

SanRex

Plasma Welding Torches

PWH/M P75, P15, P22, P30

Operators Manual

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General Information

1.1. DESCRIPTION OF EQUIPMENT

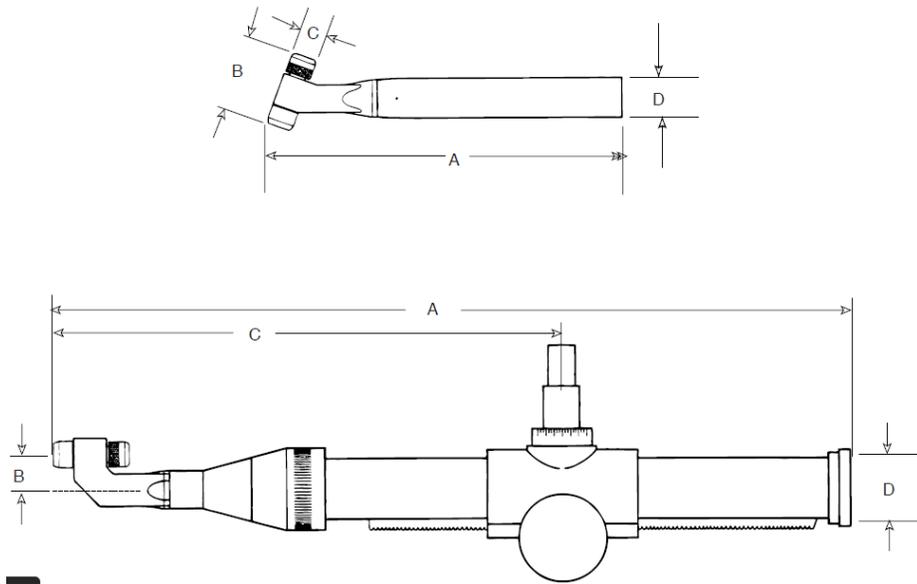
The Sanrex Plasma Welding Torches are designed for direct current plasma arc welding of ferrous metals using the transferred arc plasma process.

1.2. TORCH SPECTFICATIONS

P75 (2A) Specifications

- Straight Polarity Current Rating: 75 amperes DC maximum at 60% .
- Plasma Gas: Argon (Consumption): 0.5 – 2.5 SCFH (0.24 – 1.18 lpm)
- Shield Gas/Straight Polarity: Argon or Argon/Hydrogen (Consumption: 8-15 SCFH (3.8-7.1 lpm).
- Pilot Current – 2 Amps to 5 Amps on average.
- Shipping Weight:
 - Hand torch PWH-24: 1 lbs. (0.45 kg);
 - Machine mounted torch PWM-24: 2 lbs. (0.9k g).
- Cooling Requirements: 2,000 BTU/hr, ¼ gpm of Torch Coolant @ 50 psi.

P75 Torch Dimensions



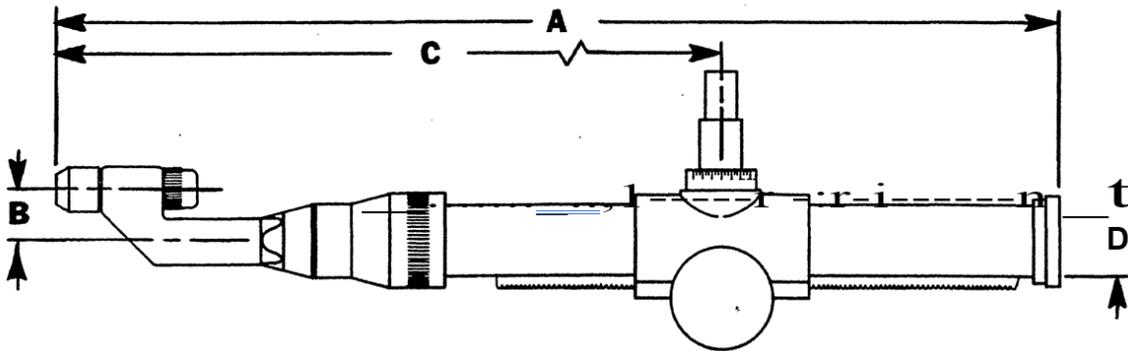
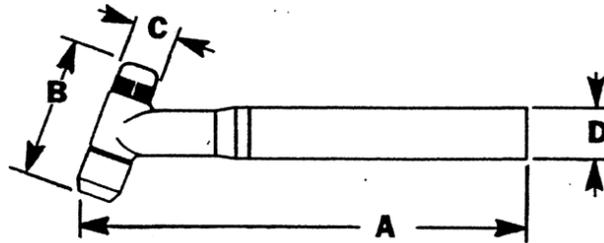
	A		B		C		D	
	Inches	(cm)	Inches	(cm)	Inches	(cm)	Inches	(cm)
PWH-P75 (70)	8.00	(20.32)	1.62	(4.11)	0.62	(1.57)	0.88	(2.24)
PWH-P75 (90)	7.75	(19.68)	1.62	(4.11)	0.62	(1.57)	0.88	(2.24)
PWM-P75	18.00	(47.72)	0.81	(2.06)	7.12	(18.08)	1.38	(3.50)

					15.00	(38.10)		
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P15 (3A) Specifications

- Straight Polarity Current Rating: 150 amperes DC maximum at 60% Duty Cycle.
- Plasma Gas: Argon (Consumption): 0.5 – 3 SCFH (0.24 – 1.51 lpm)
- Shield Gas/Straight Polarity: Argon or Argon/Hydrogen (Consumption: 8-15 SCFH (3.8-7.1 lpm).
- Pilot Current – 5 Amps to 10 Amps on average.
- Shipping Weight:
 - Hand torch PWH-15: 2 lbs. (0.9 kg);
 - Machine mounted torch PWM-15: 3 lbs. (1.4k g).
- Cooling Requirements: 4,000 BTU/hr, 1/3 gpm of Torch Coolant @ 50 psi.

P15 Torch Dimensions

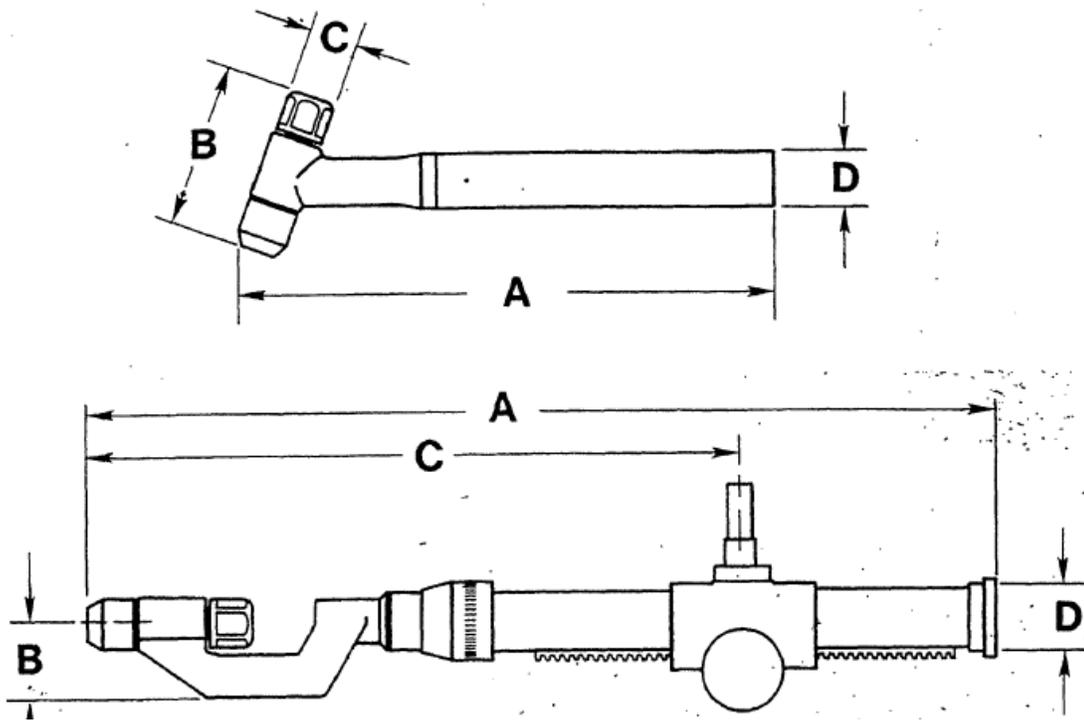


	A		B		C		D	
	Inches	(cm)	Inches	(cm)	Inches	(cm)	Inches	(cm)
PWH-P15 (70)	8.75	(22.22)	2.62	(6.65)	0.88	(2.24)	1.00	(2.54)
PWH-P15 (90)	8.50	(21.59)	2.62	(6.65)	0.88	(2.24)	1.00	(2.54)
PWM-P15	19.25	(48.90)	1.00	(2.54)	9.25	(23.50)	1.38	(3.50)
					16.75	(42.54)		

P22 (4A) Specifications

- Straight Polarity Current Rating: 220 amperes DC maximum at 30% Duty Cycle.
- Plasma Gas: Argon (Consumption): 0.5 – 7 SCFH (0.24 – 3.30 lpm)
- Shield Gas/Straight Polarity: Argon or Argon/Hydrogen (Consumption: 10-20 SCFH (4.72-9.44 lpm).
- Pilot Current – 7 Amps to 12 Amps on average.
- Shipping Weight:
 - Hand torch PWH-22: 2 lbs. (0.9 kg);
 - Machine mounted torch PWM-22: 3 lbs. (1.4k g).
- Cooling Requirements: 8,000 BTU/hr, 1/2 gpm of Torch Coolant @ 50 psi.

