



Hypertherm[®]

Machine-side reference guide

803640

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Hypertherm®

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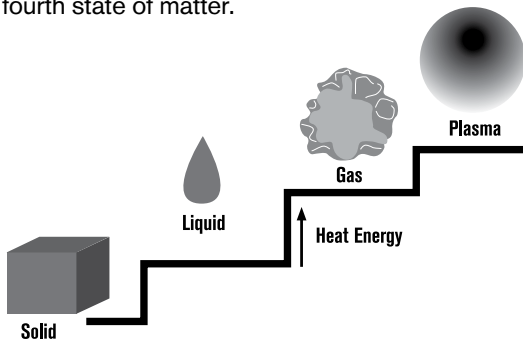
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Plasma

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 (¾")
	Stainless steel	32 mm (1¼")	10 mm (¾")
	Aluminum	32 mm (1¼")	10 mm (¾")
Powermax 1250	Mild Steel	38 mm (1½")	10 mm (¾")
	Stainless steel	38 mm (1½")	10 mm (¾")
	Aluminum	38 mm (1½")	10 mm (¾")
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

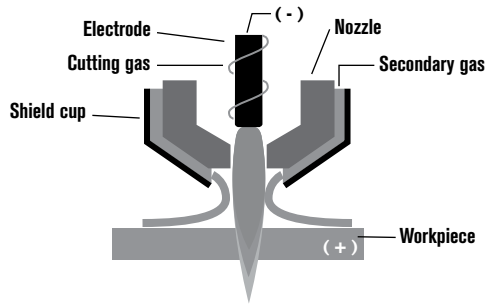
Plasma gas is also called the cutting gas. Gas that is ionized in the plasma process, exits through the nozzle orifice.

- 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
 - CO₂
 - 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 contaminants can cause misfiring, poor cut quality or poor consumable life. Contaminates can be: gas impurities, moisture, oil, dirt, piping system contaminants or improper gases (ie. air in O₂ 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 for bevel	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
	Mild steel	O ₂	Air

*O₂ cutting is only for 340 amps maximum. Must use N₂ 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 → **Mild steel** ← **Material Type**
 O₂ Plasma / Air Shield
 400 A

Flow rates - lpm/scfh		
	O ₂	Air
Preflow	0 / 0	190 / 400
Cutflow	66 / 140	137 / 290

Setup Parameters → **Consumable Selection**

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	
O ₂	Air	24	50	60	50	12	139	3.6	4430	7.2	200	250	0.4	
						15	142		3950				0.5	
						20	146		2805				0.7	
						25	150	4.0	2210	8.0	0.9			
						30	153	4.6	1790	9.2	1.1			
						40	158	5.3	1160	11.5	1.9			
						50	167	6.4	795	19.1	360	5.2		
						60	173	7.9	580	Edge start				
						70	183		380					
						80	197		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
O ₂	Air	24	50	60	50	1/2	140	0.14	170	0.28	200	0.4
						5/8	143		150			0.5
						3/4	145		115			0.6
						1	151	0.16	85	0.32	0.9	
						1-1/4	153	0.18	65	0.36	1.2	
						1-1/2	157		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	Edge start		
						2-1/2	175		20			
3	193	10										

Marking

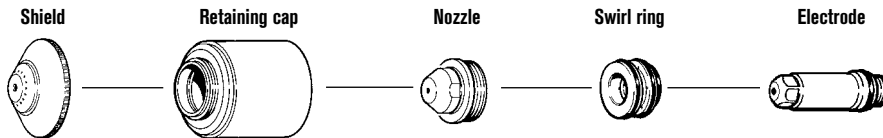
Select Gases		Set Preflow		Set Cutflow		Amperage	Torch-to-Work Distance		Marking Speed		Arc Voltage
N ₂	N ₂	10	10	10	10	Amps	mm	in	mm/min	ipm	Volts
N ₂	N ₂	10	10	10	10	22	2.5	0.10	1270	50	123
Ar	Air	20	10	30	10	25	3.0	0.12	1270	50	55

Consumables

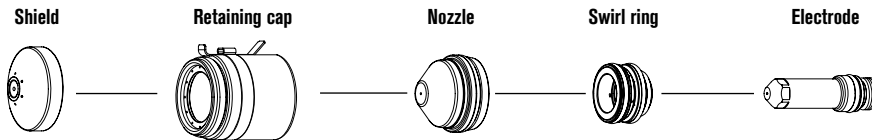
Installing consumables

- 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.

