

**ZX7-250、315、400MA SERIES
MA INVERTER DC ARC WELDING MACHINE**

**OPERATOR'S MANUAL
(PLEASE READ CAREFULLY BEFORE OPERATION).**

CHENGDU HUAYUAN ELECTRIC EQUIPMENT CO., LTD.

Safety Depends on You

Huayuan arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part.

DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.

Attention

● **ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH.**

● **BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.**

● **ARC RAYS can burn.**

- a. 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..
- b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- c. 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.

● **ELECTRIC SHOCK can kill.**

- a. 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.
- b. 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.
- c. 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.
- d. Ground the work or metal to be welded to a good electrical (earth) ground.
- e. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- f. Never dip the electrode in water for cooling.

● **FUMES AND GASES can be dangerous.**

- a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone.
- b. 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.
- c. Read and understand the manufacturer's instructions for this equipment and the consumables to be used.

● **FOR ELECTRICALLY powered equipment.**

- a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- b. Install equipment in accordance with the National Electrical Code, all local codes and the manufacturer's recommendations.
- c. Ground the equipment in accordance with the National Electrical Code and the manufacturer's recommendations.

● **WELDING SPARKS can cause fire or explosion.**

- a. 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.
- b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations.
- c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- d. 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".
- e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

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1. Characteristics

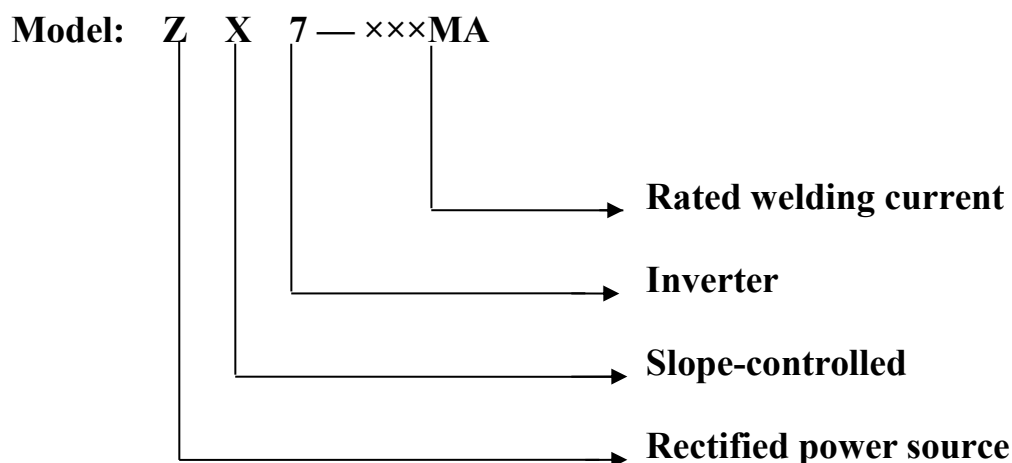
1.1 General Description

ZX7-MA Series MA inverter AC arc welding machines can use all types of welding electrode, especially suitable for low-hydraulic electrode to weld carbon steel and mid-carbon steel., which is mainly used in electric power build, chemical industry, oil field construction, etc.

1.2 Design Features

- Good dynamic characteristic of arc and arc stability -- good weld appearance
- Adjustable force current.
- Pre-setting welding current.
- "Clean" appearance and local/remote controls -- easy to operate.
- Electronic and thermostatic protection from overloads.
- Fluctuation of input voltage is saving automatically.
- Submersion dipping of assembled transformer, choke, and rectifier in special sealing/insulating material gives extra protection against moisture and corrosive atmospheres.
- Lower unloaded loss.
- Small, light, easy to move

1.3 Instruction on Model



2. Work conditions and environments

2.1 Input power conditions.

2.1.1 input voltage wave should be sinusoidal wave, and the fluctuation of wave's frequency cannot exceed $\pm 1\%$ of rated value.

