CRUXWELD®

INDUSTRIAL EQUIPMENTS PVT. LTD.

ROKR 16K

Pedal Operated Rocker Arm Spot Welding Machine

16 kVA | Electronic timer | 6-step current tap switch | Water-cooled arms and electrodes



INSTRUCTION MANUAL

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

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This manual contains the description, installation, operation and maintenance instructions of the Cruxweld ROKR 16K pedal operated rocker arm spot welding machine.

For your own safety and that of other people, please read and understand this manual carefully before installing and operating the machine, and keep it near the machine for future reference.

Cruxweld provides a warranty for this machine from the date of purchase, as stated in Chapter 12.

Cruxweld improves its products continuously. The contents of this manual may be revised without prior notice.

1 Preface and safety signs

Thank you for choosing a Cruxweld resistance welding machine. The ROKR 16K is a rugged, pedal operated rocker arm spot welder for joining sheet metal in continuous production. This manual describes the hardware of the machine and explains how to install, operate and maintain it. For your own safety and that of other people, please read it carefully before using the machine.

Pay attention to the signs

Pay attention to the text that follows each of the signs below.

Sign	Meaning
⚠ DANGER	The text after this sign describes a **serious hazard** which may cause a major accident, damage or even death if it is not observed.
⚠ WARNING	The text after this sign describes a **potential hazard** which may cause injury or damage to property if it is not observed.
⚠ ATTENTION	The text after this sign describes a **potential risk** which may cause a fault in, or breakdown of, the machine if it is not observed.

Intended use

The ROKR 16K is designed only for resistance spot welding of mild steel, stainless steel and brass sheets within the range given in Chapter 5. Any other use is regarded as improper. Cruxweld cannot be held liable for damage resulting from improper use, from modifications made to the machine by the user, or from non-observance of the instructions in this manual.

Operator

- The machine must be installed, operated, checked and maintained only by trained and qualified personnel.
- The operator must have adequate knowledge of the resistance (spot) welding procedure with this type of machine.
- Only one person may work on the machine at a time. Do not allow unauthorised persons into the working area.

▲ DANGER
Persons with a cardiac pacemaker or other implanted medical device must not operate the machine or come near it while it is in use. The strong magnetic field produced during welding can affect such devices.

2 Safety

The design and manufacture of the machine take safety into account. Incorrect operation can nevertheless cause accidents. Please observe the rules below.

2.1 Electric shock

- Contact with live electrical parts can cause a fatal electric shock or burns. Keep away from all live parts.
- The machine and the workpiece must be earthed by qualified personnel, in compliance with the applicable regulations.
- Always switch off and isolate the machine from the mains before installation, inspection, maintenance or opening any cover.
- Do not use cables with damaged insulation, loose terminals or an inadequate cross-section. Make sure all connections are tight and well insulated.
- Never use the machine with the covers or enclosure removed.
- Do not operate the machine in a humid or wet place or in the rain. Never use wet or damaged insulating gloves.
- Switch off the mains supply when the machine is not in use.

2.2 Crushing hazard – moving arms and electrodes

> **▲ WARNING**
> A force of up to about 150 kgf is applied at the electrode tips. Never put your fingers, hands or any other part of the body between the arms or the electrodes – danger of squeezing.

- Keep fingers, hair and loose clothing away from the moving upper arm, the rocker mechanism and the pedal linkage.
- Take care that the moving arm and electrodes cannot strike persons or objects.
- Do not operate the pedal without a workpiece between the electrodes.

2.3 Burns, sparks and fire

- Spot welding produces sparks and expelled molten metal, and the workpiece, electrodes and arms become hot. Wear safety glasses, welding gloves, a leather apron and protective clothing without metal accessories.
- Keep flammable materials at least 10 m away from the working area. Keep a fire extinguisher close to the machine.
- Never weld containers or tanks which have held liquids, gases or combustible materials – they may explode.
- Keep hot workpieces away from flammable material and gases after welding.

2.4 Fumes and gases

- Welding galvanised, painted, oiled or otherwise coated sheet produces smoke and fumes which are harmful to health. Ensure good ventilation or use a suitable fume extraction system.
- Never weld in degreasing, washing or spray-painting areas.

2.5 Magnetic fields

- During welding the machine generates strong magnetic fields. Iron particles and small steel parts may be attracted.
- Do not wear rings, bracelets, watches or other metal objects while welding. They can be attracted by the magnetic field or heated by the welding current and cause burns.
- Watches, mobile phones and other mechanical, electrical or electronic devices can be damaged near the machine.

2.6 Noise

Wear hearing protection if the noise level at the workplace is high.

