

Arc Stud Welding Machine

CDS-2500

IGBT inverter drawn-arc stud welder with ceramic ferrule

Operation Manual



Please read this manual carefully before installation, operation and maintenance.

User Safety Tips

All Cruxweld welding and cutting equipment is designed with the safety and comfort of the user fully taken into account. Nevertheless, installing and using the equipment properly will be of great benefit to your safety. Please do not install, use or repair the equipment without reading these instructions carefully.



Special suggestions — very important

1. When the welder is placed on an inclined surface, take care to prevent it from toppling over.
2. Do not use the welding machine for thawing pipelines.
3. The protection grade of this series of welding machines is **IP21S**, so the machine is not suitable for use in the rain.

Notice

- Switching the function mode while welding is in progress may damage the equipment.
- Before servicing, be sure to disconnect the welding gun cable from the equipment.
- To protect against earth leakage, a safety switch (RCD) is required in the supply.
- Welding tools and consumables should be of good quality.
- The operator must be suitably qualified.

Safety Considerations

If the equipment is not operated correctly, welding can be dangerous to the operator, to people in or near the work area, and to the surrounding environment. Welding must therefore be carried out rigorously and in full compliance with all relevant safety regulations. Read and understand this manual carefully before installation and operation.

Electric shock — can be fatal

- Connect the earth (ground) conductor according to the standard.
- Avoid touching live parts of the welding circuit, the stud and the cables with bare hands. Wear dry welding gloves.
- Keep yourself insulated from the workpiece.

Fumes and gases from welding — harmful to health

- Avoid breathing the fumes and gases produced by welding.
- Keep the work area well ventilated, or use local extraction.

Arc radiation — harmful to eyes and skin

- Wear a welding helmet with the correct filter, protective glasses and work clothing.
- Screen the work area so that people nearby are also protected.

Fire hazard

- Welding spatter may start a fire. Remove flammable material from the workplace.
- Keep fire extinguishers nearby and train staff to use them.

Noise — may damage hearing

- Welding can produce high noise levels; use hearing protection where necessary.

Machine malfunction

- Refer to this manual first.
- Contact Cruxweld service or your supplier for further advice.

Contents

1. Product overview and application	5
2. Features of the stud welding machine	6
3. Characteristics of the power source	7
4. Control board interface specification	8
5. Control board and parameters	9
5.1 Control board main view	9
5.2 Set-up parameter list P01 – P10	10
5.3 Panel-adjustable parameters and glossary	11
5.4 The welding sequence	12
5.5 Operating keys and fault indicators	13
6. Preparation for operation	14
6.1 Safety matters	14
6.2 Installation and supply requirements	15
7. Power source structure and panel	16
7.1 Front panel items	17
7.2 Output terminals and rear panel	18
8. Welding torch	19
8.1 Torch parts list	20
8.2 Torch adjustment	21
9. Operating procedure	22
10. Welding under different conditions	24
11. Welding parameters and quality control	26
12. Maintenance	28
13. Wiring diagram	29

1. Product Overview and Application

With the increasing degree of industrialisation, the use of welded studs (bolts) has become more and more widespread. Welding a stud with an ordinary welding machine is slow, produces heavy spatter and calls for high labour intensity. Quality is also difficult to guarantee, because only the periphery of the stud is melted.

The Cruxweld **CDS-2500** arc stud welding machine is an efficient piece of equipment for welding studs of carbon steel, stainless steel, copper, aluminium and their alloys onto the corresponding metal parts. It offers a short welding time, high production efficiency, strong adaptability, small welding distortion, good joint quality, material saving and a simplified production and assembly process.

The machine is widely used in steel-structure buildings, bridges, locomotives, shipbuilding, boilers, industrial furnaces and other industrial fields.



Cruxweld CDS-2500 arc stud welding power source

2. Features of the Stud Welding Machine

1. It can weld carbon steel, stainless steel, copper, aluminium and electroplated materials, and can also weld dissimilar metal combinations.
2. The welding time is short, about **0.1 to 2 seconds**, giving high efficiency — 16 to 25 studs can be welded per minute.
3. The stud stands perpendicular, there is no weld mark on the back of the plate, there is no distortion and the pass rate is high.
4. Through-deck (penetration) welding is easy to carry out; in most cases no pre-drilled hole is needed, so the integrity of the plate is not damaged.
5. The weld strength is high and can reach the strength of the parent material and of the stud.
6. Smoke, arc radiation and noise are greatly reduced compared with manual arc welding. The ceramic ferrule optimises the working environment, greatly reducing the effect on the welder's body and lowering labour intensity.
7. Easy to operate.

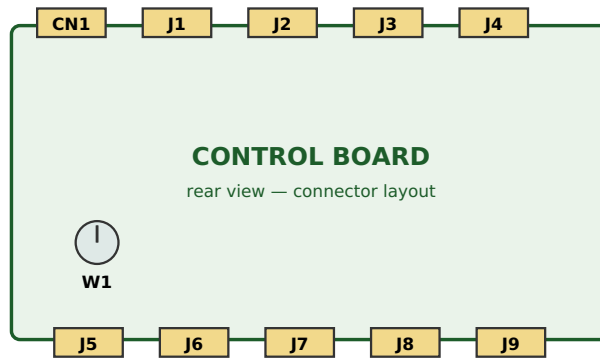
Welding principle
The stud is held in the torch chuck and pressed against the workpiece through a ceramic ferrule. When the trigger is operated, the torch lifts the stud, drawing an arc that melts the full end face of the stud and the corresponding area of the plate. At the end of the set welding time the current is switched off and the stud is plunged into the molten pool, forming a full cross-section joint.