2.1.2 The fluctuation of input voltage must within $\pm 10\%$ of rated value.

2.1.3 Uneven rate of three phases input voltage $\leq 5\%$.

2.2 Environment conditions.

2.2.1 The environment temperature range: welding statue $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
 carriage or store statue $-25^{\circ}\text{C} \sim +55^{\circ}\text{C}$

2.2.2 Relative humidity level: at 40°C , $\leq 50\%$
 at 20°C , $\leq 90\%$

2.2.3 Around working location, dust, corrosive gas and materials don't exceed the normal content.

2.2.4 Should be used in the place where the sea level is less than 1000m.

2.2.5 Wind speed must be less than 1m/s at working location

2.2.6 Keep in dry and ventilation, avoid directly sunshine and rain.

3. Product specification and technical parameters

Model	ZX7-250MA	ZX7-315MA	ZX7-400MA
Input power	3~ 380V±15% 50 / 60 Hz		
Rated input capacity (KVA)	11.2	14.5	19.8
Rated input current (A)	16.4	20.9	28.7
Non-load voltage (V)	78	78	78
Rated welding current (A)	250	315	400
Rated welding voltage (V)	30	32.6	36
Rated duty cycle (%)	35%		
Current adjust range (A)	20~250	20~315	20~400
Insulation grade	F		
dimension(L×W×H)(mm)	446×250×430	585×280×485	
weight (Kg)	20	24	28

The rated duty cycle is 35%, which means the machine work 3.5 min, then should rest for 6.5 min. when the machine work over the rated duty cycle, the inner part temperature of the machine will increase. In order to protect the machine been burnt, the machine has protection function. When it over heat or over load, the indicator on the panel will on, then there is no output until the temperature is normal, and the indicator off, then the machine can continue to work again.

2. Welding electrode diameter and related current for reference

➤ 422 electrode

Electrode dia. (mm)	2.5	3.2	4.0	5.0
Welding current (A)	70 ~ 110	100 ~ 150	160 ~ 210	200 ~ 260

➤ 507 electrode

Electrode dia. (mm)	2.5	3.2	4.0	5.0
Welding current (A)	70 ~ 110	100 ~ 140	140 ~ 180	180 ~ 230

4. Constructions and Functions Description

4.1. Machine's theory

ZX7-MA series welding machine uses MA for its main inverter component. Input three-phases AC is rectified by rectified-bridge and the DC sends to the MA inverter and creating a 20kHz AC output. This AC is transformed low voltage by the high-frequency transformer (20kHz) and use the fast recovery diodes to rectify again, then the rectified current flow through the choke, be controlled with 'current negative feedback', finally the machine will supply the adjustable output current to meet the welding needs.

The output current is controlled with adjusting pulse width of driving signal. The feedback signal is amplified from shunt, to be sent to the negative input of PWM's error amplifier, control the on-times of MA, so the machine will obtain constant-current and dropping characteristic.

