



INDUSTRIAL EQUIPMENTS PVT. LTD.

CWA-ARC452

ARC Welding Machine – ARC 450A

Heavy duty transformer based regulator type | 2 phase, 415 V | 50 – 450 A stepless



INSTRUCTION MANUAL

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

Cruxweld Industrial Equipments Pvt. Ltd.

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This manual contains the description, installation, operation, safety and maintenance instructions for the Cruxweld CWA-ARC452 heavy duty arc welding machine.

Please read and understand this manual 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 10.

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

Signs used in this manual

▲ DANGER	A serious hazard which may cause death, serious injury or major damage if it is not observed.
▲ WARNING	A hazard which may cause injury or damage to property if it is not observed.
▲ ATTENTION	A risk which may cause a fault in, or damage to, the machine if it is not observed.
Note	Useful information for correct operation.

1 Safety precautions

Arc welding can be dangerous to the operator and to people in or near the work area. Read this chapter carefully and follow all safety rules. Installation, operation, inspection and maintenance must be carried out only by trained persons.

1.1 Electric shock can kill

- Do not touch live electrical parts. Do not touch the electrode, the electrode holder or the work clamp with bare skin or wet clothing.
- Wear dry, hole-free insulating gloves. Insulate yourself from the workpiece and from the ground.
- Use a fully insulated electrode holder. Never use cables with worn, damaged or bare insulation.
- Earth the machine properly. Connect the work clamp firmly to the job, as close to the weld as possible.
- Switch off and isolate the mains supply before installing, inspecting, opening or servicing the machine.
- Keep all covers and panels in place while the machine is in use.

1.2 Arc rays can burn eyes and skin

- The welding arc produces intense visible, ultraviolet and infrared light. Always use a welding helmet or hand screen with the correct filter glass (shade 11 – 13 for this current range).
- Wear leather gloves, a leather apron, long-sleeved flame-resistant clothing and leather safety shoes.
- Protect other people in the area with screens and warn them not to look at the arc.

1.3 Fumes and gases

- Keep your head out of the fumes. Weld only in a well-ventilated area or use fume extraction.
- Do not weld on coated, galvanised or painted metal without extraction or suitable breathing protection.
- Do not weld in confined spaces without proper ventilation and supervision.

1.4 Fire and explosion

- Welding sparks, spatter, slag and hot metal can cause fire. Keep the welding area clean and free from flammable materials.
- Keep a fire extinguisher nearby and know how to use it.
- Never weld on drums, tanks or pipes that have held flammable material unless they have been properly cleaned and made safe.
- Allow the work and the electrode stubs to cool before handling them.

1.5 Magnetic fields and other hazards

- High welding currents produce magnetic fields. Persons with a cardiac pacemaker must consult their doctor before going near arc welding.
- Welding is noisy; wear hearing protection if required.
- Keep hands, hair and clothing away from the cooling fan when covers are open.

2 General description

The Cruxweld CWA-ARC452 (ARC 450A) is a heavy duty, transformer based AC arc welding machine of the regulator type, for manual metal arc (MMA / stick) welding with covered electrodes. It is designed for heavy fabrication, structural work, workshops and outdoor site use.

The machine is built without any electronic circuitry, which makes it truly rugged and robust, with a long, trouble-free service life. It is mounted on four castor wheels for easy movement on the shop floor and on site.

2.1 Working principle

The welding transformer steps down the 415 V input supply to a safe open-circuit voltage of about 70 V. The welding current is adjusted by a **moving core magnetic shunt**: turning the current control handle on top of the machine moves a laminated iron shunt core in or out between the primary and secondary coils. When the shunt is moved in, more magnetic flux bypasses the secondary coil and the welding current falls; when it is moved out, the current rises. The adjustment is stepless and smooth, and it can be made even while welding is in progress.

