

# **ZX7-400IGBT Pro**

## **INVERTER DC ARC WELDING MACHINE**

# **MANUAL INSTRUCTION**

PLEASE READ CAREFULLY BEFORE OPERATION

### **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.

## CONTENT

|   |   |
|---|---|
| 1. Main usage and application range ..... | 1 |
| 2. Working Environment .....              | 1 |
| 3. Technical Specification .....          | 2 |
| 4. General Description .....              | 3 |
| 5. Installation and adjustment .....      | 5 |
| 6. Operations .....                       | 6 |
| 7. Maintenance .....                      | 7 |
| 8. Troubleshooting .....                  | 7 |
| 9. Packing List .....                     | 8 |



# 1. Main usage and application range

## 1.1 Main usage

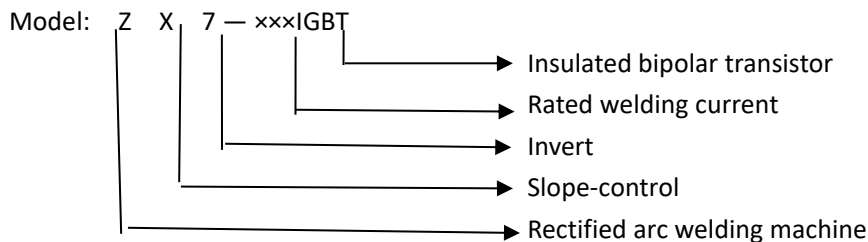
ZX7-IGBT Pro welding machine can be used for different types of electrode, especially suitable for hydrogen electrode to weld low carbon steel, mid-carbon steel and their alloy workpiece. It is mainly used in the industries like ship-building, boiler, power tower, petroleum and construction industries.

ZX7-IGBT Pro is one of our newest energy-saving power source, which with excellent technical standard and welding craft. Its advantages as:

- Good dynamic characteristic, stable arc, good performance, little spatter
- Wide distribution voltage: 380VAC±60VAC
- Arc force adjust function
- Hot current adjust function
- Welding current preset function
- Easy to operate, with remote control connector
- Lack voltage, over heat protection function
- Input voltage fluctuation compensation function, keep stable output current
- High efficiency, Low non-load loss
- Small volume, light weight, easy to move

## 1.2 Model specification

This welding machine designed and produced according to the GB15579.1-2004、JB/T7824-1995.



Note: if there is a "Q" in the rear of the model name, this indicates the fibrin welding machine, the operation method the same as the ZX7-IGBT Pro machines, which is specially suitable for fibrin electrode.

## 1.3 Symbol instruction

|  |                         |  |                   |
|--|-------------------------|--|-------------------|
|  | Read instruction manual |  | Ground connecting |
|  | Positive                |  | Negative          |
|  | Parameter +/-           |  | Current           |
|  | MMA                     |  |                   |

# 2. Working Environment

## 2.1. Environmental area

1 Operating altitudes: less than 1000m

2 Temperature ranges:

Operating temperature range: -10°C~+40°C

Storage temperature range: -25°C~+55°C

3 Relative humidity: 50% for temperature up to 40°C  
90%@20°C

4 Do not locate where there is harmful gases, chemical depositions, mycete, and other explosive or corrosive substances, prevent shaking and jolt.

5 Keep the machine inside and dry all the times, do not place it in a confined space, do not locate where the machine is exposed to direct sunlight.

## 2.2 Safety precautions

1 Open and check the machine: only qualified personnel should perform to avoid danger or machine damage

2 Turn off input power before open the machine, do not touch the electrical conductors to avoid electric shock.

3 Dirt and dust which may cause short circuit should be kept to a minimum.

4 Welding may produce fumes and gases hazardous to health. Use enough ventilation and exhaust at the arc to keep fumes and gases away from the breathing zone.

5 .Arc rays may cause eye injury, please do not watch the arc nor expose to the arc rays.

6 Remove fire hazards from welding area, welding sparks and hot materials from welding can easily go through small crack and cause fire.

