



**CUT-20D, 30D, 40D, 50D**

**INVERTER DUAL VOLTAGE PLASMA CUTTER**

# **OPERATION MANUAL**



## **SAFETY FIRST**

Welding and plasma cutting is dangerous not only to the operator himself, but also to people in the surrounding area. Therefore, this machine must be used under the most strict and comprehensive observance of all relevant safety rules. Please read and understand this instruction manual fully before installing and operating this machine.

### **GUARANTEE**

This inverter cutting machines is manufactured in full compliance with IEC974 international safety standards. It comes with a one-year limited warranty on parts and labor from the date of purchase. The manufacturer will either repair or replace any of its mechanical and electric parts if they are defective in material or workmanship.





## SAFETY CAUTIONS

### General safety rules

- ✧ The following rules must be followed or accidents may happen;
- ✧ The design & construction of power supplies, the selection of installation site, and the use of high pressure air, etc., must abide by the relevant criteria and regulations;
- ✧ Non-welding personnel should not enter the workplaces;
- ✧ Installation, overhaul, maintenance, and operation must be carried out by professionals;
- ✧ Other than welding, the welder should not be used for such purposes as charge, heating, etc.;
- ✧ On uneven ground, make sure to keep the welder from tipping over.

### Avoid electric shock or burn

- ✧ Keep the earth ground clamp connected to your work piece all the time. Never contact live components of the welding circuit, electrodes/torches or wires with bare hands or skin;
- ✧ Connect the welder to the ground with copper wire specified section by a professional electrician.
- ✧ Connect the welder to power supply by copper wire specified by a professional electrician, and make sure the insulation sheathing is intact;
- ✧ The operator should wear dry welding gloves at work, and always keep the working piece insulated from him, especially at damp or small places;
- ✧ Shut off the input power supply when the machine is not in use.

### Avoid breathing welding smog

- ✧ Smog generated at welding and cutting is harmful to health. To avoid gas poisoning and suffocation, keep the working area well ventilated.

### Avoid hazards to eyes and skin by welding arc, spatter and slag

- ✧ Wear approved anti-radiation glasses at work as welding arc may cause eye inflammation, and splash and sparks may harm eyes;
- ✧ Wear welding gloves, helmet, working clothes, foot protection cover, etc. to protect the skin from such hazards as arc light, splash and sparks.

### Prevent accidents, such as fire, explosion, outburst, etc.

- ✧ Remove any flammable materials from the work area as welding splash and sparks may cause a fire;
- ✧ Welding cable and working pieces must be connected tightly to avoid fire caused by high heat;
- ✧ Do not operate when flammable gases are present. Do not weld on items containing flammable materials to avoid explorations;
- ✧ Do not weld within closed container;

✧ Always have a fire extinguisher ready nearby and a trained personal ready to use it.

**Avoid injuries by the moving parts**

✧ Keep fingers, hair, and clothes, etc. away from the moving parts, such as cooling fans;

✧ Do not hold the welding torch too close to eyes, face or body in operation.

**Safe use of gas bottle and gas regulator**

✧ Gas bottle should be secured in place;

✧ Do not expose gas bottle to high temperature or direct sunlight;

✧ Only use gas regulator supplied or recommended by manufacturer and follow instructions.

## DEFINITIONS

### **A. Plasma**

Plasma cutters work by sending a pressurized gas (air) through a small channel. In the center of this channel, there is a negatively charged electrode. Below the electrode is the nozzle. The swirl ring causes the plasma to turn rapidly as it passes through. When power is applied to the negative electrode, and the nozzle is in contact with the metal, the connection creates a circuit. A powerful spark is then 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 degrees F or more and moving at a speed of 20,000 feet per second, which 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 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**

This machine has automatic voltage compensation in the power supply, which allows it to operate within the given ranges. In the case that the voltage exceeds the stipulated value, the over voltage may damage the components of this equipment or shorten the service life of the machine.

### **C. Thermal Protection**

The thermal protection circuits will engage if operation exceeds duty cycle. This protection mechanism will shut down the machine. The indicator on the front panel will come on. The fan will most likely continue to run until the machine cools down to an acceptable temperature before it starts to work again.

