

DURALLOY®

TIG 191P AC/DC OWNER'S MANUAL



CONTENT

1 SAFETY	1
1.1 SIGNAL EXPLANATION.....	1
1.2 ARC WELDING DANGERS.....	1
1.3 THE KNOWLEDGE OF ELECTRIC AND MAGNETIC FIELDS.....	5
2 SUMMARY	6
2.1 BRIEF INTRODUCTION.....	6
2.2 WORKING PRINCIPLE.....	8
2.3 VOLT-AMPERE CHARACTERISTIC.....	8
3 INSTALLATION AND ADJUSTMENT	9
3.1 PARAMETERS.....	9
3.2 DUTY CYCLE & OVER HEAT.....	10
3.3 MOVEMENT AND PLACEMENT.....	10
3.4 POWER SUPPLY INPUT CONNECTION.....	11
3.5 POLARITY CONNECTION (MMA).....	11
3.6 ASSEMBLING THE EQUIPMENT (TIG).....	12
4 OPERATION	13
4.1 LAYOUT FOR THE PANEL.....	13
4.2 CONTROL PANEL.....	14
4.4 ARGON ARC WELDING OPERATION.....	18
4.4.1 TIG welding (4T operation).....	18
4.4.2 TIG welding (2T operation).....	19
4.5 WELDING PARAMETERS.....	21
4.5.1 Joint forms in TIG/MMA.....	21
4.5.2 The explanation of welding quality.....	21
4.5.3 TIG Parameters Matching.....	21
4.6 OPERATION ENVIRONMENT.....	24
4.7 OPERATION NOTICES.....	24
5 MAINTENANCE & TROUBLESHOOTING	25
5.1 MAINTENANCE.....	25
5.2 TROUBLESHOOTING.....	26
5.3 ELECTRICAL PRINCIPLE DRAWING.....	29
6 EXPLODED VIEW DRAWING	30

1. SAFETY

1.1 Signal Explanation.



⌘ The above signals mean warning! Notice! Running parts and getting an electric shock or thermal parts will take damage for your body or others. The corresponding notices are as follows. It is quite a safe operation after taking several necessary protection measures.

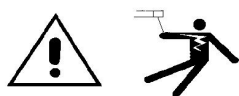
1.2 Arc Welding dangers.

⌘ The following signals and word explanations are some dangers for your body or others near the welding operation. While seeing these, please remind of yourself this operation can be dangerous.

⌘ Only ones who are trained professionally can install, debug, operate, maintain, and repair the equipment.

⌘ During the operation no other people should be present.

⌘ After turning off the machine power, please maintain and examine the equipment according to (5) because of the DC voltage existing in the electrolytic capacitors.



ELECTRIC SHOCK CAN KILL.

⌘ Never touch 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 small space, uneven surface, and wet areas.

⌘ Never turn on the machine power before installation and adjustment.

⌘ Ensure to install the equipment correctly and ground the work or metal to be welded to a good electrical (earth) ground according to the operation manual.

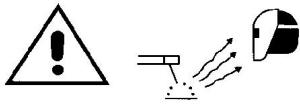
⌘ The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

- ⌘ In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.
- ⌘ Always 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 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 open circuit voltage of both welders.
- ⌘ When working above floor level, use a safety belt to protect yourself from a fall should you get a 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 the fume. 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 on 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 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 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 proper 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 other nearby personnel with suitable, non-flammable screening and /or warn them not to watch the arc nor expose themselves to the arc rays or 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 the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing 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 used to prevent 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 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. They may explode.

⌘ Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuff less trousers, safety boots and welding hood. Wear ear plugs when welding out of position or in confined places. 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. 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.



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 The knowledge of Electric and Magnetic Fields.

Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). The discuss on the effect of EMF is ongoing all the world. Up to now, no material evidence shows that EMF may have effects on health. However, the research on damage of EMF is still ongoing. Before any conclusion, we should minimize exposure to EMF as few as possible.

To minimize EMF, we should use the following procedures:

- ⌘ Route the electrode and work cables together – Secure them with tape when possible.
- ⌘ All cables should be put away and far from the operator.
- ⌘ Never coil the power cable around your body.
- ⌘ Make sure welding machine and power cable to be far away from the operator as far as possible according to the actual circumstance.
- ⌘ Connect the work cable to the workpiece as close as possible to the area being welded.
- ⌘ The people with heart-pacemaker should be away from the welding area.

2.SUMMARY

2.1 Brief Introduction.

TIG-191PACDC 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 to replace the traditional large transformer style machine. Thus, it is characterized with portable, small size, light weight, low power consumption etc.

The parameters of TIG-191PACDC on the front panel all can be adjusted continuously, such as start current, crater arc current, welding current, base current, duty ratio, up-slope time, down-slope 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 ignition to ensure the success ratio of initiating the arc.

TIG-191PACDC Characteristics:

- MCU control system responds immediately to any changes.
- High frequency and high voltage for arc igniting to ensure the success ratio of igniting the arc, the reverse polarity ignition ensures good ignition behavior in TIG-AC welding.
- Avoid AC arc-break with special means, even if arc-break occurs the HF will keep the arc stable.
- Pedal foot control of the welding current. (optional)
- TIG/DC operation, If the tungsten electrode touches the work piece when welding, the current will drop to short-circuit current to protect tungsten.
- Intelligent protection: over-voltage, over-current, over-heat, when the problems listed before occurring, the alarm lamp on the front panel will be on and the output current will be cut off. It can self-protect and prolong the equipment lifespan.
- Double purposes: AC inverter TIG and DC inverter TIG/MMA, Excellent performance on Al-alloy、 carbon steel、 stainless steel、 titanium.

According to choosing the front panel functions, the following five welding processes can be used.

- DC MMA
- DC TIG
- DC Pulse TIG
- AC TIG
- AC Pulse TIG

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

2.For DC TIG, DCEP is used normally (work piece connected to positive polarity, while torch connected to negative polarity). This connection has many characters, such as stable welding arc, low tungsten consumption, more welding current, narrow and deep weld.

3.For AC TIG (square wave), arc is more stable than Sine AC TIG. At the same time, you can not only obtain the max penetration and the min tungsten consumption, but also obtain a better cleaning effect.

4.DC Pulsed TIG has 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. Is suitable for thin sheet and super thin sheet welding. 3) Exact control heat input and the size of the molten pool. The depth of penetration is even. Is 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 porosity, and improve the mechanical performance of the joint. 5) High frequency arc is suitable for high welding speed to improve productivity.

