

# **DigiTig 200AC/DC Inverter Pulse Welder**





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Read carefully and understand all **ASSEMBLY AND OPERATION INSTRUCTIONS** before operating. Failure to follow the safety rules and other basic safety precautions may result in serious personal injury.

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Please read this manual carefully before using

## WARRANTY

## **EFFECTIVE JULY 1, 2015**

#### LIMITED WARRANTY

This warranty applies to the original purchaser and is subject to the terms and conditions listed below. This Limited Warranty is for new equipment sold after the above date, providing coverage for defects in material and workmanship at the time it is shipped from the factory.

Limited to the warranty periods below, Crossfire Equipment or an approved Crossfire Repair Centre will repair or replace the item under warranty that fails due todefects in material and workmanship. Crossfire must be notified within 30 days of the failure, so as to provide instructions on how to proceed with the repair of you welder and warranty claim processing. Warranty period begins at the time the welder is purchased from Crossfire. <u>Keep your receipt as proof of purchase.</u>

**Engine Warranty** 

The engine on this unit is warranted separately by the engine manufacturer. Please see the engine manual.

#### **Warranty Periods**

Limited Warranty is divided into four categories. No Warranty, 90 days, 1 year and 3 years.

#### **No Warranty**

Normal wear items, MIG gun parts (contact tips, nozzle, contact tip adapter, MIG gun liner), drive roll, electrode holder, ground clamps, Plasma torch parts (nozzle, electrode, diffuser, cover) are considered consumable items and are not covered under warranty.

#### 90 days

Parts for Crossfire spool guns, welding carts and welding cabinets. This warranty covers the absence of or defective parts.

Parts and Labour on MIG gun parts (except those listed under normal wear items), cables, regulator, plasma torch (except those listed under normal wear items). Any shipping related to warranty repair is the responsibility of the customer.

#### Limited Warranty 1 year/Parts/Labour + 3 year Parts

This warranty covers parts and labour on items such as: transformer, reactor, rectifier, solenoid valve, PC Board, switches, controls, gas valve, drive motor, drive system other than drive roll and any other component that requires the removal of the sheet metal to access. Any shipping related to warranty repair is the responsibility of the customer.

#### **Voiding Warranty**

Warranty does not apply to: Shipping Damage, Misuse and abuse of the unit, alteration of the unit in any way.

#### Warranty Claim

This is a parts and labour warranty. <u>Do not return your unit</u>. Retain your receipt in case a warranty claim is needed. No warranty will be provided without the original receipt from retailer. To make a warranty claim, please contact <u>crossfirewelders@gmail.com</u>.

No Crossfire warranty service can begin without a service file number including – Model # - Serial Number – Purchase Date.



## **GENERAL SAFETY RULES**

WARNING: Read and understand all instructions. Failure to follow all instructions listed below may result in serious injury.

CAUTION: Do not allow persons to operate or assemble this DigiTig 200AC/DC until they have read this manual and have developed a thorough understanding of how the DigiTig 200AC/DC works.

WARNING: The warnings, cautions, and instructions discussed in this instruction manual cannot cover all possible conditions or situations that could occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

## **1.1 Your Welding Environment**

-Keep the environment you will be welding in free from flammable materials.

-Always keep a fire extinguisher accessible to your welding environment.

-Always have a qualified person install and operate this equipment.

-Make sure the area is clean, dry and ventilated. Do not operate the welder in humid, wet or poorly ventilated areas.

-Always have your welder maintained by a qualified technician in accordance with local, state and national codes.

-Always be aware of your work environment. Be sure to keep other people, especially children, away from you while welding.

-Keep harmful arc rays shielded from the view of others.

-Mount the welder on a secure bench

or cart that will keep the welder secure and prevent it from tipping over or falling.

## 1.2 Your Welder's Condition

-Check ground cable, power cord and welding cable to be sure the insulation is not damaged. Always replace or repair damaged components before using the welder.

-Check all components to ensure they are clean and in good operating condition before use.

## 1.3 Use of Your Welder

## **A** CAUTION

Do not operate the welder if the output cable, electrode, torch, wire or wire feed system is wet. Do not immerse them in water. These components and the welder must be completely dry before attempting to use them.

-Follow the instructions in this manual.

-Keep welder in the off position when not in use.

-Connect ground lead as close to the area being welded as possible to ensure a good ground.

-Do not allow any body part to come in contact with the welding wire if you are in contact with the

material being welded, ground or electrode from another welder.

-Do not weld if you are in an awkward position. Always have a secure stance while welding to prevent accidents. Wear a safety harness if working above ground.

-Do not drape cables over or around your body.

-Wear a full coverage helmet with appropriate shade (see ANSI Z87.1 safety standard) and safety glasses while welding.

-Wear proper gloves and protective clothing to prevent your skin from being exposed to hot metals, UV and IR rays.

-Do not overuse or overheat your welder. Allow proper cooling time between duty cycles.

-Keep hands and fingers away from moving parts and stay away from the drive rolls.

-Do not point torch at any body part of yourself or anyone else.

-Always use this welder in the rated duty cycle to prevent excessive heat and failure.

## 1.4 Specific Areas of Danger, Caution or Warning



# Electrical Shock

Electric arc welders can produce a shock that can cause injury or death. Touching electrically live parts can cause fatal shocks and severe burns. While welding, all metal components connected to the wire are electrically hot. Poor ground connections are a hazard, so secure the ground lead before welding.

-Wear dry protective apparel: coat, shirt, gloves and insulated footwear.

-Insulate yourself from the work piece. Avoid contacting the work piece or ground.

