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TIG251 AC/DC INVERTER TIG WELDER

OPERATION INSTRUCTIONS



Version 2014-1

Thank you for selecting the R-Tech Tig251 Inverter AC/DC TIG Welder.

The Tig251 has many benefits over traditional TIG welders, including 250Hz AC frequency adjustment, AC squarewave balance control, full pulse welding, slope up/down, remote foot option and an industrial 60% duty cycle

We want you to take pride in operating our Tig251 as much pride as we have taken in making this product for you. Please read all information in this manual before operation

PLEASE EXAMNINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt from the courier. Consequently all claims for material damaged in shipment must be made by purchaser against the transportation company used.

Please record your equipment identification below for future reference. This information can be found on data plate at rear of machine.

Product TIG251

Serial No. _____

Date of Purchase _____

Where Purchased _____

Whenever you request replacement parts or information on this equipment please always supply information you have recorded above

This product is covered by 2 years parts and labour warranty, we will cover cost of collecting, repair and returning of item to you (UK mainland only, other areas are RTB). External items, torch, earth lead etc are covered by 3 months warranty. Any faults/damage found caused by customer will be charged pro-rata

Pay particular attention to the safety instructions we have provided you for your protection

The level of seriousness to be applied to each section is explained below



This statement appears where the information must be followed exactly to avoid serious personal injury.

CAUTION

This statement appears where the information must be following to avoid a minor personal injury or damage to this equipment.

Introduction

The R-Tech Tig251 is a member of our field acclaimed family of welding products. Premium features include:-

1. Inverter power source – more efficient to operate, provides smoother weld characteristics.
2. AC squarewave frequency adjustment to 250Hz
3. AC squarewave balance control
4. Full featured pulse welding in both AC and DC modes
5. Patented HF Microstart – Reduces electronic interference to local area
6. Slope up / slope down
7. Remote foot pedal option
8. Digital amp meter
9. Industrial 60% Duty cycle at 250 Amps @ 40C

Recommended Processes

The R-Tech Tig251 is recommended for the TIG welding processes within its output capacity of 250 Amps

Equipment Limitations

The R-Tech Tig251 is protected from overloads beyond the output ratings and duty cycle as per machine specifications with thermostat protection of the output coils and rectifiers.

Welding Capability – Duty Cycle

The R-Tech Tig251 is rated at 250 Amps at 60% duty cycle on a ten minute basis. If the duty cycle is exceeded a thermal protector will shut machine off until the machine cools.

Technical Specifications

Model No.	R-Tech TIG251	
Input (volts/amps)		240V AC 60Hz 32-Amp
MMA	No-load Voltage	60V – 80V
	Current Range	10A – 200A
	Rated Output Current	200A
	Duty Cycle	60%
TIG	No-load Voltage	60V – 80V
	Current Range	(AC 20A – 250A) (DC 10-250A)
	Rated Output Current	250A
	Duty Cycle	60% @40c at 250 Amps
	AC Balance	30% – 70%
	Up-Slope Time	10 Seconds
	Down-Slope Time	10 Seconds
	Pulse Current Range	10A – 250A
	Pulse Width Range	0.1 – 0.9 Seconds
	Pulse Frequency Range	0.5Hz – 25Hz
Gross Weight		28 KG
Insulation		IP21S
Dimensions mm		430 x 200 x 290

Safety Precautions

Read entire section before starting installation



WARNING!

Electric Shock can kill – Only qualified personnel should perform this installation. Turn off input power at the fuse box before working on this equipment. Do not touch electrically live parts. Always connect the machine to an earthed mains supply as per national recommended standards.

Select suitable location

Place the welder where clean cooling air can freely circulate in and out of the front & rear louver vents. Dirt, dust or any foreign material that can be drawn through vents into welder must be kept to a minimum. Failure to observe these precautions can result in excessive operating temperatures which can lead to plant failure.

Grinding

Do not direct grinding particles towards the welder. An abundance of conductive material can cause plant failure.

Stacking

This machine cannot be stacked.

Transport – Unloading

Never underestimate the weight of equipment, never move or leave suspended in the air above people. Use recommended lifting equipment at all times.



WARNING!

Falling Equipment can cause injury. Never lift welder with gas bottle attached. Never lift above personnel.

Tilting

Machine must be placed on a secure level surface or on a recommended undercarriage/trolley. This machine may topple over if this procedure is not followed.

Environmental Rating

The welding power source carries the IP21S rating. It may be used in normal industrial and commercial environments. Avoid using in areas where water / rain is around.

Read and follow the 'Electric Shock Warnings' in the safety section if welding must be performed under electrically hazardous conditions such as welding in wet areas or water on the work piece.

Electrical Installation



WARNING!

ELECTRIC SHOCK CAN KILL

Machine grounding and High Frequency Interference Protection

This welder must be grounded to earth. See national electrical codes for proper grounding methods.

The high frequency generator being similar to a radio transmitter may cause interference to radio, TV and other electronic equipment. These problems may be the result of radiated interference. Proper grounding methods can reduce or eliminate this.

