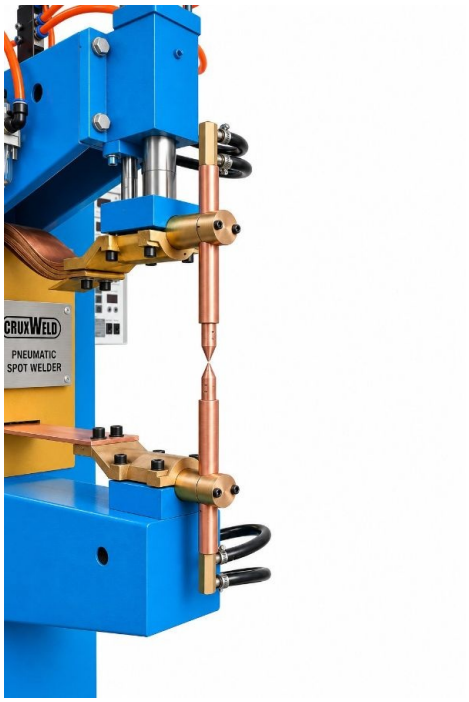
CRUXWELD®

INDUSTRIAL EQUIPMENTS PVT. LTD.

ProSpot 3500

Pneumatic Spot Welding Machine

35 kVA | 16,000 A | 3 + 3 mm mild steel | 6200 N | microcomputer controller, 16 schedules



USER MANUAL

Please read this manual carefully before installing and using the machine.

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This manual describes the installation, operation and maintenance of the Cruxweld ProSpot 3500 pneumatic spot and projection welding machine and its microcomputer resistance weld controller. Read it before installing and using the machine and keep it near the machine. Cruxweld improves its products continuously; the contents of this manual may be revised without prior notice.

Signs used in this manual

Sign	Meaning
▲ **DANGER**	Immediate danger which will cause death or serious injury if it is not avoided.
▲ **WARNING**	A potential hazard which may cause death or serious injury if it is not avoided.
▲ **CAUTION**	A hazard which may cause injury or damage to the machine if it is not avoided.
Note	Useful information for correct operation.

1 Safety precautions

1.1 Electrical safety

▲ DANGER

The machine works on 380 V. Only a qualified electrician may connect it, through an isolator and fuses or a circuit breaker of adequate rating. The machine body must be earthed. Switch off and isolate the supply before opening any cover, changing electrodes or doing maintenance.

- Do not use the machine with damaged cables, covers or controller.
- Keep the controller and electrical parts dry. Water leaks from the cooling circuit must be repaired at once.

1.2 Crushing hazard

▲ WARNING

The pneumatic cylinder closes the electrodes with up to 6200 N. Keep hands and fingers away from the electrodes when the foot switch is pressed or the Squeeze switch is on. Never reach between the electrodes while the machine is in Work mode.

- Only one trained operator should use the machine at a time; others must keep clear of the foot switch.
- Use Adjust mode (no current) when lining up electrodes or fixtures.

1.3 Sparks, heat and personal protection

- Spot welding produces sparks and expelled hot metal. Wear safety glasses or a face shield, leather gloves, flame-resistant clothing and safety shoes.
- Electrodes, arms and the workpiece become hot. Do not touch them immediately after welding.
- Remove flammable materials from the working area and keep a fire extinguisher nearby.
- Weld coated, galvanized or oily sheet only with good ventilation or fume extraction.

1.4 Magnetic fields

The high welding current creates strong magnetic fields near the arms. Persons with heart pacemakers or other electronic implants must not operate the machine or stand near it without medical advice.

1.5 Compressed air

- Release the air pressure before working on the cylinder, valves, hoses or the F.R.L. unit.
- Do not exceed the rated air pressure.

2 General description

The Cruxweld ProSpot 3500 is a 35 kVA pedestal pneumatic spot and projection welding machine. The welding transformer sits in the steel column; the water-cooled arms, the pneumatic cylinder, the solenoid valve, the air tank, the filter-regulator-lubricator (F.R.L.) unit and the microcomputer weld controller are all mounted on it.

