source, power indicator is lit, fan is not working.	Fan is broken	Change fan
		There is something in the fan	Clean it
		The start capacitor of fan damaged	Change capacitor
2	Turn on the power source, fan is working, power indicator is not lit	The power light damaged or connection is not good	Change the power light
		The power board is broken	Change it
		Display panel is broken	Change it
3	Turn on the power source, fan is not working, power indicator is not lit	The power cable connected not good	Connect correctly
		The power cable is broken	Repair or change it
		Power on switch is damaged	Change it
		The light of the power indicator is broken and the problems mentioned in Nr. 2	Change the light of the power indicator or refer to the solution in Nr. 2
4	Turn on the power source, power indicator is lit, fan is working, there is no welding output.	The power board is broken	Change it
		Control board is broken	Change it
		1 st inverter circuit damaged	Replace it
5	The number of the display is not intact	The display panel is damaged	Change the display panel
		Digital tube is broken	Change it
6	No no-load voltage output (MMA)	If the overheat indicator is on	Wait a few minutes, the machine can be operated normal
		The main circuit is broken	Check and repair
		The machine is broken	Consult the dealer or the manufacturer

Nr.	Troubles	Reasons	Solution
7	Turn on the power source ,power indicator is lit, gas flows, wire roller cannot feed	The wire roller is wrong installed	Check and change it
		The wire roller is twined	Check and sort it out
		Pressure roller arm is fitted firmly	Check and connect correctly
		The wire is not correctly through the inlet wire guide	Check and install correctly
		The size of the groove ,wire and torch tip are not from the same size	Change to the same size of the needed parts
		Control board is broken	Consult the dealer or the manufacturer
8	Turn on the power source ,power indicator is lit ,gas flows, wire feeding, no arc igniting	Check the welding circuit is correct	Correct properly
		The mig torch is not correctly fitted to machine	Check and connect correctly
		Control board is broken	Consult the dealer or the manufacturer
9	No gas flow (TIG)	Gas cylinder is close or gas pressure is low	Open or change the gas cylinder
		Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it
		Air tube is brocken	Change it
		Pressure too high or air regulator is broken	Check gas
10	Gas always flows	If the gas checking function is selected	Close it
		Something is in the valve	Remove it
		Electromagnetic valve is damaged	Change it
11	Without triggering the mig torch but the wire roller feeding wire automatically	Checking if the wire checking indicator is on	Close the wire checking function
		Wire feeding board(for R251 and R311) is broken or the control board (for R221 and R231) is broken	Consult the dealer or the manufacturer
12	The welding current cannot be adjusted	Checking if the electorde stick to the work piece that the anti-stick function is on	Separate the electrode and work piece
		Control board is broken	Repair or change it
		Shut off the power when changing the torch	
13	The welding current displayed isn't accordant with the actual value	The min value displayed isn't accordant with the actual value	Adjust potentiometer Imin on the control board
		The max value displayed isn't accordant with the actual value	Adjust potentiometer Imax on the control board
14	The penetration of molten pool is not enough	The welding current is adjusted too low	Increase the welding current
		The arc is too long in the welding process	Adjust the distance from torch to work piece
		The power cable or the welding cable is too long	Use the suitable length from manufacturer

Nr.	Troubles	Reasons	Solution
15	Thermal overload indicator light is on	Over-heat protection ,too much welding current	Reduce the welding current
		Over-heat protection ,working too much time	Reduce the welding time
		Over-current protection, current in the main circuit is out of control	Check and repair main circuit and drive board
		Input voltage is too low	Check the power supply
		Fan is broken	Change the fan
16	Tig electrode melts when welding (for R231)	Tig torch is connected to the positive terminal	Connect the tig torch to negative terminal
17	Arc flutters during Tig welding	Tungsten electrode is too big for the welding current	Select the correct size of tungsten electrode
		Check the earth clamp position on the work piece	Adjust the position of earth clamp

