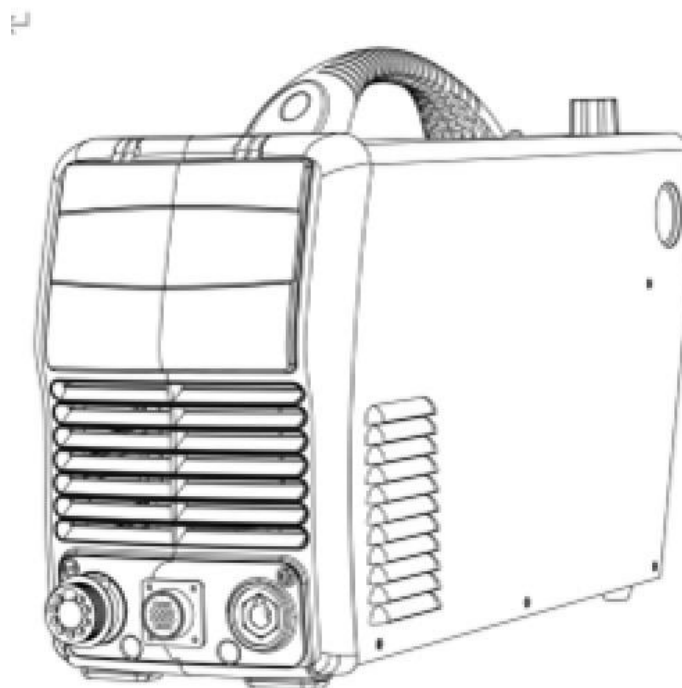




HSW-6006 LCD

60-Amp Inverter Plasma Air Cutter



OPERATORS' MANUAL

IMPORTANT: Read this Owner's Manual Completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. Contact your distributor if you do not fully understand this manual.

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§1 Safety

Notice: The instructions are for reference only. The manufacturer reserves the right to change and upgrade the product specifications!

Important Safety Precautions: Operation and maintenance of plasma ARC equipment can be dangerous to your health.

- Plasma arc cutting produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near plasma arc cutting applications should consult their medical health qualified technician and the manufacturer of the health equipment to determine whether a hazard exists.
- To prevent possible injury, read and understand all warnings, safety precautions and instructions before using the equipment.



GASES AND FUMES

Gases and fumes produced during the plasma cutting process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the cutting fume plume.
- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the plasma arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or cutting any metals which may contain one or more of the following:

Antimony	Chromium	Mercury	Beryllium
Arsenic	Cobalt	Nickel	Lead
Barium	Copper	Selenium	Silver
Cadmium	Manganese	Vanadium	

Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using.

These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.

- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.



ELECTRIC SHOCK

Electric Shock can injure or kill. The plasma arc process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically “live” or “hot.”
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the cutting circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.



FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks or the plasma arc.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapors from the workplace.
- Do not cut or weld on containers that may have held combustibles.
- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminum workpieces when they are cut underwater or while using a water table. DO NOT cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.



NOISE

Noise can cause permanent hearing loss. Plasma arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.



PLASMA ARC RAYS

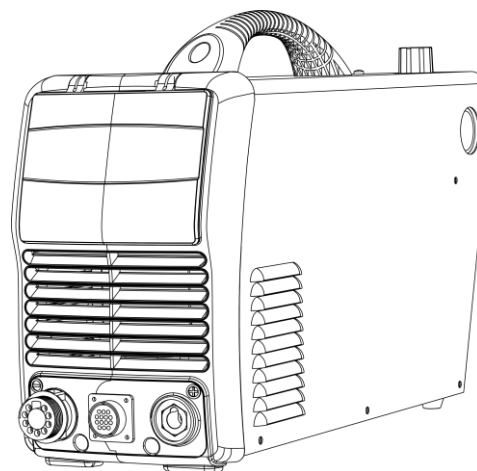
Plasma arc rays can injure your eyes and burn your skin. The plasma arc process produces very bright ultra-violet and infrared light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a cutting helmet or shield. Also always wear safety glasses with side shields, goggles, or other protective eye wear.
- Wear cutting gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep your welding helmet or safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens, or shields.

§2 Overview

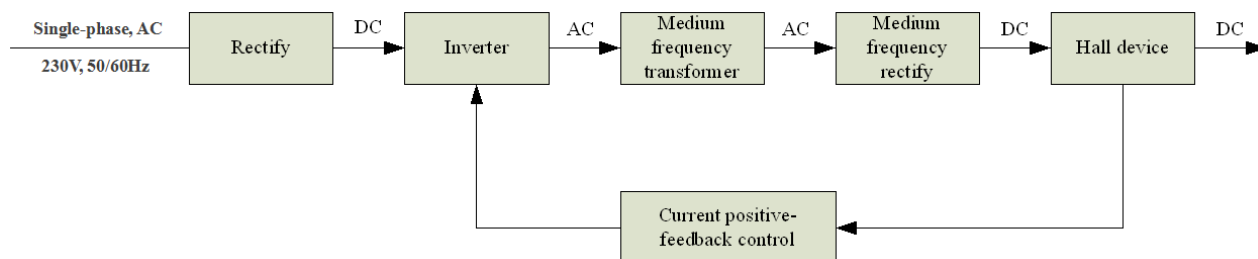
§2.1 Features

1. Panel cover blocks contamination; not view.
2. Color 5" LCD screen for accurate control, setting, adjustment & feedback of cutting performance.
3. With CNC interface, it can synchronize with many CNC machine cutting tables.
4. IGBT parallel balanced current technology and digital control technology for high capacity.
5. Wider input voltage flexibility provides peak performance power under variable input power conditions ($\pm 10\%$) for steady cuts.
6. EMI filter restrains electronic noise transmission from the power supply to surrounding electronics.
7. Starts without high frequency so it will not interfere with controls or computers.
8. Pilot-Arc controller increases cutting capabilities, speeds, and improves tip life.
9. Various protective and alarm functions for pressure, tip, over-temperature and over-current allow faster troubleshooting, and eliminates unnecessary downtime.
10. Pilot-arc NPT68 plasma torch ensures reliable ignition and quality of arc for premium cutting performance and extend consumable life.



