

Part # TG2010

2015-06

Processes

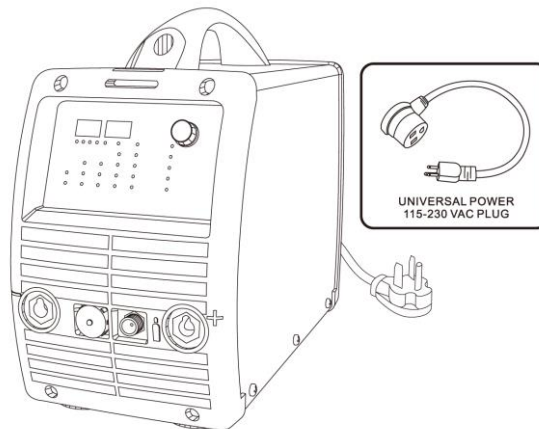


TIG(GTAW) Welding

110-240VAC Arc Welding machine

INVERTER AC/DC PULSED TIG WELDER

TG2010 AC/DC PFC



OPERATOR'S MANUAL

2015. 06

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 we have provided for your protection. Contact your distributor if you do not fully understand this manual.

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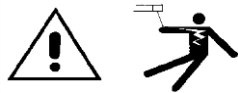
1 SAFETY

1.1 Signal and Hazard Explanation



- The above signals mean Warning, Notice, and Running Parts
- Safe operation is simple after taking several necessary protection measures. The protection measures and hazard explanations are listed in the following pages.
- The following pages are meant to prevent most injuries that might occur while welding. While welding, please remind yourself and others of any danger that that you might be in.
- Only trained professionals can install, operate, maintain and repair the welding equipment.
- During the operation, only necessary people should be present in the work space.
- After shutting off the main power, please remain to examine and maintain the equipment according to section 5 because of the DC voltage stored in the electrolytic capacitors.

1.2 Arc Welding Damage



ELECTRIC SHOCK CAN KILL.

- Never touch electrical parts.
- Wear welding-duty safety clothing including hole-free gloves to insulate yourself.
- Insulate yourself from other work and the ground by using dry insulation. Make **certain** the insulation is large enough to cover your full area of physical contact with work and ground.
- Machine should not be operated in wet areas and all cables and hoses should be dry.
- Never turn “ON” the machine power before reinstalling covers, guards and cables.
- Be sure to install the power cord correctly. Ground the work or metal to be welded with an earth clamp and be certain that the machine is grounded according to the operation manual.
- The electrode and earth circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing as electrocution may result.
- Always be sure the work cable makes a good electrical connection with the metal being

welded. The connection should be as close as possible to the area being welded.

- Maintain the electrode holder, work clamp, welding cable and welding machine 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 welders because voltage between the two can be the total of the voltage of both welders.
- When working above ground level in unenclosed areas, use a safety belt to protect yourself per local codes.



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 the fumes and have enough ventilation near the arc to keep fumes and gases away from the breathing zone. When welding with electrodes which require special ventilation such as stainless, hard facing, 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 some instances, specifically when in small spaces, a respirator may be required. Additional precautions are also required when welding on galvanized steel.
- Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors 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 insure breathing air is safe.
- Read and understand the manufacturer’s instructions for this equipment and the consumables, including the material safety data sheet and follow employer’s safety practices.



ARC RAYS CAN BURN AND BLIND.

- Use suitable, flame-resistant clothing material to protect your skin from the arc rays.
- Protect other nearby personnel with suitable, non-flammable screening and /or warn them not to watch the arc nor expose themselves to the arc rays.

- Be careful to avoid hot spatter or metal caused from the arc rays.
- Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding.

DIN SHADE GUIDE TABLE

Welding Process	ARC CURRENT (Amperes)															
	0.5	2.5	10	20	40	80	125	175	225	275	350	450				
	1	5	15	30	60	100	150	200	250	300	400	500				
SMAW				9	10		11		12		13	14				
MIG (heavy)						10	11		12		13	14				
MIG (light)						10	11		12	13	14	15				
TIG, GTAW			9	10	11	12		13			14					
MAG/CO ₂					10	11	12		13		14	15				
SAW							10	11	12	13	14	15				
PAC							11	12		13						
PAW		8	9	10	11	12		13		14		15				

NOTE:

SMAW – Shielded Metal Arc Welding

TIG, GTAW – Gas Tungsten Arc Welding

SAW – Shielded Semi-Automatic Arc Welding

PAC – Plasma Arc Cutting

MIG (Heavy) – MIG on Heavy Metals

MIG (Light) – MIG on Light Alloys

MAG/CO₂ – Metal Active Gas

PAW – Plasma Arc Welding

**WELDING SPARKS can cause fire or explosion.**

- Remove fire hazards from the welding area. If this is not possible, cover them with a nonflammable material to prevent the welding sparks from starting a fire.
- Have a fire extinguisher readily available.
- Avoid welding near hydraulic lines as the fluid may be flammable.
- Secure all gas cylinders and use only rated regulators and certified hoses.
- When not welding, make certain no part of the electrode circuit is touching the work or ground as 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 insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”.
- Vent hollow castings or containers before heating, cutting or welding to prevent explosions.
- Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuff less trousers, high closed-toe shoes and a cap over your hair. Wear ear plugs when welding out of normal position or in confined places. Always wear safety glasses with correct DIN shading and side shields when in a welding area.

- Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.



Gas cylinder safety precautions.

- 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 a 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 source of heat, sparks or flame.
- Never allow the electrode or any other electrically “hot” parts to touch a cylinder.
- Keep your head and face away from the cylinder valve outlet when opening the valve.
- Valve protection caps should always be securely in place except when the cylinder is in use or connected for use in secured location.

1.3 Explanation of Electric and Magnetic Fields

Electric current flowing through any conductor causes localized Electro Magnetic Fields (EMF). The effects of EMF are an ongoing discussion around the world. Up to now, no material evidence has shown that EMF may have effects on health; however, the research on potential damage due to EMF is still ongoing. Before any conclusion, all should minimize exposure to EMF as much as possible by routing cables together (in cable cover if possible), keeping cables a safe distance from the operator, being sure never to coil around your arms or body, connecting the LINE power & ground (GRD) correctly and clamping the work cable to the work-piece as close as possible to the weld area.

Warning: People with heart-pacemaker should be away from the welding operating area.

2 Introduction

2.1 TG2010AC/DC Information

The TG2010 AC/DC TIG welding machine adopts 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 hulking work frequency transformer with the cabinet medium frequency transformer. Thus, it is known for being portable, small in size, light weight, and having low consumption.

The parameters of TG2010 on the front panel all can be adjusted with a single control knob. The parameters include, start current, crater arc current, welding current, base current, duty ratio, upslope time, downslope time, pre-gas, post-gas, pulse frequency, AC frequency, balance, 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 ignition.

Characteristics:

- **MCU control system:** Responds immediately to any changes.
- **High frequency & voltage ignition:** Ensures the success ratio of igniting arc, the reverse polarity ignition ensures good ignition behavior for TIG welding.
- **Break-arc Protection:** Avoid arc-break by keeping torch in close proximity to material; however, if arc-break occurs the HF will keep the arc stable.
- **Foot pedal control:** Provides adjustable welding current for best quality welds.
- **Tungsten protection:** If the tungsten electrode touches the work-piece when DC-TIG welding, the current will drop automatically to protect tungsten rod.
- **Intelligent protection:** In the event of over-voltage, over-current or over-heating, the alarm lamp on the front panel will illuminate and the output current will be cut off. Machine will auto reset when condition has cleared.
- **Double purpose AC/DC inverter:** Excellent performance on Al-alloy、all carbon steels、stainless steel & titanium.