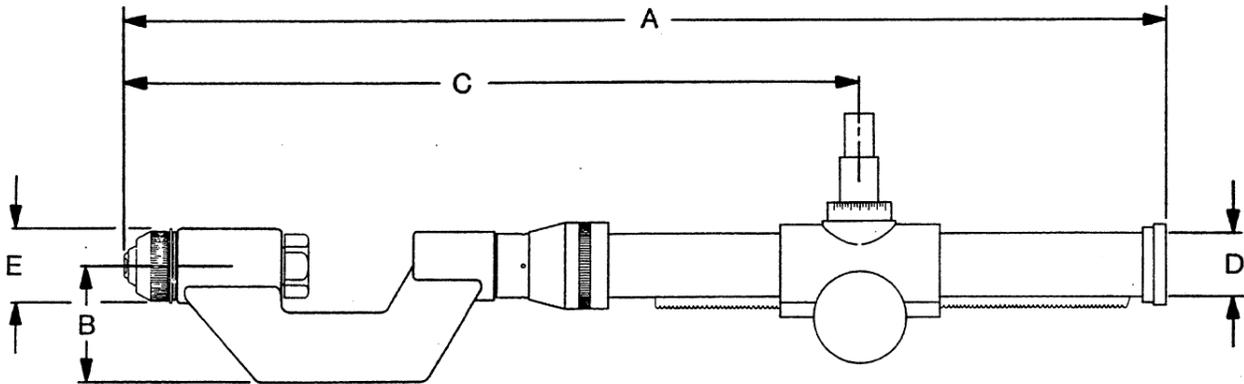
P22 Torch Dimensions



	A		B		C		D	
	Inches	(cm)	Inches	(cm)	Inches	(cm)	Inches	(cm)
PWH-P22 (70)	12.50	(31.80)	3.19	(8.1)	1.25	(2.24)	1.31	(3.3)
PWH-P22 (90)	12.25	(31.10)	3.19	(8.1)	1.25	(2.24)	1.31	(3.3)
PWM-P22	21.00	(53.30)	1.75	(4.4)	11.25	(28.6)	1.38	(3.5)
					19.00	(48.2)		

P30 (300) Specifications

- Straight Polarity Current Rating: 300 amperes DC maximum at 60% duty cycle.
- Plasma Gas: Argon (Consumption): 1.5 – 3.5 SCFH (0.71 – 1.65 lpm)
- Shield Gas/Straight Polarity: Argon or Argon/Hydrogen (Consumption: 10-20 SCFH (4.72-9.44 lpm).
- Pilot Current – 10 Amps to 15 Amps on average.
- Shipping Weight:
 - Machine mounted torch PWM-22: 3 lbs. (1.4k g).
- Cooling Requirements: 12,000 BTU/hr, 3/4 gpm of Torch Coolant @ 100 psi.

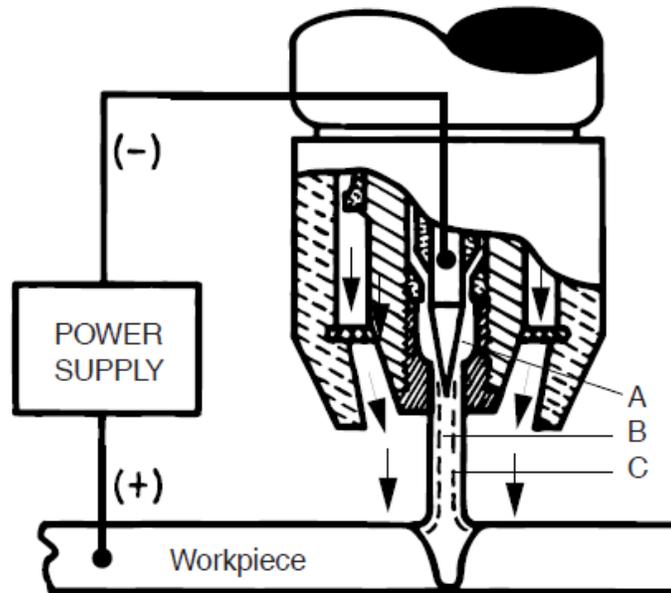


	A		B		C		D		E	
PWM-P30	22.19	(56.4)	2.50	(6.35)	12.44	(31.6)	1.38	(3.5)	1.63	(4.14)
					20.19	(51.3)				

1.3. PLASMA

Plasma is a gas which has been heated to an extremely high temperature and ionized so that the gas becomes electrically conductive. The welding process uses this plasma to transfer an electric arc to the workpiece. The metal to be welded is melted by the heat of the arc.

In a plasma torch, a cool gas such as Argon enters in Zone A. In Zone B a pilot arc between the electrode and the front of the torch heats and ionizes the gas. An arc transfers to the workpiece through a column of plasma gas in Zone C.



By forcing the plasma gas and electric arc through a small orifice, Plasma torches deliver a high concentration of heat to a very small area. The stiff, constricted plasma arc is shown in Zone C. Direct current straight polarity is used for most plasma welding, as shown in the illustration.

The Dual-Flow design of Plasma welding torches uses a shield gas shown by the small arrows. The shield gas surrounds the plasma arc and channels it to the workpiece, thus improving weld characteristics and shielding the weld puddle from atmospheric contamination.

Coolant from the coolant recirculator flows through the liquid cooled power leads to the torch head and back.

The plasma arc is infinitely variable from soft to stiff. Most applications can best be accomplished with a softer arc, i.e. lower plasma gas flow. Full penetration or Keyhole welds require a stiff arc, i.e. high plasma gas flow.

1.4. THEORY OF OPERATION

TORCH CONNECTIONS

The plasma gas flows to the torch through the black lead, around the electrode end gas distributor and out through the tip orifice.

The shield gas flows through the yellow torch lead, around the torch front end and out through the shield cup.

The torch coolant and negative (-) power flow to the front end of torch through the green (color coded) lead.

The coolant returns and positive (+) power for the pilot arc flow through the red (color coded) lead.

PILOT ARC

When the torch is started, an arc is established between the electrode and welding tip. This pilot arc appears as a small "flame" at the front of the torch. This serves to illuminate the workpiece and assists in starting the main (welding) arc. It should be left on while welding to stabilize the welding arc and reduce consumable erosion.

HIGH FREQUENCY

A high voltage, high frequency current is superimposed on the direct current to establish the pilot arc.

WELDING ARC

The power supply provides the direct current (DC) for welding. The negative output is connected to the torch electrode through the negative liquid cooled lead. The positive output is connected to the workpiece through the work cable. The electrically charged plasma gas serves to close this electrical circuit and thus becomes the welding arc.

INSTALLATION

2.1 PRE-OPERATION SET-UP

The selection of specific parameters for a given welding application depend on the type of material, configuration of the joint and type of weld desired. Proper settings for a given joint must be developed on the job.

The value for a stiff collimated arc is with the electrode setback to its maximum (see Fig. 3-A). A softer, less constricted arc can be obtained by decreasing the electrode setback. The minimum setback is with the electrode point flush with the face of the tip (see Fig. 3-B). By decreasing the electrode setback the plasma gas flow can be decreased while maintaining the higher current ratings of the tip. This gives a wider weld bead and, in most cases, allows for faster travel speeds.

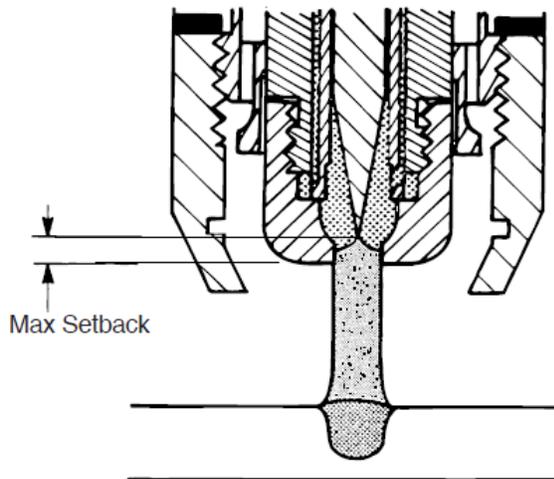


Figure 3-A

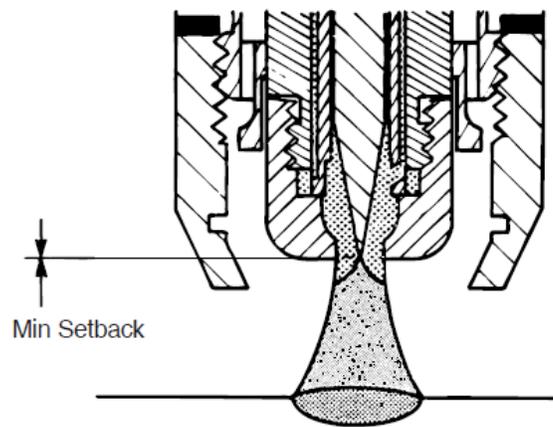


Figure 3-B

The electrode gauge values given will result in maximum electrode setback for the given tip. This setback, when used with the given values for current and plasma gas flow will produce a stiff collimated arc that results in a narrower weld bead.

