Stealth

DIGI-TIG 180 DC PULSE PFC MV

Part No. 9010H

OPERATOR'S MANUAL

SWP

IMPORTANT

Read this Owner's Manual completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions provided for your protection. Contact your distributor if you do not fully understand this manual.

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1. SAFETY

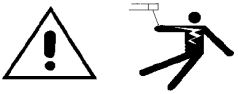


1.1 Icons Explanation

- The above icons mean Warning! Notice! Running and thermal parts or receiving an electric shock may harm you or others. The following precautions apply as a guide to working safely.

1.2 Arc Welding Damage

- The following icons explanations are to prevent accidents to you or others during the welding process.
- Only experienced personell can install, operate, maintain and repair the equipment.
- During the operation make sure those around you are properly protected.
- After turning off the machine power, please maintain and examine the equipment according to **5** due to DC voltage existing in the electrolytic capacitors.



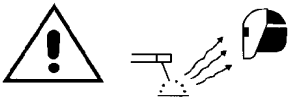
ELECTRIC SHOCK CAN KILL

- Never touch live electrical parts.
- Wear dry, hole-free gloves and clothes to insulate yourself.
- Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.
- Take care when using the equipment in a confined space, on uneven surfaces and in damp conditions.
- Shut down the incoming electrical supply prior to the equipment's installation.
- Ensure the equipment is installed correctly and the work or metal is earthed according to the operation manual.
- The electrode and work (or ground) circuits are 'hot' when the machine is on. Do not touch these electrically 'hot' parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically 'hot'.
- Always ensure the work cable makes a good electrical connection and is as close as possible to the metal being welded.
- Ensure the electrode holder, work clamp, welding cable and welding machine are in good, safe operating condition. Replace any damaged insulation.
- Never dip the electrode in water for cooling.
- Never simultaneously touch electrically 'hot' parts of electrode holders connected to two machines as voltage between the two can be the total of the open circuit voltage of both welders.
- When working above floor level, use a safety belt to protect yourself from a fall should you receive an electric shock.



FUMES AND GASES CAN BE DANGEROUS

- Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.
- When welding, keep your head out of fumes. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding with electrodes which require special ventilation such as stainless or hard facing or lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.
- Do not weld in locations near chlorinated hydrocarbon vapours coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapours to form phosgene – a highly toxic gas – and other irritating products.
- Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to ensure breathing air is safe.
- Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet and follow your employer's safety practices.



ARC RAYS CAN BURN

- Use a shield with the correct filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding.
- Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- Protect nearby personnel with suitable, non-flammable screening and/or warn them to avert their eyes from the arc rays or expose themselves to hot spatter or metal.



SELF-PROTECTION

- Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
- Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.



DO NOT add fuel near an open flame welding arc or when the engine is running. Stop the machine and allow it to cool before refuelling to prevent spilled fuel from vapourising on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.




WELDING SPARKS can cause fire or explosion

- Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- Where compressed gases are to be used at the job site, special precautions should be taken to prevent a hazardous situation.
- When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to ensure that any flammable or toxic vapours have been eliminated from within. They can cause an explosion even though they have been 'cleaned'.
- Vent hollow castings or containers before heating, cutting or welding. They may ignite.
- Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuff less trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in a confined space. Always wear safety glasses with side shields when in a welding area.
- Connect the work cable to the work as close to the welding area as practical. Keep work cables connected to the building framework or other locations away from the welding area.



Rotating parts may be dangerous

- Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- Cylinders should be located:
  - Away from areas where they may be struck or subjected to physical damage.
  - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- Never allow the electrode, electrode holder or any other electrically 'hot' parts to touch a cylinder.
- Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

1.3 Electric and Magnetic Fields

- Electric current flowing through any conductor causes localised Electric and Magnetic Fields (EMF). The discussions of the effect of EMF is ongoing globally. Up to now, there is no material evidence that EMF has any adverse effects on health.

  Minimise exposure to EMF as far as possible by applying the following procedures:
  - Route the electrode and work cables together. Secure them with tape when possible.
  - All cables should be stored away from the operator.
  - Never coil the power cable around your body.
  - Make sure welding machine and power cable are far enough away from the operator according to the working environment.
  - Connect the work cable to the workpiece as close as possible to the area being welded.
  - Personnel fitted with a heart-pacemaker should keep their distance from the welding area.

2 SUMMARY

2.1 Brief Introduction

The TIG DC PULSE PFC MV welding machine features the latest Pulse Width Modulation (PWM) technology and Insulated Gate Bipolar Transistor (IGBT) power module, which can change work frequency to medium frequency so as to replace the traditional large transformer with a medium frequency transformer – making it smaller, portable light- weight and low consumption.
The front panel parameters can be adjusted continuously and steplessly, such as start current, crater arc current, welding current, base current, duty ratio, upslope time, downslope time, pre-gas, post-gas, pulse frequency, hot start, arc force and arc length etc. When welding, it takes high frequency and high voltage for arc igniting to ensure the success ratio of igniting arc.

