

S T A M P

SIZE

TEMPERATURE

APPLICATION

MEDIA

PRESSURE



Half SAE Bend



Tough Cover



SuperTough Cover



High Temperature



Low Temperature



Compact

Technical

Flow Temperature Pressure Installation Chemical Resistance
Performance Standards & Specifications Fitting Identification
Safety Guide

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Size

Flow Capacities at Recommended Flow Velocities

The nomogram below is provided as an aid in determining the correct hose size.

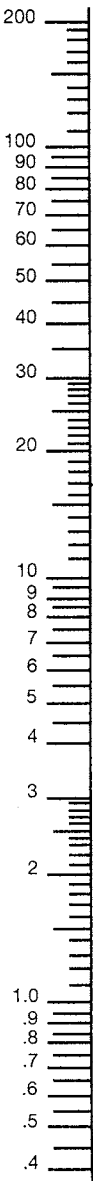
How to use the nomogram: Determine the proper flow rate your system requires, then connect a straight edge from the selected flow rate to the recommended velocity range. The required hose I.D. will appear at the intersection of the straight edge and the center column. If the straight edge passes through the scale between sizes listed, use the next larger I.D. hose.

Example: Locate 16 gallons per minute in the left-hand column and 20 feet per second (fps) in the right-hand column (the maximum

recommended velocity range for pressure lines). Lay a straight edge across these two points. The inside diameter required is shown in the center column at or above the straight edge. In this case, we need a hose I.D. of 0.625 (5/8") inch (or larger).

Use the same procedure for suction or return lines, except utilizing their respective maximum recommended velocities.

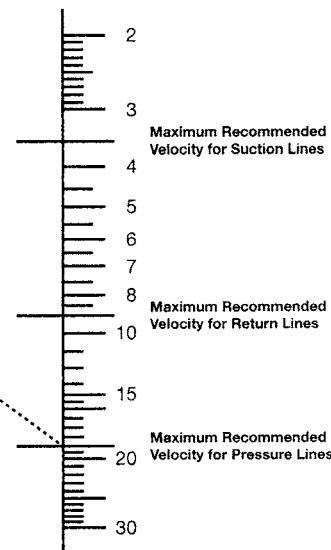
Flow
Gallons per Minute



**Inside Diameter of Hose
Inch / Dash Size**
20, 21, 22, 23, All Others
Group XV, 90, 91

2-3/8"	40	32	2"
1-13/16"	32	24	1-1/2"
1-3/8"	24	20	1-1/4"
1-1/8"	20	16	1"
7/8"	16	12	3/4"
5/8"	12	10	5/8"
1/2"	10	8	1/2"
13/32"	8	6	3/8"
5/16"	6	5	5/16"
1/4"	5	4	1/4"
3/16"	4	3	3/16"

**Velocity
Feet per Second**



The nomogram is based on the following formula:

$$D = \sqrt{\frac{Q \times 0.4081}{V}}$$

Where: Q = Flow in Gallons per Minute (gpm)
V = Velocity in Feet per Second (ft/sec)
D = Hose Inside Diameter (inches)



Size

**Hose Flow Capacities
Pressure Drop**

Hose Dash Size	-04		-05		-06		-08		-10		-12		-16		-20		-24		-32		-40	-48	
Hose I.D. (Inches)	0.19	0.25	0.25	0.31	0.31	0.38	0.41	0.50	0.50	0.63	0.63	0.75	0.88	1.00	1.13	1.25	1.38	1.50	1.81	2.00	2.38	3.00	
0.25	10.0	3.1	3.1																				
0.5	19.0	6.0	6.0	2.7	2.7																		
1	40.0	12.0	12.0	5.5	5.5	2.4																	
2	95.0	24.0	24.0	10.0	10.0	4.8	3.5																
3	185.0	46.0	46.0	17.0	17.0	7.0	5.0	2.2	2.2														
4		78.0	78.0	29.0	29.0	12.0	8.0	3.0	3.0	1.2	1.2												
5		120.0	120.0	44.0	44.0	18.0	12.0	4.5	4.5	1.6	1.6	0.7											
8				95.0	95.0	39.0	26.0	10.0	10.0	3.6	3.6	1.4	0.6										
10						59.0	40.0	15.0	15.0	5.7	5.7	2.0	1.0	0.6									
12						80.0	52.0	20.0	20.0	7.2	7.2	2.6	1.5	0.8	0.4								
15							75.0	30.0	30.0	10.0	10.0	4.2	2.2	1.2	0.7	0.4							
18							107.0	40.0	40.0	15.0	15.0	6.3	3.0	1.5	0.7	0.6	0.4						
20								49.0	49.0	19.0	19.0	8.0	3.4	2.0	1.1	0.7	0.4	0.3					
25								72.0	72.0	26.0	26.0	11.0	5.5	3.0	1.6	1.0	0.6	0.4	0.2				
30										34.0	34.0	14.0	7.0	3.6	2.2	1.3	0.8	0.5	0.2	0.1			
35										47.0	47.0	19.0	9.5	5.0	2.8	1.7	1.1	0.7	0.3	0.2			
40												25.0	12.0	6.5	3.4	2.2	1.4	0.9	0.4	0.2			
50												36.0	17.0	9.0	5.3	3.3	2.0	1.3	0.5	0.4	0.2		
60												50.0	23.0	12.0	7.5	4.4	2.8	1.8	0.8	0.5	0.2		
70													31.0	17.0	9.3	6.0	3.8	2.4	1.0	0.7	0.3		
80													38.0	21.0	12.0	7.1	4.6	3.0	1.2	0.8	0.3	0.1	
90													49.0	27.0	15.0	9.0	5.9	3.8	1.5	1.0	0.5	0.1	
100														33.0	19.0	12.0	7.0	4.7	1.9	1.3	0.6	0.2	
150														60.0	36.0	22.0	13.0	8.5	3.4	2.2	1.0	0.3	
200															36.0	23.0	15.0	6.0	3.9	1.7	0.6		
250															54.0	33.0	22.0	8.5	5.3	2.5	0.8		
300																45.0	29.0	12.0	7.5	4.0	1.1		
400																	51.0	21.0	14.0	6.5	2.2		
500																		32.0	20.0	10.0	3.0		
800																					18.0	5.0	
1000																							10.0

Pressure drop in psi (pounds per square inch) per 10 feet of hose (smooth bore) without fittings.

Fluid specification: Specific gravity = 0.85; Viscosity = ν = 20 centistokes (C.S.), (20 C.S. = 97 S.S.U.)

Pressure drop values listed are typical of many petroleum based hydraulic oils at approximately +100°F (+38°C). Differences in fluids, fluid temperature and viscosity can increase or decrease actual pressure drop compared to the values listed.

Temperature

Temperature / Pressure Chart - 201, 206, 213, and 266 Hose

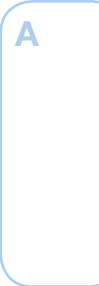
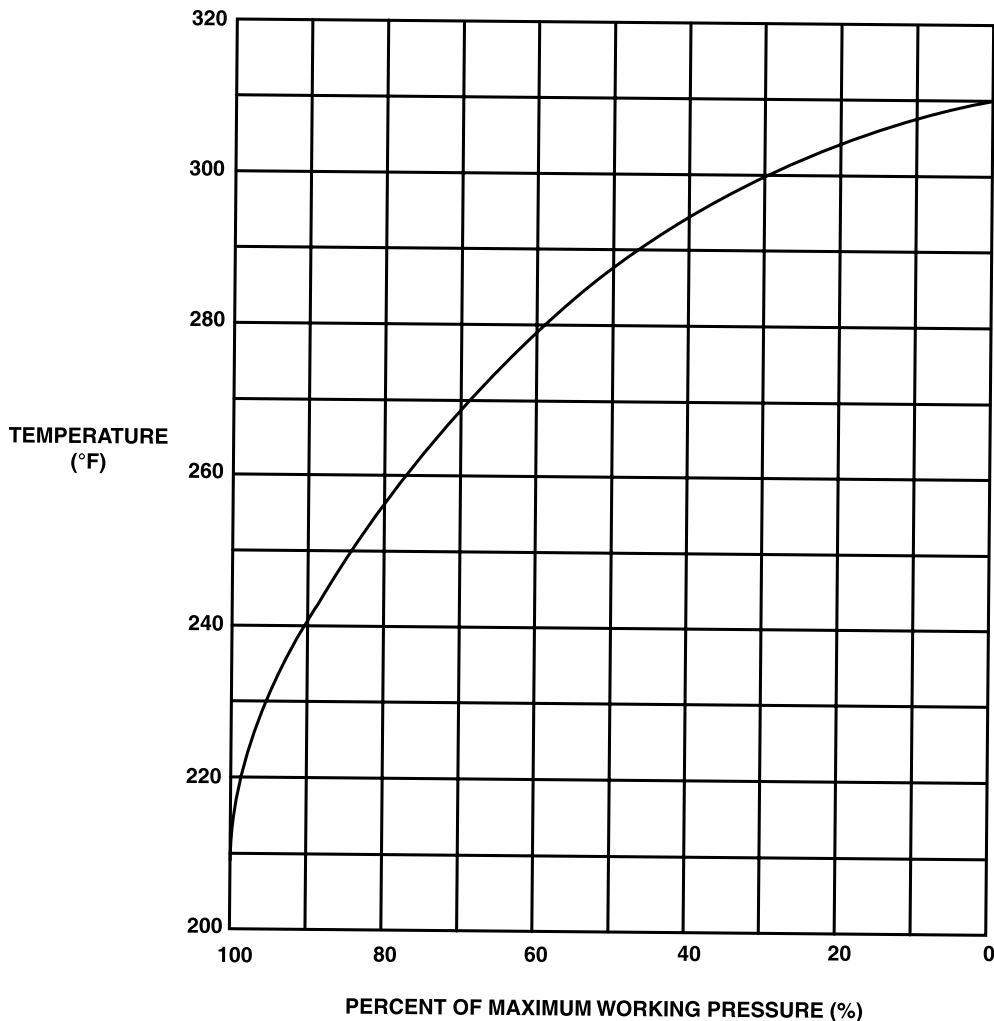
The Temperature / Pressure Chart identifies the effects temperature change has on the maximum working pressure of specific hoses.

How to use the chart:

- 1st** - Identify the Maximum Working Pressure of selected hose.
- 2nd** - Identify the maximum working temperature of the application.
- 3rd** - Locate point where temperature and Percent of Maximum Working Pressure intersect on the chart.
- 4th** - Based on percentage figure, calculate Maximum Working Pressure of the application.

Example: 201-8 hose to be used a 250°F (121°C)

Maximum Working Pressure up to 212°F (100°C)	x	(Multiplier from chart)	=	Maximum Working Pressure at 250°F (121°C)
2,000 psi	x	(85%)	=	1,700 psi



Temperature

Minimum/Maximum Temperature

(Page 1 of 4)

Hose Family	Cover (ISO Rating)	Petroleum base hydraulic fluids and lubricating oils	Antifreeze solutions	Diesel fuels	SAE J1942 Marine lube oil and diesel fuel systems (Application Code F)**
GlobalCore 187	Standard	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	TC (AC)	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	TC (AS)	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	ST (AC)	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	ST (AS)	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
GlobalCore 387	Standard	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	TC	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	ST	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
GlobalCore 487	Standard	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	TC	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	ST	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
GlobalCore 722	Standard	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	TC	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	ST	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
GlobalCore 787	Standard	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	TC (DC)	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	TC (AC)	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	ST (DC)	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	ST (AC)	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
GlobalCore 797	Standard	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	TC (CC, DC)	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	TC (AC)	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
	ST (CC, DC)	-40°C to +125°C (-40°F to +257°F)	-40°C to +125°C (-40°F to +257°F)	x	x
	ST (AC)	-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
201*		-40°C to +150°C (-40°F to +302°F)	-40°C to +150°C (-40°F to +302°F)	-40°C to +150°C (-40°F to +302°F)	x
206*		-48°C to +150°C (-55°F to +302°F)	-48°C to +150°C (-55°F to +302°F)	-48°C to +150°C (-55°F to +302°F)	x
213*		-45°C to +150°C (-50°F to +302°F)	-45°C to +150°C (-50°F to +302°F)	-45°C to +150°C (-50°F to +302°F)	x
221FR		-20°C to +100°C (-4°F to +212°F)	x	-20°C to +100°C (-4°F to +212°F)	-20°C to +100°C (-4°F to +212°F)
266*		-48°C to +150°C (-55°F to +302°F)	-48°C to +150°C (-55°F to +302°F)	-48°C to +150°C (-55°F to +302°F)	x
271		x	x	x	x
293		-50°C to +150°C (-58°F to +302°F)	-50°C to +150°C (-58°F to +302°F)	-50°C to +150°C (-58°F to +302°F)	x
302		-40°C to +100°C (-40°F to +212°F)	x	x	-40°C to +100°C (-40°F to +212°F)
304		x	x	x	x
422		-40°C to +100°C (-40°F to +212°F)	x	x	-40°C to +100°C (-40°F to +212°F)
424		x	x	x	x
426		-46°C to +150°C (-50°F to +302°F)	x	x	-46°C to +150°C (-50°F to +302°F)
436		-48°C to +150°C (-55°F to +302°F)	x	x	x
471TC/ST		-40°C to +100°C (-40°F to +212°F)	x	x	x
472LT		-57°C to +100°C (-70°F to +212°F)	x	x	x
472TC		-40°C to +100°C (-40°F to +212°F)	x	x	x
482TC/ST		-40°C to +100°C (-40°F to +212°F)	x	x	x
611HT		-48°C to +150°C (-55°F to +302°F)	-45°C to +150°C (-55°F to +302°F)	-45°C to +150°C (-55°F to +302°F)	x

* The maximum working pressures for these hoses are reduced at temperatures above +212°F (+100°C). Consult the pressure/temperature curve on E-5 for the reduced maximum working pressure.

** Maximum service pressure for lube oil and fuel systems applications (Code F) may be less than maximum service pressure for other systems applications, e.g., Code H. Refer to individual hose listings in Section A and Hose Assemblies List, SAE J1942-1 or HPD Approval Bulletin #APR-004.

Temperature

Minimum/Maximum Temperature

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Hose	Cover (ISO Rating)	Air	Water, water/oil emulsion	Water/glycol hydraulic	Water	Phosphate ester fluids	Polyol ester fluids
GlobalCore 187	Standard	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
	TC (AC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
	TC (AS)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
	ST (AC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
	ST (AS)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
GlobalCore 387	Standard	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
	TC	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	ST	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
GlobalCore 487	Standard	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
	TC	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	ST	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
GlobalCore 722	Standard	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	TC	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	ST	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
GlobalCore 787	Standard	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	TC (DC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	TC (AC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	ST (DC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	ST (AC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
GlobalCore 797	Standard	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	TC (CC, DC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	TC (AC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	ST (CC, DC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
	ST (AC)	+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
201*		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
206*		+100°C (+212°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
213*		+93°C (+200°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
221FR		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
266*		+93°C (+200°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
271		100°C (212°F)	x	x	x	x	x
293		+93°C (+200°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
302		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
304		+70°C (+158°F)	x	+85°C (+185°F)	+85°C (+185°F)	-40°C to +80°C (-40°F to +176°F)	x
422		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
424		+70°C (+158°F)	x	+85°C (+185°F)	+85°C (+185°F)	-40°C to +80°C (-40°F to +176°F)	x
426		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
436		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
471TC/ST		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
472LT		+70°C (+157°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	
472TC		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
482TC/ST		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	+65°C (+150°F)
611HT		+100°C (+212°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x

* The maximum working pressures for these hoses are reduced at temperatures above +212°F (+100°C). Consult the pressure/temperature curve on E-5 for the reduced maximum working pressure.

** Maximum service pressure for lube oil and fuel systems applications (Code F) may be less than maximum service pressure for other systems applications, e.g., Code H. Refer to individual hose listings in Section A and Hose Assemblies List, SAE J1942/1 or HPD Approval Bulletin #APR-004.



Temperature

Minimum/Maximum Temperature

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Hose Family	Cover (ISO Rating)	Petroleum base hydraulic fluids and lubricating oils	Antifreeze solutions	Diesel fuels	SAE J1942 Marine lube oil and diesel fuel systems (Application Code F)**
722LT		-57°C to +100°C (-70°F to +212°F)	x	x	x
792LT		-57°C to +100°C (-70°F to +212°F)	x	x	x
F42		x	x	x	x
774		x	x	x	x
781		-40°C to +125°C (-40°F to +257°F)	x	x	x
801		-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
804		x	x	x	x
811		-40°C to +100°C (-40°F to +212°F)	x	x	x
821		-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
821FR		-40°C to +100°C (-40°F to +212°F)	-40°C to +100°C (-40°F to +212°F)	x	x
836		-48°C to +150°C (-55°F to +302°F)	-48°C to +150°C (-55°F to +302°F)	x	x
881		-40°C to +125°C (-40°F to +257°F)	x	x	x
JK		-40°C to +49°C (-40°F to +120°F)	x	x	x
SS23CG		x	x	x	x
SS25UL		x	x	x	x
811HT		-46°C to +125°C (-50°F to +257°F)	x	x	x

* The maximum working pressures for these hoses are reduced at temperatures above +212°F (+100°C). Consult the pressure/temperature curve on E-5 for the reduced maximum working pressure.

** Maximum service pressure for lube oil and fuel systems applications (Code F) may be less than maximum service pressure for other systems applications, e.g., Code H. Refer to individual hose listings in Section A and Hose Assemblies List, SAE J1942/1 or HPD Approval Bulletin #APR-004.

