TIG ARC 200 AC/DC

GWS GLOBAL WELDING SUPPLIES
Keeping New Zealand Together

INSTRUCTIONAL MANUAL

Contents

TIG ARC 200 AC/DC

Features

- AC/DC TIG, MMA
- Single phase input from 230V±10%
- Microprocessor, precise control.
- Anti-sticking, Arc force, Hot start
- Electric HF ignition: Easy arc striking
- Remote control (Optional Feature w/ Torch)
- Foot pedal ready
- AC balance: high quality welds on Aluminum
- Higher AC frequency (50-250Hz), fast travel speed
- Smart-V technology: Better ignition, lower loss
- Soft Switching: low consumption, small but stable
- Intelligent protection: Over-voltage, Low-voltage, Over-current and Over-heat
- PFC technology (Power Factor Correction)
- TIG Pulse function and all Pulse parameters can be adjusted
- Complies with EN 60974-1

AC Waveforms

Advanced Square wave
Fast freezing puddle, deep penetration and fast travel speeds

Soft Square wave
For a soft buttery arc with maximum puddle control and good wetting action

Sine Wave
For those who prefer traditional arc characteristics. Quieter welding with good wetting

Triangle Wave
Reduces heat input which is ideal for thin aluminium welding. Allows for faster travel speeds

PLEASE NOTE that under no circumstances should your TIGARC 200AC/DC be altered or changed in any way from standard factory configuration. Doing so, will void the machine warranty.

1.0 Recommended Safety Precautions

1.1 Health Hazard Information

The welding process can cause a variety of possible hazards for the operator and those in close proximity. All appropriate safety precautions should be made to prevent harm and injury. Although these precautions are not all inclusive, the following considerations should be followed for most welding applications. As always, electrical equipment should be used in accordance with the manufacturer's recommendations.

Eyes

The welding process produces ultraviolet rays that can cause permanent eye damage. In addition, welding fumes may also cause serious eye irritation.

Skin

Arc rays are dangerous to uncovered skin and will cause burning of the skin.

Inhalation

Welding fumes and gases are dangerous to both operator and to those in close proximity. Fumes may cause a number of respiratory ailments. Excessive exposure may cause nausea, dizziness, dryness, irritation of nose, throat & lungs or even permanent lung damage.

1.2 Personal Protection

Respiratory

Welding in confined areas should be carried out with the aid of a fume respirator or air supplied respirator as per AS/NZS 1715 and AS/NZS 1716 Standards.

- Ensure proper ventilation at all times
- Keep your head out of the fumes emitted by the arc
- Fumes from the welding of some metals could have an adverse effect on your health. DO NOT breathe them in. If you are welding on materials such as stainless steel, nickel, alloys or galvanised steel, additional precautions are necessary.
- Wear a respirator when natural or forced ventilation is not sufficient.

Eye Protection

A welding helmet fitted with the appropriate welding shade lens for the welding operation must be worn at all times when welding. The welding arc and the reflecting arc flash emits ultraviolet and infrared rays. Protective welding screening and eye protection should be provided for others working in the area.

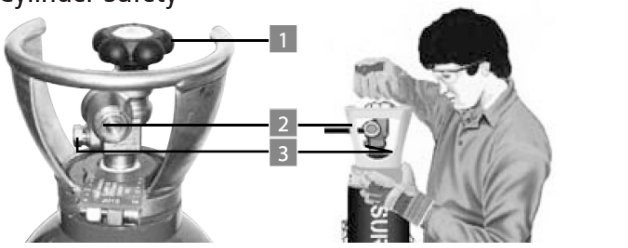
Clothing

Suitable clothing must be worn to prevent excessive skin exposure to UV radiation, sparks and molten metal. Flame-proof, loose fitting cotton clothing buttoned to the neck, protective leather gloves, spats, apron and steel toe safety boots are also highly recommended. In addition, use a helmet with the recommended shade lens for amperage listed in the shade chart below.

Less than 150 amps	**Shade 9**
150 to 250 amps	**Shade 10**
250 to 300	**Shade 11/12**
300 to 350	**Shade 13**
Over 350 amps	**Shade 14**

Use one shade darker for aluminium welding

Cylinder Safety



Back view of typical cylinder valve

Operator wearing personal protection equipment (PPE) in safe position

1. Cylinder valve hand wheel
2. Back-plug
3. Bursting disc

Ten Points about Cylinder Safety

1) Read labels and Material Safety Data Sheet (MSDS) before use
2) Store upright and use in well ventilated, secure areas away from pedestrian or vehicle thoroughfare
3) Guard cylinders against being knocked violently or being allowed to fall
4) Wear safety shoes, glasses and gloves when handling and connecting cylinders
5) Always move cylinders securely with an appropriate trolley. Take care not to turn the valve on when moving a cylinder

Ten Points about Cylinder Safety (continued)

6) Keep in a cool, well ventilated area, away from heat sources, of ignition and combustible materials, especially flammable gases

7) Store full and empty cylinders separately

8) Keep ammonia-based leak detection solutions, oil and grease away from cylinders and valves

9) Never use excessive force when opening or closing valves

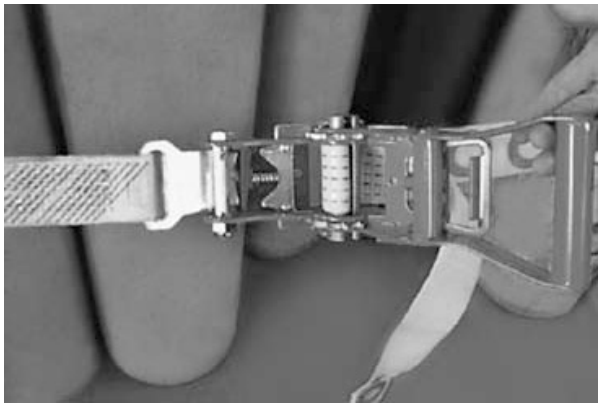
10) Don't repaint or disguise markings or damage. If damaged, return cylinders immediately

Cylinder Valve Safety

When working with cylinders or operating cylinder valves, always wear appropriate protective clothing – gloves, boots and safety glasses. When moving cylinders, ensure that the valve is not accidentally opened in transit.

Before operating a cylinder valve:

- Ensure that the system you are connecting the cylinder into is suitable for the gas and pressure involved
- Ensure that hoses are securely connected to the cylinder valve and system. A hose, for example, can potentially flail about dangerously if it is not restrained at both ends and accidentally pressurised
- Stand to the side of the cylinder so that neither you nor anyone else is in line with the back of the cylinder valve. This is in case a back-plug is loose or a bursting disc vents. The correct stance is shown in the "Cylinder Safety" diagram previously in this section



When operating the cylinder valve:

- Open by hand turning the valve hand wheel anti-clockwise using no more than reasonable force
- Ensure that no gas is leaking from the cylinder valve connection or the system to which the cylinder is connected. DO NOT use ammonia-based leak detection fluid as this can damage the valve. Approved leak detection fluid, can be obtained from your gas provider
- When cylinder is empty, close the valve by turning the valve hand wheel in a clockwise direction using no more than reasonable force

1.3 Electrical Shock

- Never touch 'live' electrical parts
- Earth clamp all work materials
- Never work in wet or damp environments

Avoid electric shock by:

- Wearing dry, insulated boots
- Using dry, leather gloves
- Never changing electrodes with bare hands or wet gloves
- Never cool electrode holders in water
- Work on a dry, insulated floor where possible
- Never hold the electrode or holder under your arm

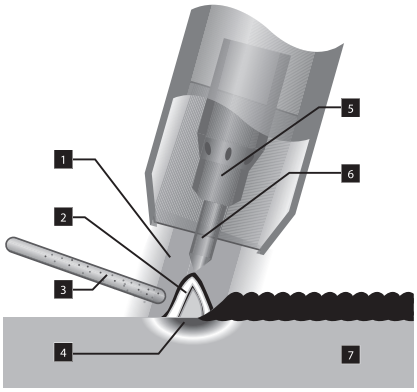
1.4 User Responsibilities

- Read the Instructional Manual prior to using your TIGARC 200AC/DC
- Unauthorised repairs to this equipment may endanger the technician and operator and will void your Warranty. Only qualified personnel should perform repairs
- Always disconnect mains power before investigating equipment malfunctions
- Replace broken, damaged, missing or worn parts & hoses immediately.
- Equipment should be cleaned & serviced periodically

2.0 Gas Tungsten Arc Welding (GTAW/TIG)

2.1 Introduction

1. Sheilding gas
2. Arc
3. TIG filler rod
4. Weld pool
5. Collet body
6. Tungsten electrode
7. Workpiece



Either direct or alternating current may be used in the welding process. For DC operation the tungsten may be connected to either output terminal, however is most commonly connected to the negative terminal. The output characteristics of the power source will have an effect on both the quality and speed of the weld.

Shielding gas is directed into the arc area through the welding torch. A collet body inside the torch distributes the shielding gas evenly over the weld area. In the torch the welding current is transferred to the tungsten electrode from the copper conductor.

2.2 Polarity Variations

DCEN

When direct-current electrode-negative (straight polarity) is used:

- Electrons strike the part being welded at a high speed
- Intense heat on the base metal is produced
- The base metal melts very quickly
- Ions from the inert gas are directed towards the negative electrode at a relatively slow rate

Use of DCEN

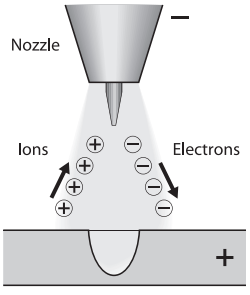
For a given diameter of tungsten electrodes, higher amperage can be used with straight polarity. Straight polarity is used mainly for welding:

- Carbon steels
- Stainless steels
- Copper alloys
- Titanium

The increased amperage provides:

- Deeper penetration
- Increased welding speed
- A narrower, deeper, weld bead
- Better arc control

DCEN - Narrow bead - Deep penetration



DCEP

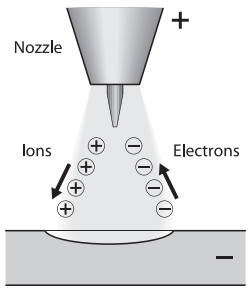
DCEP (reverse polarity) is different from DCEN in the following ways:

- High heat is produced on the electrode rather than on the base metal
- The heat melts the tungsten electrode tip
- The base metal remains relatively cool compared to straight polarity
- Relatively shallow penetration is obtained

Use of DCEP

- Intense heat means a larger diameter of electrode must be used with DCEP
- Maximum welding amperage should be relatively high

