Hypertherm®

HyDefinition HD3070®

Manual Gas Console Upgrade

Field Service Bulletin
(P/N 803110)

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Hypertherm

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Introduction

This field bulletin describes how to perform the required procedures below in order to complete this upgrade:

- Replace the existing manual gas console with the new manual gas console.
- Replace the existing off-valve with the new off-valve.
- Upgrade the HD3070 power supply control board.

Tools Required

2 Phillips head screwdriver
7/16-inch open end wrench
5/8-inch open end wrench
11/16-inch open end wrench
3/4-inch open end wrench
5/32-inch (4 mm) hex wrench
008197 Connector Pin Extractor Tool*

*Included in Kit

Upgrade Kits

The manual gas console upgrade kits are listed below. The kit part number is determined by the gas lead length required (between gas console and off-valve).

Upgrade Kit Part No.	Gas Lead Part No.
128258	128175 – 15 ft (4.6 m)
128259	128176 – 20 ft (6.1 m)
128260	128177 – 25 ft (7.6 m)
128261	128178 – 30 ft (9.1 m)
128262	128179 – 35 ft (10.6 m)
128263	128180 – 40 ft (12.2 m)
128264	128181 – 50 ft (15.2 m)
128265	128182 – 75 ft (23 m)
128266	128183 – 100 ft (30.5 m)

Kit Contents

Part No.	Description	Quantity
078059	Manual Gas Console	1
128175 - 128183	Gas Leads (see above)	1
129239	Off-Valve	1
123256	Off-Valve Cable (part of 129239)	1
041753	Manual Gas Console Control Board	1
123387	Jumper Wire	1
008197	Tool: Connector Pin Extractor	1
803110	Field Bulletin, HD3070 Automatic Gas Console Upgrade	1

Procedure

WARNING

Turn off all power to HD3070 system. Always press the power unit OFF (O) pushbutton switch and set the line disconnect switch to Off. Lock-out and tag-out switch.

Remove Old Gas Console and Off-Valve

1. At the gas suppliy cylinders shut the gases off.

2. At the gas console
   - Disconnect the inlet gas hoses.
   - Disconnect the gas lead hoses and control cable plug 3X3.
   - Disconnect control cable plugs 3X1 and 3X2.
   - Disconnect the PE ground wire.
   - Remove the gas console.

3. At the off-valve
   - Disconnect the gas lead hoses and control cable plug 4X1. (Discard gas lead.)
   - Disconnect the 10-inch plasma and shield gas hoses.
   - Disconnect the PE ground wire.
   - Remove off-valve and discard.

Install New Gas Console and Off-Valve

1. At the gas console
   - Connect the inlet gas hoses.
   - Connect the new gas lead hoses and control cable plug 3X3.
   - Connect control cable plugs 3X1 and 3X2.
   - Connect the PE ground wire.

2. At the off-valve
   - Connect the gas lead hoses and control cable plug 4X1.
   - Connect the 10-inch plasma and shield gas hoses.
   - Connect the PE ground wire.

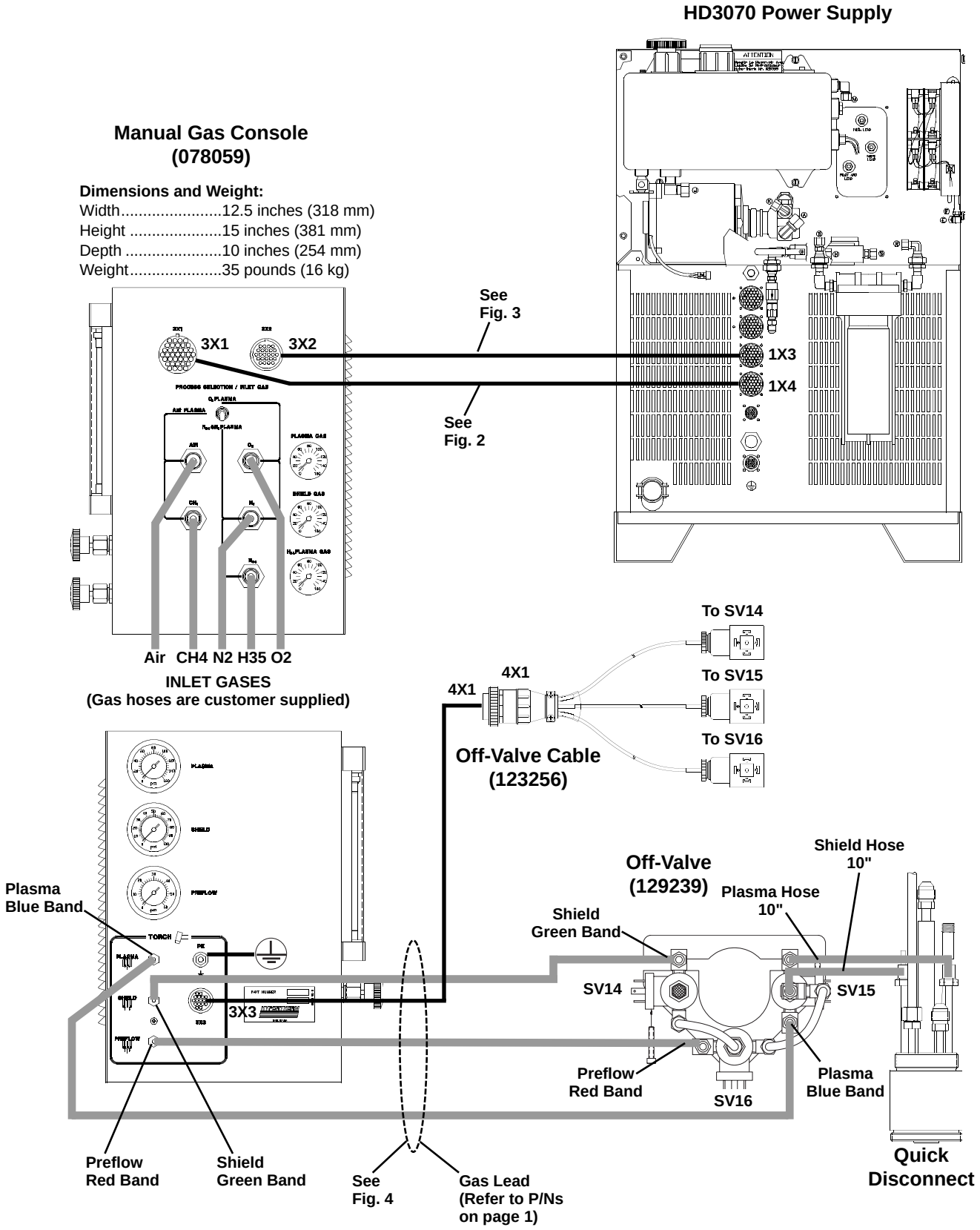
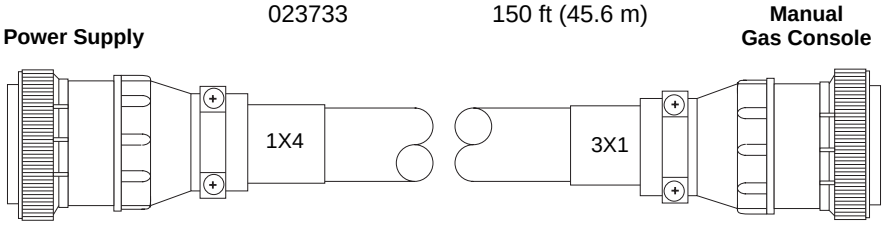


Figure 1 Manual Gas Console Upgrade Installation Diagram

Part Number	Length
023673	6 ft (1.8 m)
023558	10 ft (3 m)
023472	25 ft (7.6 m)
023556	50 ft 15 m)
023557	75 ft (23 m)
023760	100 ft (30.5 m)
023744	125 ft (38 m)
023733	150 ft (45.6 m)

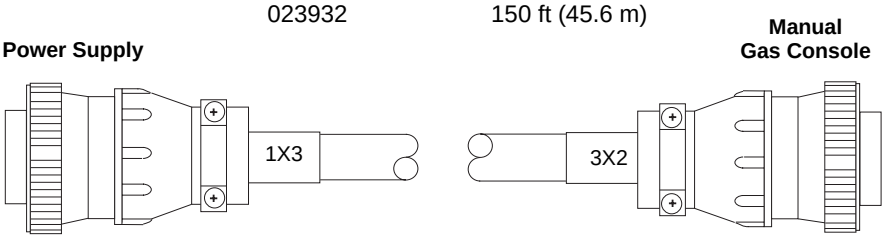


RUN LIST

SIGNAL	PLUG 1X4	COLOR	PLUG 3X1
Spare Valve # 1	14	Black	14
	15	Green	15
Gnd	9	Shield	9
Shield Operate	12	Black	12
	13	Yellow	13
Gnd	7	Shield	7
Air and CH_4	23	Black	23
	24	Blue	24
Gnd	29	Shield	29
Shield Preflow	10	Black	10
	11	Orange	11
Gnd	5	Shield	5
H35 and N_2	25	Black	25
	26	White	26
Gnd	31	Shield	31
Plasma On & Off	1	Black	1
	2	Brown	2
Gnd	6	Shield	6
O_2 and N_2	27	Red	27
	28	Brown	28
Gnd	33	Shield	33
Unassigned	3	Black	3
	4	Red	4
Gnd	8	Shield	8
Gas System Power	36	Red	36
	37	Brown	37
Gnd	32	Shield	32
Unassigned	34	Black	34
	35	Red	35
Gnd	30	Shield	30
Key	N/A	N/A	16