TIG DC PULSE PFC MV Characteristics

- DC Pulsed TIG and MMA, adopt IGBT and advanced PWM technology
- High performance MCU, Digital control, Digital display
- Preset all parameters with hold process
- HF/Lift TIG, current down slope and up slope, gas post-flow, pulse frequency
- Intelligent protection: over-voltage, under-voltage, over-current, over-heat

1. For MMA, polarity connection can be chosen according to different electrodes (please refer to 3.5).
2. For DC TIG, DCEP is used normally (workpiece connected to positive polarity, while torch connected to negative polarity). This connection has many characters, such as stable welding arc, low tungsten pole loss, more welding current, narrow and deep weld.
3. DC Pulsed TIG has the following characteristics:
   - **Pulse heating**. Metal in Molten pool has short time on high temperature status and freezes quickly, which can reduce the possibility to produce hot crack of the materials with thermal sensitivity
   - **Workpiece gets little heat**. Arc energy is focused. Suitable for thin sheet and super thin sheet welding.
   - **Exact control heat input and size of molten pool**. Depth of penetration is even and suitable for welding one side and forming two sides and all position pipe welding.
   - **High frequency arc** can make metal for microlite fabric, eliminate blowhole and improve the mechanical performance of the joint. It is also suitable for high welding speed for improved productivity.

TIG DC PULSE PFC MV-series welding machine is suitable for all position welding for a variety of plates of stainless steel, carbon steel, alloyed steel, titanium, magnesium, cuprum, etc, also applied to pipe installation, mould repair, petrochemical, architectural decoration, car repair, bicycle, handicraft and DIY.

MMA Manual Metal Arc welding

PWM Pulse-Width Modulation

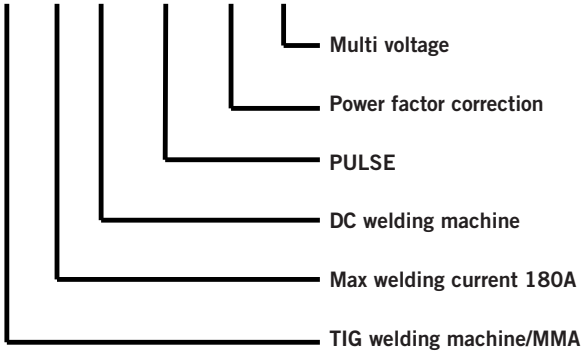
IGBT Insulated Gate Bipolar Transistor

TIG Tungsten Insert Gas welding

2.2 Module Explanation

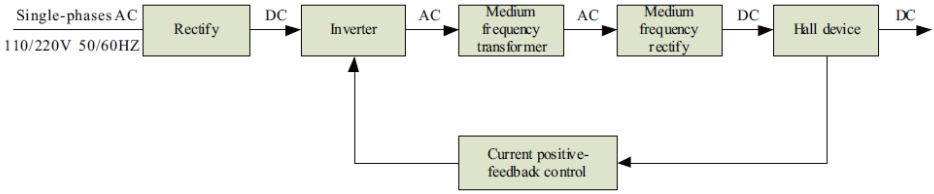
The module explanation of arc welding machine must accord with the National Standard GB10249, explained as follows (using the TIG 180 DC PULSE PFC MV as an example).

TIG 180 DC PULSE PFC MV



2.3 Working Principle

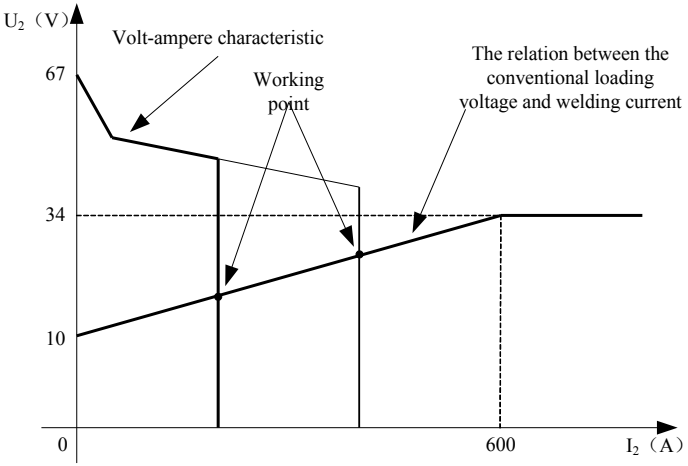
The working principle of TIG DC PULSE PFC MV-series welding machines is shown as follows: Single phases work frequency AC 110/220V(50 Hz) is transformed into DC(155/312V), then is converted to medium frequency AC (about 50/40KHZ) by inverter device (IGBT). After reducing voltage by medium transformer (the main transformer) and rectifying by medium frequency rectifier (fast recovery diode), output is produced by inductance filtering. The circuit adopts current feedback control technology to ensure current output stability. Meanwhile, the welding current parameter can be adjusted continuously and steplessly to meet with the requirements of welding craft.



2.4 Volt-Ampere Characteristic

The TIG DC PULSE PFC MV welding machine has an excellent volt-ampere characteristic, as shown as the following graph (see next page). The relation between the conventional rated loading voltage U_2 and the conventional welding current I_2 is as follows:

When $I_2 \leq 600A$, $U_2=10+0.04I_2(V)$; When $I_2>600A$, $U_2=34(V)$.


