STAR INDUSTRIAL SUPPLY CHAIN CO.,LTD
WWW.SISCTHAI.COM

RSN-1600/2500/3150HD

STUD WELDING MACHINE

MANUAL INSTRUCTION

(PLEASE READ CAREFELLY BEFORE OPERATION)

1.1 Safety Depends on You

Huayuan arc welding and cutting equipments are designed and built with safety in mind. However, your overall safety can be increased by proper installation.

DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT. And, most importantly, think before you act and be careful.

Purchase Date： _____

Serial Number： _____

Machine Type： _____

Purchase Place： _____

Special Attention (Very Important):

- **AVOID FALLING DOWN WHEN THE WELDING MACHINE IS PLACED ON THE INCLINED PLANE.**
- **IT CAN NOT BE USED FOR UNFREEZING PIPELINES.**
- **THE SHIELD RANK OF THIS SERIES OF WELDING MACHINE IS IP21S, AND IT IS NOT SUTABLE FOR WORKING IN THE RAIN.**

 **Cautions**	**Arc and arc rays may harm health**

Arc welding can be hazardous. All performing welding workers ought to have health qualification that provided by authority organization. Protect yourself and others from possible serious injury or death. Keep children away. Pacemaker wearers should consult with their doctor before operating. Be sure that all installation, operation, maintenance and repair procedures are performed only by qualified individuals.

1 **Electric shock can kill**: 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. Users need to follow the below items to avoid electric shocks:

- 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. Otherwise, use automatic or semiautomatic welding machines, DC welding machines as possible as you can.
- In semiautomatic or automatic wire welding, the electrode,electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically"hot".
- 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.
- Ground the work or metal to be welded to a good electrical(earth) ground.
- Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- Never dip the electrode in water for cooling.
- Never simultaneously touch electrically"hot"parts of electrode holders connected to two welders, because voltage between the two can be the total of the open circuit voltage of both welders.
- When working above floor level, please do wear safety belt to avoid falling or losing balance on electric shock.

2 **Arc rays can burn**: 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. Headshield and filter lens should conform to nation standards.

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

3 **Fumes and Gases can be dangerous**: Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. While working in limited room, use enough ventilation and/or exhaust to keep fumes and gases away from the breathing zone, or use the respirator.

- Shielding gases used for arc welding can displace air and cause injury or death. Always use enough

ventilation,especially in confined areas to insure breathing air is safe.

- 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.
- Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. Make sure they are asepsis and innocuity.

4 **Spatter**: Welding or cutting spatter can cause fire or explosion.

- 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.
- Where compressed gases are to be used in the field, special precautions should be used to prevent explosion.
- When not welding, make certain that no electriferous part is touching the work piece or the work stage. Accidental contact can create a fire hazard.
- Do not weld containers or lines, which are not proved to be innocuity.
- 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".
- Spatter might cause burn. Wear leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair to prevent from burning by spatter. Wear the ear shield when performing sideways or face up welding. Always wear safety glasses with side shields when being in a welding area.
- The welding cables should be as close to the welding area as possible, and the short, the better. Avoid welding cables going through the building framework, lifting chains, AC or DC cables of other welding machines and appliances. The welding current is strong enough to damage them while having short circuit with them.

5 **Cylinder may explode if damaged.**

- Make sure that the gas in the storage cylinder is qualified for welding, and the decompression flowmeter, the adapter and the pipe are all in good condition.
- Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- Be sure to put the cylinder in the working space with no crash or shake, and far from welding area.
- Never allow the electrode, electrode holder or any other electrically"hot"parts to touch a cylinder.
- Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

6 **Power**: (For electrically powered welding and cutting equipment) Turn off input power before installation, maintenance and repair to avoid accidents.

- Huanyuan welding equipment is I class safeguard equipment; please install the equipment in accordance with the manufacturer's recommendations by specific persons.
- Ground the equipment perfectly in accordance with the manufacturer's recommendations.

7 **Power**:(For engine driven welding and cutting equipment)

- Work in ventilated place or outdoors.