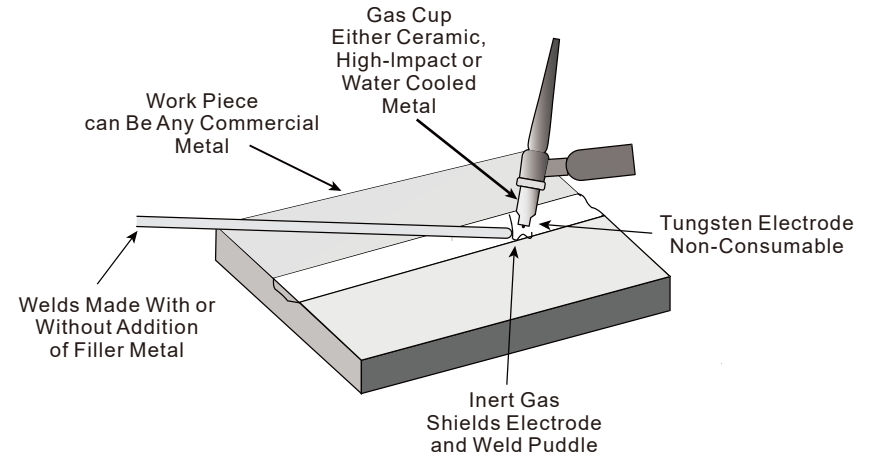
CHAPTER 7

WELDING TECHNIQUE AND MAINTENANCE



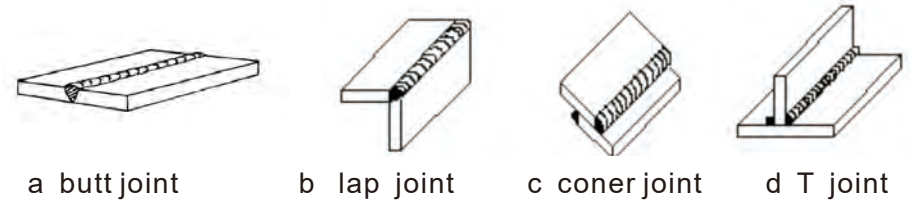
1.1 TIG Basic Welding Technique

Gas Tungsten Arc Welding (GTAW) or TIG (Tungsten Inert Gas) as it is commonly referred to, is a welding process in which fusion is produced by an electric arc that is established between a single tungsten (non-consumable) electrode and the work piece. Shielding is obtained from a welding grade shielding gas or welding grade shielding gas mixture which is generally Argon based. A filler metal may also be added manually in some circumstances depending on the welding application.



TIG Welding Application Shot

1.2 Joint forms in TIG



a butt joint b lap joint c coner joint d T joint

1.3 The explanation of welding quality

The relation of welding area color & protect effect of stainless steel

Welding area color	argent, golden	blue	red-grey	grey	black
Protect effect	best	better	good	bad	worst

The relation of welding area color & protect effect of Ti-alloy

Welding area color	bright argent	orange-yellow	blue-purple	caesious	white powder of titanium oxid
Protect effect	best	better	good	bad	worst

1.4 TIG Parameters Matching

The corresponding relationship between gas nozzle diameter and electrode diameter

Gas nozzle diameter/mm	Electrode diameter/mm
6.4	0.5
8	1.0
9.5	1.6 or 2.4
11.1	3.2

Notice: the above parameters originate from <<Welding Dictionary>> P142, Volume 1 of Edition 2.

Gas nozzle and the shield gas flow rate

Welding current range/A	DC positive connection		AC	
	Gas nozzle diameter/mm	Gas flow rate/L·min ⁻¹	Gas nozzle diameter/mm	Gas flow rate/L·min ⁻¹
10~100	4~9.5	4~5	8~9.5	6~8
101~150	4~9.5	4~7	9.5~11	7~10
151~200	6~13	6~8	11~13	7~10
201~300	8~13	8~9	13~16	8~15

Notice: the above parameters originate from <<Welding Dictionary>> P149, Volume 1 of Edition 2.

Tungsten Electrode

Tungsten Electrode Diameter/mm	Sharpened of the Electrode Diameter/mm	Angle of Cone(°)	Background Current/a
1.0	0.125	12	2~15
1.0	0.25	20	5~30
1.6	0.5	25	8~50
1.6	0.8	30	10~70
2.4	0.8	35	12~90
2.4	1.1	45	15~150
3.2	1.1	60	20~200
4.0	1.5	90	20~300

TIG of stainless steel(single run welding)

Workpiece thickness /mm	Joint form	tungsten electrode diameter /mm	welding wire diameter /mm	Argon gas flow rate/ L·min ⁻¹	welding current (DCEP)	Welding speed/ cm·min ⁻¹
0.8	Butt joint	1.0	1.6	5	20~50	66
1.0	Butt joint	1.6	1.6	5	50~80	56
1.5	Butt joint	1.6	1.6	7	65~105	30
1.5	Corner joint	1.6	1.6	7	75~125	25
2.4	Butt joint	1.6	2.4	7	85~125	30
2.4	Corner joint	1.6	2.4	7	95~135	25
3.2	Butt joint	1.6	2.4	7	100~135	30
3.2	Corner joint	1.6	2.4	7	115~145	25
4.8	Butt joint	2.4	3.2	8	150~225	25
4.8	Corner joint	3.2	3.2	9	175~250	20
6.0	Butt joint	4.0	4.0	10-12	220~300	25

Notice: the above parameters originate from <<Welding Dictionary>> P150, Volume 1 of Edition 2.

