

Semi-Automatic Circle Cutting Machine

CIRCO 600 ▪ CIRCO 1000

Oxy-fuel circular and flange gas cutting machine

Operating Manual



Please read this manual carefully so that the machine is used correctly. To ensure safety, the configuration, maintenance, inspection and repair of the circle cutting machine must be carried out by a qualified person, or by a person with a very good understanding of electrical equipment. Be sure to understand the contents of this manual fully before using the machine. Keep this manual in a place where everyone concerned can see it at any time, and read it again whenever necessary.

Preface

Thank you for purchasing this Cruxweld cutting product. We will accompany your use of this product with sincere service.

In order to support our service, we recommend that you read this manual carefully before using the machine. It gives detailed information on the application, construction, technical parameters and method of use of the machine, for your reference during actual work. Keep this manual at hand so that you can refer to it at any time.

The pictures, text and data in this material are for reference only. As the product is continuously improved, the actual product may differ. The specific data is subject to the actual product supplied.

If you have any doubts or corrections regarding the contents of this manual, or regarding this product, please contact our service team. Our customer service staff will provide you with professional support and will sincerely accept your comments and corrections. Feel free to contact us at any time.

Cruxweld Industrial Equipments Pvt. Ltd.

5, Sector 29, Faridabad – 121008 (Haryana), India

Phone: +91 8800 882 983 | +91 (129) 489 2868

Email: sales@cruxweld.com | Service: support@cruxweld.com | www.cruxweld.com

Before Use, Please Read

To ensure safe operation, be sure to comply with the following matters.



Warning! Be careful to avoid major personal accidents

- **Clothing and safety gear**

To prevent eye injury and skin burns from the cutting flame and hot slag, follow the labour safety and hygiene rules and wear the corresponding protective gear — cutting goggles or a face shield, leather gloves, an apron and safety shoes.

- **Gas safety**

Oxygen and fuel gas cylinders must be upright and secured. A **flashback arrestor must be fitted in both the oxygen and the fuel-gas line**. Check all hoses and connections for leaks with soapy water before lighting the torch. Never use oil or grease on oxygen fittings.

- **Precautions for ventilation**

To prevent poisoning and suffocation from harmful gases and fumes, work in a well-ventilated area, install local exhaust devices or use effective respiratory protective equipment.

- **Electrical safety**

The machine must be earthed. Switch off and disconnect the supply before opening the control box or carrying out any maintenance.



Attention! Prevent machine damage and fire-related accidents

- **Prevent fire caused by sparks and hot slag**

Keep flammable items at least 50 cm away and do not let sparks or molten slag fall onto flammable material.

- **Prevent damage caused by the machine falling**

Set the machine squarely on the plate and tighten the foot screws so that it cannot slip or topple, especially when cutting on a vertical or inclined plate.

- **The operating manual must be read**

Read this manual carefully before using the machine.

Contents

1. Application	5
2. Technical performance and characteristics	5
3. Outline drawing and parts list	6
4. Main technical parameters	7
5. Main structural description	8
6. Electrical wiring diagram	9
7. Cutting nozzle selection	10
8. Operating instructions	11
9. Cutting on vertical and inclined plate	12
10. Maintenance	13
11. Faults and countermeasures	14

1. Application

The Cruxweld **CIRCO** series of semi-automatic circle cutting machines comprises two models, **CIRCO 600** and **CIRCO 1000**. They are used in the petroleum, chemical, shipbuilding, power-generation and general machinery-manufacturing industries to cut holes, discs, flanges and similar circular workpieces, using oxygen with acetylene, or oxygen with liquefied petroleum gas or other fuel gases.

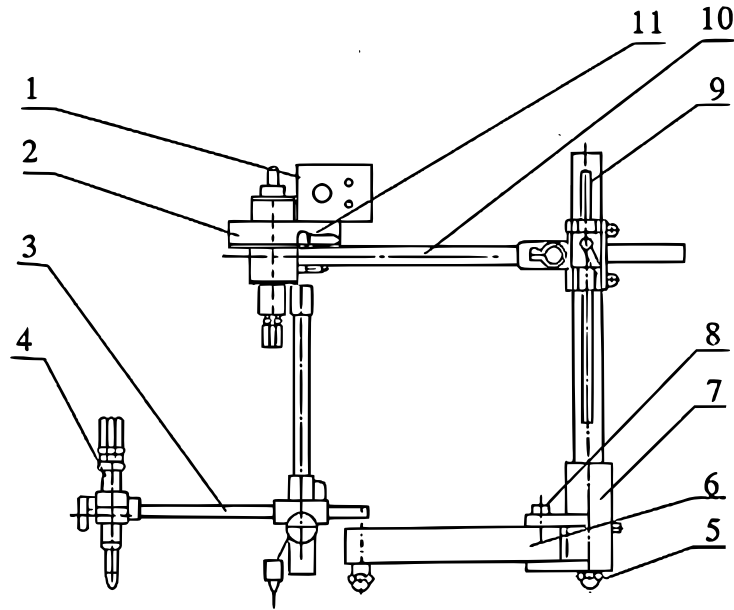
2. Technical Performance and Characteristics