§2.2 Working Principle

The working principle of Plasma 68 cutting machine is shown as the following figure. Single-phase 230V work frequency AC is rectified into DC, then it is converted to medium frequency AC by inverter device (discrete IGBT), after reducing voltage by medium transformer (the main transformer) and rectified by medium frequency rectifier (fast recovery diode) and is outputted by inductance filtering. The circuit adopts current feedback control technology to insure current output stably. Meanwhile, the cutting current parameter can be adjusted infinitely to meet with the requirements of application.



§2.3 Technical Data

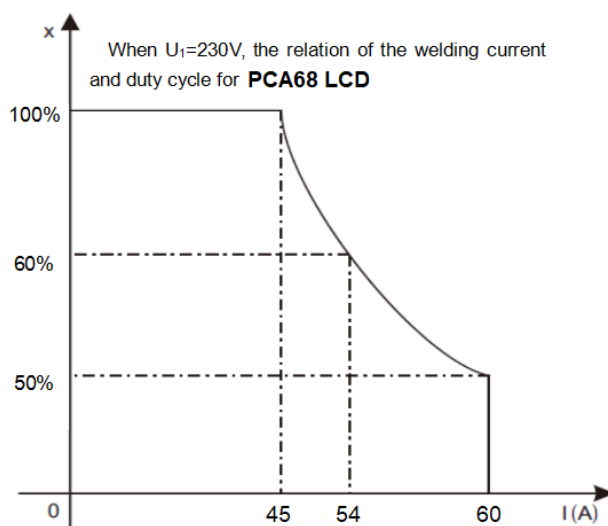
Models		PLASMA 68 LCD
Parameters		
Rated input voltage (V)		1~230±10%
Frequency (HZ)		50/60
Rated input current (A)		48.0
Rated input power (kVA)		11.0
Cutting current adjustment range (A)		20~60
No-load voltage (V)		348
Duty cycle (40℃ 10minutes)		100% 60A
Severance Cut for Carbon Steel (mm)		≤35
Optimal cutting thickness (mm)	Carbon steel	≤25
	Stainless steel	≤ 25
	Aluminum	≤ 20
	Cuprum	≤ 14
Dimensions (mm)		550*200*360
Protection class		IP21S
Circuit breaker		LW31-32B 4AB-02/1
Net weight (kg)		14.0
Cooling method		AF

Note: The above parameters are subject to change with the improvement of machines.

§2.4 Duty Cycle and Over-heat

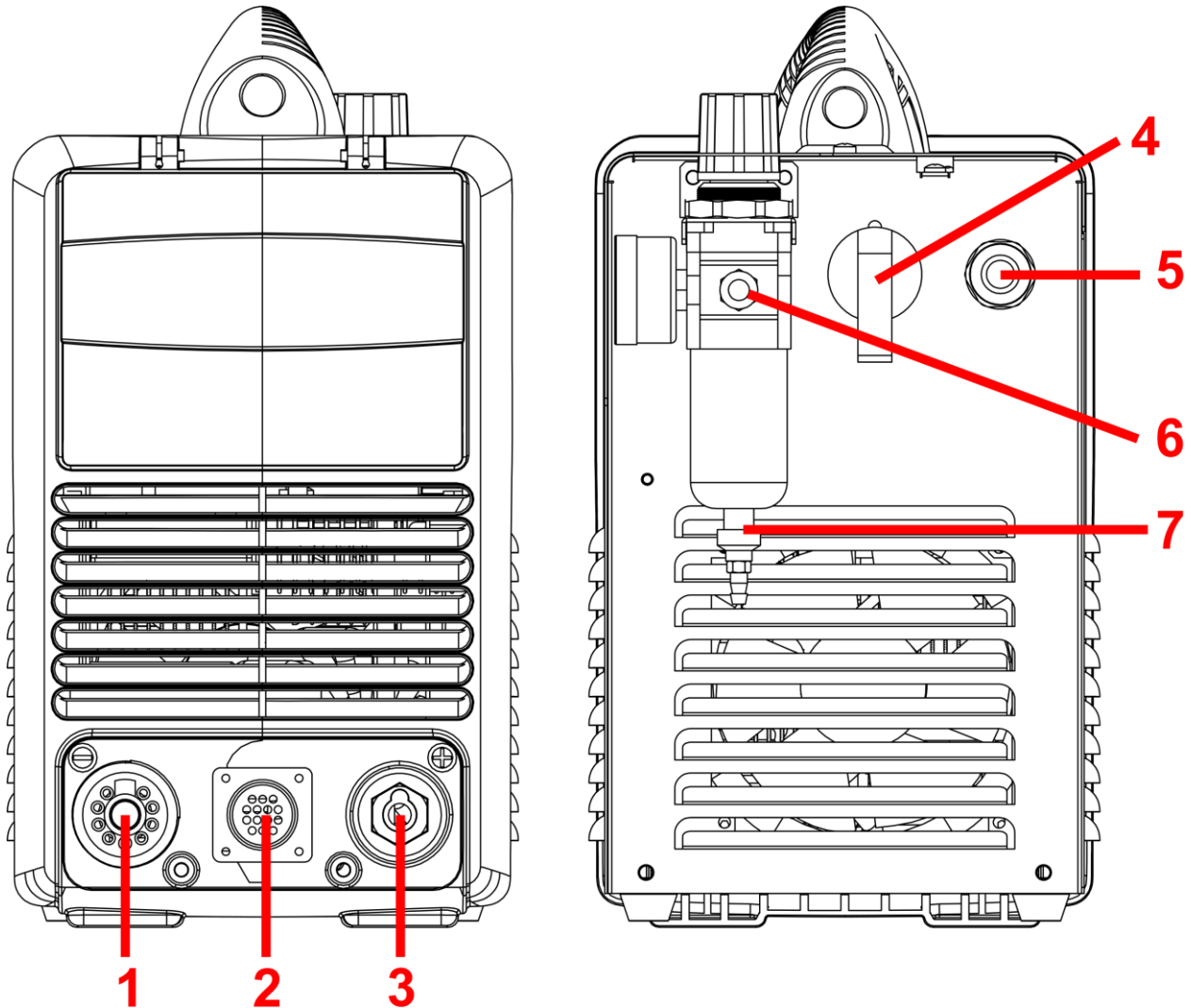
The letter “X” stands for Duty Cycle, which is defined as the portion of the time a cutting machine can cut at **maximum rated output** current within a 10-minute cycle.