TIG-191P series welding machine is suitable for all positions welding for various plates made of stainless steel, carbon steel, alloyed steel, titanium, aluminium.

MMA—Manual Metal Arc welding.

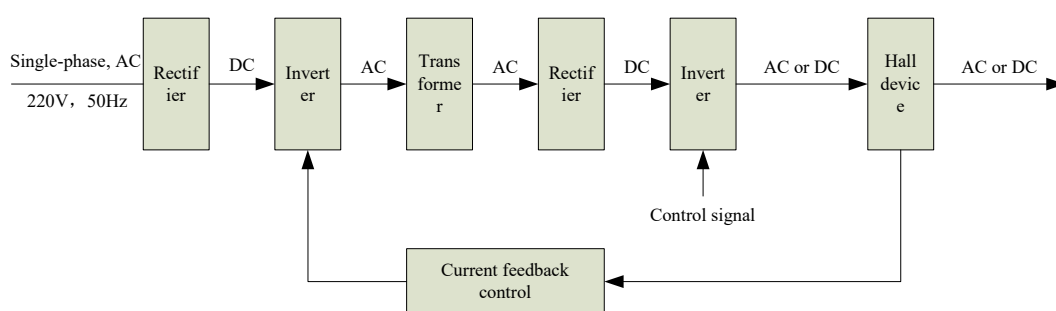
PWM—Pulse-Width Modulation.

IGBT—Insulation Gate Bipolar Transistor.

TIG—Tungsten Insert Gas welding.

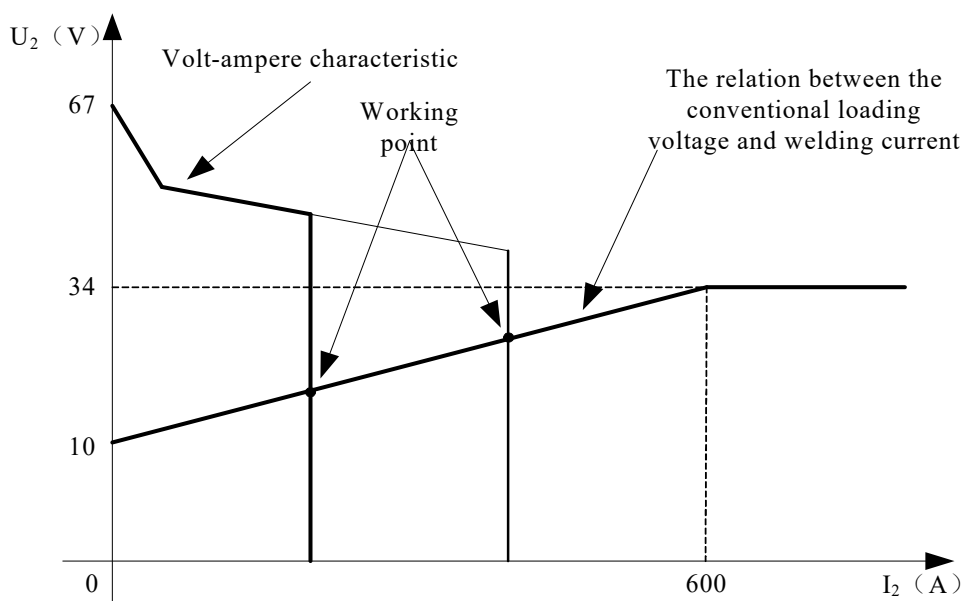
2.2 Working Principle.

The working principle of TIG191P welding machines is shown as the following figure. Single-phase 220V work frequency AC is rectified into DC (about 312V), then is converted to medium frequency AC (about 50KHz) 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 current output stably. Meanwhile, the welding current parameter can be adjusted continuously to meet with the requirements of the process.



2.3 Volt-Ampere Characteristic.

TIG-191PACDC welding machine has an excellent volt-ampere characteristic, whose graph is shown as the following figure. The relation between the conventional rated loading voltage U_2 and the conventional welding current I_2 is as follows:



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

3. Installation and Adjustment

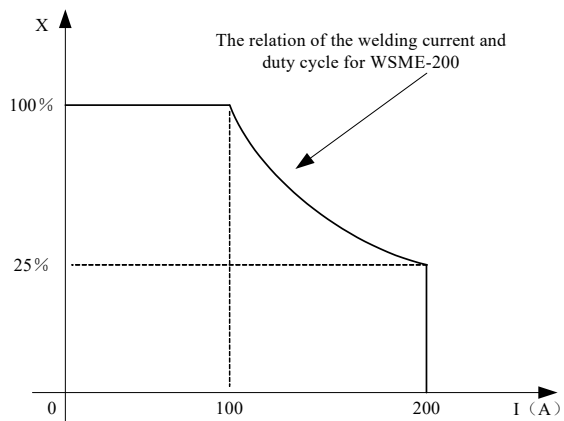
3.1 Parameters

Models Parameters	TIG-191P AC/DC			
Input power	1~240±10%, 50Hz			
Rated input current (A)	37 (TIG)		44 (MMA)	
Rated input power (KVA)	8.2 (TIG)		9.6 (MMA)	
Power factor	0.73			
Max no-load voltage(V)	78			
Adjustment range of start current (A)	TIG		MMA	
	AC		DC	DC
	HF	LIFT	10~welding current	—
	10~welding current	30~welding current		
Adjustment range of welding current (A)	10~200	30~200	10~200	10~180
Adjustment range of Crater arc current (A)	10~200	30~200	10~200	10~180
Adjustment range of downslope time (S)	0~5			
Pre-gas time (S)	0.1~1			
Adjustment range of post-gas time (S)	0.1~10			
Clearance effect (%)	20~50			
Efficiency Duty cycle	AC		DC	
	10% 200A		10% 180A	
	60% 82A		60% 73A	
	100% 63A		100% 57A	
Protection class	IP21S			
Insulation class	H			
Dimensions of Machine (L×W×H) (mm)	475X185X325			
Weight (Kg)	8			

3.2 Duty cycle & Overheat.

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 right figure.



If the welder is over-heat, the IGBT

over-heat protection unit inside it will output an instruction to cut output welding current and illuminate the over-heat pilot lamp on the front panel. At this time, the machine should be rested for 15 minutes to cool. When operating the machine again, the welding output current or the duty cycle should be reduced.