Radiated interference can develop in the following ways

1. Direct interference from welder power source
2. Direct interference from the welding leads
3. Direct interference radiated from feedback into power lines
4. Interference from re-radiation by un-grounded metallic objects.

Keeping these contributing factors in mind, installing equipment as per following instructions should minimize problems.

1. Keep the welder input power lines as short as possible and enclose as much of them as possible in metal conduit or equivalent shielding. There should be a good electrical contact between this conduit and ground (Earth).
2. Keep the work and electrode leads as short as possible. Tape the leads together where practical.
3. Be sure the torch and earth leads rubber coverings are free from cuts and cracks that allow welding power leakage
4. Keep earth lead connection to work in good condition – Clean area on workbench where earth clamp is situated on a regular basis.

Input Connections

Make sure the voltage, phase and frequency of input power is as specified on machine rating plate located at rear of machine.

Have a qualified electrician provide suitable input power as per national electrical codes. Make sure machine is earthed / grounded.

Make sure fuse or circuit breaker is correct rating for machine. Using fuses or circuit breakers smaller than recommended will result in 'nuisance' shut off from welder inrush currents even if welding at low amperages.

Failure to follow these instructions can cause immediate failure within the welder and void machines warranty.

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

Have a qualified electrician install & service this equipment.

Allow machine to sit for 5 minutes minimum to allow the power capacitors to discharge before working inside this equipment. Do not touch electrically live parts

The TIG251 Inverter TIG Welder requires a 240V 50/60Hz supply. It requires a 32A supply for TIG and MMA welding. It comes with a 3 metre mains cable attached.

Connect wires according to national coding.

Brown wire – Live

Blue wire – Neutral

Green/Yellow Wire – Earth (Ground)

Connecting to a mains electrical supply

**THIS MACHINE IS OF AN INDUSTRIAL SPECIFICATION AND MUST BE
FITTED TO A 32AMP 240V MAINS INPUT**

Connecting to an Engine Driven Generator

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

Minimum Generator KVA Output – 10 KVA continuous

Generator must be fitted with AVR (automatic voltage regulation)

DO NOT USE ON A GENERATOR WITHOUT AVR

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

Connections for Tig251

Rear machine connections



Fig 1

1. On/Off Switch

2. Auxiliary 240V AC output

For water cooler – Maximum load 5A – Do not connect to power tools etc

3. Fuse Holder

5A fuse for water cooling socket

4. Mains input cable

Fit required plug as per your electrical installation

5. Gas input connector

Connect input gas hose ensuring connection is tight

6. Earth for chassis

If experiencing localized interference when using machine, connect workbench to this point using correct graded earth wire (not normally used)

Connections for TIG (GTAW) Welding

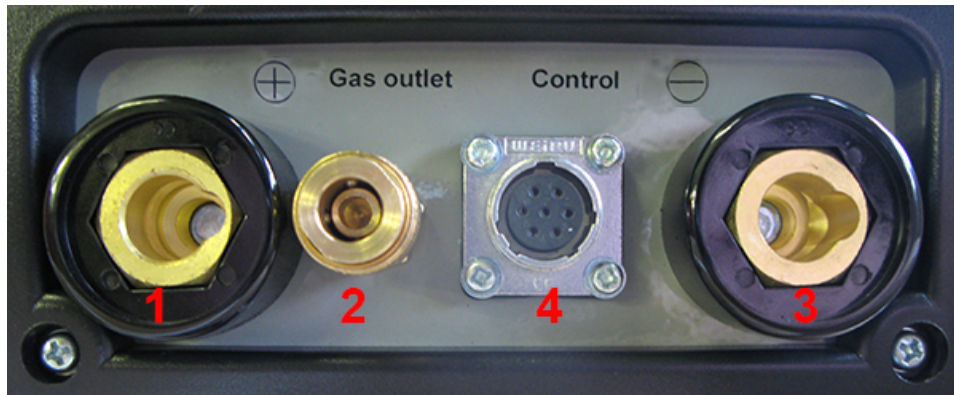


Fig 2

1. Positive power connector +

Connect the earth lead to by inserting and twisting until tight and the earth clamp to work/bench.

2. Gas outlet

Connect the torch gas hose

3. Negative power connector -

Connect TIG Torch Dinze to power connector by inserting and twisting until tight

4. Torch control socket 7-Pin

Connect torch control plug

To avoid a High Frequency shock keep the TIG torch in good condition and replace if any of the insulation is damaged.

Connect the gas input hose to gas regulator and use 'Pure Argon' Gas, available from local suppliers. Set gas flow/pressure to 8-12 LPM.

Make sure gas bottle is secured to avoid injury.

Remote Foot Pedal connection.

Disconnect TIG Torch switch plug from torch control socket (Fig2.4) and connect plug from foot pedal.