Figure 2 Control Cable 1X4/3X1

Part Number	Length
023927	10 ft (3 m)
023672	25 ft (7.6 m)
023928	50 ft 15 m)
023929	75 ft (23 m)
023930	100 ft (30.5 m)
023931	125 ft (38 m)
023932	150 ft (45.6 m)



RUN LIST

SIGNAL	PLUG 1X3	COLOR	PLUG 3X2
DC On Light	23	White	23
	24	Black	24
Gnd	19	Shield	Cut & Key
O_2 Plasma Select	21	Blue	21
	22	Black	22
Gnd	17	Shield	Cut & Key
Test Preflow	12	Yellow	12
	13	Black	13
Gnd	7	Shield	Cut & Key
Test Operate	14	Green	14
	15	Black	15
Gnd	9	Shield	Cut & Key
H35 & N_2 Plasma Select	10	Red	10
	11	Brown	11
Gnd	5	Shield	Cut & Key
Jumper	3	Black	3
	4	Red	4
Gnd	8	Shield	Cut & Key
Gas Pressure	1	Gray	N/A
	2	Gray	N/A

Figure 3 Control Cable 1X3/3X2

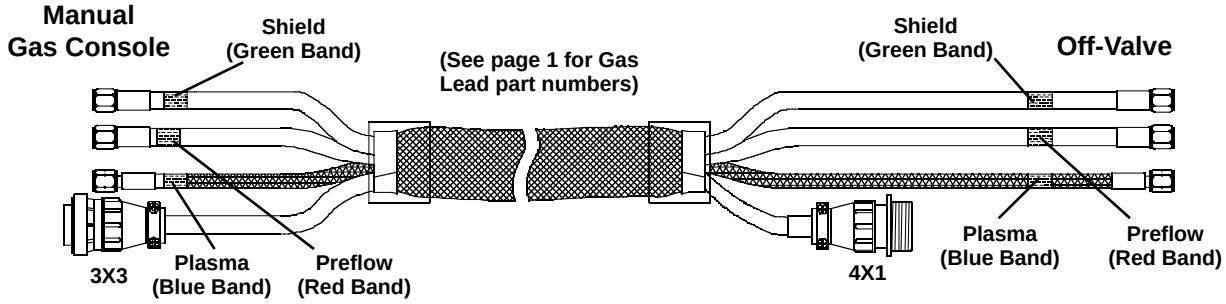


Figure 4 Gas Lead

Power Supply Control Board Upgrade

1. Remove front cover from power supply.
2. Locate control board 1XPCB3 (See figure 5).
3. Remove old board and install new board.

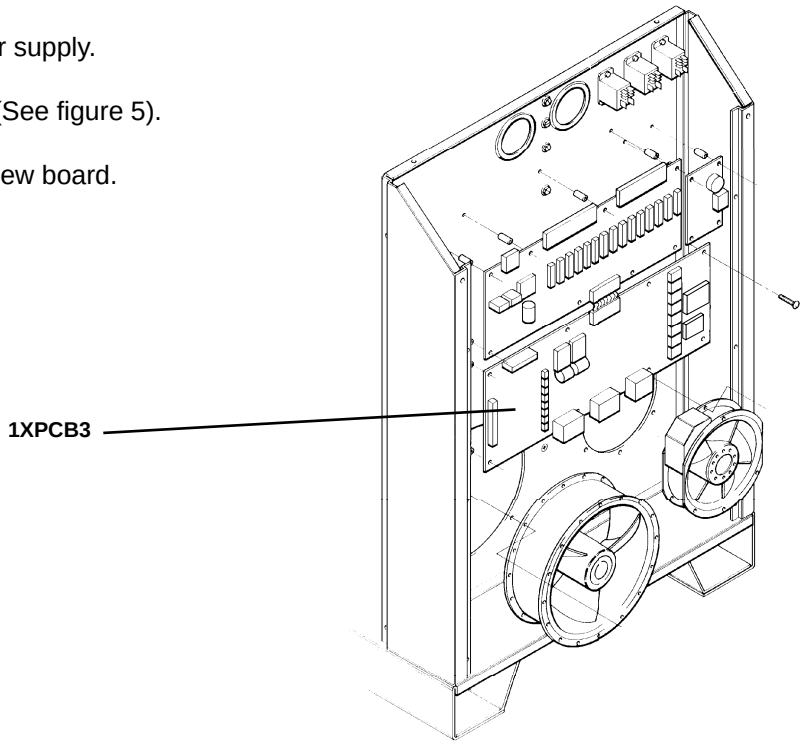


Figure 5 Power Supply Control Board 1XPCB3 and Firmware IC (U9) Locations

4. Install 123387 jumper wire to Power Supply 1XPCB3 Control Board (Figure 6):
   a. Remove plug PL11 and PL10 from the 1XPCB3 control board.
   b. Using pin extractor tool 008197:

      Remove pin 12 from plug PL11.

      Remove pin 3 from plug PL10.

   c. Insert 123387 jumper wire into pin hole 3 of plug PL10.
   d. Insert 123387 jumper wire into hole 12 of plug PL11.
   e. Install plug PL11 and PL10 to the 1XPCB3 control board.
5. Replace power supply front cover.

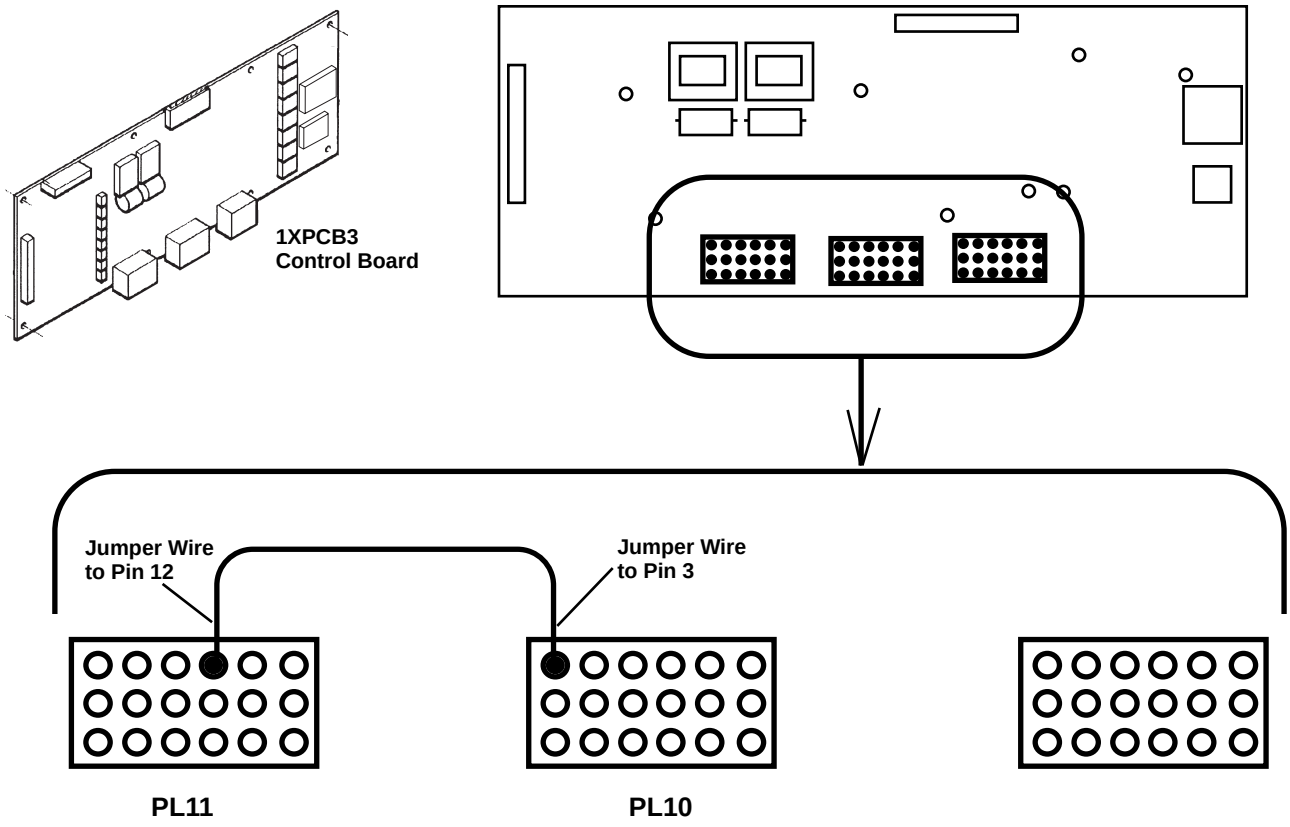


Figure 6 Install Jumper Wire to Control Board Plugs

Gas Console Controls and Indicators

Process Selection/Inlet Gas

- **Inlet Gas** pressure gauges (PG1, PG2 and PG3)

  H35 Plasma Gas gauge (PG1) indicates the **H35** inlet supply pressure of 120 psi (8.2 bar).
  Plasma Gas gauge (PG2) indicates the **O_2** or **Air** inlet supply pressure of 120 psi (8.2 bar).
  Shield Gas gauge (PG3) indicates the **N_2** or **CH_4** inlet supply pressure of 120 psi (8.2 bar).