DCEP - Wide bead - Shallow penetration

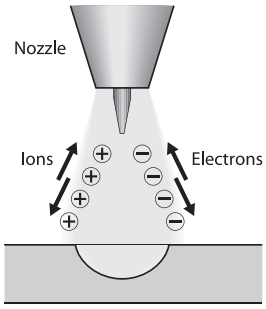


High-Frequency AC Welding

Welding with alternating current combines both direct-current characteristics:

- In the positive phase, cleaning action occurs in the weld puddle
- During the negative phase, heat is concentrated in the weld puddle.
- The above causes increased penetration

AC - Average bead - Average penetration



2.3 Shielding Gas Selection

Material	Shielding Gas	Benefits
Aluminium alloys	Argon	1)Usd with high frequency AC good stable arc good cleaning action
	Argon/Helium	1)Usd with high frequency AC good cleaning action higher welding speed increased penetration
Aluminium bronze	Argon	Reduces penetration during surfacing minimising dilution
Brass	Argon	Stable arc Low fume
Cobalt-based alloys	Argon	Stable and easy to control arc
Copper-nickel (Monel)	Argon	Stable and easy to control arc Can be used for copper-nickel to steel
Deoxised copper	Helium	Increased heat input Stable arc Good penetration
	Helium(75%)/	Stable arc
	Argon(25%)	Lower penetration
Nickel alloys (Inconel)	Argon	Stable arc Manual operation
	Helium	High speed automated welding
Steel	Argon	Stable arc Good penetration
	Helium	High speed automatic welding Deeper penetration Small concentrated HAZ
Magnesium alloys	Argon	Used with continuous high frequency AC Good arc stability Good cleaning action
Stainless steel	Argon	Good penetration Good arc stability
	Helium	Deeper penetration
Titanium	Argon	Stable arc
	Helium	High speed welding

2.4 Consumable Selection

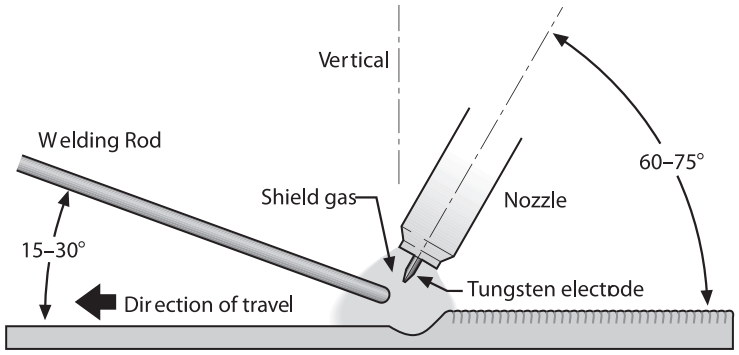
Welding Wire

The following table includes the recommended welding consumable for the most commonly welded materials.

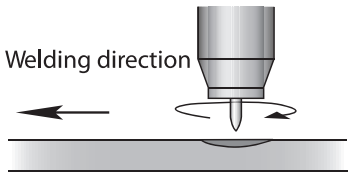
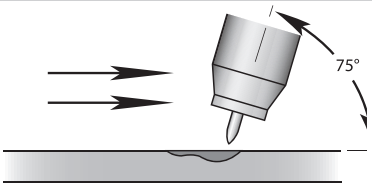
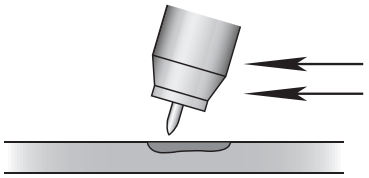
Base Material	Consumable
C-Mn and low Carbon steels	Mild steel TIG wire
Low Alloy steels	
1.25Cr/0.5Mo	CrMo1
2.5Cr/1Mo	CrMo1
Stainless steels	
304/304L	308L
316/316L	316L
309/309-C-Mn	309L
321/Stabilised grades	347L
Aluminium	
1000 series	1100
5000 series	4043/4047/5356
6000 series	4043/4047/5356

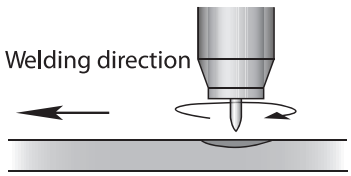
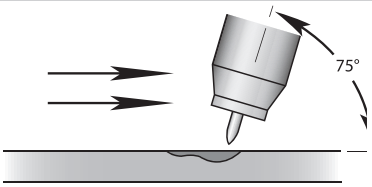
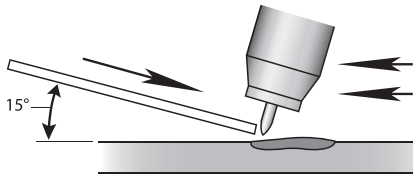
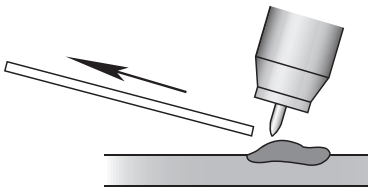
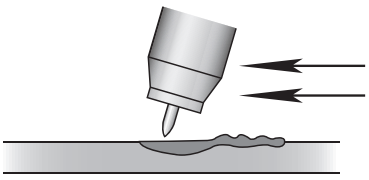
Filler rod diameter(mm)	Thickness of metal(mm)
0.9 - 1.6	0.5-2
1.6 - 2.0	2-5
1.6 - 2.0	5-8
2.4	8-12
3.2	12 or more

2.5 Welding Techniques

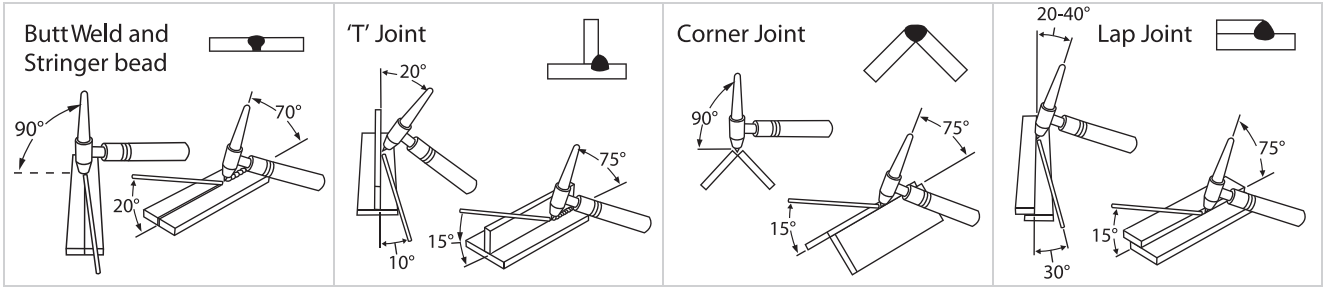
Welding techniques	
	The suggested electrode and welding rod angles for welding a bead on plate.The same angles are used when making a butt weld.The torch is held 60–75° from the metal surface.This is the same as holding the torch 15–30° from the vertical. Take special note that the rod is in the shielding gas during the welding process.

2.6 Torch Movement During Welding

Tungten Without Filler Rod		
		
Form pool	Tilt torch	Move torch to front of pool. Repeat process.

Tungten With Filler Rod		
		
Form pool	Tilt torch	Add filler metal
		
Remove rod	Move torch to front of pool. Repeat process.	

2.7 Positioning Torch Tungsten for Various Weld Joints



Non Consumable Tungstens

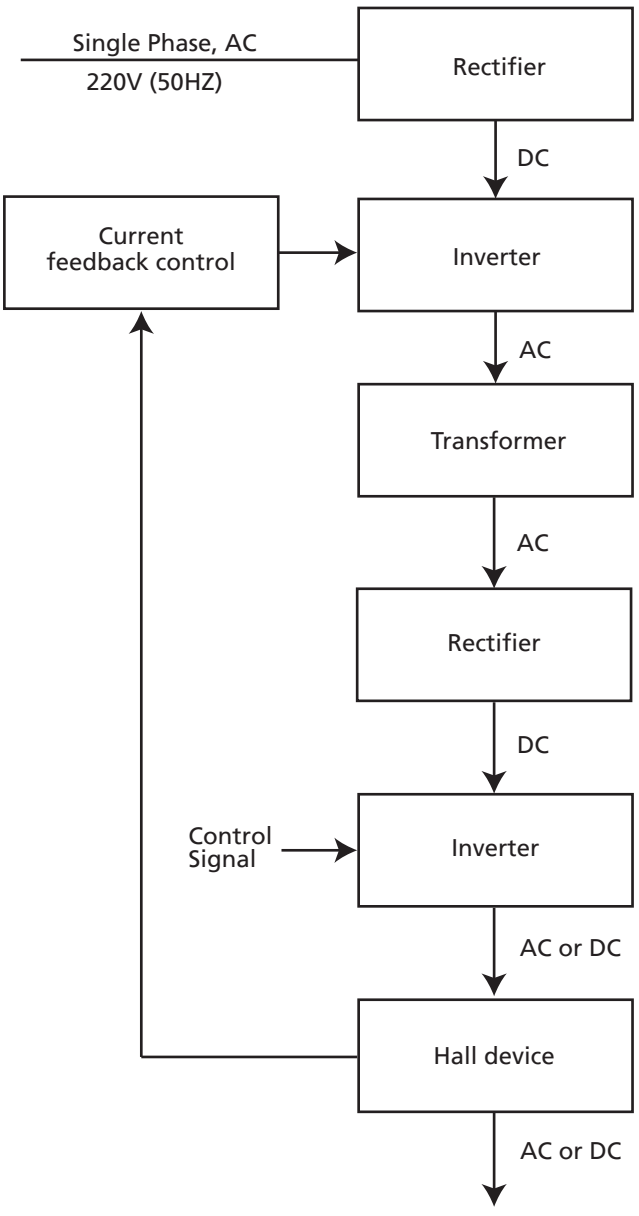
Tungsten Electrode Selector Chart				
Base metal type	Thickness range	Desired results	Welding current	Elextrode type
Aluminium alloys, Magnesium alloys	All	General purpose	ACHF	Pure(EW-P)
				Zirconiated(EW-Zr)
				2%Thoriated(EW-Th2)
	Only thin sections	Control penetration	DCEP	2%Ceriated(EW-Ce2)
	Only thick sections	Increase penetration or travel speed	DCEN+ 100% He	2%Thoriated(EW-Th2)
				2%Ceriated(EW-Ce2)
Copper alloys, Cu-Nl alloys and Nickel alloys	All	General purpose	DCEP	2%Thoriated(EW-Th2)
				2%Ceriated(EW-Ce2)
	Only thin sections	Control penetration	ACHF	Ziconiated(EW-Zr)
	Only thick sections	Increase penetration or travel speed	DCEN 100% He	2%Ceriated(EW-Ce2)
Mild Steels, Carbon Steels, Alloy Steels, Stainless Steels & Titanium Alloys	All	General purpose	DCSP	2%Thoriated(EW-Th2)
				2%Ceriated(EW-Ce2)
				2%Lanthanated(EWG-La2)
	Only thin sections	Control penetration	DCEN	
	Only thick sections	Increase penetration or travel speed	DCEN 100% He	2%Ceriated(EW-Ce2)
				2%Lanthanated(EWG-La2)

