Hypertherm®

Machine-side reference guide

803640

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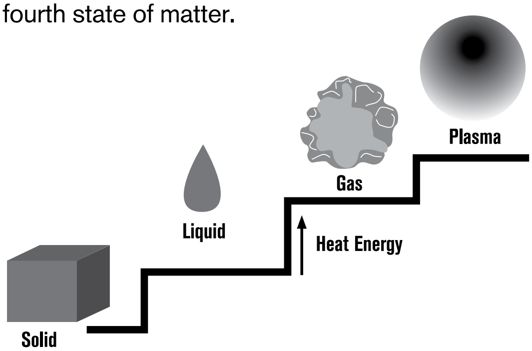
Plasma

Plasma: "the fourth state of matter"

The first three states of matter are solid, liquid and gas. For the most commonly known substance – water – these states are ice, water and steam. If you add heat energy, the ice will change from a solid to a liquid, and if more heat is added, it will change to a gas (steam). When substantial heat is added to a gas, it will change from gas to plasma, the fourth state of matter.



Plasma definition

Plasma is an electrically conductive gas. The ionization of gases causes the creation of free electrons and positive ions among the gas atoms. When this occurs, the gas becomes electrically conductive with current-carrying capabilities. Thus, it becomes a plasma.

Plasma in nature

One example of plasma, as seen in nature, is lightning. Just like a plasma torch, the lightning moves electricity from one place to another. In lightning, gases in the air are the ionization gases.

Cutting with plasma

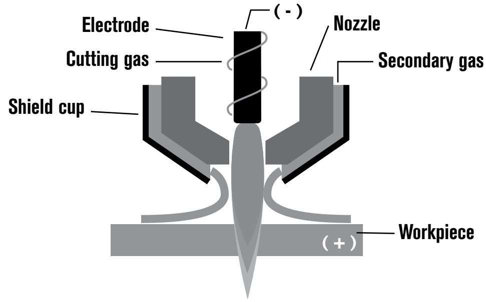
Plasma cutting is a process that utilizes an optimized nozzle orifice to constrict a very high-temperature, ionized gas so that it can be used to melt and sever sections of electrically conductive metals.

The plasma arc melts the metal, and the high-velocity gas removes the molten material.

System	*Material type*	*Severance capacity*	*Production pierce*
Powermax 1000	Mild Steel	32 mm (1¼")	10 mm (⅜")
	Stainless steel	32 mm (1¼")	10 mm (⅜")
	Aluminum	32 mm (1¼")	10 mm (⅜")
Powermax 1250	Mild Steel	38 mm (1½")	10 mm (⅜")
	Stainless steel	38 mm (1½")	10 mm (⅜")
	Aluminum	38 mm (1½")	10 mm (⅜")
Powermax 1650	Mild Steel	44 mm (1¾")	12 mm (½")
	Stainless steel	44 mm (1¾")	12 mm (½")
	Aluminum	44 mm (1¾")	12 mm (½")
MAX200	Mild Steel	50 mm (2")	25 mm (1")
	Stainless steel	50 mm (2")	25 mm (1")
	Aluminum	50 mm (2")	25 mm (1")
HT2000	Mild Steel	50 mm (2")	38 mm (1½")
	Stainless steel	50 mm (2")	25 mm (1")
	Aluminum	50 mm (2")	25 mm (1")
HSD130	Mild Steel	38 mm (1½")	25 mm (1")
	Stainless steel	25 mm (1")	20 mm (¾")
	Aluminum	25 mm (1")	20 mm (¾")
HPR130XD	Mild Steel	38 mm (1½")	32 mm (1¼")
	Stainless steel	25 mm (1")	20 mm (¾")
	Aluminum	25 mm (1")	20 mm (¾")
HPR260XD	Mild Steel	64 mm (2½")	38 mm (1½")
	Stainless steel	50 mm (2")	32 mm (1¼")
	Aluminum	50 mm (2")	25 mm (1")
HPR400XD	Mild Steel	80 mm (3.2")	50 mm (2")
	Stainless steel	80 mm (3.2")	45 mm (1¾")
	Aluminum	80 mm (3.2")	45 mm (1¾")
HPR800XD	Mild Steel	80 mm (3.2")	50 mm (2")
	Stainless steel	160 mm (6¼")	75 mm (3")
	Aluminum	160 mm (6¼")	75 mm (3")

Gas Selection

Selecting the proper gas for the material you are cutting is critical to get a quality cut.



Plasma gas

Plasma gas is also called the cutting gas. Gas that is ionized in the plasma process, exits through the nozzle orifice.

- Examples
  - Air
  - Nitrogen
  - Oxygen
  - Argon-Hydrogen

Shield gas

The shield gas is the secondary gas in the plasma process. It surrounds the arc and is used to help constrict the arc and cool the torch. It creates the cutting environment, which, among other things, affects the edge quality.

- Examples
  - Air
  - Air-Methane
  - CO_2
  - Nitrogen
  - Oxygen-Nitrogen
  - Methane

Selecting the right gas

Gas quality is critical for the proper operation of plasma arc cutting systems and optimal cut quality. Any contaminates can cause misfiring, poor cut quality or poor consumable life. Contaminates can be: gas impurities, moisture, oil, dirt, piping system contaminates or improper gases (ie. air in O_2 systems leaks, not following proper purge procedures when changing gas).

GAS SELECTION CHART

System	***Material***	***Plasma gas***	***Shield gas***
Powermax1000, Powermax1250, and Powermax1650	Mild steel*	Air	Air
	Stainless steel	Air, N_2	Air, N_2
	Aluminum	Air, N_2	Air, N_2
HyPerformance	Mild steel	Ar, O_2	Air, O_2
	Stainless steel	Ar, H35, N_2, H35-N_2, F5	N_2
	Aluminum	Ar, H35, Air, H35-N_2	N_2, Air
HySpeed Plasma HSD130	Mild steel	O_2, Air	Air
	Stainless steel	Air, N_2, F5, H35	Air, N_2
	Aluminum	Air, H35	Air, N_2
MAX200 and HT2000	Mild steel	Air, O_2, N_2	Air, O_2, CO_2
	Stainless steel	Air, N_2, H35	Air, CO_2, N_2
	Aluminum	Air, N_2, H35	Air, CO_2, N_2
for bevel	Mild steel	O_2	Air

*O_2 cutting is only for 340 amps maximum. Must use N_2 for higher current.

Cut Charts

Using cut charts

- The cut charts in the Instruction Manual give all parameters needed to set up your system to cut.
- Flow rates should always be adjusted according to the cut charts, unless additional notes section gives tips on adjusting to improve cut quality.