4.2 Electric theory block diagram

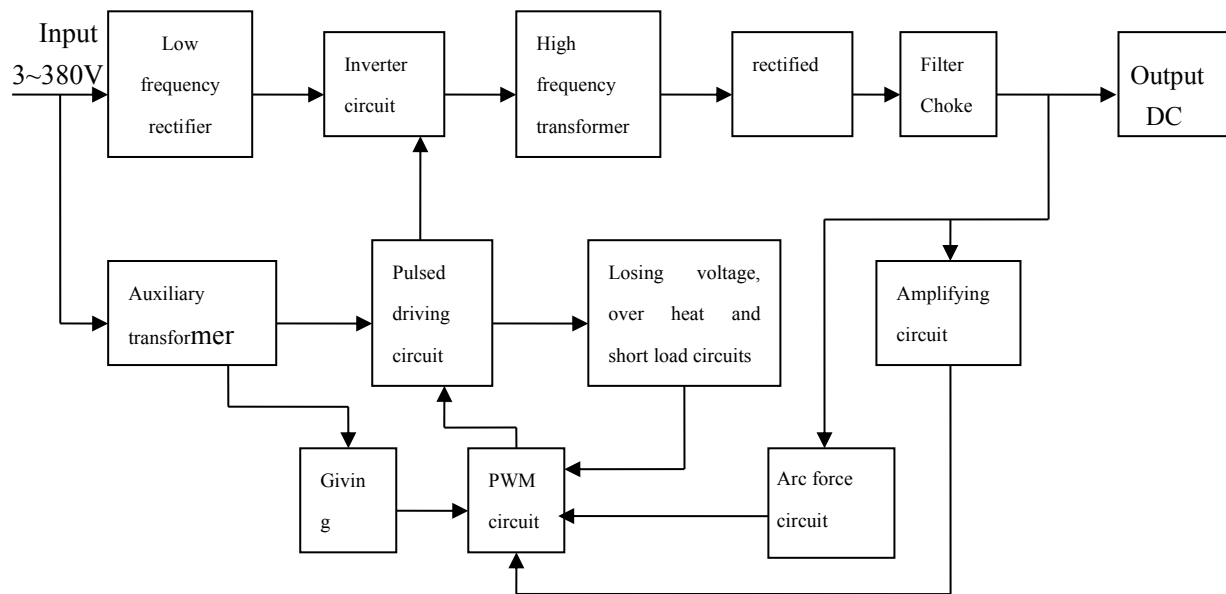
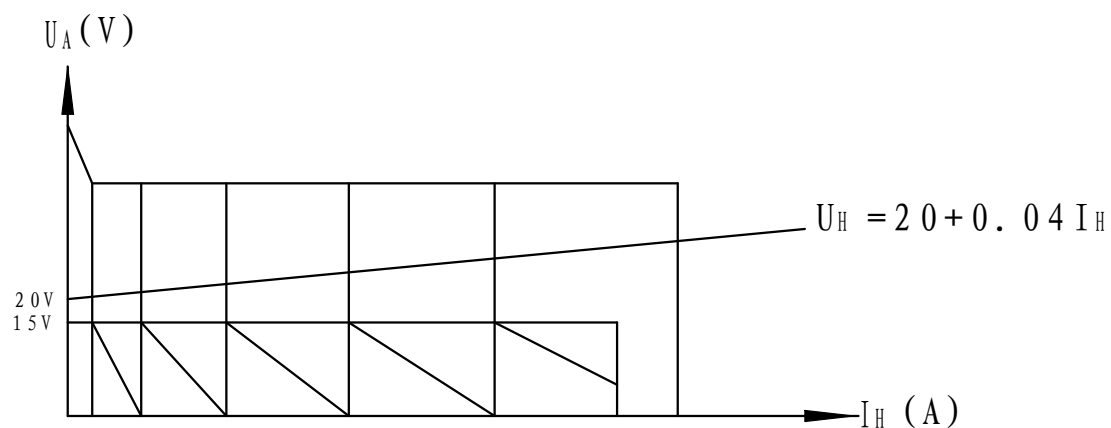


Figure 1. ZX7-MA series theory block diagram

4.3 The arc force function

When the welding voltage is lower than 15v, the control circuit will give a additional current to the output current, to avoid the electrode short-circuit with the work piece, and increase the arc force.

Static characteristic of arc



4.4 Spare parts list

No.		Name	Model	Note
1	V1	3-phase bridge rectifier	MDS35-14	ZX7-250MA
			MDS50-14	ZX7-315MA
			MDS75-12	ZX7-400MA
2	V2 ~ V3	MA tube	IKW40N120T2	ZX7-250、315MA
		MA module	GD75HFV120C1S	ZX7-400MA
3	V4、V5	diode	MMF300ZB040DK1	ZX7-250MA
			MMF200ZB040DK1	ZX7-315、400MA
4	TA1	Hall sensor	TKC500BR	ZX7-250、315、400MA
5	QF1	Air switch	DZ47-63/3P D25	ZX7-250、315MA
			DZ47-40/3P D40	ZX7-400MA
7	EV1	Fan	2123XSL	ZX7-250MA
			200FZY2-D/220V	ZX7-315、400MA
8	RP1、RP2、RP3	potentiometer	WH118-2W-4.7K	ZX7-250、315、400MA
9	AP1	PCB	ZX7-IIAP1	ZX7-250、315、400MA
10	KT1	Temperature relay	KSD305A-75℃±3D 常闭	ZX7-250、315、400MA
11	AP3	Filter board	LGK63MA-AP5	ZX7-250MA
			ZX7-II AP3	ZX7-315、400MA
12	TC1	Control transformer	ZX7-4	ZX7-250、315、400MA

