

**DA-1600i Stud Welding Machine**

**DA-2000i Stud Welding Machine**

**DA-2500i Stud Welding Machine**

# Operate Manual

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## 1. STUD WELDING INTRODUCTION

Stud welding: It is a method to weld metal fasteners onto working piece. It has advantages like high speed, high strength, heat affected zone is small, less pollution etc. It is widely used in such industries as automobile, boiler, steel structure and ship industries.

It can be used to weld thread fasteners, normal pin, open pin and bolt, which is made by low carbon steel, low alloy steel, stainless steel, cooper and etc.



Welding current (A) can be chose 50-100 times of stud Dia.

$$I = (50-100) d \text{ (A)}$$

Welding time (Ms) can be chose 50-150 times of stud Dia.

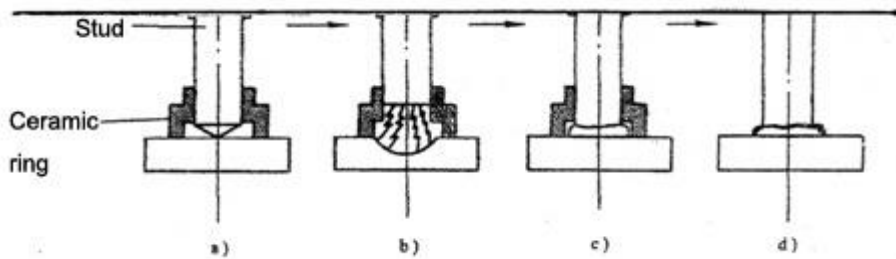
$$T = (50-150) d \text{ (ms)}$$

According to our experience, following is the data for low carbon steel bolt welding. For other material, you need to do welding test.

| STUD |  |       |  |       |
|------|--|-------|---|-------|
|      | DIRECT WELDING   |       | THROUGH DECK WELDING  |       |
|      | CURRENT  | TIME  | CURRENT   | TIME  |
| φ 10 | 600A   | 1.20S | ---   | ---   |
| φ 12 | 800A   | 1.12S | ---   | ---   |
| φ 13 | 900A   | 1.00S | 700A  | 1.40S |
| φ 16 | 1300A  | 1.20S | 1000A   | 1.70S |
| φ 19 | 1600A  | 1.30S | 1400A   | 1.90S |
| φ 22 | 1900A  | 1.40S | 1700A   | 2.00S |

Principle of DA serial arc stud welding machine:

- Put the stud inside ceramic ring, and contacted with work piece.
- Start of welding torch switch, welding torch lift automatically, and arc creates high temperate bath.
- Welding torch push stud into high temperate, stud and work piece are combined.
- Break ceramic ring, stud welding is finished.





### 3. Safety

#### 3.1 Worker safety.

- a. The welding operator must have qualification to hold a Studs Welding Operator's Certificate and must strictly follow the Specifications on Welding Operator's Operating Safety for purpose of safety of the welding operator and the other people.
- b. The operator must properly wear Personal Protective Equipment (PPE) such as dry insulated shoe, insulated gloves; welding operator's working clothing, helmet, or goggles etc.
- c. Don't wear metallic ornaments such as necklace, ear ring, and watch etc.
- d. The persons wearing heart defibrillators or unsuitable for approaching the strong magnetic field shall keep away from equipment and electrical cables in the process of welding.
- e. The equipment shall be connected to the power supply box with leakage protection function.
- f. Follow the other relevant provisions of safety to ensure personal safety.
- g. All the electrical connections and cables shall be kept in a good order. Especially, the chucks must well contact with the welding studs for prevention of too relaxed chucks and of injury due to arc generation of bonding face.
- h. Please immediately seek medical care and notify the insurance company or local safety supervision authority in case of safety accidents.

### 3.2 Equipment safety

- a. The equipment shall be connected to the power supply and properly be protectively grounded by a professional electrician. The power supply shall be provided with leakage and short circuit protection.
- b. All the electrical cables and distribution boxes must be kept in a good order. Eliminate all hidden hazards which influencing safety (if any).
- c. An unauthorized person is not allowed to open the equipment.
- d. The space shall be well-ventilated when the equipment is running. The ventilation grill shall be more than 30m from such obstructions as wall etc.
- e. Dust inside the equipment shall be removed by professionally trained personnel for ensuring heat dissipation. The interval shall depend on situation of working environment.
- f. Don't operate the equipment under a working environment with more flying metallic powder because metallic powder entering into the equipment may possibly result in short circuit.
- g. Equipment shall stably be located on a moisture-proof, harm-proof, weather-proof, well-ventilated, clean, and safe location. Water and metal may possibly damage equipment shall strictly be prohibited entering into the equipment.
- h. The power supply box shall be switched off (instead of switching off welding machine only) when the equipment is shutdown, maintenance and repairing or cleaning for purpose of prevention of electric shock.
- i. Don't measure, weld or cut this welding machine with a megger, plasma cutter, argon-arc welding machine etc. with high voltage due to a great deal of electronic elements provided into the equipment for prevention of equipment damage. Don't weld the same working piece together with the other high voltage arcing equipment either.
- j. This machine is designed for special purpose only.