Temperature

Minimum/Maximum Temperature (Page 4 of 4)

Hose	Cover (ISO Rating)	Air	Water, water/oil emulsion	Water/glycol hydraulic	Water	Phosphate ester fluids	Polyol ester fluids
722LT		x	x	x	x	x	x
792LT		+70°C (+158°F)	x	x	x	x	x
F42		+70°C (+158°F)	x	x	x	x	x
774		+70°C (+158°F)	x	+85°C (+185°F)	+85°C (+185°F)	-40°C to +80°C (-40°F to +176°F)	x
781		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
801		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
804		+70°C (+158°F)	x	+93°C (+200°F)	+93°C (+200°F)	+80°C (+176°F)	x
811		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
821		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
821FR		+100°C (+212°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
836		+100°C (+212°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
881		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x
JK		x	x	x	x	x	x
SS23CG		x	x	x	x	x	x
SS25UL		x	x	x	x	x	x
811HT		+70°C (+158°F)	+85°C (+185°F)	+85°C (+185°F)	+85°C (+185°F)	x	x

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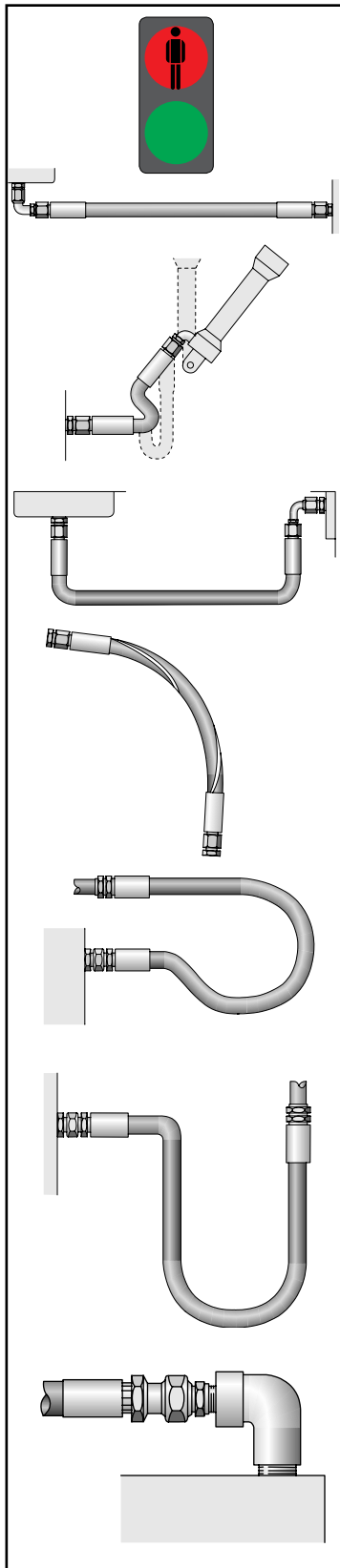
* The maximum working pressures for these hoses are reduced at temperatures above +212°F (+100°C). Consult the pressure/temperature curve on E-5 for the reduced maximum working pressure.

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Application

Hose Installation Tips

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.

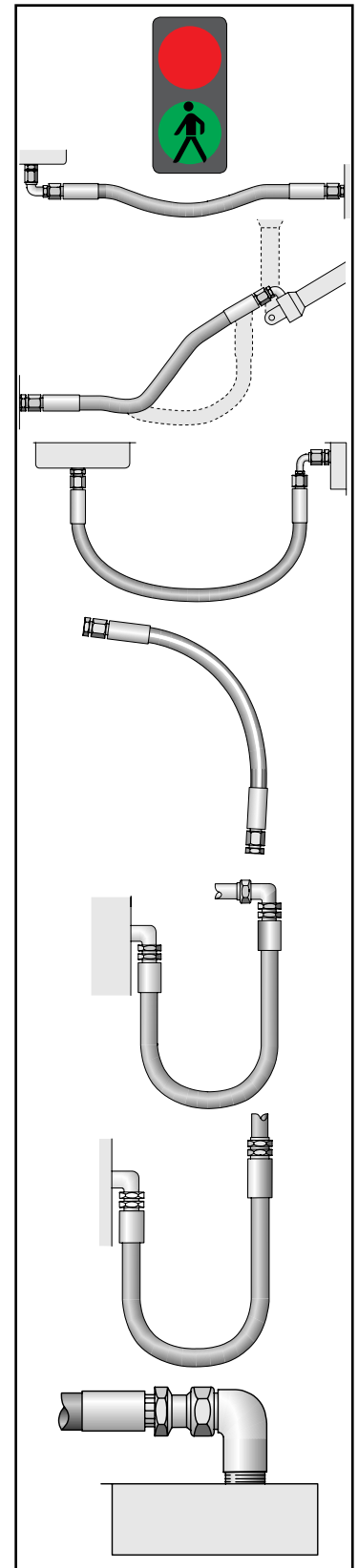
However, do not to allow too much slack and therefore introduce the risk of the hose snagging on other equipment or rubbing on other components.

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 catalog.

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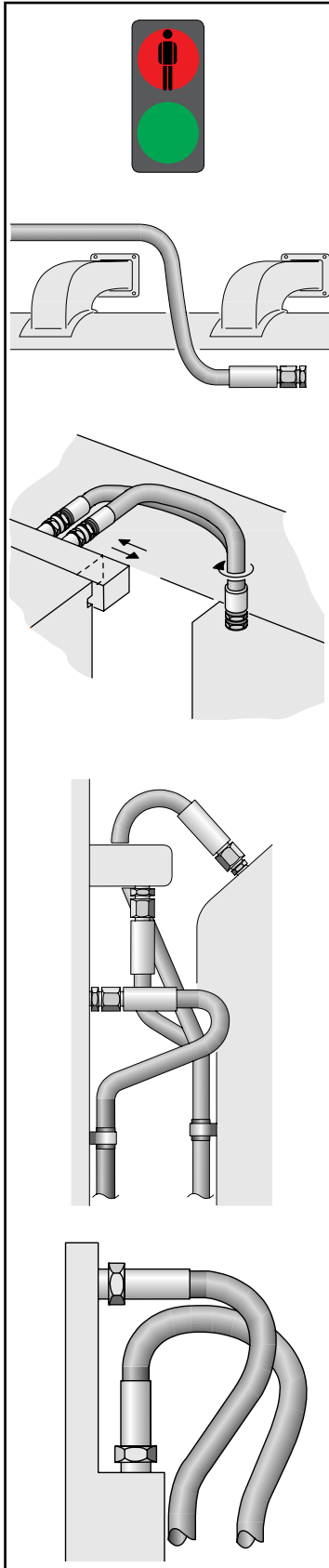
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Correct clamping (holding/supporting) of the hose should be exercised to securely route the hose or to avoid the hose contacting surfaces that will cause the hose damage. It is however, vital that the hose be allowed to keep its functionality as a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

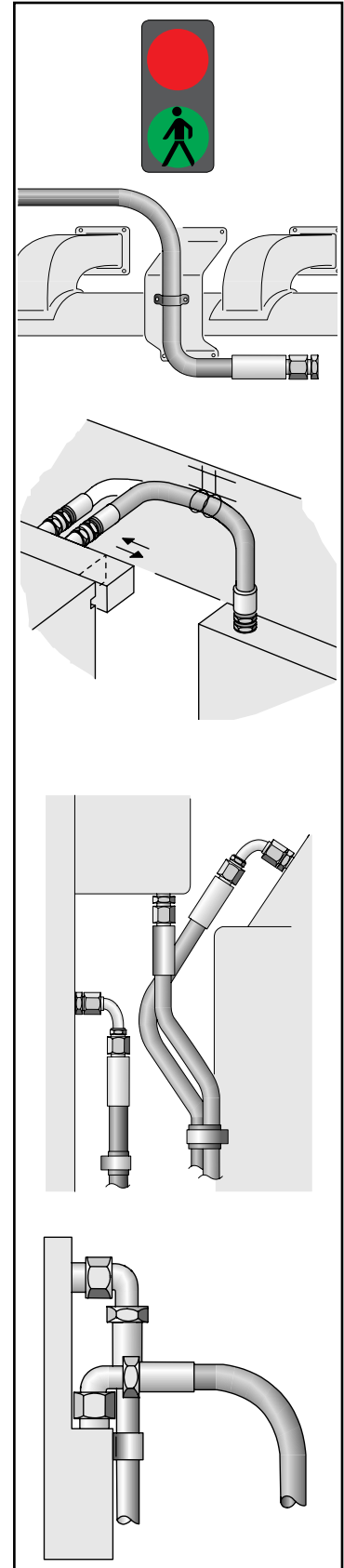
It should also be noted that hoses for high- and low-pressure lines shall not be crossed or clamped together, as the difference in changes in length could wear the hose covers.

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



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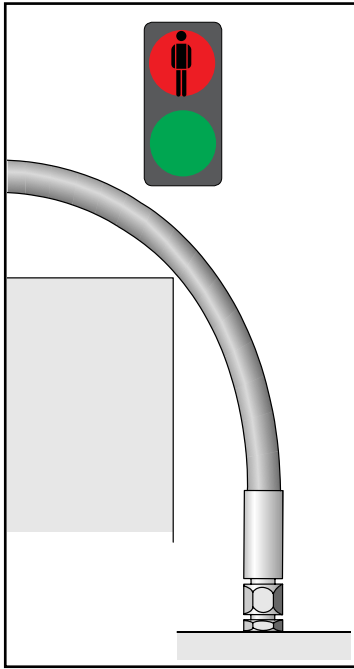
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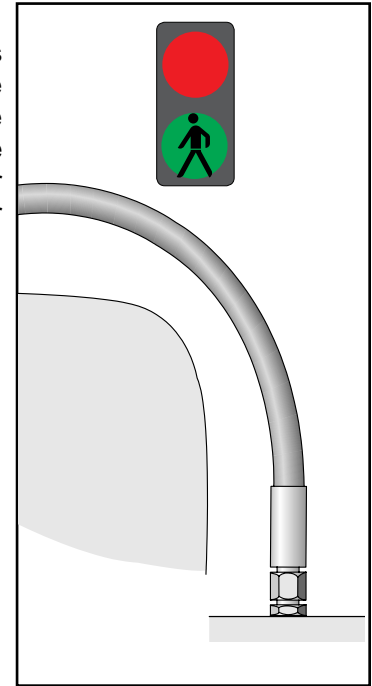


Abrasive influences

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.

Parker **TOUGH COVER** (TC) or **SUPER TOUGH** (ST) covers offer 80 times or respectively 450 times the abrasion resistance of standard rubber covers.

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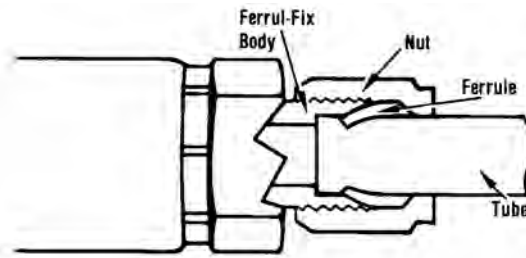
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Application

Ferrule-Fix



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, some equipment dealers are unable to stock all of the many odd tube configurations.

Parker FERRUL-FIX, a field attachable, reusable hose end fitting, now makes it possible to salvage the bent tube section of the original assembly for replacement. Most important, it gets you back into operation FAST!

- Gets you back in operation fast - No costly delays while replacement assemblies are rushed from the factory.
- Lets you reuse expensive bent tube ends with Parker Hose fittings - You can replace the hose at a fraction of the cost of complete assembly.

- Eliminates the need for emergency brazing or welding in the field - Ferrul-Fix can be assembled without special tools or equipment when using Parker Reusable Hose fittings.

3-Piece Design - Body, nut and 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 dis-assembled, an important safety feature. Self-centering action assures even bite around circumference of tube.

Parkerized Finish - Ferrul-Lok fittings have the Parkerized black finish, providing "built-in" lubrication which reduces wrench torque required.

Ferrul-Fix Installation Instructions



1. Cut the formed tube off squarely next to the permanent hose fitting. Lightly deburr 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).

Application

Performance Standards and Specifications

Hose	Meets or Exceeds:						
	ISO	SAE	EN	NFPA	EES	DOT	UL
187	ISO 18752						
187TC	ISO 18752						
187ST	ISO 18752						
387	ISO 18752						
387TC	ISO 18752						
387ST	ISO 18752						
487	ISO 18752						
487TC	ISO 18752						
487ST	ISO 18752						
722 (-6 through -16)	ISO 18752						
722TC (-6 through -16)	ISO 18752						
722ST (-6 through -16)	ISO 18752						
787	ISO 18752						
787TC	ISO 18752						
787ST	ISO 18752						
797	ISO 18752						
797TC	ISO 18752						
797ST	ISO 18752						
201		SAE J517 100R5 / SAE J1402 AII				DOT FMVSS 106 AIR BRAKE - AII	
206		SAE J517 100R5 / SAE J1402 AII				DOT FMVSS 106 AIR BRAKE - AII	
213		SAE J1402 AI				DOT FMVSS 106 AIR BRAKE - AI	
221FR	ISO 7840	SAE J1527 A CLASS I / SAE J1942					
244		SAE J2064 B CLASS I					
266		SAE J1402 AII				DOT FMVSS 106 AIR BRAKE - AII	
271		SAE J1402 A				DOT FMVSS 106 AIR BRAKE - A	
285		SAE J2064 C (w/ 26 series)					
293		SAE J1402 AI				DOT FMVSS 106 AIR BRAKE - AI	
302	ISO 1436-1 Type 2SN	SAE J517 100R2AT / SAE J1942	EN 853 Type 2SN				
304							
422	ISO 1436-1 Type 1SN	SAE J517 100R1AT / SAE J1942	EN 853 Type 1SN				
424							
426		SAE J517 100R1AT / SAE J1942					
436	ISO 11237 Type R16	SAE J517 100R16					
471TC	ISO 11237 Type 2SC	SAE J1942	EN 857 Type 2SC				
471TC Twin Tough	ISO 11237 Type 2SC	SAE J1942	EN 857 Type 2SC				
471ST	ISO 11237 Type 2SC	SAE J1942	EN 857 Type 2SC				

KEY TO UNDERSTANDING AGENCY APPROVALS FOR BUILDING HOSE ASSEMBLIES

ABS Approved assemblies can be manufactured at any location with Parker's permission. No restrictions.

DNV Approved assemblies can only be manufactured in a Parker approved location that demonstrates a quality system and management program is in place and must be audited by DNV. Each location must be granted a "license" issued by Parker HPD for building hose assemblies. Three exist today; Davenport Iowa, Grimsby Canada, and Yangsan Korea.

BV Approved assemblies can only be produced in a BV approved location that demonstrates a quality system and management program is in place. Each location must have an initial audit performed by BV before the "license" can be issued. Additionally, ongoing audits setup by BV will be required at each approved location. Davenport Iowa is our only approved assembler.

UL "Listed" CSA/CGA Assemblies must be made at Davenport Iowa
Assemblies must be made at Davenport Iowa

Application

Performance Standards and Specifications

Hose	Meets or Exceeds:			Agency Approvals:												
	ECE	CSA	AS/NZS	ABS	DNV	USCG	LR	MSHA	BV	CSA	RDW	UL	AGA	DOT	IMCI	NK
187																
187TC								•								
187ST								•								
387																
387TC				•	•	•	•	•								
387ST				•	•	•		•								
487																
487TC				•	•	•	•	•								
487ST				•	•	•		•								
722 (-6 through -16)						•										
722TC (-6 through -16)				•	•	•	•									
722ST (-6 through -16)				•	•	•	•									
787																
787TC				•	•	•	•	•								
787ST				•	•	•		•								
797																
797TC				•	•	•	•	•								
797ST				•	•	•		•								
201														•		
206														•		
213														•		
221FR				•	•	•	•	•							•	
244																
266														•		
271														•		
285																
293														•		
302				•	•	•			•							•
304																
422				•	•	•										
424																
426				•		•		•								
436				•		•		•								
471TC				•	•	•		•	•							
471TC Twin Tough				•	•	•		•	•							
471ST				•	•	•		•								

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Notes:

(1) U.S.C.G./MTH (Marine Technical & Hazardous Materials Branch) hoses, hose assemblies and appropriate fittings meet 46CFR56.60-25(c) for use on commercial vessels. Hoses and hose assemblies meet the requirements of SAE J1942. Hose fittings meet the requirements of SAE J1475.

F = Fuel and lube systems.

H = Hydraulic Systems.

*Some hoses are accepted for different pressures for F and H. Also, not all sizes are accepted for all applications. See HPD approval bulletin #APR-004 or consult the Parker Hose Products Division, Technical Services Department, for details. The Canadian Coast Guard accepts all hoses accepted by the U.S. Coast Guard.

(2) Det Norske Veritas (DnV) approvals are with permanent (crimp) type fittings only. See HPD Approval Bulletin #APR-006 or consult the Parker Hose Products Division, Technical Services Department, for details.

(3) Hose with MSHA (Mine Safety and Health Administration) approved flame resistant cover will be marked accordingly on the layline.

(4) 221FR is type accepted by Lloyd's Register. It meets the requirements of the American Boat and Yacht Council. 221FR is certified to meet the EC Directive 94/25/EC in accordance with ISO 7840.

For questions on standards and specifications please contact the Hose Products' Technical Services Department at (440) 943-5700.

Continued on next page

Application Performance Standards and Specifications

Continued from previous page

Hose	Meets or Exceeds:						
	ISO	SAE	EN	NFPA	EES	DOT	UL
472TC		SAE J1942					
472LT			EN 857 Type 2SC				
482TC	ISO 1436-1 Type 1SN	SAE J517 100R1AT / SAE J1942	EN 853 Type 1SN				
482ST	ISO 1436-1 Type 1SN	SAE J517 100R1AT	EN 853 Type 1SN				
611HT		SAE J517 100R6	EN 854 Type R6				
722TC (-20 through -32)	ISO 3862-1 Type R12	SAE J517 100R12 / SAE J1942	EN 856 Type R12				
722ST (-20 through -32)	ISO 3862-1 Type R12	SAE J517 100R12 / SAE J1942	EN 856 Type R12				
722LT	ISO 3862-1 Type R12	SAE J517 100R12	EN 856 Type R12				
774							
792LT	ISO 3862-1 Type R15	SAE J517 100R15	EN 856 Type R15				
801							
804							
811		SAE J517 100R4 / SAE J1942					
811HT		SAE J517 100R4 / SAE J1942					
821							
821FR							
836							
881		SAE J517 100R4 / SAE J1942					
F42							
JK	ISO 1436-1 Type 2SN	SAE J517 100R2AT	EN 853 Type 2SN	NFPA 1936	EES 116-4		
SS23CG				NFPA 58			UL 21
SS25UL (-4 through -12)				NFPA 58			UL 21
SS25UL-AGA (-4, -6, -8)							

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Application Performance Standards and Specifications

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472TC				•	•	•		•								
472LT						•		•								
482TC						•		•								
482ST								•								
611HT								•								
721								•								
722ST (-20 through -32)				•	•	•	•	•								
722LT								•								
774																
792LT								•								
801								•								
804																
811						•										
811HT				•		•		•								
821																
821FR																
836								•								
881				•		•		•								
F42																
JK								•								
SS23CG	ECE R110 / ECE R67	CDA 8.1 2015 Type III								•	•	•				
SS25UL (-4 through -12)												•				
SS25UL-AGA (-4, -6, -8)			AS/NZS 1869-2012 Class D										•			

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Notes:

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H = Hydraulic Systems.