Resistance spot welding joins two sheets with pressure and current alone. The electrodes clamp the sheets, a high current flows through the small contact area for a few mains cycles, the metal melts into a nugget, and the force is held until the nugget freezes. On the ProSpot 3500 the pneumatic cylinder gives the same electrode force on every weld, set at the regulator, and the controller times every stage in mains cycles, so every weld is repeatable.



Fig. 2.1 Spot welding sheet metal

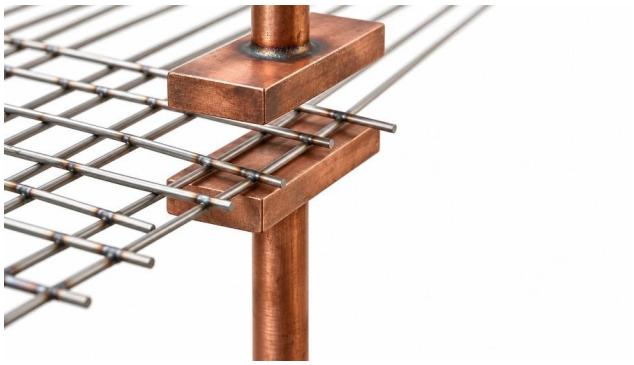


Fig. 2.2 Flat electrodes on wire mesh

2.1 Features

- Pneumatic head: constant electrode force up to 6200 N, set at the F.R.L. regulator.
- Microcomputer controller with 17 parameters, 16 stored schedules, constant-current or constant-voltage control, weld counter and 8 fault codes with automatic shutdown.
- Pre-heat, slope up, weld, slope down and temper current for coated and thicker sheet.
- Water-cooled arms and electrode holders for continuous production.
- Air tank on the column for steady pressure on fast repeat work.
- Interchangeable electrodes: pointed tips for sheet, flat bars for wire and mesh, projection dies for nuts and bolts.

2.2 Applications

Sheet-metal enclosures, panels and ducting; wire mesh, grills and baskets; projection welding of weld nuts and studs; automotive components; kitchen and stainless products; furniture and racks.

3 Technical specifications

Parameter	ProSpot 3500
General	
Model	ProSpot 3500
Type	Pedestal pneumatic spot and projection welding machine
Control	Microcomputer resistance weld controller, 16 schedules
Electrical	
Rated power	35 kVA
Input voltage	380 V
Frequency	50 / 60 Hz
Maximum welding current	16,000 A
Maximum short-circuit current	15 kA
Insulation class	H
Welding	
Welding capability	Up to 3.0 mm + 3.0 mm mild steel
Maximum electrode force	6200 N
Arm dimensions	220 × 420 mm
Electrode arm diameter	50 mm
Electrode holder diameter	25 mm
Cylinder stroke	60 mm
Services	
Input air pressure	0.5 MPa
Cooling water	≥ 3.5 L/min
Size	
Dimensions (L × W × H)	940 × 640 × 1560 mm
Weight	350 kg

All values are for reference; the rating plate on the machine applies. Specifications may change without notice as a result of continuous improvement.

3.1 Scope of supply

No.	Item
1	ProSpot 3500 pneumatic spot welder, 35 kVA, with water-cooled arms and electrode holders
2	Microcomputer resistance weld controller mounted on the column
3	Pneumatic cylinder, solenoid valve, air tank and F.R.L. unit, fitted and piped
4	Foot pedal switch
5	One set of copper electrodes
6	User manual

Options: flat electrode bars for mesh, projection die sets for nuts and bolts, AquaWeld 20 water cooling unit. **Not included:** fixtures and jigs for your parts.