- Do not attempt to repair or maintain the welder while the power is on.

-Inspect all cables and cords for any exposed wire and replace immediately if found.

-Use only recommended replacement cables and cords.

-Always attach ground clamp to the work piece or work table as close to the weld area as possible.

-Do not touch the welding wire and the ground or grounded work piece at the same time.

-Do not use a welder to thaw frozen pipes.

## **Fumes and Gases**

## **A**WARNING

-Fumes emitted from the welding process displace clean air and can result in injury or death.

-Do not breathe in fumes emitted by the welding process. Make sure your breathing air is clean and safe.

-Work only in a well-ventilated area or use a ventilation device to remove welding fumes from the environment where you will be working.

-Do not weld on coated materials (galvanized, cadmium plated or containing zinc, mercury or barium). They will emit harmful fumes that are dangerous to breathe. If necessary use a ventilator, respirator with air supply or remove the coating from the material in the weld area.

-The fumes emitted from some metals when heated are extremely toxic. Refer to the material safety data sheet for the manufacturer's instructions.

-Do not weld near materials that will emit toxic fumes when heated. Vapors from cleaners, sprays and degreasers can be highly toxic when heated.

## UV and IR Arc Rays



## **A DANGER**

The welding arc produces ultraviolet (UV) and infrared (IR) rays that can cause injury to your eyes and skin. Do not look at the welding arc without proper eye protection.

-Always use a helmet that covers your full face from the neck to top of head and to the back of each ear.

-Use a lens that meets ANSI standards and safety glasses. For welders under 160 Amps output, use a shade 10 lens; for above 160 Amps, use a shade 12. Refer to the ANSI standard Z87.1 for more information.

-Cover all bare skin areas exposed to the arc with protective clothing and shoes. Flame-retardant cloth or leather shirts, coats, pants or coveralls are available for protection.

-Use screens or other barriers to protect other people from the arc rays emitted from your welding.

-Warn people in your welding area when you are going to strike an arc so they can protect themselves.

## **Fire Hazards**

## **A**WARNING

Do not weld on containers or pipes that contain or have had flammable, gaseous or liquid combustibles in them. Welding creates sparks and heat that can ignite flammable and explosive materials.

-Do not operate any electric arc welder in areas where flammable or explosive materials are present.

-Remove all flammable materials within 35 feet of the welding arc. If removal is not possible, tightly cover them with fireproof covers.

-Take precautions to ensure that flying sparks do not cause fires or explosions in hidden areas, cracks or areas you cannot see.

-Keep a fire extinguisher close in the case of fire.

-Wear garments that are oil-free with no pockets or cuffs that will collect sparks.

-Do not have on your person any items that are combustible, such as lighters or matches.

-Keep work lead connected as close to the weld area as possible to prevent any unknown, unintended paths of electrical current from causing electrical shock and fire hazards.

-To prevent any unintended arcs, cut wire back to 1/4" stick out after welding.



# Hot Materials

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Welded materials are hot and can cause severe burns if handled improperly. -Do not touch welded materials with bare hands.

-Do not touch MIG gun nozzle after welding until it has had time to cool down.



## Sparks/Flying Debris

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Welding creates hot sparks that can cause injury. Chipping slag off welds creates flying debris.

-Wear protective apparel at all times: ANSI-approved safety glasses or shield, welder's hat and ear plugs to keep sparks out of ears and hair.



## Electromagnetic Field

-Electromagnetic fields can interfere with various electrical and electronic devices such as pacemakers.

-Consult your doctor before using any electric arc welder or cutting device

-Keep people with pacemakers away from your welding area when welding.

-Do not wrap cable around your body while welding.

-Wrap MIG gun and ground cable together whenever possible.

-Keep MIG gun and ground cables on the same side of your body.



## Shielding Gas Cylinders Can Explode

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High pressure cylinders can explode if damaged, so treat them carefully.

-Never expose cylinders to high heat, sparks, open flames, mechanical shocks or arcs.

-Do not touch cylinder with MIG gun.

-Do not weld on the cylinder

-Always secure cylinder upright to a cart or stationary object.

-Keep cylinders away from welding or electrical circuits.

-Use the proper regulators, gas hose and fittings for the specific application.

-Do not look into the valve when opening it.

-Use protective cylinder cap whenever possible

## 1.5 Proper Care, Maintenance and Repair A DANGER

-Always have power disconnected when working on internal components.

- Do not touch or handle PC board without being properly grounded with a wrist strap. Put PC board in static proof bag to move or ship.

-Do not put hands or fingers near moving parts such as drive rolls of fan

#### DigiTig 200AC/DC USE AND CARE

- Do not modify the DigiTig 200AC/DC in any way. Unauthorized modification may impair the • function and/or safety and could affect the life of the equipment. There are specific applications for which the DigiTig 200AC/DC was designed.
- Always check of damaged or worn out parts before using the DigiTig 200AC/DC. Broken parts will affect the DigiTig 200AC/DC operation. Replace or repair damaged or worn parts immediately.
- Store idle DigiTig 200AC/DC. When DigiTig 200AC/DC is not in use, store it in a secure place out of the reach of children. Inspect it for good working condition prior to storage and before re-use.



Notice: \* If the internal temperature exceess the safe zone the welder will shut down and the protection indicator will light up. The welder will come back on when it cools down.

\* Turn off the power switch and Argon valve, before leaving the work area.

Shut off at end of day or temporary absences.

\* Welders should wear canvas work clothes and welding face shield to protect from spares and light rays

- \* Put welding screens up to protect others in the work area.
- \* Flammable, explosive items should not be put near the welding area;
- \* Every outlet of the welder should be connected and grounded correctly.



