

## Foreword

Thank you for choosing the ZX7-M Series DC Inverter Manual Arc Welder of Delixi (Hangzhou) Drives Co., Ltd.

Before use ZX7-M Series DC Inverter Manual Arc Welder, please carefully read this Manual to ensure correct use. Incorrect use may lead to abnormal operation, failure and reduction of service life of and even personal injury accidents. Therefore, ZX7-M Series DC Inverter Manual Arc Welder you must carefully read this Manual and strictly follow it. This Manual is a standard Annex, which is must be properly kept after reading for overhauling and maintaining the ZX7-M Series DC Inverter Manual Arc Welder in future.

Except Operating Instructions stated herein, this Manual also provides the circuit diagram for your information. If you have any questions or special requirements on this products, please contact our local offices or distributors, you also can phone the Customer Service Center of our headquarters directly, we are at your service.

The contents of this Manual are subject to change without prior notice

Before unpacking, please carefully read the following contents:

1. Whether the products are damaged, the spare parts are broken and fall off or main body is scratched during the transportation.
2. Whether the rated value stated on the nameplate of this machine is consistent with your ordering requirements, as well as the machine ordered, Product Certificate, User's Manual and Warranty are within the carton.

Our company has strict Quality Assurance System on the manufacturing and packaging of the products, in case of any inspection omitted, please immediately contact our Company or your supplier to deal with it.



Warning

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## **I. Features and application for ZX7-M Series DC Inverter Manual Arc Welder**

ZX7-M series DC Inverter Manual Arc Welder is manufactured with advanced invert technology.

Invert power is supplied by high power V-MOS field effect transistor which converts operating frequency of 50/60 Hz to high frequency of approximate 100 kHz and performs voltage dropping and rectification, and then output high power DC power by PWM. The weight and size of main transformer has been reduced and its efficiency has been improved by more than 30%. It has the following features of stability, reliability, portability, energy-saving, less electromagnetism noise. The high frequency inverter welder is a revolution of welder industry.

Manual Arc Welder is equipped with the following features: high efficiency, energy-saving, portability, excellent dynamic characteristic, stable arcing and easy to control welding puddle. Higher voltage at no load and excellent energy and thrust compensation can be used widely and is applicable to aloft working, field working and indoor and outdoor decoration. It has the following features of small size, light weight, easy installation and operation compared with similar products at home and abroad:

- 1 It was manufactured by advanced full-bridge invert technology and VMOS power switch element and with the features of high efficiency and energy-saving;
- 2 Adopt PWM (Pulse-Width Modulation) technology featured with invert frequency up to 100 KHz, high speed of dynamic response, stable arc, excellent welding performance and beautiful welded joint molding;
- 3 Easy to check and set current by digital current display;
- 4 Welder (larger than ZX7-250M) is equipped with the adjustment function for thrust current to ensure stable arcing and convenient operation;
- 5 Have Abnormal Protections for overheating and over-current to make welder operate safely and reliably.

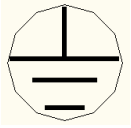
Applicable scope:

It is mainly used for the welding of stainless steel, carbon steel, cast iron, copper and their alloys.

It is widely used in machinery, petroleum, chemical industry, shipbuilding, automobile, electric facility construction and architectural decoration etc.

## II. Notice for Safety

2.1 Must be familiar with the meanings of graphical symbols of the welder before safe operation.



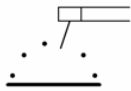
This equipment must be reliably grounded;



During the process of maintenance, reconstruction and cable connection, you must ensure power-off operation and request professionals to conduct the maintenance.



Warning: Please read caution information and pay attention to operation;



Manual metal arc welding (ZX7)

2.2 Pay attention to avoiding serious personal injury from occurring

a. In order to ensure operational safety, the following item must be abided by:

Follow the laws and regulations or your company's enterprise standard to Notice for input-side power, place-setting selection, use and storage of high-pressure gas, piping and safekeeping of the welding products and waste disposal.

b. Wear the clothes and safe protection devices

In order to prevent eye inflammation and skin burn, you must abide by Labor Safety and Health Rules and wear corresponding protection devices.

c. Notice for Welding Places

In order to prevent the damage to human health from welding fume and harmful gas, you must abide by Labor Safety and Health Law and the rules concerning dust danger in its Implementation Ordinance, partial exhausters are installed or effective protection devices for breath are adopted

d. Don't use it when disassembling the shell or cover of the electric welder.

e. The welding power equipped with adjustable hoisting device is used for moving and disassembling the welding position, the gas cylinder and wire feeder must be fixed firmly to prevent from inclining and overturning.