	Shielding gas	Tungsten performance characteristics
	Argon	Balls easily. Low cost. Tends to spit at higher currents. Used for non-critical welds only.
	Argon	Balls well. Takes high current, with less spitting and with better arc starts and arc stability than pure tungsten.
	75% Argon/ 25% Helium	Higher current range and stability. Better arc starts, with lower tendency to spit. Medium erosion.
	Argon Helium	Lowest erosion rate. Widest current range. AC or DC. No spitting. Best arc starts and stability.
	75% Argon/ 25% Helium	Best stability at medium currents. Good arc starts. Medium tendency to spit. Medium erosion rate.
	Helium	Low erosion rate. Wide current range. AC or DC. No spitting. Consistent arc starts. Good stability.
	75% Argon/ 25% Helium	Best stability at medium currents. Good arc starts. Medium tendency to spit. Medium erosion rate.
	75% Argon/ 25% Helium	Low erosion rate. Wide current range. AC or DC. No spitting. Consistent arc starts. Good stability.
	Argon	Use on lower currents only. Spitting on starts. Rapid erosion rates at higher currents.
	75% Argon/ 25% Helium	Low erosion rate. Wide current range. AC or DC. No spitting. Consistent arc starts. Good stability.
	75% Argon/ 25% Helium	Best stability at medium currents. Good arc starts. Medium tendency to spit. Medium erosion rate.
	75% Argon/ 25% Helium	Low erosion rate. Wide current range. AC or DC. No spitting. Consistent arc starts. Good stability.
	75% Argon/ 25% Helium	Lowest erosion rate. Widest current range on DC. No spitting. Best DC arc starts and stability.
	Argon	Use on lower current only. Spitting on starts. Rapid erosion rates at higher currents.
	75% Argon/ 25% Helium	Low erosion rate. Wide current range. No spitting. Consistent arc starts. Good stability.
	Helium	Lowest erosion rate. Highest current range. No spitting. Best DC arc starts and stability.

2.9 Working Principle

The working principle of the TIG200AC/DC is shown in the flowchart below.

The single phase 220V work frequency (50/60 Hz) AC is rectified into DC (approx 310V) which is then converted to a medium frequency AC (approx. 44KHz) by using an inverter device (IGBT module). The voltage is further reduced by using a medium transformer (the main transformer) and then rectified by using a medium frequency (fast recovery diode), then is outputted DC or AC by selecting IGBT module. The circuit adopts current feedback control technology to ensure current output stability. The welding current parameter can also be adjusted continuously to meet welding requirements.



3 Installation and Adjustment

3.1 Parameters

Machine	TIGARC 200 AC/DC			
Power Supply Voltage(V)	1~200/220/230/240±10%			
Frequency(Hz)	50/60Hz			
Function	TIG		MMA	
	DC	AC	DC	AC
Rated Input Power(KW)	4.7	5.0	5.3	5.8
Rated Input Current(A)	21.4	21.7	23.0	25.0
Effective Current(A)	10.7	11.9	12.6	14.9
Duty Cycle(40°C 10min)	25%200A	30%200A	30%170A	35%170A
	60%130A	60%140A	60%120A	60%130A
	100%100A	100%110A	100%90A	100%110A
Start/Welding/Crater Current Range(A)	5-200	10-200	5-170	10-170
No Load Voltage(V)	45V(Controlled)			
Power Factor	0.98			
Up/Down Slope Time (S)	0-10			
Pre/Post Flow(S)	0.1-10/1-10			
Clearance Effect (AC TIG)%	15-50			
Multi-AC Waveforms	square			
AC Frequency(Hz)	50-250			
Pulse Frequency(Hz)	0.5-200			
Pulse Width Range(%)	5-100			
Net Weight(Kg)	11.2			
Dimensions(mm)	480x175x310			
Protection Class	IP23			
Insulation Class	F			
Cooling	FAN			
Standard	EN-60974-1			

3.2 Operation Environment

- Height above sea level is below 1000m.
- Operation temperature range:-10°C~+40°C.
- Relative humidity is below 90 %(+20°C). relative humidity is below 50% (40°C).
- The inclination of the power source does not exceed 10°.
- Protect the machine against heavy rain, or in hot circumstances, against direct sunshine.
- The content of dust, acid, corrosive gas in the surrounding air or substance can not exceed normal standards.
- Take care that there is sufficient ventilation during welding. There is at least 30cm free distance between the machine and wall.

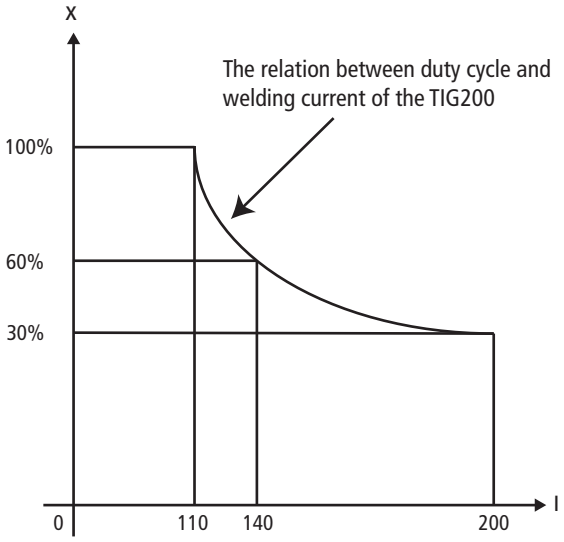
3.3 Operation Notices

- Read section 1 carefully before attempting to use this equipment.
- Connect the ground wire with the machine directly, and refer to section 3.
- In the case of closing the power switch, no-load voltage may be exported. Do not touch the output electrode with any part of your body.
- Do not watch the arc with no eye protection.
- Ensure good ventilation of the machine to improve duty ratio.
- Turn off the engine when finished to save power.
- When power switch shuts off protectively because of failure, don't restart it until the problem is resolved. Otherwise, the range of potential problems will be exacerbated.

3.4 Duty Cycle & Over heating

Refer to the diagram on the right. The vertical axis "X" stands for duty cycle, which is defined as the proportion of time that a machine can work continuously within a certain timeframe (10 minutes). Horizontal axis "I" is the output current in amperage(A).

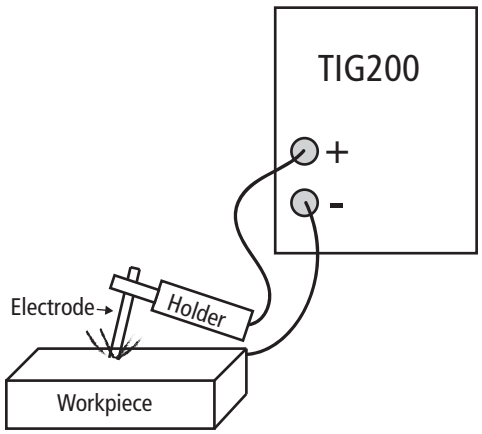
The relation between the duty cycle "X" and the output welding current "I" is shown in the figure to the right.



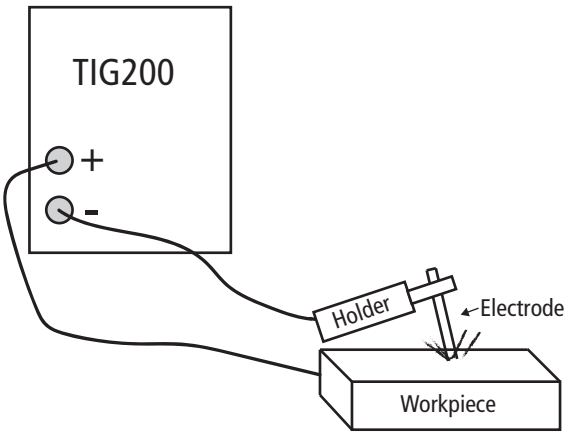
If the welder overheats, the IGBT over-heat protection unit inside will cut the output welding current to the minimum and illuminiate the over-heat pilot lamp on the front panel. In the event this occurs, the machine should be left to idle for 15 minutes allowing the fan to cool the machine. Before operating the machine again, try reducing the welding output current and/or the duty cycle. Take special care and monitor the over-heat lamp on the panel.

3.5 Polarity Connection (MMA)

MMA (DC): Choosing the connection of DCEN or DCEP according to the different electrodes.
Please refer to the electrode manual.
MMA (AC): No requirements for polarity connection.