It may be necessary to adjust travel speeds and torch-to-work-distance/arc voltage settings to optimize cut quality and system performance. Following sections of this manual will instruct you how to make these adjustments.

- Purge gases for at least 1 minute after changing consumables and before cutting.

Current and Gas Selection

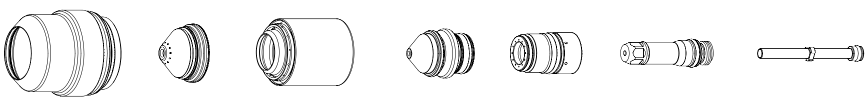
Material Type

Mild steel

O_2 Plasma / Air Shield

400 A

Flow rates – lpm/scfh		
	O_2	Air
Preflow	0 / 0	190 / 400
Cutflow	66 / 140	137 / 290



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Consumable Selection

Setup Parameters

Metric

Select Gases		Set Preflow		Set Cutflow		**Material Thickness**	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Plasma	Shield	Plasma	Shield	Plasma	Shield	**mm**	Volts	mm	mm/m	mm	Factor %	Seconds
						12	139		4430			0.4
						15	142	3.6	3950	7.2		0.5
						20	146		2805		200	0.7
						25	150	4.0	2210	8.0		0.9
O_2	Air	24	50	60	50	**30**	153	4.6	1790	9.2		1.1
						40	158		1160	11.5	250	1.9
						50	167	5.3	795	19.1	360	5.2
						60	173	6.4	580	Edge start		
						70	183		380			
						80	197	7.9	180			

English

Select Gases		Set Preflow		Set Cutflow		**Material Thickness**	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Plasma	Shield	Plasma	Shield	Plasma	Shield	**in**	Volts	in	ipm	in	Factor %	Seconds
						1/2	140		170			0.4
						5/8	143	0.14	150	0.28		0.5
						3/4	145		115		200	0.6
						1	151	0.16	85	0.32		0.9
						1-1/4	153		65	0.36		1.2
O_2	Air	24	50	60	50	**1-1/2**	157	0.18	48	0.45	250	1.6
						1-3/4	160		40			2.5
						2	168	0.21	30	0.75	360	5.5
						2-1/4	171	0.25	25			
						2-1/2	175		20	Edge start		
						3	193	0.31	10			

Marking

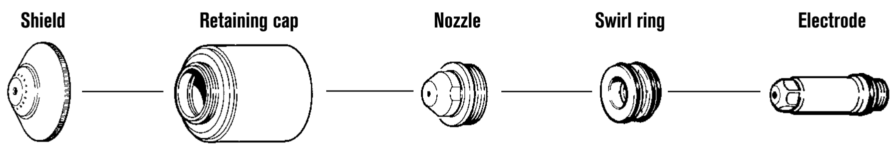
Select Gases		Set Preflow		Set Cutflow		**Amperage**	Torch-to-Work Distance		Marking Speed		Arc Voltage
						Amps	mm	in	mm/min	ipm	Volts
N_2	N_2	10	10	10	10	**22**	2.5	0.10	1270	50	123
Ar	Air	20	10	30	10	**25**	3.0	0.12	1270	50	55

Consumables

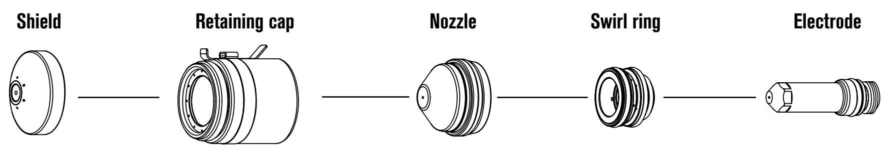
Installing consumables

- Select consumable parts using the appropriate cut chart.
- Install consumables using the tools provided in your parts kit. DO NOT OVERTIGHTEN.
- Lubricate all consumable O-rings with silicone grease that is provided in the consumable parts kits. Do not over-apply, only a thin film is needed. Apply the lubricant to your fingers (only enough to glisten) and then lubricate O-rings.
- Electrodes and nozzles should be replaced as a set. Swirl rings should be replaced when necessary, usually every 5–10 electrode/nozzle changes. Shields, retaining caps, etc. only need replacing when they are physically worn or when cut quality becomes poor.
- Protect your investment: use only genuine Hypertherm parts.

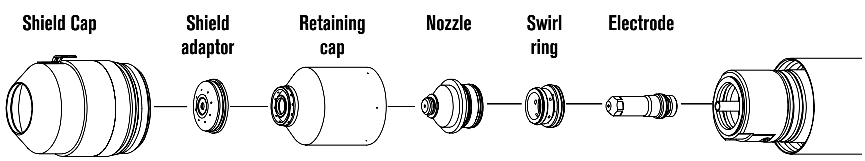
Conventional or HySpeed HT2000 Plasma



HSD Plasma



HyPerformance Plasma



Recording consumable life

- Recording consumable life is an important task that should be done each time consumables are changed.
- With records like this, you will easily see when you are having a consumable life problem, which will aid in effective troubleshooting.
- The chart below is a good example for your log.

CONSUMABLE USAGE LOG							
Starts	**Arc time**		**Errors**	**Material cut**	**Current/Process**	**Consumable part #**	**Notes**
	Start	**End**					

Consumable life

In addition to proper set-up and operation, consumable life can be increased by following these steps:

The average life of the consumables is dependent on the number of pierces and length of cut. Consumable life is not solely gauged by the number of pierces.

1. **Pierce height.** Proper pierce height is critical for long consumable life, cut quality and to avoid misfiring.

- Pierce height should be 1.5 – 2 times the torch cut height.
- Piercing too close to the plate will cause blow-back slag to enter the torch. This will cause consumable damage and possibly damage the torch.
- Piercing too high will cause excessive pilot arcing. This will cause excessive nozzle wear.

If you are using the Hypertherm Command THC, review the Instruction Manual for more information on piercing and some of its features that will reduce consumable damage.

2. **Reducing errors.** Reducing errors will add considerable life to your consumables. Errors are generally caused by not starting and/or stopping the cut on the plate or running the arc off the plate. This interrupts the Longlife process.