Notice: The cover protection degree of the WAVE series Square DigiTig 200AC/DC pulsed inverter TIG welder is IP21S.When the welder is operated, do not insert finger or round stick diameter less than 12.5mm (especially metal stick) into the welder; Do not allow to press heavily onto the welder.

# **TECHNICAL SPECIFICATION**

| TERM                           | UNIT | DigiTig 200AC/DC |
|--------------------------------|------|------------------|
| Rated Input Voltage            | V    | 230              |
| Power Frequency                | Hz   | 50/60            |
| Rated Input Capacity           | KVA  | 8.0              |
| Rated Input Current            | А    | 35               |
| Output No Load Voltage         | V    | 68               |
| Rated Working Voltage          | V    | 18               |
| DC Argon Welding Current       | А    | 5~200            |
| AC Argon Welding Current       | А    | 10~200           |
| Stick Welding Current          | А    | 5~170            |
| Current Up Time                | S    | 0~15             |
| Current Drop Time              | S    | 0~25             |
| Pulse Frequency                | Hz   | 0.5~250          |
| Pulse Width Adjustment<br>(DC) | %    | 15~85            |
| AC Frequency                   | Hz   | 15~150           |
| Clear Area Control (AC)        | %    | 15~65            |
| Gas Stop Delay Time            | S    | 0~30             |
| Rated Duty Cycle               | %    | 35               |
| Cooling Type                   |      | Air cooling      |
| Effiency                       | η    | ≥ 85%            |
| Power Factor                   | Cosφ | 0.92             |
| Insulation Degree              |      | Н                |
| Cover Protection Degree        | IP   | IP21S            |
| Weight                         | kg   | 19.5             |
| Dimension L×W×H                | mm   | 500*240*410      |

| Mode                  | Material<br>Type      | Designe<br>d Joint | WORK<br>Thicknes<br>s<br>(mm) | Wire<br>Dia<br>Φ<br>(mm) | Welding<br>Current<br>(A) | Polarity       | Argon<br>Flow<br>(dm <sup>3</sup> /mi<br>n) | Tungste<br>n Stick<br>Dia Φ<br>(mm) | Angle  | Top Dia<br>Φ<br>(mm) |
|-----------------------|-----------------------|--------------------|-------------------------------|--------------------------|---------------------------|----------------|---|-------------------------------------|--------|----------------------|
|                       |                       | Vertical<br>Joint  | 1.6~3.0                       | 1 6~2 5                  | 50~90                     |                | 8~12  | 1.0                                 | 12~20° | 0.12~0.25            |
| DC Stainless<br>Steel | Stainless<br>Steel    | V groove           | >3.0~6.0                      | 1.0 2.0                  | 70~120                    | DC<br>Positive | 0 12  | 1.6                                 | 25~30° | 0.50~0.75            |
|                       |                       | X groove           | >6.0~12                       | 2.5~3.2                  | 100~150                   |                | 10~14                                       | 2.4                                 | 35~45° | 0.75~1.10            |
|                       | Pure                  | Vertical<br>Joint  | 1~2.5                         | 1.6~2.5                  | 45~90                     |                | 2~6   | 2~3                                 |        |                      |
| AC                    | Aluminium,<br>Alu-Mag | V groove           | 3~6                           | 2~4                      | 90~180                    | Positive       | 10~12                                       | 3~4                                 | 90°    | 1.50                 |
|                       | Alloy                 | X groove           | 8~12                          | 4~5                      | 150~220                   |                | 12~16                                       | 4~5                                 |        |                      |

Welding regulations parameter table (only for reference)

## KNOW YOUR WELDER

#### Description

The DigiTig 200AC/DC can be used for SMAW ,AC Tig ,DC Tig and pulse Tig The parameters are presented on a digital display allowing for easy operation

## 1. Front panel

## 1. 1. Know the Front panel



## 1.2. Current display

To show the preset current when setting and the welding current when working.

#### 1.3. AC/DC transfer knob

Use this knob to choose AC or DC, when AC indicator light, means the Machine is under AC mode. When DC indicator light, means the machine is under DC mode.

#### 1.4. Pulse switch

Use this knob to choose whether you need the pulse, when indicator is lit it you are working in pulse mode.

#### 1.5. Welding mode knob

Use this knob to choose the welding mode, Either MMA、HF TIG and contact-type TIG.

#### 1.6. Parameter knob and positive knob

Use this knob to choose the Procedure, indicator light will Display the procedure you have selected.

#### 1.7. Adjustment knob

Use this knob to adjust the parameter, and the parameter will be shown on the display.

#### 1.8. Gas check knob

This machine has A gas check function, use knob to check the gas. Press this knob, the gas check indicator light, air valve works, that means the gas circuit is Functioning. Press this knob again, the indicator extinguish, gas check function does not work.

#### 1.9. Voltage display

To show the preset current when setting and the welding current when working.

#### 1.10. Procedure parameter display

This displays the procedure, you have selected.

The illuminated process is the one you arc adjusting.



| 1 | Pre-flow Time indicator light            | 8  | Pulse frequency indicator light (PULSE)    |
|---|--|----|--|
| 2 | Hot start current indicator light (MMA)  | 9  | Background current indicator light(PULSE)  |
| 3 | Arc starting current indicator light(4T) | 10 | Minus grade time indicator light (4T)      |
| 4 | Uphill time indicator light (4T)         | 11 | Arc stopping current indicator light (4T)  |
| 5 | Welding current indicator light (CC)     | 12 | Gas delay time indicator light             |
| 6 | Peak current indicator light (PULSE)     | 13 | Clear area width (ACTIG) / arc force (MMA) |
| 7 | Pulse width indicator light (PULSE)      | 14 | AC frequency (ACTIG)                       |

## 1.11.1. Thermal protection:

This machine use NTC for temperature sensing element to monitor & protect internal components

in real time.