Parameters of piping back sealing welding for mild steel(DCEP)

Piping diameter Φ/mm	Tungsten electrode diameter/mm	Gas nozzle diameter/mm	Welding wire diameter/mm Welding current/A	Welding current/A	Arc voltage/V	Argon flow rate/L·min ⁻¹	Welding rate/cm·min ⁻¹
38	2.0	8	2	75~90	11~13	6~8	4~5
42	2.0	8	2	75~95	11~13	6~8	4~5
60	2.0	8	2	75~100	11~13	7~9	4~5
76	2.5	8~10	2.5	80~105	14~16	8~10	4~5
108	2.5	8~10	2.5	90~110	14~16	9~11	5~6
133	2.5	8~10	2.5	90~115	14~16	10~12	5~6
159	2.5	8~10	2.5	95~120	14~16	11~13	5~6
219	2.5	8~10	2.5	100~120	14~16	12~14	5~6
273	2.5	8~10	2.5	110~125	14~16	12~14	5~6
325	2.5	8~10	2.5	120~140	14~16	12~14	5~6

Notice: the above parameters originate from <<Welding Dictionary>> P167, Volume 1 of Edition 2.

Parameters of AC TIG(MMA) for Aluinium and its alloy

Steet thickness /mm	Welding wire diameter /mm	Tungsten eletrode diameter /mm	Pre-heat Temper-ature/°C	Welding current/A	Argon flow rate/L·min ⁻¹	Gas nozzle diameter /mm	Remark
1	1.6	2		45~60	7~9	8	Flange welding
1.5	1.6~2.0	2	—	50~80	7~9	8	Flange or butt welding by one side
2	2~2.5	2~3	—	90~120	8~12	8~12	Butt welding
3	2~3	3	—	150~180	8~12	8~12	V-groove butt welding
4	3	4	—	180~200	10~15	8~12	
5	3~4	4	—	180~240	10~15	10~12	
6	4	5	—	240~280	16~20	14~16	
8	4~5	5	100	260~320	16~20	14~16	
10	4~5	5	100~150	280~340	16~20	14~16	X-groove butt welding
12	4~5	5~6	150~200	300~360	18~22	16~20	
14	5~6	5~6	180~200	340~380	20~24	16~20	
16	5~6	6	200~220	340~380	20~24	16~20	
18	5~6	6	200~240	360~400	25~30	16~20	
20	5~6	6	200~260	360~400	25~30	20~22	
16~20	5~6	6	200~260	300~380	25~30	16~20	
22~25	5~6	6~7	200~260	360~400	30~35	20~22	

Notice: the above parameters originate from 《Welding Dictionary》 P538, Volume 2 of Edition 2.

1.5 E-Series Equipment TIG Parameters Matching

Tungsten Electrode Current Ranges

Electrode Diameter	DC Current (Amps)
1.0mm (0.040")	30-60
1.6mm (1/16")	60-115
2.4mm (3/32")	100-165
3.2 (1/8")mm	135-200
4.0mm (5/32")	190-280
5mm (3/16")	250-340

Guide for Selecting Filler Wire Diameter

Filler Wire Diameter	DC Current Range (Amps)
1.6mm (1/16")	20-90
2.4mm (3/32")	65-115
3.2mm (1/8")	100-165
5mm (3/16")	200-350

Tungsten Electrode Types

Electrode Type (Ground Finish)	Welding Application	Features	Color Code
Thoriated 2%	DC welding of mild steel, stainless steel and copper	Excellent arc starting, Long life, High current carrying capacity	Red
Zirconated 1%	High quality AC welding of aluminium, magnesium and their alloys.	Self cleaning, Long life, Maintains balled end, High current carrying capacity.	White
Ceriated 2%	AC & DC welding of mild steel, stainless steel, copper, aluminium, magnesium and their alloys	Longer life, More stable arc, Easier starting, Wider current range, Narrower more concentrated arc.	Grey

