HYPERTHERM®
A Hypertherm Associates Brand

Powermax45 SYNC®

Operator Manual

811470 - Revision 3

English

Register your new Hypertherm system

Benefits of registration

- **Safety:** Registration allows us to contact you in the unlikely event a safety or quality notification is required.
- **Education:** Registration gives you free access to online product training content via the Hypertherm Cutting Institute.
- **Confirmation of ownership:** Registration can serve as proof of purchase in case of an insurance loss.

Go to www.hypertherm.com/registration for easy and fast registration.

If you experience any problems with the product registration process, please contact registration@hypertherm.com.

For your records

Serial number: _____

Purchase date: _____

Distributor: _____

Maintenance notes: _____

_____

_____

Warranty information

You can find warranty information for your product at www.hypertherm.com/warranty.

Recycling information

You can find recycling information for your product at www.hypertherm.com/resources/system-support/recycling/.

Contact us

hypertherm.com/contactus


```
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Powermax45 SYNC®

Operator Manual

811470
Revision 3

English
Original Instructions

December 2025

Hypertherm, Inc.
Hanover, NH 03755 USA
www.hypertherm.com

Safety information

WARNING! Before operating any Hypertherm equipment, read the safety instructions in your product's manual, the Safety and Compliance Manual (80669C), Waterjet Safety and Compliance Manual (80943C), and Radio Frequency Warning Manual (80945C). Failure to follow safety instructions can result in personal injury or in damage to equipment.

Copies of the manuals can come with the product in electronic and printed formats. Electronic copies are also on our website. Many manuals are available in multiple languages at www.hypertherm.com/docs.

FastConnect, FineCut, Hypertherm, Powermax, Powermax SYNC, Powermax45 SYNC, and SmartSYNC are trademarks of Hypertherm, Inc. and may be registered in the United States and other countries. All other trademarks are the property of their respective holders.

Environmental stewardship is one of Hypertherm's core values, and it is critical to our success and our customers' success. We are striving to reduce the environmental impact of everything we do. For more information: www.hypertherm.com/environment.

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Electromagnetic Compatibility (EMC) introduction

Hypertherm's CE-marked equipment is built in compliance with standard EN60974-10. The equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

The limits required by EN60974-10 may not be adequate to completely eliminate interference when the affected equipment is in close proximity or has a high degree of sensitivity. In such cases it may be necessary to use other measures to further reduce interference.

This cutting equipment is designed for use only in an industrial environment.

Installation and use

The user is responsible for installing and using the plasma equipment according to the manufacturer's instructions.

If electromagnetic disturbances are detected then it shall be the responsibility of the user to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the cutting circuit, see Earthing of the workpiece. In other cases, it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases, electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Assessment of area

Before installing the equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

a. Other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the cutting equipment.

b. Radio and television transmitters and receivers.

c. Computer and other control equipment.

d. Safety critical equipment, for example guarding of industrial equipment.

e. Health of the people around, for example the use of pacemakers and hearing aids.

f. Equipment used for calibration or measurement.

g. Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.

h. Time of day that cutting or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Methods of reducing emissions

Mains supply

Cutting equipment must be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply.

Consideration should be given to shielding the supply cable of permanently installed cutting equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the cutting mains supply so that good electrical contact is maintained between the conduit and the cutting power source enclosure.

Maintenance of cutting equipment

The cutting equipment must be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the cutting equipment is in operation. The cutting equipment should not be modified in any way, except as set forth in and in accordance with the manufacturer's written instructions. For example, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Cutting cables

The cutting cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

Equipotential bonding

Bonding of all metallic components in the cutting installation and adjacent to it should be considered.

However, metallic components bonded to the workpiece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode (nozzle for laser heads) at the same time.

The operator should be insulated from all such bonded metallic components.

Earthing of the workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, for example, ship's hull or building steel work, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitances selected according to national regulations.

Note: The cutting circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, for example, by allowing parallel cutting current return paths which may damage the earth circuits of other equipment. Further guidance is provided in IEC 60974-9, Arc Welding Equipment, Part 9: Installation and Use.

Screening and shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire plasma cutting installation may be considered for special applications.

1 Where to Find Information

Information about this product

This operator manual includes the following information for the Powermax45 SYNC® plasma power supply and SmartSYNC® hand torches:

- Specifications, ratings, and installation and setup information
- Operating instructions for the plasma power supply and torch
- Instructions for cutting, piercing, gouging, and marking
- Maintenance and troubleshooting information

For related information, refer to the following documents:

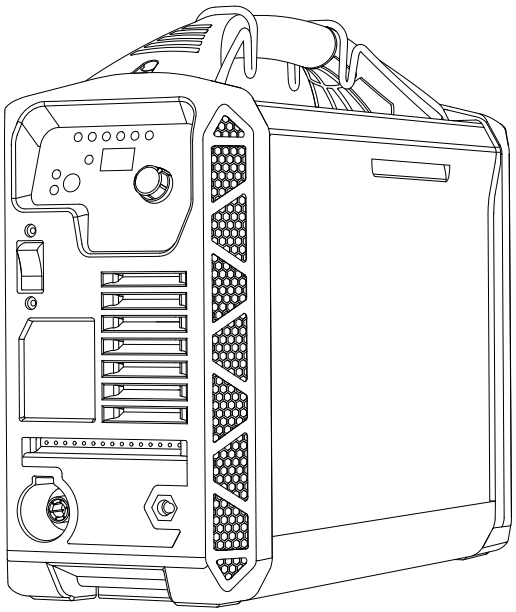
- *Safety and Compliance Manual (80669C)*
- *Powermax45/65/85/105 SYNC Cut Charts Guide (810500MU)*
- *Powermax45/65/85/105 SYNC Parts Guide (810490)*
- *Powermax45/65/85/105 SYNC Mechanized Cutting Guide (810480)*

Technical documentation is current as of the date of its release. Subsequent revisions are possible. Refer to www.hypertherm.com/docs for the most recent revisions of released documents.

2 Install and Set Up the Plasma Power Supply

The Powermax45 SYNC system

The Powermax45 SYNC is a portable 45 A plasma cutting system that you can use for many handheld and mechanized cutting and gouging applications. The automatic gas and automatic voltage features make it easy to set up and use the system even if you have limited plasma cutting experience.



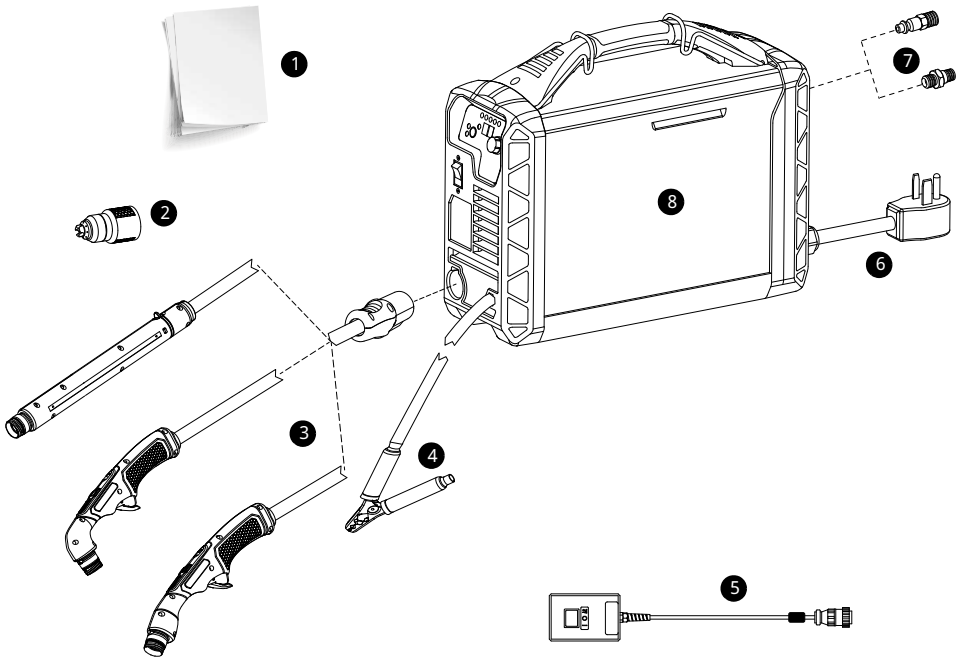
With the Powermax45 SYNC you can:

- Use air or nitrogen to cut electrically conductive metals such as mild steel, stainless steel, and aluminum.
- Use F5 gas to cut stainless steel.

- Use a single-piece cartridge instead of a set of consumables.
- Let the plasma power supply automatically set the operating mode, output current (A), and gas pressure related to the SmartSYNC torch and Hypertherm® cartridge that you install.
- Monitor cartridge life using the Hypertherm Cartridge Reader kit (528083).
- Lock the SmartSYNC torches without setting the plasma power supply to OFF.
- Change between torches using the FastConnect™ system (quick-disconnect).

Make sure that you have all the components

It is important to make sure that you have all the components that come with your Powermax SYNC®.



1 Documentation:
- *Product Safety Information and Instructions (811500MU)*
- *Radio Equipment Directive (810600MU)*
- *Fault code labels (811490MU)*
- *Powermax45 SYNC Getting Started Guide (811550MU)*

2 SmartSYNC cartridge

3 15° or 75° hand torch with lead or machine torch with lead

4 Work clamp with work lead

5 Remote-start pendant (optional – mechanized configurations only)

6 Power cord:
- CE/CCC and 480 V CSA models: power cord with no power plug

- CSA 200 V – 240 V models: power cord with 50 A, 250 V plug (NEMA 6-50P)

7 Region-specific gas inlet fitting (may not be preinstalled)

8 Plasma power supply

Claims for damage or missing components

Do these steps if your system has damage or components that are missing.

- **Claims for damage during shipment:**
  - ☐ Send a claim to the carrier if your system was damaged during shipment.
  - ☐ Get the system's model number and serial number from the data plate on the bottom of the plasma power supply. Refer to System specifications on the data plate on page 21 for a sample data plate.
  - ☐ Get a copy of the bill of lading from Hypertherm. For additional assistance, contact the nearest Hypertherm office listed in the front of this manual.
- **Claims for missing or damaged merchandise:**
  - ☐ Speak to your Hypertherm distributor or authorized repair facility
  - ☐ Speak to the nearest Hypertherm office.

Hypertherm plasma power supply ratings

Rated open-circuit voltage (U_0)	200 V – 240 V, CSA/CE/CCC 400 V, CE/CCC 480 V, CSA	275 VDC 265 VDC 275 VDC
Output characteristic [1]	Drooping	
Rated output current (I_2)	9 A – 45 A [2]	
Rated output voltage (U_2)	155 VDC	
Duty cycle at 40°C (104°F) [3]	50% at 45 A (I_2) / 155 VDC (U_2) 60% at 41 A (I_2) / 155 VDC (U_2) 100% at 32 A (I_2) / 155 VDC (U_2)	
Operating temperature	-10°C – 40°C (14°F – 104°F)	
Storage temperature	-25°C – 55°C (-13°F – 131°F)	

Power factor	200 V - 240 V, 1-phase, CSA/CE/CCC 400 V, 3-phase, CE/CCC 480 V, 3-phase, CSA		0.99 0.94 0.93
Idle state power consumption (CE models)	230 V 400 V		17 W 23 W
Power source efficiency at rated maximum output power (CE models)	230 V 400 V		90.3% 89.9%
R_{sce} – Short Circuit Ratio (CE models only)	U_1 - Volts AC rms, 3-phase 400 V, CE		R_{sce} 73
Electromagnetic Compatibility (EMC) emissions classification CISPR 11 (CE models only) [4]	Class A		
Input voltage (U1) / Input current (I1) at rated output (U2 MAX I2 MAX)	CSA (50 Hz/60Hz) 1-Phase: ▪ 200 V: 40 A ▪ 208 V: 37.5 A ▪ 240 V: 33 A 3-Phase: ▪ 480 V: 10 A		CE/CCC (50 Hz/60 Hz) 1-phase [5, 6] ▪ 220 V: 37 A ▪ 230 V: 34.3 A 3-phase [4, 7] ▪ 380 V: 13 A ▪ 400 V: 12 A
Gas type	Air	Nitrogen (N_2)	F5 [8]
Gas quality	Clean, dry, oil-free per ISO 8573-1 Class 1.2.2	99.95% pure Clean, dry, oil-free	99.98% pure (F5 = 95% nitrogen [N_2], 5% hydrogen [H])
Recommended gas inlet flow rate/ pressure	Cutting		212 slpm at 5.9 bar (450 scfh at 85 psi)
	Maximum removal gouging		212 slpm at 4.8 bar (450 scfh at 70 psi)
	Marking		142 slpm at 4.1 bar (300 scfh at 60 psi)

1 Defined as a plot of output voltage versus output current.

2 An output current setting of 9 A to 19 A is reserved for marking, and is only available when a FineCut® Hypertherm cartridge is installed on the torch.

3 Refer to the data plate on the bottom of the plasma power supply for more information about duty cycle and for IEC ratings.

4 NOTICE: This Class A equipment is not intended for use in residential locations where the public low voltage supply system supplies the electrical power. It is not always easy to supply electromagnetic compatibility in those locations, because of conducted and radiated disturbances.

5 This product meets the technical requirements of IEC 61000-3-3 and is not subject to conditional connection.

6 Equipment complies with IEC 61000-3-12.

7 Equipment complies with IEC 61000-3-12 if the Short-circuit power (Ssc) is greater than or equal to 1003 KVA at the interface point between the operator's supply and the public system. The installer or user of the equipment must consult with the distribution network operator, if necessary, to ensure that the equipment is connected only to an electric power source with a Ssc greater than or equal to 1003 KVA.

8 F5 is only recommended to cut stainless steel.

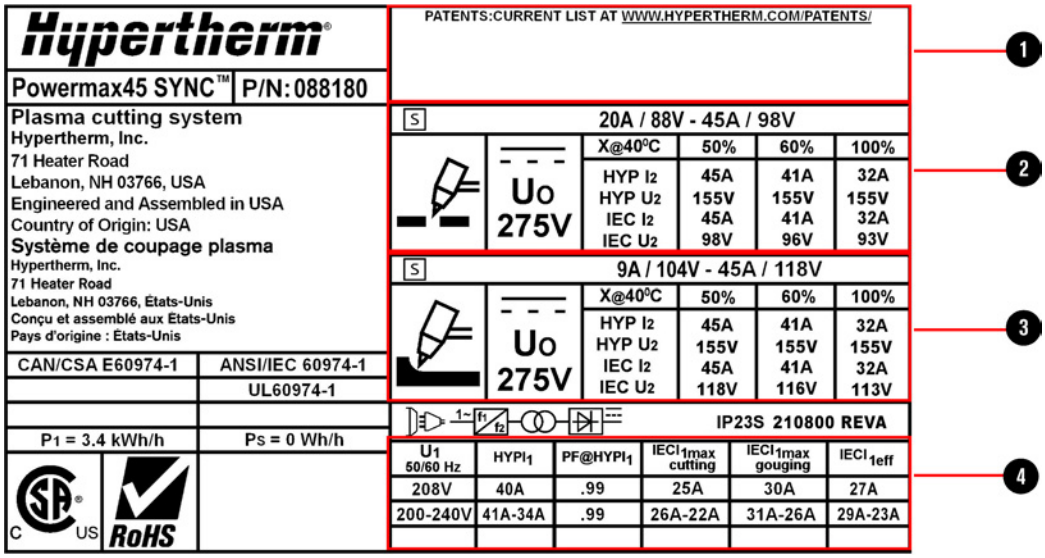
System specifications on the data plate

The data plate on the plasma power supply shows two sets of ratings: one for the IEC and one for Hypertherm.

- The **HYP** ratings are Hypertherm plasma power supply ratings. They show the capability of the system related to the internal testing done by Hypertherm.
- The **IEC** ratings are the minimum ratings that the system must get to meet the requirements of IEC standard 60974-1.

CSA and CE/CCC data plates have small differences.

Figure 1 - CSA data plate example



1 Serial number, bar code, and date made

Figure 1 - CSA data plate example (continued)

2 Plasma cutting ratings

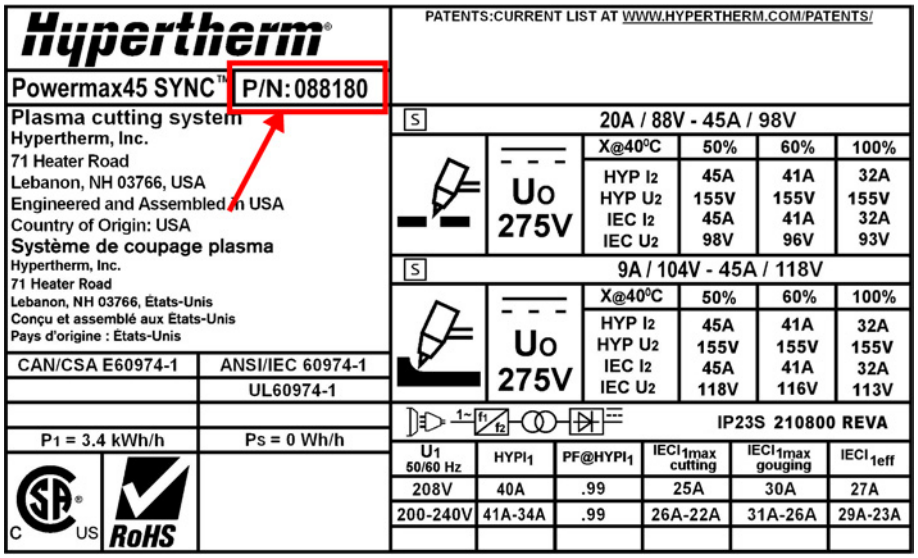
3 Plasma gouging ratings

4 Plasma power supply ratings

- **HYP:** Hypertherm internal rating
- **IEC:** IEC rating
- **I_1:** Input current (A)
- **I_2:** Conventional welding current (A)
- **PF:** Power factor
- **U_0:** Rated no load voltage
- **U_1:** Input voltage (V)
- **U_2:** Conventional welding voltage (V)
- **X:** Duty cycle (%)

Location of the system part number

The part number for your plasma power supply is near the top of the data plate.



Critical raw materials

Critical raw material	Components that contain more than 1 gram
Antimony	Torch leads
Bauxite	Heatsinks, metal covers
Borate	All printed circuit boards
Magnesium	Heatsinks, metal covers
Silicon metal	Heatsinks, metal covers
Strontium	Fans

Powermax45 SYNC China energy label

The Powermax45 SYNC plasma power supply can have a China energy label with energy-efficiency information.

1 Energy-efficiency rating: Level 1 is most efficient, level 3 is least efficient

2 Manufacturer name and plasma power supply model

3 Energy efficiency (%)

4 Rated output current, power factor under load, and no-load current

Table 1 - Energy-efficiency specifications for the Powermax45 SYNC plasma power supply

Input voltage	Efficiency rating	Efficiency (%)	Rated current (A)	Power factor under load	No-load current
220	3	78.5	45	/	/
380	2	86	45	0.85	/

Safety and EMC symbols and marks

You can see different safety and EMC symbols and marks on your system. Each image identifies a specific regional certification.

Your product may have one or more of the following marks on or near the data plate. Because of differences and conflicts in national regulations, not all marks are applied to every version of a product.

S mark

The S mark indicates that the power supply and torch are suitable for operations carried out in environments with increased hazard of electrical shock according to IEC 60974-1.

CSA mark

Products with a CSA mark meet the United States and Canadian regulations for product safety. The products were evaluated, tested, and certified by CSA-International. Alternatively, the product may have a mark by one of the other Nationally Recognized Testing Laboratories (NRTL) accredited in both the United States and Canada, such as UL or TÜV.

CE mark

The CE marking signifies the manufacturer's declaration of conformity to applicable European directives and standards. Only those versions of products with a CE marking located on or near the data plate comply with European Directives. Applicable directives may include the European Low Voltage Directive, the European Electromagnetic Compatibility (EMC) Directive, the Radio Equipment Directive (RED), and the Restriction of Hazardous Substances (RoHS) Directive. See the European CE Declaration of Conformity for details.

Eurasian Customs Union (CU) mark

CE versions of products that include an EAC mark of conformity meet the product safety and EMC requirements for export to Russia, Belarus, and Kazakhstan.

GOST-TR mark

CE versions of products that include a GOST-TR mark of conformity meet the product safety and EMC requirements for export to the Russian Federation.

RCM mark

CE versions of products with an RCM mark comply with the EMC and safety regulations required for sale in Australia and New Zealand.

CCC mark

The China Compulsory Certification (CCC) mark indicates that the product has been tested and found compliant with product safety regulations required for sale in China.

UkrSEPRO mark

The CE versions of products that include a UkrSEPRO mark of conformity meet the product safety and EMC requirements for export to the Ukraine.

Serbian AAA mark

CE versions of products that include a AAA Serbian mark meet the product safety and EMC requirements for export to Serbia.

RoHS mark

The RoHS mark indicates that the product meets the requirements of the European Restriction of Hazardous Substances (RoHS) Directive.

United Kingdom Conformity Assessed mark

CE versions of products that include a UKCA mark of conformity meet the product safety, EMC, RF, and RoHS requirements for export to the UK.

IEC symbols

You can see different IEC symbols on the system. Each image has a specific meaning in the context of operating a plasma cutting system.

The following symbols can appear on the data plate, control labels, and switches.

Direct current (DC)

Alternating current (AC)

Plasma torch cutting

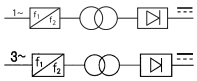
Gouging

AC input power connection

The terminal for the external protective (earth) (PE) conductor

Power is ON

Power is OFF



A 1-phase or 3-phase inverter-based power source

Volt/amperage curve, “drooping” characteristic

Acoustical noise levels

This plasma system can make more than the permitted acoustical noise levels as defined by national and local codes. Always put on correct ear protection when cutting or gouging. Any acoustical noise measurements taken are related to the specific environment in which the system is used. Refer to *Noise can damage hearing* in the *Safety and Compliance Manual (80669C)*.

In addition, you can find an *Acoustical Noise Data Sheet* for your system at www.hypertherm.com/docs. In the search box, enter `data sheet`.

Radio Frequency Identification (RFID) specifications

The Hypertherm Radio Frequency Identification (RFID) near-field wireless communication system contains these components:

