TIG ARC™ 200 DC

INSTRUCTIONAL MANUAL

Contents

Features

- DC TIG, MMA
- IGBT technology, MCU control system, Easy HF ignition
- Outstanding performance on aluminium alloys, carbon steel, stainless steel & titanium
- Low current consumption
- Power Factor Correction (PFC)

PLEASE NOTE that under no circumstances should your TIGARC 200DC 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.

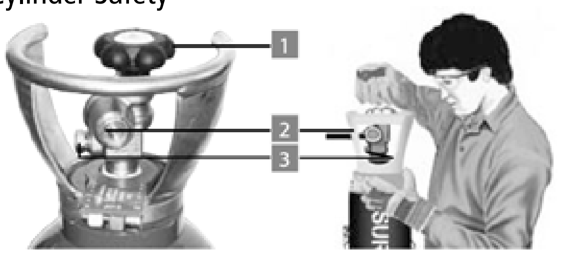
Eye Protection
A welding helmet fitted with the appropriate welding shade lens for the welding operation must be worn at all times when welding. The welding arc and the reflecting arc flash emits ultraviolet and infrared rays. Protective welding screening and eye protection should be provided for others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

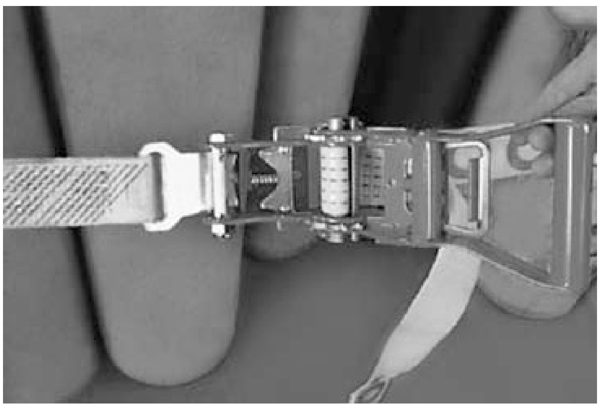
When working with cylinders or operating cylinder valves, always wear appropriate protective clothing – gloves, boots and safety glasses. When moving cylinders, ensure that the valve is not accidentally opened in transit.

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 200DC

- 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

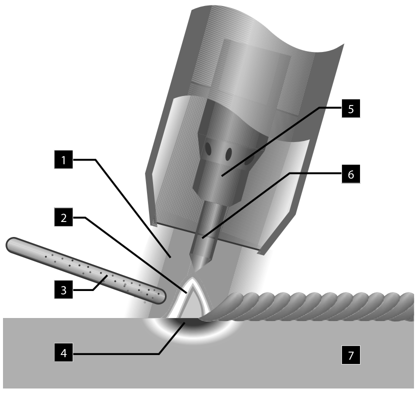
- Replace broken, damaged, missing or worn parts & hoses immediately.

- 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

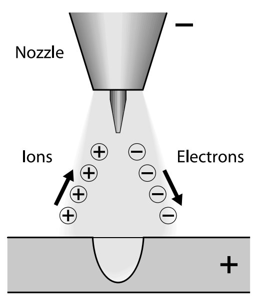
For a given diameter of tungsten electrodes, higher amperage can be used with straight polarity. Straight polarity is used mainly for welding:

- 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

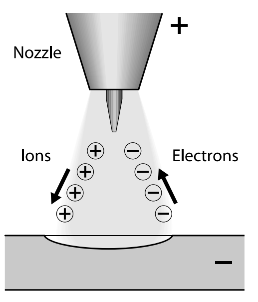
DCEP (reverse polarity) is different from DCEN in the following ways:

- 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



2.3 Shielding Gas Selection

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

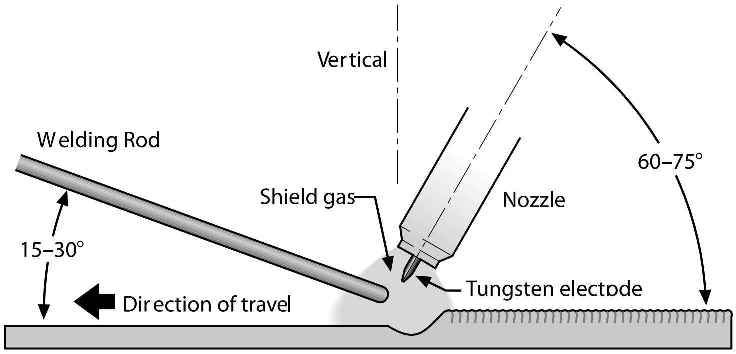
The following table includes the recommended welding consumable for the most commonly welded materials.

