General Technical

Hose Assembly Instructions

Hose Selection, Installation & Maintenance

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Parker

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Hose Assembly Tutorial

Crimping

- **Steps for crimping** are clearly marked with sequences showing product distinctions between products lines.
  - Crimping section, as well as universal preparations, for all hoses appear first. The new, global 56 series fitting assembly instructions are segmented on pages G:13-G:16. Segmented instructions have also been added for the PAGE hose product line on pages G:13-G:16.
  - Field attachable assemblies appear next

.

Twin/Multi-Line Hose

- Review **twin/multi-line hose separation,** pg. G-39 if applicable – this will give you information before proceeding to the assembly pages – Not following this procedure may cause permanent damage to hoses.

*The PARKRIMP crimping system is the same for all standard Parker portable or bench style crimpers.

Please note: You must become familiar with your own specific crimper to determine its operational features. Please review thoroughly and understand your operator's manual included with your machine. Never use a crimper beyond its recommended published capacities. Crimp specifications can be found in this catalog and online by accessing Crimp Source. *www.parker.com/crimpsource*

Selection of Hose Diameter

From Flow Rate and Velocity

The Fluid Velocity Nomogram gives the velocity of a liquid as a function of flow rate and inside diameter of the fluid line. The commonly recommended maximum velocities for hydraulic oil systems at 200°F or less are indicated for guidance.

Example: At 10 gpm, what is the minimum size within the recommended velocity range for a hydraulic pressure line?

The dashed line drawn from the 10 gpm mark on the left hand line to the maximum velocity of 20 fps intersects the middle line at .438" (7/16" I. D. hose or tubing). For a hose application, use 1/2" I. D., the nearest common standard size.

This chart is based on the following formulas:

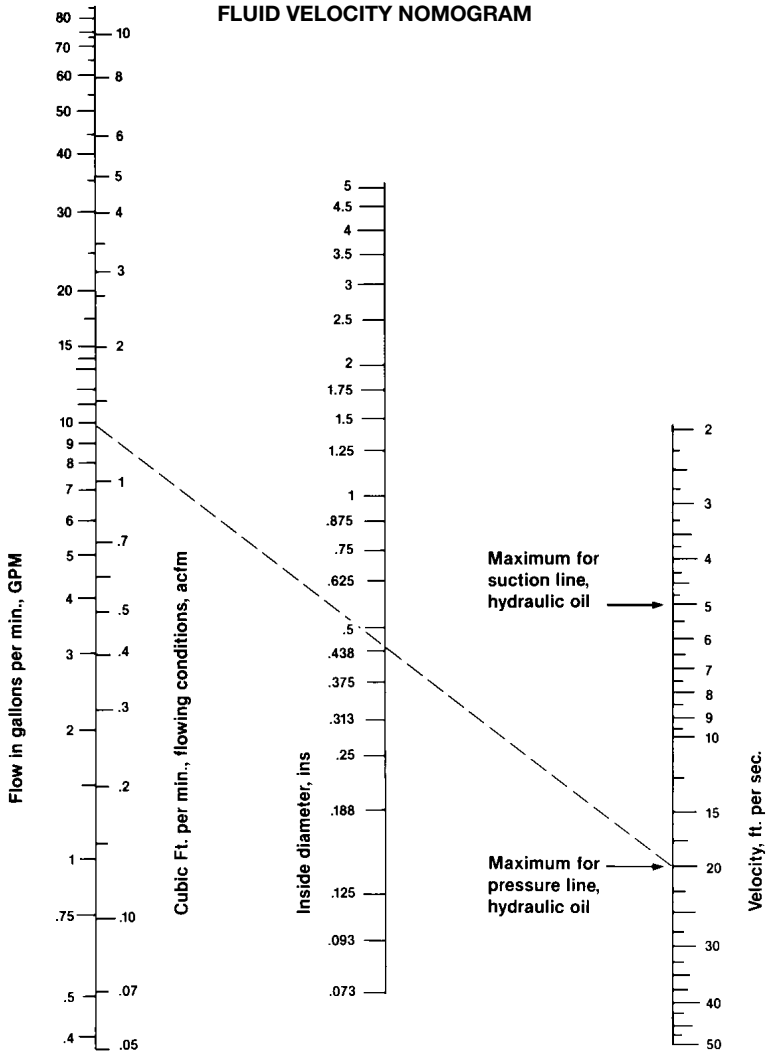
$$v_{fps} = \frac{.321Q}{\frac{\pi d^2}{4}}$$

Q = gal per min
d = hose or tube I. D. (inch)

cu. ft./min. = .1337 Q

The cu. ft. per min. value is the actual volume flow rate under flowing conditions. For air, standard cfm of free air = 7.81 actual cfm when the inlet air is at 100 psig, 68°F.

FLUID VELOCITY NOMOGRAM



For detailed ordering information, please consult price list or contact Parflex® Division.

Calculation of Hose Length

For Over-the-Sheave Applications

The exact cutoff length for an optimum over-the-sheave assembly depends on the particular mechanical arrangement of the machine. A method for finding an approximate starting point is as follows:

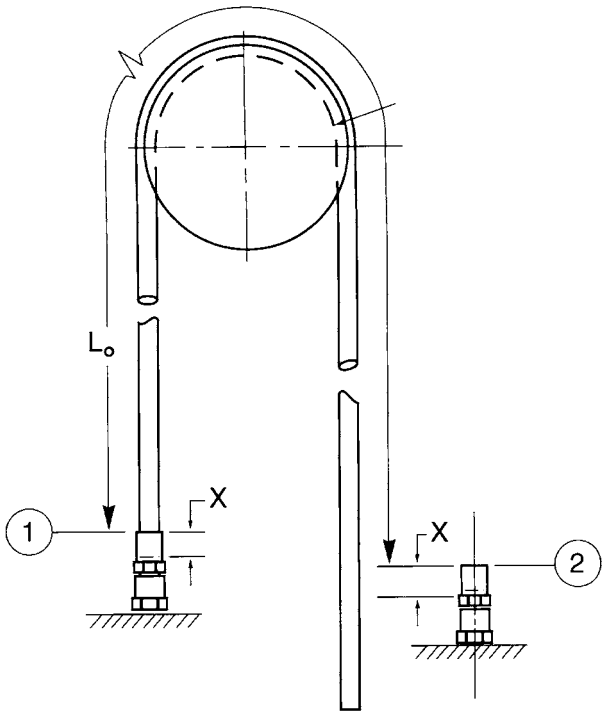
1. Assemble hose with one coupling as shown in diagram.

2. Measure hose length from point 1 to point 2 with hose taut (.985 accounts for 1.56 stretch).
   LO = length

3. Calculation of insert allowance (x) may be found from the coupling dimension tabulations in the fittings section or from direct measurement on the coupling. A 1.5% stretch allowance is provided in this formula.

4. Calculate hose cutoff or free length LF:
   LF = 0.985 LO + 2x
   Where LF includes coupling, insert allowance on both ends.

5. Couple the remaining hose end, check crimp, and assemble on the machine.



For detailed ordering information, please consult price list or contact Parflex® Division.

Volumetric Expansion of Hose

Hydraulic hoses expand under pressure. On some applications, customers can use the differences in expansion between hoses to tune systems for better performance or even noise reduction. Parflex has tested a select list of hoses and determined the rate of expansion in cubic centimeters per foot of hose (cc/ft).

To calculate the volumetric expansion of a hose, substitute the desired pressure into the "X" values in the appropriate equation. For other hoses, please contact the division.

Hose Part Number	Volumetric Expansion at Maximum Working Pressure		Equation for Volumetric Expansion
	(psi)	(cc/ft)	Y=(cc/ft) X=(psi)
510C-3/518C-3	3250	2.33	Y=0.0007X+0.0581
510C-4/518C-4	3000	2.71	Y=0.0009X+0.0059
510C-5/518C-5	2500	3.41	Y=0.0013X+0.1647
510C-6/518C-6	2250	4.32	Y=0.0019X+0.0471
510C-8/518C-8	2250	7.36	Y=0.0032X+0.1637
510C-12/518C-12	1250	8.99	Y = 0.00745x - 0.29910
510C-16/518C-16	1000	15.33	Y = 0.01573x - 0.44928
520N-3/528N-3	5000	1.13	Y = 0.0002x + 0.1621
520N-4/528N-4	5000	2.05	Y = 0.00031x + 0.47589
520N-5/528N-5	4500	2.63	Y = 0.00048x + 0.48415
520N-6/528N-6	4000	2.87	Y = 0.00053x + 0.75151
520N-8/528N-8	3500	3.64	Y = 0.00086x + 0.64994
520N-10/528N-10	2750	4.25	Y = 0.001x + 1.505
53DM-3/538DM-3	3000	1.36	Y = 0.00039x + 0.13035
53DM-4/538DM-4	3000	1.90	Y = 0.00062x + 0.02373
53DM-5/538DM-5	3000	2.78	Y = 0.0009x + 0.0403
53DM-6/538DM-6	3000	3.19	Y = 0.0010x + 0.0647
53DM-8/538DM-8	3000	4.68	Y = 0.0016x + 0.0384
53DM-10/538DM-10	3000	9.82	Y = 0.0033x - 0.2254
540N-2/548N-2	3000	1.11	Y = 0.00036x + 0.04607
540N-3/548N-3	3000	1.75	Y = 0.00057x + 0.03059
540N-4/548N-4	2750	2.33	Y = 0.00079x + 0.14354
540N-5/548N-5	2500	3.46	Y = 0.00124x + 0.31870
540N-6/548N-6	2250	4.06	Y = 0.00174x + 0.15045
540N-8/548N-8	2000	6.05	Y = 0.0030x + 0.0928
540N-12/548N-12	1250	10.26	Y = 0.0081x - 0.2671
560-3	3500	0.575	Y = 0.00017x + 0.00875
560-4	3250	0.757	Y = 0.0002x + 0.1172
560-5	3000	0.729	Y = 0.00021x + 0.09887
560-6	2750	1.33	Y = 0.0004x + 0.1918
560-8	2500	1.98	Y = 0.0007x + 0.2093
560-10	2000	3.04	Y = 0.0012x + 0.5704

Hose Part Number	Volumetric Expansion at Maximum Working Pressure		Equation for Volumetric Expansion
	(psi)	(cc/ft)	Y=(cc/ft) X=(psi)
575X-3	5000	1.69	Y = 0.0003x + 0.2119
575X-4	5000	2.05	Y = 0.0003x + 0.5601
575X-6	5000	2.71	Y = 0.0004x + 0.8412
575X-8	5000	4.59	Y = 0.00064x + 1.41795
575X-12	5000	12.52	Y = 0.00192x + 2.92038
575X-16	5000	16.81	Y = 0.0028x + 2.9560
590-3	5000	0.646	Y = 0.00013x + 0.01692
590-4	5000	0.888	Y = 0.00016x + 0.09821
590-6	4000	1.87	Y = 0.00038x + 0.32317
590-8	3500	2.17	Y = 0.00049x + 0.43765
590-10	3000	3.69	Y = 0.00095x + 0.82449
590-12	2500	4.20	Y = 0.0013x + 0.8216
590-16	2000	6.21	Y = 0.0026x + 1.0558
D604	3000	1.80	Y = 0.00044x + 0.51607
D606	3000	2.00	Y = 0.0006x + 0.2892
D608	3000	2.88	Y = 0.00057x + 1.20744
D610	3000	2.08	Y = 0.00061x + 0.23127
D612	3000	5.53	Y = 0.00142x + 1.21743
D616	3000	7.33	Y = 0.00205x + 1.24905
H604	3000	1.80	Y = 0.00044x + 0.51607
H605	3000	1.35	Y = 0.00036x + 0.26536
H606	3000	2.00	Y = 0.0006x + 0.2892
H608	3000	2.88	Y = 0.00057x + 1.20744
H610	3000	2.08	Y = 0.00061x + 0.23127
H612	3000	5.53	Y = 0.00142x + 1.21743

The actual volumetric expansion achieved is influenced by multiple variables including fluid properties, hose routing and application temperature. The volumetric expansion calculation is only a general guideline and must be verified by actual testing in the end-use application. No performance warranty in design is expressed or implied by this calculation. Parker recommends that the user review and understand all the precautions listed in the Parker Safety Guide for Selecting and Using Hose, Fittings and Accessories, bulletin BUL. 4400-b.1.

Hose Permeation Data (510A)

Permeation Rate at 120°F
(Pound per Linear Hose Foot per Year)

Hose Size	R12	R22	R507	R404A	R502	R134A
-2	-	.28	-	-	.03	-
-3	-	.30	.08	.07	-	-
-4	-	.71	.15	.10	-	-
-6	-	1.11	-	-	.87	-

Permeation Rate at 212°F
(Pound per Linear Hose Foot per Year)

Hose Size	R12	R22	R507	R404A	R502	R134A
-2	-	-	-	-	-	-
-3	-	1.25	-	-	-	-
-4	.08	2.32	-	-	-	.07
-6	-	-	-	-	-	-

Notes:

1. Data is for comparison only. Actual results may vary due to differences in application temperature and pressure.
2. Data is collected in highly controlled tests per UL1963.
3. Parker Safety Guide for Selecting and Using Hose, Tubing, Fittings and Related Accessories, Section 2.6:

Permeation: Permeation (that is, seepage through the Hose) will occur from inside the Hose to outside when Hose is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials as helium, diesel fuel, gasoline, natural gas, or LPG). This permeation may result in high concentrations of vapors which are potentially flammable, explosive, or toxic, and in loss of fluid. Dangerous explosions, fires, and other hazards can result when using the wrong Hose for such applications.

The system designer must take into account the fact that this permeation will take place and must not use Hose if this permeation could be hazardous. The system designer must take into account all legal, government, insurance, or any other special regulations which govern the use of fuels and refrigerants. Never use a Hose even though the fluid compatibility is acceptable without considering the potential hazardous effects that can result from permeation through the Hose Assembly.

Permeation of moisture from outside the Hose to inside the Hose will also occur in Hose assemblies, regardless of internal pressure. If this moisture permeation would have detrimental effects (particularly, but not limited to refrigeration and air conditioning systems), incorporation of sufficient drying capacity in the system or other appropriate system safeguards should be selected and used.

Pressure Rating of Hose End Connections

The maximum dynamic working pressure of the hose assembly is the lesser of the rated working pressure of the hose and the end connections used.

PRESSURE RATINGS HOSE ASSEMBLIES - psi

PRESSURE OF THE HOSE AND THE END CONNECTIONS USED

Hose End Connection Description	Part Number Codes	Inch Size Fittings (psi)													
		-2	-4	-5	-6	-8	-10	-12	-16	-20	-24	-32	-40	-48	-64
Hose End	Part	Inch Size Fittings													
Male Pipe (NPTF)	01	12,000	12,000		10,000	10,000		7,500	6,500	5,000	3,000	2,500			
Female Pipe (NPTF, NPSM)	02 & 07	7,500	7,000		6,000	5,000		4,000	3,000	2,500	2,000	2,000			
Male Pipe (BSP)	91 & D9	5,000	9,000		8,000	6,250		5,000	4,000	3,500	3,000	3,000			
Female Pipe (BSP)	92, B1, B2 & B4	5,000	9,000		8,000	6,250	5,500	5,000	4,000	3,500	3,000	3,000			
Female Pipe (JIS)	FU, GU, MU & UT		5,000		5,000	5,000		4,000	3,000	2,500	1,500	1,500			
O-Ring Swivel and 45° Flare	13, 1L, S2, 0G, 0L, 48, 08, 77 & 79		3,000	3,000	3,000	3,000	2,750	2,250	2,000	1,625	1,250	1,125			
37° Flare and Straight Thread	03, 05, 06, 37, 39, 41, L7 & L9		6,000	6,000	5,000	5,000	5,000	5,000	4,000	3,000	2,500	2,500			
Flare	04														
SAE Flareless	TU & AL		6,000	6,000	5,600	5,600	4,200	4,200	3,500	3,500	3,000	3,000			
SAE Inverted Flare	28, 67 & 69		2,750	2,500	2,250	2,000									
Seal-Lok®* (O-Ring Face Seal)	JM, JC, JS, J0, J1, J5, J7 & J9		6,000		6,000	6,000	6,000	6,000	6,000	4,000	4,000				
Specialty	TU, AL		6,000	6,000	5,600	5,600	4,200	4,200	3,500	3,500	3,000	3,000			

Hose End Connection	Part Number Codes	Metric Fittings (psi)															
		-6	-8	-10	-12	-14	-15	-16	-18	-20	-22	-25	-28	-30	-35	-38	-42
DIN Light "L" without O-Ring	C3, C4, C5 & 1D	3,500	3,500	3,500	3,500		3,500		2,250		2,250		1,400		1,400		1,400
DIN Light "L" with O-Ring	D0, CA, CE & CF	4,500	4,500	4,500	4,500		4,500		2,250		2,250		2,250		2,250		2,250
DIN Heavy "S" without O-Ring	C6, C7, C8 & 3D		9,000	9,000	9,000	9,000		5,750		5,750		5,750		3,500		3,500	
DIN Heavy "S" with O-Ring	C9, 0C, 1C & D2		9,000	9,000	9,000	9,000		6,000		6,000		6,000		6,000		4,500	

NOTE: All the above ratings are based on low carbon steel hose fittings. Higher pressure ratings can be attained with medium carbon and alloy steel hose fittings and mating adapters.

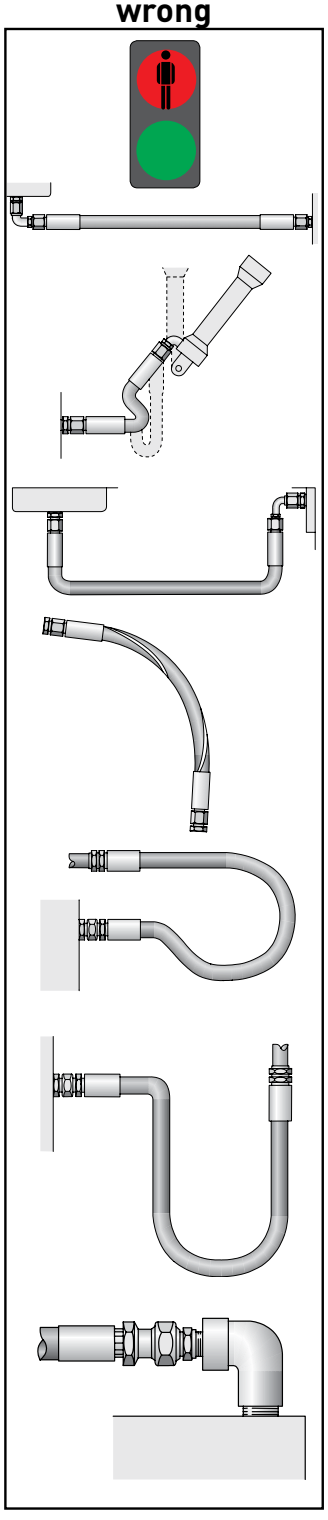
PRESSURE RATING OF HOSE - psi

THE MAXIMUM WORKING PRESSURES OF HOSES ARE LISTED ON PAGE A-10 : A-17 WITH EACH HOSE DESCRIPTION IN SECTION A.

Selection, Installation & Maintenance

Recommended Practices for Hydraulic Hose Assemblies

wrong



The routing of the hose assembly and the environment in which the hose assembly operates directly influence the service life of the hose assembly. The following diagrams indicate the correct routing of hose assemblies that will maximize its service life and assure a safe working functionality.

When hose installation is straight, there must be enough slack in the hose to allow for changes in length that occur when pressure is applied. When pressurized, hose that is too short may pull loose from its hose fittings or stress the hose fitting connections, causing premature metallic or seal failures.

The hose length must be determined so that the hose assembly has enough slack to allow the system components to move or vibrate without creating tension in the hose.

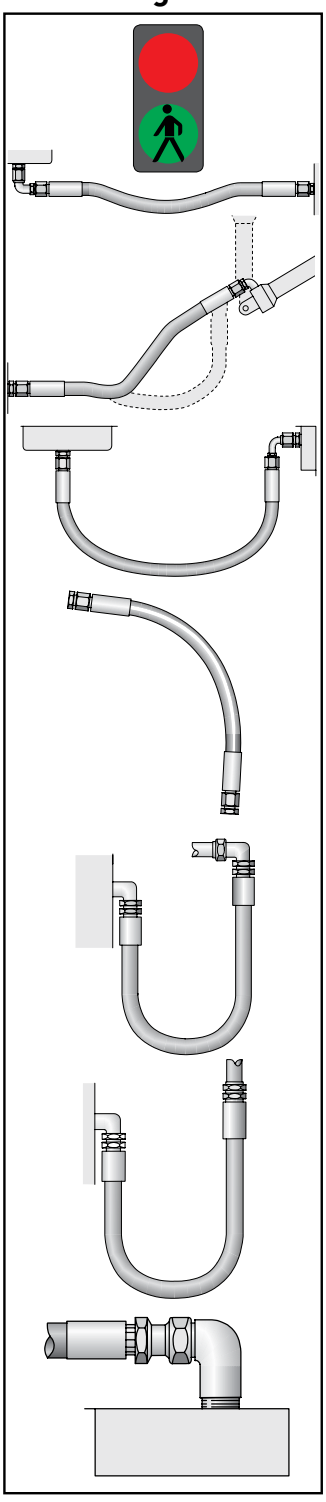
However, do not allow too much slack and therefore introduce the risk of the hose snagging on other equipment or rubbing on other components.

