CRUXWELD®

INDUSTRIAL EQUIPMENTS PVT. LTD.

TriPhase 400iS

Inverter Arc Welding Machine

400 A MMA (stick) | single, two or three phase | 230 V / 415 V | Arc Force, VRD



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 TriPhase 400iS inverter arc welding machine. Read it carefully before 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

Arc welding can cause injury or death to the operator and to people nearby if the machine is not used correctly. Read the following rules before operating the machine and keep these instructions.

1.1 Work area

- Keep the work area clean and well lit.
- Do not weld in explosive atmospheres or near flammable liquids, gases or dust: sparks can ignite them.
- Keep children, bystanders and untrained persons away from the machine and the work area.

1.2 Electric shock – it can kill

▲ DANGER

Do not use the machine in wet areas. Make sure the machine is connected to a properly earthed supply, and that the workpiece and the earth clamp are well connected. Replace damaged or worn cables at once. Keep clothes, gloves, the work area, cables, the electrode holder and the machine dry. Keep your body insulated from the workpiece and the ground; in confined or damp places stand on a dry wooden board or an insulating mat. Wear dry, intact welding gloves before switching on, and switch off before taking them off.

1.3 Arc rays and spatter

- Always wear a welding helmet or face shield with the correct filter, and safety goggles in the work area.
- Wear flame-resistant clothing, gloves, safety shoes and a cap to protect your skin from arc rays, sparks and spatter; keep collars and cuffs buttoned.
- Use non-flammable screens or curtains to protect other people from the arc. Wear goggles when chipping slag.
- Wear hearing protection where the noise level is high.

1.4 Fire and explosion

- Remove flammable materials (wood, cloth, fuel, gas) from the welding area and keep a fire extinguisher nearby.
- Never weld on closed containers or on containers that have held flammable material.
- Do not overload the machine. Check the area for smouldering material after welding.

1.5 Fumes and gases

Do not breathe welding fumes and gases. Provide natural or mechanical ventilation. Take special care, with extraction, when welding coated, galvanized or stainless steel, copper, zinc, lead or other metals that give off toxic fumes. Do not weld near degreasing or spraying operations. Stop welding and improve the ventilation if your eyes, nose or throat become irritated.

1.6 Electromagnetic fields

Welding current creates electromagnetic fields. People with heart pacemakers must consult their doctor before welding. Keep the electrode cable and the earth cable together on one side of your body, never wrap them around yourself, connect the earth clamp as close to the weld as possible, and keep away from the machine and cables as far as practical.

1.7 Machine use and service

- Switch off and disconnect the machine from the mains before connecting cables, cleaning or servicing.
- Do not use the machine if the switch does not turn it on and off.
- Installation, maintenance and repair must be done by qualified persons only, using genuine spare parts. Do not modify the machine.

2 General description

The Cruxweld TriPhase 400iS is a 400 A IGBT inverter welding machine for MMA (stick) welding that runs on a single-phase 230 V supply and also on a 415 V two-phase or three-phase line. It gives the full 20 – 400 A on every supply, for electrodes from 1.6 mm up to 5 mm.

The high inverter frequency reduces the size and weight of the machine and the losses in copper and steel, so the welder is efficient and energy-saving. The switching frequency is above the audible range, so the machine runs quietly. The control system gives an easy arc strike, little spatter, a stable current and a good weld bead, with both basic and acid electrodes.



Fig. 2.1 TriPhase 400iS stick welding on a steel bench



Fig. 2.2 TriPhase 400iS on a workshop bench

2.1 Features

- Full 20 – 400 A on single phase 230 V, two phase 415 V or three phase 415 V, from the same input terminal.
- IGBT inverter with digital ammeter, Hot Start, adjustable Arc Force and anti-stick.
- Built-in VRD with ON / OFF switch on the front panel.
- Over-voltage, over-current and thermal protection for long shifts.
- Generator (DG set) compatible.

2.2 Applications

Fabrication shops (frames, gates, tanks and structures with 3.15, 4 and 5 mm electrodes), sites with only a two-phase or single-phase supply, construction and erection, maintenance teams, and rental and contract work.