3. Characteristics of the Power Source

The power source consists of a contactor, IGBT modules, fast-recovery diodes and a digital control circuit.

1. **Digital control:** the welding sequence is controlled precisely by a single-chip microcontroller, which ensures reliability.
2. **Automatic mains-fluctuation compensation:** the welding current is held automatically at the set value and is not affected by fluctuation of the supply voltage, so the welding current is stable and repeatable.
3. **Accurate time control:** the welding time is controlled by the microcontroller from **0.01 to 9.99 s**, so the welding heat is accurate, reliable and highly repeatable.
4. **Accurate current control:** the welding current is controlled by the microcontroller and preset on the digital display, so the welding current is exactly the same at any time and in any place.
5. **Automatic / manual selection:** suitable for special applications such as multi-pass welding.
6. **Manual welding / stud welding selection:** the machine can perform stud welding and also simple manual (stick) welding.
7. **Manual welding time limit:** after the torch switch is pressed, the maximum output time is **9.99 seconds**, which prevents damage to the machine through incorrect operation.

4. Control Board Interface Specification



Designations are explained in the interface list below

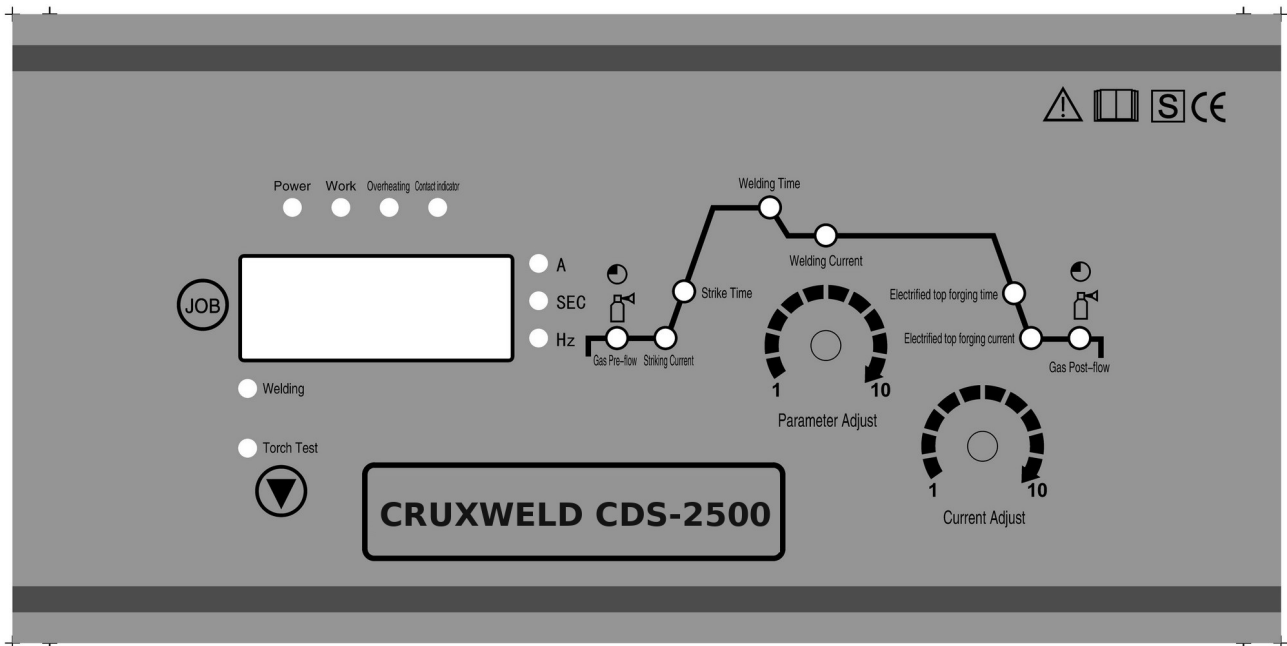
Control board — rear view connector layout

Connector	Interface specification
CN1	CAN bus — CAN GND, CAN-L, CAN-H, CAN +5 V
J1	Main power supply, dual 17 V
J2	Setting socket — connects to the drive board
J3	Welding Hall (current) sensor input socket
J4	Fault input
J5	Torch trigger
J6	Air valve, AC 36 V
J7	Not used on this board
J8	Power source, 19 V
J9	Special interface
W1	Potentiometer — actual output current setting

Refer to the system wiring diagram in section 13 for the detailed connections.

5. Control Board and Parameters

5.1 Control board main view



CDS-2500 control board / front panel overlay

The control board uses a fully digital design with a highly integrated circuit; the panel is the main board, which makes it easy to install and highly reliable. The main board provides two sets of drive outputs and can drive two driving plates at the same time, which suits high-power double-action hard-switching and soft-switching main circuits. The machine model, Hall-sensor model, gas pre-flow and post-flow times, welding current, welding time, electrified top-forging time and electrified top-forging current can all be set from the panel.

