

OPERATOR'S MANUAL

INVERTER AC/DC PULSED TIG WELDER

SANARG 180AP

SanRex

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 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 Damage

- The following signals and word explanations are to some damages for your body or others happening on the welding operation. While seeing these, please remind of yourself or others to be dangerous.
- Only ones who are trained professionally can install, debug, operate, maintain and repair the equipment.
- During the operation, non-concerned people should be lift, especially for children.
- After shut off the machine power, please maintain and examine the equipment according to 5 because of the DC voltage existing in the electrolytic capacitors.



- 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 carefully when using the equipment in small place, falling-off and wet circumstance.
- Never close 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 insure 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 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. 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, high shoes and a cap over your hair. 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 evidences show 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.

In order 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

SANARG 180AP welding machine adopts the latest pulse width modulation (PWM) technology and insulated gate bipolar transistor (IGBT) power module. Thus, it is characterized as portable, small size, light weight, low consumption and etc.

SANARG 180AP CHARACTERISTICS:

- MCU control system, responds immediately to any changes.
- The newest PFC technology, power factor more than 0.98
- HF Start - High frequency and high voltage for non-contact arc starting to ensure arc ignition.
- TIG/DC operation, If the tungsten electrode touches the workpiece 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 occurred, 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 use life.
- Double purposes: AC inverter TIG/SMAW and DC inverter TIG/SMAW, Excellent performance on Al-alloy、 carbon steel、 stainless steel、 titanium.

Front panel functions.

- DC SMAW
- DC TIG
- AC SMAW
- AC TIG

1. For DC SMAW, polarity connection can be selected according to different electrodes, please refer to 3.5.

2. For AC SMAW, polarity does not matter.

3. For DC TIG, DCSP 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 electrode loss, more welding current, narrow and deep weld;

4. For AC TIG (rectangle wave), arc is more stable than Sine AC TIG.

SANARG 180AP welding machine is suitable for all welding positions on various plates made of stainless steel, carbon steel, alloyed steel, titanium, aluminum, magnesium, etc, which is also applied to pressure pipe, tool & die, petrochemical, architecture decoration, Automotive repair, and common manufacture.

SMAW - Shielded Metal Arc Welding (STICK).

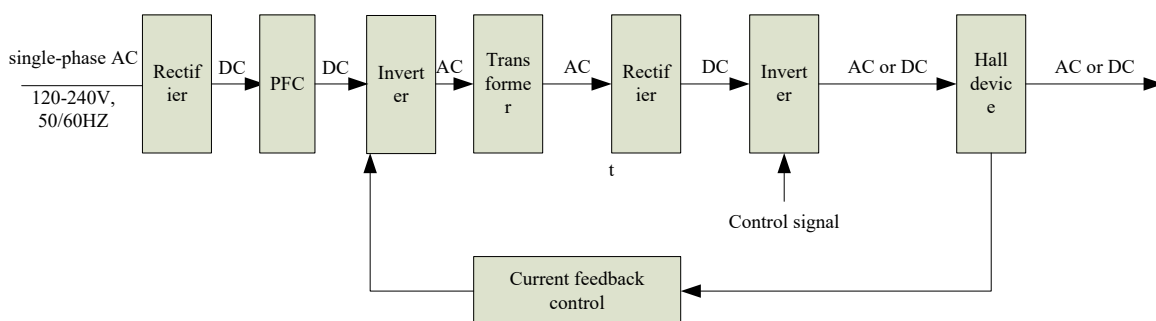
PWM - Pulse-Width Modulation.

IGBT - Insulation Gate Bipolar Transistor

GTAW - Gas Tungsten Arc welding (TIG)

2.2 Working Principle

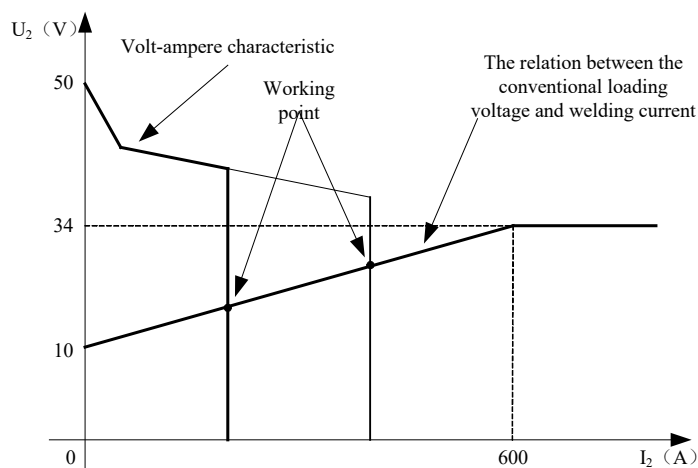
The working principle of SANARG 180AP welding machines is shown as the following figure. single-phase 120/240VAC 50/60Hz. frequency is rectified into DC, then by PFC circuit, DC (about 380V), then is converted to medium frequency AC (about 44K Hz) by inverter device (IGBT module), after reducing voltage 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 and steplessly to meet with the requirements of welding craft.



2.4 Volt-Ampere Characteristic

SANARG 180AP welding machine has an excellent volt-ampere characteristic, as the following figure shows. The relation between the conventional rated load voltage U_2 and the conventional welding current I_2 is as follows:

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



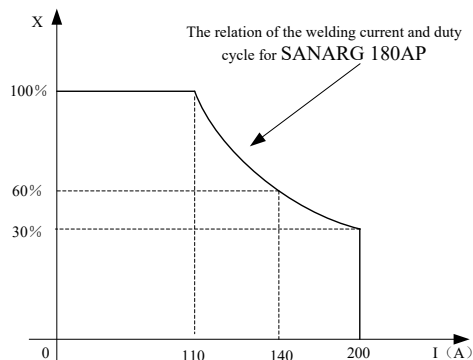
3 Installation and Adjustment

3.1 Parameters

model Parameters	SANARG 180AP							
Rated input voltage (V)	1~120V±10%, 50Hz				1~240V±10%, 50Hz			
Rated input current (A)	TIG		SMAW		TIG		SMAW	
	27.8(AC) 26.6(DC)		29.2(AC) 27(DC)		21.7(AC) 21.4(DC)		25(AC) 23(DC)	
Rated input power (KW)	3.7(AC) 3.4(DC)		3.7(AC) 3.4(DC)		5.0(AC) 4.7 (DC)		5.8(AC) 5.3(DC)	
	45(52)							
Welding current adjust range (A)	TIG		SMAW		TIG		SMAW	
	AC	DC	AC	DC	AC	DC	AC	DC
Start Current Range (A)	10~ 140	5~140	10~100	5~100	10~200	5~200	10~ 170	5~170
Crater Current Range (A)	10~ 140	5~140	10~100	5~100	10~200	5~200	10~ 170	5~170
Up Slope Time(S)	0~10							
Down Slope Time(S)	0~10							
Pre Flow(S)	0.1~10							
Post Flow(S)	1~10							
Pulse Frequency(Hz)	0.5~200							
Pulse Width Range (%)	5~100							
AC Frequency (Hz)	50~250							
Clearance Effect (%)	15~50							
Are Force	0~10							
Hot Start	0~10							
Are Length	0~10							
Duty Cycle (40°C 10min)	40% 140A		DC 35% 100A AC 40% 100A		DC 25% 200A AC 30% 200A		DC 30% 170A AC 35% 170A	
	60% 110A		DC 60% 75A AC 60% 80A		DC 60% 130A AC 60% 140A		DC 60% 120A AC 60% 130A	
	100% 85A		100% 60A		DC 100% 100A AC 100% 110A		DC 100% 90A AC 100% 110A	
Protection class	IP23							
Insulation class	F							
Machine figure size (length xwidth x height)	17.7" x 6.7" x 10.6" (450*170*270mm)							
Net Weight(Kg)	24.7lb. 11.2Kg							

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 in the diagram.