3 Technical specifications

Parameter	TriPhase 400iS
General	
Model	TriPhase 400iS (ARC 400, 1/2/3 phase)
Welding process	MMA / stick, DC
Technology	IGBT inverter
Input	
Input voltage	230 V / 415 V ±15%
Phase	Single phase, two phase or three phase
Input frequency	50 / 60 Hz
Max. load capacity	14.2 kVA
Power factor	0.93
Efficiency	≥ 85%
Generator compatible	Yes
Output	
Welding current range	20 – 400 A (single, two and three phase)
Rated output current / voltage	400 A / 36.0 V
Duty cycle, 415 V	400 A at 60%; 310 A at 100%
Open-circuit voltage	75 V
Electrode diameter	1.6 – 5.0 mm
Controls and protection	
Display	Digital ammeter
Hot Start	Yes
Arc Force	Adjustable (1 – 10)
Built-in VRD	Yes, ON / OFF switch
Protection	Over-voltage, over-current, overheating
Build	
Cooling	Fan cooled
Protection class	IP23
Insulation class	H
Dimensions (L × W × H)	633 × 368 × 578 mm
Weight	25 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 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. For example, 60% at the rated current means 6 minutes of welding followed by 4 minutes of rest. If the duty cycle is exceeded, the O.C (protection) lamp lights and the output stops until the machine has cooled down.

3.2 Symbols on the rating plate

Symbol	Meaning
U_0	Open-circuit (no-load) voltage, V
X	Rated duty cycle
I_2	Welding current, A
U_2	Welding voltage, V
U_1	Rated supply voltage
I_{1max}	Maximum supply current, A
I_{1eff}	Effective supply current, A
IP2xS	Degree of protection of the enclosure
S	Suitable for use where there is an increased risk of electric shock
1~ / 3~ 50/60 Hz	Supply phases and frequency

3.3 Scope of supply

No.	Item
1	TriPhase 400iS inverter welding machine (1 unit)
2	Welding cable with electrode holder (1)
3	Grounding cable with earth clamp (1)
4	User manual

> **Note:** The exact scope, including cable lengths, is confirmed on the quotation. Longer leads, helmets and spare parts are available from Cruxweld.

4 Machine overview

4.1 Control panel



Fig. 4.1 Control panel of the TriPhase 400iS

Items are numbered in the order they appear on the panel, as printed next to each lamp, knob and switch.

No.	Item	Function
1	Digital ammeter	Shows the welding current in amps. Set the current before you strike and read it while you weld.
2	230 V lamp	Lights when the machine runs on a 230 V single-phase supply.
3	Thermal lamp	Lights when the overheating protection pauses the output. Keep the machine switched on so the fan cools it; welding resumes by itself.
4	415 V lamp	Lights when the machine runs on a 415 V two-phase or three-phase supply.
5	Arc Force knob (1 – 10)	Sets how hard the arc digs: low for a soft arc on thin sheet, high for vertical, overhead and root runs. Helps stop the rod sticking.
6	Welding Current knob (1 – 10)	Sets the welding current from 20 A to 400 A. Read the exact amps on the display.
7	Generator-ready mark	The machine works on generator (DG set) power as well as the mains.
8	VRD ON / OFF switch	ON keeps the electrode holder at a low, safer voltage when you are not welding.
9	ARC 400 1/2/3 PHASE	Model marking: runs on single, two and three phase.

4.2 Front connections and rear panel



Fig. 4.2 Front with the welding sockets



Fig. 4.3 Rear panel

Front connections

Mark	Socket	Use
+	Positive output socket	For the electrode holder (standard connection, see Section 5.4).
−	Negative output socket	For the earth clamp (standard connection).

The sockets take twist-lock cable plugs: push the plug in and turn it clockwise until tight.

Rear panel

No.	Item	Function
1	Three-pole MCB	Switches the machine on and off and protects against overload.
2	U, V, W input terminal	One terminal for single, two and three phase, with the wiring printed above it.
3	Rating label	Model and electrical ratings of the machine.
4	Cooling fan	Keeps the inverter at a safe temperature.
5	Earth stud	Connect the machine body to earth before welding.

5 Installation

5.1 Unpacking

1. On receipt, check the machine for transport damage. Report any damage to the carrier and any missing parts to your dealer or to Cruxweld at once.
2. Take the accessories out of the box, remove all packing material, and check that nothing is left in the box.
3. Check that no packing material blocks the cooling air openings of the machine.

