Hypertherm®

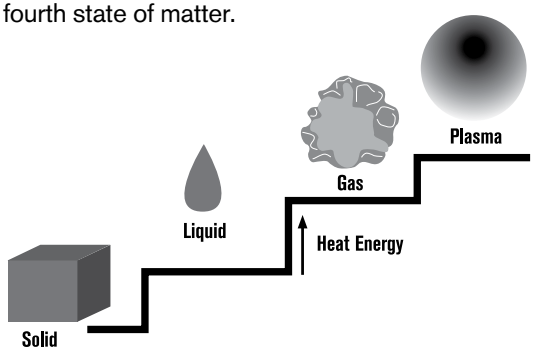
Machine-side reference guide

803640

Plasma

Plasma: "the fourth state of matter"

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



Plasma definition

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

Plasma in nature

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

Cutting with plasma

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

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

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

Recording consumable life

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

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

Consumable life

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

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

1. **Pierce height.** Proper pierce height is critical for long consumable life, cut quality and to avoid misfiring.
   - Pierce height should be 1.5 – 2 times the torch cut height.
   - Piercing too close to the plate will cause blow-back slag to enter the torch. This will cause consumable damage and possibly damage the torch.
   - Piercing too high will cause excessive pilot arcing. This will cause excessive nozzle wear.

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

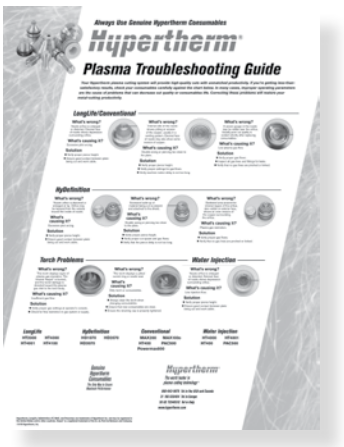
2. **Reducing errors.** Reducing errors will add considerable life to your consumables. Errors are generally caused by not starting and/or stopping the cut on the plate or running the arc off the plate. This interrupts the Longlife process.
   - Every error equals approximately 10 – 15 pierces on most systems. HyPerformance and HyDefinition are more sensitive to errors; each error equals more than 15 pierces.
   - Errors should be less than 10% of the number of pierces.

Consumables

Troubleshooting consumables

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

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



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

Cut Quality

Reading the cut

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

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

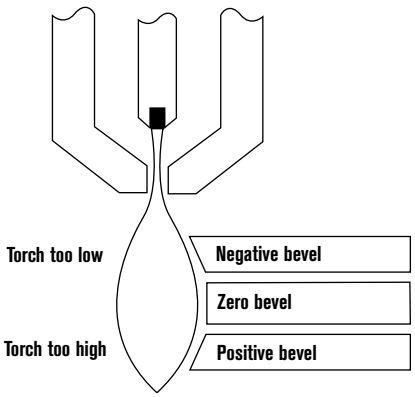
The adjustments that the operator can make to improve these qualities are:

- Torch height or arc voltage
- Cut speed

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

Bevel angle

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



EFFECTS OF TORCH HEIGHT

Decreasing dross (slag)

Top dross

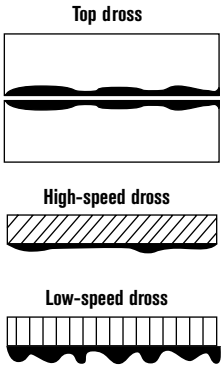
Splatter appears on the top edge of both pieces of the plate. Lower the voltage in increments of 5 volts (maximum) until top dross disappears. Usually only seen with air plasma.

High-speed dross

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

Low-speed dross

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



Cut Quality

More on dross

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

Appearance of cut

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

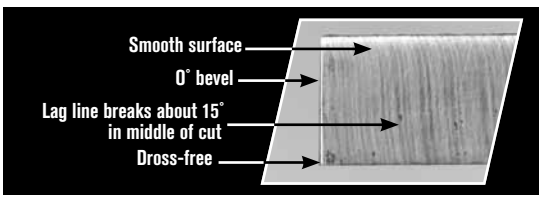
Good quality stainless steel cut

Good quality aluminum cut

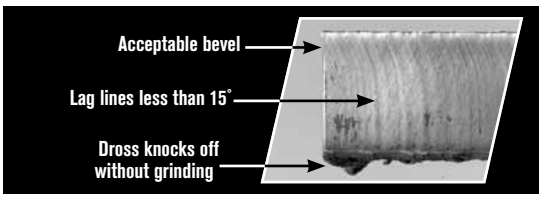
Reading lag lines

Mild Steel, O_2 cutting only

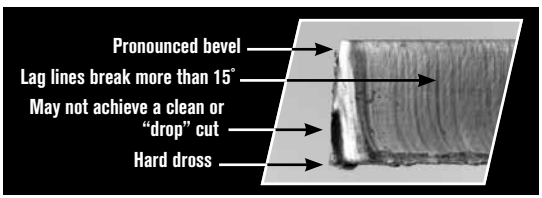
- Using the lag lines of a cut are an excellent way to determine proper cut speeds.
- The lines should generally trail the cut by approximately 10–15 degrees.
- When the lines are more vertical, the speed is too low.
- When the lines are more trailing, the speed is too high.



Correct speed



Too slow



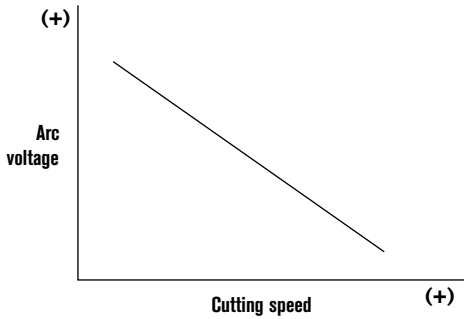
Too fast

Effects of cutting speed on arc voltage

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

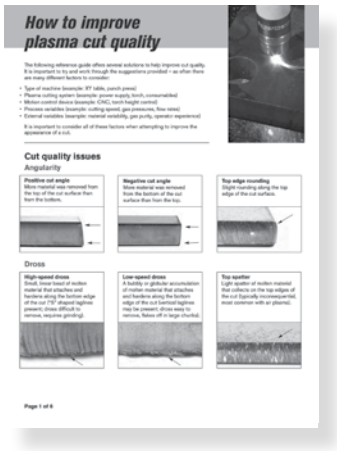
  * This will cause dross in corners and contours.
- Reaction of THC
  - Torch will dive as speed decreases**
  - Torch will rise as speed increases**

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



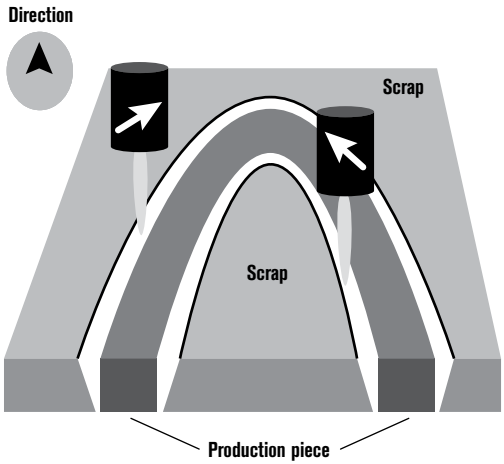
Note: Graph is independent of system and metal thickness.