If the welder over-heats, the IGBT over-heat protection unit inside it will output an instruction to cut output welding current, and brighten the over-heat pilot lamp on the front panel. At this time, the machine should let cool for 15 minutes turned on so cooling fan can perform its function. 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 can be moved by the handle on the top of the welder.

3.4 Power supply input connection

SANARG 180AP welding machine operates on single-phase 120 - 240VAC primary power. When the power supply voltage is over voltage, there are over voltage and under voltage protection inside the welder, the alarm light will turn on, at the same time, the current output will turn off,

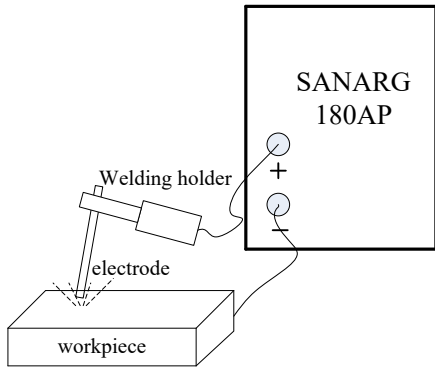
If the power supply voltage continually goes beyond the safe work voltage range, it will shorten the welder lifespan.

3.5 Polarity Connection (SMAW)

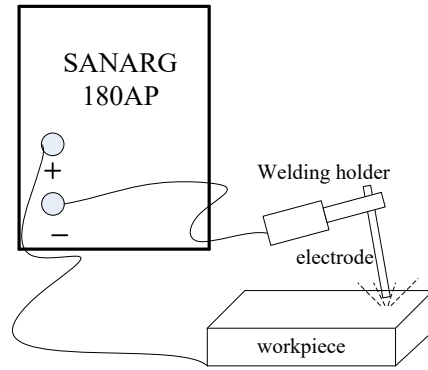
SMAW (DC): Choosing the connection of DCEN or DCEP according to the different electrodes.

Please refer to the electrode Data Sheet.

SMAW (AC): No requirements for polarity connection.