CAUTION: Decreasing the electrode standoff can only be done with tip orifice diameters of .046 or larger.

This procedure should be followed at the beginning of each shift:

WARNING: Check to be sure the main disconnect switch is open.

1. Check the torch to be sure that it has the proper components and is adjusted properly.
2. Close the main disconnect switch supplying power to the welding system.

When the electrode is at minimum setback (flush with tip face) the plasma gas flow rate can be reduced while maintaining the given current levels. This produces a softer arc that results in less depth of penetration, giving a wider weld bead, and allowing faster travel speeds.

Suggested Starting Parameters

Fusion welding - Sanrex P75 Torch

Material Thickness	Current Range	Plasma Gas Argon Flow SCFH	Shield Gas Flow SCFH 8 – 15
Stainless Steel			
0.005"/0.13mm	3 - 5	0.25 – 0.5	Ar/Hy 95/5 Or Argon
0.010"/0.25mm	4 – 10	0.25 – 0.5	
0.020"/0.051mm	10 – 15	0.25 – 0.5	
1/32"/0.80mm	20 – 30	0.4 – 0.6	
1/16"/1.6mm	30 – 45	0.6 - 0.9	
3/32"/2.4mm	45 – 60	0.9 – 1.2	
1/8"/3.2mm	60 - 75	1.2 – 1.5	
Carbon Steel			
0.050"/1.3mm	25 – 40	0.5 – 0.8	Ar/Hy 95/5 Or Argon
1/16"/1.6mm	30 – 50	0.6 – 1.0	
3/32"/2.4mm	60 – 75	0.9 – 1.4	
Titanium			
0.010"/0.25mm	4 – 8	0.25 – 0.5	Argon
0.020"/0.51mm	10 - 15	0.25 – 0.5	

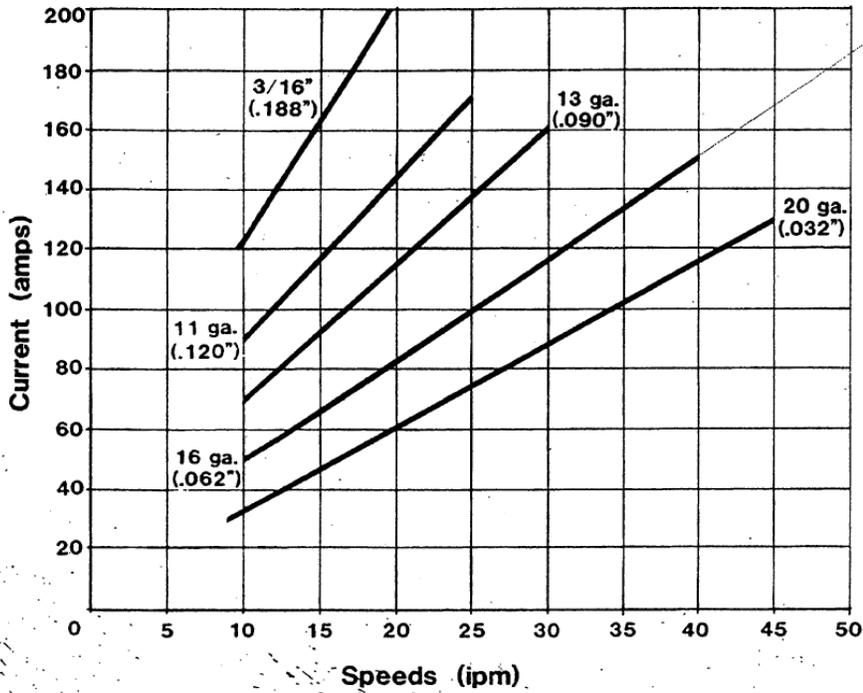
Fusion welding - Sanrex P15 Torch

Material/Thickness		Tip		Electrode			Current Range (Amps)	Plasma Gas (Argon) Flow		Shield Gas 8-15 SCFH (3.8-7.1 LPM)
In.	(mm)	Cat. No.	Orifice Dia. In.	Cat. No. Std.	Ext.**	Gauge*		SCFH	LPM	
Stainless Steel										
.005	(.13)	8-3052	.014	9-1747	9-1775	0	3-6	.25-.5	.12-.24	Ar (95%)/H ₂ (5%) or Argon
		9-1788	.031			1	3-6	.25-.5	.12-.24	
.010	(.025)	8-3052	.014	↓	↓	0	3-10	.25-.5	.12-.24	
		8-3053	.022			0	4-10	.25-.5	.12-.24	
		9-1788	.031			1	3-10	.25-.5	.12-.24	
.020	(.051)	8-3053	.022	↓	↓	0	12-15	.25-.5	.12-.24	
		9-1782	.031			0	12-20	.25-.5	.12-.24	
		9-1789	.046			1	12-20	.25-.5	.12-.24	
1/32	(.80)	9-1782	.031	↓	↓	0	20-30	.4-.6	.19-.28	
1/16	(1.6)	9-1783	.046			0	30-45	.6-.9	.28-.42	
		3/32	(2.4)			9-1783	.046	0	45-50	
9-1790	.062			1	45-55	.9-1.1	.42-.52			
9-1784	.062			0	45-60	.9-1.2	.42-.57			
1/8	(3.2)	9-1784	.062	↓	↓	0	60-75	1.2-1.5	.57-.71	
		9-1791	.081			1	60-75	1.2-1.5	.57-.71	
		9-1811	.093			1	60-85	1.2-1.7	.57-.80	
		9-1795	.093			3	60-100	1.2-2.0	.57-.94	
Carbon Steel										
.050	(1.3)	9-1782	.031	↓	↓	0	25-30	.5-.6	.24-.28	Ar (95%)/H ₂ (5%) or Argon
		9-1783	.046			0	25-40	.5-.8	.24-.38	
1/16	(1.6)	9-1783	.046	↓	↓	0	30-50	.6-1.0	.28-.47	
		9-1790	.062			1	30-50	.6-1.0	.28-.47	
3/32	(2.4)	9-1784	.062	↓	↓	0	45-75	.9-1.5	.42-.71	
		9-1791	.081			1	45-75	.9-1.5	.42-.71	
1/8	(3.2)	9-1784	.062	↓	↓	0	60-75	1.2-1.5	.57-.71	
		9-1791	.081			1	60-75	1.2-1.5	.57-.71	
		9-1811	.093			1	60-85	1.2-1.7	.57-.80	
		9-1785	.081			0	60-100	1.2-2.0	.57-.94	
		9-1795	.093			3	60-100	1.2-2.0	.57-.94	
Titanium										
.010	(.25)	8-3052	.014	↓	↓	0	4-10	.25-.5	.12-.24	Argon
		9-1788	.031			1	4-10	.25-.5	.12-.24	
.020	(.51)	8-3053	.022	↓	↓	0	10-15	.25-.5	.12-.24	
		9-1782	.031			0	10-20	.25-.5	.12-.24	
		9-1789	.046			0	10-20	.25-.5	.12-.24	
						1	10-20	.25-.5	.12-.24	