If the cutting machine is operated beyond the rated duty-cycle, the IGBT heat sensor will send a signal to the cutting machine control unit to switch the output cutting current OFF and the error code is displayed on the screen. In that case, the machine should not be operated for 10~15 minutes to cool down with the fan running. When operating the machine again, cutting current or the duty cycle should be reduced.



§3 Panel Functions & Descriptions

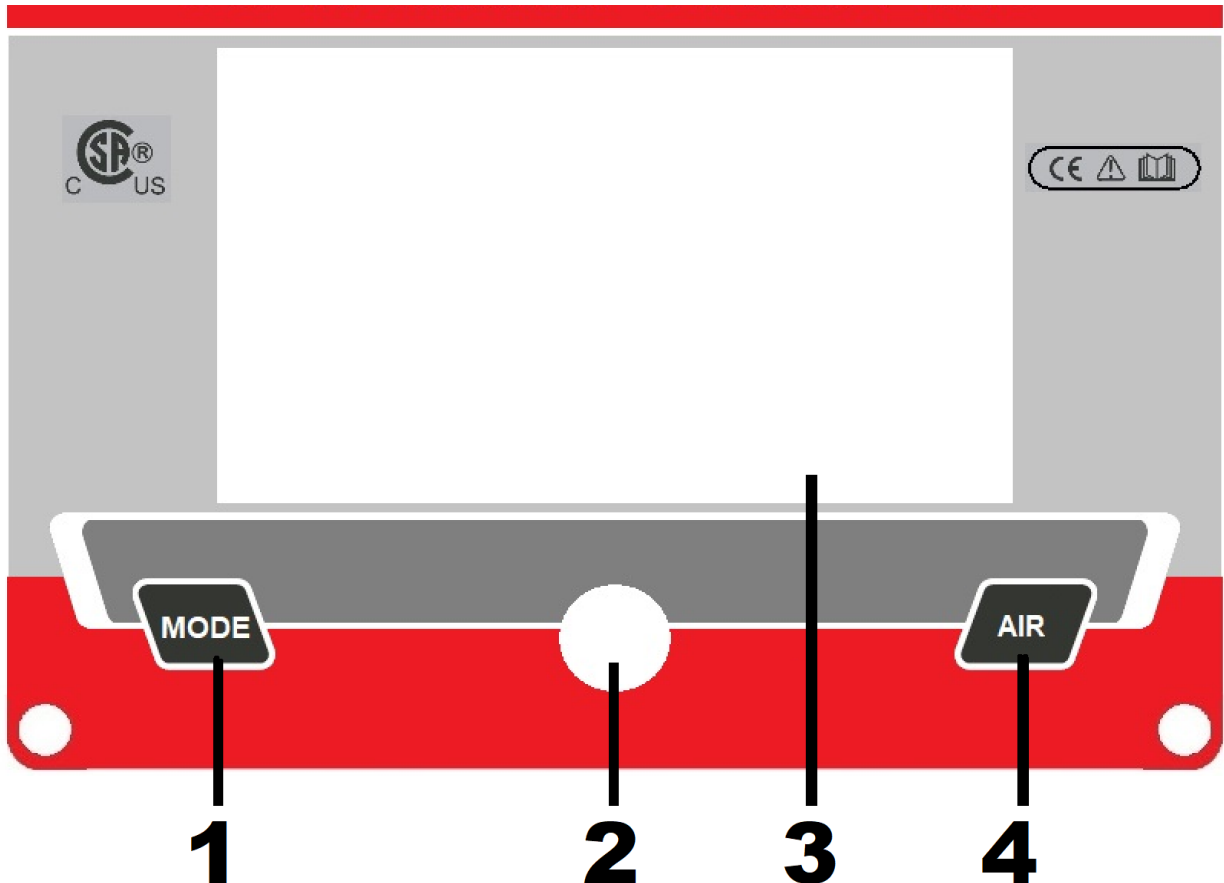
§3.1 Front and rear panel layout of cutting machine



1. Plasma torch central adaptor socket connector.
2. CNC interface connection socket.
3. Earth (ground) lead cable connection socket.
4. Power switch: Control "On" or "Off" power to inverter.
5. Power cord: Connect to the mating NEMA6-50R receptacle.
6. Compressed air inlet to regulator / filter / dryer unit.
7. Air filter condensate drain tube.