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



Cutting direction

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



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

Cut Quality

What drives cut quality?

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

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

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

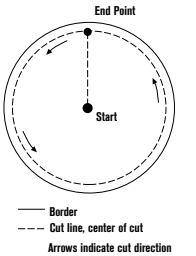
There are numerous manufacturers of metal cutting systems in the marketplace today producing a variety of different types of machines. Consequently, results may vary. Cut samples provided by Hypertherm represent cut quality attainable on **one type** of cutting machine and in no way indicate expected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

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

Cutting holes

- Cutting internal holes can be very difficult with plasma. The minimum hole sizes, assuming excellent motion control characteristics are:
  - HyPerformance/HyDefinition (O_2 on mild steel)
    - $^1/_8$" (3 mm) plate and less: $^3/_{16}$" (4.7 mm)
    - Above $^1/_8$" (3 mm): 1.5 times material thickness
  - Conventional (O_2 on mild steel)
    - $^1/_8$" to $^1/_2$" (3 – 13 mm) plate: 2 times material thickness
    - Above $^1/_2$" (13 mm): 1.5 times material thickness
  - For best results:
    - Turn THC off.
    - Reduce speed.
    - Make lead-in perpendicular to side.
    - Minimize lead-out. Only enough for part to drop out.

PLATE WITH INTERNAL HOLE



Operator troubleshooting

Status LEDs

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

Note

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

Tips

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

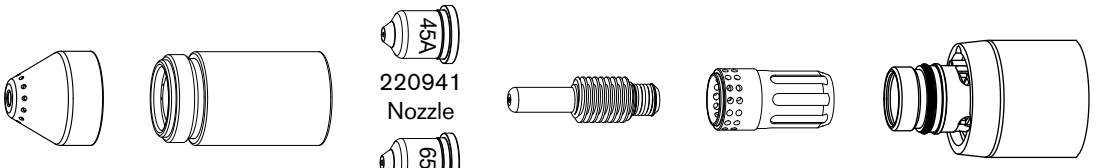
Choose the machine torch consumables

Powermax systems with the Duramax M65, M85, M65m, or M85m are shipped with a complete set of consumables. Hypertherm also includes spare electrodes and nozzles. In addition, an ohmic-sensing retaining cap is available for use with shielded consumables. With shielded consumables, the torch tip may touch the metal when cutting. With unshielded consumables, you must keep the torch a small distance, about .08 inch (2 mm), away from the metal. Unshielded consumables generally have a shorter life than shielded consumables.

Both styles of machine torches use the same consumables.