2.7 Electromagnetic compatibility

Before installation, assess possible electromagnetic problems in the surrounding area, for example:

- power, control, signal and telephone cables near the machine;
- radio and TV transmitters and receivers, computers and other control equipment;
- safety-related and measuring equipment;
- the health of people nearby, such as users of pacemakers or hearing aids.

To reduce interference: connect the machine to the mains as described in this manual, maintain it regularly, keep the supply cable as short as possible and earth the machine and the workpiece properly. The user is responsible for any interference caused by welding.

2.8 Storage

- Store the machine in a dry place at a temperature between 0 °C and 40 °C, protected from the weather and away from heat sources.
- Before storing the machine in a place where the temperature may fall below 0 °C, drain all cooling water from the arms and electrode holders.

2.9 Handling and transport

- The machine weighs about 160 kg. Handle and position it with care and suitable lifting equipment, avoiding shocks and falls which could damage it.
- When using a forklift, lift the machine from the side, with the forks under the base, to prevent it from toppling over.
- After positioning, check that the machine stands level and stable.

2.10 Modifications

If the user modifies or alters the machine, or integrates it into a plant, the manufacturer’s liability ends. Non-observance of the instructions in this manual makes the safety features of the machine ineffective and causes serious risk of personal injury and damage to property.

3 General description

The Cruxweld ROKR 16K is a versatile 16 kVA pedal operated rocker arm spot welder. It is used as a stationary spot welder for sheet metal work in industries such as automobile parts, panels and enclosures, tanks, furniture, architecture and general fabrication. The machine is fitted with an electronic timer mounted on the front, which lets the operator set the weld time during production, and with a 6-step tap switch for the welding current. The throat depth is adjustable for flexibility with parts of different sizes and shapes.

3.1 Construction

Transformer	Rugged, air-cooled transformer with vacuum-impregnated coils and a positive-locking tap switch. The winding impregnation increases reliability and service life in continuous production.
Electrodes	Detachable electrodes in ejector-type, water-cooled tip holders for No. 1 Morse taper electrodes, supplied as standard. The chromium-copper electrode holders are designed for long life and can be mounted straight or at an angle.
Arms	Solid copper arms, drilled at 90° to accommodate the water-cooled electrode holders. The arm length (throat depth) is adjustable.
Electrode force	The force on the work is obtained through a heavy spring on the pressure rod at the back of the machine, applied by the foot pedal through the rocker arm.
Electrode stroke	Adjusted by vertical adjustment of the electrode holder.
Weld initiation	A mechanically operated switch initiates the weld only after the preset electrode force has been built up.
Time control	Electronic timer for the welding current, adjustable from 5 to 50 cycles or from 1 to 10 seconds, for high-quality, repeatable spots.
Current control	Quick setting of the welding current with a rotary tap switch, in 6 steps between 50 % and 100 %.
Cooling	The transformer is air cooled. The arms and electrodes are water cooled, with hose connections.

3.2 Salient features

- Mechanically operated 16 kVA spot welder – simple, robust and economical.
- Adjustable throat depth for maximum flexibility with the workpiece.
- 380 / 415 V supply, connected across two lines.
- Consistent weld quality with electronic, synchronised weld time control.
- Water-cooled electrodes and arms, and a rugged air-cooled transformer, for heavy-duty production.
- Access to workpieces of various shapes; electrode holders for straight and angled mounting.
- Adjustable electrode stroke, and compatibility with a wide range of electrodes.

4 Spot welding process

Spot welding joins two sheets by clamping them between two electrodes and passing a heavy current through them for a very short time. The material directly between the electrodes heats up quickly because of its resistance to the flow of current, and melts locally to form a weld nugget. The principle is shown in Fig. 4.1.