5.2 Location

- Place the machine on firm, level ground (tilt not more than 15°), in a well-ventilated place away from dust, dirt, moisture and corrosive vapour.
- Keep at least **0.5 m** between the machine and walls or other objects, and never cover the air inlet and outlet.
- Do not use the machine in rain or snow. See Section 7.4 for the permitted environment.

5.3 Power supply and earth

> **▲ DANGER**
> Only a qualified electrician may connect the machine to the mains. Switch off and isolate the supply before connecting.

The rear input terminal is marked **U, V** and **W**, with the wiring printed above it:

Supply	Connect to
Single phase 230 V, 50/60 Hz	U and V
Two phase 415 V, 50/60 Hz	U and V
Three phase 415 V, 50/60 Hz	U, V and W

The machine detects the supply automatically; the 230 V or 415 V lamp shows which supply it is on. The full 20 – 400 A is available on every supply. Have a qualified electrician make the connection and fit the correct plug or isolator for your line.

- Connect the earth stud of the machine to a proper earth.
- Check that the supply voltage stays within the permitted range; a supply above the permitted voltage can damage the machine.

5.4 Connecting the welding cables

> **▲ CAUTION**
> Make all cable connections only with the machine switched off and disconnected from the mains.

1. Insert the plug of the electrode holder cable into the **“+”** socket and turn it clockwise until tight.
2. Insert the plug of the earth clamp cable into the **“−”** socket and turn it clockwise until tight. Clamp the earth clamp to clean metal on the workpiece, close to the weld.
3. Check the polarity required by the electrode (see below) and swap the plugs if necessary.

Polarity. A DC welding machine can be connected in two ways:

Connection	Cable sockets	Typical use
DC reverse polarity (DCEP)	Electrode holder to +, workpiece (earth clamp) to −	Basic (low-hydrogen) electrodes
DC straight polarity (DCEN)	Electrode holder to −, workpiece (earth clamp) to +	Acid (rutile) electrodes, where recommended

Select the polarity according to the electrode manufacturer’s instructions. Wrong polarity gives an unstable arc, heavy spatter and electrode sticking; in that case, swap the two plugs.

> **Note:** Very long welding cables reduce the arc-starting performance because of the voltage drop. When longer cables are needed, use cables with a larger cross-section.

6 Operation

> **▲ WARNING**
> Wear a welding helmet, gloves and protective clothing whenever you weld.

6.1 Setting the machine

1. Switch on the three-pole MCB on the rear panel. The 230 V or 415 V lamp lights and the ammeter shows the set current.
2. Set the VRD switch: ON for everyday work, especially in damp, confined or crowded areas.
3. Turn the Welding Current knob until the ammeter shows the current for your electrode (Table 6.1).
4. Set the Arc Force knob: 1 – 3 soft (thin sheet, 1.6 – 2.5 mm rods), 4 – 6 normal (general fabrication, 3.15 – 4 mm rods), 7 – 10 digging (vertical and overhead, root runs, basic rods, long cables).
5. Strike the arc and weld.

6.2 Electrode and current

The TriPhase 400iS works with 1.6 to 5.0 mm electrodes. Typical currents for mild steel electrodes:

Electrode	Typical current	Use
1.6 mm	30 – 60 A	Thin sheet
2.5 mm	60 – 110 A	General
3.15 mm	90 – 150 A	General
4.0 mm	120 – 200 A	Thick plate
5.0 mm	160 – 280 A	Heavy plate

Table 6.1 Typical welding currents

Job	Electrode	Current	Arc Force	VRD
Thin sheet, light frames	1.6 – 2.5 mm	30 – 110 A	1 – 3	ON
General fabrication, gates, grills	3.15 mm	90 – 150 A	4 – 5	ON
Vertical and overhead joints	3.15 mm (basic)	90 – 140 A	6 – 8	ON
Thick plate, structures	4.0 mm	120 – 200 A	5 – 7	ON
Heavy plate, fast filling	5.0 mm	160 – 280 A	5 – 7	ON

Table 6.2 Starting settings by job

Typical values only. Follow the electrode manufacturer’s current range for your electrode, joint and welding position, and fine-tune on a test piece.

6.3 Welding

1. Clamp the earth clamp to the workpiece and fit an electrode in the holder.
2. Strike the arc by scratching or tapping the electrode on the workpiece, then hold a short, steady arc.
3. If the electrode sticks, the anti-stick function cuts the current so that it can be freed easily. Twist the electrode free; do not pull the holder hard.
4. At the end of the work, remove the electrode from the holder and switch off the machine.