2.3 Prevent machine burn-out and fire accidents from occurring

a. Prevent the fire disaster and machine burn-out from over-heating

Keep the distance between welding power and wall over 30cm and with combustibile materials over 50cm.

b. Prevent fire accidents and machine burn-out from the sparks

The sparks are forbidden from spattering on combustibile materials or entering into the machine through air suction port and open port.

c. Prevent collision and machine burn-out from falling

When installing the welder in high attitude and on inclined plane, the safety must be ensured to prevent the welder from slipping off and dropping, and secure the welder firmly.

d. Don't take the gas pipe filled with the gas inside the welding and the sealed tank and duct without the gas.

e. Forbid the welder from being adopted to defreeze the pipe.

2.4 Notes for Electrical Connection

a. The electric connection must be operated under the conditions of closing the switch of distribution box and ensuring the safety.

b. Don't touch the live parts by hands or use worn-out and wet gloves to touch them.

c. The cables selected shall be not less than given specification.

d. Don't put heavy objects on the cables and touch the welding parts.

e. Firmly press the connecting parts of the cable and use the insulated tape to wrap the exposed live parts well.

f. Qualified electricians are allowed to weld the shell and earthing engineering for the clamps of work-piece connection.

g. Please cut off the power of all devices when not under service.

### III. Technical Parameters

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Table 1 Technical Parameters

Parameter	Model	ZX7-160M	ZX7-200M
<b>Input power</b>		Single-phase, AC220V±10% 50/60Hz	
Rated Input Current (A)		26	32
No-load Voltage (V)		56	56
Output current regulation (A)		20-160	20-200
Rated output voltage (V)		27	28
Thrust Welding Range (A)		—	—
Load Duration Factor (%)		35	35
No-load loss (W)		40	40
Efficiency (%)		85	85
Power factor		0.93	0.93
Shell Protection Level		IP21S	IP21S
Insulation Level		F	F
Dimension (W×D×H) mm		155×295×375	155×295×375
Weight (kg)		8	8

### III. Technical Parameters

Parameter \ Model	ZX7-250M	ZX7-315M	ZX7-400M
<b>Input power</b>	Three-phase, AC380V±10% 50/60Hz		
Input Current (A)	8.2	11	21
No-load Voltage (V)	56	56	56
Output current regulation (A)	20-250	20-315	20-400
Rated output voltage (V)	30	33	36
Thrust Welding Range (A)	0-100	0-100	0-100
Load Duration Factor (%)	60	60	60
No-load loss (W)	60	80	100
Efficiency (%)	85	85	85
Power factor	0.93	0.93	0.93
Shell Protection Level	IP21S	IP21S	IP21S
Insulation Level	F	F	F
Dimension (W×D×H) mm	205×360×480	355×470×580	355×470×580
Weight (kg)	15	18	28

## **IV. Installation and Connection**

### 4.1 Applied Place Condition

The welder must be place on solid and flat ground, which is clean and not wet.

Forbid to use the welder when it is placed on the following places:

- a. May be under sun exposure and suffer the wind and rain (Protection Level of Welder: IP21S);
- b. Have a lot of dust and combustible gas;
- c. Be full of harmful or corrosive gas;
- d. Have high-humidity steam;
- e. Have vibration and is easy to be collided;
- f. The distance to the surrounding space is less than 30cm;
- g. The ambient temperature is higher than  $+40^{\circ}\text{C}$  or lower than  $-10^{\circ}\text{C}$ .

### 4.2 Earthing

Connect the earthing terminal with distribution earthing wire to prevent the accidents from electric shock and machinery damage.

### 4.3 Ventilation Requirements

In order to ensure welding quality, reduce the impact of the air current from the welding part on electric arc as much as possible. When operating under enclosed space, provide sufficient ventilation facilities to prevent the lack of oxygen.