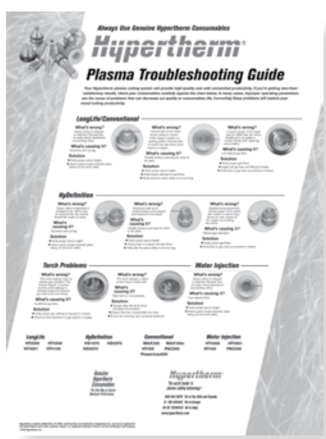
- Every error equals approximately 10 – 15 pierces on most systems. HyPerformance and HyDefinition are more sensitive to errors; each error equals more than 15 pierces.
- Errors should be less than 10% of the number of pierces.

Consumables

Troubleshooting consumables

Learning how to evaluate consumables will allow the experienced operator to quickly evaluate the operation of his system and find any problem that may arise. The chart below shows common problems and solutions:

Problem	Possible cause	Solution	Notes
Electrode quickly erodes	Gas restriction, low gas flow	1. Verify proper flow setting and supply pressure/flow	Torch will dive if equipped with THC
		2. Verify proper consumables are installed	This problem could also cause misfiring
		3. Check swirl ring for blockage and proper amount of lubrication	
		4. Check for hose blockage or kink	
		5. Check for malfunctioning valve	
	High coolant temperature or low coolant flow	1. Verify proper temperature if equipped with external chiller	
		2. Perform coolant flow test	
	Excessive errors	Make programming changes to allow system to ramp up/down properly	
Electrode pit wearing is non-concentric	Blocked or defective swirl ring	Replace swirl ring	Excessive lubricant can block swirl rings
	Defective torch	Replace torch main body	
Nozzle orifice wears out of round or orifice wears from the outside in	Excessive pilot arcing	1. Verify proper pierce height	
		2. Check work cable connection	Excess slag on table can cause this problem
		3. Shorted torch	Measure resistance of torch
		4. Pilot arc relay is staying closed	
Nozzle erodes on the inside	Contamination	Check gas supply or check for leak	A leak when cutting with O_2 can cause contaminates to enter the plasma gas line
	Double arcing	Verify proper pierce height	Electrode and nozzle will be black. Torch will rise if equipped w/THC



Contact Hypertherm to get a free copy of our Plasma Troubleshooting Guide poster.

Cut Quality

Reading the cut

There are four basic measurements used to determine good cut quality:

- Bevel angle
- Dross levels
- Appearance of cut
- Lag lines
  (Mild steel – O_2 cutting only)

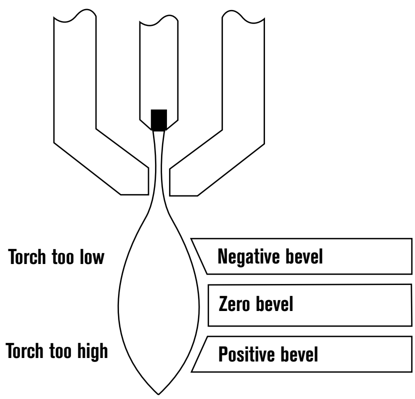
The adjustments that the operator can make to improve these qualities are:

- Torch height or arc voltage
- Cut speed

Remember: the cut charts are the place to start, but cut speed and torch height may need to be adjusted on some materials.

Bevel angle

- By increasing or decreasing the height of the torch, the bevel angle can be changed.
- This is done by adjusting the Arc Voltage setting on plasma systems with arc voltage torch height control (THC). If the plasma system is not equipped with THC, then it must be manually adjusted.
- If the angle is not equal on all sides of a cut part, then the torch may not be square to the plate and will need to be adjusted.



EFFECTS OF TORCH HEIGHT

Decreasing dross (slag)

Top dross

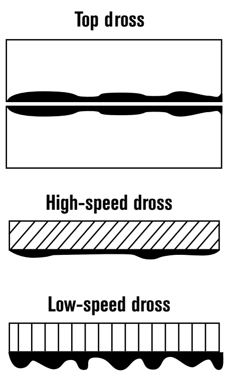
Splatter appears on the top edge of both pieces of the plate. Lower the voltage in increments of 5 volts (maximum) until top dross disappears. Usually only seen with air plasma.

High-speed dross

Fine, roll-over dross that welds to bottom edge. Cleaning requires chipping or grinding. Reduce cut speed to decrease high-speed dross.

Low-speed dross

Globular dross that forms in large deposits. Comes off very easily, in large pieces. Increase cut speed to decrease low-speed dross.



Cut Quality

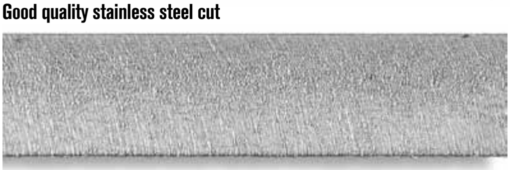
More on dross

- Some types of metal inherently cut with more dross than others. Some of the more difficult plates and treatments are:
  - High carbon content
  - Clean metal surfaces
  - Shot-blasted plate
  - Aluminum
  - Hot-rolled steel
  - Warm or hot metal
  - High silicon steel
  - Some of the easier types are:
  - Cold-rolled steel
  - Oil-pickled steel
- If plate has an oily, scaly or rusty surface, cut with this side down.
- A water muffler or underwater cutting will tend to increase dross levels.

Appearance of cut

- When cutting metals besides mild steel with O_2, lag lines are not a good indicator of cut speed.
- Bevel angle, dross levels and appearance of the cut must be factored together. The smoothness or roughness of the face and the dross levels will determine correct speed.
- Concave cut face is due to torch-to-work distance being too low or consumables are worn.
- Convex cut face is due to torch-to-work being too high or consumables are worn.

Good quality stainless steel cut

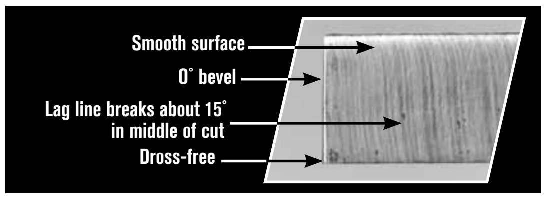


Good quality aluminum cut

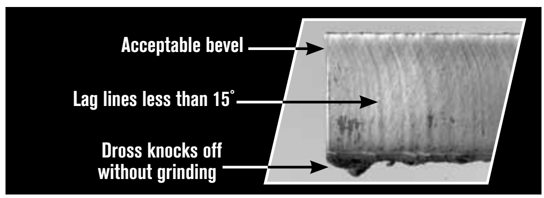
Reading lag lines

Mild Steel, O_2 cutting only

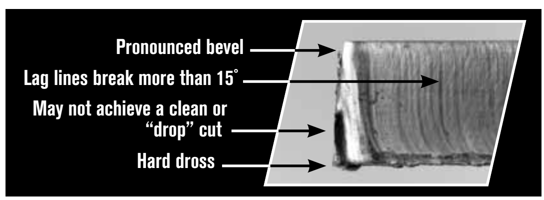
- Using the lag lines of a cut are an excellent way to determine proper cut speeds.
- The lines should generally trail the cut by approximately 10–15 degrees.
- When the lines are more vertical, the speed is too low.
- When the lines are more trailing, the speed is too high.