#### 1.11.2. Overvoltage protection:

When the input voltage is below or Above the specified voltage, the machine will cut off the power to protect itself until the Proper input voltage is available.

## INSTALLATION

 POWER REQUIREMENT - AC single phase 230V, 60 HZ with a 50 amp circuit breaker is required. DO NOT OPERATE THIS UNIT if the ACTUAL power source voltage is less than 220 volts AC or greater than 240 volts AC.

AWARNING

- High voltage danger from power source! Consult a qualified electrician for proper installation of receptacle. This welder must be grounded while in use to protect the operator from electrical shock.
- Do not remove grounding prong or alter the plug in any way. Do not use any adapters between the welder's power cord and the power source receptacle. Make sure the POWER switch is OFF when connecting your welder's power cord to a properly grounded 220 VAC, 60 HZ, Single Phase, 50 Amp input power supply.

**2. EXTENSION CORD** - We do not recommend an extension cord because of the voltage drop they produce. This drop in voltage can affect the performance of the welder. If you need to use an extension cord, we recommend you check with a qualified electrician and your local electrical codes for your specific area. Do not use an extension cord over 25 ft. in length.

#### 3. MMA mode connection method



#### 4. TIG mode connection method



#### 5. Input connection method



#### **A**WARNING

EXPOSURE TO A WELDING ARC IS EXTREMELY HARMFUL TO THE EYES AND SKIN! Prolonged exposure to the welding arc can cause blindness and burns. Never strike an arc or begin welding until you are adequately protected. Wear flame-proof welding gloves, a heavy long sleeved shirt, trousers without cuffs, high topped shoes, and an ANSI approved welding helmet.

#### OPERATION

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High voltage danger from power source! Consult a qualified electrician for proper installation of receptacle at the power source. This welder must be grounded while in use to protect the operator from electrical shock. If you are not sure if your outlet is properly grounded, have it checked by a qualified electrician. Do not cut off the grounding prong or alter the plug in any way and do not use any adapter between the welder's power cord and the power source receptacle. Make sure the POWER switch is OFF then connect your welder's power cord to a properly grounded 220 VAC, 60 HZ, single phase, 50 amp power source.

#### 1. MMA: DC Stick arc welding

Set the [Welding mode knob] to ", adjust the [Adjustment knob] to change the welding current.

The hot start current " $\int$ -"and arc force current " $\Box$ " can be adjusted at this mode according to the welding materials.

NOTICE: If set [Welding mode knob] to ", just the hot start current " /-' and arc force current



#### 2. TIG:



#### 2.1 DC TIG welding

Set the [Welding mode knob] to " f f ?, and [AC/DC transfer knob] to DC" ,would enter

into DC TIG welding mode. In this mode use the Parameter positive knob":

- **[**] to adjust the Pre-flow time
- [ Ic ] to adjust the welding current;
- **(** $\mathbf{i}^{\circ}$ **)** to adjust the stopping gas delay time;

## 2.2 DC pulse TIG welding

Set [Welding mode knob] to "TIG f = f, [AC/DC transfer knob] to "DC ", [Pulse switch] set on "Pulse" to enter pulse tig welding .Use Parameter knob""Parameter positive knob":

- $\begin{bmatrix} \circ \\ \bullet \end{bmatrix}$  to adjust the Pre-flow time;
- [ ] to adjust the pulse peak current;
- to adjust the Pulse width;
- [ ) [ ) to adjust the Pulse frequency;
- [ ] to adjust the Pulse Background current;
- **[**  $\dot{\bullet}^{\circ}$  **]** to adjust the stopping gas delay time;

## 2.3 Trigger Mode Control Button (HF TIG and LIFT TIG Mode only)

The trigger mode control is used to switch the torch trigger between 2T (normal), and 4T (latch mode).

#### 2.3.1 2T Normal Mode

In this mode, the torch trigger must remain depressed for the welding output to be active. Press and hold the torch trigger to activate the power source (weld). Release the torch trigger switch to cease welding.

#### NOTE

in this operation mode, the function of UP SLOPE and DOWN SLOPE is not used!



## 2.3.2 4T Latch Mode

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

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

#### NOTE

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



#### 2.4 AC TIG welding

Set [Welding mode knob] to "TIG f = f = and [AC/DC transfer knob] to "AC <math>f" would enter into AC TIG welding mode. Then use "Parameter positive knob":

I to adjust the Pre-flow time;
I to adjust the welding current;
I to adjust the stopping gas delay time;
I to adjust the clear area width;
I to adjust the AC square wave frequency;

Choose 2step,4step switch ]set on different gears to choose the welding method "2 step 2T", "four



## 2.5 AC pulse TIG welding

Set [Welding mode knob] to "TIG f = f and [AC/DC transfer knob] to "AC f ", [Pulse switch] set on "Pulse" to enter into AC pulse TIG welding mode. Then use "Parameter positive knob":

- **to adjust the Pre-flow time;**
- [ ] to adjust the pulse peak current;
- to adjust the Pulse width;
- [ ) [ ] to adjust the Pulse frequency;
- [ ] to adjust the Pulse Background current;
- I to adjust the stopping gas delay time;
- [ ] to adjust the AC square wave frequency;

Choose [2step,4step switch] set on different gears to choose the welding method "2 step 27", "four

step 4T

#### 2.6 LIFT TIG welding

Set [Welding mode knob] to "TIG  $\widehat{\square}$ ", let the TIG torch contact the workpiece, press the switch, at this time there will be a 50A arc starting current, press the switch more than 0.5s(Pre-flow time not included), then lift the torch, make the distance between the torch and workpiece is 2~4mm, then start welding.