### 4.4 Power Units and Connecting Cable



IV. Installation and Connection

Table 2 Power Units and Connecting Cable

Model		ZX7-160M	ZX7-200M	ZX7-250M	ZX7-315M	ZX7-400M
Input voltage		Single-phase, AC 220V±10% 50Hz		Three-phase, AC 380V±10% 50Hz		
Capacity of power supply equipment	Applicable Power	8kVA above	10kVA 以上 10kVA above	12kVA above	15kVA above	18kVA above
	Engine Generator	2 x 8KVA above	2 x 10KVA above	2 x 12KVA above	2 x 15KVA above	2 x 18KVA above
Input Protection Equipment	Fuse	36A	47A	20A	30A	40A
	No Fuse Circuit Breaker (or Leakage Protector)	40A	60A	20A	30A	40A
Input cable		3 mm <sup>2</sup> above	4 mm <sup>2</sup> above	3 mm <sup>2</sup> above	4 mm <sup>2</sup> above	6 mm <sup>2</sup> above
Output cable		16 mm <sup>2</sup> above	25 mm <sup>2</sup> above	35 mm <sup>2</sup> above	50 mm <sup>2</sup> above	70 mm <sup>2</sup> above
Protecting Earth Wire		4 mm <sup>2</sup> above				

4.5 Schematic Diagram for Welder Connection (for example ZX7-160M)

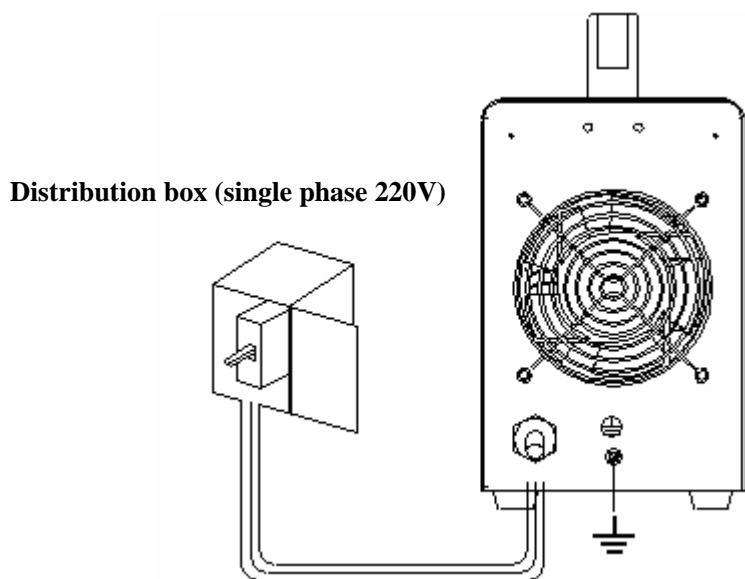


Figure 1-1 Schematic Diagram for Welder Power Connection

- a. Connect the wire according to the requirements in Table 2;
- b. When wiring, make sure that the power switch of welder is switched off. Do not connect with load in order to prevent burning by electric arc;
- c. All wirings shall be properly connected;
- d. All naked live conductors shall be insulated with the insulated tape;
- e. **After connecting the wiring, properly cover the plate and cable the bolts (forbid to open the cover for operation);**
- f. In consideration of the safety, don't exert (pull) the force to input cable;

4.6 Positive polarity connection and inverted polarity connection

Positive polarity connection and inverted polarity connection is entitled according to the polarity of welder connected with base metal. Positive polarity connection i.e. base metal connects with positive electrode of welder. On the contrary, inverted polarity connection i.e. base metal connects with negative electrode of welder.