KeyHole welding - Sanrex P15 Torch

Material/Thickness		Tip		Electrode Gauge *	Current Range (Amps)	Plasma Gas (Argon) Flow		Welding Speeds Inches/min (meters/min)	Shield Gas 8-15 SCFH (3.8-7.1 LPM)	
In.	(mm)	Cat. No.	Orifice Dia. In.			SCFH	LPM			
Stainless Steel										
1/16	(1.6)	9-1783	.046	0	30-45	1.6-1.8	.76-.85	6-8 (.15-.20)	Ar (95%)/H ₂ (5%)	
3/32	(2.4)	9-1783	.046	0	45-50	1.8-2.0	.85-.94	6-8 (.15-.20)		
		9-1790	.062	1	45-65	1.8-2.0	.85-.94	6-8 (.15-.20)		
1/8	(3.2)	9-1784	.062	0	65-75	2.0-2.5	.94-1.18	8-10 (.20-.25)		
		9-1791	.081	1	65-75	2.0-2.5	.94-1.18	8-10 (.20-.25)		
		9-1811	.093	1	65-85	2.0-2.5	.94-1.18	8-10 (.20-.25)		
5/32	(4.0)	9-1811	.093	1	70-85	2.5-3.0	1.18-1.42	8-10 (.20-.25)		
		9-1785	.081	0	70-100	2.5-3.0	1.18-1.42	8-10 (.20-.25)		
Carbon Steel										
1/16	(1.6)	9-1783	.046	0	35-50	1.5-1.8	.71-.85	6-8 (.15-.20)		Argon
		9-1790	.062	1	35-50	1.5-1.8	.71-.85	6-8 (.15-.20)		
3/32	(2.4)	9-1784	.062	0	60-75	1.8-2.0	.85-.94	8-10 (.20-.25)		
		9-1791	.081	1	60-75	1.8-2.0	.85-.94	8-10 (.20-.25)		
1/8	(3.2)	9-1811	.093	1	75-85	2.0-2.5	.94-1.18	8-10 (.20-.25)		
		9-1785	.081	0	75-100	2.0-2.5	.94-1.18	8-10 (.20-.25)		
Inconel										
3/32	(2.4)	9-1784	.062	0	50-70	1.8-2.0	.85-.94	6-8 (.15-.20)	Ar (95%)/H ₂ (5%)	
		9-1791	.081	1	50-70	1.8-2.0	.85-.94	6-8 (.15-.20)		
1/8	(3.2)	9-1784	.062	0	60-75	2.0-2.5	.94-1.18	8-10 (.20-.25)		
		9-1791	.081	1	60-75	2.0-2.5	.94-1.18	8-10 (.20-.25)		
Hastelloy										
1/16	(1.6)	9-1782	.031	0	25-40	1.2-1.8	.57-.85	6-8 (.15-.20)		Ar (95%)/H ₂ (5%)
		9-1783	.046	0	25-40	1.2-1.8	.57-.85	6-8 (.15-.20)		
		9-1790	.062	1	25-40	1.2-1.8	.57-.85	6-8 (.15-.20)		

Fusion welding - Sanrex P22 Torch



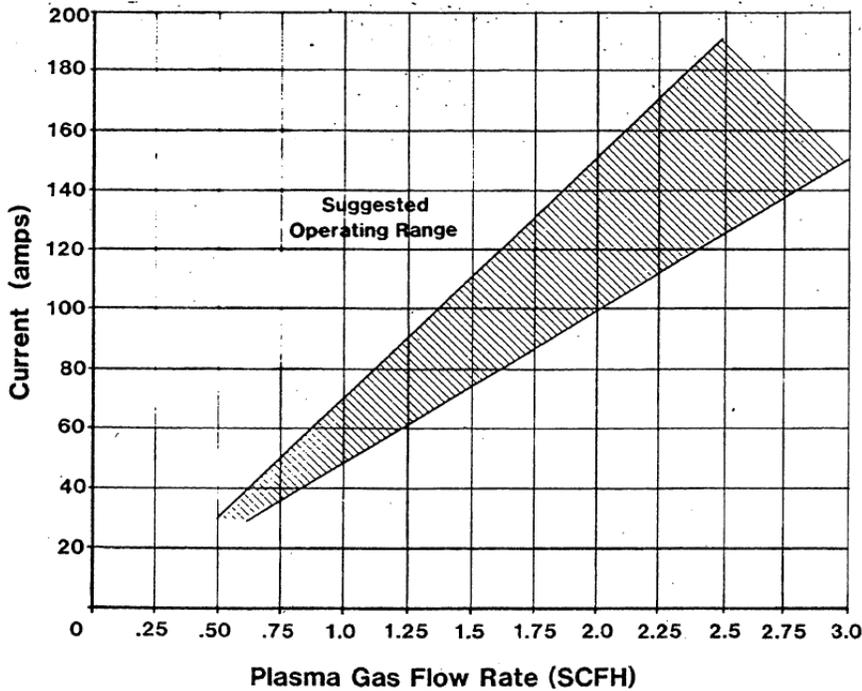
Materials

- Stainless Steels
- Carbon Steels
- Alloy Steels
- Nickels

Joint Types

- Butts
- Corner*
- Edge*
- Flanged*

Electrode setback at minimum.



Use .093 tip up to 125 amps, above 125 amps use .125 tip.

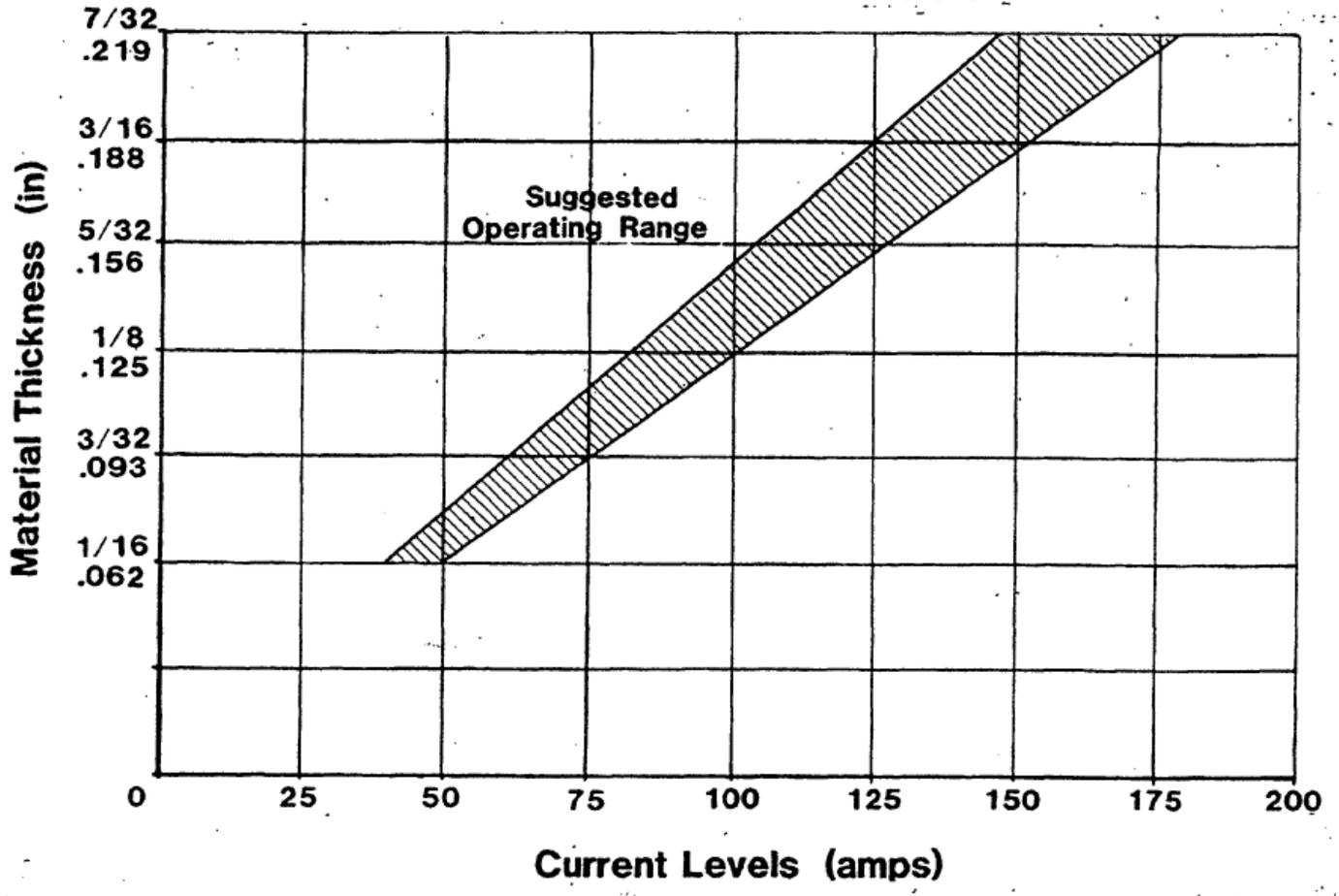
Argon- Plasma Gas
Argon-Hydrogen- Shield Gas (10-20 SCFH)

Most steels require approximately 10-15% higher current at equal travel speed.