## 2.7 Description for using TIG torch with amperage control and foot pedal control:

**Firstly**, preset max output current on the front panel of machine which user will welding, e.g. 100A. the digital will show 100A preset current;

**Secondly,** user can only adjust max welding current on TIG torch or foot pedal during welding. However, output amperage range will be limited to preset amperage on welder, that means the output amperage range is min amperage to 100A.

Note: if there is no other adjustment after presetting current 4s or 5s, digital will show real current.

#### 3. Stick welding skill

#### 3.1 Welding positions

There are two basic positions, for welding: Flat and Horizontal. Flat welding is generally easier, faster, and allows for better penetration. If possible, the work piece should be positioned so that the bead will run on a flat surface.

## 3.2 Preparing the Joint

Before welding, the surface of work piece needs to be free of dirt, rust, scale, oil or paint or it will create brittle and porous welds. If the base metal pieces to be joined are thick or heavy, it may be necessary to bevel the edges with a metal grinder, the correct bevel should be around 60 degree. See following picture:



Based on different welding position, there are different welding joint, see following images for more information.



#### **3.3 GROUND CLAMP CONNECTION**

Clear any dirt, rust, scale, oil or paint on the ground clamp. Make certain you have a good solid ground connection. A poor connection at the ground clamp will waste power and heat. Make sure the ground clamp touches the metal.

#### **3.4 ELECTRODE**

The welding electrode is a rod coated with a layer of flux. When welding, electrical current flows between the electrode (rod) and the grounded metal work piece. The intense heat of the arc between the rod and the grounded metal melts the electrode and the flux. For best performance on this unit, we suggest the use of 6013 electrodes.

## 3.5 SELECTING THE PROPER ELECTRODE

There is no golden rule that determine the exact rod or heat setting required for every situation. The type and thickness of metal and the position of the work piece determine the electrode type and the amount of heat needed in the welding process. Heavier and thicker metals required more amperage. It is best to practice your welds on scrap metal which matches the metal you intend to work with to determine correct heat setting and electrode choice. See the following helpful trouble shooting tips to determine if you are using a correct electrode.



3.5.1. When proper rod is used:

3.5.1.a. The bead will lay smoothly over the work without ragged edges

3.5.1.b. The base metal puddle will be as deep as the bead that rises above it

3.5.1.c. The welding operation will make a crackling sound similar to the sound of eggs frying

3.5.2. When a rod too small is used;

3.5.2. a. The bead will be high and irregular

3.5.2. b. The arc will be difficult to maintain

3.5.3. When the rod is too large

3.5.3. a. The arc will burn through light metals

3.5.3. b. The bead will undercut the work

3.5.3. c. The bead will be flat and porous

3.5.3. d. Rod may be freeze or stick to work piece

**Note:** Rate of travel over the work also affects the weld. To ensure proper penetration and enough deposit of rod, the arc must be moved slowly and evenly along the weld seam.

## 3.6 SETTING THE AMPERAGE CONTROL

The welder has an infinite current control. It is capable of welding with electrodes up to 3/32" diameter. There is no golden rule that determines the exact amperage required for every situation. It is best to practice your welds on scrap metal which matches the metals you intend to work with to determine correct setting for your job. The electrode type and the thickness of the work piece metal determine the amount of heat needed in the welding process. Heavier and thicker metals require more voltage (amperage), whereas lighter and thinner metals require less voltage (amperage). Consult the welding electrode packaging for recommended welding amperage range.

## **3.7 WELDING TECHNIQUES**

The best way to teach yourself how to weld is with short periods of practice at regular intervals. All practice welds should be done on scrap metal that can be discarded. Do not attempt to make any repairs on valuable equipment until you have satisfied yourself that your practice welds are of good appearance and free of slag or gas inclusions.

## 3.7.1 Holding the electrode

The best way to grip the electrode holder is the way that feels most comfortable to you. Position the Electrode to the work piece when striking the initial arc it may be necessary to hold the electrode perpendicular to the work piece. Once the arc is started the angle of the electrode in relation to the work piece should be between 10 and 30 degrees. This will allow for good penetration, with minimal spatter. 3.7.2 Striking the arc

## **A**WARNING

EXPOSURE TO A WELDING ARC IS EXTREMELY HARMFUL TO THE EYES AND SKIN! Prolonged exposure to the welding arc can cause blindness and burns. Never strike an arc or begin welding until you are adequately protected. Wear flame-proof welding gloves, a heavy long sleeved shirt, trousers without cuffs, high topped shoes, and an ANSI approved welding helmet.

Scratch the work piece with the end of electrode to start arc and then raise it quickly about 1/8 inch gap between the rod and the work piece, see following picture



It is important that the gap be maintained during the welding process and it should be neither too wide or too narrow. If too narrow, the rod will stick to the work piece. If too wide, the arc will be extinguished. It needs much practice to maintain the gap. A beginner may get sticker or arc extinguishing. When the rod is stuck to the work piece, gently rock it back and forth to make them separate. If not, a short circuit will occur and it will break the welder. A good arc is accompanied by a crisp, cracking sound. The sound is similar to that made by eggs frying. To lay a weld bead, only 2 movements are required; downward (as the electrode is consumed) and in the direction the weld is to be laid, as in following figure:



#### 3.7.3 Types of weld bead

The following paragraphs discuss the most commonly used arc welding beads.