Connections for STICK MMA (SMAW) Welding

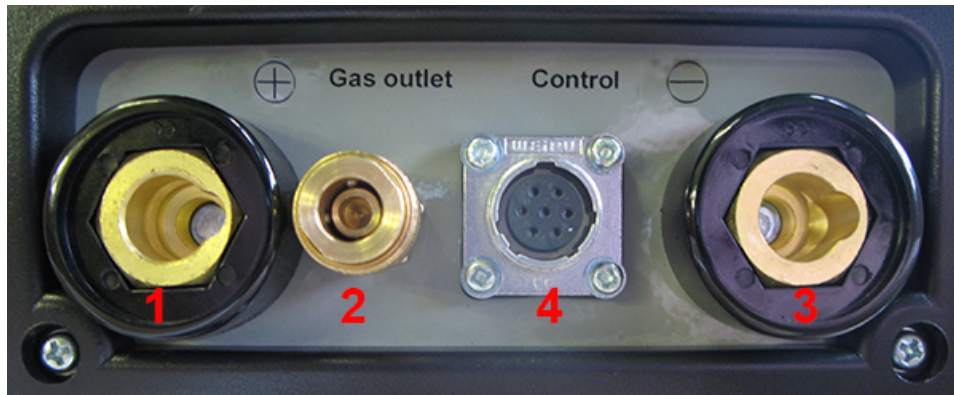


Fig 3

1. **Positive power connector +**

Connect the electrode holder by inserting and twisting until tight

2. Not used in MMA mode

3. **Negative power connector -**

Connect the earth lead to by inserting and twisting until tight and the earth clamp to work/bench.

4. Not used in MMA mode

Controls and Settings

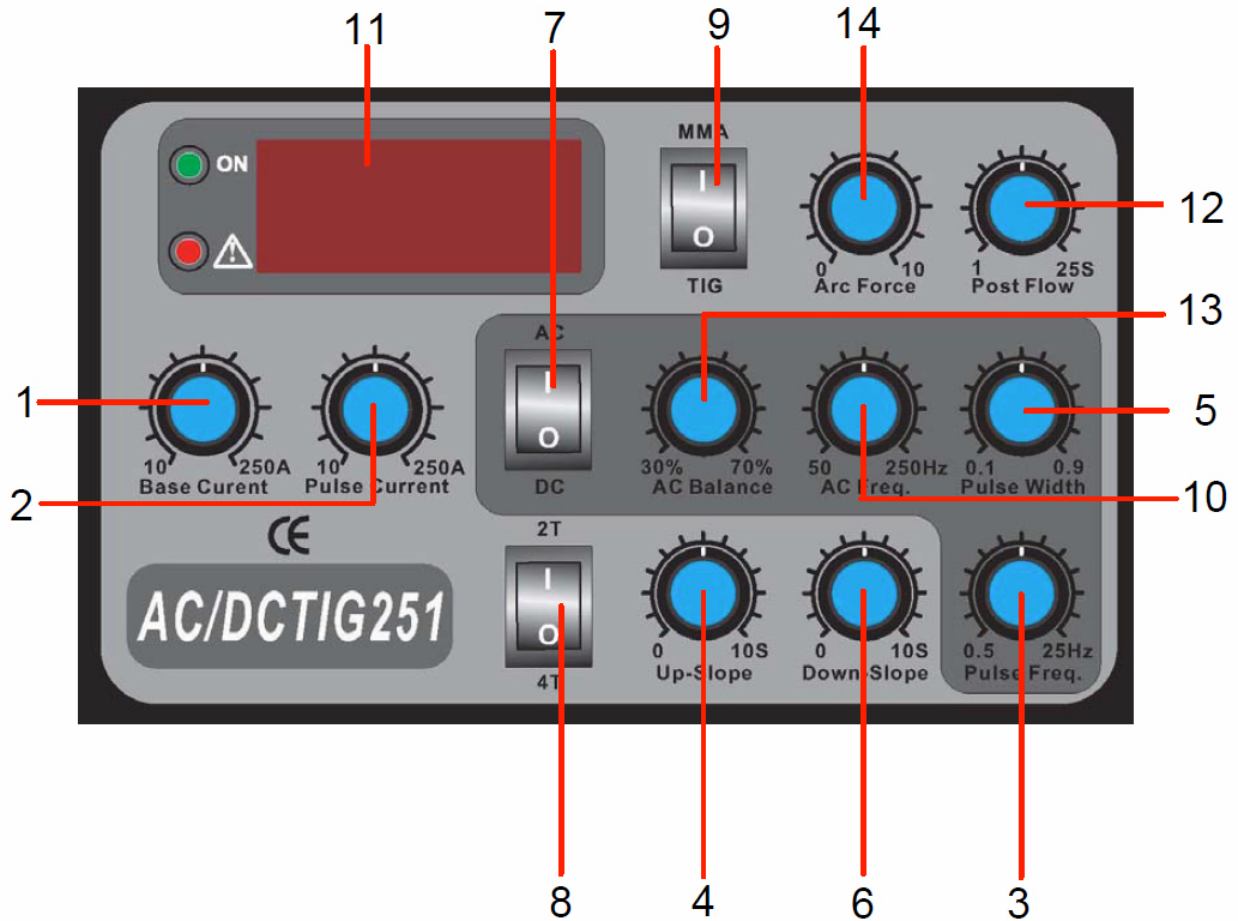


Fig 4

1. **Base current control**

This adjusts the main welding current and is shown in L.E.D (Fig 4.11)

2. **Pulse peak current adjustment**

This sets pulse amperage and must be set above the base (main) current amperage. If set to zero pulse welding is disabled.