- **Air Plasma/O_2 Plasma/H35 & N_2 Plasma** gas selector toggle switch (S1)

  Air Plasma (White) - This position selects air as the plasma gas.
  O_2 Plasma (Red) - This position selects oxygen as the plasma gas.
  H35 & N_2 Plasma (Blue) - This position selects a mixture of argon-hydrogen and nitrogen as the plasma gas.

Test Cutflow/Run/Test Preflow toggle switch (S2)

This switch is used to set test preflow and test cut flowrates using the controls described below. Test preflow and test cut flowrates are specified in *Cut Charts.* In both the test preflow or test position the contactor is disabled, so that current is not delivered to the electrode and the arc cannot be fired. The Run position enables normal operation after the test prefow and test cut flowrates have been set.

- **Test Cutflow**

  PLASMA metering valves (MV1 and MV2) set the test cut flowrates on flowmeters (FM1 and FM2) for selected plasma gases. **Motor valve MV1 and flowmeter FM1 only operate when H35 is selected.**

  PLASMA pressure gauge (PG4) indicates the pressure (psi) of the set plasma gas test cut flowrate. If correct flowrate values cannot be obtained, PG4 and refer to Section 5, *Maintenance* to perform gas system back pressure checks.

  SHIELD metering valves MV3 and MV4 set the test cut flowrates on flowmeters FM3 and FM4 for selected shield gases.

  SHIELD pressure gauge (PG5) indicates the pressure of the set shield gas test cut flowrates. If correct flowrate values cannot be obtained, PG5 and refer to Section 5, *Maintenance* to perform gas system back pressure checks.

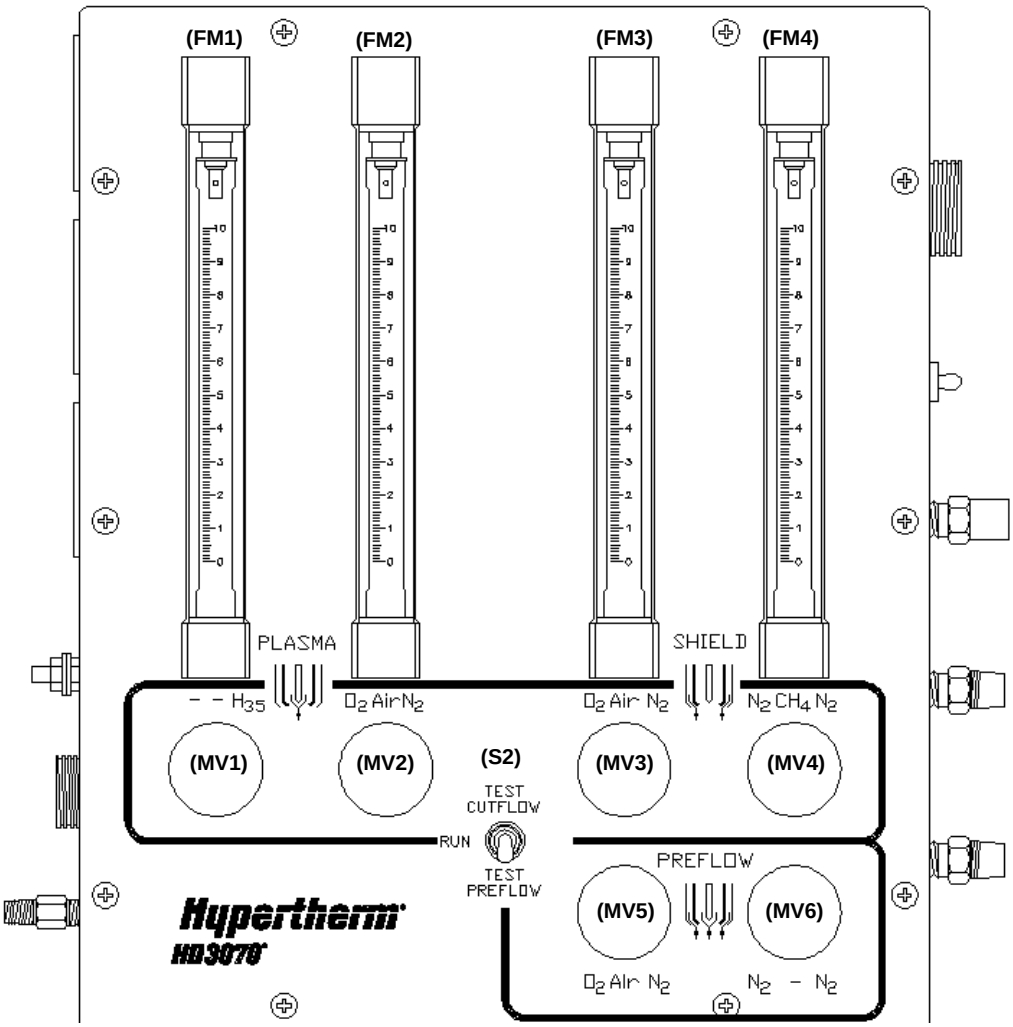
- **Test Preflow**

  PREFLOW metering valves (MV5 and MV6) set the test preflow flowrates on flowmeters (FM3 and FM4) for selected gases.

  PREFLOW pressure gauge (PG6) indicates the pressure (psi) of the set test preflow flowrates. If correct flowrate values cannot be obtained, PG6 and refer to Section 5, *Maintenance* to perform gas system back pressure checks.

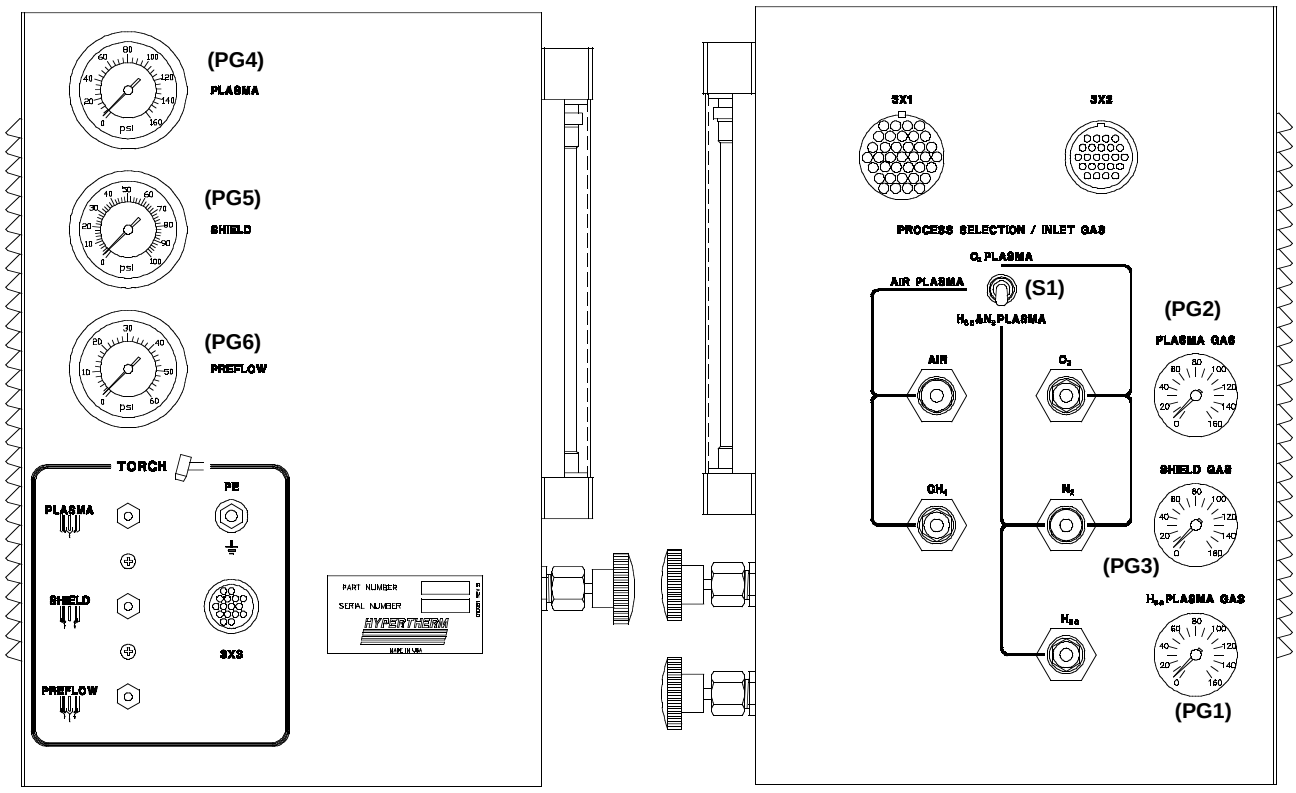
- **RUN**

  This position enables the contactor and the subsquent firing of the arc after the gas flowrates have been set in the **TEST PRE** and **TEST CUT** modes.



