INVERTER ARC
WELDING MACHINE
INARC 250 DSI

OPERATION MANUAL

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PREFACE

Thank you very much for purchasing our products.

This series products are the inverter Welding machines manufactured by this company by adopting advanced inverter technology.
The Working Principle is to adopt the pulse width modulation (PWM) and high power Switch component IGBT to rectify 50Hz/60Hz power frequency to direct current Invert the current into High Frequency upto 20 KHz and then reduce the voltage for Rectification.
The PWM output can support high power DC power supply for Welding; due to the switch power inverting technology adopted, the weight and Volume of the welding machine decrease greatly and the whole-set conversion rate increases by over 30 %

We recommend you read carefully and understand completely this manual before Installation and operation in order to protect the safety of you and others

CONTENTS

I BEFORE USE

1-1 SAFETY NOTICES

·Before use, please read carefully this manual for your proper use.

·The notices listed in this manual aim at ensuring the safe use of the device and Protection measured taken during welding so as to prevent you and others from being harmed and injured.

·When this welding machine is designed and made, the safety has been fully considered; be sure to conform to the notices herein during use; otherwise, major personal accidents such as death or heavy injury may occur.

ALARM SIGN	SIGNAL WORDS
	EXTREME DANGER
	DANGER
	CAUTION

For the welding machine use, adopt the signs shown below to indicate Dos and Don'ts

	COMPULSORY	MUST DO, SUCH AS GROUND
	FORBIDDEN	MUST NOT DO

The above signs are used in general conditions.

1-2 THE FOLLOWING SAFETY NOTICES SHOULD BE OBSERVED:

 **DANGER** In order to avoid major accidents, be sure to obey the following rules:

1. Never use the welding machine for the operation rather than welding.
2. When this welding machine is designed and made, the safety has been fully considered; be sure to pay attention to the notices herein during use; otherwise, major personal accidents such as death or heavy injury may occur.

3. With regard to the construction of the power source at input side, the selection of the installation place, the use, the keeping and configuration of high-pressure gas, the keeping of workpieces and the waste disposal after welding, etc, be sure to conform to related regulations and the internal standards of the company.
4. Never enter the welding operation place for unrelated personnel.
5. For people using the heart pacemaker, never be close to the welding machine during use or stay around the welding operation place without the doctor's permission.
6. Ask personnel with professional qualifications or professionals to install, overhaul and maintain the welding machine.
7. In order to ensure safety, please properly understand the contents in this manual and ask personnel with safe application knowledge and techniques to operate the welding machine.

DANGER To avoid electric shock, be sure to follow the instructions below.

The touch with the live positions out of the secondary electrode may cause electric shock or burning.

1. Never touch live parts.
2. Ask related electrical personnel to earth the welder and parent material as per related regulations.
3. During installation and servicing, the power supply of the distribution box must be first turned off and the operation can be conducted in 5 minutes. Because the capacitor is rechargeable, even if the power is shut off, never work before your make sure the capacitor is not charging.
4. Never use the cable without enough capacity and with insulation sleeve damaged to cause the conductor to be exposed.
5. Ensure the insulation of the cable connection.
6. Never use the welder with the housing removed.
7. Use dry insulation gloves.
8. Use safety grille during work at height.
9. Conduct regular maintenance and servicing; do not use it until damaged part is repaired.
10. When it is not in use, turn off all input power supplies.
11. Use the anti-electrical shock function when using the AC arc welder in narrow places or at height.

DANGER In order to prevent welding fume and gas harming you and others, always use protective tools.

- Welding fume and gas may harm health.
- In narrow place, welding may cause suffocation due to oxygen shortage.

1. In order to prevent gas poisoning, suffocation, etc, please use only the specified facilities and breathe protective tools.

2. In order to prevent dust harm and poison such as welding smoke, etc, be sue to use the specified local exhaust equipment and breathe protective devices.
3. In case of welding on the bottom of cases, boilers, vessels, etc, as such gases heavier than air as CO2, Air, etc will settle on the bottom, therefore, make sure sufficient gas exchange and breath protective tools are available.
4. When working in the narrow place, please accept the check of the supervisor, make sure sufficient air exchange is available and prepare the breath protective devices.
5. Do not conduct welding in degreasing, cleaning and spraying areas.
6. When welding the steel plate with plating or coating, harmful fume and gases may occur, so always use breath protective tools.

DANGER

In order to prevent fire, explosion, burst, etc, be sure to follow the following regulations:

- ✳ Splashes and hot parent materials having just been welded may cause fire.
- ✳ When the point with bad cabling, the side current loop of such parent materials as steel bar, etc have incomplete touch, electric heating may occur and thus cause fire.
- ✳ Do not weld on the container with flammables, otherwise, explosion may occur.
- ✳ Do not weld the sealed container, such as trough (case), tube, etc, otherwise, burst may occur.

1. Do not place flammables in the welding place.
2. Do not weld near flammable gases.
3. Do not keep the hot parent material having just been welded near flammables
4. When welding parvis, ground or wall, remove the flammables on the back.
5. Make sure the cable connection point is well insulated.
6. The cable on the parent material shall close to the welding point as possible.
7. Do not weld such units as gas pipe, sealed trough, etc with gases.
8. Always place some extinguishers near the welding area to prevent fire.