DC Positive Connection

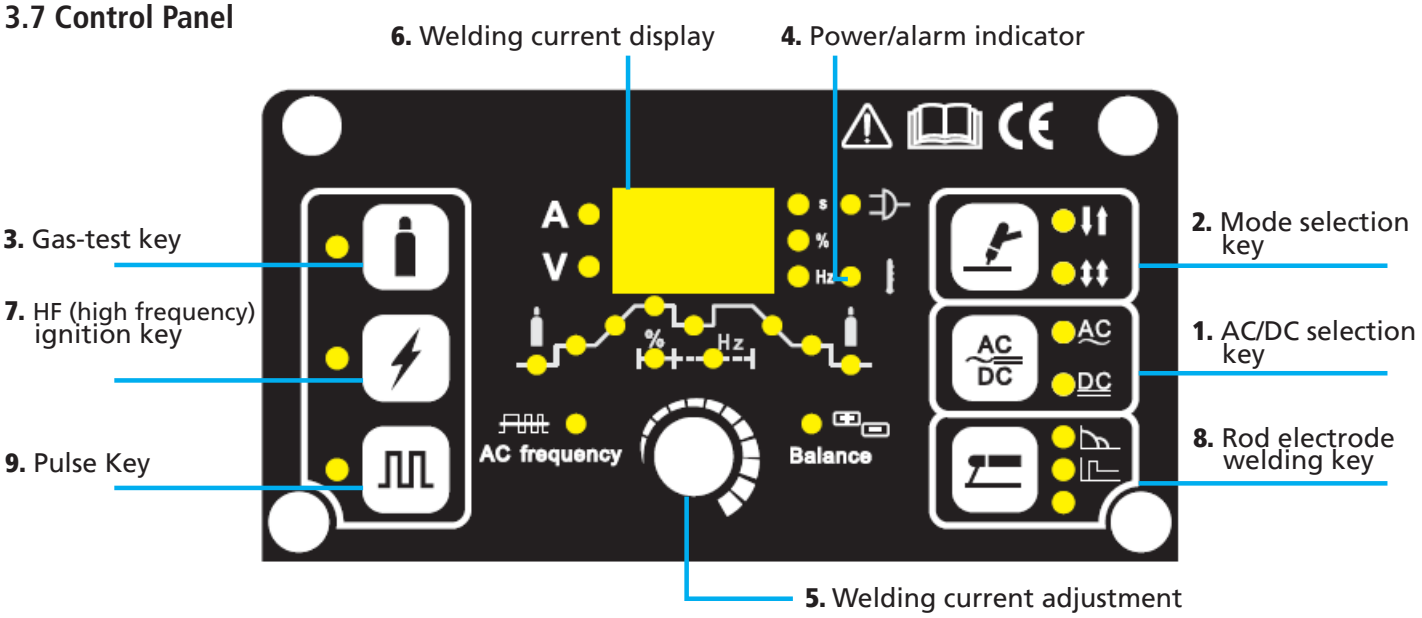


DC Negative Connection

3.6 Machine layout and components

1. Negative output	The welder's negative polarity output.
2. Shield gas connector	Is connected to the gas input pipe of torch.
3. Aero socket	Is connected to torch switch control wire (it has 8 leads and lead 2 - lead 3 are connected to torch switch control wire.
4. Positive output	The welder's positive polarity output.
5. Shield gas input joint	To connect one head of the gas hose while the other head of which is connected to argon gas cylinder.
6. Power source switch	Turns the power source ON/OFF
7. Power cable	Connected to the appropriate power supply.
8. Fan	

3.7 Control Panel



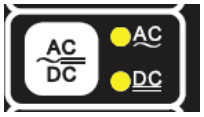
3.Overview

The key feature of the control panel is the logical way in which the controls are arranged. All the main parameters needed for day-to-day welding can easily be

- selected with the keys
- altered with the adjustment dial
- shown on the display during welding

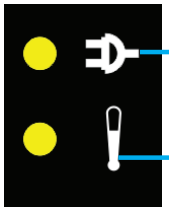
The illustration below shows an overview of the main settings needed for day-to-day welding. To expand on the TIG200 AC/DC control panel above, you will find a detailed description of these settings in the following section.

1. AC/DC selection key



2. Mode selection

4. Power/Alarm indicator



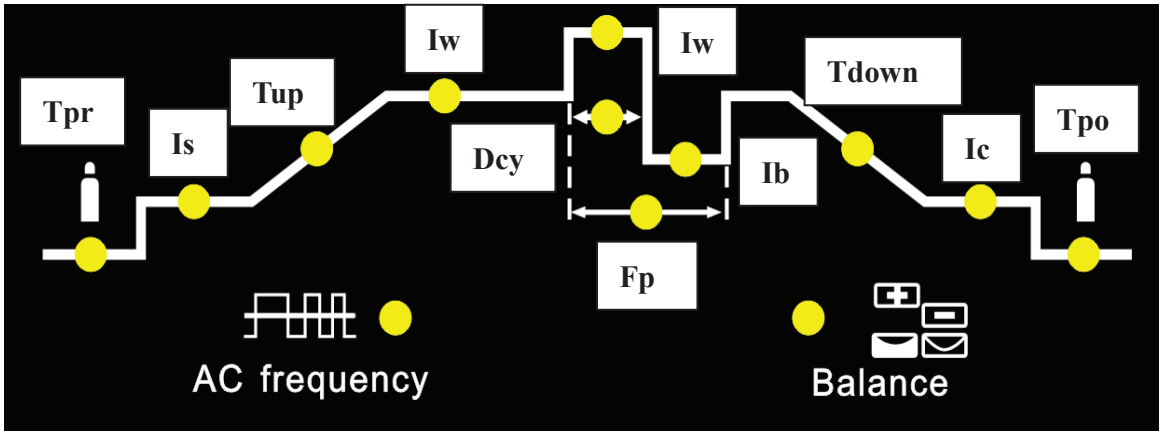
Lights up if the power switch is on

Lights up if the welder overheats, has excess voltage, or excess current. Also displays Err 001.

5. Welding current adjustment
Before welding, you can use this potentiometer to adjust welding current

6. Welding current display
Display the preset or the actual welding current value
Before welding, it shows the preset current value.
Once welding, it shows the present actual value of the welding current.

7. Adjusting dial
If the parameter indicator lights up, then the selected parameter can be altered by the adjustment dial (view next page)



Available parameters where 2T and 4T mode have been selected:

Tpr Gas pre flow time

Unit	S
Setting range	0.1-10
Factory setting	0.3

Is Starting current (only with 4T)

Unit	A
TIG200 AC/DC	5-200 (DC) 10-200 (AC)

Tup Upslope time

Unit	S
Setting range	0-10
Factory setting	0

Iw Welding current

Unit	A
TIG200 AC/DC	5-200 (DC) 10-200 (AC)

Ib Base current

Unit	A
TIG200 AC/DC	5-200 (DC) 10-200 (AC)

Important!
Only selectable when pulse key has been pressed

Dcy Ratio of pulse duration to base current duration

Unit	%
Setting range	5-100
Factory setting	5

Important!
Only selectable when pulse key has been pressed

Fp Pulse frequency

Unit	Hz
Setting range	0.5-200
Factory setting	0.5

Important!
Only selectable when “pulse key” has been pressed

Tdown Downslope time

Unit	S
Setting range	0-10
Factory setting	0

Ic Crater arc current (only with 4T)

Unit	A
TIG200 AC/DC	200P 5-200 (DC); 10-200 (AC)

Tpo Gas post flow time

Unit	S
Setting range	1-10.0
Factory setting	3

AC frequency (only with TIG AC)

Unit	Hz
Setting range	
50-250	(Iw<170 A)
50-200	(70 A≤Iw<1 00 A)
50-150	(1 00 A≤Iw<1 40 A)
50-120	(1 40 A≤Iw< 170 A)
50-100	(170 A≤Iw)

Balance (only with TIG-AC)

Balance adjustment is mainly used to set the adjustment of eliminating metal oxide (such as Aluminium, Magnesium and its alloy) while AC output

Unit	%
Setting range	15-50
Factory setting	15

7. Rod electrode(MMA) welding key

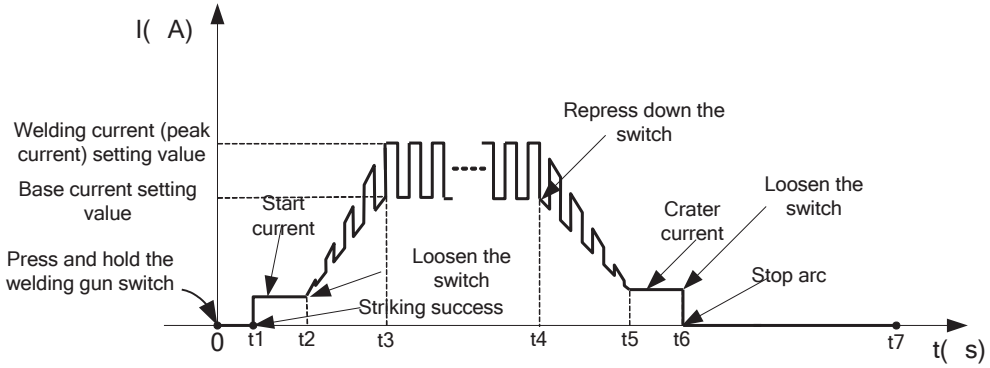
Parameter	Setting range
Arc Force	0-10
Hot start	0-10

4. Argon ARC Welding Operation

4.1 TIG Welding (4T Operation)

The start current and crater current can be pre-set. This function can compensate the possible crater that appears at the beginning and end of welding. Thus, 4T is suitable for the welding of medium thickness plates.

Pulsed TIG long welding (4T):



Introduction:

- 0: Press and hold the gun switch, Electromagnetic gas valve is turned on. The shielding gas starts to flow
- 0~t1: Pre flow time, adjustment range of pre flow time: 0.1~1.0S
- t1: Striking success, adjustment range of start current 5~200A
- t2: Loosen the gun switch, the output current slopes up from start current. If the output pulse function is turned on, the output current is pulsed
- t2~t3 Output current slopes up to the setting current value; adjustment range of up slope time 0~10.0S
- t3~t4: Welding process. During this period, the gun switch is loosened

  Note: If the output pulse function is turned on, the output current is pulsed. If the output pulse function is turned off, the output current is DC current
- t4: Repress down the gun switch, the output current slopes down to crater current, if the output pulse function is turned on, the slope down current is pulsed
- t4~t5: Down slope time, adjustment range of down slope time: 0~10.0S
- t5~t6: Crater current holds time; adjustment range of crater current: 5~200A
- t6: Loosen the gun switch, stop arc, and keep on argon flowing
- t6~t7: Post flow time, adjustment range of post flow time: 1.0~10.0S
- t7: Electromagnetic valve is closed and argon flowing stopped. Welding is finished.

Remarks

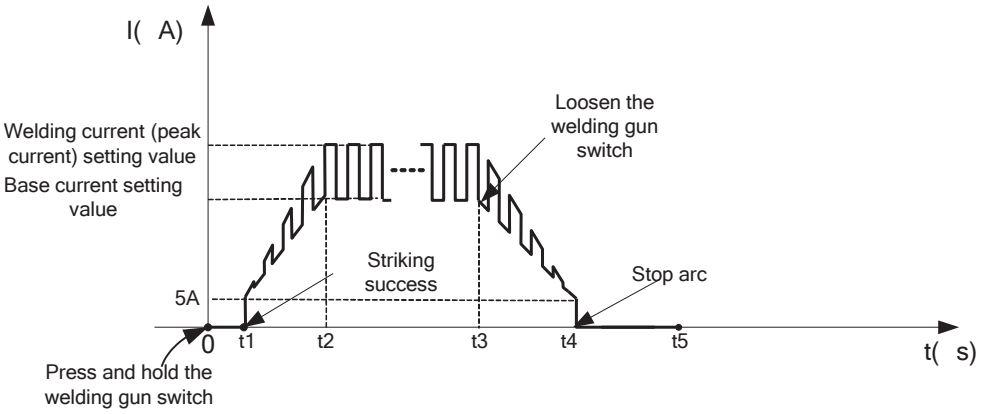
Repeat welding function:

In 4T mode, when you press the second time to stop the arc and if you press in a very short time, the output current will initially reduce to half, then the user can weld in small current as desired without ignition again. If you press the trigger again to stop the arc, but press in for more than 0.5 seconds, the arc will stop at your second press.