Mechanical straining of the hoses needs to be avoided, so the hose must not be bent below its minimum bend radius or twisted during installation. The minimum bending radii for each hose is stated in the hose tables in the catalogue.

The plane of movement must also be considered and the hose routing selected accordingly.

Hose routing also plays an important role on the selection of the hose fittings, as the correct fittings can avoid straining the hoses, unnecessary hose length or multiple threaded joints.

right



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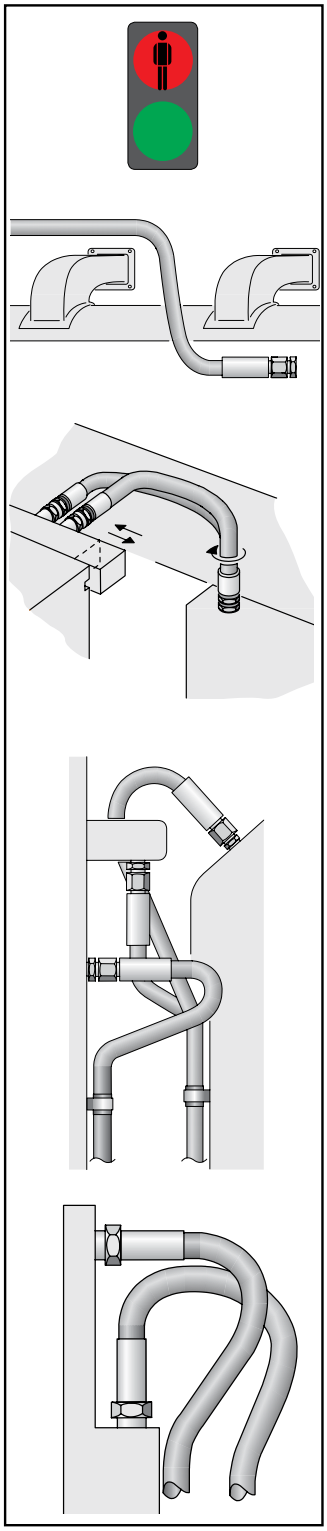


Correct clamping (holding/supporting) of the hose should be exercised to securely route the hose or to avoid the hose contacting surfaces that will cause the hose damage. It is however, vital that the hose be allowed to keep its functionality as a “flexible-pipe” and not be restricted from changing in length when under pressure.

It should also be noted that hoses for high- and low-pressure lines shall not be crossed or clamped together, as the difference in changes in length could wear the hose covers.

Hose should not be bent in more than one plane. If hose follows a compound bend, it shall be coupled into separate segments or clamped into segments that each flex in only one plane.

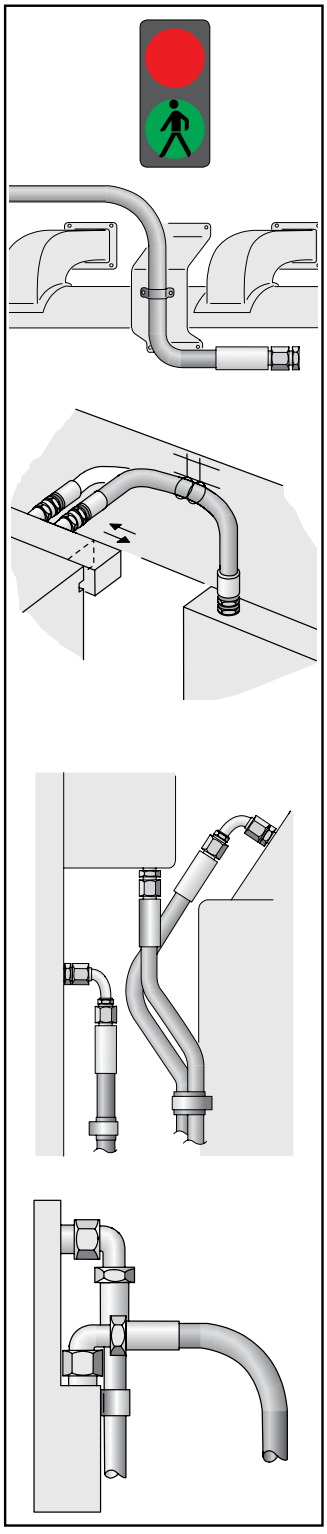
Hoses should be kept away from hot parts as high ambient temperatures shorten hose life.

Protective insulation may need to be used in unusually high ambient temperature areas.

While the importance of the functionality is primary, the aesthetics and practicality of the installation should also be considered in the design.

Maintenance might be necessary at some point in the future, so prohibitive design routings should be avoided.

right



Selection, Installation & Maintenance (cont.)

Recommended Practices for Hydraulic Hose Assemblies

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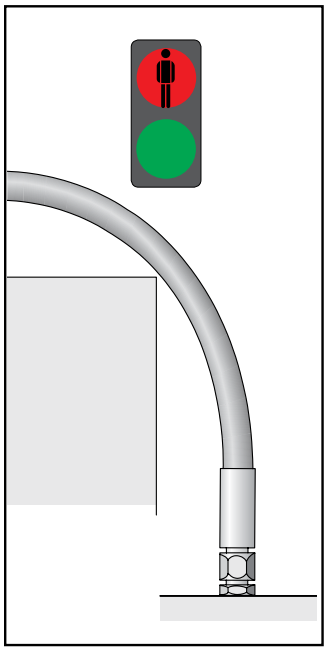
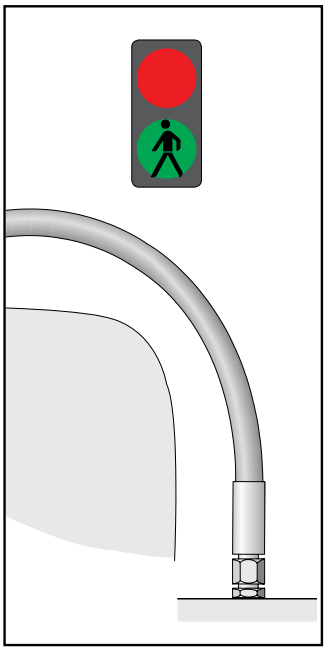


Abrasive influences

In general care should be taken so that the hose is not exposed to direct surface contact that will cause abrasive wearing of the outer cover (either hose to object or hose to hose contact). If however, the application is such that this cannot be avoided, either a hose with a higher abrasion resistant hose cover or a protective sleeve need to be used.

right



Hose Assembly and Crimping

How To Use Crimpsource

1

Data

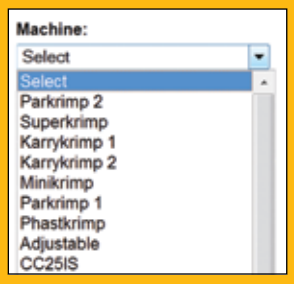
The most **up-to-date** information for crimping is located at www.parker.com/crimpsource. Not only is it accurate, but it is easy.

NOTE: If the hose does not come up, then you cannot crimp that hose on the machine you selected.

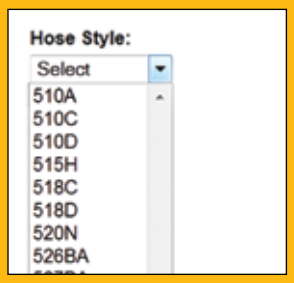
If the fitting you choose doesn't come up, then that series is not available for that hose. Same with size.

2

Make your Selections



Choose the correct machine.

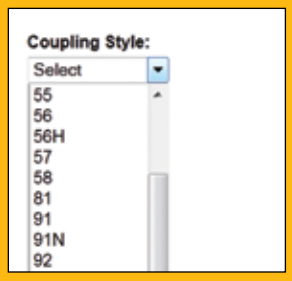


Choose the hose you are crimping.

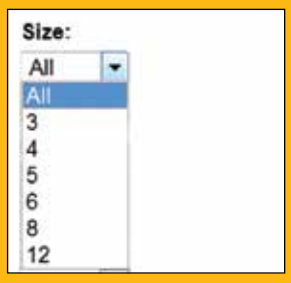
Note If the hose does not come up, then the crimper chosen does not work with the selected hose.

3

Make your Selections



Choose the fitting style.



Choose the fittings size. Once you have selected values from each field, hit the search button.

Note If the chosen fitting/size doesn't come up, the series/size is not available for that hose.

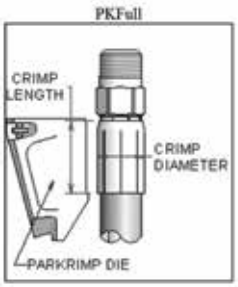
4

Review The Results

Home Print

Hose Style:	Coupling Style:	Crimper:	Hose Description
540N	56	Minikrimp	Meets or exceeds SAE 100R7

Size	Die		Die Ring	Crimp Diameter	Crimp Length	Hose Insertion	Drawing
Parker Parflex Crimp Dies							
-8	80C-P08		82C-R01	0.850	FULL	1-1/8	PKFull



Comments
PFD: Crimp diameter is measured four places, 45 degrees apart, at the top, then middle and bottom of the crimp.
PFD: Crimp diameter tolerance on all Parkrimp Crimpers is ± 0.010" (± 0.25mm) unless otherwise specified. Crimp length tolerance is ± 0.030" (± 0.76mm).
PFD: Align measurement caliper or micrometer on the center of crimp impressions avoiding the crimp ribs.
PFD: Crimp diameter tolerance on all Adjustable Crimpers is ± 0.005" (± 0.13mm). Crimp length tolerance is ± 0.030" (± 0.76mm).
PFD: Reference Parker Fluid Connector Group (FCG) Safety Bulletin 4400-B.1 (www.parker.com/safety)

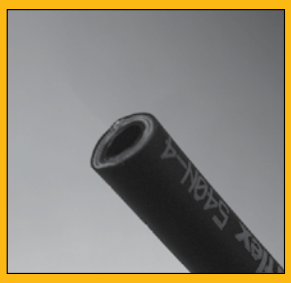
For detailed ordering information, please consult price list or contact Parflex® Division.

Hose Assembly and Crimping

Permanent Crimp Series 56

CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1 Inspection



Hose – Visually inspect both ends of hose for square cut. Remove any burrs, loose fibers or wires.

Fittings – Verify fitting series corresponds to the selected hose. Visually inspect fitting(s) for a through-hole, threads and damage.

2 Assembly Prep

Insertion Depth – Shown is a 56 series fitting. Using Parflex Depth Insertion Block (part# TH9-1-56), mark the hose with the proper insertion depth line. On some fittings such as 55 Series, this depth is represented by a dashed or knurled line on the crimp shell.

Lubrication (as required) – Using an SAE 20 weight lubricating oil, lightly lubricate inside of hose end.

Warning

Do not use lubricating oil when installing fittings on hose used in oxygen service. When installing fittings on hose used in oxygen service, lubricate with a non-oil based soap solution. Failure to do so may result in an explosion and personal injury when hose is used.

3 Assembly

Assemble hose – Push hose into fitting all the way to depth insertion mark. (If fitting does not readily slide onto hose, perform the next step.)

Using Parker VBS or VBL (vise blocks) and a rubber mallet, tap fitting onto hose until bottom of fitting shell is aligned with depth insertion mark.

For detailed ordering information, please consult price list or contact Parflex® Division.

Hose Assembly and Crimping

Permanent Crimp Series 56 (cont.)

4

Die Selection

Select proper Parkrimp die set. (Reference Crimp Die Selection on Crimpsource online at www.parker.com/crimpsource)

5

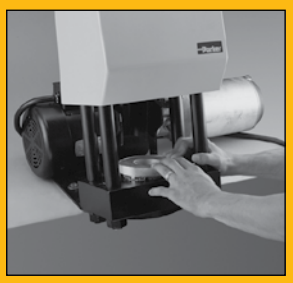
Lubricate Bowl

Grease frequently using a premium, quality, lithium-base grease. Apply a thin layer of grease on bowl of crimper base plate.

6

Die & Spacer Ring

Crimp Die – Place die set into bowl.



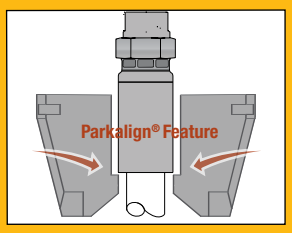
Die Ring – Place applicable die ring on top of die. Position ring so it is centered on die.

(Reference Crimp Die Selection on Crimpsource online at www.parker.com/crimpsource)

7

Crimp

Assemble hose – Insert hose and fitting from bottom of crimper and up through die set. Position fitting so bottom of fitting skirt rests on die step (PARKALIGN® feature).



While holding hose and fitting in position on die step, crimp fitting onto hose until die ring contacts base plate.

Warning

Keep fingers and hands away from die-pusher area. Failure to do so may result in personal injury.

Note

Pump on crimper must not exceed the rated pressure of the crimper being used. Parker Hannifin will not accept responsibility for the operation of or provide warranty coverage for a crimper that is operated by a power unit other than equipment supplied by Parker Hannifin for the express purpose of operating the crimper.

Hose Assembly and Crimping

Permanent Crimp Series 56 (cont.)

8

Measure & Inspect

Measure and verify hose assembly length.

Inspect insertion depth mark at fitting ends. Insertion mark must be visible but not exceed 1/8" from end of crimped fitting shell.

Measure crimp diameter of each fitting at top, middle and bottom of shell. Take measurements at a minimum of three places around shell circumference. Verify crimp diameter is within tolerances.

(Reference Crimp Die Selection on Crimpsource online at www.parker.com/crimpsource)

MiniKrimp™ Fitting Assembly Procedures

Permanent Crimp Series 56

CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1 Inspection

Hose – Visually inspect both ends of hose for square cut. Remove any burrs, loose fibers or wires.

Fittings – Verify fitting series corresponds to the selected hose. Visually inspect fitting(s) for a through-hole, threads and damage.

2 Assembly Prep

Insertion Depth – Shown is a 56 series fitting. Using Parflex Depth Insertion Block (part# TH9-1-56), mark the hose with the proper insertion depth line. On some fittings such as 55 Series, this depth is represented by a dashed or knurled line on the crimp shell.

Lubrication (as required) – Using an SAE 20 weight lubricating oil, lightly lubricate inside of hose end.

Warning

Do not use lubricating oil when installing fittings on hose used in oxygen service. When installing fittings on hose used in oxygen service lubricate with a non-oil based soap solution. Failure to do so may result in an explosion and personal injury when hose is used.

3 Assembly

Assemble hose – Push hose into fitting all the way to depth insertion mark. (If fitting does not readily slide onto hose, perform the next step.)

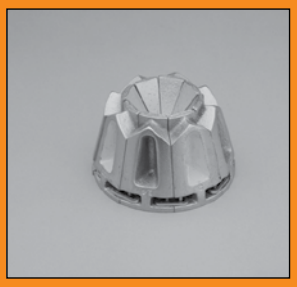
Using Parker VBS or VBL (vise blocks) and a rubber mallet, tap fitting onto hose until bottom of fitting shell is aligned with depth insertion mark.

MiniKrimp™ Fitting Assembly Procedures

Permanent Crimp Series 56 (cont.)

4

Die Selection



Select proper Parkrimp die set. (Reference Crimp Die Selection on Crimpsource online at www.parker.com/crimpsource)

5

Lubricate Bowl

Remove pusher from shoulder bolt.

Using a premium, quality, lithium-base grease, apply a thin layer of grease on bowl of crimper base plate.

6

Die & Spacer Ring

Crimp Die – Place die set into bowl.

Die Ring – Place applicable die ring on top of die. Position ring so it is centered on die.

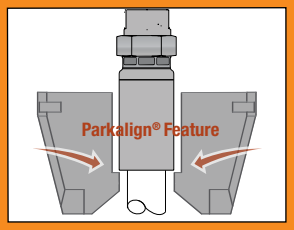
(Reference Crimp Die Selection on Crimpsource online at www.parker.com/crimpsource)

Replace pusher onto shoulder bolt.

7

Crimp

Assemble hose – Insert hose and fitting from bottom of crimper and up through die set. Position fitting so bottom of fitting skirt rests on die step (PARKALIGN® feature).



While holding hose and fitting in position on die step, crimp fitting onto hose until die ring contacts base plate.

Warning

Keep fingers and hands away from die-pusher area. Failure to do so may result in personal injury.

Note

Parker Hannifin will not accept responsibility for the operation of or provide warranty coverage for a crimper that is operated by a power unit other than equipment supplied by Parker Hannifin for the express purpose of operating the crimper.

MiniKrimp™ Fitting Assembly Procedures

Permanent Crimp Series 56 (cont.)

8

Measure & Inspect

Measure and verify hose assembly length.

Inspect insertion depth mark at fitting ends. Insertion mark must be visible but not exceed 1/8" from end of crimped fitting shell.

Measure crimp diameter of each fitting at top, middle and bottom of shell. Take measurements at a minimum of three places around shell circumference. Verify crimp diameter is within tolerances.

(Reference Crimp Die Selection on Crimpsource online at www.parker.com/crimpsource)

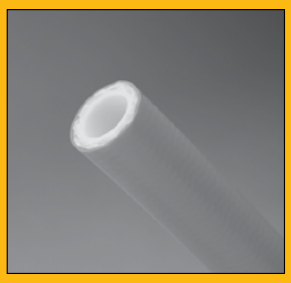
Hose Assembly and Crimping

Permanent Crimp

Series 54, 55, 58, 58H, 92, CY, HY, LV, MS, SF

CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1 Inspection



Hose – Visually inspect both ends of hose for square cut. Remove any burrs, loose fibers or wires.

Fittings – Verify fitting series corresponds to the selected hose. Visually inspect fitting(s) for a through-hole, threads and damage.

2 Assembly Prep

Insertion Depth – Shown is a 55 series fitting. See Hose Fitting Insertion Values, pg. G-43 for insertion depths of fitting series that do not incorporate an insertion depth. Mark hose end with proper insertion depth line.

Lubrication (as required) – Using an SAE 20 weight lubricating oil, lightly lubricate inside of hose end.

Warning

Do not use lubricating oil when installing fittings on hose used in oxygen service. When installing fittings on hose used in oxygen service, lubricate with a non-oil based soap solution. Failure to do so may result in an explosion and personal injury when hose is used.

3 Assembly

Assemble hose – Push hose into fitting all the way to depth insertion mark. (If fitting does not readily slide onto hose, perform the next step.)

Using Parker VBS or VBL (vise blocks) and a rubber mallet, tap fitting onto hose until bottom of fitting shell is aligned with depth insertion mark.

For detailed ordering information, please consult price list or contact Parflex® Division.

Hose Assembly and Crimping

Permanent Crimp (cont.)

Series 43, 54, 55, 58, 58H, 92, CY, HY, LV, MS, SF

4

Die Selection

Select proper Parkrimp die set. (Reference Crimp Die Selection Charts - pg. G-13 or Crimpsource online at www.parker.com/crimpsource)

5

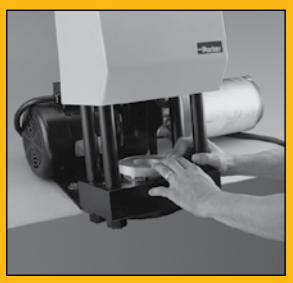
Lubricate Bowl

Grease frequently using a premium, quality, lithium-base grease. Apply a thin layer of grease on bowl of crimper base plate.

6

Die & Spacer Ring

Crimp Die – Place die set into bowl.



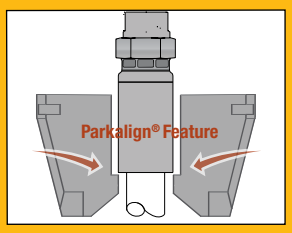
Die Ring – Place applicable die ring on top of die. Position ring so it is centered on die.

(Reference Crimp Die Selection Charts - pg. G-13 or Crimpsource online at www.parker.com/crimpsource)

7

Crimp

Assemble hose – Insert hose and fitting from bottom of crimper and up through die set. Position fitting so bottom of fitting skirt rests on die step (PARKALIGN® feature).



While holding hose and fitting in position on die step, crimp fitting onto hose until die ring contacts base plate.

Warning

Keep fingers and hands away from die-pusher area. Failure to do so may result in personal injury.

Note

Pump on crimper must not exceed the rated pressure of the crimper being used. Parker Hannifin will not accept responsibility for the operation of or provide warranty coverage for a crimper that is operated by a power unit other than equipment supplied by Parker Hannifin for the express purpose of operating the crimper.

Hose Assembly and Crimping

Permanent Crimp (cont.)

Series 54, 55, 58, 58H, 92, CY, HY, LV, MS, SF

8

Measure & Inspect

Measure and verify hose assembly length.

Inspect insertion depth mark at fitting ends. Insertion mark must be visible but not exceed 1/8" from end of crimped fitting shell.

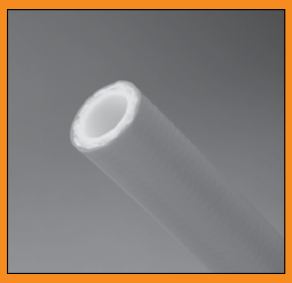
Measure crimp diameter of each fitting at top, middle and bottom of shell. Take measurements at a minimum of three places around shell circumference. Verify crimp diameter is within tolerances.

(Reference Crimp Die Selection Charts - pg. G-13 or Crimpsource online at www.parker.com/crimpsource)

MiniKrimp™ Fitting Assembly Procedures

CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1 Inspection



Hose – Visually inspect both ends of hose for square cut. Remove any burrs, loose fibers or wires.

Fittings – Verify fitting series corresponds to the selected hose. Visually inspect fitting(s) for a through-hole, threads and damage.