- Do not add fuel near to fire or during engine starting or welding. When not working, add fuel after engine is cooling down; otherwise, the evaporation of hot fuel would result in dangers. Do

not splash fuel out of the fuel tank, and do not start the engine until complete evaporation of the outside fuel.

- Make sure that all the safeguard equipments, machine cover and devices are all in a good condition. Be sure that arms, clothes and all the tools do not touch all the moving and rotating components including V belt, gear and fan etc.
- Sometimes some parts of the equipment have to be dismantled during maintenance, but you still have to keep the strongest safety awareness .
- Do not put your hand close to fans and do not move the brake handle while operating.
- Please remove the connection between the engine and the welding equipment to avoid sudden starting during maintenances.

- When engine is hot, it is forbidden to open the airtight cover of the radiator water tank to avoid hurt by the hot vapor.

8 **Electromagnetic**: Welding current going though any area can generate electromagnetic, as well as the welding equipment itself.

- Electromagnetic would affect cardiac pacemaker, the cardiac pacemaker users should consult one's doctor first.
- The effect of electromagnetic to one's health is not confirmed, and it might have some negative effect to one's health.
- Welders may use following method to reduce the hazardous of electromagnetic:

a. Bundle the cable connected to the work piece and the welding cable together.

b. Do not enwind partially or entirely your body with the cable.

c. Do not place yourself between the welding cable and the ground (work piece) cable, if the welding cable is by your left side, then the ground cable should be by your left side too.

d. The Welding cable and the ground cable are as short as possible.

e. Do not work near to the welding power source.

9 **Lifting equipment**: carton or wooden boxes package the welding machines supplied by Huayuan. There is no lifting equipment in its wrapper. Users can move it to the prospective area by a fork-lift truck, then open the box.

- If there are rings, the machine can be transited by rings. While Huayuan Welding Machine Manufacture reminds users, there is potential risk to damage the welding machine. So it is better to push the welding machine by its rollers unless special situations.
- Be sure that the appurtenances are all removed off when lifting.

- When lifting, make sure that there is no person below the welding machine, and remind people passing by at any moment.

  Do not move the hoist too fast.

10 **Noise**: Huayuan Welding Machine Manufacture reminds users: Noise beyond the limit (over 80 db) can cause injury to vision, heart and audition depending on oneself. Please consult local medical institution. Use the equipment after doctor's permission would help to keep healthy.

CONTENT

1 USAGE

With the development of industrialization, studs are more widely used in different industries. However, the welding quality of studs is bad if we use general welding methods because of slow welding speed, heavy spatter and heavy labour intensity, etc. Our company explored a new series of RSN arc stud welding machine according to advanced technique in the world, which is high efficiency welding equipment suitable for welding carbon steel, stainless steel, copper, aluminium and their alloy,etc. This equipment has the features of short welding time, high production efficiency, good adaptability, little welding deformation, material saving and so on. It is widely used in manufacturing of steel structure, bridges, vehicles, shipping and boiler, etc.

2 FEATURES

RSN series arc stud welding machines come with welding torch and welding cable. It has below features:

2.1 Features of common arc stud welding machine:

- It is suitable for welding carbon steel, stainless steel, copper, aluminium and dissimilar metal materials,etc;
- Short welding time(0.1~2 seconds) and high efficiency(it can weld 16~25 studs per minute);
- Good verticality, little welding deformation, high qualification rate and there is no welding marks at the back of workpiece;
- Easy operation of through welding , strong intensity of welding spot, tapping is not needed and the globality of plate can be well kept;
- The working condition is improved to protect welder better because of the application of ceramic ring, and the labour intensity is decreased too;
- Less pollution of smoke, arc rays and noise;
- Easy to operate.

2.2 Unique features of Huayuan arc stud welding machine:

The power source consists of contactor, IGBT module, fast recovery diode and digital control circuit, which specify as:

(1) Digital control: welding process is accurately controlled by electronic dialing, which ensure the reliability.