Machine Welding Functions

- DC MMA (STICK electrode welding for ferrous metals)
- DC TIG (TIG welding for ferrous metals)
- DC Pulse TIG (TIG with pulsed power for welding ferrous metals)
- AC MMA (STICK electrode welding for aluminum metals)
- AC TIG (TIG welding for aluminum metals)
- AC Pulse TIG (TIG with pulsed power for welding aluminum metals)

1. For DC MMA, polarity connection can be chosen according to different electrodes, please refer to 3.5;

2. For AC MMA, magnetic flow caused by invariable DC polarity can be avoided;

3. For DC TIG, ***DCEP is normally used*** (work-piece 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.

4. For AC TIG Square wave arc is more stable than Sine wave arc. Additionally, you can not only obtain maximum penetration with the minimum tungsten pole loss, but also obtain better cleaning effect.

5. For DC TIG Pulsed, see the following characters: 1) 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. 2) The work-piece gets little heat. Arc energy is focused. Suitable for thin sheet and super thin sheet welding. 3) Exactly control heat input and the size of the molten pool. The depth of penetration is even. Suitable for welding by one side and forming by two sides and all position welding for pipe. 4) High frequency arc can make metal for microlite fabric, eliminate blowhole and improve the mechanical performance of the joint. 5) High frequency arc is suitable for high welding speed to improve the productivity.

TG2010 welding machine is suitable for all positions welding for various plates made of stainless steel, carbon steel, alloyed steel, titanium, aluminum, magnesium, cuprum, etc. It can be used for pipe installment, mold mend, petrochemical, architecture design, car repair, bicycle repair, common manufacturing and more.

2.2 Inverter module explanation

MMA——Manual Metal Arc welding (STICK welding)

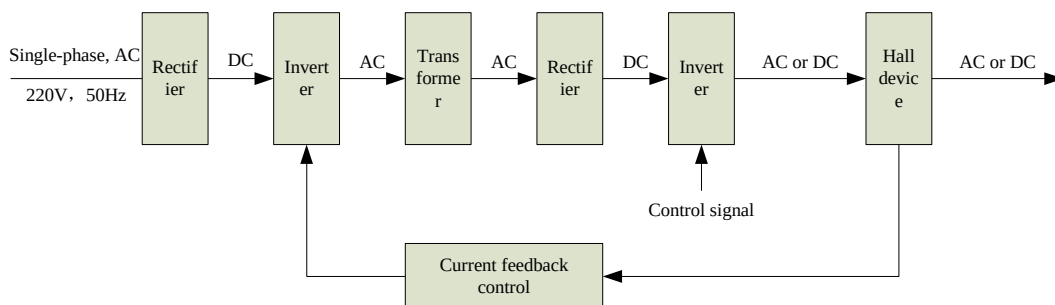
PWM——Pulse-Width Modulation (Method of varying output power)

IGBT——Insulation Gate Bipolar Transistor (Fast acting, high power switching)

TIG——Tungsten Insert Gas welding

2.3 Working principle

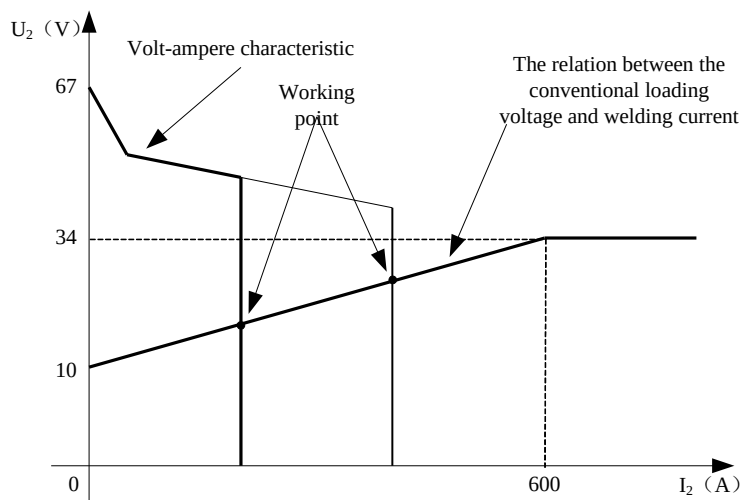
The working principle TG2010 welding machines is shown as the following figure. Single-phase 110-220V work frequency AC is rectified into DC (about 312V), then is converted to medium frequency AC (about 20KHz) by inverter device (IGBT module), after reducing voltage by medium transformer (the main transformer) and rectifying by medium frequency rectifier (fast recovery diodes), then is outputted DC or AC by selecting IGBT module. The circuit adopts current feedback control technology to insure stable current output. Meanwhile, the welding current parameter can be adjusted continuously and infinitely to meet with the requirements of welding craft.



2.4 Volt-Ampere Characteristic

The TG2010 AC/DC welding machine has an excellent volt-ampere characteristic as shown in the following figure. The relation between the conventional rated loading voltage U_2 and the conventional welding current I_2 is as follows:

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



3 Installation and Adjustment

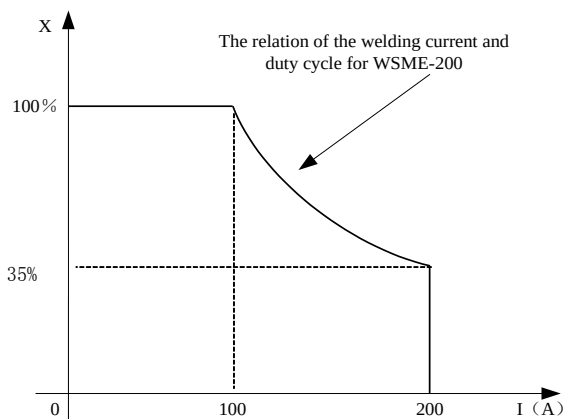
3.1 Parameters

els Parameters	TG2010 AC/DC PFC							
Input power	1~220±10%, 50Hz				1~110±10%, 50Hz			
Rated input current (A)	20/18 (AC/DC TIG)		30/27 (AC/DC MMA)		29/33 (AC/DC TIG)		34/39 (AC/DC MMA)	
Rated input power (KW)	4.5/3.9 (AC/DC TIG)		7/5.7 (AC/DC MMA)		3.4/3.7 (AC/DC TIG)		3.8/4.3(AC/DC MMA)	
Power factor	0.99							
Max-no-load voltage(V)	67							
Start current adjustment (A)	TIG		MMA		TIG		MMA	
	AC	DC	AC	DC	AC	DC	AC	DC
	5~ welding current	5~ weldin g current	—	—	5~ welding current	5~ weldin g current	—	—
Welding current adjustment (A)	10~200	5~200	10~ 170	5~170	10~ 200	5~ 200	10~170	5~170
Down slope time adjustment (S)	0~10							
Pre-gas time (S)	0.1~2							
Post-gas time adjustment (S)	0~10							
Clearance effect (%)	20~50							
Efficiency Duty cycle (40℃, 10 minutes)	AC		DC		AC		DC	
	40% 200A		35% 200A		30% 130A		30% 160A	
	60% 165A		60% 155A		60% 95A			
	100% 130A		100% 120A		100% 70A		100% 125A	
Protection class	IP23							
Insulation class	H							
Dimensions (L×W×H) (mm)	510×190×340							
Weight(Kg)	14.5							

3.2 Duty cycle & over heat

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 at the rated welding current.

