COMBO-401 i /501 i

Inverter CO2/MIG/MAG Gas Shield
Welding Machines

OPERATOR'S MANUAL

(PLEASE READ CAREFELLY BEFORE OPERATION)

Safety Depends on You

Our arc welding and cutting equipment s are designed and built with safety in mind. However, your overall safety can be increased by proper installation.
DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND FOLLOWING THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.

Special Attention (Very Important):

- **PLACE THE MACHINE ON A PROPER PLANE, SO THAT THE MACHINE DOES NOT SLIP.**
- **PLEASE KEEP THE MACHINE AWAY FROM RAIN (UNDER PROPER ROOFING).**

Purchase Date：_____

Serial Number：_____

Machine Type：_____

Purchase Place：_____

Cautions	Arc and arc rays may harm health.

Arc welding can be hazardous. All performing welding workers ought to have health qualification that provided by authority organization. Protect yourself and others from possible serious injury or death. Keep children away. Pacemaker wearers should consult with their doctor before operating. Be sure that all installation, operation, maintenance and repair procedures are performed only by qualified individuals.

1 **Electric shock can kill**: 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. Users need to follow the below items to avoid electric shocks:

- 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. Otherwise, use automatic or semiautomatic welding machines, DC welding machines as possible as you can.
- 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.
- Ground the work or metal to be welded to a good electrical(earth) ground.
- 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, please do wear safety belt to avoid falling or losing balance on electric shock.

2 **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. Head shield and filter lens should conform to nation standards.

- 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.

3 **Fumes and Gases can be dangerous**: Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. While working in limited room, use enough ventilation and/or exhaust to keep fumes and gases away from the breathing zone, or use the respirator.

- 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.
- 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.
- Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. Make sure they are asepsis and innocuity.

4 **Spatter**: Welding or cutting spatter 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 in the field, special precautions should be used to prevent explosion.
- When not welding, make certain that no electriferous part is touching the work piece or the work stage. Accidental contact can create a fire hazard.
- Do not weld containers or lines, which are not proved to be innocuity.
- 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".
- Spatter might cause burn. Wear leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair to prevent from burning by spatter. Wear the ear shield when performing sideways or face up welding. Always wear safety glasses with side shields when being in a welding area.
- The welding cables should be as close to the welding area as possible, and the short, the better. Avoid welding cables going through the building framework, lifting chains, AC or DC cables of other welding machines and appliances. The welding current is strong enough to damage them while having short circuit with them.

5 **Cylinder may explode if damaged.**

- Make sure that the gas in the storage cylinder is qualified for welding, and the decompression flowmeter, the adapter and the pipe are all in good condition.
- Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- Be sure to put the cylinder in the working space with no crash or shake, and far from welding area.
- 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.

6 **Power**: (For electrically powered welding and cutting equipment) Turn off input power before installation, maintenance and repair to avoid accidents.

- Huanyuan welding equipment is I class safeguard equipment; please install the equipment in accordance with the manufacturer's recommendations by specific persons.
- Ground the equipment perfectly in accordance with the manufacturer's recommendations.

7 **Power**:(For engine driven welding and cutting equipment)

- Work in ventilated place or outdoors.

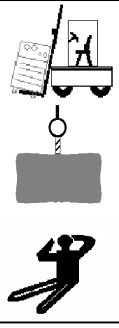
- Do not add fuel near to fire or during engine starting or welding. When not working, add fuel after engine is cooling down; otherwise, the evaporation of hot fuel would result in dangers. Do not splash fuel out of the fuel tank, and do not start the engine until complete evaporation of the outside fuel.

- Make sure that all the safeguard equipment's, machine cover and devices are all in a good condition. Be sure that arms, clothes and all the tools do not touch all the moving and rotating components including V belt, gear and fan etc.
- Sometimes some parts of the equipment have to be dismantled during maintenance, but you still have to keep the strongest safety awareness .
- Do not put your hand close to fans and do not move the brake handle while operating.
- Please remove the connection between the engine and the welding equipment to avoid sudden starting during maintenance's.
- When engine is hot, it is forbidden to open the airtight cover of the radiator water tank to avoid hurt by the hot vapor.

8 **Electromagnetic**: Welding current going though any area can generate electromagnetic, as well as the welding equipment itself.

- Electromagnetic would affect cardiac pacemaker, the cardiac pacemaker users should consult one's doctor first.
- The effect of electromagnetic to one's health is not confirmed, and it might have some negative effect to one's health.
- Welders may use following method to reduce the hazardous of electromagnetic:

a. Bundle the cable connected to the work piece and the welding cable together.
b. Do not enwind partially or entirely your body with the cable.
c. Do not place yourself between the welding cable and the ground (work piece) cable, if the welding cable is by your left side, then the ground cable should be by your left side too.
d. The Welding cable and the ground cable are as short as possible.
e. Do not work near to the welding power source.



9 **Lifting equipment**: carton or wooden boxes package of the welding machines supplied by WARPP Engg. There is no lifting equipment in its wrapper. Users can move it to the prospective area by a fork-lift truck, then open the box.

- If there are rings, the machine can be transited by rings. While Our Welding Machine Manufacture reminds users, there is potential risk to damage the welding machine. So it is better to push the welding machine by its rollers unless special situations.
- Be sure that the appurtenances are all removed off when lifting.
- When lifting, make sure that there is no person below the welding machine, and remind people passing by at any moment.

Do not move the hoist too fast.

10 **Noise**: Our Welding Machine Manufacture reminds users: Noise beyond the limit (over 80 db) can cause injury to vision, heart and audition depending on oneself. Please consult local medical institution. Use the equipment after doctor's permission would help to keep healthy.

CONTENTS

1. Usage Notices

1. 1 Machine Model is :

COMBO 401 I / 501 I

Process : SMAW
GMAW
FCAW

Features & Advantages

Slow feeding speed with high open circuit voltage for better arc striking.

Unique feedback circuit for both voltage and current confirms stable welding process,less spatter good weld bead and good adaptability for continues change in arc length.

Excellent F.T.T - Globule control circuit makes positive striking of arc.

crater current and voltage function for elimination of crater at the End of the weld.

PWM inverter technique with 20 khz operating frequency make the system much responsive.

It can be widely used in Gas-shielded welding, carbon arc air gouging and manual welding.

Usage

It is suitable for welding mild steel, stainless steel, aluminum and their alloy.

The machine can be used for all position welding with solid and flux cored wire.It can be used with Φ0.8 , Φ1.0 , Φ1.2 , Φ1.6 depends on model.

It can be used for manual metal arc welding with acid and basic types of electrodes.

Safety

For you and others safety, please follow the guide line mentioned below.

- The machine have to be grounded properly.

To prevent electric shock, make sure the grounded bolt of the power source is grounded well.

- use proper personal protection equipment.

To prevent injury of your eyes and skin from the ultraviolet radiation, strong sparks and splash, please make sure to use proper personal protection equipment like helmet,hand gloves ,apron etc.

- Protection against welding fume

The gases and fumes produced by welding are hazardous to health. Make sure that working space is properly ventilated or use equipment like fume extractor for your safety.

- The gas cylinder to be located in a fixed place or use proper trolley.
- The machine and working area should be keep away from flammable things.
- Prevent particles getting inside the machine and prevent cables from sharp things it may cut the cables .
- Prevent the machine from damage by falling or hitting. Once it falls or hit, the machine cannot be used again without professional checking.

Environmental Area

For satisfactory performance of the machine , please follow guide line mention below..

- Keep the machine away from direct sunlight , rain and dusty atmosphere.
- The environment temperature range should be -10℃ ~ 40℃.
- Avoid metal particles entering into the power source.
- The distance between the power source and wall or other close things should be more than 30cm. The distance between two machines should be more than 30cm.
- Welding area should be protected from wind.

Input Power conditions

Power supply : 380-440VAC

The fluctuation range of frequency: < ±1%

The imbalance rate of three-phase voltage : < ±5%

While using engine generator, the output power should be two times larger than the rated input power of the welding power source and compensation coil is needed.

