



INDUSTRIAL EQUIPMENTS PVT. LTD.

CPG-NM

Portable Gas Cutting Machine (PUG Cutting Machine)

Straight, bevel and circle cutting | Up to 110 mm | NM-type nozzle-mix cutter



INSTRUCTION MANUAL

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

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This manual contains the safety, installation, operation and maintenance instructions for the Cruxweld CPG-NM portable gas cutting 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 11.

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

As with every industrial process, gas cutting requires safety precautions to be adopted to avoid risk to personnel and property. Read this chapter carefully before using the machine.

1.1 Fumes

Fumes from gas cutting are not considered dangerous provided there is adequate ventilation. Always work in a well-ventilated area and use fume extraction when cutting coated, painted or galvanised plate.

1.2 Gases

- All fuel gases used for cutting (acetylene, LPG / propane, natural gas) must be treated as a potential **explosion hazard**. No naked flames may be near the cutter when purging hoses or making the first pressure and flow adjustments.
- Keep open flames away from gas storage areas, cylinders and hoses.
- Acetylene pipelines and cylinders must never be exposed to a temperature above **54 °C (130 °F)**.
- Oxygen itself does not burn, but in its presence combustible materials burn much more readily. Take great care to prevent oxygen enrichment of the atmosphere, especially in confined spaces.
- Oxygen in contact with oil, grease or other hydrocarbons can cause spontaneous ignition, resulting in fire or explosion.
- Never use oxygen to blow out hoses or clothing. New hoses must be purged before use with oil-free air, nitrogen or carbon dioxide.

1.3 Lighting and extinguishing the cutter

Use a friction lighter or a pilot flame to light the cutter. Do not use matches. Always light and extinguish in the correct sequence:

Step	Lighting (ON)	Extinguishing (OFF)
1	Fuel gas ON (red)	Cutting oxygen OFF (black)
2	Heating oxygen ON (blue)	Heating oxygen OFF (blue)
3	Cutting oxygen ON (black)	Fuel gas OFF (red)

Use only approved cutters and nozzles for the process.

1.4 Regulators and gauges

- Every gas source must be fitted with a regulator able to control the outlet pressure to the values given in the operating data (Chapter 7).
- Never use a regulator on a gas other than the one it is designed for.
- Release the regulator control pressure when shutting down, after the pressure in the hose has been released.
- Treat regulators and gauges as precision instruments. Do not subject them to sudden pressure surges by opening the cylinder valves quickly.
- Replace a regulator that “creeps” (passes gas when the adjusting screw is released, or builds up pressure on the low-pressure side when the cutter valve is shut).
- Replace a gauge that does not return to zero when the pressure is released – it cannot be relied on to read the correct pressure.
- Keep regulators, valves and pipework clean and free from oil and grease.

1.5 Protective clothing

- Wear cotton overalls and safety shoes to protect the body and feet from slag and falling cut pieces. Wear leather gloves at all times.
- Wear goggles with suitable filter lenses for gas cutting to protect the eyes and to see the flame clearly.

1.6 Electric shock

- Install and maintain the machine in accordance with the current electrical regulations. Connect it only to an earthed supply socket.
- Disconnect the machine from the electrical supply before any servicing or maintenance.
- Do not let the power cable touch hot plate, slag or the flame.

1.7 Leaks

- Do not ignore gas, air or water leaks.
- Gas leaks at valve glands, joints and hoses can be detected by applying soapy water, and remedied by tightening the gland nuts and joints.

▲ DANGER

Never test for leaks with a flame.

- Take particular care when changing nozzles: make gas-tight joints by making sure the seatings are clean.

1.8 Hoses

- Do not expose hoses to heat, slag, sparks, oil or grease.
- Replace faulty hoses, or repair them by cutting out the faulty section and inserting an approved coupling.
- **Do not use wire to secure hoses. Use approved hose clips only.**
- Where acetylene is used as the fuel gas, do not use copper tubing to connect the hose.
- Never kink or nip hoses to cut off the gas supply temporarily – close the valves.

1.9 Flashback

A flashback can be serious and may damage the hose and regulator; in severe cases the operator can be at risk. It is avoided by following the recommended operating procedures.