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For questions on standards and specifications please contact the Hose Products' Technical Services Department at (440) 943-5700.

Application

Standards and Specifications

JIS - Adapters

JIS B8363 Code	Parker Part Number	Mates with End Configuration
A1	F3T4	FU
A2	F3P4	GU
A3	F63P4	UT
E1	C3T4	FU
E2	C3P4	GU
E3	V3T4	FU
E4	V3P4	GU

Note: See website at www.Parker/tfd.com, Catalog 4300 or call (614) 279-7070 for additional information.

JIS - Hose Fittings

JIS B8363 Code	Parker End Configuration Code	Fitting Series 43	Fitting Series 70	Fitting Series 71	Fitting Series 79
R	UT	X		X	
F	FU	X		X	
C	GU	X	X	X	
MF	MU	X		X	
S	15	X	X	X	
4S	17	X	X	X	
9S	19	X	X	X	
H	6A		X	X	X
4H	6F			X	X
9H	6N		X	X	X

Note: Parker Hose Standards are listed on page E-14 thru E-17

Application

Assembly Methods

JIC 37° and SAE 45° Flare

Parker's recommended assembly method for JIC 37° flare and SAE 45° flare is the Flats From Wrench Resistance (FFWR) method. This includes steel as well as other materials.

The torque values assigned by size are for reference only, and are only applicable to Parker system components using the FFWR method with trivalent chromate passivation on zinc plating of carbon steel components without lubrication.

Dash Size	Flats From Wrench Resistance (FFWR)	Swivel Nut Torque	
		Newton Meters (Ref)	Pound Feet (Ref)
-4	2	18	13
-5	2	19	14
-6	1-1/2	30	22
-8	1-1/2	57	42
-10	1-1/2	81	60
-12	1-1/4	114	84
-16	1	160	118
-20	1	228	168
-24	1	265	195
-32	1	360	265

Seal-Lok®

Parker's recommended assembly method for Seal-Lok® connections is the torque method.

Dash Size	Swivel Nut Torque		Flats From Wrench Resistance (FFWR)
	Newton Meters (+10% / -0)	Pound Feet (+10% / -0)	
-4	25	18	1/2 - 3/4
-6	40	30	1/2 - 3/4
-8	55	40	1/2 - 3/4
-10	80	60	1/2 - 3/4
-12	115	85	1/3 - 1/2
-16	150	110	1/3 - 1/2
-20	205	150	1/3 - 1/2
-24	315	230	1/3 - 1/2
-32	-	-	-

Note: The assembly torques listed are higher than the test torques published in SAE J1453.

Torque Conversion Equivalents

Torque Conversion Equivalents		
Pound Inch - Pound Foot - Newton Meter		
Pound Foot x 12	=	Pound Inch
Pound Foot x 1.356	=	Newton Meter
Newton Meter x 8.850	=	Pound Inch
Newton Meter x 0.737	=	Pound Foot
Pound Inch x .083	=	Pound Foot
Pound Inch x 0.113	=	Newton Meter

The torque values for other materials are as follows:

- Brass fittings and adapters - 65% of the torque value for steel.
- Stainless steel, and Monel - Use 5% higher than listed for steel. Threads to be lubricated for these materials.
- Dissimilar metals - use torque value designated for the lower of the two metals.
- All fittings are dry except as noted above.

The Flats From Wrench Resistance (FFWR) and torque values listed above are consistent with the values recommended by Parker Tube Fittings Division (614) 279-7070 or www.parker.com/tfd.



Identifying Fitting Types

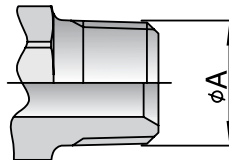
In general fittings can be identified by their visual appearance, their sealing surface/sealing type or by their thread type/form. Viewing the following pages, the visual identification will be self explanatory. The sealing mechanism and the method of thread identification, however, needs further explanation

Determining Sealing Mechanisms:

- Thread interface
- O-ring
- Matching angle or metal-to-metal joint
- Mated angle with O-ring

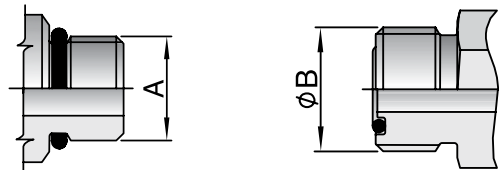
Thread Interface

The sealing is assured by the flattening of the edges of the threads when the male is screwed into the female fitting. Typically the front of the male fittings is narrower than the back of the fittings – often referred to as tapered threads.



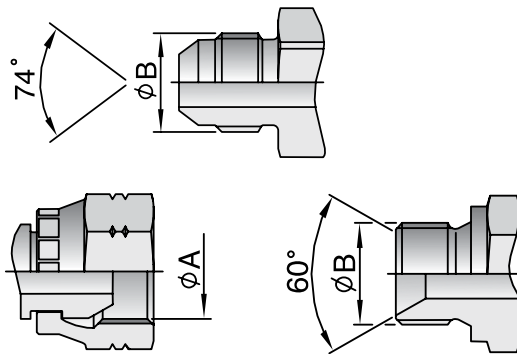
O-ring

The O-ring on the male is compressed against the corresponding female and assures the seal. This type of sealing mechanism should be the preferred choice for high-pressure applications.



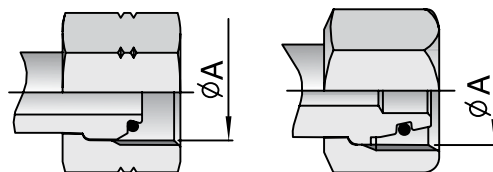
Matching Angle or Metal-to-Metal Joint

Sealing takes place where the two angled faces of the male and corresponding female meet and are wedged into one another by the tightening of the threaded nut. The sealing surfaces can either be convex or concave (seat) on the male or in the head of the pipe of the female as shown.



Matching Angle with O-ring

These fittings combine the functionality of both the matching angle seal with the O-ring. The O-ring is in the angled sealing surface of the fitting so that when the threaded male and female are screwed together the sealing surfaces wedge together and at the same time deform the O-ring between them.

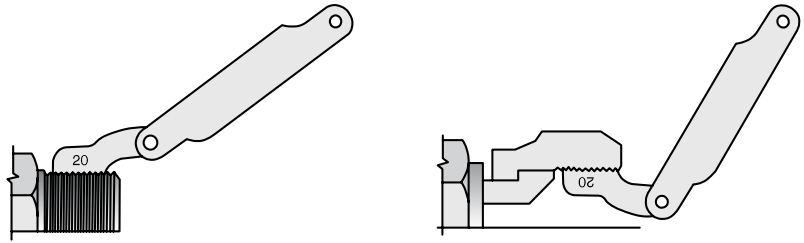


Determining the Thread Type

In general of the threads of various fittings look similar and hinder the easy identification of the thread. To assure the correct identification, the threads must be measured and compared to the tables listed in the following section.

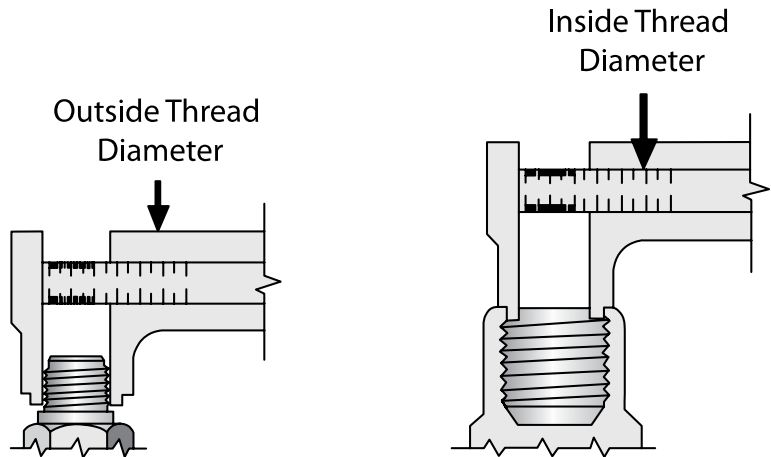
Thread Gauge

Using a thread gauge, the number of threads per inch can be determined. Holding the gauge and coupling threads in front of a lighted background helps to obtain an accurate measurement.



Caliper Measure

A vernier caliper should be used to measure the thread diameter of the largest point. (Outside diameter (O.D.) of male threads – Inside Diameter (I.D.) of female threads.)



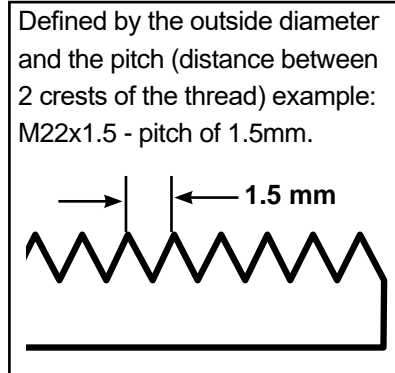
German DIN Hose Fittings

Often referred to as metric fittings, these fittings seal using the angled sealing surfaces (metal-to-metal) or the combination of metal-to-metal with O-rings.

They are available in very light (LL), light (L) or heavy series (S).

The sealing face angles are either 24° with or without O-rings, or 24°/60° universal cones.

Identification is made by measuring the thread size and also the tube outside diameter.

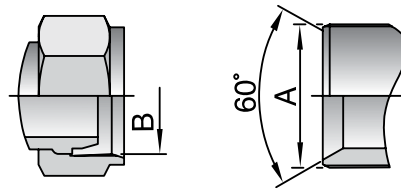


DIN Very Light Series (LL)

The male 60° cone will mate with the female 60° cone only.

The male has a 60° sealing angle (seat) and straight metric thread.

The female has a 60° seat and straight metric thread.



Standard

DIN 20078 Part 3 ¹⁾

Parker end configurations
C0

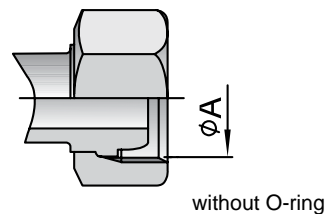
Tube O.D. (DN)	Thread metric	ØA (mm)	ØB (mm)
20	M30x1.5	30.00	28.50
25	M38x1.5	38.00	36.50
32	M45x1.5	45.00	43.50
40	M52x1.5	52.00	50.50
50	M65x2	65.00	63.00

DIN Light (L) and Heavy Series (S) without O-ring

The male 24° cone will mate with the female universal 24° or 60° cone only.

The male has a 60° sealing angle (seat) and straight metric threads.

The female has a 24° and 60° universal seat and straight metric threads.



Standard

DIN 20078 Part 2 ¹⁾

(previously known as
DIN 20078 A, D & E)

Parker end configurations
light series

C3, C4, C5, C6

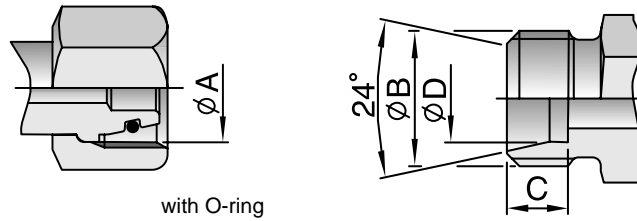
(Often also referred to as “Ball nose cones”)

¹⁾ obsolete standard, no exact replacement

DIN 24° Light (L) and Heavy Series (S) with O-ring

The male has a 24° sealing angle cone seat with straight metric threads.

The female has a 24° convex cone with O-ring and a swivel straight metric threaded nut.



with O-ring

Standard

ISO 12151-2 / ISO 8434-1 & ISO 8434-4

(Previously

DIN 20 078 Part 4, 5, 8, 9)

Parker end configurations

light series

CA, CE, CF, D0

Parker end configurations

heavy series

C9, 0C, 1C, D2

Tube O.D. (mm)	Spec.	Thread metric	ØA (mm)	ØB (mm)	C (mm)	ØD (mm)
6.00	6L	M12X1.5	10.50	12.00	7.00	6.20
6.00	6S	M14X1.5	12.50	14.00	7.00	6.20
8.00	8L	M14x1.5	12.50	14.00	7.00	8.20
8.00	8S	M16x1.5	14.50	16.00	7.00	8.20
10.00	10L	M16x1.5	14.50	16.00	7.00	10.20
10.00	10S	M18x1.5	16.50	18.00	7.50	10.20
12.00	12L	M18x1.5	16.50	18.00	7.00	12.20
12.00	12S	M20x1.5	18.50	20.00	7.50	12.20
14.00	14S	M22x1.5	20.50	22.00	8.00	14.20
15.00	15L	M22x1.5	20.50	22.00	7.00	15.20
16.00	16S	M24x1.5	22.50	24.00	8.50	16.20
18.00	18L	M26x1.5	24.50	26.00	7.50	18.20
20.00	20S	M30x2	27.90	30.00	10.50	20.20
22.00	22L	M30x2	27.90	30.00	7.50	22.20
25.00	25S	M36x2	33.90	36.00	12.00	25.20
28.00	28L	M36x2	33.90	36.00	7.50	28.20
30.00	30S	M42x2	39.90	42.00	13.50	30.20
35.00	35L	M45x2	42.90	45.00	10.50	35.30
38.00	38S	M52x2	49.90	52.00	16.00	38.30
42.00	42L	M52x2	49.90	52.00	11.00	42.30



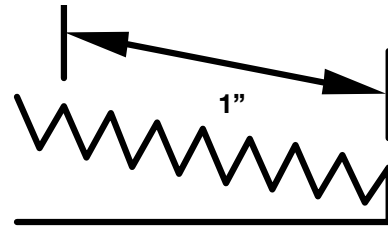
British Standard Pipe (BSP)

Also referred to as Whitworth threads, the BSP thread type fittings seal use metal-to-metal angled surfaces or a combination of metal-to-metal and an O-ring.

The angle of the sealing surfaces is 60° for both forms.

There are two popular thread forms: British Standard Pipe Parallel (BSPP) and British Standard Pipe Tapered (BSPT).

Identification is made by measuring the outside diameter of the thread and the number of threads per inch (25.4 mm)



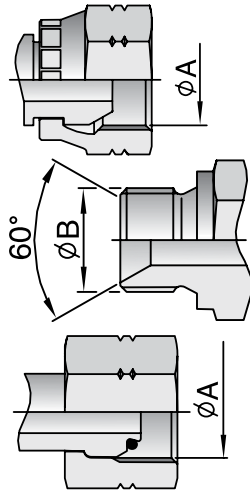
BSPP BS5200

Parker end configurations
92, B1, B2, B4, D9

BSPP
metal-to-metal with O-ring
Standard

ISO 12151-6

Some Parker end configurations may be non-standard parts.

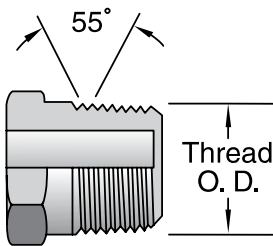


Tube I.D./O.D. (mm)	Size	Thread BSP	ØA (mm)	ØB (mm)
6/10	-2	1/8x28	8.60	9.70
8/13	-4	1/4x19	11.50	13.20
12/17	-6	3/8x19	14.90	16.70
15/21	-8	1/2x14	18.60	20.90
18/23	-10	5/8x14	20.60	22.90
20/27	-12	3/4x14	24.10	26.40
26/34	-16	1x11	30.30	33.20
33/42	-20	1-1/4x11	38.90	41.90
40/49	-24	1-1/2x11	44.90	47.80
50/60	-32	2x11	56.70	59.60

BSPT

fittings seal through the thread interface mechanism. Care should be taken not to confuse the BSPT fitting with the NPTF male fitting. BSPT has a 55° thread angle. NPTF has 60° thread angle.

Parker end configuration
91

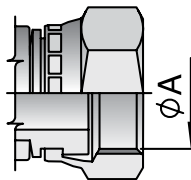


Tube I.D./O.D. (mm)	Size	Thread BSP	ØA (mm)
5/10	-2	1/8x28	9.73
8/13	-4	1/4x19	13.16
12/17	-6	3/8x19	16.66
15/21	-8	1/2x14	20.96
20/27	-12	3/4x14	26.44
26/34	-16	1x11	33.25
33/42	-20	1-1/4x11	41.91
40/49	-24	1-1/2x11	47.80
50/60	-32	2x11	59.61

BSP Flat Seal

These fittings have BSP parallel threads but the sealing surface is flat. The seal is made when the composite seal is compressed against the female flat face.

Some Parker end configurations may be non-standard parts.



Tube I.D./O.D. (mm)	Size	Thread BSP	ØA (mm)
6/10	-2	1/8x28	8.6
8/13	-4	1/4x19	11.5
12/17	-6	3/8x19	14.9
15/21	-8	1/2x14	18.6
18/23	-10	5/8x14	20.6
20/27	-12	3/4x14	24.1
26/34	-16	1x11	30.3

French Gas Fittings

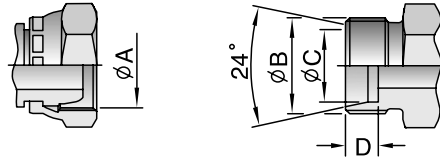
Typical to the French market the French Gas fittings have a 24° sealing surfaces seat with metric straight threads. Although similar to German DIN fittings the threads differ in some sizes as the French Gas fittings have fine threads in all sizes whereas the German DIN fittings use standard threads in the larger sizes.