- Parameters are adjusted with the rotary encoder; the display consists of three seven-segment digits.
- The panel carries power, work, overheating and contact indicators.
- The panel provides switching between **welding** and **torch test** (in torch test the main board gives no drive output).
- Setting function: machine type, Hall type and mode parameters can be set. All settings are retained when the power is switched off.

5.2 Set-up parameter list P01 - P10

Parameter	Max	Min	Step	Default	Unit / remark
P01 — Hall sensor type	3000	100	1	3000	A
P02 — Machine model	3000	100	1	3000	A
P03 — Minimum current	40	5	1	40	A
P04 — Current display mode	1	0	1	1	1 = display the actual current 0 = always display the preset current
P05 — Arc time	10.0	0.0	0.1	10	s
P06 — Arc-break pattern	1	0	1	1	1 = automatic re-ignition after the arc breaks 0 = after the arc breaks, wait for the torch to start the arc again
P07 — Address	10	0	1	10	CAN bus address
P08 — Cooling mode	1	0	1	1	0 = air cooling · 1 = water cooling
P09 — Arc switching point	40	10	1	0	0 = switching off; any value above 0 is the switching current value
P10 — Arc ignition method	1	0	1	0	0 = HF arc ignition · 1 = lift (air) arc ignition

Attention

P01 to P10 are machine set-up parameters and are configured at the factory. Change them only when instructed by Cruxweld service; an incorrect setting can prevent the machine from welding correctly.

5.3 Panel-adjustable parameters

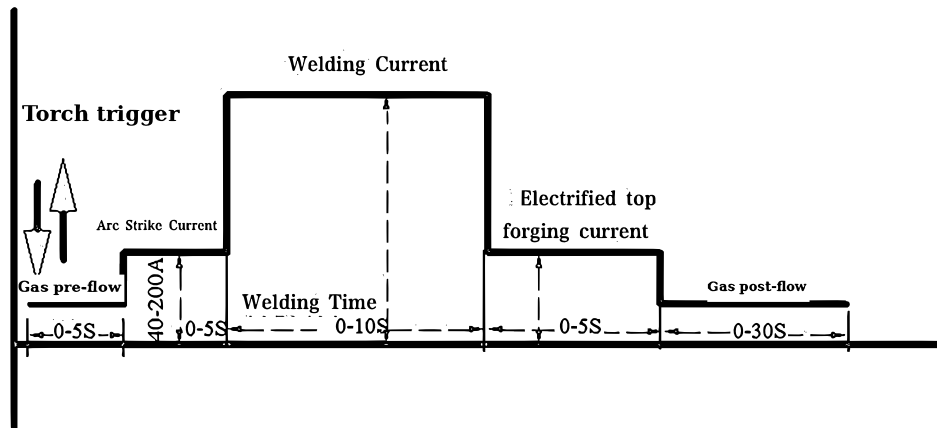
Parameter	Max	Min	Step	Default	Unit
Gas pre-flow time	5.00	0.00	0.01	1.00	s
Arc striking current	200	40	1	20	A
Arc striking time	10.00	0.00	0.01	0.03	s
Welding time	4.00	0.01	0.1	1.0	s
Welding current	P02 machine type	P03 min. current	1	—	A
Electrified top-forging time	10.00	0.00	0.1	0.5	s
Electrified top-forging current	P02 machine type	P03 min. current	1	20	A
Gas post-flow time	6.00	0.00	0.01	1.00	s

Glossary

Term	Meaning
Gas pre-flow time	Shielding-gas lead time before the arc is struck.
Arc striking current	Current flowing before the stud is lifted by the gun.
Arc striking time	Duration of the arc striking current.
Welding current	Output current during welding.
Welding time	Duration for which the welding current flows.
Electrified top-forging time	Duration of the top-forging (plunge) current.
Electrified top-forging current	Current delivered after the welding current has finished, while the stud is plunged.
Gas post-flow time	Shielding-gas run-on time after the arc is extinguished.

5.4 The welding sequence

The diagram below shows the complete welding sequence of the CDS-2500, with the adjustment range of each step.



CDS-2500 welding sequence — current against time

Step	Range	What happens
Gas pre-flow	0 – 5 s	Shielding gas starts to flow; no current.
Arc striking current	40 – 200 A	A pilot current is established as the stud is lifted.
Arc striking time	0 – 5 s	Duration of the pilot arc.
Welding time	0 – 10 s	Full welding current melts the stud end face and the plate.
Electrified top-forging	0 – 5 s	Reduced current while the stud is plunged into the weld pool.
Gas post-flow	0 – 30 s	Gas continues to flow while the joint solidifies.

5.5 Operating keys

Key	Function	Operation and display
Gas test	Gas test	Press to make the shielding gas flow without welding, so that the gas supply can be checked.
Run mode	2T / 4T	Press to choose between 2T (hold the trigger) and 4T (latched) operation.
JOB	Job selection	Press the JOB key to select the job number, from 0 to 9; ten sets of parameters can be stored. Pressing the JOB key repeatedly enters the setting state; in the setting state the JOB key exits the setting state.
Adjust knob K1 (normal mode)	Parameter adjustment	Turn the knob to change the parameter of the current state. Clockwise increases, anticlockwise decreases. The data is stored automatically after about 10 seconds.
Adjust knob K1 (set mode)	Parameter setting	1. Press the knob to step through the set-up parameters P01 to P10. 2. Turn the knob to adjust the value of the current parameter; clockwise increases, anticlockwise decreases. 3. Press the knob to leave the setting state; the settings are stored at the same time.