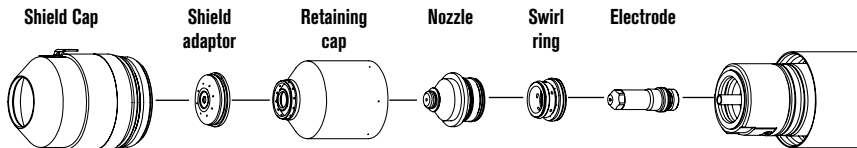
Conventional or HySpeed HT2000 Plasma



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.

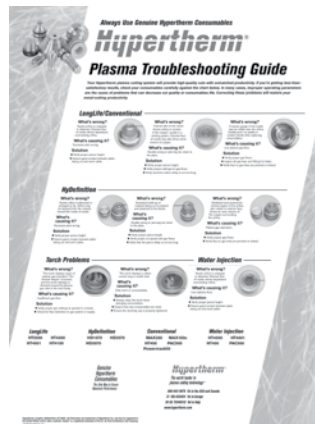
2. **Reducing errors.** Reducing errors will add considerable life to your consumables. Errors are generally caused by not starting and/or stopping the cut on the plate or running the arc off the plate. This interrupts the Longlife process.
 - Every error equals approximately 10–15 pierces on most systems. 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 – O₂ cutting only)

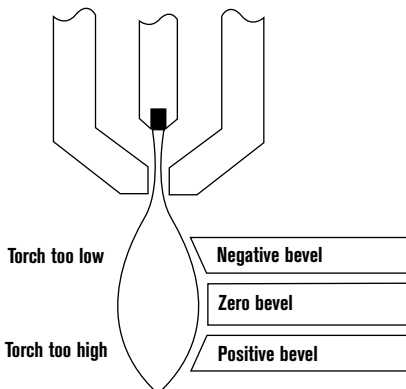
The adjustments that the operator can make to improve these qualities are:

- 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

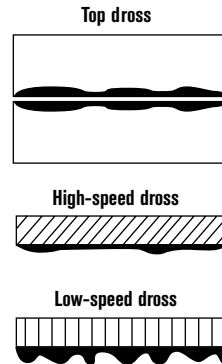
Splatter appears on the top edge of both pieces of the plate. Lower the voltage in increments of 5 volts (maximum) until top dross disappears. Usually only seen with air plasma.

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 O₂, 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

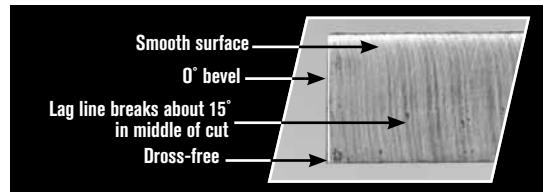


Good quality aluminum cut

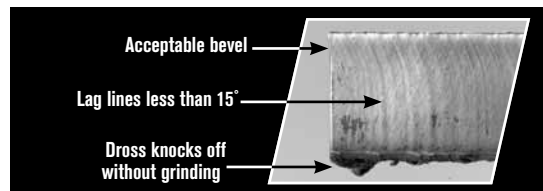
Reading lag lines

Mild Steel, O₂ cutting only

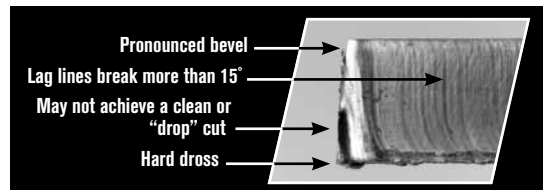
- Using the lag lines of a cut are an excellent way to determine proper cut speeds.
- The lines should generally trail the cut by approximately 10–15 degrees.
- When the lines are more vertical, the speed is too low.
- When the lines are more trailing, the speed is too high.