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

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

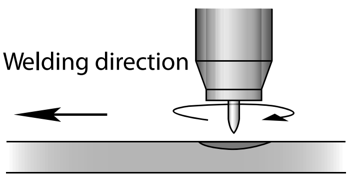


The suggested electrode and welding rod angles for welding a bead on plate.The same angles are used when making a butt weld.The torch is held 60–75° from the metal surface.This is the same as holding the torch 15–30° from the vertical.

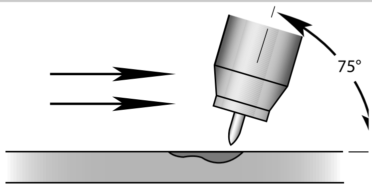
Take special note that the rod is in the shielding gas during the welding process.

2.6 Torch Movement During Welding

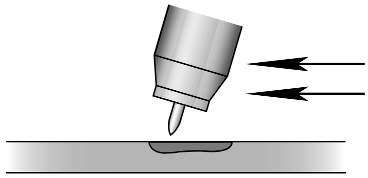
Tungten Without Filler Rod



Form pool

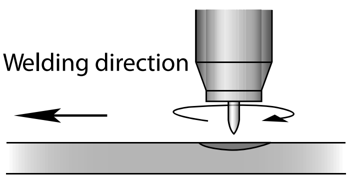


Tilt torch

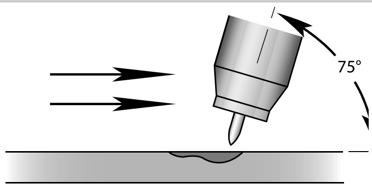


Move torch to front of pool.
Repeat process.

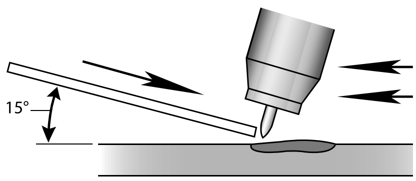
Tungten With Filler Rod



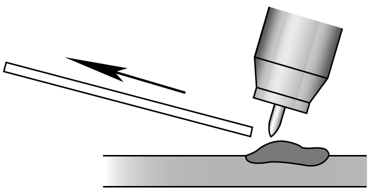
Form pool



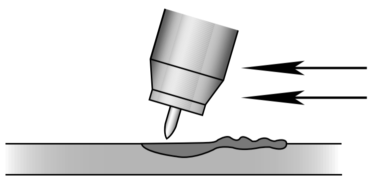
Tilt torch



Add filler metal



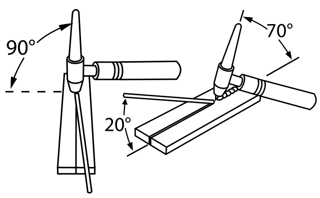
Remove rod



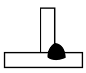
Move torch to front of pool.
Repeat process.

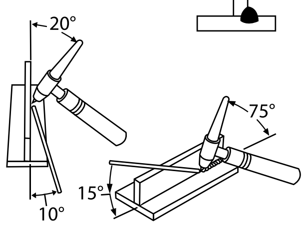
2.7 Positioning Torch Tungsten for Various Weld Joints

Butt Weld and Stringer bead

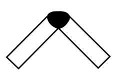


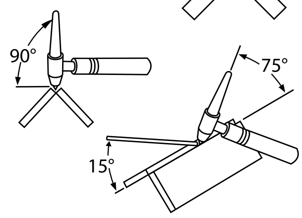
'T' Joint



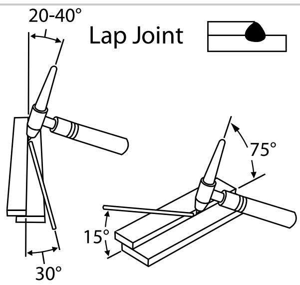


Corner Joint





Lap Joint



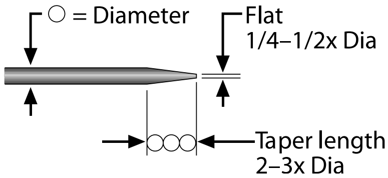
Non Consumable Tungstens

Tungsten Electrode Selector Chart				
Base metal type	Thickness range	Desired results	Welding current	Elextrode type
Copper alloys, Cu-NI alloys and Nickel alloys	All	General purpose	DCEP	2%Thoriated(EW-Th2)
				2%Ceriated(EW-Ce2)
	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)