French Metric 24° Cone Gas Fittings

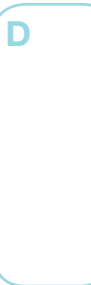
The sealing mechanism is metal-to-metal.

The fittings are not specified in any international standard.

Some Parker end configurations may be non-standard parts.



Tube O.D. (mm)	Spec.	Thread metric	ØA (mm)	ØB (mm)	ØC (mm)	D (mm)
6.00	6N	M12x1	11.00	12.00	6.20	9.00
8.00	8N	M14x1.5	12.50	14.00	8.15	9.00
10.00	10N	M16x1.5	14.50	16.00	10.20	9.00
12.00	12N	M18x1.5	16.50	18.00	12.15	9.00
13.25	13G	M20x1.5	18.50	20.00	13.50	9.00
14.00	14N	M20x1.5	18.50	20.00	14.15	9.00
15.00	15N	M22x1.5	20.50	22.00	15.15	9.00
16.00	16N	M24x1.5	22.50	24.00	16.15	9.00
16.75	17G	M24x1.5	22.50	24.00	17.00	9.00
18.00	18N	M27x1.5	25.50	27.00	18.15	9.00
20.00	20N	M27x1.5	25.50	27.00	20.15	9.00
21.25	21G	M30x1.5	28.50	30.00	21.50	9.00
22.00	22N	M30x1.5	28.50	30.00	22.15	9.00
25.00	25N	M33x1.5	31.50	33.00	25.15	9.00
26.75	27G	M36x1.5	34.50	36.00	27.00	9.00
28.00	28N	M36x1.5	34.50	36.00	28.25	9.00
30.00	30N	M39x1.5	37.50	39.00	30.25	9.00
32.00	32N	M42x1.5	40.50	42.00	32.25	9.00
33.25	34G	M45x1.5	43.50	45.00	33.80	9.00
35.00	35N	M45x1.5	43.50	45.00	35.25	9.00
38.00	38N	M48x1.5	46.50	48.00	38.25	9.00
40.00	40N	M52x1.5	50.50	52.00	40.35	9.00
42.25	42G	M52x1.5	50.50	52.00	42.55	9.00
48.25	49G	M58x2	55.90	58.00	49.00	11.00



North American Thread Types

This type of fitting uses the thread interface to seal and as such has a tapered thread that deforms and forms the seal.

They have 30° sealing angle surfaces, forming a 60° inverted (concave) seat. The fittings are most frequently seen on machines of US origin.

Dryseal American Standard Taper Pipe Thread (NPTF)

The NPTF male will mate with the NPTF, NPSF, or NPSM females. Care should be taken not to confuse the NPTF fitting with the BSPT male fitting. NPTF fittings have a 60° thread angle.

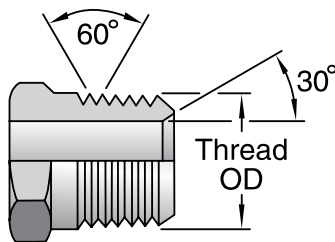
BSPT has a 55° thread angle.

Standard

SAE J516

Parker end configuration

01



ØA dimension is measured on the 4th pitch of the thread

Size	Thread NPTF	ØA (mm)	ØB (mm)
-2	1/8x27	10.24	8.73
-4	1/4x18	13.61	11.90
-6	3/8x18	17.05	15.90
-8	1/2x14	21.22	19.05
-12	3/4x14	26.56	24.60
-16	1x11.5	33.22	30.95
-20	1-1/4x11.5	41.98	39.69
-24	1-1/2x11.5	48.05	45.24
-32	2x11.5	60.09	57.15

SAE JIC 37°

Commonly referred to as JIC fittings, these metal-to-metal sealing type fittings have a 37° flare (sealing surface angle) and straight United National Fine Threads (UNF).

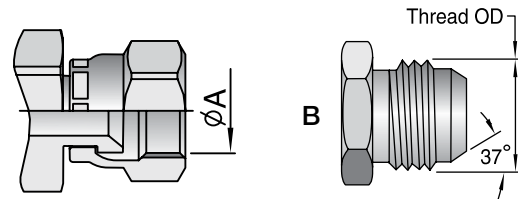
The original design specification for the fittings comes from the Society of Automotive Engineers (SAE) and these fittings are the most common American fitting types in Europe.

Standard

ISO 12151-5, ISO8434-2 and

SAE J516

Parker JIC hose fittings are fully compatible with Parker Triple-Lok Tube Fittings and adapters.



Tube O.D. (inch)	Tube O.D. (mm)	Thread UNF	Size	ØA (mm)	ØB (mm)
3/16		3/8x24	-3	8.60	9.50
1/4	6	7/16x20	-4	10.00	11.10
5/16	8	1/2x20	-5	11.60	12.70
3/8	10	9/16x18	-6	13.00	14.30
1/2	12	3/4x16	-8	17.60	19.10
5/8	14-15-16	7/8x14	-10	20.50	22.20
3/4	18-20	1-1/16x12	-12	24.60	27.00
7/8	22	1-3/16x12	-14	28.30	30.10
1	25	1-5/16x12	-16	31.30	33.30
1-1/4	30-32	1-5/8x12	-20	39.20	41.30
1-1/2	38	1-7/8x12	-24	45.60	47.60
2		2-1/2x12	x32	61.50	63.50

Parker end configurations

03, 06/68, 37/3V, 39/3W, 41/3Y, L9

SAE 45° Flare

The angle of the flare is commonly used as a name when referring to these metal-to-metal sealing fittings.

The female fittings have a 90° concave inverted seat, created by the 45° angle sealing surfaces.

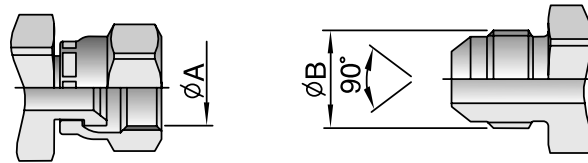
The SAE 45° flare male will mate with an SAE 45° flare female only or a dual seat JIC 37°/SAE45°.

Standard

SAE J516

Parker end configurations

04, 08/68, 77/3V, 79/3W, 81/3Y

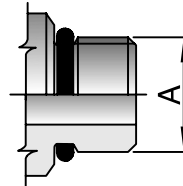


Tube O.D. (inch)	Size	Thread UNF	ØA (mm)	ØB (mm)
1/4	x4	7/16x20	9.90	11.10
5/16	-5	1/2x20	11.50	12.70
3/8	-6	5/8x18	14.30	15.90
1/2	-8	3/4x16	17.50	19.10
5/8	-10	7/8x14	20.60	22.20
3/4	-12	1-1/16x14	25.00	27.00

SAE O-ring (Boss Type)

This male fitting has straight threads, a sealing face and an O-ring. It is compatible only with female boss type fittings generally found in the ports of machines. Sealing is achieved through the O-ring of the male and through the sealing face of the female. Parker end configuration

05



Thread UNF	Size	ØA (mm)
5/16x24	-2	7.93
3/8x24	-3	9.52
7/16x20	-4	11.11
1/2x20	-5	12.70
9/16x18	-6	14.28
3/4x16	-8	19.10
7/8x14	-10	22.22
1-1/16x12	-12	27.00
1-3/16x12	-14	30.10
1-5/16x12	-16	33.30
1-5/8x12	-20	41.30
1-7/8x12	-24	47.60
2-1/2x12	-32	63.50

O-ring Face Seal (ORFS)

ORFS fittings are becoming the most popular international fitting type used on global OEM machines due to their high level of sealing and their good vibration resistance. The fittings use the O-ring compression mechanism to seal.

The female fittings have flat faces and straight threaded UNF swivel nuts. The male fittings have the O-ring in a groove in the flat face.

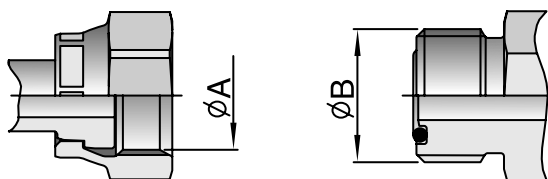
Seen as a major advantage, these fittings offer the possibility to build the hose assemblies into fixed distances/spaces, without having to move back other system components due the flat faces of the male and female fittings – the hose assembly can be slotted in.

Standard

ISO 12151-1, ISO8434-3 and SAE J516

Parker end configurations

JC, JM/J0, JS, JU, J1, J3, J5, J7, J9



Tube O.D. (inch)	Tube O.D. (mm)	Thread UNF	Size	ØA (mm)	ØB (mm)
1/4	6	9/16x18	-4	13.00	14.20
3/8	10	11/16x16	-6	15.90	17.50
1/2	12	13/16x16	-8	19.10	20.60
5/8	16	1x14	-10	23.80	25.40
3/4	20	1-3/16x12	-12	28.20	30.10
1	25	1-7/16x12	-16	34.15	36.50
1-1/4	32	1-11/16x12	-20	40.50	42.90
1-1/2	38	2x12	-24	48.80	50.80

Flange Fittings Code 61 and Code 62

The 4-bolt split flange (or full flange) fitting is used worldwide for connecting high-pressure hoses typically to pumps, motors and cylinders, where the hose assemblies are subjected to large pressure loadings.

The sealing mechanism is through compression of the O-ring in the face of the flange head against the surface of the port/connection.

The flange fittings are generally separated into two pressure classes referred to as 3000 psi (SFL) or 6000 psi (SFS).

ISO 12151-3 refers to the flange fittings as code 61 for the 3000 psi and code 62 for the 6000 psi.

In addition to these flanges, custom-specific Komatsu® and CATERPILLAR® flanges can also be found in the market.

Parker end configurations

Code 61 (3000 psi)

15, 16, 17, 19, P5, P7, P9

5000 psi (Code 61 dimensions)

4A, 4F, 4N

Code 62 (6000 psi)

6A, 6F, 6N, PA, PF, PN, 89

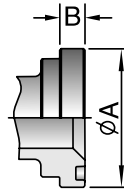
Caterpillar flange

XA, XF, XG, XN

Although not in the SAE or the ISO standard the size -10 (5/8) flange head is gaining popularity.

This flange is often found on Komatsu equipment or hydrostatic drives in agricultural machines.

- Standard Code 61 for 3000 to 5000 psi max., depending on size
- High Pressure Code 62 for 6000 psi max. regardless of size



Flange (inch)	Size	Code 61 MPa / psi	Code 62 MPa / psi
1/2	-8	34.5 / 5000	41.3 / 6000
3/4	-12	34.5 / 5000	41.3 / 6000
1	-16	34.5 / 5000	41.3 / 6000
1-1/4	-20	27.5 / 4000	41.3 / 6000
1-1/2	-24	20.7 / 3000	41.3 / 6000
2	-32	20.7 / 3000	41.3 / 6000

Note: 5000 psi in size -20/-24/-32 with 4A,4F and 4N fittings and 50H flange halves.

Code 61 – SAE – 3000 psi

Flange (inch)	Size	ØA (mm)	B (mm)	O-Ring
1/2	-8	30.18	6.73	18.64x3.53
3/4	-12	38.10	6.73	24.99x3.53
1	-16	44.45	8.00	32.92x3.53
1-1/4	-20	50.80	8.00	37.69x3.53
1-1/2	-24	60.33	8.00	47.22x3.53
2	-32	71.42	9.53	56.74x3.53
2-1/2	-40	84.12	9.53	69.44x3.53
3	-48	101.60	9.53	85.32x3.53

Code 62 – SAE – 6000 psi

Flange (inch)	Size	ØA (mm)	B (mm)	O-Ring
1/2	-8	31.75	7.75	18.64x3.53
3/4	-12	41.28	8.76	24.99x3.53
1	-16	47.63	9.53	32.92x3.53
1-1/4	-20	53.98	10.29	37.69x3.53
1-1/2	-24	63.50	12.57	47.22x3.53
2	-32	79.38	12.57	56.74x3.53

CATERPILLAR®

Flange (inch)	Size	ØA (mm)	B (mm)	O-Ring
3/4	-12	41.28	14.22	25.40x5.00
1	-16	47.63	14.22	31.90x5.00
1-1/4	-20	53.98	14.22	38.20x5.00
1-1/2	-24	63.50	14.22	44.70x5.00

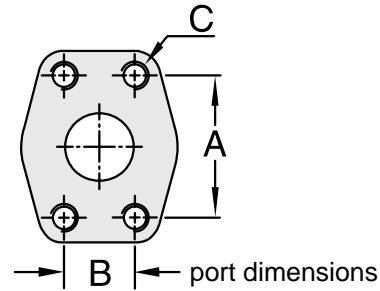
Komatsu®

Flange (inch)	Size	ØA (mm)	B (mm)	O-Ring
5/8	-10	34.25	6.00	21.7x3.5

4-Bolt Split Flange

A 4-bolt split flange is used to attach the flange fittings to their ports.

- Standard Code 61 for 3000 to 5000 psi max., depending on size
- High Pressure Code 62 for 6000 psi max., regardless of size



Code 61 – SAE – 3000 psi

Flange (inch)	Size	A (mm)	B (mm)	C	
				(inch)	(metr.)
1/2	-8	38.1	17.5	5/16x18	M8x1.25
3/4	-12	47.6	22.3	3/8x16	M10x1.5
1	-16	52.4	26.2	3/8x16	M10x1.5
1-1/4	-20	58.7	30.2	7/16x14	M10x1.5
1-1/2	-24	69.9	35.7	1/2x13	M12x1.75
2	-32	77.8	42.8	1/2x13	M12x1.75*

Code 62 – SAE – 6000 psi

Flange (inch)	Size	A (mm)	B (mm)	C	
				(inch)	(metr.)
1/2	-8	40.5	18.2	5/16x18	M8x1.25
3/4	-12	50.8	23.8	3/8x16	M10x1.5
1	-16	57.2	27.8	7/16x14	M12x1.75
1-1/4	-20	66.7	31.8	1/2x13	M12x1.75*
1-1/2	-24	79.4	36.5	5/8x11	M16x2
2	-32	96.8	44.4	3/4x10	M20x2.5

*M14x2 still used in the market but no longer in accordance with ISO 6162

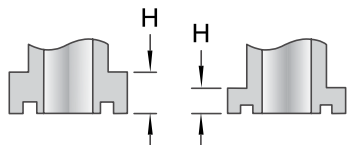
Replacing Caterpillar® 6000 PSI Flange Fittings with SAE Code 62 Flange Fittings and Parker “Caterpillar®” Style Flange Fittings

Caterpillar® has a proprietary 6000 PSI hydraulic flange fitting for use on their equipment. This fitting is similar to the SAE Code 62 hydraulic flange (SAE J518). Flange diameters and bolt hole spacing are the same. The Caterpillar® flange head is thicker (.560” in all sizes) and the configuration and location of the O-ring groove is different, requiring the use of a special O-ring.

The Caterpillar® 6000 PSI flange fitting can be replaced with a Parker “Caterpillar®” style flange fitting

such as the 1XA78 using the existing Caterpillar® flange halves and bolts. In this case the XARG O-ring would be used. The fitting could also be replaced with a standard Code 62 flange fitting such as the 16A78. In this case use HFH flange halves or the HFHFHK kit with the standard SAE O-ring (711510).

Do not use the Caterpillar® 6000 PSI split flange halves on SAE Code 62 flange fittings or SAE Code 62 flange halves on Caterpillar® 6000 PSI flange fittings.



Size		H (in)	
		Caterpillar®	SAE Code 62
3/4	(-12)	.560	.345
1	(-16)	.560	.375
1-1/4	(-20)	.560	.405
1-1/2	(-24)	.560	.495

Procedure	P-ring P/N	Flange Half P/N	Flange Kit P/N
When replacing Caterpillar® 6000 PSI Flange Fittings with Parker “Caterpillar® Style” Fittings:	XARG-Size	Use existing flange halves and bolts	Use existing flange halves and bolts
When replacing Caterpillar® 6000 PSI Flange Fittings with SAE Code 62 Flange Fittings:	711510*	HFH-Size	HFHFHK-Size

Japanese Fittings

The Japanese Industrial Standard (JIS) is seen on most Japanese equipment and uses a 30° sealing angle seat and either British Standard Pipe Parallel or metric threads.

Care must be taken not to confuse the JIS fittings with BSP or JIC fittings.

