Thyristor Based

MIG Welding Machines

Operating Manual

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CATALOGUES

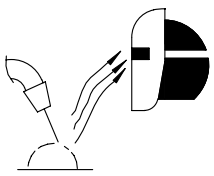
I. SAFE MEASURE:

Though the safety of welder has been fully considered during design and manufacture, please notice the regulation of operation manual during operation. Only qualified special person

For guarding against being electrified or serious personal injury caused by accident, please obey the following rules.

can be allowed to install, operate, maintain and repair the welder. A few explanations of safe measure are given as follows:

* Avoid other person close to welder or welding operation area without definite purpose.
* Not allowed by doctor, the person with heart pulser shouldn't close to welder or welding operation area when welder is operating. Because at that time, magnetic field produced by welder seriously influence heart pulser.
* Don't touch the electric part.
* Before repair, please turn off the switch of distribution box.
* Don't use the cable without enough capacity, damaged or with baring electric part.
* For the cable connection part, please tighten first and then take insulation treatment.
* Please wear with dry gloves and safe shoes instead of worn or wet ones.
* Please use safe net and belt when operate at the place above ground.
* Periodically maintain and inspect the welder. It can be used only after the damage part has been repaired.



Please use protection utensils for guarding against arc light, spatter, noises and so on.

* Don't immerse welding electrode handle in water for cooling.
* When welding process is over, please cut off all power supply.

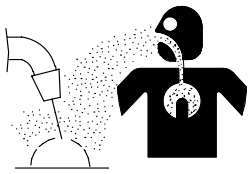
- Arc light would cause inflammation of eyes and burn on skin.

- Spatter would bung up eyes and cause scald.
- Noises would cause hearing abnormity.

* Please use hand shield with enough shading function while welding or observing.

* For guarding against spatter, please wear protection glass.

* During welding, please use protection utensils such as fur gloves, long sleeves work clothes without reversal pleat, feet shade, fur apron and so on.



Please use protection utensils for guarding against soot and gas produced during welding process.

* Please put barriers around welding site for guarding against arc light hurting eyes.

* If the welding site is very noisy, please use sound insulation utensils.

- Soot and gas produced during welding process is harmful to health.
- Welding at narrow site would cause air lacking and suffocation.
- For guarding against gas poisoning and suffocation, please use local exhaust or breathing protection utensils prescribed rule of law (Rule of labor, safety, hygiene; Rule of guarding against powder).

* Welding at narrow site, please ventilate very well or use breathing protection utensils. At same time, the disciplined surveillant should keep watch on welding.

* Don't weld near busywork of degreasing and spraying because harmful soot and gas will be produced if weld at the place.

For guarding against fire, explosion and rupture, please obey the following items.

* Please ventilate the room very well or use breathing protection utensils because of soot or gas produced while welding deep steel plate.

- Spatter or base metal just welded can cause fire.

- If cable isn't connected very well or current of base metal isn't unhindered, the electrified part would heat and cause fire.
- For initiating arc on petrol or other combustibles would cause explosion.
- Welding hermetic seal jar or tube would cause explosion or rupture.

* Remove the combustible article to keep spatter away from them. If they can't be removed, please cover them with articles which isn't combustible.
* Don't weld at the place with combustible gas.
* Don't put base metal just welded near combustible article.
* Welding the part about roof, floor or wall, please remove combustible article at shelter.
* Please tighten and insulate connecting part of cable.
* Cable should be locally connected with base metal as near base metal as possible
* Please adopt good ventilating measure while welding hermetic seal jar or tube.
* Be ready for all eventualities, please place fire extinguisher nearby.

II.INTRODUCTION OF EQUIPMENT:

1. Application and characteristic:

Absorbing advanced technology at home and abroad, the company has developed high-efficiency welder WONDERMIG series CO_2 gas shielded arc welding machine. With reasonable layout and excellent performance, it's easy to be operated and maintained. So it's widely used in many fields such as power, oil, shipbuilding, architecture, mechanical manufacture and so on. The prominent characteristic is as follows:

- Because adopt initiating arc with high voltage and slow wire drive feed control, the rate of success has been over 95%.
- Automatically keeping crater function is suitable for long welding seam and can achieve best crater effect.
- With removing melting ball function (FTT), when welding is ended, the small ball at the end of wire will be automatically removed.
- With protection function about short circuit of secondary winding and overheat.

- The dust-proof performance is excellent. Adopting the dust-proof design of space for printed wiring board, the performance is improved by a big margin. So the application fields and spaces are wider.
- The stability and reliability are excellent. All main elements such as semiconductor and others are original assembly device imported.
- With excellent dynamic characteristic, stable arc, less spatter and beautiful weld bead formation.
- Arc with deep penetration, deep melting slot and good welding seam.
- Strong function of power network compensation.

2. Main technical data are shown as List 1.

List 1 List of main technical data of WONDERMIG series

Model	WONDERMIG 400	WONDERMIG 500
Rated input voltage	3 phase 415V 50Hz	3 phase 415V 50Hz
Rated input capacity	16.9KVA	32KVA
No-load voltage	50V	65V
Welding voltage	17 - 35V	18 - 42V
Output current	60-400A	80-500A
Rated duty cycle	60%	60%
Suitable wire dia.	1.2 - 10mm	1.5 - 20mm
Suitable plate thickness.	0.8/1.0/1.2	1.2/1.4/1.6
Overall dimension (mm)	690×384×750	690×440×795
Weight (kg)	120	155