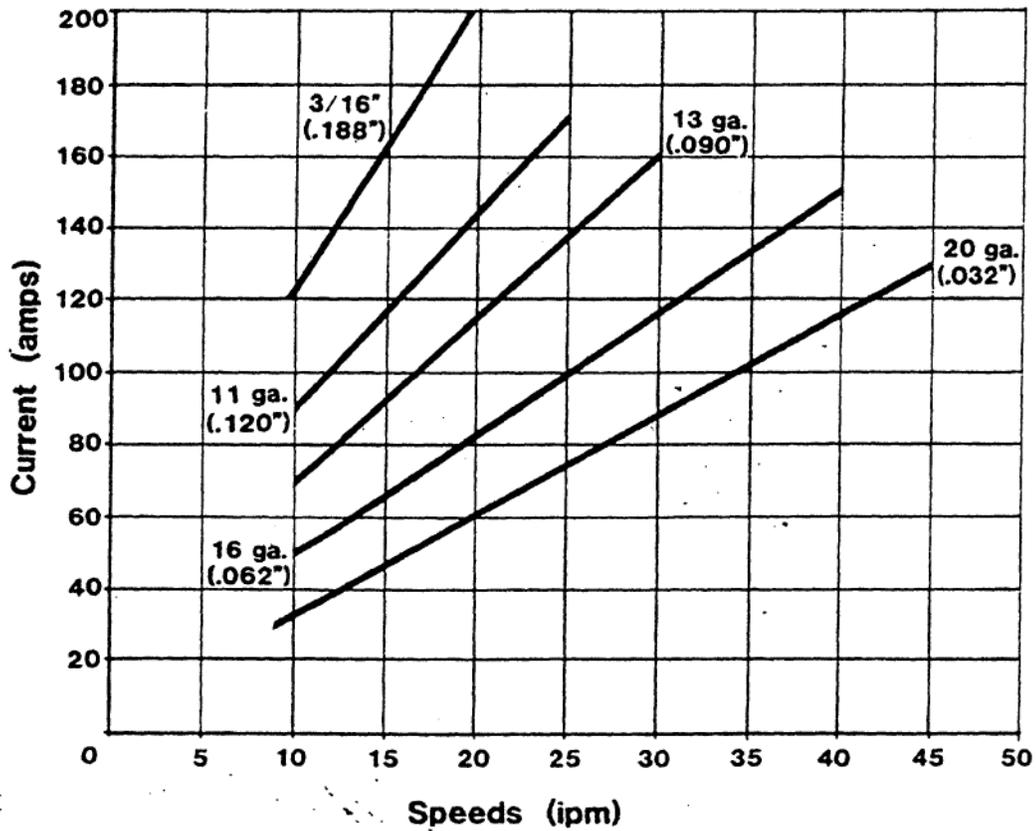
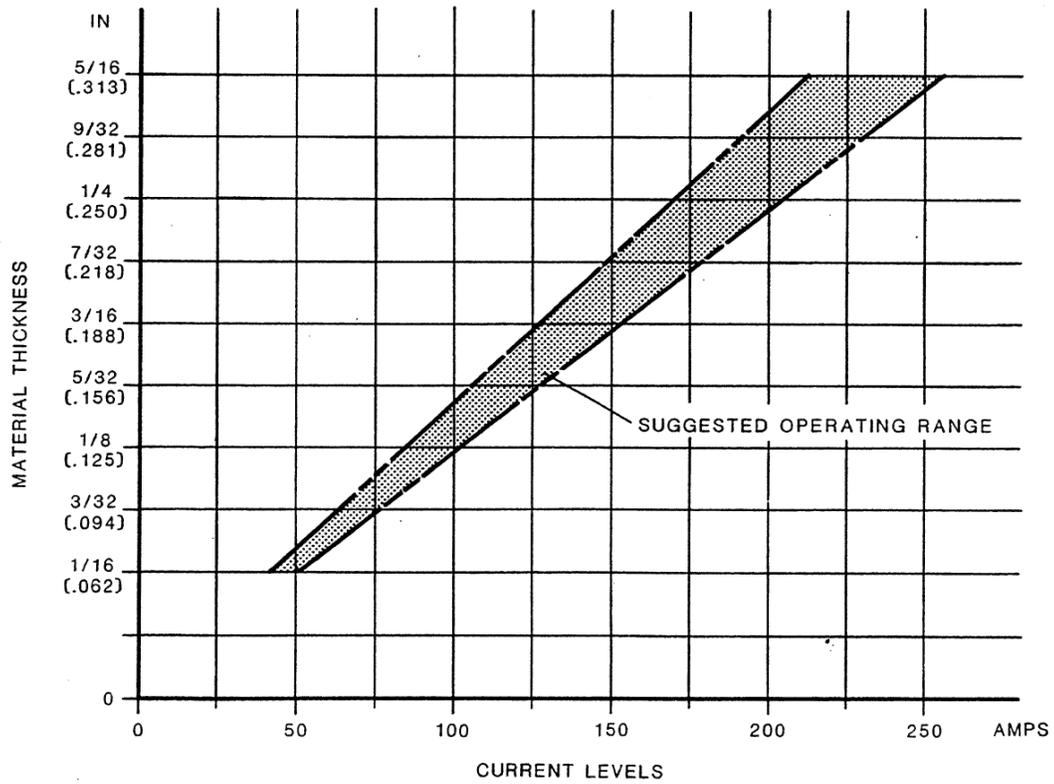
* Faster travel speeds may be required for these welds.

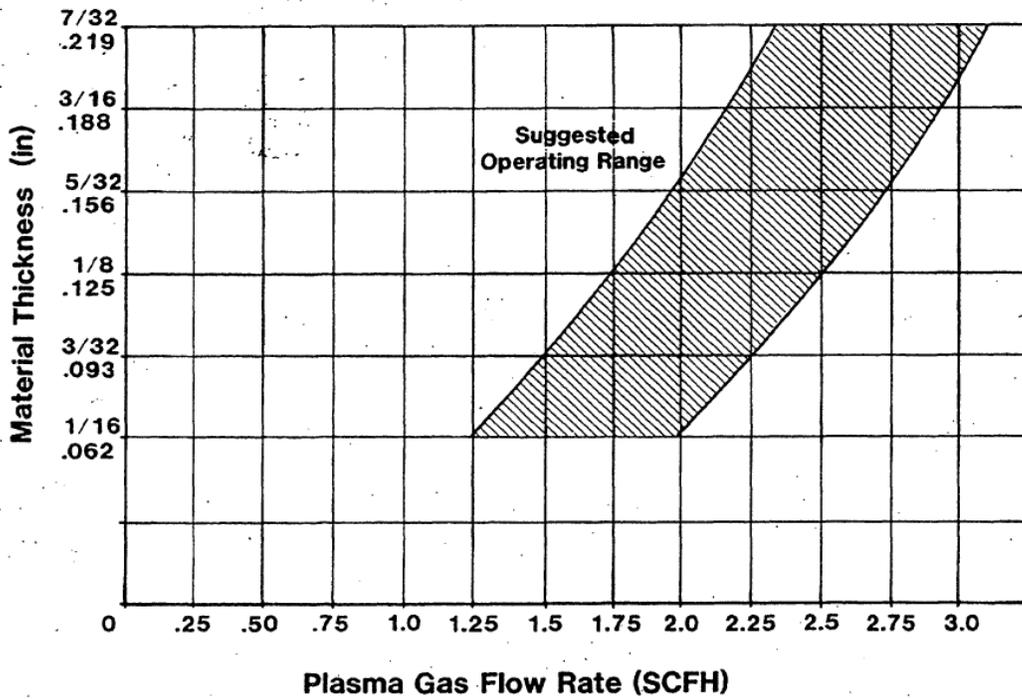
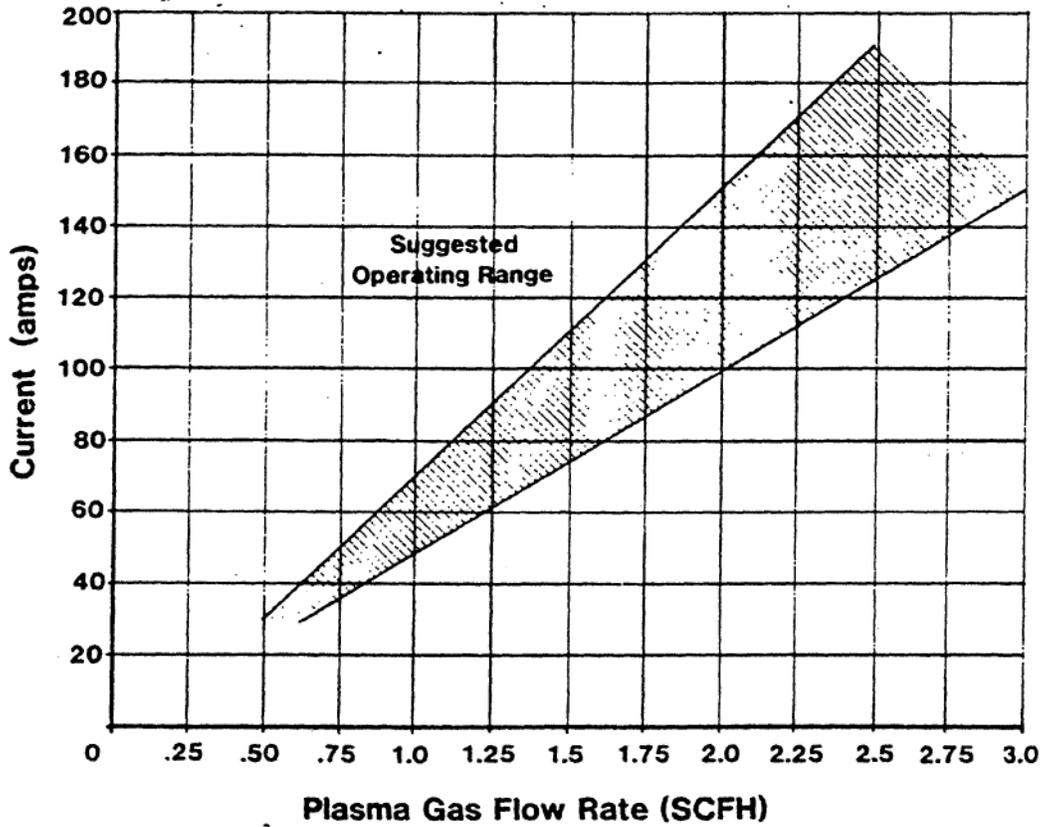
See page 10 for gas selection information.