2 Assembly Prep

Insertion Depth – Mark hose end with proper insertion depth line. See Hose Fitting Insertion Values, pg. G-43 for insertion depths of fitting series that do not incorporate an insertion depth.

Lubrication (as required) – Using an SAE 20 weight lubricating oil, lightly lubricate inside of hose end.

Warning

Do not use lubricating oil when installing fittings on hose used in oxygen service. When installing fittings on hose used in oxygen service lubricate with a non-oil based soap solution. Failure to do so may result in an explosion and personal injury when hose is used.

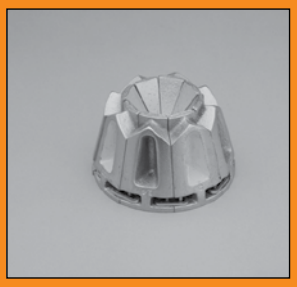
3 Assembly

Assemble hose – Push hose into fitting all the way to depth insertion mark. (If fitting does not readily slide onto hose, perform the next step.)

Using Parker VBS or VBL (vise blocks) and a rubber mallet, tap fitting onto hose until bottom of fitting shell is aligned with depth insertion mark.

MiniKrimp™ Fitting Assembly Procedures
(cont.)

4
Die Selection



Select proper Parkrimp die set. (Reference Crimp Die Selection Charts - pg. G-13 or Crimpsource online at www.parker.com/crimpsource)

5
Lubricate Bowl

Remove pusher from shoulder bolt.

Using a premium, quality, lithium-base grease, apply a thin layer of grease on bowl of crimper base plate.

6
Die & Spacer Ring

Crimp Die – Place die set into bowl.

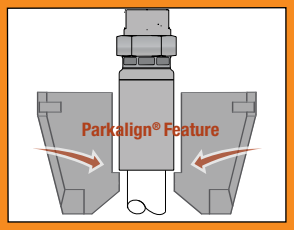
Die Ring – Place applicable die ring on top of die. Position ring so it is centered on die.

(Reference Crimp Die Selection Charts - pg. G-13 or Crimpsource online at www.parker.com/crimpsource)

Replace pusher onto shoulder bolt.

7
Crimp

Assemble hose – Insert hose and fitting from bottom of crimper and up through die set. Position fitting so bottom of fitting skirt rests on die step (PARKALIGN® feature).



While holding hose and fitting in position on die step, crimp fitting onto hose until die ring contacts base plate.

Warning

Keep fingers and hands away from die-pusher area. Failure to do so may result in personal injury.

Note

Parker Hannifin will not accept responsibility for the operation of or provide warranty coverage for a crimper that is operated by a power unit other than equipment supplied by Parker Hannifin for the express purpose of operating the crimper.

MiniKrimp™ Fitting Assembly Procedures
(cont.)

8

Measure & Inspect

Measure and verify hose assembly length.

Inspect insertion depth mark at fitting ends. Insertion mark must be visible but not exceed 1/8" from end of crimped fitting shell.

Measure crimp diameter of each fitting at top, middle and bottom of shell. Take measurements at a minimum of three places around shell circumference. Verify crimp diameter is within tolerances.

(Reference Crimp Die Selection Charts - pg. G-13 or Crimpsource online at www.parker.com/crimpsource)

Hose Assembly & Crimping

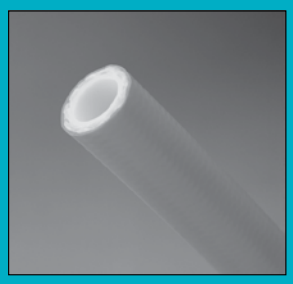
Field Attachable

Series 51, BU & MS (Do not use these fittings on oxygen service lines)

CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1

Inspection



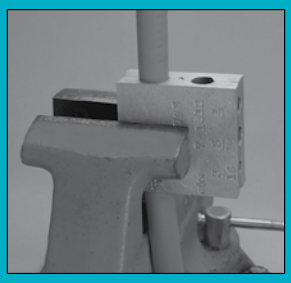
Hose – Visually inspect both ends of hose for square cut. Remove any burrs, loose fibers or wires.

Fittings – Inspect socket for damaged or missing threads. Do not use if conditions exist.

Inspect nipple for a through-hole, damaged or missing threads and improperly crimped nut (if applicable). Do not use if these conditions exist.

2

Assembly



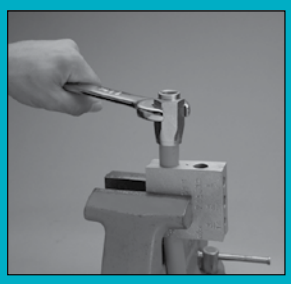
Using the Parker VBS or VBL vise block, place hose in proper hole of the vise block and then clamp in a bench vise. Ensure enough hose extends from the vise block to install socket.

Caution

Ensure hose is installed in correct size hole of vise block. Clamping hose in a smaller hole will crush hose.

3

Assembly



Using a wrench, screw socket onto hose counterclockwise until it bottoms. Ensure end of hose is against inside shoulder. Back off socket 1/4 turn clockwise.

Socket should be firm when tightened but not difficult to turn. If socket is difficult to install, apply lubricant that is compatible with the hose material.

Note

Do not use a lubricant with MS series.

For detailed ordering information, please consult price list or contact Parflex® Division.

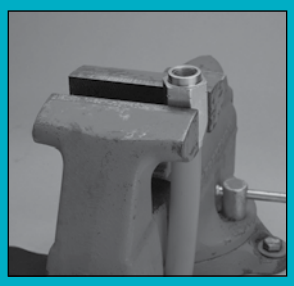
Hose Assembly & Crimping

Field Attachable (cont.)

Series 51, BU & MS (Do not use these fittings on oxygen service lines)

4

Assembly



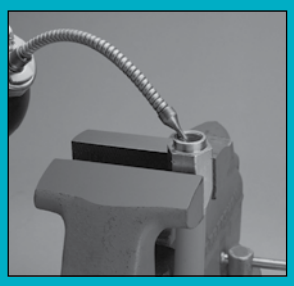
Place hex portion of socket into vise and tighten vise. Ensure socket extends past vise jaws enough to allow for installation of nipple.

Caution

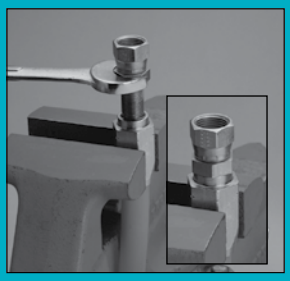
When tightening socket in vise, do not over tighten vise jaws. Over tightening vise jaws will distort internal threads of socket and hamper installation of nipple.

5

Assembly



Using an SAE 20 weight lubricating oil, generously lubricate nipple and socket, threads and hose I.D.



Using a wrench on the nipple hex, screw nipple into socket clockwise until nipple bottoms against socket shoulder.

Caution

Nipple should be firm when tightened but not difficult to turn. If nipple is difficult to install, check hose for proper lubrication. Re-apply lubricating oil as necessary. Installation of nipple without proper lubrication will damage core tube.

6

Inspection

Measure and verify hose assembly length.

Hose Assembly & Crimping

PTFE Permanent Crimp

Series 91, 91N & 93N

CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1

Cut

Using a power hose cutoff saw, cut hose squarely.

Note

PTFE Hose should be taped prior to cutting. Hose should be cut at center point of taped section.

2

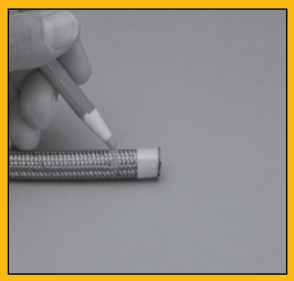
Inspection

Hose – Visually inspect both ends of hose for square cut. Remove any burrs, loose fibers or wires.

Fittings – Verify fitting series corresponds to the selected hose. Visually inspect fitting(s) for a through-hole, threads and damage.

3

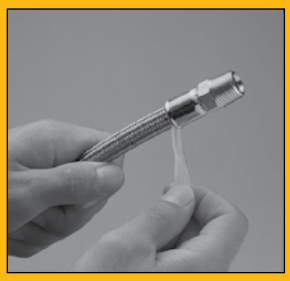
Assembly Prep



Insertion Depth – Mark hose end with proper insertion depth line. See Hose Fitting Insertion Values, pg. G-43 for insertion depths of fitting series that do not incorporate an insertion depth. For jacketed PTFE hoses, use a sharp knife and light pressure to cut back the cover at least the length of the insertion depth of the fitting.

Warning

Do not use lubricating oil when installing fittings on hose used in oxygen service. When installing fittings on hose used in oxygen service, lubricate with a non-oil based soap solution. Failure to do so may result in an explosion and personal injury when hose is used.



Assemble hose – Push fitting onto hose slightly and then remove tape. Continue pushing fitting onto hose until fitting reaches depth insertion mark.

For detailed ordering information, please consult price list or contact Parflex® Division.

Hose Assembly & Crimping

PTFE Permanent Crimp (cont.)

Series 91, 91N & 93N

4

Die Selection

Select proper Parkrimp die set. (Reference Crimp Die Selection Charts - pg. G-13 or Crimp-source online at www.parker.com/crimpsource)

5

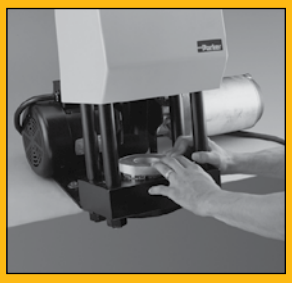
Lubricate Bowl

Using a premium, quality, lithium-base grease, apply a thin layer of grease on bowl of crimper base plate.

6

Die & Spacer Ring

Crimp Die – Place die set into bowl.



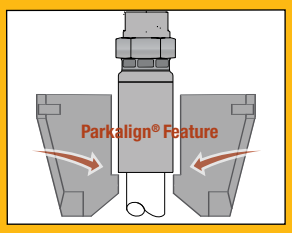
Die Ring – Place applicable die ring on top of die. Position ring so it is centered on die.

(Parflex hoses utilize silver die ring with the exception of HTB hose. Reference Crimp Die Selection Charts - pg. G-13 or Crimpsource online at www.parker.com/crimpsource)

7

Crimp

Assemble hose – Insert hose and fitting from bottom of crimper and up through die set. Position fitting so bottom of fitting skirt rests on die step (PARKALIGN® feature).



While holding hose and fitting in position on die step, crimp fitting onto hose until die ring contacts base plate.

Warning

Keep fingers and hands away from die-pusher area. Failure to do so may result in personal injury.

Note

Pump on crimper must not exceed the rated pressure of the crimper being used. Parker Hannifin will not accept responsibility for the operation of or provide warranty coverage for a crimper that is operated by a power unit other than equipment supplied by Parker Hannifin for the express purpose of operating the crimper.

Hose Assembly & Crimping

PTFE Permanent Crimp (cont.)

Series 91, 91N & 93N

8

Measure & Inspect

Measure and verify hose assembly length.

Inspect insertion depth mark at fitting ends. Insertion mark must be visible but not exceed 1/8" from end of crimped fitting shell.

Measure crimp diameter of each fitting at top, middle and bottom of shell. Take measurements at a minimum of three places around shell circumference. Verify crimp diameter is within tolerances.

(Reference Crimp Die Selection Charts - pg. G-13 or Crimpsource online at www.parker.com/crimpsource)

Hose Assembly & Crimping

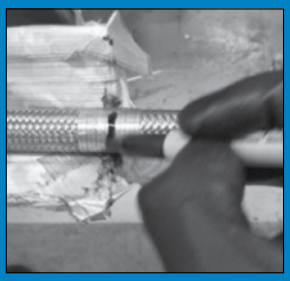
PTFE Crimp

Series PAGE Fittings

CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1

Inspection/Marking



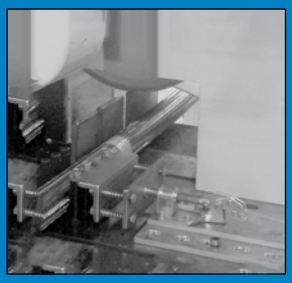
Obtain correct hose, fittings and collars per customer order. Inspect to make certain no defects are present on fittings, collars or hose.

Using 1" wide filament tape, apply 1 to 1½ wraps of tape tightly around hose at location to be cut. Mark tape in the middle where cut will be made. Tape will be left on during crimping so only ½" width of tape should remain.

Fittings – Inspect each component for possible damage. In addition, inspect socket and nipple for a through-hole and threads.

2

Cutting

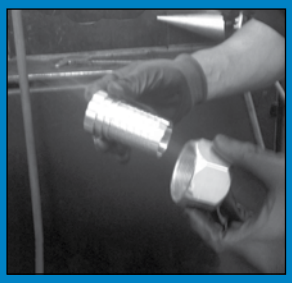


Using a rotary power cutting saw with a smooth toothless blade, cut hose squarely to proper length. Fitting length being used in the assembly shall be taken into account when calculating hose length.

Blow ends of hose off / out to remove any debris left from cutting operation. Cut off wires or fabric extending past the end of hose.

3

Assembly



PAGE series fittings are not one piece but two pieces (insert + collar) and must be properly installed to assure leak free long life assemblies.

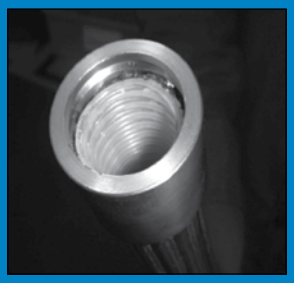
Hose Assembly & Crimping

PTFE Crimp (cont.)

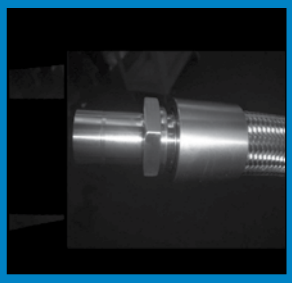
Series PAGE Fittings

4

Assembly

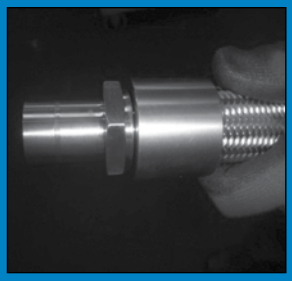


a. Orient and place collar on hose end fully.



b. Using a taper punch, push punch into tube to enlarge bore of hose so insert just slides into hose.

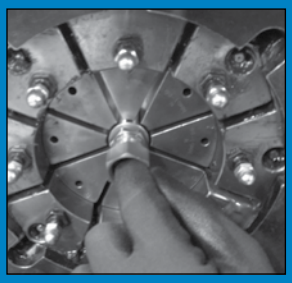
c. Push insert into hose until lock groove of insert is just at end of collar.



d. Pull collar out towards end of insert until at correct crimp position on insert of collar.

5

Assembly



Crimp assembly only in Parker Approved adjustable crimper. Select correct die and crimp spec from Parker Crimp Source.

www.parker.com/crimpsource

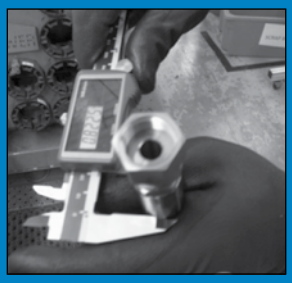
a. Place assembly into crimp dies so full collar length crimp is obtained.

b. Check crimp dimensions in four places around the middle of the crimp circumference. Verify the average of those readings is within crimp specification tolerances. Adjust crimper up or down if needed to obtain proper dimension.

c. Crimp opposite end following the same procedures.

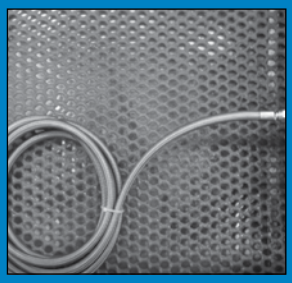
6

Inspect



Inspect assembly, noting the length.

a. Test to correct test pressures to assure no leaks are observed using hydrostatic pressure unit (recommended). Air or nitrogen under water can be used with caution utilizing the proper pressure and procedures for that equipment.



Blow out all water from the assembly and recheck length.

**Note any movement of length and make compensations as needed on next assembly.

Package assembly appropriately for customer requirements.

For detailed ordering information, please consult price list or contact Parflex® Division.

Hose Assembly & Crimping

PTFE Field Attachable

Series 90

CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1

Inspection

Hose – Visually inspect both ends of hose for square cut. Remove any burrs, loose fibers or wires.

Fittings – Inspect each component for possible damage. In addition, inspect socket and nipple for a through-hole and threads.

2

Assembly

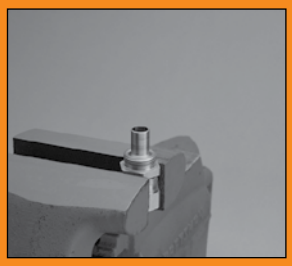
Slide two sockets over end of hose with bottom of sockets back to back. Position sockets at each end of hose.

Note

When installing sockets on hose, check hose ends to determine if wire braid "necks down" (bends inward). If one end "necks down" use this end to slide sockets onto hose.

3

Assembly



Mount nipple hex in vise. Ensure nipple end extends beyond vise jaws sufficiently to allow installation of hose.

Push hose bore onto nipple to size tube and to aid in separating braid before assembling ferrule onto hose.

Once completed, remove hose from nipple.

Hose Assembly & Crimping

PTFE Field Attachable (cont.)

Series 90

4

Assembly

By hand, push sleeve over end of PTFE core tube and under wire braid.

To complete positioning of sleeve, push hose end with sleeve against a solid flat surface.

5

Assembly

Verify tube butts against inside shoulder of ferrule.

Using a tapered punch, push punch into end of sleeve and tube to set sleeve barbs into tube.

6

Assembly

Using SAE 20 weight oil, lubricate nipple and socket threads. For stainless steel fittings use Parker ThreadMate™ or a molybdenum type lubricant.

Warning

Do not use lubricating oil when installing fittings on hose used in oxygen service. When installing fittings on hose used in oxygen service lubricate with a non-oil based soap solution. Failure to do so may result in an explosion and personal injury when hose is used.

Assemble hose – Using a twisting motion, push hose over nipple until hose is seated against nipple chamfer.

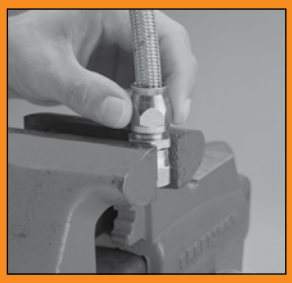
Hose Assembly & Crimping

PTFE Field Attachable (cont.)

Series 90

7

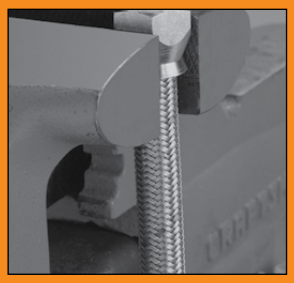
Assembly



Push socket forward and hand-start threading of socket to nipple.

Caution

When tightening socket in vise, do not over tighten vise jaws. Over tightening vise jaws will distort internal threads of socket.



Remove assembly from vise and reposition with socket in vise jaws. Ensure socket extends beyond vise jaws far enough to allow nipple to be completely tightened.

8

Assembly

Wrench tighten nipple hex until clearance between hex and socket hex is 1/32" or less.

Tighten further to align corners of nipple and socket hexes if necessary.

9

Measure & Inspect

Measure and verify hose assembly length.

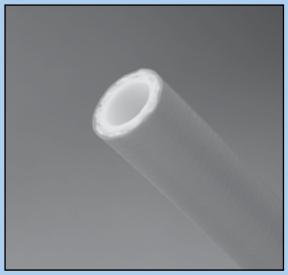
SQ-Swage Instructions

Sewer Hose

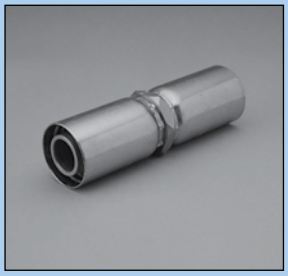
CAUTION: There are several different sections for Hose Assembly and Crimping. Be sure you are in the section that corresponds to the fitting series you are using. **See Table of Contents for listing.**

1

Inspection



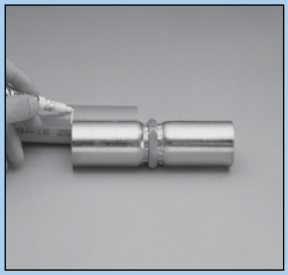
Hose – Visually inspect both ends of hose for square cut. Remove any burrs, loose fibers or wires.



Fittings – Visually inspect fitting for properly crimped shells, internal barbs, a through-hole and damage.

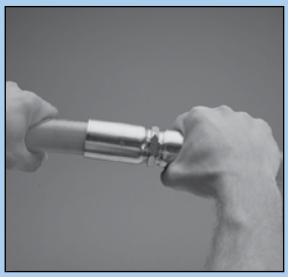
2

Assembly



Insertion Depth – Mark hose end with proper insertion depth line.

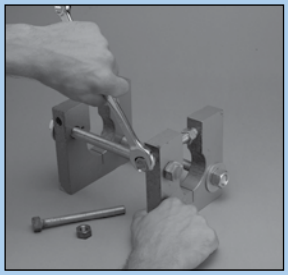
Lubricate – Using an SAE 20 weight oil, lightly lubricate inside of both hose ends.



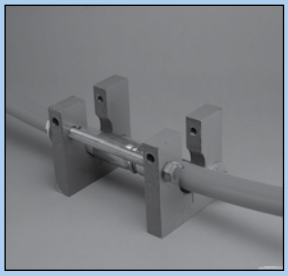
Assemble hose – Push each hose end into fitting to the depth insertion mark.

3

Assembly



Remove both die securing bolts and nuts.