Correct speed



Too slow



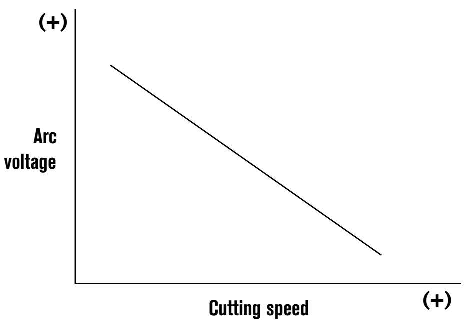
Too fast

Effects of cutting speed on arc voltage

- As cutting speed *increases,* arc voltage *decreases* and vice versa.
- Cutting speed changes:
  - When going in and out of corners*
  - At beginning and end of a cut*
  - When cutting circles and contours*

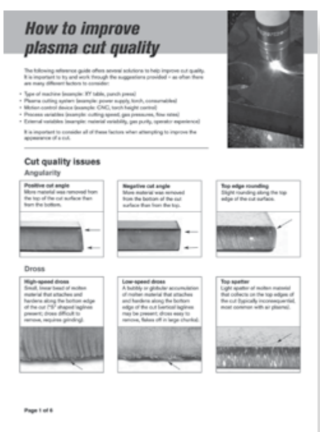
  * This will cause dross in corners and contours.
- Reaction of THC
  - Torch will dive as speed decreases**
  - Torch will rise as speed increases**

  ** THC must be turned off or "Locked Out" when speed decreases.



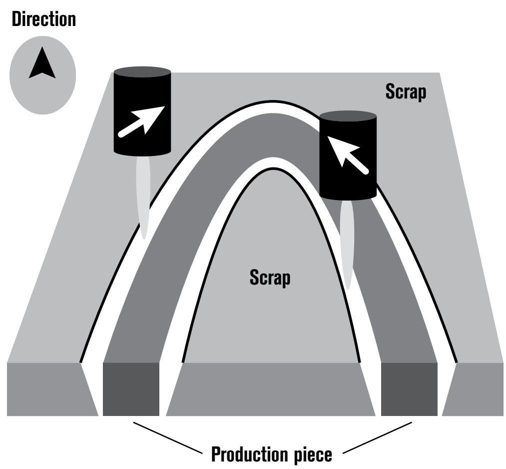
Note: Graph is independent of system and metal thickness.

Contact Hypertherm to get a free copy of our *How to improve plasma cut quality* guide.


How to improve plasma cut quality

Cutting direction

- Due to the swirling action of the plasma gas, one side of the cut will always have a bevel angle. This is called the "bad side" of the cut.
- In order to get the minimum amount of bevel on your production pieces, the torch must travel in the proper direction. The "good side" is on the right as the torch is traveling away from you. Refer to picture.
- The swirl direction can be reversed, by using different swirl rings on some models to achieve the opposite results (Used for cutting mirror image parts).



Clockwise: Cutting outer boundary of part. Part falls out
Counter-Clockwise: Cutting inside hole. Scrap falls out

Cut Quality

What drives cut quality?

The cut sample can be an excellent way to visually represent the capabilities of metal cutting equipment. By evaluating the smoothness of the cut, bevel angle and dross levels an accurate depiction of the potential success of this process can be observed. However, the cut sample cannot and should not be the sole determining factor in the purchasing decision. Many parameters directly impact the quality of the cut part. An understanding of all the factors that contribute to a successful cut is critical before a purchasing decision should be made.

The plasma cutting process is directly influenced by four primary factors:

- Cutting machine (XY table, punch press, etc.)
- Motion control device (CNC)
- Process variables (gas purity, travel speed, material variability, etc.)
- Plasma cutting system (power supply, torch, etc.)

There are numerous manufacturers of metal cutting systems in the marketplace today producing a variety of different types of machines. Consequently, results may vary. Cut samples provided by Hypertherm represent cut quality attainable on **one type** of cutting machine and in no way indicate expected results on other cutting equipment.

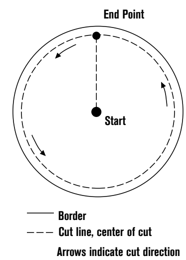
Hypertherm strongly recommends that you obtain a cut sample that has been made on equipment representative of the cutting machine being considered. Only then can a more accurate determination of expected results be possible.

Cutting holes

- Cutting internal holes can be very difficult with plasma. The minimum hole sizes, assuming excellent motion control characteristics are:

- HyPerformance/HyDefinition (O_2 on mild steel)
  - 1/8" (3 mm) plate and less: 3/16" (4.7 mm)
  - Above 1/8" (3 mm): 1.5 times material thickness
- Conventional (O_2 on mild steel)
  - 1/8" to 1/2" (3 – 13 mm) plate: 2 times material thickness
  - Above 1/2" (13 mm): 1.5 times material thickness
  - For best results:
    - Turn THC off.
    - Reduce speed.
    - Make lead-in perpendicular to side.
    - Minimize lead-out. Only enough for part to drop out.

PLATE WITH INTERNAL HOLE



Operator troubleshooting

Status LEDs

The green or amber lights on the front of the power supply are good indicators of common problems. If the LEDs are green then they should be on; if they are amber they should be off. Check your Instruction Manual to see how to troubleshoot with these LEDs.

Note

- HyPerformance plasma has no indicator lights on the power supply.

Tips

- System shuts off during cut or when trying to cut: Hold down on the Start button to see which LED “flickers”. This may be the one causing the system to shut down.
- Constant bevel: Check for the proper direction of cut, torch height, cut speed, condition of consumables and torch alignment (perpendicular to plate). If all appear to be correctly set and in good condition, have maintenance check for any leak or restriction. If no other problems are found, it may be necessary to replace the torch.

Maintenance

To optimize performance, minimize overall operating costs and prolong the life of your Hypertherm plasma cutting system, a regular preventive maintenance schedule should be followed.

The following summary briefly details the recommended minimum maintenance schedule.

Contact Hypertherm to get a free copy of our Preventive Maintenance Protocol booklet.