4 Machine overview

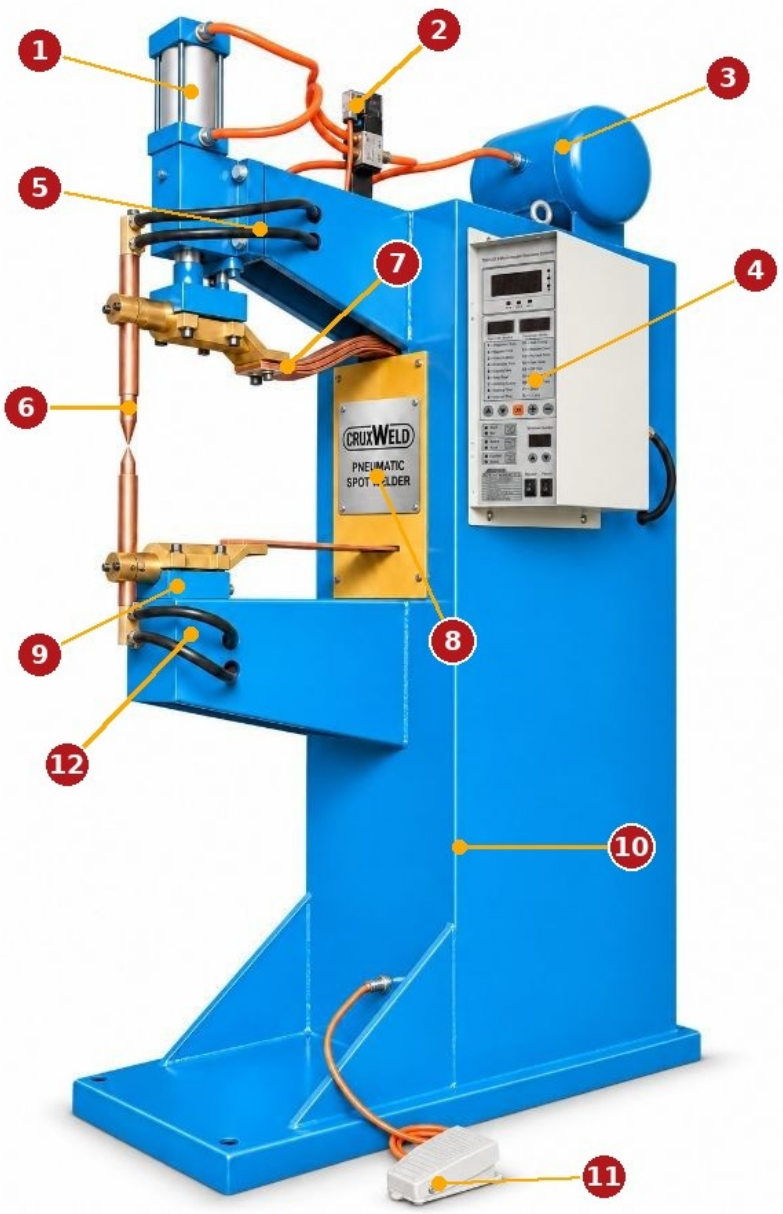


Fig. 4.1 Main parts of the ProSpot 3500

No.	Part	No.	Part
1	Pneumatic cylinder	7	Flexible copper shunt
2	Solenoid valve	8	Rating plate
3	Compressed air tank	9	Lower arm and electrode holder
4	Weld controller	10	Column with welding transformer
5	Upper arm (water-cooled)	11	Foot switch
6	Copper electrodes	12	Cooling water hoses



Fig. 4.2 F.R.L. unit (filter, regulator with gauge, lubricator)



Fig. 4.3 Air tank with drain valve

5 Installation

5.1 Location

- The machine weighs 350 kg. Lift it only by the lifting eyes on top, with suitable lifting equipment.
- Install it on a level, firm floor in a dry room with ambient temperature up to 45 °C and humidity up to 85 % without condensation, free from strong magnetic fields, heavy vibration, corrosive gas and conductive dust.
- Leave enough space around the machine for operation, maintenance and cooling-air circulation.

5.2 Electrical connection

> **▲ DANGER**
> Electrical connection must be made only by a qualified electrician, with the supply isolated.

1. Connect the machine to a 380 V, 50/60 Hz supply through an isolator and fuses or a circuit breaker sized for a 35 kVA spot welder. Use a supply cable of adequate cross-section; long or thin cables reduce the welding current.
2. Connect the earth terminal of the machine to a proper earth.
3. Check the foot switch connection to the controller.