3. Control function of panel is shown as Fig.1, List 2.

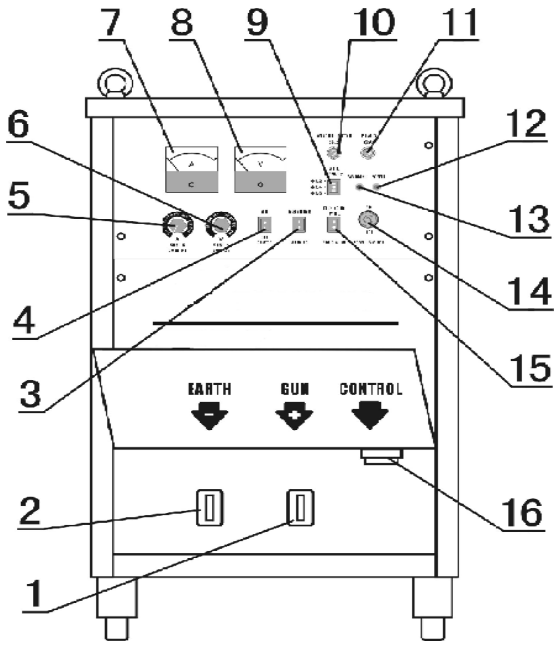


Fig.1 Control function of panel diagram

List 2 Introduction of panel control function

No.	Name	Function
1	Output terminal +	The positive electrode connected with welding gun.
2	Output terminal -	The negative electrode connected with work piece.
3	Checking gas changer	Preset gas flow before welding.
4	Crater changer on/off	While welding, it's used to decide crater voltage, current exists or not.
5	Crater current adjustment	While welding, it's used to adjust crater current.
6	Crater voltage adjustment	While welding, it's used to adjust crater voltage.
7	Ampere	Show the value of output current.
8	Voltmeter	Show the value of output voltage.
9	Wire diameter changer	For choosing diameter of wire.
10	Motor fuse	Overload and short-circuit protection for wire drive feed power supply.
11	Power fuse	Overload and short-circuit protection for power supply.
12	Power indicator	If the welder has been electrified, the indicator will light up.
13	Alert indicator	If the welder is overloaded or other abnormal phenomena appear, the indicator will light up.

14	Power source switch of welder	Control the distribution box contacting with the internal circuit of welder.
15	Welding wire type changer	According to needing choose flux-cord wire or welding wire.
16	Control socket	For inserting control plug of wire drive feed device into the socket.

III.INSTALLATION OF EQUIPMENT:

1. Requirement of installing environment

- The welder should be installed at the place without rain and direct shining. The humidity should be low. Less dust is allowed there. The temperature should be -5°C ~ +40°C.
- No any metal or others are allowed to be in the welder.
- The distance between welder and wall should be over 200mm. If the welder is installed side by side, the distance between them should be over 300mm.
- The arc should be initiated at the place without wind. Otherwise, please set fender.
- For guarding against gas poisoning and suffocation, please ventilate. Otherwise, please install exhaust or use breathing protection utensils.

※ Note: ① **Allowed network voltage fluctuation is ±10% of rated input voltage.**

② **If there is no network power, when using engine as power supply, please notice the capacity of engine should be over 2 times of welder and the engine should be with compensating winding.**

2. Connection of welder and distribution box is shown as Fig.2

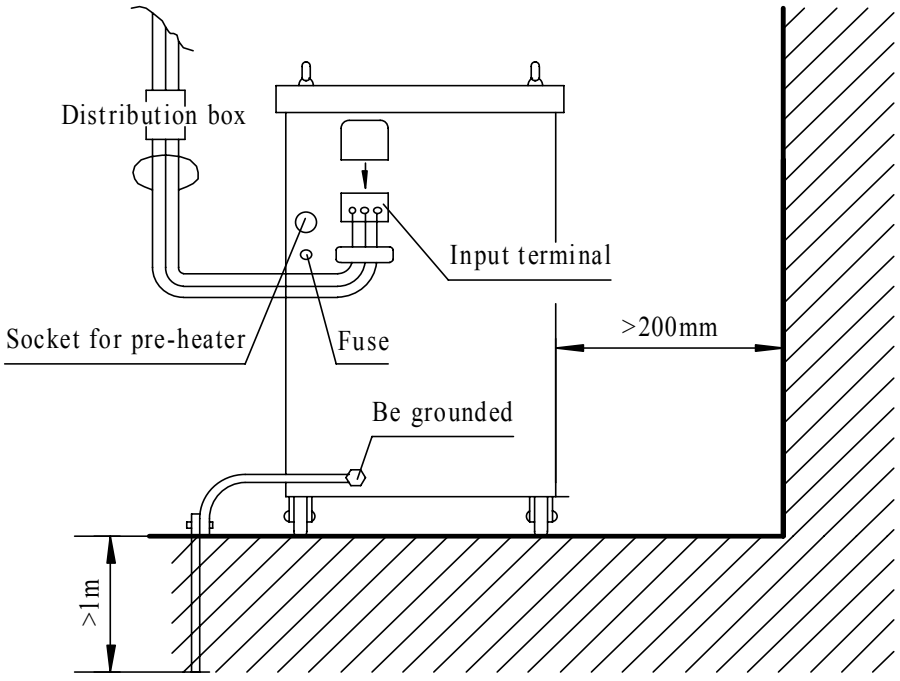


Fig.2 Connection of welder and distribution box

① Please loosen the two M4 screws of input terminal cover and take the cover off.

② Connect the input cable to input terminal.

③ Well tangle the leakage of electricity part with insulation rubberized tape.

④ Assembly the input terminal cover again and tighten up the screws.

⑤ Connect the other end of input cable to the automatic switch of distribution box or circuit breaker without fuse (or leakage of electricity protector)

⑥ Ground base metal with cable whose section area is over 14mm^2.

