

AC/DC GTAW WELDING MACHINE MANUAL



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OPERATING MANUAL

AC/DC GTAW WELDING MACHINE

MODEL : SI -TIG - 300

Works :- Soham Impex,
Vavadi survey no.28, Plot no.7, Near Sunny Raj Metal, Rajkot City,
Gujarat – 360004

AC/DC GTAW WELDING MACHINE

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1. Introduction of GTAW welding machine

This series of power sources apply IGBT soft switch inverter technology. Its internal control system applies digital signal processor which ensures quick response to any change during the welding process so as to achieve precise control of welding process and ensure optimal welding results.

Power source features

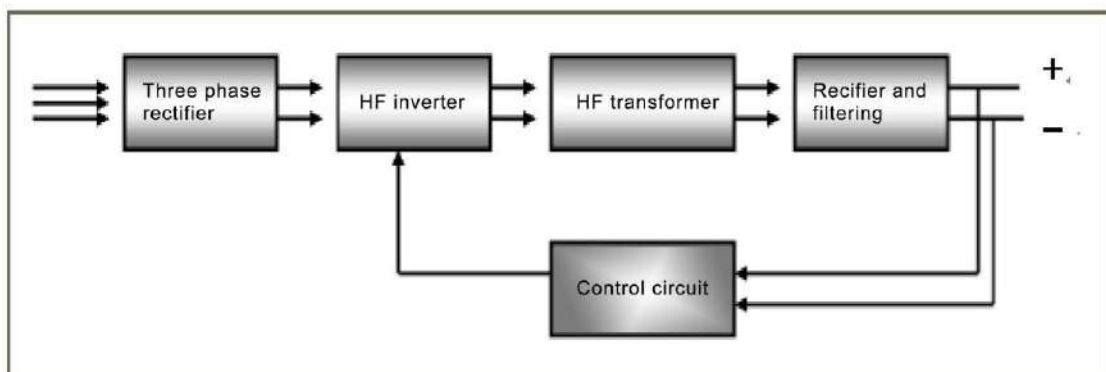
This series of power sources are microprocessor controlled and apply MCU + DSP control technology to improve the control precision. The strong ability of arc self-adjustment ensures a highly stable welding current against grid fluctuation and arc length change to get optimal results.

Highlights as follows:

- User friendly interface, synergic, easily control;
- Embedded welding expert database, automatic intelligent combination of parameters
- To achieve beautiful ripple pattern of welding seam with the function of Pulse TIG
- Perfect functions of starting arc and reducing melting ball while stopping arc
- Special 4-step mode is suitable for welding metal with good thermal conductivity, with perfect welding quality when starting arc and stopping arc
- Multiple protection functions
- TIG torch with quick and convenient adjustment of welding current at Torch handle

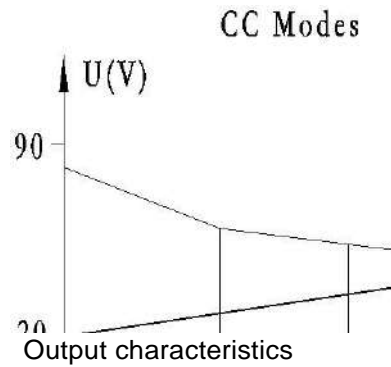
Functional principle

This series of power sources adopt IGBT soft switch inverter technology to improve the dynamic response rate and make the machines with small size and light weight. The control circuit's closed-loop control makes the power source enjoy strong ability against power grid fluctuation and perfect welding performance. The schematic diagram is as shown in Fig. 1-2-1:



Schematic diagram

Output characteristics



Duty cycle

Duty cycle is percentage of 10 minutes that a machine can weld at rated load without overheating. If overheats, thermostat(s) will open, output stops. Wait for fifteen minutes for the machine to cool down. Reduce amperage or duty cycle before welding.



Note! Exceeding duty cycle can damage the machine and greatly reduce its lifespan

Applications

This series of machines have many welding processes and can weld most of the metal materials, including carbon steel, stainless steel, aluminum and Al-Mg alloy, copper and alloy, etc.

Recommended areas of use as follows:

- Automobile and car manufacture industry
- Chemical structure and engineering
- Boiler pressure vessel manufacture
- Shipbuilding and offshore engineering
- Electric power construction
- Vehicle manufacturing
- Mechanical industry
- Other industries

Warning

DANGEROUS! WARNING!	<ul style="list-style-type: none"> ● Read the operating manual carefully before installation. ● Only qualified electricians may install and operate. 		
	<ul style="list-style-type: none"> ● ELECTRIC SHOCK can kill. ● Keep the welder and work place in good grounding. 		<ul style="list-style-type: none"> ● GASES AND FUMES can be dangerous & hazardous to your health ● Keep adequate ventilation, anti-dust and exhaust
	<ul style="list-style-type: none"> ● ARC RAYS, Spatter can injure eyes and skins. ● NOISE can cause permanent hearing loss. ● Wear protective clothing and welding shield with filter. 		<ul style="list-style-type: none"> ● FIRE, EXPLOSION can be caused by hot slag, spatter and sparks. ● Remove combustibles from working area. ● Provide fire watch as well as fire appliance in the working area.

Warning

2. Safety Instructions

Danger!



“**Danger**” indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Warning!



“**Warning!**” indicates a possible hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are explained in the text.

Caution!



“**Caution**” indicates a possible hazardous situation which, if not avoided, may result in slight or moderate injury.

Note!



“**Note!**” indicates a situation which implies a risk of impaired welding result and damage to the equipment.

Important!

“**Important!**” indicates practical tips and other useful special-message. It is no signal word for a harmful or dangerous situation.

Utilization for intended purpose only



- The machine may only be used for jobs as defined by the “Intended purpose”.
- Utilisation for any other purpose, or in any other manner, shall be deemed to be “not in accordance with the intended purpose”. The manufacturer shall not be liable for any damage resulting from such improper use.

Safety signs



- All the safety instructions and danger warnings on the machine must be kept in legible condition, not removed, not be covered, pasted or painted cover.

Safety inspection



- The owner/operator is obliged to perform safety inspection at regular intervals.
- The manufacturer also recommends every 3-6 months for regular maintenance of power sources.

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 MIG/MAG welding, the wire, drive rollers, wire feed housing and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.
- Do not touch live electrical parts of the welding circuit, electrodes and wires with your bare skin or wet clothing.

and body protection while performs the welding.

- Insulate yourself from work and ground using dry insulating protection which is large enough to prevent you full area of physical contact with the work or ground.
- Connect the primary input cable according to rules. Disconnect input power or stop machine before installing or maintenance.
- If welding must be performed under electrically hazardous conditions as follow: in damp locations or wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or in occasion when there is a high risk of unavoidable or accidental contact with the work piece or ground. Must use additional safety precautions: semiautomatic DC constant voltage (wire) welder, DC manual (Stick) welder and AC welder with reduced open-load voltage.
- Maintain the electrode holder, ground clamp, welding cable and welding machine in good, safe operating condition. Replace damaged part immediately.

Electric and magnetic fields (EMF) may be dangerous



- If electromagnetic interference is found to be occurring, the operator is obliged to examine any possible electromagnetic problems that may occur on equipment as follow:
 - minas, signal and data-transmission leads
 - IT and telecoms equipment
 - measurement and calibration devices
 - Wearers of pacemakers
- Measures for minimizing or preventing EMC problems:
 - Mains supplyIf electromagnetic interference still occurs, despite the fact that the mains connection in accordance with the regulations, take additional measures
 - Welding cables

Keep these as short as possible

Connect the work cable to the work piece as close as possible to the area being welded.

Lay tem well away from other cables.

Do not place your body between your electrode and work cables.

- Equipotential bonding
- Work piece grounding (earthing)
- Shielding

Shield the entire welding equipment and other equipment nearby.

ARC rays can burn.



- Visible and invisible rays can burn eyes and skin.
- Wear an approved welding helmet or suitable clothing made from durable flame-resistant material (leather, heavy cotton, or wool) to

protect your eyes and skin from arc rays and sparks when welding or watching.

- Use protective screens or barriers to protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or material.

Fumes and gases can be dangerous



- Welding may produce fumes and gases, breathing these fumes and gases can be hazardous to your health.
- When welding, keep your head out of the fume. If inside, ventilate the area at the arc to keep fumes and gases away from the breathing zone. If ventilation is not good, wear an approved air-supplied respirator.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator.
- Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

Welding and cutting sparks can cause fire or explosion.



- When not welding, make sure the electrode circuit is not touching the work or ground. Accidental contact can cause sparks, explosion, overheating, or fire. Make sure the area is safe before doing any welding.
- Welding and cutting on closed containers, such as tanks, drums, or containers, can cause them to blow up. Make sure proper steps have been taken.
- When pressure gas is used at the work site, special precautions are required to prevent hazardous situations.
- Connect work cable to the work as close to the welding zone as practical to prevent welding current from passing too long and creating fire hazards or overheat.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- Be attention that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas and start a fire. Remove fire hazardous from the welding area, if not possible, cover them thoroughly. Do not weld where flying sparks can strike flammable material and where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Protect yourself and others from flying sparks and hot metal. Remove any combustibles from operator before perform any welding.

**Cylinder can
explode if
damaged.**



- Keep a fire extinguisher readily available.
- Empty containers, tanks, drums, or pipes which have combustibles before perform welding.
- Apply correct fuses or circuit breakers. Do not Remove stick electrode from electrode holder or cut off welding wire at contact tip when not in use.
- Oversize or bypass them.

- Pressure 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.
- Cylinders should be located away from areas where they may be struck or subjected to physical damage. Use proper equipment, procedures, and sufficient number of persons to lift and move cylinders.
- Always install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling over or tipping.
- Keep a safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- No touching cylinder by welding electrode, electrode holder or any other electrically “hot” parts. Do not drape welding cables or welding torches over a gas cylinder.
- Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the process used; maintain them and associated parts in good condition.
- Use only compressed gas cylinders containing the correct shielding gas for the and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- Open the cylinder valve slowly and keep your head and face away from the cylinder valve outlet.
- Valve protection caps should be kept in place over valve expect when the cylinder is in use or connected for use.

**Hot parts can
burn**



- Do not touch hot parts with bare hand or skin.
- Ensure equipment is cooled down before perform any work.
- If touching hot parts is needed, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

**Flying metal
or dirt can
injure eyes**



- When welding, chipping, wire brushing, and grinding can cause sparks and flying metal. It can hurt your eyes.
- Remember wear appropriate safety glasses with side shields when in welding zone, even under your welding helmet.