5.3 Compressed air

1. The machine has an air tank on the column. Fill it from the air supply and check that the F.R.L. regulator reads the working pressure (0.5 MPa input).
2. Fill the lubricator of the F.R.L. unit with light pneumatic oil.
3. Check all air hoses and connections for leaks.

5.4 Cooling water

1. Connect the cooling water inlet and outlet hoses to a clean water supply and a drain, or to an AquaWeld 20 closed-loop cooling unit.
2. The water flow must be at least **3.5 L/min**. Check that water flows from the outlet before welding.
3. Keep the water flowing whenever the machine is switched on.

> **▲ CAUTION**
> Never weld without cooling water. The arms, electrode holders and transformer will overheat and can be damaged.

6 Weld controller

The microcomputer resistance controller compares the measured welding current (or voltage) with the setting and corrects the thyristor firing angle automatically, so that the welding current stays constant when the mains voltage or the secondary impedance changes. It stores 16 welding schedules, counts the welds and switches off with a fault code if it detects a fault.



Fig. 6.1 Controller panel

Control	Function
Current display (top)	Welding current or voltage during and after welding. Lamps V, A, kA show the unit.
Work / Valve 1 / Valve 2 lamps	Weld cycle running; main valve on; boost valve on.
Parameter Number / Value	Number and value of the parameter selected; parameter list printed on the panel.
▲▼ keys	Select the parameter number. Hold ▲ for 5 s to enter or leave the level-2 menu.
+ / − keys	Change the parameter value.
Work / Set	Work: the foot switch starts the stored schedule; parameters locked. Set: edit parameters; foot switch disabled.
Adjust / Weld	Adjust: valves operate without current, for setting up. Weld: normal welding.
Counter / Normal	Counter: shows the weld count (hold 10 s to clear). Normal: shows parameter values.
Schedule Number	Number of the active schedule (1 – 16), selected with its ▲▼ keys.
Squeeze switch	Closes the electrodes (main valve) by hand, without current.
Power switch	Switches the controller on and off.

6.1 Controller data

Item	Value
Supply	Single phase 220 – 420 V AC, 50 Hz ± 5 % (from the machine)
Power consumption	≤ 25 W
Thyristor drive	Thyristor module, rated current ≤ 2000 A
Valve outputs	3 outputs, DC 24 V / 150 mA each
Mains voltage compensation	Output current change ≤ 2 % for +15 % / −25 % mains voltage change
Constant-current control	Output current change ≤ 2 % for ±15 % change of secondary impedance
Response	Sampling 0.5 cycle; control response 1 cycle
Time settings	0 – 250 cycles each
Ambient	Up to 45 °C, humidity up to 85 % without condensation

6.2 Level-1 parameters (welding schedule)

Each of the 16 schedules has 17 parameters. Set the controller to **Set**, choose the schedule number, select the parameter with ▲ ▼ and change it with + / −. Times are in mains cycles (1 cycle = 20 ms at 50 Hz). A current stage with time 0 is skipped, so the machine can work with one, two or three current pulses.

No.	Parameter	Range	Description
1	Pre-pressing time	0 – 250 cycles	After start, the main valve closes the electrodes. Used for the first weld of a cycle (single welding: pre-pressing + squeeze time before each weld; repeat welding: only for the first weld).
2	Squeeze time	0 – 250 cycles	Time the electrodes press the workpiece before the current flows.
3	Pre-heating current	0 – 999	Pre-heat current (V, A or kA according to the control mode).
4	Pre-heating time	0 – 250 cycles	Duration of the pre-heat current.
5	Cooling time	0 – 250 cycles	Pause between pre-heat and the next stage.
6	Slow rising	0 – 250 cycles	Time for the current to rise gradually to the welding current.
7	Welding current	0 – 999	Main welding current.
8	Welding time	0 – 250 cycles	Duration of the welding current.
9	Cooling time	0 – 250 cycles	Pause between welding current and the next stage.
10	Slow falling	0 – 250 cycles	Time for the current to fall gradually from welding current to temper current (when cooling time 9 = 0).
11	Temper current	0 – 999	Temper (post-heat) current.
12	Temper time	0 – 250 cycles	Duration of the temper current.
13	Hold time	0 – 250 cycles	Electrodes keep the force on after the current stops, while the nugget freezes. Then the main valve opens.
14	Off time	0 – 250 cycles	Pause between two welds in repeat welding.
15	Pressurization time-delay	0 – 250 cycles	Delay from start to the boost-pressure (valve 2) signal.
16	Pressurization time	0 – 250 cycles	Duration of the boost pressure.
17	Working method	0 / 1	0: single welding; 1: repeat (continuous) welding.