3. **Pulse frequency adjustment**

This sets how often pulse will occur 0.5 – 25hz

4. **Up slope**

Adjustment 0-10 seconds. The main welding current raises from minimum amperage to main current selected in time selected when weld started

5. Pulse width

Pulse width adjustment – This sets length of pulse 0.1 – 0.9 seconds

6. Down slope

Down-Slope adjustment 0-10 seconds. The main welding current decreases from main amperage to minimum amperage in time selected when weld finished

7. AC – DC Selector switch

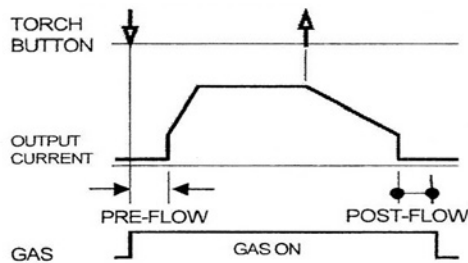
This switch selects either DC for welding steels or AC for welding alloys

DO NOT SWITCH WHEN WELDING AS DAMAGE TO MACHINE CAN OCCUR.

8. 2/4 Way selector switch

2/4 Step trigger mode switch – TIG welding can either be done in 2 or 4 step mode.

When the trigger mode is in the 2 step position the following sequence will occur



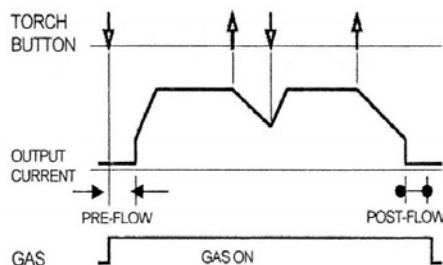
Press and hold the TIG torch switch to start sequence.

The machine will open gas valve to start flow of shield gas, after a 0.5 seconds pre-flow time to purge air from torch hose the welding output of machine will be turned on and the arc will be started. After the arc is started the output current will increase from the start (min) current to base (main) current in time selected by slope-up.

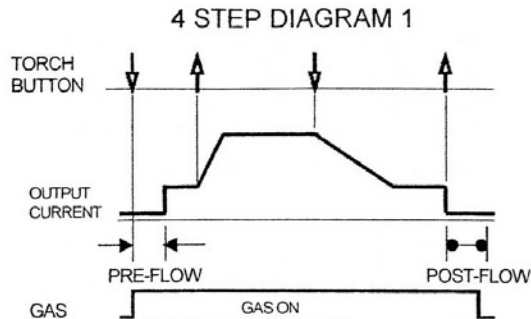
Release the TIG torch switch to end sequence.

The machine will now decrease output to finish (min) current in time set by slope-down, once at finish (min) current the machine will stop output and the gas valve will continue to operate for the selected time (post flow)

Possible variations of this standard sequence are shown in diagram below. It is possible to press and hold TIG torch switch a second time during downslope time to restart. After the switch is pressed the output current will raise to base (main) current



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



Press and hold the TIG torch switch to start sequence.

The machine will open gas valve to start flow of shield gas, after a 0.5 seconds pre-flow time to purge air from torch hose the welding output of machine will be turned on and the arc will be started. After the arc is started the output current will be at start (min) current

This condition can be maintained as long as required.

Release the TIG torch switch to go to step 2

The machine will now increase output to base (main) current in time set by slope-up.

Press and hold the TIG torch switch when main weld is complete

The machine will now decrease the welding output current to finish (min) in down-slope time set. Once at finish (min) output you can release the TIG torch switch to end weld the gas post-flow will continue to run for set time.

9. **MMA – TIG mode switch**

MMA-TIG mode switch. Switches between TIG (GTAW) & MMA STICK (SMAW) welding

10. **AC squarewave frequency adjuster**

AC Squarewave frequency adjustment 20-250Hz.

Traditional TIG welders have a fixed frequency of 60Hz, the TIG251 advanced technology allows AC frequency adjustment from 20-250hz, as you turn up the frequency the width of arc from tungsten decreases allowing more control of weld pool and an increase travel speed

The pitch noise of weld will increase when AC frequency is turned up, this is normal.

11. **LED Display**

3 digit LED meter is used to display the pre-set (before welding) amperage and actual amperage (when welding).

12. Gas post flow adjustment

Gas post flow adjustment 1 – 25 seconds. The gas keeps flowing after weld has finished, this cools & stops tungsten from getting contaminated.

Note: Gas pre-flow time is fixed at 0.5 seconds in TIG mode but no pre-flow time will occur if the arc is restarted during post flow time as gas is already flowing.