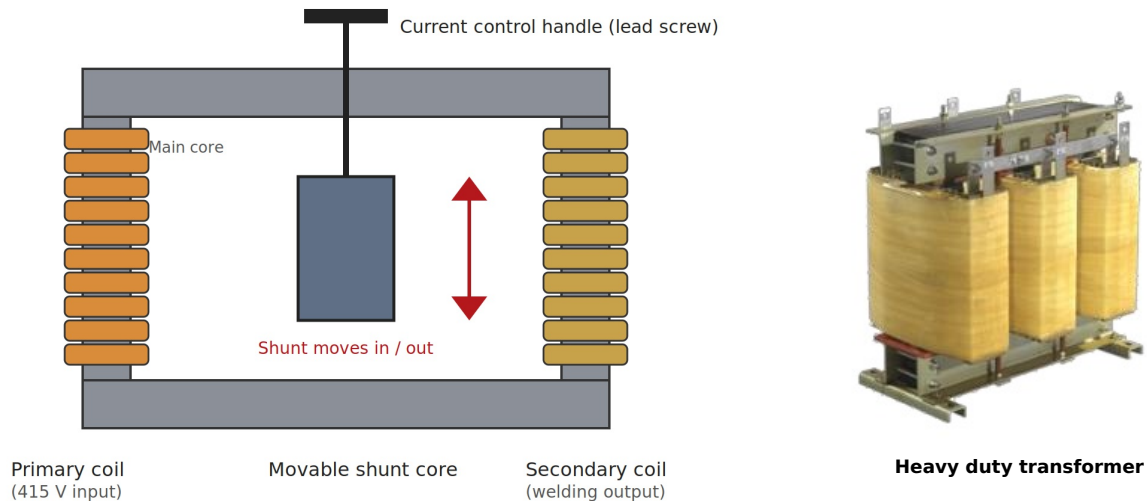


Fig. 2.1 Moving core magnetic shunt principle

2.2 Salient features

- Heavy duty arc welding machine with smooth current control by moving core magnetic shunt design.
- Truly rugged and robust for industrial and outdoor use; no electronic circuitry for a longer service life.
- Current can be adjusted even while welding is in progress.
- ON-OFF switch, current control and current indicator on the front panel.
- Excellent dynamic characteristics for a smooth, uninterrupted arc and optimum metal transfer with minimum spatter.
- Fine control of the welding current to minimise heat input to the job and reduce the heat-affected zone (HAZ).
- Compact, robust transformer – an ideal choice for site use.
- Modern, rugged moving core mechanism for years of trouble-free service; operator friendly.

3 Technical specifications

Specification	Unit	CWA-ARC452
Input supply	V	380 / 415 ±15 %
Phase	No.	2 (2 lines of 3-phase AC)
Frequency	Hz	50 / 60
Max. input at 60 % duty cycle	kVA	22.5
Welding current range	A	50 – 450
Open-circuit voltage	V	70
Welding current at 60 % duty cycle	A	450
Output	–	AC, constant current (CC)
Output current regulation	–	Stepless (moving core magnetic shunt)
Suitable electrode sizes	mm	2.5, 3.15 and 4
Insulation class	–	H
Cooling	–	Forced air (fan)
Dimensions (L x W x H)	mm	785 x 500 x 660
Weight (approx.)	kg	81

Specifications may change without notice as a result of continuous improvement.

3.1 Duty cycle

The duty cycle is the percentage of a 10-minute period during which the machine can weld at a given current without overheating. At 450 A the machine may weld for 6 minutes out of every 10 minutes (60 %); at lower currents the permissible welding time increases.

Welding current	Duty cycle	Welding time in 10 minutes
450 A	60 %	6 min
350 A	100 %	Continuous

The 100 % value is calculated from the 60 % rating. Do not exceed the duty cycle – overheating damages the transformer insulation.