U2（V）
Volt-ampere characteristic
67
Working
point
The relation between the
conventional loading
voltage and welding current
34
10
0
600
I2（A）

3 INSTALLATION AND ADJUSTMENT

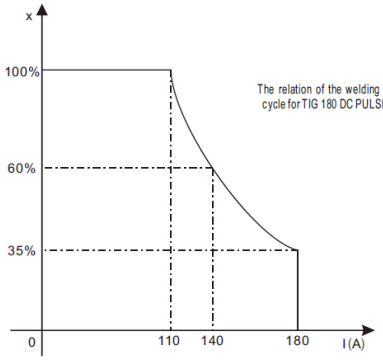
3.1 Parameters

DIGI-TIG 180 DC PULSE PFC MV				
Power Supply Voltage (V)	1~110/120/130		1~220/230/240	
	±10%		±10%	
Frequency (Hz)	50/60			
	TIG	MMA	TIG	MMA
Rated Input Current (A)	17.2	33	17	26.5
Rated Input Power (Kw)	1.9	3.2	3.7	5.8
Power Factor	0.99			
Welding Current Adjustment Range (A)	5-110		5-180	
Maximum No Load Voltage (V)	66			
Up-slope/Down-slope (S)	0-10			
Pre/Post Flow (S)	0-2/0-10			
Pulse Frequency (Hz)	0.5-200			
Pulse Width Range (%)	5-95			
Efficiency (%)	≥85			
Duty Cycle (40ºC / 10 min)	35% 110A	30% 110A	35% 180A	25% 180A
	60% 85A	60% 80A	60% 140A	60% 120A
	100% 65A	100% 65A	100% 110A	100% 100A
Protection Class	IP23			
Insulation Class	H			
Cooling	AF			
Net Weight (Kg)	7.5			
Dimensions (mm) L × W × H	465 × 146 × 278			

3.2 Duty Cycle and Over-heating

The letter 'X' stands for duty cycle, which is defined as the proportion of the time that a machine can work continuously within a certain time (10 minutes). The rated duty cycle means the proportion of the time that a machine can work continuously within 10 minutes when it outputs the rated welding current.

The relation between the duty cycle 'X' and the output welding current 'I' is shown as the figure on the right.



The relation of the welding current and duty cycle for TIG 180 DC PULSE PFC MV (220V)

If the welder is over-heating, the IGBT over-heating protection unit inside will send a message to cut output welding current and illuminate the pilot lamp on the front panel.

At this point, the machine should be turned off for 15 minutes to cool the fan. When operating the machine again, the welding output current or the duty cycle should be reduced.

3.3 Movement and Placement

Please take care when moving it the machine and keep it level.
It also can be moved by the handle on the top. Place the machine securely when in the right location. When moving using a forklift, ensure the arm lengths are long enough to reach outside the machine to safely lift.
The movement may result in the potential danger or substantive hazard, so please make sure that the machine is in a safe position before using it.

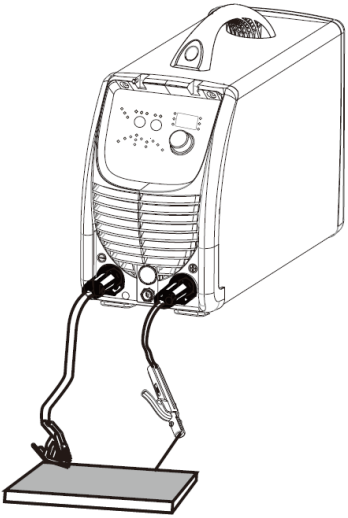
3.4 Power Supply Input Connection

TIG DC PULSE PFC MV welding machine's power supply connects to 110/220V.
When the power supply voltage is over the safe working voltage, there are over-voltage and under-voltage protection inside the welder. The alarm light will illuminate and, at the same time, the current output will be cut off.
If the power supply voltage continually goes beyond the safe work voltage range, it will shorten the machine's life-span. The below measures can be used:

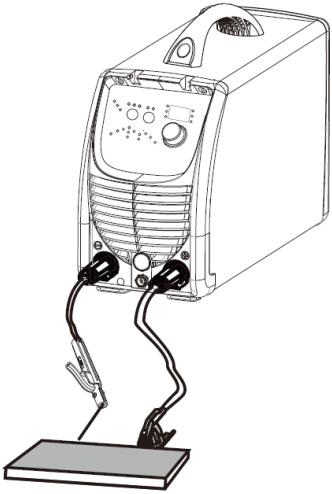
- Change the power supply input net (connect the welder with the stable power supply voltage of distributor).
- Switch on the machines using power supply at the same time.
- Set the voltage stabilisation device in the front of power cable input.

3.5 Polarity Connection (MMA)

MMA (DC): Choosing the connection of DCEN or DCEP according to the different electrodes.
Please refer to the electrode manual.