13. AC Squarewave balance (SP%)

SP% AC Squarewave balance control is adjustable from 30% – 70%

Set at 50% this provides balanced control for AC Welding. The machine spends 50% of cycle in positive mode which lifts the oxide surface off the work (power flows from workpiece to tungsten) and 50% in negative mode which penetrates the work (power flows from tungsten to workpiece)

30% is maximum penetration, the machine is more torch negative - 30% positive / 70% negative.

70% is maximum cleaning, the machine is more torch positive - 70% positive / 30% negative

With clean metal you can select more penetration and the machine will spend more time penetrating work (negative part of cycle).

When welding dirty/contaminated material more cleaning may need to be selected, the machine will spend more time lifting coating off the work (positive part of cycle).

For most AC welding we suggest you set machine to about 40% SP. This means 40% of weld cycle is positive (cleaning) and 60% of weld is negative (penetration)

Tip. If you are welding close to the tungsten limits, I.E 160amps on a 2.4mm tungsten and the end of tungsten is wobbling and falling off, turning down the SP% will give better tungsten stability as the current is flowing from tungsten giving more penetration (negative part of cycle - more penetration)

In AC mode if you set machine to 30%, maximum penetration and set the AC frequency to 150Hz or above, you can grind the tungsten tip to a point to give a much narrower arc and the tungsten will stay sharper for longer.

14. Arc force (Stick – SMAW only)

This provides better arc starting when in MMA stick mode, useful when you are welding dirty/rusty material or cold/damp welding electrodes

Operating machine

SAFETY PRECAUTIONS



WARNING!

ELECTRIC SHOCK CAN KILL

Do not touch electrically live parts or electrode with skin or wet clothing.
 Insulate yourself from work and ground
 Always wear dry insulating gloves



WARNING!

FUMES AND GASES can be dangerous

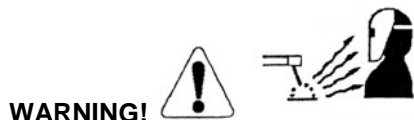
Keep your head out of fumes & gases produced from welding.
 Use ventilation or exhaust to remove fumes & gases from breathing zone and general area.



WARNING!

WELDING SPARKS can cause fire or explosion

Keep flammable material away from work area.
 Do not weld on containers that have held combustibles



WARNING!

ARC RAYS can burn

Wear eye, ear and body protection – Make sure work area is protected by proper shielding to avoid injury to passers by.

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

1. Connect the TIG torch and earth lead to machine & work piece.
2. Set the TIG/MMA switch to TIG
3. Select either DC (steel) or AC (alloys)
4. Select 2 or 4 way torch operation
5. Connect Argon gas and set flow to approx 8-12 LPM
6. Set Gas post flow to 10 Seconds
7. Adjust Base current to desired welding current
8. Set Pulse current, width & Freq to minimum setting (pulse off)
9. If welding on AC set AC Frequency to 100hz and SP% to 50
10. Press the TIG torch switch to start welding

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

1. Connect the TIG Torch to machine, connect earth lead to machine & work piece.
2. Set the TIG/MMA switch to TIG
3. Select either DC (steel) or AC (alloys)
4. Select 2 or 4 way torch operation
5. Connect Argon gas and set flow to approx 8-12 LPM
6. Set Gas post flow to 5 Seconds
7. Adjust Base current to desired welding current.
8. Adjust Pulse current to desired setting
9. Adjust Pulse width to desired setting
10. Adjust Pulse freq. to desired setting
11. If welding on AC set AC Frequency to 100Hz and SP% to 50
12. Press the TIG torch switch to start welding

Notes: When welding with Pulse, the pulse amperage must be set higher than the base amperage.

The LED display will show Pre-set amperage with base and pulse current settings.

The benefits of pulse welding is the ability to control the weld pool and amount of heat absorbed by work resulting in a smaller heat affected zone which results in fewer deformations and reduced chance of cracking.

There are no set rules for pulse welding as this is down to personal choice by the welder.

Welding in TIG mode – with Remote foot pedal

1. Connect the Tig Torch to machine, connect earth lead to machine & work piece.
2. Connect remote foot pedal to machine
3. Set the TIG/MMA switch to TIG
4. Select either DC (steel) or AC (alloys)
5. Select 2 way torch operation
6. Connect Argon gas and set flow to approx 8-12 LPM
7. Set Gas post flow to 5 Seconds
8. If welding on AC set AC Frequency to 100Hz and SP% to 50
9. Adjust base current knob to desired maximum welding current that foot pedal will go to
10. Press the foot pedal to start welding.

Note: When welding with remote foot pedal

Pre-set amperage in LED display will show what the maximum amperage foot pedal will go to (what base amperage control knob is set to), upon welding it will show actual welding amperage.

Upon pressing of foot pedal welding arc will start, if you find it hard to start arc push pedal down a bit further to aid starting.

The benefits of welding with remote foot pedal is greater control of amount of heat going into work especially beneficial on alloys as these absorb the heat much quicker than steel. Press pedal fully to start weld, upon weld pool formation you can slightly release the pedal to decrease amperage to sustain perfect weld pool and increase again as required to sustain weld characteristics.

The foot pedal adjusts from Start (min) current to Max current set on base current knob on front of machine as shown in LED before welding.