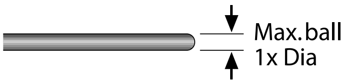
	Shielding gas	Tungsten performance characteristics
	Argon	Balls easily. Low cost. Tends to spit at higher currents. Used for non-critical welds only.
	Argon	Balls well. Takes high current, with less spitting and with better arc starts and arc stability than pure tungsten.
	75% Argon/ 25% Helium	Higher 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.

Tungsten tip preparation

DCSP (EN) or DCRP (EP)



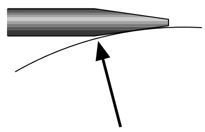
ACHP General Purpose

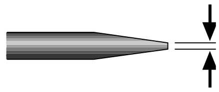


Ball tip by arcing on clean metal at low current DCRP (EP) then slowly increase current to form the desired ball diameter. Return setting to AC.

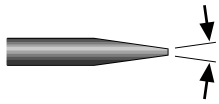
Tungsten Grinding

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)





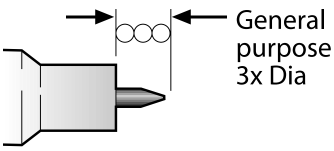
The included angle determines weld bead shape and size. Generally, as the included angle increases, penetration increases and bead width decreases.



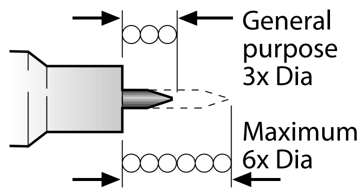
Use a medium (60 grit or finer) aluminium oxide wheel.

Tungsten Extension

Standard Parts



Gas Lens Parts



(in draft free areas)

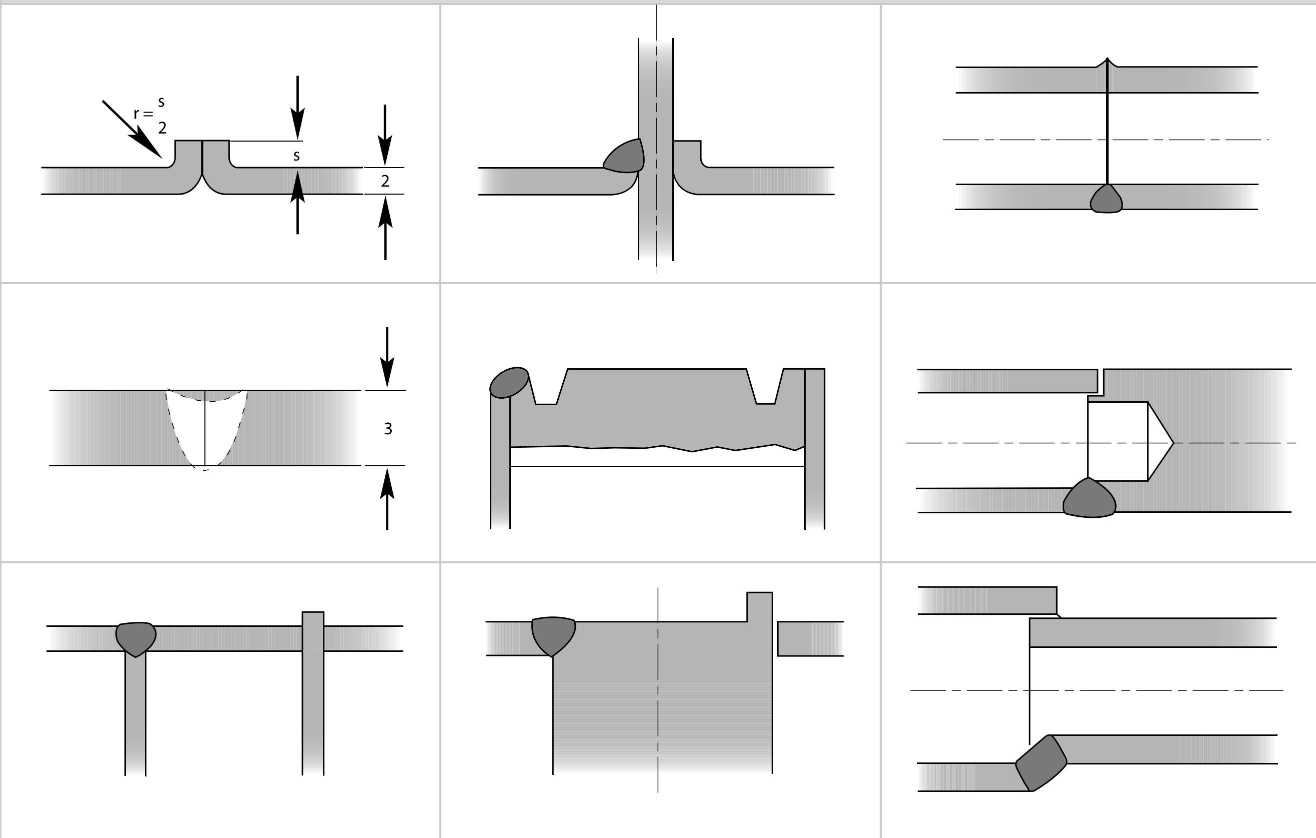
Tungsten electrode tip shapes and current ranges