4 Machine overview and controls



Fig. 4.1 Main parts of the CWA-ARC452

1	Current control handle (top)	7	EARTH output terminal (work cable)
2	ON-OFF switch	8	Input supply terminal box (380 – 415 V)
3	Current indicator (ampere scale)	9	Cooling air louvres
4	POWER indicator lamp	10	Castor wheels
5	Rating plate	11	Handle for moving the machine
6	HOLDER output terminal (electrode cable)		

4.1 Controls

Control	Function
ON-OFF switch	Turn to ON to start the cooling fan, energise the main transformer and light the POWER lamp. Turn to OFF to switch the machine off.
POWER indicator lamp	Lights when the machine is switched on and the supply is present.
Current control handle	Turn clockwise to increase and anti-clockwise to decrease the welding current. The adjustment is stepless and can be made while welding.
Current indicator	Shows the set welding current in amperes on the scale on the front panel. The pointer moves as the current control handle is turned.
HOLDER / EARTH terminals	Output terminals for the electrode holder cable and the work (earth) cable. The output is AC, so either cable may be connected to either terminal; by convention the electrode cable goes to HOLDER and the work cable to EARTH.

Note: The current indicator shows the approximate welding current. The actual current also depends on the supply voltage, the cable length and the arc length.

5 Installation

5.1 Location

- Place the machine in a relatively clean, dry place on a level floor. Protect it from rain, dripping water, dust and corrosive vapours.
- Leave at least **0.5 m** of free space on all sides for the circulation of cooling air. The fan draws fresh air in through the louvres and blows it out; never block the air openings or place filters over them.
- Lock the castor wheels or chock the machine so that it cannot roll.

5.2 Electrical input connection

▲ DANGER

The input connection must be made by a qualified electrician with the supply switched off and isolated.

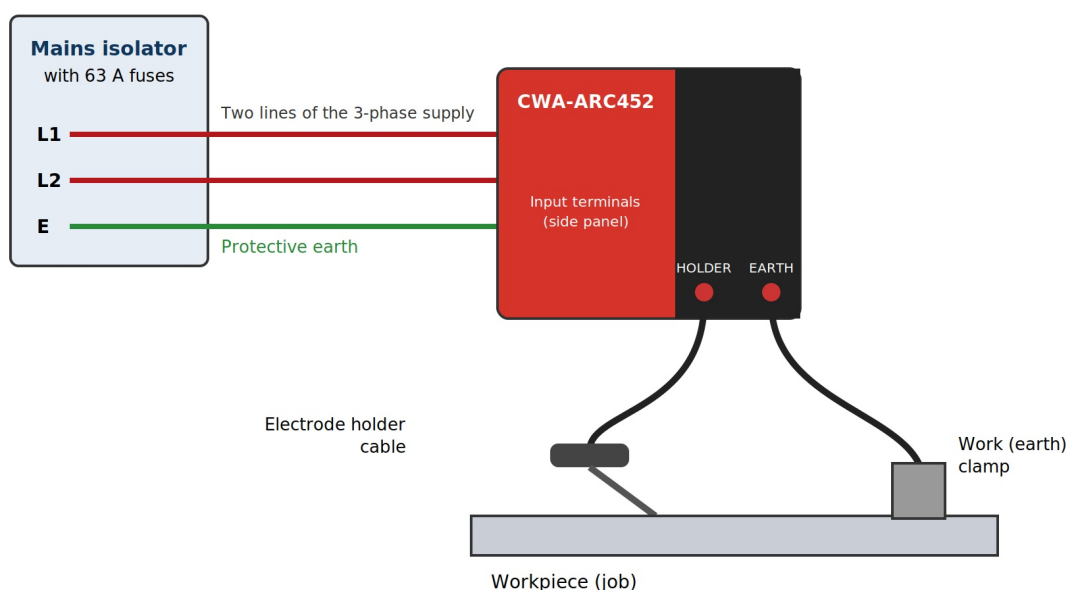


Fig. 5.1 Input and output connections

1. Check that the supply voltage matches the rating plate: **380 / 415 V, 50 / 60 Hz**. The machine uses **two lines** of the 3-phase supply.
2. Provide a separate, good-quality mains isolator with fuses (recommended **63 A**) near the machine, easily reachable by the operator.
3. Remove the cover of the input terminal box on the side panel. Connect the two supply lines to the input terminals with a 3-core cable of at least **10 mm²** copper (two lines + earth).
4. Connect the earth conductor to the earth terminal of the machine. **The machine must always be properly earthed.**
5. Make sure all connections are firm and tight, then refit the terminal box cover.