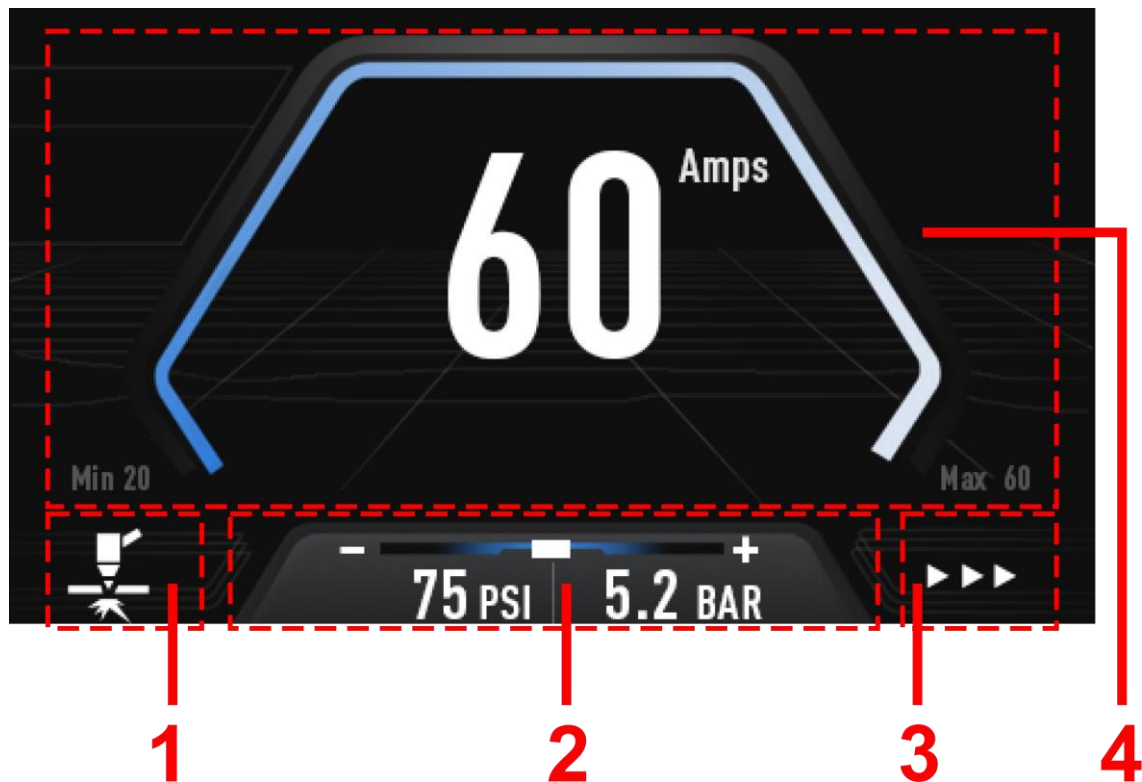
§3.2 Control panel of cutting machine

§3.2.1 Panel introduction



1. **Mode touchpad:** Press to select *Standard* cutting, *Grid* cutting or *Gouging* cutting.
2. **Current adjustment knob:** Rotate clockwise to increase cutting current and rotate counterclockwise to reduce cutting current.
3. **LCD screen:** Displays cutting current, cutting mode, air pressure and error codes.
4. **Air purge touchpad:** Press to confirm compressed air line connection and purge moisture from the torch cable on start-up. If the machine is not connected or the air pressure is low for safe operation, the screen will display "**E12 Lack of gas**".

§3.2.2 Display introduction



1. **Cutting mode display:** This will display the cutting mode currently in use. *
2. **Air pressure display:** This will display the input air pressure value currently set on regulator. Press AIR touchpad to confirm adjustments. Unit: PSI and BAR. *
3. **Working condition display:** There are three small arrows. One arrow = Standard cutting, 2 arrows = Grid cutting and 3 arrows = Gouging
4. **Current display:** This will display “set” current in ready state and “actual” cutting current in operation.

* Denotes more detailed explanation of function to follow.

Cutting mode display (1)

Press the cutting mode touchpad to select Standard cutting, Grid cutting and Gouging mode.



Standard Cutting

Cutting arc breaks immediately when the cutting torch nozzle leaves the workpiece surface to maintain tip life by reducing heat.



Grid Cutting

Cutting arc is maintained as long as trigger switch is engaged. When the cutting torch leaves the workpiece surface, the arc will still exist. This function is used for continuous cutting of grated workpieces.



Gouging

Gouging can work on any conductive metal, including low carbon steel, stainless steel, aluminum, and copper. Operator can plane a smooth, clean and consistent planer slot or remove weld between materials.

Air gouging manual, semi-automatic or CNC controlled fully automatic air gouging may be accomplished in this mode.

Air pressure display (2)

Press the AIR button to purge moisture from torch lines on start-up and confirm the air passage to torch is smooth. When functioning properly, the screen will display the air pressure values as set by the operator, as shown in the figure below:



If the machine is not connected correctly to the compressed air line or the air pressure is too low, it will cause the machine to alarm and display “E12 Lack of gas”, as shown in the figure below:



§4 Installation

§4.1 Unpacking

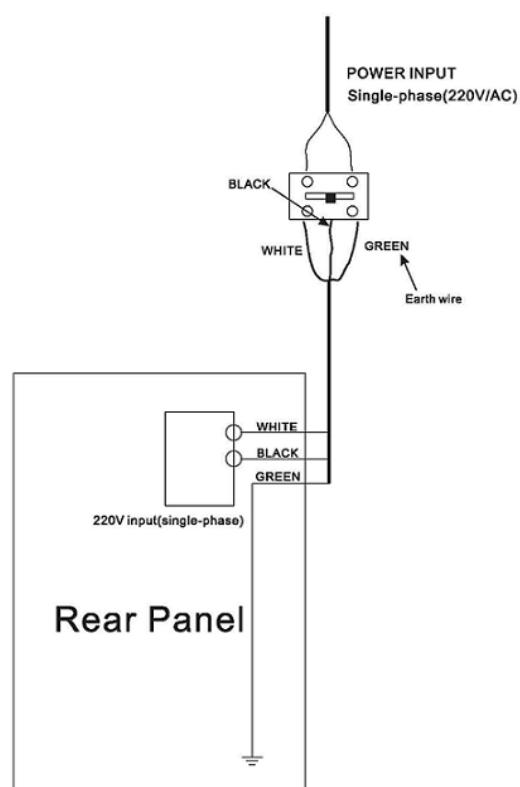
Use the packing lists to identify and account for each item.