CAUTION

In order to prevent welding arc, splash, welding slag, noise, etc from harming you and others, please use the specified protective tools.

- ✳ Arc may cause eye inflammation or skin burning, etc
- ✳ Splash and welding slag can burn your eyes and your skin.
- ✳ Noise may affect listening.

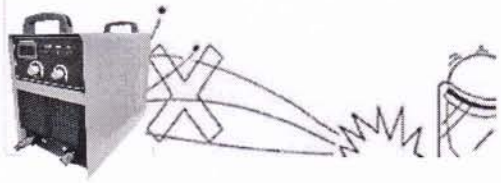
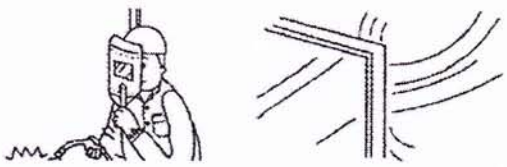
1. When welding or monitoring the welding, please use protectors with enough opacity.
2. Please wear protective glasses.
3. Please use welding protectors welding such as leather protective gloves, long-sleeve clothes, foot protectors and aprons.
4. Install protective barriers around the welding place in order to prevent arc from harming others.
5. In case of large noise, be sure to use sound-insulated devices.

1-3 HANDLING, INSTALLATION PLACE

1-3-1 HANDLING

⚠ CAUTION	Keep flat during transport; properly protect the welding machine to prevent scratches, bruises, etc.

1-3-2 INSTALLATION PLACE

Place the welding machine in the rainproof room with no direct sunshine, low humidity and little dust (room temperature 10°C~40°C). 	Any conductive foreign object can not enter the welding power supply. 
Keep the welding power supply over 20cm away from the wall. Two welding machines should be over 30cm apart when placed in parallel. 	Conduct the welding at the place without wind (use the wind shield, etc). 

⚠ CAUTION	This product should be used indoor; it's recommended not to use it in the place which may suffer from rain.
In case this product is soaked with rain, rain drops may fall into the power supply inside; at this time, a serious accident may occur. Therefore, ask professional personnel to conduct related check and maintenance.	

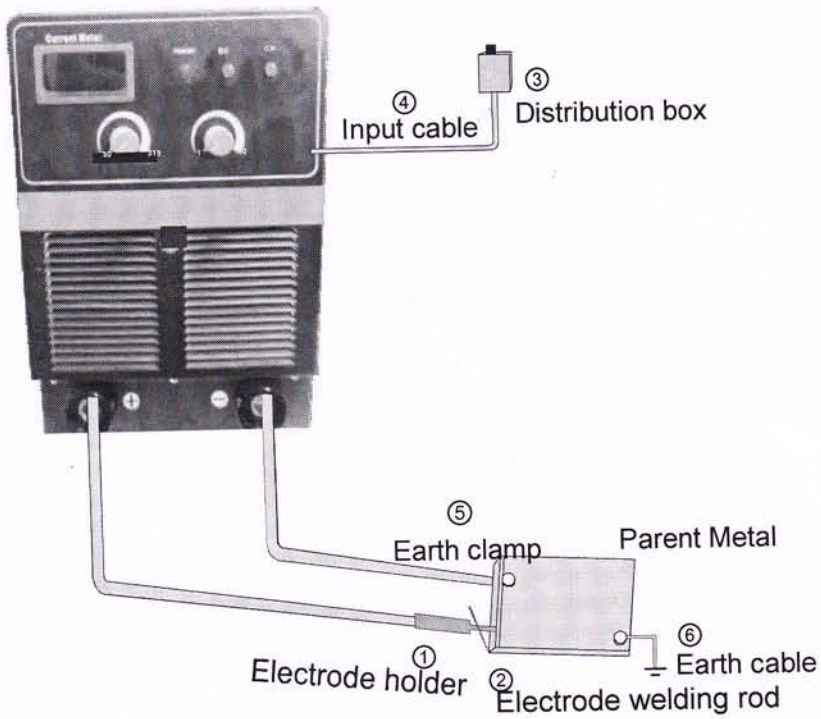
1-4 DEVICE PARTS

1-4-1 APPARATUSES NECESSARY FOR WELDING CONSTRUCTION

NO.	STANDARD PRODUCTS NEEDED	RMKS
①	Electrode holder	500A
②	Electrode welding rod	1.6~5.0
③	Distribution box	Three-phase 380V

NO.	STANDARD PRODUCTS NEEDED	RMKS
④	Input cable	Over 8mm^2
⑤	Earth clamp	500A
⑥	Earth cable	Over 8mm^2

⚠CAUTION	The following diagram is the connection diagram of the welding machine applied with other apparatuses; be sure to apply the welding machine with the specified electrode holder and earth clamp; otherwise, the welding performance will be affected and the welding machine may be damaged.



1-4-2 CABLE CONNECTION

⚠CAUTION	Waterproof measures

When this welding machine is used under the circumstance with water, be sure to adopt waterproof measures in the cable connection position. (If water enters the connection position, the insulation resistance may decrease or even the short circuit may occur between connecting lines, thus causing failures.)