Noise can damage hearing
Moving parts can injure



- Noise from some processes or equipment can damage hearing.
- Remember wear approved ear protection to protect ears if noise level is high.
- Stay away from moving parts such as fans.
- Stay away from pinch points such as drive rolls.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Have only qualified persons remove doors, panels, covers, or guards for servicing and maintenance.
- Reinstall doors, panels, covers, or guards when servicing and maintenance is finished and before reconnecting input power.

Overuse can cause overheating



- Use machine follow duty cycle. Reduce current or reduce duty cycle before starting to weld again.
- Allow cooling period.
- Do not block or filter airflow to unit.

Safety markings



Equipment with CE-markings fulfils the basic requirements of the Low-Voltage and Electromagnetic Compatibility Guideline (e.g. relevant product standards according to EN 60 974).

3. INSTALLATION AND COMMISSIONING OF AC/DC GTAW WELDING MACHINE



Warning! Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described here until you have read and completely understood “safety rules”.

❖ Utilization for intended purpose only

The power source may only be used for DC TIG , AC TIG , MMA , PULSE DC TIG , PULSE AC TIG welding . Utilization for other purposes, or in any other manner, shall be deemed to be "not in accordance with the intended purpose". The manufacturer shall not be liable for any damage resulting from such improper use. Operate, inspect and maintain should follow all the instructions given in this manual.

❖ Machine installation rules

Protection degree of this power source is IP23. However, the internal key components must be protected from direct soaking.



Warning! A machine that topples over or falls from its stand can cause injury. Place equipment on an even, firm floor in such a way that it stands firmly.

The venting duct is very important for safety protections. When choosing the machine location, make sure it is possible for the cooling air to freely enter and exit through the louvers on the front and back of machine. Any electro conductive metallic dust like drillings must not be allowed to get sucked into the machine.

❖ Power source connection

- The power source is designed to run on the voltage given on the nameplate.
- The mains cables and plugs must be mounted in accordance with the relevant technical standards.
- The power supply sockets that come with power source are designed to use strictly according to the marked voltages.

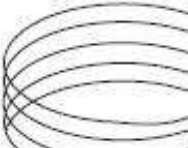
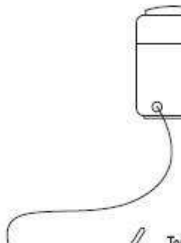
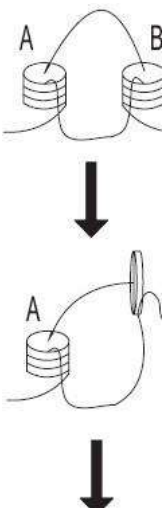


Note! Inadequately dimensioned electrical installations can lead to serious damage. The mains lead, and its fuse protection, must be dimensioned in accordance with the local power supply. The technical data shown on the nameplate shall apply.

❖ **Welding cables instruction**

When welding, please pay attention to the followings:

- The welding cables should be kept as short as possible;
- If extended cable is used, please do as shown in Fig. 3-4-1.

<p style="text-align: center;">Wrong</p> <p>Coil the excess ground cable and welding cable in same direction respectively.</p>	
<p style="text-align: center;">Correct</p> <p>Straighten the ground cable and welding cable and make them close to each other.</p> <p>Bundle the ground cable and welding cable together, running the wires close to the ground.</p>	
<p style="text-align: center;">Correct</p> <p>When the excess cables are only be used by rolling up, coil the cables to two windings in reverse direction and overlap them.</p> <p>The number of turns for A is same as the number for B.</p> <p>Handle the welding cable and ground cable according to above-mentioned method.</p>	

Welding cables instruction

❖ **Connecting to a mains electrical supply**

THIS MACHINE IS OF AN INDUSTRIAL SPECIFICATION AND MUST BE FITTED TO A MINIMUM of 16AMP 415V MAINS INPUT

❖ **Connecting to an Engine Driven Generator**

If connecting this machine to an engine driven generator please ensure the following

Minimum Generator KVA Output – 20 KVA continuous

Generator to be fitted with AVR (automatic voltage regulation)

DO NOT USE ON A GENERATOR WITHOUT AVR

Connecting to a generator without the above minimum requirements will in-validate your warranty.

Commissioning of AC/DC GTAW machine

❖ Back panel machine connections

❖ POWER SOURCE

1. On/Off Switch

2. **Mains input cable** : Fit required plug as per your electrical installation

3. **Gas Inlet : Input connector** Connect input gas hose ensuring connection is tight . Gas hose from Flow meter is connected here.

4. **Main chassis earth bolt** : If you experience interference you can fit extra earth to this point (Not normally used)

❖ Front panel machine connections

A:- Connections for TIG (GTAW) Welding

1. **Negative power connector** - Connect Tig Torch connector to power connector by inserting and twisting until tight

ENSURE TIG TORCH IS FITTED TO NEGATIVE CONNECTOR OTHERWISE YOU WILL EXPERIENCE TUNGSTEN BURNBACK

2. **Positive power connector +** Connect the earth lead to by inserting and twisting until tight and the earth clamp to work/bench
3. **Gas outlet - Quick release type** Connect the torch gas hose
4. **Torch control socket 7-Pin** Connect torch control plug
5. **FRONT PANEL** : All welding Process and Parameter are SET and Operate operated from this panel . Its Display will show all values. Details of each buttons and is use is elaborated in chapter 6
6. **Water Inlet:** Connect water hose from TIG torch : Water input to cool the TIG torch
7. **Water outlet:** Connect water hose from TIG torch : Water Output from the TIG torch
8. **Water Circulating Tank:** Tank with Water Inlet and Water outlet
9. **Input Supply cable for water tank:** To make Water Cooling unit ON

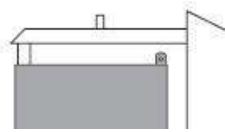
B:- Connections for STICK MMA (SMAW) Welding

1. **Negative power connector** - Connect the earth lead to by inserting and twisting until tight and the earth clamp to work/bench

2. **Positive power connector** +Connect the electrode holder by inserting and twisting until tight

All other front panel connectors are not used for MMA welding

• Gas cylinder installation



Gas cylinder installation

1. Stand the gas cylinder on the trolley and secure it by fixing the cylinder strap around a point in the top third of the cylinder-but never around the neck of the cylinder.
2. Take the protective cap off the gas cylinder.
3. Gently turn the gas-cylinder valve anticlockwise, and blow off any dust and dirt.
4. Screw the pressure regulator onto the gas cylinder and tighten it.
5. Connect the shielding-gas connector to the pressure regulator.

Note :-

- To avoid a High Frequency shock keep the Tig torch in good condition and replace if any of the insulation is damaged.
- Connect the gas input hose to gas regulator and use 'Gas Test ' Button to Set gas flow / pressure to 8-12 LPM. Make sure gas bottle is secured and properly mounted in trolley to avoid injury.

4. OPERATING INSTRUCTION

❖ **Welding in TIG mode – No Pulse – No remote foot pedal**

1. Connect the Tig Torch to machine, connect earth lead to machine & work piece.
2. Set to Tig mode pulse off
3. Select 2 or 4 way torch operation
4. Connect Argon gas and set flow to approx 8-12 LPM
5. Adjust welding amps to desired welding current
6. Press the Tig torch switch to start welding and release to finish

❖ **Welding in TIG mode –with Pulse – No remote foot pedal**

1. Connect the Tig Torch to machine, connect earth lead to machine & work piece.
2. Set to Tig mode pulse on
3. Select 2 or 4 way torch operation
4. Connect Argon gas and set flow to approx 8-12 LPM
5. Adjust Pulse freq. to desired setting (how often pulse happens)
6. Adjust base amperage %
7. Adjust pulse width to desired setting (how long pulse happens)
8. Adjust main current for maximum welding current
9. Press the Tig torch switch to start welding

The benefits of pulse welding is the ability to control the weld pool and amount of heat absorbed by work resulting in a smaller heat affected zone which results in fewer deformations and reduced chance of cracking. There are no set rules for pulse welding as this is down to personal choice by the welder.

❖ **Welding in TIG mode – with Remote amperage torch**

1. Connect the Tig Torch to machine, connect earth lead to machine & work piece.
2. Set to Tig mode pulse OFF or Tig mode pulse ON In welding with pulse in remote torch, the foot pedal controls peak main welding amperage.
3. Select 2T or 4T torch operation – Ensure the PEDAL (remote) LED is illuminated.
4. Connect Argon gas and set flow to approx 8-10 LPM
5. Adjust welding amps knob on machine to desired maximum welding current that remote torch will go to.
7. Press the torch switch to start welding. (on maximum it will go to maximum amps set on machine)

❖ **Welding in TIG mode – with Remote foot pedal**

1. Connect the Tig Torch to machine, connect earth lead to machine & work piece.
2. Connect remote foot pedal to machine
3. Set to Tig mode pulse off or Tig mode pulse on In welding with pulse in foot pedal, the foot pedal controls peak main welding amperage
4. Select 2 way torch operation - Foot pedal will not work in 4-WAY mode
5. Connect Argon gas and set flow to approx 8-12 LPM
6. Adjust peak current knob on machine to desired maximum welding current that foot pedal will go to.
7. Press the foot pedal to start welding.

Note: When welding with remote foot pedal Upon pressing of foot pedal welding arc will start, if you find it hard to start arc push pedal down a bit further to aid starting. Press pedal fully to start weld, upon weld pool formation you can release the pedal to decrease amperage to sustain perfect weld pool and increase again as required to sustain weld characteristics. The foot pedal adjusts from Start (min) current to maximum current as set on main current knob on front of machine.

Advantage of Remote current control on Torch switch : No need to vary current while starting as well as operating TIG welding only if welder need variation then only you need to adjust. Foot switch is needed always to press and foot pressing can not keep current at always the same level may vary as foot shakes during welding.

❖ **Tig tungsten size / amperage guide**

All values below are based on using pure argon shielding gas. Other current values may be employed depending on the shielding gas and application

ELECTRODE RATINGS			
Electrode Diameter (mm)	2% Thoriated on DC (amps) Red Tip – Grind to point	Pure Tungsten on DC (amps)	Zirconiated 0.8% Tungsten on AC (amps) White Tip – No need to grind
1.0mm / 0.040"	5 - 80	30	20 - 60
1.6mm / 1/16"	40- 150	80	40 - 100
2.4 mm/ 3/32"	140 - 250	130	80 - 180
3.2mm / 1/8"	240 - 400	180	160 - 250
4.0mm / 5/32"	380- 500	240	220 - 320
4.8mm / 3/16"	500- 750	300	280 - 390
6.4mm / 1/4"	750 - 1000	400	360 - 525

❖ **Welding in STICK MMA (SMAW) Mode**

1. Fit MMA electrode holder to + terminal on machine
2. Fit earth lead to - terminal on machine and to work piece
3. Select stick on front panel
4. Place electrode in holder
5. Select desired welding current with selector knob
6. Select desired MMA options, Arc Force, Hot start time and Amps
7. Strike arc and weld



ELECTRIC SHOCK CAN KILL

When machine is switched to MMA mode, output terminals are always live, take care and do not touch electrode and earth by person at same time, otherwise electric shock will occur.