5.3 Welding cable connection

1. Connect the electrode holder cable to the **HOLDER** terminal and the work cable to the **EARTH** terminal. Tighten the terminal nuts firmly – loose terminals overheat.
2. Use welding cables of adequate size and keep them as short as possible:

Welding current	Cable length up to 15 m	Cable length 15 - 30 m
up to 250 A	35 mm ²	50 mm ²
250 – 350 A	50 mm ²	70 mm ²
350 – 450 A	70 mm ²	95 mm ²

Total length of electrode cable plus work cable. Cable sizes are recommendations for copper welding cable.

6 Operation

6.1 Starting to weld

1. Install and connect the machine as described in Chapter 5.
2. Wear dry insulating gloves, protective clothing and a welding helmet with the correct filter glass.
3. Connect the work clamp firmly to clean, bare metal on the job, as close to the weld as possible.
4. Switch on the mains isolator.
5. Turn the **ON-OFF switch** to ON. The cooling fan starts, the main transformer is energised and the POWER lamp lights.
6. Turn the **current control handle** until the current indicator shows the required current (see Table 6.1).
7. Insert the selected electrode in the holder, with the bare end fully gripped.
8. Strike the arc (6.3) and begin welding. Readjust the current if necessary – it may be adjusted while welding.

6.2 Current setting

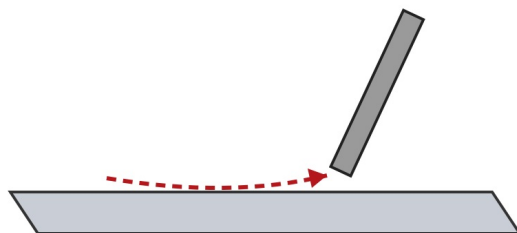
Electrode diameter (mm)	Welding current (A)	Typical plate thickness (mm)
2.5	60 – 90	2 – 4
3.15	90 – 140	3 – 8
4.0	130 – 190	5 and above

Table 6.1 Guide values for mild steel electrodes (flat position)

- Always follow the current range printed on the electrode packet.
- Use a lower current for thin plate, for small parts and for vertical and overhead welding (about 10 – 15 % less than in the flat position).
- Use a higher current for thick plate and heavy sections.

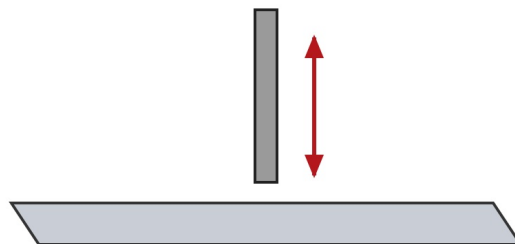
6.3 Striking the arc

A Scratch method



Strike the electrode lightly across the plate like a match, then lift it to the arc length.

B Tapping method



Bring the electrode straight down onto the plate and lift it at once to the arc length.

Fig. 6.1 Arc striking methods

If the electrode sticks (“freezes”) to the work, free it with a quick twist of the wrist. Practise both methods; the scratch method is usually easier for beginners.