The machine stands on the plate to be cut on **three support points**. The motor drives the radius rod through a gearbox, and the radius rod in turn rotates the cutting torch around the centre point, so that a true circle is cut. The length of the radius rod is adjustable, which sets the diameter of the circle.

The machine can also be set up for cutting on vertical plate and on inclined plate or angle steel, and it can cut concentric circles. Using the machine improves cutting efficiency, guarantees a consistent cut quality and reduces the labour intensity of the operator.

- Three-point support — quick, stable set-up directly on the workpiece.
- Stepless speed control by potentiometer, with forward / stop / reverse switching.
- The torch can be rotated clockwise or anticlockwise. An **infinitely rotating gas distributor** is used, so the hoses never become wound up.
- The torch can be raised and lowered on a rack and pinion, and swivelled for bevel cutting.
- Isobaric (equal-pressure) cutting torch with interchangeable nozzles for acetylene or LPG.
- Cutting accuracy better than 0.5 mm per revolution.
- Robust body of high-quality cast iron and aluminium castings with seamless tube.

3. Outline Drawing and Parts List



No.	Part	No.	Part	No.	Part
1	Control box	5	Foot screws	9	Column
2	Gearbox	6	Foot	10	Cross bar
3	Radius rod	7	Base	11	Clutch lever
4	Cutting torch	8	Tightening screw		

4. Main Technical Parameters

Item	CIRCO 600	CIRCO 1000
Cutting diameter	30 – 600 mm	30 – 1000 mm
Cutting plate thickness	5 – 100 mm	5 – 100 mm
Cutting (rotation) speed	0.2 – 6.2 r.p.m.	0.2 – 6.2 r.p.m.
Cutting accuracy	< 0.5 mm per revolution — roundness deviation of the cut circle less than 0.5 mm	
Body dimensions (L × W × H)	750 × 300 × 700 mm	Extended cross bar and radius rod *
Body weight	38 kg	Extended cross bar and radius rod *
Drive motor	Permanent-magnet DC servo motor, 4200 r.p.m., 24 W, 110 V DC	
Control box supply	AC 220 V ±10 %, 50 Hz	
Fuel gas	Acetylene, or liquefied petroleum gas with the corresponding nozzle	
Oxygen pressure	0.20 – 0.50 MPa depending on the nozzle and plate thickness	

* The CIRCO 1000 is of the same construction as the CIRCO 600 but is supplied with a longer cross bar and radius rod for the larger cutting diameter; its overall length and weight are correspondingly greater. Please refer to the packing list supplied with the machine for the exact shipping dimensions and weight.

The specifications and technical content of this product are subject to change without notice. The specific data is subject to the actual product supplied.

5. Main Structural Description

5.1 Transmission mechanism

The drive consists of a permanent-magnet DC servo motor, a worm-and-worm-wheel reduction pair and three sets of reduction gear components. The output turns the radius rod, which carries the cutting torch around the centre.

5.2 Machine body

The whole body is made of high-quality cast iron and aluminium castings together with seamless tube, giving a rigid structure with low vibration.

5.3 Cutting torch and nozzle

An isobaric (equal-pressure) cutting torch with an interchangeable cutting nozzle is used. The torch can be moved up and down by a rack and pinion to set the nozzle-to-plate distance, and it can be swivelled to the required angle for bevel cutting.