Keyhole welding - Sanrex P22 Torch



Keyhole welding - Sanrex P30 Torch





NOTE: This information represents our best judgement, but Sanrex assumes no liability for its use. The parameters listed above may be varied to optimize performance.

System Operation

1. Turn the system on.
2. Set the gas supply pressure regulator at 35 psig. Adjust the flow rates as required.
3. Purge for approximately 3 minutes by letting the plasma gas run. This will remove any condensation of moisture that may have accumulated in the torch while it was shut down.

NOTE: Only the plasma gas line needs to be purged.

4. Select the welding mode.
5. Set the current to the selected amperage level.

The torch is now ready for operation.

WARNING: Read and understand the precautions listed in the front of this manual. Be sure the operators are equipped with proper gloves, clothing and eye protection and that proper ventilation is provided.

2.2. HAND TORCH OPERATION

- 1) Pick up the torch and turn on the pilot.

CAUTION: The pilot arc is established at this time. Be careful of the direction the torch tip is pointed in so as not to get burned.

- 2) Lower the welding helmet and position the torch at the beginning of the weld zone. The light from the pilot arc will help to find this position. Hold the torch approximately 3/16 inch from the workpiece and activate the weld control switch. When the welding arc transfers, adjust the torch standoff and amperage until the desired penetration is achieved. Move the torch along the line of weld at a speed to coincide with the weld puddle to achieve the desired weld quality.
- 3) Deactivate the weld control switch.
- 4) Leave the pilot on between welds.
- 5) Shutting the system down – Turn off the pilot, leave the plasma gas purge and the recirculator on to cool down the torch. When cool turn off the system.

2.3. MACHINE TORCH OPERATION

Same start up and shut down procedures as Hand torch operation.

- 1) Locate the torch at the required starting position for the weld. Adjust the height as required.
- 2) Activate control switch.
- 3) Rate of travel of the torch will depend on the material and type of weld. This will have to be determined by the operator.
- 4) After the weld is completed, deactivate the control switch.

Note: Leave pilot on between welds.

SERVICE

The Service Section is divided, into two parts:

- 4.1. Torch Maintenance
- 4.2. Torch Leads

3.1. TORCH MAINTENANCE

WARNING: Check to be sure the main disconnect to the welding system is open before disassembling the torch.

Torch Disassembly and inspection

CAUTION: The electrode cap has an O-ring seal to prevent gas leakage. It is important to observe the following precautions for the O-ring:

- A) Make sure that the groove and the surface that the O-ring will seal against is clean and free of nicks and scratches.
- B) Check to see that the O-ring is not cut or cracked.
- C) Lubricate O-ring with a light coating of O-ring lubricant. This should be used sparingly, just enough to make the O-ring slippery, but not enough to accumulate in the torch.

Disassemble the torch as follows:

- 1) Unscrew the ceramic shield cup (1).

CAUTION: Hold the torch with the tip end up preventing the gas distributor from falling out and breaking.

- 2) Using the wrench (10), unscrew the tip (2).
- 3) Unscrew the electrode cap (9) while still holding torch tip end up. Slowly lower the cap until the collet (7), and the electrode (8) can be grasped with fingers. The gas distributor (3) will come out with the electrode and collet.

TORCH ASSEMBLY

WARNING: Primary power to the welding system must be disconnected before assembling the torch.

- 1) Insert the electrode (8) in the collet (7) and then this assembly into the rear of the torch head (5). Hold in place with finger.
- 2) Turn the torch upside down and slide the gas distributor (3), (end with holes in last), into the torch.

CAUTION: Care must be taken to ensure that the gas distributor (3) is installed in the correct direction.

- 3) Screw the electrode cap (9) on firmly then back off a couple of turns so that the electrode (8) can be adjusted.

- 4) Select the proper gauge on the gauge and wrench (10) assembly. The electrode (8) must contact the gauge to be properly adjusted (Fig. 4-B). Insert the gauge into the front of the torch and press until the shoulder of the gauge contacts the torch anode (Step 2, Fig. 4-B). Tighten the electrode cap (9) securely while holding pressure against the gauge.
- 5) install the welding tip (2) and tighten gently with the tip 'wrench (10).
- 6) Stretch the gasket (4) over the front end of the torch and position against the torch body.
- 7) Screw on shield cup (1).

The torch is now assembled and ready to be checked for possible leakage before operating. Turn on the torch coolant recirculator and observe the tip and orifice of the torch for possible sign of moisture.

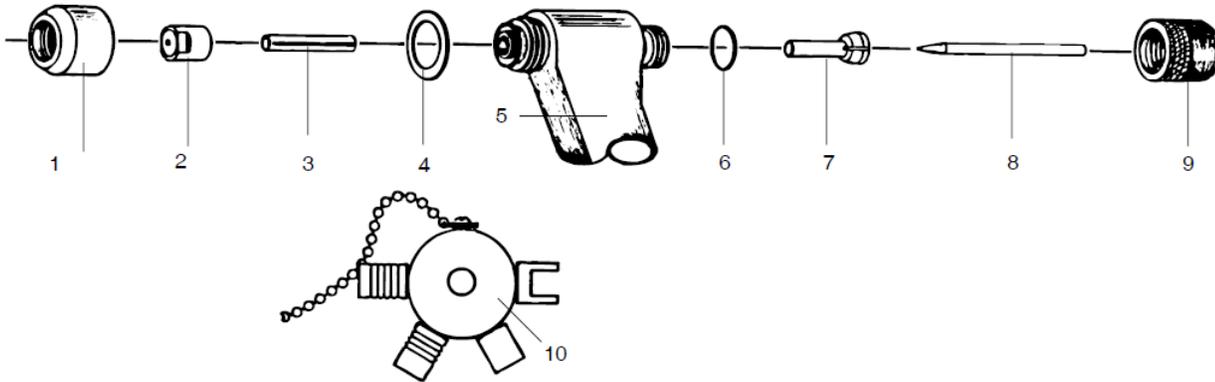


Figure 4A
P75 Shown – Similar for the other torches.

Turn on the plasma gas and watch the gas stream for possible signs of moisture In the stream before operating. Do not attempt to operate the torch until the source of the moisture has been identified and corrected.

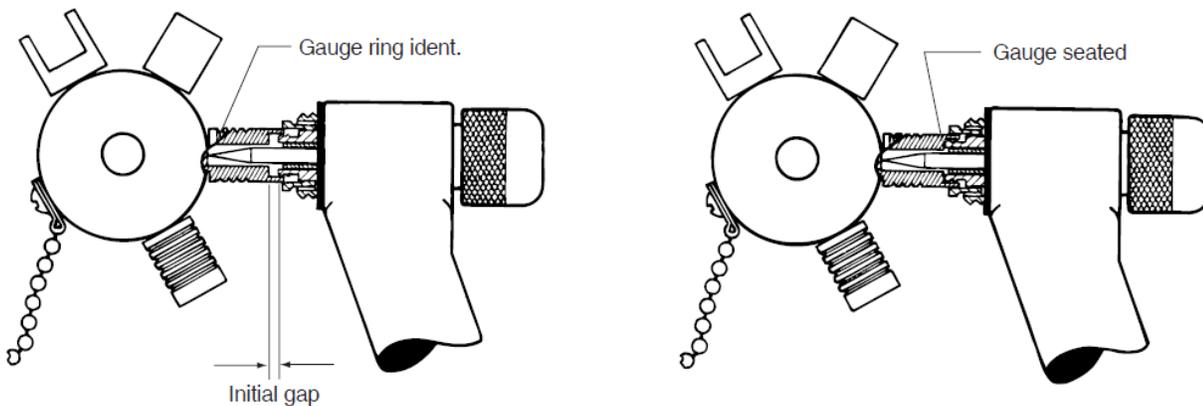


Figure 4B Gauging Electrode

3.2. TORCH LEADS REPLACEMENT

Hand Torch

- 1) Cut off the shrink-on tubing that is on the end of the handle and leads sleeving.

- 2) Unscrew the handle from the torch.
- 3) Disconnect the four hoses from the torch.
- 4) Remove the handle from the old leads and insert on new leads.
- 5) Connect the new leads to the torch making sure the color-coded leads mate with their color-coded torch fittings. Do not overtighten.
- 6) Screw the handle back onto the torch.
- 7) Slide the new shrink-on tubing over the handle until 1 /2 of it is on the handle. Shrink the tubing with heat (not flame) until it is firm around the handle and sleeving.

