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# **RICHMOND**

**CUT-40F, CUT-50F, CUT-60F, CUT-80, CUT-100**

**PILOT ARC INVERTER PLASMA CUTTER**

**INSTRUCTION MANUAL**



Thank you for using our cutting machine!

For your safety, please read this manual book before operation.

### **GURANTEE**

We give our unreserved guarantee that the Inverter Welding and Cutting machines comply with IEC974 international safety standard. Maintenance for one year since the date of purchase.

Service of this equipment is restricted to trained personnel; unqualified personnel are strictly cautioned against attempting repairs or adjustments not covered in this manual, at the risk of personal injury and/or voiding the Warranty.

## SAFETY ATTENTION

### ➤ **Following attentions should be observed for safety guarantee**

- a. Confirm the followings such as supply power connected from your side, the spot for welder's installing, high-pressure gas, storage of workpiece and the treatment of rubbish according to your national laws or your company's standards.
- b. On spot of welding  
To avoid from the injure and hurt by smoke and bad gas, the exhaust equipments ought to be installed or useful breath apparatus should be used, depending on your rules.
- c. Don't open up the welder or use it in open position.

### ➤ **Avoid any possible danger**

- a. Avoid burning from over-heat  
Keep the welder from the wall more than 30cm and from combustible articles more than 50cm.
- b. Avoid burning from spark  
Keep spark far away from tinder or open holes.
- c. Avoid welder from impact or falling  
Fasten the welder by fixed bolts.
- d. Don't weld the tubes with gas or hermetic tubes and vessels.
- e. Don't hang the torch on the gas bottle or touch the bottle with electrode.
- f. For your health, please wear the protecting articles according to your relevant rules.

### ➤ **Attention while connecting**

- a. Only after disconnection of power and safety ensuring, the connection of welder can be operated.
- b. Don't touch the parts with electricity or wear the wet broken gloves.
- c. The cables should be selected according to the appointed standard.
- d. Don't place the heavy on cables.
- e. The cables should be well connected and the bare electric parts should be wrapped with insulation.
- f. Only electrician with certificate can do grounding of welder or workpiece.
- g. The power of all equipments should be turned off while not using.
- h. The welding cables should be shortened as possible.

- i. Place the cables nearly to the floor or ground with extending position.
- j. Place the cables of workpiece and cables of torch in parallel.
- k. The grounding of workpiece can't be used together with other machines.

## DEFINITIONS

### **A. Plasma**

Plasma cutters work by sending a pressurized gas, such as air, through a small channel. In the center of this channel, you'll find a negatively charged electrode. The electrode is at the center, and the nozzle is just below it. The swirl ring causes the plasma to turn rapidly as it passes. When you apply power to the negative electrode, and you touch the tip of the nozzle to the metal, the connection creates a circuit. A powerful spark is generated between the electrode and the metal. As the inert gas passes through the channel, the spark heats the gas until it reaches the fourth state of matter. This reaction creates a stream of directed plasma, approximately 30,000 F (16,649 °C) or more and moving at 20,000 feet per second (6,096 m/sec) that reduces metal to vapor and molten slag.

The plasma itself conducts electrical current. The cycle of creating the arc is continuous as long as power is supplied to the electrode and the plasma stays in contact with the metal that is being cut. The cutter nozzle has a second set of channels. These channels release a constant flow of shielding gas around the cutting area. The pressure of this gas flow effectively controls the radius of the plasma beam.

NOTE! This machine is designed to use only compressed air as the “gas”.

### **B. Voltage Regulation**

The Automatic Voltage Compensation circuit prevents voltage load from exceeding maximum in accordance with the main technical data sheet and shortening the life of the machine.

### **C. Thermal Protection**

The thermal protection circuits will engage if unit exceeds duty cycle. This will cause the machine to stop working. The indicator will be lit on the front of the machine. The fan will most likely continue to run until unit cools down. When it reaches an acceptable temperature, it will operate again.