Front

Figure 7 Controls and Indicators (1 of 2)



Left Side **Right Side**

Figure 8 Controls and Indicators (2 of 2)

Daily Start-Up Procedure

Prior to start-up, ensure that your cutting environment and that your clothing meet the safety requirements outlined in the Instruction Manual, Section 1, *Safety.* If problems occur during start-up, refer to the Instruction Manual, Section 3, *Installation* to check installation requirements and procedures. The daily start-up procedure involves setting up the system for cutting as follows:

1. Check that the consumable parts are not worn or damaged. Refer to *Changing Consumable Parts* in the Instruction Manual.

2. Select cutting current at the **AMPS** thumbwheel (S1).

   Always use the cutting current for which the consumables are rated. For example, do not select 25 or 35 amps for 30 amp consumables. Cutting at a current other than the rated current will cause excessive consumable wear and unpredictable cutting performance. It will also be more difficult to troubleshoot cutting faults, since baseline data does not exist for other than the 30 amp current.

3. Ensure that the torch is at right angles to the workpiece to get a clean, vertical cut. Use a square to align the torch. The torch should be aligned at 0° and 90°.

4. Set initial torch height using the suggested initial height data from the *Cut Charts*.

   Torch initial height sensing should be accurate and consistent for good electrode and nozzle life. When the initial height is too high, the pilot arc is prevented or prolonged from transferring to the cutting arc. When the initial height is too low, pierce slag can build up on the shield increasing the chance for a double- arc on subsquent starts. If a pierce is made with the shield touching the workpiece, the molten slag will be forced between the nozzle and shield, rendering the shield gas useless and probably ruining the shield and nozzle.

5. Set arc voltage on torch height control unit (THC), which is customer supplied, using the suggested arc voltage data from the *Cut Charts*. One (1) arc volt equals approximately .005 inches (.127 mm).

   Arc voltage is typically how the torch height is maintained above the workpiece during a cut. A higher arc voltage will maintain a higher standoff between the torch and workpiece. The arc voltage potential is between the tip of the electrode (actually the bottom of the pit in the hafnium element) and the workpiece being cut. As the electrode tip wears, a pit is formed and the arc voltage may have to be increased to compensate for the longer distance that now exists between the bottom of the pit and the workpiece.

   For example, after a few hundred starts, the torch will ride closer to the workpiece causing an undercut cut edge. To correct the undercut, simply increase the arc voltage setting by a couple of arc volts. The torch standoff distance will increase, and cut quality will return.

6. Set the pierce delay **PIERCE DELAY** potentiometer (P1) to the suggested pierce delay data on the *Cut Charts*.

7. Ensure that the gas inlet supplies are connected and available at 120 psi (8.2 bar) on the **INLET GAS** pressure gauges (PG1, PG2 and PG3). **It is important to keep equal values of the pressures to obtain the correct mixtures of the gases.**

8. Select the plasma gas with the **PROCESS SELECTION** toggle switch (S1) on the gas console right side panel.

9. Set the main disconnect switch for the power supply to **On**.

10. Turn on the power supply by depressing the **POWER ON (1)** switch (PB1). Ensure the green **POWER ON** indicator (LT1) lights. If not check the **STATUS** LEDs. Refer to *Front Panel Controls and Indicators* in the HD3070 instruction manual IM-217.

11. Set **TEST CUTFLOW/RUN/TEST PREFLOW** toggle switch (S2) on the gas console to **TEST CUTFLOW** to check the flowrates for cutting**.** To do this, procced as follows:

    Note: The metering valves normally turn hard. Do not loosen the packing nut around the valve stems to make the valves turn more easily. Loosening the packing nuts breaks the seals and allows gases to leak out around the valve stems. The packing nuts should be 1/4 to 3/4 of a turn past finger-tight.

    - Turn the **PLASMA** gas metering valves MV1 and MV2 to set flowrates on flowmeters FM1 and FM2. Refer to the *Cut Charts*. **Motor valve MV1 and flowmeter FM1 only operate when H35 is selected.**

    - Turn the **SHIELD** gas metering valves MV3 and MV4 to set flowrates on flowmeters FM3 and FM4. Refer to the *Cut Charts*.

12. Set switch (S2) to **TEST PREFIOW** to set the preflow flowrates**.** To do this, procced as follows:

    - Turn the **PREFLOW** metering valves MV5 and MV6 to set the flowrates on flowmeters FM3 and FM4. Refer to the *Cut Charts.*

13. If correct flowrate values cannot be obtained, check the associated pressure gauges on the left side of the gas console to check the back pressure. Refer to the Instruction Manual, Section 5, *Maintenance* to perform the gas system back pressure check.

14. The system is now ready for operation.

Operating Data (Cut) Charts

The *Cut Charts* on the following pages are optimized to provide the best cut angle, least dross and best cut surface finish. Keep in mind that these charts provide a good starting point and that optimum cutting must be tuned to the application and materials on site. Increasing cut speed, lowering the torch standoff, higher current consumables on thinner metals or increasing the oxygen ratio in the shield mix, for example, all present certain tradeoffs as mentioned in *How to Get Better Cut Quality* in the Instruction Manual. Depending on the cutting application, it is up to the operator to determine if the tradeoffs are acceptable.

The cut charts also provide part numbers and illustrations of the consumables required to cut at specific amperages. For more detailed information, refer to the gas console control and indicator descriptions and the daily start-up procedure at the front of this section.

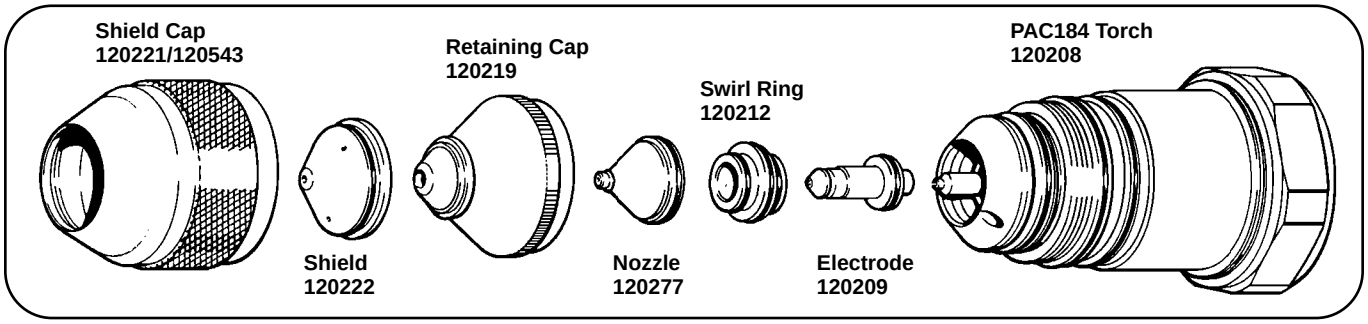
Cut Chart Index

PAC184

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

15 Amp Cutting



Material Thickness			Test Cut Flowrates (%)				Test Preflow* Flowrates (%)		Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height		Pierce Delay	
			Plasma		Shield		Preflow										
(GA)	(in)	(mm)	— (Red)	O_2	O_2 (Red)	N_2	O_2 (Red)	N_2	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
26	0.018	0.5	—	40	30	10	5	75	134	0.020	0.5	145	3.68	0.040	1.0	0	0.05
24	0.024	0.6	—	40	30	10	5	75	135	0.020	0.5	129	3.28	0.040	1.0	0	0.05
22	0.030	0.8	—	40	30	10	5	75	136	0.020	0.5	115	2.92	0.040	1.0	0	0.05
20	0.036	0.9	—	40	30	10	5	75	136	0.020	0.5	100	2.54	0.040	1.0	0	0.05
18	0.048	1.3	—	40	30	10	5	75	137	0.020	0.5	85	2.16	0.040	1.0	0.5	0.16
16	0.060	1.5	—	40	30	10	5	75	142	0.030	0.8	65	1.65	0.040	1.0	1	0.27
14	0.075	1.9	—	40	30	10	5	75	144	0.040	1.0	45	1.14	0.060	1.5	1.5	0.37
12	0.105	2.7	—	40	30	10	5	75	148	0.040	1.0	35	0.90	0.060	1.5	2	0.50
10	0.135	3.4	—	40	30	10	5	75	151	0.040	1.0	25	0.64	0.060	1.5	2.5	0.60