3.3 Movement and placement.

Please take care of the welder when moving it.

It also can be carried by the handle on the top of the welder. Place the welder in the right position. When the machine gets to the destination, it needs to be placed on a flat surface.

Any movement may result in the potential danger or substantive hazard, so please make sure that the machine is on the safe position before using it.

3.4 Power supply input connection.

TIG-191P welding machines' power supply connects to 240V 10a.

When the power supply voltage is over the safe work voltage, there are over voltage and under voltage protection inside the welder, the alarm light will illuminate, at the same time, the current output will be shut off.

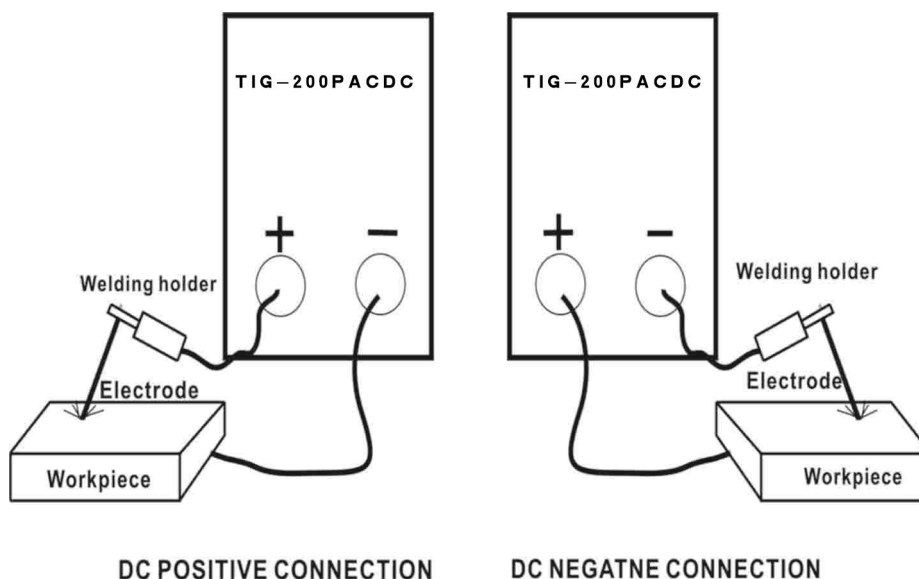
If the power supply voltage continually goes beyond the safe work voltage range, it will decrease the welder's lifespan. The below measures can be used:

- Ensure the machine is plugged into a 240v 10amp supply.

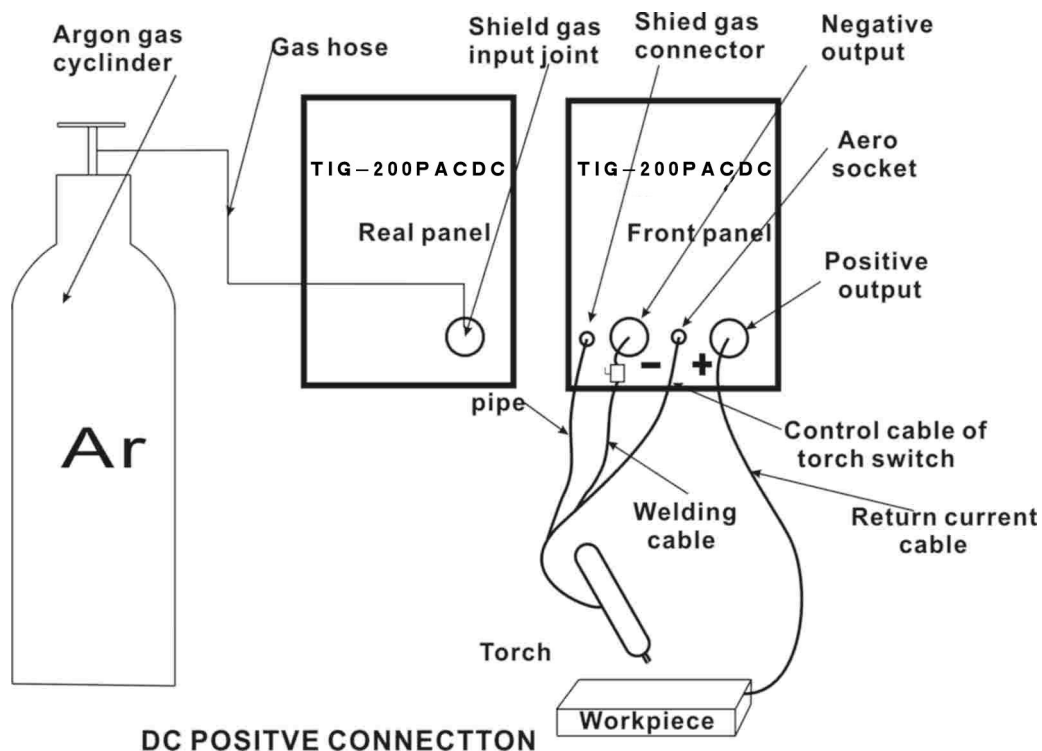
3.5 Polarity Connection (MMA) .

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

MMA: requirements for polarity connection.