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



If the welder over-heats due to operation beyond duty-cycle, the IGBT

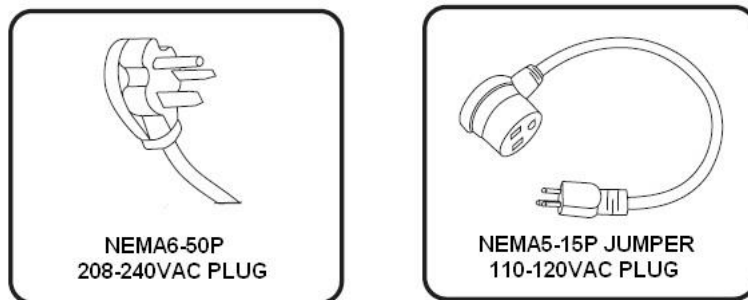
over-heat protection will output an instruction to cut output welding current, and brighten the over-heat pilot lamp on the front panel. If this condition occurs, welding should stop for 10 minutes while the machine cooling fan reduces internal heat. When operating the machine again, the welding output current or the duty cycle should be reduced so as not to repeat over-heating condition.

3.3 Movement and placement

- Place the welder on a firm surface in horizontal position with all four feet in contact.
- Locate machine in dry, clean environment with open-air space for cooling.
- Place gas cylinder in upright position and secure in place for safe operation.
- Make sure that all cables and torches are in a safe position before using welder.
- Ensure all electrical and grounding connections are secure per local codes.
- Safety shields and curtains should be used to protect other personnel in shop.

3.4 Power supply input connection

The TG2010 AC/DC PULSE PFC welding machine features electronic switching power supply allowing it to be connected to any 115-240VAC, 1-Phase LINE power outlet.



208-240VAC LINE CONNECTION: Machine is provided with NEMA 6-50P LINE Service cord to be plugged into any 6-50R outlet with 208-240VAC, single-phase power and **50-amp circuit breaker**.

110-120VAC LINE CONNECTION: Machine is provided with NEMA 6-50R to NEMA 5-15P "Jumper" Service cord. This allows machine to be plugged into any 5-15R standard outlet with 110-120VAC, single-phase power and **20-amp circuit breaker**.

In the event NEMA6-50R or 5-15R outlets, with rated LINE circuit breaker amperage are not available, they should be installed by a licensed electrician in accordance to all national & local codes.

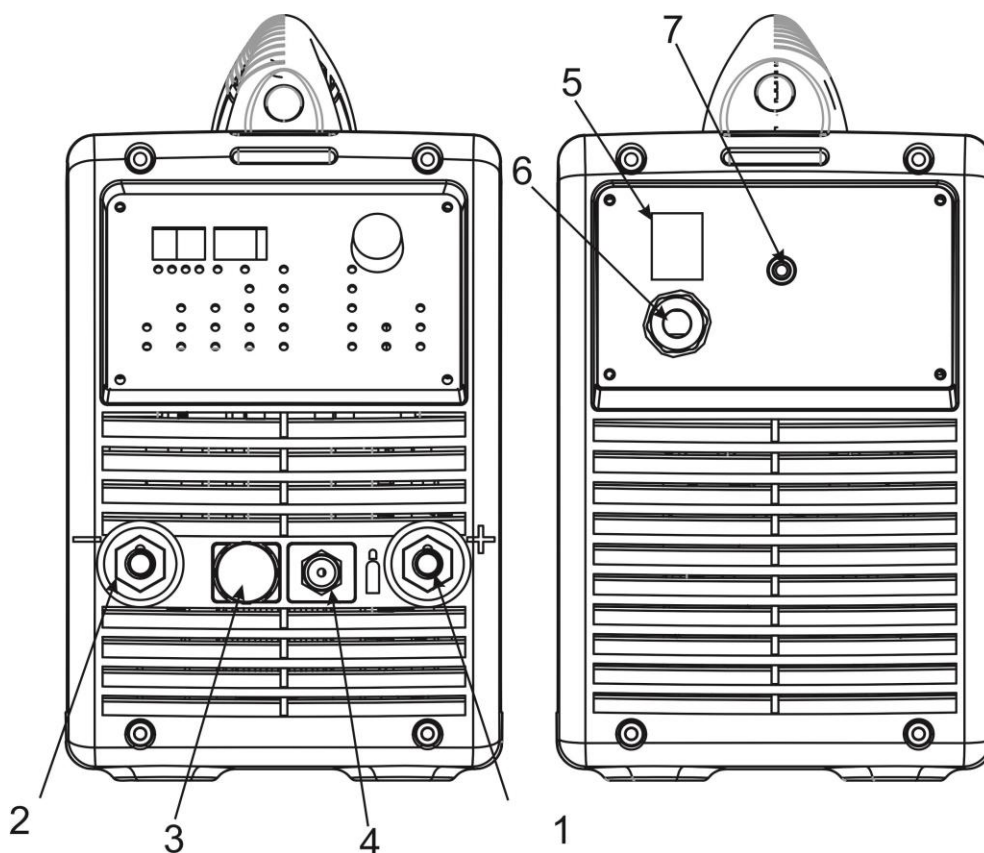
In the event LINE power supply is over voltage (>245) or under voltage (<195), protection circuit inside the machine will illuminate alarm light and current will be cut off.

If the power supply voltage continually goes beyond the safe work voltage range, it will shorten the life of the machine. If this occurs, the below measures should be taken:

- Change the LINE power supply. Such as, connect the welder to a dedicated circuit.
- Shut off other machines using LINE power supply at the same time as welding.

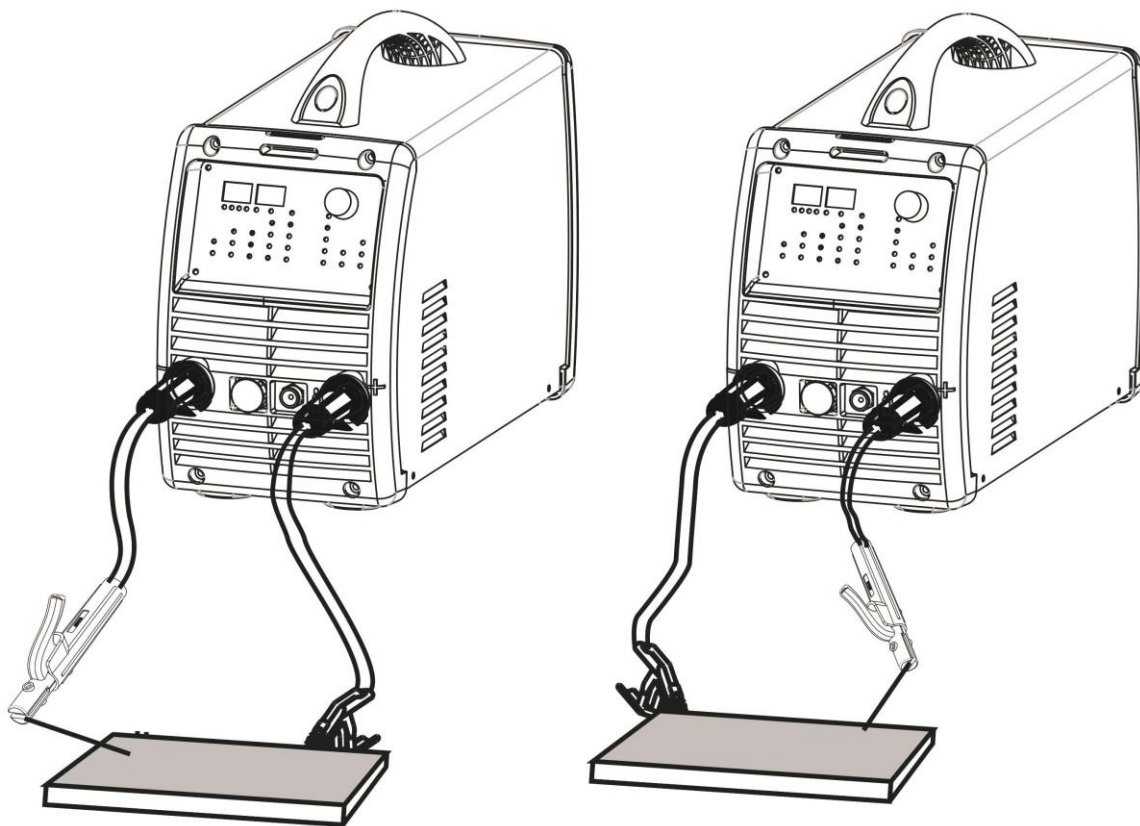
WARNING: Any modification or removal of factory installed service power cords will VOID MACHINE WARRANTY!