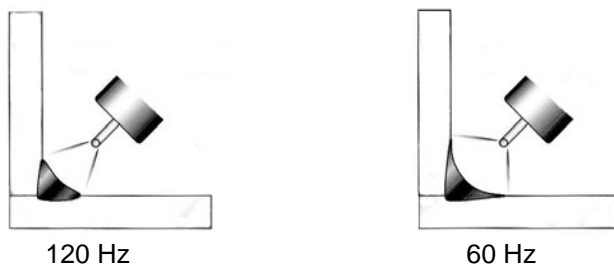
Tips for AC Welding

The TIG251 offers two significant advantages over conventional silicon rectifier SCR transformer power sources.

1. The AC square wave balance (SP%) can be set to a higher percentage electrode negative (decrease below 50%) which minimizes tungsten heating and erosion
2. The AC square wave frequency can be varied to focus the arc and achieve quicker travel speed

Increasing the AC frequency above 60Hz will narrow the cone shape arc from the tungsten's tip.

Decreasing the AC frequency below 60Hz will broaden the cone shape arc from tungsten's tip.



The two above benefits above can be used to maintain a tight focus of arc for precise heat control & tight joint access. Because of the TIG251 Inverter Technology the following recommendations are made as a starting point.

The other benefits are quicker travel speed the higher the AC frequency, thus increasing output

A 2% Thoriated tungsten is recommended instead of pure tungsten normally used for AC welding.

Thoriated tungsten's emit electrons easier and therefore will improve starting.

Tungsten size / amperage guide

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

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

Welding in STICK MMA (SMAW) Mode

1. Fit MMA electrode holder to machine
2. Fit earth lead to machine and to work piece
3. Select MMA on MMA/TIG switch
4. Select DC or AC (DC is most commonly used)
5. Place electrode in holder
6. Select desired welding base current
7. Select desired Arc Force
8. Strike arc and weld

WARNING!



ELECTRIC SHOCK CAN KILL

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

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

Maintenance

Routine and periodic maintenance



WARNING!

ELECTRIC SHOCK CAN KILL

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

Have a qualified electrician install & service this equipment.

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

Do not touch electrically live parts

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

Troubleshooting

Service & repair should only be performed by R-Tech welding trained personnel. Unauthorised repairs performed on this welding equipment may result in danger or injury to the technician and machine operator and will invalidate your warranty.

For your safety and to avoid electric shock, please observe all safety notes and precautions detailed throughout this manual

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

If fault / problem is not listed below check our [Tig Welder Support](#) page on our website

www.r-techwelding.co.uk/support.php

or contact R-Tech by phone. Contact details can be found on front of this manual and our website

Tig welding problems

- **No output - Power light is not lit**

Check machine on/off switch is in the 'on' position
 Check Input power to machine
 Check plug wiring
 Check mains trip / fuses

- **No output - Fan runs - Power light is lit**

Check torch connections are secure and torch switch operation, try replacing TIG torch.

If you have a multi-meter check continuity between pins 1 and 2 on torch switch plug when pressing torch switch

- **No output - Power light is lit - Warning light is lit**

Welding application may have exceeded recommended duty cycle, allow machine to cool down until the warning light goes out.

- **No output – Power light is lit – Gas at torch end when trigger pressed**

Check torch condition – possible break in torch power cable – replace torch

- **Machine keeps overheating - Warning light is lit on machine**

Check if fan is running – if not contact R-Tech for repair

Check the cooling vents for obstruction, blow out machine with clean dry low pressure air supply. Check for adequate ventilation around machine

- **Porosity in weld – No / low gas at torch tip**

Check gas supply from gas bottle

Check flow rate on regulator

Check gas hose for restrictions

Check for draughts in local area, open doors etc

Replace TIG torch – may have gas restriction

- **Poor weld penetration**

Check condition of earth lead and clamp and ensure clamp is connection via a clean area on work piece

Check condition of TIG torch, try other TIG torch

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

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

- **When using foot pedal machine is stuck on minimum amps**

Make sure 2/4 way switch is in 2 way position, the remote foot pedal will not work in the 4-way position, this is for torch switch operation only.

- **Output current reduced significantly when AC balance control knob is set near or on max setting or when base current is set near or at max output**

Input power to machine doesn't have sufficient capacity. Try changing input power to a sufficient supply, refer to installation section

or. Machine is powered from engine generator. If welding at high currents are required try switching to fixed mains supply