Japanese fittings - JIS

The sealing mechanism of the fittings is the 30° metal-to-metal angled surfaces

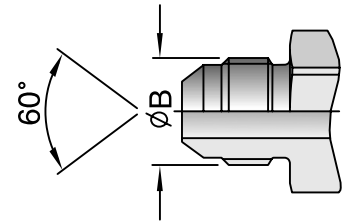
Parker end configurations

MU, XU (Metric)

FU (BSP)

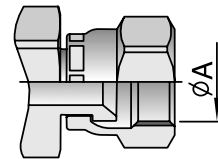
JIS 30° metric

Symbol	Thread metric	ØA (mm)	ØB (mm)
MU-6	M14x1.5	12.50	14.00
MU-9	M18x1.5	16.50	18.00
MU-12	M22x1.5	20.50	22.00
MU-15	M27x2	25.00	27.00
MU-19	M27x2	25.00	27.00
MU-25	M33x2	31.00	33.00
MU-32	M42x2	40.00	42.00
MU-38	M50x2	48.00	50.00
MU-50	M60x2	58.00	60.00











JIS 30° BSP










Symbol	Thread BSP	ØA (mm)	ØB (mm)
GUI-3	1/8x28	8.60	9.70
GUI-5-6	1/4x19	11.50	13.20
GUI-8-9	3/8x19	14.90	16.70
GUI-12	1/2x14	18.60	20.90
GUI-15-19	3/4x14	24.10	26.40
GUI-25	1x11	30.30	33.20
GUI-32	1-1/4x11	38.90	41.90
GUI-38	1-1/2x11	44.90	47.80
GUI-50	2x11	56.70	59.60



Application

Thread Guide

								
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 Flare-less 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	-
4	1/4 - 18	7/16 - 20	7/16 - 20	7/16 - 20	7/16 - 24	-	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 - 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	1 11/16 - 12
24	1 1/2 - 11 1/2	1 7/8 - 12	-	1 7/8 - 12	-	1 7/8 - 14	1 7/8 - 12	2-12
32	2 - 11 1/2	2 1/2 - 12	-	2 1/2 - 12	-	2 1/2 - 12	2 1/2 - 12	-

									
Fitting Size	DIN "L" Swivel Female Thread Size	DIN "S" Swivel Female Thread Size	DIN "L" Male Stud Thread Size	DIN "S" Male Stud Thread Size	Male BSPP Thread Size	BSP Swive Female Thread Size	French Swivel Female Gaz Series	French Swivel Female Metric Series	French Male Stud Metric Series
4	-	-	-	-	1/4x19	1/4x19	--	-	-
6	M12x1,5	M14x1,5	M12x1,5	M14x1,5	3/8x19	3/8x19	-	-	M12x1
8	M14x1,5	M16x1,5	M14x1,5	M16x1,5	1/2x14	1/2x14	-	-	M14x1,5
10	M16x1,5	M18x1,5	M16x1,5	M18x1,5	5/8x14	5/8x14	-	-	M16x1,5
12	M18x1,5	M20x1,5	M18x1,5	M20x1,5	3/4x14	3/4x14	-	-	M18x1,5
-	-	-	-	-	-	-	M20x1,5	-	-
14	-	M22x1,5	-	M22x1,5	-	-	-	-	M20x1,5
15	M22x1,5	-	M22x1,5	-	-	-	-	-	M22x1,5
16	-	M24x1,5	-	M24x1,5	1x11	1x 11	-	-	M24x1,5
-	-	-	-	-	-	-	M24x1,5	-	-
18	M26x1,5	-	M26x1,5	-	-	-	-	-	M27x1,5
20	-	M30x2	-	M30x2	1 1/4x11	1 1/4x11	-	-	M27x1,5
-	-	-	-	-	-	-	M30x 1,5	-	-
22	M30x2	-	M30x2	-	-	-	-	-	M30x1,5
25	-	M36x2	-	M36x2	1 1/2x11	1 1/2x11	-	-	M33x1,5
-	-	-	-	-	-	-	M36x1,5	-	-
28	M36x2	-	M36x2	-	-	-	-	-	M36x1,5
30	-	M42x2	-	M42x2	2x11	2x11	-	-	M39x1,5
33	-	-	-	-	-	-	M45x1,5	-	-

A

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E

Application

Standard Fitting Connections by Connection Type

A

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E

	Description	End Code
Pipe	Male NPTF Pipe - Rigid - Straight	01
	Male NPTF Pipe - Swivel - Straight	13
	Male NPTF Pipe - Swivel - 90° Elbow	1L
	Male API Pipe - Rigid - Straight	AP
	Female NPTF Pipe - Rigid - Straight	02
	Female NPSM Pipe - Swivel - Straight (60° Cone)	07
	Female NPTF Pipe - Swivel - Straight	S2
	Female NPSM Pipe - Gasket Joint - Swivel - Straight	7G
	Female Grease Connection - SPL-PTF Taper Thread - Rigid Straight - 1/2 x 27	GJ
	Male NPTF Pipe - Rigid - 45° Elbow	31
Male NPTF Pipe - Rigid - 90° Elbow or Side Outlet	21	
SAE Str. Trd.	Male SAE Straight Thread with O-Ring - Rigid - Straight	05
	Male SAE Straight Thread with O-Ring - Swivel - Straight	0G
	Male SAE Straight Thread with O-Ring - Adjustable - 45° Elbow	25
	Male SAE Straight Thread with O-Ring - Swivel - 90° Elbow	0L
	Male SAE Straight Thread with O-Ring - Adjustable - 90° Elbow	35
Flare	Male JIC 37° - Rigid - Straight	03
	Male JIC 37° - Bulkhead without Locknut - Straight	LB
	Female JIC 37° - Swivel - Straight	06
	Female JIC 37° - Swivel - 45° Elbow - Short Drop	37
	Female JIC 37° - Swivel - 45° Elbow - Medium Drop	L7
	Female JIC 37° - Swivel - 90° Elbow - Short Drop	39
	Female JIC 37° - Swivel - 90° Elbow - Medium Drop	L9
	Female JIC 37° - Swivel - 90° Elbow - Long Drop	41
	Female JIC 37° - Swivel - Straight	48
	Female JIC 37° - Swivel - 150° Elbow	4V
	Male SAE 45° - Rigid - Straight	04
	Female SAE 45° - Swivel - Straight	08
	Female SAE 45 / Swivel - 45° Elbow	77
	Female SAE 45 / Swivel - 90° Elbow	79
	Female SAE 45 / Swivel - 90° Elbow - Long Drop	81
Female JIC 37°/SAE 45° Dual Flare - Swivel - Straight	68	
Inverted Flare	Male Inverted SAE 45° - Swivel - Straight	28
	Male Inverted SAE 45° - Swivel - 45° Elbow	67
	Male Inverted SAE 45° - Swivel - 90° Elbow	69
	Male Inverted SAE 45° - Swivel - 90° Elbow - Long (In-Line)	71
	Female Inverted SAE 45° - Rigid - Straight	29

	Description	End Code
Tube-O	Male Tube-O - Swivel - Straight - Short Pilot	S5
	Male Tube-O - Swivel - Straight - Long Pilot	45
	Male Tube-O - Swivel - Straight - Long Pilot with Low Pressure Charge Port for R134a	45-PT
	Female Tube-O - Swivel - 90° Elbow - Long Pilot	5L
	Female Tube-O - Swivel - 90° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5L-PT
	Male Tube-O - Swivel - 90° Elbow - Long Pilot	5M
	Male Tube-O - Swivel - 90° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5M-PT
	Male Tube-O - Swivel - 90° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5M-PV
	Male Tube-O - Rigid - Straight - Internal Long Pilot (3-Step)	5G
	Male Tube-O - Swivel - 45° Elbow - Short Pilot	5R
	Male Tube-O - Swivel - 45° Elbow - Long Pilot	5P
	Male Tube-O - Swivel - 45° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5P-PT
	Male Tube-O - Swivel - 90° Elbow - Short Pilot	5K
	Male Tube-O - Swivel - 90° Elbow - Short Pilot with High Pressure Charge Port for R134a	5K-PB
	Female Tube-O - Swivel - Straight - Short Pilot	5S
	Female Tube-O - Swivel - Straight - Long Pilot	59
	Female Tube-O - Swivel - Straight - Long Pilot with High Pressure Charge Port for 134a	59-PB
	Female Tube-O - Swivel - Straight - Long Pilot with Low Pressure Charge Port for R134a	59-PT
	Female Tube-O - Swivel - 45° Elbow - Short Pilot	5H
	Female Tube-O - Swivel - 45° Elbow - Long Pilot	5N
Female Tube-O - Swivel - 45° Elbow - Long Pilot with High Pressure Charge Port for R134a	5N-PB	
Female Tube-O - Swivel - 45° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5N-PT	
Female Tube-O - Swivel - 90° Elbow - Short Pilot	5T	
Compressor	Female Compressor - Swivel - 45° Elbow	5V
	Female Compressor - Swivel - 90° Elbow	5W
	Female Compressor - Swivel - 90° Elbow - Block Type	5Z
	Female Compressor - Swivel - 135° Elbow	RV
	Female Compressor - Swivel - 180° Elbow - Block Type	RZ
Flange	Two Hole (2.25" X 0.44") Flange - Rigid - 90° Elbow	2H
	SAE Code 61 Flange Head - Straight	15
	SAE Code 61 Flange Head - Straight (5,000 psi)	4A
	SAE Code 61 Flange Head - 22½° Elbow -	16

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Application

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Standard Fitting Connections by Connection Type

	Description	End Code
Flange	SAE Code 61 Flange Head-30° Elbow	26
	SAE Code 61 Flange Head-45° Elbow	17
	SAE Code 61 Flange Head-45° Elbow (5,000 psi)	4F
	SAE Code 61 Flange Head-60° Elbow	27
	SAE Code 61 Flange Head - 67½° Elbow	18
	SAE Code 61 Flange Head - 90° Elbow	19
	SAE Code 61 Flange Head - 90° Elbow - (5,000 psi)	4N
	SAE Code 61 Flange Head - 90° Elbow - Long Drop	89
	SAE Code 61 Flange Head - 110° Elbow	2U
	SAE Code 62 Flange Head - Straight	6A
	SAE Code 62 Flange Head - 22½° Elbow	6B
	SAE Code 62 Flange Head - 30° Elbow	6E
	SAE Code 62 Flange Head - 45° Elbow	6F
	SAE Code 62 Flange Head - 60° Elbow	6G
	SAE Code 62 Flange Head - 90° Elbow	6N
	Caterpillar® Flange Head - Straight	XA
	Caterpillar® Flange Head - 22½° Elbow	XB
	Caterpillar® Flange Head - 30° Elbow	XE
	Caterpillar® Flange Head - 45° Elbow	XF
	Caterpillar® Flange Head - 60° Elbow	XG
Caterpillar® Flange Head - 67½° Elbow	XM	
Caterpillar® Flange Head - 90° Elbow	XN	
Seal-Lok	Male Seal-Lok - Rigid - Straight (with O-Ring)	J0
	Male Seal-Lok - Bulkhead without Locknut - Straight (with O-Ring)	JB
	Female Seal-Lok - Swivel - Straight - Long	JS
	Female Seal-Lok - Swivel - Straight - Short	JC
	Female Seal-Lok - Swivel - 221/2° Elbow	J6
	Female Seal-Lok - Swivel - 45° Elbow	J7
	Female Seal-Lok - Swivel - 90° Elbow - Short Drop	J9
	Female Seal-Lok - Swivel - 90° Elbow - Medium Drop	J5
	Female Seal-Lok - Swivel - 90° Elbow - Long Drop	J1
	Metric	Female Metric Swivel - Straight (30° Flare)
Female Metric - Swivel - Straight (30° Flare)		XU
Male Metric L - Rigid - Straight (24° Cone)		D0
Male Standpipe Metric L - Rigid - Straight		1D
Female Metric - Swivel - Straight (Ball Nose)		C0
Female Metric L - Swivel - Straight (Ball Nose)		C3
Female Metric L - Swivel - 45° Elbow (Ball Nose)		C4

	Description	End Code
Metric	Female Metric L - Swivel - 90° Elbow (Ball Nose)	C5
	Female Metric L - Swivel - Straight (24° Cone with O-Ring)	CA
	Female Metric L - Swivel - 45° Elbow (24° Cone with O-Ring)	CE
	Female Metric L - Swivel - 90° Elbow (24° Cone with O-Ring)	CF
	Male Metric S - Rigid - Straight (24° Cone)	D2
	Male Standpipe Metric S - Rigid - Straight	3D
	Female Metric S - Swivel - Straight (Ball Nose)	C6
	Female Metric S - Swivel - 45° Elbow (Ball Nose)	C7
	Female Metric S - Swivel - 90° Elbow (Ball Nose)	C8
	Female Metric S - Swivel - Straight (24° Cone with O-Ring)	C9
BSP	Female Metric S - Swivel - 45° Elbow (24° Cone with O-Ring)	0C
	Female Metric S - Swivel - 90° Elbow (24° Cone with O-Ring)	1C
	Male BSP Taper Pipe - Rigid - Straight	91
	Female BSP Parallel Pipe - Swivel - Straight (60° Cone)	92
	Male BSP Parallel Pipe - Rigid - Straight (60° Cone)	D9
	Female BSP Parallel Pipe - Swivel - 45° Elbow (60° Cone)	B1
	Female BSP Parallel Pipe - Swivel - 90° Elbow (60° Cone)	B2
	Female BSP Parallel Pipe - Swivel - 90° Elbow Block Type (60° Cone)	B4
	Female BSP Parallel Pipe - Swivel - Straight (Flat Seat)	B5
	Male BSP Taper Pipe - Rigid - 45° Elbow	BV
Fr. Gaz	Male BSP Taper Pipe - Rigid - 90° Elbow or Side Outlet	BZ
	Female BSP Parallel Pipe - Swivel - Straight (30° Flare)	FU
	Male BSP Taper Pipe - Rigid - Straight (60° Cone)	UT
	Female BSP Parallel Pipe - Swivel - Straight (60° Cone)	GU
	Female BSP Parallel Pipe - Swivel - 45° Elbow (60° Cone)	G1
	Female BSP Parallel Pipe - Swivel - 90° Elbow (60° Cone)	G2
	Male French Gaz Series - Rigid - Straight (24° Cone)	FG
	Female French Gaz Series - Swivel - Straight (Ball Nose)	F4
	DIN Metric Banjo - Straight	49
	88 Series Heavy Duty Hose Clamp (Double Bolt Hose Clamp)	88DB
Specialty	88 Series Hose Clamp- <i>SAE</i> 100R4 Two-Bolt Clamp	88HC-H
	88 Series Hose Clamp (Worm Gear)	88HC
	Push-Lok Union	82
	Hose Splicer	88
	Male Standpipe - Rigid - Straight (Inch Size Tube O.D.)	34
	Male Ferulok Flareless-Rigid-Straight (24° Cone with Nut and Ferrule)	11
	Female Ferulok Flareless - Swivel - Straight (24° Cone)	12
	Female Air Brake Jounce Line - Swivel - Straight	7B
	Male Refrigerant Tube Mender - Straight (with Nut and Ferrule)	T1
	Female PTT 30° - Swivel	32
Male <i>SAE</i> Compression Seat (without Nut or Sleeve)	61	

A

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Application

Standard Fitting Connections by End Code

A

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E

Description	End Code
Female Metric S - Swivel - 45° Elbow (24° Cone with O-Ring)	0C
Male SAE Straight Thread with O-Ring - Swivel - Straight	0G
Male SAE Straight Thread with O-Ring - Swivel - 90° Elbow	0L
Male NPTF Pipe - Rigid - Straight	01
Female Metric S - Swivel - 90° Elbow (24° Cone with O-Ring)	1C
Male Standpipe Metric L - Rigid - Straight	1D
Male NPTF Pipe - Swivel - 90° Elbow	1L
Female NPTF Pipe - Rigid - Straight	02
Two Hole (2.25" X 0.44") Flange - Rigid - 90° Elbow	2H
SAE Code 61 Flange Head - 110° Elbow	2U
Male JIC 37° - Rigid - Straight	03
Male Standpipe Metric S - Rigid - Straight	3D
Male SAE 45° - Rigid - Straight	04
SAE Code 61 Flange Head - Straight (5,000 psi)	4A
SAE Code 61 Flange Head-45° Elbow (5,000 psi)	4F
SAE Code 61 Flange Head - 90° Elbow - (5,000 psi)	4N
Female JIC 37° - Swivel - 150° Elbow	4V
Male SAE Straight Thread with O-Ring - Rigid - Straight	05
Male Tube-O - Rigid - Straight - Internal Long Pilot (3-Step)	5G
Female Tube-O - Swivel - 45° Elbow - Short Pilot	5H
Male Tube-O - Swivel - 90° Elbow - Short Pilot	5K
Male Tube-O - Swivel - 90° Elbow - Short Pilot with High Pressure Charge Port for R134a	5K-PB
Female Tube-O - Swivel - 90° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5L-PT
Male Tube-O - Swivel - 90° Elbow - Long Pilot	5M
Male Tube-O - Swivel - 90° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5M-PT
Male Tube-O - Swivel - 90° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5M-PV
Female Tube-O - Swivel - 45° Elbow - Long Pilot	5N
Female Tube-O - Swivel - 45° Elbow - Long Pilot with High Pressure Charge Port for R134a	5N-PB
Female Tube-O - Swivel - 45° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5N-PT
Male Tube-O - Swivel - 45° Elbow - Long Pilot	5P
Male Tube-O - Swivel - 45° Elbow - Long Pilot with Low Pressure Charge Port for R134a	5P-PT
Male Tube-O - Swivel - 45° Elbow - Short Pilot	5R
Female Tube-O - Swivel - Straight - Short Pilot	5S
Female Tube-O - Swivel - 90° Elbow - Short Pilot	5T

Standard Fitting Configurations by Connection and End Code Listed in Numerical Order

Description	End Code
Female Compressor - Swivel - 45° Elbow	5V
Female Compressor - Swivel - 90° Elbow	5W
Female Compressor - Swivel - 90° Elbow - Block Type	5Z
Female JIC 37° - Swivel - Straight	06
SAE Code 62 Flange Head - Straight	6A
SAE Code 62 Flange Head - 22½° Elbow	6B
SAE Code 62 Flange Head - 30° Elbow	6E
SAE Code 62 Flange Head - 45° Elbow	6F
SAE Code 62 Flange Head - 60° Elbow	6G
SAE Code 62 Flange Head - 90° Elbow	6N
Female NPSM Pipe - Swivel - Straight (60° Cone)	07
Female Air Brake Jounce Line - Swivel - Straight	7B
Female NPSM Pipe - Gasket Joint - Swivel - Straight	7G
Female SAE 45° - Swivel - Straight	08
Male Ferulok Flareless-Rigid-Straight (24° Cone with Nut and Ferrule)	11
Female Ferulok Flareless - Swivel - Straight (24° Cone)	12
Male NPTF Pipe - Swivel - Straight	13
SAE Code 61 Flange Head - Straight	15
SAE Code 61 Flange Head - 22½° Elbow -	16
SAE Code 61 Flange Head-45° Elbow	17
SAE Code 61 Flange Head - 67½° Elbow	18
SAE Code 61 Flange Head - 90° Elbow	19
Male NPTF Pipe - Rigid - 90° Elbow or Side Outlet	21
Male SAE Straight Thread with O-Ring - Adjustable - 45° Elbow	25
SAE Code 61 Flange Head-30° Elbow	26
SAE Code 61 Flange Head-60° Elbow	27
Male Inverted SAE 45° - Swivel - Straight	28
Female Inverted SAE 45° - Rigid - Straight	29
Male NPTF Pipe - Rigid - 45° Elbow	31
Female PTT 30° - Swivel	32
Male Standpipe - Rigid - Straight (Inch Size Tube O.D.)	34
Male SAE Straight Thread with O-Ring - Adjustable - 90° Elbow	35
Female JIC 37° - Swivel - 45° Elbow - Short Drop	37
Female JIC 37° - Swivel - 90° Elbow - Short Drop	39
Female JIC 37° - Swivel - 90° Elbow - Long Drop	41
Male Tube-O - Swivel - Straight - Long Pilot	45
Male Tube-O - Swivel - Straight - Long Pilot with Low Pressure Charge Port for R134a	45-PT
Female JIC 37° - Swivel - Straight	48