## 3. Technical Specification

### 3.1 Parameter

| Item                        | Unit | Parameter               |
|-----------------------------|------|-------------------------|
| Input Power                 | V/Hz | 3~380V/415±15% 50/60 Hz |
| Rated Input Capacity        | KVA  | 19.7                    |
| Rated Input Current         | A    | 30                      |
| Rated Open Circuit Voltage  | V    | 81                      |
| Rated Duty Cycle            | -    | 35% (40°C)              |
| Efficiency                  | -    | 87%                     |
| Power Factor                | -    | 0.88                    |
| Output Current Range        | A    | 20~400                  |
| Arc Force Current Range     | A    | 0~150                   |
| Hot Start Current Range     | A    | 0~120                   |
| Suitable Electrode Diameter | mm   | ≤Φ6                     |
| Cooling Mode                | -    | Air Cooling             |
| Insulation Grade            | -    | F                       |
| Ingress Protection          | -    | IP21S                   |
| Dimension (L*W*H)           | mm   | 520×260×495             |
| Net Weight                  | kg   | 23                      |

\* Rated duty cycle 35% means, take 10min as the working cycle, the welding machine work 6min under the rated current status, rest for 4min. When the welding machine work more than 3.5min, the temperature in the machine will higher than the setting value, the overload indicator will on, and machine no output until the temperature in the machine lower to the setting value. When the overload indicator off, the machine can work again.

### 3.2 Welding electrode and related parameter setting

422 type electrode

|                    |       |        |         |         |         |         |
|--------------------|-------|--------|---------|---------|---------|---------|
| Electrode dia.(mm) | 2.0   | 2.5    | 3.2     | 4.0     | 5.0     | 5.8     |
| Welding current(A) | 50~70 | 70~110 | 100~150 | 160~210 | 200~260 | 260~310 |

507 type electrode

|                    |       |        |         |         |         |
|--------------------|-------|--------|---------|---------|---------|
| Electrode dia.(mm) | 2.0   | 2.5    | 3.2     | 4.0     | 5.0     |
| Welding current(A) | 60~80 | 80~110 | 100~140 | 140~180 | 180~230 |

## 4. General Description

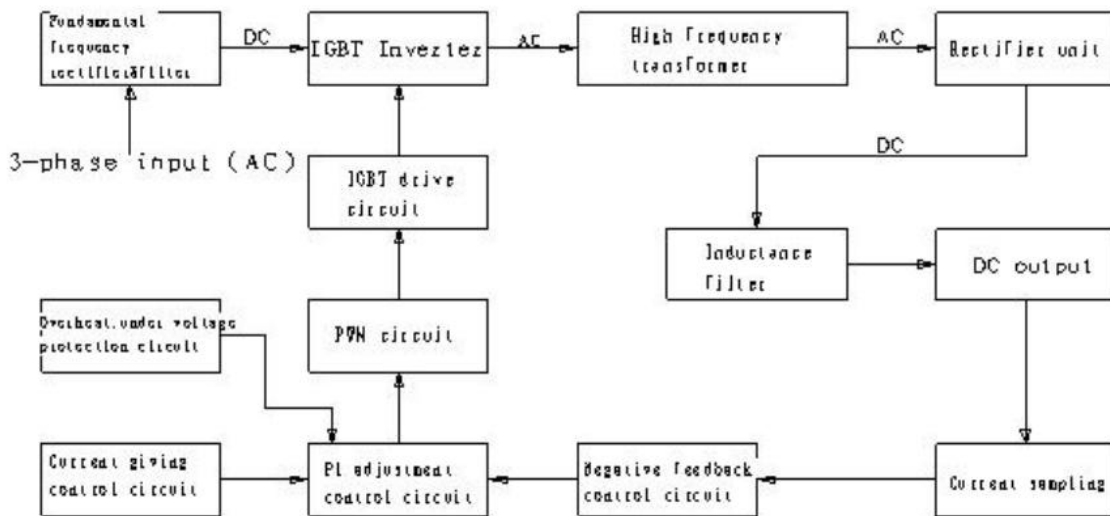
### 4.1 Working theory

ZX7-IGBT Pro welding machine adopts IGBT as the main circuit switch. The three-phase AC input power inverted to 20KHz HF current through the rectify of the full bridge. While after the depression of the HF transformer, rectified by the FRD and filtered by the reactor, the HF current will change to the low-voltage but high welding current..