Fault and status indicators

Indicator	Meaning
Power	The control supply is energised.
Contact	Indicates a short circuit between the stud (nozzle) and the workpiece. The lamp is on while the short circuit exists.
Work	Lights when the stud is in contact with the workpiece (contact indicator on) and the machine is ready to work.
Overheating	The temperature switch is normally closed. When it opens, the overheating indicator lights and the display shows E01 . Allow the machine to cool with the fan running.
Power failure	On loss of a supply phase the power indicator lights and the display shows E04 . Check the three-phase supply.

6. Preparation for Operation

6.1 Safety matters

1. **Lifting the machine:** special lifting tackle should be used where the machine is lifted frequently. The machine is of chassis-bearing construction; its normal handling method is by forklift or by crane. If it is lifted frequently, a purpose-designed lifting device is required.
2. **The machine must be reliably earthed:** to avoid an electric shock accident, make sure that the earthing bolt of the power source is reliably connected to earth.
3. **Protective equipment must be worn:** to prevent damage to the eyes and skin from ultraviolet radiation and intense light, follow the relevant labour-protection regulations and wear the corresponding protective equipment.
4. **Do not breathe the welding fume:** the gas and fume produced during welding are harmful to health. Follow the relevant labour-protection regulations, wear the corresponding protective equipment and install local ventilation.
5. **Keep the machine and the welding site away from combustible materials.**
6. **Prevent foreign matter from entering the machine,** and prevent sharp objects from cutting or damaging the cables.
7. **Prevent the machine from falling or being struck:** stud welding machines are often hoisted and transported on site. Nobody is allowed under the machine while it is being lifted. After a fall or a collision the machine may only be used again after it has been checked and released by a qualified person.

6.2 Installation and operating conditions

- The supply voltage fluctuation must not exceed ± 10 %.
- The three-phase unbalance must be less than 5 %.
- The frequency fluctuation must not exceed 1 %.
- Ambient temperature 25 °C to +40 °C, relative humidity not more than 90 % at 25 °C, clean surroundings.
- Protection grade IP21S — do not use the machine in the rain.

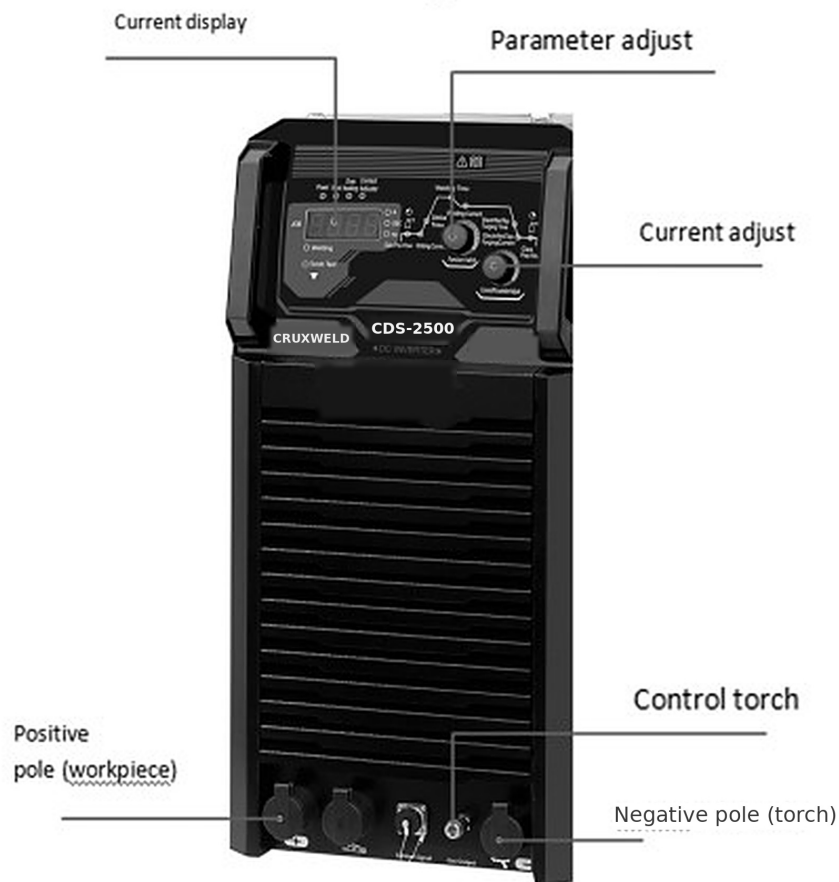
The power cord, switch, fuse and isolator selected for the supply panel must comply with the following table.

Item	CDS-2500
Supply	3-phase AC 380 V, 50 Hz
Contactors capacity	200 A
Fuse capacity	200 A
Cross-sectional area of copper supply conductor	16 mm ²
Cross-sectional area of copper earthing conductor	16 mm ²

Warning

An air circuit breaker of the corresponding capacity must be fitted in the supply. Connect the power cable and the earth conductor correctly before switching on. Only a qualified electrician may make the supply connection.