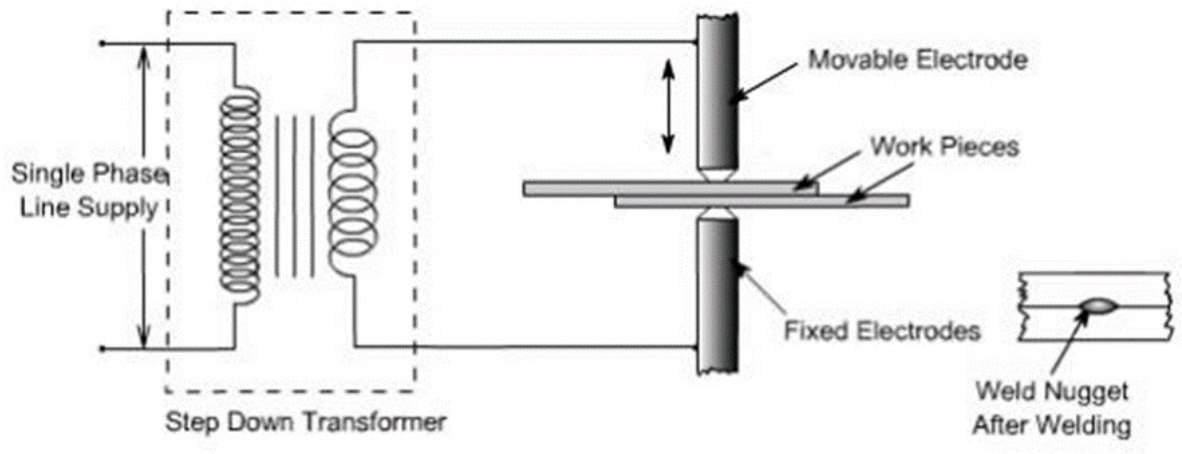


Fig. 4.1 Principle of spot welding

4.1 Spot welding cycle

The welding cycle starts when the upper electrode moves down and presses the workpieces against the stationary lower electrode (squeeze). Only when the workpieces are held under pressure does the heavy current flow between the electrodes for the preset time (weld). The contact area of the metals is rapidly raised to welding temperature, and the electrode force squeezes the hot metal together to complete the weld. The weld nugget is allowed to cool under pressure (hold), and then the pressure is released. This complete sequence is the resistance spot welding cycle, shown in Fig. 4.2.

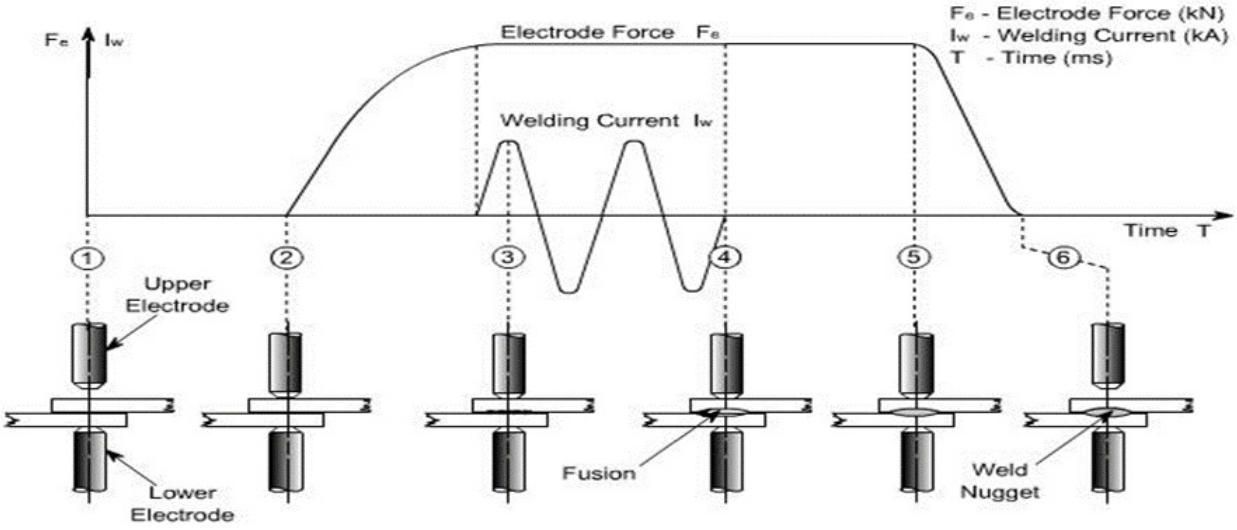


Fig. 4.2 Spot welding cycle

1	2	3	4	5	6
Electrode open	Squeeze – force builds up	Weld – current flows	Fusion – nugget forms	Hold – cools under force	Release – weld nugget

4.2 Electrode shapes

Electrodes of different tip shapes are used (Fig. 4.3):

- **Truncated cone** (included angle 120° – 140°) – used for ferrous metals. With continuous use the tip wears and must be dressed.
- **Dome (ball-shaped)** – withstands heavier loads and severe heating without damage; normally used for non-ferrous metals. The dome radius is generally 50 – 100 mm.
- **Flat tip** – used where minimum indentation or invisible welds are required.