- If a flashback occurs, switch off the electrical supply and shut off the gas supply at the cylinders as quickly as possible.
- As soon as it is safe, inspect the equipment to find the cause. The most probable causes are loose connections, a faulty seating in the cutter, a dirty or faulty nozzle, incorrect pressure, or ignition before the fuel gas flow was properly established.
- Check all items from the nozzle to the gas sources: nozzle, cutter, hoses, regulators and pressure gauges.
- Purge the hoses before relighting, making sure there are no naked flames nearby. Set the pressures as required and relight the cutter.

Fitting flashback arrestors at the regulator outlets and non-return valves at the cutter inlets is strongly recommended.

2 General description

The Cruxweld CPG-NM is a lightweight, portable, motorised gas cutting machine (PUG cutting machine) for straight, bevel and circle cutting of steel plate. It is operated with oxygen and a fuel gas – acetylene or LPG – and produces clean, sharp and smooth cut edges.

The machine runs on a 1.8 m extruded aluminium track for straight cutting. The track can be extended with additional lengths, so straight cuts of any length, with a square or bevel edge, can be made. With the trammel (radius) bar attachment the machine cuts circles, and when guided by hand it can also follow shapes with gradual curves.

The machine is driven by a 220 / 240 V single-phase motor. A forward / off / reverse switch sets the direction of travel, and a speed control knob with a graduated dial sets the cutting speed. The heavy base gives stable cutting, and the wrap-round handle makes the machine easy to carry.

2.1 Salient features

- High-quality motorised flame cutting machine for straight lines, circles and bevels with clean, sharp and smooth edges.
- No backfire during cutting thanks to **nozzle-mix (NM) technology** – the gases mix only in the nozzle.
- Travels on a standard 1.8 m extruded aluminium track; extendable for longer cuts.
- Cutter can be swivelled for bevels up to 45° with rack and pinion; the bevel setting can be locked for accuracy during long cuts.
- Durable, smooth and precise horizontal and vertical adjustment of the cutter.
- Heat reflector with an air gap protects the motor and electrical parts from overheating.
- Single-lever ON/OFF of the cutting oxygen makes stopping and restarting a cut simple and saves gas.
- Lightweight, handy and robust, with a wrap-round handle for easy portability and protection.
- Possible to attach a plasma torch holder for plasma cutting applications.

2.2 Applications

Metal fabrication, preparation of weld edges (bevels), structural steel work, ship building, tank and pressure vessel manufacturing, and general plate cutting on the shop floor or on site.



Plasma torch holder (optional)



Clean, square cut edge

3 Technical specifications

Model	CPG-NM
Cutting capacity	Up to 110 mm
Straight cut	1800 mm, or longer by adding additional track lengths
Circle cutting	Ø 100 – 1200 mm
Bevel cutting	Up to 45°
Cutting speed	160 – 900 mm/min
Cutter	NM-type (nozzle mix)
Fuel gas	Acetylene or LPG, with oxygen
Speed control	Rotary resistance (speed control knob with graduated dial)
Direction of travel	Forward / off / reverse switch
Horizontal adjustment of cutter	80 mm
Vertical adjustment of cutter	60 mm
Power supply	220 / 240 V, single phase
Frequency	50 / 60 Hz
Motor fuse	500 mA
Track	Extruded aluminium, 1.8 m
Dimensions	410 x 260 x 450 mm
Weight	10.5 kg

