

HyPro2000™ Straight Torch

HT2000 Torch Upgrade for Punch Presses

Field Service Bulletin

807230 – Revision 2 – September 2013

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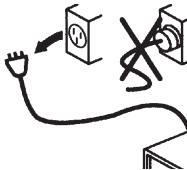
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		DANGER ELECTRIC SHOCK CAN KILL
		Disconnect electrical power before performing any maintenance. All work requiring removal of the power supply cover must be performed by a qualified technician. See the <i>Safety Section</i> of the system's Manual for more safety precautions.

Introduction

Purpose

This document describes the steps necessary to upgrade the HT2000 with the HyPro2000 straight torch for punch presses.

Required tools

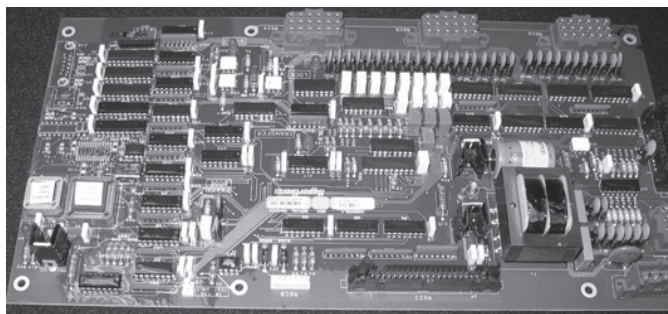
5/16 inch, 3/8 inch, 7/16 inch, 1/2 inch, open end wrench, and 2 inch spanner wrench.

Kits

Part number	Description	Qty
228778	Kit: HyPro2000 straight torch retrofit with Control PCB	1
228777	Kit: HyPro2000 straigh torch retrofit	1



Straight torch retrofit kit



HT2000 control PCB

Kit - 228778 Contents (PCB included)

Note: This kit includes all the parts that are in the 228777 kit , plus the following items:

Part Number	Description	Qty.
141163	PCB assembly: HT2000 control board	1
223173	Jumper wire: HyPro2000/phase loss upgrade	1

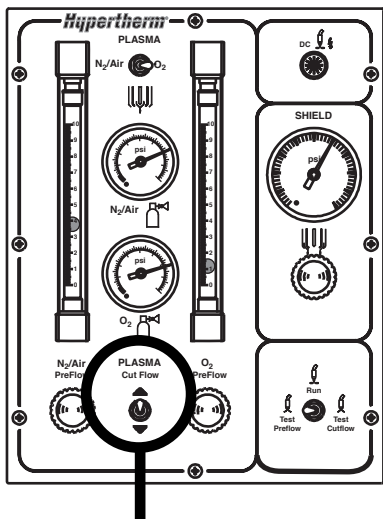
Kit - 228777 Contents (PCB not included)

Part Number	Description	Qty.
024873	Hose	1
027055	Silicone lubricant: 1/4 ounce	1
044026	O-ring: 1.239 inch x 0.070 inch	2
046065	Tubing: 9/16 inch interior diameter, 76.2 mm (0.25 ft) length	1
104119	Consumable tool	1
220831	Nozzle: 200 amp O ₂	5
220832	Shield: 200 amp O ₂ /air	1
220834	Swirl ring: 200 amp	1
220925	Electrode: 200 amp SilverPlus	3
220935	Shield cap: O ₂ /air, clockwise, with IHS tab	1
220937	Electrode: 200 amp O ₂ /air	2
220942	Torch mounting sleeve: 1-3/4 inch outside diameter	1
220943	Torch mounting sleeve: 2 inch outside diameter	1
220961	HyPro2000 straight torch	1
228567	Gauge: Plasma pressure	1
228571	Kit: Firmware upgrade	1
807230	Field service bulletin: HyPro2000, HT2000 Torch Upgrade	1

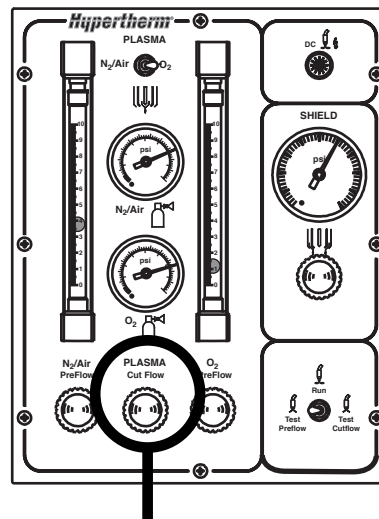
Pre-installation

Before starting this upgrade you must determine if the system is a Local High Frequency (LHF) or a Remote High Frequency system (RHF). You need to know this information to choose the correct firmware chip.

Inspect the gas console as described below:

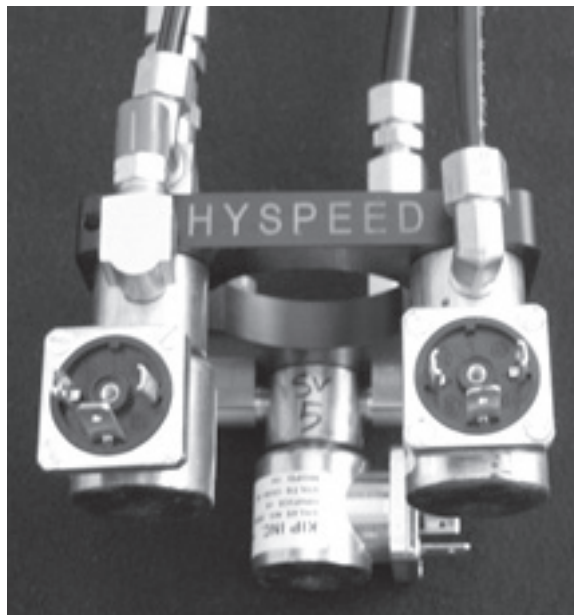


If there is a toggle switch for the plasma cutflow gas it is an RHF system



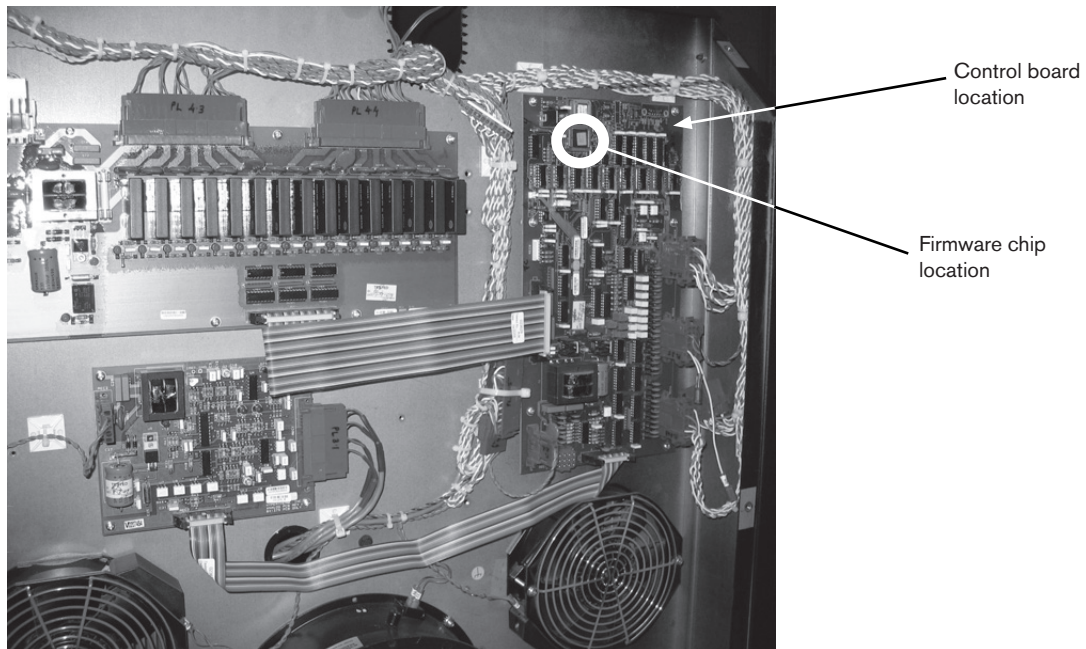
If it has a knob to adjust the plasma cutflow gas it is an LHF system

The HySpeed off-valve assembly (129840) **MUST** be installed in an LHF system to continue with this upgrade. The off-valve assembly is marked HYSPEED, as shown below.