1. Inspect each item for possible shipping damage. If damage is evident, contact your distributor and/or shipping company before proceeding with the installation.
2. Be sure to use machine handle when unpacking to ensure safe lifting of machine.
3. Make certain power supply is set on level non-flammable secure surface with 6" of free air on all four sides before using.

§4.2 Input Power Connections

Supply input power connection is shown as the Figure:

1. Check your power source for correct voltage before connecting to power receptacle.
2. Power cord: This power supply includes a NEMA 6-50P input power cord suitable for 220-240VAC, 1-phase input power.
3. If the supply (LINE) voltage continually goes beyond the safe working range of +/-10%, it will shorten machine life! The following measures may correct this problem:
 - Change the power supply to the outlet using a professional Electrician;
 - Reduce other machines using power supply at the same time.



§4.3 Air Connections

1. Connect the air hose to the inlet port of the air filter on the rear panel.
2. Do NOT install pressure regulator between compressor and machine filter.
3. An external air dryer may be installed on the line in the event of highly contaminated compressed air from the shop system.
4. Confirm the quantity of air to the machine by pressing down the AIR touchpad and checking the machine pressure display. Adjust as required.
5. Confirm the quality of air to the machine by pressing down the AIR touchpad and holding the cutting tip over clean dry cloth. If any moisture or particulates are observed, drain regulator bowl and replace air filter element.

WARNING: Contaminated air will GREATLY reduce cutting performance and consumable life!!

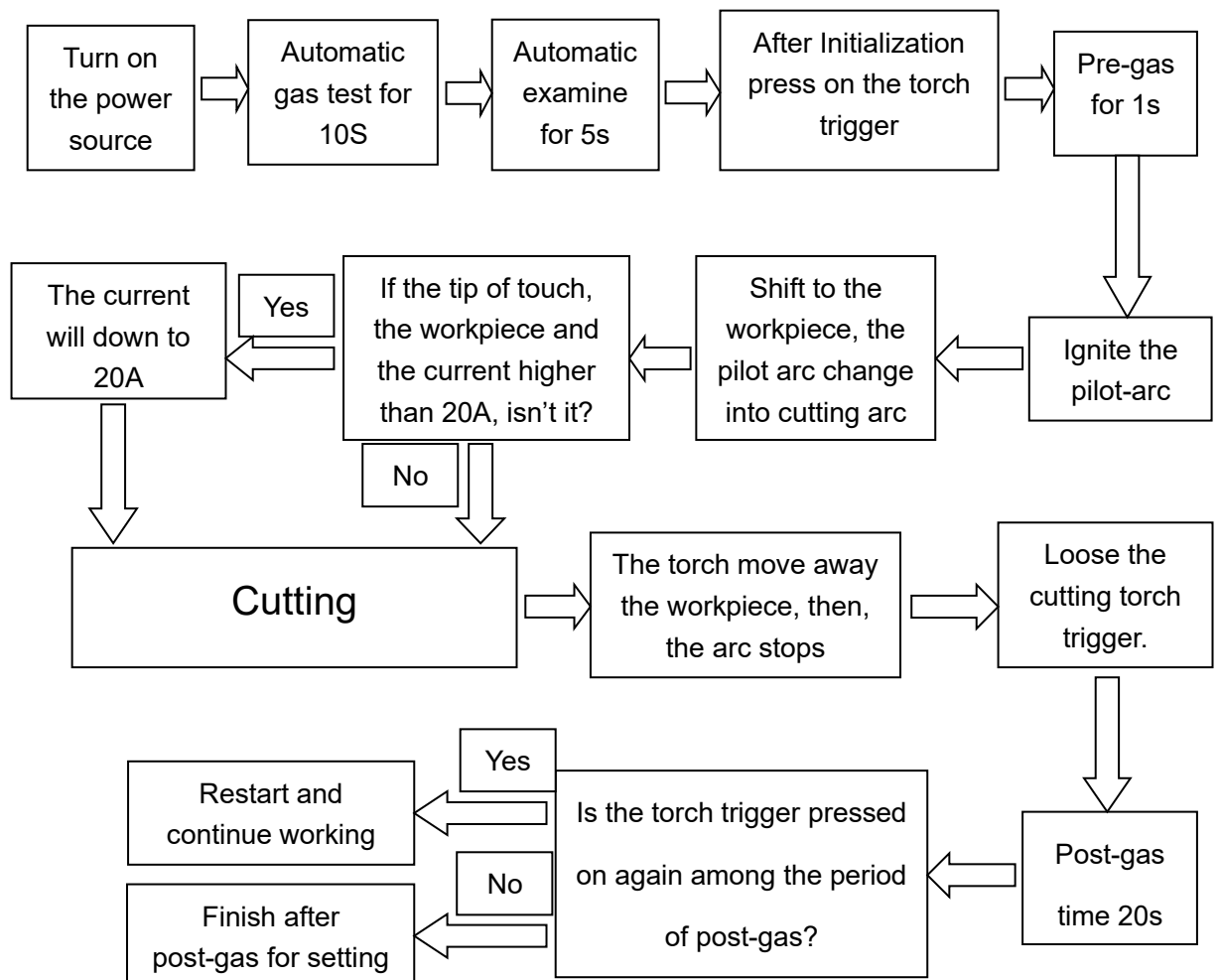
§5 Operation

§5.1 Cutting Preparation

- 1) Tightly connect the power cable to electrical socket outlet (the input voltage, refer to the section 2 technology parameters).
- 2) To connect the gas line to the air supply equipment, the earth cable to the workpiece.
- 3) Turn power switch to ON and confirm LCD screen is illuminated.
- 4) Press the cutting mode to select Standard cutting, Grid cutting or Gouging.
- 5) Adjust air regulator pressure to 50~90 PSI (3.5~6 bar). Generally, the higher the pressure the better the cut. If too high, torch will not ignite so adjust lower.
- 6) Adjust the desired cutting current after the air purge flow stops as required.