·The product adopts (-) output; after the electrode holder cable is connected with the output terminal, a scope for the welding operation can be provided. (of course, the parent metal side cable should adopt proper length based on the actual condition).

·Be sure to pay attention to the following when connecting cables:
The length and wire diameter (sectional area) should be selected properly; otherwise, the welding performance will decrease due to the voltage drop on the cable.

■ Therefore, when connecting the extended cable, please note the following:

·The relation between the cable extension and sectional area. Refer to the number table of the cable connection. (the same for the parent metal connection).

·Shorten the connection cable length as possible.

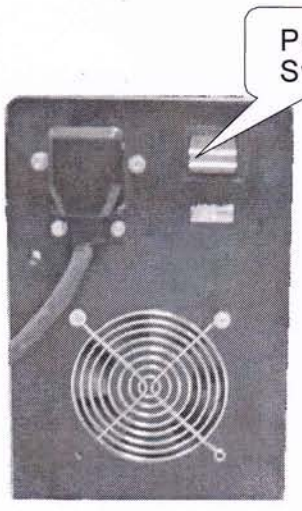
·Connect to the parent metal when needing to connect the (+) voltage test terminal of the parent metal.

·Try to use single cable and not to lengthen it in the middle.

1-5 NAMES AND FUNCTION OF VARIOUS PARTS

1-5-1 POWER SWITCH (BREAKER)

⚠ CAUTION	About Power Supply
Under the circumstance that the electric generator is used, be sure to disconnect the power supply when starting the generator.	

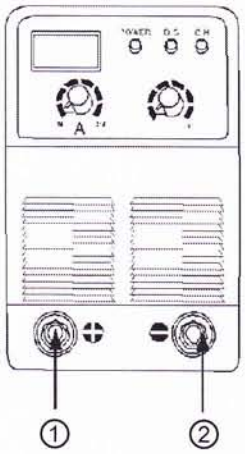


Connection and disconnection operation of the power switch

·Power-on state when the power switch is at " ON" point

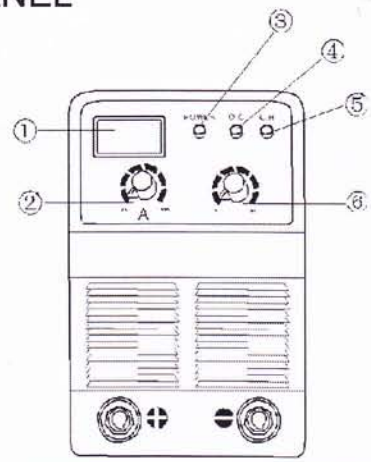
·Power-off state when the power switch is at " OFF" point

1-5-2 FRONT WIRING PART



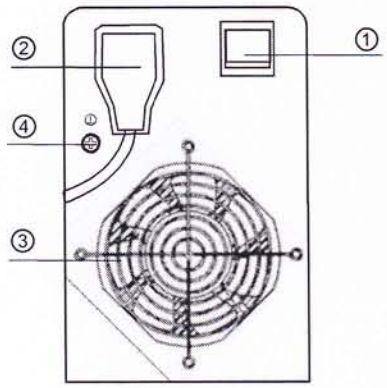
①	Electrode holder connection terminal ·Connect the terminal and electrode holder
②	Parent metal connection terminal ·Reliably connect the terminal and parent metal

1-5-3 OPERATION PANEL



SN	Name	Function
①	Digital display meter	Used for displaying the welding current
②	Current adjustment potentiometer	Used for adjusting the welding current
③	Power indicator	Used for indicating the power switch status
④	Abnormal indicator	When the over-current or overload duration rate is used , this indicator will be on and the welding machine has no output.
⑤	Over-heat indicator	When the temperature is too high, this indicator will be on and the welding machine has no output.
⑥	Thermal arc striking potentiometer	Increases arc starting current

1-5-4 REAR PANEL



①	Power switch ·Turn off the welding machine power switch
②	Power input cable ·When connecting the power input cable, be sure to properly connect it to prevent loosening
③	Fan motor ·Inlet where the fan takes in cold air ·Do not put any wind shield object around
④	Grounding screw ·Connects to the earth cable (yellow) of the input cable.

II TECHNICAL DATA

2-1 PARAMETERS & SPECS

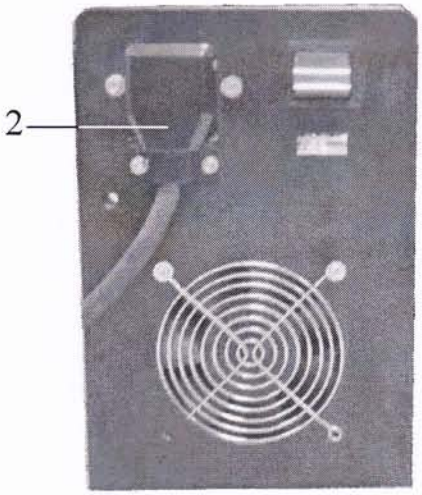
2-1-1 TECHNICAL PARAMETERS

Parameters \ Model	IN ARC-250 DSI
Input power voltage (V)	380V-420V 50/60HZ
Rated input power capacity (KVA)	9.5
No-load voltage (V)	65
Output current scope (A)	20-250
Rated output voltage (V)	30
Duty Cycle (%) (25℃)	60
No-load loss (W)	40
Efficiency (%)	85
Power factor (cosö)	>0.93
Insulation class	F
Housing protection class	IP23
Weight (KG)	18
External dimensions (mm)	540*210*355