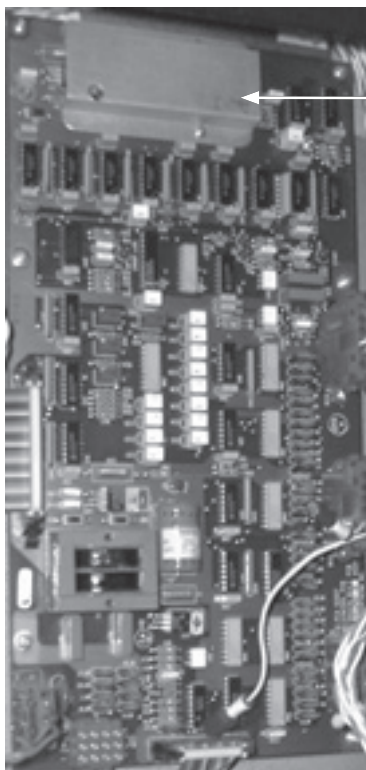
Installation of the firmware chip

1. Access the control board (PCB2) by removing the 2 front panels.

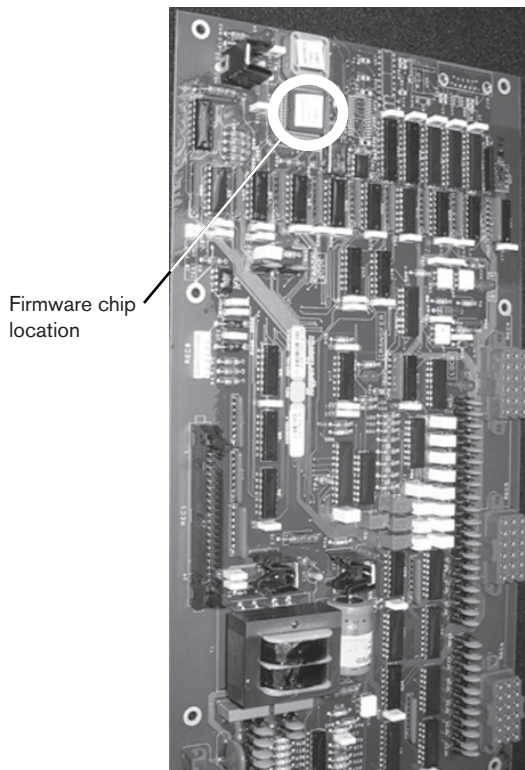


2. Inspect the control board. If it is a older model, you will have to replace the board and the firmware chip.

Older board
(replace board and chip)

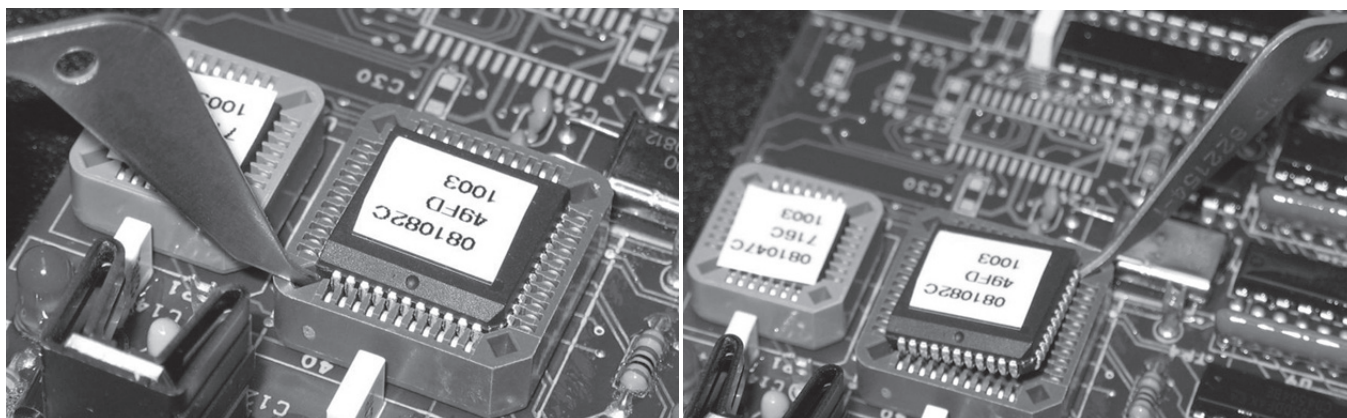


Newer board
(replace chip)



If you are installing a new control board skip to step 4

3. Remove and discard the old chip by using the tool included in this kit. See pictures below.
 - 3a. Place the straight end of the chip removal tool under one corner of the chip. Only 2 opposite corners will accept the tool.
 - 3b. Carefully pry each of the 2 corners alternately until the chip is removed. Prying the chip out from only one corner can damage the chip receptacle.

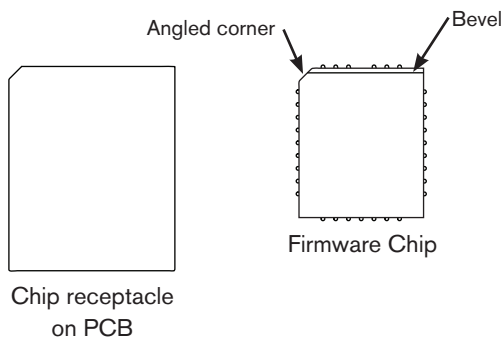


4. Choose the appropriate chip from firmware kit 228571 (located in the main kit box), and install it in the chip receptacle on the control board.

Use the chip labeled 081192 for an RHF system.

Use the chip labeled 081194 for an LHF system.

NOTE: The chip must be oriented correctly before installation. DO NOT use the orientation of the label to orient the chip to the chip receptacle. There is a bevel on one edge of each chip and one corner is angled (see figure below).