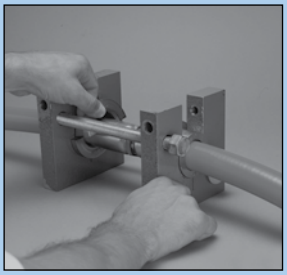


Place hose and fitting assembly into position on swager.

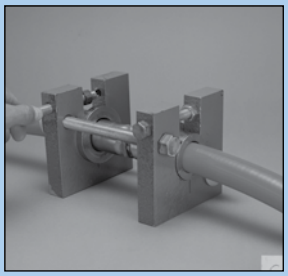
SQ-Swage Instructions (cont.)

4

Assembly



Insert both die halves around hose in each end of swager.



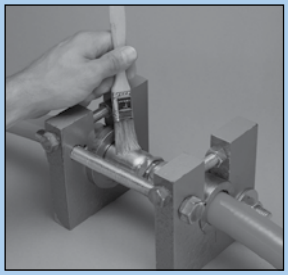
Install both die securing bolts with nuts positioned in opening of swager plates. Tighten die securing bolts 1/4 turn past finger tight.

Caution

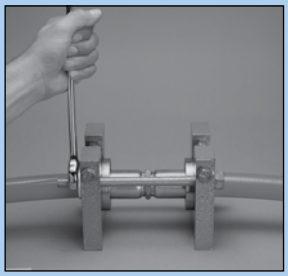
When swaging stainless steel fittings, lubricate through-hole of dies with ThreadMate™. Failure to do so may result in damage to fittings.

5

Assembly



Lubricate – Using an SAE 20 weight oil, lightly lubricate inside of both hose ends.



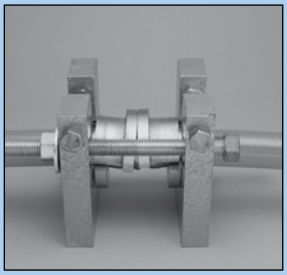
Assemble hose – Align swager plates in parallel and tighten nuts on swaging bolts uniformly until dies touch.

Caution

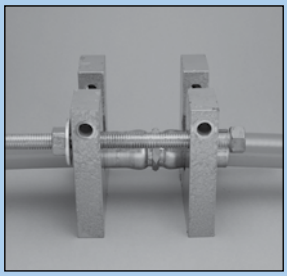
Ensure swager plates remain in parallel when tightening swager bolts. Failure to do so will result in an improperly swaged fitting.

6

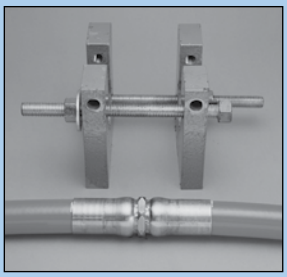
Assembly



Loosen swaging bolts to release pressure on dies.



Remove die securing bolts and nuts. Then remove dies.

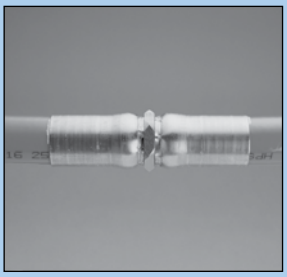


Assemble hose – Remove completed hose assembly.

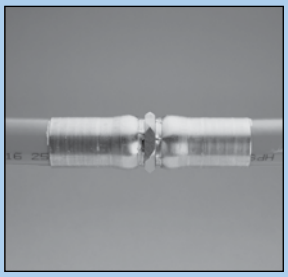
SQ-Swage Instructions (cont.)

7

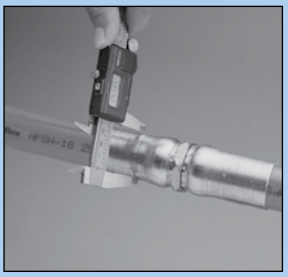
Measure & Inspect



Measure and verify hose assembly length.



Inspect insertion depth mark at fitting ends. Insertion mark must be visible but not exceed 1/8" from end of crimped fitting shell.



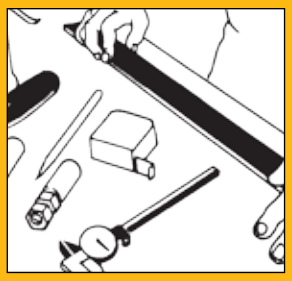
Measure swage diameter of each fitting at top, middle and bottom of shell. Take measurements at a minimum of three places around shell circumference. Verify swage diameter is within tolerances.

(Reference Swage Specification & Tool Selection Chart on pg. G-42 for proper swage diameters.)

Twin/Multi-Line Separation

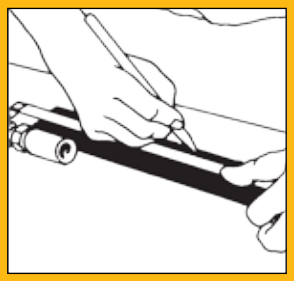
Factory-built assemblies are available using twin/multi-line hoses. When field-built assemblies are preferred, the following steps must be taken.

1



Set-Up – Position twinned or multi-line hose assembly so that it lies flat on work surface without tendency to twist or turn.

2



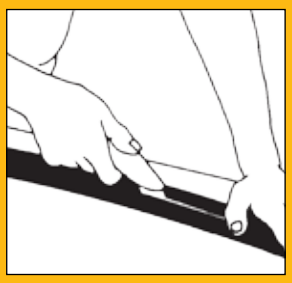
Measure hose to length – Measure and mark the length that the hoses are to be separated (commonly referred to as Split-back Length).

3

Lubricate – Lightly lubricate the web area between the hoses. Distribute the lubricant uniformly along the web of the assembly to be separated. Any lightweight oil will suffice (SAE 10 or 20). The function of the oil is to reduce the friction of the knife blade so that it naturally seeks the center of the valley formed by the hoses. This eliminates the need for the operator to steer the knife.

Twin/Multi-Line Separation (cont.)

4

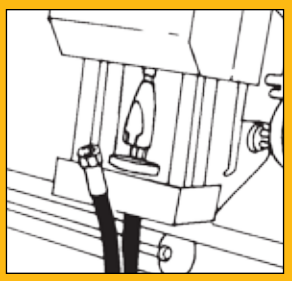


Cut Hose to Length – Press the multi-line hose assembly firmly and flat against the work surface with your free hand so that it does not move. Using a sharp utility knife, carefully draw the knife toward you with constant light to moderate pressure, and a smooth stroke. Multiple strokes will be necessary to separate the hoses.

Note

It is important that the knife blade be perpendicular to the hose during this procedure so that the blade cuts only the center line of the web. Extreme care must be taken to avoid cutting through the cover of the hoses and thereby exposing the hose reinforcement. If this occurs, the hose assembly must be discarded (See Figure 1). If the separation length is greater than that which can be accomplished with one continuous, smooth stroke, then the procedure should be repeated over shorter distances always cutting toward the free end of the hoses.

5



Measure Separation – It is suggested that the separation length be sufficiently long so that the swaging or crimping operation can be accomplished without risk of kinking the hoses or tearing the web which could result in exposure of the hose reinforcement (See Figure 2).

6

Apply Tape – At the option of the assembler, as dictated by the installation, a nylon lashing strap or tape may be applied at the termination of the separated length to provide protection against tearing of the web or hose covers.

INCORRECT HANDLING

Figure 1 – Extreme care must be taken to avoid cutting through the cover of the hoses and thereby exposing the hose reinforcement. If this occurs, the hose assembly must be discarded.

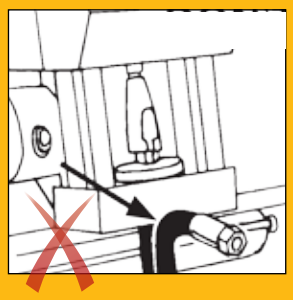


Figure 2 – The separation length must allow for the swaging or crimping operation without damaging the hose.

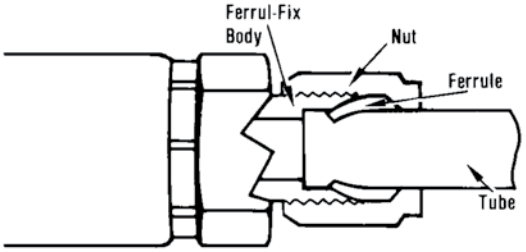
For detailed ordering information, please consult price list or contact Parflex® Division.

Ferrul-Fix Installation Instructions

Fast, on-the-job repair for ruptured bent tube hose assemblies and power steering lines.

The life of the combination tube-hose assembly is often limited to the service life of the hose alone. A replacement assembly may not be available, since equipment dealers are unable to stock all of the many odd tube configurations.

Parker Ferrul-Fix hose end fitting now makes it possible to salvage the bent tube section of the original assembly for replacement. Most importantly, it gets you back into operation FAST!



Features

- Gets you back in operation fast – No costly delays while replacement assemblies are rushed from the factory.
- Lets you reuse expensive bent tube ends – You can replace the hose at a fraction of the cost of complete assembly.
- Eliminates need for emergency brazing or welding in the field – Ferrul-Fix can be assembled without special tools or equipment.
- 3-Piece Design – Body, nut, ferrule. Wedging action of ferrule, when drawn down by nut, forms seal between body and ferrule, while cutting edge of ferrule bites into tube wall forming another positive seal.
- Visible Bite – Extent of bite at cutting edge of ferrule is completely visible when fitting is disassembled, an important safety feature. Self-centering action assures an even bite around circumference of tube.
- Parkerized Finish – Ferrul-Fix fittings have the Parkerized black finish, providing built-in torque in make-up.

Assembly

1. **Cut** the formed tube off squarely next to the permanent hose fitting. Lightly **debur** the end of the tube internally and externally.

2. **Disassemble** the Ferrul-Fix fitting, and **lubricate** threads and both ends of the ferrule with Parker Ferulube.

3. **Slide** nut and ferrule onto tubing with the long, straight end of the ferrule pointing toward the tube end.

4. **Insert** tube end into the Ferrul-Fix body until it bottoms against the shoulder. **Slide** ferrule inside body, and screw nut down finger tight.

5. **Wrench** nut down 1-3/4 turns to preset the ferrule.

6. **Disconnect** nut and **inspect** lead edge of ferrule to make certain that the biting edge has turned up a shoulder to a height of at least 50% of the ferrule and completely around the tube.

7. **Assemble** Ferrul-Fix fitting to hose. **Refer** to assembly instructions listed in appropriate fittings section. Do not assemble to hose before steps 1-6.

8. **Reassemble** tubing into Ferrul-Fix end and **turn** nut down easily until a sudden increase in force is evident. **Turn** bent tube to proper position if required. Using two wrenches, one on the fitting nipple hex and the other on the nut, **tighten** nut an additional 1/6 turn (one wrench flat).

Ferrule-Fix is Manufactured by the Tube Fittings Division. Refer to Catalog 4300 for Ferulok® instructions.

Die Selection & Swage Specification Chart

Sewer Hose

SWAGE DATA FOR SEWER CLEANING HOSE (SQ-101-SW SWAGE MACHINE ONLY)								
Hose Type	Hose I.D.	Male Pipe			Mender/Splicer		Swage O.D. +/-0.015	Swage Length
		Fitting P/N	Die P/N	Pusher P/N	Fitting P/N	Die P/N		
	inch						inch	inch
S612	3/4	101SQ-12-12	SQ-101-12S6/S9	SQ-101-12P	1HUSQ-12-12	SQ-101-12S6/S9	1.172	1.109
S616	1	101SQ-16-16	SQ-101-16S6	SQ-101-16P	1HUSQ-16-16	SQ-101-16S6	1.445	1.156
S912	3/4	101SQ-12-12	SQ-101-12S6/S9	SQ-101-12P	1HUSQ-12-12	SQ-101-12S6/S9	1.172	1.109
S916	1	101SQ-16-16	SQ-101-16S9	SQ-101-16P	1HUSQ-16-16	SQ-101-16S9	1.488	1.156

Comments:

1. Two dies required when swaging a mender/splicer fitting. A pusher is not required when swaging a mender/splicer fitting.
2. One die and one pusher required when swaging a male pipe fitting.
3. End fittings cannot be swaged on S4 series hose. Only mender/splicers can be swaged.
4. End fittings cannot be swaged on S5 series hose. Only mender/splicers can be swaged.
5. Fittings cannot be swaged on SLH series hose.

The information covered in the Swage Specification & Tool Selection Chart pertains to steel, stainless and brass hose fittings. Swage diameter roundness shall not vary by more than .010". Swage diameters are measured in the center to the crimp area. Parflex Division reserves the right to alter swage specifications.

Hose Fitting Insertion Values

Inch

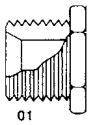
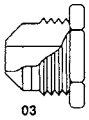
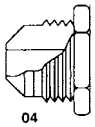
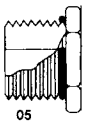
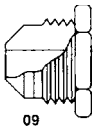
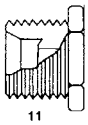
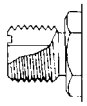
Hose Dash Size	51	54	56	55/57/58	58H	91N	92	93N	BU	CY	LV/LH	MS Reusable	MS Permanent
-2				5/8					1/2	1/2			
-3	13/16	5/8	5/8	29/32		7/16	9/16		13/16	13/16	13/16		
-4	15/16	3/4	15/16	1-3/16		1/2							
-5	15/16	7/8	1	1-3/16		9/16						11/16	11/16
-6	1-5/16	15/16	1	1-5/16		5/8		7/16				15/16	3/4
-8	1-19/32	15/16	1-1/8	1-9/16		11/16		7/16			2-1/8		
-10			1-1/4	1-11/16		11/16		3/4			2-1/4		
-12	1-13/16		1-3/8	1-23/32	2-3/16	3/4		7/8			2-3/8		
-16	1-9/16		1-7/8	2-9/32	2-15/16	15/16		15/16			2-13/16		
-20						1		1					
-24								1-1/8					
-32								1-3/8					

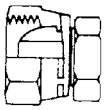
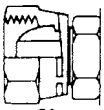
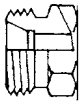
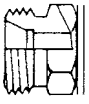
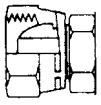
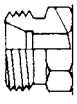
Metric (mm)

Hose Dash Size	51	54	56	55/57/58	58H	91N	92	93N	BU	CY	LV/LH	MS Reusable	MS Permanent
-2				16					13	13			
-3	21	16	16	23		11	14		21	21	21		
-4	24	19	24	30		13							
-5	24	22	25	30		14						17	17
-6	33	24	25	33		16		11				24	19
-8	40	24	28	40		17		11			54		
-10			32	43		17		19			57		
-12	46		35	44	56	19		22			60		
-16	40		48	58	75	24		24			71		
-20						25		25					
-24								29					
-32								35					

Hose Fitting Thread Guide

There are more than one hundred types of threads for fittings. Below are some of the most common thread styles offered by Parflex. The end code in a fitting part number is located directly after the first digit. ie. 10355-8-8

End Code ⇨	 01	 03	 04	 05	 28, 67, 69	 09	 11	 JM
Dash Size	**NPTF Pipe Thread Size**	**SAE (JIC) 37° Flare Thread Size**	**SAE 45° Flare Thread Size**	**"O" Ring Style Straight Thread Size**	**SAE Inverted Flare Thread Size**	**PTT 30° Flare Thread Size**	**SAE Flareless Thread Size**	**Seal-Lok™ Thread**
2	1/8 - 27	5/16 - 24	5/16 - 24	5/16 - 24	-	-	5/16 - 24	-
3	-	3/8 - 24	3/8 - 24	3/8 - 24	3/8 - 24	-	3/8 - 24	-
4	1/4 - 18	7/16 - 20	7/16 - 20	7/16 - 20	7/16 - 18	-	7/16 - 20	9/16 - 18
5	-	1/2 - 20	1/2 - 20	1/2 - 20	1/2 - 20	-	1/2 - 20	-
6	3/8 - 18	9/16 - 18	5/8 - 18	9/16 - 18	5/8 - 18	-	9/16 - 18	11/16 - 16
8	1/2 - 14	3/4 - 16	3/4 - 16	3/4 - 16	3/4 - 18	-	3/4 - 16	13/16 - 16
10	-	7/8 - 14	7/8 - 14	7/8 - 14	7/8 - 18	-	7/8 - 14	1 - 14
12	3/4 - 14	1 1/16 - 12	1 1/16 - 14	1 1/16 - 12	1 1/16 - 16	-	1 1/16 - 12	1 3/16 - 12
14	-	1 3/16 - 12	-	1 3/16 - 12	-	-	1 3/16 - 12	-
16	1 - 11 1/2	1 5/16 - 12	-	1 5/16 - 12	-	1 5/16 - 14	1 5/16 - 12	1 7/16 - 12
20	1 1/4 - 11 1/2	1 5/8 - 12	-	1 5/8 - 12	-	1 5/8 - 14	1 5/8 - 12	-
24	1 1/2 - 11 1/2	1 7/8 - 12	-	1 7/8 - 12	-	1 7/8 - 14	1 7/8 - 12	-
32	2 - 11 1/2	2 1/2 - 12	-	2 1/2 - 12	-	2 1/2 - 12	2 1/2 - 12	-

End Code ⇨	 C3	 C6	 D0	 D2	 D9	 92	 92	 F9	 FG
Dash Size	**Metric Swivel Female Thread Size**	**Metric Swivel Female Thread Size**	**Male Stud Thread Size**	**Male Stud Thread Size**	**Male BSPP Thread Size**	**BSP Swivel Female Thread Size**	**French Swivel Female Gas Series**	**French Swivel Female Metric Series**	**French Male Stud Gas Series**
4	-	-	-	-	1/4"	1/4"	-	-	-
6	M12 x 1,5	-	M12 x 1,5	-	3/8"	3/8"	-	M12 x 1	-
8	M14 x 1,5	M16 x 1,5	M14 x 1,5	M16 x 1,5	1/2"	1/2"	-	M14 x 1,5	-
10	M16 x 1,5	M18 x 1,5	M16 x 1,5	M18 x 1,5	-	5/8"	-	M16 x 1,5	-
12	M18 x 1,5	M20 x 1,5	M18 x 1,5	M20 x 1,5	3/4"	3/4"	-	M18 x 1,5	-
-	-	-	-	-	-	-	M20 x 1,5	-	M20 x 1,5
14	-	M22 x 1,5	-	M22 x 1,5	-	-	-	M20 x 1,5	-
15	M22 x 1,5	-	M22 x 1,5	-	-	-	-	M22 x 1,5	-
16	-	M24 x 1,5	-	M24 x 1,5	1"	1"	-	M24 x 1,5	-
-	-	-	-	-	-	-	M24 x 1,5	-	M24 x 1,5
18	M26 x 1,5	-	M26 x 1,5	-	-	-	-	M27 x 1,5	-
20	-	M30 x 2	-	M30 x 2	-	-	-	M27 x 1,5	-
-	-	-	-	-	-	-	M30 x 1,5	-	M30 x 1,5
22	M30 x 2	-	M30 x 2	-	-	-	-	M30 x 1,5	-
25	-	M36 x 2	-	M36 x 2	-	-	-	M33 x 1,5	-
-	-	-	-	-	-	-	M36 x 1,5	-	M36 x 1,5
28	M36 x 2	-	M36 x 2	-	-	-	-	-	-
30	-	M42 x 2	-	M42 x 2	-	-	-	M39 x 1,5	-
33	-	-	-	-	-	-	M45 x 1,5	-	M45 x 1,5

For detailed ordering information, please consult price list or contact Parflex® Division.

Media to Fitting & Seal Compatibility

Media	Fitting Material			Seal Material			
	Brass	Steel	316 SS	BUNA-N	Ethylene Propylene	Fluorocarbon	Neoprene
Acetylene	NR	F	S	S	S	S	F
Air (oil free) @ 190° F	S	F	S	S	S	S	S
Air (oil free) @ 300° F	S	F	S	F	F	S	F
Air (oil free) @ 400° F	S	F	S	NR	NR	S	NR
Alcohol, Ethyl	S	NR	NR	NR	S	NR	S
Animal Oils (Lard Oil)	F	F	F	S	F	S	F
Aromatic Fuel - 50%	ID	ID	ID	F	NR	S	NR
Aromatic Solvents	ID	ID	F	F	ID	S	NR
Asphalt	NR	NR	S	F	NR	S	F
ASTM Oil #1	S	S	S	S	NR	S	S
ASTM Oil #2	S	S	S	S	NR	S	F
ASTM Oil #3	S	S	S	S	NR	S	NR
ASTM Oil #4	S	S	S	F	NR	S	NR
ATF Oil	S	S	S	S	NR	S	F
Automotive Brake Fluid	ID	ID	ID	NR	S	NR	F
Benzene	NR	F	NR	NR	NR	S	NR
Brine (Sodium Chloride)	NR	NR	S	S	S	S	S
Butane	NR	S	S	S	NR	S	S
Carbon Dioxide	S	F	S	S	S	S	S
Carbon Monoxide	S	S	S	S	S	S	F
Chlorine (Dry)	F	F	NR	NR	ID	F	F
Compressed Air	S	F	S	S	S	S	S
Crude Oil	NR	F	S	F	NR	S	NR
Cutting Oil	ID	S	S	S	NR	S	F
Diesel Fuel	S	S	S	S	NR	S	NR
Ethanol	S	NR	NR	NR	S	NR	S
Ethers	S	S	S	NR	F	F	NR
Freon 11	S	ID	ID	F	NR	F	NR
Freon 12	S	S	NR	F	NR	S	S
Freon 22	S	NR	S	NR	NR	NR	S
Fuel Oil	NR	S	S	S	NR	S	F
Gasoline	S	F	S	S	NR	S	NR
Gas, Liquid Propane (LPG)	S	S	S	S	NR	S	F
Gas, Natural	F	S	S	S	NR	S	S
Helium	S	S	S	S	S	S	S
Hydraulic Oil, Petroleum Base	S	S	S	S	NR	S	S
Hydraulic Oil, Water Base	ID	S	S	F	S	NR	F
Hydrogen Gas	S	S	S	S	S	S	S
Jet Fuel	S	S	S	S	NR	S	NR
Kerosene	S	S	S	S	NR	S	F
Lubricating Oil SAE 10, 20, 30, 40, 50	S	S	S	S	NR	S	F

Media to Fitting & Seal Compatibility (cont.)