Correct speed



Too slow



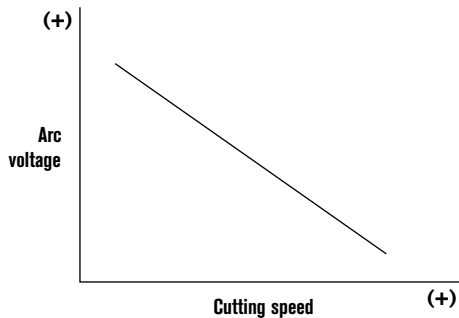
Too fast

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







The following reference guide offers several solutions to help improve cut quality. It is important to try and work through the suggestions provided - as often there are many different factors to consider.

- Type of machine (example: RT table, cart or gantry)
- Plasma cutter power (example: power supply, torch, consumables)
- Helium content (example: oxygen, C₂H₂, or high carbon)
- Plasma variables (example: torch tip speed, gas pressure, flow rates)
- Control variables (example: remote sensing, gas purity, operator experience)

It is important to consider all of these factors when attempting to improve the appearance of a cut.

Cut quality issues

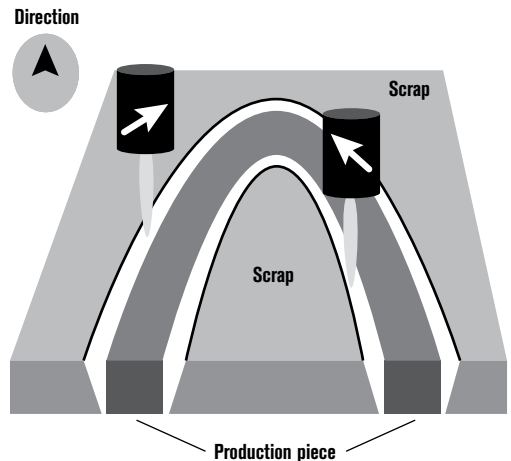
Angularity

<p>Positive cut angle More material was removed from the top of the cut surface than from the bottom.</p> 	<p>Negative cut angle More material was removed from the bottom of the cut surface than from the top.</p> 	<p>Top edge scorching Slight scorching along the top edge of the cut surface.</p> 
<p>Dross</p> <p>High speed dross Small "iron" layer of molten metal on the bottom edge of the cut (T₂ plasma) (molten plasma dross offset by remote, requires grinding)</p> 	<p>Low speed dross A fuzzy or globular accumulation of molten material that sticks to the bottom edge. The bottom edge of the cut (T₂ plasma) (molten plasma dross offset by remote, takes off in large chunks)</p> 	<p>Top scum Light layer of molten material that collects on the top edge of the cut (usually accompanied by metal dross on the air plasma)</p> 

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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

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.

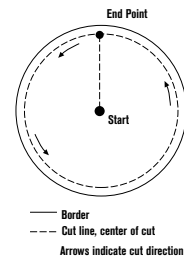
Hypertherm strongly recommends that you obtain a cut sample that has been made on equipment representative of the cutting machine being considered. Only then can a more accurate determination of expected results be possible.

Cutting holes

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

- HyPerformance/HyDefinition (O₂ 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 (O₂ 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.

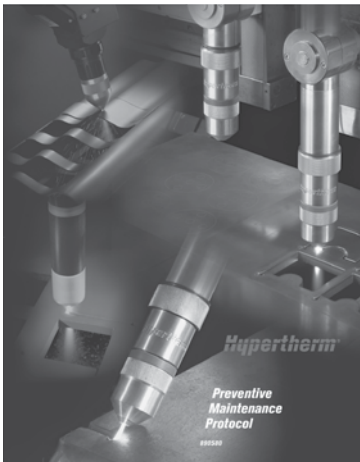
Tips

- 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

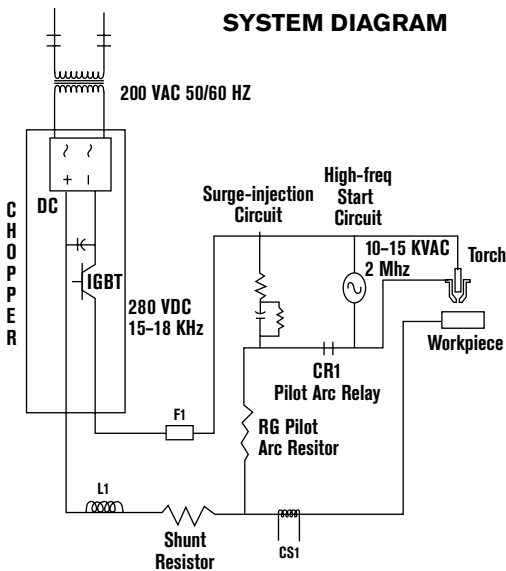
Method of initiating plasma arc using high-voltage, high-frequency AC.