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

4 Machine overview

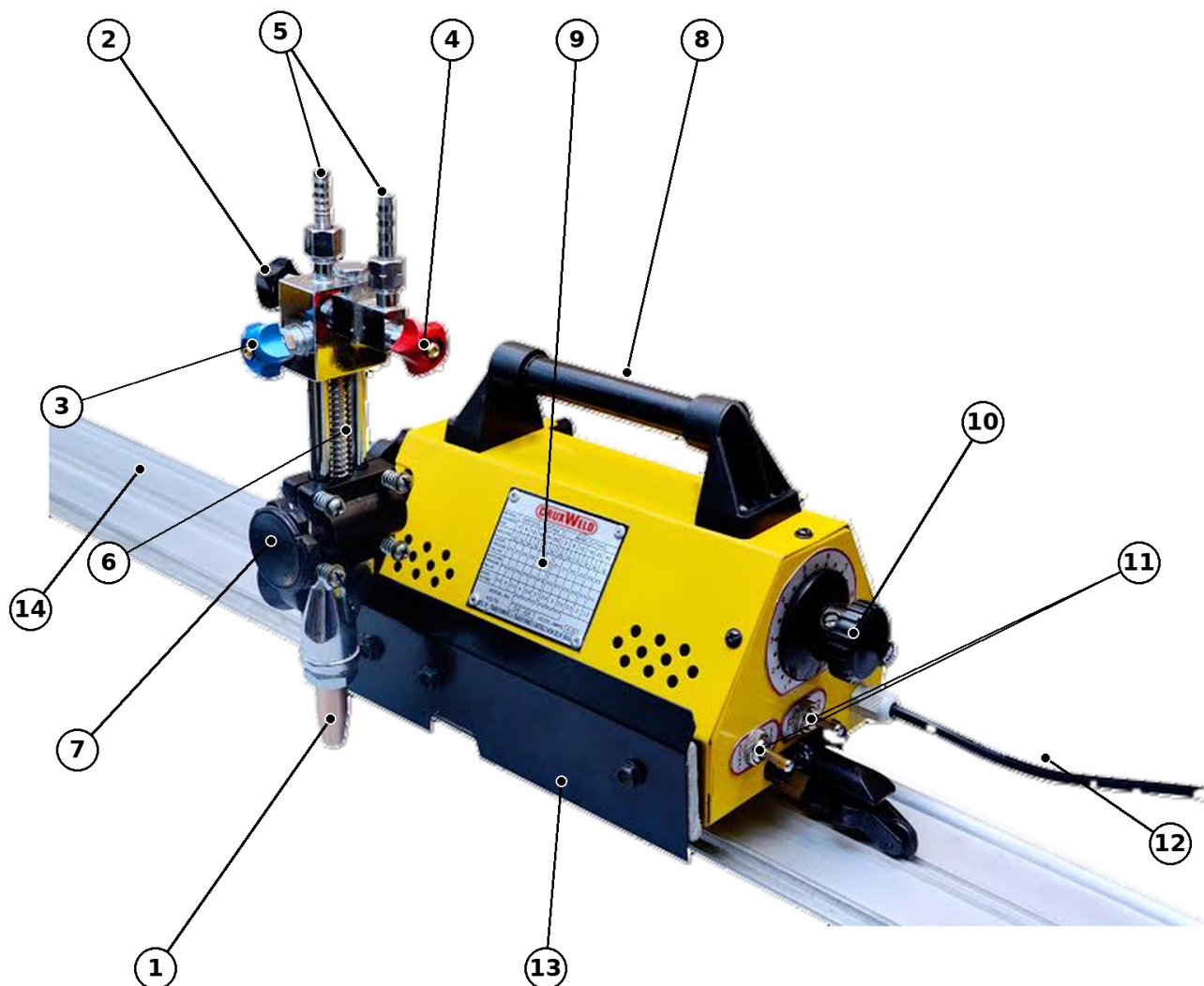


Fig. 4.1 Main parts of the CPG-NM

1	Cutting nozzle	8	Carrying handle
2	Cutting oxygen valve (black)	9	Rating plate
3	Heating oxygen valve (blue)	10	Speed control knob with graduated dial
4	Fuel gas (acetylene / LPG) valve (red)	11	Control switches (forward / off / reverse)
5	Hose connections (oxygen and fuel gas)	12	Power cable
6	Cutter column (rack) - vertical adjustment	13	Heat shield (heat reflector)
7	Cutter holder with adjustment hand wheel	14	Track (aluminium rail)

5 Installation

5.1 Electrical connection

1. Place the machine on a piece of steel plate (or on its track).
2. Make sure the forward / off / reverse switch is in the **OFF** position.
3. Connect the 3-pin plug of the machine to a **220 / 240 V, single-phase, 50 / 60 Hz** earthed supply socket. An isolator should be installed in the supply line.
4. Switch the isolator ON. Check the running of the machine by operating the forward / off / reverse switch and turning the speed control knob.

▲ ATTENTION

Do not push the machine by hand unless the front left-hand driving wheel is lifted off the surface. Pushing the machine with the drive wheel on the surface can damage the gearbox.