### **E. Duty Cycle**

Duty cycle is the percentage of on time (measured in minutes) in a 10-minute period in which the machine can be operated continually, in an environment of a specified temperature.

Exceeding duty cycle ratings will cause the thermal overload protection circuit to become energized and shut down output until the unit cools to normal operating temperature. Continual exceeding of duty cycle ratings can cause damage to the machine.

## MAIN TECHNICAL DATA

Model		CUT-40F	CUT-50F	CUT-60F	CUT-80	CUT-100
Spec.	Power supply voltage	1-ph AC 220±10% V			3-phs AC 220±10% V	
	Power frequency	50~60 Hz	50~60 Hz	50~60 Hz	50~60 Hz	50~60 Hz
	Power supply capacity	4.7 kVA	6.0 kVA	7.5 kVA	10.5 kVA	15 kVA
	Rated input current	20 A	25 A	30 A	30 A	30 A
	No-load voltage	230 V	230 V	240 V	240 V	240 V
	Output current range	10-40 A	10-50 A	10-60 A	20-80 A	20-100 A
	Output voltage	96 V	102 V	108 V	108 V	108 V
	Duty cycle	60%	60%	60%	60%	60%
	Efficiency	85%	85%	85%	85%	85%
	Tip hole diameter	1.0 mm	1.0 mm	1.2 mm	2.0 mm	2.0 mm
	Arc striking model	Untouch	Untouch	Untouch	Untouch	Untouch
	Cosφ (η)	0.93	0.93	0.93	0.93	0.93
	Air pressure	0.4 MPa	0.4 MPa	0.5 MPa	0.6 MPa	0.6 MPa
Cutting thickness	Steel	1-8 mm	1-10 mm	1-13 mm	1-20 mm	1-25 mm
	Aluminum	1-6 mm	1-8 mm	1-10 mm	1-12 mm	1-16 mm
	Copper	1-4 mm	1-6 mm	1-8 mm	1-10 mm	1-12 mm
	Air flow	100 L/min	110 L/min	120 L/min	140 L/min	140 L/min
	Insulation grade	F	F	F	F	F
	Protection grade	IP 21S	IP 21 S	IP 21 S	IP 21 S	IP 21 S
	Net Weight	8.9 kg	9.2 kg	14.7 kg	23.8 kg	23.8
	Dimensions (mm)	385*155*295	385*155*295	500*210*365	520*330*375	520*330*375

# INSTALLATION

## **A. Unpacking**

Unpack all items and verify that all items have been received according to the packing list enclosed.

## **B. Operating Environment**

Make sure working area is well ventilated. The unit is cooled by an axial-flow fan which provides airflow through the back panel over the electronics and out the machine cover vents. (NOTE! The cover must be installed with the vents closest to the front of the machine) Provide at least 15cm at the rear and 15cm on each side for clearance. If unit is operated without sufficient cooling air, the duty cycle will be greatly reduced.

## **C. Input Cable Connection**

Every machine includes a primary input power cable capable of handling the input voltage and current for this unit. If the unit is connected to power that exceeds the required voltage, or is of the incorrect phase, serious damage will be incurred and warranty will become void.

CUT40F, CUT50F and CUT60F machine must be operated on 220 volts single phase 50/60Hz; CUT80 and CUT100 machine must be operated on 220 volts three phases 50/60Hz.

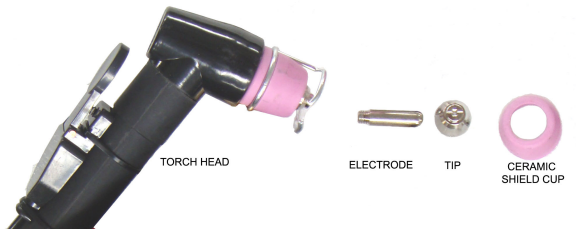
Neutral (Ground) wire is yellow with a green stripe or solid green. This wire must be connected to the “ground” terminal of the power plug you use.