Surge-injection circuit

Maintains output current while high frequency is on.

Pilot arc circuit

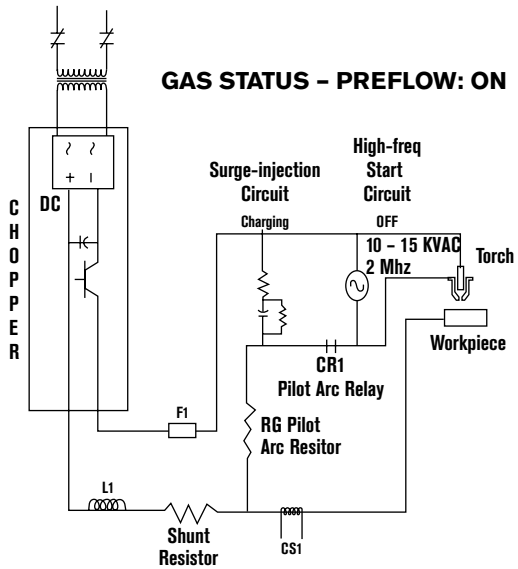
Used to initiate an arc by providing a path for the high-frequency start circuit between the nozzle (+) and the electrode (-).



Sequence of operation

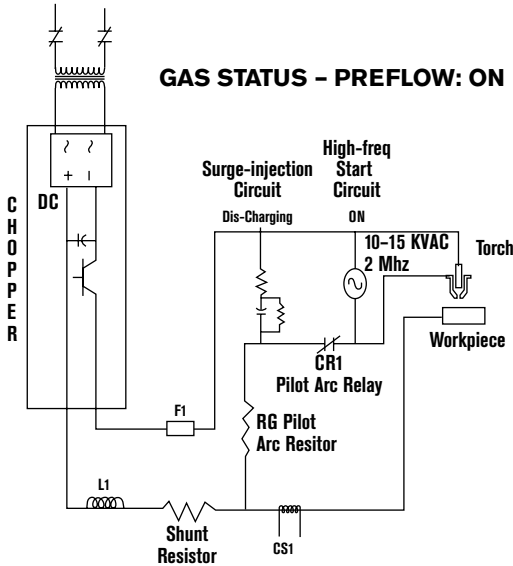
1. Preflow

- 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.



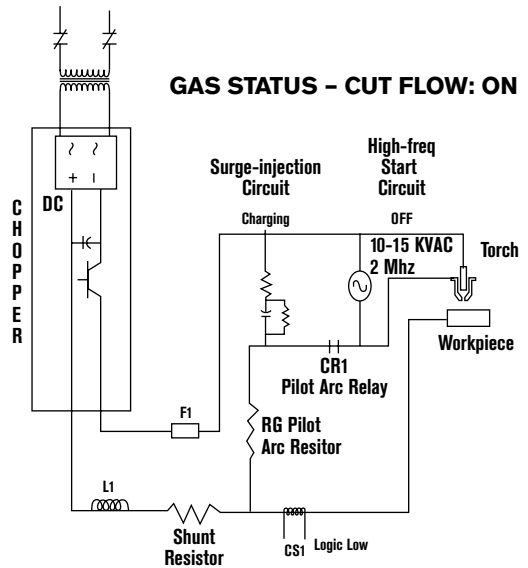
2. Pilot arc

- 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.