The foot pedal has no affect on welding current in MMA mode and the gas flow and high frequency starting circuit is disabled.

NOTE:- Please refer to **Chapter 6 Front Panel** for selecting and setting all parameters For TIG/MMA welding.

5. COMPONENT DETAILS OF WELDING PLANT

Welding Plant components

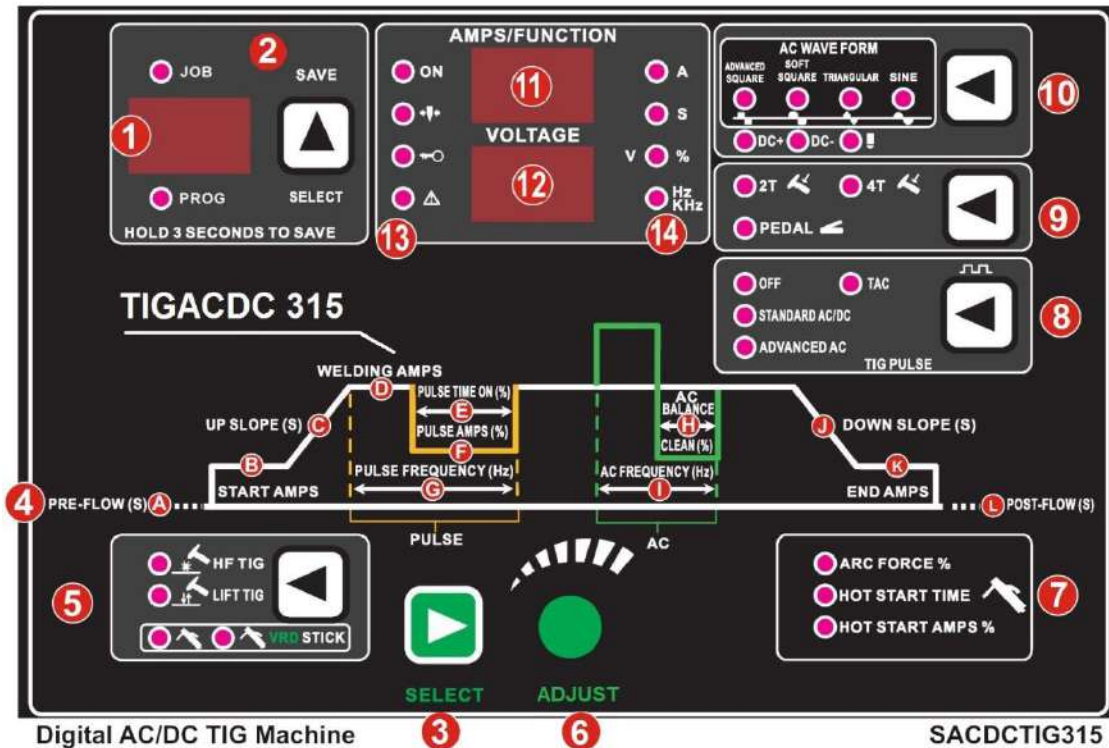
❖ AC/DC GTAW Welding Plant Includes

- Power source with Inbuilt Water cooling unit
- TIG Welding torch
- Argon gas regulator with flow meter and gas hose
- Welding cable with Electrode Holder
- Ground Earthling cable with Clamp
- Standard tool kit for operating plant

❖ Scope of supply by Consignee:

- Input Supply 3 PHASE , 340 to 460 VAC , 50 Hz
- Argon gas cylinder (Provided by consignee)
- Welding material (Electrode /wire)

6. WELDING PARAMETER SELECTION AND SETTING [FRONT PANEL]



1. Memory store function :

There are memory store programs to enable you to select required parameters for job in hand and then store to select channel. Press memory button until required program you wish to store is showing in LED Then enter parameters as required, now press and hold save button for 3 seconds and release, the green save LED will now light for about 2 seconds and then go out. The parameters have now been stored. The red select LED will then come back on, if you make any more adjustments these will not be save until you save again

2. **Save button:** to save the parameters on control panel

3. Select :

Parameter selector Button : Press this button to scroll from left (A) to right (L) to select the machine parameters an adjust the value of the same within 2 seconds or you have to repeat the procedured again as LED will move to its initial (D) position.

4. Parameter Sequence : From A to L as explained below :

A. Pre-flow gas : Adjustable from 0 - 25 seconds, this enables the backed up gas pressure to be released from torch before actual arc is started. Common settings for most application is about .3 to .5 seconds - If welding stainless steel etc sometimes a longer pre-flow is required.

B. Start Amperage : This allows you to set the initial start current from 5A DC and 10A AC. In 4T mode when trigger is pressed and held you will remain at start amps, when you let go machine will then go to main set amps. Do not set the start amperage too low for tungsten size otherwise you may experience sluggish / non arc starting. I.E A 3.2mm tungsten is for high range 160+ amps welding, so you would not need to set start amps at 5. The thicker the tungsten used the higher the start amperage has to be. We recommend to achieve faster arc starting:-1.0mm Tungsten - 5 Amps minimum
1.6mm Tungsten - 15-20 Amps minimum
2.4mm Tungsten - 40 Amps minimum
3.2mm Tungsten - 60 Amps minimum
Note:

C. Up-Slope : Adjustable from 0 - 25 seconds, This allows you to gradually increase the amperage from start amps to main amps when using torch trigger operation.

D. Welding Amps : Main current control : This adjusts the main welding current and is shown in L.E.D when welding is in process. Welding range AC is 5A to 300A
Welding range DC is 3A to 300A

E. Pulse Time ON (%) : Pulse width When pulse welding you have the main (peak) amperage and base (background) amperage set. By adjusting the width you determine which will be more prominent, the pulse or the base. This is adjustable from 5-95%. At a low % the base current will be on long so you will reduce heat input. At a high % the pulse current will be more prominent so you will get increased heat input..

F. Pulse Amps (%) : This sets the base amperage as a % of main amps set. I.E if mains amperage is 120A and you set to 50%, base amps will be 60A.

G. Pulse Frequency (Hz) Adjustment :This can be adjusted as follows: DC Mode 0.1 to 500Hz
AC Advanced Squarewave 0.1 - 250Hz
AC Soft Square, Triangular and Sinewave 0.1 - 10Hz
Advanced AC Pulse 0.1 - 10Hz

H. AC Balance This sets the % of electrode positive used during AC welding to provide a cleaning action as alloys have a oxide layer that has a higher melting temperature than the base metal and this needs to be lifted off. So you can control the amount of cleaning or penetration. Too much cleaning will cause the tungsten to wobble and split, Too little cleaning can result in a dirty dull weld. So as you increase the % the more cleaning will happen however less penetration will be achieved. For most situations a setting of 30 - 40% will give you a good clean weld finish, If you go above 50% you will find the tungsten will overheat and the end can fall of into weld pool. If you find you are getting tungsten wobble using 30-40% balance then you may need to go up a tungsten size.

I. AC Frequency Transformer based welders are normally fixed at 60Hz, due to the advanced inverter technology you can adjust from 20 - 250Hz. The higher the AC frequency the narrower the arc becomes allowing you to have a more precise weld bead and penetration. This can also quicken up travel speed and ideal for production welding. You will hear the pitch of the weld noise get higher, this is normal. Welding at lower frequency will give reduced control of arc and a wider weld pool.

J. Down-Slope Adjustable from 0 - 25 seconds, This allows you to gradually decrease the amperage from main amps to end/final amps when using torch trigger operation.

K. End Amperage This allows you to set the end current from 5A DC and 10A AC. In 4T mode when trigger is pressed and held the second time you will remain at end amps, when you let go machine will then stop welding.

L. Post Flow Gas Adjustable from 0 - 50 seconds. When you stop welding the gas will continue to flow for this set amount of time, this allows the tungsten to cool without getting contaminated and also protect the weld bead until it has cooled slightly. For up to 100 amps use about 8 seconds, for 100 - 150 use 12 seconds and 150-320 use 15 seconds.

5. Process selector :-

A) HF Tig - For automatic arc starting (normal setting for AC & DC Tig Welding)

B) Lift Tig - If welding near sensitive electronic devices (car ECU etc) DC Only Stick - NON VRD - Normal 70v OCV is present before welding happens Stick - VRD (Voltage reduction device). The OCV is reduced to below 20V (+/- 3v) for added safety. Once the electrode touches work piece the arc is established and weld carries on as normal. However when using VRD sometimes it can be harder to strike the arc and you may need to scratch the electrode on work a bit more, even more so with rusty / dirty metals. When welding with VRD you may notice a slight delay in the initial striking, this is normal.

C) STICK WELDING : ARC welding Process is Selected . Adjust all Arc welding parameter after selecting this function. OCV is same as of Power source.

D) STICK WITH VRD : Same procedure of ARC (Stick) Welding with Advance feature VRD : Voltage Reduction Device ,This eliminates the risk of Shock due to High OCV.

6. Parameter adjustment Knob : Turn this knob to adjust parameter values, if you hold the knob in and turn it increase adjustment speed.

7. (a) MMA Arc Force control This controls the arc response to when electrode is held close/away from work piece. Arc force automatically adjusts by changing the volts / amps to maintain a stable arc. This is represented as a % of available arc force amperage

7.(b) MMA Hot Start time Adjusts the time from 0 - 2 seconds that the hot start will happen at beginning of weld. This helps to reduce electrode sticking to work.

7.(c) MMA Hot Amps % For controlling the amount of extra amps when the arc is first started and prevents the electrode sticking to work. Adjustable from 0 - 100% of hot start amps available.

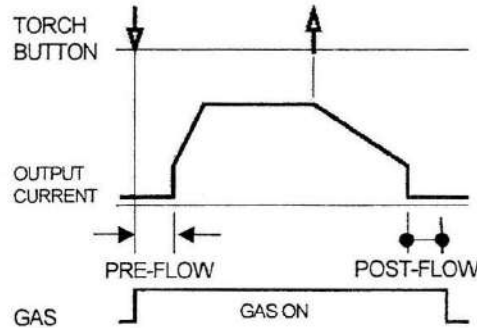
8. Tig Pulse mode selector This machine has two pulse modes.