- A passive RFID tag in the Hypertherm cartridge
- A wireless radio transceiver on the Printed Circuit Board (PCB) in the SmartSYNC torch:
  - Operating frequency: 13.56 MHz
  - Protocol: ISO/IEC 15693
  - Maximum range: 8 mm (0.32 inch)
  - Maximum transmit power: 104 mW

Cutting specifications

Recommended cut capacity

Cut speed	Material thickness
500 mm/min (20 inches per minute [in/min]) [1]	16 mm (5/8 inch)
250 mm/min (10 in/min) [1]	22 mm (7/8 inch)
125 mm/min (5 in/min) [1] – severance capacity	29 mm (1-1/8 inch)

1 Cut capacity speeds are not necessarily maximum speeds. They are the speeds at which the plasma power supply is rated to cut that thickness.

Pierce capacity

Torch type	Material thickness
Handheld	12 mm (1/2 inch)

Maximum cut speeds (mild steel)

Maximum cut speeds are the results of laboratory testing done by Hypertherm. Actual cutting speeds may be different for different cutting applications.

Material thickness	Maximum cut speed
6 mm (1/4 inch)	2286 mm/min (90 in/min)
9 mm (3/8 inch)	1219 mm/min (48 in/min)
12 mm (1/2 inch)	762 mm/min (30 in/min)
16 mm (5/8 inch)	508 mm/min (20 in/min)
19 mm (3/4 inch)	330 mm/min (13 in/min)
25 mm (1 inch)	178 mm/min (7 in/min)

Gouge capacity (mild steel)

Process	Output current	Metal removal rate
Maximum removal gouging (26 A – 45 A)	45 A	3.4 kg/hour (7.5 lb/hour)

Correct position for the plasma power supply

Make sure that the plasma power supply is in a safe position and location before you operate the cutting system.

WARNING

CHANCE OF ELECTRIC SHOCK

Electric shock can cause serious injury.

Never cut under water or put the torch in water.

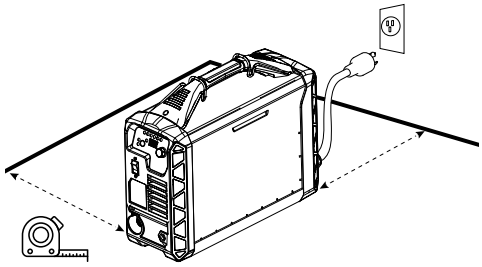
⚠ WARNING

TOXIC FUMES CAN CAUSE INJURY OR DEATH

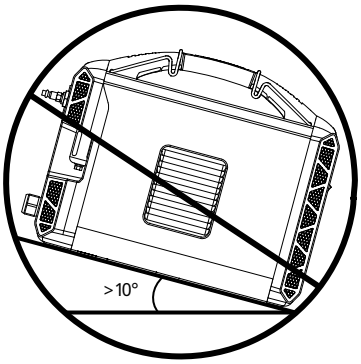
Some metals, including stainless steel, can release toxic fumes when cut.

Make sure that your work site has sufficient ventilation to make sure that the air quality level complies with all local and national standards and regulations. Refer to the *Safety and Compliance Manual (80669C)* for more information.

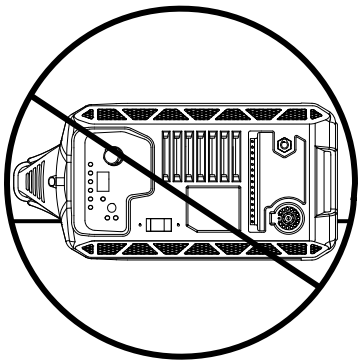
- Do not use the system in rain or snow.
- Put the plasma power supply near the line-disconnect switch or near an approved power receptacle for your installation.
- Keep at least 0.25 m (10 inches) of space around the plasma power supply for sufficient ventilation.



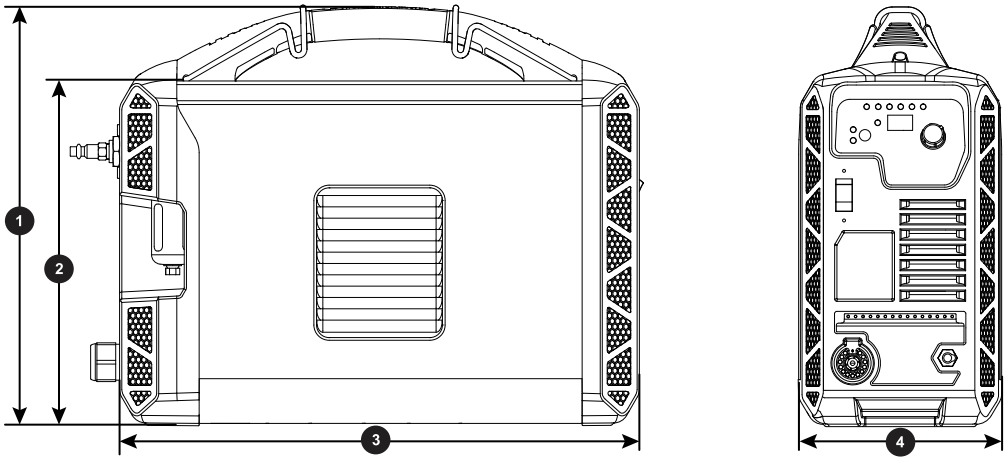
- Put the plasma power supply on a stable, level surface before you use it. The plasma power supply can fall over if it is set at an angle greater than 10°.



- Do not put the plasma power supply on its side. Doing so can cause a blockage of the air circulation necessary to keep internal components cool.



Plasma power supply dimensions and weight



1 357 mm (14.1 inches)

2 312 mm (12.3 inches)

3 443 mm (17.4 inches)

4 173 mm (6.8 inches)

Model	Plasma power supply with power cord	Plasma power supply (and power cord) with 6.1 m (20 foot) hand torch and 7.6 m (25 foot) work lead
200 V – 240 V CSA	12 kg (26 lb)	14 kg (31 lb)
230 V CE/CCC	12 kg (26 lb)	15 kg (32 lb)
400 V CE/CCC	11 kg (25 lb)	14 kg (31 lb)
480 V CSA	11 kg (25 lb)	14 kg (31 lb)

Work lead weights

Work lead	Weight
Work clamp with 7.6 m (25 foot) work lead	1.2 kg (2.6 lb)
Work clamp with 15 m (50 foot) work lead	2.1 kg (4.7 lb)

For hand torch weights, refer to Hand torch weights on page 80. For machine torch weights, refer to the *Powermax45/65/85/105 SYNC Mechanized Cutting Guide (810480)*.

Connection requirements for electrical power

Use the Hypertherm input current ratings to determine conductor sizes for power connection and installation instructions.

The Hypertherm ratings are designated **HYP** on the data plate on the bottom of the plasma power supply. Use the higher HYP input current value for installation purposes. Refer to System specifications on the data plate on page 21 for a sample data plate.

NOTICE

MAKE SURE THAT CIRCUITS HAVE PROTECTION

Supply each circuit with appropriately sized time-delay fuses and a line-disconnect switch.

The maximum output voltage changes related to input voltage and the circuit's amperage. Because the current draw changes during startup, time-delay fuses are recommended. Time-delay fuses are resistant to currents up to 10 times the rated value for short periods of time.

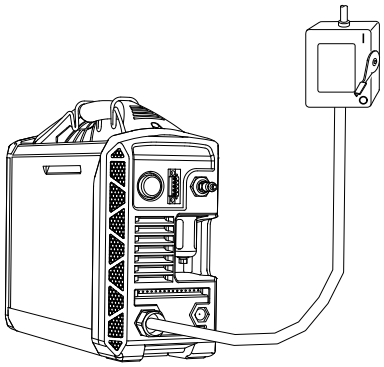
NOTICE

DO NOT USE PHASE CONVERTERS FOR 3-PHASE POWER

Do not use phase converters to supply 3-phase power to your Powermax plasma power supply.

The warranty from Hypertherm does not include system damage that is a result of unsatisfactory or defective power quality from phase converters or incoming line power.

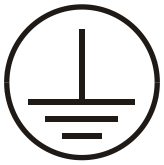
- Use a line-disconnect switch for each plasma power supply so that the operator can stop the incoming power quickly in an emergency.



- Put the switch in a location where the operator can get access easily. A licensed electrician must install the power switch according to national and local codes.
- The interrupt level of the switch must equal or be more than the continuous rating of the fuses.
- The switch must also do the following:
  - Isolate the electrical equipment and disconnect all live conductors from the incoming supply voltage when in the OFF position.
  - Have one OFF and one ON position that are clearly marked with **O** (OFF) and **I** (ON).
  - Have an external operating handle that can be locked in the OFF position.
  - Contain a power-operated mechanism that operates as an emergency stop.
  - Have approved time-delay fuses installed. Refer to Voltage configurations on page 33 for recommended fuse sizes.

Requirements for grounding

To make sure of personal safety and correct operation, and to decrease Electromagnetic Interference (EMI), the plasma power supply must be correctly grounded.



- The plasma power supply must be grounded through the power cord according to national and local electrical codes.
- 1-phase service must be of the 3-wire type with a green or green/yellow wire for the protective earth ground. 1-phase service must comply with national and local requirements. **Do not use a 2-wire service.**
- 3-phase service must be of the 4-wire type with a green or green/yellow wire for protective earth ground. 3-phase service must comply with national and local requirements.

Refer to the *Safety and Compliance Manual (80669C)* for more information about grounding.

For mechanized cutting systems, refer to *EMI grounding and shielding best practices* in the *Powermax45/65/85/105 SYNC Mechanized Cutting Guide (810480)*.

Rated output of the plasma power supply

Wattage output shows a plasma power supply's cutting power more than its amperage output.

Table 2 - Rates outputs for the plasma cutting system

Maximum output amperage	45 A
Maximum rated output voltage	155 VDC
Cutting power	6.9 kW

To calculate the cutting power in watts (W), multiply the maximum output amperage (A) by the maximum rated output voltage (VDC).

Example

45 A × 155 VDC = 6,975 W (6.9 kW)

Voltage configurations

The plasma power supply automatically adjusts for correct operation at the current input voltage. You do not have to change or rewire components. But there are tasks you must do for correct installation.

For correct installation of the plasma cutting system:

- Install the Hypertherm cartridge in the torch. Refer to Step 4 – Install the cartridge on page 49.
- Make sure that the output current (A) is correct for the cartridge that you installed. If necessary, turn the adjustment knob on the front panel to adjust the output current. Refer to Manual adjustments to gas pressure and current on page 59

To operate the plasma power supply at full output and at its rated duty cycle, you must make your electrical service the correct size. The tables that follow show the maximum rated output for typical input voltages. The output setting that you use relates to the thickness of the workpiece and the limit of the input power to the plasma power supply.

In certain applications, such as gouging, stretching the plasma arc is common. Using the recommended fuse sizes allows for spikes in input current during this process.

CSA/CE/CCC 200 V – 240 V (1-phase)

Input voltage at 50 Hz/60 Hz*	200 V – 240 V
Input current at rated output (45 A x 155 V = 6.9 kW)	40 A – 33 A
Input current during arc stretch	44 A – 36 A
Fuse (time-delay)	50 A
Voltage tolerance	+20% to -15%

CSA 208 V (1-phase)

Input voltage	208 V
Input current at rated output (45 A x 155 V = 6.9 kW)	37 A
Input current during arc stretch	43 A
Fuse (time-delay)	50 A
Voltage tolerance	+20% to -15%

CCC 220 V (1-phase)

Input voltage	220 V
Input current at rated output (45 A x 155 V = 6.9 kW)	35 A
Input current during arc stretch	39 A
Fuse (time-delay)	50 A
Voltage tolerance	+20% to -15%

CE 230 V (1-phase)

Input voltage	230 V
Input current at rated output (45 A x 155 V = 6.9 kW)	34 A
Input current during arc stretch	37 A
Fuse (time-delay)	48 A
Voltage tolerance	+20% to -15%

CCC 380 V (3-phase)

Input voltage	380 V
Input current at rated output (45 A x 145 V = 6.5 kW)	13 A
Input current during arc stretch	15 A – 20 A
Fuse (time-delay)	20 A
Voltage tolerance	+20% to -15%

CE 400 V (3-phase)

Input voltage	400 V
Input current at rated output (45 A x 145 V = 6.5 kW)	12 A
Input current during arc stretch	15 A – 20 A
Fuse (time-delay)	20 A
Voltage tolerance	+20% to -15%

CSA 480 V (3-phase)

Input voltage	480 V
Input current at rated output (45 A x 145 V = 6.5 kW)	10 A
Input current during arc stretch	12 A – 17 A
Fuse (time-delay)	20 A
Voltage tolerance	+20% to -15%

Low rated electrical power source considerations

Make sure that the electrical service is the correct size to operate the plasma power supply at full output and at its rated duty cycle.

If you operate the plasma power supply on an electrical service that is rated lower than what is recommended in Voltage configurations on page 33, it can be necessary to:

- Decrease the cutting current (amperage setting).
- Decrease plasma arc stretch. The more you stretch the plasma arc, the more current the system pulls and the more likely you are to overheat the system or trip the circuit breaker.

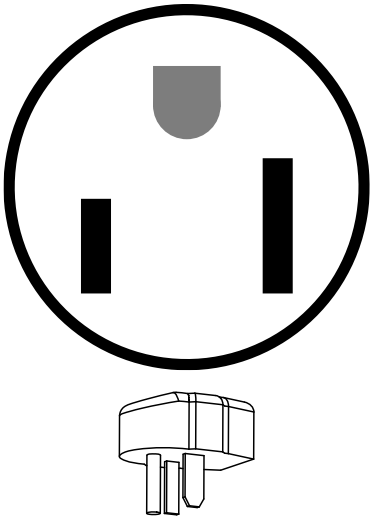
Example

If you use a 1-phase system with an input voltage of 230 V on a 20 A breaker, the recommended output current is 19 A.

Input voltage	230 V
Input current at rated output (19 A x 155 V = 2.9 kW)	18 A
Input current during arc stretch	19 A
Voltage tolerance	+20% to -15%

Power cord and plug requirements

Table 3 - CSA systems

Model	Configurations	Power cord	Power plug
1-phase	200 V – 240 V	10 AWG 3-wire	50 A, 250 V power plug (NEMA 6-50P) included 
3-phase	480 V	14 AWG 4-wire	Power plug not included [1]

1 An approved plug must be installed on the power cord by a licensed electrician according to all national and local codes.

Table 4 - CE/CCC systems

Model	Configurations	Power cord	Power plug
1-phase	200 V – 240 V	10 AWG 3-wire	Power plug not included [1]
		6 mm^2 3-wire style H07RN-F [2]	
3-phase	380 V / 400 V	2.5 mm^2 4-wire style H07RN-F [3]	Power plug not included

1 An approved plug must be installed on the power cord by a licensed electrician according to all national and local codes.

2 Style H07RN-F cord is a harmonized, heavy-duty, flexible, rubber-insulated, black-neoprene-jacketed multi-conductor IEC60245-4 / EN50525 European power cord with **CE** printed on the cord. The H07RN-F cord used by Hypertherm also has a CCC certification to GB/T 5013.4, with **CCC** printed on the cord.

Extension cord recommendations

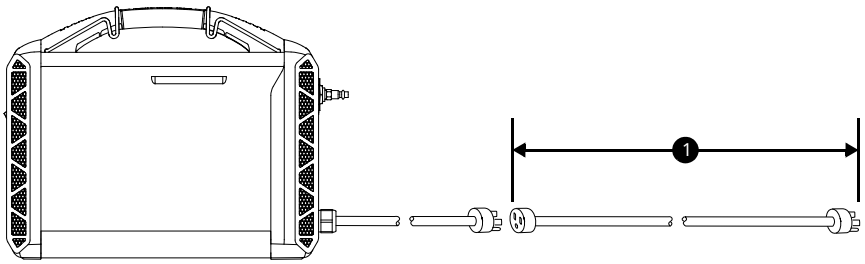
The recommended extension cord to use is different for different cord lengths and input voltages.

Use an extension cord that meets these requirements:

- Wire gauge is approved for the cord length and plasma power supply voltage
- Complies with national and local codes

Extension cords can cause the plasma power supply to receive less input voltage than the output of the circuit. This can limit the cut capacity of your plasma power supply.

This table gives the recommended gauge sizes for different cord lengths and input voltages.



Input voltage	Phase	Cord Length	Cord Gauge
200 VAC – 240 VAC	1	up to 15 m (50 feet)	10 mm^2 (8 AWG)
		15 m – 30 m (50 feet – 100 feet)	16 mm^2 (6 AWG)
		30 m – 45 m (100 feet – 150 feet)	25 mm^2 (4 AWG)
380 VAC – 480 VAC	3	up to 15 m (50 feet)	4 mm^2 (12 AWG)
		15 m – 45 m (50 feet – 150 feet)	6 mm^2 (10 AWG)

Generator considerations

There are various considerations when you use a generator.

- Only use a generator that meets the requirements for Hypertherm cutting systems. Refer to Hypertherm plasma power supply ratings on page 19.
- Adjust the output current (A) if necessary related to the rating, age, and condition of the generator.
- A 10 kW generator is recommended for cutting when a full arc stretch is necessary, such as for many gouging applications. These generators let spikes in input current occur when you stretch the plasma arc.
- If a fault occurs, set the power switch on the plasma power supply to OFF (**O**). Wait approximately one minute before you set the power switch to ON (**I**).

Generators used with this system must meet the voltage requirements in this table.

Engine drive rating	Plasma power supply output current	Performance (arc stretch)
10 kW	45 A	Full
8 kW	45 A	Limited
6 kW	30 A	Full

Adapter for 4-wire 1-phase connections (CSA 1-phase models only)

A 4-wire 1-phase connection (for example, NEMA 14-50R) is necessary for some generators.

If you must use a 4-wire 1-phase connection, use an adapter to connect the plasma power supply's 3-wire power cord plug (NEMA 6-50P) to the 4-wire connector on the generator. Refer to Power cord and plug requirements on page 36 for more information.

Connect the gas supply

Before you begin:

WARNING

EXPLOSION HAZARD

The air filter bowl in the plasma power supply can explode if the gas pressure is more than 9.3 bar (135 psi).

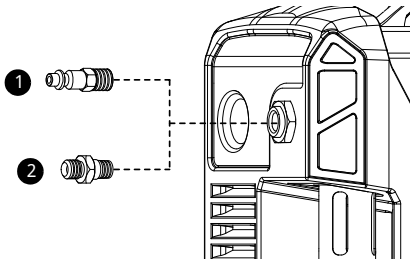
Never use more than the maximum gas pressure of 9.3 bar (135 psi).

NOTICE

PTFE TAPE CAN CAUSE CLOGGED VALVES, REGULATORS, AND TORCHES

Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male thread ends.

1. Make sure that the correct gas inlet fitting is installed.
   - ☐ CSA models come with an industrial interchange quick-disconnect nipple with 1/4 NPT threads. Tighten the fitting to 11.3 N·m (100 lbf·in). The fitting comes with thread sealant applied.
   - ☐ CE/CCC models come with a British Pipe Thread adapter G-1/4 BSPP with 1/4 NPT threads. Tighten the adapter to 10.2 N·m (90 lbf·in).

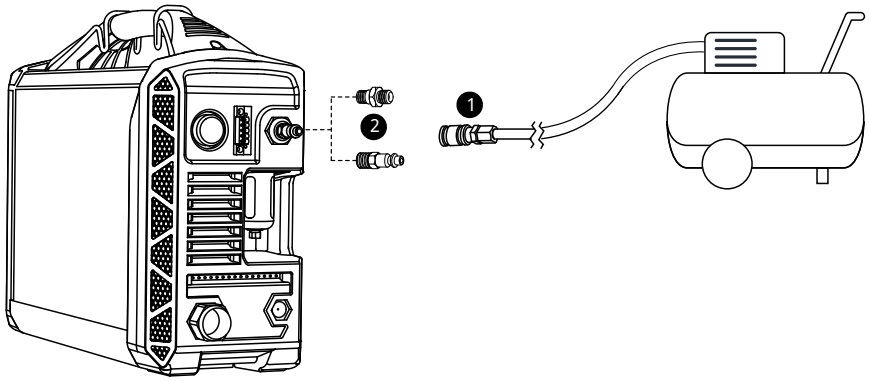


1 Quick disconnect nipple

2 British pipe thread adapter

2. Get an inert-gas hose with the correct internal diameter.
   - For hoses that are less than 15 m (50 feet), use an internal diameter of 10 mm (3/8 inch) or greater.
   - For hoses that are 15 m – 30 m (50 feet – 100 feet), use an internal diameter of 13 mm (1/2 inch) or greater.
   - **Do not use hoses with an internal diameter less than 10 mm (3/8 inch).** Hoses that are too small can cause problems with cut quality and cut performance.
3. Connect the gas hose to the gas inlet fitting.

   Refer to Inlet gas pressure requirements (while gas is flowing).



1 Gas hose

2 Gas inlet fitting

Gas supply source

Hypertherm recommends that air compressors supply air that complies with the requirements of *ISO Standard 8573-1:2010 Class 1.4.2*.

Any air compressors that supply air to the cutting system must have filtration to remove oil.

Table 5 - Recommended requirements from ISO Standard 8573-1:2010 Class 1.4.2

Maximum particle count in 1.0 m^3:	▪ 20,000 at 0.1 microns – 0.5 microns ▪ 400 at 0.5 microns – 1.0 microns ▪ 10 at 1.0 microns – 5.0 microns
Maximum water vapor pressure dew-point:	3°C (37°F) [1]
Maximum oil concentration:	0.1 mg/m^3 (for aerosol, liquid, and vapor)

1 Speak to your air compressor manufacturer if you operate the cutting system in temperatures colder than 3°C (37°F) or if you are unsure that the air compressor can comply with the International Organization for Standardization (ISO) standard for air quality.

NOTICE

DIRTY, OILY AIR CAN CAUSE DAMAGE TO THE AIR FILTER BOWL

Some air compressors use synthetic lubricants that contain esters. Esters can cause damage to the polycarbonates in the air filter bowl.

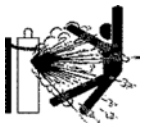
Add more gas filtration if necessary.

- Use shop-compressed gas or cylinder-compressed gas.
- Use a high-pressure regulator on either type of gas supply. The regulator must be able to supply gas to the air inlet on the plasma power supply at the specified flow rate and specified pressure.
- **Use only clean, moisture-free gas.**
- Oil, water, vapor, and other contaminants in the gas supply can cause damage to internal components over time.
- Poor gas supply quality causes:
  - Decreased cut quality and cut speeds
  - Decreased cut thickness capability
  - Decreased consumable life

To correct these problems, use an optional air filtration system. Refer to Add more gas filtration on page 44.

High-pressure gas cylinders

⚠ WARNING



GAS CYLINDERS CAN EXPLODE IF THEY HAVE DAMAGE

Gas cylinders contain gas under high pressure. If a cylinder has damage, it can explode.

For high pressure regulators, comply with the manufacturer's guidelines for safe installation, operation, and maintenance.

Before operating a plasma power supply with compressed gas, read the safety instructions in the *Safety and Compliance Manual (80669C)*. If you do not comply with these safety instructions, personal injury or equipment damage can occur.

⚠ WARNING

EXPLOSION HAZARD – CUTTING WITH FLAMMABLE OR OXIDIZING GASES

Flammable and oxidizing gases can cause explosive conditions during plasma cutting operations.

Do not use flammable or oxidizing gases with Powermax systems.

An example of an oxidizing gas is oxygen. Examples of flammable gases are acetylene, propylene, methane, and pure hydrogen. Refer to the *Safety and Compliance Manual (80669C)*.

You can use these gases to cut with this plasma power supply. Refer to Hypertherm plasma power supply ratings on page 19 for requirements on gas quality. **Do NOT use oxygen to cut with Powermax® systems.**

- Compressed air
- Nitrogen
- F5 (stainless steel only)