Daily

- Verify proper inlet gas pressures.
- Verify proper gas flow settings.
- Verify proper coolant pressures and temperatures.
- Inspect torch and replace consumables as needed.

Weekly

- Clean power supply with compressed air or vacuum.
- Verify cooling fans are working properly.
- Clean torch threads and current ring.
- Verify proper coolant level.

Monthly

- Inspect for loose wiring connections.
- Inspect main contactor for wear.
- Inspect pilot arc relay.
- Inspect air filter on front panel of system, if equipped with a filter.
- Verify proper operation of coolant flow switch(es).
- Perform coolant flow test.
- Perform gas leak test.
- Inspect cable connections.
- Inspect spark gap assembly.

Bi-Annually

- Drain and flush main coolant system. Replace coolant filter element. Replace coolant with genuine Hypertherm coolant.

Annually

- Replace pilot arc relay.

System Overview

System overview

This basic overview describes how an arc is established and maintained. This must be understood to effectively troubleshoot your plasma arc cutting system.

Chopper

A constant-current DC power source is used in most Hypertherm mechanized plasma cutting systems.

High-frequency start circuit

Method of initiating plasma arc using high-voltage, high-frequency AC.

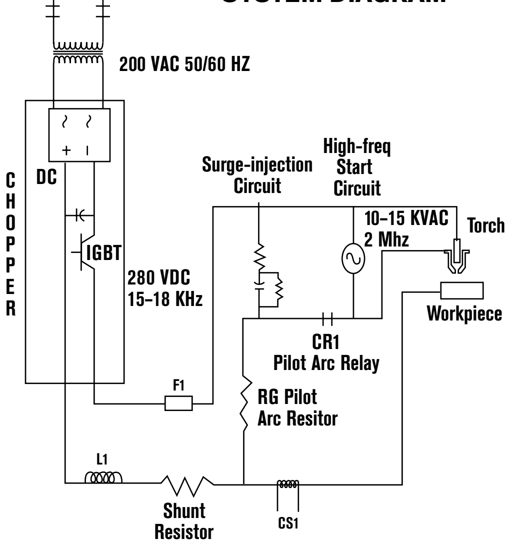
Surge-injection circuit

Maintains output current while high frequency is on.

Pilot arc circuit

Used to initiate an arc by providing a path for the high-frequency start circuit between the nozzle (+) and the electrode (-).

SYSTEM DIAGRAM

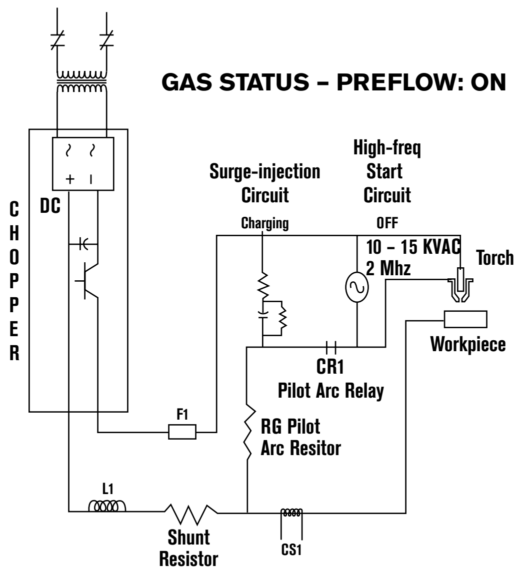


Sequence of operation

1. Preflow

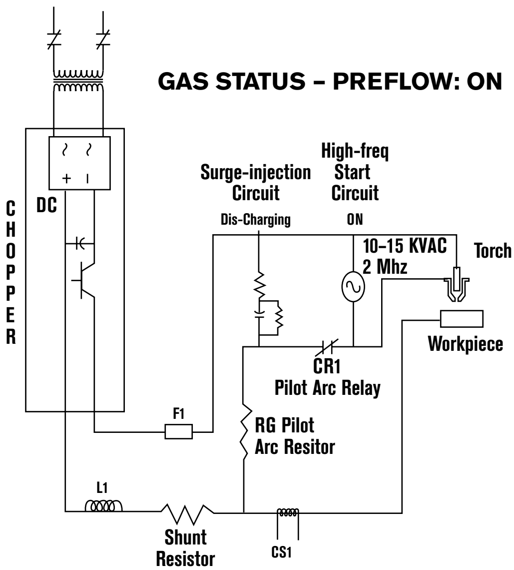
- A start signal is given to the power supply. The main contactor is closed, creating Open Circuit Voltage (OCV).
- Plasma gas preflow is turned on.
- Surge-injection circuit charges.

GAS STATUS – PREFLOW: ON



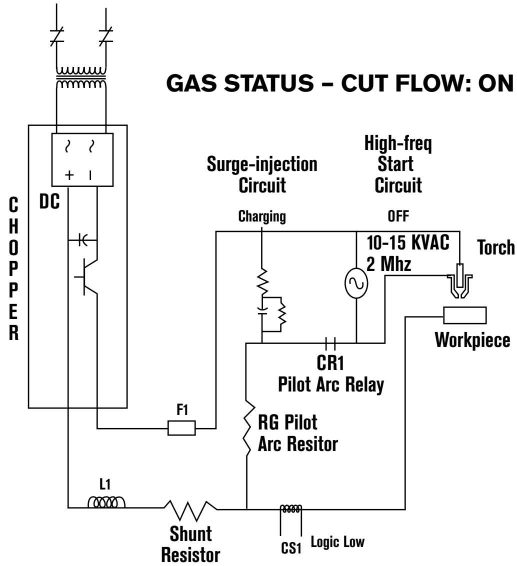
2. Pilot arc

- The pilot arc relay is closed and the high-frequency circuit is turned on.
- Surge-injection circuit discharges to maintain circuit voltage while high frequency is on.