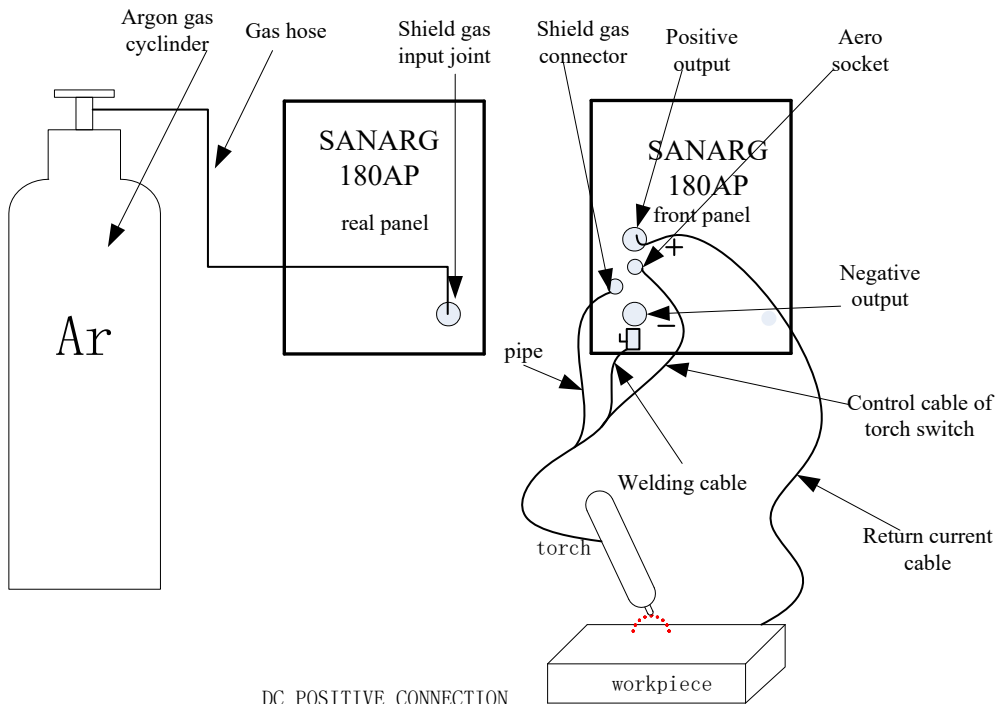


DC POSITIVE CONNECTION



DC NEGATIVE CONNECTION

3.6 SETUP for GTAW (TIG)

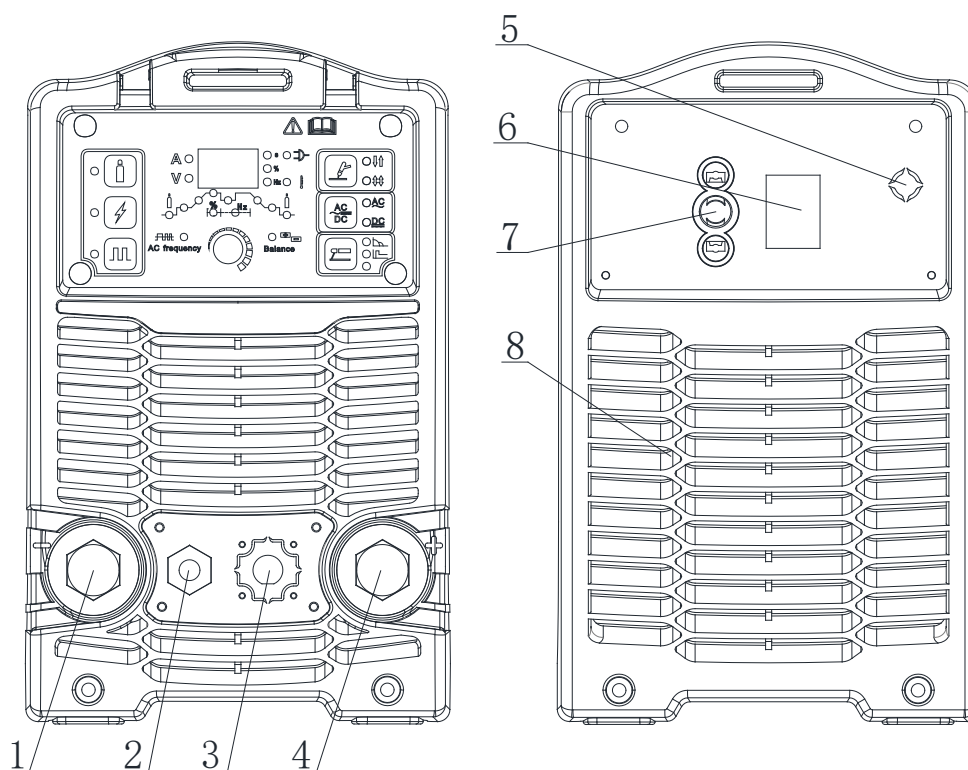


DC POSITIVE CONNECTION

- The workpiece is connected to the positive receptacle of the welding machine, and the welding torch is connected to the negative receptacle.
- The control cable of torch switch consists of 2 wires, pedal control of 3 wires and the aero socket (Remote Receptacle).
- Consumable parts for TIG torch, such as tungsten electrode, tip, gas nozzle, electrode shield(short/long) are 10N series common TIG Consumables..
- When SANARG 180AP welding machine is 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.

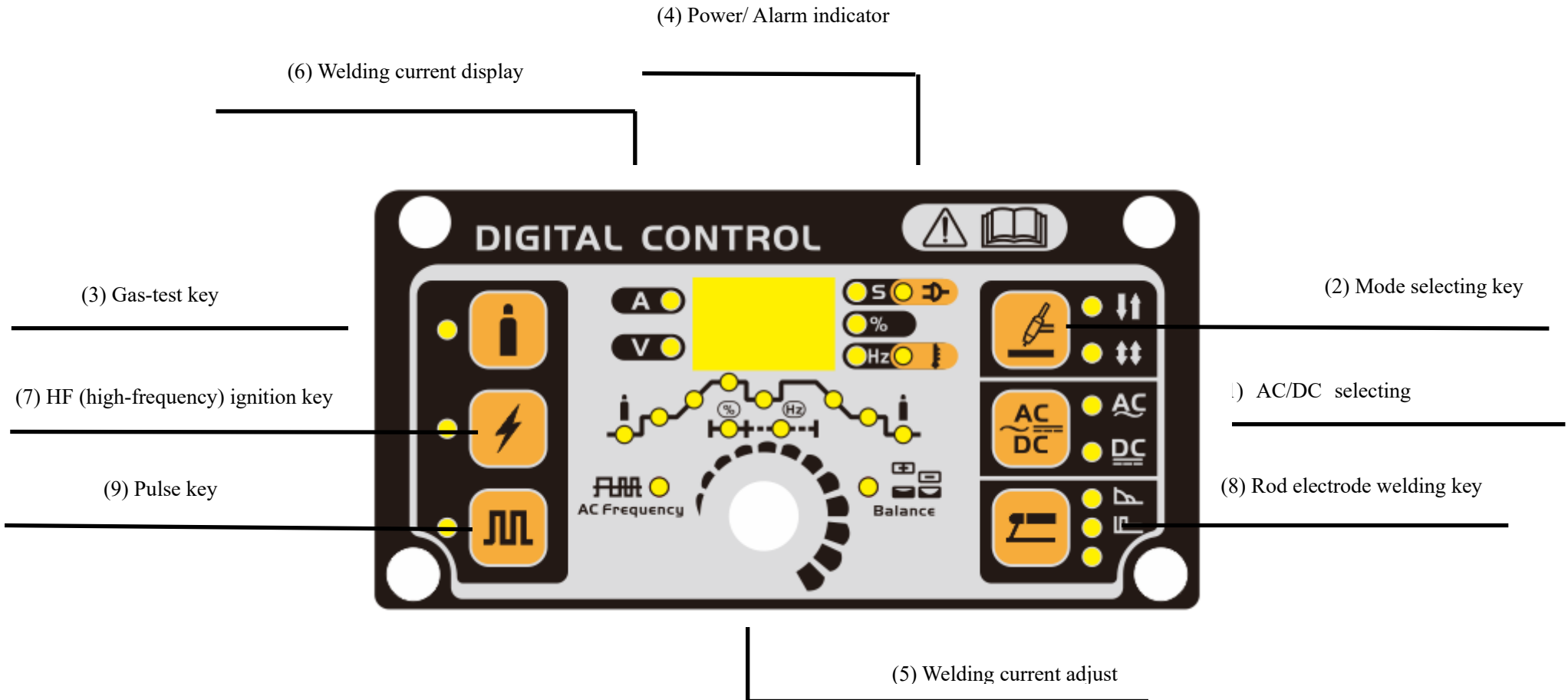
4 Operation

4.1 Layout for the panel



- 1 **Negative output** - Negative polarity output.
- 2 **Shield gas connector** - Is connected to the gas input pipe of torch.
- 3 **Aero socket (Remote Receptacle)** - Is connected to torch switch control wire.
- 4 **Positive output** - Positive polarity output.
- 5 **Shield gas input fitting** - Connect one end of the gas hose and the other end to the argon gas cylinder.
- 6 **Power source switch** - Switch to "ON", the welder turns on, while switch to "OFF", the welder turns off.
- 7 **Power source input** - To connect primary power source.
- 8 **Fan** - It is used for cooling the components and parts inside the welder. Operated when needed to cool the welder.

4.2 Control panel

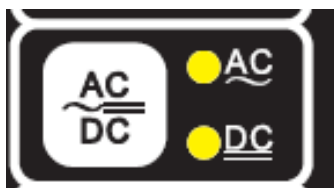


Overview

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 working 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 operation, using the SANARG 180AP control panel as an example. You will find a detailed description of these settings in the following section.

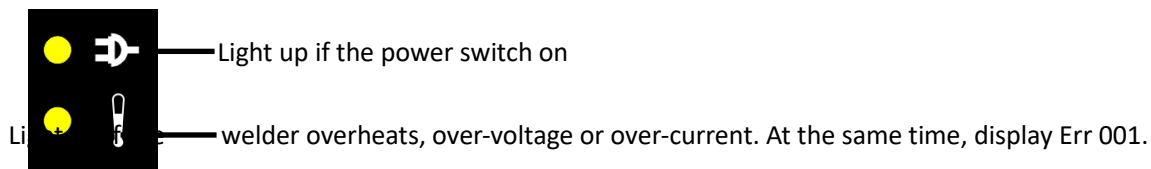
(1) AC/DC selecting key



(2) Mode selecting key



(4) Power/ Alarm indicator



(5) Welding current adjust

Before welding, you can use this potentiometer to adjust the welding current.