If you use high-pressure gas cylinders as the gas supply:

- Refer to the manufacturer's specifications for installation and maintenance procedures of high-pressure regulators.

- Make sure that the cylinder has an adjustable high-pressure regulator with the following capabilities:
  - Gas outlet pressures up to 9.3 bar (135 psi). **Never use more than the maximum gas pressure of 9.3 bar (135 psi).**
  - Gas flow rate of 210 slpm (450 scfh)
- Make sure that the cylinder valves are clean and free of oil, grease, and other contaminants. Open each cylinder valve just long enough to blow out any dust that is possibly present.
- Connect the supply hose correctly to the cylinder.
- Comply with inlet gas pressure requirements (while gas is flowing).

Maximum inlet pressure

Never use more than the maximum gas pressure of 9.3 bar (135 psi).

WARNING

EXPLOSION HAZARD

The air filter bowl in the plasma power supply can explode if the gas pressure is more than 9.3 bar (135 psi).

Never use more than the maximum gas pressure of 9.3 bar (135 psi).

For optimum system performance, make sure that the inlet gas pressure stays between 7.6 bar – 8.3 bar (110 psi – 120 psi) while gas is flowing.

Minimum inlet pressure and gas flow rate

Make sure that your worksite complies with the minimum gas flow rate and inlet gas pressure requirements for the cutting, gouging, and marking processes.

Process	Minimum gas flow rate and inlet pressure
Cutting (20 A – 45 A)	212.4 slpm (450 scfh) at 5.9 bar (85 psi)
Gouging (20 A – 45 A)	212.4 slpm (450 scfh) at 4.8 bar (70 psi)
FineCut Marking (9 A – 19 A)	141.6 slpm (300 scfh) at 4.1 bar (60 psi)

You can adjust these pressures for different conditions that are specific to your environment.

Additional gas filtration installed between the gas supply and the plasma power supply can have an effect on gas pressure and gas flow. Speak to the filter manufacturer about gas pressure requirements.

Hypertherm recommends that you install an inline pressure gauge at the gas inlet on the rear of the plasma power supply. Use this gauge to monitor the gas pressure at the plasma power supply, after all external filtration.

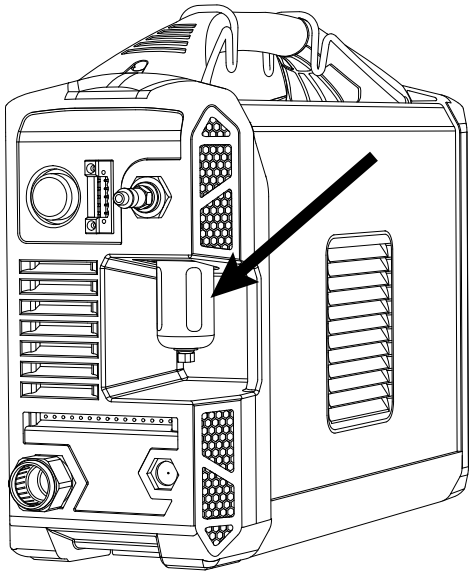
Add more gas filtration

Add additional, external filtration if necessary to keep a clean, dry gas line.

It is extremely important to keep a clean, dry gas line to:

- Prevent oil, water, dirt, and other contaminants from causing damage to internal components.
- Get optimal cut quality and consumable life.

Dirty, oily air is the root cause of many common problems that occur in Powermax systems. In some conditions it can void the warranty on the plasma power supply and on the torch. Refer to the gas quality recommendations in the ratings tables that start on Hypertherm plasma power supply ratings on page 19.

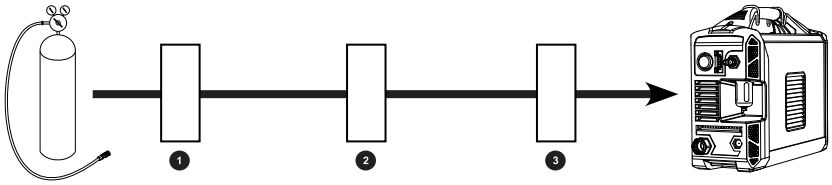


The plasma power supply contains a built-in air filter. Regularly do a check of the filter element inside the air filter bowl and replace it as necessary. Refer to Maintenance for the air filter bowl and filter element on page 139.

The built-in air filter does not take the place of sufficient external filtration. Install an external filtration system if:

- You work in an environment that is very warm and humid.
- Your work site conditions introduce oil, vapors, or other contaminants into the gas line.

A 3-stage coalescing filtration system is recommended. A 3-stage filtering system works as follows to clean contaminants from the gas supply.



1 Water and particle filter

2 Oil filter

3 Oil vapor filter

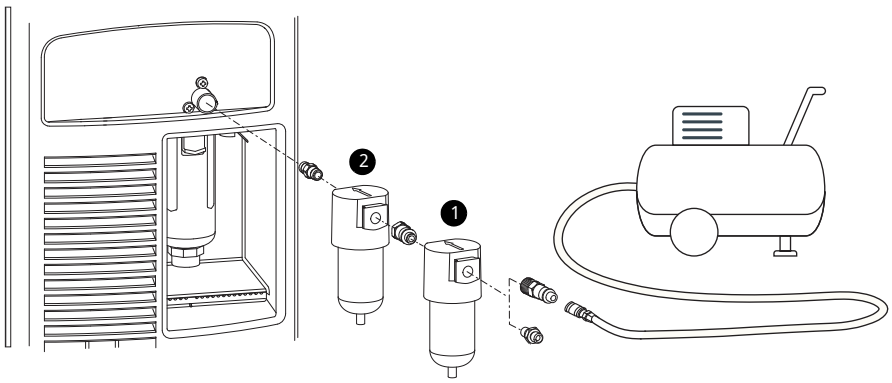
The filtering system must be installed between the gas supply and the plasma power supply.

Additional gas filtration can make higher pressure from the gas supply necessary. For the recommended gas inlet flow rate and pressure, refer to Inlet gas pressure requirements (while gas is flowing). Hypertherm offers the following optional external filter kits:

- Kit 128647: The Eliminizer moisture removal air filter removes water and dirt from the gas supply. For more information, refer to the *Optional Air Filter Kit and Element Replacement Procedure Field Service Bulletin (804180)*.
- Kit 428719: The oil removal air filter removes oil, oil aerosols, and dirt from the gas supply. For more information, refer to the *Optional Oil Removal Air Filter Kit and Element Replacement Field Service Bulletin (809610)*.

If you use both external filters, install them in the order shown to prevent damage to the gas line and equipment.

Figure 2 - Optional Hypertherm external filters



1 Eliminizer moisture removal air filter

2 Oil removal air filter

3 Operate the Plasma System

Step 1 – Make sure that power and gas is connected

1. Make sure that the power cord for the plasma power supply is correctly connected to electrical power source according to national and local codes.

   Refer to:

   - ☐ Connection requirements for electrical power on page 31
   - ☐ Power cord and plug requirements on page 36

2. Connect the gas supply line to the fitting on the rear of the plasma power supply.

   Refer to:

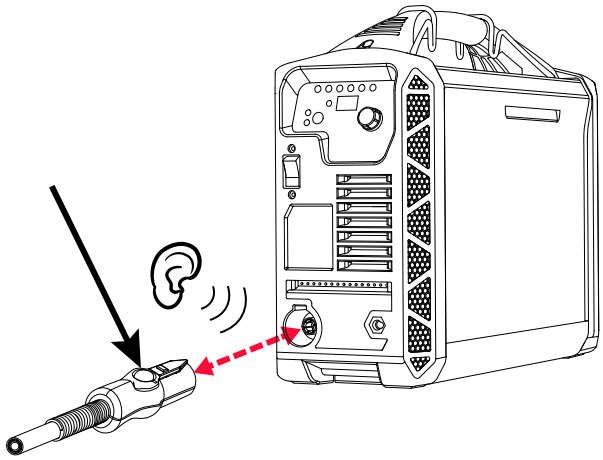
   - ☐ Connect the gas supply on page 39
   - ☐ Inlet gas pressure requirements (while gas is flowing)

Step 2 – Connect the torch lead

1. Always set the power switch on the plasma power supply to OFF (**O**) before you connect or disconnect a torch.
2. To connect a hand torch or machine torch, push the connector into the receptacle on the front of the plasma power supply.

   The connector makes a click when it is fully engaged.

3. To disconnect the torch, push the red button on the connector and pull the connector out of the receptacle.



Step 3 – Connect the work lead and work clamp

Before you begin:

NOTICE
INCORRECT WORK LEADS CAN CAUSE AN UNSTABLE PLASMA ARC Work leads are approved for specified amperages, lengths, and connectors. Make sure that you use a work lead that is approved for your plasma power supply. Refer to the *Powermax45/65/85/105 SYNC Parts Guide (810490)*. The amperage of a work lead is identified near the rubber boot of the work lead connector.

NOTICE
LOOSE WORK LEADS CAN OVERHEAT When you move the work lead or the plasma power supply, examine the work lead connector to make sure that it is fully and tightly connected to the plasma power supply.

NOTICE

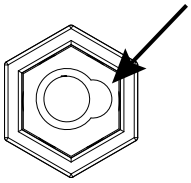
CORRECTLY ATTACH THE WORK CLAMP

Do not attach the work clamp under water. If the plasma power supply is below the work clamp, water can get into the plasma power supply through the work lead and cause much damage.

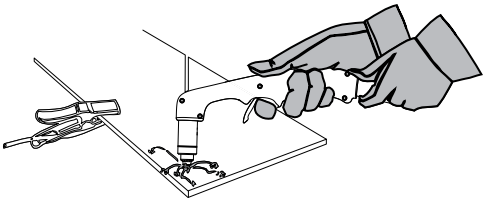
Do not attach the work clamp to the part of the workpiece to be cut away.

1. Put the work lead connector in the receptacle on the front of the plasma power supply.

   Align the key on the connector with the opening in the receptacle.



2. Turn the connector clockwise approximately 1/4 turn until the connector is fully engaged and locked in position.
3. Remove rust, dirt, paint, coatings, and other debris from the workpiece so that the work clamp makes sufficient contact with the workpiece or cutting table.
4. Attach the work clamp as close as possible to the area being cut, and make sure that the work clamp makes good metal-to-metal contact with the workpiece or cutting table.



- ☐ **Hand cutting:** The work clamp must be connected to the workpiece that you are cutting.
- ☐ **Mechanized cutting:** If you are using this plasma power supply with a mechanized cutting system, you can connect the work clamp directly to the cutting table or to the workpiece you are cutting. Refer to your equipment manufacturer's instructions.

Step 4 – Install the cartridge

Install the correct cartridge for the cutting that you want to do. Unlock the torch to fire a plasma arc.

SmartSYNC torches include a switch that lets you lock the torch. This torch-lock switch prevents the torch from firing accidentally, even when the plasma power supply is ON. Cartridges are not preinstalled on new torches.

Use this switch to lock the torch when:

- The torch is not in use
- You change the Hypertherm cartridge
- You move the plasma power supply or torch while the plasma power supply is ON

Before you begin:

WARNING

INSTANT-ON TORCHES – PLASMA ARC CAN CAUSE INJURY, BURNS

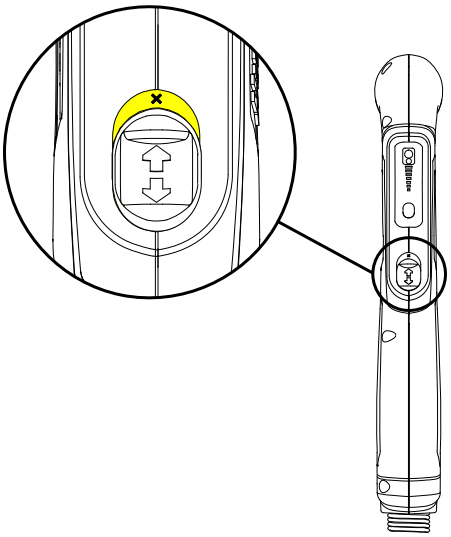
Ignition of the plasma arc occurs immediately when you pull the torch trigger. Before changing the cartridge, one of the following steps is necessary. Whenever possible, complete the first step.

Set the power switch on the plasma power supply to OFF (**O**).

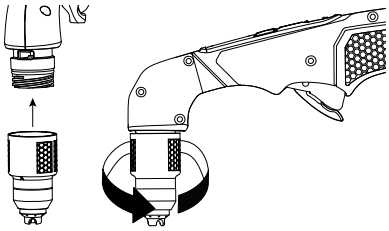
OR

Move the torch-lock switch to the yellow lock (**X**) position. Pull the trigger to make sure that the torch does not fire a plasma arc.

1. Make sure that the power switch on the plasma power supply stays OFF (**O**).
2. Make sure that the torch-lock switch on the torch is set to the yellow lock (**X**) position.



3. If this is a new torch, remove the vinyl cap from the torch.
4. Select the correct Hypertherm cartridge for your cutting or gouging application.
5. Place the cartridge on the torch, and tighten it 1/4 of a turn to install it.



The Torch Cap Light Emitting Diode (LED) on the front panel comes on when you remove the consumables or set the torch-disable switch to the yellow lock (**X**) position while the plasma power supply is still ON. The LED extinguishes after you install the consumables and set the torch-disable switch to the green "ready to fire" position.

Cut expanded metal

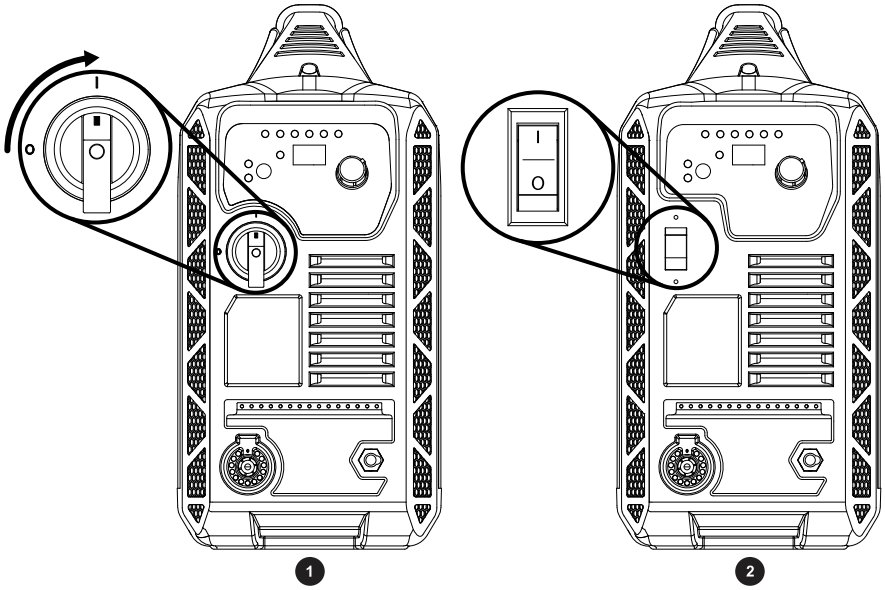
Expanded metal has a slotted or mesh pattern.

To cut expanded metal, install a Hypertherm cutting cartridge. The system does not use a dedicated mode for cutting expanded metal.

Cutting expanded metal causes cartridges to wear more quickly because a continuous pilot arc is necessary. A pilot arc occurs when the torch is fired but the plasma arc is not in contact with the workpiece.

Step 5 – Set the power switch to ON (I)

1. Set the power switch on the front panel of the plasma power supply to ON (**I**).



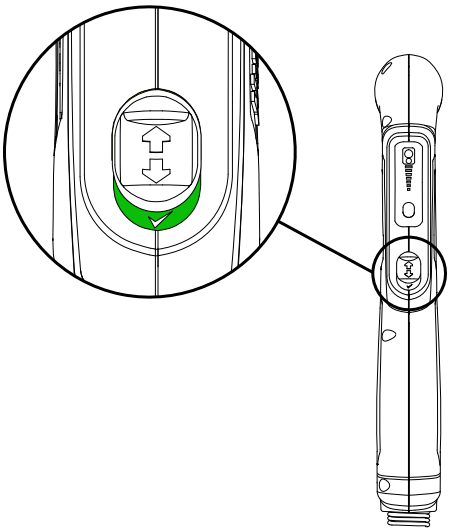
1 400 V, 480 V

2 200 V – 240 V

2. If the torch-lock switch is set to the green "ready to fire" position when you set the power switch to ON, the hand torch puts out a puff of air.
3. If the torch-lock switch is set to the yellow lock (**X**) position when you set the power switch to ON, the Torch Cap LED on the front panel comes on.

Step 6 – Unlock the SmartSYNC torch

1. Move the torch-lock switch to the green "ready to fire" position.



2. Pull the torch trigger one time to get the warning puffs of air.

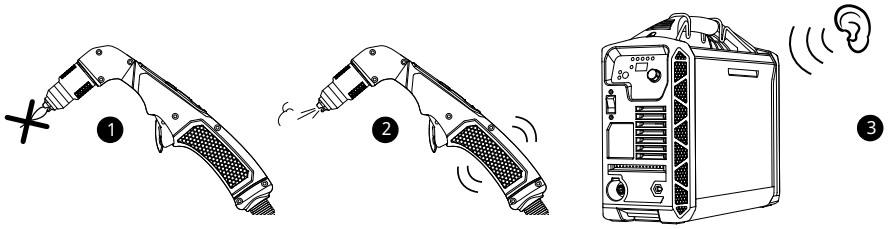
   Refer to Warning puffs of air on page 53.

3. When the warning puffs of air stop, the torch is prepared to fire a plasma arc.

If you see a fault code and fault icon on the control panel, remove the fault condition before you continue. Refer to Fault icons and fault codes on page 106.

Warning puffs of air

The following happens on SmartSYNC hand torches the first time that you try to fire the torch after moving the torch-lock switch to the yellow lock (**X**) position and then back to the green "ready to fire" position:



1 The plasma arc does not fire.

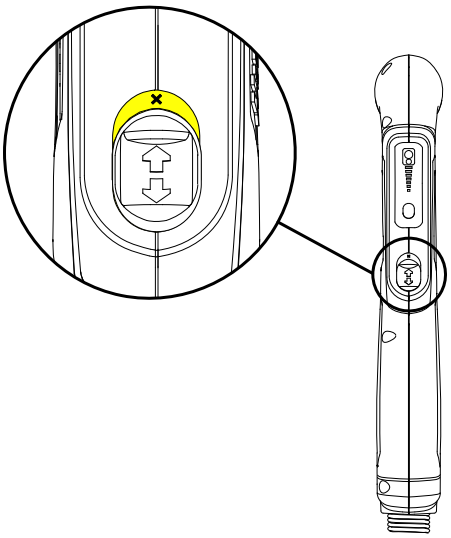
2 The torch quickly puts out multiple puffs of air. You can feel a light tap in the torch handle with each puff of air.

3 The plasma power supply makes a pressure-release sound that you can hear with each puff of air.

This feedback is a warning. It does not identify a fault condition. **It tells you that the torch is unlocked and will fire a plasma arc the next time that you pull the trigger.**

Change a cartridge

1. Move the torch-lock switch to the yellow lock (**X**) position.

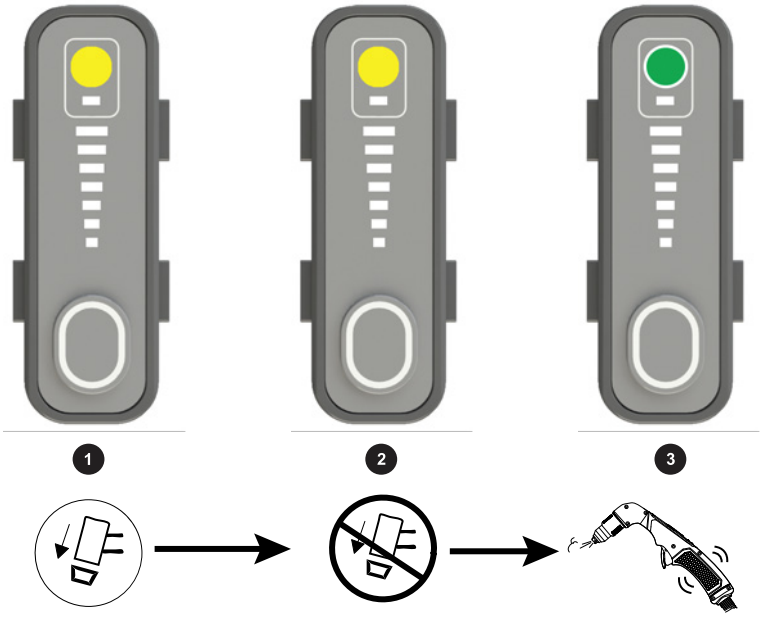


2. Remove the cartridge and install a new one.

   Refer to Step 4 – Install the cartridge on page 49.

3. Move the torch-lock switch to the green "ready to fire" position.
4. Pull the torch trigger one time to get the warning puffs of air.

LED behavior during a cartridge change



On the plasma power supply:

1 (Yellow)	When you set the torch-lock switch to the yellow lock (**X**) position while the plasma power supply is ON, the Torch Cap LED on the front panel illuminates and a 0-50-2 code shows.
2 (Yellow)	After you install the cartridge and set the torch-lock switch to the green "ready to fire" position, the Torch Cap LED extinguishes.
3 (Green)	**Hand torch:** After the torch puts out the warning puffs of air, the 0-50-2 code extinguishes.

Step 7 – Use the SmartSYNC hand torch

Use the correct system settings, cartridges, and methods to cut and gouge:

- Refer to Hand torch description on page 65.
- Refer to Gouging cartridges for the hand torch on page 81.

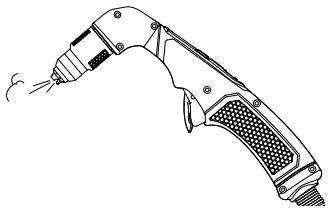
What occurs during and after cutting

Postflow

After you complete a cut and release the torch trigger, air continues to flow from the torch to decrease the temperature of the cartridge. This is referred to as *postflow*.

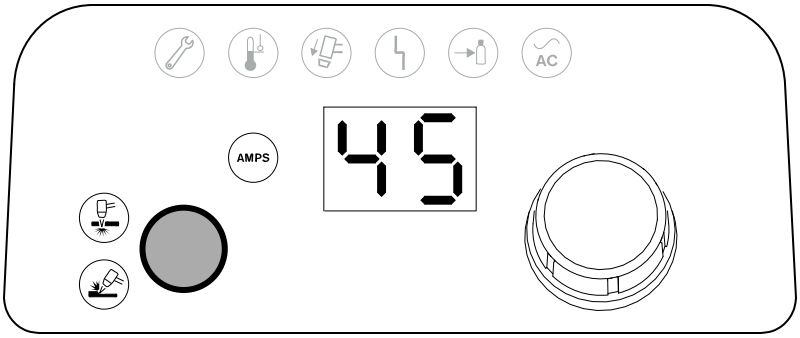
Fan activity

The cooling fan inside the plasma power supply automatically comes on as necessary during and after cutting to decrease the temperature of internal components.



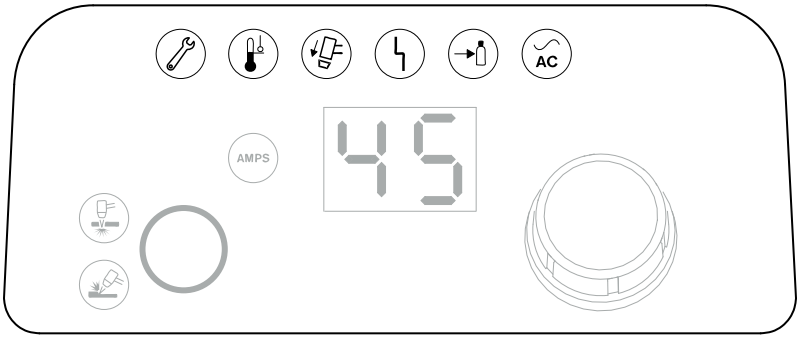
Controls and indicators on the plasma power supply

Cutting and gouging controls



	Mode button Push this button to toggle between cut mode and gouge mode. The system automatically adjusts the gas pressure to align with: ▪ The mode selected ▪ The torch connected to the plasma power supply ▪ The length of the torch lead
	Cut Mode LED (green) When illuminated, this LED identifies that the system is ready to perform plasma cutting operations.
	Gouge Mode LED (green) When illuminated, this LED identifies that the system is ready to perform plasma gouging operations.
45	**2-digit display** This display shows the output current by default. When some system faults occur, this display shows a fault code. Refer to Fault icons and fault codes on page 106. If you manually adjust system settings, such as the gas pressure for example, this display shows this information. Refer to Manual adjustments to gas pressure and current on page 59.
AMPS	**AMPS LED (green)** When illuminated, this LED identifies that the 2-digit display shows the cutting current (amperage). When the 2-digit display shows other values, such as gas pressure or a fault code, the AMPS LED is not illuminated.
– +	**Adjustment knob** Use this knob to set the cutting current between 9 A and 45 A in 1-unit increments. You can also use this knob to increase or decrease the gas pressure.

Indicator LEDs

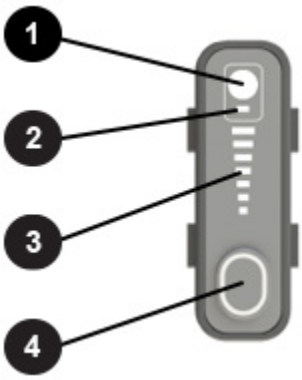


AC	**Power ON LED (green)** When illuminated, this LED identifies that the power switch is set to ON (**I**) and the system is ready to cut.
	Gas Pressure LED (yellow) When illuminated, this fault LED identifies that the inlet gas pressure is too low or that there is no inlet gas connection. Refer to Fault icons and fault codes on page 106.
	System Fault LED (yellow) When illuminated, this fault LED identifies that there is a fault with the plasma power supply. In many instances, when this LED illuminates, a fault code also flashes on the 2-digit display. Refer to Fault icons and fault codes on page 106.
	Torch Cap LED (yellow) When illuminated, this fault LED identifies that the consumables are loose, incorrectly installed, or missing. Refer to Fault icons and fault codes on page 106.
	Temperature LED (yellow) When illuminated, this fault LED identifies that the system's temperature is outside the permitted operating range. Refer to Fault icons and fault codes on page 106.
	Service LED This LED is used by qualified service technicians for troubleshooting the plasma power supply.

Some fault conditions cause more than one LED to illuminate or flash at the same time. For information on what these fault conditions are and how to clear them, refer to Fault icons and fault codes on page 106.

Controls and indicators on the hand torch

The SmartSYNC torch has a status indicator LED.



1 Status indicator LED

2 **LED OFF** = System is in Cut mode

LED ON = System is in Gouge mode

3 Power output level

4 Current adjustment switch

Table 6 - Status LED colors

LED color	Meaning
	Green = Prepared to cut.
	Yellow = Torch is locked.
	Red = An internal system component is possibly faulty.

Manual adjustments to gas pressure and current

The plasma power supply automatically sets the gas pressure and current to align with the Hypertherm cartridge type, operating mode, the torch type, and the length of the torch lead.

You can adjust the output current, the gas pressure, or both manually if necessary.

Changing the operating settings from their defaults is recommended only for experienced operators.

- The plasma power supply keeps the manual settings until you install a different type of Hypertherm cartridge or you install a different torch.

- If you manually set the operating settings and then replace the Hypertherm cartridge with a new cartridge of the same type, the plasma power supply keeps your settings.

  A **type** of Hypertherm cartridge refers to the cartridge application, such as gouging, standard drag-cutting, FineCut or mechanized. Each **type** of Hypertherm cartridge has a different part number.

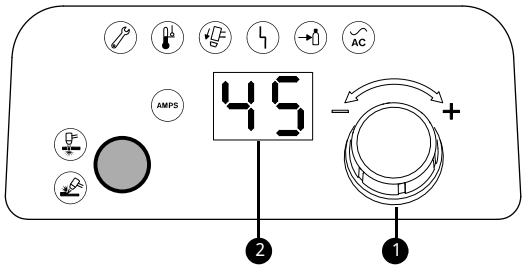
- The plasma power supply also keeps your settings if you do a quick restart or a cold restart.

Adjust the output current manually

Before you begin: Make sure that the **output current (A)** you select is correct for your cutting or gouging application. For example, an output current that is too low or too high for the material you are cutting can result in poor cut quality.

1. Move the torch-lock switch to the green "ready to fire" position before you adjust the output current.
2. Turn the adjustment knob as necessary to set the output current in increments of 1 A.

   You can also use the hand torch to set the output current. Refer to Adjust the output current from the hand torch on page 60.



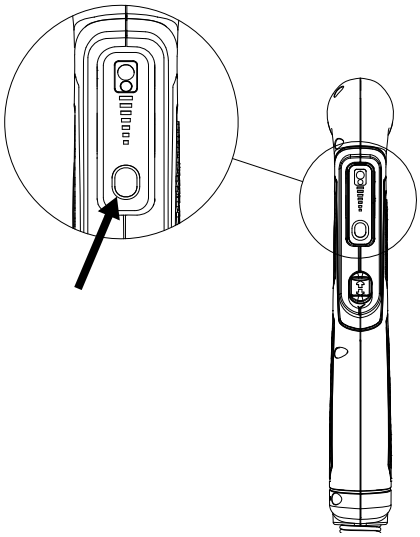
1 Adjustment knob

2 Output current

The mode LED flashes to let you know that the amperage has been manually adjusted. It continues to flash until you set the current back to default.