Standard pulse works in both AC and DC modes

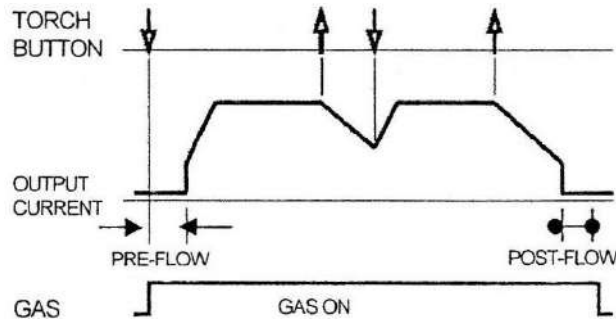
Advanced AC pulse works only in AC mode

Pulse is used to help control the amount of heat going into work piece and commonly used on stainless steels and alloys. In standard mode AC, both the pulse peak and base amperage are AC In standard mode DC, both the pulse and base amperage are DC In advanced AC pulse mode, the machine pulses between AC and DC- and is ideal to control the heat input on thin alloys.

9. 2T/4T, remote foot pedal and torch amp control selector: 2/4 Step trigger mode switch – Tig welding can either be done in 2 or 4 step mode. When the trigger mode is in the 2 step position the following sequence will occur

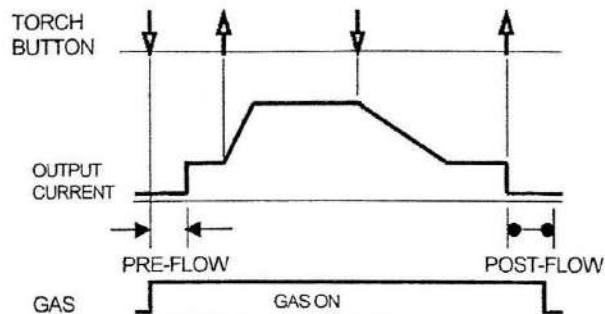


Press and hold the Tig torch switch to start sequence. The machine will open gas valve to start flow of shield gas, after the set pre-flow time to purge air from torch hose the welding output of machine will be turned on and the arc will be started. After the arc is started the output current will increase from the start (min) current to base (main) current in time selected by slope-up. Release the Tig torch switch to end sequence. The machine will now decrease output to finish (min) current in time set by slope-down, once at finish (min) current the machine will stop output and the gas valve will continue to operate for the selected time (post flow) Possible variations of this standard sequence are shown in diagram below. It is possible to press and hold Tig torch switch a second time during down slope time to restart. After the switch is pressed the output current will raise to base (main) current



When the trigger mode is in the 4 step position the following sequence will occur

4 STEP DIAGRAM 1



Press and hold the Tig torch switch to start sequence. The machine will open gas valve to start flow of shield gas, after preset gas pre-flow time to flow time to purge air from torch hose the welding output of machine will be turned on and the arc will be started at start (min) current This condition can be maintained as long as required. Release the Tig torch switch to go to step 2, the machine will now increase output to peak (main) current in time set by slope-up. Press and hold the Tig torch switch when main weld is complete. The machine will now decrease the welding output current to finish (min) in down-slope time set. Once at finish (min) output you can release the Tig torch switch to end weld the gas post-flow will continue to run for set time. Foot pedal operation When using a foot pedal you can adjust the amperage while you are welding by pressing the pedal, the more you press the more amps you will achieve. The foot pedal at maximum depression will go to the amperage set in LED before welding. I.E set the welding amps to 120A and when pedal is fully depressed you will achieve 120Amps. Foot pedal can't be used with 4T operation, ensure 2T operation is set. Remote amperage torch, When using a remote amperage torch you can adjust the amperage while you are welding by using your thumb to adjust knob on torch handle. This does take some getting used to but is handy when you are welding in a position where a foot pedal is not use-able. You can use a remote amperage torch in 2T or 4T mode, most common is 4T as you press trigger to start weld and then release you can then use thumb/finger for torch switch to adjust amperage knob, once weld has finished press the torch switch again to finish weld.

10. AC Waveform / DC selector The machine features AC and DC operation, it also has 4 x AC waveforms allowing very specialised welding to be carried out. Advanced Squarewave is the default mode and offers excellent arc control. Soft square and Sinewave are similar to older transformer style welders. Soft square gives a smooth buttery feel and maintains good control of the arc Sinewave gives a softer arc with less control. Triangular wave is designed for rapid wet in and high travel speed and a rapid freeze of weld puddle.

11. AMP/FUNCTION : Display It displays Welding parameter values as well as Nominal , Actual , Hold values of Welding Current

12. VOLTAGE : Display It displays Welding parameter values as well as Nominal , Actual , Hold values of Welding Voltage

13. LED Data indicator : Warning On This also includes a self diagnosing function which shows an error code if case of machine problem.

14. LED Data indicator This single display shows the data always accompanied by a corresponding LED light which indicates what value is being represented. Amps Seconds Percent % Hertz

7. MAINTENANCE

❖ CARE AND MAINTENANCE

● Before open the machine



Warning! An electric shock can be fatal. Before doing any work on the machine:

- Switch it off and unplug it from the mains
- Put up a clearly legible and easy-to-understand warning sign to stop anybody in advertently switching it on again
- Check to make sure the electrically charged components (e.g. capacitors) have been discharged.
- Bolts in machine case also work for ground connection. Never use other bolt that cannot work for ground connection.

❖ Maintenance

Please follow the instructions as below to ensure normal lifespan of power source.

- Conduct safety check at regular intervals (see “Safety rules”)
- Dismantle machine side panels and clean machine inside with clean and low-pressure compressed air by professional technician, not less than twice per year. Clean the components at a certain distance only;
- If a lot of dust has accumulated, clean the cooling-air ducts.

❖ Maintenance of water-cooled welding torch

For water-cooled welding torch:

- Check the connections of water cooling system
- Check the coolant level and cleanliness(clean coolant only)
- Frequently check coolant’s backflow state

❖ Daily maintenance

			Disconnect main power before maintenance
3 months			
6 months	Blow or suck inner part, and clean every month when working in harsh environmental conditions		
		OR	

❖ Routine and periodic maintenance



WARNING!

ELECTRIC SHOCK CAN KILL

Turn the input power OFF at the mains switch & fuse box before working on this equipment.

Have a qualified electrician install & service this equipment.

Allow machine to sit for 5 minutes minimum to allow the power capacitors to discharge before working inside this equipment.

Do not touch electrically live parts

1. Periodically remove the side/top panels of machine and clean out machine with a low pressure dry air line paying particular attention to PC Boards, Fan blades, HF points
2. Inspect input and output cables & hoses for fraying, cuts & bare spots
3. Keep tig torch and cables in good condition
4. Clean air vents to ensure proper air flow and cooling
5. The fan motor has sealed bearings which requires no maintenance

❖ Troubleshooting

Service & repair should only be performed by trained personnel who has knowledge of internal . Unauthorised repairs performed on this welding equipment may result in danger or injury to the technician and machine operator and will invalidate your warranty. For your safety and to avoid electric shock, please observe all safety notes and precautions detailed throughout this manual

The troubleshooting guide is provided to help you locate possible machine malfunctions

If fault / problem is not solved please send complaint to our company

Details of our address , phone numbers and E mail id are given in front page of this manual.

Tig welding problems

- **No output - Power light is not lit** Check machine on/off switch is in the 'on' position Check Input power to machine Check plug wiring Check mains trip /fuses
- **No output - Fan runs - Power light is lit** Check torch connections are secure and torch switch operation, try replacing tig torch. If you have a multi-meter check continuity between pins 1 and 2 on torch switch plug when pressing torch switch
- **No output - Power light is lit - Warning light is lit** Welding application may have exceeded recommended duty cycle, allow machine to cool down until the warning light goes out.
- **No output – Power light is lit – Gas at torch end when trigger pressed** Check torch condition – possible break in torch power cable – replace torch

- **Machine keeps overheating - Warning light is lit on machine** Check if fan is running – if not contact R-Tech for repair Check the cooling vents for obstruction, blow out machine with clean dry low pressure air supply. Check for adequate ventilation around machine
- **Porosity in weld – No / low gas at torch tip** Check gas supply from gas bottle Check flow rate on regulator Check gas hose for restrictions Check for draughts in local area, open doors etc Replace tig torch – may have gas restriction
- **Poor weld penetration** Check condition of earth lead and clamp and ensure clamp is connection via a clean area on work piece Check condition of tig torch, try other tig torch

Machine stuck on minimum amps when welding although higher amperage has been set

Make sure machine has not been set to 4-way operation as when in this mode when you press torch switch you get minimum amps and when you let go of switch machine will go to maximum amps set.

- **When using foot pedal machine is stuck on minimum amps** Make sure 2/4 way selector is in 2 way position, the remote foot pedal will not work in the 4-way position, this is for torch switch operation only or remote amperage control torch.
- **Arc ‘Flutters’ when TIG welding** 1. Tungsten electrode may be too large in diameter for the current setting. 2. Tungsten not sharp when in DC mode 3. Gas shielding flow may be low or high, check gas flow , reduce tungsten stick out beyond ceramic 4. Check for leaks in torch & gas hoses
- **Black areas along weld bead** 1. Clean any oily or organic contamination from the work piece 2 Tungsten electrode contaminated. Replace or sharpen 3 Check for leaks or contamination on gas hoses & connections. 4 Gas flow may be insufficient, Increase gas flow, reduce tungsten stick out from ceramic
- **Weak HF – Poor arc striking – welding output normal** 1 Check torch and earth connections – is torch cable insulation in good condition. 2 Check for leaks or contamination on gas hoses & connections. 3 Gas flow may be insufficient, increase gas flow, reduce tungsten stick out from ceramic 4 Keep output cables short as possible
- **HF spark is present at the tungsten electrode but unable to start welding arc, Machine has normal welding output** 1 Tungsten may be contaminated - replace or sharpen 2 The current may be set too low 3 Tungsten may be too large for process 4 Gas flow may be insufficient, increase gas flow, reduce tungsten stick out from ceramic

No HF when torch trigger pressed, no blue spark between HF points Examine and clean HF points with clean dry low pressure air line HF PCB faulty – Contact R-Tech for repair

MMA Stick welding problems

- **Stick electrode 'blasts off' when arc is struck** Welding current set to high, reduce amperage or use thicker electrode Contaminated electrodes or material
- **Electrode sticks in weld puddle** Welding current is set too low Arc is too short, keep electrode further away from work
- **Excessive splatter** Too long an arc, keep electrode closer to work
- **Poor penetration** Travel speed too fast Too much welding current, reduce welding amperage
- **Porosity in weld** Electrodes are damp Arc too long, get electrode closer to work