TIG Welding Filler Rods

Base Metal Thickness	DC Current for Mild Steel	DC Current for Stainless Steel	Tungsten Electrode Diameter	Filler Rod Diameter (if required)	Argon Gas Flow Rate LPM (CFH)	Joint Type
1.0mm 0.040"	35-45 40-50	20-30 25-35	1.0mm 0.040"	1.6mm 1/16"	5-7(10-15)	Butt/Corner Lap/Fillet
1.2mm 0.045"	45-55 50-60	30-45 35-50	1.0mm 0.040"	1.6mm 1/16"	5-7(10-15)	Butt/Corner Lap/Fillet
1.6mm 1/16"	60-70 70-90	40-60 50-70	1.6mm 1/16"	1.6mm 1/16"	7(15)	Butt/Corner Lap/Fillet
3.2mm 1/8"	80-100 90-115	65-85 90-110	1.6mm 1/16"	2.4mm 3/32"	7(15)	Butt/Corner Lap/Fillet
4.8mm 3/16"	115-135 140-165	100-125 125-150	2.4mm 3/32"	3.2mm 1/8"	9(20)	Butt/Corner Lap/Fillet
6.4mm 1/4"	160-175 170-200	135-160 160-180	3.2mm 1/8"	4.0mm 5/32"	9(20)	Butt/Corner Lap/Fillet

TIG Welding is generally regarded as a specialized process that requires operator competency. While many of the principles outlined in the previous Arc Welding section are applicable a comprehensive outline of the TIG Welding process is outside the scope of this Operating Manual.

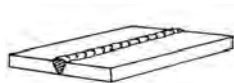
2.1 MMA Basic Welding Technique

Arc Welding Practice

The techniques used for arc welding are almost identical regardless of what types of metals are being joined. Naturally enough, different types of electrodes would be used for different metals as described in the preceding section.

Welding Position

The electrodes dealt with in this publication can be used in most positions, i.e. they are suitable for welding in flat, horizontal, vertical and overhead positions. Numerous applications call for welds to be made in positions intermediate between these. Some of the common types of welds are shown



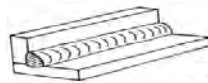
Flat Position,
Down Hand Butt Weld



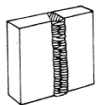
Flat Position,
Gravity Fillet Weld



Horizontal Position,
Butt Weld



Horizontal-Vertical
(HV) Position



Vertical Position,
Butt Weld



Vertical Position,
Fillet Weld



Vertical Position,
Fillet Weld



Overhead Position,
Fillet Weld

Joint Preparations

In many cases, it will be possible to weld steel sections without any special preparation. For heavier sections and for repair work on castings, etc., it will be necessary to cut or grind an angle between the pieces being joined to ensure proper penetration of the weld metal and to produce sound joints.

In general, surfaces being welded should be clean and free of rust, scale, dirt, grease, etc. Slag should be removed from oxy-cut surfaces.

Arc Welding Technique - A Word to Beginners

For those who have not yet done any welding, the simplest way to commence is to run beads on a piece of scrap plate. Use mild steel plate about 6.4mm (1/4") thick and a 3.2mm (1/8") electrode. Clean any paint, loose scale or grease off the plate and set it firmly on the work bench so that welding can be carried out in the downhand position. Make sure that the work clamp is making good electrical contact with the work, either directly or through the work table. For light gauge material, always clamp the work lead directly to the job, otherwise a poor circuit will probably result.

The Welder

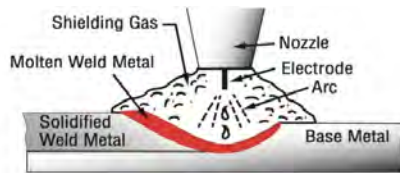
Place yourself in a comfortable position before beginning to weld. Get a seat of suitable height and do as much work as possible sitting down. Don't hold your body tense. A taut attitude of mind and a tensed body will soon make you feel tired. Relax and you will find that the job becomes much easier. You can add much to your peace of mind by wearing a leather apron and gauntlets. You won't be worrying then about being burnt or sparks setting alight to your clothes.

Place the work so that the direction of welding is across, rather than to or from your body. The electrode holder lead should be clear of any obstruction so that you can move your arm freely along as the electrode burns down. If the lead is slung over your shoulder, it allows greater freedom of movement and takes a lot of weight off your hand. Be sure the insulation on your cable and electrode holder is not faulty, otherwise you are risking an electric shock.