3. Connection of welder with base metal, wire drive feed unit, welding gun, cylinder and so on is shown as Fig.3.

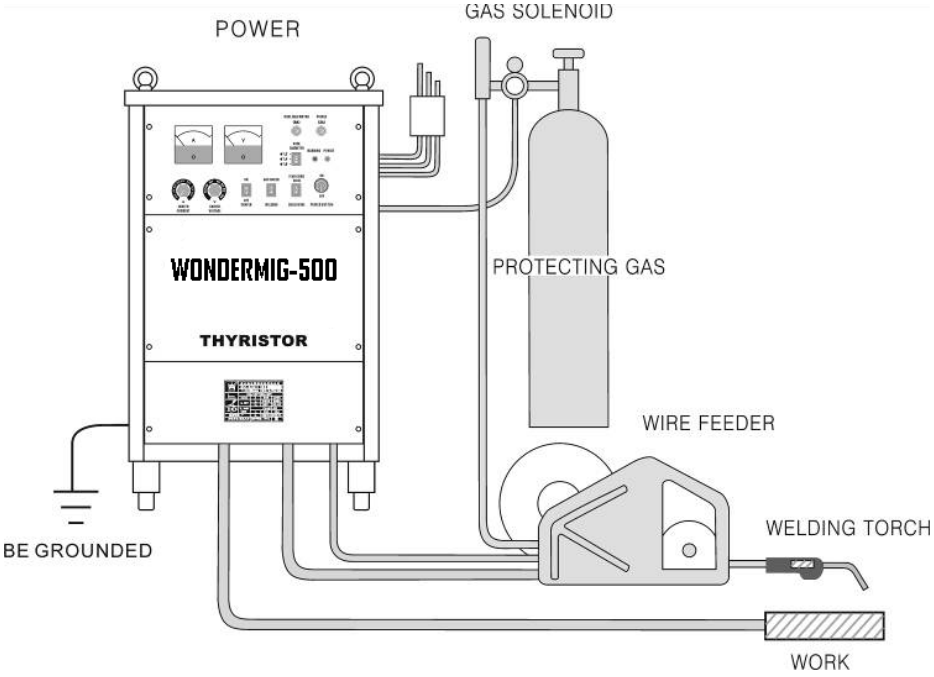


Fig.3 Connection of welder with base metal, wire drive feed unit, welding gun, cylinder.

① Connection of welder and base metal:

a) Turn off power switch of distribution box and welder.

b) Remove the two screws of output terminal cover board and lift the board.

c) Connect one end of base metal cable to the negative electrode of output terminal.

d) Connect the other end of base metal cable to base metal.

e) Ground base metal with cable whose section area is over 14mm^2.

※ Note: Don't assembly the cover board again at once. After the wire drive feed unit is well connected, please tighten the screws up.

② Connection of welder with wire drive feed unit and welding gun:

a) Turn off power switch of distribution box and welder.

b) Insert the control cable plug of wire drive feed unit to the socket of welder along guiding slot and tighten it up.

c) Connect the output cable of wire drive feed unit to the positive electrode of output terminal. And well tangle the leakage of electricity part with insulation rubberized tape.

Prompt	* Before operating, carefully read the "Safe measure"of operation manual. * Operator must wear protection eyes glass, ear cover, proper clothes. Otherwise, he (or she) would be hurt by arc.

d) Connect the gas tube of wire drive feed unit to the outlet of gas flow meter.

(Note: Now please put the output terminal cover board down and tighten the screws up.)

e) Along the jag direction insert CC joint of welding gun. Rotate it 90°and tighten it up with screws.

f) Connect the gas tube of welding gun to the gas outlet of wire drive feed unit. Insert the control plug of welding gun into the control socket of wire drive feed unit.

③ Connection of welder and heat pressure reducer:

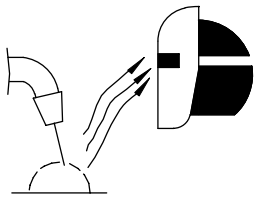
a) Assembly gas heater on gas cylinder with joining nut. Tighten the nut up with wrench.

b) Connect the gas tube of wire drive feed unit to the outlet of gas flow meter.

c) Insert cable plug of heater into the socket at the rear of welder.

IV. BRIEF INTRODUCTION OF WELDING OPERATION:

1. Inspect and prepare before welding:



① Please carefully inspect the whole set of equipment again. Only after be sure of correct connection according to Fig.3, the operator can be allowed to prepare for welding.

② Prepare to weld:

a) Turn on the switch of distribution box and welder, the power indicator lights up.

b) Set the gas checking switch at “checking gas ”position.

c) Make heater knob being in closing status. Slowly loosen cylinder switch. At this time, the pressure meter shows gas pressure inside cylinder.

d) Slowly rotate flow adjustment knob in opening direction. According to the case of work piece and so on, adjust the flow value. (Shown on flow meter).

e) After adjust the flow set the checking gas switch at “Welding” position.

③ Fix wire:

a) According to welding necessary, inspect if the wire drive feed roller and the wire is matching.

b) Pull the pressure handle down to left and lift pressure arm up.

c) Adjust rectifier (No rectifier in 200K/400K model welder). Loosen locking nut. Adjust bolt and rectify.

d) Assembly wire spiral on wire drive feed shaft. Notice the spiral should be rotated in clockwise. Then fix sheltering flake and tighten the screws up.

e) Remove proof-loosening device from the edge of spiral. Notice whether wire rebounds, loosens or not.

f) Pull wire out, cut off waste end of wire. Make wire pass through the gap among rectifying rollers (For 200K/400K model welder, that’s wire drive feed contact tip) and CC joint.

g) In proper order, please reset pressure arm and handle.

h) According to wire diameter, rotate pressure handle for adjusting pressure. The wire thicker, the pressure stronger.

i) Press on fast wire drive feed switch, then begin to loosen it. (Notice thinner wire Φ0.8 is easily broke. Please rein in wire drive feed speed.)

2. Welding operation:

Two welding methods can be adopted by using the crater changer and welding gun switch on top panel.

① Welding with crater function:

The method is suitable for filling the sunken part when welding is over. It's also suitable thick plate. The operation process is shown as follows:

Set crater changer at "With"position. Successively press and loosen the welding switch for two times to weld. It's shown as Fig.4.