4.2 TIG Welding (2T operation)

This function without the adjustment of start current and crater current is suitable for the Re-tack welding, transient welding, thin plate welding and so on.

Pulsed TIG short welding (2T):



Introduction:

- 0: Press and hold the gun switch, Electromagnetic gas valve is turned on. The shielding gas starts to flow.
- 0~t1: Pre flow time, adjustment range of pre flow time: 0.1~1.0S
- t1~t2: Striking success, the output current slopes up to the setting current from minimum current (5A) if the output pulse function is turned on, the slope up current is pulsed.
- t2~t3: During the whole welding process, the gun switch is pressed and held without releasing.
  Note: If the output pulse function is turned on, the output current is pulsed. If the output pulse function is turned off, the output current is DC current
- t3: Loosen the gun switch, the output current slopes down; if the output pulse function is turned on, the slope down current is pulsed
- t3~t4: The output current slopes down to minimum current (5A), stop arc; adjustment range of down slope time: 0~10S
- t4~t5: Post flow time, adjustment range of post flow time: 0.1~10.0S
- t5: Electromagnetic valve is closed and argon flowing stopped. Welding is finished.

Short circuit protection function:

1. TIG /DC/LIFT：If the tungsten electrode touches the workpiece when welding, the current will drop to 20A, which can reduce tungsten spoilage, prolonging the life of the tungsten electrode, and prevent tungsten clipping.

2. TIG /DC/HF：If the tungsten electrode touches the workpiece when welding, the current will drop to 0 within 1s, which can reduce tungsten spoilage, prolonging the life of the tungsten electrode, and prevent tungsten clipping.

3. MMA：if the electrode touches the workpiece for over two seconds, the welding current will drop to the 0 automatically to protect the electrode.
Prevent arc-break function：TIG operation, Avoid arc-break with special means, even if arc-break occurs the HF will keep the arc stable.

4. **TIG:** If the TIG torch is pressed quickly, the welding current will drop by half, then if the TIG torch is pressed quickly again, the welding current will go back.

Notices:

- Check the condition of welding and connection units first, otherwise there may be malfunctions such as ignition sparks, gas leakages, loss of control and so on.
- Check whether there is enough Argon gas in the shield gas cylinder, you can test the electromagnetic gas valve via the switch on the front panel.
- Do not let the torch aim at your hand or other parts of your body. When you press the torch switch, the arc is ignited with a high-frequency, high-voltage spark and the ignition spark can cause interferences in equipment.
- The flow rate is set according to the welding power used in the job. Turn the regulation screw to adjust the gas flow which is shown on the gas hose pressure meter or the gas bottle pressure meter.
- The spark ignition works better if you keep the 3mm distance from the workpiece to the tungsten electrode during the ignition.

Note: When selecting AC output, the current and the wave form are the same as the above, but output polarity changes alternately.

4.3 The Explanation of Welding Quality

The relation of welding area colour & the protection effect of stainless steel

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

The relation of welding area colour & the protection effect of Ti-alloy

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

4.4 TIG Parameters

The corresponding relationship between gas nozzle diameter and electrode diameter

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

Welding current range/A	DC		AC	
	Gas Nozzle Diameter/mm	Gas Flow Rate/ $L \cdot min^{-1}$	Gas Nozzle Diameter/mm	Gas Flow Rate/ $L \cdot min^{-1}$
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

Electrode Diameter MM	Diameter At Tip MM	Angle Of Cone (°)	Background Current A
1.0	.125	12	2~15
1.0	.250	20	5~30
1.6	.500	25	8~50
1.6	.800	30	10~70
2.4	.800	35	12~90
2.4	1.100	45	15~150
3.2	1.100	60	20~200

TIG of stainless steel (single run welding)

Workpiece Thickness /MM	Joint Form	Tungsten Electrode Diameter/MM	Welding Wire Diameter/MM	Argon Gas Flow Rate/ $L \cdot min^{-1}$	Welding Current (DCEP)	Welding Speed/ $cm \cdot min^{-1}$
0.8	Butt	1.0	1.6	5	20~50	66
1.0	Butt	1.6	1.6	5	50~80	56
1.5	Butt	1.6	1.6	7	65~105	30
1.5	Corner	1.6	1.6	7	75~125	25
2.4	Butt	1.6	2.4	7	85~125	30
2.4	Corner	1.6	2.4	7	95~135	25
3.2	Butt	1.6	2.4	7	100~135	30
3.2	Corner	1.6	2.4	7	115~145	25
4.8	Butt	2.4	3.2	8	150~225	25
4.8	Corner	3.2	3.2	9	175~250	20

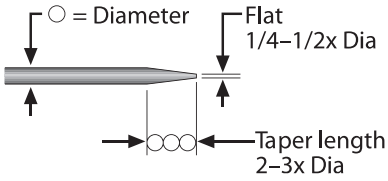
Parameters of pipe welding for mild steel

Piping Diameter Φ/MM	Tungsten Electrode Diameter/MM	Gaas Nozzle Diameter/MM	Welding Wire Diameter/MM	Welding Current/A	Arc Voltage/V	Argon Flow Rate/ $L \cdot min^{-1}$	Welding Rate/ $cm \cdot min^{-1}$
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

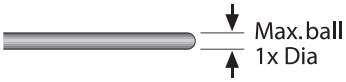
Sheet thickness MM	Welding Wire Diameter MM	Tungsten Electrode Diameter MM	Pre-heat Temperature °C	Welding Current A	Argon Flow Rate/ $L \cdot min^{-1}$	Gas Nozzle Diameter MM	Remark
1	1.6	2	-	45~60	7~9	8	Flange welding
1.5	1.6~2.0	2	-	50~80	7~9	8	Flange or butt welding by one side
2	2~2.5	2~3	-	90~120	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	
12	4~5	5~6	100~150	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	X-Groove butt welding
22~25	5~6	6~7	200~260	360~400	30~35	20~22	

Tungsten tip preparation

DCSP (EN) or DCRP (EP)



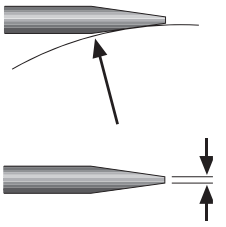
ACHF General Purpose



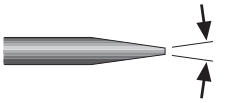
Ball tip by arcing on clean metal at low current DCRP (EP) then slowly increase current to form the desired ball diameter. Return setting to AC.

Tungsten Grinding

Shape by grinding longitudinally (never radially). Remove the sharp point to leave a truncated point with a flat spot. Diameter of flat spot determines amperage capacity. (See below)



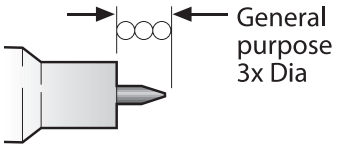
The included angle determines weld bead shape and size. Generally, as the included angle increases, penetration increases and bead width decreases.



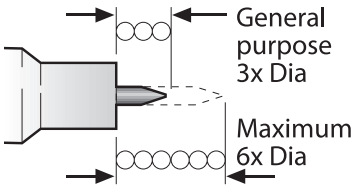
Use a medium (60 grit or finer) aluminium oxide wheel.

Tungsten Extension

Standard Parts



Gas Lens Parts



(in draft free areas)

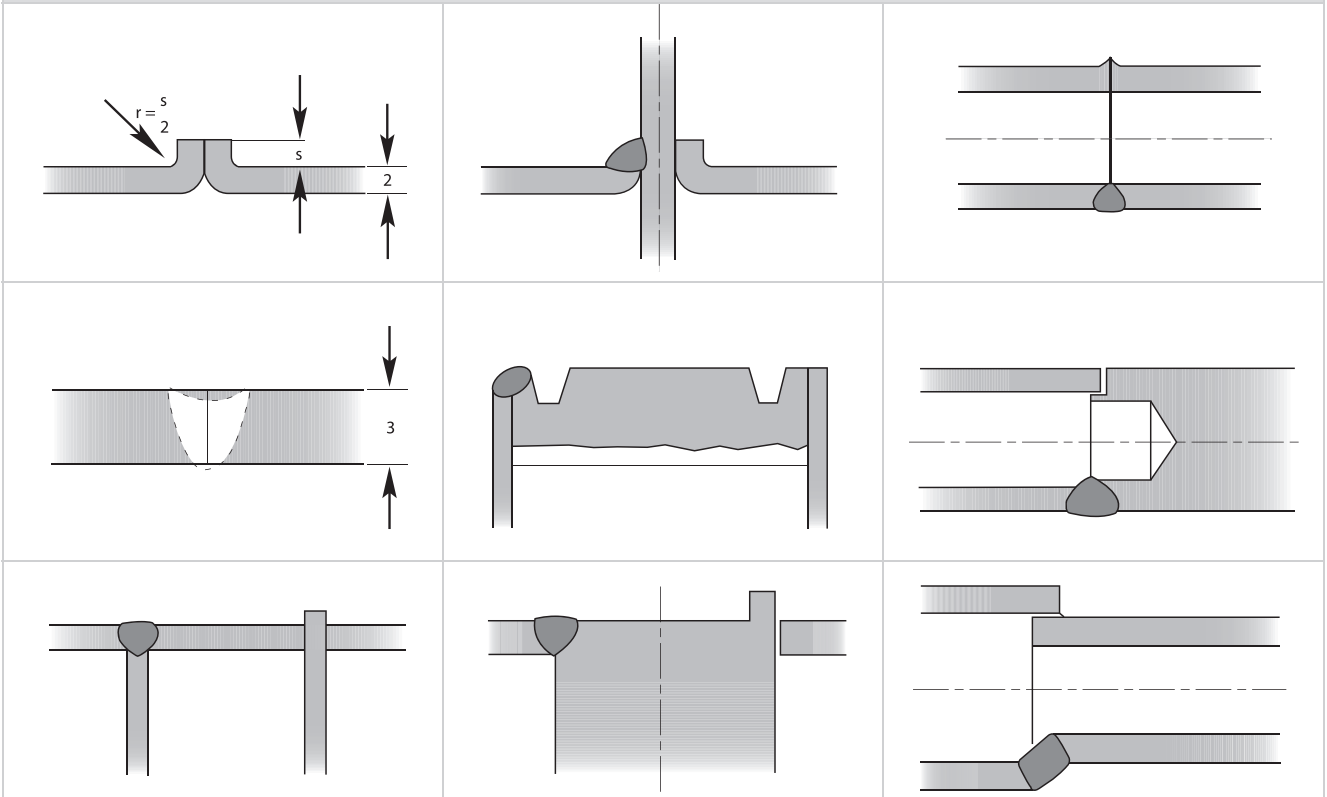
Tungsten electrode tip shapes and current ranges

Thoriated, ceriated, and lanthanated tungsten electrodes do not ball as readily as pure or zirconiated tungsten electrodes, and as such are typically used for DCSP welding. These electrodes maintain a ground tip shape much better than the pure tungsten electrodes. If used on AC, thoriated and lanthanated electrodes often spit. Regardless of the electrode tip geometry selected, it is important that a consistent tip configuration be used once a welding procedure is established. Changes in electrode geometry can have a significant influence not only on the weld bead width, depth of penetration, and resultant quality, but also on the electrical characteristics of the arc. Below is a guide for electrode tip preparation for a range of sizes with recommended current ranges.