With current-transformer sampling up to 100 A or induction-coil sampling up to 10 kA, the controller automatically refines the resolution to 0.1 A or 0.01 kA.

6.3 Level-2 parameters (system settings)

These are set in the factory and normally need no change. In Set mode, hold ▲ in the parameter-number window for about 5 s to enter the level-2 menu; hold it again for 5 s to leave.

Code	Setting	Values
P	Start method	0: pulse start, debounced (foot switch); 1: pulse start, fast response (mechanical contact); 2: switch-signal start
A	Constant current / voltage	0: constant-voltage control; 1 – 999: constant-current control, value = rated scale of the current transformer (A) or induction coil (kA), depending on b
b	Primary / secondary sampling	0: primary current transformer (A); 1: secondary induction coil (kA)
AH	Upper current alarm	0 – 100 %: alarm Er04 when the actual current exceeds the set value by this percentage
AL	Lower current alarm	0 – 100 %: alarm Er05 when the actual current is below the set value by this percentage
AA	Overheat input	0: normally-open thermal switch; 1: normally-closed thermal switch
Ab	Auxiliary output	0: no auxiliary output on error; 1: auxiliary output on error
AC	Control mode	0: constant voltage / current (as set by A); 1: constant heat
AE	Filter step	0 – 5; normally 0. Raise only if there is electrical interference
AF	Filter range	0 – 100; normally 20 – 30 when filtering is used
T	Error handling	0: stop the schedule, restart with the foot switch; 1: stop, clear with Work/Set before restarting; 2: error messages off
C	Schedule selection	0: use the current schedule; N (1 – 16): run schedules 1 to N in sequence

6.4 Weld sequence

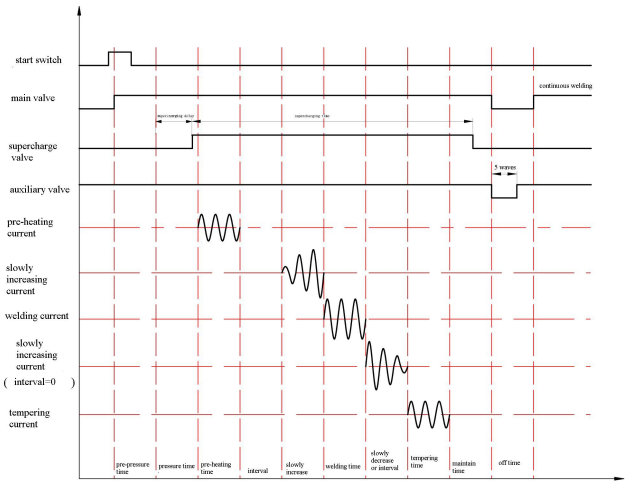


Fig. 6.2 Time sequence of a weld cycle

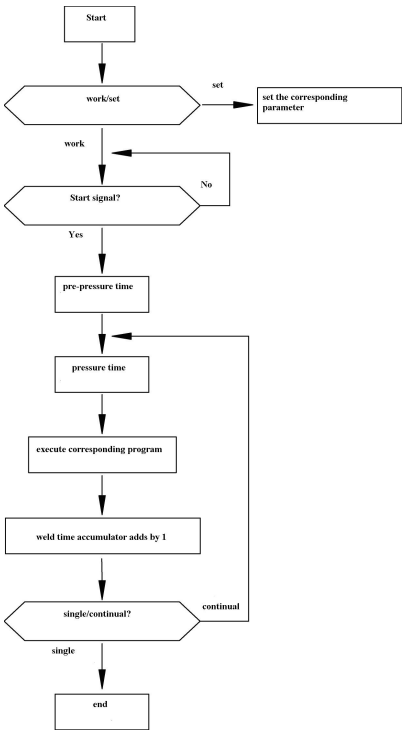


Fig. 6.3 Working flow chart

7 Operation

7.1 Before welding

- Cooling water flowing (≥ 3.5 L/min); air tank pressurised and drained; lubricator filled.
- Correct electrodes fitted and tight; electrode tips clean and dressed.
- Electrode force set at the F.R.L. regulator (Fig. 7.1).