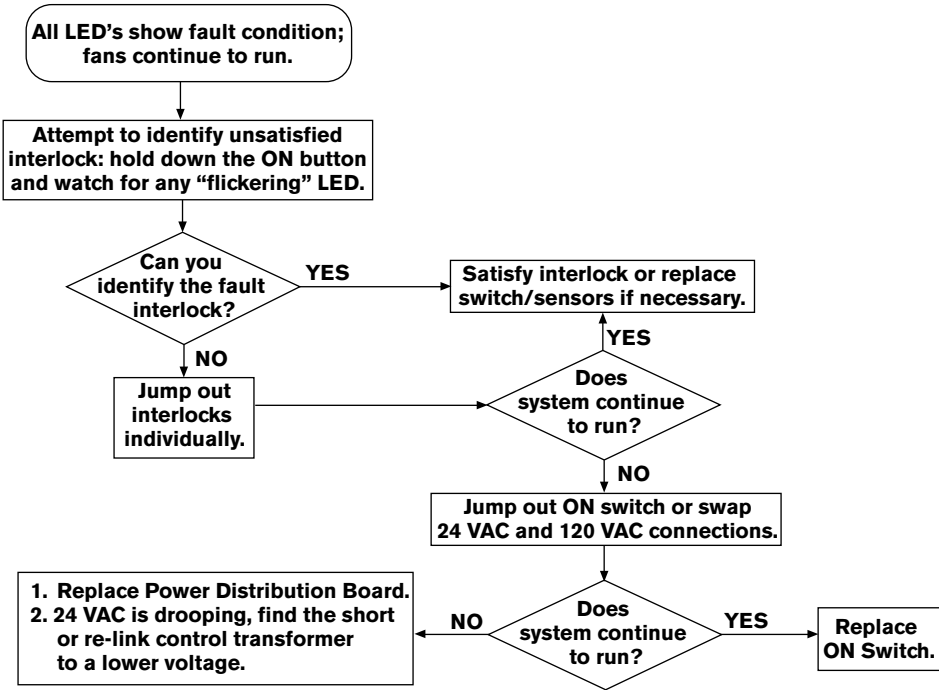
3. Cut mode

- 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.