Adjust the output current from the hand torch

- Push the button on the amperage adjustment control to move the current setting from one preset amperage to another.



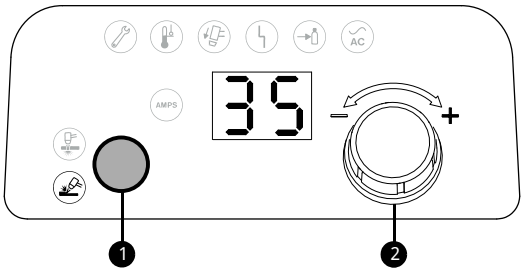
Adjust the gas pressure manually

The system sets the gas pressure for you, but you can adjust it.

Before you begin: Make sure that the **gas pressure** you select is correct for your cutting or gouging application.

1. Move the torch-lock switch to the green "ready to fire" position.
2. Push and hold the Mode button.
3. While holding the Mode button, turn the adjustment knob to adjust the gas pressure to the necessary level.

   In this example, we decreased the gas pressure to 2.4 bar (35 psi).



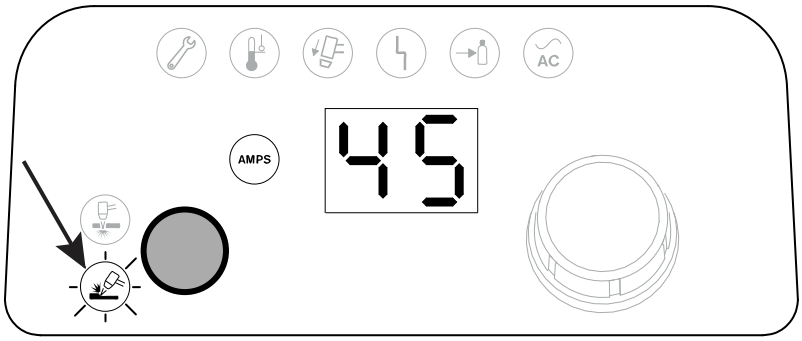
1 Mode button

2 Adjustment knob

In many conditions, you can increase and decrease the gas pressure by a maximum of 0.7 bar (10 psi). The acceptable range can change if the cartridge you are using has a smaller maximum limit.

4. Release the Mode button.

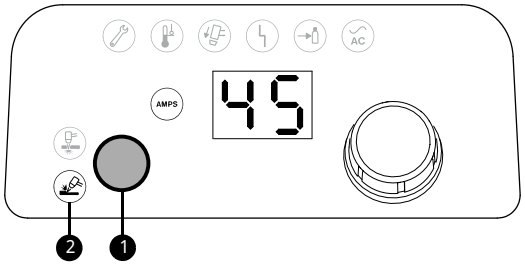
- After you release the Mode button, the AMPS LED illuminates again, and the 2-digit display changes from gas pressure back to amperage.
- The selected mode LED flashes to let you know that the gas pressure has been manually adjusted. It continues to flash until you set the pressure back to default.



What to do next: To see the gas pressure setting again, push and hold the Mode button.

Go back to automatic settings mode

- Push the Mode button to go back to automatic settings mode.



1 Mode button

2 Mode LED

- The selected mode LED next to the button stops flashing.
- When you change **from manual gas pressure mode to automatic gas pressure mode**:
  - The plasma power supply automatically sets the gas pressure related to the Hypertherm cartridge.

  - The amperage setting stays the same.
- When you change **from automatic gas pressure mode to manual gas pressure mode**:
  - The plasma power supply uses the last manual gas pressure that you set.
  - The amperage setting stays the same.
- When you do a **quick restart or a cold restart of the plasma power supply in manual gas pressure mode**, the plasma power supply keeps the last manual gas pressure and amperage that you set unless you install a different type of cartridge.
- When you connect a different torch, the plasma power supply goes back **to automatic gas pressure mode**.

Data contained on the cartridge

Each Hypertherm cartridge contains data about how it has been used.

You can monitor this data if necessary using the Hypertherm Cartridge Reader kit (528083). For example, you can compare data between Hypertherm cartridges if one cartridge had significantly better life than a different cartridge, or if you want to calculate the average cartridge life over a period of time.

Overheating prevention and duty cycle

The duty cycle ratings help you to know how to operate a Powermax system without overheating it.

Duty cycle is the percentage of time during a 10-minute interval that a plasma arc can stay on without causing the plasma power supply to overheat.

Output current	Duty cycle [1]
45 A	50%
41 A	60%
32 A	100%

1 If the ambient operating temperature is 40°C (104°F).

If the plasma power supply overheats:

- The plasma arc stops.
- The cooling fan inside the plasma power supply continues to operate.
- The temperature fault icon illuminates.

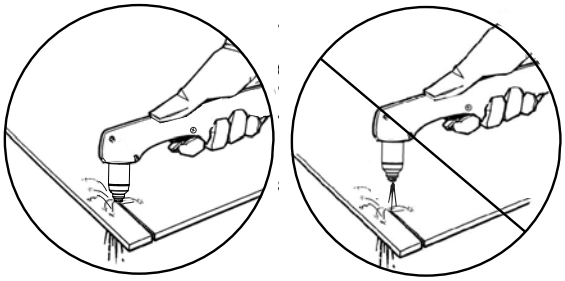
When the plasma power supply overheats, you must:

- Keep the plasma power supply on so that the fan can decrease the temperature of the plasma power supply.
- Wait for the temperature fault icon to go off before you start to cut again.

Arc stretch and drag-cutting

Stretching the plasma arc for long periods decreases the duty cycle.

Whenever possible, drag the torch on the workpiece. Refer to Start a cut from the workpiece edge on page 69.

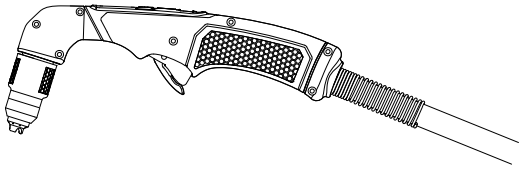


If you operate the plasma power supply on a lower rated electrical service, stretching the plasma arc for long periods can cause the plasma power supply to overheat more quickly and can cause the circuit breaker to open (trip).

4 Cut and Mark with the Hand Torch

Hand torch description

SmartSYNC hand torches come in 75° and 15° models.



- The 75° hand torch is a general purpose torch designed for the widest range of applications.
- The 15° hand torch is designed to point heat away from the operator during gouging. It also makes it easier to cut overhead or in areas that are not easy to reach.

SmartSYNC hand torch features include:

- A control on the torch that lets you adjust the output current (A) from the torch. Refer to Adjust the output current from the hand torch on page 60.
- Automatic setting of operating mode, amperage, and gas pressure related to the Hypertherm cartridge that you install, the torch type, and the torch lead length
- Communication of cartridge information to the plasma power supply, such as cartridge type
- A torch-lock switch that prevents the torch from firing accidentally, even when the plasma power supply is ON. Refer to Step 6 – Unlock the SmartSYNC torch on page 52.
- The FastConnect quick-disconnect system that lets you easily remove and change torches

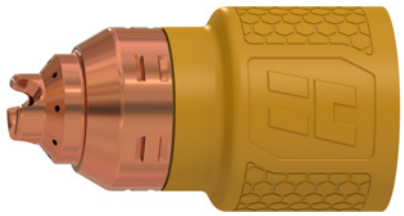
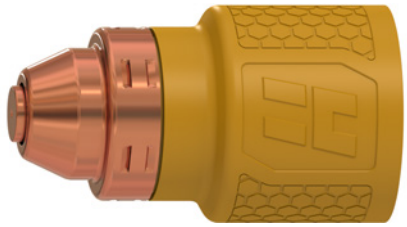
For more information:

- For information about the thicknesses you can cut and pierce with a SmartSYNC hand torch, refer to Recommended cut capacity on page 27.
- For gouging information, refer to Gouging cartridges for the hand torch on page 81.

- To correct problems with cut quality, refer to The cut quality is unsatisfactory, or the cut does not sever the workpiece on page 99.

Cutting cartridges for the hand torch

Hypertherm offers the following types of hand-cutting cartridges, which can be used with both the 15° and the 75° SmartSYNC hand torches:

Cartridge type		Purpose
	Drag-cutting (yellow)	Use these cartridges to drag the torch on the workpiece (drag-cut) for the widest range of cutting applications.
	FineCut hand (yellow)	Use these cartridges to get a narrower kerf on thin mild steel and stainless steel up to 3 mm (10 gauge). Also use these cartridges to mark mild steel, stainless steel, and aluminum. Refer to Marking process guidelines on page 75.

- For a full list of the cutting and gouging cartridges available, refer to the *Powermax45/65/85/105 SYNC Parts Guide (810490)*.
- If your preference is to keep a standoff while cutting, you can use the gray mechanized cutting cartridges on your SmartSYNC hand torch.
- For information on gouging processes and cartridges, refer to Gouging cartridges for the hand torch on page 81.
- For information on installing the cartridge, refer to Step 4 – Install the cartridge on page 49.

Prepare to fire the torch

To prevent accidental firing, the hand torch has a torch-lock switch and a safety trigger.

Before you begin:

WARNING

INSTANT-ON TORCHES – PLASMA ARC CAN CAUSE INJURY, BURNS

Ignition of the plasma arc occurs immediately when you pull the torch trigger. Before changing the cartridge, one of the following steps is necessary. Whenever possible, complete the first step.

Set the power switch on the plasma power supply to OFF (**O**).

OR

Move the torch-lock switch to the yellow lock (**X**) position. Pull the trigger to make sure that the torch does not fire a plasma arc.

WARNING

INSTANT-ON TORCHES – STAY CLEAR OF PLASMA ARC

The plasma arc will cut quickly through gloves and skin.

- Put on the correct and approved protective equipment.
- Keep hands, clothing, and objects away from the torch tip.
- Do not hold the workpiece. Keep your hands clear of the cutting path.
- Do not point the torch at yourself or others.

⚠ WARNING

RISK OF BURNS AND ELECTRIC SHOCK – USE INSULATED GLOVES

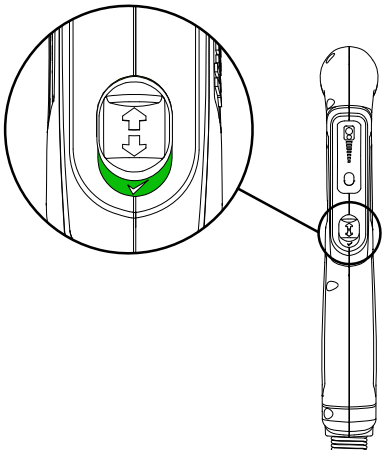
The cartridges get very hot during cutting and can cause severe burns. Touching the cartridges can also cause electric shock if the plasma power supply is ON and the torch-lock switch is in the green "ready to fire" position.

Always put on insulated gloves when changing the cartridges. Also make sure that the torch is in the yellow lock (**X**) position.

1. Install the correct cartridge.

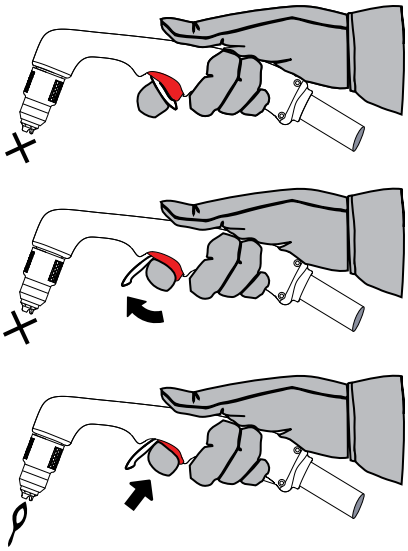
To cut	When you install a Hypertherm cutting cartridge, the system goes to **Cut mode**. Gouge mode is not available.
To gouge	When you install a Hypertherm gouging cartridge, the system goes to **Gouge mode**. Cut mode is not available.

2. Make sure that the torch-lock switch is in the green "ready to fire" position.



The first time that you pull the torch trigger after you set the torch to the "ready to fire" position, multiple puffs of air quickly come from the torch. This is a warning that the torch is active and will fire an arc the next time that you pull the trigger.

3. Flip the trigger's safety cover forward and pull the red torch trigger.



- After you complete a cut and release the torch trigger, air continues to flow from the torch to decrease the temperature of the cartridge.
- This is referred to as postflow.
- Always let postflow complete before you remove a cartridge.

Start a cut from the workpiece edge

Slag produced during piercing can cause damage to the tip of the cartridge. Start the cut from the edge of the workpiece, when possible, to decrease this damage and to optimize cartridge life.

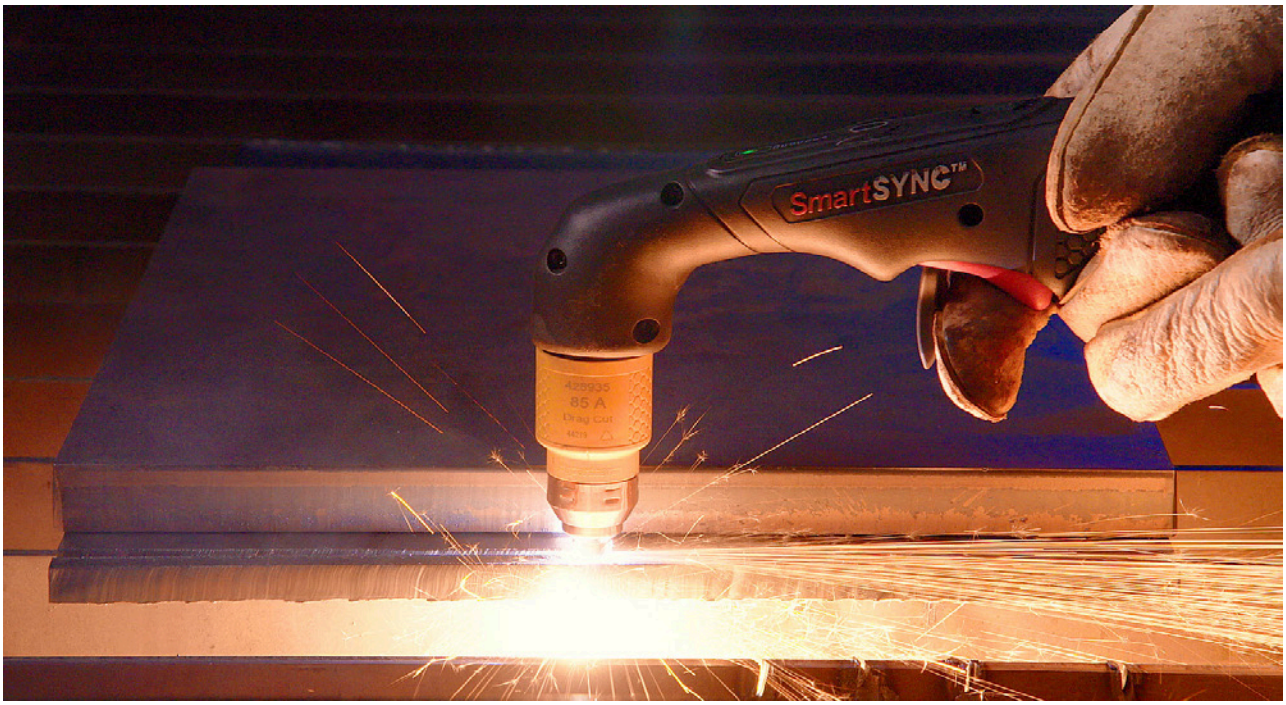
1. With the work clamp attached to the workpiece, hold the torch tip perpendicular (90°) to the edge of the workpiece.

2. Pull the torch trigger to start the arc.

   Stay at the edge until the arc has cut completely through the workpiece.

3. Drag the torch lightly across the workpiece to continue with the cut.

   Keep a smooth, stable pace.



Pierce a workpiece

The hand torch can pierce interior features on metal. The type of pierce that you do relates to the thickness of the workpiece and the pierce capacity of the system.

- **Straight pierce:** Use a straight pierce to cut a workpiece that is thinner than 8 mm (5/16 inch). If a straight pierce does not pierce the workpiece, try a rolling pierce.
- **Rolling pierce:** Use a rolling pierce to cut a workpiece that is 8 mm (5/16 inch) or thicker, or if a straight pierce does not pierce the workpiece.

Before you begin:

⚠ WARNING

SPARKS AND HOT METAL CAN INJURE EYES AND BURN SKIN

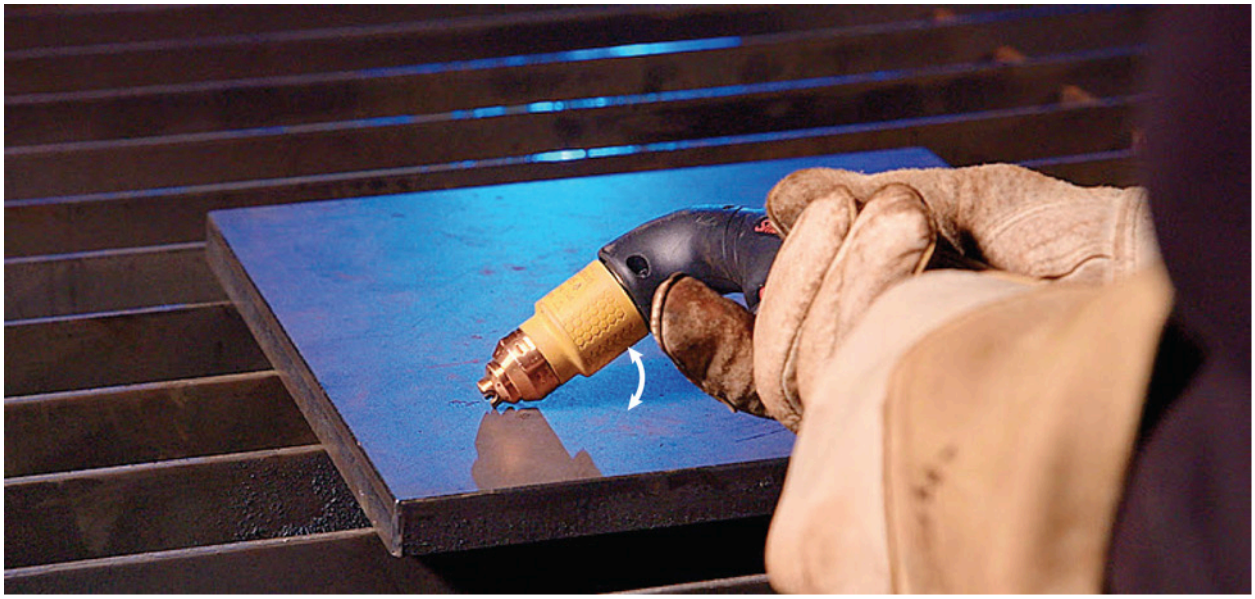
When you fire the torch at an angle, sparks and hot metal will spray out from the torch tip.

Point the torch away from yourself and others. Always put on correct protective equipment including gloves and eye protection.

1. Attach the work clamp to the workpiece.

2. Hold the torch at the correct angle to the workpiece.

Straight pierce	Hold the torch perpendicular (90°) to the workpiece.
Rolling pierce	Hold the torch at an approximate 30° angle to the workpiece with the torch tip touching the workpiece before firing the torch.

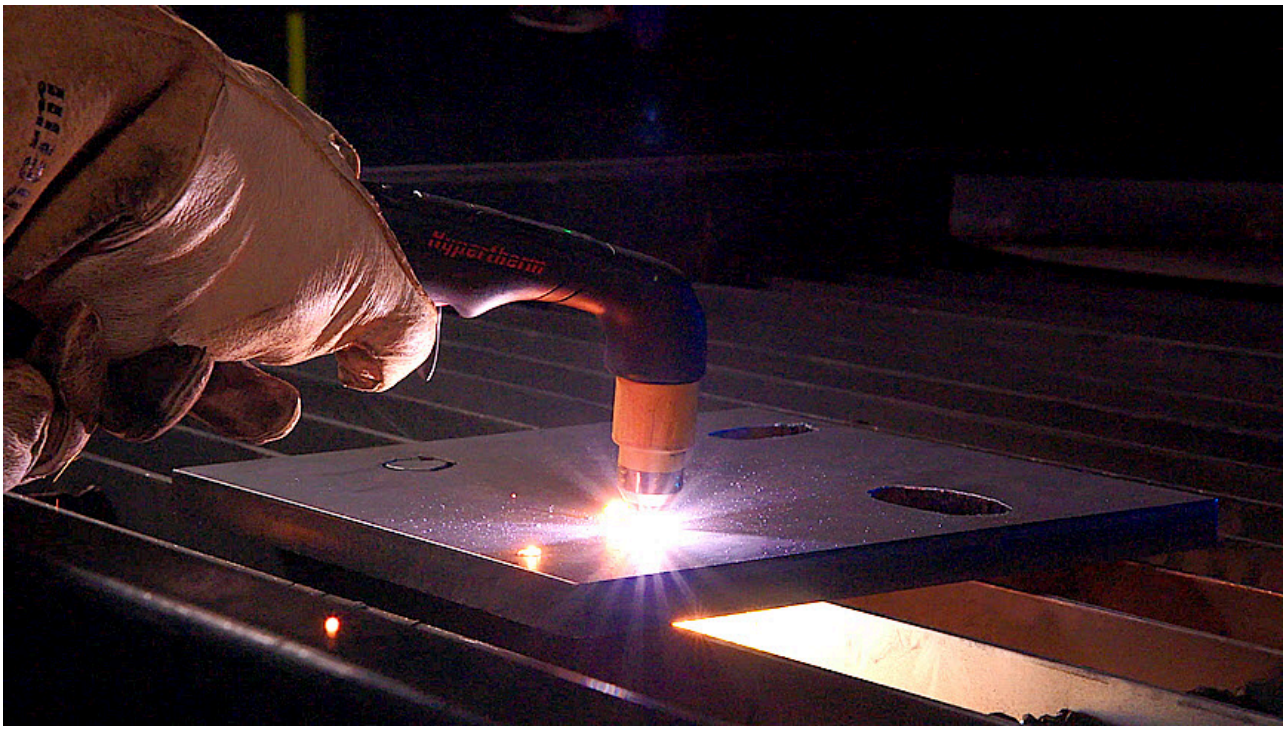


3. Start to pierce.

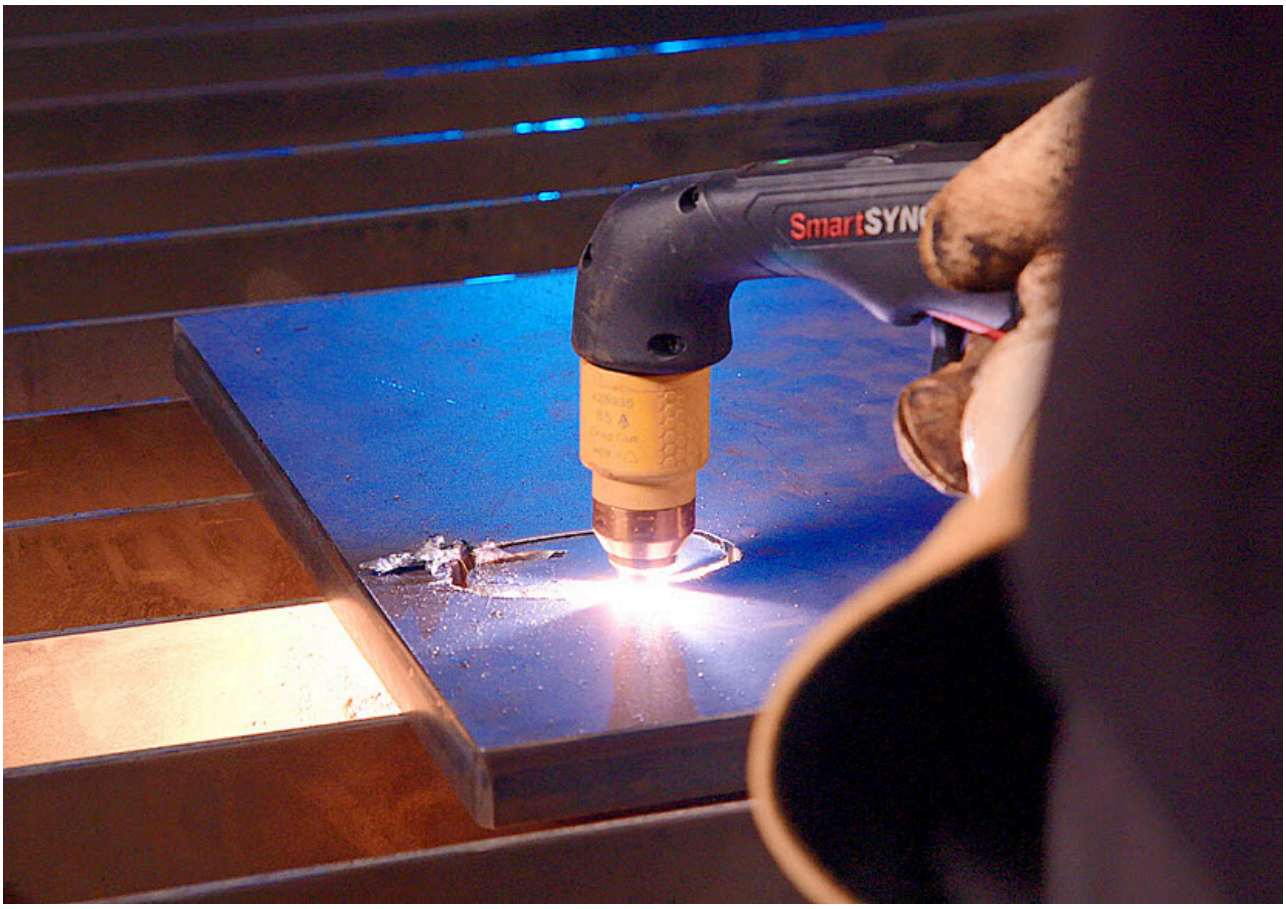
Straight pierce	Pull the torch trigger to start the arc.
Rolling pierce	Pull the torch trigger to start the arc while still at an angle to the workpiece, then move the torch up to the perpendicular (90°) position.

4. Hold the torch in position while continuing to pull the trigger.

   When sparks are coming from below the workpiece, the arc has pierced the material.



5. When the pierce is complete, drag the torch tip lightly across the workpiece to continue with the cut.

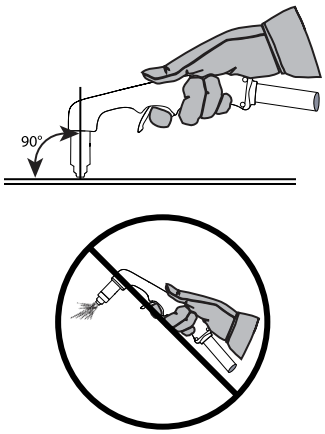


Guidelines for hand torch cutting

- Drag the torch tip lightly and smoothly across the workpiece to keep a stable cut.

  Sometimes the torch sticks slightly to the workpiece when you cut with FineCut cartridges. This is not an indication of a problem.

- Pulling, or dragging, the torch across the cut is easier than pushing it.
- If sparks spray up from the workpiece, move the torch more slowly, or set the output current higher.
- While cutting, make sure that sparks are coming from the bottom of the workpiece. When cutting correctly, the sparks lag slightly behind the torch as you cut (15° – 30° angle from vertical).



- Hold the torch tip perpendicular to the workpiece so that the head of the torch is at a 90° angle to the cutting surface. Observe the cutting arc as the torch cuts.
- If you fire the torch unnecessarily, you shorten the life of the cartridge.
- For straight-line cuts, use a straight edge as a guide. To cut circles, use a template or a radius cutter attachment (a circle cutting guide). For beveled cuts, use a bevel cutting guide. Refer to the *Powermax45/65/85/105 SYNC Parts Guide (810490)*.

To troubleshoot problems with cut quality, refer to The cut quality is unsatisfactory, or the cut does not sever the workpiece on page 99.

Marking process guidelines

You can mark mild steel, stainless steel, and aluminum by using a FineCut cartridge with bottled air or shop-compressed air.

Before you begin marking:

- Install a FineCut cartridge. **Marking is only possible with a FineCut cartridge.**
- Set the plasma power supply output current to 9 A through 19 A.

A current setting of 9 A will give you the lightest mark. A current setting of 19 A will give the heaviest mark.

Additional considerations:

- You can vary the depth and width of marks by varying torch speed, output current, and torch-to-workpiece height.
- You cannot manually adjust the gas pressure when the plasma power supply is in marking mode.

Get the most out of your cartridges

How often it is necessary to change the cartridge on your hand torch relates to many factors.

- **Gas supply quality**
  - It is extremely important to keep the gas supply line clean and dry.
  - Oil, water, vapor, and other contamination in the gas supply can decrease cut quality and cartridge life.
  - Refer to Gas supply source on page 40 and Add more gas filtration on page 44.
- **Cutting technique**
  - Whenever possible, start cuts from the edge of the workpiece. This helps to extend the life of the cartridge. Refer to Start a cut from the workpiece edge on page 69.
  - Use the correct piercing method for the thickness of the workpiece that you are cutting. In many conditions, a rolling pierce method is an efficient way to pierce the workpiece while you decrease the cartridge wear that naturally occurs during piercing. Refer to Pierce a workpiece on page 71 for an explanation of the straight pierce and rolling pierce methods and when to use each.
- **Thickness of the workpiece being cut**
  - In general, the thicker the workpiece being cut, the more quickly the cartridges become worn. For best results, 80% of the workpieces that you cut should be equal to or less than the thickness specified for this system and cartridge. Refer to Recommended cut capacity on page 27.
  - In general, do not cut material that is thicker than what is specified for this system and cartridge.
- **Expanded metal cutting and pilot arc time**
  - Expanded metal has a slotted or mesh pattern. Cutting expanded metal wears out cartridges more quickly because it requires a continuous pilot arc. A pilot arc occurs when the torch is fired but the plasma arc is not in contact with the workpiece.
  - Fire the torch only when necessary to keep pilot arc time to a minimum.
  - Frequent pilot arcs cause the nozzle in the cartridge to wear more quickly. You can see the cumulative pilot arc time for a cartridge using the Hypertherm Cartridge Reader kit (528083).
- **Arc stretch when cutting**
  - To get maximum cartridge life, only stretch the arc when it is necessary.
  - Drag the torch on the workpiece whenever possible.
  - Refer to Guidelines for hand torch cutting on page 74.

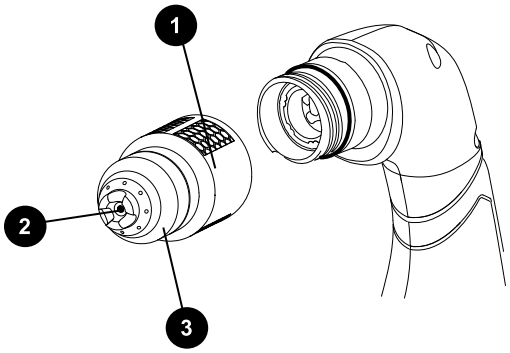
During standard hand cutting with Powermax45 SYNC systems under lab conditions, Hypertherm got 1 to 3 hours of actual "arc on" time.

Signs that a cartridge is near end-of-life

There are various indicators that denote when a cartridge is near the end-of-life.

Usually, the best indication of when to install a new cartridge is when the cut quality is no longer satisfactory. When it is necessary to replace a cartridge, replace the full cartridge with a new one. **Do not try to disassemble the cartridge.**

Figure 3 - Cartridge components



1 Retaining cap

2 Nozzle hole (circular)

3 Shield

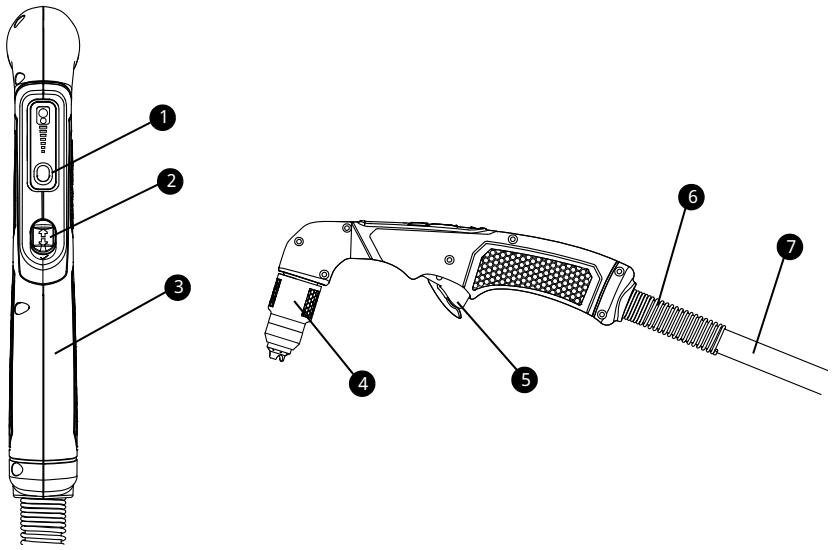
The following signs can be indications that a cartridge is near or at end-of-life:

- **Examine the nozzle hole.** A nozzle hole in good condition is circular. If the nozzle hole is not circular, replace the cartridge.
- **Look for a higher rate of Torch Stuck Open (TSO) or Torch Stuck Closed (TSC) errors.** As a cartridge wears, unwanted material can collect inside the cartridge and cause TSO and TSC faults to occur. Refer to Troubleshooting for TSO and TSC faults on page 117. In some conditions, you can remove this material by carefully shaking the cartridge.
- **Examine the crown.** The crown is the square copper piece inside of the cartridge. Push down the crown and then release the spring tension.

A crown in good condition goes back to its start position. If the crown stays in the down position, carefully shake the cartridge. If the crown continues to stay in the down position, replace the cartridge.

If you do a lot of piercing, it is possible to see black marks on the retaining cap. Usually this is not a sign that the cartridge is at end-of-life. Continue to cut with the cartridge until the cut quality is no longer satisfactory.

Hand torch components



1 Amperage-adjustment control

2 Torch-lock switch

3 Shell

4 Cartridge

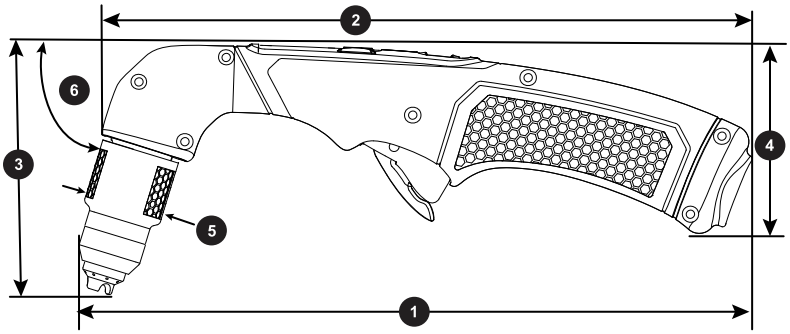
5 Safety trigger

6 Strain relief for torch lead

7 Torch lead

Hand torch dimensions

75° torch



1 267 mm (10.5 inch)

2 250 mm (10.2 inch)

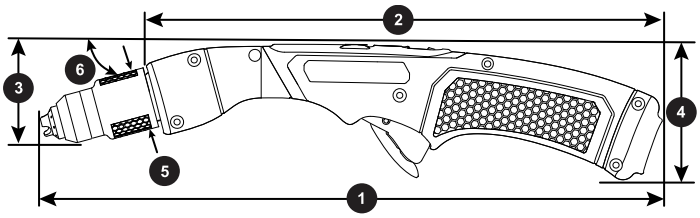
3 99 mm (3.9 inch)

4 70 mm (2.75 inch)

5 32 mm (1.25 inch)

6 75°

15° torch



1 320 mm (12.6 inch)

2 268 mm (10.5 inch)

3 51 mm (2.0 inch)

4 68 mm (2.7 inch)

5 32 mm (1.25 inch)

6 15°

Hand torch weights

Torch	Weight (without a cartridge installed)
Hand torch with 7.6 m (20 foot) lead	2.4 kg (5.2 lb)

5 Gouge with the Hand Torch

Gouging cartridges for the hand torch

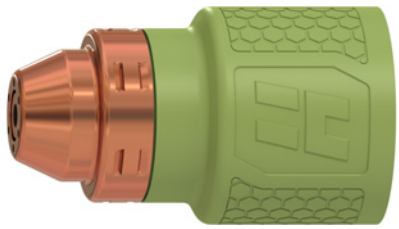
⚠ WARNING

SPARKS AND HOT METAL CAN INJURE EYES AND BURN SKIN