8. TROUBLE SHOOTING

❖ Troubleshooting

Service & repair should only be performed by trained personnel who has knowledge of internal . Unauthorised repairs performed on this welding equipment may result in danger or injury to the technician and machine operator and will invalidate your warranty. For your safety and to avoid electric shock, please observe all safety notes and precautions detailed throughout this manual

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❖ Tig welding problems

- **No output - Power light is not lit** Check machine on/off switch is in the 'on' position Check Input power to machine Check plug wiring Check mains trip /fuses
- **No output - Fan runs - Power light is lit** Check torch connections are secure and torch switch operation, try replacing tig torch. If you have a multi-meter check continuity between pins 1 and 2 on torch switch plug when pressing torch switch
- **No output - Power light is lit - Warning light is lit** Welding application may have exceeded recommended duty cycle, allow machine to cool down until the warning light goes out.
- **No output – Power light is lit – Gas at torch end when trigger pressed** Check torch condition – possible break in torch power cable – replace torch
- **Machine keeps overheating - Warning light is lit on machine** Check if fan is running – if not contact R-Tech for repair Check the cooling vents for obstruction, blow out machine with clean dry low pressure air supply. Check for adequate ventilation around machine

- **Porosity in weld – No / low gas at torch tip** Check gas supply from gas bottle Check flow rate on regulator Check gas hose for restrictions Check for draughts in local area, open doors etc Replace tig torch – may have gas restriction
- **Poor weld penetration** Check condition of earth lead and clamp and ensure clamp is connection via a clean area on work piece Check condition of tig torch, try other tig torch

Machine stuck on minimum amps when welding although higher amperage has been set

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- **When using hand pedal machine is stuck on minimum amps** Make sure 2/4 way selector is in 2 way position, the remote hand pedal will not work in the 4-way position, this is for torch switch operation only or remote amperage control torch.
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- **Black areas along weld bead** 1. Clean any oily or organic contamination from the work piece 2 Tungsten electrode contaminated. Replace or sharpen 3 Check for leaks or contamination on gas hoses & connections. 4 Gas flow may be insufficient, Increase gas flow, reduce tungsten stick out from ceramic
- **Weak HF – Poor arc striking – welding output normal** 1 Check torch and earth connections – is torch cable insulation in good condition. 2 Check for leaks or contamination on gas hoses & connections. 3 Gas flow may be insufficient, increase gas flow, reduce tungsten stick out from ceramic 4 Keep output cables short as possible
- **HF spark is present at the tungsten electrode but unable to start welding arc, Machine has normal welding output** 1 Tungsten may be contaminated - replace or sharpen 2 The current may be set too low 3 Tungsten may be to large for process 4 Gas flow may be insufficient, increase gas flow, reduce tungsten stick out from ceramic

No HF when torch trigger pressed, no blue spark between HF points Examine and clean HF points with clean dry low pressure air line HF PCB faulty – Contact R-Tech for repair

❖ **MMA Stick welding problems**

- **Stick electrode ‘blasts off’ when arc is struck** Welding current set to high, reduce amperage or use thicker electrode Contaminated electrodes or material
- **Electrode sticks in weld puddle** Welding current is set too low Arc is too short, keep electrode further away from work
- **Excessive splatter** Too long an arc, keep electrode closer to work

- **Poor penetration** Travel speed too fast Too much welding current, reduce welding amperage
- **Porosity in weld** Electrodes are damp Arc too long, get electrode closer to work



Warning! An electric shock can be fatal. Before doing any work on the machine:

- Switch it off and unplug it from the mains
- Put up a clearly legible and easy-to-understand warning sign to stop anybody inadvertently switching it on again
- Check to make sure the electrically charged components (e.g. capacitors) have been discharged.
- Bolts in machine case also work for ground connection. Never use other bolt that can not work for ground connection.

❖ **Error code display**


This series of machines have automatic protection and error code display function. Relevant Cause & Remedy can be found according to below Error codes,

Error code	Trouble	Cause	Remedy
E01	Over-heat protection	The welding machine is over heat; or Temperature Relay fault	Shut down the welding machine and wait for cooling; or replace Temperature Relay
E02	Over-current protection	Short circuit of Output; Current Sensor fault	Check output cable and replace Current Sensor
E04	Water-cooling is abnormal	No circulating water in water cooling system	Check water flow and repair
E05	Torch fault when turn on the machine	The torch trigger may be short , No current output after pressing torch trigger for more then 2s	Turn off the machine, reset or release the torch trigger

Displayed error code

Important! If any error message that is not described here appears on the displays, then the fault is one that can only be put right by a service technical. Make a note of the error message shown in the display, and the serial number and configuration of the power source, and get in touch with our after-sale service, giving them a detailed description of the error.

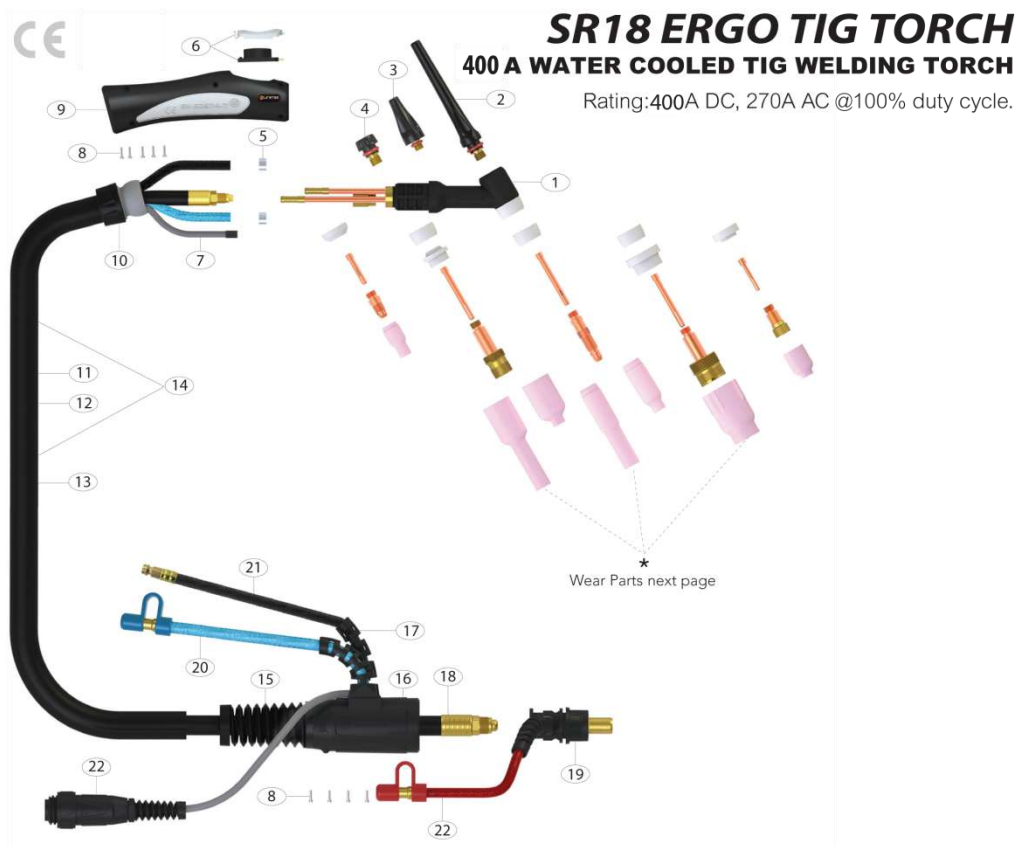
❖ **Power source trouble shooting CHART**

 **Note!** The flowing troubles and causes are uncertain. However, during the process of MIG Pulse and the normal using conditions, that might happen.

Trouble	Remedy
Power source cannot work NO LED Glow	<ul style="list-style-type: none"> • Check the mains supply lead, make sure that the mains plug is plugged in

	<ul style="list-style-type: none"> • Check whether the switch is ON • Check the fuse and breaker • Check whether the ground cable is connected
Dirty welding face, poor welding seam	<ul style="list-style-type: none"> • Check whether shielding gas is provided • Check and set shielding gas flow • Check whether shielding gas is correct • Check whether polarity of welding torch is correct
Unstable welding performance	<ul style="list-style-type: none"> • Check whether Power source is correctly set to operate as per mode selected • Check whether the welding torch is too hot or GAS flow not proper • Check whether the cables and ground cable are firmly connected • Check whether the setting parameters are correct • Check Tungsten rods selected is Proper
Fan Not working	<ul style="list-style-type: none"> • Check the mains supply lead of Fan , make sure that the mains is connected • Check Fan is JAM due to dust , clean it ,if still not OK replace it
Machine Showing Error code	<ul style="list-style-type: none"> • Check Code number and then rectify it as per problem mentioned in code list
Welding current can not be regulated	<ul style="list-style-type: none"> • Check Potentiometer on torch is ok , also check its wiring • Check parameter is properly selected or locked • Check Potentiometer and its knob of the Power source
TIG flame not proper and Tungsten rod s burning	<ul style="list-style-type: none"> • Check Argon Gas flow
Welding not proper and spatter	<ul style="list-style-type: none"> • Check whether the setting parameters are correct • Check the setting of arc force • Check the length of the cables • Check the type and flow rate of the shielding gas • Check whether welding cable is correctly connected • Check the filing metal • Check whether fault in 3 phase or low Input supply voltage

9. TIG WELDING TORCH DETAILS





Torch Model	Part Number
SR18 Pro-Grip Lite Tig Torch Package c/w QF Gas Connect	SR-18-13FTCP50

Spare Parts		Part Number	Description		
1	WP18	Torch Body Standard	14	UERCO200-40	Sheath X 12.5ft Inc Leather Cover
	SG18FX	Torch Body Flexible	15	UERCO200-80	Sheath X 25ft Inc Leather Cover
2	57Y02	Back Cap Long	16	USLH26-S	Cable Support Large
3	57Y03	Back Cap Medium	17	USLH26-H	"Surelok TM" Housing Large
4	57Y04	Back Cap Short	18	USLH1820-C	"SurelokTM" Housing Support
5	UB5041	Water Hose Clamp 8.7mm / 0.3442"	19	USL40V64AR	Power Cable X 12.5ft "Surelok TM" Rubber
6	UER1MS	Momentary Kit	20	USL41V29AR	Power Cable X 25ft "Surelok TM" Rubber
7	UERSWL4	Trigger Lead 12.5ft	21	USL3550	"SurelokTM" Body & Support
8	UERSWL8	Trigger Lead 25ft	22	*U45V07OB-SL-#	Water Feed Hose X 12.5ft Rubber
9	UERSP1	Screw Pack	23	*U45V08OB-SL-#	Water Feed Hose X 25ft Rubber
10	UERH200	Large Ergo Tig Handle		*U45V09OB-#	Gas Supply Hose X 12.5ft Rubber
11	UERKJ200	Large Knuckle Joint		*U45V10OB-#	Gas Supply Hose X 25ft Rubber
12	UERLC200-08	Leather Cover X 0.8mt UERJK200		*USL-1-#	Water Return Hose
13	UERJK200	Jointing Repair Kit UERNCL-32			
	UERNCL-32	Neoprene Cover X 3.2mt / 10ft			
	UERNCL-72	Neoprene Cover X 7.2mt / 23ft			