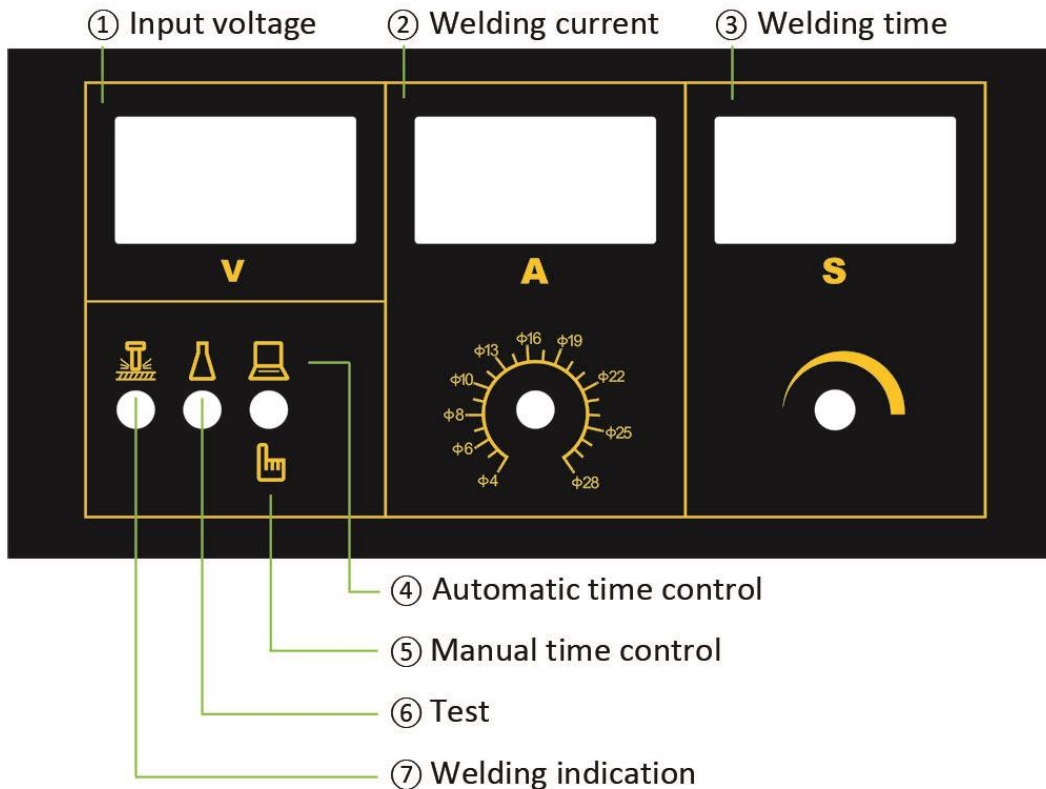
### 3.3 Safety of Welding Environment

- a. All the flammable, explosive, and hazard items in the vicinity of welding area shall be cleaned up. Welding operation must be monitored by exclusively designated personnel and provided with fire extinguishers. Apply welding operation after all the hazardous items under the welding area must be cleaned up or after measures have been taken for the welding operation in the height for prevention of damage and loss due to falling spark splash.
- b. Ask an inspector for examination before applying welding operation. Apply welding operation only it can meet the requirements of safety.
- c. Apply welding operation after taking special protective measures under highly electric-shock, and flammable environment, or under special situation harmful to health.
- d. Ensure that the working area is well ventilated. Don't weld on the working pieces with water accumulated when welding galvanized, nickel-plated, or chrome-plated pieces having harmful gas volatilization.
- e. Don't apply welding operation on the enclosed container filling with or ever filled with hazardous items resulting in explosion or generating harmful gas, except for taking overall measures of treatment and it is proven for reliability.
- f. Keep away from the objects, such as magnetic card, watch, computer etc, easily disturbed by electromagnetic field in a safe distance.
- g. The tie-in of working piece must directly be connected to the working pieces welded and properly contacted. Otherwise, high welding current may pass through the other approaches to damage the other items.
- h. Simultaneously apply four eyebolts when moving, transporting, and lifting the equipment. The angle between the steel wire rope shall not be more than 30°. Ensure that the equipment shall not be attacked by the others and the other accidents shall not occur at any time.
- i. Carefully follow all kinds of safety provisions on construction sites.