Installation diagram

Connection between welding equipment s and other equipment's (Please refer to the Figure 1).

1.8 Components name and Function Introductions (Please refer to the Figure 2)

1. **Voltage meter:** to indicate the actual welding voltage
2. **Current meter:** to indicate the actual welding current
3. **Current adjustment knob:** When switch 10 is placed on the manual welding position, this knob can adjust the manual welding current. When switch 10 is placed in the gas-shield welding position, this knob can adjust the gas-shield welding current.
4. **Crater voltage adjustment knob:** adjust the crater voltage.
5. **Arc characteristic adjustment knob:** While used as gas-shield welding, it is to adjust and control the current changing rate in different duration of the melt drop transfer in the welding process. It will directly influence arc's soft and rigid characteristics, quantity of spatter, shaping of welding seam and the stability of arc. It is advised to use standard characteristic. Adjust it to the soft characteristic while doing as small criterion welding, and adjust it to the rigid characteristic while doing as middle and large criterion welding. (**Note: the softer arc, the less spatter, vice versa**.)
6. **Under voltage indicator lamp:** When the distribution voltage is lower than 320VAC, it lights, and the output current will be cut automatically. After the voltage is back to normal, the machine will work again.
7. **Over heat indicator lamp:** If it runs beyond excess of its rated duty cycle, or in a high temperature environment, the thermal sensor's temperature achieves 75℃±5℃, the heat protection circuit will work, and the heat indicator LED will glow, the output current will be cut off. Wait until the machine cool down and LED turned off, you can restart the machine after that. If the entrance of the gas path is jammed or the fan doesn't work, the LED will also glow.
8. **Power source indicator lamp:** As soon as the machine start, it lights.
9. **Welding mode selection switch:** It is to switch the welding process from manual welding to gas-shield welding.
10. **Welding wire diameter selection switch:** It is to switch the standard welding wire's diameter to adopt the machine. It is actually to choose the suitable welding program. Turn the switch to the diameter matched with the welding wire.
11. **Welding wire type selection switch:** It is to switch the standard welding wire's type to adopt the machine. Turn it to the solid position while using solid welding wire; turn it to the flux-cored position while using flux-cored welding wire.
12. **Crater mode selection switch :**It is to determine whether fill the arc holes at the end of welding. That means to determine whether use crater function or not.
13. **Gas-supply selection switch :** To check gas flow, turn it to "checking" position; to weld, turn it to "welding" position.
14. **Power overload protection switch:** To cut off power and protect the machine in fault condition, it is only used for protection, you should use other power switch while installing.
15. **Control signal interface:** Output interface of arc striking, to control automatic welding equipments. The rated control load ability is 3A/250VAC or 3A/30VDC.(This interface is optional)

16. **Gas heater supply :** Power socket of the gas heater, its output voltage is 36VAC.
17. **Fuse holder :** 3A glass fuse holder.
18. **Input connection line of three phase power:** connect it to distribution box, the green-yellow line should be connected to protective ground line well.
19. **Adjustment knob of welding current:** To adjust the welding current.
20. **Adjustment knob of welding voltage:** To adjust the welding voltage.
21. **Manual wire feeding button :**Press the button, the wire feeder begins to feed wire. The speed of wire feeding can be adjusted by the welding current adjustment knob. While using thinner wire, the feeding speed should be slowed down to avoid distorting the wire.

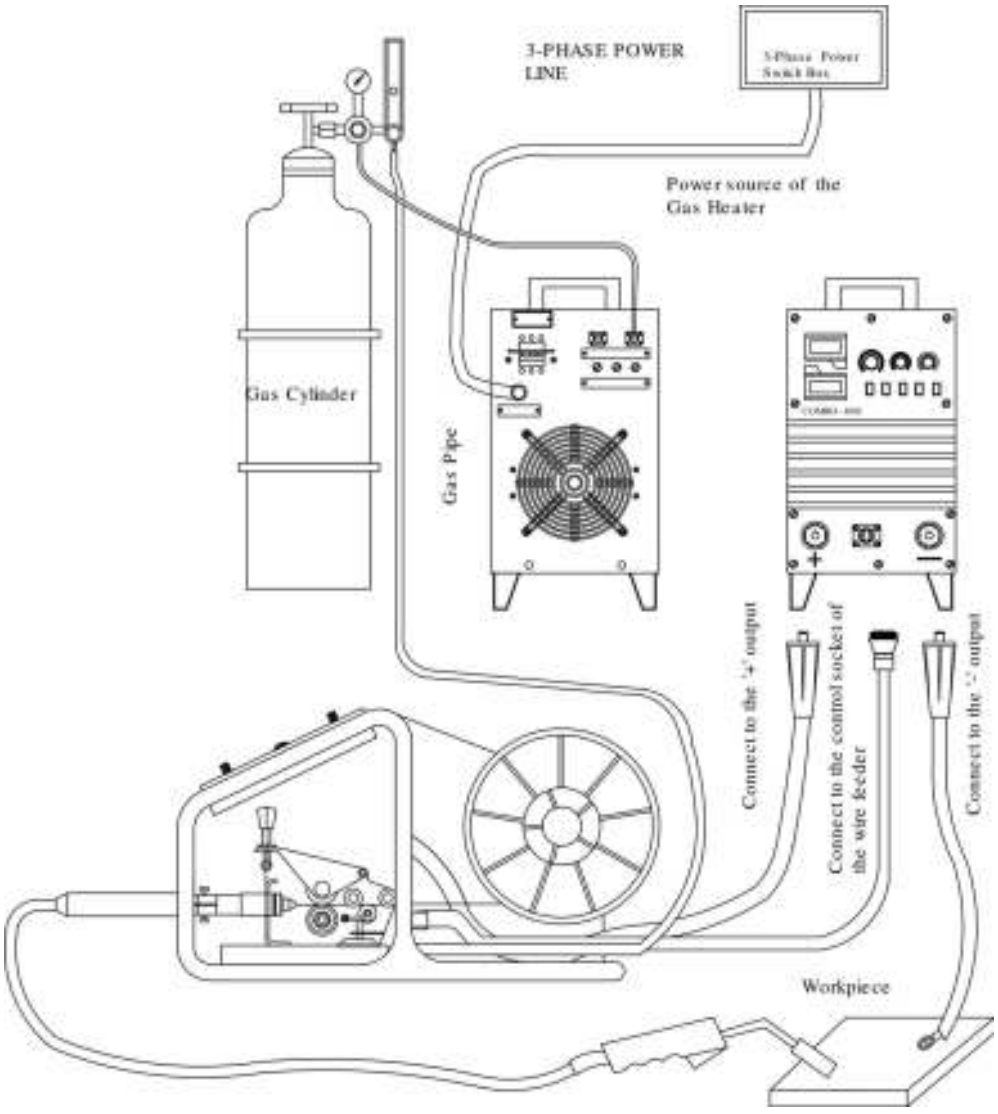
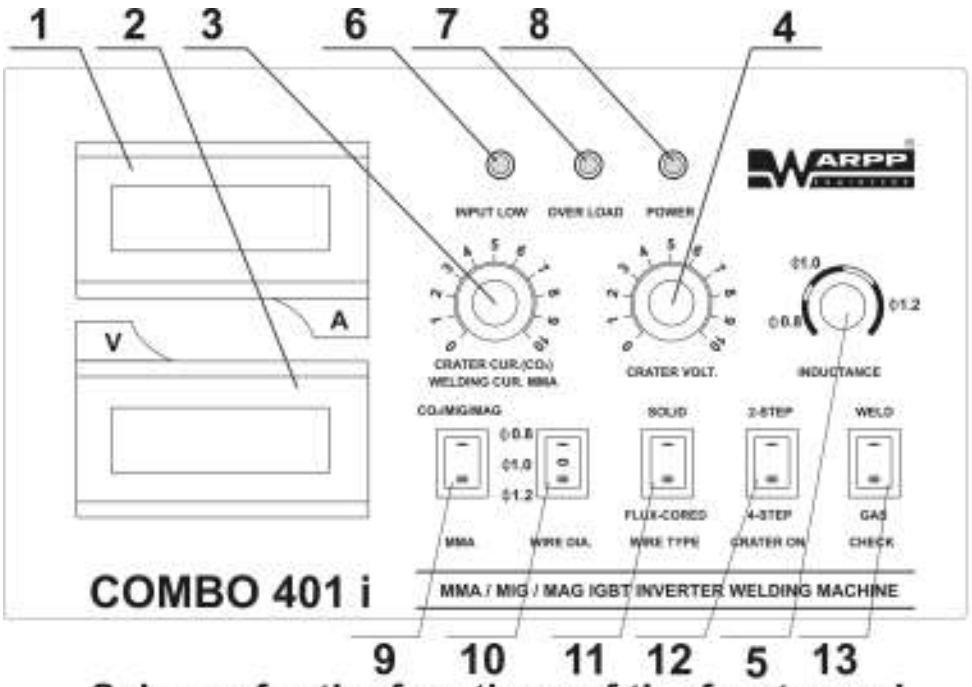
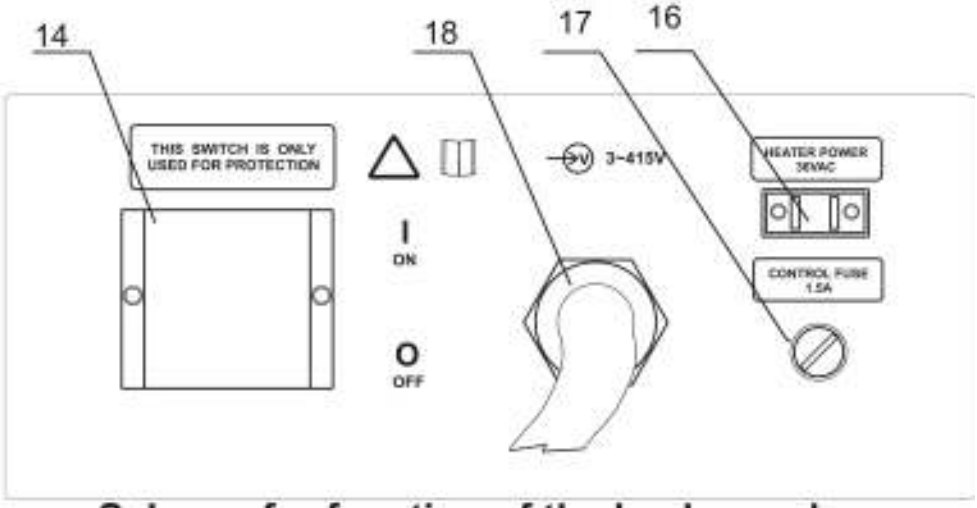