When you fire the torch at an angle, sparks and hot metal will spray out from the torch tip.

Point the torch away from yourself and others. Always put on correct protective equipment including gloves and eye protection.

Hypertherm offers the following gouging cartridge, which you can use with both the 15° and the 75° SmartSYNC hand torches.

Cartridge type		Purpose
	Maximum Removal gouging (green)	Use these cartridges for aggressive metal removal, deep gouge profiles, and extreme metal washing. A faster gouging speed is recommended to control the concentrated plasma arc.

For a full list of cartridges available for the Powermax45 SYNC, refer to the *Powermax45/65/85/105 SYNC Parts Guide (810490)*.

Prepare to fire the torch

To prevent accidental firing, the hand torch has a torch-lock switch and a safety trigger.

Before you begin:

WARNING

INSTANT-ON TORCHES – PLASMA ARC CAN CAUSE INJURY, BURNS

Ignition of the plasma arc occurs immediately when you pull the torch trigger. Before changing the cartridge, one of the following steps is necessary. Whenever possible, complete the first step.

Set the power switch on the plasma power supply to OFF (**O**).

OR

Move the torch-lock switch to the yellow lock (**X**) position. Pull the trigger to make sure that the torch does not fire a plasma arc.

WARNING

INSTANT-ON TORCHES – STAY CLEAR OF PLASMA ARC

The plasma arc will cut quickly through gloves and skin.

- Put on the correct and approved protective equipment.
- Keep hands, clothing, and objects away from the torch tip.
- Do not hold the workpiece. Keep your hands clear of the cutting path.
- Do not point the torch at yourself or others.

⚠ WARNING

RISK OF BURNS AND ELECTRIC SHOCK – USE INSULATED GLOVES

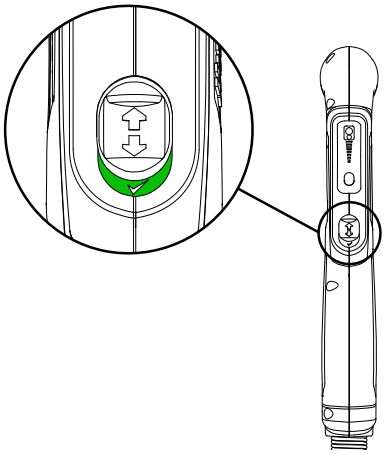
The cartridges get very hot during cutting and can cause severe burns. Touching the cartridges can also cause electric shock if the plasma power supply is ON and the torch-lock switch is in the green "ready to fire" position.

Always put on insulated gloves when changing the cartridges. Also make sure that the torch is in the yellow lock (**X**) position.

1. Install the correct cartridge.

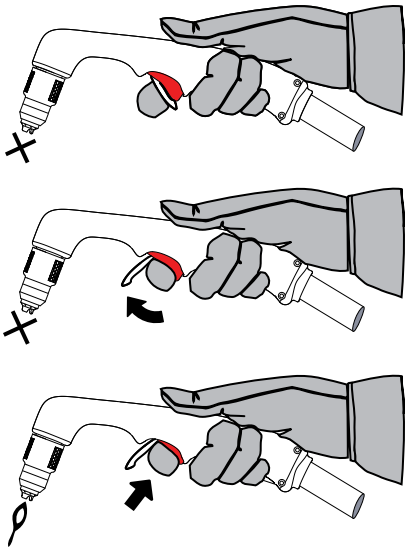
To cut	When you install a Hypertherm cutting cartridge, the system goes to **Cut mode**. Gouge mode is not available.
To gouge	When you install a Hypertherm gouging cartridge, the system goes to **Gouge mode**. Cut mode is not available.

2. Make sure that the torch-lock switch is in the green "ready to fire" position.



The first time that you pull the torch trigger after you set the torch to the "ready to fire" position, multiple puffs of air quickly come from the torch. This is a warning that the torch is active and will fire an arc the next time that you pull the trigger.

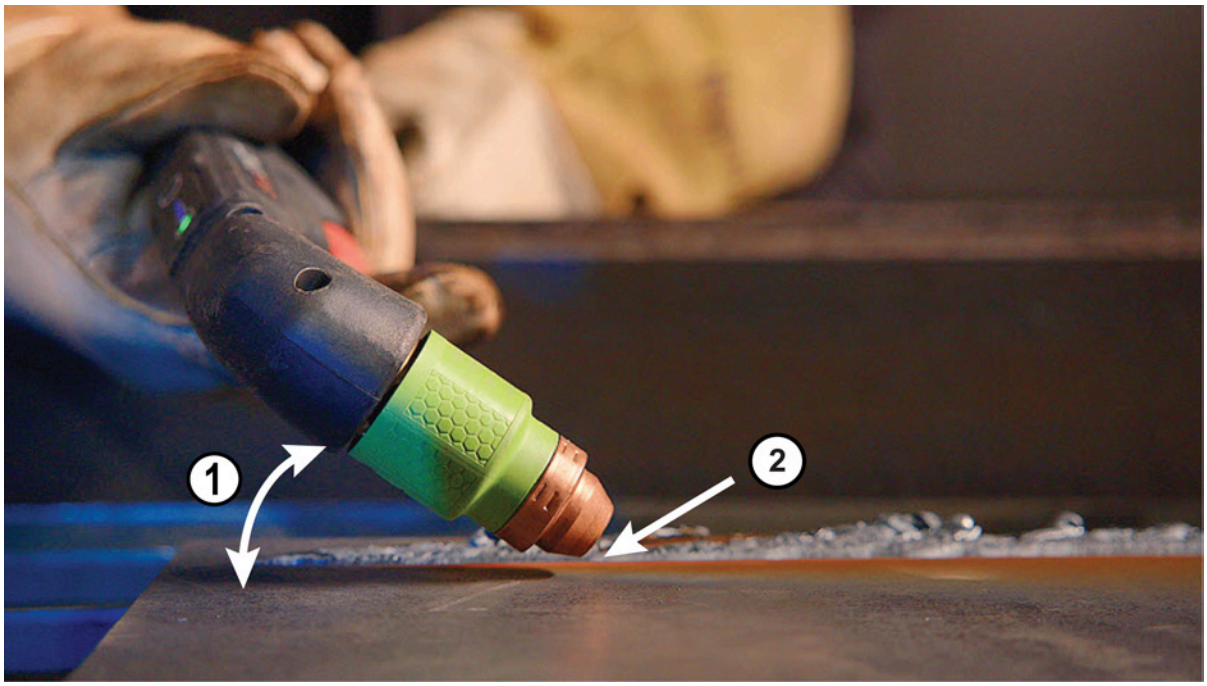
3. Flip the trigger's safety cover forward and pull the red torch trigger.



- After you complete a cut and release the torch trigger, air continues to flow from the torch to decrease the temperature of the cartridge.
- This is referred to as postflow.
- Always let postflow complete before you remove a cartridge.

Start a gouge angled to the workpiece

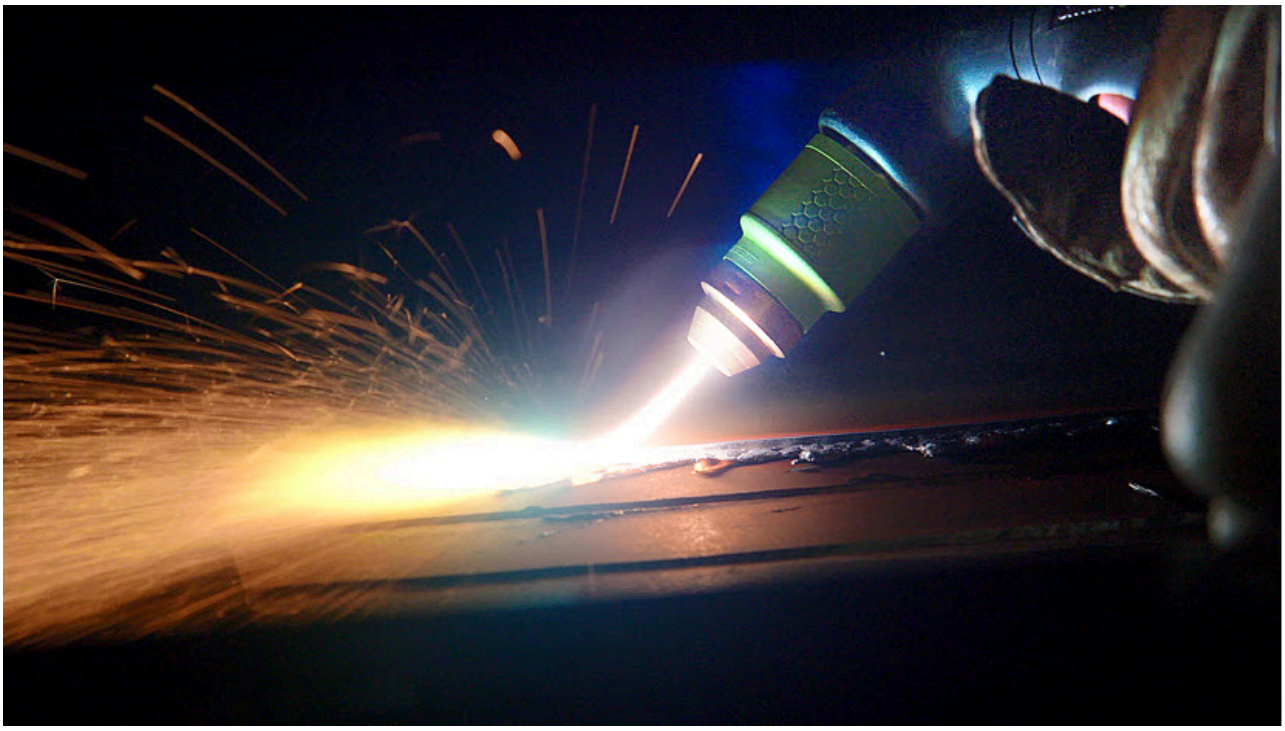
1. Before firing the torch, hold the torch at approximately a 40° – 45° angle to the workpiece with the torch tip approximately 6 mm – 12 mm (1/4 in. – 1/2 in.) from the workpiece.



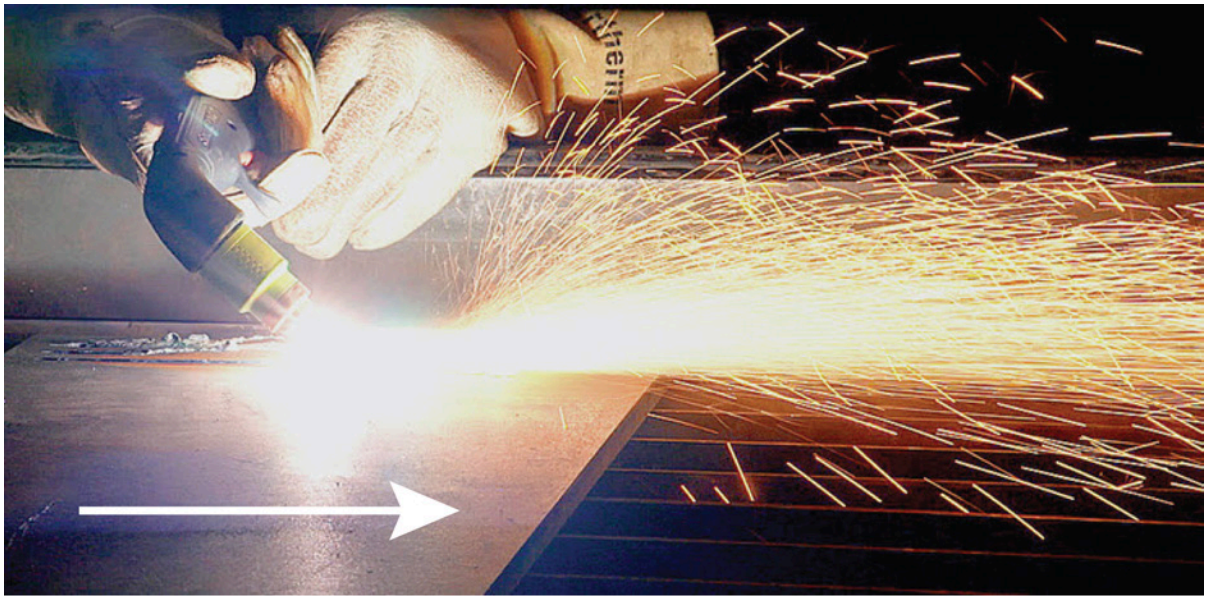
1 40° – 45° angle

2 6 mm – 12 mm (1/4 in. – 1/2 in.)

2. Pull the trigger to get a pilot arc and transfer the arc to the workpiece.
3. Stretch the arc to 25 mm – 32 mm (1 inch – 1-1/4 inches).



4. Keep this position as you push the plasma arc in the direction of the gouge that you want to create.



5. Change the position of the torch as necessary to get the gouge contour that you want.

Refer to Guidelines for hand torch gouging on page 86. Keep at least a small distance between the torch tip and the molten metal to increase cartridge life and prevent damage to the torch.

Guidelines for hand torch gouging

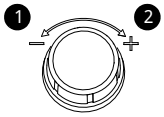
The width and the depth of the gouge contour are a result of five primary factors.

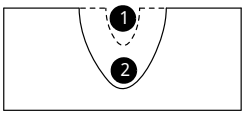
Adjust these factors in combination to get the gouge that you want.

Output current (A)

Arc stretch is related to the output current (A) of the plasma power supply. The higher the amperage, the longer that you can stretch the arc. Hypertherm recommends that you keep amperage and arc stretch consistent.

- Decrease the amperage on the front panel to make the gouge more narrow and shallow.
- Increase the amperage to make the gouge wider and deeper.



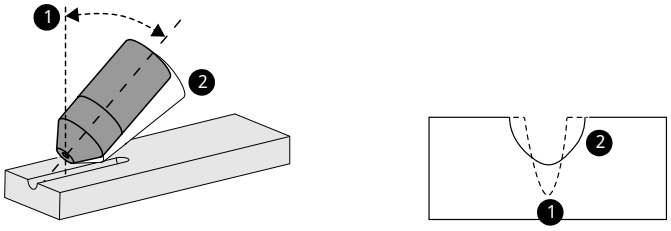


1 Results of decreasing the amperage.

2 Results of increasing the amperage.

Angle of the torch to the workpiece

- Put the torch in a more upright position to make the gouge narrower and deeper.
- Tilt the torch down so that it is closer to the workpiece to make the gouge wider and more shallow.

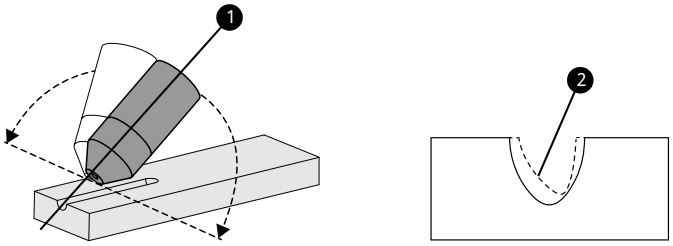


1 Steeper angle and the resulting depth of gouge.

2 More shallow angle and the resulting depth of gouge.

Turn of the torch

Move the torch left or right relative to the torch center line to make the gouge flatter and steeper on one side.



1 Center line of the torch when cutting straight on the workpiece.

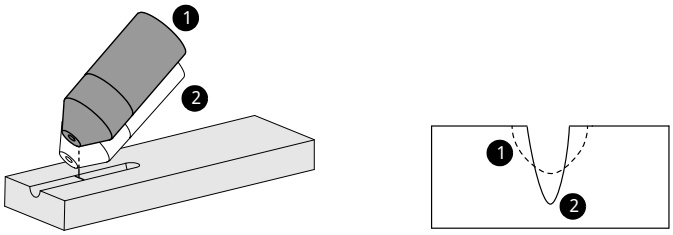
2 Resulting gouge if cutting to the left or right of the torch center line.

Torch standoff / arc stretch

Arc stretch is related to the output current (A) of the plasma power supply. The higher the amperage, the longer that you can stretch the arc. Hypertherm recommends that you keep amperage and arc stretch consistent.

Keep at least a small distance between the torch tip and the molten metal to increase cartridge life and prevent damage to the torch.

- Move the torch away from the workpiece to make the gouge wider, shallower, and smoother on the bottom.
- Move the torch closer to the workpiece to make the gouge narrower and deeper.

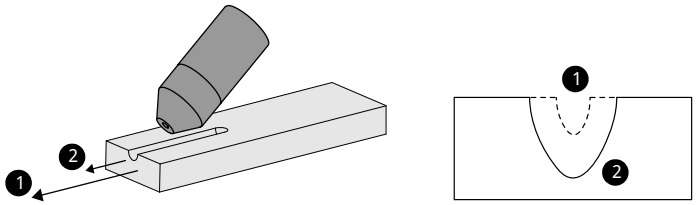


1 Larger distance and the resulting gouge.

2 Shorter distance and the resulting gouge.

Speed of the torch

- Increase the speed of the torch movement to make the gouge more narrow and shallow.
- Decrease the speed of the torch movement to make the gouge wider and deeper.



1 Moving faster results in a more shallow gouge.

2 Moving slower results in a deeper gouge.

6 Troubleshoot Common Problems

Start here: troubleshooting checklist

When a problem occurs, go through the troubleshooting checklist first. It is necessary to complete these steps before doing other troubleshooting procedures.

As you do this checklist, record any problems or questions. If you cannot find a solution to the problem by complying with the specified recommendations, or if more aid is necessary, do these steps:

1 Get the serial number for your system from the data plate that is on the bottom of the plasma power supply.

2 Speak to your Hypertherm distributor or authorized repair facility.

3 Speak to the nearest Hypertherm office.

Refer to the *Powermax45/65/85/105 SYNC Parts Guide (810490)* for information on frequently used replacement parts.

Before you begin: Make sure that any changes to the plasma power supply or power cord are done by a licensed electrician.

WARNING

ELECTRIC SHOCK CAN KILL

The plasma power supply contains dangerous electric voltages that can seriously injure or kill you. Even if the plasma power supply is turned OFF, you can still get a serious electric shock if the plasma power supply remains connected to an electric power source.

Use extreme caution if you do diagnosis or maintenance tasks when the plasma power supply remains connected to an electric power source and the outer cover or panels are removed. All work that requires removal of the plasma power supply outer cover or panels must be done by a qualified technician. Refer to the *Safety and Compliance Manual (80669C)* for more safety information.

WARNING

INSTANT-ON TORCHES – PLASMA ARC CAN CAUSE INJURY, BURNS

Ignition of the plasma arc occurs immediately when you pull the torch trigger. Before changing the cartridge, one of the following steps is necessary. Whenever possible, complete the first step.

Set the power switch on the plasma power supply to OFF (**O**).

OR

Move the torch-lock switch to the yellow lock (**X**) position. Pull the trigger to make sure that the torch does not fire a plasma arc.

- ☐ Examine the power source.
  - ☐ Can the power source supply sufficient power to the plasma power supply for the applications that you are doing?
  - ☐ If you are using a generator, make sure that it has sufficient power to let you do a full plasma arc stretch.

    Refer to Generator considerations on page 38.
  - ☐ Are the circuit breakers or fuses sufficient for your plasma power supply and for the applications that you are doing?

Refer to Voltage configurations on page 33.

- ☐ Did the circuit breaker open (trip)?

☐ Examine the plasma power supply.

- ☐ Is the plasma power supply in an upright position on a flat, level surface?
- ☐ Does the plasma power supply have sufficient ventilation (approximately 0.25 m or 10 inches of clearance on all sides)?
- ☐ Are the louvers in the plasma power supply cover blocked?
- ☐ Is the power switch on the front panel of the plasma power supply operating correctly?
- ☐ Is there any visible damage to the plasma power supply?

☐ Examine the front panel controls.

- ☐ Is the fault LED on?

- ☐ Is the AC LED flashing?

- ☐ Does the front panel show a fault code or fault icon?

  Refer to Fault icons and fault codes on page 106.

☐ Examine the power cord.

- ☐ Is the power cord plugged in, or is it connected correctly to a line-disconnect switch or other power source?
- ☐ Is there any visible damage to the power cord?
- ☐ Are there wires that are frayed or have other damage?
- ☐ Are the power cord wires in the power plug or line-disconnect box short-circuited?
- ☐ Is the power plug correct for the power cord?

  For example, do not install a 1-phase power **plug** on a 3-phase power **cord**. Refer to Power cord and plug requirements on page 36.

- ☐ Is the power cord ground wire connected to ground in the plasma power supply and in the power plug or line-disconnect box?

- ☐ Are the remaining power cord wires connected correctly in the plasma power supply and in the power plug or line-disconnect box?

  Refer to Power cord and plug requirements on page 36.

- ☐ Are the power cord wires fully tightened inside the plasma power supply and in the power plug or line-disconnect box?

☐ Examine the work lead and work clamp.

- ☐ Is the work lead connected correctly to the plasma power supply?

  Make sure that you turn the connector clockwise approximately 1/4 turn until the connector is fully engaged in the lock position. Refer to Step 3 – Connect the work lead and work clamp on page 48.

- ☐ Is the work lead twisted or kinked?

- ☐ Are there wires in the work lead that are frayed or have other damage?

- ☐ Is the work clamp connected to the workpiece that you are cutting?

- ☐ Does the work clamp have good metal-to-metal contact?

  If necessary, remove any rust, paint, or other debris to give a clean surface for a better connection.

☐ Examine the torch and torch lead.

- ☐ Is the torch lead connected correctly to the plasma power supply?

  Refer to Step 2 – Connect the torch lead on page 47. The torch lead connector makes a click when it is fully connected.

- ☐ Is the torch lead twisted or kinked?

- ☐ Are there wires in the torch lead that are frayed or have other damage?

- ☐ Are there signs of damage to the torch handle or shell, or to the wires in the torch handle?

- ☐ Is the status LED on the torch solid yellow or red, or is it flashing yellow?

  Refer to Controls and indicators on the hand torch on page 57.

- ☐ Are the torch trigger and safety latch operating correctly, and are there signs of damage to the torch trigger?

- ☐ Is the torch-lock switch operating correctly?

  Refer to Step 6 – Unlock the SmartSYNC torch on page 52.

- ☐ Examine the Hypertherm cartridge.
  - ☐ Is the cartridge worn, or does it have damage?

    Refer to Signs that a cartridge is near end-of-life on page 77.
  - ☐ Is the cartridge installed correctly?

    Refer to Step 4 – Install the cartridge on page 49.
  - ☐ Did you select the correct cartridge for the job that you are doing?

    Refer to Cutting cartridges for the hand torch on page 66 and Gouging cartridges for the hand torch on page 81.
- ☐ Examine the gas supply.
  - ☐ Is the gas supply hose connected correctly to the fitting on the rear panel of the plasma power supply?
  - ☐ Is the gas supply hose connected correctly to the air compressor, gas cylinder, or other gas source?
  - ☐ Are there signs of leaks at the fittings and connection points in the gas supply line?
  - ☐ Is the gas supply hose twisted or kinked, or does it have other signs of damage?
  - ☐ Is something causing the pressure to decrease too much while cutting?

    For example, is the gas supply hose too long? Are there other devices that use gas from the same source?
  - ☐ Is sufficient gas pressure getting to the plasma power supply?

    Refer to Minimum inlet pressure and gas flow rate on page 43.
  - ☐ Are you able to keep gas pressure constant while you are cutting?

    Refer to Troubleshooting for gas pressure problems on page 94.
- ☐ Examine the gas quality.
  - ☐ Are there signs of contamination in the gas supply line, such as from oil, water, or dirt?

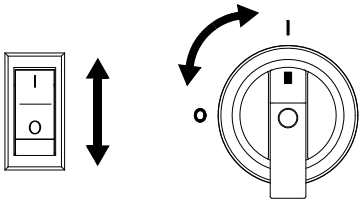
    It is extremely important to keep a clean, dry gas line. Refer to Keep a clean gas line on page 96.
  - ☐ Is your air filtration system sufficient to prevent moisture, oil, and other contaminants from getting into the plasma power supply's gas line?
  - ☐ Is there contamination on the filter element in the plasma power supply's built-in air filter?

To replace the filter element, refer to Examine the filter element on page 142.

Frequently used procedures for troubleshooting

Restart the plasma power supply

- To restart the plasma power supply, set the power switch on the plasma power supply to OFF (**O**) and then set the power switch to ON (**I**).



In some conditions, it is possible that you will be asked specifically to do a "cold restart" or a "quick restart."

Do a cold restart

1. Set the power switch on the plasma power supply to OFF (**O**).
2. Wait approximately 1 minute or until all of the amperage LEDs on the hand torch go off.
3. Set the power switch on the plasma power supply to ON (**I**).

Do a quick restart

1. Set the power switch on the plasma power supply to OFF (**O**).
2. Immediately set the power switch on the plasma power supply to ON (**I**).

If a fault occurs while you are using a generator, a quick restart does not always remove the fault. Do a cold restart instead.

Troubleshooting for gas pressure problems

Incorrect gas pressure can cause errors that prevent cutting or that cause problems with cut quality and cut performance.

Install a pressure gauge

- Install an inline pressure gauge at the gas inlet on the rear of the plasma power supply, after all external filtration.
- Use this gauge to monitor the gas pressure during cutting and when the system is idle.
- Make sure that the gas pressure is stable. The pressure reading on the gauge should be stable when you go from idle to cutting and when you go from cutting to idle again.

Monitor the inlet gas supply

- For optimum system performance, make sure that the inlet gas pressure stays between 7.6 bar – 8.3 bar (110 psi – 120 psi) while gas is flowing.

  Never use more than the maximum gas pressure of 9.3 bar (135 psi).

Use a gas hose that is the correct size

- Make sure that the gas hose is the correct size for your system:
  - Use an internal diameter of 10 mm (3/8 inch) or greater for gas hoses that are less than 15 m (50 feet).
  - Use an internal diameter of 13 mm (1/2 inch) or greater for gas hoses that are 15 m – 30 m (50 feet – 100 feet).

Adjust the pressure manually

- The plasma power supply adjusts gas pressure automatically, but you can adjust the gas pressure manually if necessary. To adjust the gas pressure manually, push and hold the Mode button and turn the adjustment knob at the same time.
- When testing is completed, push the Mode button again to go back to the automatic settings mode.

Do a gas test to find if the output gas pressure is too low

- Do a gas test to see if the plasma power supply's actual output gas pressure is lower than the set pressure by more than an acceptable quantity.

  The set pressure is the gas pressure that the system sets to align with the type of Hypertherm cartridge and torch installed. Refer to Do a gas test on page 97.

Keep a clean gas line

It is extremely important to keep a clean, dry gas line to prevent oil, water, dirt, and other contaminants from causing damage to internal components. A clean gas line also helps you to get optimal cut quality and consumable life.

Dirty, oily air is the root cause of many common problems that occur in Powermax plasma power supplies. In some conditions it can void the warranty on the plasma power supply and torch.

The plasma power supply's built-in air filter can remove particulates as small as 5 microns. It can also remove some moisture from the gas supply.

Before you begin:

- Comply with the gas quality recommendations in Hypertherm plasma power supply ratings on page 19.
- If you work in an environment that is extremely warm and humid, or if work site conditions let oil, vapor, or other contaminants into the gas line, install an external filtration system that cleans the gas supply before it gets into the plasma power supply.

NOTICE

DIRTY, OILY AIR CAN CAUSE DAMAGE TO THE AIR FILTER BOWL

Some air compressors use synthetic lubricants that contain esters. Esters can cause damage to the polycarbonates in the air filter bowl.

Add more gas filtration if necessary.

1. Examine the air filter element in the plasma power supply's built-in air filter.

2. Replace the filter element if it is dirty.
3. Clean the air filter bowl to remove oil, dirt, and other contaminants.

   A yellow residue on the filter bowl shows that oil is getting into the gas supply line.