§5.2 Cutting Operation

1. Normal Cut



Note:

- 1) If the alarm appears on the screen when cutting, check the plasma torch connection at central adaptor until the alarm resets, then press trigger to restart work.
- 2) To confirm “cutting” air pressure, press AIR touchpad and observe display.
- 3) After storage period, the surface of the electrode and nozzle may have oxidation reaction. Please replace the electrode and nozzle. The alarm indicator will illuminate when torch shield cup is removed and machine will not provide current as safety.
- 4) After a cut, a 20-second period of post gas will commence, if trigger is re-engaged before 20-seconds, the arc will immediately restart. If trigger is not re-engaged the air will stop after 20-seconds. Depressing the trigger again will ignite the torch.

2. Account for the alarm indicator:

- 1) In the event the machine reaches “over-heat”, the screen will display error code “E01 Overheat”.



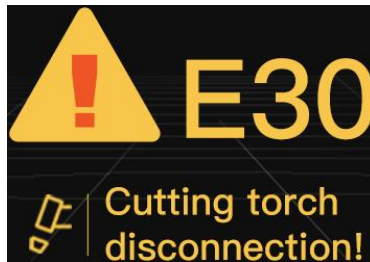
Over-heat: The alarm will release after the required period of fan cooling and cutting may resume. This should NOT occur in normal operation and may decrease life.

- 2) When the air pressure is too low, the screen will display error code “E12 Lack of gas”.



- 3) When the torch swirl ring is un-installed, there is no alarm while operating the machine but there may be no or an erratic arc. Open the torch and install swirl ring.

- 4) If the plasma cutting torch is not properly connected to the machine or the cutting torch is faulty, the following alarm will appear.



§5.3 About the CUT voltage divider

The Plasma 60LCD power supplies are equipped with an optional, factory-installed, four-position voltage divider that is designed to be safely connected to CNC control. The built-in voltage divider provides a scaled down arc voltage of 20:1, 30:1, 40:1, and 50:1 (maximum output of 18 V). An optional receptacle on the rear of the power supply provides access to the scaled down arc voltage and signals for arc transfer and plasma start.

Note:

The factory presets the voltage divider to 20:1. To change the voltage divider to a different setting, refer to the section on the next page.

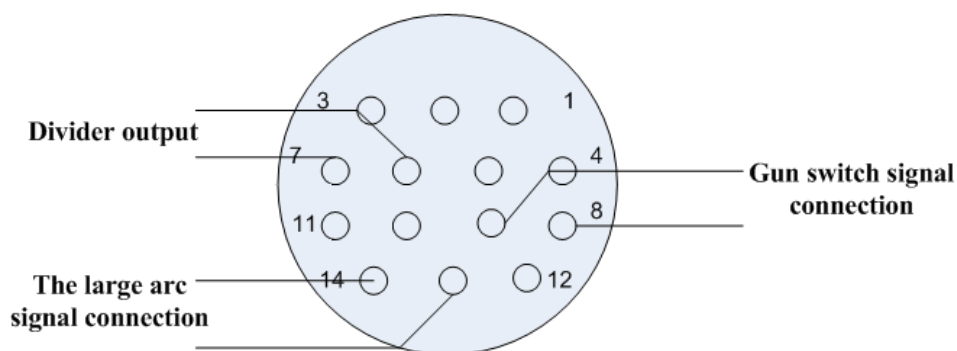
	The factory-installed internal voltage divider provides a maximum of 18V under open circuit conditions. This is an impedance-protected functional extra low voltage (ELV) output to prevent shock, energy, and fire under normal conditions at the machine interface receptacle and under single fault conditions with the machine interface wiring. The voltage divider is not fault tolerant and ELV outputs do not comply with safety extra low voltage (SELV) requirements for direct connection to computer products.
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The cover on the machine interface receptacle prevents dust and moisture from damaging the receptacle when not in use. This cover should be replaced if damaged or lost.

NOTE: Installation of the machine interface cable must be performed by a qualified service technician.

Installing the machine interface cable:

1. Turn OFF the power and disconnect the power cord.
2. Remove the machine interface receptacle's cover from the rear of the power supply.
3. Connect the machine interface cable to the power supply.



Refer to the following table when connecting the plasma system to a torch height controller or CNC controller with a machine interface cable.

signal	type	Instruction	Connector socket	Cable ends
Start (start plasma)	Input	Normally open. 18 VDC open circuit voltage at START terminals. Requires dry contact closure to activate.	8、 9	8 (yellow)、 9 (green)
Transfer(start machine motion)	Output	Normally open. Dry contact closure when the arc transfers. 120 VAC/1 A maximum at the machine interface relay or switching device (supplied by the customer).	13、 14	13 (blue)、 14 (white)
Voltage divider	Output	CUT: Divided arc signal of 20:1, 30:1, 40:1, 50:1 (provides a maximum of 18 V).	6 (+)、 7 (-)	6 (red)、 7 (black)

Setting the five-position voltage divider

The factory presets the voltage divider to 20:1. To change the voltage divider to a different setting:

1. Turn OFF the power supply and disconnect the power cord.
2. Remove the power supply cover.
3. Locate the voltage divider DIP switches on the left side of the power supply.

Note: Table below for the shift and scale selection

Scale selection Dial number	20:1	30:1	40:1	50:1
1	ON	1	1	1
2	2	ON	2	2
3	3	3	ON	3
4	4	4	4	ON

CNC control cable selectable type:

Number	Standard (m)
6.310.660	5
6.310.660-D	10
6.310660-E	15

§5.4 Operation Environment

- ▲ Height above sea level ≤ 1000 M.
- ▲ Operation temperature range: 14~104°F (-10 ~ +40°C).
- ▲ Air relative humidity is below 90%.
- ▲ Preferable site the machine some angles above the floor level does not exceed 15°.
- ▲ Protect the machine against high moisture, water and against direct sunshine.
- ▲ Take care that there is sufficient ventilation during welding. There must be at least 1-1/2" (38cm) free distance between the machine and wall.