(2) Automatic compensation for the grid fluctuation, stable welding current and good repeatability;

（**3**）The welding time is controlled by electronic dialing(0.00~9.99S): the welding heat can be accurately and reliably controlled, the repeatability precision is high;

（**4**）The welding current is stepless adjusted and digital displayed, which ensures the same welding conditions, accordingly guarantee the high welding quality;

（**5**）Manual/auto selection function, suitable for multi layer penetration welding

（**6**）MMA/Stud welding selection function, can work as stud welding and stick welding both

（**7**）Automatic welding time preset function, the longest time limitation is 9.99S after press the welding torch switch to avoid damaged caused by mal-usage

3 MAIN TECHNICAL PARAMETERS

Parameter	Unit	RSN-1600HD	RSN-2500HD	RSN-3150HD
Input Power	V/Hz	3～380/415V 50/60Hz		
Rated Input Capacity	KVA	69	94	126
Rated Input Current	A	112	162.5	220

Efficiency	-	74.3%	80%	82%
Power Factor	-	0.94	0.88	0.94
Rated Overload Voltage	V	80		
Production Rate	Pcs/Min	10～25	7～25	
Current Adj. Range	A	160～1600（Stud welding）	250~2500（Stud welding）	315~3150（Stud welding）
		50~400（MMA）		
Stud Diameter	mm	Φ6～Φ19	Φ6～Φ25	Φ6～Φ30
Stud Length	mm	≤400		
Cooling Mode	-	Air cooling		
Insulation Class	-	IP21S		
Protection Degree	-	F		
Dimension（L×W×H）	mm	680×320×630	780×390×800	780×390×800
Weight	Kg	85	105	105

Table 1 Reference value technical parameter:

Welding current(A)	Applicable stud diameter(mm)	Welding time(S)	Productivity (piece/minute)
420	6	0.20	25
550	10	0.33	25
800	13	0.55	25
1200	16	0.80	16
1600	19	0.90	12
2000	22	1.10	8
2500	25	1.10	7
3150	30	1.30	6

4 OPERATION PREPARATION

4.1 Safety caution

- The lifting of welding machine: if the lifting of machine frequent, you should use special lifting equipment. Since the thrust face is on the bottom of machine, so forklift is the right choice;
- The machine should be grounded well: to prevent electric shock, please connect the ground bolts of power source well;
- Safety guards should be worn according to related labour protection regulations to prevent ultraviolet rays and arc rays from injuring eyes and skin;

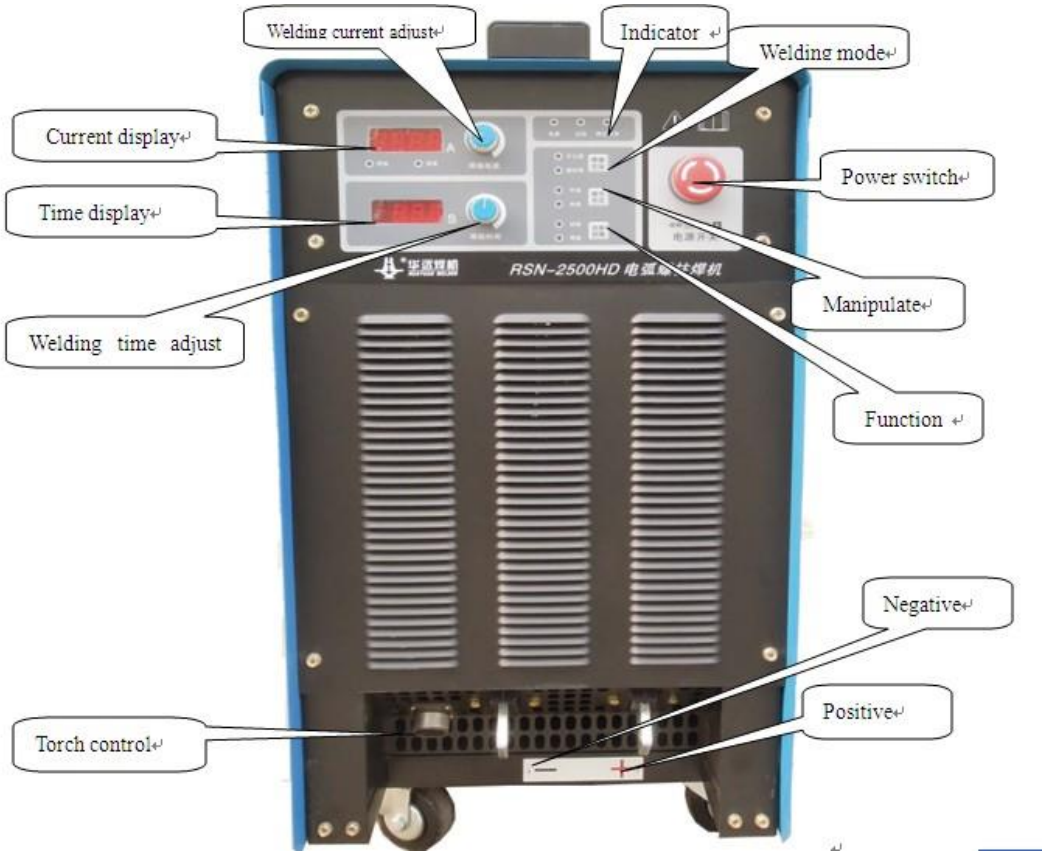
- Never breath in harmful welding gas: the gas which produced in welding process is harmful to health, so ventilating devices should be set according to related labour protection regulations;
- Welding machines and operation place should be away from combustibles;
- Prevent foreign matters and sharp objects from dropping in the machine;
- Prevent machine from dropping and crash.