Standard Fitting Configurations by Connection and End Code Listed in Numerical Order

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Application

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Standard Fitting Connections by End Code

Description	End Code
DIN Metric Banjo - Straight	49
Female Tube-O - Swivel - Straight - Long Pilot	59
Female Tube-O - Swivel - Straight - Long Pilot with Charge Port for 134a	59-PB
Female Tube-O - Swivel - Straight - Long Pilot with Charge Port	59-PT
Male SAE Compression Seat (without Nut or Sleeve)	61
Male Inverted SAE 45° - Swivel - 45° Elbow	67
Female JIC 37°/SAE 45° Dual Flare - Swivel - Straight	68
Male Inverted SAE 45° - Swivel - 90° Elbow	69
Male Inverted SAE 45° - Swivel - 90° Elbow - Long (In-Line)	71
Female SAE 45 / Swivel - 45° Elbow	77
Female SAE 45 / Swivel - 90° Elbow	79
Female SAE 45 / Swivel - 90° Elbow - Long Drop	81
Push-Lok Union	82
Hose Splicer	88
88 Series Heavy Duty Hose Clamp (Double Bolt Hose Clamp)	88DB
88 Series Hose Clamp (Worm Gear)	88HC
88 Series Hose Clamp- <i>SAE 100R4 Two-Bolt Clamp</i>	88HC-H
SAE Code 61 Flange Head - 90° Elbow - Long Drop	89
Male BSP Taper Pipe - Rigid - Straight	91
Female BSP Parallel Pipe - Swivel - Straight (60° Cone)	92
Male API Pipe - Rigid - Straight	AP
Female BSP Parallel Pipe - Swivel - 45° Elbow (60° Cone)	B1
Female BSP Parallel Pipe - Swivel - 90° Elbow (60° Cone)	B2
Female BSP Parallel Pipe - Swivel - 90° Elbow Block Type (60° Cone)	B4
Female BSP Parallel Pipe - Swivel - Straight (Flat Seat)	B5
Male BSP Taper Pipe - Rigid - 45° Elbow	BV
Male BSP Taper Pipe - Rigid - 90° Elbow or Side Outlet	BZ
Female Metric - Swivel - Straight (Ball Nose)	C0
Female Metric L - Swivel - Straight (Ball Nose)	C3
Female Metric L - Swivel - 45° Elbow (Ball Nose)	C4
Female Metric L - Swivel - 90° Elbow (Ball Nose)	C5
Female Metric S - Swivel - Straight (Ball Nose)	C6
Female Metric S - Swivel - 45° Elbow (Ball Nose)	C7
Female Metric S - Swivel - 90° Elbow (Ball Nose)	C8
Female Metric S - Swivel - Straight (24° Cone with O-Ring)	C9
Female Metric L - Swivel - Straight (24° Cone with O-Ring)	CA
Female Metric L - Swivel - 45° Elbow (24° Cone with O-Ring) -	CE
Female Metric L - Swivel - 90° Elbow (24° Cone with O-Ring) -	CF
Male Metric L - Rigid - Straight (24° Cone)	D0
Male Metric S - Rigid - Straight (24° Cone)	D2
Male BSP Parallel Pipe - Rigid - Straight (60° Cone)	D9
Female French Gaz Series - Swivel - Straight (Ball Nose)	F4

Standard Fitting Configurations by Connection and End Code Listed in Numerical Order

Description	End Code
Male French Gaz Series - Rigid - Straight (24° Cone)	FG
Female BSP Parallel Pipe - Swivel - Straight (30° Flare)	FU
Female BSP Parallel Pipe - Swivel - 45° Elbow (60° Cone)	G1
Female BSP Parallel Pipe - Swivel - 90° Elbow (60° Cone)	G2
Female Grease Connection - SPL-PTF Taper Thread - Rigid Straight - 1/2 x 27	GJ
Female BSP Parallel Pipe - Swivel - Straight (60° Cone)	GU
Male Seal-Lok - Rigid - Straight (with O-Ring)	J0
Female Seal-Lok - Swivel - 90° Elbow - Long Drop	J1
Female Seal-Lok - Swivel - 90° Elbow - Medium Drop	J5
Female Seal-Lok - Swivel - 221/2° Elbow	J6
Female Seal-Lok - Swivel - 45° Elbow	J7
Female Seal-Lok - Swivel - 90° Elbow - Short Drop	J9
Male Seal-Lok - Bulkhead without Locknut - Straight	JB
Female Seal-Lok - Swivel - Straight - Short	JC
Female Seal-Lok - Swivel - Straight - Long	JS
Female JIC 37° - Swivel - 45° Elbow - Medium Drop	L7
Female JIC 37° - Swivel - 90° Elbow - Medium Drop	L9
Male JIC 37° - Bulkhead without Locknut - Straight	LB
Female Metric Swivel - Straight (30° Flare)	MU
Female Compressor - Swivel - 135° Elbow	RV
Female Compressor - Swivel - 180° Elbow - Block Type	RZ
Female NPTF Pipe - Swivel - Straight	S2
Male Tube-O - Swivel - Straight - Short Pilot	S5
Male Tube-O - Swivel - Straight - Short Pilot with Charge Port for R12	S5-PR
Male Refrigerant Tube Mender - Straight (with Nut and Ferrule)	T1
Male BSP Taper Pipe - Rigid - Straight (60° Cone)	UT
Caterpillar® Flange Head - Straight	XA
Caterpillar® Flange Head - 22 1/2° Elbow	XB
Caterpillar® Flange Head - 30° Elbow	XE
Caterpillar® Flange Head - 45° Elbow	XF
Caterpillar® Flange Head - 60° Elbow	XG
Caterpillar® Flange Head - 67 1/2° Elbow	XM
Caterpillar® Flange Head - 90° Elbow (with O-Ring)	XN
Female Metric - Swivel - Straight (30° Flare)	XU

Standard Fitting Configurations by Connection and End Code Listed in Numerical Order

A

B

C

D

E

Application

Metric Conversion

METRIC to ENGLISH EQUIVALENTS ENGLISH to METRIC EQUIVALENTS

inches x 25.4 = millimeters (mm)
 inches x 2.54 = centimeters (cm)
 feet x .3048 = meters (m)
 yard x .9144 = meters (m)
 psi x .0689 = bar
 psi x .0069 = Megapascals (MPa)
 psi x .0703 = Kilogram force per square centimeter (Kgf/cm²)
 pound force x 4.448 = Newtons
 pound · inch x .113 = Newton · meters (N · m)
 pound · foot x 1.356 = Newton · meters (N · m)
 millimeter x .0394 = inch (in)
 centimeter x .3937 = inch (in)
 meters x 3.281 = feet (ft)
 meters x 1.0936 = yards (yd)
 bar x 14.5 = psi
 Megapascals x 145.0 = psi
 Kilogram force per square centimeter x 14.22 = psi
 Newtons x .2248 = pounds force (lbf)
 Newton · meter x 8.850 = pound · inches (lb · in)
 Newton · meter x .737 = pound feet (lb · ft)

METRIC I.D. KIT

INTERNATIONAL HOSE FITTING IDENTIFICATION KIT

The booklet, gauges and caliper contained in this fitting I.D. Kit, can be used to identify most types of hydraulic hose fittings and adapters including:

- U.S. Standards
- British Standard Pipe
- German (DIN) Metric
- French Metric and GAZ
- Japanese Standards (JIS)

Contents of Kit:

- Instruction Book with Tables
- Screw Pitch Gauge for U.S. Threads
- International Gauge for Metric and British Threads
- Inch and Millimeter Caliper
- Carry Case

MILLIMETERS to FRACTIONS to DECIMALS

MM	INCHES		MM	INCHES		MM	INCHES		MM	INCHES	
	FRACTION	DECIMAL		FRACTION	DECIMAL		FRACTION	DECIMAL		FRACTION	DECIMAL
0.3969	1/64	0.0156	6.7469	17/64	0.2656	13.0969	33/64	0.5156	19.4469	49/64	0.7656
0.7938	1/32	0.0312	7.1438	9/32	0.2812	13.4938	17/32	0.5312	19.8438	25/32	0.7812
1.1906	3/64	0.0468	7.5406	19/64	0.2968	13.8906	35/64	0.5468	20.2406	51/64	0.7968
1.5875	1/16	0.0625	7.9375	5/16	0.3125	14.2875	9/16	0.5625	20.2375	13/16	0.8125
1.9844	5/64	0.0781	8.3344	21/64	0.3281	14.6844	37/64	0.5781	21.0344	53/64	0.8281
2.3812	3/32	0.0937	8.7312	11/32	0.3437	15.0812	19/32	0.5937	21.4312	27/32	0.8437
2.7781	7/64	0.1093	9.1281	23/64	0.3593	15.4781	39/64	0.6093	21.8281	55/64	0.8593
3.1750	1/8	0.1250	9.5250	3/8	0.3750	15.8750	5/8	0.6250	22.2250	7/8	0.8750
3.5719	9/64	0.1406	9.9219	25/64	0.3906	16.2719	41/64	0.6406	22.6219	57/64	0.8906
3.9688	5/32	0.1562	10.3188	13/32	0.4062	16.6688	21/32	0.6562	23.0188	29/32	0.9062
4.3656	11/64	0.1718	10.7156	27/64	0.4218	17.0656	43/64	0.6718	23.4156	59/64	0.9218
4.7625	3/16	0.1875	11.1125	7/16	0.4375	17.4625	11/16	0.6875	23.8125	15/16	0.9375
5.1594	13/64	0.2031	11.5094	29/64	0.4531	17.8594	45/64	0.7031	24.2094	61/64	0.9531
5.5562	7/32	0.2187	11.9062	15/32	0.4687	18.2562	23/32	0.7187	24.6062	31/32	0.9687
5.9531	15/64	0.2343	12.3031	31/64	0.4843	18.6531	47/64	0.7343	25.0031	63/64	0.9843
6.3500	1/4	0.2500	12.7000	1/2	0.5000	19.0500	3/4	0.7500	25.4000	1	1.0000

Media

Chemical Resistance Information

Warning: This chemical compatibility guide must not be used in conjunction with any other compatibility guides from previous or future catalog editions, bulletins or publications. Incorrect use of these charts could result in death, personal injury or property damage.

Hose Selection by Medium and Hose Type

This hose compatibility chart is a ready reference of Parker hose compatibility with various fluid media. It is intended as a guide to chemical compatibility with inner tube materials and assembly lubricant applied internally. The specific recommendations are based upon field experience, the advice of various polymer or fluid suppliers, and specific laboratory experiments. **It must be stressed, however, that this information is offered only as a guide.** Final hose selection depends also upon pressure, fluid temperature, ambient temperature, and special requirements or variations, which may not be known by Parker Hannifin. Legal and other regulations must be followed with particular care. Where an external compatibility problem may occur, or for fluids not listed, we encourage you to first contact the fluid manufacturer for a recommendation prior to contacting your Parker Hannifin Field Representative or the Technical Service Department, Hose Products Division, Wickliffe, Ohio.

Use the Chart as Follows:

1. Locate medium to be carried using the Chemical Resistance Table on the following pages.
2. Select suitability of hose and fitting material from the table based on the letter rating in the table. See resistance rating key below for explanation of compatibility ratings. See list of numerals below for an explanation when a numeral, or a numeral and a letter rating are present in the table.
3. The Column headings on the Chemical Resistance Table, I, II, III, IV, V, refer to specific groups of hoses.
4. Locate hose part number under Column I, II, III, IV, V from the list below.
5. For fitting material availability refer to appropriate fitting section of catalog.
6. Check hose specifications in this catalog. Contact Hose Division Technical Service Department on any items not cataloged.

Resistance Rating Key

A = Preferred, good to excellent with little or no change in physical properties.

F = Fair, marginal or conditional with noticeable affects on physical properties.

X = Unsuitable, severe affects on physical properties.

~ = No rating, insufficient information.

Note: All data based on 70°F unless otherwise noted.

Numerals

1. For air or gaseous applications above 250 PSI (1,7 MPa), the cover should be pin pricked. The service life for air or gaseous applications can be unpredictable, especially at higher pressures. Contact Technical Service Department for more information.
2. Legal and insurance regulations must be considered. Contact Technical Service Department for more information.
3. Push-Lok hoses 801 and 836 are approved for diesel fuel applications only when coupled with HY series fittings.
4. Use 285, 235 or 244 hoses. The compatibility of the systems refrigeration oil with these hoses needs to be evaluated on a case by case basis. Contact HPD Technical Service Department for more information. Do not use mineral oil or Alkyl Benzene refrigeration oils with 244 hose. Chemical compatibility does not imply low permeation.
5. 150°F (65°C) maximum.
6. Satisfactory at some concentrations and temperatures, unsatisfactory at others.
7. For Phosphate Ester and Skydrol fluids, be aware a certain amount of permeation will occur. The rate and amount will depend on the fluid type, any blends or additives to the fluid, and the system operating parameters.
8. Acceptable for flushing hose assemblies.
9. 221FR hose recommended.
10. For dry air applications, hoses with inner tubes from columns IV, and V are preferred. See hose specifications for maximum recommended temperatures with air.
11. Use SS23CG or SS25UL
12. Use SS23CG

Hose Types

Column I

201, 601, 881

Column II

SS25UL, 421WC, 471TC, 471ST, 472LT, 722LT, 792LT, 801, 811, 811HT

Column III

JK, 187/TC/ST, 221FR, 302, 387/TC/ST, 422, 472TC, 482TC, 482ST, 487/TC/ST, 722/TC/ST, 787/TC/ST, 797/TC/ST, 821

Column IV

206, 213, 266, 293, 426, 611HT, 821FR, 836, 436

Column V

F42, 304, 424, 774, 804

Caution:

The fluid manufacturer's recommended maximum operating temperature for any specific name-brand fluid should be closely observed by the user. Specific name brand fluids can vary greatly between manufacturers even though they are considered to be from the same family or type of fluids. Using fluids above the manufacturers maximum recommended temperature can cause the fluid to break down, creating by-products that can be harmful to elastomers or other materials used in the system. When selecting a hose type, both the fluid manufacturer and hose manufacturers maximum temperature limit must be taken into consideration, with the lower of the two taking precedence.

A

B

C

D

E

Media

Chemical Resistance Information (Page 1 of 9)

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
3M FC-75	A	A	A	A	A	A	A	A
Acetic Acid	X	X	X	A	6	X	X	A
Acetone	X	X	X	A	A	A	A	A
Acetylene	X	X	X	X	X	~	~	~
Aeroshell 31	F	A	A	F	~	A	A	A
AEROSHELL Turbine Oil 500	X	X	F	X	X	A	A	A
Air	A,1,10	A,1,10	A,1,10	A,1,10	A,1,10	A	A	A
Air (dry)	X	X	X	A,1,10	A,1,10	A	A	A
Alcohol (Methanol-Ethanol)	F	F	F	F	F	F	A	A
Americas Choice AW ISO 46	~	F	F	~	~	~	~	~
Ammonia (Anhydrous)	X	X	X	X	X	X	X	X
Ammonium Chloride	A	A	A	A	A	X	X	X
Ammonium Hydroxide	F	F	F	A	A	F	X	A
Ammonium Nitrate	A	A	A	F	A	F	X	A
Ammonium Phosphate	A	A	A	A	A	X	X	F
Ammonium Sulfate	A	A	A	A	A	F	X	F
Amoco 32 Rykon	X	A	A	F	X	A	A	A
Ampol PE 46	X	X	X	X	A,7	A	A	A
AMSOIL Synthetic ATF	F	A	A	A	X	A	A	A
Amyl Alcohol	X	X	X	F	F	X	A	A
Anderol 495,497,500,750	X	X	X	F	X	A	A	A
Aniline	X	X	X	F	A	A	X	A
Animal Fats	X	F	F	F	F	6	6	A
Aquacent Light, Heavy	X	A	A	X	X	A	A	A
Aries/Athena	F	F	F	~	X	A	A	A
Aromatic 100,150	X	F	F	~	X	A	A	A
Arrow 602P	A	A	A	A	X	A	A	A
Asphalt	X	F	F	F	X	F	F	A
ASTM #3 Oil	F	F	F	F	X	A	A	A
Astrol 1044AW	A	A	A	~	X	A	A	A
ATF-M	F	A	A	A	X	A	A	A
Automotive Brake Fluid	X	X	X	X	~	X	X	X
AW 32,46,68	F	A	A	A	X	A	A	A
BCF	F	F	F	F	~	A	A	A
Benz Petraulic 32,46,68,100,150,220,320,460	F	A	A	A	X	A	A	A
Benzene, Benzol	X	X	X	F	X	A	A	A
Benzgrind HP 15	~	A	A	A	X	A	A	A
Benzine	X	X	X	F	X	A	A	A
Bio Diesel B20	~	A	A	A	X	A	A	A
Bio-Soy, Agri Industries	X	A	A	X	X	A	A	A
Biodegradable Hydraulic Fluid 112B	X	A	A	X	~	A	A	A
Borax	F	F	F	F	A	F	A	A
Boric Acid	A	A	A	X	A	X	6	A
Brayco 882	X	A	A	A	X	A	A	A

Media

Chemical Resistance Information

(Page 2 of 9)