Machine torch consumables

Mechanized shielded consumables: Powermax65



220817 Shield

220854 Retaining cap

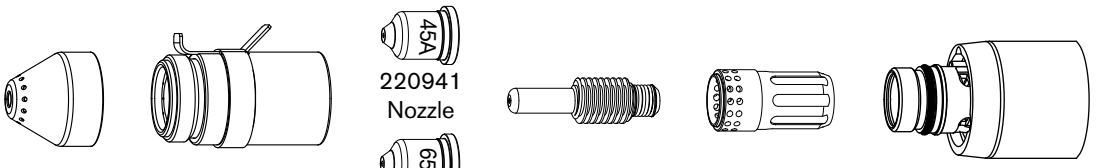
220941 Nozzle

220819 Nozzle

220842 Electrode

220857 Swirl ring

Mechanized shielded with ohmic consumables: Powermax65



220817 Shield

220953 Ohmic-sensing retaining cap

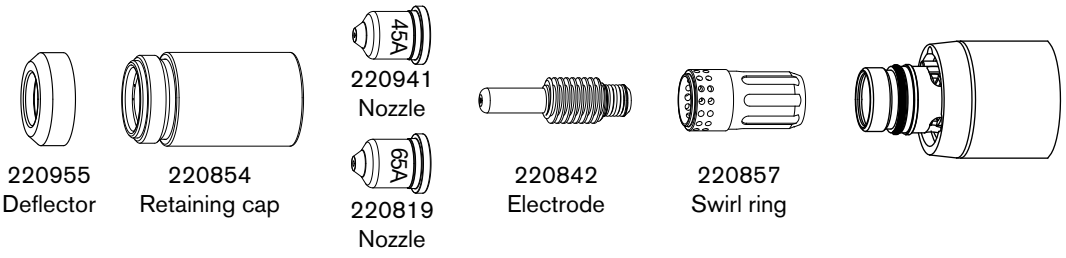
220941 Nozzle

220819 Nozzle

220842 Electrode

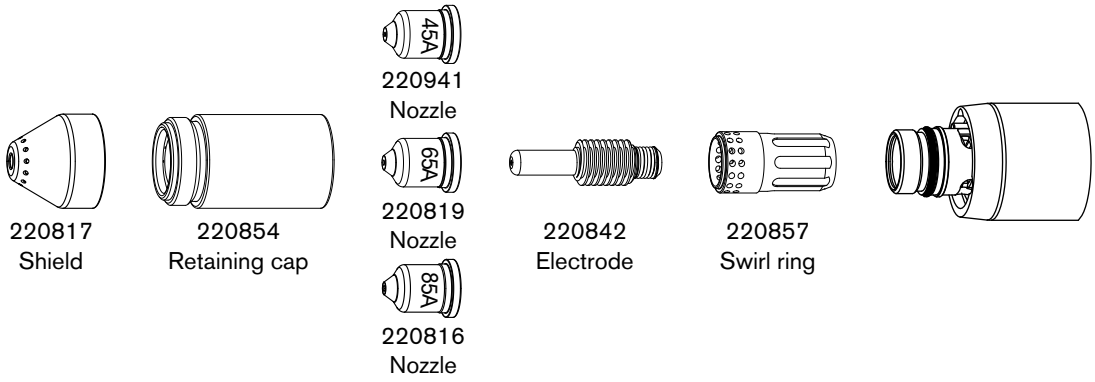
220857 Swirl ring

Mechanized unshielded consumables: Powermax65



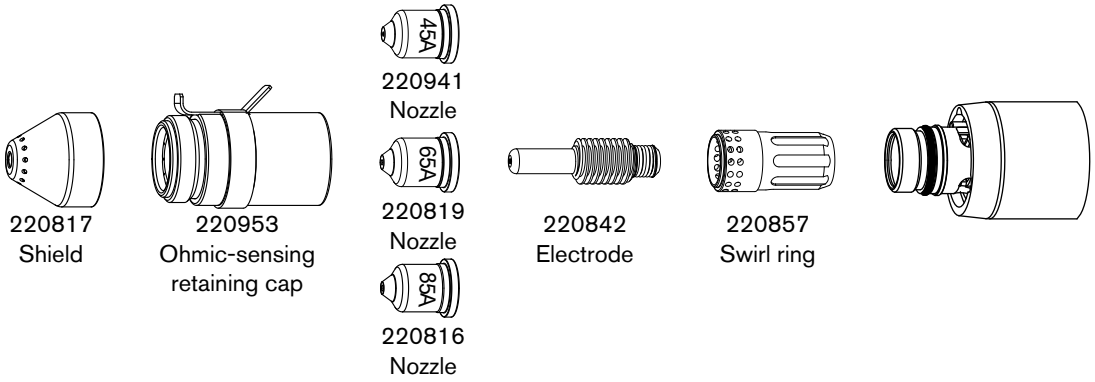
220955 Deflector | 220854 Retaining cap | 220941 Nozzle | 220819 Nozzle | 220842 Electrode | 220857 Swirl ring

Mechanized shielded consumables: Powermax85



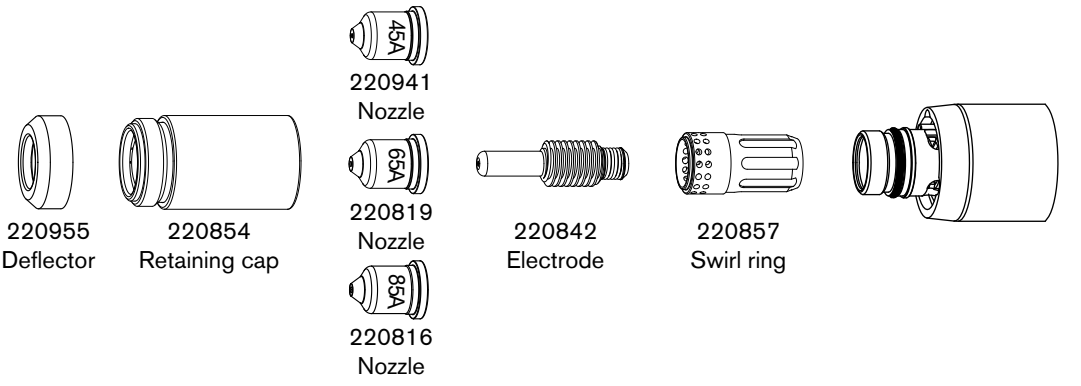
220817 Shield | 220854 Retaining cap | 220941 Nozzle | 220819 Nozzle | 220816 Nozzle | 220842 Electrode | 220857 Swirl ring

Mechanized shielded with ohmic consumables: Powermax85



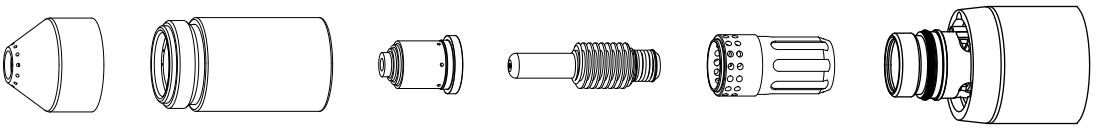
220817 Shield | 220953 Ohmic-sensing retaining cap | 220941 Nozzle | 220819 Nozzle | 220816 Nozzle | 220842 Electrode | 220857 Swirl ring

Mechanized unshielded consumables: Powermax85



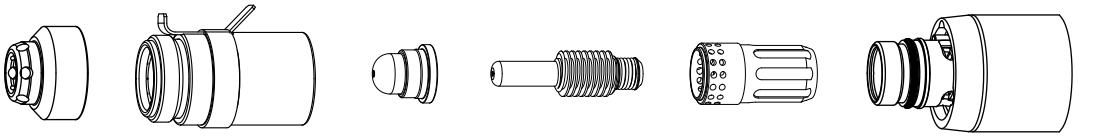
220955 Deflector | 220854 Retaining cap | 220941 Nozzle | 220819 Nozzle | 220816 Nozzle | 220842 Electrode | 220857 Swirl ring

Gouging consumables



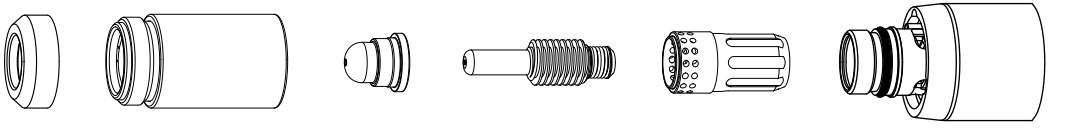
220798 Shield | 220854 Retaining cap | 220797 Nozzle | 220842 Electrode | 220857 Swirl ring

FineCut® shielded consumables



220948 Shield | 220953 Retaining cap | 220930 Nozzle | 220842 Electrode | 220857 Swirl ring

FineCut® unshielded consumables



220955 Deflector | 220854 Retaining cap | 220930 Nozzle | 220842 Electrode | 220857 Swirl ring

Using the cut charts

The following sections provide cut charts for each set of mechanized consumables. A consumable diagram with part numbers precedes each set of charts. For each consumable type, there are Metric and English charts for mild steel, stainless steel, and aluminum.

Each chart contains the following information:

- Material Thickness — Thickness of the workpiece (metal plate being cut).
- Torch-to-Work Distance — For shielded consumables, the distance between the tip of the shield and the workpiece during cutting. For unshielded consumables, the distance between the tip of the nozzle and the workpiece during cutting.
- Initial Pierce Height — Distance between the tip of the shield (shielded) or the nozzle (unshielded) and the workpiece when the torch is triggered, prior to descending to the cut height.
- Pierce Delay Time — Length of time the triggered torch remains stationary at the pierce height before the torch starts the cutting motion.
- Best Quality Settings (cut speed and voltage) — Settings that provide the starting point for finding the best cut quality (best angle, least dross, best cut-surface finish). Adjust the speed for your application and table to obtain the desired result.
- Production Settings (cut speed and voltage) — 80% of the maximum speed ratings. These speeds result in the greatest number of cut parts, but not necessarily the best possible cut quality.

Note: The arc voltage increases as the consumables wear and the voltage setting should be increased to maintain the correct Torch-to-Work Distance.

Each cut chart lists hot and cold air flow rates.

- Hot air flow rate — Plasma is on, the system is operating at running current, and the system is in a steady state at the default system pressure (automatic mode).
- Cold air flow rate — Plasma is off and the system is in a steady state with air flowing through the torch at the default system pressure.

Note: Hypertherm collected the data under laboratory test conditions using new consumables.

Estimated kerf-width compensation

The widths in the tables below are for reference. The data are obtained with the “Best Quality” settings. Differences between installations and material composition may cause actual results to vary from those shown in the tables.