Media	Fitting Material			Seal Material			
	Brass	Steel	316 SS	BUNA-N	Ethylene Propylene	Fluorocarbon	Neoprene
Methanol	S	S	S	S	S	NR	S
MIL-F-8192 (JP-9)	S	S	S	NR	NR	S	NR
MIL-H-5606	S	S	S	S	NR	S	F
MIL-H-6083	S	S	S	S	NR	S	S
MIL-H-7083	S	S	S	S	S	F	F
MIL-H-8446 (MLO-8515)	F	S	S	F	NR	S	S
Mil-L-2104 & 2104B	S	S	S	S	NR	S	F
MIL-L-7808	NR	F	S	F	NR	S	NR
Mineral Oil	S	S	S	S	NR	S	F
Nitrogen	S	S	S	S	S	S	S
Petrolatum	S	S	S	S	NR	S	F
Petroleum Oil (<250° F)	S	S	S	S	NR	S	F
Propane	S	S	S	S	NR	S	F
R134A	S	S	S	NR	S	NR	NR
Sea Water	F	NR	S	S	S	S	F
Skydrol 500, Type 2	NR	S	S	NR	S	NR	NR
Skydrol 7000, Type 2	NR	S	S	NR	S	F	NR
Soap Solutions	NR	NR	S	S	S	S	F
Steam (<400° F)	F	S	S	NR	S	NR	NR
Stoddard Solvent	F	S	S	S	NR	S	F
Transmission Fluid (Type A)	S	S	S	S	NR	S	F
Trichloroethane	ID	F	S	NR	NR	S	NR
Water	S	F	S	S	S	F	F

Table U4 – Fluid Compatibility Chart

Codes:
S = Satisfactory
F = Fair
NR = Not recommended
ID = Insufficient data

Metal Tube & Fitting Material Compatibility

As a general rule, tube and fitting materials should be the same. If different materials must be considered, the following chart can be used as a general guide. Since operating conditions differ with applications, this chart should be used only as a guide and not a firm recommendation. Before making a final decision on material combination, it should be sufficiently tested under appropriate conditions to assure suitability for the intended application. For additional material combinations, contact the Tube Fittings Division.

Tube Material	Specification	Construction	Condition	Maximum Hardness	Temperature Range (7)	Application	Tube Material to Fitting & Material Compatibility												
							Seal-Lok™ ORFS (SAE J1453)			Triple-Lok® 37° Flare (SAE J514)				Ferulok® Flareless (SAE J514)				Intru-Lok® Flareless	EO/EO-2 Flareless (ISO 8434-1)
							S	SS	B	S	SS	B	M	S	SS	M	B	S SS B, M
Carbon Steel C-1010	SAE J524 (ASTM A179) (8)	Seamless	Fully Annealed	HRB 72	-65° to 500°F -55° to 260°C	High pressure hydraulics, air, & some specialty chemicals	E	NR	(6)	G	NR	(6)	NR	E	NR	NR	NR	NR
	SAE J525 (ASTM A178) (8)	Welded & Drawn					E	NR	(6)	E	NR	(6)	NR	E	NR	NR	NR	NR
	SAE J356	Welded & Flash Controlled					G	NR	(6)	NR	NR	(6)	NR	G	NR	NR	NR	NR
Carbon Steel C-1021	SAE J2467	Welded & Flash Controlled	Fully Annealed	HRB 75	-65° to 500°F -55° to 260°C	High pressure hydraulics	E	NR	(6)	NR	NR	(6)	NR	E	NR	NR	NR	NR
	SAE J2435	Welded & Drawn					E	NR	(6)	E	NR	(6)	NR	E	NR	NR	NR	NR
Carbon Steel High Strength Low Alloy (HSLA)	SAE 2613	Welded & Flash Controlled	Sub-critically annealed	HRB 90	-65° to 500°F -55° to 260°C	High pressure hydraulics	E (10)	NR	(6)	NR	NR	NR	NR	NR	NR	NR	NR	NR
	SAE J2614	Welded & Drawn					E	NR	(6)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Alloy Steel 4130	ASTM A519	Seamless			-65° to 500°F -55° to 260°C	High pressure hydraulics	E (4)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
St 37.4 (Carbon Steel)	DIN 2391 Part 2 (Metric)	Seamless	Fully Annealed	HRB 72	-65° to 500°F -55° to 260°C	High pressure hydraulics, air, & some specialty chemicals	E	NR	NR	G	NR	NR	NR	NR	NR	NR	NR	E
Stainless Steel 304 & 316	ASTM A213 ASTM A269	Seamless	Fully Annealed	HRB 90	-425° to 1200°F -255° to 650°C (3)	High pressure, high temp, or generally corrosive media (1)	(6)	E	(6)	(6)	G	(6)	NR	(6)	E	NR	NR	NR
	ASTM A249 ASTM A269	Welded & Drawn					(6)	E	(6)	(6)	E	(6)	NR	(6)	E	NR	NR	NR
1.4571 1.4541 Stainless Steel	DIN 17458 Tab 8 (Metric)	Seamless	Fully Annealed	HRB 90	-425° to 120°F -255° to 650°C (3)	High pressure, high temp, or generally corrosive media (1)	(6)	E	NR	(6)	G	NR	NR	NR	E	NR	NR	E
Copper	SAE J528 (ASTM B-75) (8)	Seamless	Soft Annealed Temper 0	60 Max. Rockwell 15T	-325° to 400°F -200° to 205°C	Low pressure, low temp, water, oil & air	E	(6)	E	G	(6)	E	NR	G (2)	NR	NR	E	E
Aluminum 6061	ASTM-B210	Seamless	T6 Temper	HRB 56	-325° to 400°F -200° to 205°C	Low pressure,low temp, water, oil, air & some specialty chemicals	NR	NR	NR	G	NR	NR	NR	E (2)	NR	NR	(6)	NR
			0 & T4 Temper	HRB 30			E (5)	NR	NR	G	NR	NR	NR	E (2)	NR	NR	(6)	NR

(Cont.)

Metal Tube & Fitting Material Compatibility
(cont.)

Tube Material	Specification	Construction	Condition	Maximum Hardness	Temperature Range (7)	Application	Tube Material to Fitting & Material Compatibility											
							Seal-Lok™ ORFS (SAE J1453)			Triple-Lok® 37° Flare (SAE J514)				Ferulok® Flareless (SAE J514)			Intru-Lok® Flareless	EO/EO-2 Flareless (ISO 8434-1)
							S	SS	B	S	SS	B	M	S	SS	M	B	S SS B, M
Monel 400	ASTM-B165	Seamless	Fully Annealed	HRB 70	-400° to 800°F -240° to 425°C	Sour gas, marine & gen chemical processing media	NR	(6)	NR	NR	(6)	NR	E	NR	(6)	E	NR	NR
Nylon		Extruded	Flexible & Semi-Rigid		-60° to 200°F -50° to 95°C	Lube lines, chemical process controls & air	NR	NR	NR	NR	NR	NR	NR	G (2)	G (2)	G (2)	E	G (2), (9)
Polyethylene	ASTM D-1248	Extruded	Instrument Grade		-80° to 150°F -60° to 65°C	Instrumentation lines	NR	NR	NR	NR	NR	NR	NR	G (2)	G (2)	G (2)	E	G (2), (9)
PVC		Extruded	Instrument & Laboratory Grade		0° to 140°F -20° to 60°C	General purpose laboratory use	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	G	NR
PTFE		Extruded & Sintered			-65° to 400°F -55° to 205°C	Very high temp, fuel, lube, chemical, pharma, food	NR	NR	NR	NR	NR	NR	NR	G (2)	G (2)	G (2)	G	G (2), (9)

Table U7 – Tube and Fitting Material Compatibility

Ratings Key:
NR = Not Recommended
F = Fair
G = Good
E = Excellent

Fittings Materials Code:
S = Steel
SS = Stainless Steel
B = Brass
M = Monel

Notes:
1. For highly corrosive media or service environment, contact the Tube Fittings Division.
2. Requires different assembly procedure. Contact the Tube Fittings Division.
3. Low temperature limit for stainless steel Ferulok® fittings is -20°F (-30°C).
4. For brazing only. Grade 4130 not recommended with Parflange process.
5. For use with Parflange process only. Not recommended with brazing.
6. Use depends on specific application. Contact the Tube Fittings Division.
7. Applies to tube material.
8. Comparable specifications to SAE.
9. With metric version of tubing.
10. Not tested with Parflange. Contact the Tube Fittings Division.

O-Ring Material Selection

Standard O-rings supplied with Parker tube fittings and adapters are 90 durometer hard nitrile (Buna-N) Parker compound #N0552. These O-rings are well suited for most industrial hydraulic and pneumatic systems. They have high extrusion resistance making them suitable for very high pressure static applications. Optional high temperature fluorocarbon, Parker compound #V0894, is also available for higher temperature specifications.

O-rings for other than normal hydraulic media or higher temperature applications can be selected from the following chart. The chart should be used only as a general guide. Before making final selection for a given application, it is recommended that appropriate tests be conducted to assure compatibility with the fluid, temperature, pressure and other environmental conditions.

For fluids not shown in the chart, please contact the Tube Fittings Division.

Polymer	Abbreviated Name	Parker Compound No.	Color	SAE J515 Type	Hardness Shore "A"[7]	Temperature Range	Recommended For	Not Recommended For
Nitrile-Butadiene	NBR	N0552	● B	CH[2]	90[6]	-30° to 250°F	Petroleum base oils and fluids, mineral oils, ethylene glycol base fluids, silicone and di-ester base lubricants, air, water under 150°F, and natural gas. Hydrogen fuel cells. Meets FDA requirements for food products. CNG Applications.	Phosphate ester base hydraulic fluids, automotive brake fluids, strong acids, ozone, freons, ketones, halogenated hydrocarbons, and methanol.
		N0674		-	70	-30° to 250°F		
		N0103		-	70	-65° to 225°F		
Nitrile-Butadiene (Low compression set – N1059)		N1059		CH[2]	90	-30° to 275°F		
Nitrile-Butadiene		N0507		-	90	-65° to 180°F		
		N0304		-	75	-65° to 225°F		
		N0508		-	75	-35° to 250°F		
		N0756		-	75[6]	-65° to 275°F		
Ethylene-Propylene	EPDM	E0540	● B	CA[3]	80	-65° to 275° F	Phosphate ester base hydraulic fluids, hot water, steam to 400°F, silicone oils and greases, dilute acids and alkalis, ketones, alcohols and automotive brake fluids. CO_2 climate control systems.	Petroleum base oils and di-ester base lubricants.
		E0893	● P[1]	CA[3]	80			
		E0962	● B	-	90			
Neoprene	CR	C0873	● B	-	70	-45° to 250° F	Refrigerants (freons, ammonia), high aniline point petroleum oils, mild acids and silicate ester lubricants.	Phosphate ester fluids and ketones.
		C0944	● R[1]	-	70			
Fluorocarbon	FKM[5] or FPM	V0747	● B	-	75	-15° to 400° F	Petroleum base oils and fluids, some phosphate ester base fluids, silicone and silicate ester base lubricants, di-ester base lubricants, acids and halogenated hydrocarbons.	Ketones, skydrol fluids, amines (VDMH), anhydrous ammonia, low molecular weight esters and ethers, and hot hydrofluoric or chlorosulfonic acids.
		V0884	● BR[1]	-	75			
		V0894	● BR[1]	HK[4]	90[6]			
Silicone	Si	S0604	● RU[1]	-	70	-65° to 450° F	Dry heat (air to 400°F) and high aniline point oils.	Most petroleum fluids, ketones, water and steam.

Table U-6 – O-Ring Selection

*Color Code: B – Black, P – Purple, R – Red, BR – Brown, RU – Rust

Notes:
1. These Parker "Chromassure" color assurance O-rings are available from the Parker Hannifin O-Ring Division. They help eliminate assembly errors, reduce warranty costs and liability risks, and assure safety in aftermarket business.
2. Formerly SAE Type I.
3. Formerly SAE Type II.
4. Formerly SAE Type III.
5. "FKM" is the ASTM designation for fluorocarbon. Its ISO designation is "FPM".
6. Standard compounds available from stock.
7. Use 90 durometer hard O-rings for applications with 1500 psi or higher pressures.

Metals Corrosion Scale

Corrosion of Base Metals in Contact

The susceptibility of different base metals to corrosion while in contact depends upon the difference between the contact potentials or the electromotive voltages of the metals involved. The greater the potential difference is, the greater is the tendency for corrosion. The metal with the higher potential forms the anode and is corroded. The larger the separation distance in the electromotive chart between the two metals in contact, the higher the contact potential and chances for corrosion. For example, zinc and aluminum are very short distance apart in the chart; therefore potential for corrosion when these two metals are in contact is very low. On the other hand, aluminum and passivated 316 stainless steel are far apart; hence, when in contact, the potential for corrosion is very high. Aluminum, being more anodic metal, will corrode in this combination.

As a general guideline, if the metals are half the length of the chart or more apart, the combination should be avoided. Also, it is not a good idea to combine an anodic metal part with thin cross section, such as thin wall tubing, with a cathodic or less anodic metal part of a heavy cross section, such as a fitting.

Example: A thin wall brass tube with steel fitting is a better, although not ideal, combination than a thin wall steel tube with brass fitting.

Electromotive or Galvanic Series for Metals	
+ Anodic (least noble) corroded Electric current flows from plus to minus Direction of attack - Cathodic (most noble) protected	Magnesium Magnesium alloys Zinc **(Parker steel fittings are zinc plated)** Berillium Aluminum 5052, 3004, 3003, 1100, 6053 Cadmium Aluminum 2117, 2017, 2024 Mild steel (1018), wrought iron, **free machining steel (12L14)** Low alloy high strength steel, cast iron Chrome iron (active) 430 Stainless (active) 302, 303, 321, 347, 410, 416, stainless steel (active) Ni-resist 316, 317 stainless steel (active) Carpenter 20Cb-3 stainless (active) Aluminum bronze (CA 687) Hastelloy C (active) Inconel 625 (active) Titanium (active) Lead/Tin solder Lead Tin Inconel 600 (active) Nickel (active) 60 Ni-15 Cr (active) 80 Ni-20 Cr (active) Hastelloy B (active) Naval brass (CA 464), Yellow brass (CA 268), **Brass (CA360)** Red brass (CA 230), Admiralty brass (CA 443) Copper (CA 102) Maganese bronze (CA 675), Tin bronze (CA 903, 905) 410, 416 Stainless (passive) Phosphor bronze (CA 521, 524) Silicon bronze (CA 651, 655) Nickel silver (CA 732, 735, 745, 752, 754, 757, 764, 770, 794) Cupro Ni 90-10 Cupro Ni 80-20 430 Stainless steel (passive) Cupro Ni 70-30 Nickel aluminum bronze (CA 630, 632) Monel 400, K500 Silver solder Nickel (passive) 60 Ni 15 Cr (passive) Inconel 600 (passive) 80 Ni 20 Cr (passive) Chrome iron (passive) 302, 303, 304, 321, 347 stainless steel (passive) 316, 317 stainless steel (passive) **(Parker stainless steel fittings are passivated)** Carpenter 20 Cb-3 stainless (passive), Incoloy 825 Silver Titanium (passive), Hastelloy C & C276 (passive), Inconel 625 (passive) Graphic Zirconium Gold Platinum

Table U5 – Electromotive or Galvanic Series for Metals

Materials to Parflex Part Number Guide

Ratings Code:

G – Good to excellent. Little or no swelling, tensile or surface changes. Preferred choice.

L – Marginal or conditional. Noticeable effects but not necessarily indicating lack of serviceability. Further testing suggested for specific application. Very long-term effects such as stiffening or potential for crazing should be evaluated.

P – Poor or unsatisfactory. Not recommended without extensive and realistic testing.

— – Indicates that this was not tested.

– For fluoropolymer. Indicates good chemical resistance but potential for excessive permeation.

MATERIAL CODE FOR HOSE CORE TUBES		PARKER PRODUCT
H	Copolyester	D6, D6R, H6, R6, HFS, HFS2, HFSR, M8, HTB, HJK, 560, 563, 590, 593, 510C, 518C, 515H, 53DM/538DM, 55LT, HLB, S5N, S6, S9, SLH
N	Nylon	510D, 518D, 520N, 526BA, 527BA, 528N, 540N, 548N, 56DH/568DH, 573X, 575X, 580N, H580N, 588N, 1035HT, 5CNG, MSH, PTH
NC	Nylon Copolymer	510, 510A
O	Copolymer	540P
PFX	Proprietary Elastomer	1035A
TFE/PFA	Fluoropolymer PTFE/PFA	919/919B, 919J, 919U, 929/929B, 929BJ, 939/939B, 943B, 944B, 950B, 955B, S30/S30B, S40/S40B, STW/STWB, SCW/SCB, PCW/PCB, SBFB/SBFW, SCWV/SCBV, PCWV/PCBV, SCWV-FS/SCBV-FS, PCWV-FS/PCBV-FS
U	Polyurethane	83FR, B9
MATERIAL CODE FOR HOSE COVERS		**PARKER PRODUCT**
EPDM	Rubber	RCTW/RCTB (Contact Engineering for chemical resistance questions)
HF	Low Temperature Copolyester	55LT, 53DM/538DM
PFX	Proprietary Elastomer	510C, 518C
M	Silicone	SWPV, 919J, 929BJ
U	Polyurethane	All except 55LT, 53DM/538DM, 518C, 1035HT and PTFE hoses
MATERIAL CODE FOR THERMOPASTIC TUBING		**PARKER PRODUCT**
HDPE	High Density Polyethylene	HDPE
N	Flexible Nylon	N
NR	Unplasticized Nylon (semi-rigid)	NR
PE	Linear Low Density Polyethylene	E
PEFR	Flame Resistant Polyethylene	PEFR
PP	Polypropylene	PP
PV	Flexible Polyvinyl Chloride (PVC)	PV
U	Polyurethane	U, HU
MATERIAL CODE FOR FLUOROPOLYMER TUBING		**PARKER PRODUCT**
FEP	Fluorinated Ethylene Propylene	103, 203, HS1.3FEP, HS1.6FEP,
PFA	Perfluoroalkoxy	104, 204
TFE	Polytetrafluoroethylene	TFL, TFS, TFT, TFH, 101, 201, TFB, HS2TFS, HS2TFT, HS2TFL, HS2TFI, HS4TFI
PVDF	Polyvinylidene Fluoride	110,111

Media to Hose Material Compatibility Guide

Media	H	N	U/HF UFR	PV	NC	O	PFX	HFR	FEP	PTFE/ PFA
Acetaldehyde	G	L	L	P	-	L	L	G	G	G
Acetic Acid Glacial	L	L	L	G	P	G	L	L	L	G
Acetone	L	G	P	P	G	P	P	L	G	G
Acetylene	2	2	2	2	2	2	2	2	2	2
Air (4)	G	G	G	G	G	G	G	G	G	G
Ammonium Chloride	G	P	G	G	P	G	G	G	L	G
Ammonium Hydroxide	L	G	P	L	-	G	P	L	G	G
Anhydrous Ammonia	P	P	P	P	P	P	P	P	8	8
Aniline	P	P	P	P	P	L	P	P	G	G
Animal Oils (6)	G	G	G	G	G	P	G	G	-	G
Aromatic Hydrocarbons	L	G	L	P	G	P	L	L	-	G
Asphalt	G	G	G	G	G	L	G	G	L	G
Baygon (Insecticide)	L	G	P	-	-	-	P	L	-	G
Beer	G	G	G	G	-	G	G	G	G	G
Benzene	L	G	L	P	L	P	L	L	G	G
Brake Fluid (DOT #3)	-	G	P	P	-	P	P	-	-	G
Butane (2) (4)	G	G	L	L	P	L	L	G	#	#
Butter (6)	G	G	G	G	-	G	G	G	-	G
Calcium Chloride	G	3	G	L	3	G	G	G	G	G
Carbon Dioxide (4)	G	G	G	G	G	G	G	G	#	#
Carbon Monoxide (4)	G	3	G	G	3	L	G	G	#	#
Carbon Tetrachloride	L	G	P	L	G	P	P	L	G	G
Castor Oil	G	L	L	G	L	P	L	G	-	G
Chlorinated Hydrocarbon Base Fluids	L	G	L	P	-	-	L	L	-	G
Chlorinated Petroleum Oil	G	G	L	-	L	-	L	G	-	-
Chlorinated Solvents	P	3	P	L	3	L	P	P	-	G
Chlorine, Gaseous, Dry	P	P	P	G	P	L	P	P	#	#
Chlordane (Insecticide)	L	G	P	-	-	-	P	L	-	-
Chloroform	P	P	P	P	P	P	P	P	G	G
Chromic Acid	P	3	P	G	P	3	P	P	L	G
Citric Acid Solutions	G	G	L	G	G	G	L	G	G	G
Crude Petroleum Oil	G	G	G	G	G	P	G	G	-	G
Cyclohexane (2)	G	G	G	-	-	P	G	G	G	G
Cygon (Insecticide)	L	G	P	-	-	-	P	L	-	-
Diazion (Insecticide)	L	-	P	L	-	-				
Diesel Fuel (2)	G	G	G	L	G	P	G	G	-	G
Diester Oils	L	G	P	P	-	P	P	L	-	G
Enamels	G	G	G	L	-	L	G	G	-	G
Ethanol (6)	G	G	L	L	L	G	L	G	-	G
Ethers	L	G	P	L	G	L	P	L	G	G
Ethylene Glycol	L	G	L	G	G	G	L	G	G	G
Ethylene Oxide	G	G	L	P	-	L	L	G	#	#
Fatty Acids	G	G	3	G	G	L	3	G	G	G
Formaldehyde	L	L	P	L	L	G	P	L	G	G
Formic Acid	P	P	P	G	P	G	P	P	G	G

(Cont.)