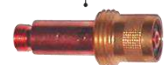

* NOTE: # = WF3 C/W Quick Fit

SR18 ERGO TIG TORCH

Standard Front End Parts

Part #	Description	Part #	Description	Part #	Description
18CG	Cup Gasket	10N30	Collet Body 1.0mm / 0.040"	10N49L	Long Alumina Nozzle Ø 8mm / (5/16) #5L
		10N31	Collet Body 1.6mm / (1/16)	53N48L	Long Alumina Nozzle Ø 10mm / (25/64)#6L
		10N32	Collet Body 2.4mm / (3/32)	53N47L	Long Alumina Nozzle Ø 11mm / (7/16) #7L
		10N28	Collet Body 3.2mm / (1/8)		
					
		10N22	Collet 1.0mm / 0.040"	10N50	Alumina Nozzle Ø 6mm / (15/64) #4
		10N23	Collet 1.6mm / (1/16)	10N49	Alumina Nozzle Ø 8mm / (5/16) #5
		10N24	Collet 2.4mm / (3/32)	10N48	Alumina Nozzle Ø 10mm / (25/64) #6
		10N25	Collet 3.2mm / (1/8)	10N47	Alumina Nozzle Ø 11mm / (7/16) #7
				10N46	Alumina Nozzle Ø 13mm / (33/64) #8
				10N45	Alumina Nozzle Ø 16mm / (5/8) #10
				10N44	Alumina Nozzle Ø 19mm / (3/4) #12

Compact Gas Lens Front End Parts

Part #	Description	Part #	Description	Part #	Description
54N01	Gas Lens Gasket	45V25	Gas Lens Body 1.6mm / (1/16)	54N14	Gas lens ceramic 8.0mm / (5/16)
		45V26	Gas Lens Body 2.4mm / (3/32)	54N15	Gas lens ceramic 7.0mm / (9/32)
		45V27	Gas Lens Body 3.2mm / (1/8)	54N17	Gas lens ceramic 5.0mm / (13/64)
					

TR0004-16



RED
ANSI/AWS A5.12-98
ISO 6848 WT20

2% Thoriated: Best stability at medium currents, good arc starts, medium tendency to spit, medium erosion rate. Commonly used for steel and stainless steel applications

1/16 x 7" (1.6mm x 175mm)
3/32 x 7" (2.4mm x 175mm)
1/8 x 7" (3.2mm x 175mm)

Part #	Description
TR0004-10	1.0mm x 175mm / 0.040" x 6 57/64" thoriated tungsten electrode 2%
TR0004-16	1.6mm x 175mm / (1/16) x 6 57/64" thoriated tungsten electrode 2%
TR0004-24	2.4mm x 175mm / (3/32) x 6 57/64" thoriated tungsten electrode 2%
TR0004-32	3.2mm x 175mm / (1/8) x 6 57/64" thoriated tungsten electrode 2%

TR0006-16



WHITE
ANSI/AWS A5.12 M-98
ISO 6848 WZ8

.8% Zirconiated: Balls well, handles higher current with less spitting, better arc starts and arc stability than pure tungsten. Commonly used for aluminium applications


1/16 x 7" (1.6mm x 175mm)
3/32 x 7" (2.4mm x 175mm)
1/8 x 7" (3.2mm x 175mm)

Part #	Description
TR0006-10	1.0mm x 175mm / 0.040" x 6 57/64" zirconiated tungsten electrode 1%
TR0006-16	1.6mm x 175mm / (1/16) x 6 57/64" zirconiated tungsten electrode 1%
TR0006-24	2.4mm x 175mm / (3/32) x 6 57/64" zirconiated tungsten electrode 1%
TR0006-32	3.2mm x 175mm / (1/8) x 6 57/64" zirconiated tungsten electrode 1%

10. ARGON FLOWMETER REGULATOR DETAILS

IS 6901 / ISO 2503
CML:3968994
Class-I & III

COMPRESSED GAS REGULATORS



OPTIONAL

GAS SERVICE
ACETYLENE • HYDROGEN • CARBONDIOXIDE • AIR
ARGON • HELIUM • NITROGEN • OXYGEN
OTHER NON CORROSIVE

THESE GENERAL PURPOSE REGULATORS ARE RECOMMENDED FOR INERT AND NON-CORROSIVE GAS APPLICATIONS WHERE PRECISE CONTROL OF DELIVERY PRESSURE IS NOT NECESSARY. THEY ARE WELL SUITED. WHERE CONSTANT DELIVERY PRESSURE REGARDLESS OF FLUCTUATIONS IN CYLINDER PRESSURE ARE REQUIRED.

REGULATOR FEATURE

- ❑ DESIGNED FOR EASY MAINTAINANCE.
- ❑ NO METAL TO METAL SEAT IN NOZZLE FOR EASY OPENING & CLOSING.
- ❑ ALL COMPONENT MACHINED ON CNC MACHINE.
- ❑ ALL COMPONENTS ARE ULTRASONICALLY CLEANED, ALSO POLISHING & DEBURRING IN FINISHING MACHINE.
- ❑ WEATED AREA SPRING & POPPET (PIN) MADE FROM STAINLESS STEEL TO AVAODE RUSTING.
- ❑ PRESSURE KEY MADE FROM STAINLESS STEEL & ROLL THREADED TO AVAODE WORNOUT BONNET THREAD.
- ❑ GAS FILTRATION WITH STAINLESS STEEL WIREMESH TWICE FROM INLET TO RESTRICT DUST PARTICLE TO ENTER.

MATERIALS OF CONSTRUCTION

- BODY FORGED BRASS
- BONET AL. PRES. DIE CAST / FORGED BRASS
- DIAPHRAGM REINFORCED NEOPRENE
- NOZZLE BRASS
- SEAT PTFE
- FILTER STAINLESS STEEL WIRE MESH
- SEAT RETURN SPRING STAINLESS STEEL
- BONNET SPRING SPRING STEEL PLATED
- ADJUSTING KNOB ABS WITH STAINLESS STEEL SCREW

TECHNICAL DATA SHEET

GAS SERVICE	MODEL	CYLINDER*		DELIVERY		CONNECTIONS*	
		PRESSURE BAR	GAUGE RANGE BAR	PRESSURE BAR	GAUGE RANGE BAR	INLET	OUTLET
ARGON	MAR 035 CDSF	150	0 - 300	0 - 4	0 - 7	G 3/4 RH FEMALE	G 3/8 RH MALE
CARBON DIOXIDE	MCD 035 CDSF	80	0 - 300	0 - 4	0 - 7	W 21.8 X 14 RH FEMALE	G 3/8 RH MALE
HELIUM	MHE 035 CDSF	150	0 - 300	0 - 4	0 - 7	G 3/4 RH FEMALE	G 3/8 RH MALE
HYDROGEN	MHY 035 CDSF	150	0 - 300	0 - 4	0 - 7	G 5/8 LH MALE	G 3/8 LH MALE
NITROGEN	MNI 035 CDSF	150	0 - 300	0 - 4	0 - 7	G 3/4 RH FEMALE	G 3/8 RH MALE
OXYGEN	MOX 035 CDSF	150	0 - 300	0 - 4	0 - 7	G 5/8 RH MALE	G 3/8 RH MALE

* ALSO AS PER CUSTOMER REQUIREMENT • + AVAILABLE GAUGE RANGE 400 BAR FOR PRESSURE 200 BAR

INLET - IS 3224 : 2002 OUTLET - ISO/TR 70470 : 1988

1 bar	=	14.504 psi	=	1.0197 kgf/cm2
1 psi	=	0.06894 bar	=	0.07031 kgf/cm2
1 kgf / cm2	=	14.223 psi	=	0.98068 bar

APPLICATION	
★ BRAZING	★ CHROMATOGRAPHY
★ CUTTING	★ HEATING
★ PROCESS CONTROL	★ PURGING
★ WELDING	★ RESEARCH LAB.

'MF' SERIES SPECIFICATIONS

MAXIMUM INLET	4000 PSIG
OUTLET RANGES	0-4.0 BAR
OUTLET	AS PER BIS
BODY PORT	1/4 NPT F

11. WATER COOLING UNIT DETAILS

INTRODUCTION

Before using the equipment please read the instructions in this manual carefully. To obtain the optimum performance and product life you must carefully follow the instructions for use and maintenance detailed in this manual. Any maintenance or repairs should be carried out by a suitably qualified person. Always use the correct spare parts when completing any repairs

DESCRIPTION

This Water Cooler is designed for cooling torches for welding applications by means of water re-circulation via a closed system.

The system comprises the following main parts:

- Water Circulating Motor pump (Heavy Duty for long life)
- Coolant Tank

FRONT VIEW

TECHNICAL DATA

INPUT

230 VAC from front panel of Machine

Some of the key features of the unit are:

- Corrosion free
- No priming required
- Quick fill and drain

Low and easy maintenance

INSTALLATION

The Equipment is Inbuilt with Power source. The equipment is designed for use in industrial environments

The equipment is powered from a suitable power socket. Connect the outlet of the cooler unit to the inlet of the welding unit. Connect the inlet of the cooler unit to the outlet of the welding unit.

IMPORTANT—The unit should be switched on at all times during welding to prevent damage to torches and cables

Ensure the unit is filled with water and checked once the cables and hoses have been filled before the start of the machine.

MAINTENANCE

WARNING: - BEFORE CARRYING OUT ANY INTERNAL INSPECTION DISCONNECT THE UNIT FROM THE MAINS SUPPLY AND FROM POWER SOURCE

- Periodically check the level of the cooling fluid
- Add fluid when the level drops below the minimum level indicator
- Add anti-freeze when the room temperature is below 20°C
- Make sure all the joints are tight and there are no leaks
- Periodically clean the radiator with clean dry air to eliminate blockages that may affect efficiency

IMPORTANT: - Always use original spare parts which have been specially designed for this equipment.