5. Installation

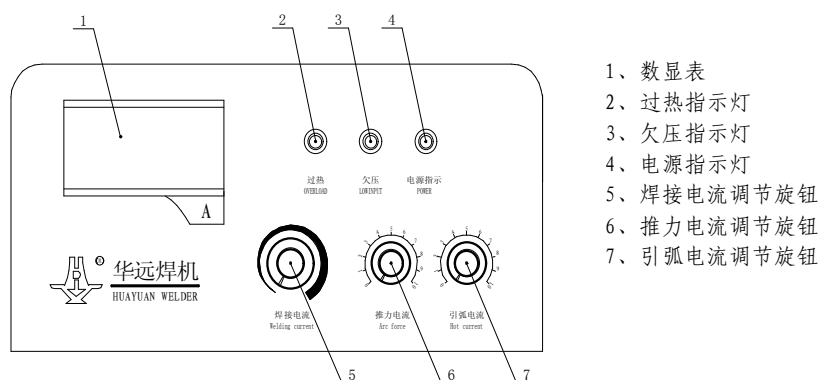
5.1 Install input power: Input power of this machine is three phase 380V/50HZ or 420V/50HZ. The input power lines must be connected with the machine through a line switch which is suitable to input power capacity.

5.2 Connect the machine grounding terminal (located on the rear of the machine) to a good electrical earth ground by copper wire.

Contents Types	Input copper wire in conduit sizes (mm ²)	Line switch (A)	Earth copper wire in conduit sizes (mm ²)
ZX7-250MA	≥2.5	25	≥4
ZX7-315MA	≥2.5	25	≥4
ZX7-400MA	≥4	40	≥4

5.3 Output connections: According to the type of electrode, to select the positive pole (+) connects to the work cable or welding cable, when you operate manual arc welding (stick).

6. Operations



Panel instruction:

1. Digital meter
2. Over heat indicator
3. Lack-voltage indicator
4. Power indicator
5. Welding current adjust knob
6. Force current adjust knob
7. Arc strike current adjust knob

Manual arc welding (stick)

- a. According to the type of electrode, to select the positive pole(+) or negative pole(-) connect to the work piece, and then start welding normally.
- b. Turn on the power switch, the indicator light will illuminate.
- c. When select "Local" mode, please turn the knob of current adjustment on front panel to expectant current value. When select "Remote" mode, please adjust the control box (extra accessory). The ammeter will display the presetting value. This value must meet the welding regulation according to the type of electrode.
- d. Arc force adjustment: when operate small welding current, may adjust suitable additional amperage to increase the short circuit current, avail the droplet transfer.

During normal welding, may turn this knob to 0 value.

7. Maintenance

1. Note:

- A. Make sure the power supply is off when check the machine
- B. The machine adopts high voltage capacitor filter, the hulk can be open after 5 min for the power off

2. Maintenance:

- A. Check the connector on time to avoid any wire loose or disconnecter.
- B. Keep clean, too much dust will short the machine life time, so please open the machine to clean twice a year.

8. Troubleshooting & Repair

TROUBLE (SYMPTOMS)	CAUSE	WHAT TO DO
1.welder turn on power, the power switch trips	1.Three phase rectifier was damaged 2.the capacitor which parallel the three phase rectifier was damaged.	1.change the rectifier; 2.change the damaged capacitor.
2 .no output current	1. fuses go out; 2. The fan does not work or the machine is overloaded cause the temperature Relay working 3. The temperature relay was damaged	1. change fuses; 2. Repair the fan; Can't work overload; 3. change the damaged relay;
3.Can't strike arc	1. The work cable doesn't connect output terminal with workpiece reliable.	1.Connect output with Work piece reliable.
4.Turn on the machine, no open voltage	1.The control PCB AP1, AP2 were damaged 2.MA modules were damaged	1.Change the damaged components and control PCB

Attention: Only qualified technicians should 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.

9. Packing list

- | | |
|----------------------|-------|
| 1. ZX7-MA machine | 1 set |
| 2. Electrode holder | 1pcs |
| 3. Fast connector | 2pcs |
| 4. Operator's manual | 1 |