Media to Hose Material Compatibility Guide
(cont.)

Media	H	N	U/HF UFR	PV	NC	O	PFX	HFR	FEP	TFE
Freon 12 (5)	P	G	L	G	G	L	L	P	#	#
Freon 22 (5)	P	G	L	G	G	L	L	P	#	#
Fruit Juices	G	G	G	G	-	G	G	G	-	G
Fuel Oil (2)	G	G	L	L	G	P	L	G	G	G
Gas (Oil) (2)	G	G	G	G	G	P	G	G	-	G
Gas (Natural) (4)	2	2	2	2	2	2	2	2	2	2
Gasoline (2)	G	G	3	P	G	P	3	G	G	G
Glue	3	3	3	3	3	3	3	3	3	3
Glycerin	G	G	L	G	G	G	L	G	G	G
Glycols (to 135°F)	L	G	L	G	G	-	L	G	G	G
Grease (Petroleum base)	G	G	G	G	G	L	G	G	-	G
Heptachlor (Insecticide)	L	G	P	L	-	P	P	L	-	G
Hexane (2)	G	G	G	L	G	P	G	G	G	G
Houghto Safe-600 Series (Hydraulic fluid)	G	G	L	G	G	G	L	G	-	G
Houghto Safe-1000 Series (Phosphate esters)	L	G	P	G	G	P	P	L	-	G
Hydraulic Fluid (Petroleum base)	G	G	G	G	G	L	G	G	L	G
Hydraulic Fluid (Phosphate ester base)	L	G	L	L	G	P	P	L	-	G
Hydraulic Fluid (Water glycol base)	G	G	G	L	G	-	G	G	-	G
Hydraulic Oil (Petroleum base)	G	G	G	G	G	L	G	G	L	G
Hydrochloric Acid	P	L	P	L	P	L	P	P	G	G
Hydrofluoric Acid	P	P	P	L	P	L	P	P	G	G
Hydrogen, Gaseous (2) (4) (5)	G	G	G	G	G	G	G	#	#	
Hydrolube (Hydraulic fluid/water glycol base)	G	G	L	G	G	G	L	G	-	G
IRUS 902 (Hydraulic fluid/water-oil emulsion)	G	G	G	G	G	L	G	G	-	G
Isocyanates (2)	L	L	L	P	-	L	L	L	-	G
IsoOctane (2)	G	G	G	L	G	L	L	G	G	G
Isopropyl Alcohol	G	G	L	L	G	G	L	G	G	G
Kerosene (2)	G	G	L	L	G	L	P	G	G	G
Ketones	L	G	P	P	G	G	P	L	G	G
Lacquer Solvents	L	G	P	P	3	L	P	L	L	G
Lactic Acid	P	G	P	G	G	G	P	P	G	G
Lime (Calcium oxide)	G	G	G	G	-	G	G	G	G	G
Lindol (Hydraulic fluid/phosphate esters)	L	G	P	-	-	-	P	L	-	G
Linseed Oil	G	G	G	L	G	L	G	G	G	G
LP - Gas	2	2	2	2	2	2	2	2	2	2
Lubricating Oils (Diester base)	L	G	P	-	G	-	P	L	-	G
Lubricating Oils (Petroleum base)	G	G	G	G	G	L	G	G	G	G
Malathion (Insecticide)	L	G	P	-	-	-	P	L	-	G
Magnesium Hydroxide	L	G	L	G	-	G	L	L	G	G
Magnesium Salts	-	G	G	G	-	G	G	-	-	G
Mercury	G	G	G	G	G	G	G	G	G	G
Meropa Oil (Sulphur base)	G	G	-	-	-	-	-	-	-	G
Methane	2	2	2	2	2	2	2	2	2	2
Methanol	G	G	P	P	G	L	P	G	-	G
Methoxychlor (Insecticide)	L	G	P	-	-	-	P	L	-	G

(Cont.)

Media to Hose Material Compatibility Guide (cont.)

Media	H	N	U/HF UFR	PV	NC	O	PFX	HFR	FEP	TFE
Methyl Alcohol (6)	G	G	P	P	G	L	P	G	G	G
Methylene Chloride	P	L	P	L	P	L	P	P	G	G
Methyl Ethyl Ketone (MEK)	L	G	P	P	G	G	P	L	G	G
Methyl Ethyl Ketone Peroxide (MEKP)	-	L	P	-	-	-	P	-	-	G
Methyl Isobutyl Ketone (MIBK)	L	G	P	P	G	L	P	L	G	G
Milk (6)	G	G	G	G	-	G	G	G	G	G
Mineral Oil	G	G	G	G	G	L	G	G	G	G
Mineral Spirits	P	-	L	P	-	-	L	P	-	G
Motor Oils	G	G	G	G	G	-	G	G	G	G
Naphtha	L	G	P	P	G	P	P	L	G	G
Natural Gas (4)	2	2	2	2	2	2	2	2	2	2
Nitric Acid	P	P	P	L	P	P	P	P	L	G
Nitrobenzene	P	G	P	P	G	P	P	P	G	G
Nitrogen, Gaseous (4) (5)	G	G	G	G	G	G	G	G	G	G
Nitrous Oxide	-	L	-	G	-	L	G	-	#	#
Oil (SAE)	G	G	G	G	G	L	G	G	-	G
Oil of Turpentine	G	G	P	G	G	P	P	G	-	G
Oleic Acid	G	G	G	L	G	L	G	G	G	G
OS 45 Type 3 Hydraulic Fluid (Silicate esters)	L	G	L	P	-	P	L	L	-	-
Oxygen, Gaseous (4) (5) (6)	G	G	G	G	G	G	G	G	G	G
Ozone	L	P	L	G	P	L	P	L	G	G
Paint Solvents (Oil base)	L	G	L	P	-	P	L	L	-	G
Paint (Oil Base) (7)	G	G	G	P	-	L	G	G	-	G
Pentane (2)	G	G	L	L	-	P	L	G	G	G
Perchloric Acid	P	P	P	L	P	P	P	P	L	G
Perchloroethylene	P	P	P	L	P	P	P	P	-	G
Petroleum Ether	-	2	2	P	2	P	2	-	2	2
Petroleum Oils	G	G	G	G	G	L	G	G	-	G
Phenols	P	P	P	L	P	P	P	P	-	G
Phosphate Esters (above 135°F)	P	G	P	P	-	P	P	L	-	G
Phosphate Esters (to 135°F)	G	G	P	P	G	P	P	G	-	G
Polyol Esters	L	G	P	P	-	-	P	L	-	G
Potassium Hydroxide, 50%	P	P	P	L	-	L	P	P	G	G
Propane (4) (5)	2	2	2	2	2	2	2	2	2	2
Propylene Glycol	-	-	G	G	-	G	-	-	G	G
Pydraul F-9, 150, 160 (to 135°F)	G	G	P	P	G	P	P	G	-	G
Pydraul 312C, 625 (to 135°F)	P	G	P	P	G	P	P	G	-	G
Quintolubric 822 Fluid	-	G	G	-	-	-	-	-	-	G
Salt Water	3	3	3	3	3	3	3	3	G	G
Sevin (Insecticides in water)	G	G	G	-	-	-	G	G	-	G
Silicone Greases	G	G	G	G	G	-	G	G	-	G
Silicone Oils	G	G	G	G	G	-	G	G	-	G
Skydrol 500 & 7000	L	G	P	P	G	P	P	L	G	G
Soap Solutions	G	G	G	G	G	G	G	G	G	G

(Cont.)

For detailed ordering information, please consult price list or contact Parflex® Division.

Media to Hose Material Compatibility Guide (cont.)

Media	H	N	U/HF UFR	PV	NC	O	PFX	HFR	FEP	TFE
Soda Water	G	G	G	G	G	3	G	G	-	G
Sodium Borate	G	G	G	G	G	G	G	G	G	G
Sodium Carbonate	3	3	3	3	3	3	3	3	3	3
Sodium Chloride Solutions	G	G	G	G	3	G	G	G	G	G
Sodium Hydroxide, 50%	L	P	P	L	P	L	P	L	G	G
Sodium Hypochlorite	L	P	P	L	-	3	P	L	G	G
Steam	P	P	P	P	P	P	P	P	G	G
Stoddard Solvent	P	G	P	L	G	P	P	P	G	G
Straight Synthetic Oils (Phosphate esters)	L	G	P	P	G	-	P	L	-	G
Sulfur	G	G	G	G	-	L	G	G	G	G
Sulfur Dioxide	P	L	L	L	-	P	L	P	G	G
Sulfur Hexafluoride Gas (4) (5)	G	G	G	G	-	G	G	G	-	G
Sulphuric Acid	P	P	P	3	P	P	P	P	-	G
Toluene	L	G	L	P	G	P	P	L	G	G
Toloul	L	G	L	P	G	P	P	L	-	G
Transmission Fluid	G	G	G	P	G	-	G	G	-	G
Trichloroethylene	P	L	P	L	G	P	P	P	G	G
Trisodium Phosphate Solutions	L	G	P	G	G	G	P	L	G	G
Turpentine	G	G	L	L	G	P	P	G	G	G
Ucon (Hydraulic fluid-water glycol base)	G	G	L	G	G	-	L	G	-	G
Varnish	G	G	G	P	G	G	G	G	-	G
Vinegar (6)	L	G	L	G	G	G	L	L	G	G
Water (to 135°F) (6)	G	G	G	G	G	G	L	G	G	G
Water (above 135°F) (6)	P	G	P	L	-	P	P	P	L	G
Water Glycols (to 135°F)	L	G	L	G	G	L	L	G	-	G
Water Glycols (above 135°F)	P	G	P	L	-	P	P	P	-	G
Water in oil Emulsions (to 135°F)	G	G	L	G	G	-	L	G	-	G
Water in oil Emulsions (above 135°F)	P	G	P	L	-	-	P	P	-	G
Whiskey, Wines (6)	G	G	L	G	G	G	G	G	G	G
Wood Oils	G	G	L	G	G	-	G	G	-	G
Xylene	L	G	P	P	G	P	P	L	G	G
Zinc Chloride	G	G	G	G	P	G	G	G	G	G

Notes:

1. The Fluid Compatibility Guides are simplified rating tabulations based on immersion tests at 75°F. Higher temperatures tend to reduce ratings. Since final selection depends on pressure, fluid and ambient temperature and other factors not known to Parker Hannifin Co., no performance guarantee is expressed or implied. Ratings do not imply compliance with specialized codes such as FDA, NSF, AGA or UL and do not cover possible fluid discoloration, taste or odor effects. For conveying foodstuffs, use FDA sanctioned materials and for potable water, use NSF listed materials. For chemicals not listed, or for advice on particular applications, please consult Product Engineering, Parflex Div., Ravenna, Ohio.

2. Hose applications for these fluids must take into account legal and insurance regulations. This does not imply AGA or UL compliance.

3. Satisfactory at some concentrations and temperatures, unsatisfactory in others.

4. For high pressure gases, the cover should be pinpricked and the pressure must not be released quickly. Chain or restrain the hose to prevent personal injury in the event of damage or failure.

5. Chemical compatibility does not imply low permeation rates. Consult the Parker factory for a suggestion for your specific requirement.

6. Does not imply NSF or FDA compliance.

7. Chemical compatibility does not imply acceptability for use in airless paint spray applications. These applications require a special conductive hose.

8. Fluoropolymers are chemically compatible with Anhydrous Ammonia. However,extreme caution must be used in dealing with Anhydrous Ammonia since it can cause severe injuries such as blindness and/or chemical burns.

Media to Plastic Tubing Material Compatibility Guide

Media	PE	HDPE	PP	N	NR	PV	U	PEFR	FEP	PFA	TFE
Acetone	P	L	G	G	G	P	P	L	G	G	G
Acetyl Bromide	L	L	L	P	P	P	-	-	-	-	-
Acetyl Chloride	L	L	L	P	P	P	-	-	G	G	G
Air	G	G	G	G	G	G	G	G	G	G	G
Alcohols	G	G	G	G	G	L	L	G	G	G	G
Aluminum Salts	G	G	G	G	G	G	G	G	-	-	-
Ammonia	G	G	G	G	G	G	G	L	-	-	-
Amyl Acetate	G	G	G	G	G	P	L	-	G	G	G
Aniline	L	G	L	P	P	P	P	-	G	G	G
Animal Oils (6)	P	L	L	G	G	G	G	-	-	-	G
Arsenic Salts	G	G	G	G	G	G	G	G	-	-	-
Aromatic Hydrocarbons	P	L	L	G	G	P	L	P	-	-	G
Barium Salts	G	G	G	G	G	G	G	G	-	-	-
Benzaldehyde	P	L	L	L	L	P	L	P	G	G	G
Benzene	P	L	L	G	G	P	L	P	G	G	G
Benzyl Alcohol	P	G	L	L	L	G	L	P	G	G	G
Bleaching Liquors	G	L	G	L	L	L	L	-	-	-	-
Boric Acid Solutions	G	G	G	G	G	G	G	G	G	G	G
Bromine	L	L	P	P	P	P	P	-	G	L	G
Butane (2)	L	G	G	G	G	L	P	-	#	#	#
Butanol	G	G	G	G	G	G	G	G	-	-	-
Butyl Acetate	G	G	L	G	G	P	L	G	G	G	G
Calcium Hypochlorite	L	L	P	P	L	L	P	L	G	G	G
Calcium Salts	G	G	G	G	G	G	G	G	-	-	-
Carbon Dioxide	G	G	G	G	G	G	G	G	#	#	#
Carbon Disulfide	L	L	L	L	L	P	L	-	#	#	#
Carbon Tetrachloride	P	P	L	L	L	L	P	P	G	G	G
Caustic Potash	G	G	G	G	G	L	G	-	G	G	G
Caustic Soda	G	G	G	G	G	L	G	-	G	L	G
Chloracetic Acid	L	G	L	L	L	P	P	-	G	L	G
Chlorine (Dry)	L	L	L	P	P	G	P	-	#	#	#
Chlorine (Wet)	L	L	L	P	P	G	L	-	G	G	G
Chlorobenzene	P	L	L	L	L	P	L	P	G	G	G
Chloroform	P	L	P	P	P	P	P	P	G	G	G
Chromic Acid	L	L	L	P	P	G	P	-	L	G	G
Copper Salts	G	G	G	G	G	G	G	G	-	-	-
Cresol	P	L	L	P	P	L	P	P	G	G	G
Cyclohexanone	L	L	L	L	L	P	P	-	G	G	G
Ethers	L	L	P	G	G	L	P	-	G	G	G
Ethyl Acetate	G	G	G	G	G	P	L	-	G	G	G
Ethyl Alcohol	G	G	G	L	L	L	G	G	-	-	-
Ethylamine	L	G	L	L	L	P	L	-	-	-	-
Ethyl Bromide	P	L	L	L	L	P	-	P	-	-	-
Ethyl Chloride	P	L	P	L	L	P	-	P	G	G	G
Fatty Acids	L	L	L	G	G	L	L	P	G	G	G

(Cont.)

Media to Plastic Tubing Material Compatibility Guide (cont.)

Media	PE	HDPE	PP	N	NR	PV	U	PEFR	FEP	PFA	TFE
Ferric Salts	G	G	G	G	G	G	G	-	-	-	-
Formaldehyde	G	G	G	L	L	L	P	-	G	G	G
Formic Acid	G	G	G	P	P	G	P	G	G	G	G
Freon	L	L	L	G	G	P	L	-	#	#	#
Gasoline (2)	P	G	L	G	G	P	L	P	G	G	G
Glucose	G	G	G	G	G	G	G	G	G	G	G
Glycerin	G	G	G	G	G	G	L	G	G	G	G
Hydriodic Acid	L	G	G	P	P	G	-	-	-	-	-
Hydrochloric Acid. (Conc.)	L	G	G	L	L	L	P	-	G	L	G
Hydrochloric Acid. (Med. Conc.)	L	G	G	L	L	L	P	-	G	L	G
Hydrofluoric Acid	L	L	G	P	P	L	P	-	G	-	G
Hydrogen Peroxide (Conc.)	L	G	L	L	L	L	G	-	-	-	-
Hydrogen Peroxide (Dil.)	L	G	L	G	G	G	G	-	-	-	-
Hydrogen Sulfide	G	G	G	G	G	G	P	-	G	G	G
Iodine	L	G	G	G	G	L	L	-	G	G	G
Kerosene (2)	L	L	L	G	G	L	L	-	G	G	G
Ketones	G	G	G	G	G	P	P	-	G	G	G
Lacquer Solvents	L	L	L	G	G	P	-	-	L	G	G
Lactic Acid	G	G	G	G	G	G	G	-	G	G	G
Lead Acetate	G	G	G	G	G	G	G	-	G	G	G
Linseed Oil	L	G	G	G	G	L	G	-	G	G	G
Magnesium Salts	G	G	G	G	G	G	G	-	-	-	G
Naphtha	L	L	L	G	G	P	L	G	G	G	G
Natural Gas	L	L	L	G	G	G	G	-	2	2	2
Nickel Salts	G	G	G	G	G	G	G	-	-	-	-
Nitric Acid (Conc.)	P	L	P	P	P	L	P	G	L	L	G
Nitric Acid (Dil.)	P	G	L	L	L	G	P	P	L	L	G
Nitrobenzene	P	L	G	L	L	P	P	P	G	G	G
Nitrogen Oxides	L	L	G	L	L	G	-	-	-	-	-
Nitrous Acid	L	L	G	L	L	G	L	-	G	G	G
Oils (Animal and Mineral)	L	L	L	G	G	L	G	-	G	G	G
Oils (Vegetable)	L	L	L	G	G	L	G	-	G	G	G
Oxygen (5) (6)	G	G	G	G	G	G	G	G	G	G	G
Perchloric Acid	P	G	L	P	P	L	P	P	L	G	G
Phenols	P	G	G	P	P	L	P	P	-	-	G
Potassium Salts	G	G	G	G	G	G	G	G	-	-	-
Pyridine	L	L	L	L	L	P	P	-	G	G	G
Silver Nitrate	G	G	G	G	G	G	G	G	G	G	G
Soap Solutions	G	G	G	G	G	G	G	G	G	G	G
Sodium Salts	G	G	G	G	G	G	G	G	-	-	-
Stearic Acid	L	L	L	G	G	P	L	-	G	G	G
Sulfur Chloride	L	L	P	L	L	L	-	-	G	G	G
Sulfuris Acid (Conc.)	P	G	G	P	P	L	P	P	-	-	-
Sulfuris Acid (Dil.)	P	G	G	L	L	G	L	P	-	-	-
Sulfurous Acid	P	G	L	L	L	G	L	P	G	G	G

(Cont.)

Media to Plastic Tubing Material Compatibility Guide (cont.)

Media	PE	HDPE	PP	N	NR	PV	U	PEFR	FEP	PFA	TFE
Tannic Acid	G	G	G	G	G	G	P	-	G	G	G
Tanning Extracts	G	G	G	G	G	G	P	-	-	-	-
Titanium Salts	G	G	G	G	G	G	G	G	-	-	-
Toluene	P	L	P	G	G	P	L	P	G	G	G
Trichloroacetic Acid	L	L	L	P	P	P	P	-	-	-	-
Trichloroethylene	P	L	P	L	L	P	P	P	G	G	G
Turpentine	P	P	L	G	G	L	L	-	G	G	G
Urea	G	G	G	G	G	G	G	-	G	L	G
Uric Acid	G	G	G	G	G	G	G	-	G	G	G
Water (6)	G	G	G	G	G	G	G	G	G	G	G
Xylene	P	L	P	G	G	P	P	P	G	G	G
Zinc Chloride	G	G	G	G	G	G	G	-	G	L	G

Notes:

1. The Fluid Compatibility Guides are simplified rating tabulations based on immersion tests at 75°F. Higher temperatures tend to reduce ratings. Since final selection depends on pressure, fluid and ambient temperature and other factors not known to Parker Hannifin Co., no performance guarantee is expressed or implied. Ratings do not imply compliance with specialized codes such as FDA, NSF, AGA or UL and do not cover possible fluid discoloration, taste or odor effects. For conveying foodstuffs use FDA sanctioned materials, and for potable water use NSF listed materials. For chemicals not listed, or for advice on particular applications, please consult Product Engineering, Parflex Div., Ravenna, Ohio.
2. Hose applications for these fluids must take into account legal and insurance regulations. This does not imply AGA or UL compliance.
3. Satisfactory at some concentrations and temperatures, unsatisfactory in others.
4. For high pressure gases, the cover should be pinpricked and the pressure must not be released quickly. Chain or restrain the hose to prevent personal injury in the event of damage or failure.
5. Chemical compatibility does not imply low permeation rates. Consult the Parker factory for a suggestion for your specific requirement.
6. Does not imply NSF or FDA compliance.
7. Chemical compatibility does not imply acceptability for use in airless paint spray applications. These applications require a special conductive hose.
8. Fluoropolymers are chemically compatible with Anhydrous Ammonia. However, extreme caution must be used in dealing with Anhydrous Ammonia since it can cause severe injuries such as blindness and/or chemical burns.