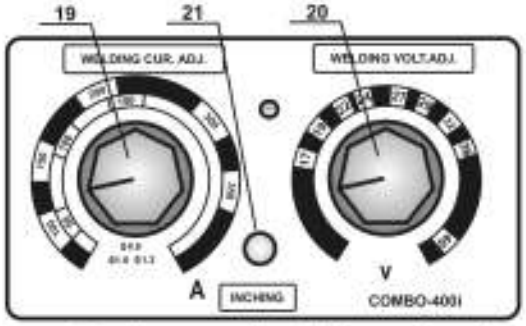
Figure 1: connection between the welding equipment and other equipment s



Scheme for the functions of the front panel



Scheme for function of the back panel



The control panel of the wire feeder

Figure : 2 Name of the component

2. Connections

(The user should choose the power cables, switches, fuses and power switches as specified in table)

Specification	COMBO-401 i	COMBO-501 i
Switch capacity (A)	40	63
Fuse capacity (A)	32	40
Section surface of power supply cables (mm^2)	4	6
Section surface of grounding cables (mm^2)	4	6

2.1 Connections of the power supply cable and the grounding cable

Methods and requirements

Make sure that power supply panel is off before connecting.

Do not connect with wet hands.

Do not place anything on the power supply cable.

Make sure all the connections are proper.

Connect the green-yellow wire of the three-phase input cable to the grounding wire on the switchboard properly.

2.2 The output cable connection of manual welding

Methods and requirements:

Please make sure the power switch is off before connecting.

Connect the copper connector of workpiece cable to the '+' and '--' output socket that on the welding power source. When it is negative connection , the welding electrode holder should be connected to the '+'. When it is positive connection , the welding electrode holder should be connected to the '--'

The welding cable and workpiece should be properly connected by bolts, and have good contact.

2.3 Connections of Gas-shielded Welding

2.3.1 Connection of the output cable

Methods and requirements

Please make sure the power switch is cut off before connecting.

Connect the copper connector of wire feeder cable to '+' output that on the welding power source;

Connect the copper connector of workpiece cable to '--' output that on the welding power source, connect the other side to workpiece with bolts;

Insert the aviation plug(six cores) of control cable into the control socket(six cores) of wire feeder, then tighten the ring nut, connect the other side of control cable to wire feeder.

2.3.2 Connections of the power source, wire feeder and welding torch(please refer to figure 1)

Methods and requirements

Make sure the power switch is cut off before connecting;

Wire feeders that produced by our company are requested to match with the certain welding machine. Otherwise the welding performance maybe bad and even damage the machine;

Insert the aviation plug(six cores) of control cable into the control socket(six cores) of wire feeder, then tighten the ring nut;

Aim the control plug of the welding gun at the guide slot, then insert it into the control output socket (2 pins), then tighten the ring nut. After the connector of welding torch aiming at guide slot, you can insert it completely. And then turn 90° by clockwise rotation and tighten the bolts; Connect the gas pipe of welding torch to the gas output connector of wire feeder, and then tighten the nuts.

2.3.3 Connections of the gas cylinder and gas adjuster

Methods and requirements

Install the gas regulator to the gas cylinder.

Connect the gas heater to the heater's power source socket on the back panel of the machine.

Connect the gas hose of the wire feeder to the gas output connector of the gas heater.

3. Directions of the manual welding mode

Turn on the power switch of distribution box.
Turn the welding machine switch to the manual welding model.
Before welding, make sure the output terminal of the welding machine is connected to the welding cable properly according to the section 2.2 above. adjusted welding current by the current adjustment knob on the panel.
Please use proper personal protection equipment.

4. Directions of the Gas-shielded Welding mode

(Please read this manual carefully and strictly operate according to it)

4.1 Checking items ,methods and requests & preparations before operation

4.1.1 Wears of safeguards

a) Wear fur gloves and safety shoes to protect the skin and bare parts;
b) Wear a helmet with proper shield filter glass that match with different welding current to protect eyes;
c) There should be ventilation in the welding area to prevent breathing the deleterious gas .

4.1.2 Checking after connection:

a) Check out all the items according to the section 2.3 "Connections of Gas-shielded Welding", make sure there's no error.
b) Check out all the items according to the section 1.6 "Input power condition" to meet all the requirement.

4.1.3 Operations of the switches & adjustment of gas flow.

First, turn on the welding machine;
Second, select the "gas-shield" mode on welding machine;
Third, select "welding wire's type " and the "welding diameter" as per requirement by respective switch to meet the type and diameter of welding wire;
Fourth, turn the "Gas-supply" switch to "check" position;
Fifth, turn on the gas valve of the cylinder, and then adjust the knob of the flow meter slowly to meet the value needed;
Sixth, turn the "gas supply" switch to "welding" position.

4.1.4 Installation of the welding wire

For the identification of operational components please refer to Figure 3 .

Methods and requirements

First, select proper size roller match with feeding wire, install the roller and make sure selected groove should be outer side ;
Second, pull down the handle of wire feeder, and then lift the press-arm;
Third, install the welding wire reel to the welding wire reel's axis, adjust the baffle of the welding wire reel's axis to be spread , screw down the manual nut. The out end of the wire is below. The welding wire will comes out at clockwise rotation;
Fourth, let welding wire go through the wire rectification wheel (or guide pipe), wire feeding wheel slot, then insert into the guide tip;
Fifth, press the welding wire with press-arm, and then pull up the handle to press the press-arm, circumgyrate the handle with suitable strength;
Sixth, check up the tip of welding torch, whose diameter should meet the diameter of the wire;
Seventh, press "manual wire feeding" button on the control box of wire feeder, adjust "welding current adjustment" knob for a right feeding speed. You can loosen the button until there is 15—20mm wire outside of welding torch.