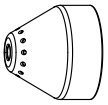
Estimated kerf-width compensation - Metric (mm)

Process	Thickness (mm)									
	0.5	1	2	3	6	8	10	12	16	20
	Mild Steel									
85A Shielded				1.7	1.8	1.9	2.0	2.2	2.4	2.6
65A Shielded			1.6	1.6	1.8	1.9	2.0	2.2	2.3	
45A Shielded	1.1	1.1	1.4	1.5	1.7					
FineCut	0.7	0.7	1.3	1.3						
85A Unshielded			1.7	1.8	1.9	2.0	2.1	2.1	2.3	
65A Unshielded			1.6	1.6	1.7	1.8	1.9	2.0		
45A Unshielded	0.5	0.9	1.3	1.3						
Stainless Steel										
85A Shielded				1.6	1.8	1.9	2.1	2.3	2.4	2.5
65A Shielded			1.4	1.5	1.8	1.9	2.0	2.2	2.4	
45A Shielded	0.9	1.1	1.5	1.6	1.8					
FineCut	0.6	0.6	1.4	1.5						
85A Unshielded			1.7	1.7	1.8	1.9	2.1	2.2	2.4	
65A Unshielded			1.6	1.6	1.8	1.8	1.9	2.0		
45A Unshielded	0.5	1.0	1.3	1.5	1.5					
Aluminum										
85A Shielded				2.0	1.9	2.0	2.1	2.2	2.4	2.6
65A Shielded			1.9	1.9	1.9	2.0	2.1	2.3	2.5	
45A Shielded		1.5	1.5	1.6	1.5					
85A Unshielded			1.9	1.9	1.9	2.0	2.0	2.1	2.2	
65A Unshielded			1.8	1.8	1.8	1.8	1.9	2.0		
45A Unshielded		1.6	1.5	1.4	1.5					

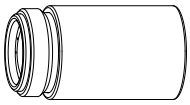
Estimated kerf-width compensation - English (inches)

Process	Thickness (inches)									
	22GA	**18GA**	**14GA**	**10GA**	**3/16**	**1/4**	**3/8**	**1/2**	**5/8**	**3/4**
	Mild Steel									
85A Shielded				0.068	0.071	0.073	0.078	0.090	0.095	0.100
65A Shielded			0.062	0.065	0.068	0.070	0.076	0.088	0.090	0.091
45A Shielded	0.035	0.054	0.055	0.061	0.065	0.066				
FineCut	0.024	0.043	0.049	0.051						
85A Unshielded				0.070	0.073	0.075	0.080	0.085	0.090	
65A Unshielded			0.062	0.064	0.066	0.068	0.075	0.081		
45A Unshielded	0.020	0.050	0.051	0.054	0.057	0.059				
Stainless Steel										
85A Shielded				0.068	0.071	0.073	0.078	0.090	0.095	0.100
65A Shielded			0.062	0.065	0.068	0.070	0.076	0.088	0.090	0.091
45A Shielded	0.035	0.054	0.055	0.061	0.065	0.066				
FineCut	0.024	0.043	0.049	0.051						
85A Unshielded				0.070	0.073	0.075	0.080	0.085	0.090	
65A Unshielded			0.062	0.064	0.066	0.068	0.075	0.081		
45A Unshielded	0.020	0.050	0.051	0.054	0.057	0.059				
Aluminum										
		1/32	**1/16**	**1/8**	**3/16**	**1/4**	**3/8**	**1/2**	**5/8**	**3/4**
85A Shielded				0.080	0.078	0.075	0.080	0.090	0.095	0.100
65A Shielded			0.073	0.074	0.075	0.076	0.083	0.091	0.100	
45A Shielded		0.059	0.061	0.065		0.060				
85A Unshielded				0.075	0.075	0.075	0.080	0.082	0.088	
65A Unshielded			0.070	0.070	0.070	0.070	0.072	0.079		
45A Unshielded		0.062	0.058	0.057		0.061				

85 A shielded consumables

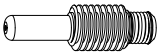


220817
Shield

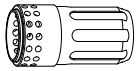


220854
Retaining cap

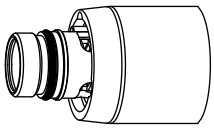
220816
Nozzle

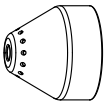


220842
Electrode

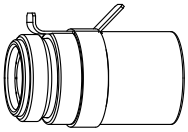


220857
Swirl ring



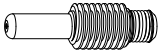


220817
Shield

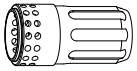


220953
Ohmic-sensing
retaining cap

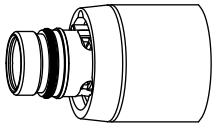
220816
Nozzle



220842
Electrode



220857
Swirl ring



85A Shielded

Mild Steel

Air flow rate - slpm/scfh	
Hot	190 / 400
Cold	235 / 500

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
3	1.5	3.8	250	0.1	6800	122	9200	120
4				0.2	5650	122	7300	122
6				0.5	3600	123	4400	125
8					2500	125	3100	127
10					1680	127	2070	128
12		4.5	300	0.7	1280	130	1600	130
16				1.0	870	134	930	133
20		6.0	400	1.5	570	137	680	136
25		Edge Start			350	142	450	141
30					200	146	300	144

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
10GA	0.06	0.15	250	0.0	250	122	336	121
3/16 in				0.2	185	123	220	123
1/4 in				0.5	130	123	160	126
3/8 in					70	126	86	127
1/2 in		0.18	300		45	131	56	131
5/8 in				1.0	35	134	37	133
3/4 in		0.24	400	1.5	24	136	29	135
7/8 in		Edge Start			19	139	22	138
1 in					13	142	17	141
1-1/8 in					9	145	13	143
1-1/4 in					7	148	10	146

85A Shielded

Stainless Steel

Air flow rate - slpm/scfh	
Hot	190 / 400
Cold	235 / 500

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
3	1.5	3.8	250	0.1	7500	122	9200	120
4				0.2	6100	122	7500	120
6				0.5	3700	122	4600	122
8					2450	124	3050	124
10		4.5	300		1550	127	1900	126
12				0.7	1100	131	1400	130
16				1.0	700	135	760	134
20		Edge Start			480	138	570	137
25					300	143	370	141

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
10GA	0.06	0.15	250	0.2	275	122	336	120
3/16 in					200	122	240	121
1/4 in				0.5	130	122	164	122
3/8 in					65	126	80	125
1/2 in		0.18	300		36	132	48	131
5/8 in				1.0	28	135	30	134
3/4 in		Edge Start			20	137	24	136
7/8 in					16	140	19	139
1 in					11	143	14	141