3.5 Machine operational layout



- 1 **Positive output:** Socket with positive polarity output.
- 2 **Negative output:** Socket with negative polarity output.
- 3 **Control output:** Socket to torch or foot pedal control wire. (Lead 8 - lead 9 are trigger)
- 4 **Shield gas output:** Brass male fitting to connect gas input hose of torch.
- 5 **Power switch:** Controls input power ON/OFF to the welding machine
- 6 **Power source input:** Power cord service cable with input power plug
- 7 **Shield gas input:** Brass male fitting to connect gas hose from shield gas cylinder.

3.6 Electrode / Torch polarity connections (MMA)



DC POSITIVE (DCEP)

DC NEGATIVE (DCEN)

- DC POSITIVE CONNECTION (DCEP): Work-piece is connected to the positive (+) socket of welding machine, and welding torch is connected to the negative (-) socket.
Most common TIG and MMA (Stick) welding connection: Torch to negative (-)
- DC NEGATIVE CONNECTION (DCEN): Work-piece is connected to the negative (-) socket of welding machine, and welding torch is connected to the positive (+) socket.
- CONTROL CABLE SOCKET: Torch or foot pedal control plug with 12 pins.
- GAS LINE CONNECT: Gas hose from welding torch connects for automatic operation.
- TIG TORCH CONSUMABLES: Refer to TIG torch parts breakdown
- ***WARNING: Use of HF ignition can cause interferences in equipment near the welding machine. Be sure to take safety precautions or shielding measures.***

3.7 Foot pedal switch control

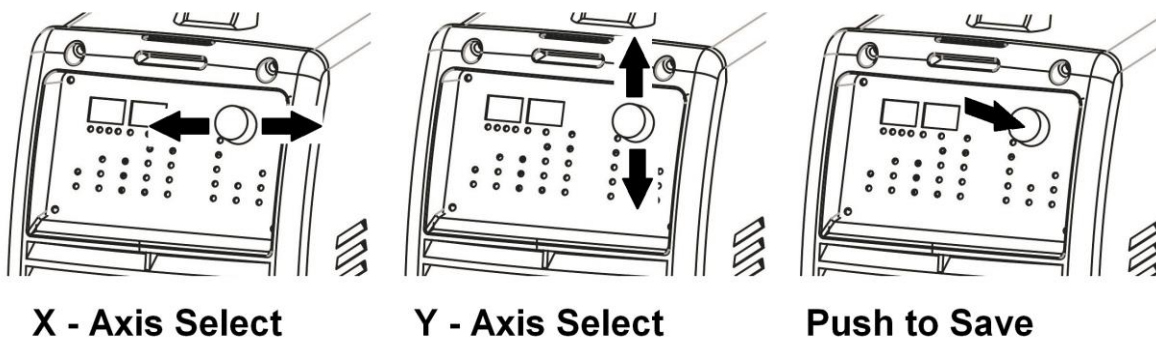
- Once the foot pedal cable is inserted into control-socket on front panel of welder, it will identify the pedal switch. Only 2T/4T modes should be selected when foot pedal operation is desired.
- Adjustment knob on side of the pedal will set the maximum output current desired for application allowing pedal to be pushed fully down to desired maximum current.
- Pins #7 & #8 on control-socket are trigger contacts. Pins #1 & #2 are contact closure (trigger) and pins #3, #4, & #5 are for adjustable resistance to control output power.

Foot pedal adjustment
of welding current

Connected to control
socket on the front
panel



3.8 Control knob function



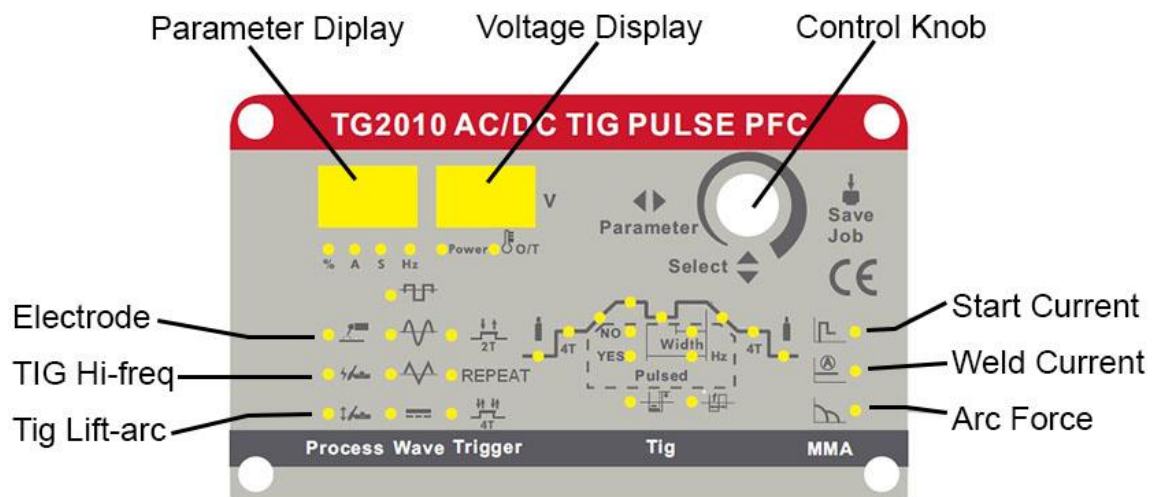
TOGGLE TO SELECT various machine processes and functions (X & Y axis)
TURN TO SET operational levels (Clockwise + & Counter-Clockwise -)
PUSH TO SAVE settings to various stored JOB programs.

4 Operation

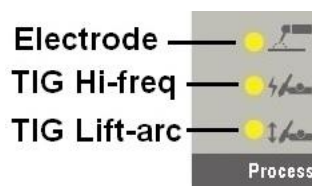
4.1 Control panel layout

The key feature of the control panel is the logical way in which the controls are arranged. All the main parameters needed for operation are easily selected and adjusted to welding application. Once parameters for a particular welding JOB have been set, push to save in memory to recall.

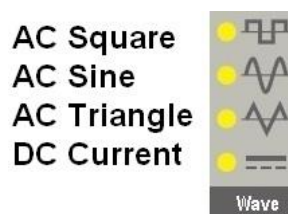
The illustration below shows an overview of the TG2010 control panel as an example. You will find a detailed description of these settings in the following section.