4. Replace the O-ring at the top of the air filter bowl if it has cracks or other damage.

5. If you use an external air filtration system, clean or replace any parts in it that are possibly dirty.

Do a gas test

Use a gas test to see if sufficient gas pressure is exiting the torch. The gas test lets you see the plasma power supply's actual gas pressure so that you can compare it to the inlet set pressure.

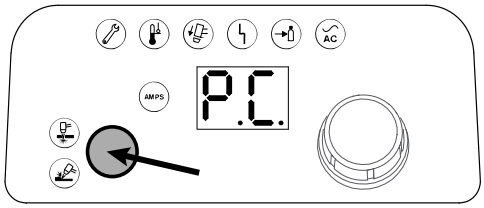
Before you begin:

CAUTION

GAS WILL FLOW FROM THE TORCH

Point the torch away from you before doing a gas test, as a precaution. Always keep hands, clothes, and objects clear of the torch tip. Never point the torch toward yourself or others.

1. Make sure the correct mode is selected for the process you want to validate (Cut or Gouge).
2. Press-and-hold the Mode button for approximately 5 seconds.

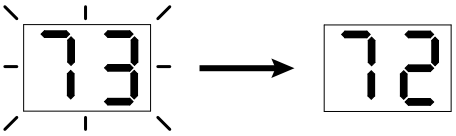


3. Release the Mode button when the 2-digit display shows P.C.

   P.C. indicates pressure check.

   a. The set pressure flashes on the 2-digit display before the actual output gas pressure shows.

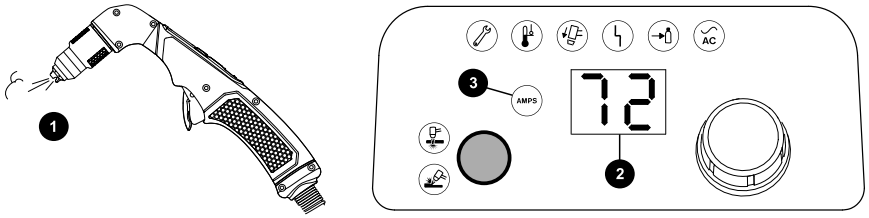
   b. Make note of the set pressure so that you can compare it to the actual pressure.



If the 2-digit display shows "0.0" (bar) or "00" (psi) when you enter gas test mode, the torch is not in a "ready to fire" state. In this case, pull the trigger. The system then emits the warning puffs of air and displays the actual pressure.

During a gas test:

- Air flows continuously from the torch tip.
- The 2-digit display shows the output gas pressure.
- The AMPS LED stays off.



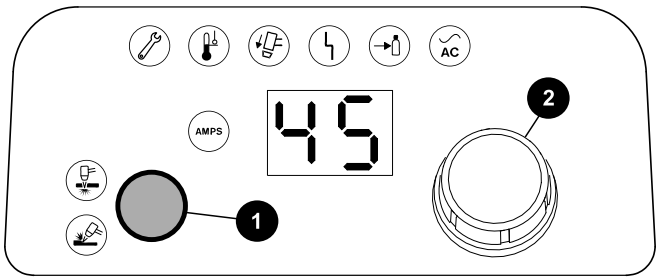
1 Air from the torch tip

2 Two-digit display

3 AMPS LED

Stop a gas test

- To stop a gas test, press the Mode button, or turn the adjustment knob.



1 Mode button

2 Adjustment knob

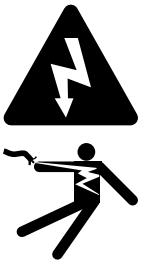
When you stop a gas test:

- The 2-digit display shows the output current (A).
- The AMPS LED illuminates.

Troubleshooting for common problems

Before you purchase a major replacement component, make sure that you speak about the problem with Hypertherm Technical Service or the nearest Hypertherm repair facility.

WARNING



ELECTRIC SHOCK CAN KILL

Let the system release internal voltages before you touch the capacitors. The capacitors can hold a charge for several minutes after the system is set to OFF.

WARNING

INSTANT-ON TORCHES – PLASMA ARC CAN CAUSE INJURY, BURNS

Ignition of the plasma arc occurs immediately when you pull the torch trigger. Before changing the cartridge, one of the following steps is necessary. Whenever possible, complete the first step.

Set the power switch on the plasma power supply to OFF (**O**).

OR

Move the torch-lock switch to the yellow lock (**X**) position. Pull the trigger to make sure that the torch does not fire a plasma arc.

The cut quality is unsatisfactory, or the cut does not sever the workpiece

Unsatisfactory cut quality can have many causes. These can be related to the cartridge, the work lead connection, the gas supply, or an incorrect output current, cut speed, operating mode, or extension cord.

There is a problem with the Hypertherm cartridge

- The Hypertherm cartridge is not installed correctly.
- The Hypertherm cartridge is at end-of-life.

1. Make sure that the Hypertherm cartridge is not too loose or too tight.
2. Examine the Hypertherm cartridge for wear or damage.
3. Replace it if it is worn or has damage.

A higher rate of TSO and TSC faults is typical as a Hypertherm cartridge gets near end-of-life.

The work lead connection is not satisfactory

1. If possible, move the work clamp closer to the area of the workpiece you are cutting.
2. Clean the area where the work clamp comes into contact with the workpiece or cutting table, and remove rust, paint, or other residue.
3. Make sure that the cutting table is correctly grounded and has good contact with the workpiece.
4. Examine the work lead for a loose connection at the plasma power supply and at the work clamp.
5. Examine the work clamp, and repair or replace the clamp if necessary.
6. Examine the work lead, and repair or replace the lead if necessary.

The output current (A) is set too low

Increase the output current (A) as necessary.

The cut speed is too fast

Decrease the cut speed as necessary.

The operating mode is incorrect

Use the correct operating mode for the cutting application. Use a Hypertherm gouging cartridge in Gouge mode. Use a Hypertherm cutting cartridge in Cut mode.

There is a gas supply problem

1. For optimum system performance, make sure that the inlet gas pressure stays between 7.6 bar – 8.3 bar (110 psi – 120 psi) while gas is flowing.

   Never use more than the maximum gas pressure of 9.3 bar (135 psi).
2. Examine the inlet gas supply hose for signs of leaks or blockages.
3. Examine the gas filtration system for signs of contaminants that are possibly causing interference with system performance.

There is a problem with the torch lead

1. Make sure that the torch lead is straight and is not twisted.

2. Replace the torch lead if it has damage.

An extension cord is not sufficient

Operate the plasma power supply without using an extension cord. If you must use an extension cord, use a heavy conductor cord of the shortest possible length.

The power switch is ON, but the power LED is off

The power switch is set to ON (**I**), but the Power ON LED is off. The voltage to the control circuits is not sufficient, or a power component has a short circuit.

Voltage to the system is missing or incorrect

1. Make sure that the power cord is connected correctly to the power outlet or line-disconnect switch box.
2. Make sure that the power is on at the main power panel or at the line-disconnect switch box.
3. Make sure that the circuit breaker did not open (trip).
4. Make sure that the line voltage is not too low (more than 15% below the rated voltage).

The arc does not transfer to the workpiece

The plasma arc does not transfer to the workpiece. The continuity between the work lead and the workpiece is unsatisfactory.

The work lead connection is not satisfactory

1. If possible, move the work clamp closer to the area of the workpiece you are cutting.
2. Clean the area where the work clamp comes into contact with the workpiece or cutting table, and remove rust, paint, or other residue.
3. Make sure that the cutting table is correctly grounded and has good contact with the workpiece.
4. Examine the work lead for a loose connection at the plasma power supply and at the work clamp.
5. Examine the work clamp, and repair or replace the clamp if necessary.
6. Examine the work lead, and repair or replace the lead if necessary.

The pierce height is too high

Decrease the cut height.

The plasma arc stopped while cutting, but starts when you fire the torch again

There is a problem with the Hypertherm cartridge, the cut height, the air filter element, or the input gas pressure.

The Hypertherm cartridge is worn or has damage

- Replace the Hypertherm cartridge.

The arc is stretched too far

1. Decrease the length of the arc stretch when you cut.
2. When you cut with a hand torch, drag the torch on the workpiece when possible.

The filter element in the air filter is dirty

- Replace the air filter element.

The gas pressure is too low or too high

1. If you manually adjusted the gas pressure before the problem occurred, set the gas pressure back to the default setting.
2. For optimum system performance, make sure that the inlet gas pressure stays between 7.6 bar – 8.3 bar (110 psi – 120 psi) while gas is flowing.

   Never use more than the maximum gas pressure of 9.3 bar (135 psi).
3. Adjust the gas pressure on the plasma power supply manually, as necessary.
4. Make sure that the incoming gas supply hose has an internal diameter that is ≥ 9.5 mm (3/8 inch).
5. Examine the gas filtration system for signs of contaminants that are possibly causing interference with system performance.

The plasma arc makes sputtering and hissing sounds

There is a problem with the air filter element, or it is necessary to clean the input gas supply. There can also be a problem with the Hypertherm cartridge.

The air filter element is dirty

- Replace the air filter element that is in the filter bowl at the rear of the plasma power supply.

There is moisture in the gas supply line

1. Examine the gas supply line moisture.
2. Clean or replace external filtration components as necessary.
3. Flush the gas supply line with nitrogen to remove oil and moisture.
4. If necessary, add additional, external filtration that is applicable for the work environment.

There is a problem with the cartridge

1. Make sure that the Hypertherm cartridge is not too loose or too tight on the torch.
2. Examine the Hypertherm cartridge for wear or damage, and replace it if necessary.

The system changes the gas pressure after you set it manually

The plasma power supply will override manual gas mode under some conditions.

One of these conditions caused the gas pressure to be changed

- You installed a different type of Hypertherm cartridge.
- You adjusted the gas pressure before you unlocked the torch.
- You enabled "marking mode" by adjusting the amperage to be less than 20 A with a FineCut Hypertherm cartridge installed on the torch.

1. Make sure that the torch-lock switch is in the green "ready to fire" position.
2. Set the amperage to be more than 20 A.
3. Manually adjust the gas pressure as necessary.

   The selected cut mode LED on the front panel flashes while the gas pressure is manually set.

The system changes the output current (A) or the operating mode after you set them

You selected the system setting while the torch was locked

The system does not keep changes to the output current (A) or operating mode while the torch-lock switch is in the yellow lock position or while there is an 0-50-n "Hypertherm cartridge off" fault condition.

When you set the torch-lock switch to the green "ready to fire" position, the system automatically sets the amperage and operating mode to match the type of Hypertherm cartridge installed on the torch.

For more information on the 0-50-n fault condition, refer to Troubleshooting for torch-lock switch faults (0-50-n) on page 128.

- Set the torch-lock switch to the green "ready to fire" position **before** you adjust the amperage or operating mode.

Possible gouging problems

When you are gouging with the torch, you may have an issue. Refer to this table to help identify the problem and solution.

When gouging, always make sure that:

- A Hypertherm gouging cartridge is installed.
- The Hypertherm cartridge is not worn or damaged. Refer to Signs that a cartridge is near end-of-life on page 77
- The operating mode is set to Gouge mode.

Problem	Solution
The arc goes out during gouging.	▪ Decrease the arc stretch (standoff). ▪ Put the torch in a more upright position.
The torch tip hits the molten metal (slag).	▪ Increase the arc stretch (standoff). ▪ Keep the torch tip pointed in the direction of the gouge that you want to make.
The gouge has too much depth.	▪ Tilt the torch down so that it is closer to the workpiece. ▪ Increase the arc stretch (standoff). ▪ Increase the gouging speed. ▪ Decrease the output current (A).

Problem	Solution
The gouge does not have enough depth.	▪ Put the torch in a more upright position. ▪ Decrease the arc stretch (standoff). ▪ Decrease the gouging speed. ▪ Increase the output current (A).
The gouge has too much width.	▪ Put the torch in a more upright position. ▪ Decrease the arc stretch (standoff). ▪ Increase the gouging speed. ▪ Decrease the output current (A).
The gouge does not have enough width.	▪ Tilt the torch down so that it is closer to the workpiece. ▪ Increase the arc stretch (standoff). ▪ Decrease the gouging speed. ▪ Increase output current (A).

Troubleshooting for power-related problems with generators

Problems with input line voltage can occur more frequently with some generators.

There is a problem with the input line voltage

The Power ON LED flashes for line voltage faults. If a line voltage fault occurs while you are using a generator, it is possible that a quick restart does not remove the fault condition.

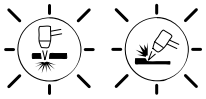
1. Set the power switch to OFF (**O**).
2. Make sure that the plasma power supply stays off for a minimum of one minute before you set the power switch to ON (**I**).
3. If you continue to have problems with input line voltage, disconnect the plasma power supply from the generator, and connect it to a power receptacle with sufficient power.

Troubleshooting procedures for fault LEDs and fault codes

Fault icons and fault codes

The Powermax45 SYNC power supply shows faults using a combination of fault icons and fault code numbers. Some faults are shown by the icons only, others are shown by the icons and a fault code number.

Sometimes the icons do not indicate a fault condition. For example, if the Cut Mode icon or the Gouge Mode icons flash, this indicates that the gas pressure has been manually adjusted. After you reset the gas pressure to its default setting, the icons stop flashing.



Fault icons

Each fault icon can help identify what the caused the problem.

Service

This icon shows when the transfer (XFR) signal on the machine interface is closed, or when the plasma power supply receives a START signal from a Computer Numerical Control (CNC).

Temperature

This icon identifies fault conditions in which the plasma power supply is outside the range of permitted operating temperatures.

Torch Cap sensor

This icon identifies fault conditions in which the Hypertherm cartridge is loose, incorrectly installed, or missing.

This icon also identifies when the SmartSYNC torch is in the yellow lock (X) position.

Fault

This icon identifies faults that cause the plasma power supply to stop cutting.

This icon also comes on when the torch is set to the yellow lock (X) position.

Gas

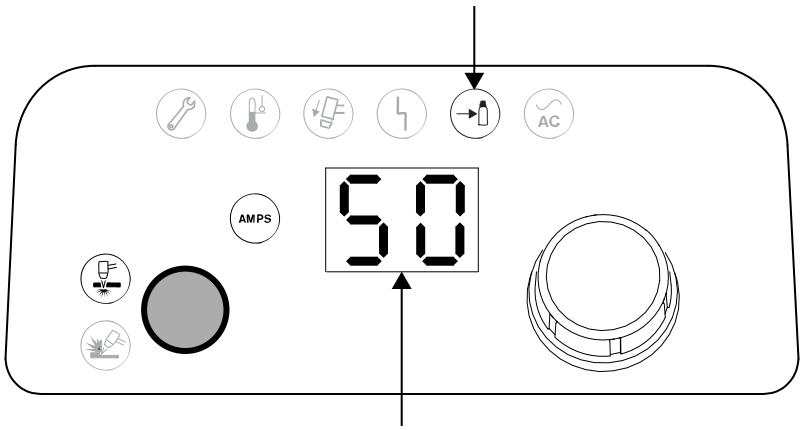
This icon identifies fault conditions in which the gas supply is disconnected from the plasma power supply or there is a problem with the gas supply.

Power ON

When flashing, this icon identifies a problem with the AC input power.

Fault codes

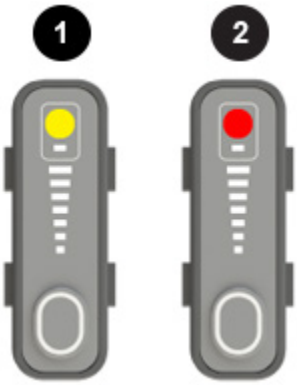
When a fault occurs with the plasma power supply or the torch, a fault icon, or a fault icon and a fault code, will show on the 2-digit display.



Fault codes give additional information when necessary to make the source of the problem easier to identify.

The codes are divided into three segments (**N-nn-n**), and each segment shows on the 2-digit display in sequence. This is an example of the 0-50-2 fault code:

The status LED on the SmartSYNC hand torch also shows the fault status.



1 **Yellow** = a 0-nn-n fault code, or the torch is locked.

2 **Red** = a 1-nn-n, 2-nn-n, or 3-nn-n fault code.

Operational faults

An operational fault code can be for a notification or for a condition that stops the cutting process. Hypertherm recommends that you do the steps for all faults that occur. Troubleshooting all faults helps you to get optimal cut quality and consumable life.

A label with descriptions for many common fault codes is included with the system. Put the label on the plasma power supply or near your work area for reference.

Fault code	Fault LEDs	Torch LED	Description
None	Flashes	Yellow	▪ The current from the incoming power line is unstable. ▪ Stop power to the system and correct the line resonance problem before continuing. ▪ Refer to Troubleshooting for AC input power that is not stable on page 114.
None	ON ON	Yellow	▪ The gas pressure is too low. ▪ Refer to Troubleshooting for low gas pressure faults on page 114.
None	Flashes quickly	Yellow	▪ There is no gas supply input. ▪ Refer to Troubleshooting for missing gas input faults on page 116.
None	Flashes slowly	Yellow	▪ There is a TSO condition. ▪ Refer to Troubleshooting for TSO and TSC faults on page 117.
None	Flashes quickly		▪ There is a TSC condition. ▪ Refer to Troubleshooting for TSO and TSC faults on page 117.
None	ON ON	Yellow	▪ The internal temperature of the plasma power supply is too hot or too cold. ▪ Refer to Troubleshooting for temperature-related faults on page 119.

Fault code	Fault LEDs	Torch LED	Description
None	ON	Yellow	▪ The Hypertherm cartridge was off, the torch was disconnected, or the torch was in the yellow lock (X) position during a restart. ▪ Refer to Troubleshooting for when the Hypertherm cartridge or torch is not ready to cut on page 119.
None	Flash alternately	Yellow	▪ The plasma power supply was receiving a signal to start cutting at the same time that the power switch was set to ON (**I**). ▪ Refer to Troubleshooting for start signal faults on page 121.
None	Flashes ON	Yellow	▪ An AC input voltage phase loss occurred. ▪ This is applicable only for 3-phase models. ▪ Refer to Troubleshooting for input voltage faults on page 122.
None	Flashes	Yellow	▪ The AC input voltage is too low (>10% less than the rated voltage for 1-phase models or >15% less than the rated voltage for 3-phase models). ▪ The AC input voltage is too high (>10% more than the rated voltage for 1-phase models or >15% more than the rated voltage for 3-phase models). ▪ Refer to Troubleshooting for input voltage faults on page 122.

Fault code	Fault LEDs	Torch LED	Description
0-11-0	AC ON	CNC use only	▪ The remote control operating mode is incorrect or not permitted for the installed Hypertherm cartridge. ▪ The permitted operating modes for Hypertherm cutting cartridges is 1 (Cut mode). ▪ The permitted operating mode for a Hypertherm gouging cartridge is 2 (Gouge mode). ▪ Refer to Troubleshooting for remote controller faults (0-11-n) on page 123.
0-11-1			▪ The remote control output current (A) is incorrect or not permitted for the installed Hypertherm cartridge. ▪ The permitted values relate to the minimum and maximum output current (A) for the plasma power supply and the installed Hypertherm cartridge. ▪ Refer to Troubleshooting for remote controller faults (0-11-n) on page 123.
0-11-2			▪ The remote control gas pressure is incorrect or not permitted. ▪ The permitted gas pressure relates to the selected process and operating mode, and to the installed torch, torch lead, and Hypertherm cartridge. ▪ Refer to Troubleshooting for remote controller faults (0-11-n) on page 123.