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

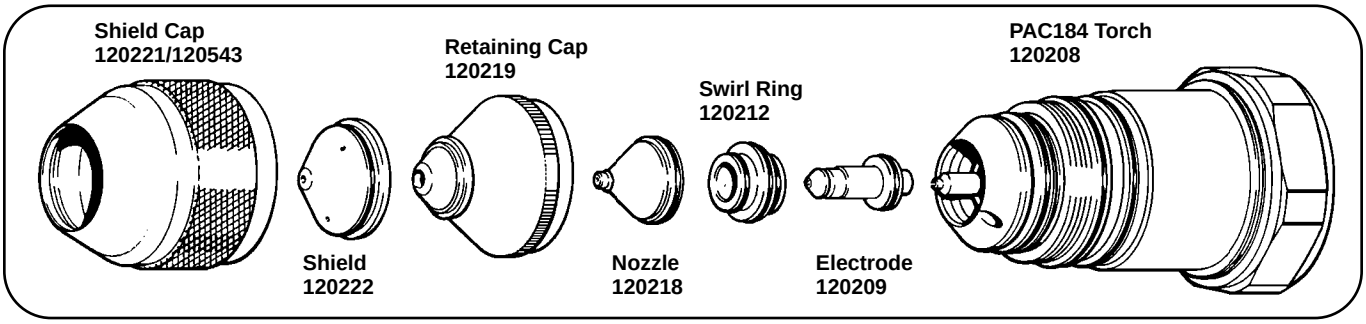
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC184

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

30 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — (Red)	Plasma O_2	Shield O_2	Shield N_2	Test Preflow* Flowrates (%) Preflow O_2	Preflow N_2	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height (in)	(mm)	Pierce Delay (dial)	(sec)
24	0.024	0.6	—	46	15	5	5	75	117	0.030	0.8	200	5.08	0.060	1.5	0	0.05
22	0.030	0.8	—	46	15	5	5	75	121	0.030	0.8	170	4.32	0.060	1.5	0	0.05
20	0.036	0.9	—	46	15	5	5	75	125	0.040	1.0	140	3.56	0.080	2.0	0	0.05
18	0.048	1.3	—	46	15	5	5	75	128	0.040	1.0	110	2.80	0.080	2.0	0	0.05
16	0.060	1.5	—	46	15	5	5	75	128	0.040	1.0	80	2.03	0.080	2.0	0	0.05
14	0.075	1.9	—	46	15	5	5	75	128	0.040	1.0	60	1.52	0.080	2.0	0.5	0.16
12	0.105	2.7	—	46	15	5	5	75	135	0.060	1.5	50	1.27	0.100	2.5	1	0.27
10	0.135	3.4	—	46	15	5	5	75	135	0.060	1.5	35	0.90	0.100	2.5	1.5	0.37
	3⁄16	4.8	—	46	15	5	5	75	135	0.060	1.5	32	0.81	0.100	2.5	2	0.50
	1⁄4	6.4	—	46	30	10	5	75	136	0.040	1.0	25	0.64	0.100	2.5	2.5	0.60

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

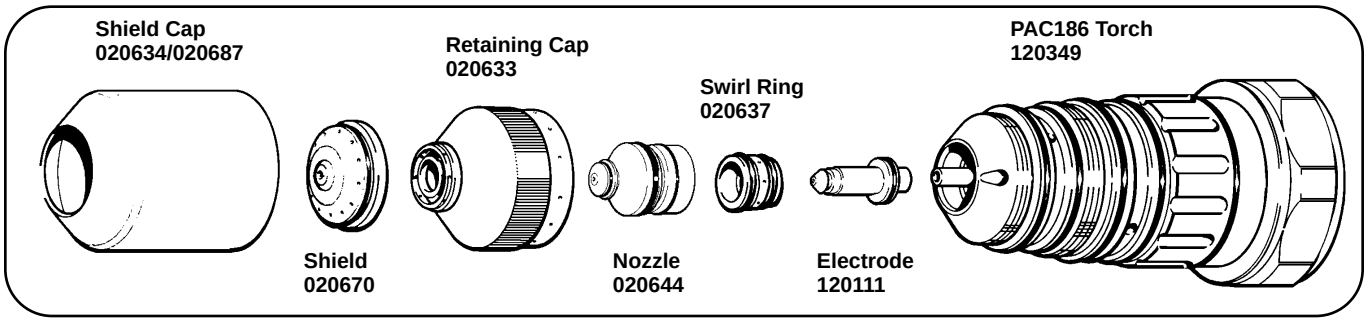
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

15 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — (Red)	O_2	Shield O_2 (Red)	N_2	Test Preflow* Flowrates (%) Preflow O_2 (Red)	N_2	Arc Voltage *** (volts)	Torch Standoff **, *** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height (in)	(mm)	Pierce Delay (dial)	(sec)
20	0.036	0.9	—	40	30	10	5	75	120	0.020	0.5	100	2.54	0.040	1.0	0	0.1
18	0.048	1.3	—	40	30	10	5	75	121	0.020	0.5	85	2.16	0.040	1.0	0	0.1
16	0.060	1.5	—	40	30	10	5	75	124	0.030	0.8	65	1.65	0.040	1.0	.5	0.2
14	0.075	1.9	—	40	30	10	5	75	130	0.040	1.0	45	1.14	0.060	1.5	1	0.3
12	0.150	2.7	—	40	30	10	5	75	132	0.040	1.0	35	0.90	0.060	1.5	1.5	0.4
10	0.135	3.4	—	40	30	10	5	75	134	0.040	1.0	25	0.64	0.060	1.5	2	0.50

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** To maintain the 0.020 inch (0.5 mm) torch standoff as the electrode wears, the arc voltage may have to be increased to avoid having the torch dive into the plate.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

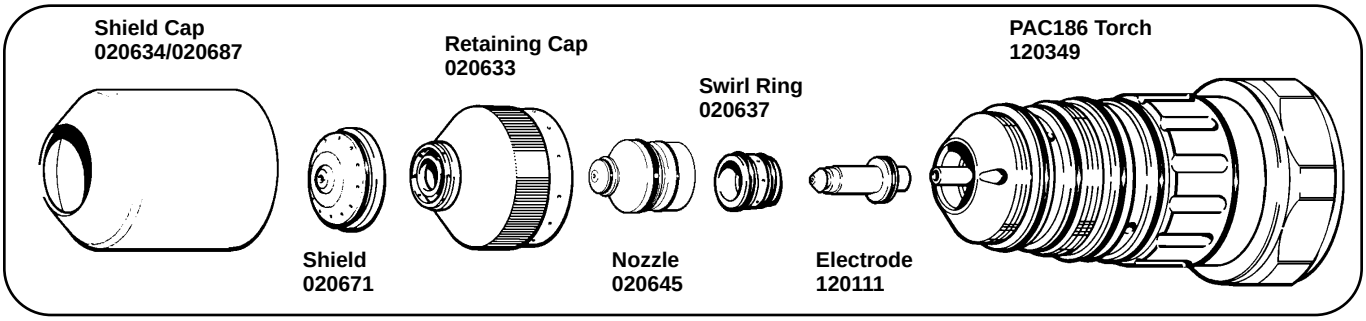
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

30 Amp Cutting



Material Thickness			Test Cut Flowrates (%)				Test Preflow* Flowrates (%)		Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height		Pierce Delay	
			Plasma		Shield		Preflow										
(GA)	(in)	(mm)	— (Red)	O_2	O_2 (Red)	N_2	O_2 (Red)	N_2	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
24	0.024	0.6	—	46	15	5	5	75	103	0.030	0.8	200	5.08	0.040	1.0	0	0
22	0.030	0.8	—	46	15	5	5	75	108	0.030	0.8	170	4.32	0.040	1.0	0	0
20	0.036	0.9	—	46	15	5	5	75	110	0.040	1.0	140	3.56	0.060	1.5	0	0
18	0.048	1.3	—	46	15	5	5	75	112	0.040	1.0	110	2.80	0.060	1.5	0	0
16	0.060	1.5	—	46	15	5	5	75	115	0.040	1.0	80	2.03	0.060	1.5	0	0.1
14	0.075	1.9	—	46	15	5	5	75	118	0.040	1.0	60	1.52	0.060	1.5	0	0.1
12	0.105	2.7	—	46	15	5	5	75	121	0.060	1.5	50	1.27	0.080	2.0	.5	0.2
10	0.135	3.4	—	46	15	5	5	75	124	0.060	1.5	35	0.90	0.080	2.0	1	0.3
	3⁄16	4.8	—	46	15	5	5	75	125	0.060	1.5	32	0.81	0.080	2.0	1.5	0.4
	1⁄4	6.4	—	46	30	10	5	75	124	0.040	1.0	25	0.64	0.080	2.0	2	0.5

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

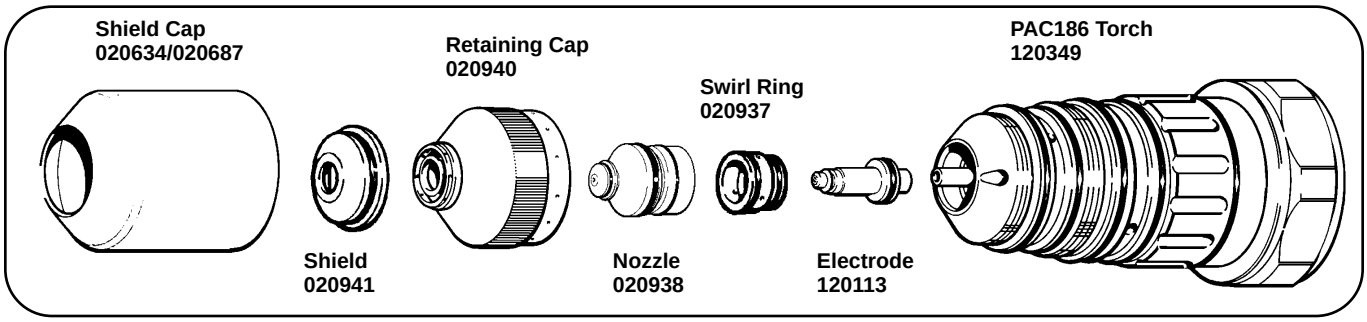
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Stainless Steel#