7. Power Source Structure and Panel



CDS-2500 — front view and output terminals

A. Power switch: turn clockwise to switch on; press down to switch off (emergency stop).

B. Welding current adjustment: clockwise rotation increases the pre-displayed current, anticlockwise rotation reduces it. The faster the knob is turned, the faster the value changes. This function works only when the machine is switched on.

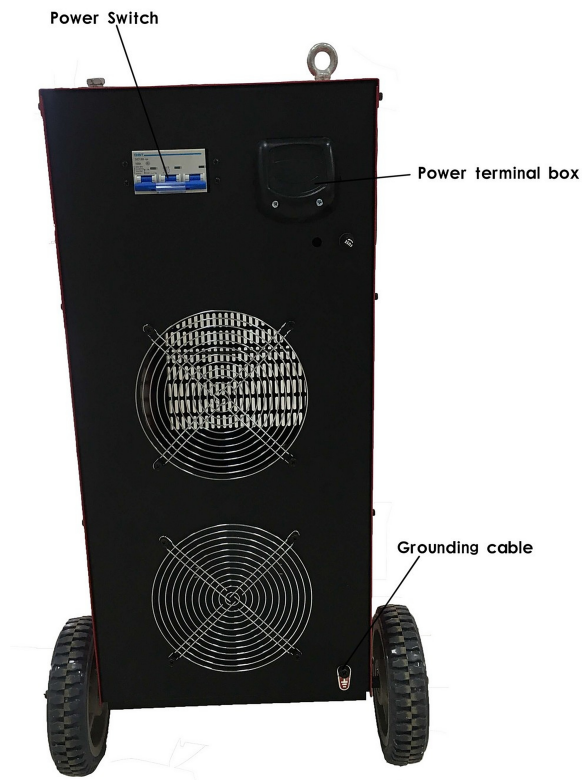
7.1 Front panel items

Item	Name	Description
C	Welding time adjustment	Clockwise rotation increases the welding time, anticlockwise reduces it. The faster the rotation, the faster the value changes. Active only when the machine is switched on.
D	Current display	Shows the pre-set current, and the actual current while welding.
E	Time display	Shows the welding time during automatic stud welding, from 0.01 to 9.99 seconds.
F	Welding method key	Switches between manual welding and stud welding.
G	Operation mode key	Switches between manual and automatic operation.
H	Function key	Switches between torch test and welding.
I	Pre-set current indicator	When lit, the displayed value is the pre-set welding current.
J	Welding current indicator	When lit, the displayed value is the actual current during welding.
K	Power indicator	When lit, the machine is energised.
L	Overheating indicator	When lit, the power source is overheated. Stop work and let the machine cool down.
M	Abnormal mains indicator	When lit, the supply is out of phase or under voltage. Switch off and have the supply checked.
N	Manual welding indicator	When lit, the welding method is manual welding.
O	Stud welding indicator	When lit, the welding method is stud welding.
P	Manual indicator	When lit, the operation mode is the manual stud welding state.
Q	Automatic indicator	When lit, the operation mode is the automatic stud welding state.
R	Torch test indicator	When lit, the selected function is torch test.
S	Welding indicator	When lit, the selected function is welding.

Note: the time display, manual indicator, automatic indicator, torch test indicator and welding indicator are off while the manual welding indicator is on. No time is displayed while the manual indicator is on.