(6) Welding current display

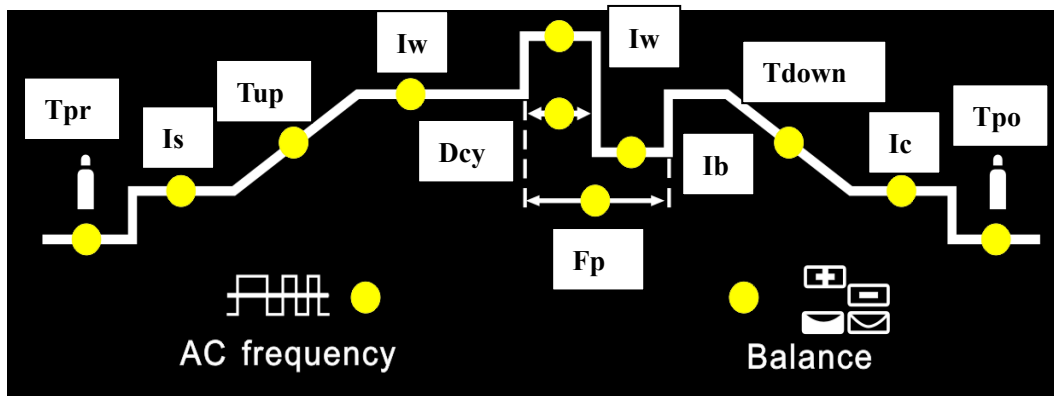
Displays the pre-set or the actual welding current value.

Before the start of welding, it shows the pre-set current value.

After the start of welding, it shows the actual value of the welding current.

(7) 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:

Tpr Gas pre-flow time

Unit S
 Setting range 0.1—10
 Factory setting 0.3

Is Starting current (only with 4T)

Unit A
 Setting range 5 - 100% of main current Iw (DC), 10 - 100% of main current Iw (AC)
 Factory setting 5

Tup Upslope time

Unit S
 Setting range 0 - 10
 Factory setting 0

Iw Welding current

Unit A
 MAGIC AC GTIG-200P 5—200 (DC); 10—200 (AC)

Ib Base current

Unit A
 MAGIC AC GTIG-200P 5 - 200 (DC); 10 - 200 (AC)

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

Dcy 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.

Fp Pulse frequency

Unit Hz
 Setting range 0.5 - 200

Factory setting 0.5

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

Tdown Downslope time

Unit S
 Setting range 0 - 10
 Factory setting 0

Ic Crater arc current (only with 4T)

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

Tpo Gas post-flow time

Unit S
 Setting range 1 - 10.0
 Factory setting 3

AC frequency (only with TIG-AC)

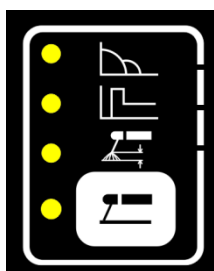
Unit Hz
 Setting range 50 - 250 (Iw < 70A)
 50 - 200 (70A ≤ Iw < 100A)
 50 - 150 (100A ≤ Iw < 140A)
 50 - 120 (140A ≤ Iw < 170A)
 50 - 100 (170A ≤ Iw)

Balance (only with TIG-AC)

Balance adjustment is used to set AC cleaning cycle on metals such as Aluminum, Magnesium and its alloy) while in AC TIG Mode. 15% is minimum cleaning.

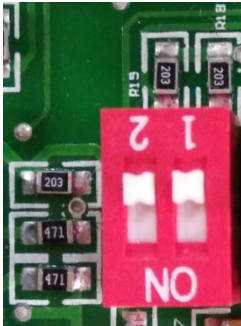
Unit %
 Setting range 15—50
 Factory setting 15

(8) STICK electrode (SMAW) welding key

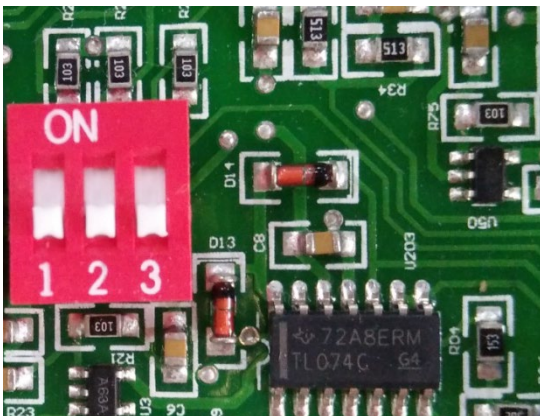


Parameter	Setting range
Arc force	0-10
Hot start	0-10
Arc length	0-10

4.3 Remote control



1-2 : They are factory set, can't be changed. If they are changed, the welder may not function.



1-2 : They are factory set, can't be changed. If they are changed, the welder may not function.

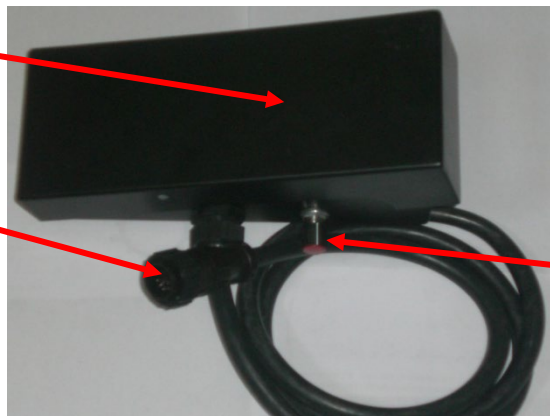
3 FOOT_REMOTE CONTROL SELECT: When it is ON, the Foot pedal control can be used; When it is OFF, the remote control can be used. Gun switch control current can be used both ON and OFF.

4.3.1 Pedal switch control

- The Welder will identify the pedal switch when connected, the welding current knob on the front panel will not operate, only 2T can be selected.
- Use the adjustment knob to set the max-current.