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.

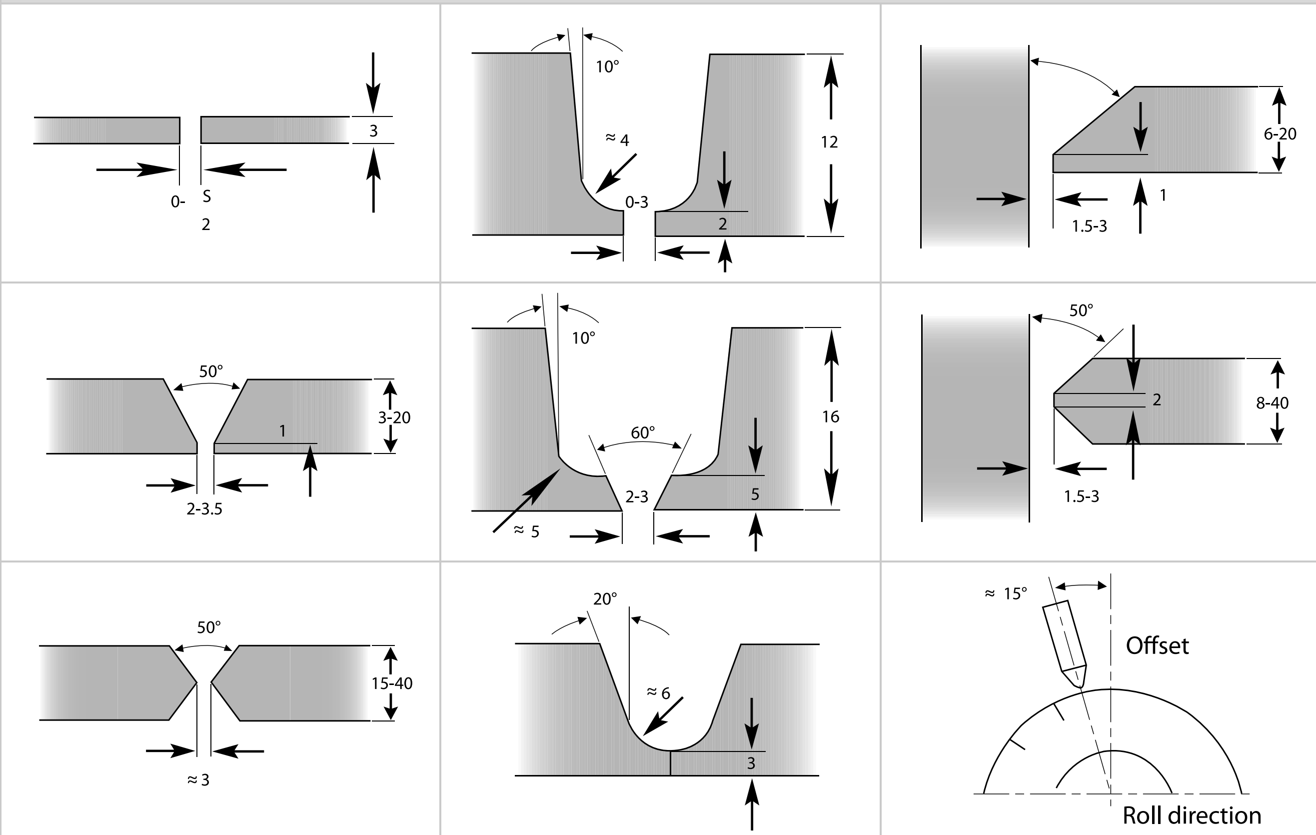
Electrode Diameter (mm)	Diameter ar tip (mm)	Constant included angle, (degrees)	Current range (A)
1.0	0.250	20	5–30
1.6	0.500	25	8–50
1.6	0.800	30	10–70
2.3	0.800	35	12–90
2.3	1.100	45	15–150
3.2	1.100	60	20–200
3.2	1.500	90	25–250