6.4 Arc length and electrode angle

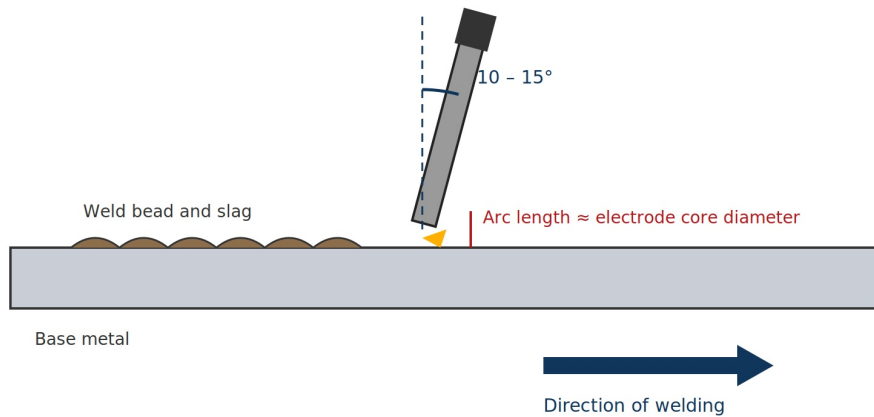


Fig. 6.2 Electrode position

- Hold a short arc: the arc length should be about equal to the core diameter of the electrode. A correct arc gives a steady, sharp crackling sound.
- Hold the electrode almost perpendicular to the work, tilted 10 – 15° in the direction of travel.
- Travel at a uniform speed and feed the electrode down steadily as it melts.
- For wider beads, move the electrode from side to side (weaving), not more than 2½ times the electrode diameter.
- Remove the slag with a chipping hammer and wire brush before depositing the next bead.

6.5 Welding positions

Welding is easiest in the flat position. Horizontal, vertical and overhead welds are also possible; in these positions reduce the current slightly, use smaller electrodes and keep a short arc.

6.6 Shutting down

1. Stop welding and remove the electrode stub from the holder. Place the holder on an insulated surface.
2. Let the machine run without load for about **3 minutes** so that the fan cools the transformer.
3. Turn the ON-OFF switch to OFF, then switch off the mains isolator.

▲ WARNING

Never leave the electrode holder with an electrode in it on the work or on a conductive surface while the machine is switched on.

7 Welding guide

7.1 Weld quality

Observation	Cause	Correction
Good bead	Correct current, arc length and travel speed.	Uniform ripples, good penetration, little spatter, no undercut.
Excessive spatter	Current too high; arc too long.	Reduce the current; hold a shorter arc.
Poor penetration, high narrow bead	Current too low; travel too fast.	Increase the current; travel slower.
Wide, flat bead; burn-through	Current too high; travel too slow.	Reduce the current; travel faster.
Undercut at the edges	Current too high; wrong electrode angle; arc too long.	Reduce the current; correct the angle; hold a shorter arc.
Porosity (holes)	Damp electrodes; dirty, rusty or oily plate; arc too long.	Use dry electrodes; clean the joint; shorter arc.
Slag inclusions	Slag not removed between passes; current too low.	Clean each pass thoroughly; increase the current.
Electrode sticks	Current too low; arc too short.	Increase the current; lift the electrode slightly.
Arc wanders	Arc blow; poor work connection.	Move the work clamp closer to the weld; weld towards the clamp.

7.2 Joint preparation

- Clean the joint of rust, scale, paint, oil and moisture before welding.
- For butt joints in plates thicker than about 6 mm, bevel the edges (single or double V) so that the weld penetrates fully.
- Tack-weld the parts at intervals before welding to hold them in position and reduce distortion.
- Control distortion by welding in short sections and alternating sides where possible.

7.3 Electrode storage

Keep electrodes in their packets in a dry place. Damp electrodes cause porosity, spatter and cracking. Re-dry low-hydrogen electrodes as recommended by the electrode manufacturer.

8 Maintenance

▲ DANGER

Switch off the ON-OFF switch and the mains isolator before opening the machine or carrying out any maintenance.