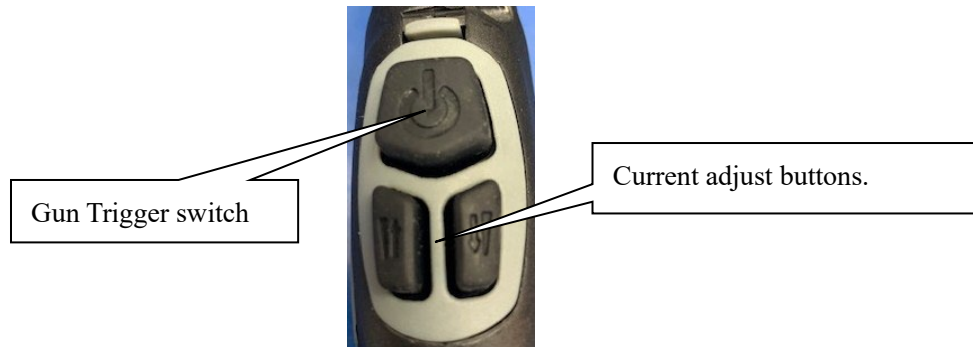
Adjustment knob of welding current

Connected to the 8-lead aero socket on the front panel



Adjustment knob of max welding current

4.3.2 Gun switch / current control

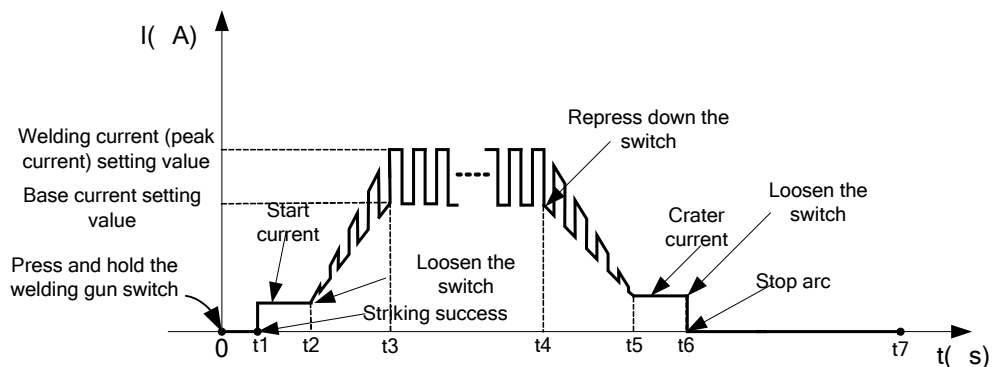


4.4 Argon Arc Welding Operation

4.4.1 TIG welding – (4T operation with supplied Torch Switch)

The start current and crater current can be pre-set.

Pulsed TIG long welding (4T):



Introduction:

- 0: Press and hold the gun switch closed, gas valve is turned on and shielding gas starts to flow;
- 0~t1: Pre flow time, adjustment range of pre flow time :0.1~10.0S;
- t1: Welding Arc established, adjustment range of start current: 5~200A;
- t2: Release 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 Weld setting current value; adjustment range of up slope time 0~10.0S ;
- t3~t4: Welding process. During this period, the gun switch is released.

Note: If the output pulse function is turned on, the output current is pulsed.

- t4: Press and Hold the gun switch closed, 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 rang of down slope time: 0~10.0S;
- t5~t6: Crater current adjustment range of crater current: 5~200A;
- t6: Release the gun switch, welding arc stops, with gas post flow.
- t6~t7: Post flow time, adjustment range of post flow time: 1.0~10.0S;
- t7: Gas stops flowing. Welding is finished.

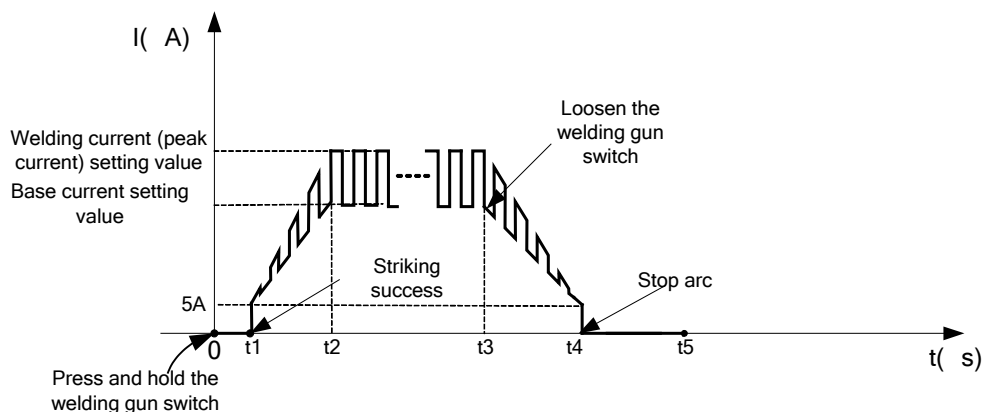
Remarks: Repeat welding function:

In 4T mode, when you press the second time to stop the arc, if your press in a very short time, the output current will reduce to half, if you press the trigger again the arc stops; But if press in more than 0.5 seconds, the arc will stop at your second press.

4.4.2 TIG welding (2T operation)

This function without the adjustment of start current and crater current.

Pulsed TIG short welding (2T):



Introduction:

- 0: Press and hold the gun switch closed, gas valve turns on and the shielding gas starts to flow;
- 0~t1: Pre flow time, adjustment range of pre flow time :0.1~10.0S;
- t1~t2: Welding Arc ignites, the output current slopes up to the set welding current from minimum current (5A); if the output pulse function is turned on, the slope up current is pulsed;
- t2~t3: During the welding process, the gun switch is held closed without releasing;
Note: If the output pulse function is turned on, the output current is pulsed.
- t3: Release 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), Welding arc stops; adjustment range of down slope time: 0~10S;
- t4~t5: Post flow time, adjustment range of post flow time: 0.1~10.0S;
- t5: Gas stops flowing. Welding is finished.

Short circuit protect function:

⌀ TIG /DC/LIFT: If the tungsten electrode touches the workpiece when welding, the current will drop to 20A, which can reduce tungsten damage, prolonging the life of the tungsten electrode.

⌀ TIG /DC/HF: If the tungsten electrode touches the workpiece when welding, the current will drop to 0 within 1s, which can reduce tungsten damage, prolonging the life of the tungsten electrode.

③ SMAW operation: if the electrode touches workpiece 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.

④ TIG: If the TIG torch is pressed quickly, the welding current will drop to half, then if the TIG torch is pressed quickly again, the welding current will go back to set current.

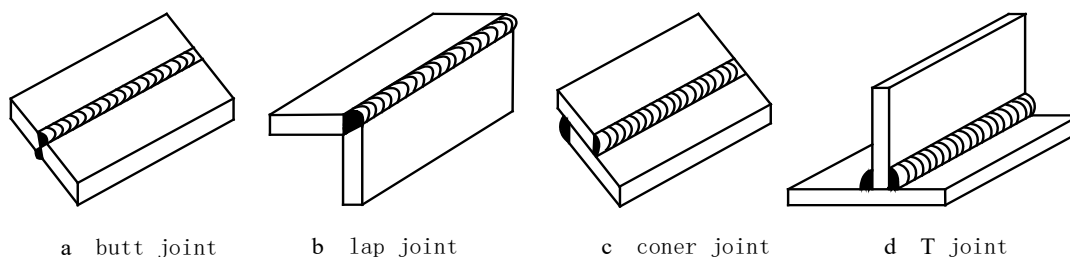
Notices:

- Check the welding functions and connections, otherwise there will be a malfunction such as ignition spark、 gas leakage、 out of control and so on.
- Check the Argon gas supply, you can test the gas valve through the gas purge switch on the front panel.
- Do not aim the torch at your hand or any part of your body. When you press the torch switch, the arc is ignited with a high-frequency, high-voltage spark, and the ignition spark can cause interferences in equipment.
- The spark ignition works better if you keep the 3mm distance from the workpiece to the tungsten electrode during the ignition.