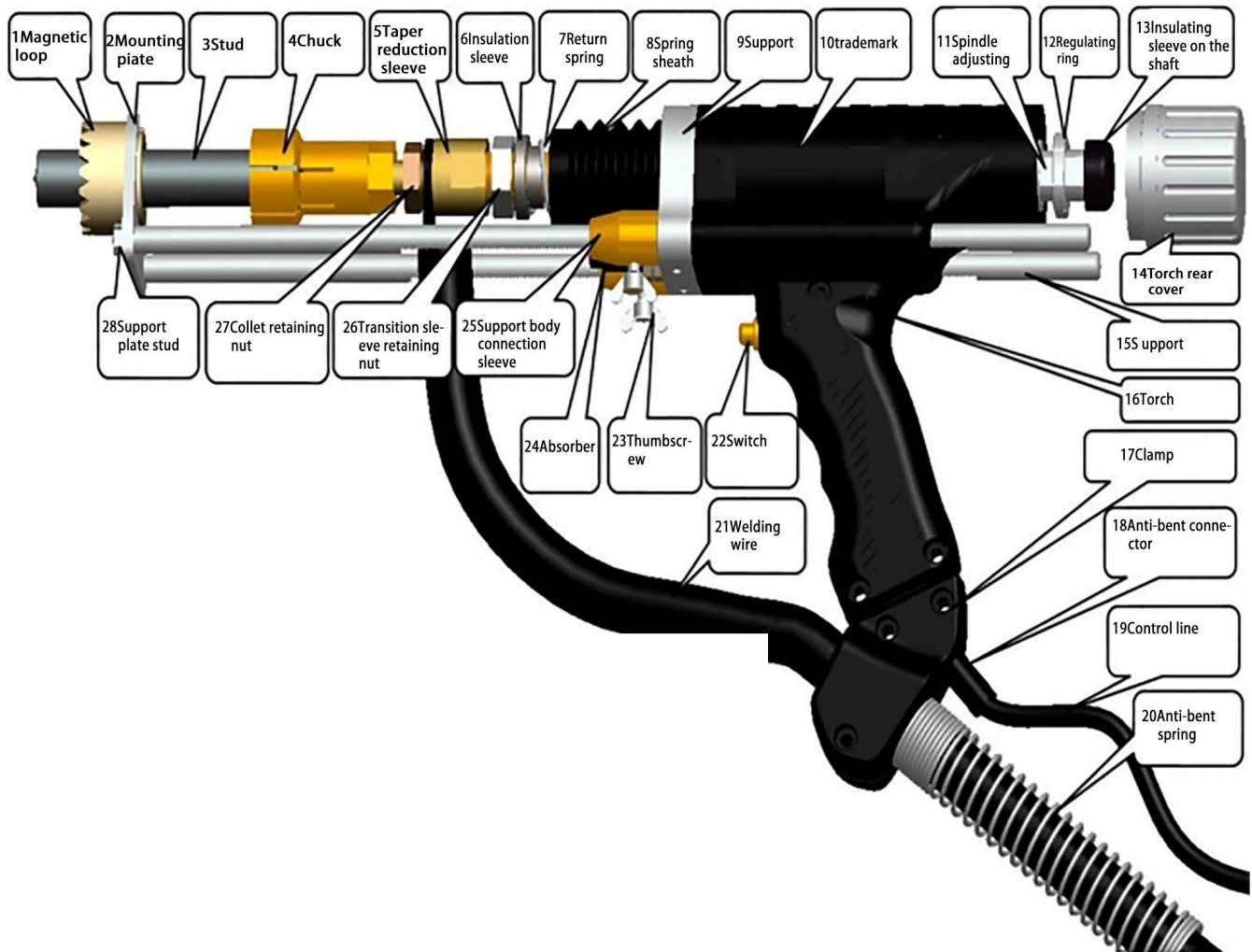
7.2 Output terminals and rear panel

Item	Terminal	Description
T	Control (welding gun)	6-core output terminal for the welding gun control cable: pins 1 and 2 — torch switch; pins 3 and 4 — torch coil; pins 5 and 6 — spare.
U	Positive pole (workpiece)	Output terminal for the workpiece (earth) welding cable.
V	Negative pole (welding gun)	Output terminal for the welding gun cable.
W	Earth (ground) bolt	The earthing bolt of the power source must be reliably connected to earth.
X	Parallel interface	Two machines can be paralleled to give an output of up to 5000 A.
Y	Group control interface	Allows the welding parameters to be controlled remotely.
m	3-phase input	Input AC 380 V.



CDS-2500 — rear view

8. Welding Torch



Welding torch (stud welding gun) — structure and components

8.1 Torch parts list

No.	Item	No.	Item
1	Magnetic loop	15	S support
2	Mounting plate	16	Torch body
3	Stud (welded fastener)	17	Clamp
4	Chuck (collet)	18	Anti-bend connector
5	Taper reduction sleeve	19	Control line
6	Insulation sleeve	20	Anti-bend spring
7	Return spring	21	Welding cable
8	Spring sheath	22	Switch (trigger)
9	Support	23	Thumbscrew M5 × 10
10	Name plate	24	Absorber
11	Spindle adjusting	25	Support body connection sleeve
12	Regulating ring	26	Transition sleeve retaining nut
13	Insulating sleeve on the shaft	27	Collet retaining nut
14	Torch rear cover	28	Support plate stud

The welding gun is dedicated to this stud welding machine. In normal use it does not need to be dismantled completely. Only trained personnel may dismantle it — some parts are not intended to be removed and forcing them apart can destroy the original accuracy of the gun, or damage the parts altogether.

8.2 Torch adjustment

1. Select the **ceramic ferrule** to suit the specification of the stud, and select the matching **chuck (collet)** and **support plate** according to the diameter of the gripped part of the stud.
2. Insert the stud into the chuck. **Note:** the welding end of the stud must be seated against the inner face of the chuck.
3. Adjust the length of the support frame according to the specification of the stud, so that the correct stud extension is obtained, and fit the ceramic ferrule into the support plate. After clamping, check that the stud, the ceramic ferrule and the collet are **concentric**. Loosen the support plate screw, align them, and lock the screw again.
Note: if the stud, the ferrule and the chuck are not concentric, both the lift of the gun and the weld quality will be affected.
4. Open the rear cover and adjust the display scale according to the stud specification, using the table below.
5. Refit the rear cover; the gun is ready for welding.

Stud extension and lift settings

Reference values for common cylinder-head studs (standard T-shaped studs) in the non-penetration welding condition:

Stud diameter (mm)	Extension length (mm)	Lift height (mm)	Display scale (mm)
Φ 16	5	3	5
Φ 19	5	3	5
Φ 22	5	3	5

Remark: starting-point height + extension length + lift height = display scale + 5 mm.

9. Operating Procedure

1. Plug the welding gun cable (negative pole), the control cable and the earth clamp cable (positive pole) into the corresponding sockets on the machine, and connect the workpiece to the other end of the earth clamp cable.
2. Adjust the welding torch as described in section 8.2.
3. Provide a supply that meets the requirements in section 6.2, with an air circuit breaker of the corresponding capacity, and connect the power cable correctly. Close the supply switch. At this point the emergency stop switch on the panel is pressed in (the machine is not powered). Turn the emergency stop switch clockwise; the display now lights. If the manual welding indicator is on, the fan will run.
If the switch is not operated again within 10 minutes the fan stops; it restarts when the switch is operated.