Fig. 4.3 Electrode tip shapes for spot welding

4.3 Working diagram

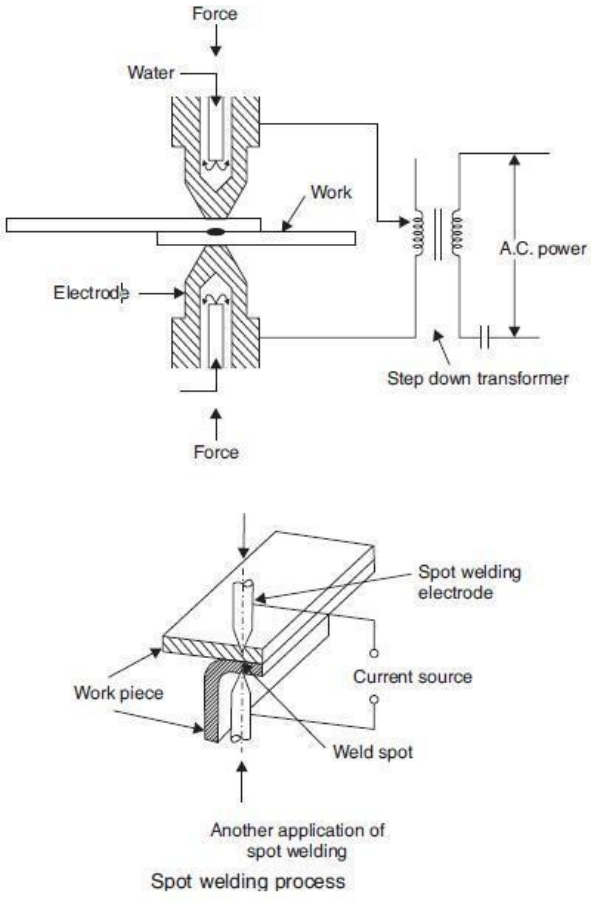


Fig. 4.4 Working diagram of the spot welding machine

5 Technical specifications

Specification	Unit	ROKR 16K
Input supply	V	**AC 380 / 415 ±15 %**
Phase	–	**1 / 2**
Rating at 50 % duty cycle	kVA	**16**
Nominal throat clearance	mm	**230**
Throat depth	mm	**450**
Electrode stroke, max.	mm	**40**
Nominal electrode force (approx.)	kgf	**150**
Maximum available short-circuit current	kA	**8.5**
Welding range, mild steel (min. – max.)	2 x mm	**0.3 – 3.0**
Welding range, stainless steel (min. – max.)	2 x mm	**0.3 – 2.8**
Welding range, brass (min. – max.)	2 x mm	**0.2 – 1.5**
Current control	–	**6-step tap switch, 50 – 100 %**
Weld timer	–	**5 – 50 cycles / 1 – 10 s**
Insulation class	–	**H**
Transformer cooling	–	**Air cooled**
Cooling for arms and electrodes	–	**Water**
Main supply copper cable size	mm²	**15**
Main disconnection switch	A	**30**
Dimensions (L x W x H)	mm	**660 x 450 x 1200**
Weight (approx.)	kg	**160**

The rating plate on the machine is binding. Specifications may change without notice as a result of continuous improvement.

5.1 Supply

The ROKR 16K is a single-phase / two-phase machine. Connect it to a **380 / 415 V** AC supply (±15 %, 50 Hz) across two lines, as stated on the rating plate, **with proper earthing**.

> **Note:** Earthing is required to protect the operator and the machine against leakage current.

6 Installation

6.1 Precautions and checks

> **▲ DANGER**
> During all installation and connection work the machine must be completely isolated from the mains supply.

> **▲ WARNING**
> Installation must be carried out by qualified personnel, in compliance with the applicable regulations and in accordance with this manual.

> **▲ ATTENTION**
> Before connecting the machine, make sure the voltage and frequency on the rating plate correspond to the mains supply available on site.

- The electrical safety of the machine is ensured only when it is connected to an efficient earthing system made in compliance with the applicable regulations. Have qualified personnel check that the earthing works. Cruxweld cannot be held liable for damage caused by the absence or inefficiency of the earthing system.
- Check that the installed power of the supply and the cables of the electrical installation are adequate for the rated power of the machine (16 kVA).

6.2 Location and environment

- Install the machine indoors on a firm, level floor, where it stands stable. Leave enough free space around it for the operator, the workpieces and maintenance.
- Working ambient temperature: 5 °C to 35 °C.
- Relative air humidity: below 90 %, without condensation.
- Keep the place free of dust, corrosive gases, flammable material and dripping water.

6.3 Electrical connection

1. Install a **30 A main disconnection switch** (with suitable fuses or circuit breaker) near the machine.
2. Use a supply cable with a copper cross-section of **15 mm²**. Keep it as short as possible.
3. Open the terminal cover and connect the supply to the terminal strip (TS) as shown in Chapter 11: connect the two supply lines (380 / 415 V) to **L1** and **L2**.
4. Connect the earth conductor of the supply cable to the earth terminal on the machine body.
5. Close the terminal cover before switching on.