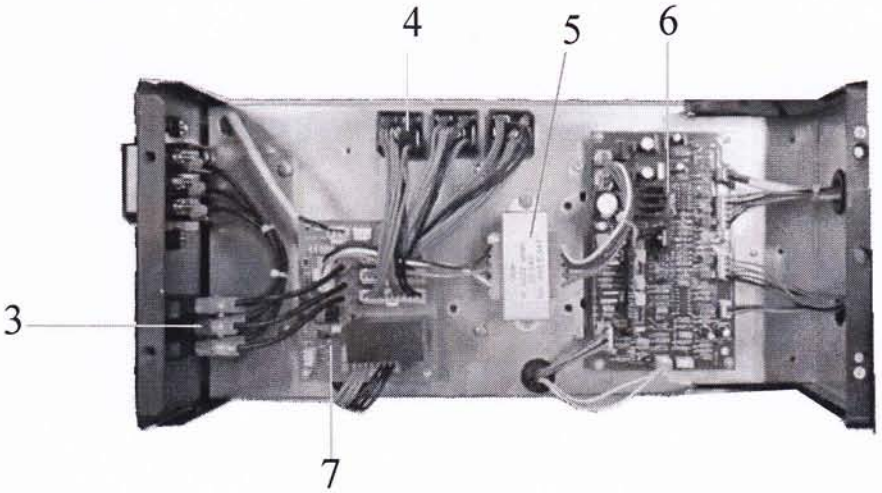
2-2 PRODUCT CONFIGURATION DIAGRAM

FRONT VIEW

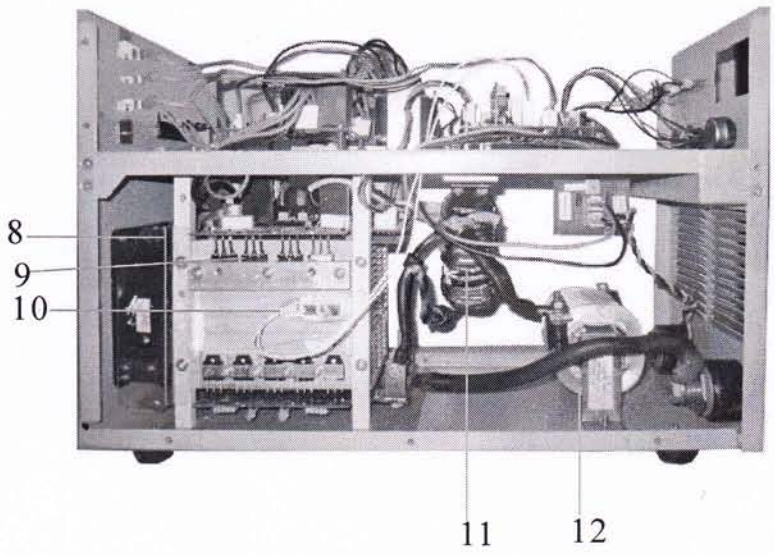
BACK VIEW



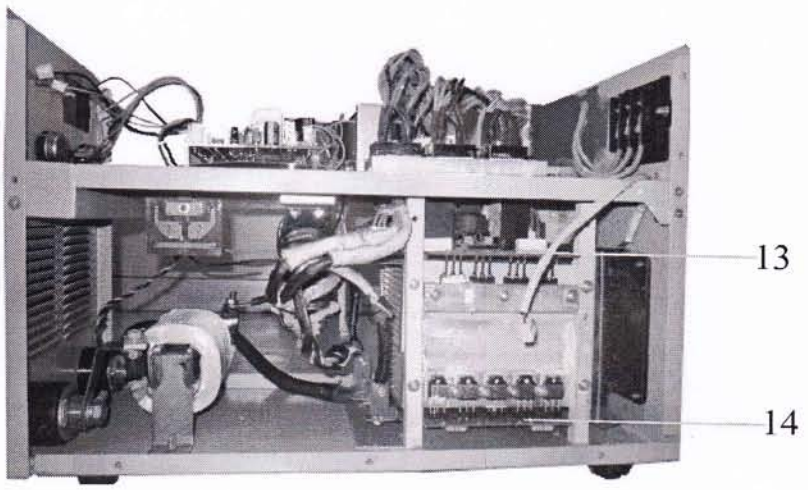
TOP VIEW



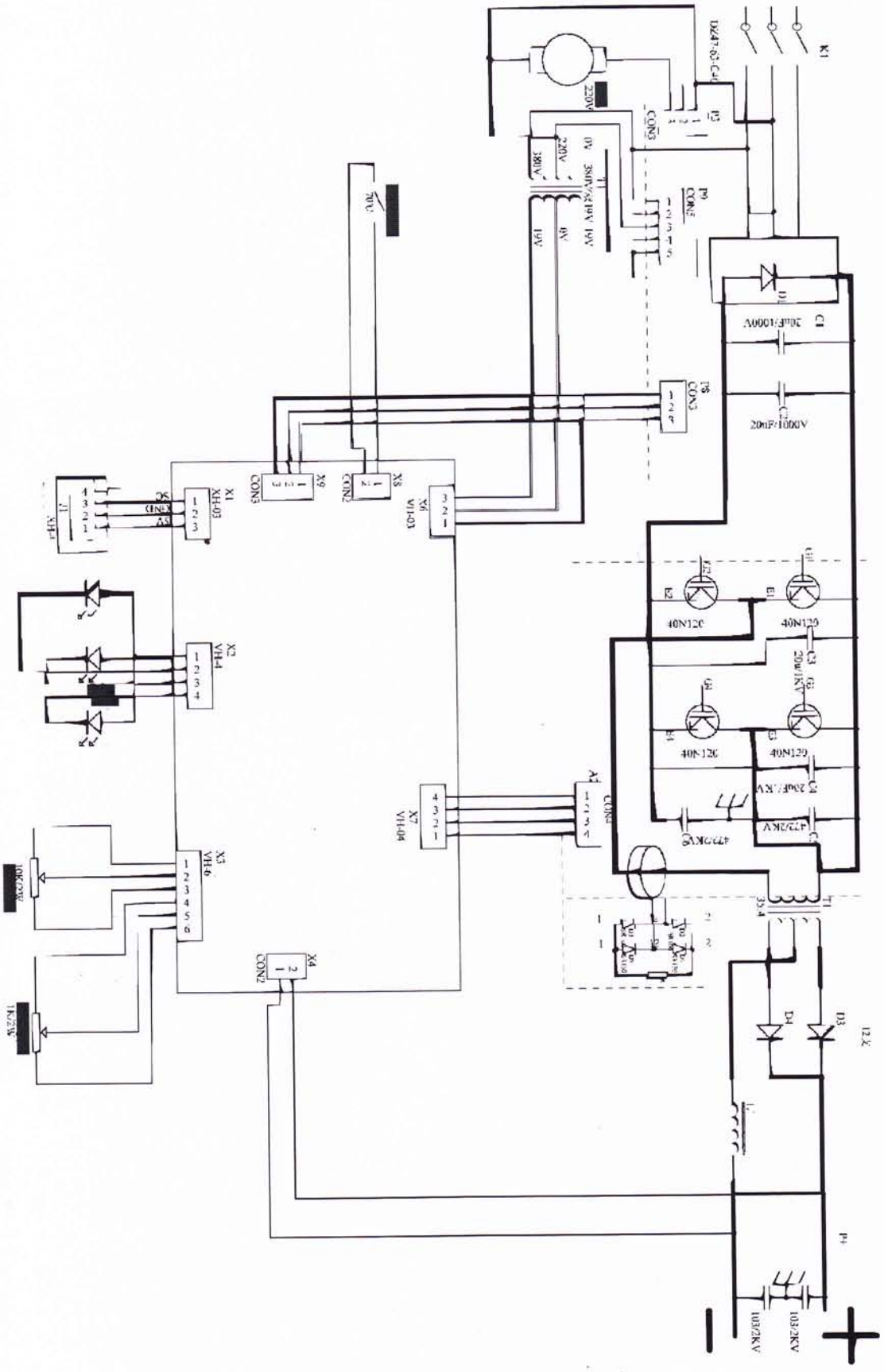
LEFT VIEW



RIGHT VIEW



2-4 BLOCK DIAGRAM



2-3 PRODUCT BREAKDOWN

SN	Name	REMARKS
1	Fast socket	Connects to the welding handle clamp and the earth clamp
2	Junction box	Prevents the power cable from being pulled or broken
3	Switch	Control the power on/off
4	Rectifier bridge	AC380V in;DC540V out
5	Working frequency transformer	Supplies power for the main control board
6	Control panel	Core control circuit, PWM adjustment and IGBT drive control available
7	Power plate	Rectify and filter
8	Fan	Used to cool heating parts inside
9	IGBT	Switch equipment
10	Radiator	Helps to exhaust heat
11	Main transformer	Reduces the voltage of AC after inversion and controls idle voltage
12	Reactor	Output DC smoothing
13	Inversion board (IGBT)	Inverts DC 540V into the branch current of 20KHZ
14	Rectifier diode	Rectifies the current after HF inversion into DC

2-5 TABLE OF WELDING CONDITIONS

1. Brand and diameter of the welding rod, mainly dependent on the material property, weldment thickness, connector type, welding seam position, welding parameter, etc. The relation between the welding rod diameter and the plate thickness is shown below:

Weldment thickness (mm)	>1	2	3	4~5	6~12	≧13
Welding rod diameter (mm	1.5	2	3.2	3.2~4	4~5	5~6