or. Set AC balance (SP%) to 50 position

- **Arc 'Flutters' when TIG welding**

1. Tungsten electrode may be too large in diameter for the current setting.

2. Tungsten not sharp when in DC mode

3. Gas shielding flow may be low or high, check gas flow , reduce tungsten stick out beyond ceramic

4. Check for leaks in torch & gas hoses

- **Black areas along weld bead**

1. Clean any oily or organic contamination from the work piece

2 Tungsten electrode contaminated. Replace or sharpen

3 Check for leaks or contamination on gas hoses & connections.

4 Gas flow may be insufficient, Increase gas flow, reduce tungsten stick out from ceramic

- **Weak HF – Poor arc striking – welding output normal**

1 Check torch and earth connections – is torch cable insulation in good condition.

2 Check for leaks or contamination on gas hoses & connections.

3 Gas flow may be insufficient, increase gas flow, reduce tungsten stick out from ceramic

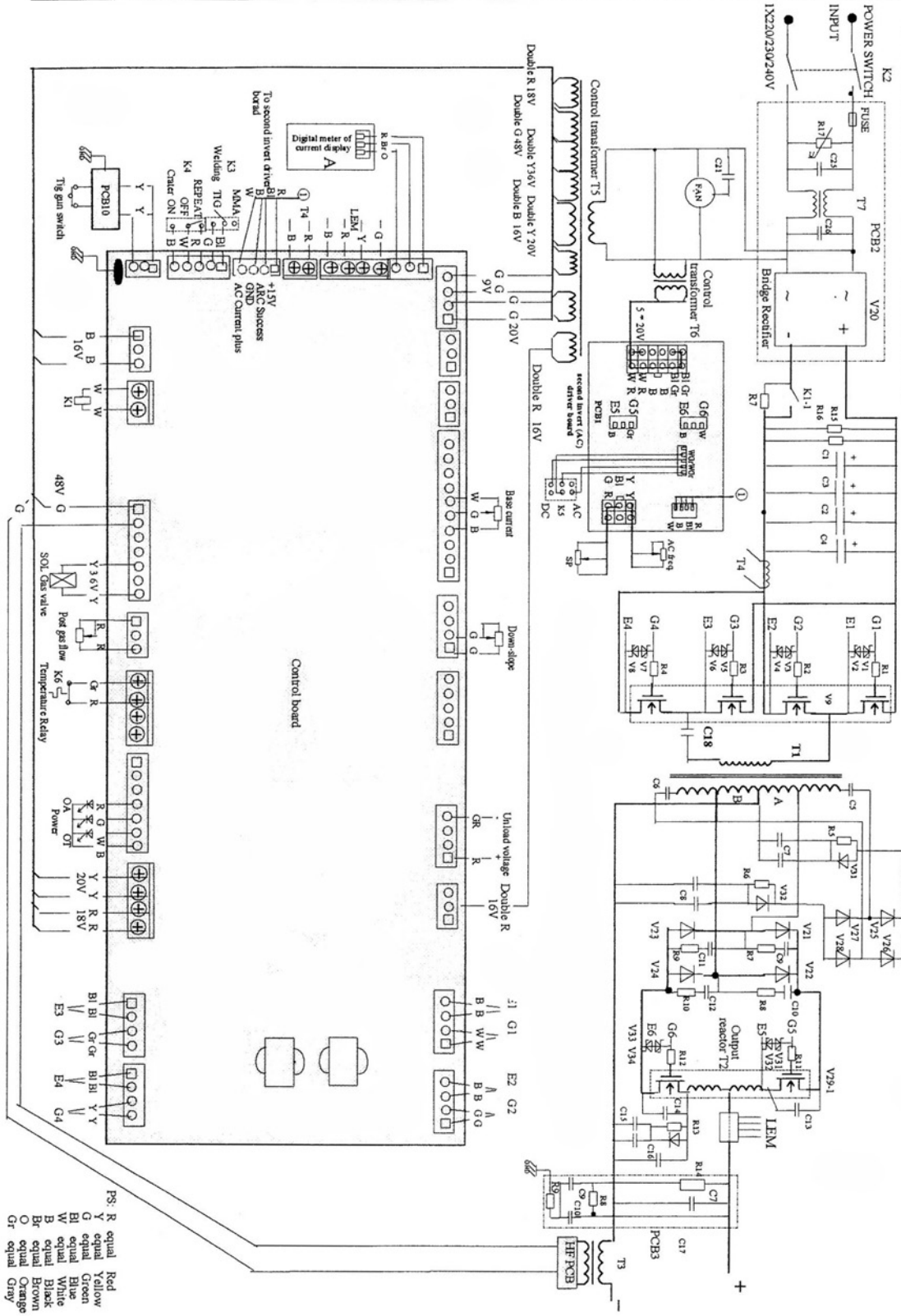
4 Keep output cables short as possible

- **HF spark is present at the tungsten electrode but unable to start welding arc, Machine has normal welding output**
 - 1 Tungsten may be contaminated - replace or sharpen
 - 2 The current may be set too low
 - 3 Tungsten may be too large for process
 - 4 Gas flow may be insufficient, increase gas flow, reduce tungsten stick out from ceramic
- **No HF when torch trigger pressed, no blue spark between HF points**
 - Examine and clean HF points with clean dry low pressure air line
 - HF PCB faulty – Contact R-Tech for repair