DC NEGATIVE CONNECTION



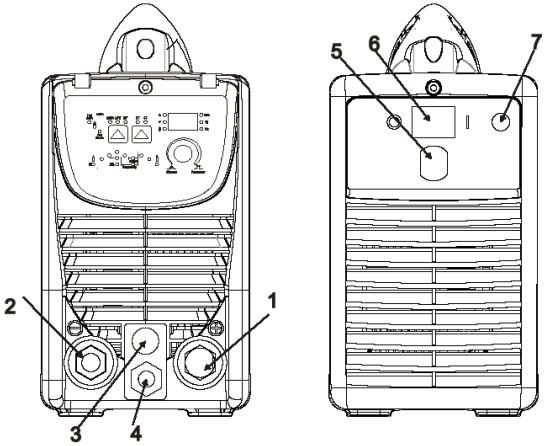
DC POSITIVE CONNECTION

3.6 Assembling the Equipment (TIG)

- The workpiece is connected to the positive electrode of the welding machine, and the welding torch is connected to the negative electrode – DC POSITIVE CONNECTION, otherwise – DC NEGATIVE CONNECTION.
  Generally, it is operated in DC POSITIVE CONNECTION in TIG welding mode.
- Control of the torch switch cable consists of 2 wires, pedal control of 3 wires and the aero socket of 14 leads.
- Consumable parts for TIG torch, such as tungsten electrode / tip / gas nozzle / electrode shield (short/long) – contact your supplier quoting the part numbers.
- When TIG DC PULSE PFC MV-series welding machines are operated in HF Ignition mode, the ignition spark can cause interferences in equipment near the welding machine. Be sure to take appropriate safety precautions or shielding measures.

4 OPERATION

4.1 Machine Controls



1 Positive output: Welder's positive polarity output

2 Negative output: Welder's negative polarity output.

3 Aero socket: Connected to torch switch control wire (has 14 leads with 8-9 connected to torch switch control wire).

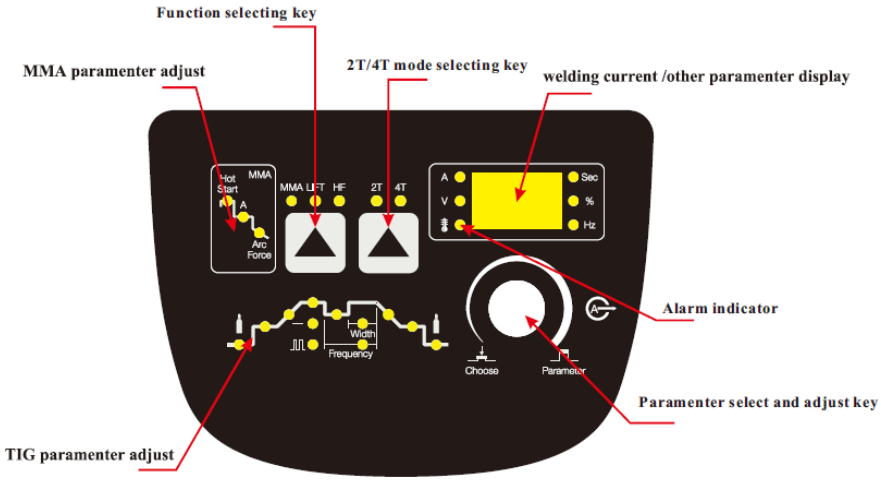
4 Shield gas connector: Connected to torch gas input pipe.

5 Power source switch: Switch to 'ON' – welder is turned on. Switch to 'OFF' – welder is turned off.

6 Power source input: Connects power source.

7 Shield gas input joint: Connects one head of the gas hose while the other is connected to argon gas cylinder.

4.2 Control Panel



Overview

The key feature of the Control Panel is the logical way in which the controls are arranged. All the main parameters needed for day-to-day operation can easily be:

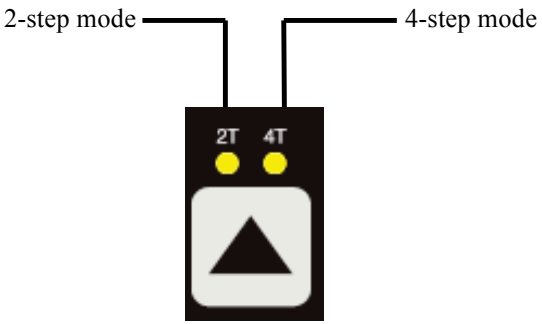
– Selected with the keys

– Altered with the adjusting dial

– Shown on the display during welding

The illustration below shows an overview of the main settings needed for day-to-day working, using the TIG DC PULSE PFC MV control panel as an example. You will find a detailed description of these settings in the following section.

(1) TIG mode selecting key



(2) Parameter select and adjust

Push the encoder to select, the parameter indicator lights up. The selected parameter can then be adjusted.