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

4.5 Welding Parameters

4.5.1 Joint forms in TIG/SMAW



TIG Parameters

Constant Current (CC) Processes

American Welding Society (AWS) Standards Guide

Recommended Tungsten Electrode, Gas Cups and Welding Current Specifications

Electrode Diameter Size Inch (mm)	DIRECT CURRENT (Amps)		ALTERNATING CURRENT (Amps)	
	DCSP (DCEN) Straight Polarity	DCRP (DCEP) Reverse Polarity	Unbalanced Wave	Balanced Wave
0.010" (0.25 mm)	Up to 15	–	Up to 15	Up to 15
0.020" (0.50 mm)	5 - 20	–	5 - 15	10 - 20
0.040" (1.0 mm)	15 - 80	–	10 - 60	20 - 30
1/16" (1.6 mm)	70 - 150	10 - 20	50 - 100	30 - 80
3/32" (2.4 mm)	150 - 250	15 - 30	100 - 160	60 - 130
1/8" (3.2 mm)	250 - 400	25 - 40	150 - 210	100 - 180
5/32" (4.0 mm)	400 - 500	40 - 55	200 - 275	160 - 240
3/16" (4.8 mm)	500 - 750	55 - 80	250 - 350	190 - 300
1/4" (6.4 mm)	750 - 1100	80 - 125	325 - 450	325 - 450

NOTE: Use EWC-2, ENL-1, EWT-1 or EWT-2 Tungsten Electrodes. The values above are based on the use of Argon as the shielding gas

**Tungsten Electrode
Current Ranges**

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

**Filler Wire Diameter
Selection Guide**

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

NOTE: The filler wire diameter specified is a guide only, other diameter wires may be used according to the welding application.


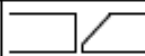

**Shielding Gas
Selection Guide**

Metal or Alloy	Shielding Gas
Aluminium & Alloys	Argon
Carbon Steel	Argon
Stainless Steel	Argon
Nickel Alloy	Argon
Copper	Argon
Titanium	Argon

Tungsten Electrode Types

Electrode Type (Ground Finish)	Welding Application	Features	Colour Code
Thoriated 2%	DC welding of mild steel, stainless steel and copper.	Excellent arc starting, Long life, High current carrying capacity.	Red
Ceriated 2%	DC welding of mild steel, stainless steel, copper, aluminium, magnesium and their alloys	Longer life, More stable arc, Easier starting, Wider current range, Narrower more concentrated arc.	Grey

**TIG Welding Parameters
for Low Carbon & Low Alloy Steel Pipe**

Electrode Type & Diameter	Current Range DC Amps	Filler Rod for Root Pass	Joint Preparation
Thoriated 2% 3/32" (2.4 mm)	120 - 170	Yes	
Thoriated 2% 3/32" (2.4 mm)	100 - 160	Yes	
Thoriated 2% 3/32" (2.4 mm)	90 - 130	No	

DC TIG Welding Parameters for Steel

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

4.6 Operation Environment

- Height above sea level is below 3280ft.
- Operation temperature range:-50°F~+204°F.
- Relative humidity is below 90 % (68°F), relative humidity is below 50 % (104°F).
- The inclination of the power source does not exceed 10°.
- 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 section 1 carefully before attempting to use this equipment.
- Connect the ground wire directly to earth refer to 3.5.
- When power switch is turned ON, no-load voltage may be at output receptacles. Do not touch the output receptacles with any part of your body.
- Do not watch the arc in unprotected eyes.
- Ensure good ventilation of the power supply

5 Maintenance & Troubleshooting

5.1 Maintenance

To guarantee the arc welding power supply works efficiently and safely, it must be maintained regularly. Maintenance items detailed in the following table.

- **Warning: For safety while troubleshooting the power supply, please shut off the input power and wait for 5 minutes!**

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 can't correct or fix the knob , please replace immediately;</p> <p>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.</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 can't 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 doesn't 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>Check up 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 were shipped from the factory, they have been tested and calebrated. So forbid anyone who is not authorized by us to do any service to the equipment!
- Only professional maintenance personal who is authorized by us can overhaul the machine!

Please contact your local service agent or distributor!

Basic Troubleshooting chart:

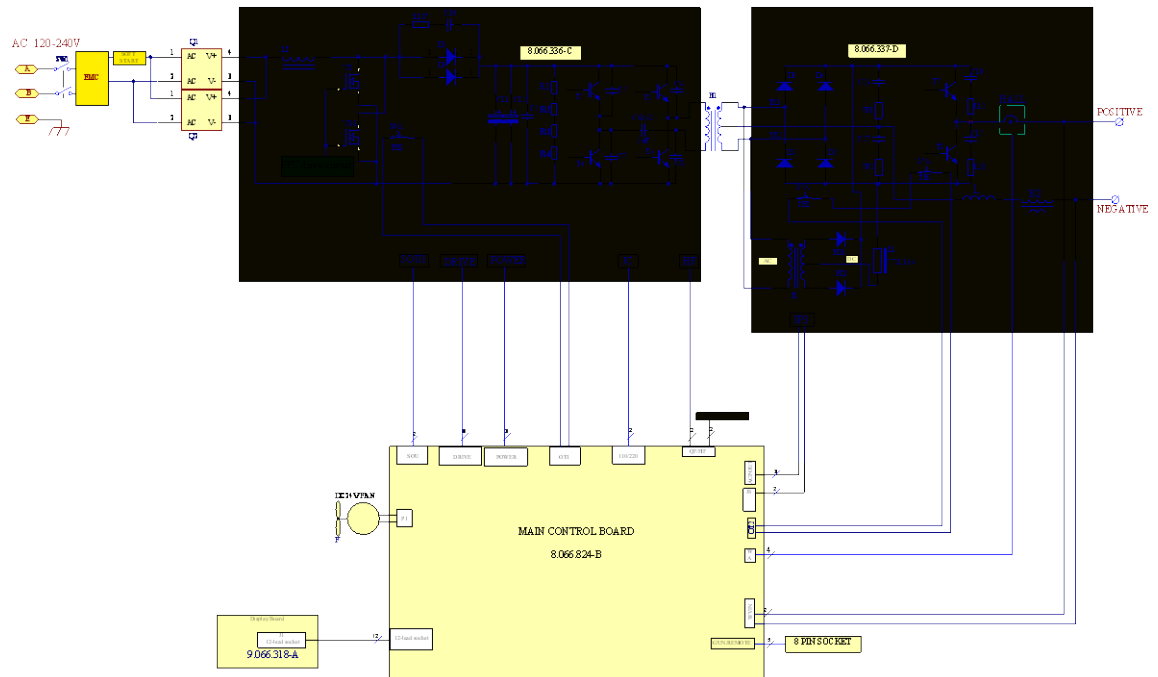
S/N	Troubles	Reasons	Solution
1	Turn on the power source, and fan works, but the power pilot lamp is not on.	The power light damaged or connection is not good	Check and repair Pr7
		The transformer of power is broken	Repair or change the transformer
		Control PCB failures	Repair or change the control Pr4
2	Turn on the power source, and the power lamp is on, but fan doesn't 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 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