(1) MMA (Stick), TIG with HF ignition or TIG with LIFT-ARC ignition process selection



(2) AC / DC output current and wave form selection



(3) Trigger mode selection (TIG only)

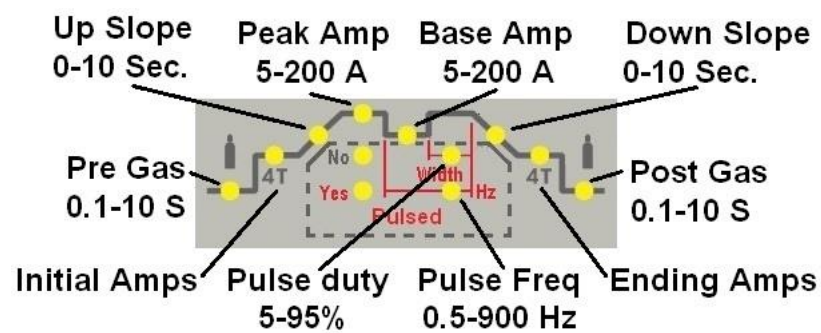
2T: On/Off

Repeat: On/Half/Off

4T: Latching

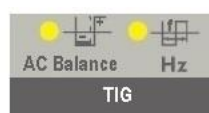


(4) TIG parameter settings



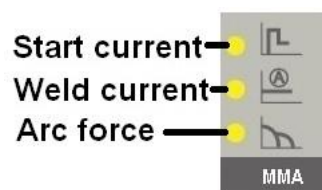
(5) AC parameter settings

(+) Cleaning
(-) Penetration



AC Frequency
50-250 Hz

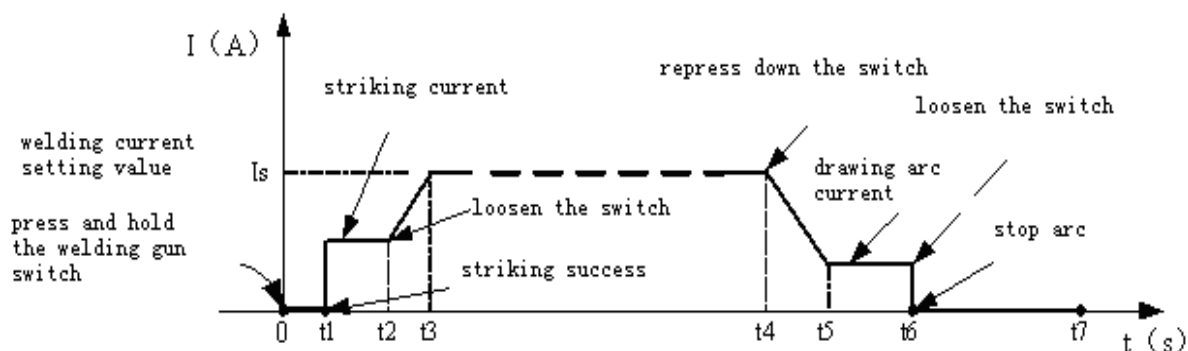
(6) MMA stick electrode parameter settings



4.2 Argon Arc Welding Operation

4.2.1 TIG welding (4T operation)

The START and END current and can be pre-set to compensate for crater that appears at the beginning and end of the welding making 4T ideal for aluminum and medium thickness plates.



Process:

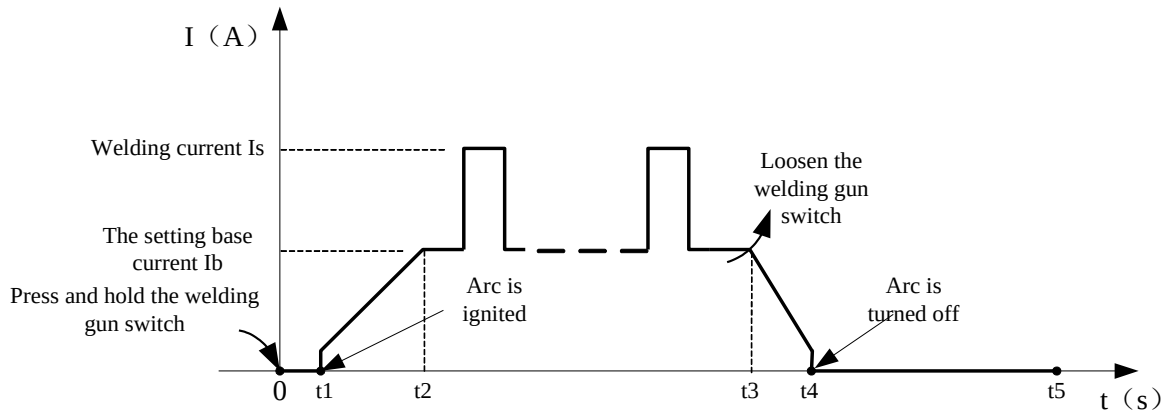
- 0: Press down and hold the pedal switch, gas valve is opened.
- 0~t1: Pre-gas flows at preset time (0.1~1S);
- t1~t2: Arc is ignited at **t1** and output is at preset value of start current;
- t2: Release pedal switch, the output current slopes up from the start current;
- t2~t3: The output current rises to the setting value (I_w or I_b), per upslope time set;
- t3~t4: Welding process. During this period, the pedal switch is UP;

Note: Select the pulsed output, the base current and welding current will be outputted alternately; otherwise, output the setting value of welding current;

- t4: Press the pedal switch DOWN and the welding current will drop per the selected down-slope time to end current setting;
- t4~t5: The output current slopes down to the end crater current setting
- t5~t6: The crater current time (controlled by pedal);
- t6: Release pedal switch to stop arc but keep shield gas flowing;
- t6~t7: Post-gas time (0.1~10S) until valve closes;
- t7: Gas valve is closed and welding process is finished.

4.2.2 TIG welding (2T operation)

This function, without the adjustment of start current and crater current, is ideal for tack welding、transient welding and thin plate welding.



Process:

- 0: Press the gun switch and hold it. Electromagnetic gas valve is turned on. The shielding gas starts to flow.
- 0~t1: Pre-gas time (0.1~1s)
- t1~t2: Arc is ignited and the output current rises to the setting welding current (I_w or I_b) from the min welding current.
- t2~t3: During the whole welding process, the gun switch is pressed and held without releasing.

Note: Select the pulsed output, the base current and welding current will be outputted alternately; otherwise, output the setting value of welding current;

- t3: Release the gun switch, the welding current will drop in accordance with the selected down-slope time.
- t3~t4: The current drops to the minimum welding current from the setting current (I_w or I_b), and then arc is turned off.
- t4~t5: Post-gas time, after the arc is turned off. You can adjust it (0.1~10s) through turning the knob on the front panel.
- t5: electromagnetic gas valve turned off, the shield gas stops to flow, and welding is finished.

4.2.3 TIG welding (Repeat)

This function only works with a triggered gun; *it will not function with foot pedal.*

This welding mode is ideal for working back and forth between two metals of varying characteristics. (Thick and thin, wide or narrow seam, deep or flat, etc.)

- This function allows the user to have easy access to two levels of current when using a triggered gun. Set repeat current to 1/2 or 1/3 of the MAIN welding current. The current will drop to this setting when trigger is released.
- Start by pulling the trigger. When the trigger is held, the original set current will go across the metal. When the trigger is released the first time, the current will drop by the fraction previously set. When the trigger is held again, back to original current.
- Example: Current is set to 160amps and the repeat setting is set to 1/2. The trigger is held and the arc flows at 160amps. The welder gets to a thinner section of metal. By releasing the trigger, the amps drop to 80amps (1/2 of 160amps) and the welder continues. By pressing the trigger again, the current returns to 160 amps.

4.3 Safe Operation

Short circuit protect function:

1. TIG /DC/LIFT: If the tungsten electrode touches the work-piece when welding, the current will drop to 20A, which can reduce the tungsten damage, prolong the life of the tungsten electrode and prevent tungsten clipping.
2. TIG /DC/HF: If the tungsten electrode touches the work-piece when welding, the current will drop to 0 within 1s, which can reduce the tungsten damage, prolong the life of the tungsten electrode and prevent tungsten clipping.
3. MMA operation: If the electrode touches work-piece over two seconds, the welding current will drop to the 0 automatically to protect the electrode.
4. TIG: If the TIG torch is pressed quickly, the welding current will drop a half, then if the TIG torch is pressed quickly again, the welding current will return to preset level.