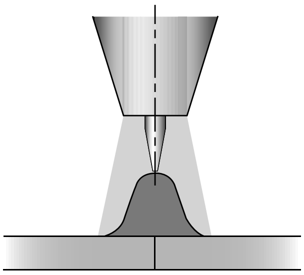
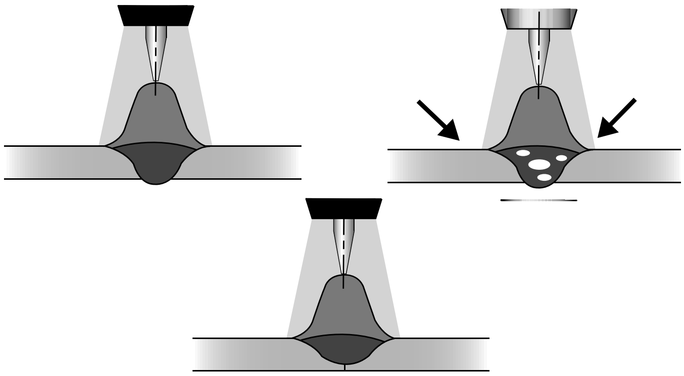
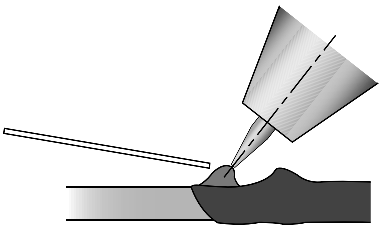
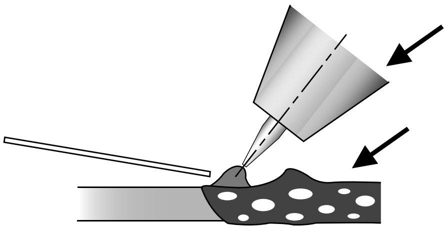
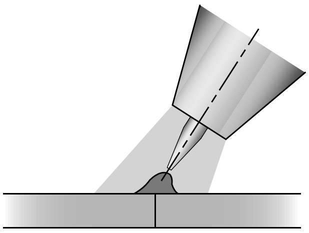
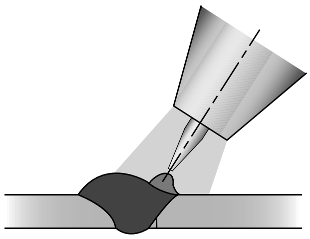
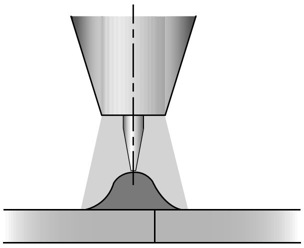
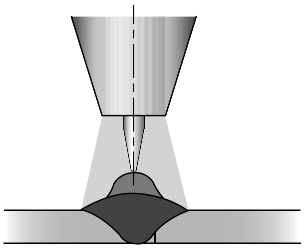
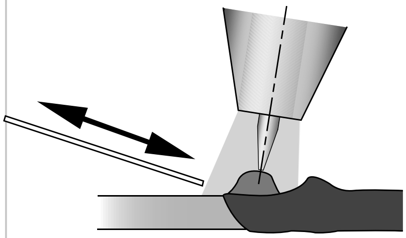
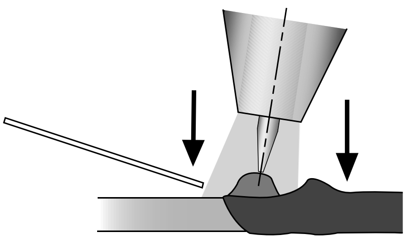
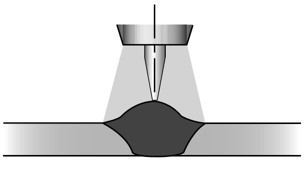
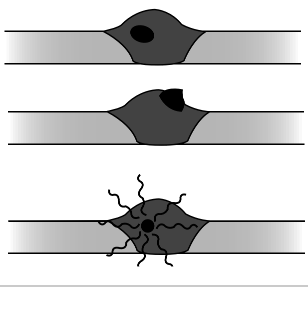
2.6 Joint Preparation