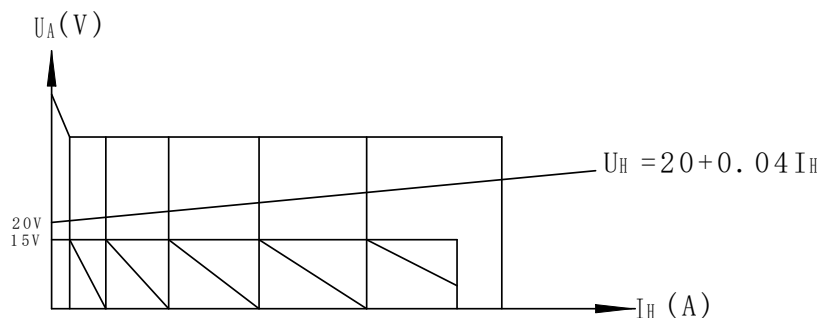
The control circuit will control the output current through the adjusting of the pulse width. The negative feedback signal, which is the real welding current get from the output current sensor, put into the special PWM circuit after compared with the current adjust signal, then output the driving pulse to control the IGBT, so that the output current will keep stable to get descending external characteristic.

Force current function: the control circuit will increase the current when the welding voltage less than 15V, so that the electrode will not stick with the workpiece to enlarge the arc penetration.