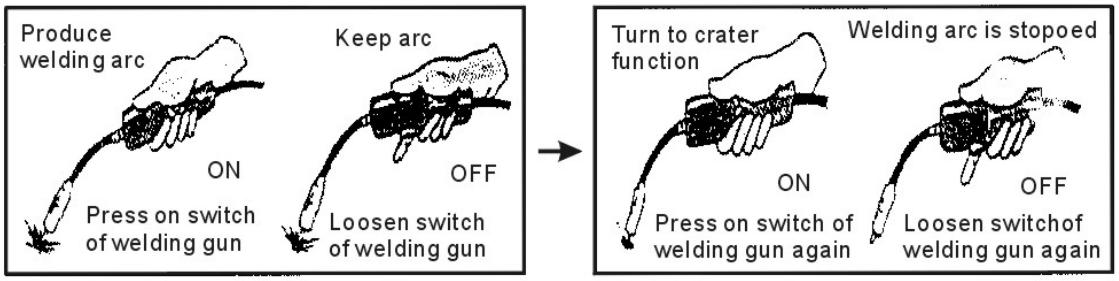


Fig.4 welding with crater function

Work program diagram: Shown as Fig.5. Self-lock through operating the welding gun switch. When stop welding, the welding current reduces. It's time to fill in crater. But if the process of breaking arc off exceeds 0.5 seconds, the self-locking is relieved.

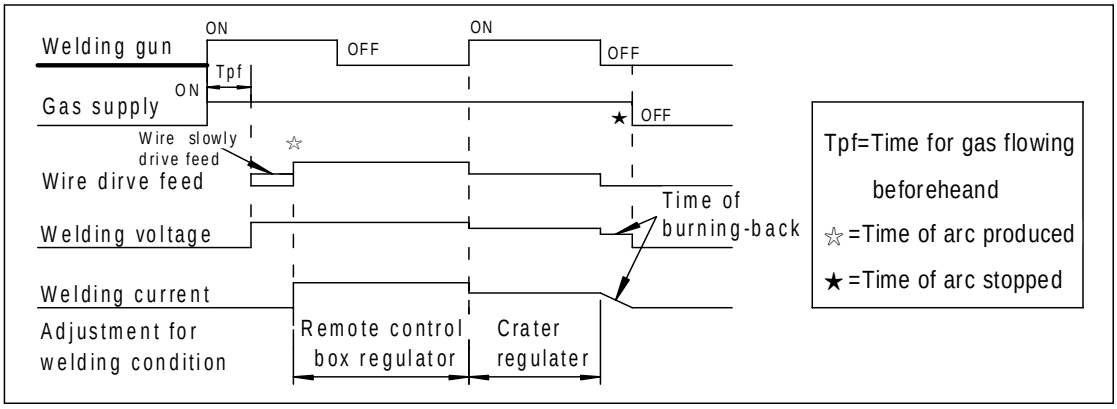


Fig.5 Work program diagram of welding with crater function

② Welding without crater function (At the same time operate welding gun):

The method is suitable for repeatedly position, instantaneous and sheet welding. The operation process is shown as follows:

Set crater changer at “Without”position. With pressing on welding switch or not, welding arc is produced or stopped. It’s shown as Fig.6.

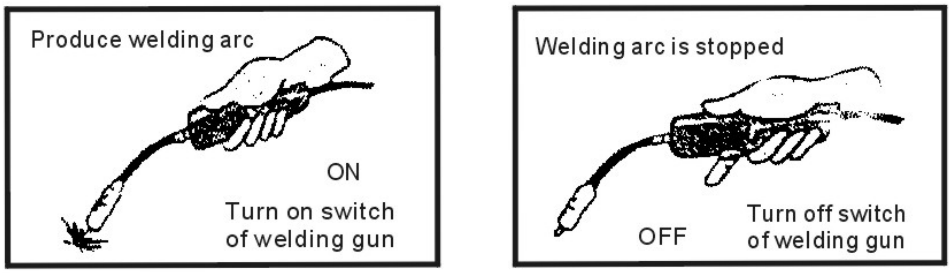


Fig.6 Welding without crater function

Work program diagram Shown as Fig.7.

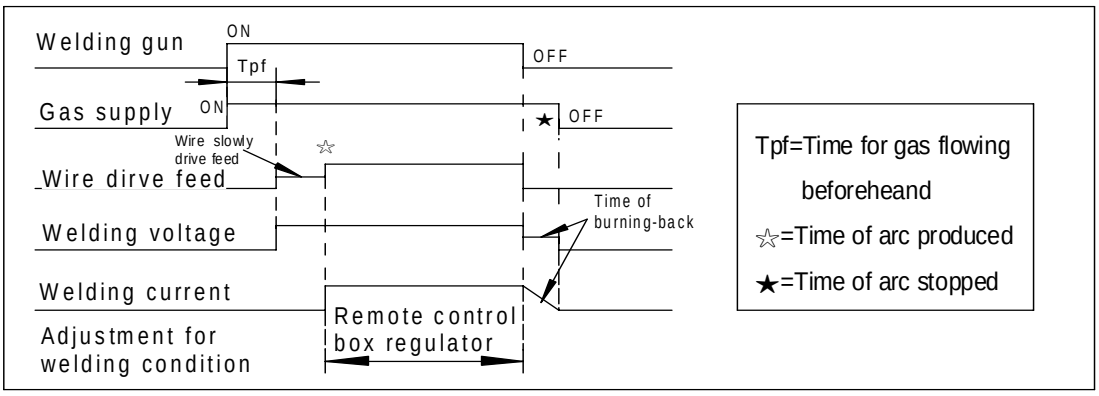


Fig.7 Work program diagram of welding without crater function

3. Usage of extension cable:

① Connecting the extension cable with the positive electrode of output terminal and output cable of wire drive feed unit make welding range be extended. (If necessary, sometimes base metal cable should be extended too.)