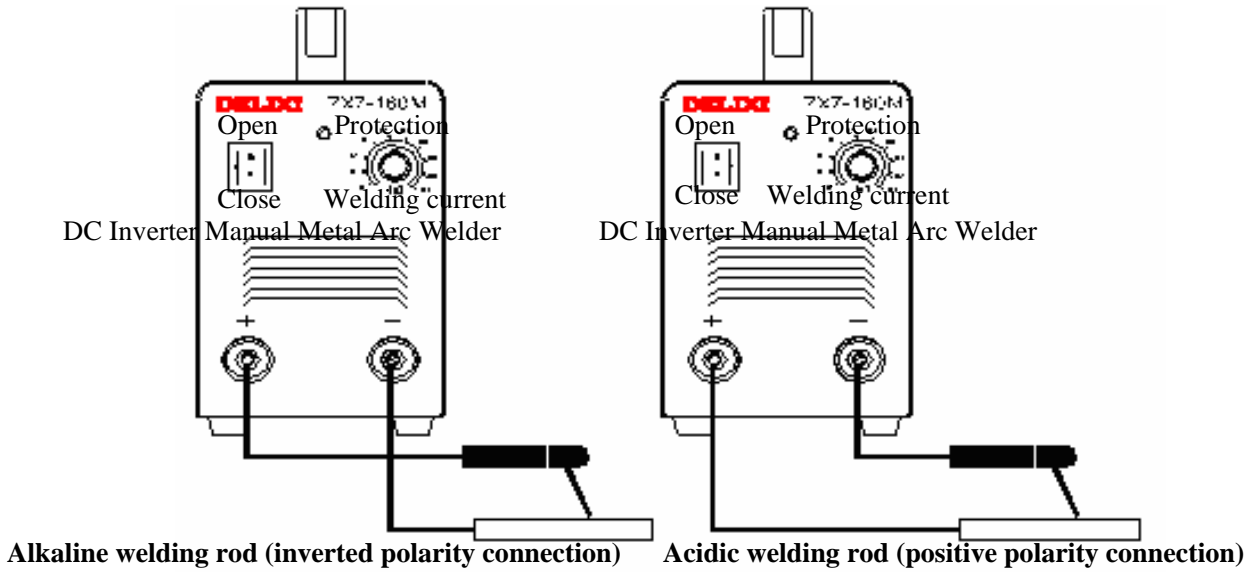
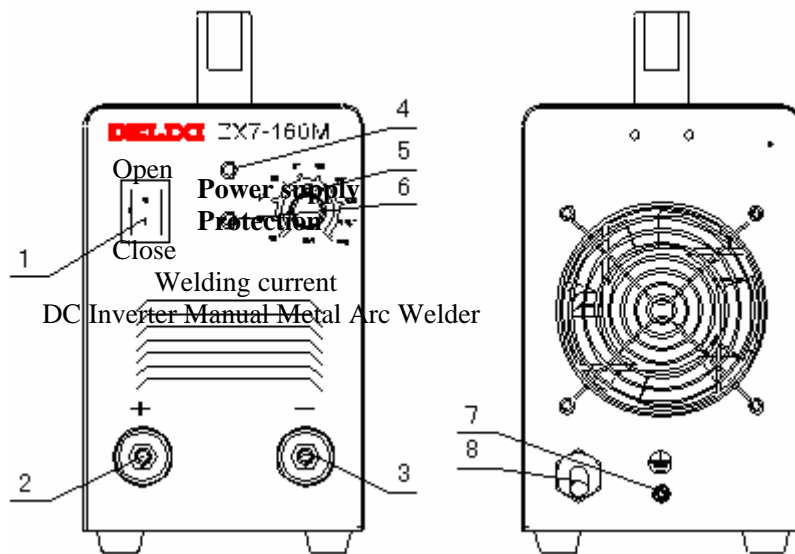


Figure 2 Positive polarity connection and inverted polarity connection

Positive polarity connection: work piece is positive electrode and welding rod is negative electrode, therefore welding depth and splashing is larger. The features for inverted polarity connection are stable arcing and little splashing. Generally all welding operations are inverted polarity connection except non-important structure with medium plate for increasing the welding depth.

Manual metal arc welding by alkaline welding rod adopts inverted polarity connection due to that arc burning is unstable and with larger splashing and noisy as well as easy to produce bubble by positive polarity connection. On the contrary, arc burning is stable and with little splashing, artistic welding seam and little noise by inverted polarity connection.