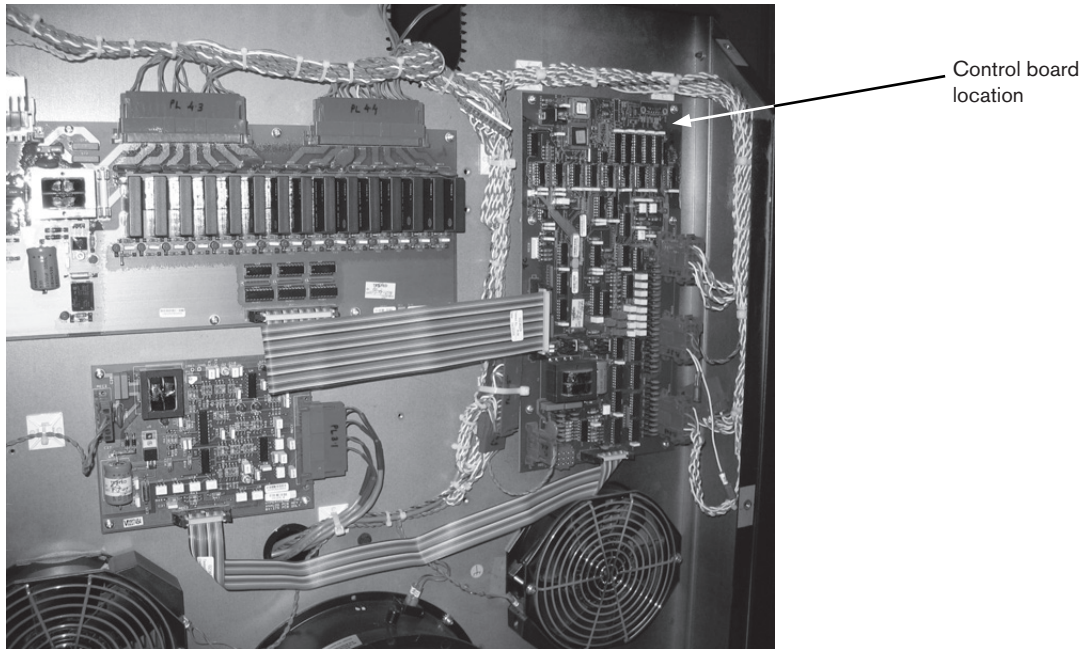


5. If you are installing a new control board see *Installation of the new control board* on the next page.

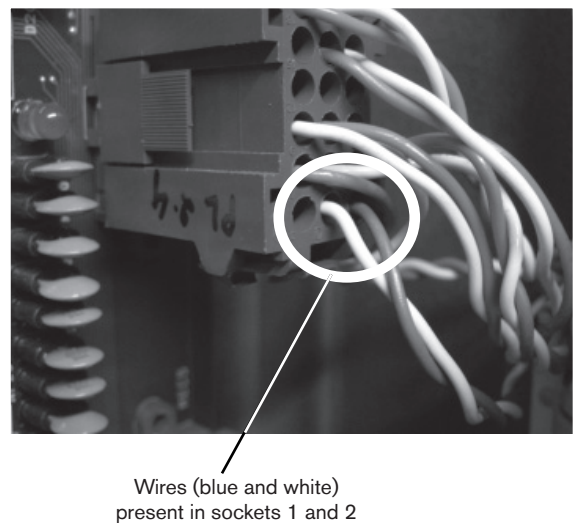
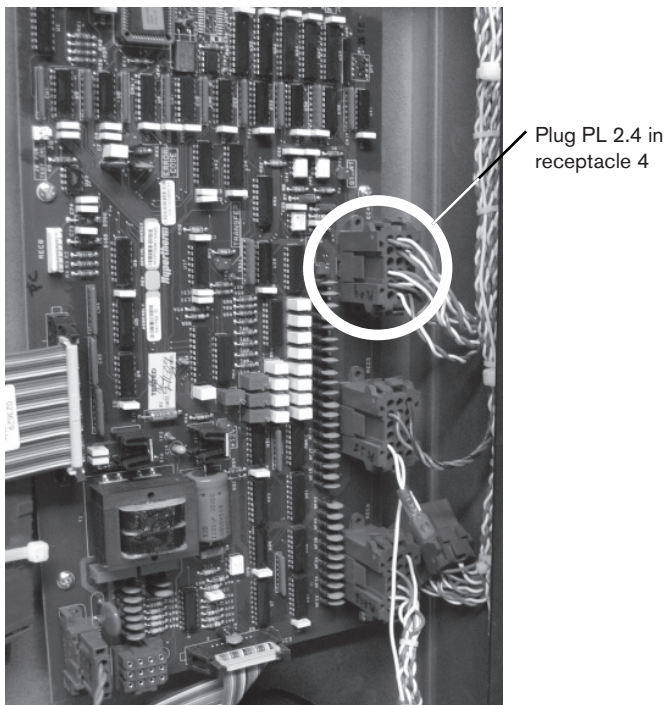
If you have installed the new chip on an existing control board see step 2 of *Installation of the new control board* on the next page, before you replace the 2 front panels of the power supply and continue to *torch and quick-disconnect installation*.

Installation of the new control board

1. Install the appropriate firmware chip on the new control board by following step 4 on the previous page.



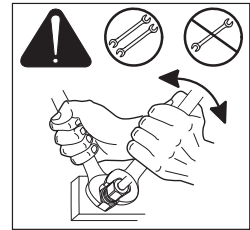
2. Locate plug PL 2.4 in receptacle 4 on the control board. If no wires are present in sockets 1 and 2 use the jumper wire provided in this kit to jump the 2 sockets.



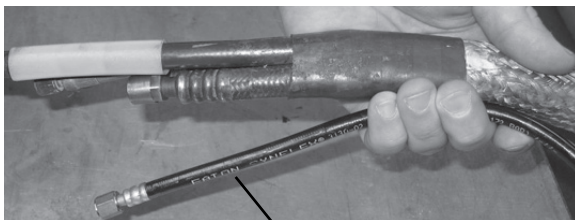
3. Label each connector before removing any connections to the old board. After labeling the connectors, remove all connections to the control board. Any wires that are present but not connected to the board will remain disconnected.
4. Remove the 6 screws that hold the control board in place, and remove the old control board. Save the screws for reuse.
5. Install the new control board using the six screws from step 3.
6. Plug all the connectors into the appropriate receptacles on the new control board.
7. Replace the 2 front panels and continue to *torch installation*.

Torch Installation

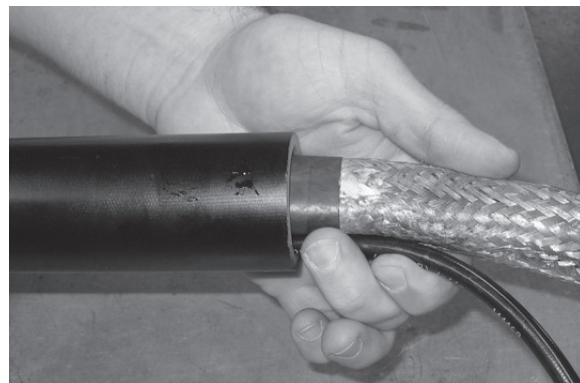
1. Remove the existing torch and mounting sleeve from the lifter.
2. Unscrew the mounting sleeve and slide it up to expose the hose fittings.
3. Disconnect all the hoses and the pilot arc connection from the torch and remove the sleeve. Always use 2 wrenches to loosen or tighten the fittings.
4. Inspect all hoses and wires for damage.
5. Loosen the off-valve assembly to remove the existing blue plasma hose. Hold the black plasma hose provided in this kit with the bundled cables and hoses, and slide the new sleeve (1-3/4 in or 2 in diameter) over the bundle.



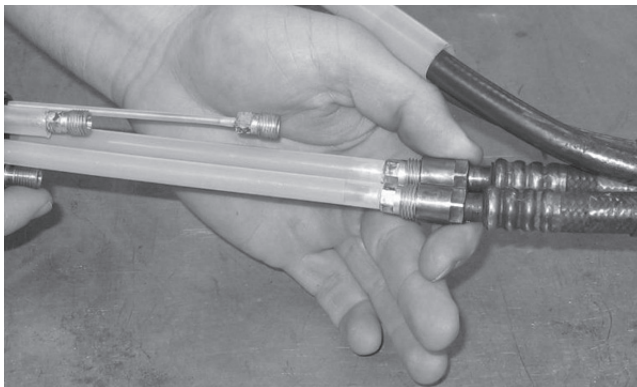
Note 1: make sure the threaded end of the torch sleeve is closest to the torch



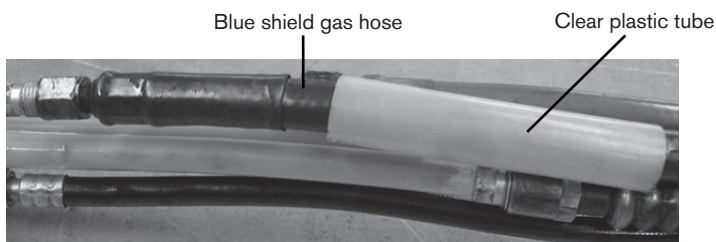
Black plasma
gas hose



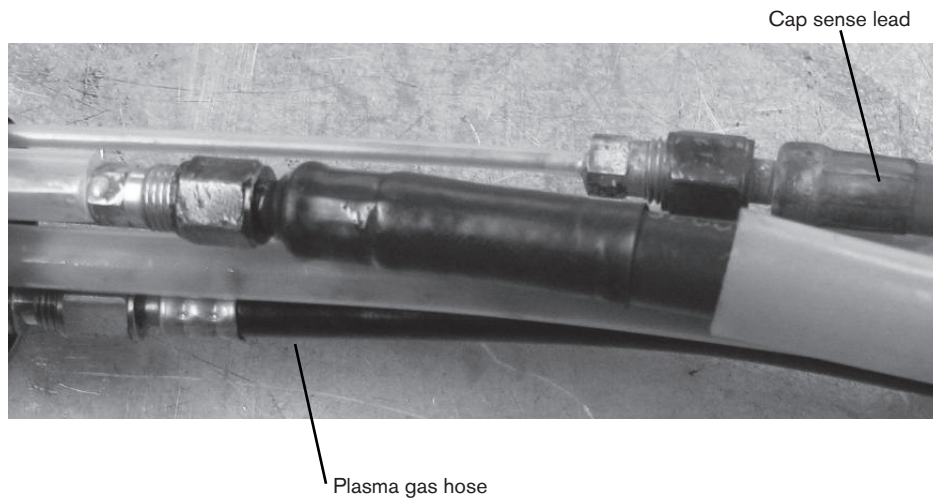
6. Connect the green and red coolant fittings to the corresponding colored hoses.



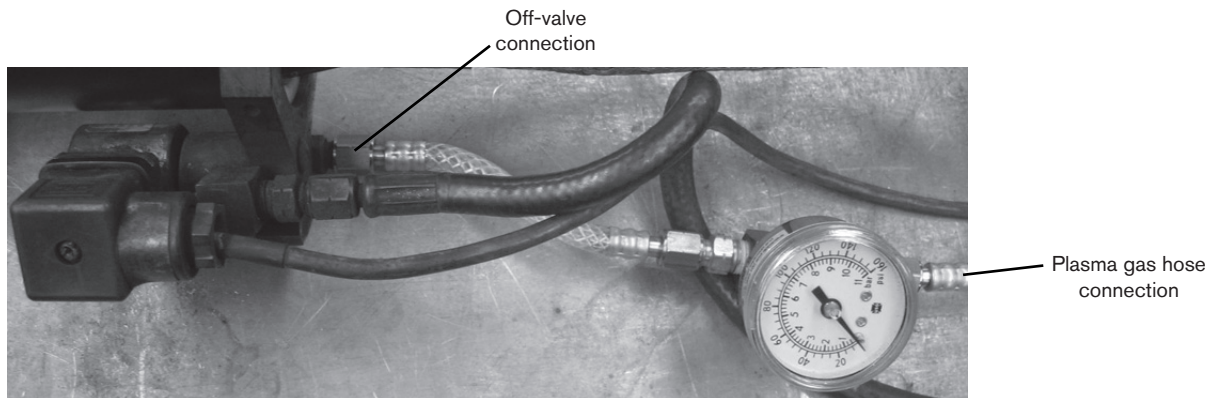
7. Slide the clear, 3 inch long, plastic tube over the blue shield gas hose before connecting it to the torch. Slide the clear tube over the connection when the connection is tight.