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

Tpr	**Gas pre-flow time**		
Unit	S		
Setting range	0-2		
Factory setting			

Is	**Starting current (only with 4T)**		
Unit	A		
Setting range	5-100%of main current Iw		
Factory setting			

Tup	**Upslope time**		
Unit	S		
Setting range	0-10		
Factory setting			

Iw	**Welding current**		
Unit	A		
TIG 180	DC PULSE PFC MV	5-110 (110V)	5-180(220V)
TIG 200	DC PULSE PFC MV	5-130 (110V)	5-220(220V)

Ib	**Base current**		
Unit	A		
TIG 180	DC PULSE PFC MV	5-110 (110V)	5-180(220V)
TIG 200	DC PULSE PFC MV	5-130 (110V)	5-220(220V)

Important! Only selectable when 'pulse key' has been pressed

Dcy	**Ratio of pulse duration to base current duration**
Unit	%
Setting range	5-95
Factory setting	

Important!	Only selectable when 'pulse key' has been pressed

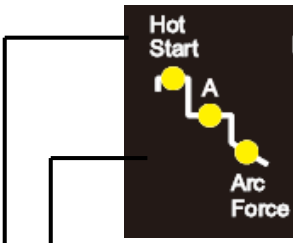
Fp	Pulse frequency
Unit	Hz
Setting range	0.5-200
Factory setting	
Important! Only selectable when 'pulse key' has been pressed	

Tdown	Downslope time
Unit	S
Setting range	0-10
Factory setting	

Ic	Crater arc current (only with 4T)
Unit	S
Setting range	5-100% of main current Iw
Factory setting	

Tpo	Gas post-flow time
Unit	S
Setting range	0-10
Factory setting	

(3) Rod electrode (MMA) welding parameter



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

(4) Power/Alarm indicator



Lights up if the machine overheats

(5) Welding current and other parameter displays

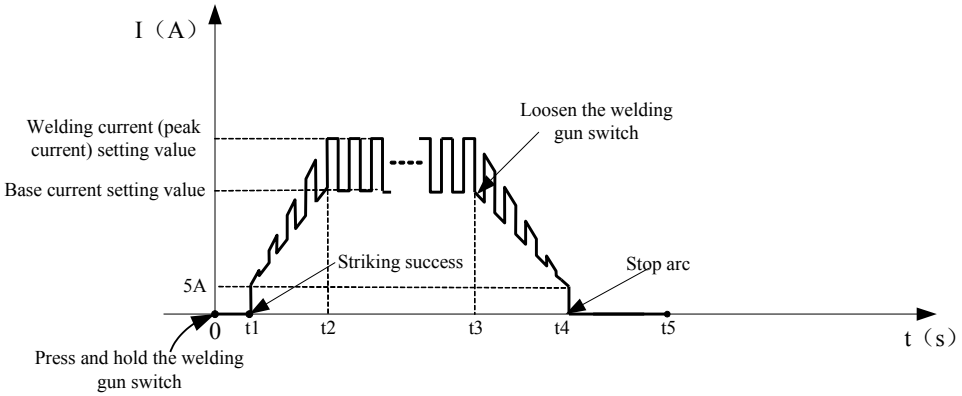
Before starting welding indicate the open-circuit voltage by pushing the encoder for 3 seconds and the display shows the pre-set value of Tpr, Is, Tup, Iw, Dcy, Iw, Fp, Ib, Tdown, Ic, Tpo. After the start of welding, display shows the present actual value of the welding current.

4.3 Argon Arc Welding Operation

4.3.1 TIG welding (4T operation)

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

Pulsed TIG long welding (4T)

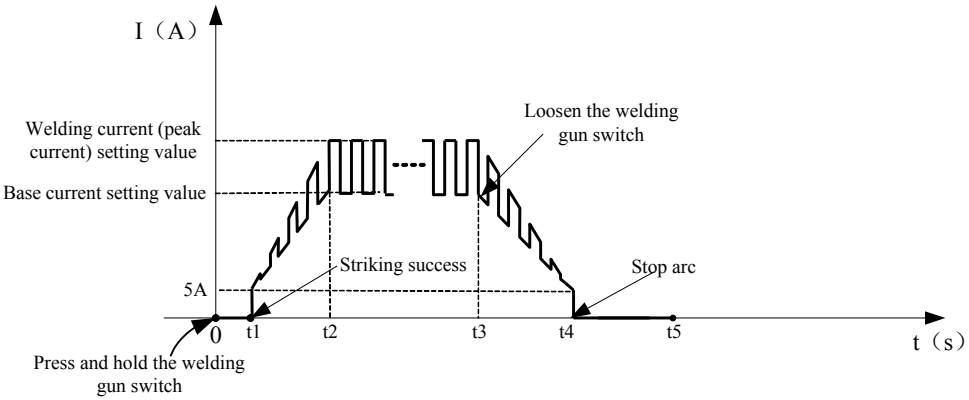


Introduction

- **0** Press and hold the gun switch – Electromagnetic gas valve is turned on. The shielding gas starts to flow
- **0~t1** Pre flow time – adjustment range of pre flow time: 0~2S
- **t1** Striking success – adjustment range of start current: 5~100% of main current
- **t2** Loosen the gun switch – the output current slopes up from start current. If the output pulse function is turned on, the output current is pulsed
- **t2~t3** Output current slopes up to the setting current value – adjustment range of up slope time 0~10S
- **t3~t4** Welding process – during this period the gun switch is loosened
  Note: If the output pulse function is turned on, the output current is pulsed. If the output pulse function is turned off, the output current is the welding current (Iw)
- **t4** Repress the gun switch – the output current slopes down to crater current. If the output pulse function is turned on, the slope down current is pulsed
- **t4~t5** Down slope time – adjustment range of down slope time: 0~10S
- **t5~t6** Crater current holds time – adjustment range of crater current: 5~100% of main current
- **t6** Loosen the gun switch – stop arc and keep the argon flowing
- **t6~t7** Post flow time – adjustment range of post flow time: 0~10S
- **t7** Electromagnetic valve is closed and stop argon flowing – welding is complete