5.4 Electrical control system

The electrical control system consists of two parts: the control box and the motor. The following are mounted on the face of the control box:

- **Speed potentiometer knob** — sets the rotation speed of the radius rod steplessly.
- **Forward / stop / reverse switch** — selects clockwise or anticlockwise rotation, or stops the drive.
- **Power indicator lamp.**

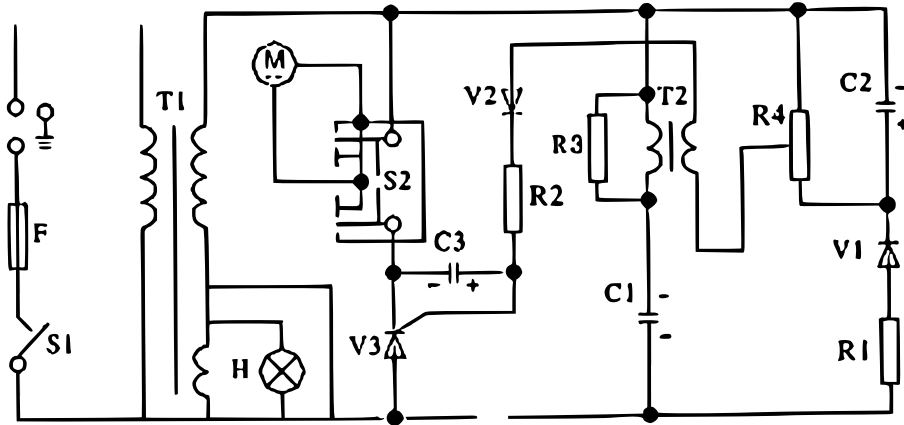
Inside the control box are the power transformer and the control circuit board. The circuit rectifies and chops the transformer output to give a smoothly variable DC voltage to the motor.



Attention

Only a qualified electrician may open the control box. Disconnect the mains plug first and wait until the capacitors have discharged.

6. Electrical Wiring Diagram



Control circuit of the CIRCO 600 / CIRCO 1000

Symbol	Component	Symbol	Component
S1	Mains switch	V1, V2, V3	Semiconductor rectifier / thyristor
F	Fuse	C1, C2, C3	Capacitors
T1	Power transformer	R1, R2, R3, R4	Resistors (R4 – speed potentiometer)
T2	Pulse transformer	H	Power indicator lamp
S2	Forward / stop / reverse switch	M	DC servo motor

7. Cutting Nozzle Selection

Select the cutting nozzle according to the thickness of the plate, and set the oxygen and fuel-gas pressures and the cutting speed from the table below.

Nozzle No.	Cutting thickness (mm)	Oxygen pressure (MPa)	Acetylene pressure (MPa)	Cutting speed (mm/min)
00	5 - 10	0.20 - 0.30	> 0.03	600 - 450
0	10 - 20			480 - 380
1	20 - 30			400 - 320
2	30 - 50	0.25 - 0.35		350 - 280
3	50 - 70	0.30 - 0.40	> 0.04	300 - 240
4	70 - 90			260
5	90 - 120	0.40 - 0.50		200 - 170

Note: The machine is supplied with acetylene cutting nozzles No. 1, No. 2 and No. 3 as standard. The remaining nozzle sizes are purchased separately. Nozzles for liquefied petroleum gas are available where LPG is used instead of acetylene, and high-speed (divergent-bore) nozzles are available for faster cutting on thicker plate.

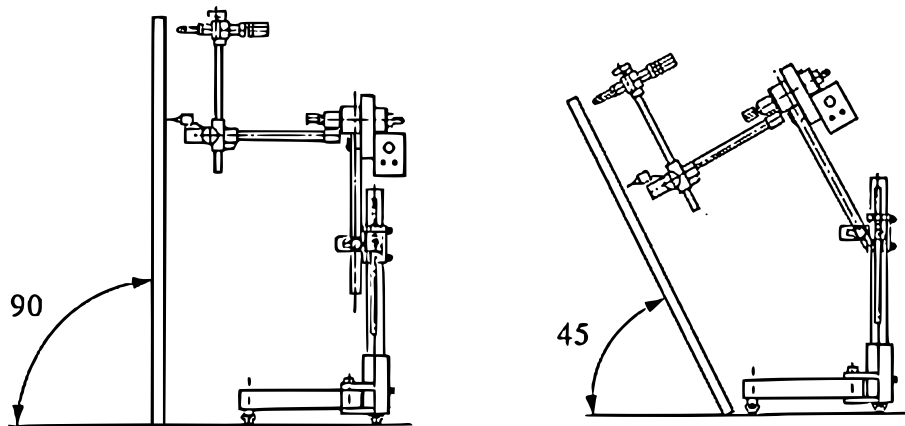
Guidance
Always start at the lower speed of the range for the nozzle in use and increase it until the slag is blown cleanly out of the bottom of the cut. If the cut face shows heavy drag lines, the speed is too high; if the top edge melts and rounds over, the speed is too low or the preheat flame is too strong.