4.2 Installation and operation conditions

- The fluctuation of distribution voltage should ≤ +_10%, three phase unbalance rate should < 5%, frequency fluctuation should ≤ +_1%;
- The power source line, switch and fuse that used on distributor should be conform to the below table:

Specification	RSN-1600HD	RSN-2500HD	RSN-3150HD
Switch capacity (A)	150	200	250
Fuse capacity (A)	125	200	200
Sectional area of copper power line(mm^2)	10	16	16
Sectional area of copper cored line(mm^2)	10	16	16

4.3 Construction and panel instruction



a. Power switch: rotate it in clockwise to start and press it to stop;
b. Adjust the welding current: rotate it in clockwise to increase the preshow current, rotate in anticlockwise to reduce the preshow current; this function works only if the machine is on power;
c. Adjust the welding time: rotate it in clockwise to increase the welding time, rotate in anticlockwise to reduce the welding time; this function works only if the machine is on power;
d. Current displaying: to display the welding current and preshow current;
e. Time displaying: to display the automatic welding time, the range in 0.01～9.99 second;
f. Welding process: to switch the welding process between stick welding and Stud welding;
g. Operating mode: to switch the welding mode between manual and automatic;
h. Function switching: to switch between torch checking and welding;
i. The indicator light of preshow welding current: it displays the preshow current when it lights;
j. The indicator light of welding current: it displays the real welding current when it lights;
k. Power indicator light: it lights when power on;
l. Overheating indicator light: it indicates that the welding power source is overheating, need to stop to cool;
m. Abnormal indicator of network voltage: it indicates the abnormal condition such as default phase on the network voltage or under-voltage, need to stop the machine and check the power voltage;
n. Stick welding indicator light: when work as stick welding, it lights;
o. Stick welding indicator light: when the welding process is on stick welding, it lights;
p. Stud welding indicator light: when the welding process is on stud welding, it lights;
q. Automatic indicator light: when the welding process is on automatic stud welding, it lights;
r. Torch checking indicator light: when check the torch, it lights;
s. Welding indicator light: it lights when welding;
t. Controlling(Welding torch): 6 cored outputting terminal of welding torch controlling wire, foot 1 and 2 is torch switch, foot 3 and 4 is torch coil, foot 5 and 6 is empty;
u. Positive pole (Workpiece): to connect with the welding cable outputting terminal of workpiece;
v. Negative pole (Welding torch): to connect with the welding cable outputting terminal of welding torch;

w. Grounding: Ground the power source well;

x. Parallel interface: to parallel two welding power source outputs max 5000A current;

y. Group control interface: to control the welding parameter in remote;

z. Three phase input cable: to input 3~380VAC voltage.