Fig. 7.1 Setting the air pressure (electrode force) at the regulator



Fig. 7.2 Setting a schedule on the controller

7.2 Mechanical adjustment

Line up the electrodes (and any fixture) before welding, in one of two ways:

- Switch the **Squeeze** switch on: the main valve closes the electrodes without current. Switch it off to open.
- Or press **Adjust/Weld** until the Adjust lamp lights, press **Work/Set** until the Work lamp lights, and press the foot switch: the full valve sequence runs (main, boost and auxiliary valves) without any welding current.

7.3 Welding

1. Set the parameters of the schedule (Chapter 6).
2. Press **Adjust/Weld** until the Weld lamp lights.
3. Press **Work/Set** until the Work lamp lights.
4. Place the workpiece between the electrodes and press the foot switch. The machine squeezes, welds, holds and opens automatically.
5. In repeat mode (parameter 17 = 1) the machine continues weld after weld while the foot switch is held; pressing the foot switch during a repeat sequence stops it.

7.4 Example: three-pulse spot weld

Pre-heat 10 kA for 3 cycles, weld 18 kA for 5 cycles, temper 10 kA for 3 cycles, hold 15 cycles; welding starts 30 cycles after the foot switch is pressed; single weld; secondary induction coil with 30.0 kA scale:

Parameter	Setting
Level 2	A = 30.0 (coil scale, kA); b = 1 (secondary sampling)
1, 2	Pre-pressing + squeeze time = 30 cycles in total
3, 4	Pre-heating current 10.0 kA; pre-heating time 3
5, 6	Cooling time 0; slow rising 0
7, 8	Welding current 18.0 kA; welding time 5
9, 10	Cooling time 0; slow falling 0
11, 12	Temper current 10.0 kA; temper time 3
13, 14	Hold time 15; off time 0
17	Working method 0 (single)

7.5 Several schedules on one part

Where the points of one part need different settings (for example several projection points), store them as schedules 1 to N, set **C = N** in the level-2 menu and set the working method (parameter 17) of each schedule: with 1 the next schedule follows automatically; with 0 the machine stops after that schedule and waits for the foot switch. Setting schedules 1 to N−1 to 1 and schedule N to 0 welds all points in one press of the pedal and then stops.

8 Electrodes and welding practice

Electrode	Use
Pointed tips	Sheet to sheet, up to 3 mm + 3 mm: enclosures, brackets, panels, ducting
Flat electrodes	Wire, rod and mesh: several crossing wires in one press
Projection dies	Weld nuts, bolts and studs (M6 – M12) onto sheet



Fig. 8.1 Projection welding a nut

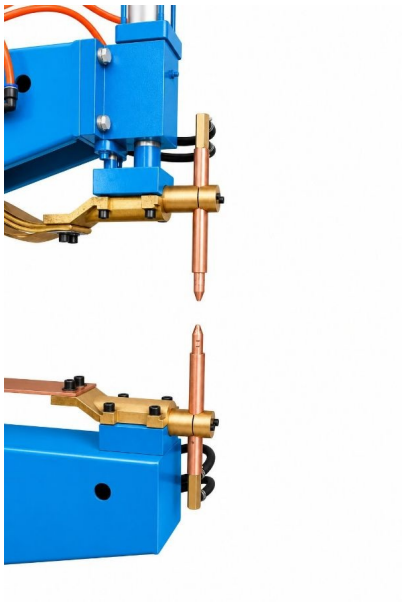


Fig. 8.2 Electrode arms and tips

- Dress the electrode tips regularly; a mushroomed tip spreads the current and the nugget becomes small.
- Set the electrode force first, then the current and weld cycles. Do not try to cure a weak weld with current alone.
- Make a test weld and peel it: a good spot tears a slug out of one sheet instead of parting at the joint face.
- Clean the sheets of oil, scale and paint at the weld spots.
- Use pre-heat, slope and temper current for coated or thicker sheet to reduce spatter and improve the nugget.