4.7 Front and Back Panel Functions



ZX7-160M Back and Front Panel

Table 3 Introduction of Front and Back Panel Functions

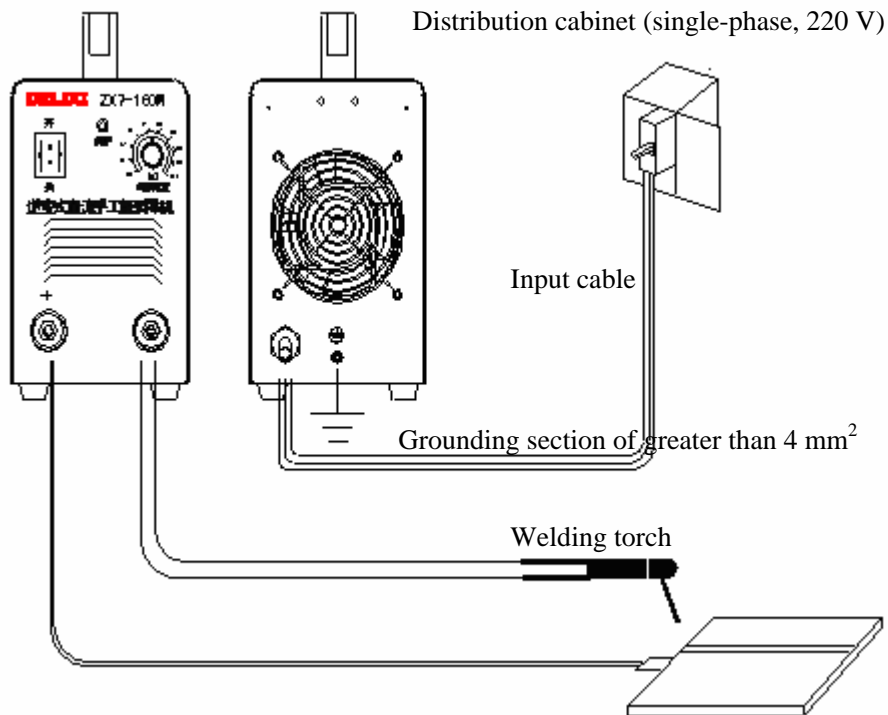
No.	Name of Part	Function Description
1	Switch	Power switch
2	Output positive electrode	Output positive electrode of welding machine, which connects with welding torch by inverted polarity connection method.
3	Output negative electrode	Output negative electrode of welding machine, which connects with base metal by inverted polarity connection method.
4	Indicator lamp for power	Indicating for power ON/OFF
5	Current adjustment	Adjustment for welding current
6	Indicator lamp for abnormal condition	Indicator lamp for abnormal condition is lighted when abnormal (over-heating or over-current) is happened inside the welder, and the welder is out of work at this point of time. The welder will restart when the abnormal return to normal and the indicator lamp will be off automatically (re-electrify when over-current). Cut off power when it is over current. The indicator lamp for over current will be off after power on.
7	Grounding mark	To ensure the safety of person, must make sure the bolt is grounded securely.
8	Waterproof connector	It is used to fix cable

Operate according to the relevant instruction and other requirements on panel.

Caution: during installation, quick plugs for positive and negative must be inserted in socket and rotate by 45 degree in clockwise and push it outward to ensure it is fixed firmly without any looseness and cranking then perform next operation. Otherwise it may cause fire and make quick plug and socket burn out due to the unstable connection between quick plugs and sockets or even burn the welder out and short circuit.

## V. Preparation and operating for welding

### 5.1 Connection of welder



Connect welder according welding requirements of item 4.5 and figure.

### 5.2 Selection of Welding Conditions

Refer to Table 4 for the materials to be welded and corresponding thickness to select proper welding rod, tungsten rod, welding wire and welding current.

ZX7 Series is DC Manual Metal Arc Welder, the load duration factor is 35-60%, and over-load operation is forbidden at service.

### 5.3 Manual Welding Operation

- After switching on, set the power switch of the welder on the position of "Power-On", the power indicator lights up, the fan starts and operates normally.
- diameter and select proper welding current by regulating the knob of "Current Regulation".
- Welder (larger than ZX7-250M) is equipped with the adjustment function for thrust current to ensure stable operation by controlling the arcing.
- When conducting all-position welding, slightly turn "Thrust Regulation" up so as to prevent the welding rod from conglutinating; when conducting flat welding or large current's welding, turn "Thrust Regulation" down and even to 1 so as to reduce the spattering of the welding.