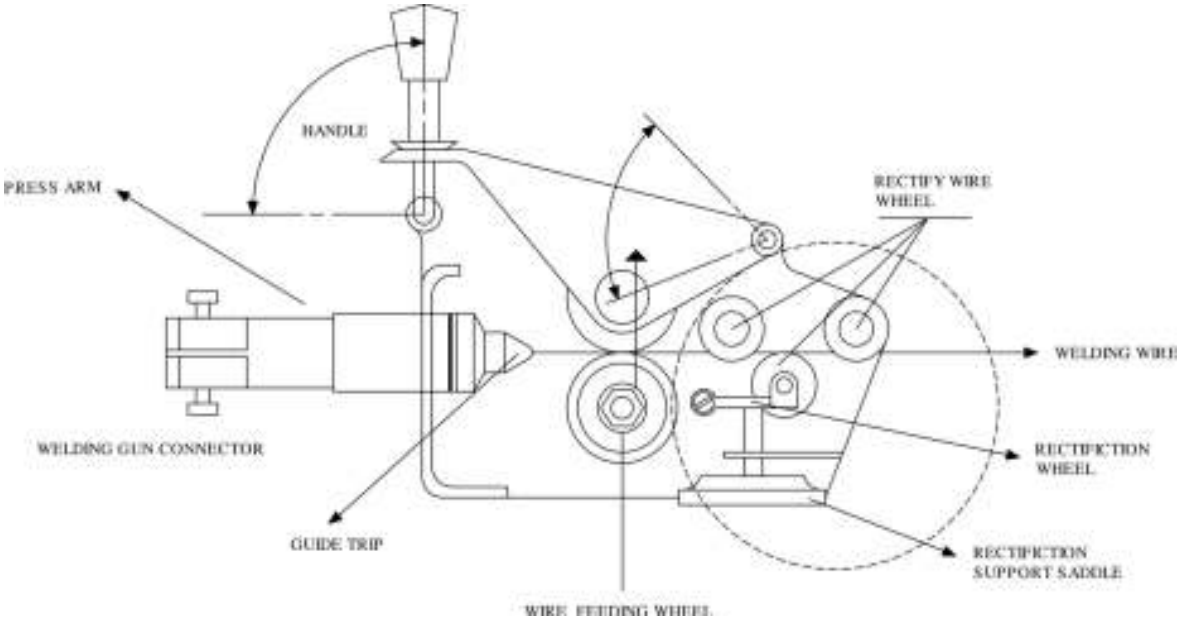


Figure 3 : Installation sketch map of welding wire

4.2 Directions of the basic welding

Welding can be performed by the "crater" switch and welding torch switch on the panel in two methods : a) with crater self-lock and b) without crater function.

4.2.1 Welding operation with crater function

1) Features instruction:

a) The main features of the welding function is the ability to fill up the hollows when ending weld, which can be propitious to connect the start-point and end-point of the welding seam continuously;

b) Mainly used in welding middling thickness plate;

c) The self-lock will be canceled if the arc is stopped for more than 0.5s.

2) Operation regulations

a) Select the 4T mode ;

b) press the welding torch switch, it begins to feed gas (gas pre-flow time) . After feeding gas for some time, welding voltage appears, then coming into the arc starting state and begins to feed wire slowly. After successful arc starting, the wire feeding speed will become normal, and then welding current appears. Then you can release the welding torch`s switch, welding goes into the self-lock state. Simultaneously, you can adjust the "welding voltage adjustment" knob and "welding current adjustment" knob for the best welding performance;

c) When welding is finishing, press the welding torch switch again, and it come into crater adjustment state. Then, set the crater voltage and current by adjusting the relative knobs on the welding power panel (or adjust them to the needed values respectively in advance, commonly to the 60 ~ 70% of the normal welding current) , thus you can control and adjust the effect of filling up hollows at the end of welding. Then release the welding torch`s switch again, wire feeding stops immediately, it will come back to burn state, the welding voltage will decrease and become back burn voltage. When the welding current becomes zero, arc quenches, gas feeding stops, and the welding finishes.

4.2.2 Welding operation without crater function (operate with welding torch`s switch synchronously)

1) Features instruction:

a) Press the welding torch`s switch to start welding, and loosen it to stop welding.

b) It is suitable for orientation welding and spot welding of thin plate.

c) There is no crater process.

2) Operation regulations:

a) Select the 2T mode;

b) press the welding torch switch, it begins to feed gas (gas pre-flow time) . After feeding gas for some

time, welding voltage appears, then coming into the arc starting state and begins to feed wire slowly. After successful arc starting, the wire feeding speed will become normal, and then welding current appears. But you can`t release the switch now.Simultaneously, adjust the "welding voltage adjustment" knob and the "welding current adjustment"knob for the best performance of welding;

c) When welding is finishing, release the welding torch switch, wire feeding stops immediately, and become back burn state, The welding voltage will decrease and becomes back burn voltage. When welding current becomes zero, arc quenches, gas sending stops, and the welding finished.

5 . Directions of prolonged output cable

The connection cable on this series of machine is allowed to be lengthened between power source and wire feeder, but the below regulations have to be followed.

a) The resistance of cable will increase with length, and also increase of the cable's voltage drop. Moreover,the cross section area of the cable effect the voltage drop;

b) When lengthening the cable, get the cable with higher cross section area ;

c) When lengthening cable, place the cable straight don't make in coil form.

6 . Technique conditions

6.1 Technical parameters

TYPE / PARAMETER		COMBO-401 i	COMBO-501 i
Shield rank		IP21S	
Rated input voltage		Three-phase power 3~415VAC 50Hz	
Rated input capacity		16.5KVA	26.3KVA
Gas-shield welding	Output current	60 ~ 400A	60 ~ 500A
	Output voltage	17 ~ 39V	17 ~ 39V
manual welding	Output current	60 ~ 400A	60 ~ 500A
	Output voltage	22.4 ~ 34V	22.4 ~ 40V
Crater current		80 ~ 400A	80 ~ 500A
Crater voltage		17 ~ 40V	17 ~ 40V
Duty cycle		100%	100%
Rated current		400A	500A
Suited welding wire's diameter		Solid 0.8mm 1.0mm 1.2mm	Solid 1.0mm 1.2mm 1.6mm
		Flux-cored 0.8mm 1.0mm 1.2mm	Flux-cored 1.0mm 1.2mm 1.6mm
Outline (length×width×height)		640×290×530 (mm)	640×320×570 (mm)
Weight		39Kg	45Kg

* Its rated duty cycle is 60%, that means in a 10 minutes working period , the machine will run for 6 minutes under rated welding current and rest for 4 minutes. If the Rated duty cycle is 100%,that means in a 10 minutes working period , the machine will run for 10 minutes under rated welding current without rest. If the machine works over the rated duty cycle, the inner temperature will rise and exceed the fixed threshold. In

order to avoid worsening the performance or even burning out the machine, there is heat protection on this series of welding machine. When the inner temperature exceeds the set temperature, the heat protection will shutdown the machine, the overload indicator LED glows, at this time the machine has no output. Wait until the temperature is below the set temperature and the overload indicator LED will turned off, the machine recovers and you can do welding again.

6.2 Crater ON function

Normally there is a small depressing at the end of the weld when welding is done at higher currents. The depression is called crater, the arc crater are caused because of the arc force and solidification of metal in all direction. To minimize the crater the machine has crater fill function.
Normally crater fill voltage and current set at 60 to 70 % of the welding voltage and current. When crater is set ON (4 step mode) the welding voltage and current will automatically switch to lower voltage and current (crater voltage and current) at the end of the welding.