6.4 Cooling water connection

1. Connect the water inlet hose to a clean, continuous water supply at a maximum temperature of **30 °C**, or to a Cruxweld water cooling unit.
2. Connect the water outlet hose to a drain, or to the return line of a water cooling unit.
3. Open the water supply and check that water flows freely from the outlet and that there are no leaks at the arms or electrode holders.

> **▲ ATTENTION**
> Never weld without cooling water. Insufficient cooling overheats the arms and electrodes and shortens their life.

7 Machine overview and controls

7.1 Main parts

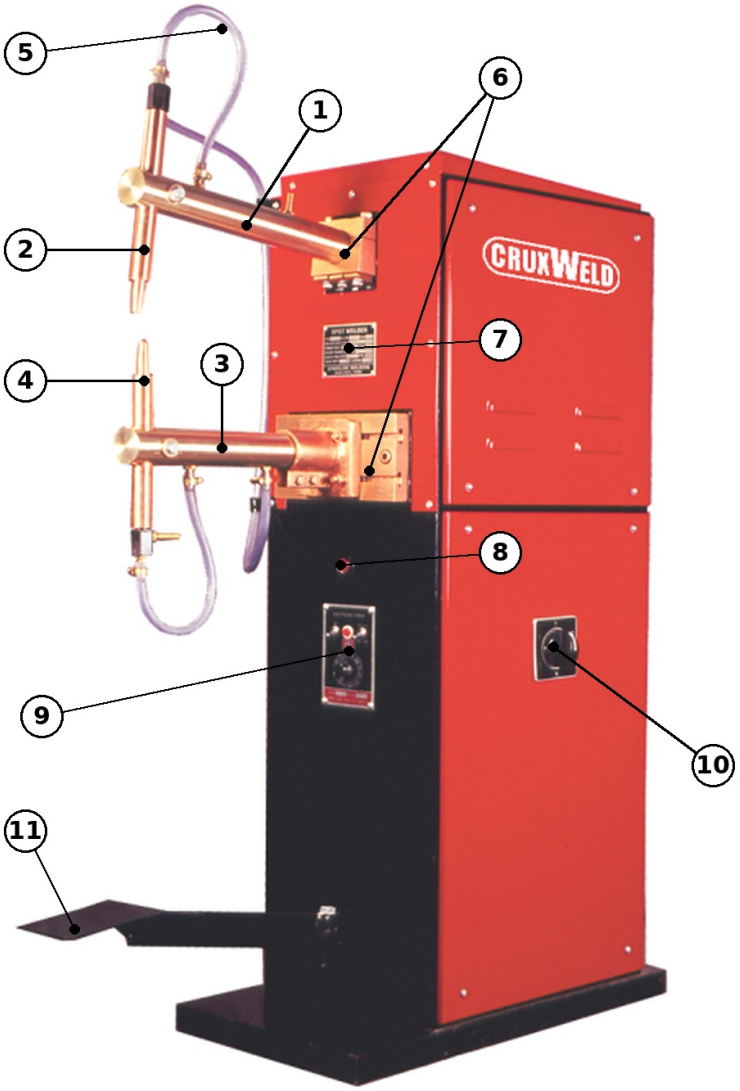


Fig. 7.1 Main parts of the ROKR 16K

1	Upper electrode arm (moving)	**6**	Arm holders (arm clamps)
2	Upper electrode holder and electrode	**7**	Rating plate
3	Lower electrode arm (fixed)	**8**	Indicator lamp
4	Lower electrode holder and electrode	**9**	Electronic timer
5	Cooling water hoses	**10**	Current tap switch
		11	Foot pedal