5.2 Gas connection

1. Fit oxygen and fuel gas regulators (with flashback arrestors) to the cylinders or the gas supply line.
2. Connect the oxygen and fuel gas hoses to the hose connections on the cutter. Connect the other ends of the hoses to the oxygen and fuel gas supply through the regulators. Secure all hoses with approved hose clips.
3. Check all connections for leaks with soapy water.

5.3 Fitting the nozzle

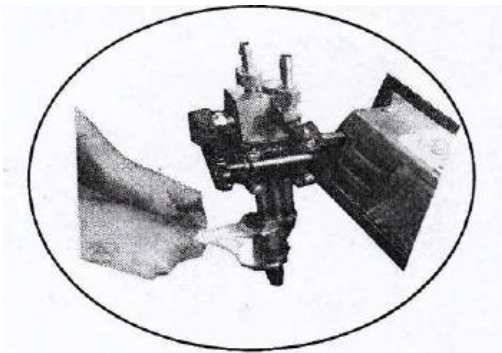


Fig. 5.1 Tightening the nozzle nut with two spanners

▲ WARNING

1. Do not use oil or grease on the oxygen connections.
2. Always use **two spanners** when tightening or loosening the nozzle nut – one to hold the cutter and one to turn the nut.

This prevents damage or distortion of the cutter assembly. The nozzle seats and the mating seating in the cutter are made to a high degree of surface finish and close tolerances. Clean them properly before assembly, otherwise gas leaks and backfire may occur during work.

Select the nozzle size according to the plate thickness from the operating data in Chapter 7.

6 Operation

6.1 Before starting the cutting operation

Follow these steps before every cutting operation:

1. Make sure the three gas valves on the cutter are **closed**.
2. Open the oxygen and fuel gas cylinder valves slowly, making sure that the pressure-adjusting screws of the oxygen and fuel gas regulators are released.
3. Open the **fuel gas valve (red)** on the cutter and set the required fuel gas pressure on the regulator.
4. Open the **heating oxygen valve (blue)** and the **cutting oxygen valve (black)** and set the oxygen pressure on the regulator as given in the operating data (Chapter 7).
5. Close all the valves on the cutter.
6. Open the **fuel gas valve (red)** on the cutter and light the gas at the nozzle with a friction lighter.
7. Open the **heating oxygen valve (blue)** and adjust both valves until a correct, neutral heating flame is obtained.
8. Open the **cutting oxygen valve (black)** and check that the stream of cutting oxygen passes from the centre of the nozzle through the heating flame. Then close the cutting oxygen valve again.
9. Set the cutter in the vertical position, or at the angle required for the bevel, using the graduated scale on the cutter.
10. Set the speed control knob for the travel speed (see the operating data in Chapter 7).
11. The machine is now ready for cutting.

6.2 Shutting down

1. Close the cutting oxygen valve (black) and switch the drive motor OFF.
2. Close the heating oxygen valve (blue), then the fuel gas valve (red).
3. Close the cylinder valves, release the pressure in the hoses by briefly opening the cutter valves, then release the regulator adjusting screws.
4. Disconnect the machine from the electrical supply.

6.3 Cutter valves at a glance

Valve	Colour	Function
Fuel gas valve	Red	Controls the fuel gas (acetylene or LPG) to the heating flame. Opened first, closed last.
Heating oxygen valve	Blue	Controls the oxygen for the heating (pre-heat) flame. Adjust with the fuel gas valve for a neutral flame.
Cutting oxygen valve	Black	Single-lever ON/OFF for the cutting oxygen jet which cuts the pre-heated metal.

Neutral flame: the inner cones of the heating flame are sharp, bright and clearly defined, without a feathery fuel-gas haze. Too much oxygen makes the cones short and hissing; too much fuel gas makes them long and feathery.