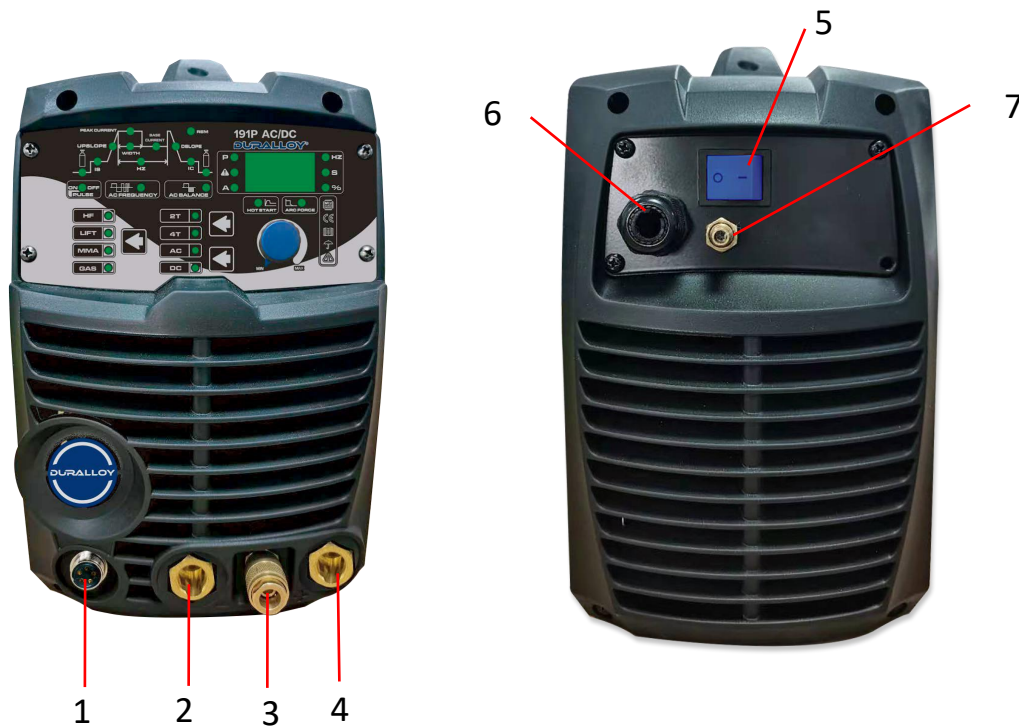
3.6 Assembling the equipment (TIG)



- Workpiece is connected to the positive electrode of welding machine, and welding torch is connected to the negative electrode, which is called DC POSITIVE CONNECTION; otherwise, that is called DC NEGATIVE CONNECTION. Generally, it is usually operated in DC POSITIVE CONNECTION in TIG welding mode.
- The control cable of torch switch consists of 2 wires, pedal control of 3 wires and the aero socket is 5 pin.
- Consumable parts for TIG torch, such as tungsten electrode, gas nozzle electrode etc , please email or phone according to the accessory codes.
- When AC/DC welding machines are operated in HF ignition method, the ignition spark can cause interferences in equipment near the welding machine. Be sure to take specially safety precautions or shielding measures.

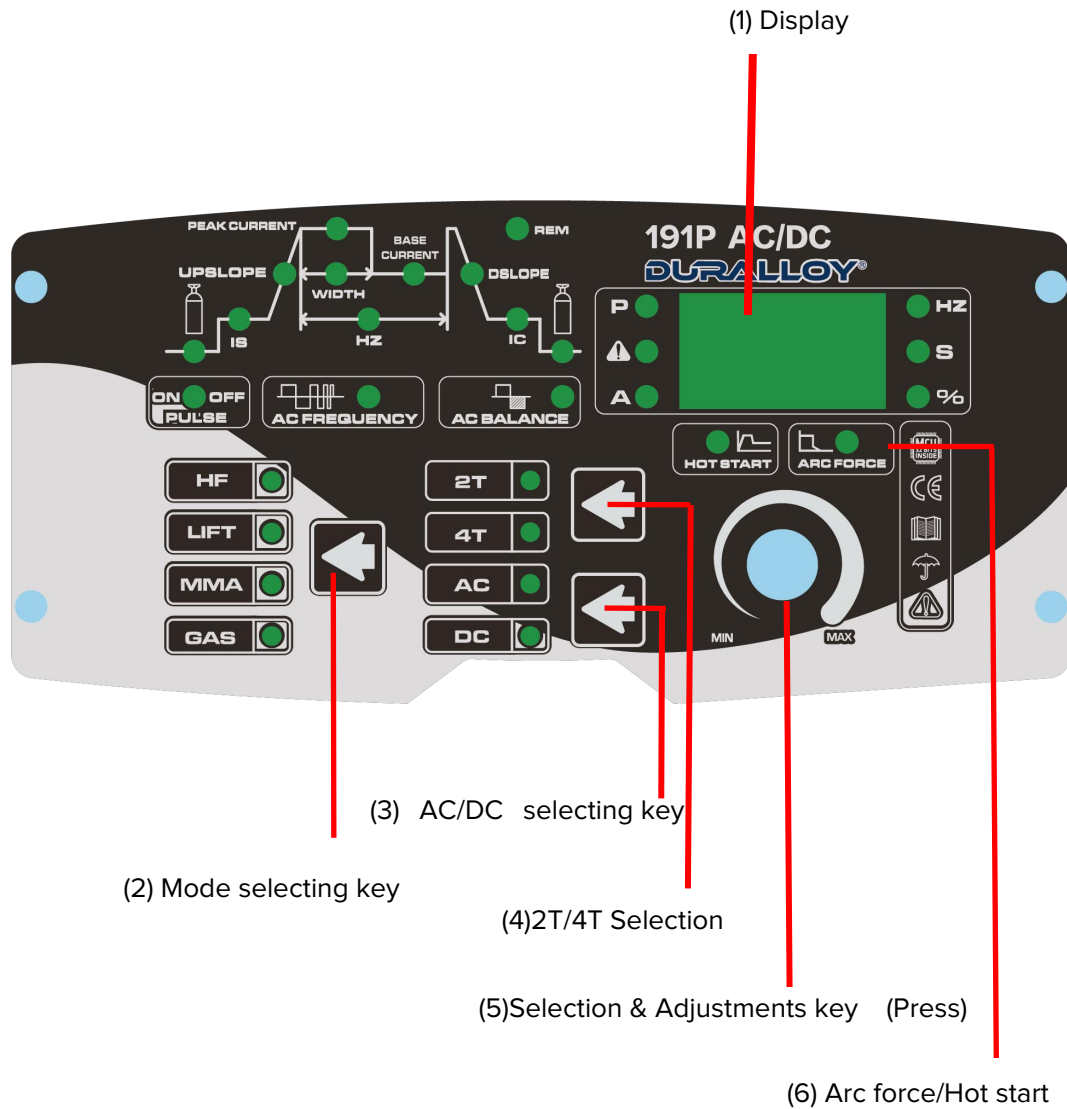
4 .Operation

4.1 Layout for the panel



- | | | |
|---|-----------------------------|-------------------------------------------------------------------------------------------|
| 1 | Aviation socket | connected to torch switch control wire. |
| 2 | Negative output | welder's negative (-) polarity output. |
| 3 | Shield gas connector | Is connected to the gas input hose of the torch. |
| 4 | Positive output | welder's positive (+) polarity output. |
| 5 | Power source switch | Switch to "ON", the welder is turned on, while switch to "OFF", the welder is turned off. |
| 6 | Power source input | connect power source. |
| 7 | Shield gas input | connect the gas hose while the other end is connected to argon regulator & gas cylinder. |

4.2 Control panel



(2) Mode selecting key

(3) AC/DC selecting key

(4) 2T/4T Selection

(5) Selection & Adjustments key (Press)

(6) Arc force/Hot start

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 working.