8. Operating Instructions

1. Place the machine on the steel plate to be cut. Set the two feet **(6)** to the required angle to each other (normally 90°) and tighten the foot screws **(5)**. If necessary use an auxiliary screw, so that the whole machine stands stably.
2. According to the diameter of the circle to be cut, pull out the cross bar **(10)** to approximately the required length. Move the clutch lever **(11)** to **disengage the clutch**, turn the radius rod **(3)** by hand and set the radius so that the torch can rotate within the required range without touching the column or the feet. Then **engage the clutch** again.
3. Set the cutting diameter by adjusting the extension of the radius rod. When a high-precision diameter is required, the centre distance must be set together with the size of the hole being cut; measure it, then **lock the radius rod** before cutting, so that an accurate circle is obtained.
4. Before cutting begins, set the correct oxygen pressure, fuel-gas pressure and cutting speed according to the cutting process specification. **A flashback arrestor must be installed in the oxygen and fuel-gas pipelines.**
5. Set the nozzle-to-plate distance with the rack and pinion on the torch holder, and set the torch angle (vertical for a square cut, tilted for a bevel).
6. Light the torch, preheat the starting point until it is bright red, open the cutting-oxygen valve, and then start the drive with the forward / reverse switch. The torch may be rotated clockwise or anticlockwise; the machine uses an **infinitely rotating gas distributor**, so the hoses never become wound up.
7. Adjust the speed with the potentiometer during the first part of the cut until the slag is blown cleanly through, then let the machine complete the circle.
8. When the circle is complete, close the cutting oxygen, stop the drive, and extinguish the flame in the correct order (fuel gas first, then oxygen, as instructed by the torch manufacturer).

9. Cutting on Vertical and Inclined Plate

Besides cutting on a horizontal plate, the machine can also be set up against a vertical plate or an inclined plate or angle steel. The base is set on the floor or on a support, and the two feet are opened to match the angle of the plate.



Set-up for cutting on a vertical plate (90°) and on an inclined plate (45°)

Attention

When the machine is set up against a vertical or inclined plate, check that the base is standing firmly and that all foot screws and the tightening screw **(8)** are tight before the drive is started. Keep clear of the falling cut-out piece.

10. Maintenance

When	What	How
Before every shift	Hoses, couplings and flashback arrestors	Check for damage and leaks with soapy water; replace any damaged hose.
Before every shift	Cutting nozzle	Check the bore for spatter and slag; clean with the correct nozzle-cleaning needle only.
Before every shift	Foot screws and tightening screw	Check that they are tight and that the machine stands without rocking.
Daily, after work	Machine body, cross bar and radius rod	Wipe off dust and slag; keep the bright rods clean and lightly oiled so they slide freely.
Weekly	Clutch and rack & pinion	Clean and apply a little light machine oil.
Periodically	Gearbox	Check for abnormal noise or overheating; have the grease renewed by a service technician.
Periodically	Gas distributor	Check that it rotates freely and does not leak.
Periodically	Supply lead, plug and earth	Check for damage; the machine must always be earthed.

Storage

- Close the cylinder valves and release the pressure from the hoses when work is finished.
- Store the machine in a dry place, away from damp and corrosive fumes.
- Protect the bright surfaces of the cross bar and radius rod with a thin film of oil before long storage.

11. Faults and Countermeasures

Fault	Possible cause	Remedy
The power lamp does not light and the machine does not run	No supply at the socket	Check the supply and the plug
	Fuse F blown	Replace the fuse with one of the same rating
	Mains switch S1 faulty	Inspect and replace the switch
The lamp lights but the torch does not rotate	Clutch lever (11) is disengaged	Engage the clutch
	Forward / stop / reverse switch in the stop position, or faulty	Select forward or reverse; inspect and replace the switch
Speed cannot be varied, or the speed is unstable	Speed potentiometer worn or its connection loose	Inspect the connection; replace the potentiometer
	Motor brushes worn	Have the brushes inspected and replaced
The cut circle is not round / diameter is wrong	Radius rod not locked, or the machine rocks	Lock the radius rod; tighten the foot screws and re-seat the machine
	Centre point has shifted	Re-set and re-measure the centre distance before cutting
Poor cut quality — slag not blown through, rough face	Wrong nozzle for the plate thickness	Select the nozzle from the table in section 7
	Oxygen pressure too low, or speed too high	Re-set the pressure and reduce the speed
	Nozzle bore blocked or damaged	Clean with a nozzle needle, or replace the nozzle

If a fault persists, or is not listed above, stop work immediately and contact Cruxweld service at **support@cruxweld.com** or **+91 8800 882 983**, quoting the model **CIRCO 600** or **CIRCO 1000**.



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