6.4 Straight-line cutting with the track

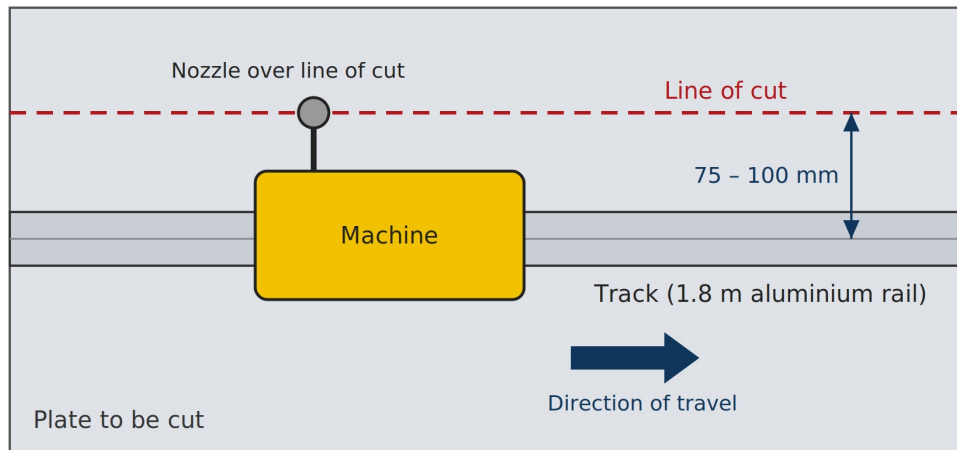


Fig. 6.1 Straight-line cutting - track set parallel to the line of cut

1. Place the track on the plate to be cut, **75 - 100 mm away from and parallel to the line of cut.**
2. Lock the castor wheel assembly with its lock screw and place the machine on the track, making sure that all three wheels are located in their track guides.
3. Adjust the nozzle height with the vertical adjustment hand wheel, and its position over the line of cut with the horizontal adjustment hand wheel.
4. Position the machine so that the cutting oxygen orifice of the nozzle is just clear of the plate edge. Light the heating flame and pre-heat the plate edge.
5. When the edge is bright red, open the cutting oxygen valve fully and at the same time switch on the drive motor.

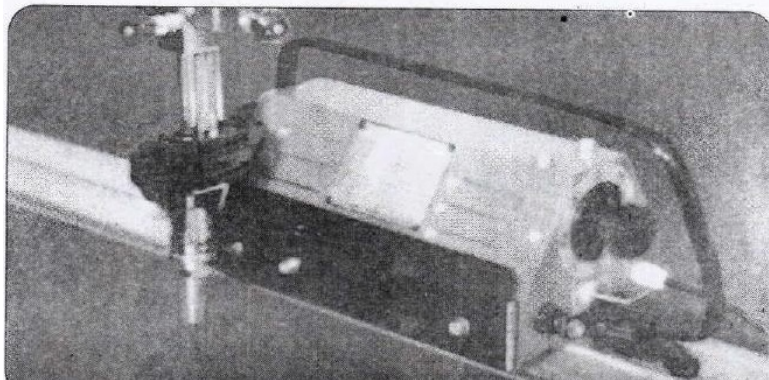


Fig. 6.2 Machine on the track for straight-line cutting

6.5 Bevel cutting

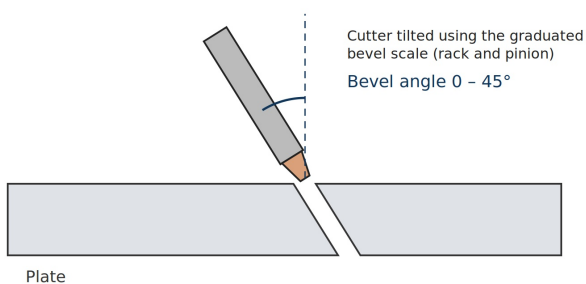


Fig. 6.3 Bevel cutting

1. Loosen the bevel lock and swivel the cutter to the required angle (0 - 45°) using the graduated scale.
2. Lock the bevel setting firmly so that the angle does not change during long cuts.
3. Readjust the nozzle position so that the cut starts on the marked line.
4. Use the bevel cutting data in Chapter 7.

6.6 Circle cutting

The trammel (radius) bar is assembled on the machine base:

- For circles of **510 - 1140 mm diameter**, fit the trammel bar on the side of the machine opposite the cutter.
- For circles of **75 - 600 mm diameter**, fit the trammel bar on the cutter side of the machine, using the same fixing holes.
- **Unlock the castor wheel** so that it is free to swivel.
- Assemble the trammel block on the trammel bar with its hardened steel centre in line with the axle.