2. Welding current: The welding current is determined mainly based on such factors as the welding rod type and diameter, weldment thickness and connector type, welding seam position and welding layers; when the structural steel welding rod is in the flat welding position, the welding current may be selected initially according to the following emprical formula:

$$I = K d$$

I: welding current K: emprical coefficient d: welding rod diameter

The relation between the welding current emprical coefficient and welding rod diameter:

Welding rod diameter (mm)	φ1.6	φ2~2.5	φ3.3	φ4~6
Emprical coefficient (A/mm)	20~25	25~30	30~40	40~50

In vertical welding, horizontal welding or overhead welding, the welding current shall be 10~20% less than that of flat welding; during angle welding, the current shall be 10~20% more than that of flat welding. The alloy steel welding rod and the stainless steel welding rod, due to large resistance and high expansion coefficient, can become red easily during welding and thus cause the coating to fall off and the welding quality will be affected; therefore, the current should be reduced properly.

3. Connection method for welding output
The alkali welding rod, during welding, should adopt DC counterclockwise connection.
The acid welding rod, during welding, should adopt DC clockwise connection.

III CONNECTION

3-1 CONNECTION

DANGER	Any live electrical parts touched may cause fatal electric shock or serious burns. In order to prevent such personal accidents as electric shock and burn, be sure to follow the instructions below:

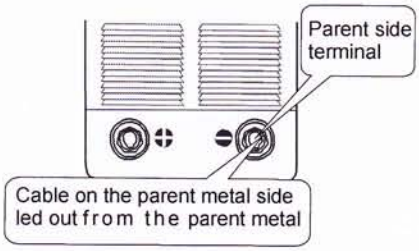
- Please connect the cable after turning off the distribution box, this power switch and power supplies of related equipment.
- Do not operate when there is water on your hand.
- Make sure the exposed conductor part is reliably insulated, such as connection position.
- Never place any heavy object on the cable or make the cable touch the welding position.
- In order to ensure safety, ask professional electrical construction operator with qualifications to conduct the reliable construction.

⚠ CAUTION	Too hot cables may cause fire, so please follow the instructions below.
Please use the specified cables and connect them to their own positions reliably and tightly.	

3-1-1 CONNECTION OF INPUT SIDE

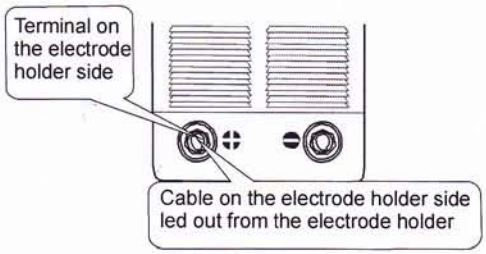
Connection of parent metal.

Please connect the parent metal to the terminal on the parent metal side with the attached quick plug.



Connection of the cable on the electrode holder

Connect the electrode holder cable to the terminal on the electrode holder side with the attached quick plug.

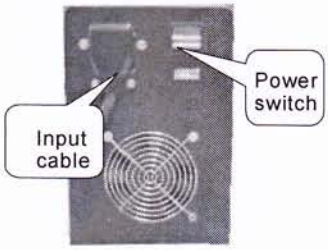


3-1-2 CONNECTION OF OUTPUT SIDE

Connection of input power supply

⚠ DANGER	Please configure one power distribution box for every welding machine.

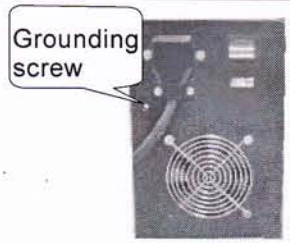
Connect the cable on the input side to the output terminal of the switch of the power distribution box.



Connection of earth wire

⚠ Caution	As the tap water pipe and reinforced bars for houses have no full grounding, never connect the earth wire to such places.

Connect one end of the earth wire to the rear grounding terminal
Reliably ground the other end of the earth wire



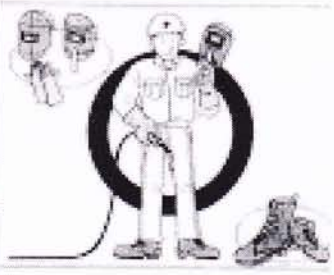
IV USE INSTRUCTIONS

4-1 OPERATION BEFORE AND AFTER WELDING

4-1-1 PREPARATION BEFORE OPERATION

⚠ DANGER		During operation, be sure to use protective devices or air exhaust system to protect you and others from being damaged due to the welding fume and ensure sufficient oxygen supply.
·If the welding operation is conducted in small and badly ventilating area, it may lead to the oxygen deficiency and even make people suffocated. ·The fume intake during welding is very harmful to the human body; be sure to provide fume exhaust and air exchange methods or use the respiratory protective device.		

⚠ WARNING		During operation, be sure to use protective devices to protect you and others from being damaged by the arc, splash, noise, etc caused by welding.
·Wear the special protective clothes, such as gloves, safety boots, etc to protect eyes and the exposed skin. ·Please prepare shades or use protective masks with shadow shield.		



■ After connection is over, check if the following connections are completed.
Parent metal: Earth wire
Welding machine: Grounding terminal earth

■ Power on
Turn the switch of the power distribution box on and then turn on the switch of this device.