## 4. Operation

### 4.1 Structure of front and rear panel



① Input voltage: The voltage of input power.

② Welding current: Only display when welding.

③ Welding time: 0-3 second, it is **NOT on-time** display; need to use **test button** to check.

④ Auto time control: The welding time will be exactly same as setting.

⑤ Manual time control: The welding time is controlled by your holding time of torch button or test button. But it has max limitation. E.g. if you set welding time 2.0s, and switch to manual, the real welding time only can be controlled within 0-2.0s.

⑥ Test: This button has two functions, one is checking time, and another is checking if torch is broken.



## 4.2 Operation

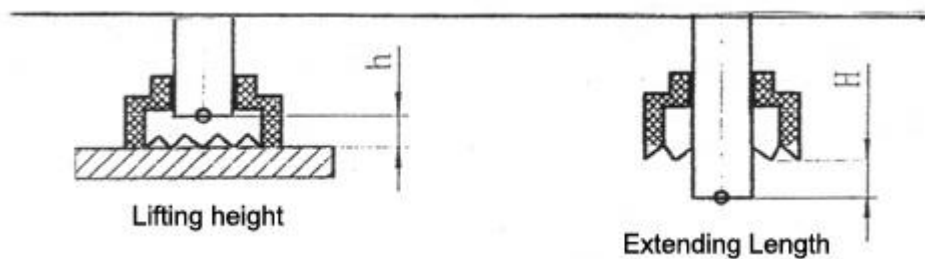
| <b>Preparation</b>  |  |
|---|--|
| The persons holding <i>Studs Welding Operator's Certificate</i> may operate this equipment have to read this instruction manual and understand it entirely. |  |
| a.  | Welding machine shall stably be located on a moisture-proof, harm-proof, weather-proof, well-ventilated, clean, and safe location.   |
| b.  | Materials used for experiment prior to normally make welding operation (such as sample of working piece, ceramic loop of stud) shall be properly prepared.   |
| c.  | Properly connect the gun cable and the welding machine to working piece (referred to as welding grounding wire). Properly connect the working piece and cable. Grind rust and paint etc on the working piece (if any). |
| d.  | Connection of power supply shall be made by a professional electrician according to technical data of this machine. This equipment is provided with a switch, short circuit, and leakage circuit protection function.  |

| <b>Welding</b> |   |
|----------------|---|
| a.             | Preset the control parameters (e.g. current, time, lifting elevation, and extending length etc) of the welding machine approximately depending on situation of welding stud and field. Preset the control parameters (e.g. current, time, lifting elevation, and extending length etc) of the welding machine approximately depending on situation of welding stud and field. |
| b.             | Switch on the power supply.   |
| c.             | Press pushbutton of the welding machine to wait for a minute. Observe until the welding machine is normal.  |
| d.             | Test the welding gun without stud and examine whether the lifting time is normal. Make a trial welding after it is normally running.  |
| e.             | Put it into normal service after the test welding piece is acceptable. Tips: All the welding studs ceramic loop shall meet requirements of national standards, which shall be dried to ensure construction quality.   |
| f.             | Switching-off: Press the OFF button on the welding machine. Switch off power supply after the welding machine is switching off.   |

## 5. Quality control

### 5.1 Lifting elevation

It is crucial to welding combustion quality. If it is too high, the arc is too long, which may result in too shallow welding pool and pores etc. if it is too low, the arc is too short, which may result in short circuit due to welding drips, bad combustion quality, not bright welding seam etc. The specific lifting elevation shall be determined in the field laboratory. Generally, the smooth plate shall be welded by 4mm – 8mm. Welding penetration of profiled plate shall be by 3mm – 6mm. The lifting elevation adjusting screw locates in the rear cover of the welding gun. You may find it after opening the rear cover of the welding gun.