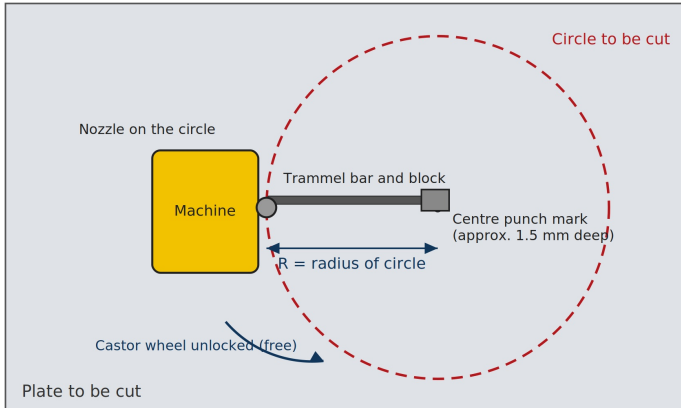


Fig. 6.4 Circle cutting with the trammel bar

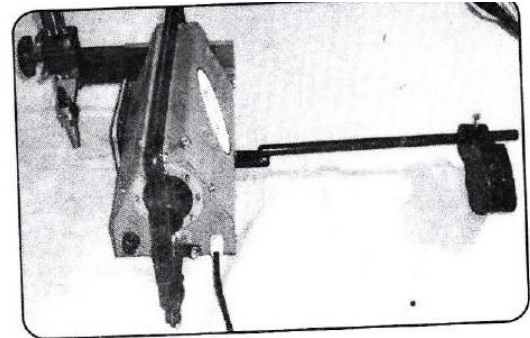


Fig. 6.5 Trammel bar fitted to the machine

1. Mark out the circle to be cut, allowing for the kerf, and make a centre punch mark about 1.5 mm deep at its centre.
2. Set the distance between the cutting nozzle and the steel centre of the trammel block to the radius of the circle.
3. Place the machine on the plate with the trammel centre in the centre punch mark, and make the final adjustment of nozzle height and position with the hand wheels.

Note: When cutting circles, loop or support the gas hoses and the motor cable properly so that they do not foul or drag.

6.7 Starting a circle cut (piercing)

Use one of the following methods to start the cut:

1. **Drilled hole:** drill a hole of 12.5 mm diameter or more in the scrap part of the plate, so that a point on its circumference coincides with the circle to be cut. Use the edge of this hole as the starting point for pre-heating and cutting.
2. **Piercing on the line:** position the nozzle over the line of cut, pre-heat the plate and open the cutting oxygen valve. When the oxygen jet has pierced the plate, switch on the drive motor. A small scar will remain on the cut edge where piercing took place.
3. **Piercing in the scrap:** with the hand wheel, move the cutter about 12.5 mm away from the line of cut into the scrap part of the plate. Pierce the plate as described in method 2, then move the cutter back to the line of cut with the hand wheel, at about the same speed as circle cutting. When the circle is reached, switch on the drive motor and let the machine take over.

6.8 Free-hand cutting

For simple curves the machine can be steered by hand round the outline of the shape to be cut.

- The castor wheel must be free to swivel, and all three wheels must be in contact with the plate.
- To start cutting from a plate edge, hold the machine by its handle with the front wheels just resting on the plate.
- When the cut has progressed a sufficient distance, steer the machine along the outline of the shape.
- Steer the machine – do not push it.

6.9 Tips for a good cut

Observation	Cause and correction
Top edge melted and rounded	Speed too low or nozzle too close to the plate – increase speed, raise nozzle.
Heavy slag on the bottom edge	Speed too high or oxygen pressure too low – reduce speed, check pressure.
Cut lines strongly curved (drag lines)	Speed too high – reduce speed.
Cut face not square	Cutter not vertical – check the bevel scale at 0°.
Irregular, gouged cut face	Dirty or damaged nozzle, or uneven travel – clean or replace the nozzle; clean the track.

7 Operating data

The table gives guide settings for oxy-acetylene cutting of mild steel.