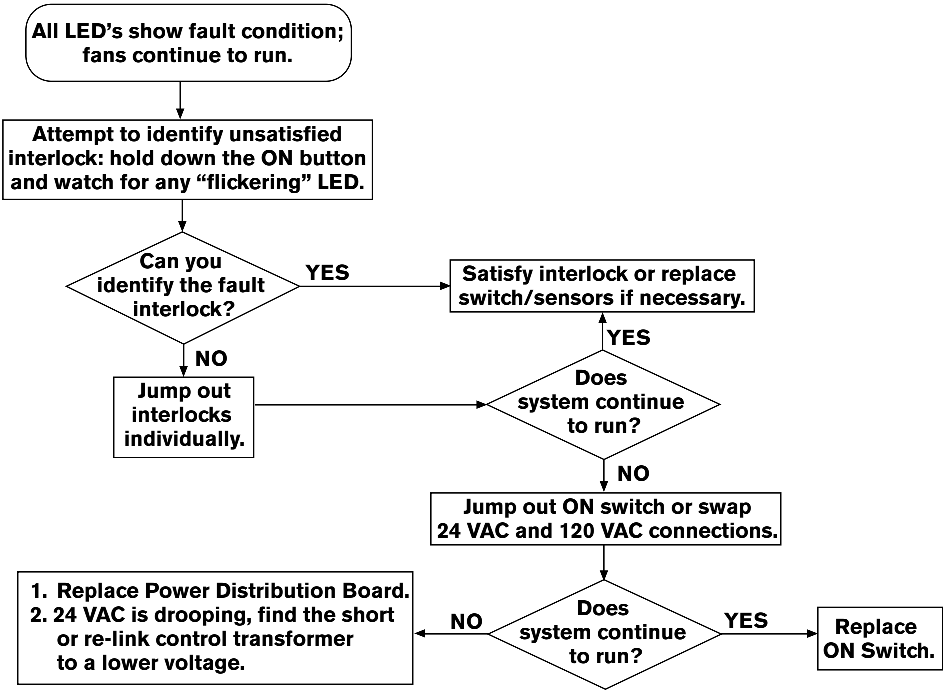
3. Cut mode

- Arc comes into contact with the work, CS1 senses current flow and goes to a logic low state: arc transfer has occurred.
- High-frequency circuit is turned off, pilot arc relay is opened.
- Gas flow is increased to the cut flow setting.