Air Plasma / Air Shield

30 Amp Cutting



Material Thickness			Test Cut Flowrates (%)				Test Preflow* Flowrates (%)		Arc Voltage ***	Torch Standoff **, ***		Travel Speed		Initial Piercing Height		Pierce Delay	
			Plasma		Shield		Preflow										
(GA)	(in)	(mm)	—	Air (White)	Air	— (White)	Air	— (White)	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
27	0.016	0.4	—	60	30	0	75	0	70-75	0.020	0.5	250	6.35	0.040	1.0	0	0
24	0.024	0.6	—	60	30	0	75	0	70-75	0.020	0.5	220	5.59	0.040	1.0	0	0
22	0.030	0.8	—	60	30	0	75	0	70-75	0.020	0.5	200	5.08	0.040	1.0	0	0.1
20	0.036	0.9	—	60	30	0	75	0	70-75	0.020	0.5	180	4.57	0.040	1.0	0	0.1
18	0.048	1.3	—	60	30	0	75	0	73-78	0.020	0.5	150	3.81	0.060	1.5	.5	0.2
16	0.060	1.5	—	60	30	0	75	0	73-78	0.020	0.5	120	3.05	0.060	1.5	.5	0.2

Air inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Stainless steel plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow Air flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** To maintain the 0.020 inch (0.5 mm) torch standoff as the electrode wears, the arc voltage may have to be increased to avoid having the torch dive into the plate.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

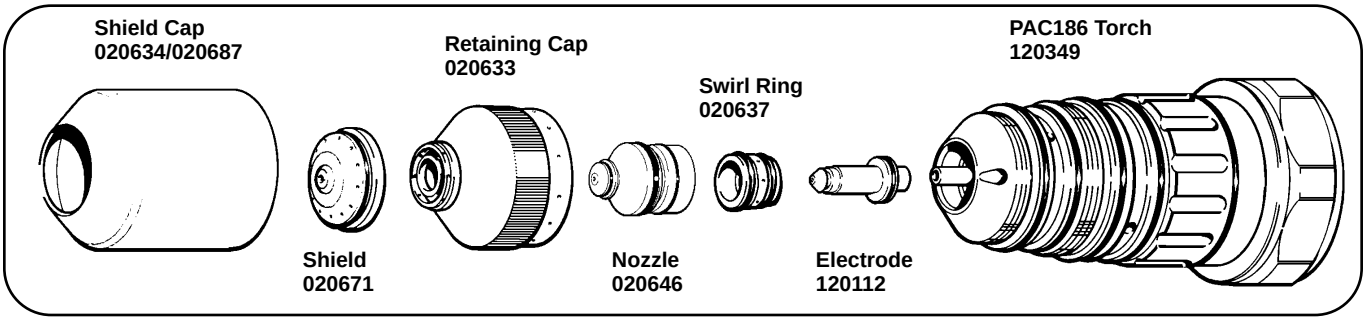
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

50 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — (Red) O_2	Shield O_2 (Red)	Shield N_2 (Red)	Test Preflow* Flowrates (%) Preflow O_2 (Red)	Preflow N_2 (Red)	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height (in)	(mm)	Pierce Delay (dial)	(sec)
22	0.030	0.8	—	40	40	0	5	75	103	0.040	1.0	270	6.86	0.060	1.5	0	0
20	0.036	0.9	—	40	40	0	5	75	103	0.040	1.0	210	5.33	0.060	1.5	0	0
18	0.048	1.3	—	40	40	0	5	75	104	0.040	1.0	160	4.06	0.060	1.5	0	0
16	0.060	1.5	—	40	40	0	5	75	109	0.050	1.3	120	3.05	0.080	2.0	0	0
14	0.075	1.9	—	40	40	0	5	75	113	0.050	1.3	100	2.54	0.080	2.0	0	0
12	0.105	2.7	—	40	40	0	5	75	119	0.050	1.3	75	1.91	0.100	2.5	0	0.1
10	0.135	3.4	—	40	40	0	5	75	122	0.060	1.5	55	1.40	0.100	2.5	.5	0.2
	3⁄16	4.8	—	40	40	0	5	75	124	0.060	1.5	45	1.14	0.100	2.5	1	0.3
	1⁄4	6.4	—	60	60	0	5	75	127	0.080	2.0	35	0.90	0.120	3.0	2	0.5

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

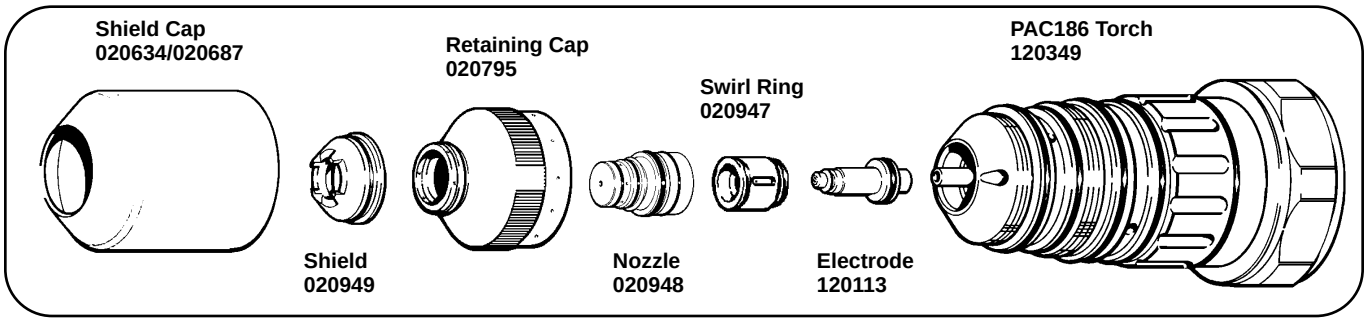
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Stainless Steel#

Air Plasma / Air Shield

50 Amp Cutting



Material Thickness			Test Cut Flowrates (%)				Test Preflow* Flowrates (%)		Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height ***		Pierce Delay	
			Plasma — Air		Shield Air —		Preflow Air —										
(GA)	(in)	(mm)	(White)		(White)		(White)		(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
14	0.075	1.9	0	40	80	0	60	0	100	0.040	1.0	120	3.05	0.120	3.0	1	0.3
12	0.105	2.7	0	40	80	0	60	0	100	0.040	1.0	80	2.03	0.120	3.0	1.5	0.4
10	0.135	3.4	0	40	60	0	60	0	110	0.060	1.5	55	1.40	0.120	3.0	1.5	0.4
	3⁄16	4.8	0	40	50	0	60	0	115	0.080	2.0	40	1.02	0.160	4.0	2	0.5

Air inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Stainless steel plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow Air flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020949.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

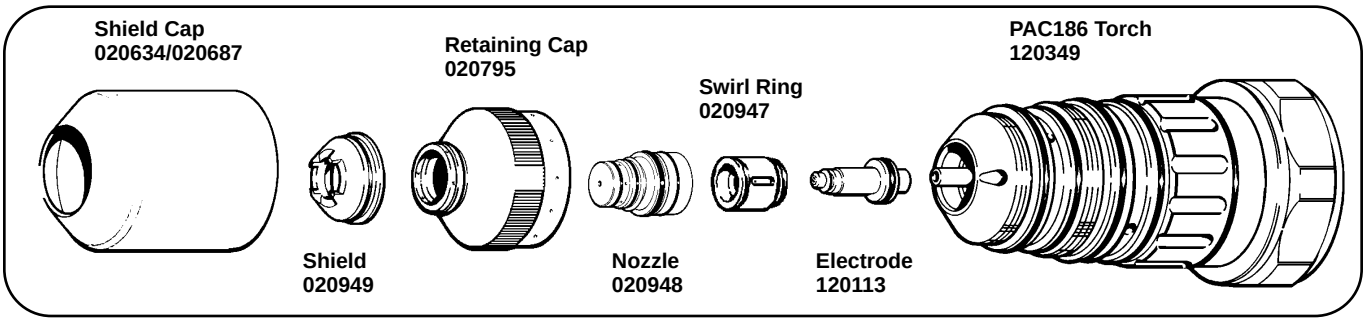
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Copper#