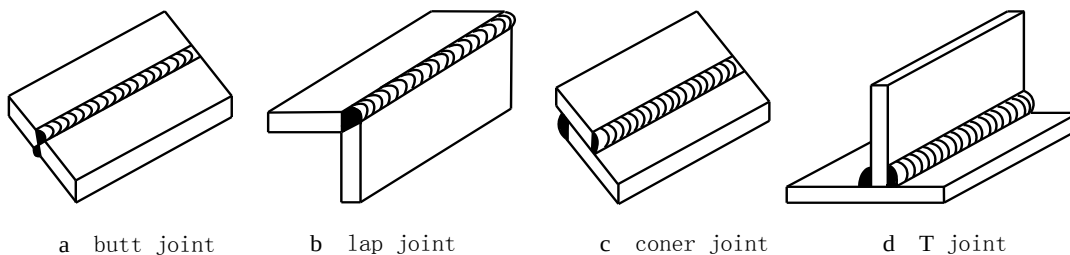
Torch & earth clamp checklist:

- Check welding cable machine connections are twist-locked in place and gas fittings are secure; otherwise there may be malfunction such as ignition spark, gas leakage, and unstable arc.
- Check that there is enough shield gas in the cylinder and that regulator is set correctly, you can test the electromagnetic gas valve through the switch on the front panel.
- Do not aim torch at your hand or anywhere on your body. When you press the torch switch, the arc is ignited with a high-frequency, high-voltage spark. The ignition spark can burns.
- The shield gas flow rate is set according to the welding power used in the job. Turn the regulation screw to adjust to the desired gas flow required for the application.
- The HF ignition works better if you keep 3mm (1/8") distance from the work-piece to the tungsten electrode during the ignition.

Note: When the AC output is selected, the settings are as same as the above, but output polarity changes.

4.4 Welding Parameters

4.4.1 Joint forms in TIG/MMA



4.4.2 The 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	very bad

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

Welding area color	bright argent	orange-yellow	blue-purple	dark blue	white powder of titanium oxide
Protect effect	best	better	good	bad	very bad

4.4.3 TIG 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.	

Gas nozzle and the shield gas flow rate

Welding current range/A	DC positive connection		AC	
	Gas nozzle diameter/mm	Gas flow rate/L·min ⁻¹	Gas nozzle diameter/mm	Gas flow rate/L·min ⁻¹
10~100	4~9.5	4~5	8~9.5	6~8
101~150	4~9.5	4~7	9.5~11	7~10
151~200	6~13	6~8	11~13	7~10
201~300	8~13	8~9	13~16	8~15

Notice: the above parameters originate from 《Welding Dictionary》 P149, Volume 1 of Edition 2.

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)

Work piece 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.

Parameters of AC TIG (MMA) for Aluminum and its alloy

Sheet thickness /mm	Welding wire diameter /mm	Tungsten electrode diameter /mm	Pre-heat Temperature /°C	Welding current /A	Argon flow rate / L·min ⁻¹	Gas nozzle diameter /mm	Remark
1	1.6	2	—	45~60	7~9	8	Flange welding
1.5	1.6~2.0	2	—	50~80	7~9	8	Flange or butt welding by one side
2	2~2.5	2~3	—	90~120	8~12	8~12	Butt welding

3	2~3	3	—	150~ 180	8~12	8~12	V-groove butt welding
4	3	4	—	180~ 200	10~15	8~12	
5	3~4	4	—	180~ 240	10~15	10~12	
6	4	5	—	240~ 280	16~20	14~16	
8	4~5	5	100	260~ 320	16~20	14~16	
10	4~5	5	100~ 150	280~ 340	16~20	14~16	
12	4~5	5~6	150~ 200	300~ 360	18~22	16~20	
14	5~6	5~6	180~ 200	340~ 380	20~24	16~20	
16	5~6	6	200~ 220	340~ 380	20~24	16~20	
18	5~6	6	200~ 240	360~ 400	25~30	16~20	
20	5~6	6	200~ 260	360~ 400	25~30	20~22	X-groove butt welding
16~20	5~6	6	200~ 260	300~ 380	25~30	16~20	
22~25	5~6	6~7	200~ 260	360~ 400	30~35	20~22	

Notice: the above parameters originate from 《Welding Dictionary》 P538, Volume 2 of Edition 2.

4.5 Operation Environment

- Operation temperature range: 14°F - 104°F (-10°C~+40°C)
- Relative humidity should be below 90 %.
- Machine placement: horizontal bench or cart to maximum angle does not exceed 15°.
- Protect the machine against heavy rain or in hot circumstance against direct sunshine.
- Sufficient ventilation of at least 1' (30cm) free space between the machine and wall.

4.6 Operation Notices

- Read section 1 carefully before attempting to use this equipment.
- Connect the ground wire with the machine directly, and refer to section 3.5
- When the power switch shuts off protectively, don't restart it until problem is resolved.

5 Maintenance & Troubleshooting

5.1 Maintenance

In order to guarantee that arc welding machine works high-efficiently and in safety, it must be maintained regularly so as to lengthen service life of arc welding machine. Maintenance items in detail are in the following table.

- **Warning: For safety while maintaining the machine, please shut off the supply power and wait for 5 minutes or until capacitor voltage drops to safe level below 36V!**

date	Maintenance item
Daily exam	Observe whether the panel knob and switch in the front and at the back of arc welding machine are flexible and put correctly in place. If the knob has not been put correctly in place, please correct; If you can't correct or fix the knob, please replace immediately; If the switch is not flexible or it can't be put correctly in place, please replace immediately; Please get in touch with maintenance service department if there are no accessories. After turning-on power, watch/listen to see whether the arc welding machine is shaking, whistling or has a peculiar smell. If one of the above problems exists, find out the reason and correct it. If you can't find out the reason, please contact your dealer or the factory. Observe whether the display value of LED is intact. If the display number is not intact, please replace the damaged LED. If it still doesn't work, please maintain or replace the display PCB. Observe whether the min/max value on LED accords with the set value. If there are any differences and it is affecting the normal welding craft, please adjust it. Check that the cooling fan is not damaged and is in normal and working condition. If the fan is damaged, please change immediately. If the fan does not rotate, look to see if there is something blocked in the blade. If it is blocked, remove it cautiously. If the fan does not rotate after fixing the above problems but starts when blade is pushed in the direction of fan, the start capacitor should be replaced. If not, replace the fan. Check if torch power and/or ground cable connectors are loose or show signs of overheating. If this is observed, they should be fastened or changed. Check whether the current output cable is damaged. If it is damaged, it should be

	wrapped up, insulated or changed.
Monthly exam	Use dry compressed air to clean and remove dusts on radiator, main voltage transformer, inductance coils, IGBT module, the fast recover diodes and PCB's. Check the cable lugs on arc welding machine, if loose, please screw down securely. If burnt, please replace. If it is rusty, please remove rust on bolt & washer for good contact.
Quarter-yearly exam	Check whether the actual current accords with the displaying value. If they do not match, they should be regulated. The actual current value can be measured by the adjusted plier-type ampere meter.
Yearly exam	Measure the insulating impedance among the main circuit, PCB and case, if it below 1MΩ, insulation is thought to be damaged and need to change or strengthen insulation.

5.2 Troubleshooting

- Before arc welding machines are dispatched from the factory, they have already been debugged accurately. So do not allow anyone who is not authorized by the factory to make any changes to the equipment!
- Maintenance course must be operated carefully. If any wire becomes flexible or is misplaced, it maybe potential danger to User!
- Only professional maintenance personnel authorized by factory should repair the machine!
- Guarantee to shut off machine's LINE power before any maintenance of the equipment!