85A Shielded

Aluminum

Air flow rate - slpm/scfh	
Hot	190 / 400
Cold	235 / 500

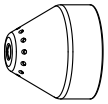
Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
3	1.5	3.8	250	0.1	8000	122	9400	121
4				0.2	6500	123	8000	123
6				0.5	3800	126	4900	126
8					2650	130	3470	129
10		4.5	300		1920	132	2500	131
12				0.7	1450	134	1930	133
16				1.0	950	139	1200	137
20		Edge Start			600	143	880	141
25					380	146	540	144

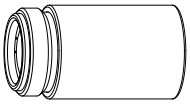
English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
1/8 in	0.06	0.15	250	0.2	300	122	360	121
1/4 in				0.5	130	127	172	127
3/8 in					80	132	104	131
1/2 in		0.18	300		50	135	68	133
5/8 in				1.0	38	139	48	137
3/4 in		Edge Start			25	142	37	140
7/8 in					20	144	29	142
1 in					14	146	20	144

65 A shielded consumables

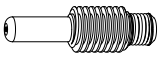


220817
Shield

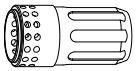


220854
Retaining cap

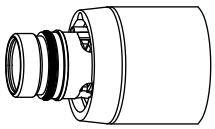
220819
Nozzle

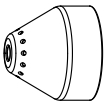


220842
Electrode

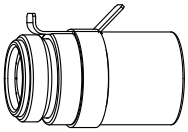


220857
Swirl ring



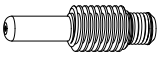


220817
Shield

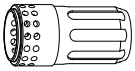


220953
Ohmic-sensing
retaining cap

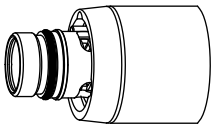
220819
Nozzle



220842
Electrode



220857
Swirl ring



65A Shielded

Mild Steel

Air flow rate - slpm/scfh	
Hot	160 / 340
Cold	220 / 470

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	1.5	3.8	250	0.1	6050	124	7000	121
3				0.2	5200	125	6100	123
4				0.5	4250	125	5100	124
6					2550	127	3240	127
8					1700	129	2230	128
10		4.5	300	0.7	1100	131	1500	129
12				1.2	850	134	1140	131
16		6.0	400	2.0	560	138	650	136
20		Edge Start			350	142	450	142
25					210	145	270	145

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
16GA	0.06	0.15	250	0.1	260	123	294	121
10GA					190	125	224	123
3/16 in				0.2	140	126	168	125
1/4 in				0.5	90	127	116	127
3/8 in				0.7	45	130	62	129
1/2 in		0.18	300	1.2	30	135	40	132
5/8 in		0.24	400	2.0	23	138	26	136
3/4 in		Edge Start			15	141	19	141
7/8 in					12	143	14	143
1 in					8	145	10	145

65A Shielded

Stainless Steel

Air flow rate - slpm/scfh	
Hot	160 / 340
Cold	220 / 470

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	1.5	3.8	250	0.1	8100	125	10000	121
3				0.2	6700	125	8260	123
4				0.5	5200	125	6150	124
6					2450	126	2850	126
8				0.7	1500	129	1860	129
10		4.5	300		960	132	1250	132
12				1.2	750	135	920	134
16		Edge Start			500	139	500	139
20					300	143	370	143

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
16GA	0.06	0.15	250	0.1	345	124	426	121
10GA					240	125	296	123
3/16 in				0.2	155	126	168	125
1/4 in				0.5	80	126	96	126
3/8 in				0.7	40	131	52	131
1/2 in		0.18	300	1.2	26	136	32	135
5/8 in		Edge Start			20	139	20	139
3/4 in					14	142	15	142

65A Shielded

Aluminum

Air flow rate - slpm/scfh	
Hot	160 / 340
Cold	220 / 470

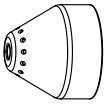
Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	1.5	3.8	250	0.1	8800	121	10300	122
3				0.2	7400	124	8800	124
4				0.5	6000	126	7350	125
6					3200	130	4400	128
8				0.7	1950	133	2750	130
10		4.5	300		1200	136	1650	132
12				1.2	1000	138	1330	136
16		Edge Start			650	143	800	141
20					380	147	560	145

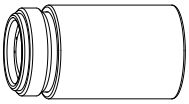
English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
1/16 in	0.06	0.15	250	0.1	365	121	428	121
1/8 in					280	124	336	124
1/4 in				0.5	105	131	152	128
3/8 in				0.7	50	135	68	131
1/2 in		0.18	300	1.2	35	139	48	138
5/8 in		Edge Start			26	143	32	141
3/4 in					16	146	24	144

45 A shielded consumables

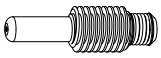


220817
Shield

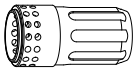


220854
Retaining cap

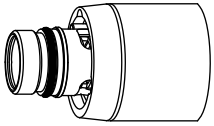
220941
Nozzle

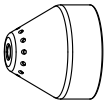


220842
Electrode

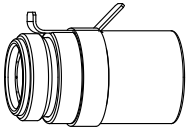


220857
Swirl ring



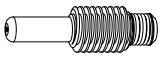


220817
Shield

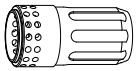


220953
Ohmic-sensing
retaining cap

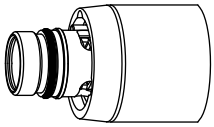
220941
Nozzle



220842
Electrode



220857
Swirl ring



45A Shielded

Mild Steel

Air flow rate - slpm/scfh	
Hot	150 / 310
Cold	210/ 450

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
0.5	1.5	3.8	250	0.0	9000	128	12500	126
1					9000	128	10800	128
1.5				0.1	9000	130	10200	129
2				0.3	6600	130	7800	129
3				0.4	3850	133	4900	131
4					2200	134	3560	131
6				0.5	1350	137	2050	132

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
26GA	0.02	0.08	400	0.0	350	128	500	128
22GA					350	128	450	128
18GA				0.1	350	129	400	128
16GA					350	130	400	129
14GA	0.06	0.15	250	0.2	270	130	320	129
12GA				0.4	190	133	216	131
10GA					100	134	164	131
3/16 in				0.5	70	135	108	132
1/4 in				0.6	48	137	73	132

45A Shielded

Stainless Steel

Air flow rate - slpm/scfh	
Hot	150 / 310
Cold	210/ 450

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
0.5	1.5	3.8	250	0.0	9000	130	12500	129
1					9000	130	10800	130
1.5				0.1	9000	130	10200	130
2				0.3	6000	132	8660	131
3				0.4	3100	132	4400	132
4					2000	134	2600	134
6				0.5	900	140	1020	139

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
26GA	0.02	0.08	400	0.0	350	130	500	129
22GA					350	130	450	129
18GA				0.1	350	130	400	130
16GA					350	130	400	130
14GA	0.06	0.15	250	0.2	250	132	360	131
12GA				0.4	140	132	206	131
10GA					100	133	134	134
3/16 in				0.5	52	135	58	135
1/4 in				0.6	30	141	35	140