② For extension cable the relationship of length and area is shown as list 3:

List 3 Relationship of length and area

Model	Original cable	Below 50m	Over 50m
WONDERMIG-400	35 mm^2	50 mm^2	75 mm^2
WONDERMIG-500	50 mm^2	75 mm^2	100 mm^2

③ For welding, the extension cable, the resistance, the connection method and so on are unfavorable. Longer the extension cable and larger the section area of extension cable, more unfavorable influence for welding. So avoid unnecessary extension as possible.

④ Must pull the extension cable straightly for using. (Because any crooks will cause welding arc unstable.)

V.MAINTENANCE OF EQUIPMENT:

1. Periodically maintenance:

For safely welding with high-efficiency, please periodically maintain. Cut off power supply before disassemble the shell of welder.

① Please periodically remove dust once every 6 months. (If the environment is with much dust and wet, please remove dust once every 3 months.) After remove dust, inspect whether the connecting part is loose, desquamating or not. If the phenomena, please firmly connect and make good insulating treatment.

② For averting accident, Please periodically inspect whether the output terminal, input terminal, earth end and other parts are loose, burnt, desquamating or not. If the phenomena exist, please repair.

③ Please periodically inspect the magnetic contact. If it's bad, for not influencing normal operation, please repair or replace on time.

2. Daily inspection:

① Welder

- The front panel

a) Inspect if all the control switches, indicators, fuses and meters are well assembled.

b) After make contact, observe if all the control switches, indicators, fuses and meters are normal.

- Cooling fan

After make contact, turn on power switch of welder. Observing fan operation and listening to the sound inspect whether it's normal or not.

- Periphery

a) Inspect whether the peripheral gas route is damaged, the gas connection part is loose or not.

b) Inspect whether the screws of shell are loose or not.

c) Inspect whether the input power supply connection is firm or not.

d) Inspect whether the output power supply connection, all kinds of control socket connection is firm or not.

e) Inspect whether the cable between the gas heater power supply and the heater socket on rear plate is firm connected or not.

② Welding gun

- Nozzle

a) Inspect whether the nozzle is firm fixed or not.

b) Inspect whether spatter from nozzle is too much or not. (Using proof-spatter agent is effective to guard against spatter.)

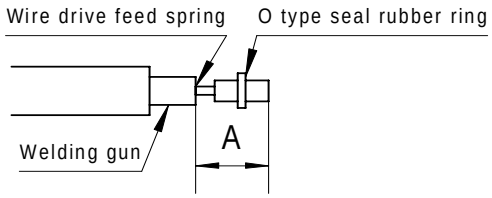
- Contact tip

a) Inspect whether the contact tip is firm fixed or not.

b) Inspect whether the hole of contact tip is worn, blocked up or not.

c) Inspect whether the diameter of wire and contact tip is matching or not.

- Wire drive feed tube



a) Inspect whether A>6mm or not. If it's too short, the arc will be unstable. (It's shown as the diagram on right.)

b) Please pull wire drive feed spring out of welding gun. Inspect whether the spring itself is bent in local part or stretched. (Note: It's the reason of poor wire drive feed and unstable arc.)

c) Inspect whether some dirt, grease, wire coat or dregs are blocking in the wire drive feed spring. (Note: It's the reason of poor wire drive feed and unstable arc.)

d) Inspect whether the shrink tube of wire drive feed spring is damaged, O type rubber ring is worn. (Note: It's the main reason of forming gas defect, sieve mesh.)

③ Wire drive feed unit

- Pressure handle

For proper degree of tightness, adjust pressure of the handle according to the diameter of wire used.

- Guide wire tip

a) Inspect whether powder, waste filings are accumulated at the guide wire tip or not. (Please clear away the powder, waste filings and inspect the reason.)

b) For the centers of guide wire tip joint and the groove of wire drive feed roller, inspect whether they're at same line or not. (Note: Stagger will cause powder produced and arc unstable.)

- Wire drive feed roller

a) Inspect whether the diameter of wire and wire drive feed roller is matching or not. (If not matching, it will cause powder produced and arc unstable.)

b) Inspect whether the operation of wire drive feed roller is normal. (Whether it operates in ellipse, slow down or not.)

- Pressure roller

Inspect whether the rotation of pressure roller is stable, the wire pressure surface is worn, the contact surface is narrower or not. (Note: It will cause poor wire drive feed and arc unstable.)

● Rectifying roller

Inspect whether the accumulating dirt, grease or wire dregs cause the rectifying roller poorly operates or not. (Note: It will cause poor wire drive feed and arc unstable.)

④ Cable

● Welding gun cable

a) Inspect whether welding gun cable is broken, worn or not.

b) Whether welding gun cable is bent too much or not.

c) Whether the connection part of welding gun cable to welding gun plug and socket is loose or not.

● Output cable

a) Inspect whether the cable is worn, damaged or not.

b) Inspect whether the connection part of cable is firm or not.

● Input cable

a) Inspect whether the connection part of cable is firm or not.

b) Inspect whether the cable is worn, damaged or not.

● Earth cable

a) Whether the earth cable for welding power supply is broken, firm connected or not.

b) Whether the earth cable for base metal is broken, firm connected or not.

VI.FAMILIAR TROUBLES AND REMOVING METHODS:

If suspecting the welder is in trouble, before repair, please carefully inspect it according to the daily inspection items. After be sure of that, please remove the troubles according to List 4,5 and flowchart 1 ~ 7.