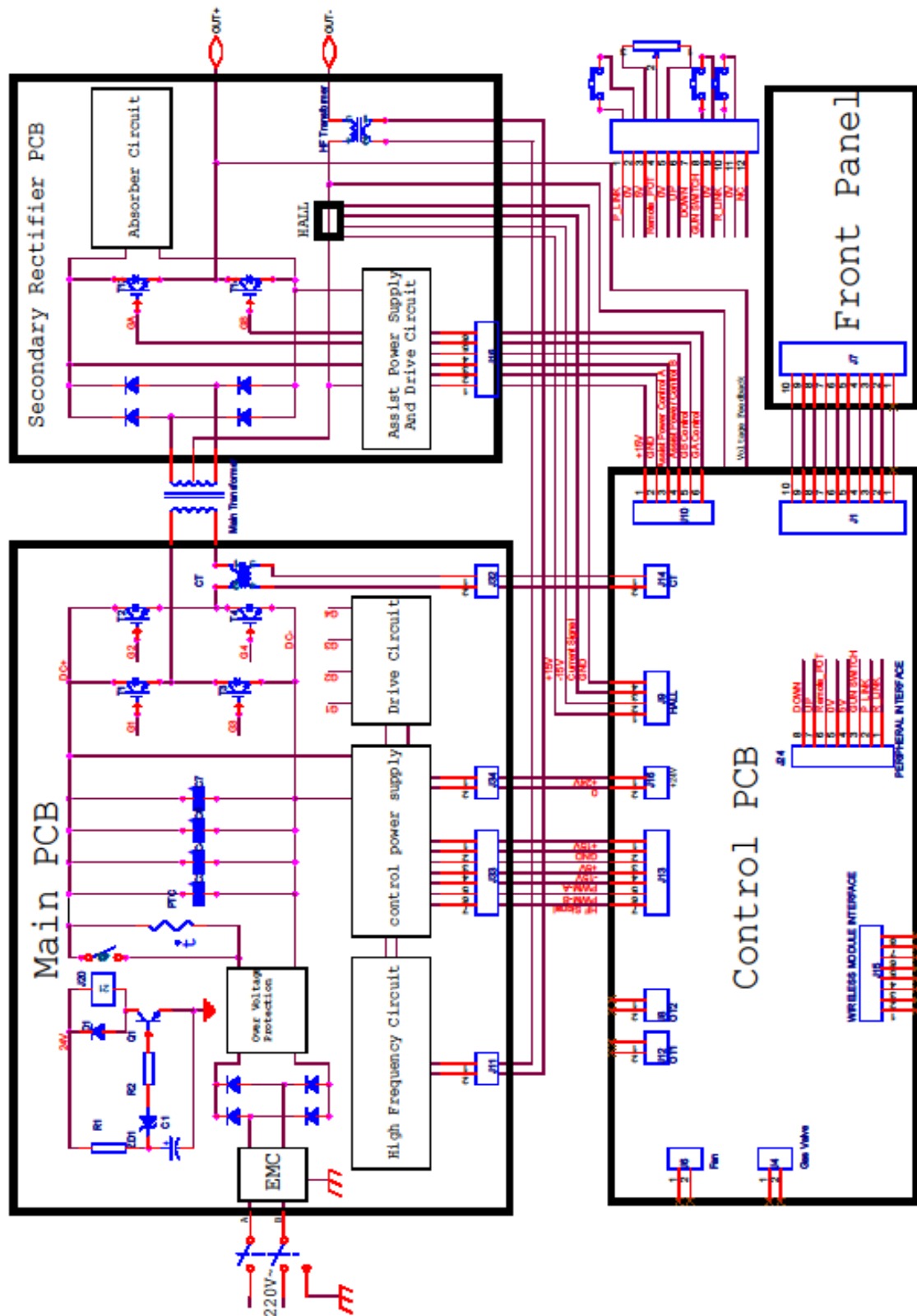
If there are some simple problems, consult the following trouble-shooting chart:

S/N	Troubles	Reasons	Solution
1	Turn on the power source, and fan works, but the power pilot lamp is not on.	The power light damaged or connection is not good	Check and repair Pr7
		The transformer of power is broken	Repair or change the transformer
		Control PCB failures	Repair or change the control Pr4
2	Turn on the power source, and the power lamp is on, but	There is something in the fan	Clear out
		The start capacitor of fan damaged	Change capacitor

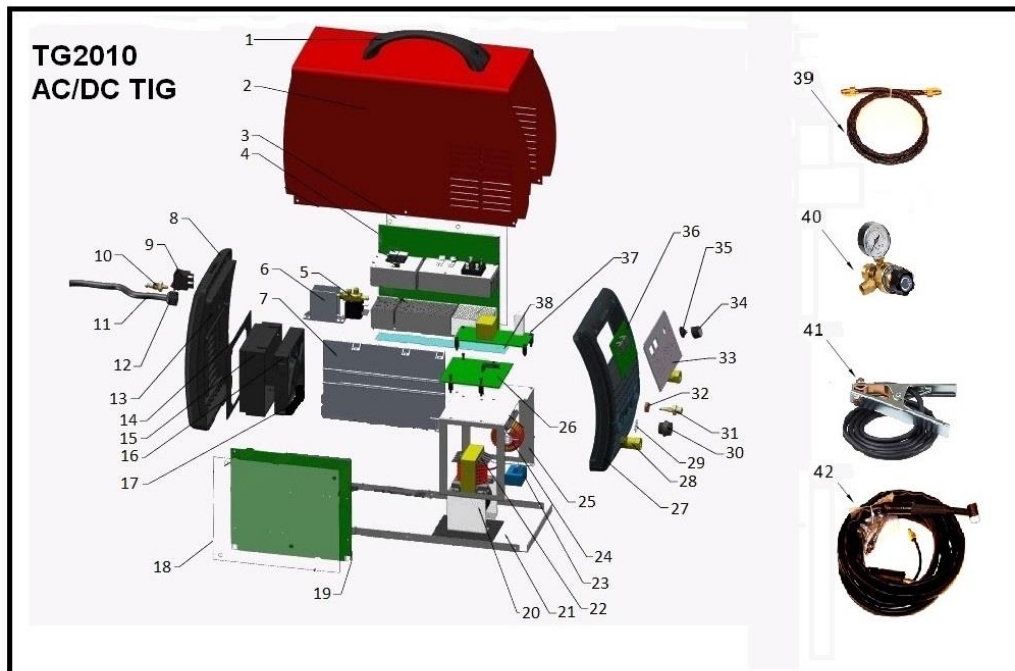
S/N	Troubles		Reasons	Solution
	fan doesn't work		The fan motor damaged	Change fan
3	Turn on the power source, the power lamp is not on, and fan doesn't work		No power supply input	Check whether there is power supply
			The fuse inside the machine damaged	Change it (3A)
4	The number on the display is not intact.		The LED in the display is broken	Change the LED
5	The max and min value displayed doesn't accord with the set value.		The max value is not accordant (refer to §3.1)	Adjust potentiometer Imin on the power board.
			The min value is not accordant (refer to §3.1)	Adjust potentiometer Imaxin the current meter.
6	No no-load voltage output (MMA)		The machine is damaged	Check the main circuit and the Pr4.
7	Arc can not be ignited (TIG)	There is spark on the HF igniting board.	The welding cable is not connected with the two output of the welder.	Connect the welding cable to the welder's output.
			The welding cable damaged.	Repair or change it.
			The earth cable connected unstably.	Check the earth cable.
			The welding cable is too long.	Use an appropriate welding cable.
			There is oil or dust on the work-piece.	Check and remove it.
			The distance between tungsten electrode and work-piece is too long.	Reduce the distance (about 3mm).
		There is not spark on the HF igniting board.	The HF igniting board does not work.	Repair or change Pr8
			The distance between the discharger is too short.	Adjust this distance (about 0.7mm).
			The malfunction of the welding gun switch.	Check the welding gun switch, control cable and aero socket.
8	No gas flow (TIG)		Gas cylinder is close or gas pressure is low	Open or change the gas cylinder
			Something in the valve	Remove it
			Electromagnetic valve is damaged	Change it
9	Gas always flows		The gas-test on the front panel is on	The gas-test on the front panel is off
			Something in the valve	Remove it
			Electromagnetic valve is damaged	Change it
			The adjustment knob of pre-gas time on the front panel is damaged	Repair or change it
10	The welding current cannot be adjusted		The welding current potentiometer on the front panel connection is not good or damaged	Repair or change the potentiometer
11	No AC output while selecting "AC"		The power PCB is in trouble.	Repair or change it.
			The AC drive PCB damaged.	Change it.
			The AC IGBT module damaged.	Change it.