- 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 use, using the TIG-191P control panel as an example. You will find a detailed description of these settings in the following section.

(1) AC/DC selection key



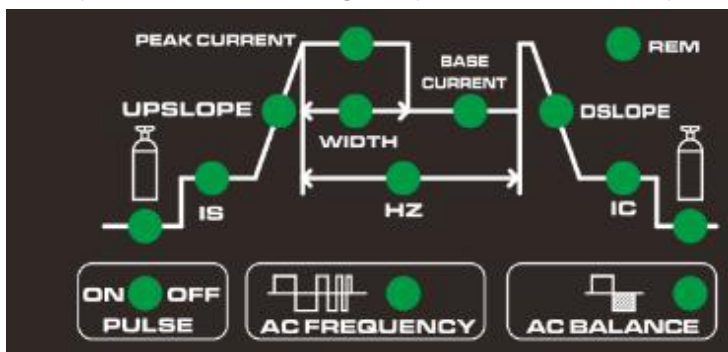
(2) Mode selection key



(4) Parameter selection keys (Press to adjust)

(8) Adjusting dial

If the parameter indicator lights up, then the selected parameter can be altered on adjusting dial.



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

Pre-flow time

Unit	S
Setting range	0.1—1
Factory setting	0.3

Start (starting only with 4T)

Unit	A
Setting range	10—100%of main current Iw (DC); 10—100%of main current Iw (AC-HF) 10—100%of main current Iw (AC-LIFT)
Factory setting	5

Upslope time

Unit	S
Setting range	0—5
Factory setting	0

IMMA/ITIG: Welding current

Unit	A
TIG-200	10—200 (TIG-DC) ; 10—200 (TIG-AC-HF); 10—200 (TIG-AC-LIFT); 10—180 (MMA-DC) ;

Base: Base current

Unit	A
TIG-200	10—200 (DC); 10—200 (AC-HF) ; 10—200 (AC-LIFT)

Important! Only selectable when “pulse key” has been pressed.

Suggestion! Ib and Iw cannot differ greatly.

Width Ratio of pulse duration to base current duration.

Unit	%
Setting range	5—100
Factory setting	5

Important! Only selectable when “pulse key” has been pressed.

Hz: Pulse frequency

Unit	Hz
Setting range	0.5—200
Factory setting	0.5

Important! Only selectable when “pulse key” has been pressed.

D slope : Downslope time

Unit	S
Setting range	0—5
Factory setting	0

Stop: Crater arc current (only with 4T)

Unit	S
Setting range	10—100% of main current Iw (DC); 10—100% of main current Iw (AC-HF) 10—100% of main current Iw (AC-LIFT)
Factory setting	5

Post-flow

Unit	S
Setting range	0.1—10
Factory setting	3

Hz: AC frequency (only with TIG-AC)

Unit	Hz
Setting range	40—200

Balance (only with TIG-AC)

Balance adjustment is mainly used to set the adjustment of eliminating metal-oxide (such as Aluminium, Magnesium and its alloy) while AC output.

Unit	%
Setting range	20—50
Factory setting	20

(9) Electrode (MMA) welding key

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

(11) Welding voltage/other parameter display

Indicate the welding voltage or other parameter.

Before the start of welding, the right-hand display shows the pre-set value of Tpr, Tup, Dcy, Fp, Tdown and Tpo. There is a 3s time-lag, open-circuit voltage is displayed after adjusting those parameters.

After the start of welding, the right-hand display shows the present actual value of the welding voltage.

(12) Welding current display

Display the pre-set or the actual welding current value.

Before the start of welding, the left-hand display shows the pre-set current value of Is, Iw, Ib and Ic.

After the start of welding, the left-hand display shows the present actual value of the welding current.

The control panel indicates which position has been reached in the welding process by brightening the light.

NOTE:

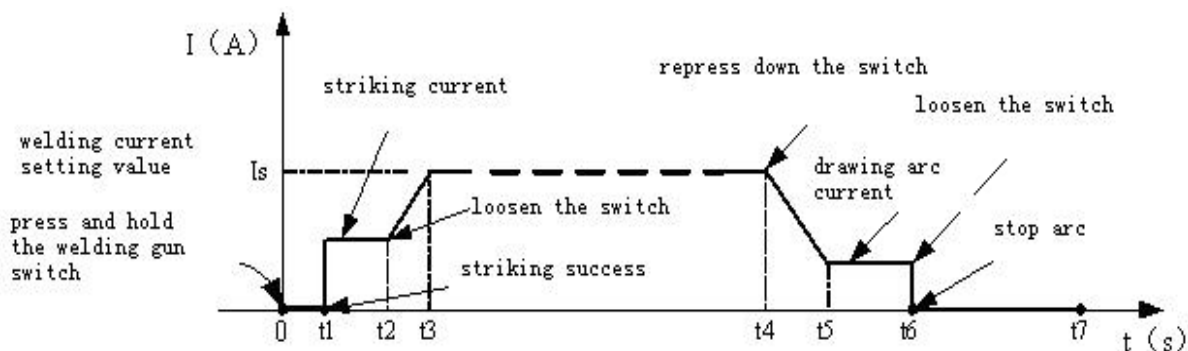
Only "Parameter selection keys" and "Adjusting dial" can be used in the welding process.

Only "Rod electrode welding key", "Adjusting dial" and "AC/DC selecting key" can be used on MMA mode.

4.4 TIG Welding Operation

4.4.1 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 the welding. Thus, 4T is suitable for the welding of medium thickness plates.



Introduction :

- 0: Press and hold the gun switch, Electromagnetic gas valve is turned on. The shielding gas starts to flow.
- 0~t1: Pre-gas time (0~1S);
- t1~t2: Arc is ignited at t1 and then output the setting value of start current.
- t2: release the gun switch, the output current slopes up from the start current.
- t2~t3: The output current rises to the setting value (Iw or Ib), the up-slope time can be adjusted.
- t3~t4: Welding process. During this period, the gun switch is released.

Note: Select the pulsed output, the base current and welding current will be outputted alternately.