O_2 Plasma / O_2 & N_2 Shield

50 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — (Red)	Plasma O_2	Shield O_2	Shield N_2	Test Preflow* Flowrates (%) Preflow O_2	Preflow N_2	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height *** (in)	(mm)	Pierce Delay (dial)	(sec)
16	0.060	1.5	—	40	20	10	35	40	92	0.080	2.0	70	1.78	0.100	2.5	4	1.0
14	0.075	1.9	—	40	20	10	35	40	92	0.080	2.0	70	1.78	0.100	2.5	4	1.0
12	0.105	2.7	—	40	20	10	35	40	94	0.080	2.0	65	1.65	0.100	2.5	7	1.5
10	0.135	3.4	—	40	20	10	35	40	94	0.080	2.0	65	1.65	0.100	2.5	9	2.0

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Copper plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020949.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

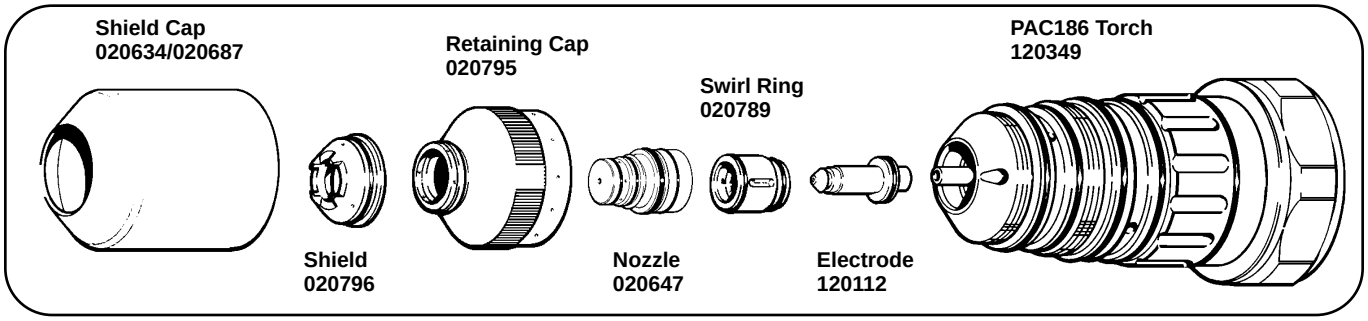
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

70 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — (Red)	O_2	Shield O_2 (Red)	N_2	Test Preflow* Flowrates (%) Preflow O_2 (Red)	N_2	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height *** (in)	(mm)	Pierce Delay (dial)	(sec)
16	0.060	1.5	—	25	0	100	5	75	107	0.060	1.5	280	7.11	0.100	2.5	0	0.1
14	0.075	1.9	—	25	0	100	5	75	107	0.060	1.5	230	5.84	0.100	2.5	0	0.1
12	0.105	2.7	—	25	0	100	5	75	109	0.080	2.0	185	4.70	0.120	3.0	0	0.1
10	0.135	3.4	—	25	0	100	5	75	114	0.080	2.0	150	3.81	0.120	3.0	.5	0.2
	3⁄16	4.8	—	25	0	100	5	75	119	0.080	2.0	120	3.05	0.120	3.0	1	0.3
	1⁄4	6.4	—	40	0	100	5	75	129	0.080	2.0	100	2.54	0.120	3.0	2	0.5
	3⁄8	9.5	—	40	0	100	5	75	135	0.100	2.5	65	1.65	0.160	4.0	4	1.0

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020796.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

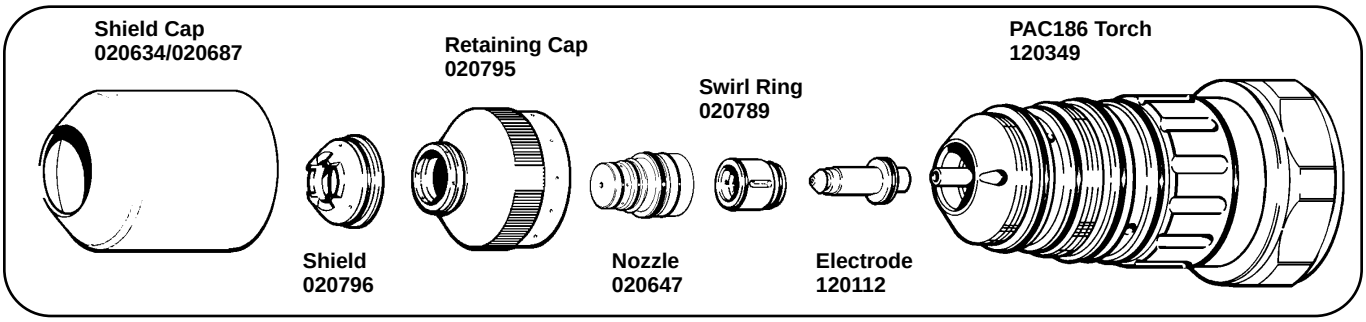
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Stainless Steel#

Air Plasma / Air & CH_4 Shield

70 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — Air (White)	Shield Air	Shield CH_4 (White)	Test Preflow* Flowrates (%) Preflow Air — (White)		Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height *** (in)	(mm)	Pierce Delay (dial)	(sec)
10	0.135	3.4	—	35	100	0	75	0	134	0.060	1.5	100	2.54	0.140	3.5	1	0.3
	3/16	4.8	—	35	60	3	75	0	139	0.080	2.0	80	2.00	0.140	3.5	1.5	0.4
	1/4	6.4	—	35	30	10	75	0	149	0.140	3.5	55	1.40	0.180	4.5	2	0.5
	3/8	9.5	—	35	30	10	75	0	164	0.140	3.5	30	0.76	0.200	5.0	2	0.5
	1/2	12.7	—	50	40	20	75	0	189	0.250	6.3	25	0.64	****		****	

Air and CH_4 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Stainless steel plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow Air flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020796.

**** Piercing 1/2 inch (12.7 mm) stainless steel is not recommended, it will shorten consumable life. Starting cuts at the edge of the metal is recommended.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

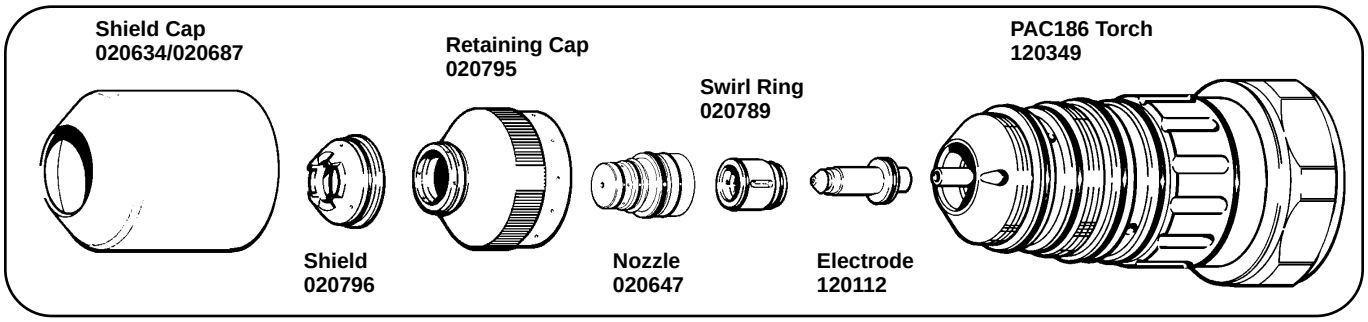
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Aluminum#

Air Plasma / CH_4 Shield

70 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — (White)	Air	Shield Air (White)	CH_4	Test Preflow* Flowrates (%) Preflow Air (White)	—	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height *** (in)	(mm)	Pierce Delay (dial)	(sec)
18	0.048	1.2	—	45	0	40	75	0	159	0.100	2.5	150	3.81	0.160	4.0	0	0.1
16	0.060	1.5	—	45	0	40	75	0	159	0.100	2.5	125	3.18	0.160	4.0	0	0.1
14	0.075	1.9	—	45	0	40	75	0	159	0.100	2.5	100	2.54	0.160	4.0	0	0.1
12	0.105	2.7	—	45	0	40	75	0	159	0.100	2.5	85	2.16	0.160	4.0	.5	0.2
	1⁄8	3.2	—	45	0	40	75	0	179	0.180	4.5	70	1.78	0.200	5.0	.5	0.2
10	0.135	3.4	—	45	0	40	75	0	179	0.180	4.5	65	1.65	0.200	5.0	.5	0.2
	1⁄4	6.4	—	45	0	40	75	0	179	0.180	4.5	45	1.14	0.200	5.0	1	0.3
	3⁄8	9.5	—	45	0	40	75	0	179	0.180	4.5	30	0.76	0.200	5.0	1	0.3

Air and CH_4 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Aluminum plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow Air flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020796.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