Metric Conversion Chart

	English to Metric		
	To Convert From	To	Multiply By
Area	Sq. in. (in^2)	Sq. mm (mm^2)	645.16
	Sq. in. (in^2)	Sq. cm (cm^2)	6.4516
	Sq. ft. (ft^2)	Sq. meters (m^2)	0.0929
Density	Pounds/Cubic foot ($lb.ft^2$)	Kilograms/Cubic meter (kg/m^2)	16.02
Energy	British thermal units (Btu) (1 J=Ws=0.2388 cal)	Joules (J)	1055
Force	Pounds – force (lbf) (1N=0.102 kgf)	Newtons (N)	4.448
Length	Inches (in)	Milimeters (mm)	25.4
	Feet (ft)	Meters (m)	0.3048
	Miles (mi)	Kilometers (km)	1.609
Mass (Weight)	Ounces (oz.)	Grams (g)	28.35
	Pounds – mass (lb)	Kilograms (kg)	0.4536
	Short tons (2000 lb) (tn)	Metric tons (100 kg) (t)	0.9072
Power	Horsepower (550 ft lb/s) (hp)	Kilowatts (kW)	0.7457
Pressure	Pounds/square inch (psi)	Kilograms (f)/square cm ($kg(f)/cm^2$)	0.7457
		Kilopascals (kPa)	0.0703
		Bars (100 kPa)	6.8948
Stress	Pounds/square inch (psi) ($1N/mm^2$=1MPa)	megapascals (MPa)	0.006895
Tempera-ture	Degrees Fahrenheit (°F)	Degrees Celsius (°C)	5/9 (after sub-tracting 32)
Torque or Bending Moment	Pounds-force-foot (lb-ft)	Newtons-meter (Nm)	1.3567
	Pounds-force-inch (lb-in)		0.113
Velocity	Feet/second (ft/s)	Meters/second (m/s)	0.3048
Viscosity	Dynamic (centipoise)	Pascal-second (Pas)	.001
	Denematic – $foot^2$/sec (ft^2/s)	$Meter^2$/sec (m^2/s)	0.0929
Volume	Cubic inch (in^3)	Cubic centimeter (cm^3) (mililiter)	16.3871
	Quarts (qt)	Liters (1000 cm^3)	0.9464
	Gallons (gal)	Liters	3.7854

	Metric to English	
To Convert From	To	Multiply By
Sq. mm (mm^2)	Sq. in. (in^2)	0.00155
Kilograms/Cubic meter (kg/m^2)	Pounds/Cubic foot (lb/ft^2)	0.0624
Joules (J)	British Thermal Units (Btu)	0.000947
Newtons (N)	Pounds - force (lbf)	0.2248
Milimeters (mm)	Inches (in)	0.03937
Meters (m)	Feet (ft)	3.281
Kilometers (km)	Miles (mi)	0.621
Grams (g)	Ounces (oz.)	0.035
Kilograms (kg)	Pounds - mass (lb)	2.205
Metric tons (100 kg) (t)	Short tons (2000 lb) (tn)	1.102
Kilowatts (kW)	Horsepower (550 ft lb/s) (hp)	1.341
Kilograms (f)/square cm ($kg(f)/cm^2$)	Pounds/square inch (psi)	14.22
Kilopascals (kPa)		0.145
Bars (100 kPa)		14.503
megapascals (MPa)	Pounds/square inch (psi) ($1N/mm^2$=1MPa)	145.039
Degrees Celsius (°C)	Degrees Fahrenheit (°F)	9/5 (then add 32)
Newtons-meter (Nm)	Pounds-force-foot (lb-ft)	0.737
	Pounds-force-inch (lb-in)	8.85
Meters/second (m/s)	Feet/second (ft/s)	3.2808
Pascal-second (Pas)	Dynamic (centipoise)	1000
$Meter^2$/sec (m^2/s)	Denematic - $foot^2$/sec (ft^2/s)	10.7643
Cubic centimeter (cm^3) (mililiter)	Cubic inch (in^3)	0.061
Liters (1000 cm^3)	Quarts (qt)	1.057
Liters	Gallons (gal)	0.2642

Government & Agency Specifications

Agency and Specifications	Parflex Products
Flame Resistance:	
MSHA	83FR, D6, D6R, HFS, HFSR, HFS2, HFS2R, HTB, HTBR, M8, 560, 563, 593, 590,(except-3), 510A (except -4, -5, -6), 510C (except -4), 515H, 520N, 540N, 56DH-2, 560R, 573X-3, 575X, 580N, HLB, HJK
UL94V-2	PEFR, HUFR
UL94HB	83FR NN, NB, NNR, NBR (wall thickness above 0.033", contact Parflex for availability)
VW1, UL-83	All PFA, FEP & PTFE tubing products
Food Contact:	
FDA, CFR21 Part 177	E, F64, PP, PV, 540P, 919, 919J, 919U, 929, 939, S30, S40, STW, SBFW, SCW, PCW, SCWV, PCWV, PCWV-FS, SCWV-FS, RCTW, All natural and black PFA, FEP, PTFE & PVDF tubing products
NSF Standard 51*	E, F64, PP, NTNA, Series Tubing
Potable Water:	
NSF Standard 61*	E Series Tubing
Natural Gas Service:	
For Vehicles and Dispensing Systems ANSI IAS NGV4.2 - CSA 12.52 - NFPA 52	5CNG
European Safety Standard (TUV) Kraftfahrt-Bundesamt ECE R110	5CNG-3, 5CNG-8 (Assemblies from Parker Polyflex Europe Only)
Hydraulic Service:	
SAE 100R1	HFS, HFSR, 560, 560R
SAE 100R2	590, 593, HFS2
SAE 100R7	540N, 540P, 548N, 510C(less-2), 518C, 518D, 55LT, 510C(less-2), 943B
SAE 100R8	520N, 528N, 580N, 588N
SAE 100R12	M8
SAE 100R14A	919, 919J, 919U, 929, S30, S40
SAE 100R14B	919B, 929B, 929BJ, S30B, S40B
SAE 100R16	HFS2, HFS2R, 590
SAE 100R17	D6, D6R, H6, R6, 563, 943B
SAE 100R18	53DM, 538DM
WASTEC WRP05:	
Waste Equipment Technology Association	S5N, S6, S9, SLH
Transportation Standards:	
SAE J844, FMVSS106 (49CFR571.106)	1120A, 1120B, BRAKCOIL®, Dollycoil™, Duo-Coil™, SliderCoil™
Electrical, Non-Conductivity:	
SAE J517	518C, 518D, 548N, 528N, 588N, 538DM
DNV (with approved fittings only)	
Det Norski (Norwegian) Veritas Marine Steel Ships, Mobile Offshore & Fixed Offshore Drilling Units	520N, 580N, 588N, H580N, 518C, 540N, 573X, 575X, 590, 593, 560, 560R
American Bureau of Shipping (ABS) Product Design Assessment:	590 (sizes -4, -6, -8), 593
Breathing Air Applications:	
CGA (Compressed Gas Association)-G-7.1 Grade E Breathing Air	526BA, 527BA
NFPA 1901	526BA, 527BA

*Indicates that products shown have been tested and certified by NSF International to the requirements of NSF Standards 51 and 61. NSF does not express or imply an approval on any product.

Agency and Specifications	Parflex Products
Aerospace Material Specifications:	
AMS 3584A	HS2TFI
AMS 3585	HS2TFT
AMS 3586	HS2TFS
AMS 3653E	101, 201, TFS, TFL, TFH, TFT, HS2TFS , HS2TFT, HS2TFL, HS2TFI, TSWTF, CV (PTFE), CVL, CVH, 81914/1, 81914/2
AMS 3654C	TFL
AMS 3655B	TFT
MIL-DTL-27267C	PTFE Conductive Tubing
AMS-DTL-23053/11A CLASS 1	HS1.3FEP
AMS-DTL-23053/11A CLASS 2	HS1.6FEP
AMS-DTL-23053/12A CLASS 1	HS2TFH
AMS-DTL-23053/12A CLASS 2	HS2TFS
AMS-DTL-23053/12A CLASS 3	HS2TFT
AMS-DTL-23053/12A CLASS 4	HS2TFL
AMS-DTL-23053/12A CLASS 5	HS2TFI
SAE AS81914/1	81914/1
SAE AS81914/2	81914/2
SAE AS81914/3	81914/3
SAE AS81914/4	81914/4
American Society for Testing and Materials:	
ASTM D1710, TYPE 1, GRADE 1, CLASS B	TFB
ASTM D2116-07	103, 203
ASTM D2902 TYPE 1	HS2TFS, HS2TFT, HS2TFL, HS2TFI, HS2TFH
ASTM D2902 TYPE II	HS1.3FEP, HS1.6FEP, HS1.25FEP
ASTM D3222	110, 111
ASTM D3295	TFB, TSWTF
ASTM D3295, Class 1	TFL
ASTM D3295, Class 2	TFT
ASTM D3295, Class 3	TFS
ASTM D3295, Class 4	TFH
ASTM D3296-03	HS1.3FEP, HS1.6FEP, CV (FEP), 81914/3, 81914/4, CR (FEP), 703
ASTM D3307-10	104, 204, 105, 205, CR (PFA), 704, 705
Canadian Standards Association:	
CSA 9032-01 300V	TFT (awg)
CSA 9032-01 600V	TFS (awg)
Military Standard - US Department of Defense:	
MIL-I-22129C	TFS
A-A-59602	TSWTF
Underwriters Laboratories:	
UL-224 150V 200°C	TFL (awg)
UL-224 300V 200°C	TFT (awg)
UL-224 600V 200°C	TFS (awg)
United States Pharmacopoeia:	
USP Class VI	101, 201, TFS, TFL, TFH, TFT, TFB, HS2TFS, HS2TFT, HS2TFL, HS2TFI, HS2TFH, CV, CVL, CVH, 103, 203, HS1.3FEP, HS1.6FEP, CR, 104, 204, 105, 205

For detailed ordering information, please consult price list or contact Parflex® Division.

Parker Safety Guide

For selecting and using Hose, Tubing, Fittings, and Related Accessories

Parker Safety Guide for Selecting and Using Hose, Tubing, Fittings and Related Accessories
Publication No. 4400-B.1
Revised: November 2007

WARNING: Failure or improper selection or improper use of hose, tubing, fittings, assemblies or related accessories ("Products") can cause death, personal injury and property damage. Possible consequences of failure or improper selection or improper use of these Products include but are not limited to:

- Fittings thrown off at high speed.
- High velocity fluid discharge.
- Explosion or burning of the conveyed fluid.
- Electrocution from high voltage electric powerlines.
- Contact with suddenly moving or falling objects that are controlled by the conveyed fluid.
- Injections by high-pressure fluid discharge.
- Dangerously whipping Hose.
- Contact with conveyed fluids that may be hot, cold, toxic or otherwise injurious.
- Sparking or explosion caused by static electricity buildup or other sources of electricity.
- Sparking or explosion while spraying paint or flammable liquids.
- Injuries resulting from inhalation, ingestion or exposure to fluids.

Before selecting or using any of these Products, it is important that you read and follow the instructions below. Only Hose from Parker's Stratoflex Products Division is approved for in flight aerospace applications.

1.0 GENERAL INSTRUCTIONS

1.1 Scope: This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) these Products. For convenience, all rubber and/or thermoplastic products commonly called "hose" or "tubing" are called "Hose" in this safety guide. All assemblies made with Hose are called "Hose Assemblies". All products commonly called "fittings", "couplings" or "adapters" are called "Fittings". All related accessories (including crimping and swaging machines and tooling) are called "Related Accessories". This safety guide is a supplement to and is to be used with the specific Parker publications for the specific Hose, Fittings and Related Accessories that are being considered for use. Parker publications are available at www.parker.com. SAE J1273 (www.sae.org) and ISO 17165 2 (www.ansi.org) also provide recommended practices for hydraulic Hose Assemblies.

1.2 Fail-Safe: Hose, Hose Assemblies and Fittings can and do fail without warning for many reasons. Design all systems and equipment in a fail safe mode, so that failure of the Hose, Hose Assembly or Fitting will not endanger persons or property.

1.3 Distribution: Provide a copy of this safety guide to each person responsible for selecting or using Hose and Fitting products. Do not select or use Parker Hose or Fittings without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the Products.

1.4 User Responsibility: Due to the wide variety of operating conditions and applications for Hose and Fittings, Parker does not represent or warrant that any particular Hose or Fitting is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the Products.
- Assuring that the user's requirements are met and that the application presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the Products are used.
- Assuring compliance with all applicable government and industry standards.

1.5 Additional Questions: Call the appropriate Parker technical service department if you have any questions or require any additional information. See the Parker publication for the Products being considered or used, or call 1 800 CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2.0 HOSE AND FITTING SELECTION INSTRUCTIONS

2.1 Electrical Conductivity: Certain applications require that the Hose be nonconductive to prevent electrical current flow. Other applications require the Hose and the Fittings and the Hose/Fitting interface to be sufficiently conductive to drain off static electricity. Extreme care must be exercised when selecting Hose and Fittings for these or any other applications in which electrical conductivity or nonconductivity is a factor.

The electrical conductivity or nonconductivity of Hose and Fittings is dependent upon many factors and may be susceptible to change. These factors include but are not limited to the various materials used to make the Hose and the Fittings, Fitting finish (some Fitting finishes are electrically conductive while others are nonconductive), manufacturing methods (including moisture control), how the Fittings contact the Hose, age and amount of deterioration or damage or other changes, moisture content of the Hose at any particular time, and other factors.

The following are considerations for electrically nonconductive and conductive Hose. For other applications consult the individual catalog pages and the appropriate industry or regulatory standards for proper selection.

2.1.1 Electrically Nonconductive Hose: Certain applications require that the Hose be nonconductive to prevent electrical current flow or to maintain electrical isolation. For applications that require Hose to be electrically nonconductive, including but not limited to applications near high voltage electric lines, only special nonconductive Hose can be used. The manufacturer of the equipment in which the nonconductive Hose is to be used must be consulted to be certain that the Hose and Fittings that are selected are proper for the application. Do not use any Parker Hose or Fittings for any such application requiring nonconductive Hose, including but not limited to applications near high voltage electric lines, unless (i) the application is expressly approved in the Parker technical publication for the product, (ii) the Hose is marked "nonconductive", and (iii) the manufacturer of the equipment on which the Hose is to be used specifically approves the particular Parker Hose and Fittings for such use.

2.1.2 Electrically Conductive Hose: Parker manufactures special Hose for certain applications that require electrically conductive Hose.

Parker manufactures special Hose for conveying paint in airless paint spraying applications. This Hose is labeled "Electrically Conductive Airless Paint Spray Hose" on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in all airless paint spraying applications. Do not use any other Hose for airless paint spraying, even if electrically conductive. Use of any other Hose or failure to properly connect the Hose can cause a fire or an explosion resulting in death, personal injury, and property damage.

Parker manufactures a special Hose for certain compressed natural gas ("CNG") applications where static electricity buildup may occur. Parker CNG Hose assemblies comply with the requirements of ANSI/IAS NGV 4.2-1999; CSA 12.52-M99, "Hoses for Natural Gas Vehicles and Dispensing Systems" (www.ansi.org). This Hose is labeled "Electrically Conductive for CNG Use" on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in, for example, high velocity CNG

dispensing or transfer. Do not use any other Hose for CNG applications where static charge buildup may occur, even if electrically conductive. Use of other Hoses in CNG applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. Care must also be taken to protect against CNG permeation through the Hose wall. See section 2.6, Permeation, for more information. Parker CNG Hose is intended for dispenser and vehicle use at a maximum temperature of 180°F (82°C). Parker CNG Hose should not be used in confined spaces or unventilated areas or areas exceeding 180°F (82°C). Final assemblies must be tested for leaks. CNG Hose Assemblies should be tested on a monthly basis for conductivity per ANSI/IAS NGV 4.2-1999; CSA 12.52-M99.

Parker manufactures special Hose for aerospace in flight applications. Aerospace in flight applications employing Hose to transmit fuel, lubricating fluids and hydraulic fluids require a special Hose with a conductive inner tube. This Hose for in flight applications is available only from Parker's Stratoflex Products Division. Do not use any other Parker Hose for in flight applications, even if electrically conductive. Use of other Hoses for in flight applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury and property damage. These Hose assemblies for in flight applications must meet all applicable aerospace industry, aircraft engine and aircraft requirements.

2.2 Pressure: Hose selection must be made so that the published maximum working pressure of the Hose and Fittings are equal to or greater than the maximum system pressure. The maximum working pressure of a Hose Assembly is the lower of the respective published maximum working pressures of the Hose and the Fittings used. Surge pressures or peak transient pressures in the system must be below the published maximum working pressure for the Hose. Surge pressures and peak pressures can usually only be determined by sensitive electrical instrumentation that measures and indicates pressures at millisecond intervals. Mechanical pressure gauges indicate only average pressures and cannot be used to determine surge pressures or peak transient pressures. Published burst pressure ratings for Hose is for manufacturing test purposes only and is no indication that the Product can be used in applications at the burst pressure or otherwise above the published maximum recommended working pressure.

2.3 Suction: Hoses used for suction applications must be selected to insure that the Hose will withstand the vacuum and pressure of the system. Improperly selected Hose may collapse in suction application.

2.4 Temperature: Be certain that fluid and ambient temperatures, both steady and transient, do not exceed the limitations of the Hose. Temperatures below and above the recommended limit can degrade Hose to a point where a failure may occur and release fluid. Properly insulate and protect the Hose Assembly when routing near hot objects (e.g. manifolds). Do not use any Hose in any application where failure of the Hose could result in the conveyed fluids (or vapors or mist from the conveyed fluids) contacting any open flame, molten metal, or other potential fire ignition source that could cause burning or explosion of the conveyed fluids or vapors.

2.5 Fluid Compatibility: Hose Assembly selection must assure compatibility of the Hose tube, cover, reinforcement, and Fittings with the fluid media used. See the fluid compatibility chart in the Parker publication for the product being considered or used. This information is offered only as a guide. Actual service life can only be determined by the end user by testing under all extreme conditions and other analysis. Hose that is chemically compatible with a particular fluid must be assembled using Fittings and adapters containing likewise compatible seals.

2.6 Permeation: Permeation (that is, seepage through the Hose) will occur from inside the Hose to outside when Hose is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials as helium, diesel fuel, gasoline, natural gas, or LPG). This permeation may result in high concentrations of vapors which are potentially flammable, explosive, or toxic, and in loss of fluid. Dangerous explosions, fires, and other hazards can result when using the wrong Hose for such applications. The system designer must take into account the fact that this permeation will take place and must not use Hose if this permeation could be hazardous. The system designer must take into account all legal, government, insurance, or any other special regulations which govern the use of fuels and refrigerants. Never use a Hose even though the fluid compatibility is acceptable without considering the potential hazardous effects that can result from permeation through the Hose Assembly.

Permeation of moisture from outside the Hose to inside the Hose will also occur in Hose assemblies, regardless of internal pressure. If this moisture permeation would have detrimental effects (particularly, but not limited to refrigeration and air conditioning systems), incorporation of sufficient drying capacity in the system or other appropriate system safeguards should be selected and used.

2.7 Size: Transmission of power by means of pressurized fluid varies with pressure and rate of flow. The size of the components must be adequate to keep pressure losses to a minimum and avoid damage due to heat generation or excessive fluid velocity.

2.8 Routing: Attention must be given to optimum routing to minimize inherent problems (kinking or flow restriction due to Hose collapse, twisting of the Hose, proximity to hot objects or heat sources). For additional routing recommendations see SAE J1273 and ISO 17165-2. Hose Assemblies have a finite life and if possible, should be installed in a manner that allows for ease of inspection and future replacement. Rubber Hose because of its relative short life, should not be used in residential and commercial buildings for HVAC (heating, ventilating and air conditioning) applications.

2.9 Environment: Care must be taken to insure that the Hose and Fittings are either compatible with or protected from the environment (that is, surrounding conditions) to which they are exposed. Environmental conditions including but not limited to ultraviolet radiation, sunlight, heat, ozone, moisture, water, salt water, chemicals and air pollutants can cause degradation and premature failure.

2.10 Mechanical Loads: External forces can significantly reduce Hose life or cause failure. Mechanical loads which must be considered include excessive flexing, twist, kinking, tensile or side loads, bend radius, and vibration. Use of swivel type Fittings or adapters may be required to insure no twist is put into the Hose. Unusual applications may require special testing prior to Hose selection.

2.11 Physical Damage: Care must be taken to protect Hose from wear, snagging, kinking, bending smaller that minimum bend radius and cutting, any of which can cause premature Hose failure. Any Hose that has been kinked or bent to a radius smaller than the minimum bend radius, and any Hose that has been cut or is cracked or is otherwise damaged should be removed and discarded.

2.12 Proper End Fitting: See instructions 3.2 through 3.5. These recommendations may be substantiated by testing to industry standards such as SAE J517 for hydraulic applications, or MIL-A-5070, AS1339, or AS3517 for Hoses from Parker's Stratoflex Products Division for aerospace applications.