### 4.2 Principal diagram

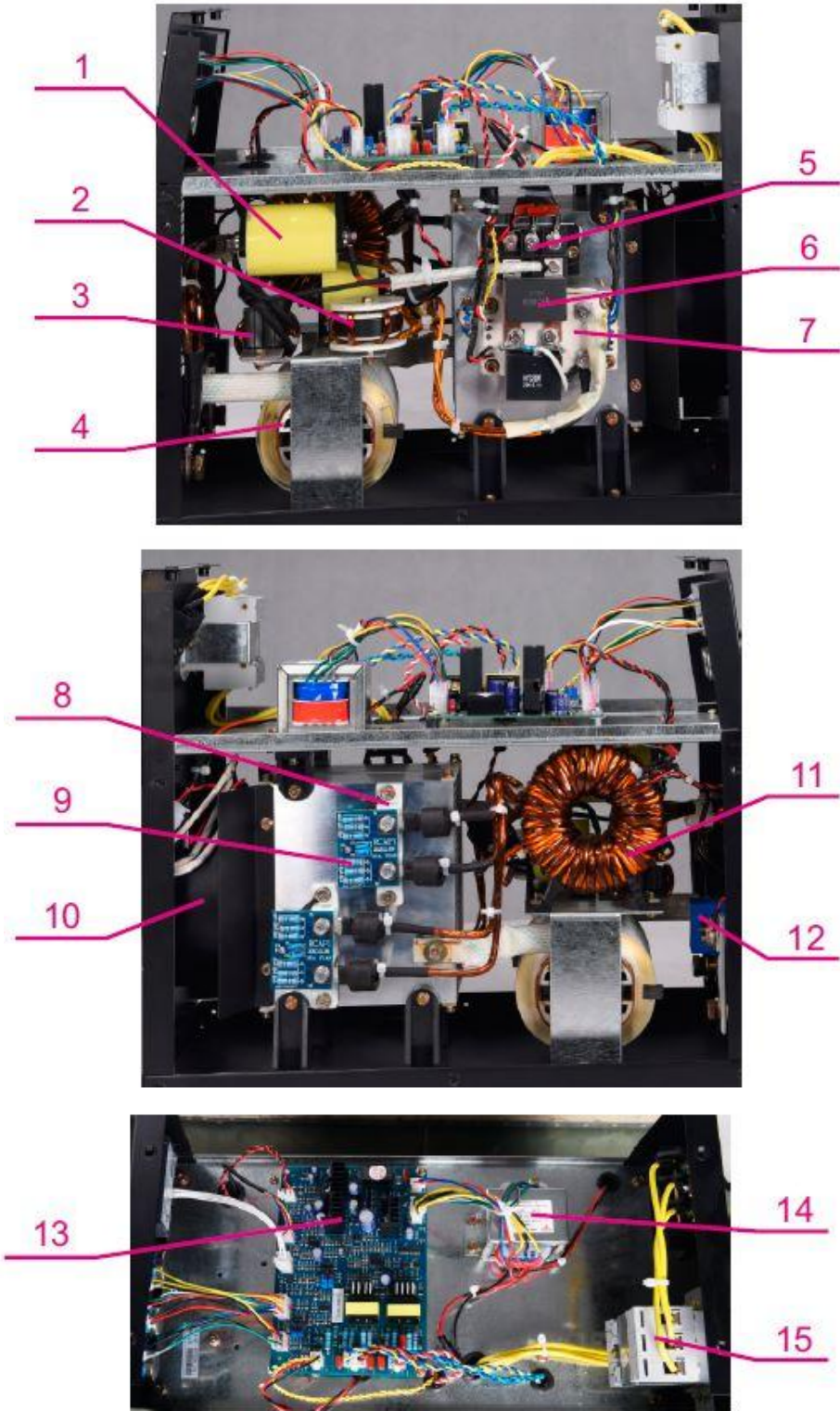


### 4.3 Welding machine output CC/CV feature diagram





4.3 Main parts list



| No. | Item                  | Model              | Note |
|-----|-----------------------|--------------------|------|
| 1   | Capacitor             | CBB88 100uF/500VAC |      |
| 2   | Saturation inductance |                    |      |
| 3   | Linear inductance     |                    |      |
| 4   | Filter reactor        |                    |      |
| 5   | Bridge rectifier      | MDS75-14 (12)      |      |
| 6   | Capacitor             | CBB21-10nF-630V    |      |
| 7   | IGBT                  | GD75HCU120B3S      |      |
| 8   | Diode                 | MMF200ZB040DK1     |      |
| 9   | PCB                   | RCAP1              |      |
| 10  | Fan                   | 150FZY2-D/AC220 吹风 |      |
| 11  | Main transformer      |                    |      |
| 12  | Hall sensor           | TKC500BR           |      |
| 13  | PCB                   | PZ08               |      |
| 14  | Control transformer   | ZX7-4              |      |
| 15  | Air breaker           | DZ47-40/3P D40     |      |

## 5. Installation and adjustment

### 5.1 Open the package and check

Check if there is any damage of the machine, if all the accessories is complete according to the packing list.

### 5.2 Installation

This machine requires 3 phase 380v/50Hz power input, so the related power cable and distribution box is needed, as well as the circuit breaker and ground lead. Reliably connect the protective ground and the yellow-green wire which on the back of the machine. The wire CSA should no less than the following table.

### 5.3 Requirements table

| Parameter<br>Model | CSA for input copper<br>wire (mm <sup>2</sup> ) | Breaker<br>capacity<br>(A) | Fuse protector<br>(A) | CSA for ground<br>lead cable<br>(mm <sup>2</sup> ) |
|--------------------|---|----------------------------|-----------------------|--|
| ZX7-400IGBT Pro    | ≥4  | 40                         | 32                    | ≥4   |

#### Warning:

Completely read the operator's manual before installation, strictly follow the installation requirements. The 3 phase input cable should steadily connected, any one of the three disconnect or poor connect will cause abnormal work.

Slowly and softly adjust the rotary knob, do not continue to turn when it reaches the endpoint.

If there is significantly worse of the performance during the welding process, the machine should be stopped to check.

The potentiometer on the control circuit has different functions, they have been routine tested before delivery, please do not adjust.

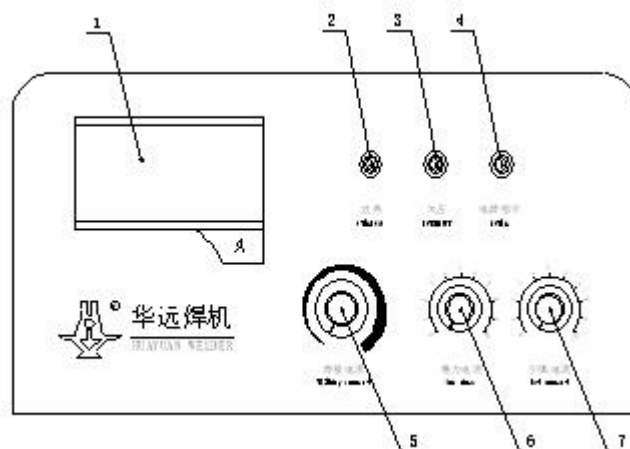
Only qualified personnel should perform this welding machine.