S/N	Troubles		Reasons	Solution
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 Imax in the current meter.
6	No no-load voltage output (SMAW)		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 workpiece.	Check and remove it.
	There is not spark on the HF igniting board.	The HF igniting board does not work.	Repair or change Pr8	
		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 can not 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 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

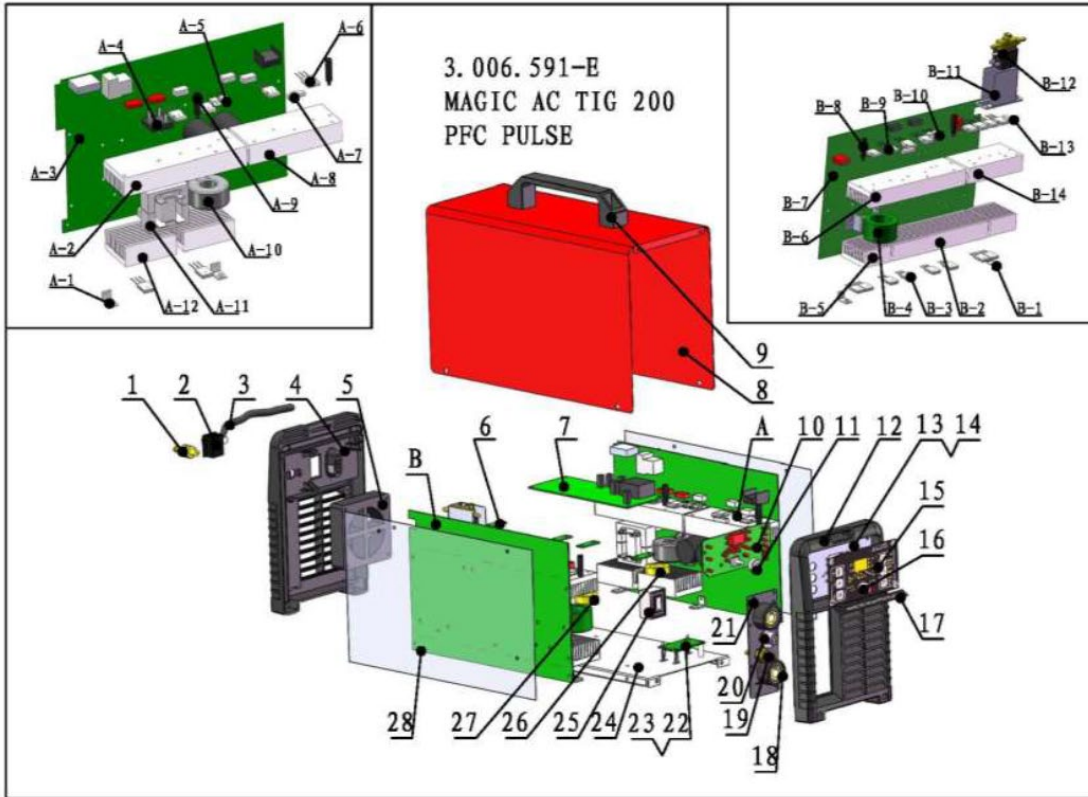
SETUP GUIDE

S/N	Troubles	Reasons		Solution
			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 principal drawing



Exploded View



MAINTENANCE & TROUBLESHOOTING

Parts List

Serial number	material number	material name	quantity
1	8.462.116	Fast plug	1.00
2	7.232.735	switch	1.00
3	7.154.404	power cable	1.00
4	8.068.620	Rear panel	1.00
5	7.720.020	fan	1.00
6	8.123.047	Connection lump	6.00
7	5.496.824-B	control board	1.00
8	8.301.590	cover	1.00
9	8.253.020	handle	1.00
	8.104.300	English caution label	1.00
10	5.496.318-A	panel board	1.00
11	8.712.304	Encoder insulation washer	1.00
12	8.069.620-B	front panel	1.00
13	8.306.591	rear plate shrouding board	1.00
14	7.224.300-B1	Switch cap	6.00
15	8.103.591-E	mask	1.00
16	7.458.330-R1	knob	1.00
17	8.104.591	Type label	1.00
18	7.152.312-A	fast female seat	2.00
19	8.462.028-H	front gas connection	1.00
	8.940.003	copper nut	1.00
20	7.132.116-B	aero socket	1.00
21	8.123.449	output assembly board	1.00
22	5.496.821-C	Gun switch isolation board	1.00
23	7.503.015	PC board interval column	3.00
24	8.055.595	Bottom panel	1.00
25	7.321.102-A	hall	1.00
26	6.271.591	inductance	1.00
27	6.271.590	inductance	1.00
28	8.713.590	Insulation sheet	2.00
29	7.511.249	brace	1.00
30	8.860.591	nameplate	1.00
31	8.103.685	Input label	1.00