S/N	Troubles	Reasons		Solution
12	The welding current displayed isn't accordant with the actual value.	The min value displayed isn't accordant with the actual value. (Please refer to §3.1)		Adjust potentiometer Imin on the power board.
		The max value displayed isn't accordant with the actual value. (Please refer to §3.1)		Adjust potentiometer Imax on the power board.
13	The penetration of molten pool is not enough.	The welding current is adjusted too low		Increase the welding current
		The arc is too long in the welding process		Use 2T operation
14	The alarm lamp on the front panel is on	Over heat protection	Two much welding current	Reduce the welding current output
			Working time too long	Reduce the duty cycle (work intermittently)
		Over-voltage protection	Power supply fluctuates	Using the stable power supply
		Low-voltage protection	Power supply fluctuates	Using the stable power supply
			Too many machines using power supply in the same time	Reduce the machines using power supply in the same time
		Over-current protection	Unusual current in the main circuit	Check and repair the main circuit and drive Pr6

5.3 Electrical principle drawing



5.4 Exploded Parts Listing



TG2010 PARTS LISTING

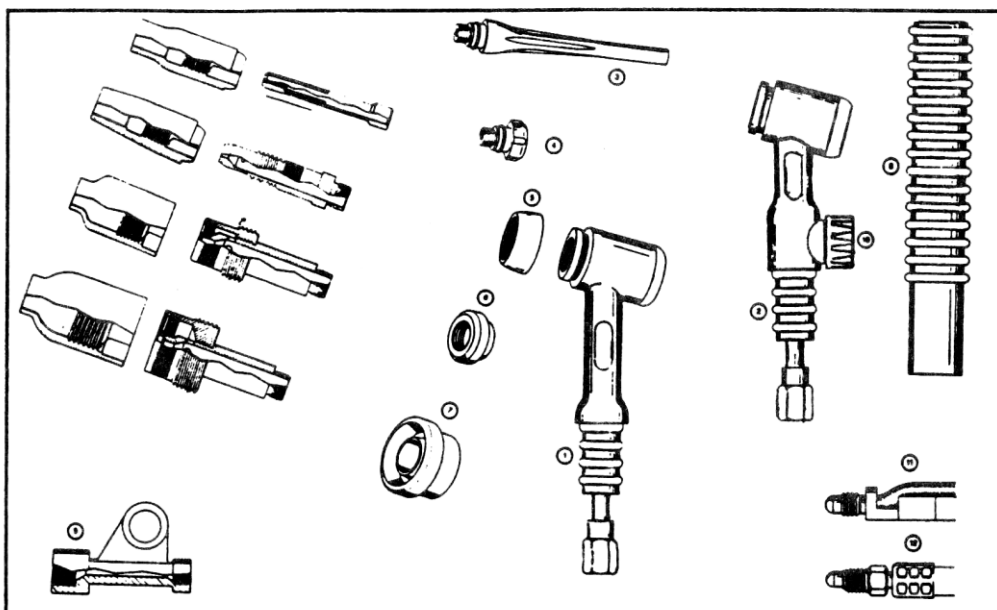
1	480.0001	Handle	22	480.0022	Transformer
2	480.0002	Cabinet cover	23	480.0023	Hall sensor
3	480.0003	Insulation plate	24	480.0024	PFC Inductor
4	480.0004	Primary inverter PCB	25	480.0025	Support plate
5	748.0024	Air solenoid 24V	26	480.0026	Control PCB
6	480.0006	Valve control PCB	27	480.0027	Front frame
7	480.0007	Support plate	28	480.0028	3550 F-connector
8	480.0008	Rear frame	29	480.0029	3550 Locking nut
9	530.0020	Power switch RED	30	480.0030	12-pin connector
10	480.0010	Gas hose fitting 5/8"	31	480.0010	Gas hose fitting 5/8"
11	570.0010	Power cord 6-50P	32	480.0032	Brass nut
12	480.0012	Cable strain relief	33	480.0033	Control panel 2010
13	480.0013	Sealing plate	34	480.0034	Knob
14	480.0014	Fan mounting plate	35	480.0035	Switch boot
15	480.0015	1225 Fan cover	36	480.0036	Display PCB
16	480.0016	Cooling fan 24VDC	37	480.0037	PFC power PCB
17	480.0017	Insulation plate	38	480.0038	Insulation paper
18	480.0018	Secondary inverter	39	480.0039	Gas hose 5/8-18x2
19	480.0019	Inductance plate	40	720.0002	Regulator 5/8-18
20	480.0020	Inductor	41	513N0021	200A Clamp cable 3550
21	480.0021	Cabinet base	42	SR17-12-2DI	TIG torch 12.5'

Technical Support Line: 800-554-0074

5.5 Exploded Torch Listing

TG2010 comes standard with a compact WP17 air-cooled TIG torch rated 60% duty-cycle @ 150 amps (30% @ 200A) with 12.5' direct-connect welding cable cover assembly with Dinse power plug and 5/8-18RHM gas line fitting. For extended duty-cycle operation or for higher power rated air-cooled or water-cooled torches, contact your Dealer.

SR-17, 17V 150 AMPS • AIR COOLED TIG TORCH



Item	Part No.	Description	Item	Part No.	Description
1.	17	150 amp Torch Head	5.	18CG	Cup Gasket
2.	17V	150 amp Torch Head w/Valve	6.	54N01	Gas Lens Insulator
N/S	17-12R	150 amp Torch w/12½', 1 pc. Rubber Power Cable	7.	54N63	Large Diameter Gas Lens Insulator
N/S	17-25R	150 amp Torch w/25', 1 pc. Rubber Power Cable	8.	H-100R	Handle, Ribbed
N/S	17V12R	150 amp Torch w/valve, 12½', 1 pc. Rubber Power Cable	9.	105Z57	Power Cable Adapter
N/S	17V25R	150 amp Torch w/valve, 25', 1 pc. Rubber Power Cable	10.	VS-2	Valve Stem w/O'Ring
3.	57Y02	Long Back Cap	N/S	S-008	O'Ring for valve stem
4.	57Y04	Short Back Cap	11.	57Y01R	1 pc. Rubber Power Cable 12½'
				57Y03R	1 pc. Rubber Power Cable 25'
			12.	57Y01-2	Optional 2 pc. Power Cable 12½'
				57Y03-2	Optional 2 pc. Power Cable 25'

CHART A • COLLETS • COLLET BODIES
• GAS LENS

Electrode Diameter	.020 (.5mm)	.040 (1.0mm)	1/16 (1.6mm)	3/32 (2.4mm)
Collet	10N21	10N22	10N23	10N24
Collet Body	10N29	10N30	10N31	10N32
Gas Lens	45V29	45V24	45V25	45V26
Lg. Dia., Gas Lens	—	—	—	45V64

CHART B • GAS CUPS

SIZE	4	5	6	7	8	10	12
Alumina	10N50	10N49	10N48	10N47	10N46	10N45	10N44
Alumina Gas Lens	54N18	54N17	54N16	54N15	54N14	—	—
Alumina Lg. Dia. Gas Lens	—	—	57N75	—	57N74	53N68	53N67
Lava	105Z43	105Z42	105Z44	105Z45	06N78	06N79	06N80