To guaranteed better arc striking every time the wire feeding is normally done at lower speed. When the torch trigger is pressed irrespective of the current (wire speed) set , wire will be fed slowly and it switches over to the set speed once the arc is struck.

What is burn-back time?

After welding, wire feeder is not stop even if the welding torch switch is shut down because of inertia. So there will be some more wire drive out from the torch, thus the wire will stick to the workpiece, or it will cause difficulty in arc striking next time. In order to avoid this , it is necessary to deal with welding machine operation , so that after releasing the welding torch switch, the output voltage will still exist for a short time to burn the wire. This process time is burn-back time. This time varies because of differences in welding conditions, the resistance of welding feeding tube and the length of output cable.

6.3 Examples of welding condition

Data in table 1, table 2 is the reference value under the standard condition.

When welding, please correct the values according to work pieces and the welding position to get the right welding conditions.

Table 1:

		Thickness (mm)	Length (mm)	Wire diameter (mm)	Welding current (A)	Welding voltage (V)	Welding speed (cm/Min)	Stick out (mm)	Gas flow (L/ Min)
T type welding	Slow speed	1.0	2.5 ~ 3	0.8	70 ~ 80	17 ~ 18	50 ~ 60	10	10 ~ 15
		1.2	3 ~ 3.5	1.0	85 ~ 90	18 ~ 19	50 ~ 60	10	10 ~ 15
		1.6	3 ~ 3.5	1.0,1.2	100 ~ 110	18 ~ 19.5	50 ~ 60	10	10 ~ 15
		2.0	3 ~ 3.5	1.0,1.2	115 ~ 125	19.5 ~ 20	50 ~ 60	10	10 ~ 15
		2.3	3 ~ 3.5	1.0,1.2	130 ~ 140	19.5 ~ 21	50 ~ 60	10	10 ~ 15
		3.2	3.5 ~ 4	1.0,1.2	150 ~ 170	21 ~ 22	45 ~ 50	15	15 ~ 20
		4.5	4.5 ~ 5	1.0,1.2	180 ~ 200	23 ~ 24	40 ~ 45	15	15 ~ 20
		6	5 ~ 5.5	1.2	230 ~ 260	25 ~ 27	40 ~ 45	20	15 ~ 20
		8, 9	6 ~ 7	1.2,1.6	270 ~ 380	29 ~ 35	40 ~ 45	25	20 ~ 25
		12	7 ~ 8	1.2,1.6	300 ~ 380	32 ~ 35	35 ~ 40	25	20 ~ 25
	High speed	1.0	2 ~ 2.5	0.8	140	19 ~ 20	150	10	15
		1.2	3	0.8	140	19 ~ 20	110	10	15
		1.6	3	1.0, 1.2	180	22 ~ 23	110	10	15 ~ 20
		2.0	3.5	1.2	210	24	110	15	20
		2.3	3.5	1.2	230	25	100	20	25
		3.2	3.5	1.2	260	27	100	20	25
		4.5	4.5	1.2	280	30	80	20	25
		6	5.5	1.2	300	33	70	25	25
Put up weld (thin plate)	Slow speed	0.8		0.8	60 ~ 70	16 ~ 17	40 ~ 45	10	10 ~ 15
		1.2		0.8	80 ~ 90	18 ~ 19	45 ~ 50	10	10 ~ 15
		1.6		0.8	90 ~ 100	19 ~ 20	45 ~ 50	10	10 ~ 15
		2.3		0.8	100 ~ 130	20 ~ 21	45 ~ 50	10	10 ~ 15
				1.0,1.2	120 ~ 150	20 ~ 21	45 ~ 50	10	10 ~ 15
		3.2		1.0,1.2	150 ~ 180	20 ~ 22	35 ~ 45	10 ~ 15	10 ~ 15
		4.5		1.2	200 ~ 250	24 ~ 26	40 ~ 50	10 ~ 15	10 ~ 15
	High speed	2.3 ~ 3.2		1.2	220	24	150	15	25
					300	26	250	15	25
Corner weld	Slow speed	1.6		0.8	65 ~ 75	16 ~ 17	40 ~ 45	10	10 ~ 15
		2.3		0.8	80 ~ 100	19 ~ 20	40 ~ 45	10	10 ~ 15
		3.2		1.0, 1.2	130 ~ 150	20 ~ 22	35 ~ 40	15	10 ~ 15
		4.5		1.0, 1.2	150 ~ 180	21 ~ 23	30 ~ 35	15	10 ~ 15

Table 2:

		Thick -ness (mm)		Wire diameter (mm)	Root gap G(mm)	Welding current (A)	Welding voltage (V)	Welding speed (cm/Min)	Wire out (mm)	Gas flux (L/Min)
I type butt welding	Slow speed	0.8		0.8	0	60 ~ 70	16 ~ 16.5	50 ~ 60	10	10
		1.0		0.8	0	75 ~ 85	17 ~ 17.5	50 ~ 60	10	10 ~ 15
		1.2		0.8	0	80 ~ 90	17 ~ 18	50 ~ 60	10	10 ~ 15
		1.6		0.8	0	95 ~ 105	18 ~ 19	45 ~ 50	10	10 ~ 15
		2.0		1,1.2	0 ~ 0.5	110 ~ 120	19 ~ 19.5	45 ~ 50	10	10 ~ 15
		2.3		1,1.2	0.5 ~ 1	120 ~ 130	19.5 ~ 20	45 ~ 50	10	10 ~ 15
		3.2		1,1.2	1 ~ 1.2	140 ~ 150	20 ~ 21	45 ~ 50	10 ~ 15	10 ~ 15
		4.5		1,1.2	1 ~ 1.5	170 ~ 185	22 ~ 23	40 ~ 50	15	15
		6	Face	1.2	1.2 ~ 1.5	230 ~ 260	24 ~ 26	40 ~ 50	15	15 ~ 20
			Inside	1.2	1.2 ~ 1.5	230 ~ 260	24 ~ 26	40 ~ 50	15	15 ~ 20
		9	Face	1.2	1.2 ~ 1.5	320 ~ 340	32 ~ 34	40 ~ 50	15	15 ~ 20
			Inside	1.2	1.2 ~ 1.5	320 ~ 340	32 ~ 34	40 ~ 50	15	15 ~ 20
	High speed	0.8		0.8	0	89	16.5	120	10	15
		1.0		0.8	0	100	17	120	10	15
		1.2		0.8	0	110	18	120	10	15
		1.6		1,1.2	0	160	19	120	10	15
		2.0		1,1.2	0	180	20	80	15	15
		2.3		1,1.2	0	200	22	100	15	20
		3.2		1.2	0	240	25	100	15	20

7. working principle

7.1 Summarize of working principle

The input three-phase AC 415VAC50Hz(60Hz) is rectified and supplied to the IGBT inverter to produce 20 kHz AC. This AC is transformed by the high–frequency transformer and rectified; then goes into the output terminal of DC power source.

7.2 Main electric elementary diagram

Please refer to appendix 1.

8. Troubles and troubleshooting

8.1 Please check with multimeter if there are any troubles:

Three-phase power should be 380 to 440 VAC, check if there is phase missing or exceeding voltage range;

Whether the fuse on the back panel of the welding machine is ok or not;

Whether the three-phase power switch at the switchboard is damaged; Whether the fuse and electrical power wire are installed properly, Otherwise it will cause phase missing and the welding machine will work abnormally.

The control cable of the wire feeder is may be broken, check the continuity of related six pins of the connector plugs at the both ends of the control cable , whether the welding cable is connected properly, and the workpiece is connected tightly.

Whether the torch switch and the wire connected are damaged or open circuit; whether the nozzle, conduct tip , conduct tip's seat and shunt are burned out and damaged.

ATTENTIONS:

This welding machine adopts large capacity,high voltage and electrolytic capacitor filter, it can not be opened until the three-phase power is shut down more than 10 minutes.