Note: when the stick welding indicator lights, the other indicators such as time displaying, automatic displaying, torch checking displaying and welding displaying do not light; When manual indicator lights, the time indicator does not light.

5 Welding on different conditions

Generally, stud welding is the welding at flat position, however, there are other welding conditions. To obtain high quality welding quality at different conditions, we hereby list some other examples to reference.

5.1 Vertical position welding (Weld position)：

At this position, melted metal will flow down to the bottom of stud and form asymmetrical weld because of the gravity. The bigger stud diameter size is, more obvious the asymmetry will be. Below are the suggestions for this condition:

- To the stud diameter that ≥16mm，the welding at vertical position is not suggested;
- If the stud diameter that ≥16mm is required, please increase the welding current and reduce the welding time;
- Pay high attention to plumb the stud on workpiece and keep the chuck clean.

5.2 Overhead position welding：

While overhead welding, sparks and spatter from the welding arc may cause burn accident. To avoid accidents, please wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and caps. Always wear safety glasses with shields at welding area. Adjust a proper welding current and welding time at flat welding position before operation. While operating, keep a constant welding time and increase the welding current to obtain high quality weld.

5.3 Lengthen the welding cable：

When working on wide ground and the welding cable must be lengthened, you can adopt bigger size cable or run cables in parallel, otherwise the welding quality will be badly influenced, because longer the cable is, the larger the resistance will be.

5.4 Short stud

Since the ceramic ring and chuck of welding torch has particular depth, and the stud should be sticked out, so if the stud is too short, the welding quality can not be good, even fail. So a special "necking stud" is suggested to use.

5.5 Sheet steel weld

The sheet steel is that when the thickness of workpiece exceed 3mm, the scale of the stud dia and workpiece thickness equal or exceed 4:1 (for example, if use Φ16 stud, the workpiece thickness is less than 3mm, that is called ‘sheet steel’); in

addition, when workpiece thickness is between 1.5 to 3mm, the scale equal or exceed 3:1(for example, if using Φ6 stud, the thickness is ≤2mm, that is called 'sheet steel').Generally, the sheet steel don`t have enough intensity to support the stud and it will be damaged by loading stud.

However, in some condition, the stud welding of sheet is needed, to get ideal welding quality, some methods are suggested below:

（1）Underlay the sheet with a flat copper, which will not only support the workpiece but also transfer away the heat that from welding pool;

（2）Change welding polarity, that is connect the welding torch to the positive pole and the workpiece to the negative pole, thus more heat act on the stud to avoid burning the sheet steel plate(workpiece). *Specially point out: this method can be only used on the sheet steel plate!*

5.6 Weld on corner, edge and other position

When welding on this position, there usually will be weld asymmetry on the stud foot, molten steel is 'blew' to one side, this is called 'arc blow' or 'magnetic blow'. Many factors cause this phenomenon, and there is no methods which can solve this absolutely. However, we can reduce bad influence by following the below(only for reference):

（1）Connect the work cable to the rear of the stud welding position that on the workpiece;

（2）Respectively connect two root work cables to the both sides of workpiece.

（3）If welding on the edge of workpiece, use a steel plate cling the edge to increase the area of magnetic effect.

5.7 Penetration welding

Penetration welding is a special stud welding method: insert a low carbon steel sheet between stud and workpiece(the thickness of steel sheet must be less than 3mm), and then weld the stud, plate and workpiece together (see figure 7). The penetration welding is specially suitable for welding profiled steel plate and it is widely used in tier steel structure building. But the profiled steel plate have a protective zinking layer, which will influence the welding quality badly.(see appendix penetration welding parameter reference value). Here are the suggestions as follows:

（1）Before welding, clean the oil, dirt and paint on the welding position. If the welding quality is still not ideal, clean the zinking layer.

（2）Drill holes on the welding position according to actual condition to ensure the welding quality.