The use of alternate parts may affect the performance of the unit

- After long periods of not being used ensure the water is circulating freely through the system
- The pump may be damaged if run without sufficient coolant
- Ensure the unit is connected to a suitable mains supply
- The motor will not run if the mains voltage is too low, the start capacitor is defective, OR the motor is defective OR the motor has not been used for a period of time. This may be corrected by pumping compressed air into the water inlet or outlet connection for 20 seconds.

12. TECHNICAL SPECIFICATION OF MACHINE

AC/DC GTAW WELDING MACHINE

AC/DC GTAW WELDING SET COMPLETE 600 AMPS.

(with water cooled torch 300 A, Argon regulator, Gas hose, with Water Cooling Unit and Power Source)

TYPE : IGBT Transformer Based

Control : Digital signal microprocessor.

Input supply : Three Phase

Frequency : 50Hz

Welding current range : 600A

Welding Voltage : 10.0V to 40.0V

Type of Welding Current : DC / AC (Inbuilt HF unit)

Duty Cycle 35% D.C : 480A

60% DC : 600A

100% DC : 480A

Duty Cycle (Torch) 35% D.C : 480A

OCV : 90V

Type of Shielding Gas : Argon

Type of Cooling : Air Cooled

Primary Power At 100% DC : 20.5 KVA

Power factor : 0.99

Efficiency : 89%

Weight : 28 Approx.

Dimensions : 560 x 235 x 445 Approx.

Ambient temp : upto 40 degC

Thickness of weld metal : 6 mm

Protection class : IP23

Insulation class : H

Noise Level in db : 80

TIG Torch

a. Type of Cooling : GAS / WATER

b. Type of Electrode : Non consumable Tungsten Rod

c. Length (cable and hose) : 4 mts.

d. Suitable Tungsten electrode : 1.0 - 4mm dia.

e. Current at 60 % Duty Cycle : 400 amps

Technical Features

- 1 H.F. ignition Inbuilt.
- 2 Type of metal that can be welded : M. S. , S.S., Aluminum , Titanium, Bronze etc.
- 3 Full Pulsed welding function, slope up, slope down.
- 4 Function selection switch for DC TIG, Pulsed TIG, AC TIG , PULSE AC TIG
- 5 Welding current Pre set with Digital .
- 6 Gas pre flow & post flow facility.
- 7 Gas test button.
- 8 2/4 step process, 2step latched/4 step latched welding program for AL.
- 9 Continuously adjustable welding power.
- 10 Step less control of setting current.
- 11 Inbuilt safety measure against open circuit, short circuit or phase fault.
- 12 Over temp protection. Under voltage and over voltage Protection and Indicator.
- 13 Hold on function to actual value of welding & voltage after welding
- 14 Error code display
- 15 Front Panel Digital Display: Welding voltage & current.
- 16 Welding Parameter values like gas pre flow time, up slope time, pulse time, ignition current main current, down slope time, gas post flow time.

ESSENTIAL FEATURES:

Digital Control	:	Digital Signal processor
Active wave	:	Inbuilt resulting quiet & highly stable arc
Panel locking features	:	Inbuilt
Scratch & HF start	:	Lift & HF start function
Digital display	:	inbuilt for current & voltage.
Protection	:	Inbuilt feature, under & over voltage.
Hot start	:	Inbuilt & adjustable features
Arc force	:	Inbuilt adjustable features
Error code	:	Inbuilt feature of machine.
Back ground current	:	Adjustable.
Earth leakage	:	inbuilt prevention through relay.
Polarity reversal	:	In built feature & automatic change of polarity as per job setting, fix position of for torch & earth cable.
AL. welding	:	GTAW/TIG AC

Current Control Unit : GTAW/TIG welding involves a high level of control compared to most welding processes. The operator must accurately manipulate the torch with one hand while carefully adding filler wire with the other. All of this must be done while simultaneously controlling the heat input.

The current typically is controlled through the use of a current control unit mounted on Torch / foot pedal control , which allows the user infinite adjustment, from the machine's lowest setting to the amperage selected on the machine's front panel.

Foot pedals are good when working at a bench or on objects that are easily adjusted to give the best possible access to the joint being welding. However, sometimes the job requires operators to move away from the bench, where this traditional arrangement can become much more difficult or even impossible to use.

Fingertip controls are truly invaluable in these cases. Being able to control the machine's output with a simple finger motion means there is no need to control your body beyond what is necessary to get your hands near the joint. Using a fingertip control also allows for fast tacking while moving around.

Accessories:

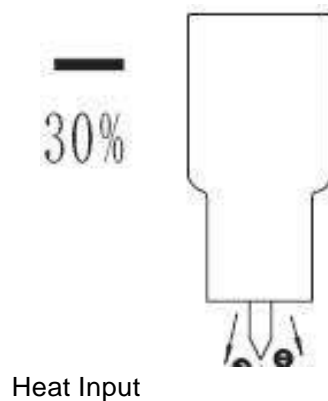
- a. Earth cable with earth clamp : 50 sq. mm copper : 5 meter
- b. Two stage Argon Gas Regulator with Flow guage (Flow meter) : Stem Type As per ISI
- c. Water Circulating Unit for TIG Torch cooling with facility to mount power source unit on TOP
- d. Remote current control on TIG Torch or Foot Padal current control with 5 meter cable and connector with suitable Plug
- e. Standard tool kit for TIG welding plant
- f. Welding Helmet (Auto Darkening)
- g. Gas Hose pipe :10 meter to connect machine with Argon Gas regulator .
- h. Instructional manual

13. BASIC WELDING TECHNIQUE

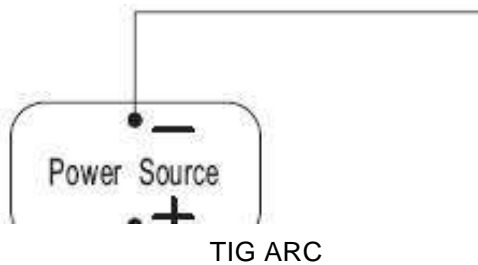


Note! This section being general welding technique guide is for reference only. Specific functions of your machine please refer to previous chapters.

❖ TIG welding technique

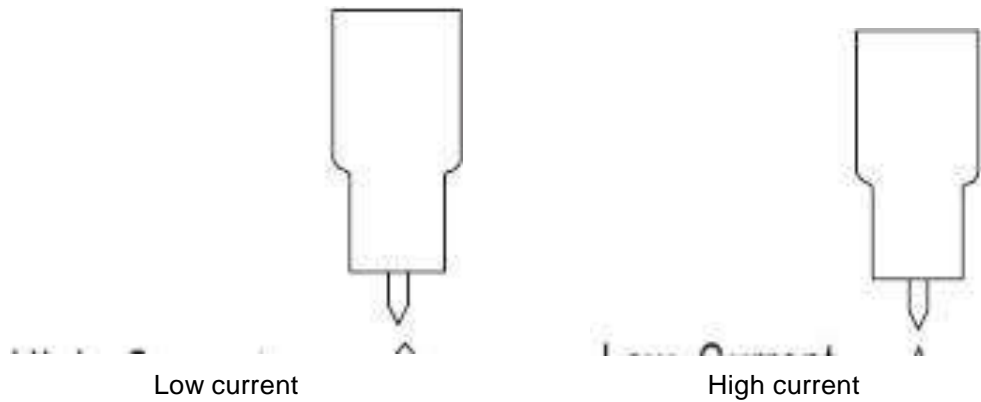


The DC power source uses what is known as DC (direct current) in which the main electrical component known as electrons flow in only one direction from the negative pole (terminal) to the positive pole (terminal). In the DC electrical circuit there is an electrical principle at work which should always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



DC TIG welding is a process in which an arc is struck between a TUNGSTEN electrode and the metal work piece. The weld area is shielded by an inert gas flow to prevent contamination of the tungsten, molten pool and weld area.

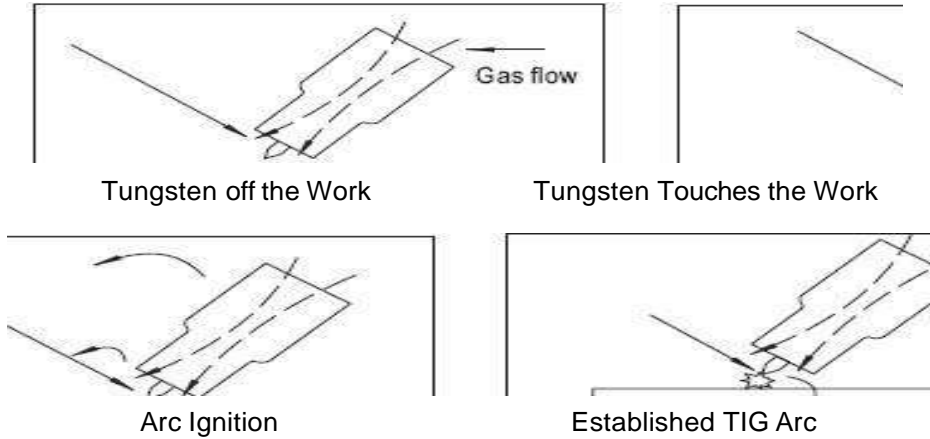
When the TIG arc is struck the inert gas is ionized and superheated changing it's molecular structure which converts it into a plasma stream. This plasma stream flowing between the tungsten and the work piece is the TIG arc and can be as hot as 9000K+. It is a very pure and concentrated arc which provides the controlled melting of most metals into a weld pool. TIG welding offers the user the greatest amount of flexibility to weld the widest range of material and thickness and types. DC TIG welding is also the cleanest weld with no sparks or spatter.



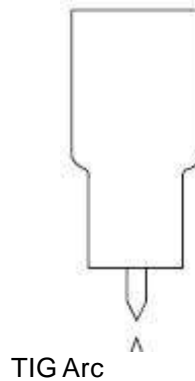
The intensity of the arc is proportional to the current that flows from the tungsten. The welder regulates the welding current to adjust the power of the arc. Typically thin material requires a less powerful arc with less heat to melt the material so less current (amps) is required, thicker material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

❖ **LIFT ARC IGNITION for TIG (tungsten inert gas) Welding**

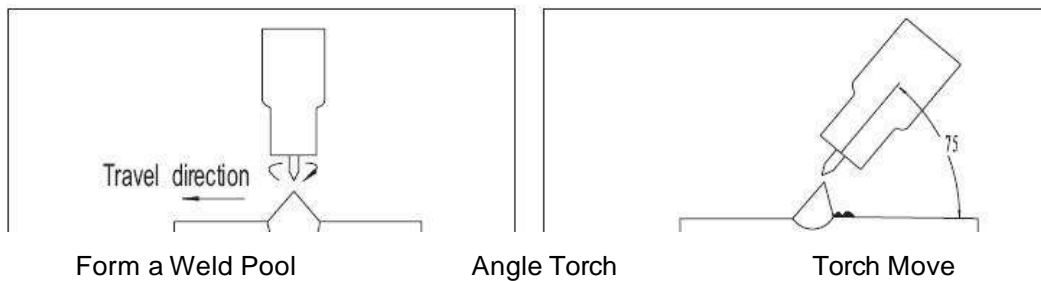
Lift Arc is a form of arc ignition where the machine has low voltage on the electrode to only a few volts, with a current limit of one or two amps (well below the limit that causes metal to transfer and contamination of the weld or electrode). When the machine detects that the tungsten has left the surface and a spark is present, it immediately (within microseconds) increases power, converting the spark to a full arc. It is a simple, safe lower cost alternative arc ignition process to HF (high frequency) and a superior arc start process to scratch start.