8.2 Common troubles and troubleshooting

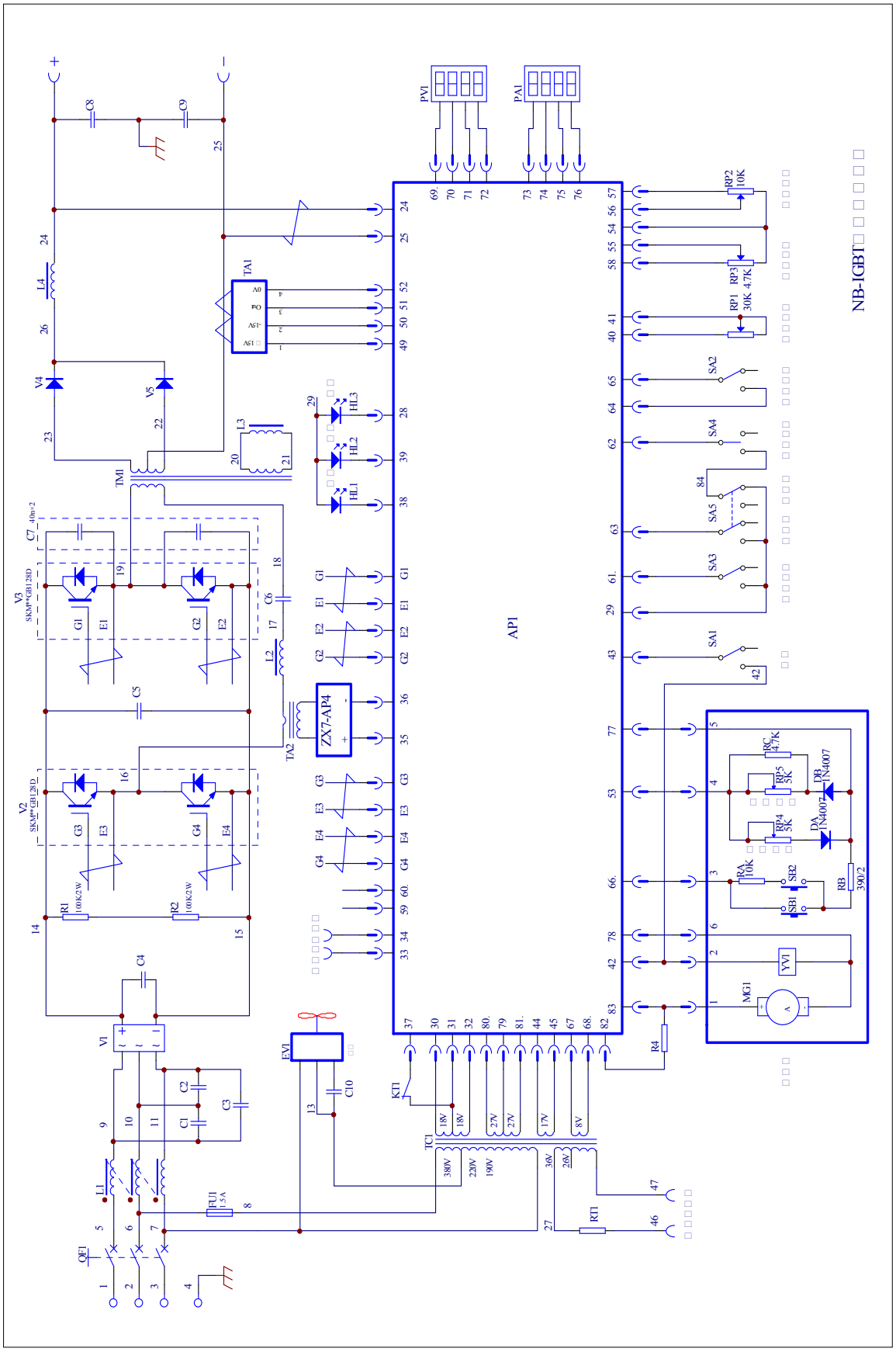
Troubles	Reasons	Troubleshooting
1 . After Turn on power, the indicator lamp doesn't light, the digital meter doesn't light.	1 . Phase lack ; 2 . Power switch is damaged ; 3 . Power control fuse (3A) is blown ;	1 . Check the three-phase power ; 2 . Replace input power switch ; 3 . Replace Power control fuses ;
2 . Welding machine does not work , the undervoltage indicator lamp lights	1 . Phase lack ; 2 . Three-phase power is under voltage ;	1. Check the three-phase power to make sure it meet the requirements of the machine ;
3. There is no output voltage and there is noise inner the machine	1 . The fast recovery diode of the main circuit is damaged ;	1.Check and replace the damaged fast recovery diode;
4 . Welding machine doesn't work , over heat indicator lamp lights	1 . The temperature is too high ; 2 . When welding , cooler fans rotate slowly or don't work, which leads to bad cooling ; 3 . Temperature relay is damaged ;	1 . Welding machine will become normal after rest for some time ; 2. Check the fans power or change cooling fans ; 3 . Replace temperature relay ;
5 . Welding wire feeder works, but there is no wire feeding or the feeding isn't stable.	1 . Wire press wheel is not pressed tightly ; 2 . The type of wire feeding slot doesn't match the welding wire ; 3 . The tip is jammed because of the spatters ; 4 . The wire feeding roller is damaged ; 5 . The wire feeding tube of the welding torch is jammed ; 6 . The curving semidiameter of the welding torch cable is too small ;	1 . Press tightly ; 2. Replace wire feeder wheel slot ; 3 . Clean the spatters in the tip ; 4 . Change wire feeding roller ; 5 . Blow off the dust with the dry compressed air or replace a right one with the same type ; 6. Make the curving semidiameter of welding torch cable over 300mm ;
6 . The feeder don't work after pressing down the torch switch or there is no open circuit voltage	1 . The control cable of the wire feeder is broken ; 2 . Short circuit of welding gun switch; 3 . The PCB is broken ;	1 . Replace the control cable ; 2 . Check control wire of the welding torch switch ; 3 . Repair or replace the PCB ;
7 .Many pores in the welding seam	1 . CO_2 gas is not pure ; 2 . The gas flow is not enough ; 3 . There is rust or oil in the welding seam ; 4 . The wind is strong when welding ; 5 . The path of CO_2 is jammed or air	1 . Use pure CO_2 gas ; 2 . Adjust the gas flow ; 3 . Clean the welding seam ; 4 . The precaution against wind should be adopted ; 5 . Check the path;

	leak； 6．Valve doesn't work； 7．The nozzle is distorted；	6．Check the voltage 24VDC of the valve winding； 7．Replace the nozzle；
8．Current /voltage is out of control	1．Control cable of wire feeder is broken； 2 .Current /voltage adjust potentiometer is damaged； 3．The PCB is damaged；	1．Replace the control cable； 2．Replace the potentiometer； 3．Repair or replace the PCB；
9. Wire feeding starts without pressing down the welding torch switch	1．The wire connecting welding gun is short circuit； 2．Control cable of the wire feeder has short circuit； 3 .The manual button of wire feeding is damaged；	1 .Repair or change welding gun； 2．Repair or change control cable； 3．Change the manual button of wire feeding；
10．The current isn't stable, and there is too much spatter	1．Welding criterion is wrong； 2．The quality of wire is bad； 3．There is rust or oil on the welding device or wire； 4．Too much fluctuation of distribution voltage； 5 .The stick out of the wire is too long； 6．wrong position of the wire diameter select switch； 7．The type of wire feeding slot doesn't match the welding wire； 8．Problems in the protective gas； 9．Incorrect type of the tip or the aperture of the tip becomes too big; 10．Too much feculency in the wire feeding tube，the resistance of the feeding wire is too large； 11．The ground cable becomes loose；	1．Adjust the welding criterion again； 2．Change wire； 3．Clean the welding device and wire； 4．The fluctuation of the line voltage can't exceed ±15%； 5．The stick out should be about 10 times than the wire diameter； 6．select a right position of wire diameter select switch； 7．Replace wire feeding wheel slot； 8．Use the purer gas； 9．Replace tip； 10．Clean the wire feeding tube； 11 .Fix the cable connected to the ground tightly；
11．Gas heater frosts	1. The input power fuses of the heater (5A) is burned； 2. The resistance wire of the heater is broken；	1. Replace the fuse with the same type； 2. Repair or replace the heater；

ATTENTION:

Only qualified technicians are allowed to perform troubleshooting work on the machine.If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact our service department for technical assistance.