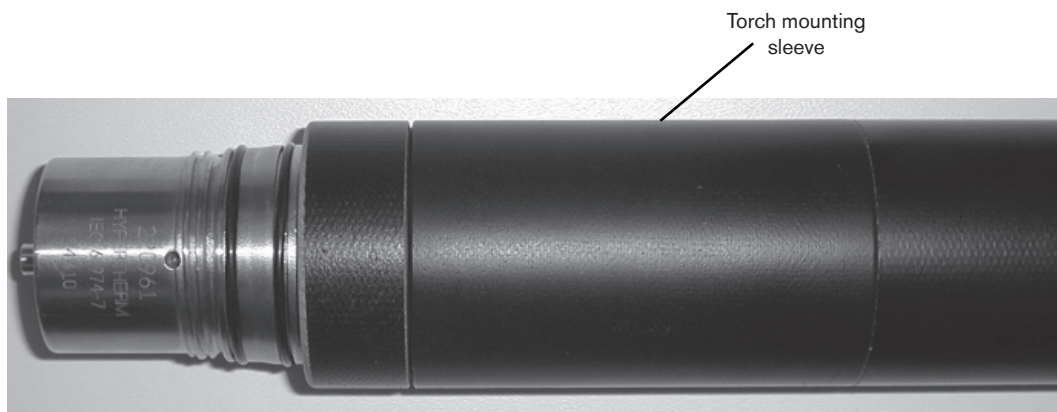
8. Connect the cap sense lead and the plasma gas hose to the torch fittings.



9. Install the pressure gauge included in this kit between the plasma gas line and the off-valve assembly.



10. Screw the torch mounting sleeve onto the torch.



11. Verify gas pressures.

11a. Turn on the power to the system and turn on the gas supplies.

11b. Adjust the gas console settings for the chosen process using the cut charts in this document.

11c. Verify the gas pressure reading on the gauge between the plasma gas line and the off-valve assembly with the table below.

Note: Recommended incoming gas (supply gas) pressures are 120 psi for oxygen and nitrogen and 90 psi for air. If the incoming gas pressures are not set correctly the back pressure reading will also be incorrect.

Current	Process	Test pressures					
		Preflow pressure (at the off-valve)		Cutflow pressure (at the off-valve)		Pressure while cutting (at the off-valve)	
Amps	Gases	psi	bar	psi	bar	psi	bar
50	Air/Air	49.2	3.4	31.3	2.2	63.2	4.4
50	O ₂ /Air	54.2	4.4	24.3	1.7	71	4.9
130	O ₂ /Air	37.5	2.6	18.4	1.3	62.8	4.3
130	Air/Air	27	1.8	50	3.4	62.5	4.3
200	O ₂ /Air (copper electrode)	27	1.8	49	3.4	69	4.8
200	O ₂ /Air (SilverPlus electrode)	32	2.2	54	3.7	75	5.1
200	Air/Air	26	1.8	36	2.5	52	3.6
200	N ₂ /Air	38.3	2.6	48.6	3.4	63.4	4.4

12. Verify that there are no leaks at any of the connections.

13. Remove the pressure gauge that was installed in step 9. and the installation is complete.

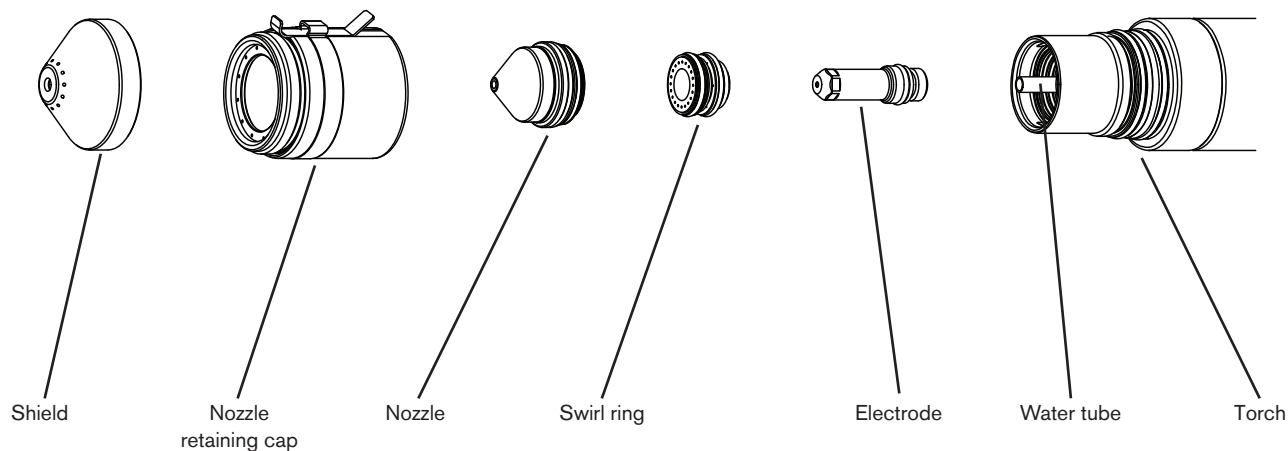
Daily start-up

Prior to start-up, ensure that your cutting environment and that your clothing meet the safety requirements outlined in the *Safety* section of the system's instruction manual.

Check torch

	WARNING
Before operating this system, you must read the <i>Safety</i> section thoroughly! Turn OFF the power supply's main disconnect switch before proceeding with the following steps.	

1. Turn OFF the main disconnect switch to the power supply.
2. Remove the consumables from the torch and check for worn or damaged parts. **Always place the consumables on a clean, dry, oil-free surface after removing. Dirty consumables can cause the torch to malfunction.**
 - Refer to *Install consumables* on the next page for details.
 - Refer to the *Cut charts* to choose the correct consumables for your cutting needs.
3. Replace consumable parts. Refer to *Changing consumables* later in this section for details.
4. Ensure that the torch is perpendicular to the workpiece.



Install consumables



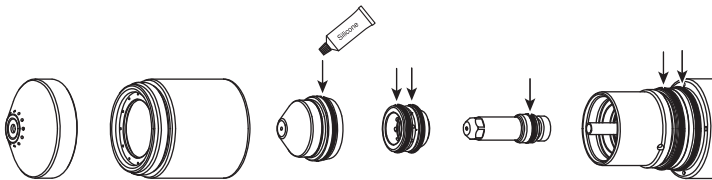
WARNING

Always disconnect power to the power supply before inspecting or changing torch consumable parts. Use gloves when removing consumables. The torch might be hot.

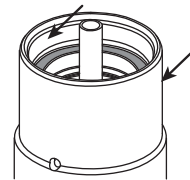
Install consumables

Check the consumable parts daily for wear before cutting. Before removing consumables, bring the torch to the edge of the cutting table, with the torch lifter raised to its highest point to prevent the consumables from dropping into the water of the water table.

Note: Do not overtighten parts! Only tighten until mating parts are seated.



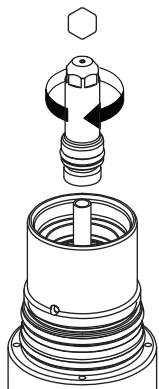
Apply a thin film of silicone lubricant on each o-ring. The o-ring should look shiny, but there should not be any excess or built-up grease.



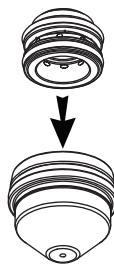
Wipe the internal and external surfaces of the torch with a clean cloth or paper towel.



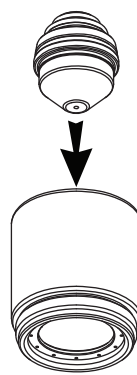
Tool: 104119



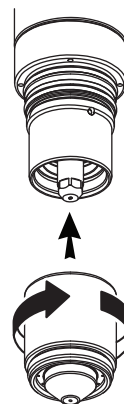
1. Install the electrode into the torch head



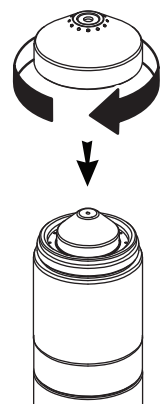
2. Install the swirl ring into the nozzle



3. Install the nozzle and swirl ring into the nozzle retaining cap



4. Install the nozzle retaining cap onto the torch head



5. Install the shield onto the nozzle retaining cap

Arc voltage

The arc voltage settings (v) shown in the cut charts may need to be adjusted to produce the correct cutting height. Physically measuring the height after stopping the torch is preferred, but visual inspection during a cut is acceptable. Over the life of a consumable set it will also be necessary to periodically adjust the arc voltage (v) up 1 to 2 volts at a time to maintain the proper torch height and to achieve the maximum life from the consumables.