V. Preparation and operating for welding

Table 4 Option of Welding Rod and Welding Current (For Your Reference)

J507 Alkaline Welding Rod (GB E5015, AWS E7015 , JIS D5015)						
Diameter of Welding Rod (mm)	2.5	3.2	4.0	5.0	5.8	
Welding Current (A)	60~90	90~120	140~180	170~210	210~260	
422 Acid Welding Rod (GB E4303,AWS E6013 , JIS D4303)						
Diameter of Welding Rod (mm)	2.0	2.5	3.2	4.0	5.0	5.8
Welding Current (A)	40~70	70~90	90~130	160~210	220~270	260~310
CHE425GX Cellulose Welding Rod (GB E4310, AWS E6010)						
Diameter of Welding Rod (mm)	2.5	3.2	4.0	5.0		
Welding Current (A)	60~90	70~110	110~150	150~200		

## VI. Routine Maintenance and Overhaul

The purpose of periodic maintenance and overhaul is to ensure safe and efficient operation of the machine. When overhauling external connectors, it is to check whether the power plugs of the welder are pulled. In order to prevent the accidents from electric shock, it is to cut off the power of the welder and wait for 10 mins to maintain it while overhauling inner circuits, such a way can fully discharge the capacitors within the welder to ensure personal safety.

Table 6 Normative Reference for Overhaul

Item of Circuit Overhaul	A Periodic Overhaul every One or Two Month
<ol style="list-style-type: none"> <li>1. Power Switch Function</li> <li>2. Whether the cooling fan rotates normally</li> <li>3. Whether there is any abnormal vibration, noise and flavor</li> <li>4. Whether the joints of the cables are over heat</li> <li>5. Whether the welding cables have abnormal heating</li> <li>6. Whether the cables are broken</li> <li>7. Whether the joints of all conductors are loose</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove the dirt: Use compressed air to remove the dirt, especially for the dirt on inductance, transformer, power transistor and printed wiring board.</li> <li>2. Overhaul for Circuit Joints: Check whether the input terminals, output joints and external wiring are loose or rusted. Tighten up the loose parts and remove the rusty parts to ensure good contact.</li> <li>3. Check whether the earthing wires are connected well.</li> </ol>

## VII. Troubleshooting

The trouble shooter can check the machine firstly as per Table 7 and then overhaul it as per Table 8.

Notes:

1. Before maintaining and overhauling inner circuits, the operators must turn off the switch on distribution panel. For the inner circuits may produce high voltage, it is to prevent people's hurt from electric shock arising from high voltage.
2. Before leaving the plant, the machine has been accurately debugged, so it is forbidden to modify it.
3. It is to check whether the circuits are connected correctly. While connecting, don't put too much force on the wires and change the wiring positions so as to avoid the accidents from occurring.

Table 7. Check Items

Failure Phenomenon	Failure Reason
No electric arc produced	Power switch's failure or broken cables of connecting switch
	Failure for the cables connected with work-piece or failure of welding holder's cables
	Phase lacking or under-voltage for input power
	Long-time overload, thermal protection or over-current protection
	Poor connection of input cables
	Poor connection of output quick cable connector
Instable electric arc or regular arc interruption	Loose joints of output cable connection
	Poor contact of input cables
Decrease of output current	Too much lower input supply voltage
	Too much thinner input power lines
	Insufficient distribution capacity