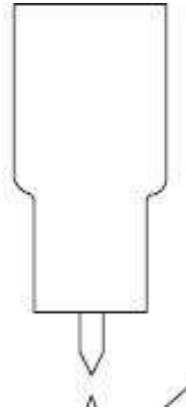
❖ TIG Welding Fusion Technique



Manual TIG welding is often considered the most difficult of all the welding processes. Because the welder must maintain a short arc length, great care and skill are required to prevent contact between the electrode and the workpiece. Similar to Oxygen Acetylene torch welding, TIG welding normally requires two hands and in most instances requires the welder to manually feed a filler wire into the weld pool with one hand while manipulating the welding torch in the other. However, some welds combining thin materials can be accomplished without filler metal like edge, corner, and butt joints. This is known as Fusion welding where the edges of the metal pieces are melted together using only the heat and arc force generated by the TIG arc. Once the arc is started the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist in creating a weld pool of the desired size. Once the weld pool is established tilt the torch at about a 75° angle and move smoothly and evenly along the joint while fusing the materials together.

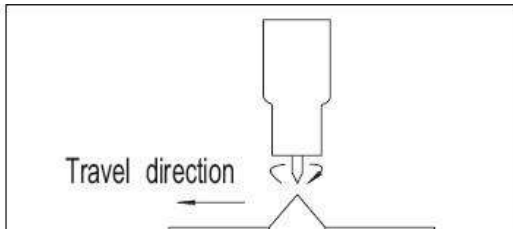


❖ **TIG Welding with Filler Wire Technique**

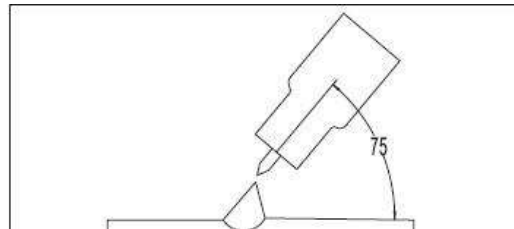


Add TIG Filler Wire

It is necessary in many situations with TIG welding to add a filler wire into the weld pool to build up weld reinforcement and create a strong weld. Once the arc is started the torch tungsten is held in place until a weld pool is created, a circular movement of the tungsten will assist in creating a weld pool of the desired size. Once the weld pool is established tilt the torch at about a 75° angle and move smoothly and evenly along the joint. The filler metal is introduced to the leading edge of the weld pool. The filler wire is usually held at about a 15° angle and fed into the leading edge of the molten pool, the arc will melt the filler wire into the weld pool as the torch is moved forward. Also a dabbing technique can be used to control the amount of filler wire added, the wire is fed into the molten pool and retracted in a repeating sequence as the torch is moved slowly and evenly forward. It is important during the welding to keep the molten end of the filler wire inside the gas shield as this protects the end of the wire from being oxidised and contaminating the weld pool.

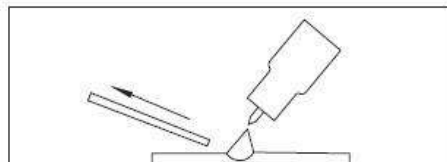


Form a Weld Pool

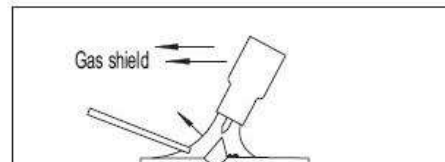


Angle Torch

Add TIG Filler Wire



Retract the Filler Wire



Torch Move

Repeat the Process

❖ Tungsten Electrodes

Tungsten is a rare metallic element used for manufacturing TIG welding electrodes. The TIG process relies on tungsten's hardness and high-temperature resistance to carry the welding current to the arc. Tungsten has the highest melting point of any metal, 3,410 degrees Celsius.

Tungsten electrodes are non consumable and come in a variety of sizes, they are made from pure tungsten or an alloy of tungsten and other rare earth elements. Choosing the correct tungsten depends on the material being welded, the amount of amps required and whether you are using AC or DC welding current.

Follow are common used tungsten types: Thoriated, Ceriated, Lanthanated, Zirconiated

Tungsten Electrodes Rating for Welding Currents

Tungsten Diameter mm	DC Current Amps Torch Negative 2% Thoriated
1.0mm	15 - 80
1.6mm	70 -150
2.4mm	150 - 250
3.2mm	250 - 400
4.0mm	400 - 500

❖ Tungsten Preparation

Always use DIAMOND wheels when grinding and cutting. While tungsten is a very hard material, the surface of a diamond wheel is harder, and this makes for smooth grinding. Grinding without diamond wheels, such as aluminium oxide wheels, can lead to jagged edges, imperfections, or poor surface finishes not visible to the eye that will contribute to weld inconsistency and weld defects.

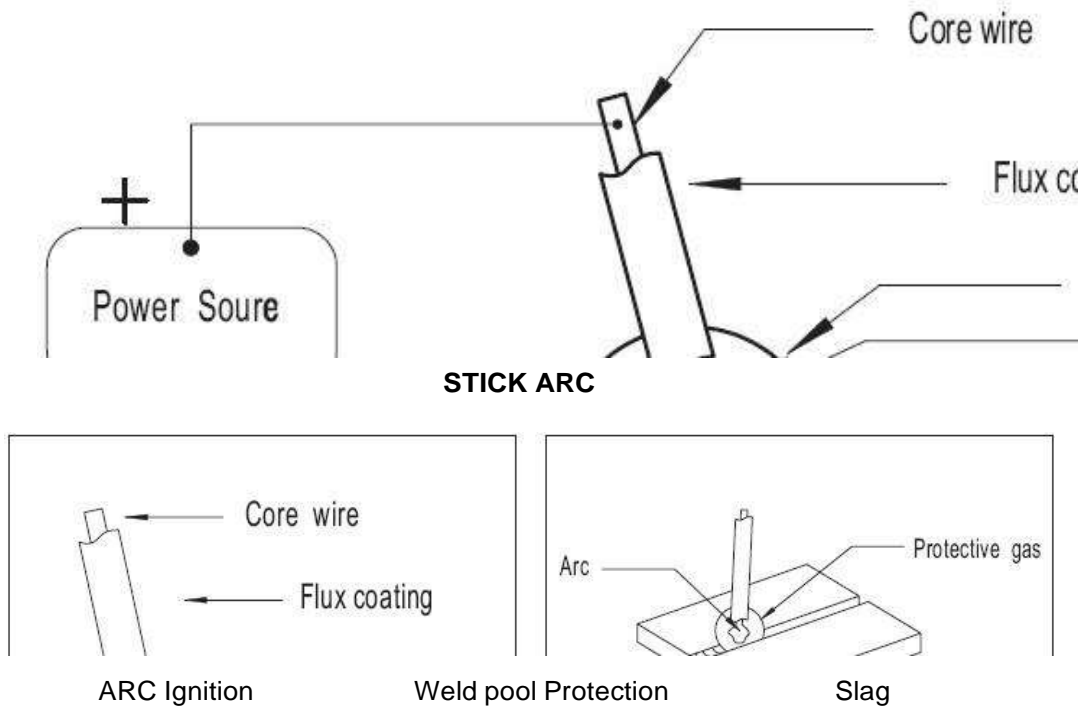
Always ensure to grind the tungsten in a longitudinal direction on the grinding wheel. Tungsten electrodes are manufactured with the molecular structure of the grain running lengthwise and thus grinding crosswise is "grinding against the grain." If electrodes are ground crosswise, the electrons have to jump across the grinding marks and the arc can start before the tip and wander. Grinding longitudinally with the grain, the electrons flow steadily and easily to the end of the tungsten tip. The arc starts straight and remains narrow, concentrated, and stable.

Tungsten Diameter Rating for Angle and Current

Tungsten Diameter	Constant Included Angle - Degrees	Current Range Amps
1.0mm	20	05 - 30
1.6mm	25	08 - 50
1.6mm	30	10 - 70
2.4mm	35	12 - 90
2.4mm	45	15 - 150
3.2mm	60	20 - 200
3.2mm	90	25 - 250

❖ SMAW (Stick) welding technique

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



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

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

The Metal Wire Core works as conductor of the current that maintains the arc.

The core wire melts and is deposited into the welding pool.

The covering on a shielded metal arc welding electrode is called Flux.

The flux on the electrode performs many different functions.

These include:

- producing a protective gas around the weld area
- providing fluxing elements and deoxidizers
- creating a protective slag coating over the weld as it cools
- establishing arc characteristics
- adding alloying elements

Covered electrodes serve many purposes in addition to adding filler metal to the molten pool. These additional functions are provided mainly by the covering on the electrode.

❖ **MMA (Stick) Welding Fundamentals**

• **Electrode Selection**

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

• **Electrode Size**

Average Thickness of Material	Maximum Recommended Electrode Diameter
1.0 - 2.0mm	2.5mm
2.0 - 5.0mm	3.2mm
5.0 - 8.0mm	4.0mm
8.0 - > mm	5.0mm

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

• **Welding Current (Amperage)**

Electrode Size \varnothing mm	Current Range (Amps)
2.5mm	60 - 95
3.2mm	100 - 130
4.0mm	130 - 165
5.0mm	165 - 260

Correct current selection for a particular job is an important factor in arc welding. With the current set too low, difficulty is experienced in striking and maintaining a stable arc. The electrode tends to stick to the work, penetration is poor and beads with a distinct rounded profile will be deposited. Too high current is accompanied by overheating of the electrode resulting undercut and burning through of the base metal and producing excessive spatter. Normal current for a particular job may be considered as the maximum, which can be used without burning through the work, over-heating the electrode or producing a rough spattered surface.

The table shows current ranges generally recommended for a general purpose type 6013 electrode.

- **Arc Length**

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

- **Electrode Angle**

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

- **Travel Speed**

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

- **Material and Joint Preparation**

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