Wear protective garments such as gloves, heavy shirts, trousers and high shoes according to the related safety precautions.

Power off immediately if the abnormal indicator on, then check the input voltage, cooling fan motor, or if there is lack-phase or overheat. Then turn on the machine again when it cooled down, if still have problem, please contact Huayuan company.

## 6. Operations

### 6.1 Front panel instruction



1. Digital meter
2. Over heat indicator
3. Lack voltage indicator
4. Power indicator
5. Welding current adjust
6. Force current adjust
7. Hot start current adjust

### 6.2 operating instruction

When the machine energized, the green indicator on the front panel on, the current/voltage select switch indicate the voltage value about 80V, the welding machine is ready to work.

#### Welding current adjust

Turn the welding current adjust knob, the current display will show the preset current which will be used during welding process

Turn the arc force current knob to adjust the force current value

Turn the hot start current knob to meet the arc start requirements

The current display shows the exact welding current during the welding process

#### Arc force current adjust

When use small current to weld, properly adjust the arc force current can increase the short circuit current value to avoid electrode adhere with work piece, so that the molten drop can easily pass through

to complete welding. Usually for the average current welding, the arc force current can decrease even to zero, so that it can reduce spatter.

#### Hot start current adjust

When use small current welding, properly adjust the hot current can increase the arc striking success ratio.

#### Cooling fan control

Cooling fan will work when welding start and stop 8.5s after welding stop

## 7. Maintenance

Install and operate the machine strictly according to the operator's manual, the warranty period is one year.