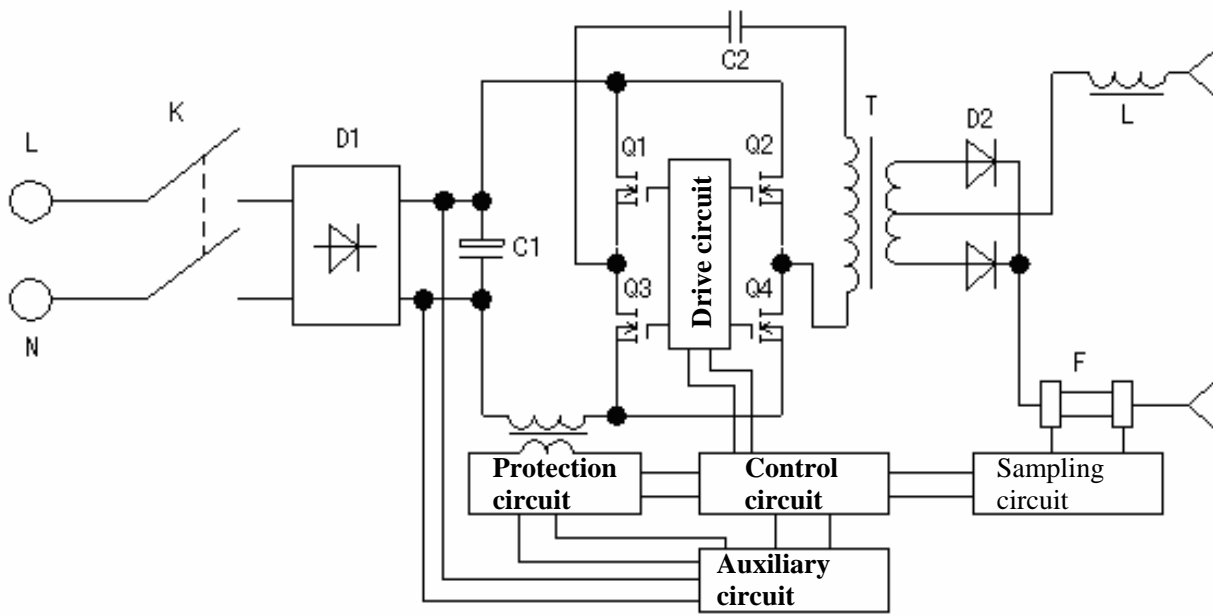


VII. Troubleshooting

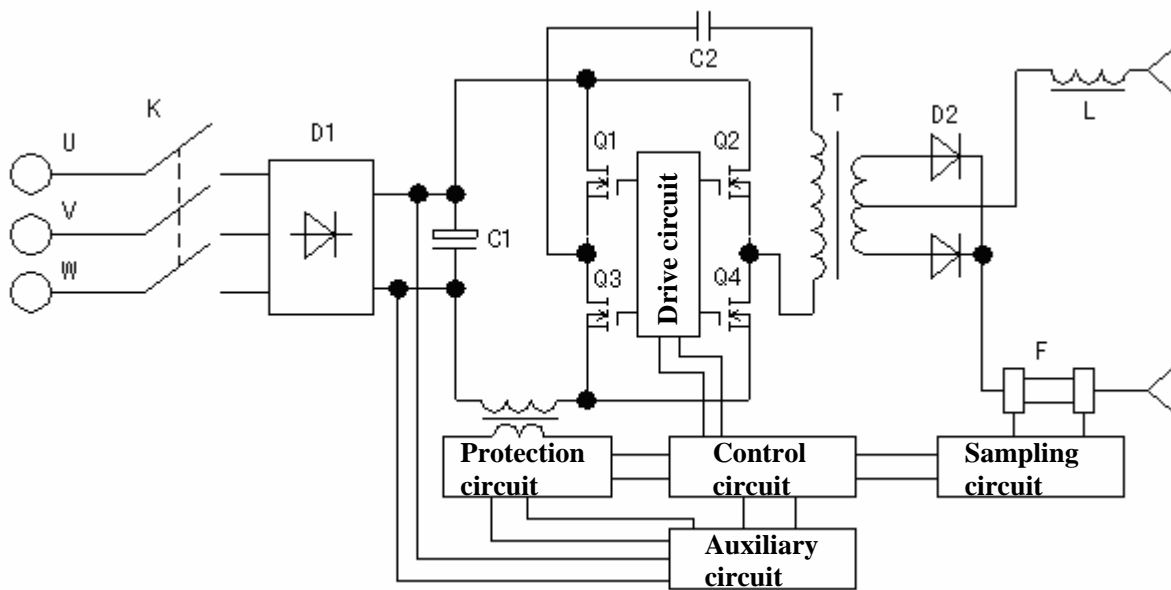
Table 8 Overhaul Table

Failure Phenomenon		Possible Failure Reason	Failure Elimination Method
The power switch trips and is unable to switch on		Short circuit of input bridge rectifier	Replace the bridge rectifier
		Broken power switch	Replace the power switch
		Broken MOS Module	Replace the MOS Module
		Short circuit of Inner Welder	Elimination upon check
After power-on, the fan can't rotate	The power indicator can't light up	No input power	Whether the input power is normal
		Broken power switch	Replace the power switch
	The power indicator light up	Broken fan	Replace the fan
The welding current is unable to be regulated		Broken current regulation potentiometer or off-line	Replace the potentiometer or lead the wire
		Broken main control panel	Replace main control panel
MOS Module is burnt out		Long-time over-load operation	Replace the MOS Module
		Long-time over-voltage or under-voltage operation	Replace the MOS Module and ensure its normal input voltage range
The output rectifier diode is burnt out		Long-time operation at high current or too much higher ambient temperature	Replace the broken diode and improve working environment

**VIII. Circuit Diagram**



Functional block diagram for ZX7-160M/200M



Functional block diagram for ZX7-250M/315M/400M