4.3.2 TIG welding (2T operation)

Pulsed TIG short welding (2T)



Introduction

- **0** Press and hold the gun switch – electromagnetic gas valve is turned on. The shielding gas starts to flow
- **0~t1** Pre flow time – adjustment range of pre flow time: 0~2S
- **t1~t2** Striking success – the output current slopes up to the setting current from minimum current (5A). If the output pulse function is turned on, the slope up current is pulsed
- **t2~t3** During the whole welding process, the gun switch is pressed and held without releasing
  Note: If the output pulse function is turned on, the output current is pulsed. If the output pulse function is turned off, the output current is DC
- **t3** Loosen the gun switch – the output current slopes down. If the output pulse function is turned on, the slope down current is pulsed
- **t3~t4** The output current slopes down to minimum current (5A) – stop arc. Adjustment range of down slope time: 0~10S
- **t4~t5** Post flow time – adjustment range of post flow time: 0~10S
- **t5** Electromagnetic valve is closed – argon stops flowing and welding is complete

Short circuit protection function

1 TIG /LIFT If the tungesten electrode touches the workpiece when welding, the current will drop to 5A which can greatly reduce the tungsten spoilage, prolong the life of the tungsten electrode and prevent tungsten clipping

2 TIG /HF If the tungesten electrode touches the workpiece when welding, the current will drop to 0 within 1S which can greatly reduce the tungsten spoilage, prolong the life of the tungsten electrode and prevent tungsten clipping

3 TMMA operation

If the electrode touches the workpiece over 2S, the welding current will drop automatically to 0 to protect the electrode

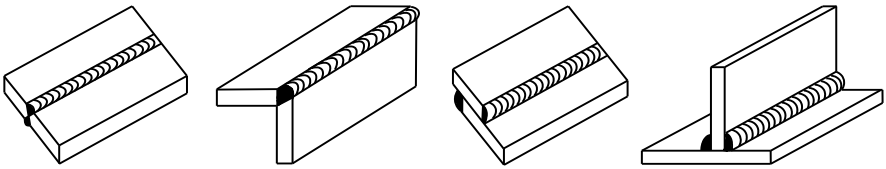
Prevent arc-break function
TIG operation – Avoid arc-break. If arc-break occurs the HF will keep the arc stable

Notes

- First check the condition of welding and connection units for any malfunction, such as ignition spark / gas leakage / out of control etc
- Check whether there is enough Argon gas in the shield gas cylinder. The electromagnetic gas valve can be tested via the switch on the front panel
- Do not point the torch at hand or body. When the torch switch is pressed, the arc is ignited with a high-frequency, high-voltage spark. The ignition spark can cause interference in equipment.
- The flow rate is set according to the welding power used. Turn the regulation screw to adjust the gas flow shown on the gas hose pressure meter or the gas bottle pressure meter.
- The spark ignition is most efficient if you keep a 3mm distance from the workpiece to the tungsten electrode during the ignition

4.4 Welding Parameters

4.4.1 Joint forms in TIG/MMA



a) butt joint b) lap joint c) corner joint d) T joint

4.4.2 Explanation of welding quality

The relation of welding area color & protect effect of stainless steel

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

The relation of welding area color & protect effect of Ti-alloy

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

4.4.3 Parameters Matching

The corresponding relationship between gas nozzle diameter and electrode diameter

Gas nozzle diameter/mm	Electrode diameter/mm
6.4	0.5
8	1.0
9.5	1.6 or 2.4
11.1	3.2
Notice: the above parameters originate from《Welding Dictionary》P142, Volume 1 of Edition 2.	

Welding current range/A	DC positive connection	
	Gas nozzle diameter/mm	Gas flow rate/L • min^{-1}
10～100	4～9.5	4～5
101～150	4～9.5	4～7
151～200	6～13	6～8
201～300	8～13	8～9

tungsten electrode diameter /mm	sharpened of the electrode diameter/mm	angle of cone（° ）	background current/A
1.0	0.125	12	2～15
1.0	0.25	20	5～30
1.6	0.5	25	8～50
1.6	0.8	30	10～70
2.4	0.8	35	12～90
2.4	1.1	45	15～150
3.2	1.1	60	20～200

TIG of stainless steel (single run welding)

Workpiece thickness /mm	Joint form	tungsten electrode diameter/mm	welding wire diameter/mm	Argon gas flow rate/ L • min^{-1}	welding current (DCEP)	Welding speed/ cm • min^{-1}
0.8	Butt joint	1.0	1.6	5	20～50	66
1.0	Butt joint	1.6	1.6	5	50～80	56
1.5	Butt joint	1.6	1.6	7	65～105	30
1.5	Corner joint	1.6	1.6	7	75～125	25
2.4	Butt joint	1.6	2.4	7	85～125	30
2.4	Corner joint	1.6	2.4	7	95～135	25
3.2	Butt joint	1.6	2.4	7	100～135	30
3.2	Corner joint	1.6	2.4	7	115～145	25
4.8	Butt joint	2.4	3.2	8	150～225	25
4.8	Corner joint	3.2	3.2	9	175～250	20

Notice: the above parameters originate from《Welding Dictionary》P150, Volume 1 of Edition 2.