4-1-2 WORK AFTER OPERATION

■ Power off
Firstly power off this device and then the power distribution box.

⚠ CAUTION	Caution In order to make this product fully cool down, be sure to disconnect the power supply after over 5min when the welding operation is finished.

4-2 OPERATION

4-2-1 OPERATION PROCESS

·Strike an arc to make the welding rod and the workpiece short, then lift the welding rod upward to ignite the arc. This process is called as the ignition and lift type arc

striking. Slightly scratch the end of the welding rod on the surface of the metal and then lift the welding rod upward to ignite the arc. This process is called as scratch type arc striking.

·In the welding process, when the arc is ignited, on the one hand, carefully observe the status of the bath, always keep the bath unchanged in size, keep adjusting the angle of the welding rod to control the arc length and prevent the metal inside the bath from flowing out; on the other hand, keep the arc moving straightly at the constant speed along the welding direction, no equal and consistent welding seams cannot be obtained unless the arc as big as the bath keeps moving at constant speed.

·When the arc ends and the welding is over, if the arc is directly drawn out, arc pits may come into being. Arc pits may produce air hole cracks and thus affect the strength of the welding seam joint. In order to avoid such defect, the following measures should be taken:

a. When the arc moves to the welding seam final end, stay there for a while or back weld a small section before ends the arc; this method is suitable for alkalic welding rod.

b. When the arc moves to the welding seam final end, repeatedly blow out and strike the arc to fill in the arc pits.

C. The welding seam of the important structure adopts arc ending plate so that arc can operate certain time on the plate before it ends.

4-2-2 OPERATION INSTRUCTIONS

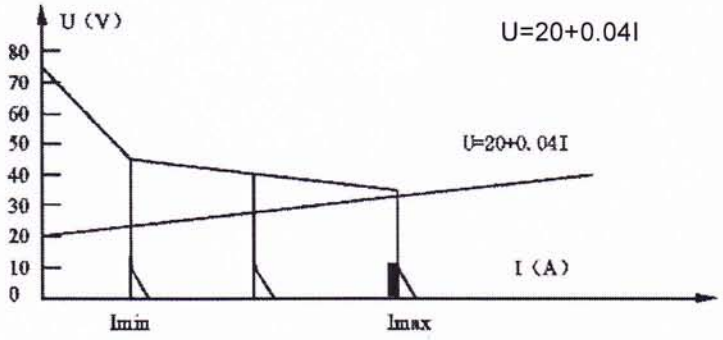
■ Operation instructions (see the panel diagram)

·Turn on the power switch and the meter screen will display the set current value, the fan will start rotation.

·Adjust " Welding current adjustment button" according to your need to make the welding performance meet your requirement.

·Generally, the corresponding values of the welding rod and welding current are:
Φ 2.5: 70-100A; Φ 3.2: 110-160A; Φ 4.0: 170-220A; Φ 5.0: 230-280A.

4-3 LOAD DURATION RATE



Input characteristics of ZX7 series welding machine

The rated load duration rate of this device is 60%, indicating: 10min as one cycle, use rated current 350A to weld for 6min and let the machine be idle for 4 min. During actual welding, due to different load duration rate, the allowed welding current varies, as shown in the following table:

Load duration rate (%)	60	100
Welding current (A)	350	271

V CHECK

5-1 DAILY CHECK

⚠WARNING	⚡	Any live electrical parts touched may cause fatal electric shock or serious burns. In order to prevent such personal accidents as electric shock and burn, be sure to follow the instructions below:
During daily check, be sure to turn off the power supplies of this product and distribution box (user's equipment). (except the appearance check not requiring touching or approaching live parts.		

·The adherence to daily check is crucial to keeping high performance of the device and safe operation.

·Conduct the check according to the check items in the table below; if necessary, clean or replace related parts.

5-1-1 WELDING POWER SWITCH

ITEMS	CHECK POINTS	RMKS
Front panel	·Check if every component is damaged or loose. ·Check if the lower quick socket is loose.	The lower quick socket is as regular check item. If defect occurs, it is necessary to check the inside, fasten the parts or replace the components where necessary.
Rear panel	·Check if the air intake of the cooling fan has foreign objects sticking to.	
Top plate Bottom plate Side panel	·When the machine cover is installed onto the housing, check if it is loose. ·Check if bolts are loose.	In case of defects, it is necessary to replace or fasten components, etc as required.
Routine	·Power on, and then check if the appearance has fading or too hot traces. ·Check if the cooling fan has stable operation sound. · Check if the cooling fan takes in air from the air intake, if odor, abnormal vibration or noise (especially during welding) occurs.	In case of defects, it is necessary to check the inside of the device.

5-1-2 CABLES

ITEMS	CHECK POINTS	RMKS
Grounding cable	·Check if every earth wire (for this device and parent metal grounding) falls off; and check if the connections are safe and reliable.	In order to avoid personal electric shock accidents, be sure to conduct related checks.
Cable	·Check if the cable insulation layer is worn and has other damages, if the conductive components are exposed. ·Check if the cable suffers abnormal exterior force ·Check if the connection of the cable connecting with the parent metal is reliable and firm.	In order to ensure the arc safety and stability, be sure to adopt proper methods to conduct the check according to the condition of the operation site; daily check should be simple while regular check should be careful.

