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. Main usage and application range

1.1 Main usage
ZX7–IGBT Series 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. ZX7-630IGBT is also suitable for air carbon arc gouging. ZX7-IGBT series 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.
Model: Z X 7 — ×××IGBT

- Insulated bipolar transistor
- Rated welding current
- Invert
- Slope-control
- Rectified arc welding machine

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

2. Working Environment

1. Environmental area
1.1 Operating altitudes: less than 1000m
1.2 Temperature ranges:
- Operating temperature range: -10℃~+40℃
- Storage temperature range: -25℃~+55℃
1.3 Relative humidity: 50% for temperature up to 40℃
   90%@20℃
1.4 Do not locate where there is harmful gases, chemical depositions, mycete, and other explosive or corrosive substances, prevent shaking and jolt.
1.5 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. Safety precautions
2.1 Open and check the machine: only qualified personnel should perform to avoid danger or machine damage.
2.2 Turn off input power before open the machine, do not touch the electrical conductors to avoid electric shock.
2.3 Dirt and dust which may cause short circuit should be kept to a minimum.
2.4 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.
2.5 Arc rays may cause eye injury, please do not watch the arc nor expose to the arc rays.
2.6 Remove fire hazards from welding area, welding sparks and hot materials from welding can easily go through small crack and cause fire.

3. Technical Specifications

3.1 Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ZX7-315IGBT</th>
<th>ZX7-400IGBT</th>
<th>ZX7-500IGBT</th>
<th>ZX7-630IGBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input power</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated input capacity (kVA)</td>
<td>13.8</td>
<td>19.7</td>
<td>26.3</td>
<td>36.2</td>
</tr>
<tr>
<td>Rated input current (A)</td>
<td>21</td>
<td>30</td>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>Open circuit voltage (V)</td>
<td>74</td>
<td>77</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Rated welding current (A)</td>
<td>315</td>
<td>400</td>
<td>500</td>
<td>630</td>
</tr>
<tr>
<td>Rated welding voltage (V)</td>
<td>32.6</td>
<td>36</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>Rated duty cycle (%)</td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current range (A)</td>
<td>20~315</td>
<td>30~400</td>
<td>40~500</td>
<td>50~630</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>35</td>
<td>38</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td>Dimension(L×W×H) mm</td>
<td>570×290×530</td>
<td></td>
<td></td>
<td>640×290×530</td>
</tr>
</tbody>
</table>

* Rated duty cycle 60% 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 6min, 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

<table>
<thead>
<tr>
<th>Electrode dia.(mm)</th>
<th>2.5</th>
<th>3.2</th>
<th>4.0</th>
<th>5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding current(A)</td>
<td>70~110</td>
<td>100~150</td>
<td>160~210</td>
<td>200~260</td>
</tr>
</tbody>
</table>

507 type electrode

<table>
<thead>
<tr>
<th>Electrode dia.(mm)</th>
<th>2.5</th>
<th>3.2</th>
<th>4.0</th>
<th>5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding current(A)</td>
<td>70~110</td>
<td>100~140</td>
<td>140~180</td>
<td>180~230</td>
</tr>
</tbody>
</table>
4. Hardware Overview

This machine including: shell, inner part, handle and base, while the inner part include: cooling fan, main transformer, IGBT modules, filter reactor, fast recovery diode modules and PCBs etc.

5. General Description

5.1 Working theory

ZX7–IGBT series 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.

5.2 Principal diagram

5.3 Welding machine output CC/CV feature diagram
6. Delivery and storage
Keep the machine away from rain and snow, the temperature should be -25~+55°C.

7. Installation and adjustment

7.1 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.

7.2 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.