0-12-1	AC ON	CNC use only	▪ The output gas pressure is too low. ▪ Refer to Troubleshooting for incorrect output gas pressure conditions (0-12-n) on page 124.
0-12-2			▪ The output gas pressure is too high. ▪ Refer to Troubleshooting for incorrect output gas pressure conditions (0-12-n) on page 124.
0-12-3			▪ The output gas pressure is not stable. ▪ Refer to Troubleshooting for incorrect output gas pressure conditions (0-12-n) on page 124.
0-14-0	ON	Flashes yellow	▪ There is a problem with the Hypertherm cartridge installation. ▪ Refer to Troubleshooting for Hypertherm cartridge installation faults (0-14-n) on page 125.
0-14-1	AC		▪ The Hypertherm cartridge is not recognized. ▪ Refer to Troubleshooting for Hypertherm cartridge installation faults (0-14-n) on page 125.

Fault code	Fault LEDs	Torch LED	Description
0-19-9	Only displays on a CNC or when you use the Hypertherm SYNC Cartridge Reader (528083) and app to read data from a Hypertherm cartridge.		▪ The input power stopped. Or, power PCB hardware protection occurred for components in the plasma power supply. ▪ Refer to Troubleshooting for PCB hardware protection faults (0-19-9) on page 126.
0-40-5	ON	Yellow	▪ The duty cycle for the plasma power supply was exceeded. ▪ Refer to Troubleshooting for duty cycle faults (0-40-5) on page 127.
0-50-1	ON	Yellow	▪ The torch-lock switch is set to the yellow lock (**X**) position. ▪ Refer to Troubleshooting for torch-lock switch faults (0-50-n) on page 128.
0-50-2			▪ The torch-lock switch is set to the green "ready to fire" position, but the torch is not prepared to fire. ▪ Refer to Troubleshooting for torch-lock switch faults (0-50-n) on page 128.
0-50-3	ON		▪ The plasma power supply is reading data from the Hypertherm cartridge. ▪ Refer to Troubleshooting for torch-lock switch faults (0-50-n) on page 128.

Fault code	Fault LEDs	Torch LED	Description
0-52-0	ON ON	None	▪ The torch is not connected. ▪ Refer to Troubleshooting for torch connection faults (0-52-0) on page 130.
0-98-1	ON	Yellow	▪ A Radio Frequency (RF) communication failure occurred between the Hypertherm cartridge and the torch. ▪ Refer to Troubleshooting for an RF communication fault (0-98-1) on page 131.
0-98-2	ON	Flashes yellow	▪ A communication failure occurred between the torch and the plasma power supply. ▪ Refer to Troubleshooting for a plasma power supply or torch communication fault (0-98-2) on page 132.

Internal component faults (1-nn-n, 2-nn-n, 3-nn-n)

Fault codes in the 1-nn-n, 2-nn-n, and 3-nn-n formats identify possible damage to components inside the plasma power supply.

Fault code	Fault icon	Fault LEDs	Description	Solutions
1-nn-n **2-nn-n** **3-nn-n**	ON AC ON	Red	A major fault occurred.	These fault codes stop the system from operating. ▪ Do a cold restart. In some conditions, a restart can remove the fault condition. ▪ If you cannot find or correct the problem, a qualified service technician must repair the system. Speak to your distributor or authorized repair facility.

Troubleshooting for AC input power that is not stable

The Power ON LED can flash to identify when the AC input power is not stable and a system shutdown is necessary.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
None	Flashes	Yellow	The AC input power is not stable.	No, but the system can operate at a decreased capacity in some conditions.
			The current from the incoming power line is unstable. Stop power to the system. Have an electrical technician correct the line resonance problem before continuing.	Yes

Corrective action for AC input power that is not stable

1. If possible, connect the system to a different AC power source.
2. Make sure that the plasma power supply is not being used on a phase converter.
3. If applicable, disconnect the system from generator power.

Troubleshooting for low gas pressure faults

When the Gas Pressure fault LED and the System Fault LED both illuminate while the system is ON, the gas pressure is less than the minimum pressure for the selected process, operating mode, torch, lead length, and Hypertherm cartridge type.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
None	ON ON	Flashes yellow	The gas pressure is too low.	No

Corrective action – gas supply checks

1. Examine all the input gas supply connections, and make sure that there are no leaks or loose connections.
2. Make sure that the internal diameter of the incoming gas supply hose is ≥ 9.5 mm (3/8 inch).
3. Make sure that the gas inlet fitting at the rear of the plasma power supply is connected correctly and is fully tightened.
   - CSA models: Tighten the 1/4 NPT fitting to 11.3 N m (100 lbf in).
   - CE/CCC models: Tighten the G-1/4 BSPP adapter to 10.2 N m (90 lbf in).
4. Manually adjust the gas pressure on the plasma power supply, and do a quick restart.
5. Examine the air filter at the rear of the plasma power supply:
   a. Replace the air filter element if it is contaminated.
   b. Clean the air filter bowl, or replace it if it has damage.
6. Start a gas test, and let the gas flow for 3 – 5 minutes to find if the gas pressure remains stable.

   Refer to Do a gas test on page 97.
7. If the actual pressure is different from the set pressure by more than 0.2 bar (3 psi) during the gas test, continue with the next procedure.

Corrective action – more external checks

1. Set the power switch to OFF (**O**), and disconnect the power cord from the power source.
2. Examine the Hypertherm cartridge for wear and damage, and replace it if necessary.
3. Make sure that the torch lead is not kinked or twisted, and replace it if necessary.

4. Make sure that the torch lead has a good connection to the plasma power supply.
5. Examine the torch lead connector and the quick-disconnect receptacle for possible damage to the pins or wires, and replace them if necessary.
6. **Optional:**

   If other devices use the same gas supply, make sure that those devices do not prevent sufficient gas pressure to the plasma power supply.
7. **Optional:**

   Clean or repair external filters, if necessary.
8. **Optional:**

   If the plasma power supply is connected to an air compressor, make sure that the compressor is the correct size for this system.
9. To find if electrical interference is preventing the solenoid valve from operating correctly, move the plasma power supply to another location.
10. If you cannot find or correct the problem, a qualified service technician must repair the system.

Troubleshooting for missing gas input faults

The Gas Pressure fault LED flashes quickly when there is no gas supply input to the plasma power supply.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
None	Flashes quickly	Yellow	There is no gas supply input.	Yes. The fault code goes away when you connect the gas supply to the plasma power supply unless there is a blockage in the gas line.

Corrective action for the input gas supply

1. Make sure that the input gas supply is connected correctly to the plasma power supply.
2. Examine the input gas supply line, and make sure that there are no gas leaks, loose connections, or blockages.

3. Do a quick restart.

Troubleshooting for TSO and TSC faults

A flashing Torch Cap fault LED identifies either a TSO or a TSC condition.

- **TSO:** The nozzle and electrode components inside the Hypertherm cartridge are not touching after a Start signal is received.
- **TSC:** The nozzle and electrode components inside the Hypertherm cartridge will not disconnect from each other after a Start signal is received.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
None	Flashes slowly	Yellow	There is a TSO condition.	Yes. These faults stop the torch from firing a plasma arc. In some conditions, you can fire the torch again and continue to cut.
None	Flashes quickly		There is a TSC condition.	

Corrective action for the Hypertherm cartridge

1. If the Hypertherm cartridge became loose or was removed while the plasma power supply was ON and the torch-lock switch was set to the green "ready to fire" position, set the power switch on the plasma power supply to OFF (**O**), correct the problem, and set the power switch to ON (**I**) to remove the fault.
2. Examine the Hypertherm cartridge to make sure that it is not worn and does not have damage.
3. Are you using a hand torch or a mechanized torch?

Hand torch	1. Move the torch-lock switch to the yellow lock position, then move the torch-lock switch to the green "ready to fire" position. 2. Fire the torch one time to get the warning puffs of air. This can clean away unwanted material that has collected around the tip of the Hypertherm cartridge.
Mechanized torch	Continue with the next step.

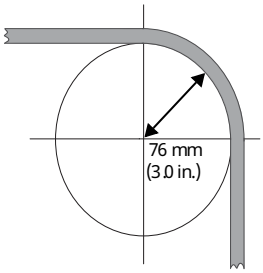
4. Remove the Hypertherm cartridge and carefully shake it to remove unwanted material that has collected inside the Hypertherm cartridge.
5. Install a new Hypertherm cartridge.

Corrective action for TSO faults that occur during postflow

A Start signal during postflow causes the remaining air pressure in the torch lead to quickly decrease. If the pressure does not decrease quickly enough, the electrode will possibly not return to its closed position in time to form the pilot arc. A TSO fault occurs.

After each step, try to fire the torch again.

1. Move the torch lock switch to the LOCK position and then back to the "ready to fire" position to reset the torch.
2. Try a different Hypertherm cartridge.
3. Do an inspection of the torch lead.
   - ☐ If the torch lead is installed in a track, remove the torch lead from the track.
   - ☐ Does the torch lead have any kinks or bends? Do not bend the torch lead around a radius that is less than the minimum bend radius of 76 mm (3.0 inches).
   - ☐ Are there cable ties around the torch lead that are too tight?
   - ☐ Are there any signs of a gas leak?



4. Do a gas test to make sure that the inlet gas pressure is sufficient.
5. Try a different torch.

   If the torch does not fire, there could be a problem with the plasma power supply instead of the torch. Speak to your distributor or authorized repair facility.

Verification

- Because TSO and TSC faults can be intermittent, do these troubleshooting steps as many times as necessary.

Troubleshooting for temperature-related faults

When the Temperature fault LED and the System Fault LED both illuminate while the system is ON, the internal temperature of the plasma power supply is too hot or too cold. Hypertherm recommends that you operate the system only in external temperatures between -10°C – 40°C (14°F – 104°F).

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
None	ON ON	Yellow	The internal temperature of the plasma power supply is too hot or too cold.	Yes. You can continue to use the system when its internal temperature is no longer too hot or too cold.

Corrective action for temperature faults

1. Keep the plasma power supply ON to let the fan decrease the temperature of the internal components.
2. If the internal temperature of the plasma power supply gets near -30°C (-22°F), move the system to a warmer location.
3. Make sure that there is sufficient air flow around the plasma power supply.
4. Make sure that the plasma power supply cover is installed with the louvers in front of the fan.

Troubleshooting for when the Hypertherm cartridge or torch is not ready to cut

The Torch Cap fault LED illuminates when the torch or Hypertherm cartridge is not ready to cut or is not able to cut.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
None	ON	Yellow	The Hypertherm cartridge was off, the torch was disconnected, or the torch was in the yellow lock (X) position during a restart.	Yes

Corrective action for the Hypertherm cartridge and torch

1. Move the torch-lock switch to the green "ready to fire" position.

   This fault can show when you do a restart while the torch-lock switch is in the yellow lock (X) position.

2. Remove the Hypertherm cartridge, and reinstall it correctly.
3. Reconnect the torch to the plasma power supply, and do a quick restart.
4. **Optional:**

   Machine torch: Lock and unlock the torch, or do a quick restart.

   This fault can be caused by removing the Hypertherm cartridge without first setting the torch-lock switch to the yellow lock position or setting the power switch to OFF (**O**).

5. **Optional:**

   Mini machine torch: Do a quick restart.

   This fault can be caused by removing the Hypertherm cartridge without first setting the power switch to OFF (**O**).

6. If possible, do a test with a different torch that is known to work correctly.
7. Push down the plunger in the torch head and then release.

8. If the plunger moves freely and goes back to its start position, speak to your distributor or authorized repair facility.

   There is possible damage in the torch or in the plasma power supply.

Troubleshooting for start signal faults

The Temperature fault LED and the System Fault LED flash alternately when the system receives a Start signal from the torch at the same time that the power switch is set to ON (**I**). This fault can prevent the torch from firing a plasma arc.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
None	Flash alternately	Yellow	The plasma power supply received a signal to start cutting at the same time that the power switch was set to ON (**I**). This condition is also referred to as a "stuck start."	Yes. A quick restart is necessary.

Corrective action: quick restart

1. Do you have a hand torch or a machine torch?

Hand torch:	Release the torch trigger.
Machine torch:	Set the Start signal to off.

2. Do a quick restart of the plasma power supply.
3. If the Temperature fault LED and the System Fault LED continue to flash alternately, speak to your distributor or authorized repair facility.

   There is a possible problem with the torch or with the plasma power supply.

Troubleshooting for input voltage faults

A flashing Power ON LED can identify a problem with the input voltage.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
None	AC Flashes ON	Yellow	An AC input voltage phase loss occurred. This is applicable only to 3-phase models.	Yes. A cold restart is necessary.
None	AC Flashes	Yellow	The AC input voltage is too low (>10% less than the rated voltage for 1-phase models or >15% less than the rated voltage for 3-phase models) or too high (>10% more than the rated voltage for 1-phase models or >15% more than the rated voltage for 3-phase models).	Yes. A cold restart is necessary.

Examine the incoming line voltage

1. If applicable, disconnect the system from generator power.
2. What fault LED do you see?

If you see this fault LED...	Do these steps...
The Power ON LED flashes and the System Fault LED is illuminated.	Have an electrical technician examine all input phases, fuses, and breakers for correct voltage (phase-to-phase and phase-to-ground) at the power source and at the plasma power supply.
The Power ON LED flashes.	Have an electrical technician examine the line and increase or decrease the voltage.

3. If you continue to see the same fault condition, speak to your distributor or authorized repair facility.

Troubleshooting for remote controller faults (0-11-n)

A 0-11-n fault code identifies a problem with the remote controller. There can also be a problem with the software interface to the system. The system cannot interpret the operating mode, output current, or gas pressure information coming from the controller.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-11-0	AC ON	CNC use only	The remote control operating mode is incorrect or not permitted for the installed Hypertherm cartridge. The permitted operating modes for Hypertherm cutting cartridges is 1 (Cut mode). The permitted operating mode for a Hypertherm gouging cartridge is 2 (Gouge mode).	No. These fault codes only apply to remotely controlled plasma power supplies.
0-11-1			The permitted operating modes for Hypertherm cutting cartridges is 1 (Cut mode). The permitted operating mode for a Hypertherm gouging cartridge is 2 (Gouge mode). The permitted values relate to the minimum and maximum output current (A) for the plasma power supply and the installed Hypertherm cartridge.	
0-11-2			The remote control gas pressure is incorrect or not permitted. The permitted gas pressure relates to the selected process and operating mode, and to the installed torch, torch lead, and Hypertherm cartridge.	

Corrective action for 0-11-0, 0-11-1, and 0-11-2 faults

1. Examine the programming code for incorrect process variables.
2. Repair the controller.
3. If you cannot find or correct the problem, a qualified service technician must repair the system.

   Speak to your distributor or authorized repair facility.

Troubleshooting for incorrect output gas pressure conditions (0-12-n)

An 0-12-n fault code identifies a condition where the output gas pressure is too low, too high, or not stable. The 0-12-n fault codes show only on a CNC through an RS-485 serial interface. They do not show on the plasma power supply 2-digit display.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-12-1	AC ON	CNC use only	The output gas pressure is too low.	No
0-12-2			The output gas pressure is too high.	
0-12-3			The output gas pressure is not stable.	

Corrective action for 0-12-0, 0-12-1, and 0-12-2 faults

1. For optimum system performance, make sure that the inlet gas pressure stays between 7.6 bar – 8.3 bar (110 psi – 120 psi) while gas is flowing.

   Never use more than the maximum gas pressure of 9.3 bar (135 psi).

2. Which fault code do you see?

0-12-1	Increase the inlet gas pressure from the gas supply source.
0-12-2	Decrease the inlet gas pressure from the gas supply source.
0-12-3	Adjust the inlet gas pressure from the gas supply source as necessary.

3. Make sure that the gas lines do not have kinks, blockages, or other damage.
4. Do a gas test to find if the plasma power supply's actual output gas pressure is lower than the set pressure by more than an acceptable quantity.

Refer to Do a gas test on page 97.

5. If the fault continues, have a qualified service technician examine the solenoid valve in the plasma power supply.

   Speak to your distributor or authorized repair facility.

Troubleshooting for Hypertherm cartridge installation faults (0-14-n)

An 0-14-n fault identifies a condition where the Hypertherm cartridge is not recognized or is not operating correctly.

Fault codes and fault LEDs