#### 7.1 Note:

A turn off the power supply when repair and maintain the machine

B. The machine adopts large capacity and high voltage filter capacitor, open the machine 3s after power off

#### 7.2 Maintenance

A. Check the connections regularly

B. Clean the machine regularly, open the machine and flow the dust with compressed air

## 8. Troubleshooting

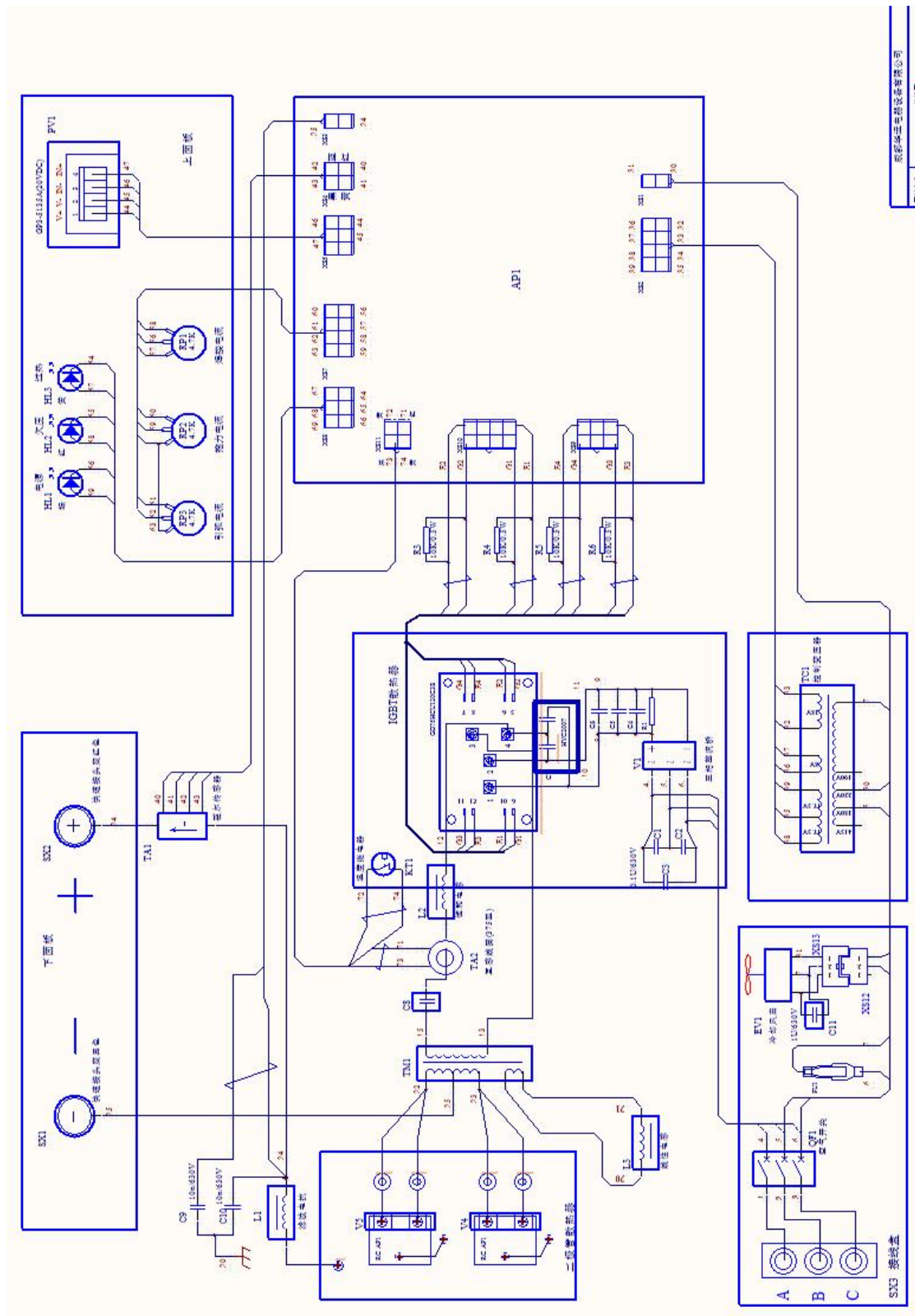
| TROUBLE (SYMPTOMS)  | POSSIBLE CAUSE  | RECOMMENDED COURSE OF ACTION  |
|---|---|---|
| When machine energized, the circuit breaker trip                          | 1.Three phase bridge rectifier may damaged<br>2. The capacitor which parallel with the three phase bridge rectifier may damaged.<br>3. IGBT may damaged | 1. change the bridge rectifier;<br>2. change the capacitor.<br>3. Replace PCB and IGBT    |
| When machine energized, the power indicator not on, no voltage indication | 1. The protective fuse on the back of the machine may break<br>2. Lack phase  | 1. Replace fuse<br>2. Check the input power   |
| When machine energized, the power indicator on, but no voltage indication | 1. PCB AP1 may damage<br>2. IGBT module may damage<br>3. Voltmeter may damage   | 1. Replace AP1<br>2. Replace IGBT module<br>3. Replace voltmeter                          |
| No OCV, there is abnormal noise from the machine                          | FRD on the main circuit is damaged  | 1. Check and replace the FRD  |
| The OCV is OK, but sometimes the arc will break                           | Lack-phase  | Check the input power   |
| Suddenly there is no welding current during the welding process           | 1.welding cable and work piece with poor connection<br>2.Protective fuse break  | 1.check the weld cable<br>2.Replace the fuse(1.5A)  |
| Machine not work, but the overload indicator on                           | 1. Cooling fan damaged cause overheat protection<br>2. Over-load use cause over heat protection   | 1. Replace cooling fan<br>2. Stop welding, let the machine operate for 10min without load |

|   |                                      |                         |
|---|--------------------------------------|-------------------------|
| Machine not work, but the lack voltage indicator on | The input lack-phase or lack voltage | Check three phase input |
|---|--------------------------------------|-------------------------|