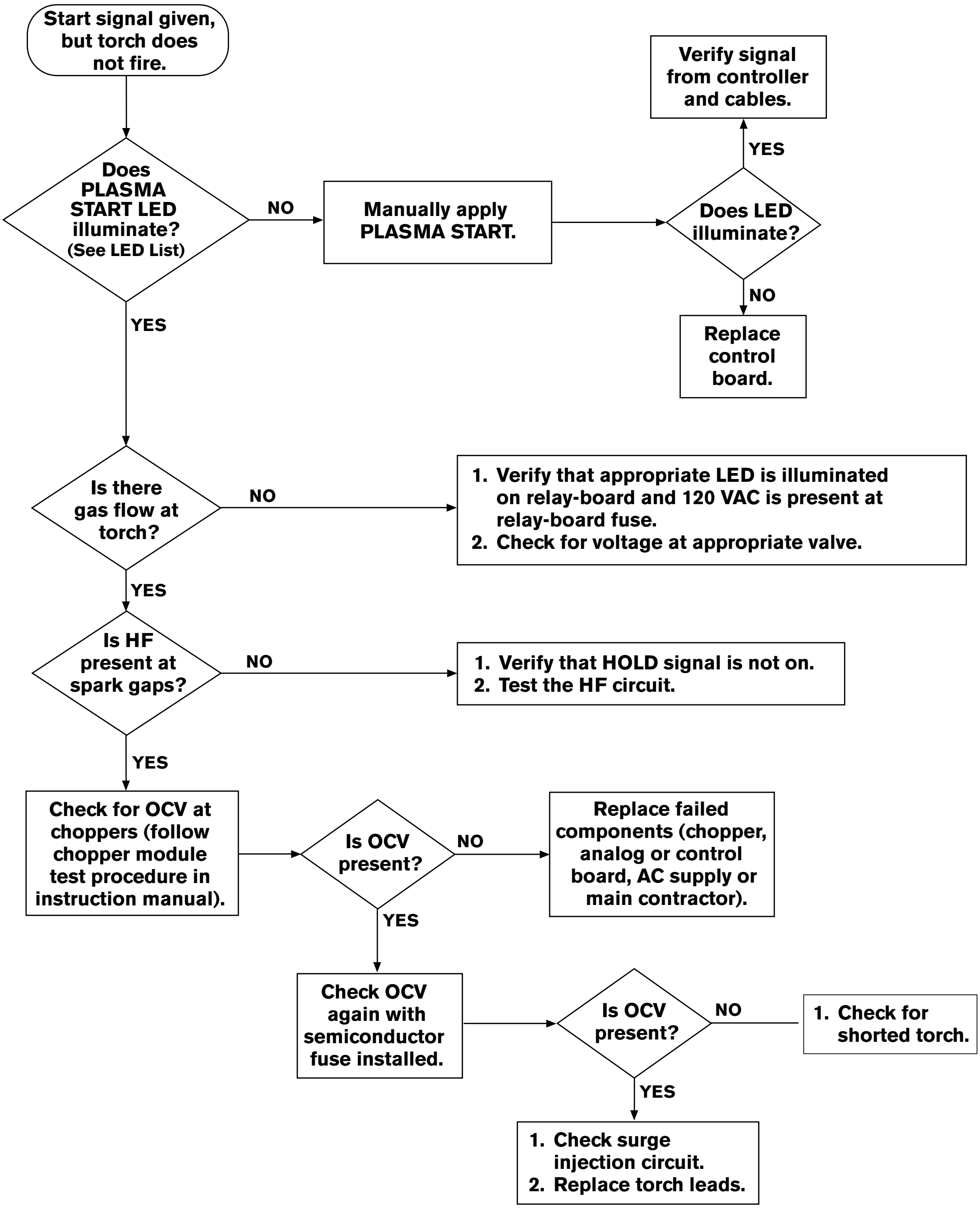


Troubleshooting

System shuts off

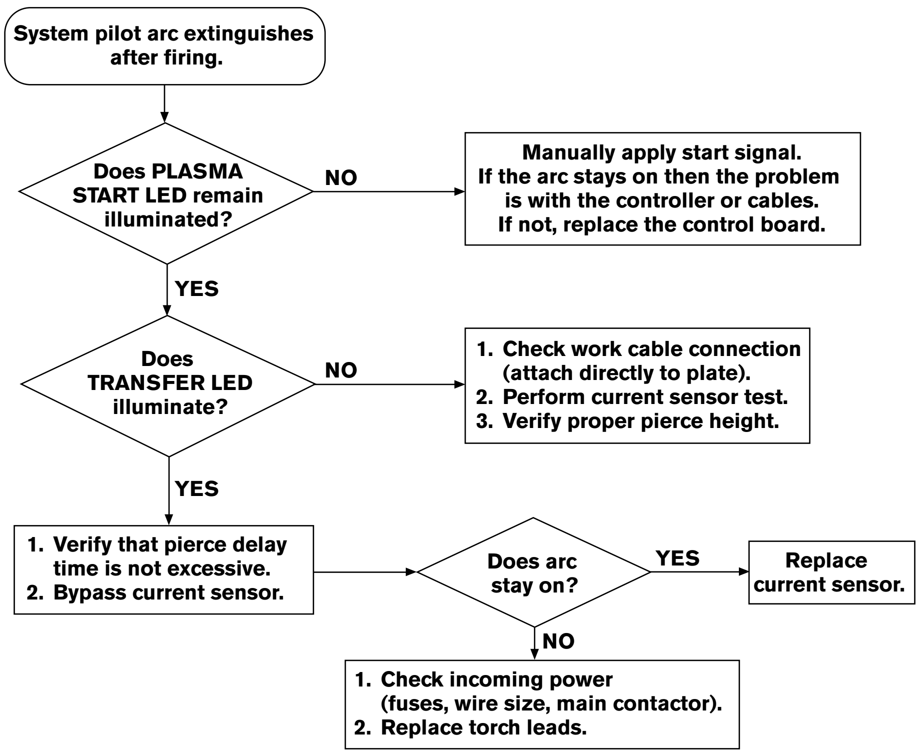


No pilot arc

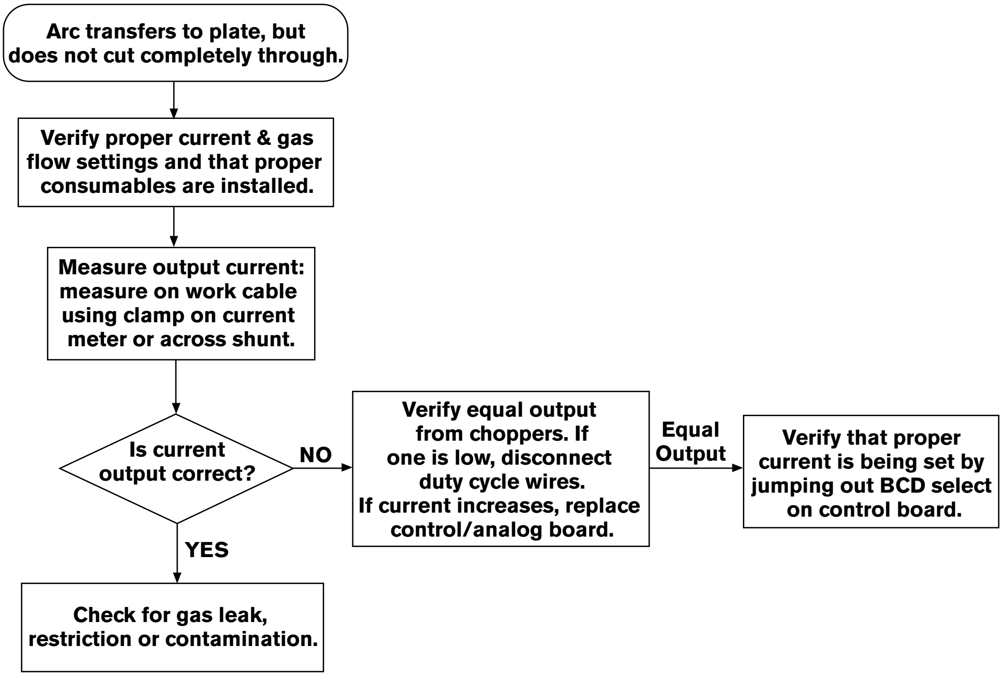

Start signal given, but torch does not fire.
Does PLASMA START LED illuminate? (See LED List)
NO
Manually apply PLASMA START.
Does LED illuminate?
YES
Verify signal from controller and cables.
NO
Replace control board.
YES
Is there gas flow at torch?
NO
1. Verify that appropriate LED is illuminated on relay-board and 120 VAC is present at relay-board fuse.
2. Check for voltage at appropriate valve.
YES
Is HF present at spark gaps?
NO
1. Verify that HOLD signal is not on.
2. Test the HF circuit.
YES
Check for OCV at choppers (follow chopper module test procedure in instruction manual).
Is OCV present?
NO
Replace failed components (chopper, analog or control board, AC supply or main contractor).
YES
Check OCV again with semiconductor fuse installed.
Is OCV present?
NO
1. Check for shorted torch.
YES
1. Check surge injection circuit.
2. Replace torch leads.

Troubleshooting

Loss of arc



Arc doesn't cut through



Service

Hypertherm takes great pride in manufacturing products of the highest quality. However, if a problem should occur, please contact your authorized Hypertherm distributor or Original Equipment Manufacturer (OEM) who is there to support you.

In most cases your questions or problems can be easily handled over the phone by knowledgeable, factory-trained technicians. If an on-site visit is necessary, please schedule an appointment through your distributor or OEM.

To get the most out of any support call, please have the Hypertherm model number and power supply serial number available.

Hypertherm, Inc.
Etna Road, P.O. Box 5010
Hanover, NH 03755 USA
603-643-3441 Tel
603-643-5352 Fax

Hypertherm

In order to register your machine for warranty, please complete the attached Field Installation Verification Check List and return it to Hypertherm by mail or fax it to:

Hypertherm, Inc.
Attn: Service
Etna Road, P.O. Box 5010
Hanover, NH 03755

603-643-5352 Fax

800-643-9878 Tel

service@hypertherm.com

This checklist was created to provide the installer with a tool to help ensure that the system is optimized during installation and that the operator has been properly trained. The main points of the checklist are to verify proper gas pressures and configurations, proper power and grounding connections, and to train the operators on the outlined material.

If you have any questions regarding the checklist, please contact our Technical Service team.