7.2 Electronic timer

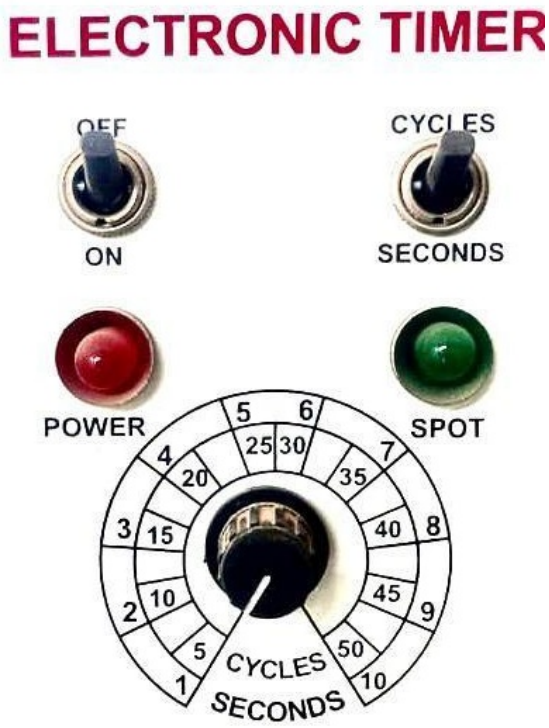


Fig. 7.2 Electronic timer panel

Control	Function
OFF / ON switch	Switches the timer control on or off.
POWER lamp (red)	Lights when the machine is energised.
CYCLES / SECONDS switch	Selects the timer range: **CYCLES** (5 – 50 cycles, inner scale) for normal sheet welding, or **SECONDS** (1 – 10 s, outer scale) for long weld times.
SPOT lamp (green)	Lights while welding current flows.
Weld time knob	Sets the weld time on the selected scale: positions 1 – 10 = 5 – 50 cycles or 1 – 10 seconds.

At 50 Hz one cycle is 20 ms: 5 cycles = 0.1 s, 50 cycles = 1 s.

7.3 Current tap switch

The rotary tap switch on the side of the machine selects the transformer tap and thus the welding current in **6 steps between 50 % and 100 %**. Step 1 gives the lowest and step 6 the highest current.

> **▲ ATTENTION**
> Change the tap position only when no welding is taking place (pedal released). Never turn the tap switch while current is flowing – this burns the switch contacts.

7.4 Main disconnection switch and indicator lamp

The machine is supplied through a 30 A main disconnection switch installed in the supply line (see 6.3). The indicator lamp above the timer shows that the machine is energised. Switch off the main disconnection switch at the end of work and before any cleaning or maintenance.

7.5 Foot pedal and weld initiation

Pressing the foot pedal moves the upper arm down through the rocker mechanism and presses the electrodes onto the workpiece. As the pedal is pressed further, the heavy spring on the pressure rod builds up the electrode force. When the preset force is reached, the mechanically operated weld-initiation switch (CI) closes and the timer starts the weld. The weld cannot start before the preset force is reached.

8 Operation

> **▲ WARNING**
> The first start-up of the machine must be carried out by qualified personnel. Before any welding, the checks and adjustments below must be made.

8.1 Checks before start-up

- The electrical connection and earthing have been made correctly, in compliance with the applicable regulations (Chapter 6).
- Cooling water is flowing and there are no leaks.
- The electrodes are of the correct diameter, in good condition, clean and aligned – the upper and lower tips must meet squarely and centrally.
- The arms and electrode holders are tightly clamped.
- The operator wears safety glasses, gloves and an apron.

8.2 Setting the machine

1. Set the **current tap switch** according to the material and sheet thickness (see Table 8.1).
2. Set the **CYCLES / SECONDS switch** and the **weld time knob** according to Table 8.1.
3. Adjust the **electrode force** with the tension nut of the spring on the pressure rod at the back of the machine: tighten for more force, loosen for less.
4. Adjust the **electrode stroke** by moving the electrode holder vertically, so that the electrodes open wide enough to insert the work and close with the arms parallel.
5. If required, adjust the **throat depth**: loosen the arm clamps, slide both arms to the same length and retighten the clamps firmly. The electrode tips must stay aligned.

8.3 Welding

1. **Switch on:** switch on the main disconnection switch and turn the timer switch to ON. The red POWER lamp lights.
2. Place the sheets to be welded between the electrodes, resting on the lower electrode.
3. Press the foot pedal steadily. The upper electrode clamps the sheets; when the preset force is reached the weld starts automatically and the green SPOT lamp lights.
4. Keep the pedal pressed until the SPOT lamp goes off and hold it briefly so that the nugget cools under pressure.
5. Release the pedal; the upper arm returns. Move the work to the next spot position and repeat.
6. Make a few trial welds on scrap pieces of the same material and check them (peel or chisel test). Adjust current, time and force until the weld is correct.
7. **Switch off:** turn the timer switch to OFF, switch off the main disconnection switch and close the cooling water.

> **▲ WARNING**
> Do not put your hands between the arms and electrodes – danger of squeezing. Avoid welding without sheets between the electrodes.

8.4 Reference settings (mild steel)

Sheet thickness (mm)	Electrode tip diameter (mm)	Tap position	Weld time (cycles)
0.3 + 0.3	3	1	5
0.5 + 0.5	4	1 – 2	5 – 10
1.0 + 1.0	5	2 – 3	10 – 15
1.5 + 1.5	6	3 – 4	15 – 25
2.0 + 2.0	7	4 – 5	25 – 35
3.0 + 3.0	8.5	6	35 – 50

Table 8.1 Starting values for clean, uncoated mild steel

The values in Table 8.1 are starting points only. The correct setting depends on the material, the surface condition, the arm length and the supply. Always confirm the setting with trial welds.