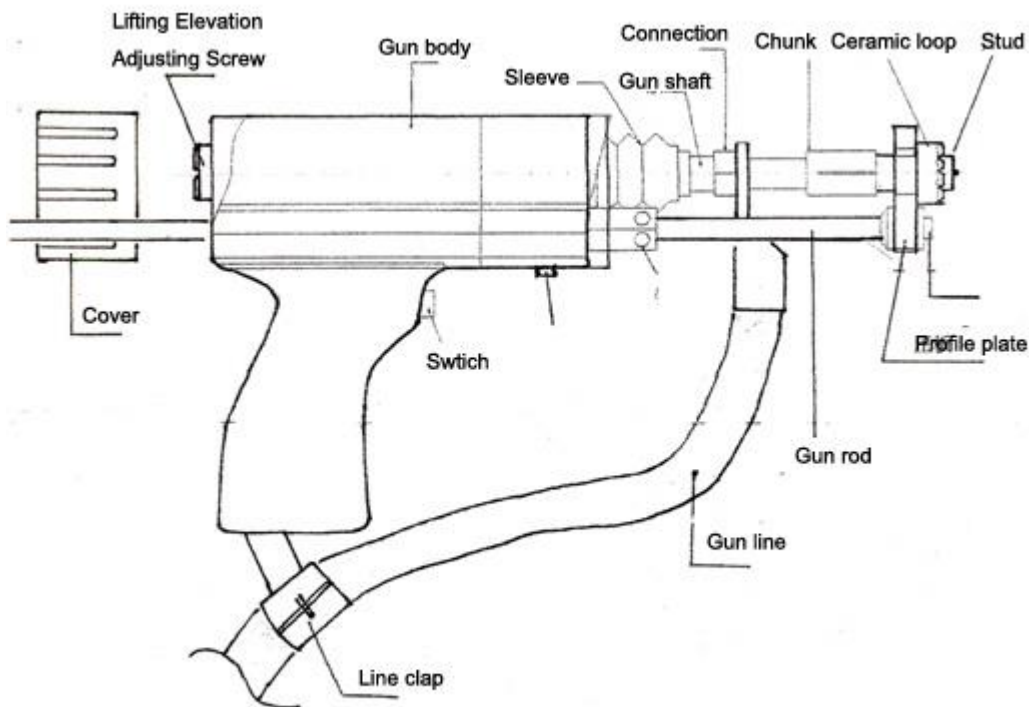


### 5.2 Ensuring Welding Quality

- a. The space between the galvanized plate and steel beam shall not be suspended in case of welding penetration of profiled plate, with clearance as small as possible. No slag inclusion (such as water, mud, rusting slag, too thick fireproof coating, and welding electrode coating falling from steel beam installation) and can be found from clearance. In general, a galvanized plate shall have a thickness not more than 1.2mm.
- b. Ambient RH not more than 85%;
- c. Remove rust, dirt, oil, and water content on the surface of the welding piece.
- d. The material quality or mechanical performance of welding stud and base material shall be matched each other with weld ability to ensure welding strength.
- e. Don't quickly pull the welding gun out after completion of welding procedure. Pull the welding gun out after the welding stud and the base material is slightly set. Pull it out along the welding direction of welding stud to ensure that the chuck is not enlarged and released when pulling out welding gun. Otherwise, the welding stud will be of bad contact.
- f. Don't weld the stud when the welding gun wire and cable are wrapped. Release or

pull the cable and the welding gun wire in a straight line when welding.

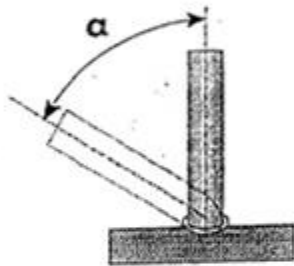
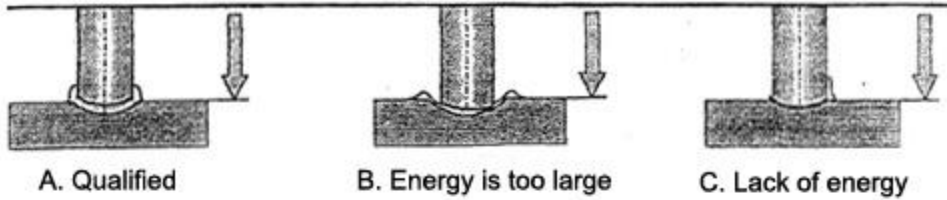
- g. Examine welding quality on each shift.
- h. In general, the welding diameter shall be less than  $\phi 16$  for vertical and overhead welding operation.
- i. The welding gun shall be lifted flexibly and free without any seizure after the ceramic loop is applied on the welding stud.
- j. The maximum ratio of stud diameter to thickness of base material shall be 4: 1, that is to say, a base material shall have minimum thickness not less than  $1/4$  stud diameter.



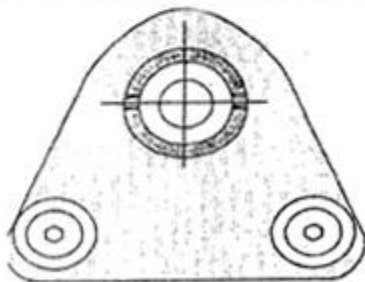
Sketch of welding gun

### 5.3 Inspection

Inspect welding quality after welding. It is qualified if height and width of welding leg exceed 1mm, and stud is bending by 30° as current applicable standard.