Hypertherm field installation verification check list

Customer ____________________ OEM/Dist/Integrator ____________________

Location ____________________ Date of Installation ____________________

____________________ Power supply S/N ____________________

Contact ____________________ PS Stock #/ Model ____________________

Phone# ____________________ Cutting machine S/N ____________________

Installer ____________________

Gas system (Check items that are applicable to system)

Oxygen source

Bulk ☐
Cryogenic ☐
H.P. Cylinder ☐

Plumbing type and diameter

Copper __________
Hose __________
Other __________

Pressure:

Static __________
Dynamic __________

Nitrogen source

Bulk ☐
Cryogenic ☐
H.P. Cylinder ☐

Plumbing type and diameter

Copper __________
Hose __________
Other __________

Pressure:

Static __________
Dynamic __________

Air source

Bulk ☐
Cryogenic ☐
H.P. Cylinder ☐

Plumbing type and diameter

Copper __________
Hose __________
Other __________

Pressure:

Static __________
Dynamic __________

Ar-H_2 source

Bulk ☐
Cryogenic ☐
H.P. Cylinder ☐

Plumbing type and diameter

Copper __________
Hose __________
Other __________

Pressure

Static __________
Dynamic __________

Methane source

Bulk ☐
Cryogenic ☐
H.P. Cylinder ☐

Plumbing type and diameter

Copper __________
Hose __________
Other __________

Pressure

Static __________
Dynamic __________

CO_2 source

Bulk ☐
Cryogenic ☐
H.P. Cylinder ☐

Plumbing type and diameter

Copper __________
Hose __________
Other __________

Pressure

Static __________
Dynamic __________

Leak Test Performed ☐ **Reference test procedure #01001**

Comments: ____________________

____

____

Electrical input power

System voltage configuration __________VAC
Measured line voltage __________VAC
L1 to L2 __________VAC
L2 to L3 __________VAC
L3 to L1 __________VAC
Wild leg is on L3 ☐ HD4070 Wild leg is on L1 ☐

Type of protection

Time delay fuses ☐
Time delay circuit breaker ☐
Amperage rating ______ Amps

System grounding

Following components connected to earth ground

Power supply ☐
High frequency console ☐
Gas console ☐
Motor valve console ☐
Ground wire size __________AWG/mm

For detailed information on grounding and shielding practices, see field service bulletin (#805400).

Overall installation check

Control cable routing		**Coolant system**	
Cables move freely in power track/festoon	☐	Hypertherm coolant, part number 028872	☐
Cable connections are tight	☐	Special mixture	☐
Hose/torch lead routing		De-ionized water	%
No kinks when moving in power track/festoon	☐	Propylene glycol	%
All fittings tight	☐	Anti-freeze protection	˚F
		Chiller temp (if applicable)	˚F
		Pressure	psi
		Water softener installed	☐

Functional tests

Arc voltage setting __________________________V

Current setting _____________________________A

Actual arc voltage __________________________V

Actual cutting current ________________________A

Training issues

The end user has been properly instructed on the following topics:

Setup		**Other**	
Selecting the proper gases for materials being cut	☐	Customer has been instructed how and where to purchase genuine Hypertherm parts	☐
Reading/Following cut charts	☐	Warranty Policy and Administration has been explained	☐
Consumable installation and maintenance	☐	Include list of all operators that were trained	☐
Setting cut parameters (gas flows, current, voltage, speed)	☐		
Operation			
Reading the cut (speed, bevel angles and dross)	☐		
Consumable life issues (pierce height, errors, starts vs length of cut)	☐		
Maintenance			
Basic operator troubleshooting	☐		
Basic maintenance staff troubleshooting	☐		

Provided _______ copies of manual #________________ with operator/supervisor ☐

Additional comments: ____

____

____

Installers signature ____________________________ Date ____________________________

By signing I acknowledge that the system has been installed to my expectations and I or my representative has verified the above checks and procedures and has been properly trained on the operation and maintenance of this system.

Customers approval signature ________________ Date ____________________________

Print name ________________________________ Phone number ___________________

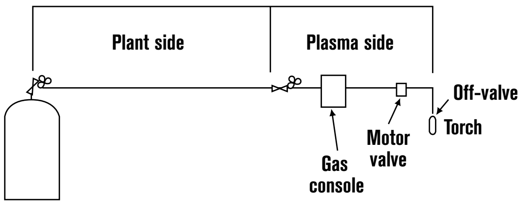
Test Procedure #01001

System gas leak test procedure

WARNING

All work must be performed only by qualified personnel!

Use this procedure to check for leaks on the plasma side of the system, that is, from the regulator supplying the gas console forward. Consult your plant maintenance personnel for instruction to test the plant side of the system.



A. HyPerformance HPR130XD, HPR260XD, HPR400XD and HPR800XD

Use the Gas System Back Pressure Checks/ Leak Test Procedure located in the Maintenance section of the Instruction Manual.

B. HySpeed HT2000

To test this system all the way out through the torch, use procedure D.

1. Place the gas console's toggle switch in the Test Preflow position. Adjust gas flows to the appropriate settings as outlined in the Operation section of the Instruction Manual.
2. Locate the off-valve solenoid and disconnect the control cable from the solenoid by disconnecting connector 4 X 2 from the motor valve console.
3. The float tubes should indicate "no flow" before continuing.
4. Close the shut-off valves for the oxygen and nitrogen supply at the source.
5. The pressure gauges on the gas console should maintain their pressure. If either nitrogen or oxygen pressures drop more than 2 psi (0.1 bar) in 10 minutes, there is an unacceptable leak.
6. If a leak is indicated, check all gas connections, using a leak-detection solution.

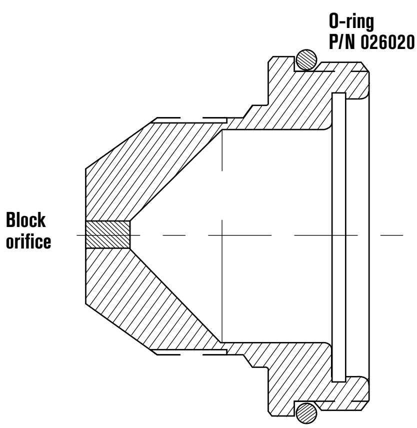
D. MAX200 and HT2000LHF

Also use this procedure to test LongLife HT2000 all the way out through the torch.

1. Block the nozzle orifice by one of several means:
   - fill with epoxy and let harden
   - fill with molten solder
   - tap for machine screw and insert screw with thread lock

1a. For MAX200, HT2000 and HT2000LHF only: add an O-ring to the thread clearance located at the bottom of the threads.
   - O-ring (Silicone) = P/N 026020 = 0.864 inches ID x 0.070 Wall

2. Place system in Test Preflow position and adjust gas flows to the appropriate settings as outlined in the Operation section of the Instruction Manual.
3. Insert modified nozzle into the torch.
4. The balls in the flow meter should drop to zero. If they do not, there is a leak in the system. Close the shut-off valves for the oxygen or nitrogen supply at the source.
5. The pressure gauges on the gas console should maintain their pressure. If either nitrogen or oxygen pressures drop more than 2 psi (0.1 bar) in 10 minutes, there is an unacceptable leak.
6. If a leak is indicated, check all gas connections, using a leak-detection solution.
7. Repeat test with gas console in the Test Cutflow position.



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