Parameters of piping back sealing welding for mild steel（DCEP）

Piping diameter Φ/mm	Tungsten electrode diameter/mm	Gas nozzle diameter/mm	Welding wire diameter/mm	Welding current/A	Arc voltage/V	Argon flow rate / L • min^{-1}	Welding rate / cm • min^{-1}
38	2.0	8	2	75～90	11～13	6～8	4～5
42	2.0	8	2	75～95	11～13	6～8	4～5
60	2.0	8	2	75～100	11～13	7～9	4～5
76	2.5	8～10	2.5	80～105	14～16	8～10	4～5
108	2.5	8～10	2.5	90～110	14～16	9～11	5～6
133	2.5	8～10	2.5	90～115	14～16	10～12	5～6
159	2.5	8～10	2.5	95～120	14～16	11～13	5～6
219	2.5	8～10	2.5	100～120	14～16	12～14	5～6
273	2.5	8～10	2.5	110～125	14～16	12～14	5～6
325	2.5	8～10	2.5	120～140	14～16	12～14	5～6

Notice: the above parameters originate from《Welding Dictionary》P167, Volume 1 of Edition 2.

4.5 Operation Environment

- Height above sea level below 1000m
- Operation temperature range: –100ºC~+400C
- Relative humidity below 90% (20ºC)
- Preferably site the machine above floor level with the maximum angle not exceeding 15º.
- Protect the machine against heavy rain, hot environments and direct sunshine
- The content of dust, acid, corrosive gas in the surrounding air or substance should not exceed normal standards
- Take care that there is sufficient ventilation during welding and there is at least 30cm free distance between the machine and wall

4.6 Operation Notices

- Read all notes carefully before attempting to use this equipment
- Connect the ground wire with the machine directly, and refer to 3.5
- If the power switch is accidentally closed, no-load voltage may be exported. Do not touch the output electrode with any part of your body
- Before operation ensure no other presonnnel is present without proper eye protection
- Ensure good ventilation of the machine to improve duty ratio.
- Turn off the engine when the operation finished to economize energy source.
- If the power switch shuts off accidentally, do not restart until the problem is resolved

5 MAINTENANCE AND TROUBLESHOOTING

5.1 Maintenance

In order to guarantee that an arc welding machine works efficiently and safely, it must be maintained regularly. Read and understand the maintenance methods and regularly carry out safety checks. Make any repairs as required in order to extend the service life of the welding machine. Maintenance items are detailed in the following tables.

- **Warning: Safely maintain the machine by shutting off the power supply and waiting for 5 minutes until the capacity voltage drops to a safe voltage of 36V.**

DATE	MAINTENANCE CHECKS
Daily examination	Observe whether panel knob and switch in the front and at the back of arc welding machine are flexible and placed correctly. If the knob has not been correctly installed, please correct. If this is not possible, replace immediately, If the switch is not flexible or it cannot be correctly installed, please replace immediately. Contact your distributor if there are no parts to hand. After switching on power, watch and listen to check the arc welding machine is not shaking, whistling or giving out an unusual odour. If so, investigate and eliminate. If any problem persists please contact your distributor. Observe the LED is working correctly. If the number is not displayed, replace the LED. If it still does not work, maintain or replace the display PCB. Observe whether the min/max value on LED accords with the set value. If there is any difference and it has affected the normal welding process, adjust accordingly. Check fan for damage and correct rotation. If damaged, change immediately. If the fan does not rotate after the arc welding machine is overheated, check the blade is not obstructed. If the fan still does not rotate after eliminating the above, push the blade in the direction the fan rotates. If the fan rotates normally, the start capacity should be replaced. If not, change the fan. Check whether the fast connector is loose or overheated. If so, it should be fastened or changed. Check the current output cable is not damaged. If so, it should be securely insulated or replaced.

DATE	MAINTENANCE CHECKS
Monthly examination	Use dry compressed air to clear the inside of arc welding machine. Pay particular attention to clear any dust on radiator, main voltage transformer, inductance, IGBT module, the fast recover diode and PCB, etc. Check the arc welding machine bolt. If loose, tighten. Replace if worn. Scrape off any rust to ensure it works efficiently.
Quarterly examination	Check the actual current accords with the displaying value. If not, they should be reconfigured. The actual current value can be measured by the adjusted plier-type ampere meter.
Annual examination	Measure the insulating impedance among the main circuit, PCB and case. If it is below 1MΩ, insulation may be damaged and should be repaired or replaced.