### **E. Duty Cycle**

Duty cycle is the percentage of time in a 10-minute period in which the machine can be operated continually before overheating in an environment with a specified temperature. Exceeding duty cycle ratings will trigger the thermal overload protection circuit and shut down the output until the unit cools down to normal operating temperature. Repeated exceeding of duty cycle ratings can cause damage to the machine.

## MAIN TECHNICAL DATA

Model		CUT-20D	CUT-30D	CUT-40D	CUT-50D
Spec.	Power supply voltage	1-ph AC 110v or 220v±10% V			
	Power frequency	50~60HZ	50~60 Hz	50~60 Hz	50~60 Hz
	Power supply capacity	1.8KVA	3.3 kVA	4.7 kVA	6.0 kVA
	Rated input current	14A	16 A	20 A	25 A
	No-load voltage	220v	230 V	230 V	230 V
	Output current range	10-20A	20-30 A	10-40 A	10-50 A
	Output voltage	88-92v	88-92 V	96 V	102 V
	Duty cycle	60%	60%	60%	60%
	Efficiency	85%	85%	85%	85%
	Tip hole diameter	1.0mm	1.0 mm	1.0 mm	1.0 mm
	Arc striking model	Touch	Touch	Touch	Touch
	Cosφ (η)	0.93	0.93	0.93	0.93
	Air pressure	0.4MPa	0.4 MPa	0.4 MPa	0.4 MPa
Cutting thickness	Steel	1-6mm	1-6mm	1-10 mm	1-12 mm
	Aluminum	1-4mm	1-5mm	1-6 mm	1-8 mm
	Copper	1-3mm	1-4mm	1-5 mm	1-6 mm
	Air flow	100L/min	100 L/min	100 L/min	110 L/min
	Insulation grade	B	B	B	B
	Protection grade	IP 21S	IP 21S	IP 21S	IP 21 S
	Net Weight	8.3 kg	8.8 kg	9.1 kg	9.4 kg
	Dimensions (mm)	385*155*295	385*155*295	385*155*295	385*155*295

# INSTALLATION

## A. Unpacking

Unpack all items and verify that all items specified on the enclosed packing list have been received.

## B. Operating Environment

Make sure working area is well ventilated. This 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 (about 6 inches) at the rear and 15cm (6 inches) 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 amperage for this unit. If the unit is connected to power that exceeds the specified voltage, or is of the incorrect phase, serious damage will be incurred and warranty will be void.

This series machine can be operated on either 110volts or 220 volts single phase 50/60Hz.

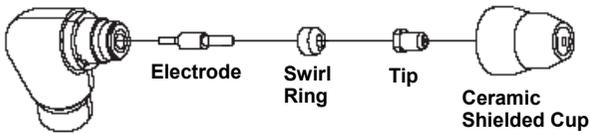
Neutral (Ground) wire is yellow with a green stripe or solid green. This wire must be connected to the “ground” terminal of the power plug in use.

*Note: The input amperage required to produce the same output power is inversely proportional to the input voltage. Example: If the machine draws 22 amps @ 220 volts it will draw 44 amps @ 110 volts to produce the same power output. This is a law of electronics theory... Power = Volts \* Amps*

## 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 shield cup from the torch head assembly (the ceramic shield cup holds the tip, ceramic swirl ring, and electrode in place).

Remove the tip, ceramic swirl ring, and electrode.

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

Install and hand 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 slight 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 0.3 to 0.5 MPa and release torch switch.

Secure ground clamp to work-piece. Connect clamp to main part of work-piece, not the part being removed.

## **Cutting**

Position torch tip slightly above work-piece, press torch switch and lower torch tip towards workpiece until contact is made and cutting arc is established. After cutting arc is established, move the torch in the desired direction while keeping the torch tip slightly angled and maintaining contact with the work-piece.

This method is called Drag-Cutting. Avoid moving too fast (which would be indicated by sparks radiating from the top side of work-piece). 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 (1/8") above the work-piece. 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 and 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 work-piece 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. Generally speaking, it is 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.