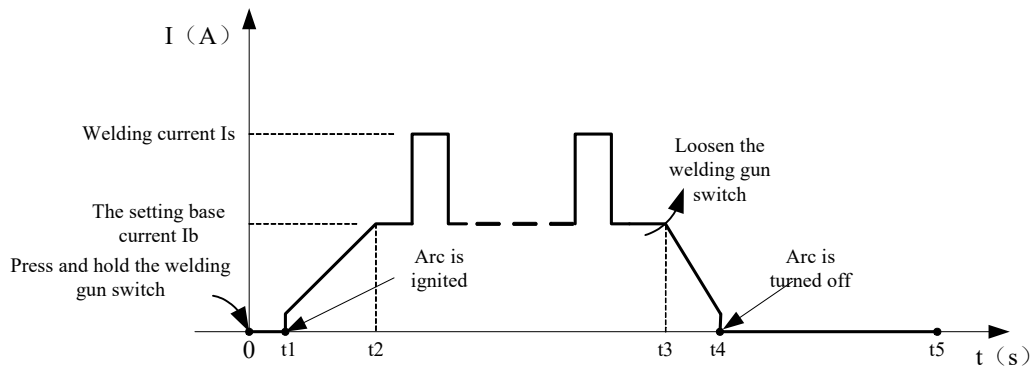
otherwise, output the setting value of welding current.

- t4: Press the torch switch again, the welding current will drop in accordance with the selected down-slope time.
- t4~t5: The output current slopes down to the crater current. The down-slope time can be adjusted.
- t5~t6: The crater current time.
- t6: Press the gun switch, stop arc and keep argon flowing.

- $t_6 \sim t_7$: Post-gas time can be set by the post-gas time adjustment knob on the front panel (0.1~10S).
- t_7 : Electromagnetic valve is closed and stops argon flowing. Welding is finished.

4.4.2 TIG welding (2T operation)

This function without the adjustment of start current and crater current is suitable for the Re-tack welding, transient welding, thin plate welding and so on.



Introduction:

- 0: Press the gun switch and hold it. Electromagnetic gas valve is turned on. The shielding gas starts to flow.
- 0~ t_1 : Pre-gas time (0~1s)
- $t_1 \sim t_2$: Arc is ignited and the output current rises to the setting welding current (I_w or I_b) from the min welding current.
- $t_2 \sim t_3$: 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.

- t_3 : Press the gun switch, the welding current will drop in accordance with the selected down-slope time.
- $t_3 \sim t_4$: The current drops to the minimum welding current from the setting current (I_w or I_b), and then arc is turned off.
- $t_4 \sim t_5$: Post-gas time, after the arc is turned off. You can adjust it (0.1~10s) through turning the knob on the front panel.
- t_5 : electromagnetic gas valve turned off, the shield gas stops to flow, and welding is finished.

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 contamination & prolong the life of the tungsten electrode also 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 contamination & prolong the life of the tungsten electrode also 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.

Prevent arc-break function: TIG operation, avoid arc-break with special means, even if arc-break occurs the HF will keep the arc stable.

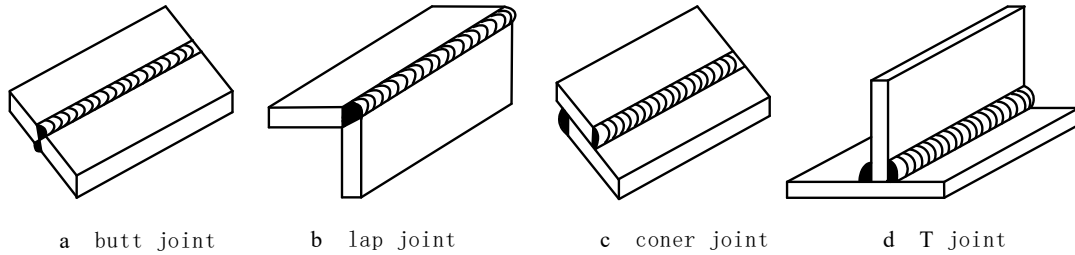
Notices:

- Check the condition of welding and connection units firstly, otherwise there will be a function such as ignition spark, gas leakage, out of control and so on.
- Check that whether there is enough Argon gas in the shield gas cylinder, you can test the electromagnetic gas valve through the switch on the front panel.
- Do not aim the torch at yourself. When you press the torch switch, the arc is ignited with a high-frequency, high-voltage spark, and the ignition spark can cause interference in equipment.
- The flow rate is set according to the welding power used in the job. Turn the regulation screw to adjust the gas flow which is shown on the gas hose pressure meter or the gas bottle pressure meter.
- The spark ignition works better if you keep the 3mm distance from the work piece to the tungsten electrode during the ignition.

Note: When select AC output, the current and the wave form are as same as the above, but output polarity changes alternately.

4.5 Welding Parameters

4.5.1 Joint forms in TIG/MMA



4.5.2 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	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

4.5.3 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)

Workpiece thickness /mm	Joint form	tungsten electrode diameter/m	welding wire diameter/m	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.

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	
16~20	5~6	6	200~260	300~ 380	25~30	16~20	X-groove butt welding
22~25	5~6	6~7	200~260	360~ 400	30~35	20~22	

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

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

4.6 Operation Environment.

- Height above sea level is below 1000m.
- Operation temperature range: -10°C~+40°C.
- Relative humidity is below 90 % (20°C).
- Preferably site the machine some angles above the floor level, so the maximum angle does not exceed 15°.
- Protect the machine against heavy rain or in hot circumstance against direct sunshine.
- The content of dust, acid, corrosive gas in the surrounding air or substance cannot exceed normal standard.
- Take care that there is sufficient ventilation during welding. There is at least 30cm free distance between the machine and wall.

4.7 Operation Notices.

- Read 1 carefully before attempting to use this equipment
- In case closing the power switch, no-load voltage may be exported. Do not touch the

output electrode with any part of your body.

- Before operation, ensure area is clear of other people or dangerous products. Do not watch the arc in unprotected eyes.
- Ensure good ventilation of the machine to improve duty cycle ratio.
- Turn off the machine when finished to preserve power.
- If the machine warning lights illuminate please have it checked by a professional to ensure its safe to use.