45A Shielded

Aluminum

Air flow rate - slpm/scfh	
Hot	150 / 310
Cold	210/ 450

Metric

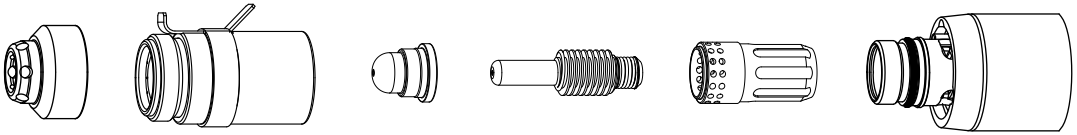
Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
1	1.5	3.8	250	0.0	8250	136	11000	136
2				0.1	6600	136	9200	135
3				0.2	3100	139	6250	134
4				0.4	2200	141	4850	135
6				0.5	1500	142	2800	137

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
1/32 in	0.06	0.15	250	0.0	325	136	450	136
1/16 in				0.1	325	136	400	136
3/32 in				0.2	200	136	328	134
1/8 in				0.4	100	140	224	134
1/4 in				0.5	54	142	96	137

FineCut® consumables

Note: The cut charts in this section apply to both shielded and unshielded consumables.



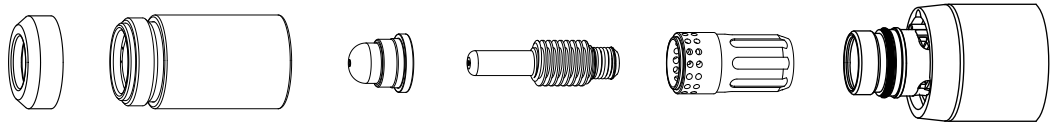
220948
Shield

220953
Retaining cap

220930
Nozzle

220842
Electrode

220857
Swirl ring



220955
Deflector

220854
Retaining cap

220930
Nozzle

220842
Electrode

220857
Swirl ring

Low Speed FineCut
Mild Steel

Air flow rate - slpm/scfh	
Hot	181 / 384
Cold	191 / 404

Metric

Material Thickness	Current	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
mm	A	mm	mm	%	seconds	(mm/min)	Volts
0.5	30	1.5	3.8	250	0	3800	69
0.6						3800	68
0.8					0.1	3800	70
1 *	40				0.2	3800	72
1.5 *					0.4	3800	75
2	45					3700	76
3					0.5	2750	78
4					0.6	1900	78

English

Material Thickness		Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
	A	in	in	%	seconds	ipm	Volts
26GA	30	0.06	0.15	250	0.0	150	70
24GA						150	68
22GA					0.1	150	70
20GA						150	71
18GA *	40				0.2	150	73
16GA *					0.4	150	75
14GA	45					150	76
12GA					0.5	120	78
10GA						95	78

Note: * indicating not dross free cut

FineCut
Mild Steel

Air flow rate - slpm/scfh	
Hot	181 / 384
Cold	191 / 404

Metric

Material Thickness	Current	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended Cut Speed	Recommended Voltage
mm	A	mm	mm	%	seconds	(mm/min)	Volts
0.5	40	1.5	3.8	250	0	8250	78
0.6						8250	78
0.8					0.1	8250	78
1	45				0.2	8250	78
1.5					0.4	6400	78
2						4800	78
3					0.5	2750	78
4					0.6	1900	78

English

Material Thickness		Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended Cut Speed	Recommended Voltage
	A	in	in	%	seconds	ipm	Volts
26GA	40	0.06	0.15	250	0.0	325	78
24GA						325	78
22GA					0.1	325	78
20GA						325	78
18GA	45				0.2	325	78
16GA					0.4	250	78
14GA						200	78
12GA					0.5	120	78
10GA						95	78

FineCut
Stainless Steel

Air flow rate - slpm/scfh	
Hot	181 / 384
Cold	191 / 404

Metric

Material Thickness	Current	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
mm	A	mm	mm	%	seconds	(mm/min)	Volts
0.5	40	0.5	2.0	400	0	8250	68
0.6						8250	68
0.8					0.1	8250	68
1	45				0.15	8250	68
1.5					0.4	6150	70
2						4800	71
3					0.5	2550	80
4					0.6	1050	80

English

Material Thickness		Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
	A	in	in	%	seconds	ipm	Volts
26GA	40	0.02	0.08	400	0.0	325	68
24GA						325	68
22GA					0.1	325	68
20GA						325	68
18GA	45				0.2	325	68
16GA					0.4	240	70
14GA						200	70
12GA					0.5	120	80
10GA					0.6	75	80

Low Speed FineCut
Stainless Steel

Air flow rate - slpm/scfh	
Hot	181 / 384
Cold	191 / 404

Metric

Material Thickness	Current	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
mm	A	mm	mm	%	seconds	(mm/min)	Volts
0.5	30	0.5	2.0	400	0	3800	69
0.6						3800	69
0.8					0.1	3800	69
1	40				0.15	3800	69
1.5					0.4	2900	69
2						2750	69
3	45				0.5	2550	80
4					0.6	1050	80

English

Material Thickness		Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Recommended	
						Cut Speed	Voltage
	A	in	in	%	seconds	ipm	Volts
26GA	30	0.02	0.08	400	0.0	150	69
24GA						150	69
22GA					0.1	150	69
20GA						150	69
18GA	40				0.2	145	69
16GA					0.4	115	69
14GA						110	69
12GA	45				0.5	120	80
10GA					0.6	75	80

Estimated Kerf-width Compensation - Metric (mm)

Process	Thickness (mm)										
	0.5	1	2	3	6	8	10	12	16	20	25
	Mild Steel										
85 A Shielded				1.7	1.8	1.9	2.0	2.2	2.4	2.6	
65 A Shielded			1.6	1.6	1.8	1.9	2.0	2.2	2.3		
45 A Shielded	1.1	1.1	1.4	1.5	1.7						
FineCut	0.9	0.7	0.5	0.6							
FineCut Low Speed	0.6	0.7	0.7	0.6							
85 A Unshielded			1.7	1.8	1.9	2.0	2.1	2.1	2.3		
65 A Unshielded			1.6	1.6	1.7	1.8	1.9	2.0			
45 A Unshielded	0.5	0.9	1.3	1.3							
	Stainless Steel										
85 A Shielded				1.6	1.8	1.9	2.1	2.3	2.4	2.5	
65 A Shielded			1.4	1.5	1.8	1.9	2.0	2.2	2.4		
45 A Shielded	0.9	1.1	1.5	1.6	1.8						
FineCut	0.2	0.5	0.4	0.5							
FineCut Low Speed	0.6	0.5	0.6	0.5							
85 A Unshielded			1.7	1.7	1.8	1.9	2.1	2.2	2.4		
65 A Unshielded			1.6	1.6	1.8	1.8	1.9	2.0			
45 A Unshielded	0.5	1.0	1.3	1.5	1.5						
	Aluminum										
85 A Shielded				2.0	1.9	2.0	2.1	2.2	2.4	2.6	
65 A Shielded			1.9	1.9	1.9	2.0	2.1	2.3	2.5		
45 A Shielded		1.5	1.5	1.6	1.5						
85 A Unshielded			1.9	1.9	1.9	2.0	2.0	2.1	2.2		
65 A Unshielded			1.8	1.8	1.8	1.8	1.9	2.0			
45 A Unshielded		1.6	1.5	1.4	1.5						