All measurements in mm



All measurements in mm



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*	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
Porosity in Weld Deposit	*1. Entrapped impurities, hydrogen, air, nitrogen, water vapour* *2. Defective gas hose or loose connection* *3. Filler material is damp* *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 leads 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

3.2 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 harden-able, 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-)

3.3 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-

3.4 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.

3.5 Aluminium (AC Welding Only)

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

3.6 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.

3.7 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.

4.0 Getting Started With Your TIGARC 200DC

4.1 Power

This machine is designed to operate on a 230+/- 15% input single phase AC outlet. The machine is supplied with a heavy duty 15A input plug. Ensure that there is adequate ventilation around the machine when it is connected to the mains power supply.

4.2 Shielding Gas

Shielding gas is required for TIG welding and may be supplied via pressure regulator to the machine from either a fixed installation or single cylinder of gas.
If a cylinder of gas is used, always ensure that the cylinder is secure so as not to move or topple accidentally. Refer to the section 1.2 regarding cylinder handling and safety, before operating. Refer to wire documentation guidelines for proper shielding gas selection.

4.3 Connecting the Torch

The TIGARC 200DC is rated at 200A, 40% duty cycle. The matching TIG torch for this machine is the TIGARC 26 Torch fitted with a separate contactor.

1) The TIGARC 26 Torch is fitted to the machine by means of the dinse back end. For DC (-) TIG operation fit the torch back end to the negative dinse connection. Similarly for DC (+) fit the torch back end to the positive dinse connection.

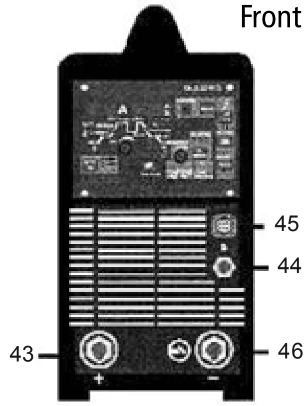
2) The gas hose is fitted to the gas fitting (GAS) located on the front bottom panel of the machine.

4.4 MMA Operation

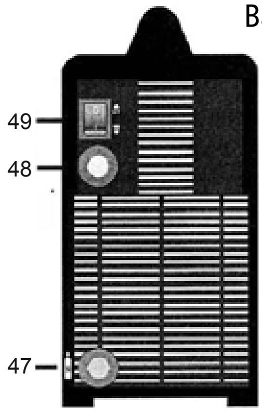
The TIGARC 200DC may be used as a MMA welding machine by fitting an electrode holder and work lead to the respective dinse connectors. Note: connectors will vary depending on the type of electrodes being used. Always consult the packaging supplied by the electrode manufacturer for the correct polarities.