- **Stainless steel:** use about 20 – 30 % less current (one tap step lower) and a shorter weld time than for mild steel of the same thickness.
- **Brass:** use a higher tap position, a short weld time and dome-shaped electrodes.
- **Galvanised or coated sheet:** use a higher current and slightly longer time, and dress the electrodes more often.
- **Longer arms** (greater throat depth) reduce the available current; select a higher tap position.

8.5 Weld quality guide

Observation	Adjustment
Weld too weak, sheets separate easily	Increase tap position or weld time; check electrode tips for wear.
Sparking, expelled metal, holes or craters	Reduce current; increase electrode force; clean sheets and electrodes.
Deep indentation or discoloured spots	Reduce weld time or current; reduce force; use larger tip diameter.
Electrodes stick to the sheet	Clean and dress electrodes; check cooling water; reduce current.

8.6 Important notes

- Keep the sheets clean and free from rust, scale, paint and oil at the weld area.
- Keep a minimum distance between spots so that the current does not shunt through the previous spot.
- Do not exceed the rated duty cycle. At high output, allow pauses between welds.

9 Maintenance

▲ DANGER
Before any maintenance, switch off the machine and isolate it from the mains supply. Close the cooling water.

9.1 Daily

- Check that cooling water flows freely and that there are no leaks.
- Check the electrode tips; clean and dress them to the original shape and diameter with a tip dresser or fine file. Replace worn electrodes.
- Check that the upper and lower electrodes are aligned.
- Keep the machine and its surroundings clean and dry.

9.2 Weekly

- Check the tightness of the arm clamps and electrode holders.
- Clean the seats of the arm holders and the electrode tapers; oxidised seats cause poor contact and weak welds.
- Lubricate the rocker arm pivot and the pedal linkage with a few drops of oil. Do not let oil reach the electrodes or current-carrying parts.

9.3 Monthly

- Check that all electrical connections, the supply terminals and the secondary (flexible) connections are tight and not overheated.
- Check the condition of the supply cable, the earth connection and the water hoses.
- Remove dust from inside the machine, especially from the air-cooled transformer, with dry, low-pressure compressed air. Keep the ventilation openings free.
- Check the operation of the weld-initiation switch and the pressure spring.

9.4 Yearly

- Have qualified personnel measure the insulation resistance of the transformer between primary, secondary and body.
- Check the tap switch contacts and replace them if burnt.
- Flush the cooling passages of the arms and electrode holders to remove scale.

Frost: if the machine is stored where the temperature may fall below 0 °C, blow out all cooling water with compressed air.

10 Troubleshooting

Below is a list of possible faults and the remedies to eliminate them. If a fault cannot be corrected, contact Cruxweld service.

Problem	Possible cause	Remedy
The machine does not switch on; POWER lamp off.	No supply or connection error. Main disconnection switch or timer switch open. Supply fuse blown.	Check the supply and the connections. Switch on the main disconnection switch and turn the timer to ON. Replace the fuse.
Pedal pressed and electrodes closed, but no weld (SPOT lamp off).	Weld-initiation switch not operating or defective. Electrode force setting too low to reach the switch point. Timer or its fuse defective.	Check and adjust or replace the switch. Increase the spring tension. Check the timer fuse; repair or replace the timer.
SPOT lamp lights, but no weld is made.	Seats of the arm holders or electrode tapers oxidised. Loose secondary connection. Tap switch contact faulty.	Clean the arm holder seats and tapers with fine abrasive paper. Tighten the connections. Check the tap switch.
Sparking and expelled metal; holes or craters at the welds.	Excessive welding current. Insufficient electrode force. Wrong electrode profile. Metal deposits on electrode tips. Dirty sheets.	Reduce the tap position. Increase the spring tension. Dress the electrodes correctly. Clean the electrodes. Clean the sheets.
Electrodes leave deep impressions on the sheets.	Electrode tip too small. Weld time too long. Excessive welding current. Electrode force too high.	Increase the tip diameter. Reduce the weld time. Reduce the welding current. Reduce the spring tension.
Weak welds.	Current or weld time too low. Worn or misaligned electrodes. Low supply voltage or undersized supply cable.	Increase tap position or weld time. Dress or replace and align the electrodes. Check the supply and cable size.
Electrodes, arms or transformer overheat.	No or insufficient cooling water. Blocked water passages. Transformer ventilation blocked. Duty cycle exceeded.	Open the water; check the flow. Flush the water passages. Clean the ventilation openings. Allow pauses between welds.
Electrodes stick to the workpiece.	Dirty or worn electrodes. Insufficient cooling. Current too high for the force.	Clean and dress the electrodes. Check the cooling water. Reduce the current or increase the force.