Estimated Kerf-width Compensation - English (inches)

Process	Thickness (inches)										
	22GA	18GA	14GA	10GA	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"
	Mild Steel										
85 A Shielded				0.068	0.071	0.073	0.078	0.090	0.095	0.100	
65 A Shielded			0.062	0.065	0.068	0.070	0.076	0.088	0.090	0.091	
45 A Shielded	0.035	0.054	0.055	0.061	0.065	0.066					
FineCut	0.028	0.026	0.016	0.023							
FineCut Low Speed	0.026	0.030	0.027	0.023							
85 A Unshielded				0.070	0.073	0.075	0.080	0.085	0.090		
65 A Unshielded			0.062	0.064	0.066	0.068	0.075	0.081			
45 A Unshielded	0.020	0.050	0.051	0.054	0.057	0.059					
	Stainless Steel										
85 A Shielded				0.065	0.068	0.070	0.080	0.094	0.095	0.096	
65 A Shielded			0.056	0.062	0.068	0.073	0.076	0.090	0.093		
45 A Shielded	0.032	0.055	0.058	0.067	0.069	0.069					
FineCut	0.025	0.019	0.014	0.027							
FineCut Low Speed	0.025	0.023	0.021	0.027							
85 A Unshielded			0.066	0.068	0.070	0.072	0.080	0.090	0.095		
65 A Unshielded			0.061	0.064	0.067	0.070	0.072	0.080			
45 A Unshielded	0.020	0.054	0.052	0.060	0.058	0.058					

Aluminum											
		1/32"	**1/16"**	**1/8"**	**3/16"**	**1/4"**	**3/8"**	**1/2"**	**5/8"**	**3/4"**	**1"**
85 A Shielded				0.080	0.078	0.075	0.080	0.090	0.095	0.100	
65 A Shielded			0.073	0.074	0.075	0.076	0.083	0.091	0.100		
45 A Shielded		0.059	0.061	0.065		0.060					
85 A Unshielded				0.075	0.075	0.075	0.080	0.082	0.088		
65 A Unshielded			0.070	0.070	0.070	0.070	0.072	0.079			
45 A Unshielded		0.062	0.058	0.057		0.061					

FineCut

Mild Steel

Air flow rate - slpm/scfh	
Hot	155 / 330
Cold	215 / 460

Metric

Material Thickness	Amps	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings	
						Cut Speed	Voltage
mm	A	mm	mm	%	seconds	(mm/min)	Volts
0.5	40	1.5	3.8	250	0.0	8250	78
0.6						8250	78
0.8					0.1	8250	78
1	45				0.2	8250	78
1.5					0.4	6400	78
2						5250	82
3					0.5	2750	83
4					0.6	1900	84

English

Material Thickness	Amps	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings	
						Cut Speed	Voltage
	A	in	in	%	seconds	ipm	Volts
26GA	40	0.06	0.15	250	0.0	325	78
24GA						325	78
22GA					0.1	325	78
20GA						325	78
18GA	45				0.2	325	78
16GA					0.4	250	78
14GA						220	82
12GA					0.5	120	83
10GA						95	84

FineCut

Stainless Steel

Air flow rate - slpm/scfh	
Hot	155 / 330
Cold	215 / 460

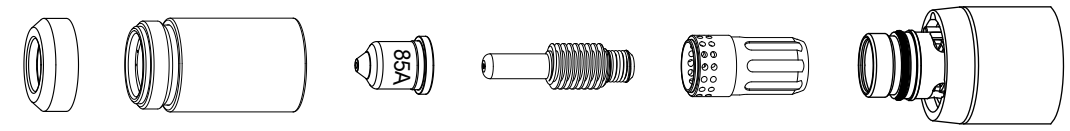
Metric

Material Thickness	Amps	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings	
						Cut Speed	Voltage
mm	A	mm	mm	%	seconds	(mm/min)	Volts
0.5	40	0.5	2.0	400	0.0	8250	68
0.6						8250	68
0.8					0.1	8250	68
1	45				0.2	8250	68
1.5					0.4	6150	70
2						4800	71
3					0.5	2550	81
4					0.6	1050	84

English

Material Thickness	Amps	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings	
						Cut Speed	Voltage
	A	in	in	%	seconds	ipm	Volts
26GA	40	0.02	0.08	400	0.0	325	68
24GA						325	68
22GA					0.1	325	68
20GA						325	68
18GA	45				0.2	325	68
16GA					0.4	240	70
14GA						200	70
12GA					0.5	120	80
10GA					0.6	75	83

85 A unshielded consumables



220955
Deflector

220854
Retaining cap

220816
Nozzle

220842
Electrode

220857
Swirl ring

85A Unshielded

Mild Steel

Air flow rate - slpm/scfh	
Hot	190 / 400
Cold	235 / 500

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	2.0	5.0	250	0.0	7150	117	10400	116
3				0.1	6240	118	9000	117
4				0.2	5250	118	7200	117
6				0.5	3450	120	4400	119
8					2400	121	3100	121
10					1560	123	2070	122
12		6.0	300	0.7	1200	126	1600	124
16		Edge Start			820	132	930	128
20					540	137	640	132
25					320	143	400	137

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
14GA	0.08	0.20	250	0.1	280	117	416	116
10GA				0.2	230	118	328	117
3/16 in					175	119	220	118
1/4 in				0.5	125	120	160	119
3/8 in					65	122	86	122
1/2 in		0.24	300	0.6	42	127	56	125
5/8 in		Edge Start			33	131	37	128
3/4 in					23	136	27	131
7/8 in					18	140	21	134
1 in					12	144	15	138

85A Unshielded

Stainless Steel

Air flow rate - slpm/scfh	
Hot	190 / 400
Cold	235 / 500

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	2.0	5.0	250	0.1	8550	117	11300	116
3					7000	118	9660	117
4				0.2	5600	118	7800	118
6				0.5	3400	120	4570	121
8					2250	121	2970	122
10		6.0	300	0.5	1430	123	1840	124
12				0.7	1000	129	1340	128
16		Edge Start			650	134	730	133
20					360	138	570	137

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
14GA	0.08	0.20	250	0.1	340	117	452	116
10GA				0.2	250	118	352	118
3/16 in					180	119	249	119
1/4 in				0.5	120	120	160	121
3/8 in					60	122	77	123
1/2 in		0.24	300	0.6	35	131	46	129
5/8 in		Edge Start			26	134	29	133
3/4 in					17	137	24	136