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
Brayco Micronic 745	~	A	A	F	X	A	A	A
Brayco Micronic 776RP	F	A	A	F	X	A	A	A
Brayco Micronic 889	X	F	F	~	X	A	A	A
Brine	F	F	F	A	A	X	F	F
Butane			See numerals 2 and 11			A	A	A
Butyl Alcohol, Butanol	F	F	F	F	F	F	F	A
Calcium Chloride	A	A	A	F	A	F	F	X
Calcium Hydroxide	A	A	A	A	A	A	A	A
Calcium Hypochlorite	X	X	X	A	A	X	F	X
Calibrating Fluid	A	A	A	A	X	A	A	A
Carbon Dioxide, gas	F	F	F	F	6	A	A	A
Carbon Dioxide, liquid	X	X	X	X	X	X	X	X
Carbon Disulfide	X	X	X	F	X	A	F	A
Carbon Monoxide (hot)	F	F	F	F	6	F	6	A
Carbon Tetrachloride	X	X	X	F	X	6	6	6
Carbonic Acid	F	F	F	X	F	X	X	F
Castor Oil	A	A	A	A	A	A	A	A
Castrol 5000	X	F	F	A	X	A	A	A
Cellosolve Acetate	X	X	X	X	A	X	X	A
Cellugard	A	A	A	~	A	A	A	A
Cellulube 90, 150, 220 300, 550, 1000	X	X	X	~	A	A	A	A
Chevron Clarity AW 32, 46, 68	A	A	A	A	X	A	A	A
Chevron FLO-COOL 180	F	F	F	~	X	A	A	A
Chevron FR-8, 10, 13, 20	X	X	X	X	A,7	A	A	A
Chevron Hydraulic Oils AW MV 15, 32, 46, 68, 100	A	A	A	A	X	A	A	A
Chevron HyJet IV (9)	X	X	X	X	A,7	A	A	A
Chevron Rykon MV	F	A	A	~	~	A	A	A
Cindol 3204 PBR	~	A	A	A	X	A	A	A
Citric Acid	F	A	A	X	A	X	X	6
Commonwealth EDM 242, 244	A	A	A	~	X	A	A	A
CompAir CN300	X	X	X	F	X	A	A	A
CompAir CS100, 200, 300, 400	X	X	X	F	X	A	A	A
Coolanol 15, 20, 25, 35, 45	A	A	A	A	A	A	A	A
Copper Chloride	F	A	A	X	A	X	X	X
Copper Sulfate	A	A	A	X	A	X	X	F
Cosmolubric HF-122, HF-130, HF-144	X	F	A	X	X	A	A	A
Cosmolubric HF-1530	X	F	A	X	X	A	A	A
Cottonseed Oil	F	A	A	F	X	A	A	A
CPI CP-4000	X	X	X	F	X	A	A	A
Crude Petroleum Oil	F	A	A	A	X	F	F	A
CSS 1001Dairy Hydraulic Fluid	F	A	A	A	X	A	A	A
Daphne AW32	A	A	A	A	X	A	A	A
Dasco FR 201-A	A	A	A	~	X	A	A	A
Dasco FR150, 200, 310	F	A	A	~	A	A	A	A
Dasco FR300, FR2550	X	X	X	~	X	A	A	A

A

B

C

D

E

Media

Chemical Resistance Information (Page 3 of 9)

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
Dasco FR355-3	X	F	A	X	X	A	A	A
Deicer Fluid 419R	A	A	A	~	~	A	A	A
Deionized Water	A	A	A	A	A	F	F	A
Dexron II ATF	F	A	A	A	X	A	A	A
Dexron III ATF (to 170°F)	A	A	A	A	X	A	A	A
Dexron III ATF (to 212°F)	X	F	F	A	X	A	A	A
Dexron III ATF (to 250°F)	X	X	X	F	X	A	A	A
Dexron III ATF (to 300°F)	X	X	X	X	X			
Dexron VI ATF (to 170°F)	A	A	A	A	X	A	A	A
Dexron VI ATF (to 212°F)	X	F	F	A	X	A	A	A
Dexron VI ATF (to 250°F)	X	X	X	X	X	A	A	A
Dexron VI ATF (to 300°F)	X	X	X	X	X			
DexronIII/Mercon (at 212°F)	X	A	A	A	X	A	A	A
Diesel Fuel (Standard and Ultra Low Sulfur)	F,3	A,3	A,3	A,3	X	A	A	A
Diester Fluids	X	X	X	F	X	A	A	A
Dow Corning 2-1802 Sullair (24KT)	~	~	~	F	~	A	A	A
Dow Corning DC 200, 510, 550, 560, FC126	A	A	A	F	~	A	A	A
Dow HD50-4	F	F	F	~	~	~	~	A
Dow Sullube 32	~	~	~	F	~	A	A	A
Dowtherm A,E	X	X	X	F	X	A	A	A
Dowtherm G	X	X	X	X	X	A	A	A
Duro AW-16, 31	A	A	A	~	X	A	A	A
Duro FR-HD	A	A	A	~	X	A	A	A
EcoSafe FR-68	A	A	A	~	~	A	A	A
Envirologic 3032, 3046, 3068	A	A	A	~	~	~	~	~
Ethanol	F	F	F	F	F	F	A	A
Ethers	X	X	X	F	X	A	A	A
Ethyl Acetate	X	X	X	F	F	F	A	A
Ethyl Alcohol	F	F	F	F	F	F	A	A
Ethyl Cellulose	F	F	F	F	F	X	F	F
Ethyl Chloride	X	X	X	X	A	F	F	F
Ethylene Dichloride	X	X	X	F	X	X	A	X
Ethylene Glycol	F	A	A	A	A	A	F	A
Exxon 2380 Turbo Oil	X	F	F	X	X	A	A	A
Exxon 3110 FR	A	A	A	A	X	A	A	A
Exxon Esstic	A	A	A	A	A	A	A	A
Exxon Mobil Rarus SHC 1026	~	~	~	A	~	A	A	A
Exxon Nuto H 46, 68	A	A	A	A	X	A	A	A
Exxon Tellura Industrial Process Oils	A	A	A	A	X	A	A	A
Exxon Terresstic, EP	A	A	A	A	A	A	A	A
Exxon Turbo Oil 2380	X	F	F	F	X	A	A	A
Exxon Univolt 60, N61	F	A	A	A	X	A	A	A
FE 232 (Halon)	X	X	X	X	F	A	A	A

Media

Chemical Resistance Information

(Page 4 of 9)

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
Fenso 150	~	A	A	~	X	A	A	A
Formaldehyde	X	X	X	A	A	X	F	A
Formic Acid	X	X	X	X	A	X	6	X
Freons see refrigerants	~	~	~	~	~	~	~	~
Fuel Oil	F	A	A	A	X	A	A	A
Fyre-Safe 120C, 126, 155, 1090E, 1150, 1220, 1300E	X	X	X	X	A,7	A	A	A
Fyre-Safe 200C, 225, 211	F	A	A	A	A	A	A	A
Fyre-Safe W/O	A	A	A	A	X	A	A	A
Fyrguard 150, 150-M, 200	A	A	A	A	A	A	A	A
Fyrquel 60, 90, 150, 220, 300, 550, 1000	X	X	X	X	A,7	A	A	A
Fyrquel EHC, GT, LT, VPF	X	X	X	X	A,7	A	A	A
Fyrtek MF, 215, 290, 295	X	X	X	X	X	A	A	A
Gardner-Denver GD5000, GD8000	X	X	X	F	X	A	A	A
Gasoline			See numeral 9			A	A	A
Glue	F	F	F	~	X	A	F	A
Glycerine, Glycerol	A	A	A	A	A	A	F	A
Grease	A	A	A	A	X	A	A	A
Green Plus ES	X	A	A	X	~	A	A	A
Greens Care 32, 46	F	A	A	F	~	A	A	A
Gulf-FR Fluid P37, P40, P43, P45, P47	X	X	X	F	A	A	A	A
H-515 (NATO)	A	A	A	~	X	A	A	A
Halon 1211, 1301	F	F	F	F	~	A	A	A
Helium Gas	X	X	X	X	X	A	A	A
Heptane	X	F	F	A	X	A	A	A
Hexane	X	F	F	A	X	A	A	A
HF-20, HF-28	~	A	A	A	A	A	A	A
Houghto-Safe 1055, 1110, 1115, 1120, 1130 (9)	X	X	X	X	A,7	A	A	A
Houghto-Safe 271 to 640	F	A	A	F	A	A	A	A
Houghto-Safe 419 Hydraulic Fluid	A	A	A	~	X	A	A	A
Houghto-Safe 419R Deicer Fluid	A	A	A	~	~	A	A	A
Houghto-Safe 5046, 5046W, 5047-F	A	A	A	A	X	A	A	A
HP 100C (Jack hammer oil)	F	A	A	A	X	A	A	A
HPWG 46B	F	A	A	F	~	A	A	A
Hul-E-Mul	A	A	A	~	X	A	A	A
Hychem C, EP1000, RDF	A	A	A	A	A	A	A	A
Hydra Safe E-190	A	A	A	F	X	A	A	A
Hydra-Cut 481, 496	A	A	A	~	X	A	A	A
Hydrafluid 760	A	A	A	~	X	A	A	A
Hydrochloric Acid	X	X	X	X	X	X	X	X
Hydrofluoric Acid	X	X	X	X	X	X	6	X
Hydrogen Gas	X	X	X	X	X	A	A	A
Hydrogen Peroxide	X	X	X	F	X	X	X	6
Hydrogen Sulfide	X	X	X	X	A	X	X	6
Hydrolube	A	A	A	F	A	A	A	A

A

B

C

D

E

Media

Chemical Resistance Information

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
Hydrolubric 120-B, 141, 595	F	A	A	F	A	A	A	A
Hydrosafe Glycol 200	A	A	A	A	A	A	F	A
HyJet IV	X	X	X	X	A,7	A	A	A
Hyspin SP 10	~	A	A	A	~	A	A	A
Ideal Yellow 77	A	A	A	A	X	A	A	A
Imol S150 to S550	X	X	X	~	~	A	A	A
Ingersoll Rand SSR Coolant	X	X	X	F	X	A	A	A
Isocyanates	F	F	F	F	X	A	~	A
Isooctane	X	F	F	A	X	A	A	A
Isopar H	X	X	X	X	X	A	A	A
Isopropyl Alcohol	F	F	F	F	F	F	A	A
Jayflex DIDP	X	X	X	X	A	A	A	A
JP3 and JP4	X	A,3	A,3	~	X	A	A	A
JP5	X	A,3	A,3	F,3	X	A	A	A
JP9	X	X	X	X	X	A	~	A
Kaeser 150P, 175P, 325R, 687R	X	X	X	F	X	A	A	A
Kerosene	X	A	A	F	X	A	A	A
KSL-214, 219, 220, 222	X	X	X	F	X	A	A	A
Lacquer	X	X	X	F	X	X	A	A
Lacquer Solvents	X	X	X	F	X	X	A	A
Lactic Acids	X	X	X	X	X	X	X	A
Lindol HF	X	X	X	F	A	A	A	A
Linseed Oil	A	A	A	A	A	A	A	A
LP-Gas			See numeral 11			A	A	A
Magnesium Chloride	A	A	A	A	A	X	X	X
Magnesium Hydroxide	F	F	F	A	A	F	F	F
Magnesium Sulfate	A	A	A	A	A	A	F	A
Mercaptans	X	X	X	X	X	~	~	~
Methane			See numeral 12			A	A	A
Methanol	F	F	F	F	F	F	A	A
Methyl Alcohol	F	F	F	F	F	F	A	A
Methyl Chloride	X	X	X	F	X	A	A	A
Methyl Ethyl Ketone (MEK)	X	X	X	F	X	F	A	A
Methyl Isopropyl-Ketone	X	X	X	X	X	F	A	A
Metsafe FR303-M, FR303	X	X	X	X	X	A	A	A
Metsafe FR310, FR315, FR330, FR350	X	X	X	X	F, 7	A	A	A
Microzol-T46	X	A	A	~	X	A	A	A
MIL-B-46176A	X	X	X	X	X	X	X	X
MIL-H-46170	X	F	F	F	X	A	A	A
MIL-H-5606	F	A	A	A	X	A	A	A
MIL-H-6083	F	A	A	A	X	A	A	A
MIL-H-7083	F	A	A	A	X	A	A	A
MIL-H-83282	F	A	A	A	X	A	A	A
MIL-L-2104, 2104B	F	A	A	A	X	A	A	A

Media

Chemical Resistance Information

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
MIL-L-23699	X	X	X	X	X	A	A	A
MIL-L-7808	F	A	A	~	X	A	A	A
Mine Guard FR	A	A	A	~	A	A	A	A
Mineral Oil	A	A	A	F	X	A	A	A
Mineral Spirits	8	8	8	8	X	A	A	A
Mobil Aero HFE	F	A	A	F	X	A	A	A
Mobil DTE 11M, 13M, 15M, 16M, 18M, 19M	F	A	A	A	X	A	A	A
Mobil DTE 22, 24, 25, 26	F	A	A	A	X	A	A	A
Mobil EAL 224H	X	A	A	X	~	A	A	A
Mobil EAL Artic 10, 15, 22,32, 46, 68, 100	X	X	X	X	X	A	A	A
Mobil EAL Evirosyn 46	A	A	A	A	X	A	A	A
Mobil Glygoyle 11, 22, 30, 80	A	A	A	~	X	A	A	A
Mobil HFA	F	A	A	A	X	A	A	A
Mobil Jet 2	X	F	F	A	X	A	A	A
Mobil Nyvac 20, 30, 200, FR	F	A	A	F	A	A	A	A
Mobil Rarus 824, 826, 827	X	X	X	F	X	A	A	A
Mobil SHC 500 Series	A	A	A	A	X	A	A	A
Mobil SHC 600 Series	F	A	A	A	X	A	A	A
Mobil SHC 800 Series	F	A	A	A	X	A	A	A
Mobil SHL 624	~	A	A	A	X	A	A	A
Mobil Vactra Oil	A	A	A	F	X	A	A	A
Mobil XRL 1618B	X	X	X	X	A,7	A	A	A
Mobilfluid 423	F	A	A	A	X	A	A	A
Mobilgear SHC 150, 220, 320, 460, 680	F	F	F	F	X	A	A	A
Mobilrama 525	A	A	A	F	X	A	A	A
Molub-Alloy 890	X	X	X	F	X	A	A	A
Moly Lube 'HF' 902	F	F	F	F	X	A	A	A
Monolec 6120 Hydraulic Oil	A	A	A	A	X	A	A	A
Morpholine (pure additive)	X	X	X	X	X	X	X	A
Naptha	X	F	F	A	X	A	A	A
Napthalene	X	X	X	F	X	A	A	A
Natural Gas			See numeral 12			A	A	A
Nitric Acid	X	X	X	X	X	X	X	F
Nitrobenzene	X	X	X	F	X	X	X	A
Nitrogen, gas	F,1	F,1	F,1	F,1	F,1	A	A	A
Nitrogen, liquid	X	X	X	X	X	X	X	X
NORPAR 12, 13, 15	8	8	8	8	X	A	A	A
Nuto H 46, 68	A	A	A	A	X	A	A	A
Nyvac 20, 30, 200, FR	F	A	A	F	A	A	A	A
Nyvac Light	X	X	X	~	A	A	A	A
Oceanic HW	F	A	A	F	X	A	A	A
Oxygen	X	X	X	X	X	X	A	A
Ozone	F	F	F	~	A	A	A	A
Pacer SLC 150, 300, 500, 700	X	X	X	F	X	A	A	A

A

B

C

D

E

Media

Chemical Resistance Information (Page 7 of 9)

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
Pennzbell AWX	F	A	A	F	X	A	A	A
Perchloroethylene	X	X	X	X	X	F	X	A
Petroleum Ether	X	F	F	F	X	A	A	A
Petroleum Oils	A	A	A	A	X	A	A	A
Phenol (Carbolic Acid)	X	X	X	A	X	X	F	A
Phosphate Ester Blends	X	X	X	X	X	A	A	A
Phosphate Esters	X	X	X	X	A,7	A	A	A
Phosphoric Acid	X	X	X	X	X	X	X	F
Plurasafe P 1000, 1200	F	A	A	A	F	A	A	A
Polyalkylene Glycol	A	A	A	~	X	A	A	A
Polyol Ester	X	F	A	X	X	A	A	A
Potassium Chloride	A	A	A	A	A	X	F	F
Potassium Hydroxide	X	X	X	F	A	6	X	A
Potassium Sulfate	A	A	A	A	A	A	A	A
Propane			See numeral 11			A	A	A
Propylene Glycol	F	A	A	A	A	F	F	F
Pydraul 10-E, 29-E, 50-E, 65-E, 90-E, 115-E	X	X	X	X	A,7	A	A	A
Pydraul 230-C, 312-C, 68-S	X	X	X	X	A,7	A	A	A
Pydraul 60, 150, 625, F9	X	X	X	X	A,7	A	A	A
Pydraul 90, 135, 230, 312, 540, MC	X	X	X	X	X	A	A	A
Pydraul A-200	X	X	X	F	X	A	A	A
Pyro Gard 43, 230, 630	X	X	X	X	X	A	A	A
Pyro Gard C, D, R, 40S, 40W	F	A	A	F	X	A	A	A
Pyro Guard 53, 55, 51, 42	X	X	X	X	A,7	A	A	A
Quakerol 641, 720	X	F	A	X	F	A	A	A
Quintolubric 700	A	A	A	A	A	A	F	A
Quintolubric 807-SN	F	A	A	~	X	A	A	A
Quintolubric 822, 833	X	F,5	A,5	X	X	A	A	A
Quintolubric 822-68EHC (71°C, 160°F maximum)	X	F,5	A,5	~	~	A	A	A
Quintolubric 888	X	F,5	A,5	X	X	A	A	A
Quintolubric 957, 958	F	A	A	F	A	A	A	A
Quintolubric N822-300	~	~	A	~	~	A	A	A
Rando	A	A	A	A	X	A	A	A
Rayco 782	X	F	A	X	X	X	X	X
Refrigerant 124			See numeral 4			A	A	A
Refrigerant Freon 113, 114	X	X	X	X	X	A	A	A
Refrigerant Freon 12			See numeral 4			A	A	A
Refrigerant Freon 22			See numeral 4			A	A	A
Refrigerant Freon 502			See numeral 4			A	A	A
Refrigerant HFC134A			See numeral 4			A	A	A
Reolube Turbofluid 46	X	X	X	X	A,7	A	A	A
Rotella	A	A	A	A	X	A	A	A
Royal Bio Guard 3032, 3046, 3068, 3100	X	~	A	X	X	A	A	A
Royco 2200, 2210, 2222, 2232, 2246, 2268	X	X	X	X	X	A	A	A
Royco 4032, 4068, 4100, 4150	X	X	X	F	X	A	A	A