Reference parameter value of penetration welding

Stud spec(mm)	Current(I)	Time(S)	plunge length(mm)	Lifting distance(mm)

Φ16	1500	1.0	7～8	3.0
Φ19	1800	1.2	7～9	3.0

6 Welding parameter selection and quality control

6.1 Welding parameter selection(please see Table 1)

6.2 Quality control

- Choose qualified stud and ceramic ring. The material of stud and ceramic ring will influence the welding quality a lot.
- Keep the welding position of workpiece clear, clean out oil, dirt, paint and oxidation.
- Regulate the welding torch exactly, such as the stud stick out length and lifting distance, etc;
- Select the proper welding parameter and standard according to different diameter stud.
- Adopt direct current straight polarity(DCSP) while welding steel i.e. the welding gun is connected to the negative pole and the workpiece is connected to the positive pole. While welding aluminium, adopt direct current reverse polarity(DCRP) i.e. the welding gun is connected to the positive pole and the workpiece is connected to the negative pole.
- The size and length of the welding cable and work cable accord with the requirement of the equipment.
- Hold the welding torch steadily and plumb the stud with the workpiece.
- Keep the equipments clean.
- Welding test before formally welding is requested to make sure the suitable welding parameter. When the stud and ceramic ring is changed, or the welding torch is regulated, we should test again;
- Wait a moment to move welding torch after welding is over.

6.3 Welding quality inspection

6.3.1 Visual inspection

Stud welding quality can be visually inspected from appearance of the weld. If the weld has any defects, the welding parameters should be adjusted.(see figure 6).

6.3.2 Intensity test

Jointing intensity should be tested when test machine, choose the welding parameter to ensure the designed jointing intensity.

a、Bend test

Bend the stud 15° away from its axis with a bending wrench, and bend it back to 0° again, if there is no crack on the joint, it

means good welding.

b、Torque test

Torque testing equipment is showed as the figure 9. Fasten the tested plate, cover a sleeve (its inner-dia is bigger than stud dia), a washer and a nut, and turn the nut with a torque spanner, good weld should be no crack when reached the value as below.

Stud dia（mm）	Φ6	Φ8	Φ10	Φ12	Φ16	Φ20	Φ22
Torque value (kg-m)	0.7	1.2	2.1	4.4	11	21	29

7 MAINTENANCE

User should maintain the machine one time per half-year at least according to using and storing condition. The methods and steps as below:

Maintenance of Welding power source：

（1）Turn off the power supply；

（2）Open the shell of machine；

（3）Clean away dust and dirt inside with dry high-pressure air or hairbrush；

（4）Check all fastener, screw down the loose fastener；

（5）Check the fan, infuse some lubrication oil to axis of rotation；

（6）Finally, put on the shell and turn on the power to check the equipment works normally or not.

8 Main elements list

No.	Item	Model	Parameter	Refer No.
1	Mid-potentiometer	JZC1-44/220V		102010400045
2	Bridge rectifier	MDS150-16	150A	102010100056
3	Filter capacitor	2200μ／400VDC+85℃		102020100058
4	IGBT	FF300R12KT4	300A	102070100074
5	Diode	DKR400AB60	400A	102070100102
6	Control transformer	RSNHDTC1		105010000601
7	PCB	PR01		211210
8	PCB	PT01		211207
9	PCB	PR03		211205

9 PACKING LIST

Product configuration

a. Arc stud welding machine 1set

b. Welding torch 1 set

c. Welding cable 10m

d. Earth wire 3m

e. Control cable 10m

f. support plate (match with chuck)

RSN-1600 provide with the Φ13⁄16⁄19mm T-stud chunk andΦ10⁄12 straight stud chuck each 1

RSN-2500 provide with the Φ10⁄13⁄16⁄19⁄22mm T-stud chunk each 1

RSN-3150 provide with the Φ13⁄16⁄19⁄22⁄25mm each 1

（1）Packing list 1 copy

（2）Certificate of quality 1 copy

（3）Warranty card 1 copy

10 ATTACHED DRAWINGS