1. Familiar troubles and removing methods are shown as List 4.

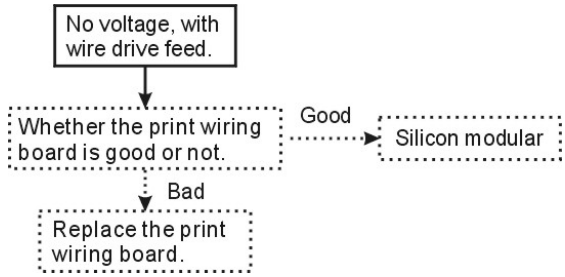
List 4 List of familiar troubles and removing methods

Trouble phenomenon	Reason	Removing method
1. After turn on power switch, cooling fan doesn't operate.	1. Input power supply isn't electrified. 2. The power switch is bad. 3. The power fuse is burnt. (2A) 4. The starting capacitance is bad. 5. Cooling fan is bad.	1. Well connect input power supply. 2. Replace the power switch. 3. Replace the fuse. 4. Replace the starting capacitance. 5. Replace the cooling fan.
2. Alert indicator lights up.	1. Machine temperature alert.	1. Checking the main loop or waiting until welding machine cools off continue working.
3. After turn on power switch, contact doesn't pickup.	1. The power fuse is burnt. 2. The control transformer T_2 is bad. 3. The contact is bad.	1. Replace the fuse. 2. Inspect and replace the control transformer T_2. 3. Replace the contact.
4. Press on the welding gun switch, but no wire drive feed.	1. The motor fuse is burnt. 2. Poor contact of the control cable and plug. 3. The print board is bad.	1. Replace the fuse. 2. Inspect the control cable and plug. 3. Inspect or replace the print board.
5. Welding current can't be adjusted.	1. Poor contact of the plug or the cable is broken at some part. 2. The print board is bad. 3. The potentiometer for adjusting current is bad.	1. Well insert the plug and connect the broken part of the cable. 2. Inspect or replace the print board. 3. Replace the potentiometer.
6. In self-lock status, but the welder can't.	1. The position of crater switch S_3 isn't correctly set or the switch is bad. 2. The print board is bad.	1. Inspect and repair the crater switch S_3. 2. Inspect and replace the print board.
7. Welding voltage can't be adjusted.	1. The knob of remote control box is poor. 2. The contact of remote control plug is poor. 3. The cable of remote control box is broken. 4. The potentiometer is bad. 5. The print board is bad.	1. Tightly fix the knob. 2. Well connect the plug. 3. Inspect the remote control box cable and well connect it. 4. Inspect and replace the potentiometer. 5. Inspect and replace the print board.
8. No protection gas.	1. Poor contact of the plug or the cable is broken at some part. 2. The print board is bad. 3. The magnetic valve is bad. 4. Rubber tube in gas route is broken or blocked.	1. Well insert the plug and connect the broken part of the cable. 2. Inspect and replace the print board. 3. Replace the magnetic valve. 4. Make the gas route normal.
9. Wire drive feed isn't good	1. The soft tube of wire drive feed is blocked.	1. Clear the drive feed soft tube.

and wire is easily blocked on wire drive feed roller.	2. Wire drive feed roller is seriously wore. 3. The adjustment of the pressure handle of wire drive feed isn't proper. (The handle is too tight.)	2. Replace the w ire drive feed roller. 3. Adjust the handle loosely.
10. The welding voltage and wire drive feed is normal, but can't initiate arc.	1. The earth cable isn't connected to base metal. 2. Poor contact of too much rust or grease on mother-board.	1. Well connect the earth cable. 2. Clear rust or grease dirt.
11. Unstable arc and more spatter.	1. The welding regulation isn't properly chosen. 2. The print board for initiating is bad. 3. The thyristor of main circuit is bad. 4. The contact tip is seriously wore. 5. The wire stretches out too much. 6. Poor contact of the welding gun and the earth cable.	1. Adjust the welding regulation again. 2. Inspect and replace the print board for initiating 3. Replace the thyristor. 4. Replace the contact tip. 5. Make the length of wire be proper. 6. Well connect the welding gun and the earth cable.

2. Familiar trouble phenomena and flowcharts:

① The trouble phenomena: No voltage, with wire drive feed.