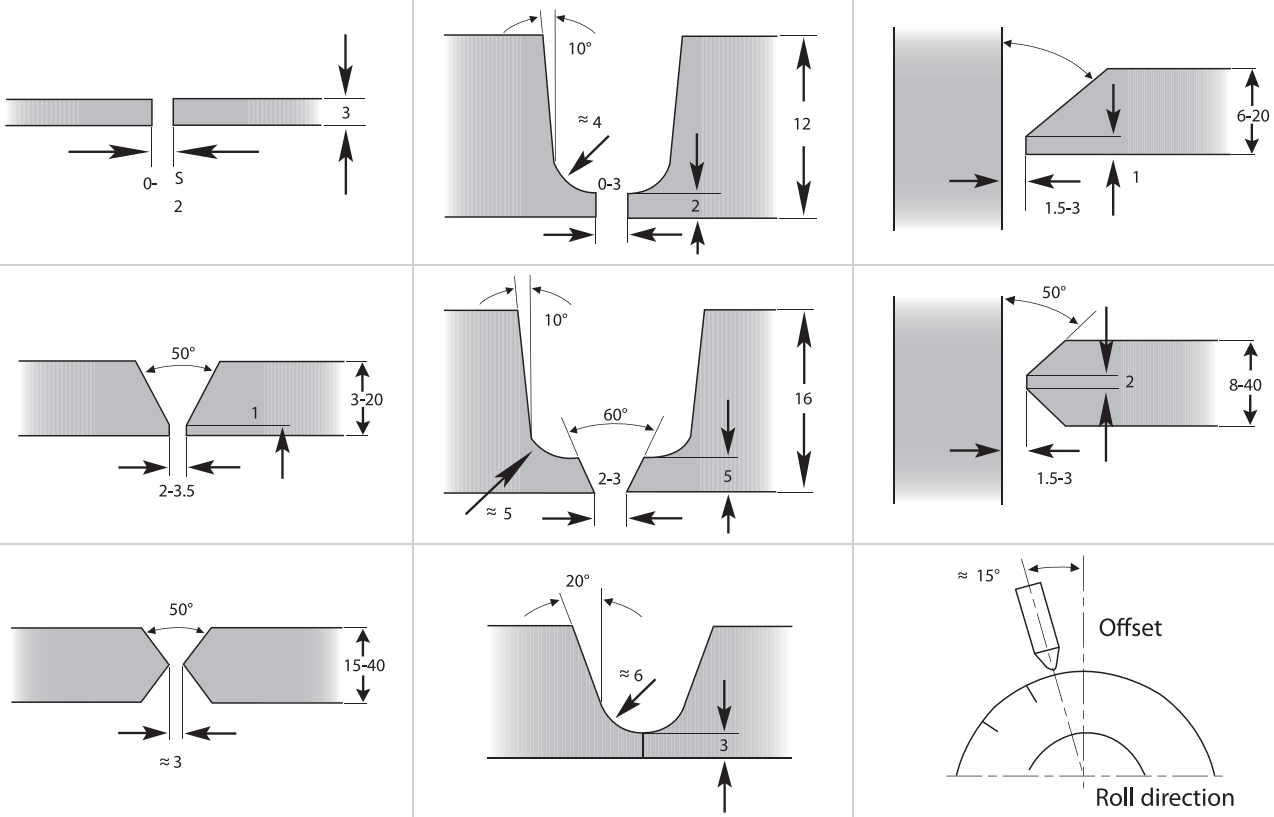
Electrode Diameter (mm)	Diameter ar tip (mm)	Constant included angle, (degrees)	Current range (A)
1.0	0.125	12	2–15
1.0	0.250	20	5–30
1.6	0.500	25	8–50
1.6	0.800	30	10–70
2.3	0.800	35	12–90
2.3	1.100	45	15–150
3.2	1.100	60	20–200
3.2	1.500	90	25–250

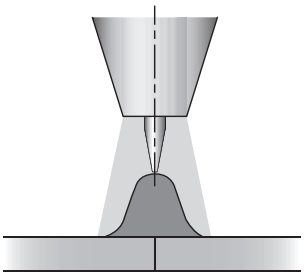
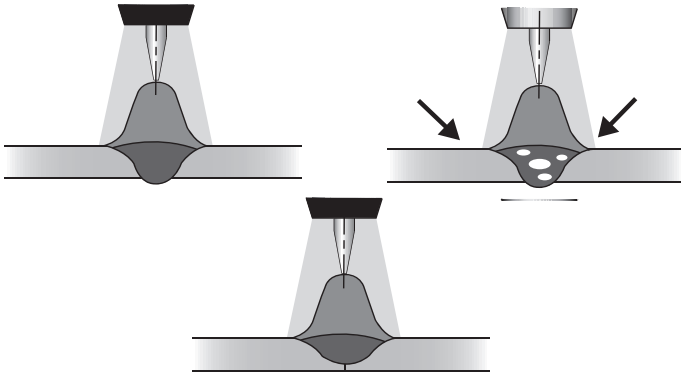
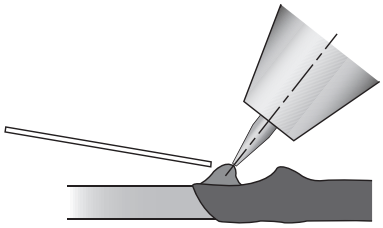
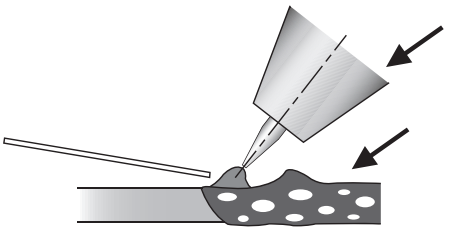
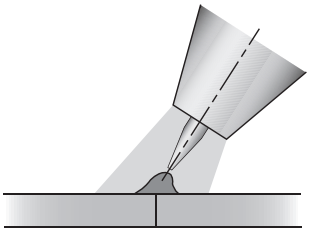
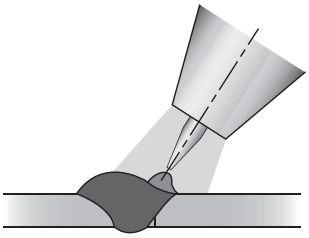
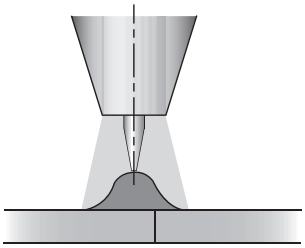
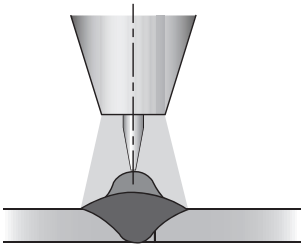
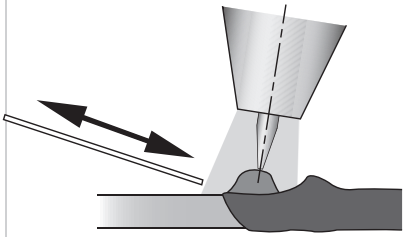
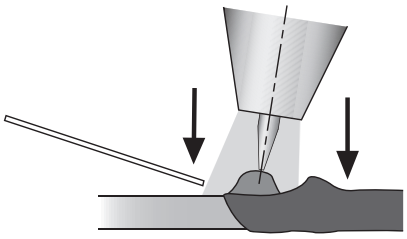
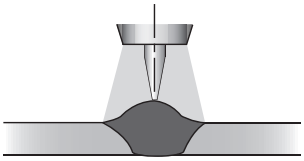
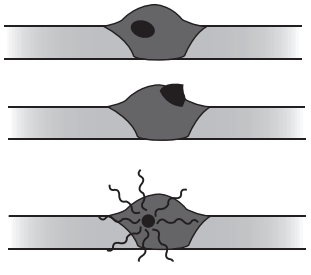
2.6 Joint Preparation

All measurements in mm



All measurements in mm



5.6 Troubleshooting

If there are simple troubles with your TIG200 AC/DC welding machine, you can consult the following overhauling chart:

	Troubles	Reasons		Solutions
1	When the machine is powered on, the fan works but the power light is not on	Light damaged or has a bad connection		Test/repair the inside circuit of power light
		Power PCB Failures		Repair or change control panel
2	When the machine is powered on, the power light is on but the fan doesn't work	There is something in the fan		Clear out
		The fan motor is damaged		Change fan motor
3	When the machine is powered on, neither the fan or power light work	No input voltage		Check whether there is input voltage
		Over Voltage (input voltage is too much or too little)		Check input voltage
4	No no-load voltage output (MMA)	The machine is damaged		Check the main circuit and the Pr4
5	The max and min value displayed doesn't match the set value	The max value isn't in accordance		Adjust potentiometer Imin on the power board
		The min value isn't in accordance		Adjust potentiometer Imaxin the current meter
6	No Gas Flow (TIG)	Something in the valve		Remove it
		Gas cylinder is closed or gas pressure is low		Open or change the gas cylinder
		Electromagnetic valve is damaged		Change it
7	The displayed current on the screen doesnt match output	The LCD screen is broken		Change the LCD screen
8	The welding current can not be adjusted	The welding current potentionmeter in the front panel has a bad connection or is damaged		Repair or change the potentionmeter
9	The penetration of the molten pool is not enough	The welding current is adjusted too low		Increase the welding current
10	Gas always flows	Something in the valve		Remove it
		The gas test on front panel is on		Turn off
		The adjustment kob of pre-gas timeon the front panel is damaged		Repair or change it
		Electromagnetic valve is damaged		Repair or change it
11	The alarm light is on	Over heat protection	Over welding current	Reduce the welding current output
			Working time too long	Reduce the duty cycle (interval work)
		Over current protection	Unusual current in the main circuit	Use a stable power supply/ ensure not too many machines are using the same power supply
		Low-Voltage Protection	Power supply fluctuates	Use a stable power supply
		Over-Voltage Protection		