2.13 Length: When establishing a proper Hose length, motion absorption, Hose length changes due to pressure, and Hose and machine tolerances and movement must be considered.

2.14 Specifications and Standards: When selecting Hose and Fittings, government, industry, and Parker specifications and recommendations must be reviewed and followed as applicable.

2.15 Hose Cleanliness: Hose components may vary in cleanliness levels. Care must be taken to insure that the Hose Assembly selected has an adequate level of cleanliness for the application.

2.16 Fire Resistant Fluids: Some fire resistant fluids that are to be conveyed by Hose require use of the same type of Hose as used with petroleum base fluids. Some such fluids require a special Hose, while a few fluids will not work with any Hose at all. See instructions 2.5 and 1.5. The wrong Hose may fail after a very short service. In addition, all liquids but pure water may burn fiercely under certain conditions, and even pure water leakage may be hazardous.

2.17 Radiant Heat: Hose can be heated to destruction without contact by such nearby items as hot manifolds or molten metal. The same heat source may then initiate a fire. This can occur despite the presence of cool air around the Hose.

2.18 Welding or Brazing: When using a torch or arc welder in close proximity to hydraulic lines, the hydraulic lines should be removed or shielded with appropriate fire resistant materials. Flame or weld spatter could

burn through the Hose and possibly ignite escaping fluid resulting in a catastrophic failure. Heating of plated parts, including Hose Fittings and adapters, above 450°F (232°C) such as during welding, brazing or soldering may emit deadly gases.

2.19 Atomic Radiation: Atomic radiation affects all materials used in Hose assemblies. Since the long-term effects may be unknown, do not expose Hose assemblies to atomic radiation.

2.20 Aerospace Applications: The only Hose and Fittings that may be used for in-flight aerospace applications are those available from Parker's Stratoflex Products Division. Do not use any other Hose or Fittings for in-flight applications. Do not use any Hose or Fittings from Parker's Stratoflex Products Division with any other Hose or Fittings, unless expressly approved in writing by the engineering manager or chief engineer of Stratoflex Products Division and verified by the user's own testing and inspection to aerospace industry standards.

2.21 Unlocking Couplings: Ball locking Couplings or other Fittings with quick disconnect ability can unintentionally disconnect if they are dragged over obstructions, or if the sleeve or other disconnect member is bumped or moved enough to cause disconnect. Threaded Fittings should be considered where there is a potential for accidental uncoupling.

3.0 HOSE AND FITTINGS ASSEMBLY AND INSTALLATION INSTRUCTIONS

3.1 Component Inspection: Prior to assembly, a careful examination of the Hose and Fittings must be performed. All components must be checked for correct style, size, catalog number, and length. The Hose must be examined for cleanliness, obstructions, blisters, cover looseness, kinks, cracks, cuts or any other visible defects. Inspect the Fitting and sealing surfaces for burrs, nicks, corrosion or other imperfections. Do NOT use any component that displays any signs of nonconformance.

3.2 Hose and Fitting Assembly: Do not assemble a Parker Fitting on a Parker Hose that is not specifically listed by Parker for that Fitting, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. Do not assemble a Parker Fitting on another manufacturer's Hose or a Parker Hose on another manufacturer's Fitting unless (i) the engineering manager or chief engineer of the appropriate Parker division approves the Assembly in writing or that combination is expressly approved in the appropriate Parker literature for the specific Parker product, and (ii) the user verifies the Assembly and the application through analysis and testing. For Parker Hose that does not specify a Parker Fitting, the user is solely responsible for the selection of the proper Fitting and Hose Assembly procedures. See instruction 1.4.

To prevent the possibility of problems such as leakage at the Fitting or system contamination, it is important to completely remove all debris from the cutting operation before installation of the Fittings. The Parker published instructions must be followed for assembling the Fittings on the Hose. These instructions are provided in the Parker Fitting catalog for the specific Parker Fitting being used, or by calling 1-800-CPARKER, or at www.parker.com.

3.3 Related Accessories: Do not crimp or swage any Parker Hose or Fitting with anything but the listed swage or crimp machine and dies in accordance with Parker published instructions. Do not crimp or swage another manufacturer's Fitting with a Parker crimp or swage die unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division.

3.4 Parts: Do not use any Parker Fitting part (including but not limited to socket, shell, nipple, or insert) except with the correct Parker mating parts, in accordance with Parker published instructions, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division.

3.5 Field Attachable/Permanent: Do not reuse any field attachable Hose Fitting that has blown or pulled off a Hose. Do not reuse a Parker permanent Hose Fitting (crimped or swaged) or any part thereof. Complete Hose Assemblies may only be reused after proper inspection under section 4.0. Do not assemble Fittings to any previously used hydraulic Hose that was in service, for use in a fluid power application.

3.6 Pre-Installation Inspection: Prior to installation, a careful examination of the Hose Assembly must be performed. Inspect the Hose Assembly for any damage or defects. DO NOT use any Hose Assembly that displays any signs of nonconformance.

3.7 Minimum Bend Radius: Installation of a Hose at less than the minimum listed bend radius may significantly reduce the Hose life. Particular attention must be given to preclude sharp bending at the Hose to Fitting juncture. Any bending during installation at less than the minimum bend radius must be avoided. If any Hose is kinked during installation, the Hose must be discarded.

3.8 Twist Angle and Orientation: Hose Assembly installation must be such that relative motion of machine components does not produce twisting.

3.9 Securement: In many applications, it may be necessary to restrain, protect, or guide the Hose to protect it from damage by unnecessary flexing, pressure surges, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

3.10 Proper Connection of Ports: Proper physical installation of the Hose Assembly requires a correctly installed port connection insuring that no twist or torque is transferred to the Hose when the Fittings are being tightened or otherwise during use.

3.11 External Damage: Proper installation is not complete without insuring that tensile loads, side loads, kinking, flattening, potential abrasion, thread damage or damage to sealing surfaces are corrected or eliminated. See instruction 2.10.

3.12 System Checkout: All air entrapment must be eliminated and the system pressurized to the maximum system pressure (at or below the Hose maximum working pressure) and checked for proper function and freedom from leaks. Personnel must stay out of potential hazardous areas while testing and using.

3.13 Routing: The Hose Assembly should be routed in such a manner so if a failure does occur, the escaping media will not cause personal injury or property damage. In addition, if fluid media comes in contact with hot surfaces, open flame or sparks, a fire or explosion may occur. See section 2.4.

3.14 Ground Fault Equipment Protection Devices (GFEPDs): ***WARNING!*** Fire and Shock Hazard. To minimize the danger of fire if the heating cable of a Multitube bundle is damaged or improperly installed, use a Ground Fault Equipment Protection Device. Electrical fault currents may be insufficient to trip a conventional circuit breaker.

For ground fault protection, the IEEE 515:1989 (www.ansi.org) standard for heating cables recommends the use of GFEPDs with a nominal 30 milliampere trip level for "piping systems in classified areas, those areas requiring a high degree of maintenance, or which may be exposed to physical abuse or corrosive atmospheres".

4.0 HOSE AND FITTING MAINTENANCE AND REPLACEMENT INSTRUCTIONS

4.1 Even with proper selection and installation, Hose life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a possible Hose failure, and experience with any Hose failures in the application or in similar applications should determine the frequency of the inspection and the replacement for the Products so that Products are replaced before any failure occurs. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.7.

4.2 Visual Inspection Hose/Fitting: Any of the following conditions require immediate shut down and replacement of the Hose Assembly:

- Fitting slippage on Hose;
- Damaged, cracked, cut or abraded cover (any reinforcement exposed);
- Hard, stiff, heat cracked, or charred Hose;
- Cracked, damaged, or badly corroded Fittings;
- Leaks at Fitting or in Hose;
- Kinked, crushed, flattened or twisted Hose; and
- Blistered, soft, degraded, or loose cover.

4.3 Visual Inspection All Other: The following items must be tightened, repaired, corrected or replaced as required:

- Leaking port conditions;
- Excess dirt buildup;
- Worn clamps, guards or shields; and
- System fluid level, fluid type, and any air entrapment.

4.4 Functional Test: Operate the system at maximum operating pressure and check for possible malfunctions and leaks. Personnel must avoid potential hazardous areas while testing and using the system. See section 2.2.

4.5 Replacement Intervals: Hose assemblies and elastomeric seals used on Hose Fittings and adapters will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Hose Assemblies and elastomeric seals should be inspected and replaced at specific replacement intervals, based on previous service life, government or industry recommendations, or when failures could result in unacceptable downtime, damage, or injury risk. See section 1.2. Hose and Fittings may be subjected to internal mechanical and/or chemical wear from the conveying fluid and may fail without warning. The user must determine the product life under such circumstances by testing. Also see section 2.5.

4.6 Hose Inspection and Failure: Hydraulic power is accomplished by utilizing high pressure fluids to transfer energy and do work. Hoses, Fittings and Hose Assemblies all contribute to this by transmitting fluids at high pressures. Fluids under pressure can be dangerous and potentially lethal and, therefore, extreme caution must be exercised when working with fluids under pressure and handling the Hoses transporting the fluids. From time to time, Hose Assemblies will fail if they are not replaced at proper time intervals. Usually these failures are the result of some form of misapplication, abuse, wear or failure to perform proper maintenance. When Hoses fail, generally the high pressure fluids inside escape in a stream which may or may not be visible to the user. Under no circumstances should the user attempt to locate the leak by "feeling" with their hands or any other part of their body. High pressure fluids can and will penetrate the skin and cause severe tissue damage and possibly loss of limb. Even seemingly minor hydraulic fluid injection injuries must be treated immediately by a physician with knowledge of the tissue damaging properties of hydraulic fluid.

If a Hose failure occurs, immediately shut down the equipment and leave the area until pressure has been completely released from the Hose Assembly. Simply shutting down the hydraulic pump may or may not eliminate the pressure in the Hose Assembly. Many times check valves, etc., are employed in a system and can cause pressure to remain in a Hose Assembly even when pumps or equipment are not operating. Tiny holes in the Hose, commonly known as pinholes, can eject small, dangerously powerful but hard to see streams of hydraulic fluid. It may take several minutes or even hours for the pressure to be relieved so that the Hose Assembly may be examined safely.

Once the pressure has been reduced to zero, the Hose Assembly may be taken off the equipment and examined. It must always be replaced if a failure has occurred. Never attempt to patch or repair a Hose Assembly that has failed. Consult the nearest Parker distributor or the appropriate Parker division for Hose Assembly replacement information.

Never touch or examine a failed Hose Assembly unless it is obvious that the Hose no longer contains fluid under pressure. The high pressure fluid is extremely dangerous and can cause serious and potentially fatal injury.

4.7 Elastomeric seals: Elastomeric seals will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Elastomeric seals should be inspected and replaced.

4.8 Refrigerant gases: Special care should be taken when working with refrigeration systems. Sudden escape of refrigerant gases can cause blindness if the escaping gases contact the eye and can cause freezing or other severe injuries if it contacts any other portion of the body.

4.9 Compressed natural gas (CNG): Parker CNG Hose Assemblies should be tested after installation and before use, and at least on a monthly basis per ANSI/IAS NGV 4.2-1999; CSA 12.52-M99 Section 4.2 "Visual Inspection Hose/Fitting". The recommended procedure is to pressurize the Hose and check for leaks and to visually inspect the Hose for damage. Caution: Matches, candles, open flame or other sources of ignition shall not be used for Hose inspection. Leak check solutions should be rinsed off after use.

5.0 HOSE STORAGE

5.1 Age Control: Hose and Hose Assemblies must be stored in a manner that facilitates age control and first-in and first-out usage based on manufacturing date of the Hose and Hose Assemblies. The shelf life of rubber Hose or Hose Assemblies that have passed visual inspection and a proof test is 10 years (40 quarters) from the date of manufacture. The shelf life of thermoplastic and polytetrafluoroethylene Hose or Hose Assemblies is considered to be unlimited.

5.2 Storage: Stored Hose and Hose Assemblies must not be subjected to damage that could reduce their expected service life and must be placed in a cool, dark and dry area with the ends capped. Stored Hose and Hose Assemblies must not be exposed to temperature extremes, ozone, oils, corrosive liquids or fumes, solvents, high humidity, rodents, insects, ultraviolet light, electromagnetic fields or radioactive materials.

ENERPAC Warranty Policy

For those ENERPAC items sold as part of the Parker Parflex Division product offering, the following warranty applies.

ENERPAC products are warranted to be free of defects in materials and workmanship under normal use for as long as they are owned by the original purchaser, subject to the exclusions and limitations described below. This warranty does not cover ordinary wear and tear, overloading, alterations, (including repairs or attempted repairs by parties other than ENERPAC or its authorized service representatives), improper fluid, use in a manner for which they are not intended or use which is contrary to instructions for the products.

THIS WARRANTY IS LIMITED TO NEW PRODUCTS SOLD THROUGH ENERPAC AUTHORIZED DISTRIBUTORS, ORIGINAL EQUIPMENT MANUFACTURERS OR OTHER DESIGNATED CHANNELS OF DISTRIBUTION. NO AGENT, EMPLOYEE, OR OTHER REPRESENTATIVE OF ENERPAC HAS THE AUTHORITY TO IN ANY WAY CHANGE OR AMEND THIS WARRANTY.

Electronic products and components are warranted against defects in material and workmanship for a period of two years from the date of purchase.

The following items supplied with ENERPAC products are excluded from this warranty:

Components not manufactured by ENERPAC, including air motors, electric motors, gasoline engines, and diesel engines. Such items are warranted to the extent of the warranty provided by the manufacturers of such items.

If the customer believes a product is defective, the product must be delivered, or shipped freight prepaid, to the nearest ENERPAC Authorized Service Center. The customer should contact ENERPAC to locate and Authorized Service Center in the customer's area.

Products that do not conform to this warranty will be returned by ground transportation, freight prepaid.

THE FOREGOING WARRANT IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The remedy of repair, replacement or refund is customer's exclusive remedy in the event of breach of this warranty.

SELLER SHALL NOT BE SUBJECT TO AND DISCLAIMS:

(a) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY,

(b) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR ARISING UNDER THEORIES OR LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY SELLER OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO, AND

(c) ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES WHATSOEVER.

ENERPAC's liability in all cases is limited to, and shall not exceed, the purchase price paid.

For the nearest authorized ENERPAC SERVICE CENTER, please call ENERPAC at 1-800-558-0530 or visit the ENERPAC web site at www.Enerpac.com.

Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, as subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such item, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold thereunder shall be free from defects in material or workmanship for a period of 365 days from the date of shipment to Buyer, or 2,000 hours of use, whichever expires first. THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GAURANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTIBILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLELY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold herunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller of if Seller is liable for the collection of such tax, the amount thereof shall be in additon to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter "Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes in the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and options, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.
If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infriges any patent, trademark, copyright, trade dress, trade secret or any similiar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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Key Word Index

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Key Word Index (cont.)

Parker's Motion & Control Product Groups

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 1 800 C-Parker (1 800 272 7537).

Aerospace

Key Markets

Aftermarket services
Commercial transports
Engines
General & business aviation
Helicopters
Launch vehicles
Military aircraft
Missiles
Power generation
Regional transports
Unmanned aerial vehicles

Key Products

Control systems & actuation products
Engine systems & components
Fluid conveyance systems & components
Fluid metering, delivery & atomization devices
Fuel systems & components
Fuel tank inerting systems
Hydraulic systems & components
Thermal management
Wheels & brakes

Automation

Key Markets

Alternative energy
Conveyor & material handling
Factory automation
Food & beverage
Life sciences & medical
Machine tools
Packaging machinery
Paper machinery
Plastics machinery
Primary metals
Safety & security
Semiconductor & electronics
Transportation & automotive

Key Products

AC/DC drives & systems
Air preparation
Electric actuators, gantry robots & slides
Human machine interfaces
Inverters
Manifolds
Miniature fluidics
Pneumatic actuators & grippers
Pneumatic valves & controls
Rotary actuators
Stepper motors, servo motors, drives & controls
Structural extrusions
Vacuum generators, cups & sensors

Climate & Industrial Controls

Key Markets

Agriculture
Air conditioning
Construction Machinery
Food & beverage
Industrial machinery
Life sciences
Oil & gas
Precision cooling
Process
Refrigeration
Transportation

Key Products

Accumulators
Advanced actuators
CO_2 controls
Electronic controllers
Filter driers
Hand shut-off valves
Heat exchangers
Hose & fittings
Pressure regulating valves
Refrigerant distributors
Safety relief valves
Smart pumps
Solenoid valves
Thermostatic expansion valves

Filtration

Key Markets

Aerospace
Food & beverage
Industrial plant & equipment
Life sciences
Marine
Mobile equipment
Oil & gas
Power generation & renewable energy
Process
Transportation
Water Purification

Key Products

Analytical gas generators
Compressed air filters & dryers
Engine air, coolant, fuel & oil filtration systems
Fluid condition monitoring systems
Hydraulic & lubrication filters
Hydrogen, nitrogen & zero air generators
Instrumentation filters
Membrane & fiber filters
Microfiltration
Sterile air filtration
Water desalination & purification filters & systems

Fluid Connectors

Key Markets

Aerial lift
Agriculture
Bulk chemical handling
Construction machinery
Food & beverage
Fuel & gas delivery
Industrial machinery
Life sciences
Marine
Mining
Mobile
Oil & gas
Renewable energy
Transportation

Key Products

Check valves
Connectors for low pressure fluid conveyance
Deep sea umbilicals
Diagnostic equipment
Hose couplings
Industrial hose
Mooring systems & power cables
PTFE hose & tubing
Quick couplings
Rubber & thermoplastic hose
Tube fittings & adapters
Tubing & plastic fittings

Hydraulics

Key Markets

Aerial lift
Agriculture
Alternative energy
Construction machinery
Forestry
Industrial machinery
Machine tools
Marine
Material handling
Mining
Oil & gas
Power generation
Refuse vehicles
Renewable energy
Truck hydraulics
Turf equipment

Key Products

Accumulators
Cartridge valves
Electrohydraulic actuators
Human machine interfaces
Hybrid drives
Hydraulic cylinders
Hydraulic motors & pumps
Hydraulic systems
Hydraulic valves & controls
Hydrostatic steering
Integrated hydraulic circuits
Power take-offs
Power units
Rotary actuators
Sensors

Instrumentation

Key Markets

Alternative fuels
Biopharmaceuticals
Chemical & refining
Food & beverage
Marine & shipbuilding
Medical & dental
Microelectronics
Nuclear Power
Offshore oil exploration
Oil & gas
Pharmaceuticals
Power generation
Pulp & paper
Steel
Water/wastewater

Key Products

Analytical Instruments
Analytical sample conditioning products & systems
Chemical injection fittings & valves
Fluoropolymer chemical delivery fittings, valves & pumps
High purity gas delivery fittings, valves, regulators & digital flow controllers
Industrial mass flow meters/controllers
Permanent no-weld tube fittings
Precision industrial regulators & flow controllers
Process control double block & bleeds
Process control fittings, valves, regulators & manifold valves

Seal

Key Markets

Aerospace
Chemical processing
Consumer
Fluid power
General industrial
Information technology
Life sciences
Microelectronics
Military
Oil & gas
Power generation
Renewable energy
Telecommunications
Transportation

Key Products

Dynamic seals
Elastomeric o-rings
Electro-medical instrument design & assembly
EMI shielding
Extruded & precision-cut, fabricated elastomeric seals
High temperature metal seals
Homogeneous & inserted elastomeric shapes
Medical device fabrication & assembly
Metal & plastic retained composite seals
Shielded optical windows
Silicone tubing & extrusions
Thermal management
Vibration dampening

ENGINEERING YOUR SUCCESS.

Parker Fluid Connectors Group
North American Divisions & Distribution Service Centers

Your complete source for quality tube fittings, hose & hose fittings, brass & composite fittings, quick-disconnect couplings, valves and assembly tools, locally available from a worldwide network of authorized distributors.

Fittings:
Available in inch and metric sizes covering SAE, BSP, DIN, GAZ, JIS and ISO thread configurations, manufactured from steel, stainless steel, brass, aluminum, nylon and thermoplastic.

Hose, Tubing and Bundles:
Available in a wide variety of sizes and materials including rubber, wire-reinforced, thermoplastic, hybrid and custom compounds.

Worldwide Availability:
Parker operates Fluid Connectors manufacturing locations and sales offices throughout North America, South America, Europe and Asia-Pacific.

For information, call toll free...

1-800-C-PARKER
(1-800-272-7537)

North American Divisions

Fluid System Connectors Division
Otsego, MI
phone 269 694 9411
fax 269 694 4614

Hose Products Division
Wickliffe, OH
phone 440 943 5700
fax 440 943 3129

Industrial Hose Division
Wickliffe, OH
phone 440 833 2120
fax 440 833 2230

Parflex Division
Ravenna, OH
phone 330 296 2871
fax 330 296 8433

Quick Coupling Division
Minneapolis, MN
phone 763 544 7781
fax 763 544 3418

Tube Fittings Division
Columbus, OH
phone 614 279 7070
fax 614 279 7685

Distribution Service Centers

Buena Park, CA
phone 714 522 8840
fax 714 994 1183

Conyers, GA
phone 770 929 0330
fax 770 929 0230

Louisville, KY
phone 502 937 1322
fax 502 937 4180

Portland, OR
phone 503 283 1020
fax 503 283 2201

Toledo, OH
phone 419 878 7000
fax 419 878 7001
fax 419 878 7420
(FCG Kit Operations)

Canada
Grimsby, ONT
phone 905 945 2274
fax 905 945 3945
(Contact Grimsby for other Service Center locations.)

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