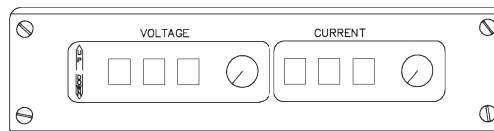
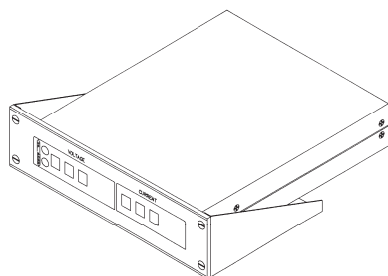
Cut charts

The following *Cut charts* show the consumable parts, cutting speeds, gas pressures, and the current settings required for each process.

The numbers shown in the *Cut charts* are recommended to provide high-quality cuts with minimal dross. Because of differences between installations and material composition, adjustments may be required to obtain desired results.

Digital remote

Hypertherm has produced a few versions of the digital remote. Some versions increase and decrease in 10 amp increments, and some increase and decrease in 20 amp increments. If you have a digital remote that increases/decreases by 20 amps, set the digital remote to 120 amps or 140 amps for a 130 amp process. The system will automatically choose the 130 amp process.



Estimated kerf width compensation

The widths in the chart below are for reference. Differences between installations and material composition may cause actual results to vary from those shown in the tables.

Metric

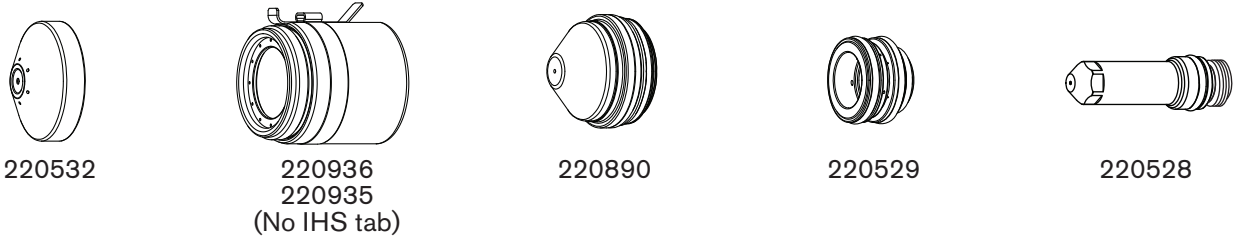
Process	Thickness (mm)												
Mild steel	3	4	6	8	10	12	15	20	25	32	38	44	50
50A O ₂ /Air	1.5	1.6	–	–	–	–	–	–	–	–	–	–	–
50A Air/Air	1.3	1.3	–	–	–	–	–	–	–	–	–	–	–
130A O ₂ /Air	2.4	2.5	2.7	2.8	2.9	3.1	3.3	3.6	4.0	–	–	–	–
130A Air/Air	2.2	–	2.4	–	2.6	2.8	2.9	3.2	3.5	–	–	–	–
200A O ₂ /Air	–	–	2.8	2.9	3.0	3.3	3.4	3.7	4.1	4.6	5.0	5.4	5.9
200A Air/Air	–	–	2.7	–	2.9	3.1	3.4	3.6	4.0	4.5	5.0	–	5.9
Stainless steel													
50A Air/Air	1.5	1.5	–	–	–	–	–	–	–	–	–	–	–
200A N ₂ /Air	–	–	2.5	2.6	2.7	2.9	3.1	3.3	3.7	4.1	4.5	–	–
Aluminum													
50A Air/Air	1.5	1.6	–	–	–	–	–	–	–	–	–	–	–
200A N ₂ /Air	–	–	3.2	3.3	3.4	3.6	3.8	4.1	4.6	5.1	5.6	–	–

English

Process	Thickness (in.)									
Mild steel	0.135	0.25	0.375	0.5	0.625	0.75	1.0	1.25	1.5	2.0
50A O ₂ /Air	0.059	0.064	–	–	–	–	–	–	–	–
50A Air/Air	0.051	0.053	–	–	–	–	–	–	–	–
130A O ₂ /Air	0.096	0.105	0.114	0.123	0.132	0.141	0.159	–	–	–
130A Air/Air	0.089	0.095	0.102	0.109	0.116	0.123	0.138	–	–	–
200A O ₂ /Air	–	0.110	0.119	0.128	0.136	0.145	0.163	0.180	0.197	0.232
200A Air/Air	–	0.106	0.115	0.124	0.132	0.141	0.159	0.177	0.195	0.231
Stainless steel										
50A Air/Air	0.059	0.062	–	–	–	–	–	–	–	–
200A N ₂ /Air	–	–	0.106	0.114	0.122	0.130	0.145	0.161	0.177	–
Aluminum										
50A Air/Air	0.060	0.062	–	–	–	–	–	–	–	–
200A N ₂ /Air	–	–	0.133	0.143	0.152	0.162	0.181	0.201	0.220	–

Mild steel
Air Plasma / Air Shield
50 A Cutting

Flow rates – lpm/scfh	
	Air
Preflow	123 / 259
Cutflow	114 / 241



Metric

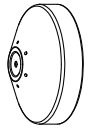
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)							
Air	Air	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
39	27	40	0.5	112	1.5	9400	3.0	200	0.0
			0.8	111	1.5	8510	3.0	200	0.0
			1.0	111	1.5	8050	3.0	200	0.1
			1.2	107	1.8	7625	3.6	200	0.1
			1.5	108	1.8	7370	3.6	200	0.1
			2.0	108	1.8	6735	3.6	200	0.1
			2.5	109	2.0	5080	4.0	200	0.2
			3.0	112	2.0	3760	4.0	200	0.3
			4.0	116	2.3	2415	4.6	200	0.4
			6.0	120	2.5	1600	5.0	200	0.5

English

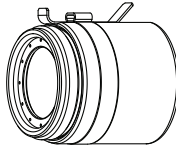
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)							
Air	Air	Air	in	Volts	in	ipm	in	factor %	seconds
39	27	40	0.018	112	0.06	375	0.12	200	0.0
			0.024	112	0.06	350	0.12	200	0.0
			0.030	111	0.06	340	0.12	200	0.0
			0.036	110	0.06	325	0.12	200	0.1
			0.048	107	0.07	300	0.14	200	0.1
			0.060	108	0.07	290	0.14	200	0.1
			0.075	108	0.07	275	0.14	200	0.1
			0.105	110	0.08	180	0.16	200	0.2
			0.135	114	0.08	110	0.16	200	0.3
			0.188	118	0.09	75	0.18	200	0.4
			0.250	121	0.10	60	0.20	200	0.5

Mild steel
O₂ Plasma / Air Shield
50 A Cutting

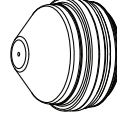
Flow rates – lpm/scfh			
	O ₂	N ₂	Air
Preflow	2 / 4	19 / 40	73 / 155
Cutflow	12 / 25		73 / 155



220532



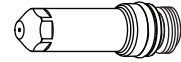
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220891



220529



220528

Metric

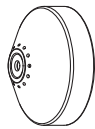
Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
35	0	21	30	0.5	98	1.5	7550	3.0	200	0.0
				0.8	98	1.5	7050	3.0	200	0.0
				1.0	98	1.5	6775	3.0	200	0.1
				1.2	98	1.5	6600	3.0	200	0.1
				1.5	98	1.5	6150	3.0	200	0.1
				2.0	98	1.5	5400	3.0	200	0.1
				2.5	100	1.8	4300	3.6	200	0.2
				3.0	102	1.8	3650	3.6	200	0.3
				4.0	104	2.0	2800	4.0	200	0.4
				6.0	108	2.5	1750	4.0	200	0.5

English

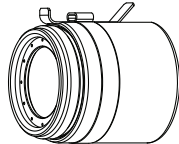
Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	in	Volts	in	ipm	in	factor %	seconds
35	0	21	30	0.018	98	0.06	300	0.12	200	0.0
				0.024	98	0.06	290	0.12	200	0.0
				0.030	98	0.06	280	0.12	200	0.0
				0.036	98	0.06	270	0.12	200	0.1
				0.048	98	0.06	260	0.12	200	0.1
				0.060	98	0.06	240	0.12	200	0.1
				0.075	98	0.06	220	0.12	200	0.1
				0.105	100	0.07	160	0.14	200	0.2
				0.135	103	0.07	130	0.14	200	0.3
				0.188	106	0.09	85	0.18	200	0.4
				0.250	108	0.10	65	0.20	200	0.5