§5.5 Operation Notices

- ▲ Read Section §1 carefully before starting to use this equipment.
- ▲ Ensure that the input is 220-240VAC, single-phase: 50/60Hz.
- ▲ Before operation, clear the working area. Do not watch the arc in unprotected eyes.
- ▲ Ensure good ventilation of the machine to improve duty cycle and life.
- ▲ Turn off power supply when the operation finished for energy consumption efficiency.
- ▲ When power switch shuts off protectively because of failure. Don't restart it until problem has been resolved. Otherwise, permanent damage could occur.
- ▲ In case of problems, contact your local dealer.

§6 Trouble Shooting

§6.1 Basic Troubleshooting Guide



WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

§6.1.1 Basic Troubleshooting

A. Turn on the machine, the screen light is on, but both fan and air control valve are not functioning.

1. Line power not connected. Please check the power cord, outlet and circuit breaker.
2. The main power board has failed. Contact dealer or factory for replacement.

B. Turn on the machine, the screen display “E12 Lack of gas”.

The air pressure is too low. Adjust the gas pressure to 65psi (4.5 bar).

C. Turn on the machine, the screen displays “Overheat” warning.

1. Air flow blocked, check for blocked air flow around the unit and correct condition.
2. Fan blocked or broken, check and correct condition.
3. The machine reached over-heat during operation, let it cool down for at least 10 minutes. Make sure the machine has not been operated beyond the Duty Cycle (refer to technology parameters in Section 2).
4. Input voltage over the normal range, choosing the proper voltage (refer to technology parameters in the Section).
5. Faulty components in the machine, return for repair or have qualified technician repair per Service Manual.

§6.1.2 Torch Pilot Arc Troubleshooting

A. The plasma torch failed to ignite the arc when triggered.

1. The shield cup is not completely installed. Turn off the power source, screw it completely clockwise on torch head, turn ON the power source.
2. The tip or electrode are not installed correctly. Turn off the power source, change tip & electrode, being sure to tighten electrode with supplied wrench and re-install shield cup properly, turn ON the power source.
3. Gas pressure is too high or too low. Adjust it to proper state.
4. Faulty components in the machine. Contact Dealer or factory.

B. Difficult igniting

1. The swirl ring (gas distributor) is “missing” or damaged. Replace inside shield cap.
2. Worn torch consumables. Shut off input power. Remove and inspect torch shield cap,

cutting tip, swirl ring, and electrode. Replace electrode or tip if worn; replace swirl ring if burnt and replace shield cup if excessive spatter adheres to surface.

C. The power indicator lights up; air flows; fan operates but when torch is triggered, the pilot arc doesn't change to cutting arc.

1. It is an inaccurate connection between torch and power supply. Check the torch leads are properly connected to power supply.
2. Earth clamp cable not connected to work piece, or machine connection is poor, make sure that work cable has good connection to the workpiece within 12" of cutting area.
 - a) Faulty components in the machine, contact Dealer or factory.
3. Faulty plasma torch. Return for repair or have qualified technician repair it.

D. Arc shuts off during operation, and it will not restart when torch is triggered.

1. Power Supply is overheated. Let unit cool down for at least 10 minutes. Make sure the unit has not been operated beyond Duty Cycle limit. Refer to Section 2.
2. Air pressure too low. Check source for at least 65 psi/4.5 bar; adjust as needed.
3. Torch consumables worn. Check torch shield cup, tip, swirl ring, and electrode; replace as needed.

§6.1.3 Cutting troubles

A. No gas flow but the screen lights are ON and fan operates

1. Compressed air line not connected, or pressure is too low. Check connections and adjust air pressure to proper setting.
2. Faulty components in the unit. Return for repair or have qualified technician repair.

B. Low cutting output

1. Incorrect setting of cutting current (A). Check and adjust to proper setting.
2. Faulty components in the machine, contact Dealer or factory.

C. Torch cutting quality is poor.

1. Current (A) control set too low. Increase current setting.
2. Operator is not "dragging" the cutting tip. Torch stand-off is designed to be IN CONTACT with the cutting surface.
3. The torch is moving too fast across the workpiece. Reduce the cutting speed.
4. Excessive oil or moisture in torch. Hold torch 1/8 inch (3 mm) from clean surface