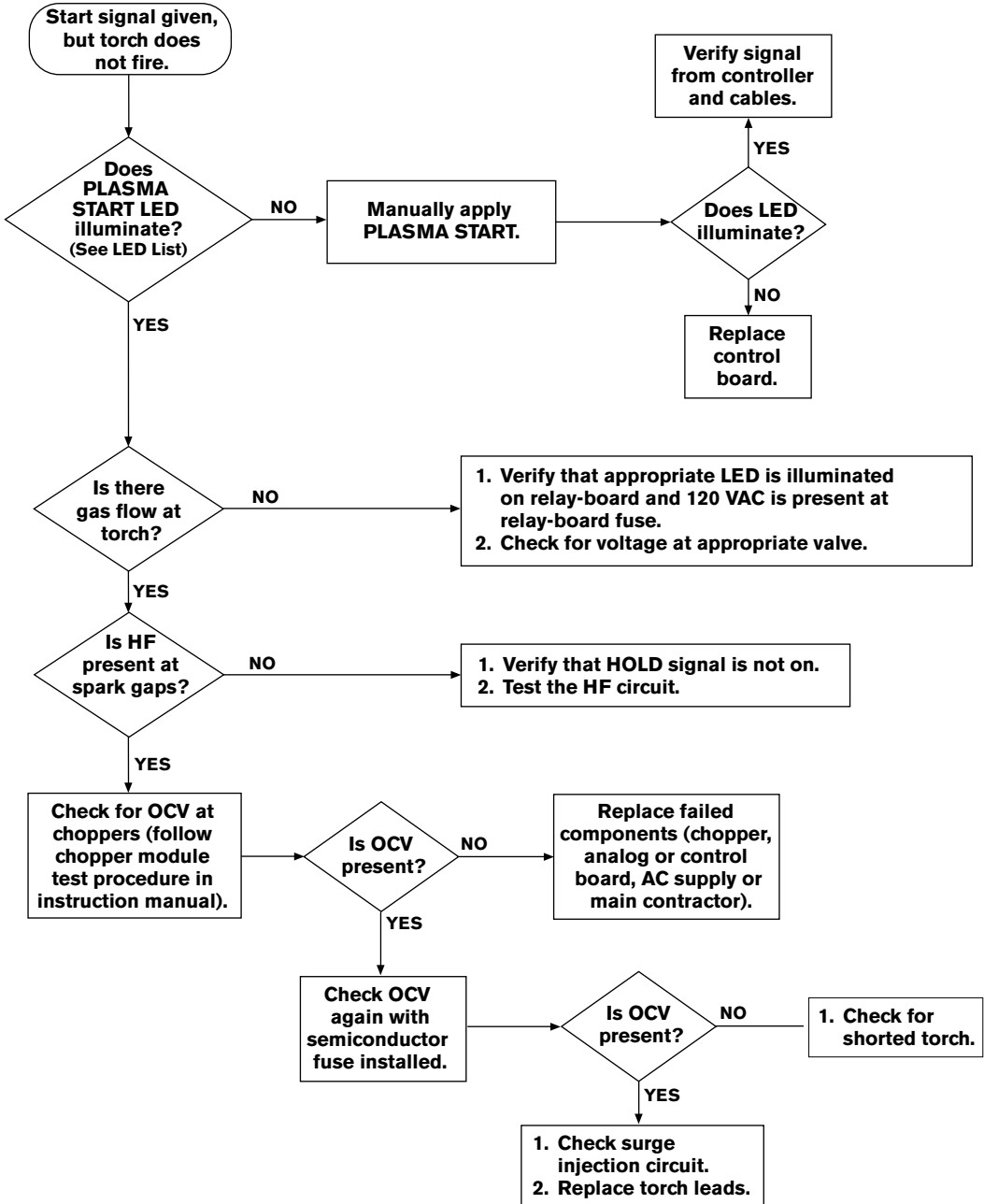


Troubleshooting

System shuts off

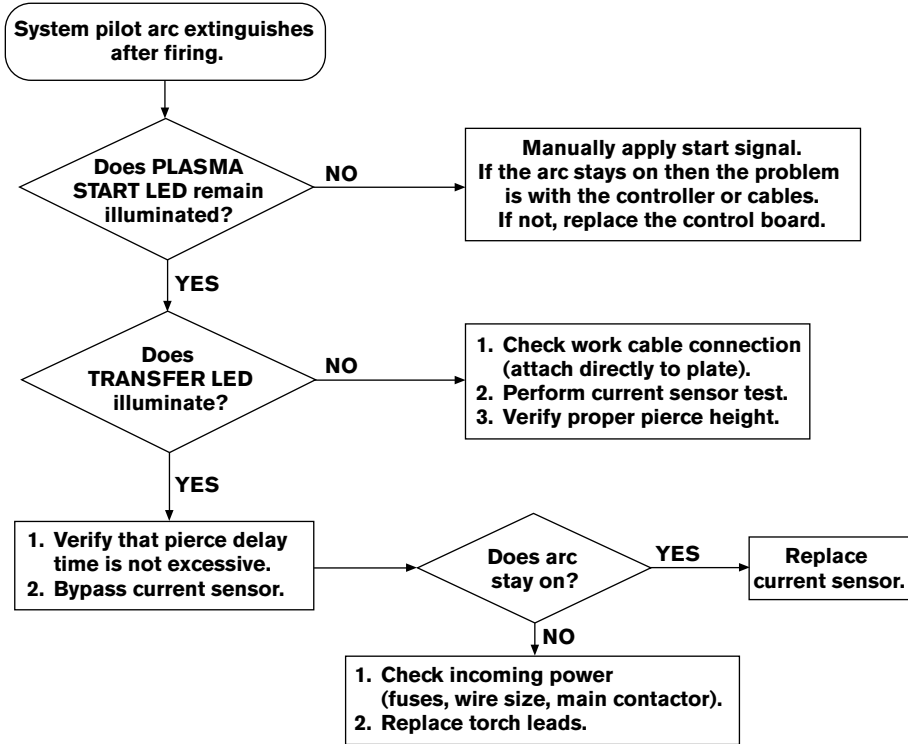


No pilot arc

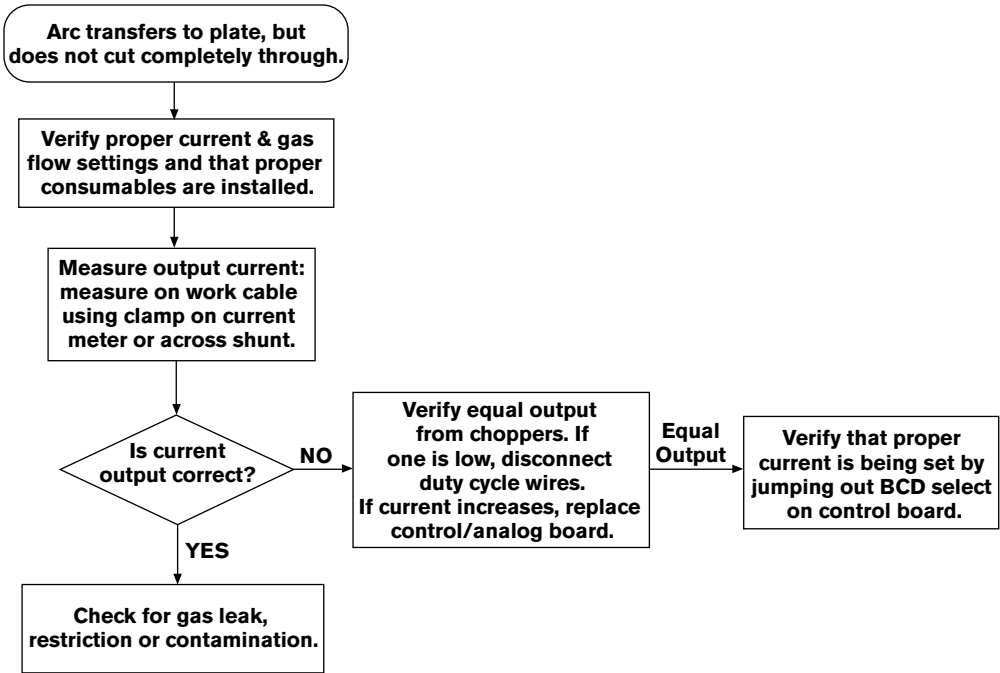


Troubleshooting

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 _____

Ar-H₂ 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 _____

Methane 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 _____

CO₂ 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

Type of protection

Time delay fuses
 Time delay circuit breaker
 Amperage rating _____ Amps

Wild leg is on L3 HD4070 Wild leg is on L1

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).

Service

Overall installation check

Control cable routing

- Cables move freely in power track/festoon
- Cable connections are tight

Hose/torch lead routing

- No kinks when moving in power track/festoon
- All fittings tight

Coolant system

- Hypertherm coolant, part number 028872
- Special mixture
- De-ionized water %
- Propylene glycol %
- Anti-freeze protection °F
- Chiller temp (if applicable) °F
- Pressure psi
- Water softener installed

Functional tests