1


NB-IGBT
AP1
PV1
PA1
TA1
TM1
L1
L2
L3
L4
ZX7-AP4
V1
V2
V3
V4
V5
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
R1
R2
R4
RP1
RP2
RP3
RP4
RP5
RA
RB
RC
SA1
SA2
SA3
SA4
SA5
SB1
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MG1
QF1
FU1
TC1
DA
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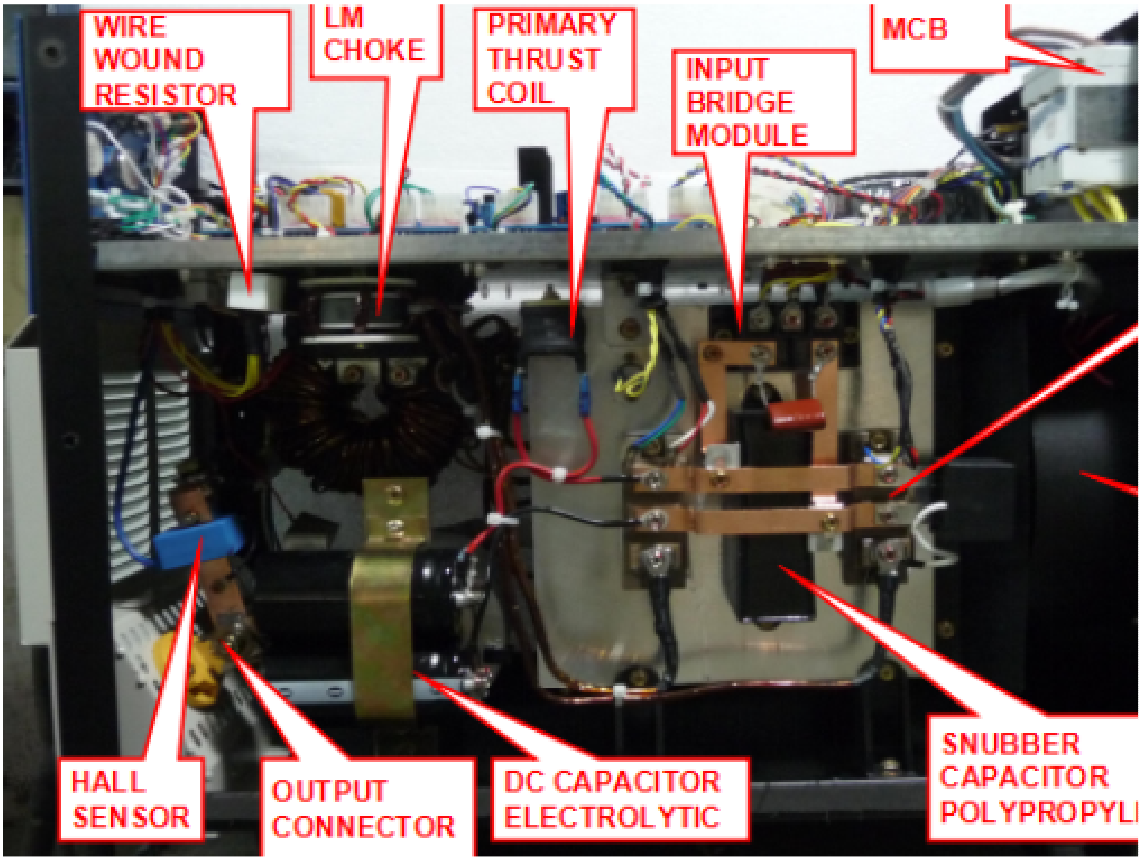
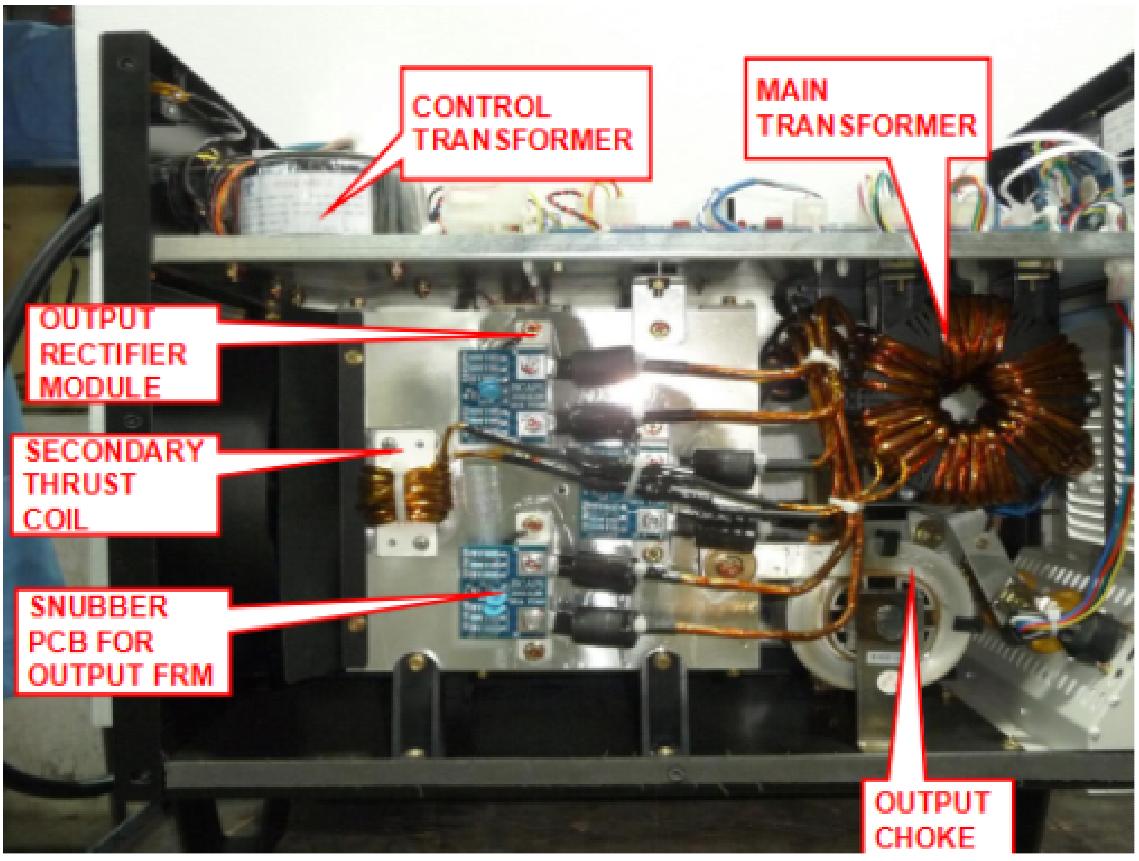
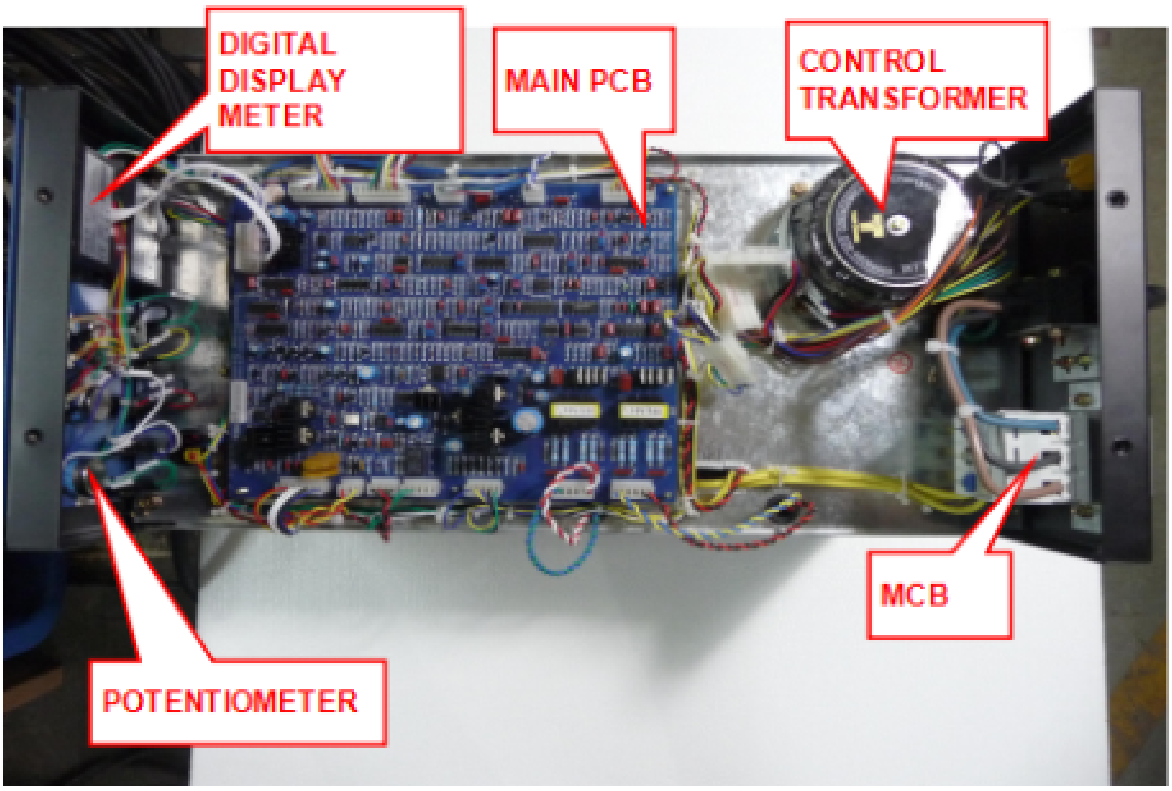