9.1 Automatic welding

4. Using the panel keys, set the welding method, the operation mode and the function to **“stud welding”**, **“automatic”** and **“torch test”**. Check that the stud is concentric with the ceramic ferrule and that the ferrule projects beyond the end of the stud by the amount required by the welding procedure.
5. Select the welding current and the welding time according to the material, diameter and welding position of the stud, following the welding procedure requirements.
6. Hold the gun with one hand and support the gun body with the other. Aim the stud at the welding position, keeping the stud perpendicular to the work surface. Press the gun down so that the end face of the ceramic ferrule and the welding end of the stud sit flat on the work surface, and press the trigger (where automatic control identification is fitted, the trigger does not have to be pressed). The machine detects the arc current automatically and a continuous blue arc, with a mild continuous crackle, is established between the stud end face and the workpiece until the pre-set welding time has elapsed. A normal torch test confirms that the machine and gun are working correctly.
7. Switch the function key to **“welding”**. Aim the stud at the welding position, press the gun down so that the ferrule and the stud end sit flat on the surface, keep the stud perpendicular, and press the trigger. The machine automatically completes the sequence: lift — arc — welding current on — welding current off — plunge into the weld pool — joint formed.
Note: do not shake the barrel of the gun after pressing the trigger, as this affects the weld quality.
8. Break away the ceramic ferrule and inspect the weld collar. The automatic welding cycle for one stud is now complete.

9.2 Manual welding

9. Using the panel keys, set the welding method, the operation mode and the function to **“stud welding”**, **“manual”** and **“torch test”**. Check the concentricity of the stud and the ferrule and the projection of the ferrule.
10. Select the welding current and welding time according to the material, diameter and welding position of the stud.
11. Hold the gun with one hand, index finger on the trigger, and hold the stud welding cable with the other hand. Aim the stud at the welding position, keep it perpendicular, press the gun down so that the ferrule and stud end sit flat on the work surface, and hold the trigger pressed (for safety the output switches off automatically after about 10 seconds with no load). Lift the stud by hand using the welding cable; a continuous blue arc with a mild crackle is established. Release the trigger and the arc is extinguished. A normal result confirms that the machine and gun are working correctly.
12. Switch the function key to **“welding”**. Align the stud with the welding position, press the gun body down so that the ferrule and the stud end are flat on the surface, keep the stud perpendicular, hold the trigger pressed and lift the welding cable by hand to lift the stud. The machine completes lift — arcing — welding current. Release the switch at the appropriate moment (the switch **must** be released to shut off the current) and plunge the stud; releasing the switch and plunging the stud should be as nearly simultaneous as possible. Break away the ferrule and inspect the joint. The manual welding cycle for one stud is now complete.
13. Check the weld quality. If it does not meet the requirement, adjust the welding parameters. If it does, load the next stud — do not press the trigger while loading the stud — and repeat the sequence.
14. After work, press the emergency stop switch to shut down the power supply.
15. Store the machine and its accessories at a temperature of 25 °C to +40 °C and a relative humidity not exceeding 90 % (at 25 °C), in clean surroundings.

10. Welding Under Different Conditions

The procedures above refer to welding in the flat position. In practice other welding situations occur. The following notes help the operator to obtain good weld quality in each case.

10.1 Welding on a vertical plate

Because of gravity, the molten metal flows to the lower part of the stud and an uneven weld collar is formed. The larger the stud diameter, the worse the effect. It is therefore recommended that:

- studs of 16 mm diameter and above are not welded in the vertical position;
- if vertical welding of a stud of 16 mm or more is unavoidable, increase the welding current and shorten the welding time.

In addition, take particular care to keep the stud perpendicular to the workpiece, and keep the chuck clean during welding.

10.2 Overhead welding

During overhead welding, molten metal spatter can cause burns. Operators must wear a protective cap, face shield and protective clothing. Before overhead welding, set the welding current and welding time from the flat-position values, then increase the welding current while keeping the welding time the same; this gives a better weld.

10.3 Lengthened welding cables

Where the working area is large and the welding cables must be lengthened, increase the cable cross-section or run cables in parallel. Otherwise the longer the cable, the greater the resistance, the lower the welding current that reaches the joint, and the worse the weld quality.

10.4 Welding short studs

The holder of the welding gun has a certain depth, the ceramic ferrule has a certain height, and the stud length has to allow for the extension adjustment. When the stud is too short to satisfy these three conditions the weld quality suffers badly, or welding becomes impossible. In such cases use a special **necked stud**, which has an extra length of reduced neck above the required welding length; the upper part of the neck is broken off after welding.

10.5 Using a template for accurate stud positions

Where the stud positions have to be accurate — for example studs on a flange plate — a template is recommended. It should follow the shape of the part, and should have a pressure plate to fix it. Holes are made in the template at the corresponding positions. Leave a gap between the template and the workpiece so that the gas generated during welding can escape.