Arc voltage setting _____ V Actual arc voltage _____ V
Current setting _____ A Actual cutting current _____ A

Training issues

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

Setup

- Selecting the proper gases for materials being cut
- Reading/Following cut charts
- Consumable installation and maintenance
- Setting cut parameters (gas flows, current, voltage, speed)

Other

- Customer has been instructed how and where to purchase genuine Hypertherm parts
- Warranty Policy and Administration has been explained
- Include list of all operators that were trained

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 _____

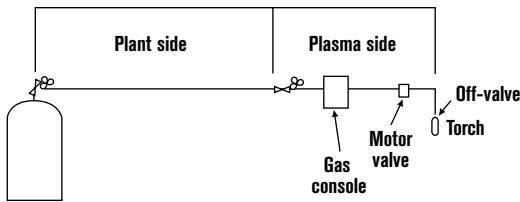
Print name _____ Phone number _____

Test Procedure #01001

System gas leak test procedure



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

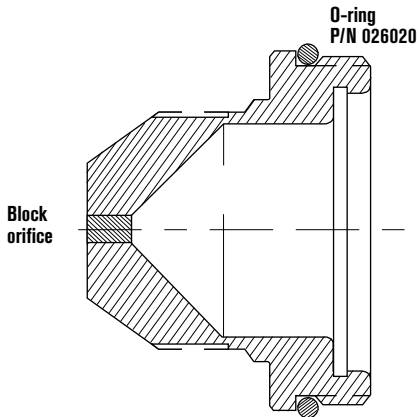
To test this system all the way out through the torch, use procedure D.

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 Outflow position.



Hypertherm[®]

Cut with confidence[™]

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