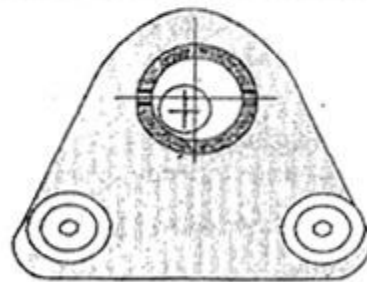


Hit stud to 60° by a hammer or sleeve, it is qualified if there is no break or cracks at welding area and thermal effect area.



A

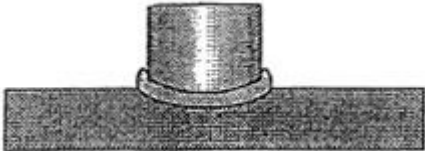
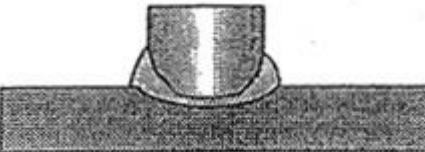



Correct alignment of leg blocks combination.



B

Unaligned leg blocks combination

**Evaluation of Stud Welding Effect**

| Appearance  | Result  |
|---|---|
|    | <p>Qualified (Ceramic protection welding)</p>   |
|    | <p>Qualified (Gas protection welding)</p>   |
|   | <p>The metal will flow toward one direction due to arc blow-off effect. It may be solved through configuration of compensation block on the edge of working piece or turning the welding gun (if the electrical cable is outside the working piece).</p>  |
|  | <p>Seizure of stud when inserting, resulting from:</p> <ol style="list-style-type: none"> <li>1. The ceramic loop on the leg blocks combination is eccentric to the stud, which result in friction between the ceramic loop and the stud.</li> <li>2. Splashing molten metal (too high energy)</li> <li>3. Short circuit due to falling drip resulting from too high lifting elevation.</li> <li>4. Defective welding gun or too high setting of buffer.</li> </ol> |
|  | <p>'Cold Welding' resulting from seizure of stud insertion can be found only through mechanical strength test. If it is bending by a small angle, breaking shall be occurred on the welding seam position and cold breaking point (lack of molten metal) can be found in the vicinity of stud or welding area. See above for detailed reasons</p>   |

## 6. Maintenance and Troubleshooting

### 6.1 Maintenance

- a. The dust will accumulate in the machine after the equipment has been operating for a period of time, which may influence normal heat dissipation. If metallic powder or moisture gas enters into it, the equipment may be possibly defective. Therefore, you shall ask exclusively designated person to regularly open the machine housing to wipe it with a hair brush and slightly blow off foreign objects in it. Don't flush it with the other detergent and don't heavily blow off it with compressed air.
- b. Regularly examine the welding gun and electrical cable. All the insulating parts shall be in a good order. Immediately take measures for any damage. Regularly examine the chuck of welding stud and the profiled plate. Replace them (if necessary). For the location fixing welding gun and high-current cable, the copper wire of welding gun may be gradually broken due to bending for a long time. The conductive area on this position will be reduced, which may result high temperature even broken or personnel injury due to arc. Therefore, examine this position in the beginning of each shift. If this position is softer than the other positions, replace it immediately.
- c. The control line may easily be broken. Handle the welding gun with care.



## 6.2 Trouble shooting

Here is a common trouble shooting list, if you still can not fix stud welding machine, please contact our tech support center.

| Trouble  | Reason  | Solution  |
|--|---|---|
| Can not start up   | No input<br>Fuse is burnout.<br>Starting button is broken<br>Lack of phrase | Ask electrician to check fuse, power switch and input power. Repair or renew. |
| Power on, no action when press gun switch, overheat light and overcurrent light is off | Gun switch is broken, control cable is broken                               | Renew or fix  |
|  | Fuse burnt  | Short in gun circuit, short in control circuit.                               |
|  | Bad connection of plug and socket   | Renew   |
| Overheat light is on   | Fan is not working  | Inspect and repair  |
|  | Dirty inside machine  | clear   |
|  | Weld too fast   | Slow down   |
| Overcurrent light is on  | Overcurrent in machine  | Find someone professional to repair   |
| Welding quality is not stable  | Bad connect of earth line   | Reconnect   |
|  | Unstable performance of torch   | Repair or renew   |
|  | Lifting height is too high or too low                                       | Set normal value  |

**7. Wiring diagram**

**Diagram of Main Circuit**