9 Maintenance

▲ WARNING

Switch off and isolate the supply, close the air and water and release the air pressure before maintenance.

Interval	Work
Daily	Drain the condensate from the air tank and the F.R.L. filter bowl. Check the lubricator oil level. Check the cooling water flow.
Regularly	Dress or replace electrode tips. Check that electrode holders, arms and the copper shunt are tight; clean contact faces.
Weekly	Check air and water hoses for leaks. Clean dust from the machine and controller.
Monthly	Check all electrical connections and the earth. Check the cylinder for leaks and smooth movement.

- In freezing conditions, drain the cooling water when the machine is not in use.
- Use only genuine Cruxweld electrodes, holders, shunts and controller parts.

10 Fault codes and troubleshooting

When the controller detects a fault, it switches off the output and shows the fault code in the parameter-value window.

Code	Fault	Cause	Remedy
Er01	Thyristor always on	One or both thyristors conduct without a firing signal	Check the thyristor module for damage or wrong wiring (qualified electrician)
Er02	Thyristor always off	Thyristors do not conduct when fired	Check the thyristor module and the controller supply wiring (the two supply wires may be reversed)
Er03	Overheat	Thermal switch on the transformer has operated	Check the cooling water flow; let the machine cool; check the thermal switch and its wiring
Er04	Over current	Welding current above the set value + AH	Check the current setting, electrodes and workpiece
Er05	Under current	Welding current below the set value − AL	Check electrodes, workpiece contact, shunt connections and supply
Er06	Transformer scale too large	Measured current too low for the transformer / coil scale	Set the correct scale (A) or use a lower-scale transformer
Er07	Memory data error	Wrong parameter settings	Check and re-enter the parameters
Er08	No synchronisation signal	Sync signal lost	Check the synchronisation input wiring

10.1 Other problems

Problem	Possible cause	Remedy
Weak or small welds	Tips worn; force too low; current or time too low	Dress tips; raise air pressure; raise current or weld time
Heavy spatter, burnt spots	Force too low; current too high; dirty sheet	Raise force; reduce current; clean the sheet; use slope up
Electrodes stick to the work	Tips dirty or overheated; poor cooling	Dress tips; check water flow
Electrodes do not close	No air; solenoid valve faulty; controller in Set mode	Check air supply and valve; set Work mode
Machine runs but no current	Adjust mode selected	Press Adjust/Weld to select Weld

If the fault cannot be cleared, contact Cruxweld service and state the model and the serial number from the rating plate.

11 Warranty

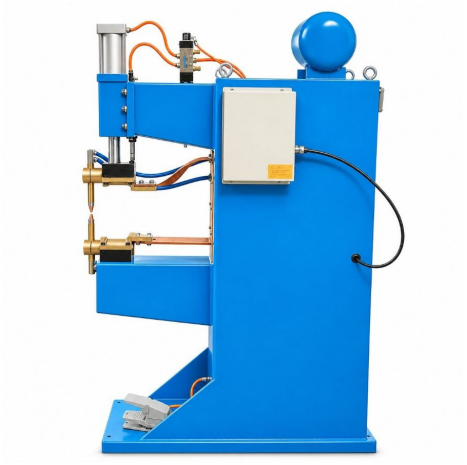
Cruxweld warrants the ProSpot 3500 against defects in material and workmanship for the period stated on the quotation and invoice. During this period Cruxweld will repair or replace parts that are found to be defective due to faulty material or workmanship.

The warranty does not cover electrodes, electrode holders, shunts, seals and other wearing parts, or damage caused by welding without cooling water, incorrect supply voltage, use not in line with this manual, or repair by unauthorised persons.

Model	ProSpot 3500
Serial number	
Invoice no. / date	
Customer	
Dealer stamp	

For service and spare parts please contact:

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