8.1 Maintenance schedule

Interval	Work
Daily	Check the welding cables, electrode holder and work clamp for damage and loose connections. Keep the air louvres free.
Every 3 months	Inspect the welding cables for breaks in the insulation; repair or replace them. Clean and tighten the output terminals and all cable connections.
Every 6 months	Remove the top cover and blow out dust and dirt from the inside with dry, low-pressure compressed air. In dusty conditions, do this every month. Check that all labels are readable.
Yearly	Lubricate the movable shunt and the lead screw (8.3). Check the fan and its bearings. Check the tightness of all electrical connections and the input terminals.

8.2 Cooling fan

The machine relies on forced air from the fan for cooling. Keep the fan and its blades clean. If the fan bearings are of the lubricated type, apply a few drops of oil at regular intervals.

8.3 Movable shunt and current control

1. Switch off and isolate the supply. Remove the top cover.
2. Locate the movable shunt assembly and the lead screw of the current control.
3. Wipe off the contact surfaces of the shunt block.
4. Apply a light coat of high-temperature grease to the lead screw and to the sliding contact surfaces of the shunt block.
5. Turn the current control handle over its full range several times to spread the grease evenly.
6. Refit the cover.

Note: When lubricating, do not get grease on the coils or other parts of the transformer.

8.4 Shunt noise

Some humming from a transformer welder is normal. If the shunt vibrates or rattles loudly, the anti-noise adjustment screws that press against the shunt can be tightened slightly (about $\frac{1}{4}$ turn at a time) by a qualified service person. Do not overtighten – the current control handle would become hard to turn.

9 Troubleshooting

Troubleshooting inside the machine must be carried out only by qualified persons, with the supply switched off.

Trouble	Probable cause	Remedy
Machine does not come on; POWER lamp off	No supply or one line missing. Mains fuse blown or isolator faulty. ON-OFF switch faulty.	Check the supply on both lines. Replace the fuse; check the isolator contacts. Replace the switch.
No welding output; fan runs	Loose or broken welding cable. Work clamp not connected. Loose output terminal.	Check and repair the cables. Connect the clamp to clean metal. Tighten the terminals.
Fan does not run; welding output OK	Fan motor or its connection faulty.	Check the fan leads; if the fan turns freely, replace the fan motor.
Welding current varies (erratic)	Loose mains or welding connections. Damp or poor-quality electrodes. Supply voltage fluctuating.	Tighten all connections. Use dry electrodes. Check the supply.
Weak, sluggish arc	Current set too low. Low supply voltage. Welding cables too long or too thin. Loose connection.	Increase the current. Check the supply voltage. Use shorter or larger cables. Tighten the connections.
Current cannot be adjusted or handle is stiff	Lead screw or shunt dry or dirty. Anti-noise screws overtightened. Shunt mechanism damaged.	Clean and grease (8.3). Readjust (8.4). Contact Cruxweld service.
Excessive spatter; unstable arc	Current too high; arc too long. Damp electrodes.	Reduce the current; shorter arc. Use dry electrodes.
Machine overheats	Duty cycle exceeded. Air openings blocked or dust inside. Fan not running.	Allow the machine to cool; reduce the welding time. Clean the louvres and the inside. Repair the fan.
Loud humming or rattling	Shunt vibrating. Loose panels or parts.	Adjust the anti-noise screws (8.4). Tighten the panels.
Mains fuse blows	Short circuit in the input cable or the primary winding. Fuse rating too low.	Check the cable and connections; have the transformer checked. Use the recommended fuse rating.

If a fault cannot be corrected, contact Cruxweld service.

10 Warranty

Cruxweld warrants the CWA-ARC452 against defects in material and workmanship for the period stated in the sales contract, from the date of invoice. The warranty does not cover welding cables, electrode holder, work clamp and other accessories, or damage caused by incorrect supply voltage, missing earth, overload, blocked ventilation, moisture, lack of maintenance, misuse or repair by unauthorised persons.

Model	CWA-ARC452
Serial number	
Invoice no. / date	
Customer	
Dealer stamp	

For service and spare parts please contact:

Cruxweld Industrial Equipments Pvt. Ltd.

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When ordering spare parts, always state the model and serial number from the rating plate.



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