10.6 Welding on thin plate

A plate counts as thin when the ratio of stud diameter to plate thickness is greater than 4:1 for plate over 3 mm (for example a $\Phi 16$ stud on plate of 4 mm or less), or greater than 3:1 for plate between 1.5 and 3 mm (for example a $\Phi 6$ stud on plate of 2 mm or less). In general a thin plate cannot be relied on to support the stud; the joint may fail when the stud is loaded. Where a stud must nevertheless be welded to thin plate:

- back the workpiece at the welding position with a flat **copper backing plate**, which supports the plate and conducts the heat away quickly so that the workpiece is not burned through;
- change the welding polarity, connecting the gun to the positive terminal and the workpiece to the negative terminal, so that more heat is generated in the stud. **This may only be done when welding thin sheet.**

10.7 Welding at corners and edges

In these positions the weld collar is often uneven and the molten metal is “blown” to one side of the stud. This is called **arc blow** (magnetic deflection). It is caused by the magnetic field around the arc being strengthened in one direction. There is no complete cure, but the following help:

- connect the earth return directly to the surface at the welding position;
- use two earth cables connected to the two ends of the workpiece;
- when welding on the edge of the workpiece, clamp an additional steel plate to the edge to increase the field area.

10.8 Through-deck (penetration) welding

Penetration welding means welding the stud through a low-carbon steel sheet of not more than 3 mm thickness placed between the stud and the workpiece. It is very suitable for welding profiled decking and is widely used in high-rise steel structures. Decking normally carries a galvanised coating, so:

- remove oil, stain and paint at the welding position; if the weld quality is still not satisfactory, remove the zinc layer as well;
- if another special coating is present, a hole may be opened in the decking at the welding position where necessary.

Reference values for penetration welding:

Stud diameter (mm)	Current (A)	Time (s)	Extension length (mm)	Lift height (mm)
$\Phi 16$	1000	1.0	7 – 8	3.0
$\Phi 19$	1800	1.2	7 – 9	3.0

11. Welding Parameters and Quality Control

11.1 Selecting the welding parameters

The welding current and welding time depend on the stud diameter, the stud and plate material and the welding position. Always establish the final values by making trial welds and testing the joints (section 11.3) before starting production. Reference values for penetration welding are given in section 10.8, and the stud extension and lift settings in section 8.2.

11.2 Quality control

1. Use studs and ceramic ferrules that meet the requirements. The stud material and the composition of the ferrule have a significant influence on weld quality.
2. Clean the welding area of the workpiece — remove oil, paint, rust and heavy scale.
3. Adjust the gun correctly, make sure its action is reliable, and set the stud extension and lift height correctly.
4. Use the correct welding current and welding time for the stud diameter and the workpiece, and select the welding specification correctly.
5. Use direct current for welding steel, and direct current for welding aluminium.
6. Make sure the workpiece is well earthed.
7. The cross-section and length of the torch cable and the earth cable must meet the requirements.
8. Hold the gun steady and do not shake it during welding; keep the stud perpendicular to the workpiece.
9. Keep the equipment clean.
10. Make trial welds before welding production parts, to establish the correct welding specification. Repeat the trial whenever the supply of studs or ferrules changes, or when the gun has been re-adjusted.
11. Allow a short interval after welding before the machine is moved.

11.3 Quality inspection

(1) Visual inspection — judge the quality of the joint from the appearance and shape of the weld collar. Adjust the welding specification if defects are found.

(2) Strength test — carry out joint strength tests at the time of trial welding, to establish the welding specification that gives the design strength of the joint.

a. Bending test: bend the stud through more than 15° with a bending wrench and then bend it back to 0°. The joint is acceptable if it does not break.

b. Torsion test: fit a sleeve over the stud (its inner diameter must be greater than the joint diameter) together with a washer and nut, and tighten the nut with a torque wrench to the value in the table. The joint is acceptable if it does not break.

Diameter (mm)	Φ6	Φ8	Φ10	Φ12	Φ16	Φ20	Φ22
Torque (kg·m)	0.7	1.2	2.1	4.4	11	21	29

12. Maintenance

12.1 Power source

Depending on storage and use, the power source should be maintained regularly — at least every six months — as follows:

1. Switch off and isolate the supply.
2. Open the cover of the welding machine.
3. Remove dust and dirt from the interior, preferably with a soft brush or clean dry compressed air at low pressure.
4. Inspect all fasteners and tighten any that are loose.
5. Check the fan and add a little oil to the shaft.
6. Refit the cover, switch on the supply and check that the machine runs normally.



Special attention

This work must be carried out by an electrician under the guidance of qualified staff. Do not move the machine by dragging its cables. The small electronic components inside the machine must not be changed at will; if an electronic component is damaged, inform Cruxweld, your supplier or qualified service staff and have it replaced.

12.2 Welding torch

1. Unscrew the rear cover and the handle, remove dust and dirt from the handle, tail and rear cover, and apply a small amount of dimethyl silicone oil.
2. Carefully remove the collet, the collet retaining nut, the sleeve, the sleeve retaining nut, the return spring and the spring protector. Remove impurities and dust from inside the collet to ensure good electrical conductivity, and clean dust from the front end of the shaft and from the dust jacket. If the front end of the shaft is too dry, apply a small amount of dimethyl silicone oil and then refit the parts in order.
3. After cleaning the front end, make sure the spring is seated correctly during assembly.



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CDS-2500 — Arc Stud Welding Machine

The specifications and technical content of this product are subject to change without notice.