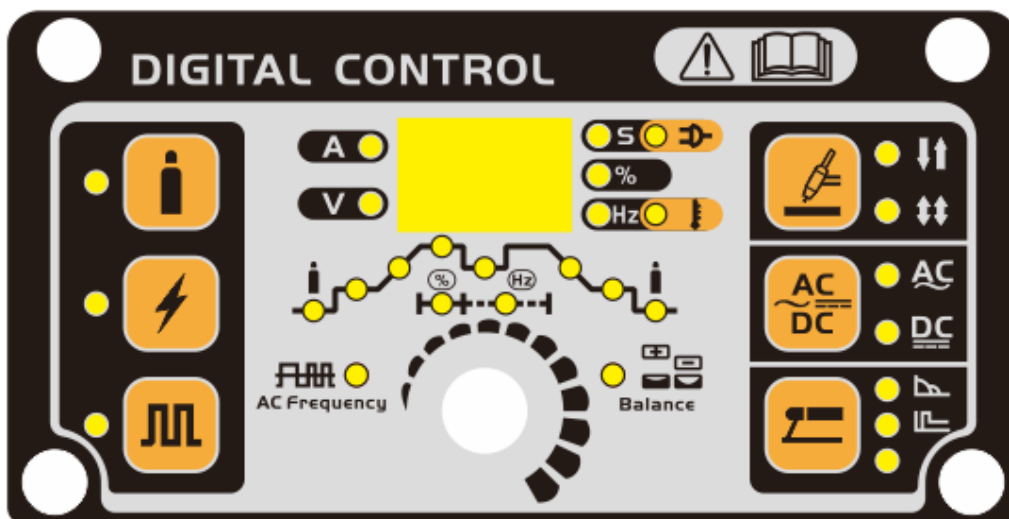
MAINTENANCE & TROUBLESHOOTING

Item	Part Number	Description	Quantity
A		MAGIC 200 PFC DC inverter module	
A-1	8.123.641	Support bar (1)	4.00
B-1			
A-2	8.425.595	Heat sink(6)	1.00
A-3	5.496.336-C	MAGIC 200 PFC DC inverter board	1.00
A-4	7.411.021	bridge	1.00
A-5	7.421.541	FRD	2.00
	8.713.182	Isolation lump	4.00
A-6	7.425.553	IGBT	6.00
A-7	7.231.280	thermal rely	1.00
A-8	8.425.597	Heat sink(8)	1.00
A-9	7.503.530-A	Isolation column	4.00
B-8			
	7.927.104-A	Plastic screw	6.00
A-10	6.190.100	PFC	1.00
A-11	6.185.590	in transformer	1.00
A-12	8.425.596	Heat sink(7)	2.00
B		MAGIC 200 PFC AC inverter module	
B-2	8.425.593	Heat sink(4)	1.00
B-3	7.421.180	FRD	8.00
	8.713.184	Isolation lump(4)	8.00
B-4	6.174.590	HF	1.00
B-5	8.425.592	Heat sink(3)	2.00
B-6	8.425.590	Heat sink(1)	2.00
B-7	5.496.337-C	MAGIC 200 PFC AC inverter board	1.00
B-9	7.425.670	IGBT	8.00
	8.713.180	Isolation lump	14.00
B-10	7.421.544	FRD	2.00
B-11	8.123RM.923	Gas valve mounting box	1.00
B-12	7.253.013	Tow-way solenoid valve	1.00
B-13	7.231.285	thermal rely	2.00
	8.713.600	Isolation sheet	3.00
B-14	8.425.591	Heat sink(2)	1.00

6 Quick Setup Guide

This guide assumes the operator has a general understanding of TIG Welding.

Please read and understand Section 1 safety, Section 3 Installation & Adjustment and Section 4 Operation in the owner's manual that came with your 180AP.



180AP TIG Setup

- Gas Purge – Pressing this button turns on the gas solenoid. Pressing the Gas Purge button again shuts off the gas solenoid.



- HF Start - For HF non-contact arc starting Press the HF Start button. The yellow light illuminates.
 - For Lift TIG contact arc starting HF light is OFF.



- Pulse – To select Pulse TIG mode Press the Pulse button. Yellow light will illuminate.
 - Pulse parameters are I_w , I_b , D_{cy} , F_p .
 - I_w – Peak current
 - I_b – Background Current
 - D_{cy} – Ratio of time spent at peak pulse. If set at 50%, then 50% of each cycle will be at peak current.
 - F_p – Pulse Frequency in Cycles Per Second.




- 2T/4T Remote Control – Select 2T (2 arrows one up one down) when using a foot control. Select 4T (2 Double arrows) when using the controls on the supplied TIG torch.



- AC/DC Selection – Selects AC or DC output.



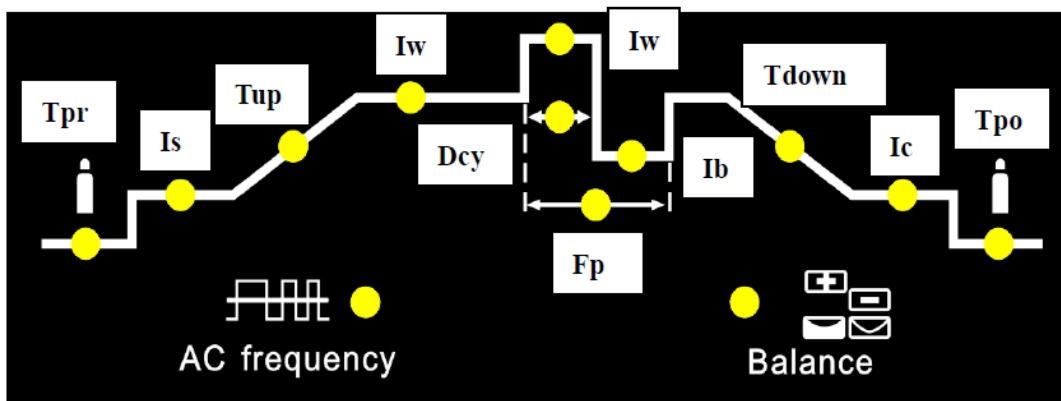
- STICK Functions -  Arc Force,  Hot Start. Select by pushing the STICK button.



- Parameter select & Set – Used to select Parameter and set value. Rotate knob to select parameter. Push knob and then rotate to set parameter value.




Parameter setup




Start left to right. Rotate the red knob to highlight the Parameter to adjust. The yellow light will illuminate to show selection. Push red knob to set parameter value.

1. Tpr - Gas Pre-Flow. Value in seconds.
2. Is – Starting Current. Value in Amperage. Used in 4T mode.
3. Tup – Up Slope Time. Value in seconds. Set to zero when using a foot control.
4. Iw – Welding amperage. Value in Amps.
 - a. Also, Peak Pulse when in Pulse Mode.
5. Dcy – Pulse Width. Only available when in Pulse Mode.
6. Fp – Pulse Frequency. Only available when in Pulse Mode.
7. Ib – Background amperage. Only available when in Pulse Mode.
8. Tdown – Down Slope Time. Value in seconds. Set to zero when using a foot control.
9. Ic – Crater current – Value in Amperage. Used in 4T mode.
10. Tpo – Pulse flow – Value in seconds.
11. AC frequency – AC welding frequency. Value in Hertz.
12. Balance – AC welding. Cleaning control. Increasing the percentage increases cleaning.

Using supplied TIG Torch

- Supplied TIG Torch has three buttons on the handle.
 - Bigger Button at the top is ON/OFF.
 - The two smaller are amperage control UP and Down.
- Set the 2T/4T Remote Control Button on the front panel for 4T operation.
 -  4T setting.
 - 4T operation in HF Start mode.
 - Press and hold close the ON/OFF button. Pre flow starts, then HF starts to transfer arc at Starting Current amperage setting.
 - Release ON/OFF button. Amperage increases at up-slope time to weld current. Now use the two smaller buttons to increase or decrease amperage while welding.



- Press and hold close the ON/OFF button again. The Amperage decreases at Down-Slope time to crater amperage.
 - Release ON/OFF button. Arc stops then post flow.
- TIG operation with Foot Control
 - Set the 2T/4T Remote Control Button on the Front Panel for 2T operation.
 -  2T Setting.
 - Set up slope and Down Slope settings to zero.

Note: Maximum welding current is set by front panel Iw Parameter. If set to maximum of 150 amps, then remote torch Up/Down switches and foot control maximum current would be 150 amps.