Troubleshooting guide		
Problem	Cause	Solution
Excessive electrode consumption	*1. Inadequate gas flow* *2. Improper size electrode for current required* *3. Operating of reverse polarity* *4. Electrode contamination* *5. Excessive heating inside torch* *6. Electrode oxidising during cooling* *7. Shield gas incorrect*	1. Increase gas flow 2. Use larger electrode 3. User larger electrode or change polarity 4. Remove contaminated portion, then prepare again 5. Replace collet. Try wedge collet or reverse collet. 6. Increase gas flow post time to approx. 1 sec per 10 amps 7. Change to proper gas (no oxygen or CO_2)
Erratic Arc	*1. Incorrect voltage (arc too long)* *2. Current too low for electrode size* *3. Electrode contaminated* *4. Joint too narrow* *5. Contaminated shield gas. Dark stains on the electrode or weld bead indicate contamination* *6. Base metal is oxidised, dirty or oily*	1. Maintain short arc length 2. Use smaller electrode or increase current 3. Remove contaminated portion, then prepare again 4. Open joint groove 5. The most common cause is moisture or aspirated air in gas stream. Use welding grade gas only. Find the source of the contamination and eliminate it promptly. 6. Use appropriate chemical cleaners, wire brush, or abrasives prior to welding
Inclusion of tungsten or oxides in weld	*1. Poor scratch starting technique* *2. Excessive current for tungsten size used* *3. Accidental contact of electrode with puddle* *4. Accidental contact of electrode to filler rod* *5. Inadequate shielding or excessive drafts* *6. Wrong gas* *7. Heavy surface oxides not being removed* ***on aluminium alloys***	1. Many codes do not allow scratch starts. Use copper strike plate or use high frequency arc starter. 2. Reduce the current or use larger electrode 3. Maintain proper arc length 4. Maintain a distance between electrode and filler metal 5. Reduce the electrode extension to recommended limits 6. Do not use ArO_2 or $ArCO_2$ GMAW (MIG) gases for TIG welding 7. Increase gas flow, shield arc from wind, or use gas lens NOTE: Use ACHF, adjust balance control for maximum cleaning, wire brush and clean the weld joint prior to welding
Porosity in Weld Deposit	*1. Entrapped impurities, hydrogen, air, nitrogen, water vapour* *2. Defective gas hose or loose connection* *3. Filler material is damp (particularly aluminium)* *4. Filler material is oily, dusty or rusty*	1. Do not weld on wet material. Remove condensation from line with adequate gas pre-flow time 2. Check hoses and connections for leaks 3. Dry filler metal in oven prior to welding 4. Replace filler metal

Troubleshooting guide

Problem	Cause	Solution
Porosity in Weld Deposit	5. *Alloy impurities in the base metal such as sulphur, phosphorous, lead and zinc*	5. Change to a different alloy composition which is weldable. These impurities can cause a tendency to crack when hot.
	6. *Excessive travel speed with rapid freezing of weld trapping gases before they escape*	6. Lower the travel speed/increase amps
	7. *Contaminated shield gas*	7. Replace the shielding gas
Cracking in Welds	1. *Hot cracking in heavy section or with metals which are hot short*	1. Preheat. Increase weld bead cross-section size. Change weld bead contour. Use metal with fewer alloy impurities & longer down slope
	2. *Crater cracks due to improperly breaking the arc or terminating the weld at the joint edge*	2. Reverse direction and weld back into previous weld at edge. **Use remote amperage or foot control to manually down slope current**
	3. *Post weld cold cracking due to excessive joint restraint, rapid cooling or hydrogen embrittlement*	3. Preheat prior to welding. Use pure or non-contaminated gas. Increase the bead size. Prevent craters or notches. Change the weld joint design.
	4. *Centreline cracks in single pass weld*	4. Increase bead size. Decrease root opening. Use preheat. Prevent craters.
	5. *Underbead cracking from brittle microstructure*	5. Eliminate sources of hydrogen, joint restraint, and use preheat
Inadequate shielding	1. *Gas flow blockage or leak in hoses or torch*	1. Locate and eliminate the blockage or leak
	2. *Excessive travel speed exposes molten weld to atmospheric contamination*	2. Use slower travel speed or carefully increase the flow rate to a safe level below creating excessive turbulence. Use a trailing shield cup.
	3. *Wind or drafts*	3. Set up screens around the weld area
	4. *Excessive electrode stickout*	4. Reduce electrode stickout. Use a larger size cup
	5. *Excessive turbulence in gas stream*	5. Change gas flow or gas lens parts
Arc Blow	1. *Induced magnetic field from DC weld current*	1. Change to ACHF current. Rearrange the split ground connection
	2. *Arc is unstable due to magnetic influence*	2. Reduce weld current and use arc length as short as possible. Move influence.
Short parts Life	1. *Short water cooled cable life*	1. Verify coolant flow direction. Return flow must be on the power cable lead
	2. *Cup shattering or cracking in use*	2. Change cup size or type. Change tungsten position
	3. *Short collet life*	3. Ordinary style is split and twists or jams. Change to wedge style
	4. *Short torch head life*	4. Do not operate beyond rated capacity. Use water cooled model. Do not bend rigid torches or overbend flexi torches

3.0 TIG Welding Material Reference

3.1 Application Summary

Material	Type of current	Polarity
C-Mn steel	Direct current(-)	DCEN
Alloyed steel	Direct current(-)	DCEN
Copper and Cu alloys	Direct current(-)	DCEN
Nickel and alloys	Direct current(-)	DCEN
Titanium and Ti alloys	Direct current(-)	DCEN
Aluminum and Al alloys	Alternating current(~)	ACEN
	Direct current (-) with Helium	DCEN
Magesium and Mg alloys	Alternating current(~)	ACEN

6.2 C-Mn Steel

TIG welding may be used for welding carbon steel but because deposition rates are low, it is usually only used for welding sheet and thin sections for high quality applications, small components, and root passes of multi-pass butt joints in plate and pipe.

Standard DC TIG equipment is normally suitable and DCEN polarity is usually chosen to provide good workpiece heating.

Only inert or reducing gases should be used for TIG welding and pure argon is normally recommended as the shielding gas for steel.

Filler rods are usually selected to match the chemical composition and the mechanical properties of the parent plate. The weldability of the steel may impose restrictions on the choice of filler rod.

Steels with carbon contents above about 0.3%are hardenable, and fast cooling will produce a hard HAZ and this is liable to result in hydrogen cracking. This form of cracking can be prevented by use of preheat and suitable welding procedures.

Plate Thickness (mm)	Joint Type	Number of Passes	Tungsten Electrode Size(mm)	Consumable Size(mm)	Current(A)
0.8	Fillet	I	2.4	1.5	25
1.0	Fillet	I	2.4	1.5	30
1.5	Fillet	I	2.4	2.0	50
2.0	Fillet	I	2.4	2.5	80
1.0	Butt	I	2.4	1.5	20
1.5	Butt	I	2.4	2.0	40
2.0	Butt	I	2.4	2.5	80

(Shielding gas:Argon,Consumable ER70S-6,Position:Downhand,Polarity:DC-)

6.3 Alloyed Steel

TIG welding may be used for welding alloyed steel but because deposition rates are low, it is usually only used for welding sheet and thin sections for high quality applications, small components and root passes of multi-pass butt joints in plate and pipe.

Standard DC TIG equipment is normally suitable and DCEN polarity is usually chosen and provide good workpiece heating. Tungsten electrodes with additions of thorium oxide are used for welding steel and they give good arc stability. Only inert or reducing gasses should be used for TIG welding and pure argon is normally recommended as the shielding gas for welding alloy steel.

Filler rods are usually selected to match the chemical composition and the mechanical properties of the parent plate. The weldability of the steel may impose restrictions on the choice of filler rod.

Alloy steels with high carbon equivalents are hardenable and fast cooling will produce a hard HAZ and this is liable to result in hydrogen cracking. This form of cracking can be prevented by preheating and other appropriate safeguards.

General Welding Parameters

PlateThickness (mm)	Tungsten Electrode (mm)	Current(A)	Consumable Size (mm)
1.0	1.6	30-60	1.0/1.2
1.5	1.6/2.4	70-100	1.6
2.0	1.6/2.4	90-110	1.6
3.0	2.4/3.2	120-150	1.6
5.0	2.4/3.2	190-250	1.6/2.4
6.0	2.4/3.2	220-340	2.4
8.0	2.4/3.2	300-360	2.4/3.2
12.0	2.4/3.2	350-450	3.2

Polarity DC-

6.4 Stainless Steel

TIG welding is often used for stainless steels, in particular, thin sheet up to 5mm thick, where weld integrity and good surface finish are critical. The process has a high degree of controllability resulting in clean, smooth, high quality welds with good penetration and strength with low defect rate.

Standard TIG equipment is suitable for stainless steel welding using DCEN polarity. A thoriated tungsten electrode is normally used, however due to health concerns, ceriated, lanthanated or E3 electrodes may also be used. The filler rod selection depends on the type of stainless base metal being welded.

Shielding gas is conventionally pure argon, but other gases are available that provide specific results. Other gasses include argon/hydrogen, argon/helium & argon/helium/hydrogen mixtures.

6.5 Aluminium

TIG welding is widely used for welding aluminium, particularly up to about 6mm thick.

TIG welding of aluminium can be carried out using alternating current (AC) or direct current electrode positive (DCEP).

AC is the most frequently used since with AC cleaning of the oxide film occurs on the electrode positive cycle and heating occurs on the electrode negative cycle. With aluminium, the surface oxide film must be removed to allow full fusion to take place and AC TIG does this efficiently allowing high quality joints to be made. High purity argon or argon/helium/hydrogen shielding gas mixtures may be used.

The AC output may be conventional sine wave or square wave and many electronic power sources allow the AC waveform to be adjusted. Some also offer the ability to provide pre and post gas flow as well as slope-in and slope out functions.