▲ CAUTION

If you weld at a high current for a long time and exceed the duty cycle, the Thermal lamp lights and the machine stops welding. Leave it switched on so the fan cools it; it restarts by itself when the temperature is normal.

7 Protection functions and cautions

7.1 Functions

Function	Description
Automatic voltage identification	The machine identifies the supply (230 V or 415 V) and switches over automatically.
Hot Start	Raises the current for a moment at the strike, for a reliable start, especially at low current.
Arc Force	Adjusts the current from the arc voltage, so the arc stays alive when it gets short; useful in vertical and overhead welding.
Anti-stick	When the electrode sticks to the workpiece, the output is cut so that the electrode can be freed.
VRD	Keeps the voltage at the electrode holder low while no arc is burning, and restores full voltage when the electrode touches the work.
Thermal / over-current protection	When the power devices reach their temperature limit, the protection lamp lights and the output stops. When the temperature is normal, the lamp goes out and welding resumes automatically.
Fan cooling	The fan cools the machine. Keep at least 0.5 m clearance and do not cover the air inlet or outlet.

7.2 Overload

Do not weld beyond the duty cycle. If the machine stops because of overheating, do not switch it off; let the fan cool it down.

7.3 Over-voltage

Use the machine only within the supply voltage range on the rating plate. Over-voltage can damage the machine.

7.4 Working environment

Condition	Limit
Ambient temperature, welding	−10 °C to +40 °C
Ambient temperature, transport and storage	−25 °C to +55 °C
Relative humidity	< 50% at 40 °C; < 90% at 20 °C
Altitude	Up to 1000 m
Tilt of the machine	Not more than 15°
Air	No more dust, acid or corrosive gas than normal, apart from that produced by welding
Noise	Not more than 75 dB

8 Maintenance

> **▲ WARNING**
> Before any maintenance, switch off the main switch and disconnect the machine from the mains.

If the machine does not work normally, stop and find the cause. Maintenance and repair must be done by trained, qualified persons using recommended spare parts.

8.1 Cleaning

- Remove the cover and blow the dust and dirt out of the air passages and internal parts with clean, dry, low-pressure compressed air. Clean as often as the working conditions require – more often in dusty places.
- Keep the air passages clean so that the cooling air can circulate.
- Clean dirt and spatter from the electrode holder jaws.
- After cleaning, check that all screws and electrical connections are tight.

8.2 Cables

> **▲ WARNING**
> Check the insulation of all cables. Replace a frayed or damaged cable at once. A bare cable can touch earthed objects, and the arc can injure your eyes or start a fire; touching a live conductor can cause burns or death.

- Keep the machine dry and free of grease, and protect it from hot metal and sparks.
- Store the cables in a clean, dry place.
- Check that the plugs of the welding cables are tight in the sockets; loose plugs overheat.

9 Troubleshooting

▲ WARNING

Before repairing, switch off the main switch or breaker. Electrical repairs must be made by a qualified technician.

Fault	Possible cause	Remedy
No output, lamps off	No supply voltage at the input; main switch off	Check the supply, plug and main switch
No output, Thermal lamp on	Overload or overheating protection active	Leave the machine on until it has cooled, then continue; keep within the duty cycle
Machine does not work when switched on	Control wire broken; circuit board damaged	Have it checked by a qualified technician; replace the circuit board
Unstable arc, heavy spatter, electrode sticks	Wrong polarity; current too low; damp electrodes; poor earth connection	Swap the cable plugs; raise the current or Arc Force; use dry electrodes; clean and tighten the earth clamp
Arc difficult to strike	Very long or thin cables; VRD with poor contact; low supply voltage	Use shorter or thicker cables; clean the workpiece; check the supply
Plugs or cables get hot	Loose cable plugs; cable too thin	Tighten the plugs clockwise; use a cable of adequate size

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

10 Warranty

Cruxweld warrants the TriPhase 400iS 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 cables, electrode holder, earth clamp and other wearing parts, or damage caused by use not in line with this manual, incorrect supply voltage, overloading, dismantling or repair by unauthorised persons, falls, transport or other external causes.

Model	TriPhase 400iS
Serial number	
Invoice no. / date	
Customer	
Dealer stamp	

For service and spare parts please contact:

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