Machine Mounted Torch

- 1) Unscrew the nut holding the positioning tube to the torch assembly. Slide the positioning tube back away from the torch.
- 2) Unscrew the sleeve adaptor from the torch. Slide up the leads until the torch fittings are accessible.
- 3) Disconnect the four hoses from the torch.
- 4) Remove the nut, sleeve adaptor and positioning tube from the old leads and install on the new leads at the torch end in the same order as they were on the old leads.
- 5) Connect the new leads to the torch making sure the color-coded leads mate with their color-coded torch fittings. Do not overtighten.
- 6) Screw the sleeve adaptor back onto the torch.
- 7) Slide the positioning tube over the sleeve adaptor and secure with the nut.

PARTS LIST

4.1. GENERAL ARRANGEMENT

Assembly Parts List

The Assembly Parts List consists of illustrated parts lists of the following:

- Welding Torch
- Torch Assembly
- Torch Leads Assembly

An item number in parentheses indicates the item is located behind the item pointed to. An asterisk beside the item number indicates the part is a main assembly, not a component. Parts listed without item numbers are not illustrated but may be ordered by the catalog number shown.

ORDERING INFORMATION

When ordering replacement parts, order by catalog number and complete description of the part or assembly, as given in the description column of the Assembly Parts List. Address all inquiries to your authorized Sanrex distributor.

RETURNS

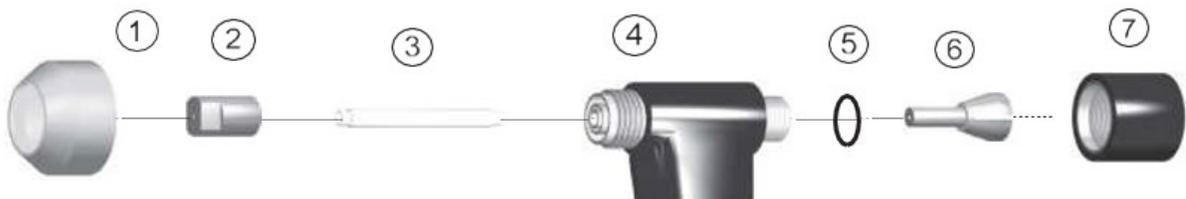
In the event that a Sanrex product must be returned for service, contact your Sanrex distributor. Material returned to Sanrex without proper authorization will not be accepted.

PWH/M P75 Complete Assembly Replacements

Note: PWH = designates a torch with molded handle
PWM = designates torch with rack & pinion

Catalog No. Description

P75-1000	PWH P75 70 DEGREE TORCH & 12.5'LEADS
P75-1001	PWH P75 70 DEGREE TORCH & 25'LEADS
P75-1002	PWH P75 90 DEGREE TORCH & 12.5' LEADS
P75-1003	PWH P75 90 DEGREE TORCH & 25'LEADS
P75-1004	PWH P75 180 DEGREE OFFSETTORCH & 12.5' LEADS
P75-1007	PWH P75 180 DEGREE OFFSET TORCH & 25' LEADS
P75-1005	PWM P75 180 DEGREE OFFSET TORCH & 12.5'LEADS
P75-1006	PWM P75 180 DEGREE OFFSET TORCH & 25'LEADS



Item	Part No.	Ref. No.	Description	Std. Pkg	Item	Part No.	Ref. No.	Description	Std. Pkg.
1.	P75-3001	8-2071	Shield Cup	5		P75-3015	8-2036	Gasket	5
	P75-3000	8-3236	Shield Cup, Ext.	10	4.	P75-2001	8-2027	Torch Head, 70°	1
2.	P75-3002	8-2023	Tip, .046, 35A	10		P75-2002	8-2028	Torch Head, 90°	1
	P75-3003	8-2024	Tip, .062, 55A	10		P75-2003	8-2097	Torch Head, Machine	1
	P75-3004	8-2025	Tip, .081, 75A	10	5.	P75-3016	8-2035	O-Ring	10
	P75-3005	8-2079	Tip, Long, .031	10	6.	P75-3017	8-2039	Collet	1
	P75-3006	8-2080	Tip, Long, .046	10		P75-3018	8-2041	Collet (.040)	1
	P75-3007	8-2082	Tip, Long, .062	10	NS	P75-3011	8-2044	Electrode (.040), Std.	10
	P75-3008	8-2083	Tip, Long, .081	10	NS	P75-3010	8-2006	Electrode, Ext. (.093)	10
3.	P75-3013	8-2040	Gas Distributor	1	7.	P75-3019	8-2032	Back Cap	1
	P75-3014	8-2042	Gas Distributor (.040)	1		P75-3020	8-2030	Back Cap, Extended	1

Hand Torch



Machine Torch



Item	Part No.	Ref. No.	Description	Std. Pkg	Item	Part No.	Ref. No.	Description	Std. Pkg.
1.	P75-2007	8-2026	Handle	1	4.		8-5005	Mounting Tube	1
2.	P30-2005	8-4018	Nut	1	5.	P30-2008	7-2827	Pinion Assembly	1
3.	P75-2010	8-2063	Sleeve	1	NS	P75-2006	8-2021	Wrench/Gauge	1

PWH/M P15 Complete Assembly Replacements

Note: PWH = designates a torch with molded handle
 PWM = designates torch with rack & pinion

Catalog No. Description

P15-1000	PWH P15 70 DEGREE TORCH & 12.5'LEADS
P15-1001	PWH P15 70 DEGREE TORCH & 25'LEADS
P15-1002	PWH P15 90 DEGREE TORCH & 12.5' LEADS
P15-1003	PWH P15 90 DEGREE TORCH & 25'LEADS
P15-1004	PWH P15 180 DEGREE OFFSETTORCH & 12.5' LEADS
P15-1006	PWH P15 180 DEGREE OFFSET TORCH & 25' LEADS
P15-1005	PWM P15 180 DEGREE OFFSET TORCH & 12.5'LEADS
P15-1007	PWM P15 180 DEGREE OFFSET TORCH & 25'LEADS

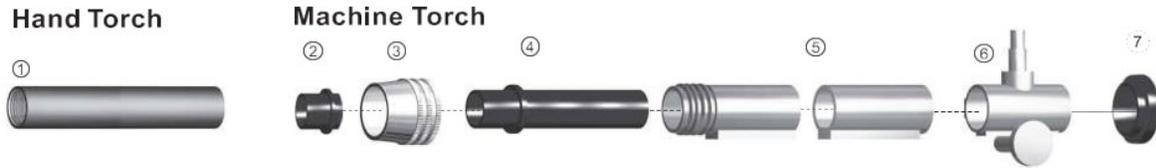


P15 Consumables

Item	Part No.	Ref. No.	Description	Std. Pkg.	Item	Part No.	Ref. No.	Description	Std. Pkg.
1.	P15-3001	8-3040	Shield Cup	1	8.	P15-2003	8-3032	Torch Head 80° offset	1
	P15-3000	8-3038	Shield Cup Standard Weight	1		P15-2001	8-3030	Torch Head 70°	1
2.	P15-3003	8-3052	Tip, .014, 10A – Std.	10		P15-2002	8-3031	Torch Head 90°	1
	P15-3005	9-1782	Tip, .031, 30A – Std.	10	9.	P15-3020	8-0527	O-Ring Electrode Cap	10
	P15-3006	9-1783	Tip, .046, 50A – Std.	10	10.	P15-3021	9-1780	Collet	1
	P15-3007	9-1784	Tip, .062, 75A – Std.	10	11.	P15-3022	9-1779	Electrode Cap – Standard	1
	P15-3008	9-1785	Tip, .081, 100A – Std.	10	12.	P15-3023	9-1803	Electrode Cap – Extended	1
	P15-3009	9-1795	Tip, .093, 150A – Std.	10	NS	P15-2010	9-1757	PWH Handle	1
3.	P15-3010	9-1788	Tip Long, .031, 10A – Ext.	10	NS	P15-3026	9-1778	Sleeve	1
	P15-3011	9-1789	Tip Long, .046, 20A – Ext.	10	NS	P30-2005	8-4018	Nut	1
	P15-3012	9-1790	Tip Long, .062, 55A – Ext.	10	NS	P30-2006	9-1901	Adaptor	1
	P15-3013	9-1791	Tip Long, .081, 75A – Ext.	10	NS	P30-2010	8-5005	Positioning Tube	1
	P15-3014	9-1811	Tip Long, .093, 85A – Ext.	10	NS	P30-2009	8-4204	End Cap	1

4.	P15-3017	9-2240	Gas Distributor Insulating Sleeve	1	NS	P15-2006	9-1810	Gage/Wrench	1
5.	P15-3024	9-1747	Electrode	1					
6.	P15-3019	8-3059	Gas Diffuser	1					
7.	P15-3018	8-3057	Gasket – Shield Cup	5					

NS – Not shown in the picture.