4.5 Panel, Functions & Features Guide

Front



Back



1. Power indicator light
2. Fault indicator illuminates on Overheating, undervoltage, machine overvoltage. Error codes: “EEE001” overheated “EEE002” over/undervoltage
3. MMA HOT START 0%-100%
4. MMA HOT START TIME 0.5S-2S
5. MMA Arc force 0%-100%
6. Pedal mode on/off
7. Pulse frequency DC=0.5HZ-500HZ AC=0.5HZ-10HZ
8. Pulse wideness 20%-80%
9. Gas purge (20 second default)
10. TIG
11. MMA
13. TIG2 indicator
14. TIG4 indicator
16. HF indicator
17. TIG LIFT indicator
18. Pre flow 0S-10S
19. Arc start amperage
20. UP SLOP TIME 0S-10S
21. Welding current
22. PULSE AMPS(%)
23. DOWN SLOPE(S)
24. Arc end amperage
25. Post flow 0S-25S
33. Pulse on
34. Pulse off
36. Welding current adjust & reset to factory settings button
38. Indicator switch to left
39. Indicator switch to right
40. Numeric display
41. Programs (1-9)
42. Program selector
43. Output positive
44. Gas output
45. HF pin plug
46. Output negative
47. Input gas
48. Power cable input
49. Power switch

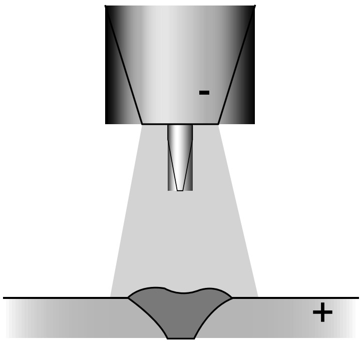
Defaulting to Factory Settings

To reset your TIGARC 200DC to original factory settings, press and hold #36 for 15 seconds.

4.6 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.

4.7 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.

5.0 Technical Parameters

TIGARC 200DC	TIG	MMA
Input Voltage(V)	1-220/230/240 50/60Hz	
Rated Input Power kVA	5.1	5.7
Output Current Range (A DC)	5-200	10-160
Supply Current I_{1eff}	16A	
Supply Current I_{1max}	23A	
Duty Cycle @ (40°C)	35% 200A	35% 160A
Power Factor	0.99	
Protection Class	IP21S	
Insulation Class	F	
Dimensions (LxWxHmm)	430x180x370	
Net Weight (kg)	12	
Certification Approval	AS/NZ60974.1	

Power Factor Correction (PFC)

The wave shape of the current drawn from the mains is made sinusoidal by the PFC device with a consequent total lack of harmonic disurbances in the mains and consumption optimisation, which allows for the use of a 16 A fuse. The PFC circuit also gives the machine a wider protection against mains voltage fluctuations by also making it safer while being operated by power generator sets.

6.0 Warranty Information

6.1 Warranty Terms

The TIGARC 200DC comes with a full 2 year warranty against manufacturer's defects and materials.

- Valid for 24 months from date of purchase
- Repairs must be carried out by an authorised service agent
- Freight, packaging and insurance costs are to be paid for by the claimant
- This warranty is in accordance with the New Zealand Consumer Guarantees Act (CGA)
- Welding leads including electrode holders and work clamps are not covered under these warranty terms

6.2 Warranty Limitations

The following conditions are not covered on the TIGARC 200DC warranty:

- Non compliance with operating and maintenance instructions such as connecting to incorrect or faulty voltage supply including voltage surges outside equipment specs, or incorrect overloading
- Natural wear and tear, and accidental damage
- Transport or incorrect storage damage

The warranty is void if:

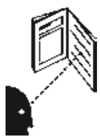
- Changes are made to the product without the approval of the manufacturer
- Repairs are carried out using non-approved spare parts
- If serviced or repaired by a non-authorised agent

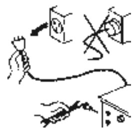
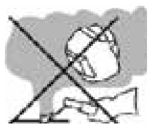
7.0 Recommended Safety Guidelines

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

8.0 Machine & Welding Hazards

Electric shock hazard	
Welding electrode may cause electric shock	
Fumes and gases produced during the welding process are harmful	
Welding arc rays are harmful to eyes and skin	
Read instructional manual fully before operating	
Seek proper training before operating	

Wear dry, insulated welding gloves while operating	
Insulate yourself from work & ground to prevent shock	
Disconnect from power before assembling or adjusting machine	
Do not operate in confined spaces or inadequate ventilation	
Use forced ventilation or exhaust to remove welding fumes	
Always use a welding helmet with appropriate shade level lens