5.2 Troubleshooting

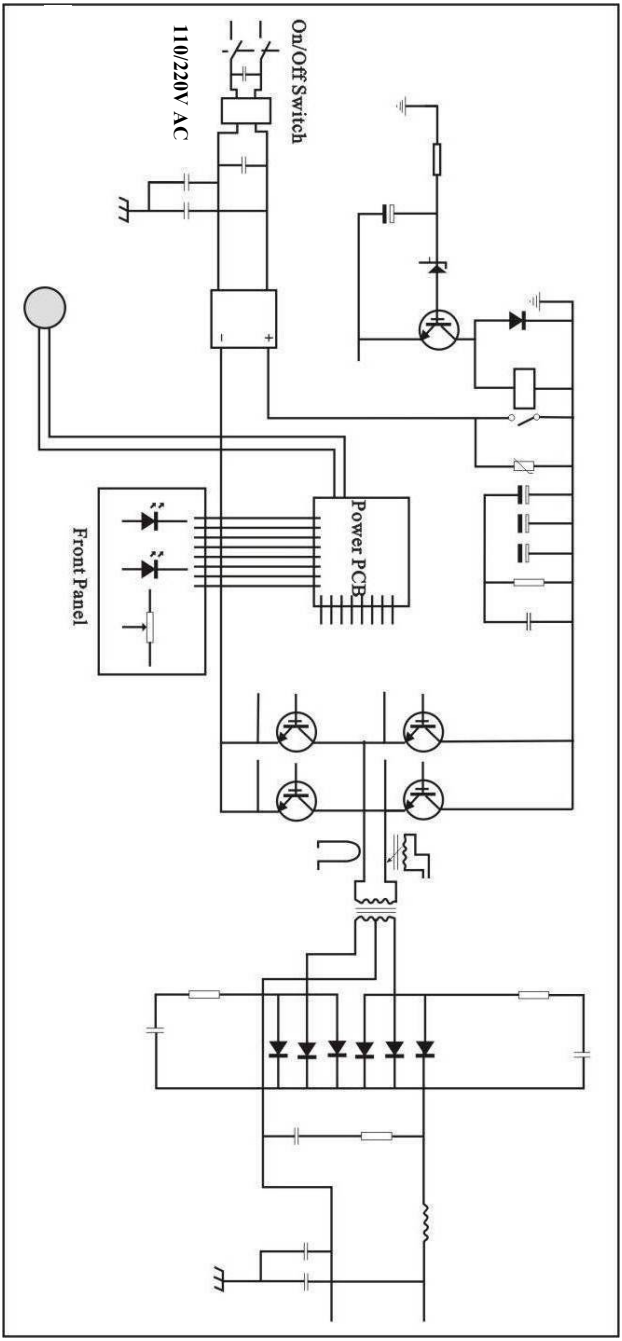
- Before arc welding machines are dispatched from the factory, they have already been carefully checked. Do not allow anyone unauthorised to make any alterations to the equipment.
- Maintenance work must be carefully undertaken. If any wire becomes loose or misplaced, it may be a potential danger to the user.
- Only authorised professional maintenance personnel should overhaul the machine.
- If a problem persists and no authorised professional maintenance personnel is available, contact your supplier.

If there are minor problems with the TIG DC PULSE PFC MV-series welding machine, consult the following chart:

S/N	PROBLEM	REASON	SOLUTION
1	Turn on the power source, and the power lamp is on but fan doesn't work	There is something in the fan	Clear out
		Fan start capacitor damaged	Change capacitor
		Fan motor damaged	Change fan
2	Number on the display is not clear	Display LED is broken	Change LED
3	The max and min value displayed doesn't accord with set value	Max value is not in accordance (refer to 3.1)	Adjust potentiometer Imax on the control
		Min value is not in accordance (refer to 3.1)	Adjust potentiometer Imin the current meter.

S/N	PROBLEM		REASON		SOLUTION
4	No no-load voltage output (MMA)		Machine is damaged		Check Pr4 main circuit
5	Arc cannot be ignited	Spark on the HF igniting board	Welding cable is not connected with two output of the machine		Connect welding cable to machine output
			Welding cable is damaged		Repair or change
			Earth cable connection unstable		Check earth cable
			Welding cable is too long		Use appropriate welding cable
			Oil or dust on the workpiece		Check and remove
			Distance between tungsten and workpiece is too long		Reduce distance (about 3mm)
		No spark on the HF igniting board	HF igniting board does not work		Repair or change Pr8
			Distance between discharger is too short		Adjust distance (about 0.7mm)
			Welding gun switch malfunction		Check switch, control cable and aero socket
6	No gas flow (TIG)		Gas cylinder is closed or gas pressure is low		Open or change gas cylinder
			Blockage in the valve		Remove
			Electromagnetic valve damaged		Change
7	Gas continually flows		Front panel gas-test is on		Turn off
			Blockage in the valve		Remove
			Electromagnetic valve damaged		Change
			Front panel gas-test adjustment knob is damaged		Repair or change potentiometer
8	Welding current cannot be adjusted		Welding current potentiometer on the front panel connection is damaged		Repair or change potentiometer
9	Welding current displayed is not accordant with actual value		Minimum value displayed is not accordant with actual value (refer to 3.1)		Adjust potentiometer Imax on the power board
			Maximum value displayed is not accordant with actual value (refer to 3.1)		Adjust potentiometer Imax on the power board
10	Penetration of molten pool is insufficient		Welding current adjusted too low		Increase welding current
11	Front panel alarm lamp is on		Over heat Protection	Too much welding current	Reduce welding current output
				Working time too long	Reduce duty cycle (work intermittently)

5.3 Main Electrical Diagram





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