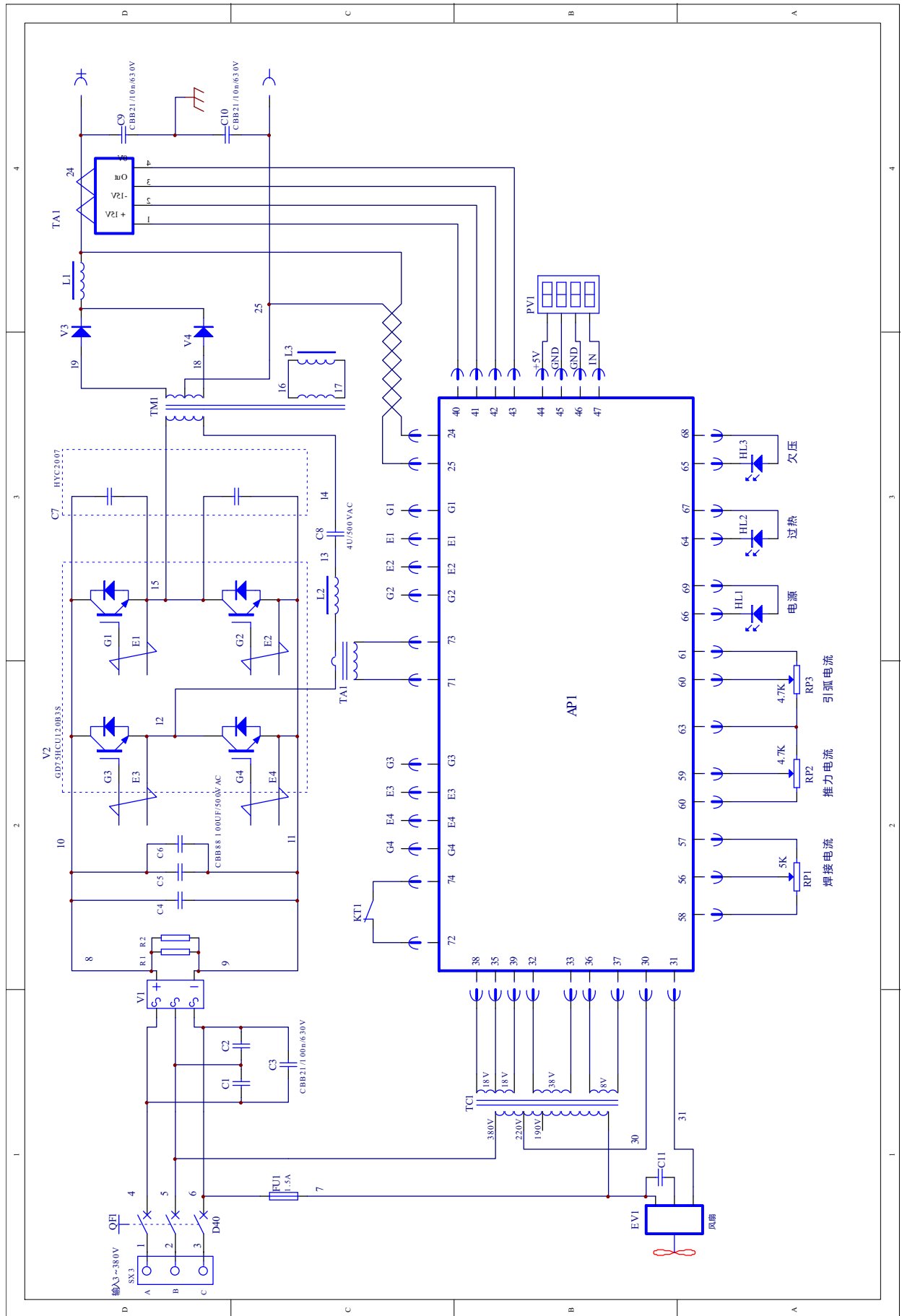
**Attention:** Only qualified technicians should perform troubleshooting work on the machine. If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, please contact us for technical assistance.

## 9. Packing List

- |                                 |       |
|---------------------------------|-------|
| 1. ZX7-IGBT Pro welding machine | 1 set |
| 2 . Electrode holder            | 1 pcs |
| 3. Fast connector               | 2 pcs |
| 4..Documents                    | 1sets |



南京中电电气设备有限公司  
NANJING ZHONGDIAN ELECTRIC EQUIPMENT CO., LTD.



The final explanation right is reserved to Huayuan Company!

If there is any change in the manual, please forgive not to inform separately!

Chengdu Huayuan Electric equipment Co.,Ltd.

Address: Wuhou National Science Park, Chengdu, China

Postcode: 610045

Telephone:0086-28-85744098

Fax:0086-28-85744095

E-mail: [hy\\_sales@126.com](mailto:hy_sales@126.com) [chengduhuayuan@hotmail.com](mailto:chengduhuayuan@hotmail.com)

[www.hwayuan.com](http://www.hwayuan.com)