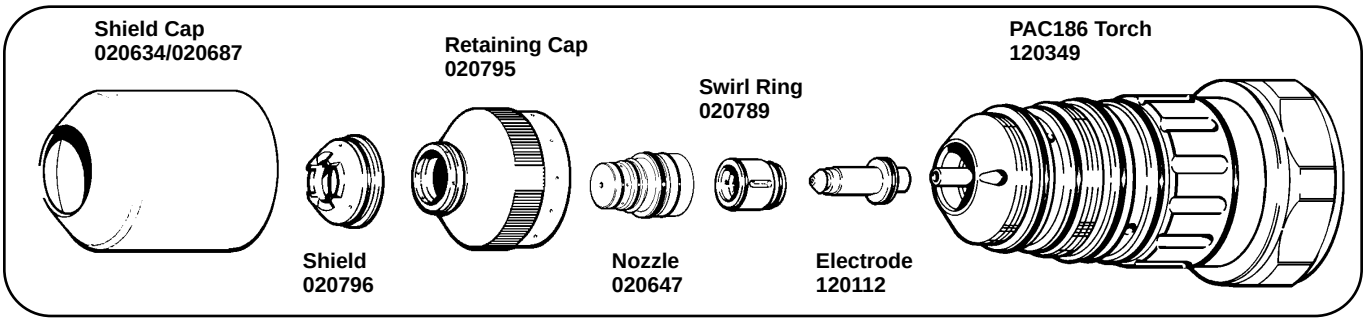
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Copper#

O_2 Plasma / O_2 & N_2 Shield

70 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — (Red)	Plasma O_2	Shield O_2	Shield N_2	Test Preflow* Flowrates (%) Preflow O_2	Preflow N_2	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height *** (in)	(mm)	Pierce Delay (dial)	(sec)
10	0.135	3.4	—	50	75	50	5	75	133	0.120	3.0	60	1.52	0.160	4.0	9	2.0
	3/16	4.8	—	50	75	50	5	75	119	0.120	3.0	55	1.40	0.160	4.0	—	2.5
	1/4	6.4	—	50	75	50	5	75	123	0.120	3.0	55	1.40	0.160	4.0	—	3.0
	3/8	9.5	—	50	75	50	5	75	129	0.120	3.0	25	0.64	0.160	4.0	—	5.0

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Copper plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020796.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

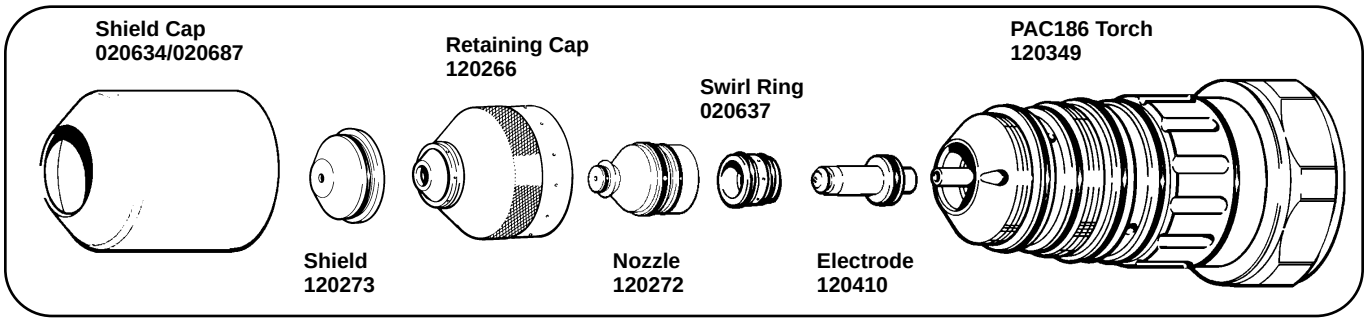
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

100 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma — (Red)	Plasma O_2	Shield O_2	Shield N_2	Test Preflow* Flowrates (%) Preflow O_2 (Red)	Preflow N_2	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height (in)	(mm)	Pierce Delay (dial)	(sec)
1/8	3.2	—	60	35	90	10	100	137	0.125	3.2	275	7.0	0.180	4.6	0	0.00
1/4	6.4	—	60	35	90	10	100	141	0.125	3.2	135	3.43	0.300	7.6	0.4	0.22
3/8	9.5	—	60	35	90	10	100	145	0.125	3.2	95	2.41	0.300	7.6	0.7	0.27
1/2	12.7	—	60	35	90	10	100	147	0.125	3.2	64	1.62	0.300	7.7	1.0	0.37

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

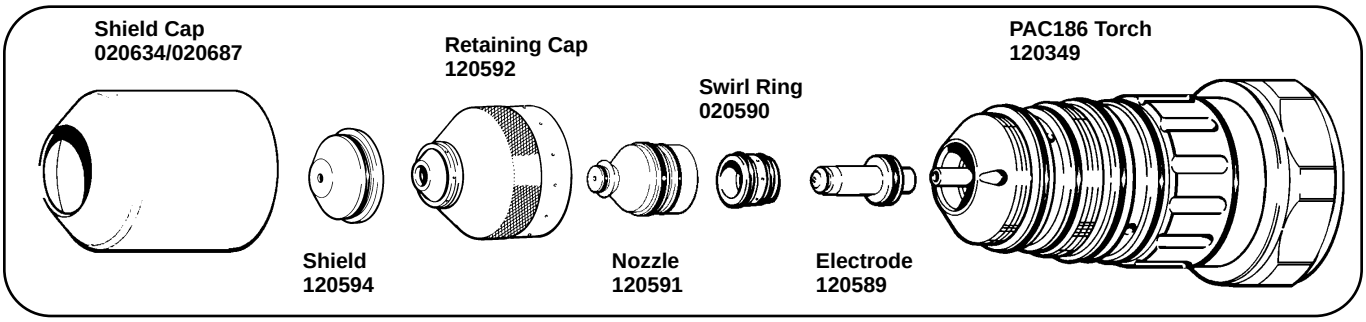
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Stainless Steel

H35 & N_2 Plasma / N_2 Shield

100 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma H35 (Blue)	Plasma N_2 (Blue)	Shield N_2 (Blue)	Shield N_2 (Blue)	Test Preflow Flowrates (%) Preflow N_2 (Blue)	Preflow N_2 (Blue)	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height (in)	(mm)	Pierce Delay (dial)	(sec)
	1/4	6.4	30	30	60	60	45	45	134	0.120	3.0	75	1.9	0.200	5.1	0	0.1
	3/8	9.5	30	30	60	60	45	45	144	0.150	3.8	65	1.6	0.200	5.1	0.5	0.2
	1/2	12.7	40	50	60	60	45	45	160	0.250	6.4	45	1.1	0.300	7.6	1	0.3

H35 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

H35 gas purity must be 99.995 % minimum.

H35 flowrate must be 85 scfh (2407 l/hr) at fullscale.

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

If the part is not completely cut away from the scrap, try modifying the leadout. Stop the cut 0.050 inch (1.3 mm) before the end of the part for 1/4 and 3/8 inch (6.4 and 9.5 mm) material and 0.100 inch (2.5 mm) for 1/2 inch (12.7 mm) material. The ramp down of the current and gases will complete the cut. If your program can not be modified, reduce cutting speed and use no leadout.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

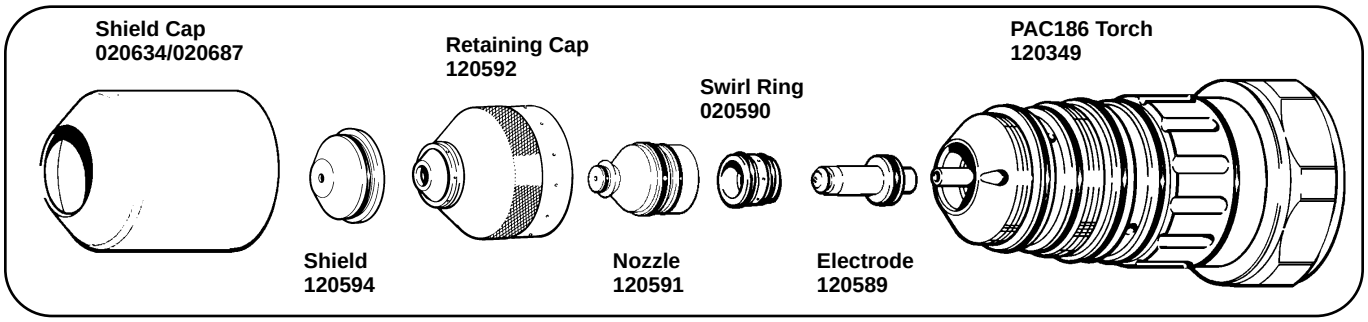
If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Aluminum

H35 & N_2 Plasma / N_2 Shield

100 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Cut Flowrates (%) Plasma H35 (Blue)	Plasma N_2	Shield N_2 (Blue)	Shield N_2	Test Preflow Flowrates (%) Preflow N_2 (Blue)	Preflow N_2	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height (in)	(mm)	Pierce Delay (dial)	(sec)
	1/4	6.4	30	30	60	60	45	45	145	0.157	4.0	100	2.5	0.236	6.0	0	0.1
	3/8	9.5	30	30	60	60	45	45	149	0.157	4.0	70	1.8	0.236	6.0	0.5	0.2
	1/2	12.7	30	30	60	60	45	45	155	0.157	4.0	40	1.1	0.236	6.0	1	0.3

H35 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

H35 flowrate must be 85 scfh (2407 l/hr) at fullscale.

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Instruction Manual, Section 6, *Parts List.*

If problems occur with the cutting process, and the flowrates are suspect, refer to Instruction Manual, Section 5, Maintenance, *Gas System Back Pressure Checks.*