MMA Stick welding problems

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

INVERTER AC/DC TIG MACHINE WIRING DIAGRAM



WARNING	<ul style="list-style-type: none"> Do not touch electrically live parts or electrode with skin or wet clothing. Insulate yourself from work and ground. 	<ul style="list-style-type: none"> Keep flammable materials away. 	<ul style="list-style-type: none"> Wear eye, ear and body protection.
Spanish AVISO DE PRECAUCION	<ul style="list-style-type: none"> No toque las partes o los electrodos bajo carga con la piel o ropa mojada. Aíslese del trabajo y de la tierra. 	<ul style="list-style-type: none"> Mantenga el material combustible fuera del área de trabajo. 	<ul style="list-style-type: none"> Protéjase los ojos, los oídos y el cuerpo.
French ATTENTION	<ul style="list-style-type: none"> Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. Isolez-vous du travail et de la terre. 	<ul style="list-style-type: none"> Gardez à l'écart de tout matériel inflammable. 	<ul style="list-style-type: none"> Protégez vos yeux, vos oreilles et votre corps.
German WARNUNG	<ul style="list-style-type: none"> Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! Isolieren Sie sich von den Elektroden und dem Erdboden! 	<ul style="list-style-type: none"> Entfernen Sie brennbares Material! 	<ul style="list-style-type: none"> Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese ATENÇÃO	<ul style="list-style-type: none"> Não toque partes elétricas e electrodos com a pele ou roupa molhada. Isole-se da peça e terra. 	<ul style="list-style-type: none"> Mantenha inflamáveis bem guardados. 	<ul style="list-style-type: none"> Use proteção para a vista, ouvido e corpo.
Japanese 注意事項	<ul style="list-style-type: none"> 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 施工物やアースから身体が絶縁されている様にして下さい。 	<ul style="list-style-type: none"> 燃えやすいものの側での溶接作業は絶対にしてはなりません。 	<ul style="list-style-type: none"> 目、耳及び身体に保護具をして下さい。
Chinese 警告	<ul style="list-style-type: none"> 皮肤或湿衣物切勿接触带电部件及焊条。 使你自已与地面和工作件绝缘。 	<ul style="list-style-type: none"> 把一切易燃物品移开工作场所。 	<ul style="list-style-type: none"> 佩戴眼、耳及身体劳动保护用具。
Korean 위험	<ul style="list-style-type: none"> 전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오. 모재와 접지를 접촉치 마십시오. 	<ul style="list-style-type: none"> 인화성 물질을 접근 시키지 마십시오. 	<ul style="list-style-type: none"> 눈, 귀와 몸에 보호장구를 착용하십시오.
Arabic تحذير	<ul style="list-style-type: none"> لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجلد الجسم أو بالملابس المبللة بالماء. ضع عازلا على جسمك خلال العمل. 	<ul style="list-style-type: none"> ضع المواد القابلة للاشتعال في مكان بعيد. 	<ul style="list-style-type: none"> ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			
<ul style="list-style-type: none"> ● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone. 	<ul style="list-style-type: none"> ● Turn power off before servicing. 	<ul style="list-style-type: none"> ● Do not operate with panel open or guards off. 	WARNING
<ul style="list-style-type: none"> ● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases. 	<ul style="list-style-type: none"> ● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio. 	<ul style="list-style-type: none"> ● No operar con panel abierto o guardas quitadas. 	Spanish AVISO DE PRECAUCION
<ul style="list-style-type: none"> ● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail. 	<ul style="list-style-type: none"> ● Débranchez le courant avant l'entretien. 	<ul style="list-style-type: none"> ● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés. 	French ATTENTION
<ul style="list-style-type: none"> ● Vermeiden Sie das Einatmen von Schweißrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes! 	<ul style="list-style-type: none"> ● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!) 	<ul style="list-style-type: none"> ● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen! 	German WARNUNG
<ul style="list-style-type: none"> ● Mantenha seu rosto da fumaça. ● Use ventilação e exaustão para remover fumo da zona respiratória. 	<ul style="list-style-type: none"> ● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas. 	<ul style="list-style-type: none"> ● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas. 	Portuguese ATENÇÃO
<ul style="list-style-type: none"> ● ヒュームから顔を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。 	<ul style="list-style-type: none"> ● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切して下さい。 	<ul style="list-style-type: none"> ● パネルやカバーを取り外したままで機械操作をしないで下さい。 	Japanese 注意事項
<ul style="list-style-type: none"> ● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。 	<ul style="list-style-type: none"> ● 維修前切斷電源。 	<ul style="list-style-type: none"> ● 蓋板打開或沒有安全罩時不準作業。 	Chinese 警告
<ul style="list-style-type: none"> ● 얼굴로부터 용접가스를 멀리하십시오. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오. 	<ul style="list-style-type: none"> ● 보수전에 전원을 차단하십시오. 	<ul style="list-style-type: none"> ● 패널이 열린 상태로 작동치 마십시오. 	Korean 위험
<ul style="list-style-type: none"> ● إبعاد رأسك بعيداً عن الدخان. ● استعمال التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها. 	<ul style="list-style-type: none"> ● أقطع التيار الكهربائي قبل القيام بأية صيانة. 	<ul style="list-style-type: none"> ● لا تشغيل هذا الجهاز إذا كانت الإغطية الحديدية الواقية ليست عليه. 	Arabic تحذير

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的銀焊材料，並請遵守貴方的有關勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع للمنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.