**Power supply wiring diagram**

110 V Wiring Diagram\*



- Brown = Positive**
- Blue = Negative**
- 2Tone = Ground**

220 V Wiring Diagram



- Brown = Positive**
- Blue = Positive**
- 2Tone = Ground**



**REMARK: 110 V operation requires minimum 30 Amps with a 10-3 Cable. BLUE WIRE MAY ALSO BE BLACK. BROWN WIRE MAY ALSO BE RED.**

## MAINEANCE

### **Each Use**

Each time you use the plasma cutter; check the torch, Tip/Nozzle, Electrode, Ceramic Swirl Ring 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 (1/8"). Replace if worn beyond this point.

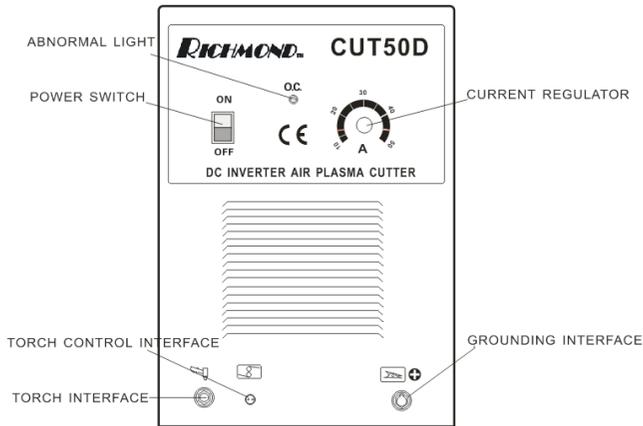
If the Ceramic Shield Cup does not go on easily, check the threads.

### **Weekly**

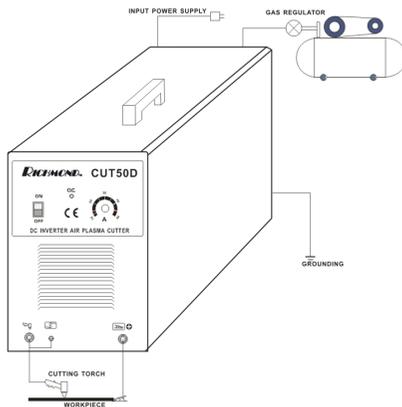
Check for proper fan operation.

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

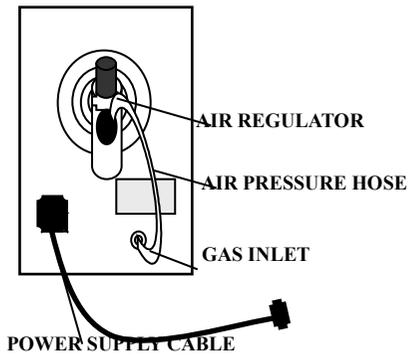
## FRONT & BACK PANEL VIEW



**View of front panel**



**Connection Structure**



**Back View**

**NOTE:** ENSURE THE PROPER GROUNDING OF THE CUTTING SURFACE. IF THE CUTTING SURFACE IS NOT PROPERLY GROUNDING, YOU WILL NOT GET ADEQUATE ARC. DEBRIS, RUST AND OTHER PARTICLES MUST BE REMOVED TO ENSURE PROPER GROUNDING OF THE CUTTING SURFACE.

## TOURBLE SHOOTING

<b>PROBLEM</b>	<b>CAUSE</b>	<b>SOLUTION</b>
Torch will not come on	Power switch off	Turn power switch on
	Air supply is compromised	Another indication of this is a more green flame check air supply
	Work-piece Ground Clamp not attached	Attach work-piece Ground Clamp securely to work-piece or steel table
Sparks are shooting upward instead of down through the material.	Plasma Torch is not piercing the material	Increase amperage
	Torch may be too far away from stock	Decrease the distance of your torch to stock
	Material may not be grounded properly	Check connections for proper grounding.
	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 amperage to high	Increase speed and/or reduce amperage until dross is reduced to minimum
	Worn torch parts	Inspect and repair or replace worn parts
Arcs tops while cutting	Cutting speed too slow	Increase speed until problem solved
	Torch is too far away from material	Lower torch to recommended height
	Worn torch parts	Inspect and repair or replace worn parts
	Work-piece ground cable disconnected	Connect Work-piece Ground Clamp to work-piece 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 input air pressure is enough