7.1 Vertical (square) cutting

Plate thickness (mm)	3	6	12	18	25	50
Nozzle size (inch)	1/32	1/32	3/64	3/64	1/16	1/16
Oxygen pressure (kg/cm ²)	2.1	2.1	2.5	2.5	2.8	3.5
Acetylene pressure (kg/cm ²)	0.15	0.15	0.15	0.15	0.15	0.15
Speed setting	5 – 6	5	4 – 5	4	3 – 4	2

7.2 Bevel cutting

Plate thickness (mm)	3	6	12	18	25	50
Nozzle size (inch)	3/64	3/64	1/16	1/16	1/16	1/16
Oxygen pressure (kg/cm ²)	2.1	2.1	2.5	2.5	2.8	3.5
Acetylene pressure (kg/cm ²)	0.15	0.15	0.15	0.15	0.15	0.15
Speed setting	3 – 4	3	2 – 3	2 – 3	2	1 – 2

7.3 Notes

1. The cutting data is given as a guide only and may vary to suit the nature of the work.
2. For bevels of less than 30°, slightly increase the cutting speed or reduce the oxygen pressure.
3. For bevels of more than 30°, reduce the cutting speed slightly.
4. A minimum acetylene pressure of **0.15 kg/cm²** is required to operate the cutter.
5. The speed setting refers to the graduated dial of the speed control knob. Always confirm the setting with a trial cut.

8 Inspection and maintenance

▲ DANGER

Before any maintenance, close the gas supply and disconnect the machine from the electrical supply.

8.1 Daily maintenance

- Wipe over the machine to remove oxide dust.
- Lightly oil the flanged bushes of the wheels and the castor wheel pin.
- Examine the hoses and the power cable for damage.
- Keep the track clean and free of slag and spatter.
- Check the nozzle; clean it with a proper nozzle cleaner if necessary.

8.2 Monthly maintenance

1. Unscrew the 3 hexagon head screws and remove the heat shield.
2. Unscrew the 8 self-tapping screws and remove the cover.
3. Blow through the motor ventilation holes at the gearbox end of the motor with compressed air at 0.7 kg/cm².
4. Reassemble the machine.

▲ WARNING

Never use oxygen to blow out the machine – use compressed air only.

8.3 Six-monthly maintenance

1. Remove and examine the motor brushes for wear. Make sure they are refitted in their original position. Renew them when only 6 mm of brush remains.
2. Unscrew the 3 screws holding the gearbox to the motor casing, remove the gearbox and repack it with light grease.

Note: It may be necessary to tap the gearbox lightly with a mallet to free it.

9 Troubleshooting

Problem	Possible cause	Remedy
Machine does not move	No supply; plug or cable faulty. Fuse (500 mA) blown. Switch in OFF position. Motor brushes worn.	Check the supply, plug and cable. Replace the fuse. Set the switch to forward or reverse. Replace the brushes.
Motor runs but machine does not travel	Drive wheel lifted or slipping. Gearbox fault.	Check that all wheels rest on the track; clean the track. Have the gearbox checked.
Speed is uneven or cannot be adjusted	Speed control potentiometer faulty. Dirty track or wheels. Hoses or cable dragging.	Replace the potentiometer. Clean the track and wheels. Support the hoses and cable.
Backfire or popping at the nozzle	Nozzle dirty, damaged or loose. Dirty seating in the cutter. Gas pressure too low. Nozzle too close to the plate.	Clean or replace the nozzle; tighten with two spanners. Clean the seating. Set pressures as in Chapter 7. Raise the nozzle.
Flame will not light or goes out	Fuel gas pressure too low; cylinder empty. Heating oxygen too high.	Check the regulator and cylinder. Reduce heating oxygen.
Cut does not go through the plate	Nozzle too small; oxygen pressure too low. Speed too high. Plate not pre-heated.	Select nozzle and pressure as in Chapter 7. Reduce the speed. Pre-heat until the edge is bright red.
Gas smell or leak	Loose joint, gland or hose.	Close the gas; find the leak with soapy water; tighten or replace.
Flashback	See section 1.9.	Switch off, close gases, inspect before relighting.

If a fault cannot be corrected, contact Cruxweld service.