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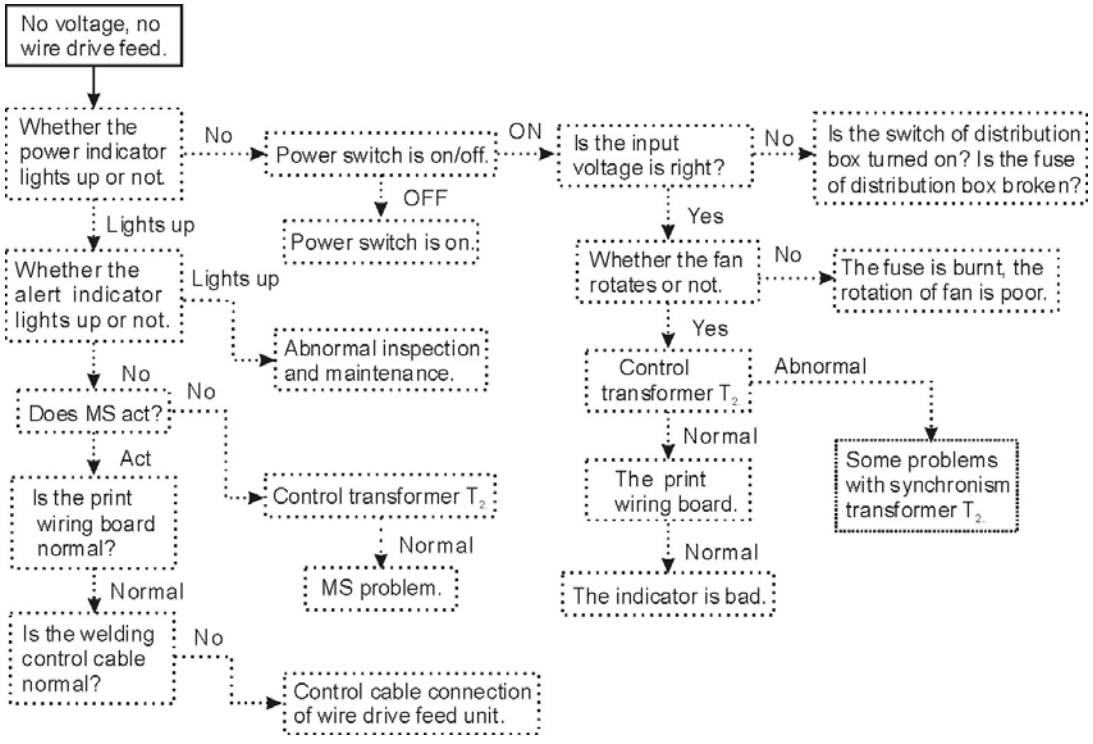
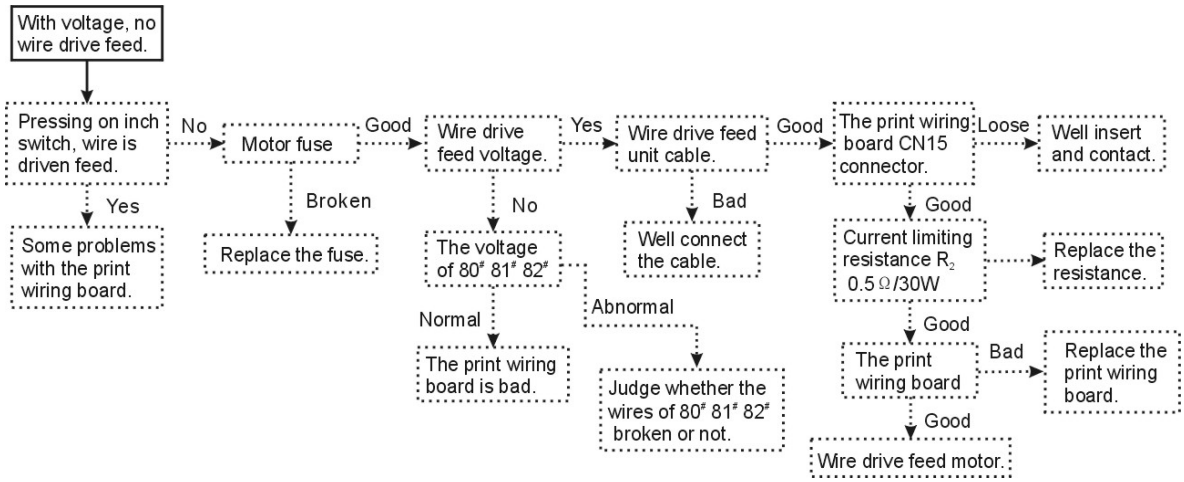
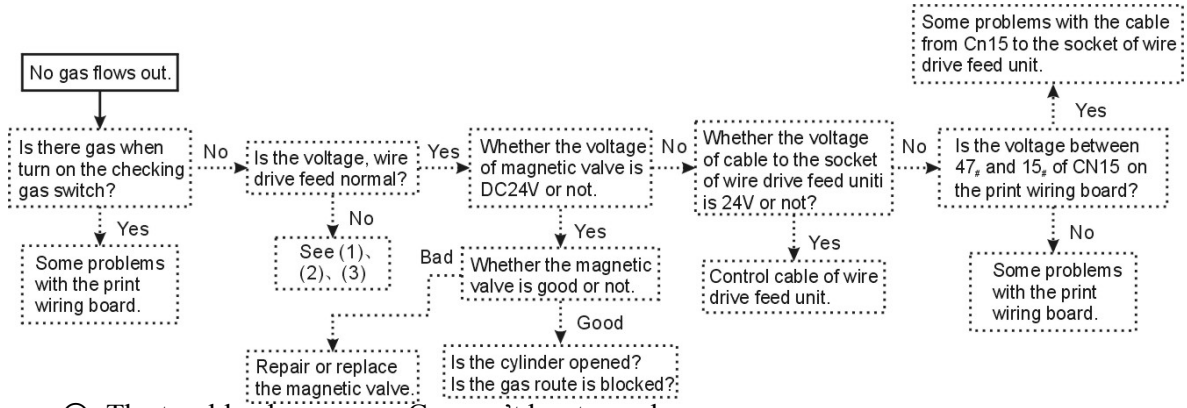


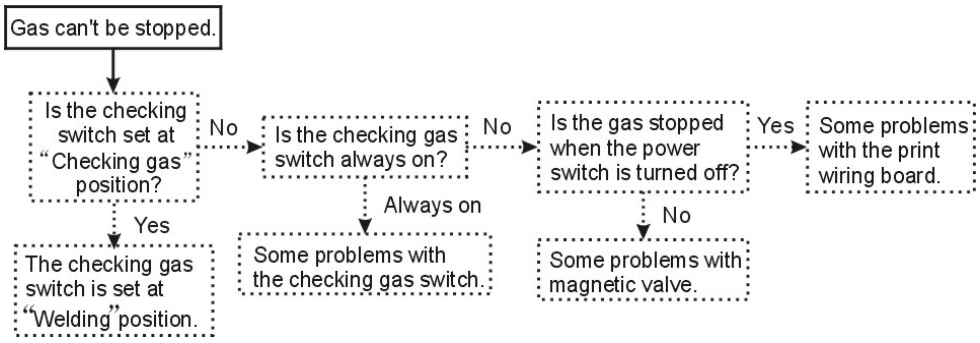
③ The trouble phenomena: With voltage, no wire drive feed.