Aluminium Welding Parameters

Plate Thickness	Joint type	Tungsten Size(mm)	Consumable size(mm)	Current (A)
1	Square butt	1.6	1.6	75
2	Square butt	1.6	3.2	110
3	Square butt	2.4	3.2	125
4	Square butt	2.4	3.2	160
5	Square butt	2.4	3.2	185
5	V-butt(70)	3.2	3.2	165
6	Square butt	3.2	3.2	210
6	V-butt(70)	3.2	3.2	185

Alternating current,Welding position:Downhand:Pure Aluminium

6.6 Balanced Square wave

The balance on square wave machines can be adjusted to achieve a desired result. Greater amounts of EN create a deeper, narrower weldbead and better joint penetration. This is ideal when welding thicker materials and allows for faster welding speeds. Greater amounts of EP removes more oxides from the surface but also have a shallower penetration.

6.7 Copper & Copper Alloys

Cleanliness is important when welding copper. All dirt, grease, and other contaminants must be removed before welding. Copper alloys containing aluminium will form a surface oxide film. This film must also be removed before welding. Preheating is required for unalloyed copper but some copper alloys can be TIG welded without preheating on thinner materials.

Standard DC TIG welding equipment is suitable for most copper and copper alloys, but aluminium bronze is normally TIG welded using AC current to break down the tenacious oxide film on the surface.

Pure argon, helium, or argon/helium mixtures are standard shielding gases for DC TIG welding on copper and copper alloys. While pure argon is the preferred shielding gas used for AC TIG welding.

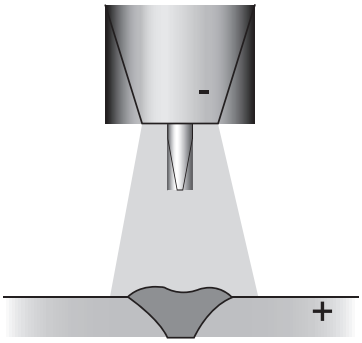
TIG wires are solid filler rods that may be composed of pure copper or several copper alloy compositions, including aluminium bronzes, silicon bronzes, and copper-nickels. Ideally, use a filler material with a similar composition to that of the parent material but this is not always possible, and sometimes not desirable.

Porosity is the main welding concern when TIG welding un-alloyed copper or some copper alloys which may be prone to solidification cracking and porosity. Certain alloys are difficult to weld; brass will lose zinc for example and materials containing lead are virtually unweldable.

6.8 Direct Current (DC) TIG Welding

Select the correct size and type of non consumable tungsten and shielding gas appropriate for the chosen application. See selection chart in 2.3 as a guidelines.

For DC- which is the most commonly used polarity, connect the TIG torch to the negative dinse plug connector and the work lead to the positive dinse plug connector.



GTAW with DCEN produces deep penetration because it concentrates the heat in the joint area. No cleaning action occurs with this. Because of this polarity heat generated by the arc occurs in the base metal, thus a smaller electrode can be used. The more concentrated arc allows for faster travel speeds.

For (DC+) applications connect the TIG torch to the positive Dinse plug connector and the work return lead to the negative dinse plug connector. In this mode most of the heat is generated within the non-consumable tungsten and the heat input into the plate is reduced resulting in lower penetration depths. (Larger tungstens are normally selected for this application.

1) Ensure that the process selector switch (10) is switched to TIG.
2) Ensure that the AC/DC selector switch (28) is set on DC.
3) Select 4T or 2T on the trigger selector switch (13/14).

For 2T Operations

Depress the trigger on the torch and hold down for the entire weld duration. Selecting the 2T function will disable the start current and the process will immediately rise to the selected welding current. Selecting 2T will also disable the downslope cycle. Releasing the trigger will therefore cut the welding current immediately.

For 4T Operations

Depress and release the trigger on the torch to begin welding and simply depress the trigger again to end welding. Selecting the 4T function will enable the start current/upslope (19/20) and the downslope/end current (23/24) cycle. These parameters must be set manually using the control panel. When using a remote device, ensure that it has been properly fitted by connecting it to the remote control outlet connector pin plug (45). The remote operating control indicator (6) must lit for operation.

6.9 DC Pulse TIG Welding

Welding of thin material can be enhanced by using the pulse mode. When using the pulse mode for DC applications the current will be varied between the welding current and the set background current. Additionally the pulse width and pulse frequency can be adjusted. By adjusting the pulse frequency and width, the optimum heat input can be achieved for a particular application.

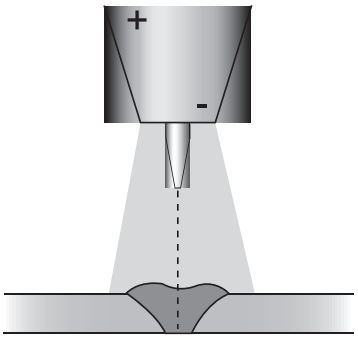
As a general rule, increasing the frequency at a given set of welding parameters, the heat input into the plate will decrease and increase arc focus.

7.0 AC TIG Welding

AC TIG welding is commonly used for the welding of aluminium and aluminium alloys. The positive half cycle of the AC current assists in the cleaning action required for successfully welding aluminium.

E3 or Zirconiated tungstens are used and the size of the tungsten depends on the current employed.

In the normal AC sine wave, equal time is spent in the positive and negative cycle of the current. This delivers a balanced weld with good penetration & cleaning action (29/30).



GTAW with AC combines the weld penetration benefits of DCEP with the desired cleaning action of DCEP. With certain types of AC waveforms, high frequency helps to re-establish the arc, which breaks each half cycle. Medium size tungstens are generally used with this process.

AC Balance Control

In addition to increasing the welding current in AC applications, a change in the penetration or cleaning when welding can be achieved by adjusting the AC Balance.

The AC balance (time spend in the positive (maximum cleaning) or negative (maximum penetration) can be adjusted by using the AC balance control knob (37). Adjusting the AC balance from 30%-50% EN progressively increases the time in the positive side of the AC curve. This results in higher heat concentration in the non-consumable tungsten electrode with reduced weld penetration.

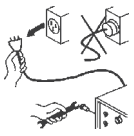
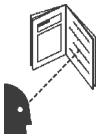
With the AC balance control set at 30%, higher currents can be used on thinner electrodes.

8.0 Recommended Safety Guidelines

Safety precautions & recommendations include:

- Repair or replace defective cables immediately
- Never look directly at the arc except through an appropriate protective shade level lens
- In confined spaces, adequate ventilation and constant observation are essential
- Leads and cables should be kept clear of foot traffic areas to prevent accidental tripping or stumbling
- Keep fire extinguishing equipment in a handy location nearby
- Keep primary terminals and live parts effectively covered
- Never strike an electrode on any gas cylinder
- Never use oxygen for venting containers

9.0 Machine & Welding Hazards

Electric shock hazard		Wear dry, insulated welding gloves while operating	
Welding electrode may cause electric shock		Insulate yourself from work & ground to prevent shock	
Fumes and gases produced during the welding process are harmful		Disconnect from power before assembling or adjusting machine	
Welding arc rays are harmful to eyes and skin		Do not operate in confined spaces or inadequate ventilation	
Read instructional manual fully before operating		Use forced ventilation or exhaust to remove welding fumes	
Seek proper training before operating		Always use a welding helmet with appropriate shade level lens	

10. Warranty Schedule 2021

GWS welding equipment is designed and tested for professional industrial environments.
As a guarantee of high quality, we offer a warranty. Valid only from the sale by GWS or an accredited distributor of the equipment or product.

In no event shall the warranty period extend more than the time stated. The warranty period includes parts and labour. GWS reserves the right to request documented evidence of the date of purchase.

Warranty terms are for single shift operation on all equipment and product. Warranty terms are a back to base warranty. All costs associated with lodging the warranty claim, including the return of goods to the Accredited Service Provider, are the responsibility of the consumer.

Any claim under this warranty must be made within the warranty period which commences on the date of purchase on the equipment or product. For the warranty to be approved the equipment or product has to be assessed by accredited GWS personnel.

Any modifications or alterations made to the equipment or product including electrical modification will result in the equipment or product not being covered under warranty. Any failures under the warranty period that are due to incorrect operation of the equipment or product will not be covered under warranty.

Consumers are reminded to only use the product in accordance with the operating instructions.
For additional operating instructions or to make a warranty claim call 0800 536 774

Main transformers - Output inductors	3 years
Power sources - Wire feeders - Cooling units	2 years
Cooling pumps - Automation products - Ventilators - Main contactors - Wire feeder motors - Solenoid valves - Welding Masks (welding helmet)	1 year
Mig, Tig & Plasma Torches Work leads, electrode holders	3 months
Mig, Tig, Plasma consumables, Welding consumables	Nil
Gas Regulator brass body	2 years
Flowmeter, elastomer seals, O rings, gauges	1 year

Parts & Accessories

Package Includes

		WSEL2504	WELDARC® Earth Lead OKC Male 250 Amp 4 Meters 35-50mm			TTS24	TIGARC® Tungsten Pro-Strike Multi-Mix 2.4mm (10/Pkt)
		TTT268FT	TIGARC® Torch Black Series 26 8Mtr HF Flexihead Tigarc 14pin			GRA	GASpro Regulator Argon Compact Flowmeter 0-25LPM

Optional Extras

		SAH1000F	ArcOne Vision Welding Helmet Black 1000F			TFP	TIG Remote Foot Pedal 10k - 14 Pin Black Plug
		TPP10KOHM	TIGARC® Black Remote Pot			MCART	MIGARC® Black Trolley
		TTS16 TTS24 TTS32	TIGARC® Tungsten Pro-Strike Multi Mix (10/Pkt)			WWCS	Water Cooler 230V 1Phase Small 580x180x230mm 5L Tank
		WSAL2504	WELDARC® ARC Lead OKC Male			TSKSL	TIGARC® Standard Series Starter Kit 1.6/2.4/3.2mm
		SGTPEL SGTPEXL	TIGpro Elite Series Gloves L/XL Black Cuff			SGTPL SGTPXL	TIGPRO® Series Glove Black Cuff
		AL5050	WELDARC® Aluminium Foil Tape for Purging Seal			GRHLATT	Hi-Lo® Regulator Argon Twin Flowmeter - Purging
		WBRUSHCSS	Wire Universal Brush VIP1000S Stainless Steel Crevice			GRAT	GASPRO® Regulator Argon Flowmeter

FIDAT Aluminum TIG Wire AL 5356

	TWAF5161	1.6mm, 1kg
	TWAF5165	1.6mm, 5kg
	TWAF5241	2.4mm, 1kg
	TWAF5245	2.4mm, 5kg
	TWAF5321	3.2mm, 1kg
	TWAF5325	3.2mm, 5kg

TIGARC® 8 Meter Torch HF

		TTT98F	8 Series, Gas Cooled
		TTT178F	17 Series, Gas Cooled
		TTT188F	18 Series, Watercooled
		TTT208F	20 Series, Water Cooled

TIGARC 200 AC/DC