11 Connection diagram

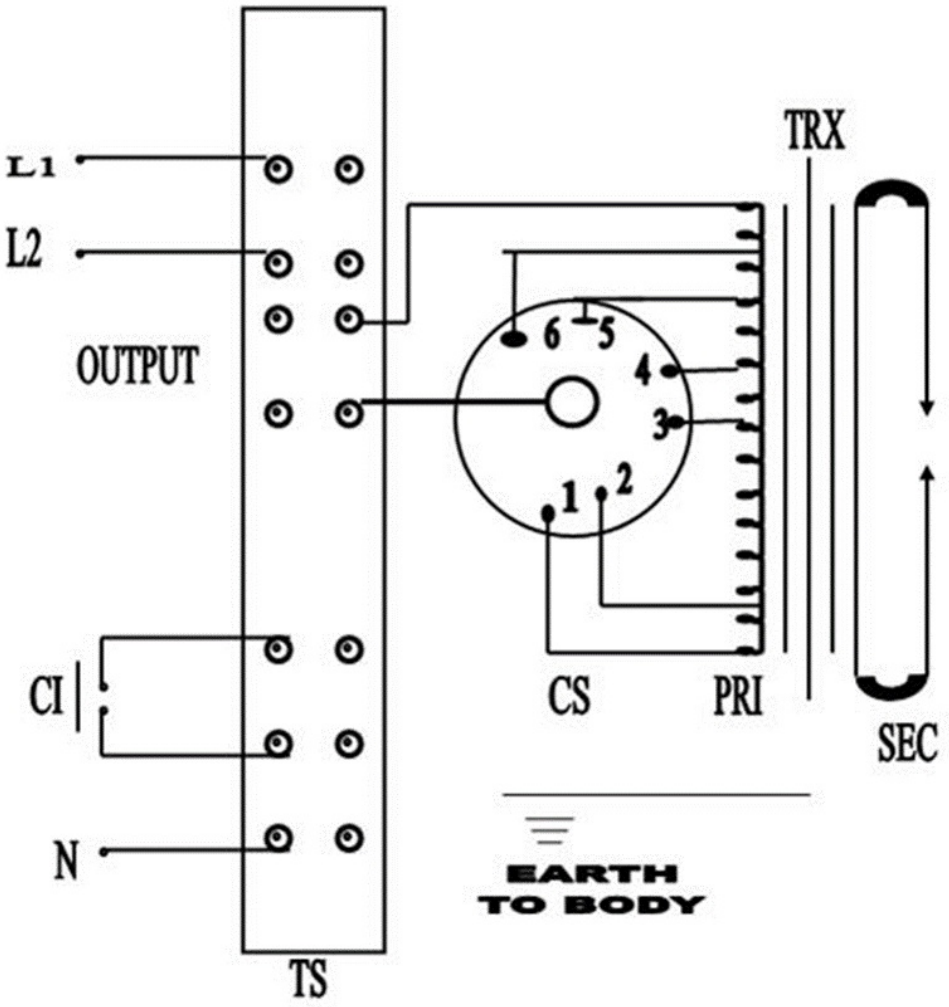


Fig. 11.1 Connection diagram of the ROKR 16K

Symbol	Description	Symbol	Description
L1	Line 1	**TS**	Terminal strip to timer
L2	Line 2	**CS**	Current selector (tap switch, taps 1 – 6)
N	Neutral	**TRX**	Main transformer
CI	Current initiating switch (weld initiation)	**PRI**	Transformer primary winding
OUTPUT	Timer output to transformer primary	**SEC**	Transformer secondary winding
Power control = current adjustment by the tap switch. **Earth to body** = protective earth connection of the machine body.			

▲ DANGER
Only qualified service personnel may open the machine and work on the electrical circuit, after isolating the machine from the mains supply.

12 Warranty

Cruxweld warrants the ROKR 16K against defects in material and workmanship for the period stated in the sales contract, from the date of invoice. The warranty does not cover consumable and wear parts (electrodes, electrode tips, hoses) or damage caused by incorrect supply voltage, missing earth, lack of cooling water, overload, lack of maintenance, misuse or repair by unauthorised persons.

Model	ROKR 16K
Serial number	
Invoice no. / date	
Customer	
Dealer stamp	

For service, spare parts and electrodes please contact:

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Cruxweld improves its products continuously. The technical data in this manual may change without notice.