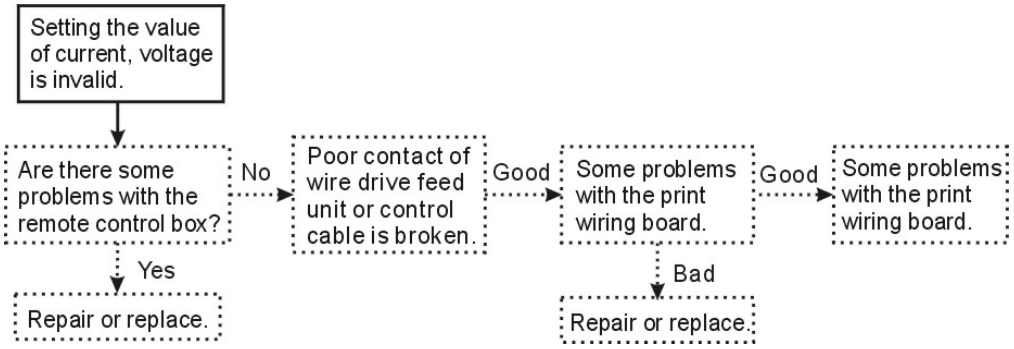
④ The trouble phenomena: No gas flows out.



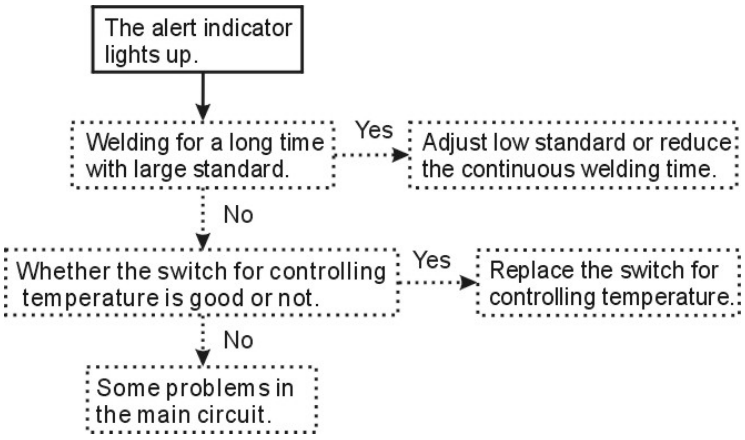
⑤ The trouble phenomena: Gas can't be stopped.



⑥ The trouble phenomena: Setting the value of current, voltage is invalid.



⑦ The trouble phenomena: Alert indicator lights up.



VII.ELECTRIC PRINCIPLE DIAGRAM AND CONNECTION DIAGRAM:

1. The electric principle diagram of WONDERMIG series CO_2 gas shielded arc welding machine.

2. List of WONDERMIG series welder parts is shown as List 5.

No.	Symbol	Name of part	Model	Quantity	Remarks
1	T1	Main transformer	TWT102-500K	1	For 500A welder
			TWT102-400K	1	For 400A welder
			TWT102-200K	1	For 200A welder
2	DCL	Filter inductor	TWD02-500K	1	For 500A welder
			TWD02-400K	1	For 400A welder
			TWD02-200K	1	For 200A welder
3	IPL	Balance inductor	TWI02-500K	1	For 500A welder
			TWI02-400K	1	For 400A welder
			TWI02-200K	1	For 200A welder
4	T2	Control transformer	TWT202-150W	1	
5	K1	Switch	KN1-202	1	Power switch
6	SW2,SW3, SW4	Ship-form switch	KN1-102	3	
7	S5	Ship-form switch	KN1-103	1	
8	FM	Fan	KFD-50K3	1	
9	MS	AC contact	CJX4-4011d/220V	1	For 500A welder
			CJX4-2510d/220V	1	For 400A welder
			CJX4-1810d/220V	1	For 200A welder
10	FUSE2,3	Glass tube fuse	8A	2	6X30mm
11	FUSE1	Glass tube fuse	2A	1	6X30mm
12	SCR	Thyristor	PWB130A40	2	For 500A welder
			PWB80A40	2	For 400/200A welder
13	CT1	Current sensor	BLM500-S7	1	For 500A welder
			BLM400-S8	1	For 400/200A welder
14	R1	Resistance	40W/120Ω	1	For 500A welder
			50W/51Ω	1	For 400/200A welder
15	U1	Voltmeter	100V	1	
16	A1	Ampere	500A/60mv	1	For 500A welder
			500A/60mv	1	For 500A welder
17	C1,2	Capacitance	400A/60mv	1	For 400/200A welder
18	VRA	Potentiometer	RV24YN20SA502	1	

SPARE PARTS LIST FOR WONDERMIG-400		
Sr. No.	**Description**	**Part Code**
1	MAIN TRANSFORMER	MTRAX-A60
2	INTER PHASE TRANSFORMER	IPTRAX-A60
3	OUT PUT CHOKE	CHK-WONDERMIG
4	MAIN PCB	PCB-MIG-THY-400
5	THYRISTOR MODULE	THY-MD-130-400
6	DIGITAL DISPLY METER (AMP)	DSP002
7	DIGITAL DISPLY METER (VOLT)	DSP004
8	CONTROL TRANSFORMER	CTRAX008
9	FAN	FAN008
10	MAIN CONTRACTOR	CON-70-220V
11	CURRENT SENSOR	CS01
12	WIRE FFEDER MOTOR WITH FEED MECHANISM (18.3V)	WFMTR004
13	SOLONOID VALVE	SV002
14	EURO ADAPTOR FOR SERVO FEEDER	EURO-BRASS-03
15	PRESUURE ARM	PRARM001
16	PRESURE HOLDER	PRHLD001
17	SUS TUBE	SUS001
18	ROLER 0.8/1.0	INMIGRLR001
19	ROLER 1.0/1.2	INMIGRLR002
20	POTENTIOMETER FOR CURRENT/VOLTAGE SETTING	POTOO5
21	KNOB FOR POT005	KNOB005