## **D. Torch Connection**

Connect the Torch to the inverter by screwing the air line fitting on the end of the torch to the torch connector fitting on the front of the machine.

Secure by tightening with wrench slightly. DO NOT OVER TIGHTEN!

## TORCH ASSEMBLY



Position the torch with the shield cup facing upward and unscrew and remove the ceramic shield cup from the torch head assembly (The ceramic shield cup holds the tip and electrode in place).

Remove the tip, ceramic swirl ring, and electrode.

Install the electrode and tip. Replace worn parts, as necessary.

Install and tighten the ceramic shield cup until it is seated on the torch head. If resistance is felt when installing the cup, check the threads and parts configuration before proceeding.

**Note:** *On some torches that do not have reversible electrodes it will be necessary to secure the electrode by slightly tightening with pliers to assure reliable electrical connection.*



# OPERATION

## **To Begin**

Turn the Power Switch to the ON position.

Position yourself to where you can read the air pressure. Press the torch switch (air will exhaust from torch, adjust the air regulator to read approximately 0.4 to 0.6 MPa and release torch switch.

Secure ground clamp to workpiece. Connect clamp to main part of workpiece, not the part being removed.

## **Cutting**

Position torch tip slightly above workpiece, press torch switch and lower torch tip toward workpiece about 3-5mm distance, and cutting arc will strike. As there's a steel ring to keep the distance from tip to workpiece, so you can just touch the steel ring to workpiece. You'd better cut from the fringe of workpiece, if you want to cut in the middle of workpiece, you'd better keep a slightly angle to ensure blow the melted metal. After cutting arc is established, move the torch in the desired direction.

This methodology is called Drag-Cutting. Avoid moving too fast as would be indicated by sparks radiating from the top side of workpiece. Move the torch just fast enough to maintain sparks concentration at the underside of the work-piece and making sure the material is completely cut through before moving on. Adjust drag speed as desired/required.

## **Stand-off Cutting**

In some cases, it may be beneficial to cut with the torch tip raised above the work-piece approximately 1/16" to 1/8" to reduce material blow-back into the tip and to maximize penetration of thick material cuts. An example of "stand-off cutting" would be used when penetration cutting or gouging operation is being performed. You can also use "stand-off" technique when cutting sheet metal to reduce the chance of splatter-back tip damage.

## **Piercing**

For piercing, position the tip approximately 3.2 mm above the workpiece. Angle the torch slightly to direct sparks away from the torch tip and operator.

Initiate the pilot arc and lower the tip of the torch until the main cutting arc transfers, sparks start.

Start the pierce off the cutting line on the scrap piece or template and then continue the cut onto the cutting line.

Hold the torch perpendicular to the workpiece after the pierce is complete and continue cutting as desired.

Clean spatter and scale from the shield cup and the tip as soon as possible.

## **Quality Cuts**

Dross (slag) is the excess material that spatters and builds up on the underside of the work-piece as you cut.

Dross occurs when the operating procedure and technique is less than optimal. It will require practice and experience to obtain cuts without dross. Although less than optimal cuts will contain dross, it is relatively easy to remove by breaking it off using pliers or chipping off with a chisel or scraping or grinding the finished cut as

needed and is generally only a minor inconvenience.

A combination of factors contributes to the buildup of dross. They include material type, material thickness, amperage used for the cut, speed of the torch across the work-piece, condition of the torch tip, input line voltage, air pressure, etc. Generally there is an inversely proportional relationship between output current and speed of cut. Do not use more output current than is necessary and adjust speed of cut toward minimizing dross buildup on underside of cut. Experiment with adjusting current and speed to minimize dross.

For more specific issues regarding quality of cuts and general operation, go to the Troubleshooting section of this manual.

## MAINTENANCE

### Each Use

Each time you use the plasma cutter; check the torch, Tip/Nozzle, Electrode, and Ceramic Shield cup.