85A Unshielded

Aluminum

Air flow rate - slpm/scfh	
Hot	190 / 400
Cold	235 / 500

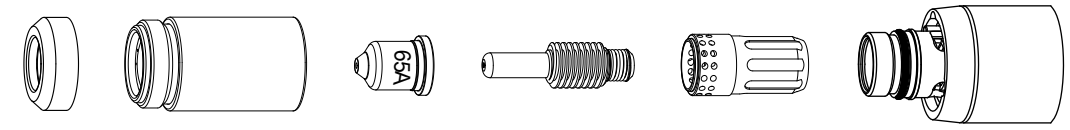
Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	2.0	5.0	250	0.1	8700	118	11200	118
3					7350	120	9600	119
4				0.2	6000	122	8100	120
6				0.5	3300	125	4930	122
8					2350	127	3250	124
10		6.0	300	0.5	1800	128	2140	127
12				0.7	1300	133	1720	130
16		Edge Start			840	139	1130	134
20					470	144	700	138

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
1/8 in	0.08	0.20	250	0.2	280	120	368	119
3/16 in					200	123	271	120
1/4 in				0.5	110	126	172	122
3/8 in					75	127	88	126
1/2 in		0.24	300	0.6	45	135	62	131
5/8 in		Edge Start			34	139	45	134
3/4 in					22	143	32	137

65 A unshielded consumables



220955
Deflector

220854
Retaining cap

220819
Nozzle

220842
Electrode

220857
Swirl ring

65A Unshielded

Mild Steel

Air flow rate - slpm/scfh	
Hot	160 / 340
Cold	220 / 470

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	2.0	5.0	250	0.1	6050	117	7340	117
3				0.2	5200	118	6330	118
4				0.5	4250	118	5250	118
6					2550	120	3560	120
8					1620	123	2230	121
10		6.0	300	0.7	970	127	1500	122
12		Edge Start			760	129	1140	124
16					500	134	650	129
20					280	138	400	133

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
16GA	0.08	0.20	250	0.1	255	116	308	117
10GA					190	118	232	118
3/16 in				0.2	135	119	172	119
1/4 in				0.5	90	120	116	120
3/8 in		0.24	300	0.7	40	126	62	122
1/2 in		Edge Start			27	130	40	125
5/8 in					20	134	26	129
3/4 in					13	137	18	132

65A Unshielded

Stainless Steel

Air flow rate - slpm/scfh	
Hot	160 / 340
Cold	220 / 470

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	2.0	5.0	250	0.1	7950	117	10300	116
3				0.2	6600	118	8500	117
4				0.5	5050	119	6500	119
6					2300	121	3070	121
8				0.7	1400	123	1900	122
10		6.0	300	0.7	920	126	1250	123
12		Edge Start			710	130	925	127
16					430	135	500	133

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
16GA	0.08	0.20	250	0.1	340	116	437	115
10GA					235	118	304	118
3/16 in				0.2	150	120	194	120
1/4 in				0.5	75	121	100	121
3/8 in		0.24	300	0.7	38	125	52	122
1/2 in		Edge Start			25	132	32	129
5/8 in					17	135	20	133

65A Unshielded

Aluminum

Air flow rate - slpm/scfh	
Hot	160 / 340
Cold	220 / 470

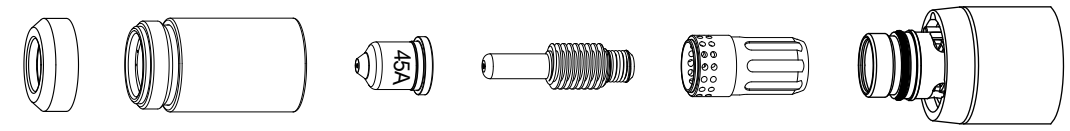
Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
2	2.0	5.0	250	0.1	7750	123	11300	122
3				0.2	6550	124	9500	123
4				0.5	5400	125	7640	124
6					3000	127	3900	126
8				0.7	1800	130	2460	127
10		6.0	300	0.7	1100	133	1640	129
12		Edge Start			900	135	1250	133
16					600	139	700	136

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
1/16 in	0.08	0.20	250	0.1	325	122	476	122
1/8 in					250	124	360	123
3/16 in					175	125	245	124
1/4 in				0.5	100	127	128	126
3/8 in		0.24	300	0.7	45	132	68	128
1/2 in		Edge Start			32	136	44	134
5/8 in					24	138	28	136

45 A unshielded consumables



220955
Deflector

220854
Retaining cap

220941
Nozzle

220842
Electrode

220857
Swirl ring

45A Unshielded

Mild Steel

Air flow rate - slpm/scfh	
Hot	147 / 310
Cold	210 / 450

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
0.5	1.5	3.8	250	0.0	9000	120	12500	120
1					9000	120	10800	121
1.5				0.1	7700	120	10200	121
2				0.3	6150	119	7800	122
3				0.4	3950	121	4900	123
4					2350	123	3560	124
6				0.5	1400	126	2050	124

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
26GA	0.06	0.15	250	0.0	350	120	500	120
22GA					350	120	450	120
18GA				0.1	350	119	400	121
16GA					300	121	400	121
14GA				0.2	250	119	320	122
12GA				0.4	200	120	216	123
10GA					100	123	164	124
3/16 in				0.5	85	122	108	124
1/4 in				0.6	48	127	73	124

45A Unshielded

Stainless Steel

Air flow rate - slpm/scfh	
Hot	147 / 310
Cold	210 / 450

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
0.5	1.5	3.8	250	0.0	9000	121	12500	119
1					9000	121	10800	119
1.5				0.1	9000	121	10200	120
2				0.3	6000	122	9600	120
3				0.4	3250	123	4750	120
4					1900	128	3000	122
6				0.5	700	130	1450	124

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
26GA	0.02	0.08	400	0.0	350	120	500	119
22GA					350	120	450	119
18GA				0.1	350	118	400	119
16GA					350	121	400	120
14GA	0.06	0.15	250	0.2	300	122	400	120
12GA				0.4	150	121	224	120
10GA					100	125	140	121
3/16 in				0.5	42	131	88	123
1/4 in				0.6	25	130	48	124

45A Unshielded

Aluminum

Air flow rate - slpm/scfh	
Hot	147 / 310
Cold	210 / 450

Metric

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
1	1.5	3.8	250	0.0	7400	126	11000	121
2				0.1	4400	127	9200	123
3				0.2	2800	129	6250	125
4				0.4	2100	132	4700	126
6				0.5	1050	135	2250	127

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
1/32 in	0.06	0.15	250	0.0	325	126	450	121
1/16 in				0.1	200	126	400	122
3/32 in				0.2	150	127	328	124
1/8 in				0.4	100	130	224	125
1/4 in				0.5	36	136	72	127