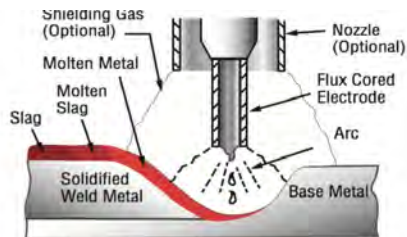
3.1 MIG (GMAW/FCAW) Basic Welding Technique

Two different welding processes are covered in this section (GMAW and FCAW), with the intention of providing the very basic concepts in using the MIG mode of welding, where a MIG Gun is hand held, and the electrode (welding wire) is fed into a weld puddle, and the arc is shielded by an inert welding grade shielding gas or inert welding grade shielding gas mixture.

GAS METAL ARC WELDING (GMAW): This process, also known as MIG welding, Co₂ welding, Micro Wire Welding, short arc welding, dip transfer welding, wire welding etc., is an electric arc welding process which fuses together the parts to be welded by heating them with an arc between a solid continuous, consumable electrode and the work. Shielding is obtained from an externally supplied welding grade shielding gas or welding grade shielding gas mixture. The process is normally applied semi automatically; however the process may be operated automatically and can be machine operated. The process can be used to weld thin and fairly thick steels, and some non-ferrous metals in all positions.

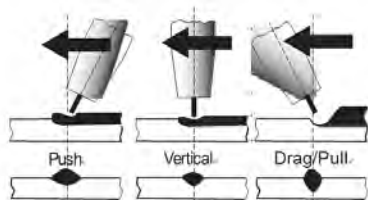


FLUX CORED ARC WELDING (FCAW): This is an electric arc welding process which fuses together the parts to be welded by heating them with an arc between a continuous flux filled electrode wire and the work. Shielding is obtained through decomposition of the flux within the tubular wire. Additional shielding may or may not be obtained from an externally supplied gas or gas mixture. The process is normally applied semi automatically; however the process may be applied automatically or by machine. It is commonly used to weld large diameter electrodes in the flat and horizontal position and small electrode diameters in all positions. The process is used to a lesser degree for welding stainless steel and for overlay work.



Position of MIG Gun

The angle of MIG Gun to the weld has an effect on the width of the weld.



The MIG Gun should be held at an angle to the weld joint. (See Secondary Adjustment Variables below)

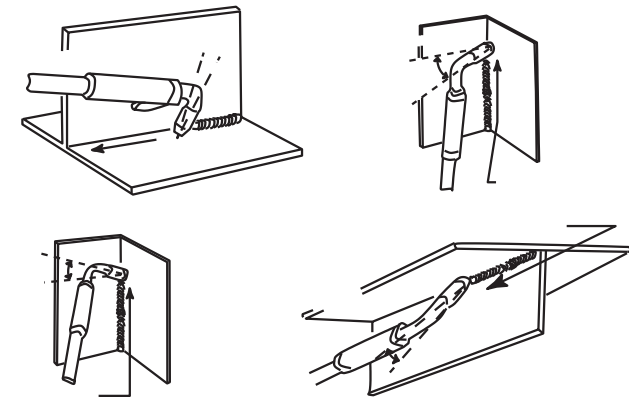
Hold the MIG Gun so that the welding seam is viewed at all times. Always wear the welding helmet with proper filter lenses and use the proper safety equipment.



WARNING

Do NOT pull the MIG Gun back when the arc is established. This will create excessive wire extension (stick-out) and make a very poor weld.

The electrode wire is not energized until the MIG Gun trigger switch is depressed. The wire may therefore be placed on the seam or joint prior to lowering the helmet.



Distance from the MIG Gun Nozzle to the Work Piece

The electrode wire stick out from the MIG Gun nozzle should be between 10 - 20 mm (3/8" - 3/4"). This distance may vary depending on the type of joint that is being welded.

Travel Speed

The speed at which the molten pool travels influences the width of the weld and penetration of the welding run.

Establishing the Arc and Making Weld Beads

Before attempting to weld on a finished piece of work, it is recommended that practice welds be made on a sample metal of the same material as that of the finished piece.

The easiest welding procedure for the beginner to experiment with MIG welding is the flat position. The equipment is capable of flat, vertical and overhead positions.

For practicing MIG welding, secure some pieces of 1.6 mm or 5.0 mm (1/16" or 3/16") mild steel plate 150 mm x 150 mm (6" x 6"). Use 0.9 mm (.035") flux cored gasless wire or a solid wire with shielding gas.