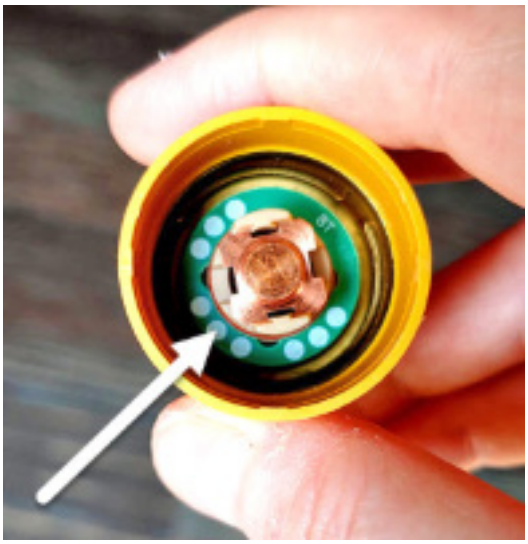
Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-14-0	ON AC ON	Flashes yellow	This fault shows when you install a Hypertherm cartridge, and it cannot send data to the plasma power supply. This fault code stops the system from operating. Electrical noise can cause a bad data connection. For example, high frequency electrical noise from TIG welders can cause interference. Keep electrical noise in the work area as low as possible. To prevent possible damage to the workpiece and Hypertherm cartridge, the system automatically: ▪ Sets the output current to 45 A. ▪ Sets the operating mode to Cut mode. ▪ Sets the output gas pressure to cut pressure. If necessary, you can manually change these settings to cut without a data connection.	Yes
0-14-1	AC ON		This fault shows when a Hypertherm cartridge cannot send data to the plasma power supply for some reason. This fault code does not stop the system from operating. This error code occurs most likely due to poor Hypertherm cartridge installation.	No

Corrective action for 0-14-0 faults

1. Decrease electrical noise in the work area as much as you can.
2. Set the torch-lock switch to the yellow lock (**X**) position and then back to the green "ready to fire" position.
3. Do a quick restart.
4. Install the Hypertherm cartridge again.

Corrective action for 0-14-1 faults

1. When this fault occurs, you can continue to cut or gouge, but **you must set the output current (A) and the operating mode manually**.
2. Lightly blow air into the Hypertherm cartridge to remove dust or other contamination.
3. Make sure that the green ring inside the Hypertherm cartridge is not broken.



4. Install the Hypertherm cartridge again.

Troubleshooting for PCB hardware protection faults (0-19-9)

A 0-19-9 fault code usually occurs when the input power stops or when power PCB hardware protection occurs for components in the plasma power supply.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-19-9	This fault code only shows on a CNC, or when you use the Hypertherm cartridge reader (528083) and the Cartridge Reader app to read data from the Hypertherm cartridge.		The plasma arc stops. After 10 seconds you can start it again.	Fault 0-19-9 can occur up to nine times before it becomes a 2-nn-n or 3-nn-n fault. A 2-nn-n or 3-nn-n fault stops the plasma power supply from operating.

Corrective action for 0-19-9 faults

1. Decrease electrical noise in the work area as much as you can, and try again to cut when the 0-19-9 fault code goes away.
2. If you use serial communications, wait for one minute for the fault to go away on its own.

   This fault can occur temporarily on the CNC when you set the plasma power supply to OFF (**O**).
3. If the 0-19-9 fault becomes a 2-nn-n fault or a 3-nn-n fault, speak to your distributor or authorized repair facility.
   - A 2-nn-n or 3-nn-n fault identifies a hardware fault with an internal component. A qualified service technician must repair the system.
   - As long as power to the system is not stopped, the 0-19-9 fault can occur up to nine times before it becomes a 2-nn-n or 3-nn-n fault.
   - A cold restart sets the 0-19-9 fault counter back to zero.

Troubleshooting for duty cycle faults (0-40-5)

A 0-40-5 fault code indicates that the plasma power supply has exceeded its rated duty cycle.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-40-5	ON	Yellow	The plasma power supply has reached its duty cycle limit and must cool down for at least 3.5 minutes.	Yes

Corrective action for 0-40-5 faults

1. Wait for the plasma power supply to cool down.
2. Make sure that there is sufficient air flow around the plasma power supply.
3. Make sure that the fan is operating correctly.
4. If possible, decrease the output current (A), or decrease the period of continuous "arc on" time when you cut.

   These steps can help to keep the system in its duty cycle limits.

Troubleshooting for torch-lock switch faults (0-50-n)

A 0-50-n fault code is usually an indication that the torch-lock switch is set to the yellow lock (X) position or that the system is reading data from the Hypertherm cartridge.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-50-1	ON	Yellow	The torch-lock switch is set to the yellow lock (X) position.	Yes
0-50-2			The torch-lock switch is set to the green “ready to fire” position, but the torch is not prepared to fire.	Yes
0-50-3	AC ON		The system is reading data from the Hypertherm cartridge. If the system cannot read the data from the Hypertherm cartridge, a different fault code will show. The usual behavior when this happens is to see a 0-50-2 fault code after 0-50-3 goes away.	Yes

Corrective action for 0-50-1 faults

1. Hand torch:
    a. Move the torch-lock switch to the green “ready to fire” position.
    b. Fire the torch one time to get the warning puffs of air.
    c. Fire the torch again to get a plasma arc.
2. Machine torch:
    a. Move the torch-lock switch to the green “ready to fire” position.
    b. Fire the torch to get a plasma arc.

Corrective action for 0-50-2 faults

1. Hand torch:
    a. Fire the torch one time to get the warning puffs of air.
    b. The 0-50-2 fault code goes off, and the LED on the hand torch changes from yellow to green.

    The torch is now prepared to fire a plasma arc.
2. Machine torch:
    a. Fire the torch to get a plasma arc.

b. **Optional:**

If the 0-50-2 fault code does not go off, send a STOP signal from the CNC to remove the fault.

Corrective action for 0-50-3 faults

1. Wait for the fault code to go away on its own.
2. If a 0-50-2 fault code shows after the 0-50-3 goes away, fire the torch one time to get the warning puffs of air.

   The 0-50-2 fault code goes away. The torch is now prepared to fire a plasma arc.
3. Try a different Hypertherm cartridge.

Troubleshooting for torch connection faults (0-52-0)

The system usually shows a 0-52-0 fault code as an indication that the torch is not connected to the plasma power supply.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-52-0	ON ON ON	None	The torch is not connected.	Yes
			If you disconnect the torch while the plasma power supply is set to ON (**I**), you get the 0-52-0 fault code.	
			If you disconnect the torch while the plasma power supply is set to OFF (**O**), you get the 0-50-0 fault code the next time you set the plasma power supply to ON (**I**).	

Corrective action for 0-52-0 faults

1. Make sure that the torch lead is correctly connected to the FastConnect receptacle on the front of the plasma power supply.
2. Do a quick restart.

Troubleshooting for an RF communication fault (0-98-1)

An 0-98-1 fault code identifies a RF communication failure between the Hypertherm cartridge and the torch.

When this fault occurs, the Hypertherm cartridge is not sending data to the system, so the system cannot collect data about the Hypertherm cartridge. The problem can be with the Hypertherm cartridge or with the SmartSYNC torch.

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-98-1	ON	Yellow	An RF communication failure occurred between the Hypertherm cartridge and the torch.	No. You can continue to cut or gouge, but you must set the output current (A) and the operating mode manually.

Corrective action for the Hypertherm cartridge (0-98-1)

1. Make sure that the Hypertherm cartridge is installed correctly.
2. Make sure that the green ring inside the Hypertherm cartridge is not broken.

3. If you have a Hypertherm cartridge reader (528083), do a test to identify if the reader can pull data from the Hypertherm cartridge.

4. Install a new Hypertherm cartridge.
5. If a new Hypertherm cartridge does not remove the fault condition, have a qualified service technician examine the SmartSYNC torch for possible damage.

   Speak to your distributor or authorized repair facility.

Troubleshooting for a plasma power supply or torch communication fault (0-98-2)

An 0-98-2 fault code identifies a communication failure between the torch and the plasma power supply.

When this fault occurs, the SmartSYNC torch is not sending data to the plasma power supply, so the system cannot collect data about the Hypertherm cartridge. The problem can be with the Hypertherm cartridge or with the SmartSYNC torch. There can be a problem with:

- The PCB in the torch
- The torch lead
- The quick-disconnect receptacle
- The torch communication circuitry on the PCB in the plasma power supply

Fault codes and fault LEDs

Fault code	Fault LEDs	Torch LED	Description	Stops the system from operating?
0-98-2	ON	Yellow	A communication failure occurred between the torch and the plasma power supply.	No. You can continue to cut or gouge, but you must set the output current (A) and the operating mode manually.

Corrective action for 0-98-2 faults

- Speak to your distributor or authorized repair facility.

  A qualified service technician must identify the source of the fault and repair the component that is damaged.

7 Complete Regular Maintenance Tasks

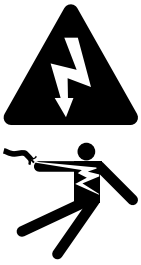
Maintenance for the plasma power supply and torch

Do these checks each time you use the system

Make sure that the plasma power supply, the torch, and the cartridge are prepared to cut.

Before you begin:

⚠ WARNING



ELECTRIC SHOCK CAN KILL

The plasma power supply contains dangerous electric voltages that can seriously injure or kill you. Even if the plasma power supply is turned OFF, you can still get a serious electric shock if the plasma power supply remains connected to an electric power source.

Use extreme caution if you do diagnosis or maintenance tasks when the plasma power supply remains connected to an electric power source and the outer cover or panels are removed. All work that requires removal of the plasma power supply outer cover or panels must be done by a qualified technician. Refer to the *Safety and Compliance Manual (80669C)* for more safety information.

WARNING

RISK OF BURNS AND ELECTRIC SHOCK – USE INSULATED GLOVES

The cartridges get very hot during cutting and can cause severe burns. Touching the cartridges can also cause electric shock if the plasma power supply is ON and the torch-lock switch is in the green "ready to fire" position.

Always put on insulated gloves when changing the cartridges. Also make sure that the torch is in the yellow lock (**X**) position.

WARNING

INSTANT-ON TORCHES – PLASMA ARC CAN CAUSE INJURY, BURNS

Ignition of the plasma arc occurs immediately when you pull the torch trigger. Before changing the cartridge, one of the following steps is necessary. Whenever possible, complete the first step.

Set the power switch on the plasma power supply to OFF (**O**).

OR

Move the torch-lock switch to the yellow lock (**X**) position. Pull the trigger to make sure that the torch does not fire a plasma arc.

Plasma power supply

- Examine each indicator LED and correct any fault conditions.

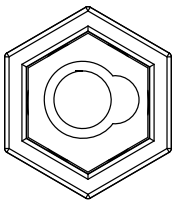
  Refer to Fault icons and fault codes on page 106.

- Examine the work lead connector to make sure that it is fully connected to the plasma power supply and is not loose.

  Make sure that you turn the connector clockwise approximately 1/4 turn until the connector is fully engaged and locked in position.

- Do a check of the plug on the work lead.

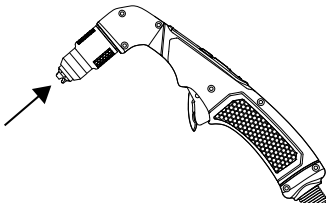
  When a plug is replaced, damage to the wire inside the plug can occur. If the plug on the work lead has been replaced, look for damage.



Torch

- Examine the cartridge for correct installation and for wear.

  Refer to Signs that a cartridge is near end-of-life on page 77 and Maintenance for the cartridge on page 138.



Do these checks each time you change the cartridge

Make sure that the torch is in a locked or off position before you change the cartridge.

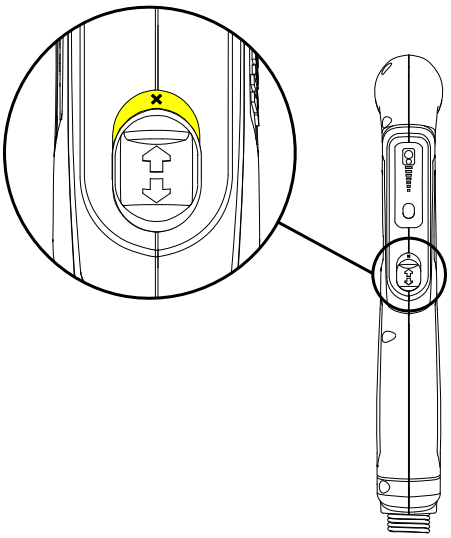
Examine the torch-lock switch

- Do a test of the torch-lock switch to make sure that it correctly locks and unlocks the torch.

  Have a qualified service technician replace the torch-lock switch if it is not working correctly. Speak to your distributor or authorized repair facility.

Lock the torch

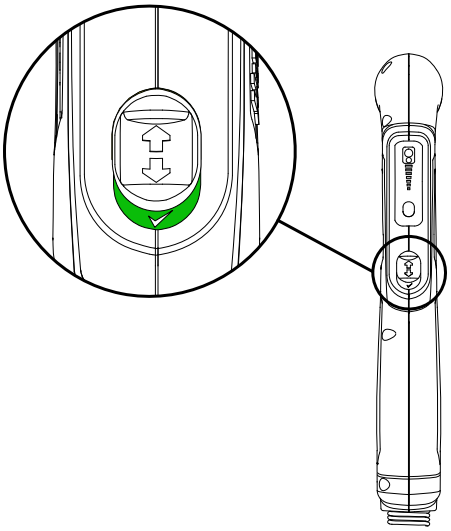
- With the plasma power supply ON, move the torch-lock switch to the **yellow** lock (**X**) position.



- Point the torch away from yourself and others.
- Pull the trigger to make sure that the torch does not fire.

Unlock the torch

- Move the torch-lock switch to the **green** "ready to fire" position.



- Point the torch away from yourself and others.
- Pull the trigger one time.

  Make sure that the torch does not fire. Make sure that multiple puffs of air quickly come from the torch instead. Refer to Warning puffs of air on page 53.

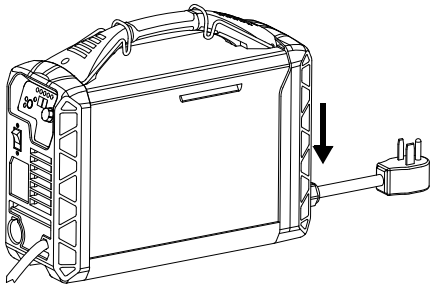
Do these checks at three-month intervals

Examine important system components for damage at regular intervals.

Plasma power supply

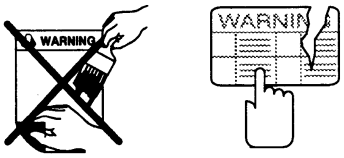
- Examine the power cord and plug and replace them if they have damage.

  Refer to the *Powermax45/65/85/105 SYNC Parts Guide (810490)*.



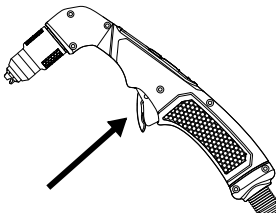
- Examine the labels and replace any that have damage.

  Refer to the *Powermax45/65/85/105 SYNC Parts Guide (810490)*.

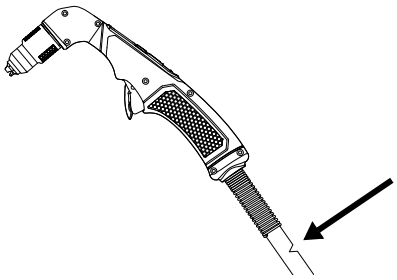


Torch

- Examine the trigger for damage.



- Examine the torch body for cracks and bare wires.
- Examine the torch lead for cracks or damage.



What to do next: If the torch lead or body has damage, have a qualified service technician replace it. Speak to your distributor or authorized repair facility.

Maintenance for the cartridge

Do the recommended steps to help keep a cartridge operating correctly.

- Carefully remove molten metal that collects in the castellations of the drag-cutting cartridges.

  Do not push the unwanted material inside the nozzle or shield.

- Carefully remove molten metal that causes a blockage of the airflow holes in the shield.

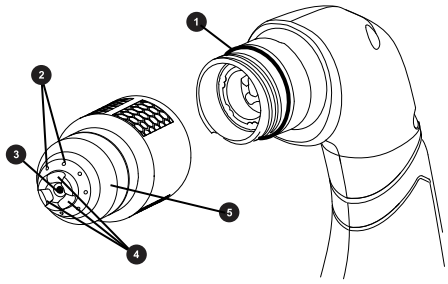
  Do not push the unwanted material inside the nozzle or shield.

- Examine the O-ring on the torch body.

If the O-ring is cracked or worn	Replace the O-ring.

If the O-ring is dry, or if it is not easy to install the cartridge	Apply a thin layer of silicone lubricant on the O-ring and the threads. Make sure that the O-ring is shiny, but do not apply too much lubricant.

Figure 4 - Components to examine



1 O-ring

2 Holes for airflow

3 Nozzle

4 Castellations

5 Shield

Maintenance for the air filter bowl and filter element

It is extremely important to keep a clean, dry gas line.

Keep a clean gas line to:

- Prevent oil, water, dirt, and other contaminants from causing damage to internal components.
- Get the best possible cut quality and consumable life.

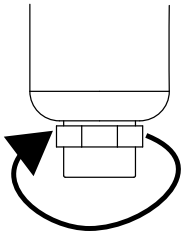
Drain water from the bowl (if necessary)

A small amount of water can collect in the bottom of the filter bowl. The water can be removed automatically or manually.

The filter bowl automatically removes the water when enough water collects to engage the float mechanism inside the bowl.

- To manually drain water from the bowl, remove the nut at the bottom of the bowl with your hand.

  To prevent damage to the plastic nut, do not use a wrench or other tool.



Examine the air filter bowl and O-ring

Figure 5 - Example of a dirty air filter bowl

Figure 5 - Example of a dirty air filter bowl (continued)

Before you begin:

NOTICE
DIRTY, OILY AIR CAN CAUSE DAMAGE TO THE AIR FILTER BOWL Some air compressors use synthetic lubricants that contain esters. Esters can cause damage to the polycarbonates in the air filter bowl. Add more gas filtration if necessary.

- Make sure that no oil, chemicals, dirt, or other contamination is on the filter bowl or the O-ring.
  - Contamination can prevent a good seal and cause gas leaks.
  - Contamination can also go through the gas line to the plasma power supply or torch and gradually cause damage to internal components.
- Make sure that the O-ring does not have cracks or other damage.
- Clean the air filter bowl by removing oil, dirt, or other contaminants.

  Yellow material on the filter bowl can be a sign that oil is getting into the gas supply line.
- Replace the air filter bowl and O-ring as necessary.
- If you use an external filtration system, such as the Eliminizer filter kit, also do a regular check of that filter for necessary maintenance or cleaning.

Examine the filter element

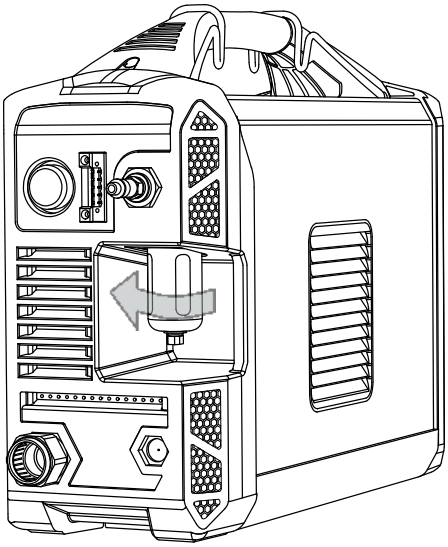
Figure 6 - Example of a clean filter element

- Do a regular check of the filter element inside the air filter bowl, especially in environments that are very dusty or very warm and humid.
- Replace the filter element when it is dirty or starts to show signs of damage.

Replace the air filter bowl and filter element

It is extremely important to keep a clean gas line in the plasma power supply.

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the air filter bowl by unscrewing the metal guard until it disconnects from the air filter assembly inside the plasma power supply.



3. Remove the air filter bowl from the metal guard.
4. Gently pry the filter element out of the filter bowl.

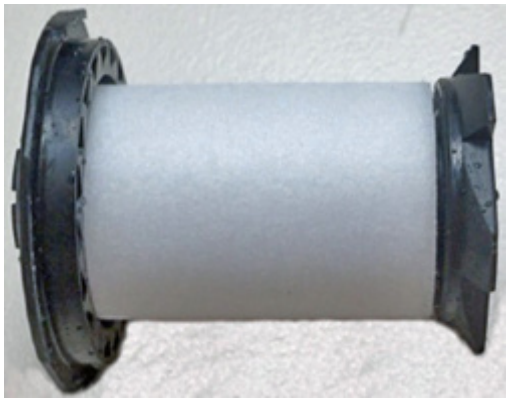
Be careful not to damage the O-ring at the top of the bowl.

5. Twist the plastic fittings until they come apart, approximately a 1/4 turn.

   Set the fittings aside.

6. Put the new air filter element in the plastic fittings.

   Twist the plastic fittings until they lock together, approximately a 1/4 turn.



7. Clean the air filter bowl by wiping away any oil, dirt, or other contaminants.

   A yellow residue on the filter bowl can be a sign that oil is getting into the gas supply line.

8. Examine the O-ring, and replace it if it has cracks or other damage.
9. Put the O-ring at the top of the filter bowl.

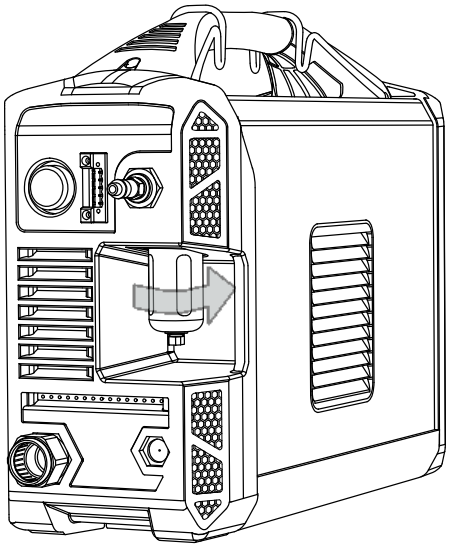
10. Put the filter element inside the air filter bowl.

    Push down on the top plastic fitting until you hear a click.

11. Put the air filter bowl inside the metal guard.

12. Put the air filter bowl back into place by screwing the metal guard into the air filter assembly that is inside the plasma power supply.

    Keep the metal guard straight so that you do not damage the threads as you install it.



13. Reconnect the gas supply.

14. Reconnect the power cord.

15. Set the power switch to ON (**I**).