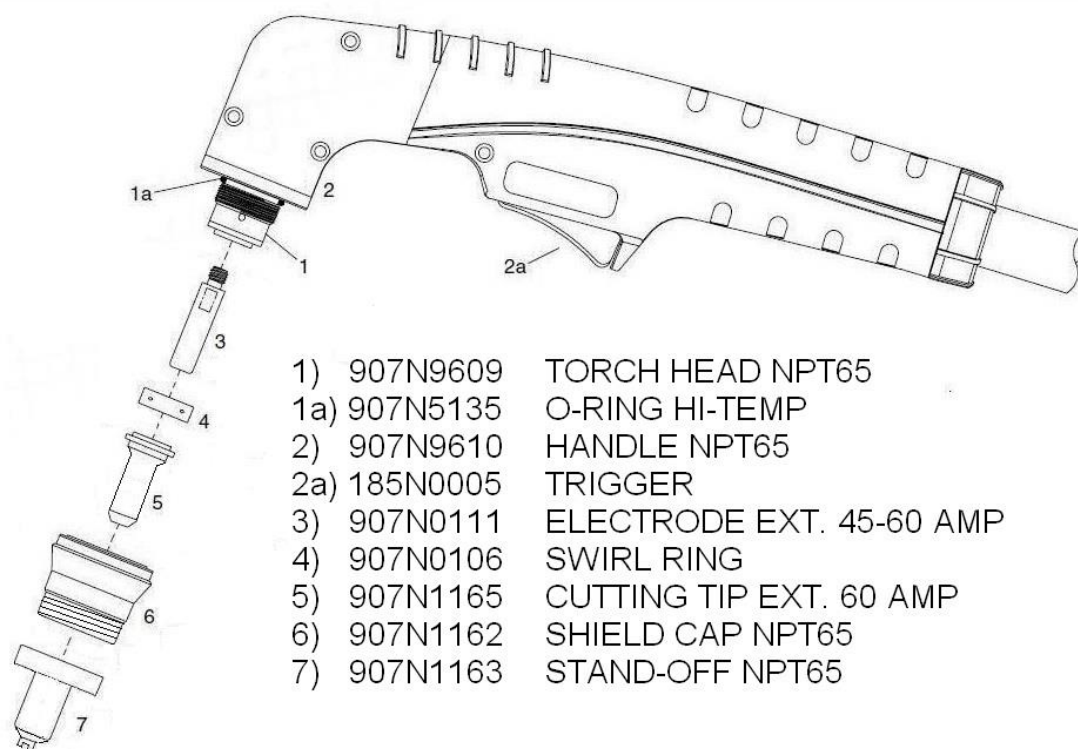
while purging and observe oil or moisture buildup (do not activate torch). If there are contaminants in the gas, additional filtering may be needed.

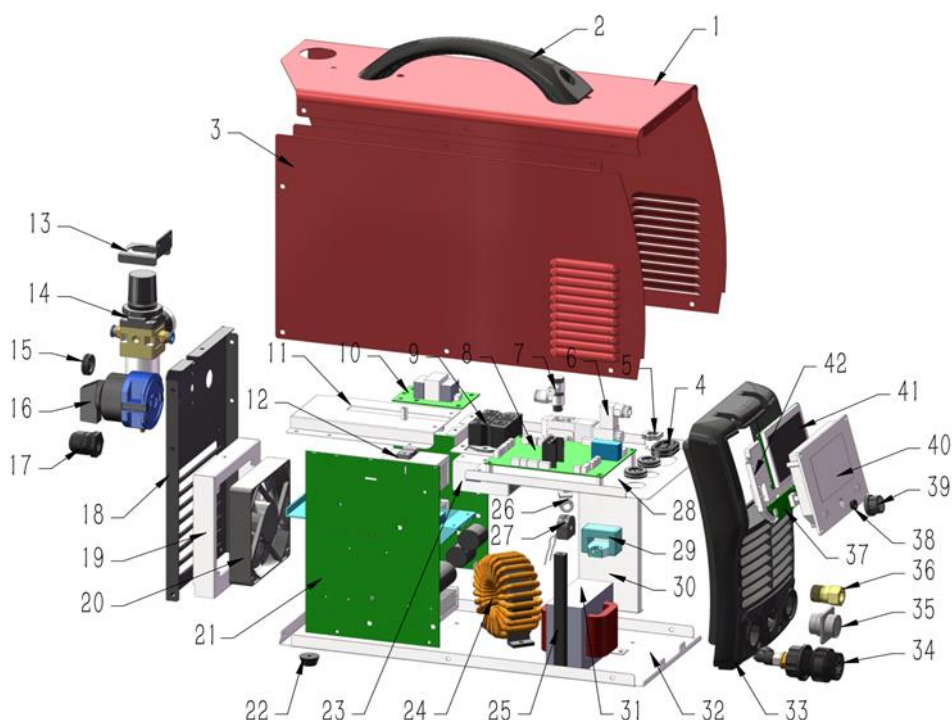
5. Lack of air pressure. Please check the air pressure and air flow, adjust it to the appropriate position. Set pressure as high as possible without “blowing out” the pilot-arc. If air blows out arc, adjust slightly lower until ignition is confirmed.

NOTE: Do not fire the torch in the air for more than 5 seconds to confirm operation.

Extended operation in free air will permanently damage plasma cutting torch!

NPT65 TORCH CONSUMABLES





Item	Part Number	Description	Item	Part Number	Description
1	760.1050	Right side panel	23	760.0129	Heatsink of rectifier
2	520.3010	Handle	24	760.1027	Transformer
3	760.1051	Left side panel	25	760.1056	Support bar
4	175N9053	Grommet- RND	26	760.1057	Inductor support
5	175N9054	Grommet - SQR	27	760.1028	Current inductor
6	740.0118	Solenoid valve	28	760.1058	Circuit installation plate
7	760.1020	Hose Fitting RA	29	480.1023	Hall current sensor
8	760.1136	PCB control bord	30	760.1056	Supporting plate
9	760.0131	Single phase rectifier	31	760.1029	Inductance
10	760.1022	PCB EMC regulate	32	760.1059	Chassis
11	760.1052	PCB mount plate	33	760.1057	Front frame
12	760.1025	MUR block 68LCD	34	501N4022	Central adaptor 5-pin
13	760.1053	Install plate for regulator	35	175N9039	Socket 14-pin
14	738.1014	Regulator	36	740.0012	Dins socket 35-50
15	175N9053	Grommet- RND	37	760.1109	PCB control panel
16	530.0020	Power switch	38	175N9055	Grommet sml
17	707.0173	Strain relief XL	39	520.3027	Knob
18	760.1054	Rear panel	40	760.1107	Seal plate 4.3" display
19	760.1055	Fan installation plate	41	760.1106	LCD display 4.3"
20	740.0121	Cooling Fan	42	760.1108	Front panel 4.3" display
21	760.1026	Inverter block 68LCD	43	513N0009	Earth clamp dins cable 10'
22	707.0162	Rubber foot	44	907N1168	NPT68 plasma torch 12.5'