<u>The stringer bead</u> Formed by traveling with the electrode in a straight line while keeping the electrode centered over the weld joint.



<u>The weave bead</u> Used when you want to deposit metal over a wider space than would be possible with a stringer bead. It is made by weaving from side to side while moving with the electrode. It is best to hesitate momentarily at each side before weaving back the other way.

3.7.4 Welding position

<u>Flat position</u> It is easiest of the welding positions and is most commonly used. It is best if you can weld in the flat position if at all possible as good results are easier to achieve.

Flat Position



Horizontal Position

<u>The horizontal position</u> it is performed very much the same as the flat weld except that the angle is different such that the electrode, and therefore the arc force, is directed more toward the metal above the weld joint. This more direct angle helps prevent the weld puddle from running downward while still allowing slow enough travel speed to achieve good penetration. A good starting point for your electrode angle is about 30 degrees DOWN from being perpendicular to the work piece.

3.7.5 Judge the good weld bead

When the trick of establishing and holding an arc has been learned, the next step is learning how to run a good bead. The first attempts in practice will probably fall short of acceptable weld beads. Too long of an arc will be held or the travel speed will vary from slow to fast (see following)



- A. Weld speed is too fast.
- B. Weld speed is too slow.
- C. Arc is too long.
- D. Ideal weld.

A solid weld bead requires that the electrode be moved slowly and steadily along the weld seam.

Moving the electrode rapidly or erratically will prevent proper fusion or create a lumpy, uneven bead.

ELECTRIC SHOCK CAN KILL! To prevent ELECTRIC SHOCK, do not perform any welding while standing, kneeling, or lying directly on the grounded workpiece.

#### 3.7.6 Finish the bead

As the coating on the outside of the electrode burns off, it forms an envelope of protective gases around the weld. This prevents air from reaching the molten metal and creating an undesirable chemical reaction. The burning coating, however, forms slag. The slag formation appears as an accumulation of dirty metal scale on the finished weld. Slag should be removed by using a chipping hammer.

#### 

PEENING THE SLAG FROM A WELD JOINT CAUSES SMALL CHIPS OF METAL TO FLY THROUGH THE AIR! Metallic chips flying through the air can cause eye injury or injury to other parts of the head, hands or exposed portions of the body. Wear goggles or safety glasses with side shields and protect the hands and other exposed parts of the body with protective garments, or if possible, work with a shield between the body and the work piece.

The intense heat produced at the arc sets up strains in the metal joined by welding. Peening the weld not only removes the scale left behind in the welding but relieves the internal strains developed by the heating and cooling process.

#### 4. TIG welding skill

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



# Tungsten Electrode Current Ranges

| Electrode Diameter | DC Current (Amps) |
|--------------------|-------------------|
| 0.040" (1.0 mm)    | 30-60             |
| 1/16" (1.6 mm)     | 60-115            |
| 3/32" (2.4 mm)     | 100-165           |
| 1/8" (3.2mm)       | 135-200           |
| 5/32" (4.0 mm)     | 190-280           |
| 3/16" (4.8 mm)     | 250-340           |

# Guide for Selecting Filler Wire Diameter

| Filler Wire Diameter | DC Current Range (Amps) |
|----------------------|-------------------------|
| 1/16" (1.6 mm)       | 20-90                   |
| 3/32" (2.4 mm)       | 65-115                  |
| 1/8" (3.2 mm)        | 100-165                 |
| 3/16" (4.8 mm)       | 200-350                 |

# Tungsten Electrode Types

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

# Aluminium Welding Material

| Base<br>Metal<br>Thickness | AC Current for<br>Aluminium | Tungsten<br>Electrode<br>Diameter | Filler Rod Diameter<br>(if required) | Argon Gas<br>Flow Rate | JOINT<br>TYPE |
|----------------------------|-----------------------------|-----------------------------------|--------------------------------------|------------------------|---------------|
| 1/16"                      | 60-80                       | 1/16"                             | 1/16"                                | 15 CFM                 | Butt/Corner   |
| 1.6 mm                     | 70-90                       | 1.6 mm                            | 1.6 mm                               | 7 I PM                 |               |
| 1/8"                       | 125-145                     | 3/32"                             | 1/16"-3/32"                          | 17 CFM                 | Butt/Corner   |
| 3.2 mm                     | 140-160                     | 2.4 mm                            | 1.6 mm - 2.4 mm                      | 8 LPM                  | Lap/Fillet    |