Mild steel
O₂ Plasma / Air Shield
130 A Cutting

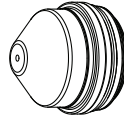
Flow rates – lpm/scfh			
	O ₂	N ₂	Air
Preflow	16 / 33	21 / 44	86 / 183
Cutflow	20 / 42		86 / 183



220491



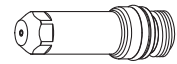
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220893



220488



220487
or 420185
SilverPlus

Metric

Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
25	30	34	35	3	128	2.6	5900	5.2	200	0.1
				4	129	2.7	5325	5.4	200	0.2
				6	129	2.8	3925	5.6	200	0.3
				10	133	3.0	2680	6.0	200	0.4
				12	135	3.0	2200	6.0	200	0.5
				15	139	3.6	1665	7.2	200	0.7
				20	141	3.9	1195	7.8	200	1.0
				25	151	4.1	685	8.2	200	1.5
				32	155	4.6	515	Edge Start		
				38	160	4.6	310			

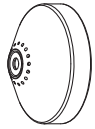
English

Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	in	Volts	in	ipm	in	factor %	seconds
25	30	34	35	0.135	128	0.10	240	0.20	200	0.1
				3/16	129	0.11	190	0.22	200	0.2
				1/4	129	0.11	150	0.22	200	0.3
				3/8	133	0.12	110	0.24	200	0.3
				1/2	135	0.12	80	0.24	200	0.5
				5/8	140	0.15	60	0.30	200	0.7
				3/4	141	0.15	50	0.30	200	1.0
				1.0	151	0.16	25	0.32	200	1.5
				1-1/4	155	0.18	20	Edge Start		
				1-1/2	160	0.18	12			

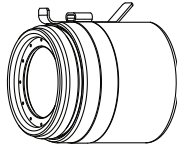
Mild steel

Air Plasma / Air Shield
130 A Cutting

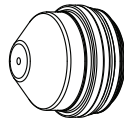
Flow rates – lpm/scfh		
	Air	Air
Preflow	26 / 56	68 / 145
Cutflow	44 / 93	68 / 145



220536



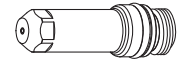
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220892



220488



220487

Metric

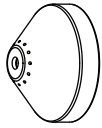
Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
Air		Air	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
45	77	24		3	139	3.0	5350	6.0	200	0.1
				4	137	3.0	4630	6.0	200	0.2
				6	142	3.4	3865	6.8	200	0.3
				10	148	4.1	2445	8.2	200	0.5
				12	149	4.1	2045	8.2	200	0.5
				15	153	4.4	1445	8.8	200	0.8
				20	159	4.6	815	10.5	230	1.2
				25	167	4.6	415	Edge Start		
				32	174	5.1	250			

English

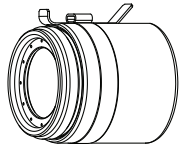
Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
Air		Air	Air	in	Volts	in	ipm	in	factor %	seconds
45	77	24		0.135	140	0.12	220	0.24	200	0.1
				3/16	136	0.12	160	0.24	200	0.2
				1/4	144	0.14	150	0.28	200	0.3
				3/8	148	0.16	100	0.32	200	0.5
				1/2	149	0.16	75	0.32	200	0.5
				5/8	154	0.18	50	0.36	200	0.8
				3/4	158	0.18	35	0.42	230	1.2
				1.0	167	0.18	15	Edge Start		
				1-1/4	174	0.20	10			

Mild steel
O₂ Plasma / Air Shield
200 A Cutting
Copper electrode

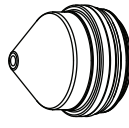
Flow rates – lpm/scfh			
	O ₂	N ₂	Air
Preflow	7 / 15	27 / 57	123 / 260
Cutflow	32 / 67		123 / 260



220832



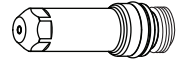
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220831



220834



220937

Metric

Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
12	38	70	53	6	145	1.5	6210	3.00	200	0.30
				8	154	3.4	4850	5.10	150	0.35
				10	160	4.6	3735	6.90	150	0.40
				12	157	3.8	3415	9.50	250	0.60
				15	156	3.1	2845	7.80	250	0.70
				20	157	3.0	1920	7.50	250	0.80
				25	163	3.2	1430	8.00	250	1.00
				32	170	3.1	805	7.80	250	1.25
				38	179	4.4	570	11.0	250	1.50
				44	185	4.4	395	Edge Start		
				50	191	4.4	270			

English

Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	in	Volts	in	ipm	in	factor %	seconds
12	38	70	53	1/4	147	0.075	235	0.150	200	0.30
				3/8	161	0.188	150	0.280	150	0.30
				1/2	156	0.140	130	0.280	200	0.30
				5/8	156	0.115	105	0.280	250	0.50
				3/4	157	0.115	80	0.280	250	0.60
				7/8	162	0.125	65	0.312	250	0.70
				1.0	163	0.125	55	0.312	250	0.80
				1-1/4	170	0.125	32	0.312	250	1.25
				1-1/2	179	0.175	22	0.437	250	1.50
				1-3/4	185	0.175	15	Edge Start		
				2.0	192	0.175	10			

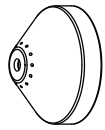
Mild steel

 O₂ Plasma / Air Shield

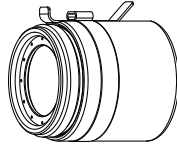
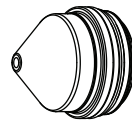
200 A Cutting

SilverPlus electrode

Flow rates – lpm/scfh			
	O ₂	N ₂	Air
Preflow	7 / 15	27 / 57	123 / 260
Cutflow	34 / 72		123 / 260



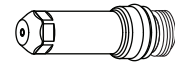
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220925

Metric

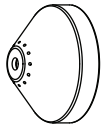
Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air					mm	factor %	
12	38	77	53	6	145	1.5	6210	3.00	200	0.30
				8	154	3.4	4850	5.10	150	0.35
				10	160	4.6	3735	6.90	150	0.40
				12	157	3.8	3415	9.50	250	0.60
				15	156	3.1	2845	7.80	250	0.70
				20	158	3.0	1920	7.50	250	0.80
				25	163	3.2	1430	8.00	250	1.00
				32	170	3.1	805	7.80	250	1.25
				38	179	4.4	565	11.0	250	1.50
				44	185	4.4	395	Edge Start		
				50	191	4.4	270			

English

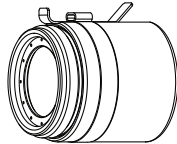
Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air					in	factor %	
12	38	77	53	1/4	147	0.075	235	0.150	200	0.30
				3/8	161	0.188	150	0.280	150	0.30
				1/2	156	0.140	130	0.280	200	0.30
				5/8	156	0.115	105	0.280	250	0.50
				3/4	157	0.115	80	0.280	250	0.60
				7/8	162	0.125	65	0.312	250	0.70
				1.0	163	0.125	55	0.312	250	0.80
				1-1/4	170	0.125	32	0.312	250	1.25
				1-1/2	179	0.175	22	0.437	250	1.50
				1-3/4	185	0.175	15	Edge Start		
				2.0	192	0.175	10			

Mild steel
Air Plasma / Air Shield
200 A Cutting

Flow rates – lpm/scfh		
	Air	Air
Preflow	26 / 56	123 / 220
Cutflow	31 / 65	123 / 220



420045



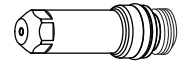
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420044



220488



220937

Metric

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
	Preflow %	Plasma %	Shield (psi)						
Air	Air	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
45	57	44	6	134	1.0	4885	3.0	300	0.3
			8	138	1.3	4515	3.9	300	0.5
			10	142	2.6	2975	5.2	200	0.8
			12	145	3.0	2655	6.0	200	0.9
			15	152	4.3	2265	8.6	200	1.0
			20	160	4.8	1415	9.6	200	1.1
			25	165	6.4	940	12.8	200	1.2
			32	172	6.4	630	12.8	200	1.8
			38	176	6.4	510	Edge Start		
			44	180	6.4	320			
			50	186	6.4	215			