5-2 REGULAR CHECK

⚠WARNING	⚡	Any live electrical parts touched may cause fatal electric shock or serious burns. In order to prevent such personal accidents as electric shock and burn, be sure to follow the instructions below:
·In order to ensure safety, the regular check must be completed by personnel with professional competency or competent personnel. ·Before check, be sure to turn off the power supplies of this product, distribution box (user's equipment), related devices (external devices connected with the input terminal); and due to the discharge of the capacitor, be sure not to operate until the welding power supply is turned off for at least 5min.		

⚠WARNING	In order to prevent the semiconductor and P plate from being damaged by static, please follow the instructions below:
Before touching the conductor of the cables and P plate inside the device, you may remove the static in advance via touching the housing metal position with your hand, etc.	

The device is designed with excellent 3-resistance structure; however, in order to improve the service life and reliability under severe circumstances, remove the device cover and clean various parts inside with dry compressed air at least once every 6 months. (If the heat radiator is covered with dust, the heat radiation will be affected and the bad effect IGBT and drive circuit will be affected on. In addition, the dust accumulated between the transformer coils will lead to the insulation performance decrease.) Please specially note if PCB wiring terminals on IGBT inverter plate and fast recovery diode plate rectifier loosen and oxidate.

You may make the label and fill in the date for the regular check.

(3-6 months) conduct an internal check for the welding power supply. For details, please refer to the user manual.

	1	2	3
Regular check Period	/ /	/ /	/ /
	4	5	6
Year/Month/Day	/ /	/ /	/ /

⚠CAUTION	If the welding machine has just been turned off, you cannot conduct an Internal overhaul to it but you should do so at least 5min after the power distribution box switch or power switch is disconnected so that the capacitor inside the welding machine can have a complete discharge.

■ CHECK CONTENTS

In addition to the check items below, the user may add more check items according to his/her actual situation.

·**Remove dust inside**

Remove the cover, remove the dirt or foreign matters hard to be blown away. Use the compressed air without water contained (dry air) to blow the accumulated dust inside away.

·**Routine Check**

Remove the cover and be sure to pay attention to the check on the following items and non-routine items.

Check if there is rare odor, fading or overheat damage traces and the connection points are loose.

·**Cable Check**

Please mainly check such non-routine check items (supplementary fastening, etc) as the earth wire, cables, etc.

VI TROUBLES AND TROUBLESHOOTING

6-1 TROUBLES AND TROUBLESHOOTING

⚠WARNING	⚡	Any live electrical parts touched may cause fatal electric shock or serious burns. In order to prevent such personal accidents as electric shock and burn, be sure to follow the instructions below:
·Troubleshooting must be completed by personnel with professional competency or competent personnel. ·Before operation, be sure to turn off the power supplies of this product, distribution box (user's equipment), related devices (external devices connected with the input terminal); and due to the discharge of the capacitor, be sure not to operate until the welding power supply is turned off for at least 5min.		

■ COMMON FAILURES, CAUSES AND SOLUTIONS

FAILURES	CAUSES	SOLUTIONS
After power-on, the indicator is not on and the welding machine does not work.	· The power cord is connected improperly ·Disconnect ·The auxiliary power supply on the control panel is damaged	·Check the power supply ·Check the circuit ·Replace the control panel
Too hot, especially bright indicator	·Too high temperature inside ·Damaged control panel or temperature sensor ·Check if the fan works normally	·Use after the welding machine is cooled ·Replace the control panel or temperature sensor ·Check if the circuit is normal; if the voltage fan doesn't turn, replace the fan
Big splashes, bad formation	·Check if the polarities are connected reversely ·The welding rod is damped or	·Exchange polarities ·Dry the welding rod or replace it

FAILURES	CAUSES	SOLUTIONS
Unstable welding current	·Unstable input voltage ·Damaged control panel	·Check the power supply ·Replace the control panel
When the power-on indicator and the digital meter is on, the welding machine will not work.	·Check if no-load voltage exists a. If no-load voltage exists, maybe the earth wire or welding wire is broken. b. If no-load voltage doesn't exist, maybe the fast recovery diode is damaged (whether the input s short circuited or not can be measured) c. Damaged control panel d. Damaged IGBT	·Check and replace the cable ·Check and replace the Rectifier tube ·Check and replace the control panel ·Check and replace IGBT or inverter plate
Unadjustable welding current	·The welding current Potential unit is broken. ·Damaged meter ·Damaged control panel	·Replace ·Replace ·Replace
The meter current can Be adjusted up, but the actual current cannot adjusted up.	·Insufficient input voltage ·Too small input power cord ·Too long earth wire and welding wire ·Damaged control panel	·The input voltage should be 220V±15% ·The input power cord should be over 4^2 ·Shorten the cable or thicken it ·Replace the control panel
The power supply trips after power-on	·Damaged IGBT tube	·Check and replace IGBT or inverter plate