#### Welding Rate

| Base Metal<br>Thickness | DC Current<br>for Mild<br>Steel | DC Current<br>for Stainless<br>Steel | Tungsten<br>Electrode<br>Diameter | Filler Rod<br>Diameter (if<br>required) | Argon Gas Flow<br>Rate | Joint Type  |
|-------------------------|---------------------------------|--------------------------------------|-----------------------------------|---|------------------------|-------------|
| 0.040"                  | 35-45                           | 20-30                                | 0.040"                            | 1/16"                                   | 10 CFH(5 LPM)          | Butt/Corner |
| 1.0 mm                  | 40-50                           | 25-35                                | 1.0 mm                            | 1.6 mm                                  |                        | Lap/Fillet  |
| 0.045"                  | 45-55                           | 30-45                                | 0.040"                            | 1/16"                                   | 13 CFH(6 LPM)          | Butt/Corner |
| 1.2 mm                  | 50-60                           | 35-50                                | 1.0 mm                            | 1.6 mm                                  |                        | Lap/Fillet  |
| 1/16"                   | 60-70                           | 40-60                                | 1/16"                             | 1/16"                                   | 15 CFH(7 LPM)          | Butt/Corner |
| 1.6 mm                  | 70-90                           | 50-70                                | 1.6 mm                            | 1.6 mm                                  |                        | Lap/Fillet  |
| 1/8"                    | 80-100                          | 65-85                                | 1/16"                             | 3/32"                                   | 15 CFH(7 LPM)          | Butt/Corner |
| 3.2 mm                  | 90-115                          | 90-110                               | 1.6 mm                            | 2.4 mm                                  |                        | Lap/Fillet  |
| 3/16"                   | 115-135                         | 100-125                              | 3/32"                             | 1/8"                                    | 21 CFH(10 LPM)         | Butt/Corner |
| 4.8 mm                  | 140-165                         | 125-150                              | 2.4 mm                            | 3.2 mm                                  |                        | Lap/Fillet  |
| 1/4"                    | 160-175                         | 135-160                              | 1/8"                              | 5/32"                                   | 21 CFH(10 LPM)         | Butt/Corner |
| 6.4 mm                  | 170-200                         | 160-180                              | 3.2 mm                            | 4.0 mm                                  |                        | Lap/Fillet  |

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

| TROUBI | ESHOOTING |
|--------|-----------|
| INCODE |           |

| No. | Breakdown    | Analysis                 | Solutions                          |
|-----|--------------|--------------------------|------------------------------------|
|     | Cooling fan  | Cooling fan broken       | Replace the fan                    |
| 1   | Not work     | Cable broken/fallen off  | Find the disconnected wire and     |
|     | Not work     |                          | Connect reliably                   |
|     |              | Torch switch broken      | Replace the torch                  |
|     | No piloting  | Main PC board broken     | Replace the PC board               |
| 2   | high         | Run-on plate             | Replace the run-on plate           |
|     | frequency    | Oabla brahan (fallon aff | Find the disconnected wire and     |
|     |              | Cable broken/fallen off  | Connect reliably                   |
|     | No Argon     |                          | Check the flow meter and resume    |
|     |              | No Argon Input           | supplying gas to the welder        |
|     |              | Main PC board broken     | Replace the PC board               |
|     |              | Electromagnetism         |                                    |
| 3   |              | Valve                    | Change the electromagnetism valve  |
|     | output       | broken                   |                                    |
|     |              |                          | Clear the eyewinker and dredge the |
|     |              | Gas path blocked         | gas                                |
|     |              |                          | path                               |
| 4   | Protection   |                          | Returns to normal when internal    |
| 4   | Indicator On | Unit has overneated      | temperature cools                  |

|   |                             | Thermal relay broken    | Replace the thermal relay              |  |
|---|-----------------------------|-------------------------|--|--|
|   |                             | Voltage variance of     | Returns to normal when voltage is      |  |
|   |                             | mode than 15%           | corrented                              |  |
|   |                             | Relevant                | Replace the potentiometer              |  |
| F |                             | potentiometer           |  |  |
|   | Panel knob                  | broken                  |  |  |
| 5 | not adjustable              | Main PC board broken    | Replace the PC board                   |  |
|   |                             | Cable broken/fellen off | Find the disconnected wire and         |  |
|   |                             | Cable broken/failen off | Connect reliably                       |  |
|   |                             | Digital Amp meter       | Change the meter                       |  |
|   | No display on the AMP meter | broken                  |  |  |
| 6 |                             | Cable broken/fellen off | Find the disconnected wire and         |  |
|   |                             | Cable broken/fallen off | Connect reliably                       |  |
|   |                             | Main PC board broken    | Replace the PC board                   |  |
|   |                             | Wrong connection        | Check and correct according the        |  |
|   |                             | between torch and       | manual                                 |  |
| 7 | Arc photing                 | welder                  |  |  |
| 1 | not                         | Argon not pure          | Use 99.99% pure Argon                  |  |
|   | SHIOOTH                     | Tungsten electrode or   | Use qualified Tungsten electrode       |  |
|   |                             | pin broken              |  |  |
|   |                             | First use after two or  | Not fault, trip caused by the          |  |
| 8 | Power trip                  | more days of inactinity | charging filter capacitor in the main  |  |
|   |                             |                         | board, reset the power swith           |  |
| 9 | Others                      |                         | Please contact authorized repair depot |  |

# **DIAGRAM & PARTS LIST**



| No | Code number    | Description                      | Qty |
|----|----------------|----------------------------------|-----|
| 1  | 2.05.08.115    | Handle                           | 1   |
| 2  | 1.1.01.01.0742 | Enclosure                        | 1   |
| 3  | 1.1.10.34.0030 | Remote control absorption module | 1   |
| 4  | 1.1.05.11.0062 | Secondary inverter arc plate     | 1   |
| 5  | 2.05.17.028    | Tension disc                     | 2   |
| 6  | 2.04.30.103    | Cable holder                     | 1   |
| 7  | 1.1.11.34.0046 | Power line                       | 1   |
| 8  | 2.07.80.987    | Switch                           | 1   |
| 9  | 2.07.54.115    | Aerial socket                    | 1   |
| 10 | 1.1.01.03.1740 | Back panel                       | 1   |
|    | 2.02.02.034    | Connecting screw rod             | 1   |
| 11 | 2.06.14.813    | Copper nut                       | 1   |