10 Motor circuit diagram

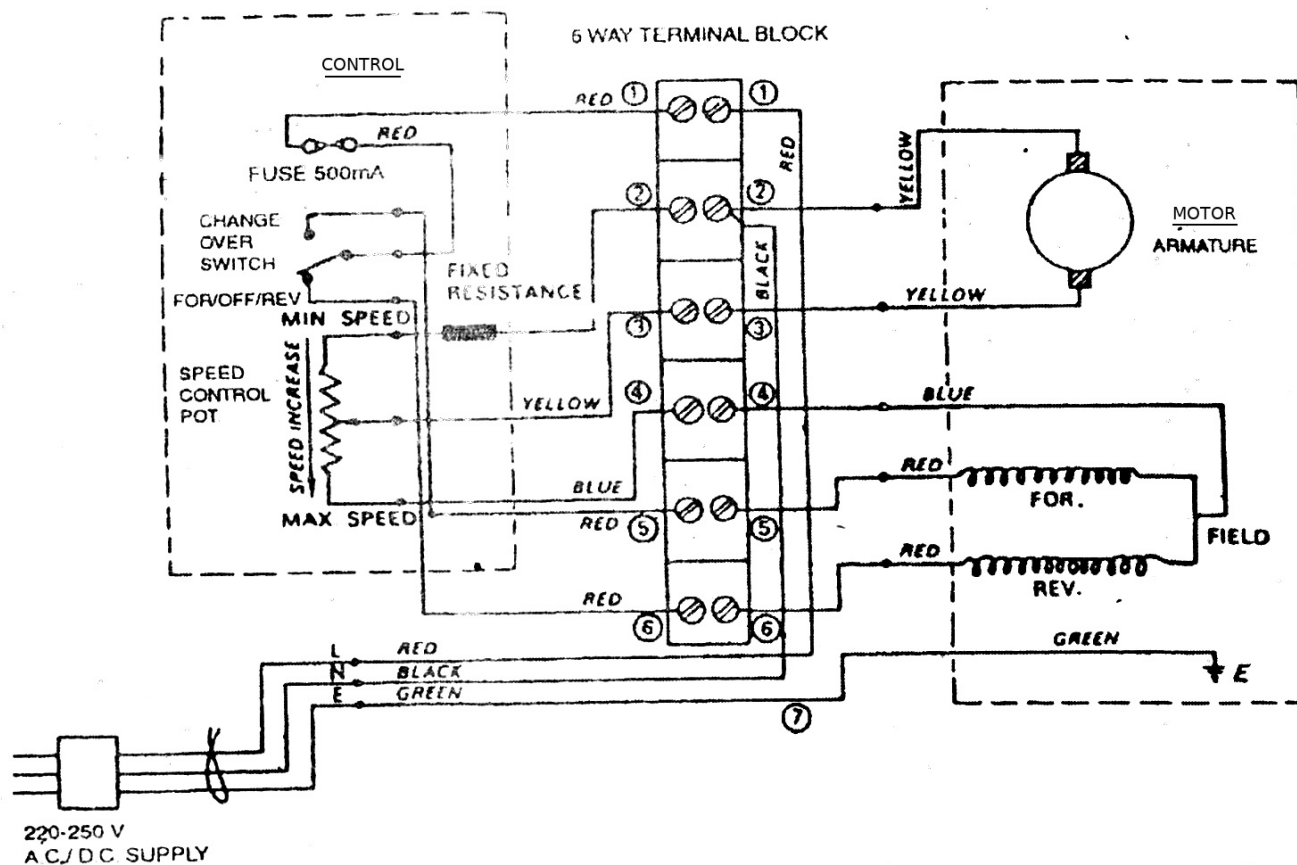


Fig. 10.1 Motor circuit diagram (schematic wiring diagram)

Item	Description
Supply	220 - 250 V single-phase: L - red, N - black, E (earth) - green (7)
Fuse	500 mA, in the line (red) supply to the control
Change-over switch	FOR / OFF / REV - selects forward or reverse travel
Speed control pot.	Sets the travel speed between MIN SPEED and MAX SPEED; fixed resistance in series
6-way terminal block	Terminals 1 - 6 connect the control to the motor
Motor armature	Yellow leads (terminals 2 and 3)
Motor field	Split field winding: FOR (red), REV (red), common (blue)

▲ DANGER

Only qualified personnel may open the machine and work on the electrical circuit, after disconnecting it from the supply.

11 Warranty

Cruxweld warrants the CPG-NM 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 (nozzles, hoses, motor brushes, fuses) or damage caused by incorrect supply voltage, flashback, misuse, dropping, lack of maintenance or repair by unauthorised persons.

Model	CPG-NM
Serial number	
Invoice no. / date	
Customer	
Dealer stamp	

For service, spare parts, nozzles and accessories please contact:

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