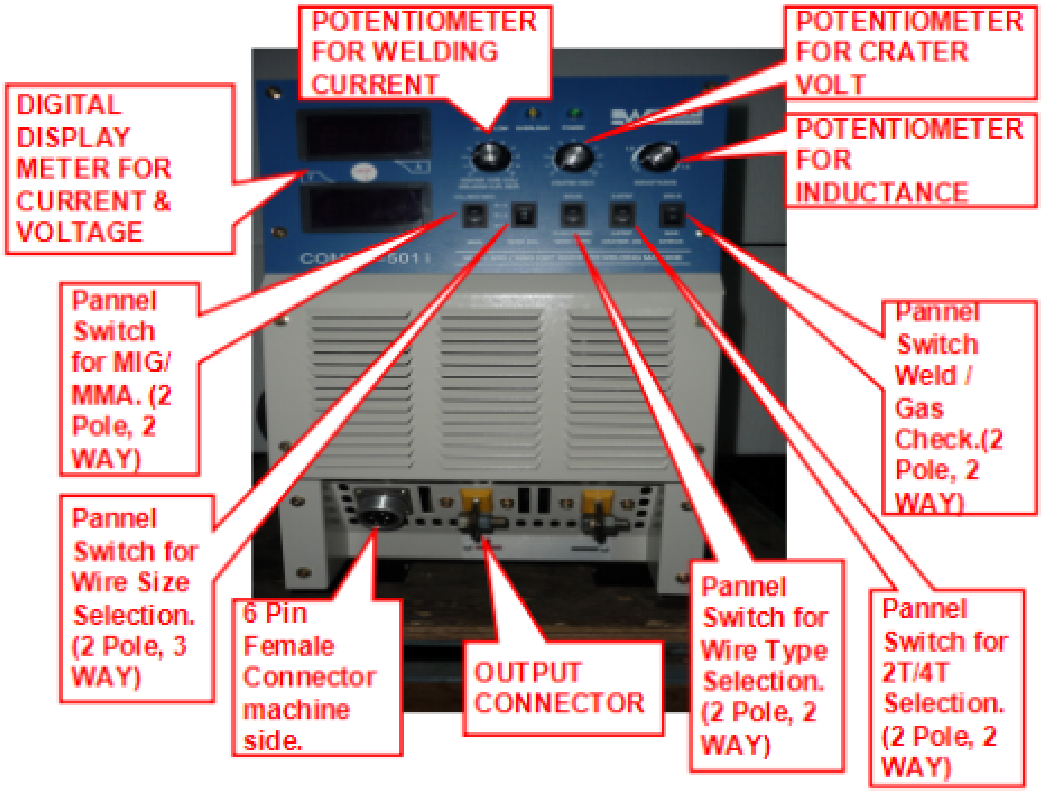
Picture 1- Right View.



Picture 2- Left View.



Picture 3- Top View



Picture 4- Front View.

COMBO I Parts List.

		Combo 401I	Combo 501I
S.No	Description.	Part Code	Part Code
1.	Main PCB	PCB-COMBO-401	PCB-COMBO-501
2.	IGBT	IGBT10012	IGBT10012
3.	INPUT BRIDGE MODULE	IBDG007	IBDG003
4.	Output Rectifier Module.	FRM001	FRM001
5.	FAN	FAN002	FAN002
6.	DC CAPACITOR	C-200UF/400V	C-200UF/400V
7.	MCB	MCB001	MCB001
8.	DIGITAL DISPLAY METER FOR CURRENT & VOLTAGE.	DSP005	DSP005
9.	THERMAL CUTOUT SENSOR	C2373	C2373
10.	Snubber PCB.	PCB-SNB-OUT-05	PCB-SNB-OUT-05
11.	CONTROL TRANSFORMER	CTRAX-B68	CTRAX-B68
12.	MAIN TRANSFORMER	MTRXB68	MTRX-B68
13.	FAN CAPACITOR	CAP05	CAP05
14.	HALL SENSOR	CS-500A/4V	CS-500A/4V
15.	Snubber Capacitor	C-8UF/800VDC	C-4UF-500 VDC
16.	Snubber capacitor box	C-0.027uF-1KV	C-0.027uF-1KV
17.	LED INDICATOR	LED-R-5MM, LED-Y-5MM, LED-G-5MM	LED-R-5MM, LED-Y-5MM, LED-G-5MM
18.	Panel Switch	PSW001	PSW001
19.	Wire wound Resistor	R-0.5OHMJ	R-0.5OHMJ
20.	Wire wound Resistor	R-1KJ	R-1KJ
21.	6 Pin Connector (F) machine side.	CON-6PNF	CON-6PNF
22.	AC CAPACITOR	CAP003	CAP003
23.	POTENTIOMETER FOR CURRENT	POT001	POT001
24.	POTENTIOMETER FOR CRATER VOLT	POT004	POT004
25.	POTENTIOMETER FOR INDUCTANCE	POT-33K	POT-33K
26.	OUT PUT CHOKE	CHK001	CHK001
27.	SECONDARY THRUST COIL	THCL-S-501	THCL-S-501
28.	O/P Connector	OUTCON001	OUTCON001
29.	Snubber PCB FOR Output FRM	PCB-SNB-OUT-05	PCB-SNB-OUT-05

	WIRE FEEDER DETAIL		
		Combo 401I	**Combo 501I**
S.No	**Description.**	**Part Code**	**Part Code**
1.	Wire feeder Motor	WFMTR002	WFMTR002
2.	SOLENOID VALVE	SV002	SV002
3.	6 PIN CONNECTOR (M)	CON-6-CM-M-01	CON-6-CM-M-01
4.	POTENTIOMETER FOR WELDING VOLTAGE	POT001	POT001
5.	POTENTIOMETER FOR WELDING CURRENT	POT001	POT001
6.	INCHING SWTTCH	INCSW001	INCSW001
7.	SPOOL HOLDER	SPOOL HOLDER-001	SPOOL HOLDER-001

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