| 12 | 1.1.10.34.0029 | Fan                                   | 1 |
|----|----------------|---------------------------------------|---|
| 13 | 1.1.05.01.0547 | Switching power supply board          | 1 |
| 14 | 1.1.05.10.0038 | Pulse run-on plate                    | 1 |
| 15 | 2.07.37.553    | Single phase rectifier bridge         | 2 |
| 16 | 1.1.05.11.0064 | Rectifier inverter board              | 1 |
| 17 | 2.07.33.996    | Single tube (IGBT)                    | 4 |
| 18 | 2.05.05.173    | Radiator support                      | 4 |
| 19 | 2.07.43.962    | Rectifier heat sink                   | 1 |
| 20 | 1.1.01.04.1411 | Bottom panel                          | 1 |
| 21 | 2.05.05.999    | Feet                                  | 4 |
| 22 | 1.1.01.05.3106 | Mounting plate                        | 1 |
| 23 | 2.07.25.107    | Output reactor                        | 1 |
| 24 | 1.1.04.05.0049 | Coupling transformer                  | 1 |
| 25 | 2.07.55.203    | Argon joint                           | 1 |
| 26 | 2.03.30.1302   | Gun switch wiring harness             | 1 |
| 27 | 2.05.05.140    | Plastic panel                         | 1 |
| 28 | 1.2.08.04.0171 | Torch                                 | 1 |
| 29 | 1.2.08.02.0466 | Earth cable                           | 1 |
| 30 | 2.07.57.960    | Europe type quick socket              | 2 |
| 31 | 2.07.11.022    | Potentiometer knob                    | 1 |
| 32 | 1.1.02.01.9020 | Board support plate                   | 1 |
| 33 | 1.1.05.07.0157 | Faceplate                             | 1 |
| 34 | 1.1.11.34.0043 | Hall                                  | 1 |
| 35 | 2.07.43.963    | Secondary rectifier heat sink(down)   | 1 |
| 36 | 2.07.28.813    | Fast recovery diode                   | 2 |
| 37 | 2.07.43.964    | Secondary rectifier heat sink (upper) | 1 |
| 38 | 1.1.05.11.0063 | Secondary rectifier inverter board    | 1 |
| 39 | 2.07.33.996    | Single tube (IGBT)                    | 8 |
|    | 2.03.30.1321   | Resistance 2                          | 1 |
| 40 | 2.03.30.1320   | Resistance 1                          | 1 |
| 41 | 1.1.05.09.0032 | Gun switch isolation plate            | 1 |
| 42 | 1.1.02.01.9019 | Board fixed plate                     | 1 |
| 43 | 1.1.05.02.0591 | Main PCB                              | 1 |
|    | 0.99.07-22     | 8m Foot Pedal                         | 1 |
|    | 1.2.08.04.0184 | 5m TIG Torch Assembly                 | 1 |
| L  |                |                                       | 1 |

# Spare Parts List for Foot Control

| 1  |                |                  | ~~~ |
|----|----------------|------------------|-----|
| No | Code number    | Description      | Qty |
| 1  | 2.05.10.405    | Top Plate        | 1   |
| 2  | 1.1.01.01.0210 | Enclosure        | 1   |
| 3  | 2.07.80.584    | Micro Switch     | 1   |
| 4  | 2.05.14.001    | Gear 1           | 1   |
| 5  | 2.06.29.003    | Torsional Spring | 1   |
| 6  | 2.06.29.033    | Spring 2         | 1   |
| 7  | 2.05.14.003    | Gear Support     | 1   |
| 8  | 1.1.01.04.0240 | Bottom Enclosure | 1   |
| 9  | 1.1.03.02.0053 | Spindle          | 1   |
| 10 | 1.1.03.02.0054 | Piovt pin        | 1   |
| 11 | 1.1.02.02.0518 | Axle Sleeve      | 1   |
| 12 | 2.06.29.032    | Spring 1         | 1   |
| 13 | 2.06.25.004    | Rivet            | 2   |
| 14 | 2.05.10.406    | Bottom Plate     | 1   |
| 15 | 2.02.21.004    | Gear 2           | 1   |
| 16 | 2.07.10.043    | Potentiometer    | 1   |
| 17 | 2.04.30.105    | Cable Head       | 1   |
| 18 | 2.03.07.902    | Cable            | 8m  |
| 19 | 2.07.54.019    | 5-pin connector  | 1   |



| Reference | part        | Description                      | Qty. |
|-----------|-------------|----------------------------------|------|
| 1         | 10N47       | Nozzle                           | 1    |
| 2         | 10N32       | Tungsten Electrode Holder, 2.4MM | 1    |
| 3         | 10N25       | Tungsten Electrode Holder, 2.4MM | 1    |
| 4         | 2.4MMC      | Tungsten Electrode, 2.4MM        | 1    |
| 5         | PRO26FX     | Torch head                       | 1    |
| 6         | 57Y02       | Tungsten Electrode               | 1    |
| 7         | PRO1MS-10   | 10K Potentiometer Switch         | 1    |
| 8         | PROSWL5     | 5 Switch Wiring                  | 1    |
| 9         | PROH200     | Handle                           | 1    |
| 10        | PROSP       | Screw                            | 1    |
| 11        | PROKJ200    | Diversion Connector              | 1    |
| 12        | PROLC200-08 | TORCH COVER                      | 1    |
| 13        | PROCO200-40 | Cable                            | 1    |
| 14        | PROJK200    | Diversion Connector              | 1    |
| 15        | PRONCL-32   | Protector                        | 1    |
| 16        | XS16J5P     | 5-pin Control                    | 1    |
| 17        | D3595-1-10  | Dinse Connector, M10             | 1    |