5. Maintenance & Troubleshooting

5.1 Maintenance.

To guarantee that arc welding machine works high-efficiently and in safety, it must be maintained regularly. Let customers understand the maintenance methods and means of arc welding machine more, enable customers to carry on simple examination and safeguarding by oneself, try one's best to reduce the fault rate and repair times of arc welding machine, 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, until capacity voltage already drops to safe voltage 36V!**

date	Maintenance item
Daily examination	<p>Observe that whether 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 cannot correct or fix the knob, please replace immediately.</p> <p>If the switch is not flexible or it cannot be put correctly in place, please replace immediately; Please get in touch with maintenance service department if there are no accessories.</p> <p>After turn-on power, watch/listen to that whether the arc welding machine has shaking, whistle calling or peculiar smell. If there is one of the above problems, find out the reason to get rid of; if you cannot find out the reason, please contact local this area agent or the branch company.</p> <p>Observe that whether the display value of LED is intact. If the display number is not intact, please replace the damaged LED. If it still does not work, please maintain, or replace the display PCB.</p>

	<p>Observe that whether the min/max value on LED accords with the set value. If there is any difference and it has affected the normal welding craft, please adjust it.</p> <p>Checkup that Whether fan is damaged and is normal to rotate or control. If the fan is damaged, please change immediately. If the fan does not rotate after the arc welding machine is overheated, observe that whether there is something blocked in the blade, if it is blocked, please get rid of ; If the fan does not rotate after getting rid of the above problems, you can poke the blade by the rotation direction of fan. If the fan rotates normally, the start capacity should be replaced; If not, change the fan.</p> <p>Observe that whether the fast connector is loose or overheated. if the arc welding machine has the above problems, it should be fastened or changed.</p> <p>Observe that Whether the current output cable is damaged. If it is damaged, it should be wrapped up, insulated, or changed.</p>
Monthly examination	<p>Using the dry compressed air to clear the inside of arc welding machine. Especially for clearing up the dusts on radiator, main voltage transformer, inductance, IGBT module, the fast recover diode and PCB, etc.</p> <p>Check up the bolt in arc welding machine, if it is loose, please screw down it. If it is skid, please replace. If it is rusty, please erase rust on bolt to ensure it works well.</p>
Quarter-yearly examination	<p>Whether the actual current accords with the displaying value. If they does not accord, they should be regulated. The actual current value can be measured by the adjusted plier-type ampere meter.</p>
Yearly examination	<p>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 and need to change or strengthen insulation.</p>

5.2 Troubleshooting.

- Before arc welding machines are dispatched from the factory, they have already been debugged accurately. So, forbid anyone who is not authorized by us to do any change 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 personal who is authorized by us could overhaul the machine!
- Guarantee to shut off the arc welding machine's power before turn on the outline of the equipment!

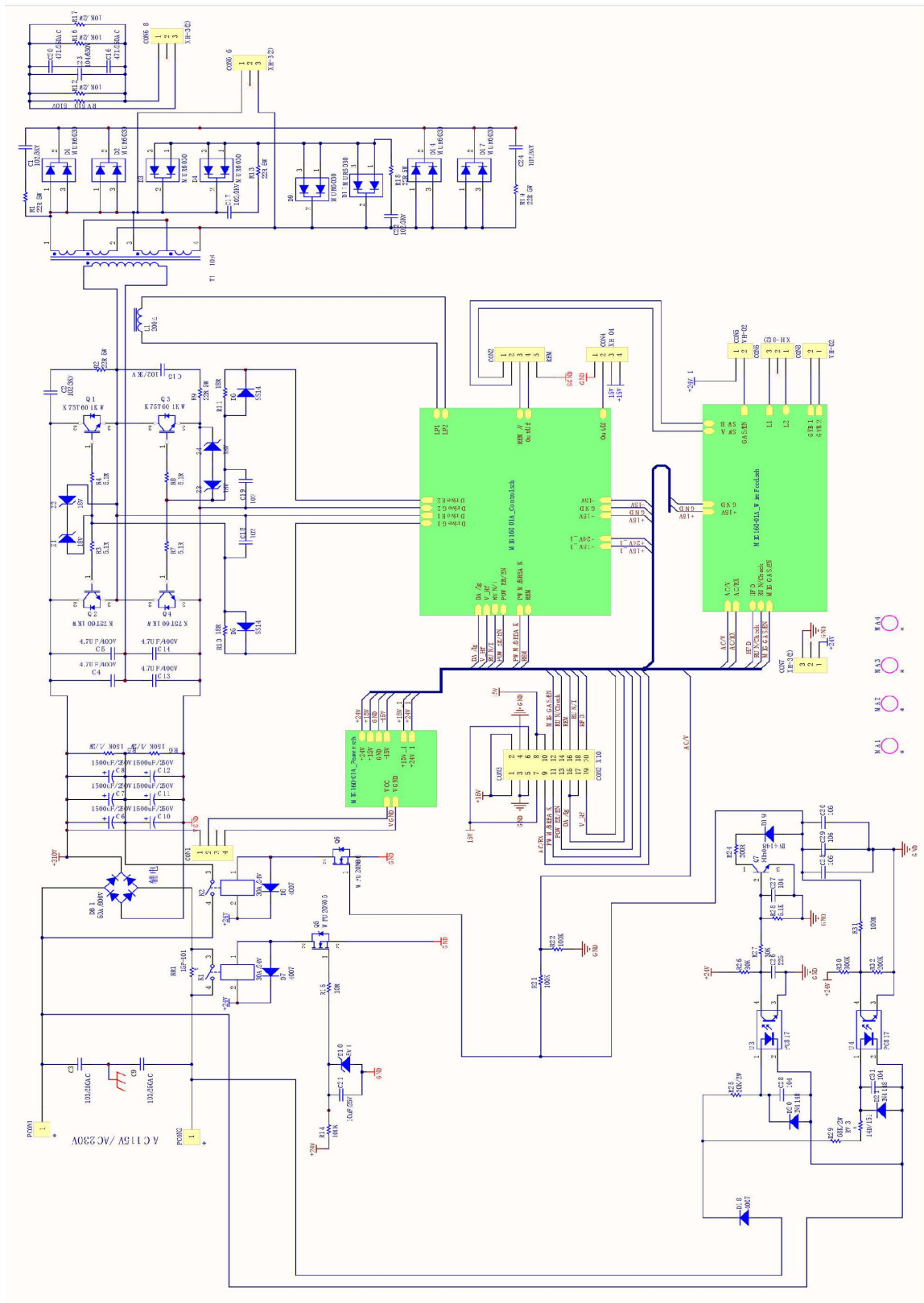
- If there is any problem and have no authorized professional maintenance personal, please contact local agent or the branch company!