English

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
	Preflow %	Plasma %	Shield (psi)						
Air	Air	Air	in	Volts	in	ipm	in	factor %	seconds
45	57	44	1/4	134	0.040	190	0.120	300	0.3
			5/16	138	0.050	180	0.150	300	0.5
			3/8	142	0.100	120	0.200	200	0.8
			1/2	145	0.125	100	0.250	200	0.9
			5/8	152	0.188	85	0.375	200	1.0
			3/4	155	0.188	60	0.375	200	1.1
			7/8	160	0.188	50	0.375	200	1.2
			1.0	165	0.250	35	0.500	200	1.2
			1-1/4	172	0.250	25	0.500	200	1.8
			1-1/2	176	0.250	20	Edge Start		
			1-3/4	180	0.250	12			
			2.0	186	0.250	8			

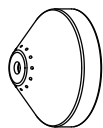
Mild steel – 3 inch under water

 O₂ Plasma / Air Shield

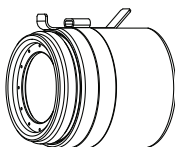
200 A Cutting

Copper electrode

Flow rates – lpm/scfh			
	O ₂	N ₂	Air
Preflow	7 / 15	27 / 57	123 / 260
Cutflow	32 / 67		123 / 260



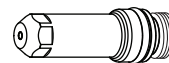
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220834



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Metric

Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
12	38	70	53	6	142	0.7	6235	1.4	200	0.3
				10	166	3.8	3460	7.6	200	0.3
				12	159	2.9	3060	5.8	200	0.3
				15	159	2.8	2555	5.6	200	0.5
				20	163	3.0	1700	7.5	250	0.6
				22	164	3.2	1545	8.0	250	0.7
				25	165	3.2	1300	8.0	250	0.8

English

Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	in	Volts	in	ipm	in	factor %	seconds
12	38	70	53	1/4	145	0.040	235	0.080	200	0.3
				3/8	168	0.157	140	0.312	200	0.3
				1/2	157	0.100	115	0.200	200	0.3
				5/8	160	0.115	95	0.230	200	0.5
				3/4	163	0.115	70	0.290	250	0.6
				7/8	164	0.125	60	0.312	250	0.7
				1.0	165	0.125	50	0.312	250	0.8

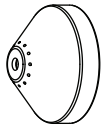
Mild steel – 3 inch under water

O₂ Plasma / Air Shield

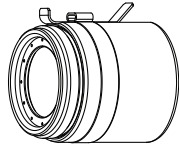
200 A Cutting

SilverPlus electrode

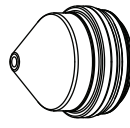
Flow rates – lpm/scfh			
	O ₂	N ₂	Air
Preflow	7 / 15	27 / 57	123 / 260
Cutflow	34 / 72		123 / 260



220832



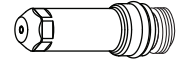
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220831



220834



220925

Metric

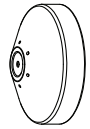
Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
12	38	77	53	6	142	0.7	6235	1.4	200	0.3
				10	166	3.8	3460	7.6	200	0.3
				12	159	2.9	3060	5.8	200	0.3
				15	159	2.8	2555	5.6	200	0.5
				20	163	3.0	1700	7.5	250	0.6
				22	164	3.2	1545	8.0	250	0.7
				25	165	3.2	1300	8.0	250	0.8

English

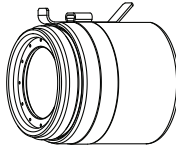
Test Preflow Flowrates		Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %		Plasma %	Shield (psi)							
O ₂	N ₂	O ₂	Air	in	Volts	in	ipm	in	factor %	seconds
12	38	77	53	1/4	145	0.040	235	0.080	200	0.3
				3/8	168	0.157	140	0.312	200	0.3
				1/2	157	0.100	115	0.200	200	0.3
				5/8	160	0.115	95	0.230	200	0.5
				3/4	163	0.115	70	0.290	250	0.6
				7/8	164	0.125	60	0.312	250	0.7
				1.0	165	0.125	50	0.312	250	0.8

Stainless steel
Air Plasma / Air Shield
50 A Cutting

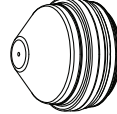
Flow rates – lpm/scfh	
	Air
Preflow	123 / 259
Cutflow	114 / 241



220532



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(No IHS tab)



220890



220529



220528

Metric

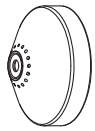
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					mm	factor %	
Air	Air	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
39	27	40	0.5	103	1.5	7620	3.0	200	0.0
			0.8	104	1.5	6730	3.0	200	0.0
			1.0	104	1.5	6350	3.0	200	0.1
			1.2	105	1.8	5715	3.6	200	0.1
			1.5	108	1.8	4830	3.6	200	0.1
			2.0	110	1.8	4190	3.6	200	0.1
			2.5	113	2.0	3175	4.0	200	0.2
			3.0	114	2.0	2160	4.0	200	0.3
			4.0	118	2.3	1400	4.6	200	0.4
			6.0	122	2.5	1145	5.0	200	0.5

English

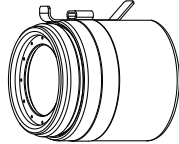
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)							
Air	Air	Air	in	Volts	in	ipm	in	factor %	seconds
39	27	40	0.018	103	0.06	300	0.12	200	0.0
			0.024	103	0.06	275	0.12	200	0.0
			0.030	104	0.06	265	0.12	200	0.0
			0.036	104	0.06	250	0.12	200	0.1
			0.048	105	0.07	225	0.14	200	0.1
			0.060	108	0.07	190	0.14	200	0.1
			0.075	109	0.07	165	0.14	200	0.1
			0.105	114	0.08	125	0.16	200	0.2
			0.135	115	0.08	85	0.16	200	0.3
			0.188	121	0.09	55	0.18	200	0.4
			0.250	122	0.10	45	0.20	200	0.5

Stainless steel
Air Plasma / Air Shield
130 A Cutting

Flow rates – lpm/scfh		
	Air	Air
Preflow	26 / 56	68 / 145
Cutflow	44 / 93	68 / 145



220536



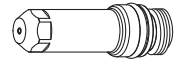
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220892



220488



220487

Metric

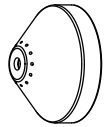
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
	Preflow %	Plasma %							
Air	Air	Shield (psi)							
45	77	24	mm	Volts	mm	mm/m	mm	factor %	seconds
			6	142	3.5	2625	7.0	200	0.3
			10	149	4.1	1700	8.2	200	0.5
			12	152	4.1	1380	8.2	200	0.8
			15	160	4.4	900	Edge Start		
			20	165	4.6	430			

English

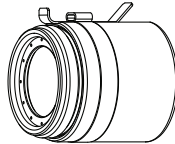
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
	Preflow %	Plasma %							
Air	Air	Shield (psi)							
45	77	24	in	Volts	in	ipm	in	factor %	seconds
			1/4	143	0.14	100	0.28	200	0.3
			3/8	148	0.16	70	0.32	200	0.5
			1/2	153	0.16	50	0.32	200	0.8
			5/8	162	0.18	30	Edge Start		
			3/4	164	0.18	20			

Stainless steel
Air Plasma / Air Shield
200 A Cutting

Flow rates – lpm/scfh		
	Air	Air
Preflow	26 / 56	123 / 220
Cutflow	31 / 65	123 / 220



420045



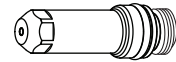
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420044



220488



220937

Metric

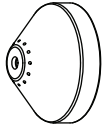
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					mm	factor %	
Air	Air	Air	mm	Volts	mm	mm/m	mm		seconds
45	57	44	5	140	2.7	5695	5.4	200	0.40
			6	144	3.0	3105	6.0	200	0.40
			10	144	3.2	2485	6.4	200	0.50
			12	147	3.2	2245	6.4	200	0.75
			15	152	3.8	1700	7.6	200	0.80
			20	156	4.9	1155	9.8	200	1.00
			25	162	5.6	670	Edge Start		
			32	172	5.6	515			
38	180	5.6	310						

English

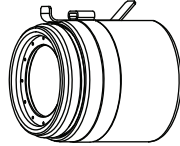
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					in	factor %	
Air	Air	Air	in	Volts	in	ipm	in	seconds	
45	57	44	3/16	140	0.110	230	0.22	200	0.40
			1/4	144	0.120	200	0.24	200	0.40
			3/8	144	0.125	160	0.25	200	0.50
			1/2	147	0.125	110	0.25	200	0.75
			5/8	152	0.157	85	0.315	200	0.80
			3/4	156	0.188	60	0.375	200	1.00
			7/8	160	0.210	50	0.420	200	1.20
			1.0	162	0.220	40	Edge Start		
			1-1/4	172	0.220	20			
			1-1/2	180	0.220	12			

Stainless steel
N₂ Plasma / Air Shield
200 A Cutting

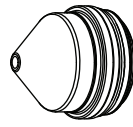
Flow rates – lpm/scfh		
	N ₂	Air
Preflow	26 / 56	123 / 220
Cutflow	31 / 65	123 / 220