7.3 Requirements table

<table>
<thead>
<tr>
<th>Model</th>
<th>Parameter</th>
<th>CSA for input copper wire (mm²)</th>
<th>Breaker capacity (A)</th>
<th>Fuse protector (A)</th>
<th>CSA for ground lead cable (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZX7-315IGBT</td>
<td>≥4</td>
<td>40</td>
<td>20</td>
<td>≥4</td>
<td></td>
</tr>
<tr>
<td>ZX7-400IGBT</td>
<td>≥4</td>
<td>40</td>
<td>32</td>
<td>≥4</td>
<td></td>
</tr>
<tr>
<td>ZX7-500IGBT</td>
<td>≥6</td>
<td>60</td>
<td>40</td>
<td>≥6</td>
<td></td>
</tr>
<tr>
<td>ZX7-630IGBT</td>
<td>≥6</td>
<td>60</td>
<td>50</td>
<td>≥6</td>
<td></td>
</tr>
</tbody>
</table>

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 potentiometers 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.

8. Operations

8.1 Front panel instruction

1. Digital meter
2. Current/voltage select switch
3. Power indicator
4. Overload indicator
5. Lack voltage indicator
6. Hot current adjust knob
7. Arc force current adjust knob
8. Welding current adjust knob
9. Remote/local control select switch
10. Remote control connector

8.2 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.

1. Local control adjust
Put the switch 9 to local control position, then all the control can operate through the front panel.
Put the current/voltage select switch to current adjust position, adjust the welding current adjust knob., the digital meter will indicate the related preset current value, you can adjust the current value to what you expect.
Adjust the arc force current knob to related value
Adjust the hot current knob to meet the needs for arc striking.
All the above step finish, the machine can begin to work, what the digital meter indicate during the welding process is the exact welding current.

2. Remote control
Connect the remote control box with the remote control connector, put the remote/local control switch to remote control position, then the current is adjusted through the remote control box, adjust method is the same as above.

3. 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.

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

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

10. Troubleshooting

<table>
<thead>
<tr>
<th>TROUBLE (SYMPTOMS)</th>
<th>POSSIBLE CAUSE</th>
<th>RECOMMENDED COURSE OF ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>When machine energized, the circuit breaker trip</td>
<td>1. Three phase bridge rectifier may damaged</td>
<td>1. change the bridge rectifier;</td>
</tr>
<tr>
<td></td>
<td>2. The capacitor which parallel with the three phase bridge rectifier may</td>
<td>2. change the capacitor.</td>
</tr>
<tr>
<td></td>
<td>damaged.</td>
<td>3. Replace PCB and IGBT</td>
</tr>
<tr>
<td></td>
<td>3. IGBT may damaged</td>
<td></td>
</tr>
<tr>
<td>When machine energized, the power indicator not on, no voltage indication</td>
<td>1. The protective fuse on the back of the machine may break</td>
<td>1. Replace fuse</td>
</tr>
<tr>
<td></td>
<td>2. Lack phase</td>
<td>2. Check the input power</td>
</tr>
<tr>
<td>When machine energized, the power indicator on, but no voltage indication</td>
<td>1. PCB AP1 may damage</td>
<td>1. Replace AP1</td>
</tr>
<tr>
<td></td>
<td>2. IGBT module may damage</td>
<td>2. Replace IGBT module</td>
</tr>
<tr>
<td></td>
<td>3. Voltmeter may damage</td>
<td>3. Replace voltmeter</td>
</tr>
<tr>
<td>No OCV, there is abnormal noise from the machine</td>
<td>FRD on the main circuit is damaged</td>
<td>1. Check and replace the FRD</td>
</tr>
<tr>
<td>The OCV is OK, but sometimes the arc will break</td>
<td>Lack-phase</td>
<td>Check the input power</td>
</tr>
</tbody>
</table>
Suddenly there is no welding current during the welding process
1. welding cable and work piece with poor connection
2. Protective fuse break
1. check the weld cable
2. Replace the fuse (1.5A)

Machine not work, but the overload indicator on
1. Cooling fan damaged cause overheating protection
2. Over-load use cause over heat protection
1. Replace cooling fan
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.

### 11 Packing List

1. ZX7-IGBT welding machine 1 set
2. Electrode holder 1 pcs
3. Fast connector 2 pcs
4. Documents (Guarantee card, operator's manual, quality certificate) 1 for each