If there are some simple troubles of WSME-series welding machine, you can consult the following overhauling chart:

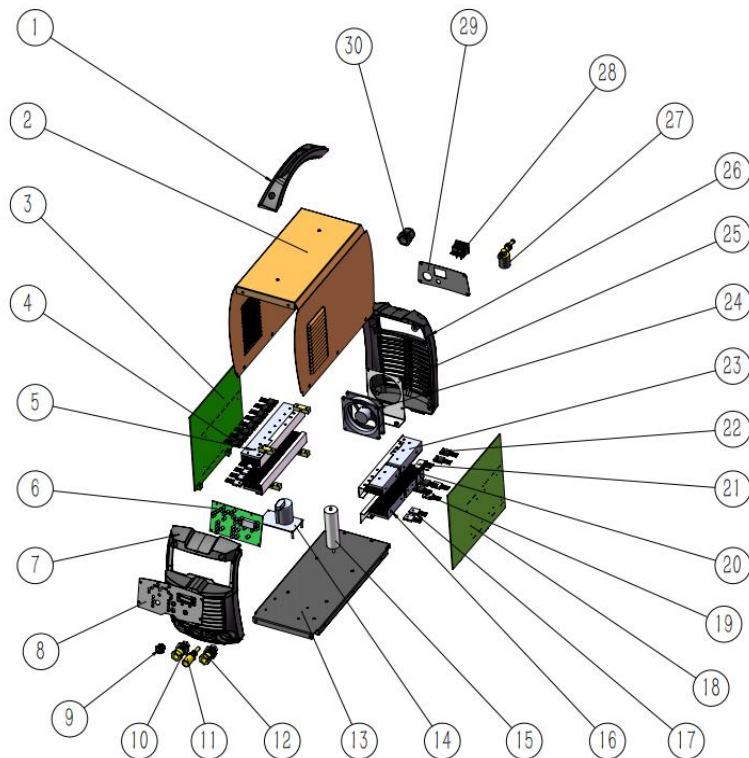
S/N	Troubles		Reasons	Solution
1		Turn on the power source, and fan works, but the power pilot lamp is not on.	The power light damaged, or connection is not good	Check and repair Pr7
			The transformer of power is broken	Repair or change the transformer
			Control PCB failures	Repair or change the control Pr4
2		Turn on the power source, and the power lamp is on, but fan does not work	There is something in the fan	Clear out
			The start capacitor of fan damaged	Change capacitor
			The fan motor damaged	Change fan
3		Turn on the power source, the power lamp is not on, and fan does not work	No power supply input	Check whether there is power supply
			Rectifier bridge or control board broken	Rectifier bridge or control board broken
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 does not 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 Imax in the current meter.
6		No no-load voltage output (MMA)	The machine is damaged	Check the main circuit.
7	Arc cannot 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 workpiece.	Check and remove it.
		The distance between tungsten electrode and workpiece is too long.	Reduce the distance (about 3mm).	
		There is not spark on the HF igniting board.	The HF igniting board does not work.	Change HF transformer or HF circuit board
The distance between the discharger is too short.	Adjust this distance (about 0.7mm).			

S/N	Troubles		Reasons		Solution
			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 off 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.
12	The welding current displayed is not accordant with the actual value.		The min value displayed is not accordant with the actual value. (Please refer to (3.1))		Adjust potentiometer Imin on the power board.
			The max value displayed is not 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 EH/EC		Overheat protection: EH	Two much welding current	Reduce the welding current output
				Working time too long	Reduce the duty cycle (work intermittently)
			Over-current protection: EC	Unusual current in the main circuit	Check and repair the main circuit and drive Pr6

5.3 Electrical principle drawing.



6. Exploded View drawing



NO.	Part Name	Consumables	NO.	Part Name	Consumables
1	handle		16	Radiator 2	
2	housing		17	Rectifier tube	Yes
3	Inverter board	Yes	18	Main board	Yes
4	IGBT1	Yes	19	Radiator 3	
5	radiator1		20	Radiator4	
6	Control board	Yes	21	Rectifier bridge	
7	plastic front panel		22	IGBT2	Yes
8	metal front panel		23	Radiator 5	
9	Aviation socket		24	Fan	Yes
10	Quick connector socket		25	Fan bracket	
11	Gas connector		26	Plastic rear panel	
12	Quick connector socket		27	Solenoid valve	
13	Metal base plate		28	Power switch	Yes
14	High frequency board	Yes	29	Metal rear panel	
15	Resistance		30	wire clip	

WARRANTY

Duralloy Welding Equipment

1 YEAR WARRANTY*

Duralloy Industrial Supply warrants the original retail purchaser that the Duralloy Welding and Cutting machines purchased will be free from defects in materials and workmanship for a period of 1 years* from the date of purchase by the customer. If a defect in material or workmanship becomes evident during this period, Duralloy Industrial Supply will at its option;

- Repair the product (or pay for the repair of the product)
- Replace the product

In case of warranty claim the product should be returned to the original place of purchase, with proof of purchase.

Any handling and transport costs (or other expenses) incurred in claiming warranty are not covered by this warranty. The warranty schedule is:

- Duralloy Power source only* - 1 year
- Duralloy Regulator - 3 months
- MIG Torches - 3 months
- TIG Torches - 3 months
- Plasma Torches - 3 months
- Ancillary Equipment - 3 months

The Obligation of Duralloy Industrial Supply under this warranty is limited to the circumstance set out above and is subject to:

- The customer being able to provide proof of purchase of the relevant equipment.
- A defect in either material or workmanship.
- The customer returning the product to Duralloy Industrial supply or an authorized repair agent.
- The product not having been altered or tampered with.
- The product not having been used outside the normal operating parameters of this equipment.
- The product to be in good condition and not damaged which may cause a fault

All goods come with a guarantee that cannot be excluded under the Australian Consumer laws. You as a consumer are entitled to a replacement or a refund for a major failure. You are also entitled to have the goods repaired or replaced if the products fail to be of acceptable quality:

This Warranty Provided by:

Duralloy Industrial Supply - (ABN - 81 831 839 268)

2 Hollylea Road Leumeah NSW 2560

1300 369 456

DURALLOY®