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Setting of the Power Source

Power source and Wirefeeder setting requires some practice by the operator, as the welding plant has two control settings that have to balance. These are the Wirespeed control (refer to section 3.06.4) and the welding Voltage Control (refer to section 3.06.10). The welding current is determined by the Wirespeed control, the current will increase with increased Wirespeed, resulting in a shorter arc. Less wire speed will reduce the current and lengthen the arc. Increasing the welding voltage hardly alters the current level, but lengthens the arc. By decreasing the voltage, a shorter arc is obtained with a little change in current level.

When changing to a different electrode wire diameter, different control settings are required. A thinner electrode wire needs more Wirespeed to achieve the same current level.

A satisfactory weld cannot be obtained if the Wirespeed and Voltage settings are not adjusted to suit the electrode

wire diameter and the dimensions of the work piece.

If the Wirespeed is too high for the welding voltage, "stubbing" will occur as the wire dips into the molten pool and does not melt. Welding in these conditions normally produces a poor weld due to lack of fusion. If, however, the welding voltage is too high, large drops will form on the end of the wire, causing spatter. The correct setting of voltage and Wirespeed can be seen in the shape of the weld deposit and heard by a smooth regular arc sound. Refer to the Weld Guide located on the inside of the wirefeed compartment door for setup information.

Electrode Wire Size Selection

The choice of Electrode wire size and shielding gas used depends on the following:

Thickness of the metal to be welded

Type of joint

Capacity of the wire feed unit and Power Source

The amount of penetration required

The deposition rate required

The bead profile desired

The position of welding

Cost of the wire

4.1 Maintenance

In order to guarantee that arc welding machine works high-efficiently and in safety, it must be maintained regularly. Let customers understand the maintenance methods and means of arc welding machine more, enable customers to carry on simple examination and safeguarding by oneself, try one's best to reduce the fault rate and repair times of arc welding machine, so as to lengthen service life of arc welding machine. Maintenance items in detail are in the following table.

◆ **Warning: For safety while maintaining the machine, please shut off the supply power and wait for 5 minutes, until capacity voltage already drop to safe voltage 36V!**

Date	Maintenance item
Daily examination	<p>Observe that whether panel knob and switch in the front and at the back of arc welding machine are flexible and put correctly in place. If the knob has not been put correctly in place, please correct. If you can't correct or fix the knob, please replace immediately</p> <p>If the switch is not flexible or it can't be put correctly in place, please replace immediately; Please get in touch with maintenance service department if there are no accessories</p> <p>After turn-on power, watch/listen to that whether the arc welding machine has shaking, whistle calling or peculiar smell. If there is one of the above problems, find out the reason to get rid of, if you can't find out the reason, Please contact local this area agent or the branch company</p> <p>Observe that whether the display value of LED is intact. If the display number is not intact, please replace the damaged LED. If it still doesn't work, please maintain or replace the display PCB</p> <p>Observe that whether the min/max value on LED accords with the set value. If there is any difference and it has affected the normal welding craft, please adjust it</p> <p>Check up that Whether fan is damaged and is normal to rotate or control. If the fan is damaged, please change immediately. If the fan does not rotate after the arc welding machine is overheated, observe that whether there is something blocked in the blade, if it is blocked, please get rid of; If the fan does not rotate after getting rid of the above problems, you can poke the blade by the rotation direction of fan. If the fan rotates normally, the start capacitor should be replaced; If not, change the fan</p> <p>Observe that whether the fast connector is loose or overheated. If the arc welding machine has the above problems, it should be fastened or changed</p> <p>Observe that Whether the current output cable is damaged. If it is damaged, it should be wrapped up, insulated or changed</p> <p>Using the dry compressed air to clear the inside of arc welding machine. Especially for clearing up the dusts on radiator, main voltage transformer, inductance, IGBT module, the fast recover diode and PCB, etc</p>
Monthly examination	<p>Check up the bolt in arc welding machine, if it is loose, please screw down it. If it is skid, please replace. If it is rusty, please erase rust on bolt to ensure it works well</p>
Quarter-yearly examination	<p>Whether the actual current accords with the displaying value. If they does not accord, they should be regulated. The actual current value can be measured by the adjusted plier-type ampere meter</p>
Yearly examination	<p>Measure the insulating impedance among the main circuit, PCB and case, if it below 1MΩ, insulation is thought to be damaged and need to change, and need to change or strengthen insulation</p>