420045



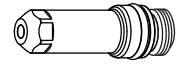
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420044



220529



020415

Metric

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					mm	factor %	
N ₂	N ₂	Air	mm	Volts	mm	mm/m	mm	seconds	
45	55	44	5	154	3.0	3505	6.0	200	0.40
			6	155	3.0	3355	6.0	200	0.40
			10	156	3.0	2670	6.0	200	0.50
			12	158	3.0	2210	6.0	200	0.75
			15	160	4.0	1930	8.0	200	0.80
			20	162	4.8	1180	9.6	200	1.00
			22	167	4.8	1035	9.6	200	1.20
			25	172	6.2	890	12.4	200	1.30
			32	180	6.2	610	Edge Start		
			38	188	6.2	380			

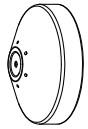
English

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					in	factor %	
N ₂	N ₂	Air	in	Volts	in	ipm	in	factor %	seconds
45	55	44	3/16	154	0.125	230	0.25	200	0.40
			1/4	155	0.125	200	0.25	200	0.40
			3/8	156	0.125	160	0.25	200	0.50
			1/2	158	0.125	110	0.25	200	0.75
			5/8	160	0.157	75	0.315	200	0.80
			3/4	162	0.188	60	0.375	200	1.00
			7/8	167	0.188	40	0.375	200	1.20
			1.0	172	0.250	35	0.50	200	1.30
			1-1/4	180	0.250	25	Edge Start		
			1-1/2	188	0.250	15			

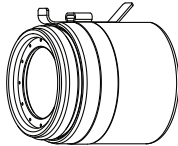
Aluminum

Air Plasma / Air Shield
50 A Cutting

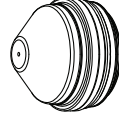
Flow rates – lpm/scfh	
	Air
Preflow	123 / 259
Cutflow	114 / 241



220532



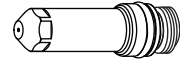
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220890



220529



220528

Metric

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
	Preflow %	Plasma %	Shield (psi)						
Air	Air	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
39	27	40	0.5	110	1.5	8000	3.0	200	0.0
			0.8	111	1.6	7750	3.2	200	0.0
			1.0	112	1.8	7115	3.6	200	0.1
			1.2	112	1.8	6350	3.6	200	0.1
			1.5	113	1.8	5335	3.6	200	0.1
			2.0	118	2.0	4200	4.0	200	0.1
			2.5	121	2.0	3300	4.0	200	0.2
			3.0	122	2.0	2800	4.0	200	0.3
			4.0	123	2.2	2300	4.4	200	0.4
			6.0	128	2.5	1400	5.0	200	0.5

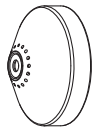
English

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
	Preflow %	Plasma %	Shield (psi)						
Air	Air	Air	in	Volts	in	ipm	in	factor %	seconds
39	27	40	0.018	110	0.06	325	0.12	200	0.0
			0.020	110	0.06	315	0.12	200	0.0
			0.024	110	0.06	305	0.12	200	0.0
			0.030	111	0.06	295	0.12	200	0.1
			0.036	112	0.07	280	0.14	200	0.1
			0.048	112	0.07	230	0.14	200	0.2
			0.060	113	0.07	195	0.14	200	0.2
			0.075	118	0.08	160	0.16	200	0.2
			0.105	121	0.08	120	0.16	200	0.3
			0.125	122	0.08	100	0.16	200	0.3
			3/16	124	0.09	75	0.18	200	0.4
			1/4	129	0.10	50	0.20	200	0.5

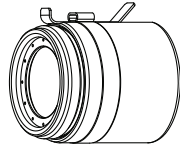
Aluminum

Air Plasma / Air Shield
130 A Cutting

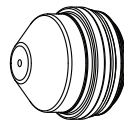
Flow rates – lpm/scfh		
	Air	Air
Preflow	26 / 56	68 / 145
Cutflow	44 / 93	68 / 145



220536



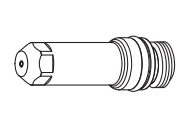
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220892



220488



220487

Metric

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)							
Air	Air	Air	mm	Volts	mm	mm/m	mm	factor %	seconds
45	77	24	6	152	2.8	2370	5.6	200	0.2
			10	155	3.0	1470	6.0	200	0.3
			12	157	3.0	1230	6.0	200	0.5
			15	161	3.2	1050	6.4	200	0.8
			20	164	3.6	725	7.9	220	1.3
			25	172	4.0	525	Edge Start		

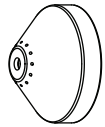
English

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					in	Volts	
Air	Air	Air	in	Volts	in	ipm	in	factor %	seconds
45	77	24	1/4	152	0.11	90	0.22	200	0.2
			3/8	155	0.12	60	0.24	200	0.3
			1/2	157	0.12	45	0.24	200	0.5
			5/8	162	0.13	40	0.26	200	0.8
			3/4	163	0.14	30	0.31	220	1.3
			1.0	173	0.16	20	Edge Start		

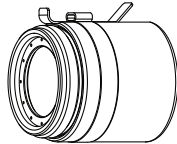
Aluminum

Air Plasma / Air Shield
200 A Cutting

Flow rates – lpm/scfh		
	Air	Air
Preflow	26 / 56	123 / 220
Cutflow	31 / 65	123 / 220



420045



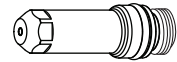
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420044



220488



220937

Metric

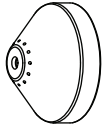
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					mm	factor %	
Air	Air	Air	mm	Volts	mm	mm/m	mm		seconds
45	57	44	5	145	2.2	6215	4.4	200	0.5
			6	148	3.0	5195	6.0	200	0.5
			10	151	3.3	3930	6.6	200	0.5
			12	154	3.7	3370	7.4	200	0.5
			15	157	4.0	2625	8.0	200	0.8
			20	161	4.9	1625	9.8	200	1.0
			25	174	5.6	1050	Edge Start		
			32	186	5.6	515			
			38	196	5.6	310			

English

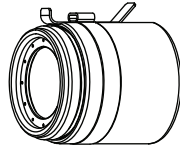
Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					in	factor %	
Air	Air	Air	in	Volts	in	ipm	in	seconds	
45	57	44	3/16	145	0.100	230	0.200	200	0.50
			1/4	148	0.125	200	0.250	200	0.50
			3/8	151	0.125	160	0.250	200	0.50
			1/2	154	0.150	125	0.300	200	0.50
			5/8	157	0.160	95	0.320	200	0.80
			3/4	161	0.188	70	0.375	200	1.00
			7/8	166	0.210	50	0.420	200	1.20
			1.0	174	0.220	40	Edge Start		
			1-1/4	186	0.220	20			
			1-1/2	196	0.220	12			

Aluminum
N₂ Plasma / Air Shield
200 A Cutting

Flow rates – lpm/scfh		
	N ₂	Air
Preflow	26 / 56	123 / 220
Cutflow	31 / 65	123 / 220



420045



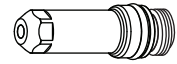
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420044



220529



020415

Metric

Test Preflow Flowrates	Test Cutflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					mm	factor %	
N ₂	N ₂	Air	mm	Volts	mm	mm/m	mm	seconds	
45	55	44	5	150	2.2	4750	4.4	200	0.5
			6	153	3.0	4345	6.0	200	0.5
			10	156	3.3	3050	6.6	200	0.5
			12	159	3.7	2490	7.4	200	0.5
			15	165	4.0	2010	8.0	200	0.8
			20	170	4.9	1450	9.8	200	1.0
			22	176	5.6	1295	11.2	200	1.2
			25	184	5.6	1040	Edge Start		
			32	194	5.6	740			
			38	200	5.6	510			

English

Test Preflow Flowrates	Test Outflow Flowrates		Material Thickness	Arc Voltage	Torch-to-Work Distance	Cutting Speed	Initial Pierce Height		Pierce Delay Time
Preflow %	Plasma %	Shield (psi)					in	factor %	
N ₂	N ₂	Air	in	Volts	in	ipm	in	seconds	
45	55	44	3/16	150	0.125	190	0.25	200	0.5
			1/4	153	0.125	200	0.25	200	0.5
			3/8	156	0.125	160	0.25	200	0.5
			1/2	159	0.125	125	0.25	200	0.5
			5/8	165	0.157	95	0.314	200	0.8
			3/4	170	0.188	70	0.376	200	1.0
			7/8	176	0.250	50	0.50	200	1.2
			1.0	184	0.250	40	Edge Start		
			1-1/4	194	0.250	20			
			1-1/2	200	0.250	12			