P15 Common Lead Set Components

Item	Part No.	Ref. No.	Description	Std. Pkg	Item	Part No.	Ref. No.	Description	Std. Pkg.
1.	P15-3027	9-5914	Handle (Use P15-3026 Adapter)	1	6.	P30-2008	7-2827	Pinion Assembly	1
2.	P15-3026	9-1778	Sleeve (Use P15-3027 Handle)	1	7.	P30-2009	8-4204	Bushing	1
3.	P30-2005	8-4018	Nut	1	5.	P30-2010	8-5005	Mounting Tube	1
4.	P30-2006	9-1901	Adapter	1	NS	P15-2006	9-1810	Wrench/ Gage	1

P15 Torch Lead Sets

Item	Part No.	Ref. No.	Description	Std. Pkg	Item	Part No.	Ref. No.	Description	Std. Pkg.
NS	P15-2004	4-2615	Leads 12 1/2'	1	NS	P15-2005	4-2624	Leads 25'	1

PWH/M P22 Complete Assembly Replacements

Note: PWH = designates a torch with molded handle
 PWM = designates torch with rack & pinion

Catalog No. Description

P22-1000	PWH P22 70 DEGREE TORCH & 12.5'LEADS
P22-1001	PWH P22 70 DEGREE TORCH & 25'LEADS
P22-1002	PWH P22 90 DEGREE TORCH &12.5' LEADS
P22-1003	PWH P22 90 DEGREE TORCH & 25'LEADS
P22-1006	PWH P22 180 DEGREE OFFSETTORCH &12.5' LEADS
P22-1007	PWH P22 180 DEGREE OFFSET TORCH & 25' LEADS
P22-1004	PWM P22 180 DEGREE OFFSET TORCH & 12.5'LEADS
P22-1005	PWM P22 180 DEGREE OFFSET TORCH & 25'LEADS
P22-1006	PWH P22 180 DEGREE INLINE TORCH &12.5' LEADS
P22-1007	PWH P22 180 DEGREE INLINE TORCH & 25' LEADS
P22-1008	PWM P22 180 DEGREE INLINE TORCH & 12.5'LEADS
P22-1009	PWM P22 180 DEGREE INLINE TORCH & 25'LEADS



P22 Torch Consumable

Item	Part No.	Ref. No.	Description	Std. Pkg.	Item	Part No.	Ref. No.	Description	Std. Pkg.
1.	N/A	8-4062	Shield Cup	5		P22-2002	8-4015	Torch Head Assembly 90°	1
	P22-3000	8-4064	Shield Cup with Lens	5		P22-2004	8-4054	Torch Head Assembly 180° inline	1
2.	P22-3003	9-1847	Tip, (.062), 100 A - Std.	10	11.	P22-3018	9-1876	Collet	1
	P22-3004	9-1848	Tip, (.093), 125 A - Std.	10	12.	P22-3020	9-1877	Electrode Cap Extended	1
	P22-3005	9-1849	Tip, (.125), 250 A - Std.	10	NS	P22-3012	9-2204	Gas Distributor	1

3.	P22-3006	9-1890	Tip, (.062), 100 A - Ext.	10	NS	P30-2005	8-4018	Nut	1
	P22-3007	9-1891	Tip, (.093), 125 A - Ext.	10	NS	P30-2006	9-1901	Adaptor	1
	P22-3008	9-1892	Tip, (.125), 250 A - Ext.	5	NS	P30-2010	8-5005	Positioning Tube	1
4.	P30-3008	9-1827	Electrode (.187) - Std.	5					
	P22-3010	9-1834	Electrode (.187) - Ext.	5					
5.	P22-3011	8-4011	Liner (without Gas Distributor)	1					
6.	N/A	8-4012	Liner (Gas Distributor included)	1					
7.	P22-2005	8-4024	Collar	1					
8.	P22-3014	8-4040	Shield Gas Diffuser - Threaded	1					
9.	P22-3013	8-4069	Gasket - Shield Cup	5					
10.	P22-2001	8-4014	Torch Head Assembly 70°	1					
	P22-2003	8-4016	Torch Head Assembly 180° offset	1					

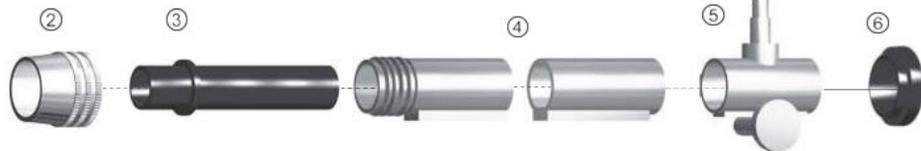
NS – Not shown in the picture.

P22 Common Lead Set Components

Hand Torch



Machine Torch



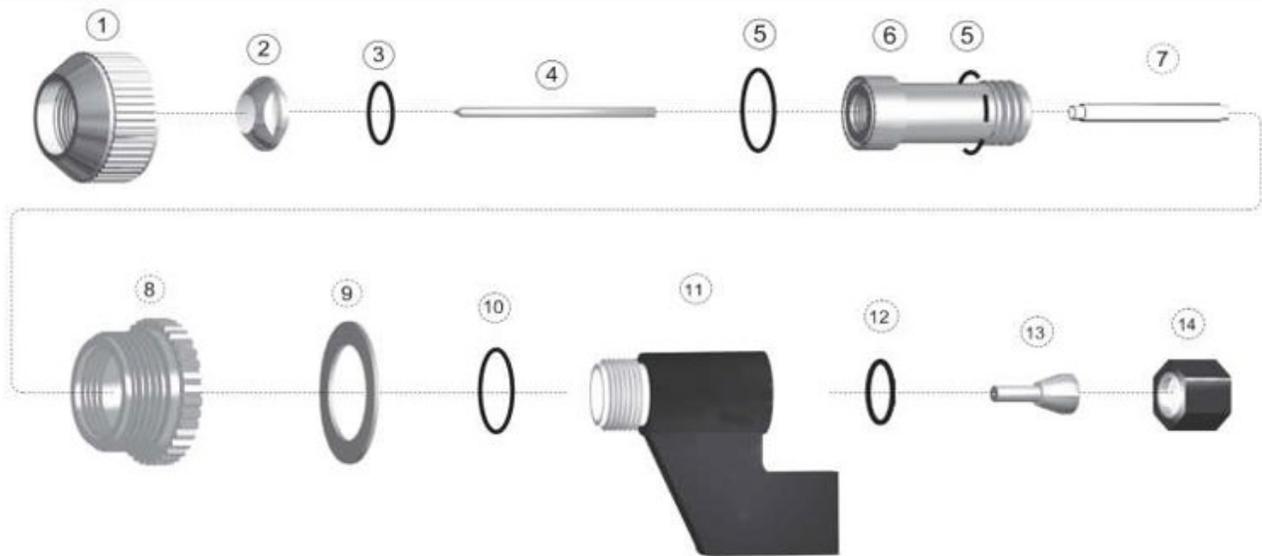
Item	Part No.	Ref. No.	Description	Std. Pkg	Item	Part No.	Ref. No.	Description	Std. Pkg.
1.	P22-2013	9-5914	Handle	1	5.	P30-2008	7-2827	Pinion Assembly	1
2.	P22-2005	8-4018	Nut	1	6.	P30-2009	8-4204	Bushing	1
3.	P30-2006	9-1901	Adapter	1	NS	P22-2006	4-2525	Leads 12.5'	1
4.	P30-2010	8-5005	Mounting Tube	1	NS	P22-2007	4-2544	Leads, 25'	1

PWM P30 Complete Assembly Replacements

Note: PWM = designates torch with rack & pinion

Catalog No. Description

P30-xxxx PWM P30 180 DEGREE OFFSET TORCH & 12.5'LEADS
 P30-xxxx PWM P30 180 DEGREE OFFSET TORCH & 25'LEADS



P30 Consumables

Item	Part No.	Item No.	Description	Std. Pkg.
1	P30-3001	8-4373	End Cap	1
2	P30-3005	8-4370	Tip, 0.093, 200A	5
	P30-3006	8-4371	Tip, 113, 250A	5
	P30-3007	8-4372	Tip, 125, 300A	5
3	P30-3016	9-2863	O-Ring	10
4	P30-3008	9-1827	Electrode	5
5	P30-3017	9-2956	O-Ring	10
6	P30-3009	8-6509	Liner, Includes O-Rings	1
7	P30-3010	8-6651	Insulating Sleeve	1
8	P30-3012	8-6652	Shield Cup Diffuser	1
9	P30-3011	8-6512	Gasket	5
10	P30-3018	8-0531	O-Ring	10
11	P30-2001	8-6649	Torch Body	1
12	P30-3013	8-0534	O-Ring	10
13	P30-3014	8-6650	Collet	1
14	P30-3015	8-6654	Electrode Cap	1

P30 Lead Set Components



Item	Part No.	Ref. No.	Description	Std. Pkg.
1	P30-2005	8-4018	Nut	1
2	P30-2006	9-1901	Adapter	1
3	P30-2010	8-5005	Mounting Tube	1
4	P30-2008	7-2827	Pinion Assembly	1
5	P30-2009	8-4204	Bushing	1
NS	P30-2002	4-2525	Torch Leads 12.5ft.	1
NS	P30-2003	4-2544	Torch Leads 25ft.	1
NS	P30-2011	8-6517	Wrench	1