Inspect torch for any wearing, cracks or exposed wires. Replace or repair before use.

A worn torch Tip/Nozzle contributes to reduced speed, voltage drop and crooked cuts.

A worn Tip/Nozzle is indicated by an elongated or oversized orifice.

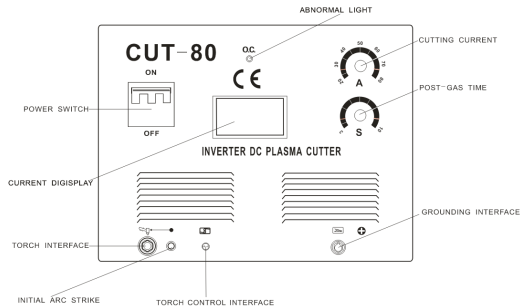
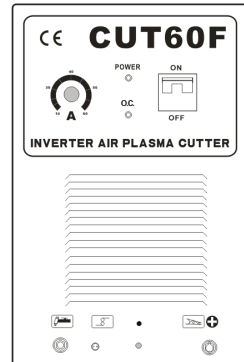
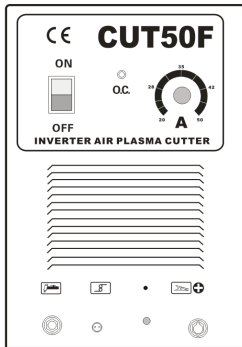
The face of the electrode should not be recessed more than 3.2mm. Replace if worn beyond this point.

### Weekly

Check for proper fan operation.

Blow or vacuum dust and dirt out of the entire machine and the air filter.

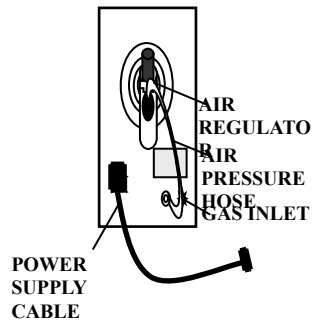
## FRONT & BACK PANEL VIEW



**Front View of CUT-80**



Connect to the cut torch



**Back View**

## TROUBLE SHOOTING

PROBLEM	CAUSE	SOLUTION
Torch will not come on	Power switch off	Turn power switch to the opposition
	Air supply is compromised	Another indication of this is a more green flame check air supply
	Workpiece Ground Clamp not attached	Attach to workpiece or to steel table with work piece securely clamped to table
Sparks are shooting upward instead of down through the material.	Plasma Torch is not piercing the material	Increase current
	Torch may too far away from stock	Decrease the distance of your torch to stock
	Material may not be grounded properly	Check connections for proper ground.
	Travel speed too fast	Reduce speed
Beginning of cut not completely pierced	Possible connection problem	Check all connections
Dross build-up on parts of cuts	Tool/Material building up heat	Allow material to cool then continue cut
	Cutting speed too slow or Current too high	Increase speed and/or reduce current until dross is reduced to minimum
	Worn torch parts	Inspect and repair or replace worn parts
Arc stops while cutting	Cutting speed too slow	Increase speed until problem solved
	Torch is too high, away from material	Lower torch to recommended height
	Worn torch parts	Inspect and repair or replace worn parts
	Workpiece ground cable disconnected	Connect Workpiece Ground Clamp to workpiece or steel table
Insufficient penetration	Cutting speed too fast	Slow travel speed
	Torch tilted too much	Adjust tilt
	Metal too thick	Several passes may be necessary
	Worn torch parts	Inspect and repair or replace worn parts
Consumables wear quickly	Exceeding unit capability	Material too thick, increase angle to prevent blow back into torch tip.
	Excessive Pilot arc time	Do not pilot for more than 5 seconds. You can also start with torch in contact with metal.
	Improperly assembled torch	See section titled "Torch Assembly"
	Inadequate air supply, pressure too low.	Check air filter, increase air pressure.
	Faulty air compressor	Check air compressor operation and make sure enough input air pressure