Media

Chemical Resistance Information

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
Royco 756, 783	A	A	A	A	X	A	A	A
Royco 770	X	F	F	F	X	A	A	A
RTV Silicone Adhesive Sealants	X	X	X	X	X	A	A	A
Safco-Safe T10, T20	~	~	~	~	A	F	F	A
Safety-Kleen ISO 32, 46, 68 hydraulic oil	F	A	A	~	X	A	A	A
Safety-Kleen Solvent	F,8	F,8	F,8	F,8	X	A	A	A
Santoflex 13	F	F	F	~	F	A	A	A
Santosafe 300	X	X	X	~	X	A	A	A
Santosafe W/G 15 to 30	~	~	~	A	A	A	A	A
Schaeffer Oil #112 HTC @ 158°F max	A	A	A	~	X	A	A	A
Schaeffer Oil #112 HTC @ 158°F to 212°F	F	F	F	~	X	A	A	A
Schaeffer Oil #275 Dilex Supreme @ 158°F max	A	A	A	~	X	A	A	A
Schaeffer Oil #275 Dilex Supreme @ 158°F to 212°F	F	F	F	~	X	A	A	A
Sea Water	F	F	F	F	A	X	F	A
Sewage	F	F	F	A	F	X	F	A
Shell 140 Solvent	8	8	8	8	X	A	A	A
Shell Clavus HFC 68	X	X	X	X	X	A	A	A
Shell Comptella Oil	F	F	F	A	X	A	A	A
Shell Comptella Oil S 46, 68	F	F	F	A	X	A	A	A
Shell Comptella Oil SM	F	F	F	A	X	A	A	A
Shell Diala A, (R) Oil AX	F	A	A	F	X	A	A	A
Shell FRM	~	~	~	~	X	A	A	A
Shell IRUS 902, 905	A	A	A	~	A	A	A	A
Shell Pella-A	A	A	A	A	X	A	A	A
Shell Tellus	F	A	A	A	X	A	A	A
Shell Thermia Oil C	A	A	A	A	X	A	A	A
Shell Turbo R	X	F	F	A	X	A	A	A
SHF 220, 300, 450	X	X	A	X	X	A	A	A
Silicate Esters	A	F	F	A	X	A	A	A
Silicone Oils	A	A	A	~	~	A	A	A
Silicone Sealants	X	X	X	X	X	A	A	A
Skydrol 500B-4, LD-4	X	X	X	X	A,7	A	A	A
Soap Solutions	X	F	F	F	A	A	A	A
Soda Ash, Sodium Carbonate	A	A	A	A	A	A	F	A
Sodium Bisulfate	F	F	F	A	A	F	A	F
Sodium Chloride	F	F	F	A	A	X	F	A
Sodium Hydroxide	X	X	X	A	A	A	X	A
Sodium Hypochlorite	F	F	F	X	F	X	X	X
Sodium Nitrate	F	F	F	A	A	A	F	A
Sodium Peroxide	X	X	X	X	A	X	X	A
Sodium Silicate	A	A	A	A	A	A	A	A
Sodium Sulfate	A	A	A	A	A	A	A	A
Soybean Oil	F	A	A	A	A	A	A	A
SSR Coolant	X	X	X	F	X	A	A	A
Steam	X	X	X	X	X	F	A	A

Media

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MEDIA	I	II	III	IV	V	Steel	Brass	SS
Stoddard Solvent	8	8	8	8	X	A	A	A
Sulfur Chloride	X	X	X	F	X	X	X	X
Sulfur Dioxide	X	X	X	X	F	X	F	F
Sulfur Trioxide	X	X	X	F	F	X	X	X
Sulfuric Acid 0%-30% Room Temp	F,6	F,6	F,6	X	F,6	6	X	6
Summa-20, Rotor, Recip	X	X	X	F	X	A	A	A
Summit DSL-32,68,100,125	X	X	X	F	X	A	A	A
Sun Minesafe, Sun Safe	X	F	F	F	X	A	A	A
Sundex 8125	X	F	F	~	A	A	A	A
Suniso 3GS	A	A	A	A	X	A	A	A
Sun-Vis 722	X	F	F	~	X	A	A	A
Super Hydraulic Oil 100, 150, 220	A	A	A	A	X	A	A	A
SUVA MP 39, 52, 66	X	X	X	X	X	A	A	A
SYNCON Oil	X	X	X	X	X	A	A	A
Syndale 2820	X	F	F	~	~	A	A	A
Synesstic 32,68,100	X	X	X	X	X	A	A	A
Syn-Flo 70,90	X	X	X	F	X	A	A	A
SYN-O-AD 8478	X	X	X	X	A,7	A	A	A
Tannic Acid	F	A	A	F	A	X	F	X
Tar	F	F	F	F	X	X	F	A
Tellus (Shell)	F	A	A	A	X	A	A	A
Texaco 760 Hydrafluid	~	~	~	~	X	A	A	A
Texaco 766, 763 (200 - 300)	~	~	~	~	A	F	F	A
Texaco A-Z Oil	A	A	A	F	X	A	A	A
Texaco Spindura Oil 22	F	F	F	F	X	A	A	A
Texaco Way Lubricant 68	A	A	A	A	X	A	A	A
Thanol-R-650-X	X	F	F	~	X	A	A	A
Thermanol 60	X	X	X	X	X	A	A	A
Toluene, Toluol	X	X	X	X	X	A	A	A
Transmission Oil	A	A	A	A	X	A	A	A
Tribol 1440	X	F	F	X	X	A	A	A
Trichloroethylene	X	X	X	F	X	X	A	A
Trim-Sol	F	A	A	F	X	A	A	A
Turbinol 50, 1122, 1223	X	X	X	X	A,7	A	A	A
Turpentine	X	X	X	F	X	A	A	A
Ucon Hydrolubes	F	A	A	F	A	A	A	A
UltraChem 215,230,501,751	X	X	X	F	X	A	A	A
Univis J26	A	A	A	A	X	A	A	A
Unleaded Gasoline			See numeral 9		~	A	A	A
Unocal 66/3 Mineral Spirits	8	8	8	8	X	A	A	A
Urea	F	F	F	A	F	F	~	F
Urethane Formulations	A	A	A	A	~	A	A	A
Van Straaten 902	A	A	A	A	X	A	A	A
Varnish	X	X	X	F	X	F	F	A
Varsol	8	F	F	8	X	A	A	A
Versilube F44, F55	~	A	A	A	~	A	A	A
Vinegar	X	X	X	F	A	F	X	A
Vital 29, 4300, 5230, 5310	X	X	X	X	X	A	A	A
Volt Esso 35	A	A	A	A	X	A	A	A
Water	F	A	A	A	A	F	A	A
Water / Glycols	A	A	A	A	A	A	F	A
Xylene, Xylol	X	X	X	X	X	A	A	A
Zerol 150	A	A	A	A	X	A	A	A
Zinc Chloride	A	A	A	X	A	X	X	F
Zinc Sulfate	A	A	A	X	A	X	A	A

Pressure

Pressure Rating of Hose End Connections

PRESSURE RATINGS HOSE ASSEMBLIES - PSI
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.

Hose End Connection Description	Part Number Codes	Inch Size Fittings (psi)												
		-2	-4	-5	-6	-8	-10	-12	-16	-20	-24	-32	-40	-48
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		
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		
SAE Flareless	11 & 12		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		9,200		9,200	9,200	6,000	6,000	6,000	4,000	4,000	3,000		
SAE Flanges Code 61	15, 16, 17, 18, 19, 26, 27 & 89					5,000		5,000	5,000	4,000	4,000	3,000	2,500	2,000
SAE Flanges Code 61 Special	4A, 4B, 4F, 4G & 4N									5,000	5,000	5,000		
SAE Flanges Code 62	6A, 6E, 6F, 6G, 6N, XA, XF, XG & XN							6,000	6,000	6,000	6,000	6,000		

For adapter pressure ratings, see Tube Fittings Division catalog 4300.

*NOTE: 45°, 37° and Seal-Lok Torque Tables are on page E-19

**NOTE: For pressure rating of 01, 06 and 39 end configurations in 73, 77, 78, and 79 series, see each description in Section B.

Hose End Connection Description	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	
DIN 20078 Form C	C0									900		900		900		900	
Banjo	49	3,000	3,000	3,000	3,000		3,000		3,000	3,000	3,000						
French Metric	F9 & FA			3,000	3,500	2,000			2,250	2,000	1,900			1,750			

Hose End Connection Description	Part Number Codes	French Gaz Fittings (psi)				
		-13	-17	-21	-27	-33
French Gaz	F4, FG, GJ & GE	5,250	3,900	3,700	3,000	2,500

*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.

The Maximum working pressure of hoses are listed with each hose description in Section A.

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Pressure

Metric Pressure Conversions

PRESSURE CONVERSIONS									
Kilo-Pascals (kPa)	Mega-Pascals (MPa)	Bar (bar)	Kilograms per Square Centimeter (Kgf/cm ²)	lbs per Square Inch (psi)	lbs per Square Inch (psi)	Kilo-Pascals (kPa)	Mega-Pascals (MPa)	Bar (bar)	Kilograms per Square Centimeter (Kgf/cm ²)
100	0,1	1,00	1.0	14.50	10	68.9	0,07	0,7	0.70
200	0,2	2,00	2.0	29.00	20	137.9	0,14	1,4	1.41
300	0,3	3,00	3.1	43.50	30	206.8	0,21	2,1	2.11
400	0,4	4,00	4.1	58.00	40	275.8	0,28	2,8	2.81
500	0,5	5,00	5.1	72.50	50	344.7	0,34	3,4	3.52
600	0,6	6,00	6.1	87.00	60	413.7	0,41	4,1	4.22
700	0,7	7,00	7.1	101.50	70	482.6	0,48	4,8	4.92
800	0,8	8,00	8.2	116.00	80	551.6	0,55	5,5	5.63
900	0,9	9,00	9.2	130.50	90	620.5	0,62	6,2	6.33
1000	1,0	10,00	10.2	145.00	100	689.0	0,70	6,9	7.00
2000	2,0	20,00	20.4	290.10	200	1379.0	1,40	13,8	14.10
3000	3,0	30,00	30.6	435.10	300	2068.0	2,10	20,7	21.10
4000	4,0	40,00	40.8	580.20	400	2758.0	2,80	27,6	28.10
5000	5,0	50,00	51.0	725.20	500	3447.0	3,40	34,5	35.20
6000	6,0	60,00	61.2	870.20	600	4137.0	4,10	41,4	42.20
7000	7,0	70,00	71.4	1015.30	700	4826.0	4,80	48,3	49.20
8000	8,0	80,00	81.6	1160.30	800	5516.0	5,50	55,2	56.30
9000	9,0	90,00	91.8	1305.30	900	6205.0	6,20	62,1	63.30
10000	10,0	100,00	102.0	1450.00	1000	6895.0	6,90	68,9	70.30
20000	20,0	200,00	204.0	2901.00	2000	13790.0	13,80	137,9	140.70
30000	30,0	300,00	306.0	4351.00	3000	20684.0	20,70	206,8	211.00
40000	40,0	400,00	408.0	5802.00	4000	27579.0	27,60	275,8	281.30
50000	50,0	500,00	510.0	7252.00	5000	34474.0	34,50	344,7	351.60
60000	60,0	600,00	612.0	8702.00	6000	41369.0	41,40	413,7	421.90
70000	70,0	700,00	714.0	10153.00	7000	48263.0	48,30	482,6	492.30
80000	80,0	800,00	816.0	11603.00	8000	55158.0	55,20	551,6	562.60
90000	90,0	900,00	918.0	13053.00	9000	62053.0	62,10	620,5	632.90
100000	100,0	1000.00	1020.0	14504.00	10000	68948.0	68,90	689,0	703.00
200000	200,0	2000.00	2040.0	29008.00	20000	137895.0	137,90	1379,0	1406.00
300000	300,0	3000.00	3060.0	43511.00	30000	206843.0	206,80	2068,0	2110.00
					40000	275790.0	275,80	2758,0	2813.00

Conversions

PSI and MPa or N/mm² Conversions

Pounds per Square Inch (abbrev. PSI) - A basic unit of pressure or tension measurement in the Imperial or English System of Weights and Measures.

1 psi = .006895 MPa,
1000 psi = 1 ksi

MegaPascal (abbrev. MPa) - A basic unit of pressure or tension measurement in the International System of Weights and Measures.

1 MPa = 145 psi,
1 MPa = 1 N/mm².

For oil field applications, units of measurement smaller than 1 psi usually have little meaning. Units of MPa may often appear with a decimal.

Example: 1000 psi = 6.895 MPa.

1 MegaPascal (MPa) = 1 Newton per Square Millimeter (N/mm²) = 145 Pounds per Square Inch (psi).

Psi, Ksi, MPa, and N/mm² all express force measurement, either pressure (as fluid pressure) or load (as tension). All of these terms may appear as pressure ratings or test pressures, and tensile or yield requirements or test results.

API Spec 6A specifies equipment pressure ratings in both PSI, and MPa as:

2,000 psi	=	13.8 MPa	=	138 bar
3,000 psi	=	20.7 MPa	=	207 bar
5,000 psi	=	34.5 MPa	=	345 bar
10,000 psi	=	69.0 MPa	=	690 bar
15,000 psi	=	103.5 MPa	=	1,035 bar
20,000 psi	=	138.0 MPa	=	1,380 bar

Bar pressure provided for information only.

To express PSI pressures in bars, convert PSI to MPa and move the decimal in the MPa value 1 space to the right, e.g. 5000 PSI = 34.5 MPa = 345 bar.

API Spec 6A specifies material property requirements* as:

Material Designation	Yield		Tensile	
	PSI	MPa	PSI	MPa
36 K	36,000	248	70,000	483
45 K	45,000	310	70,000	483
60 K	60,000	414	85,000	586
75 K	75,000	517	95,000	655

*For Elongation and Reduction of Area, see API Spec 6A. The values specified for these requirements do not require conversion.

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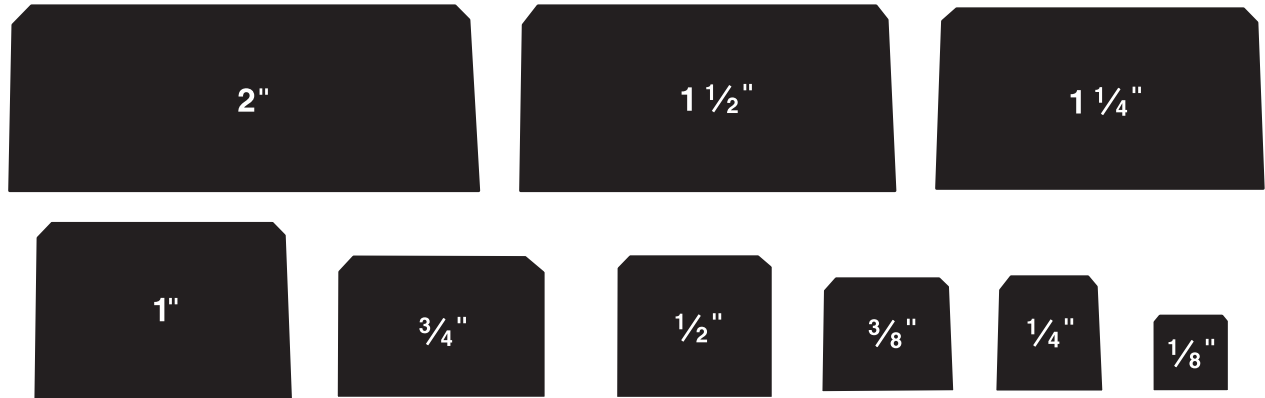
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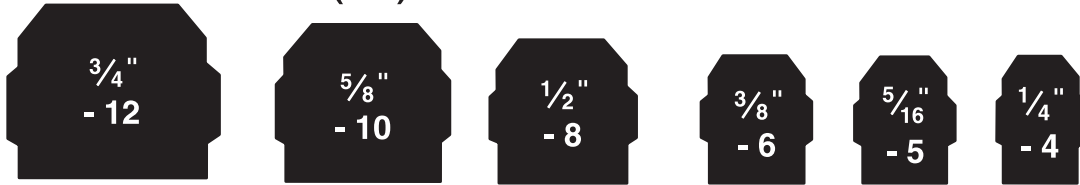
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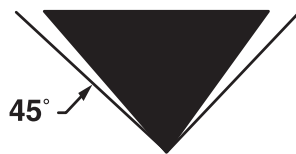
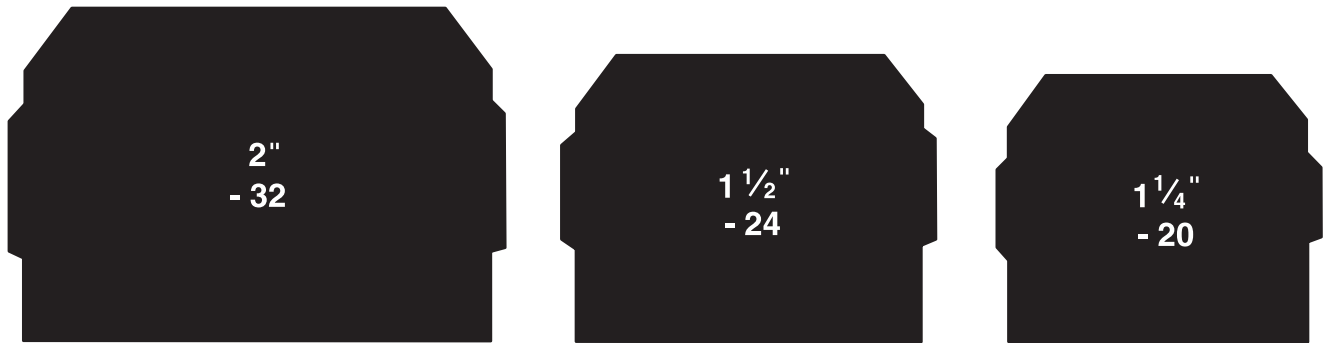
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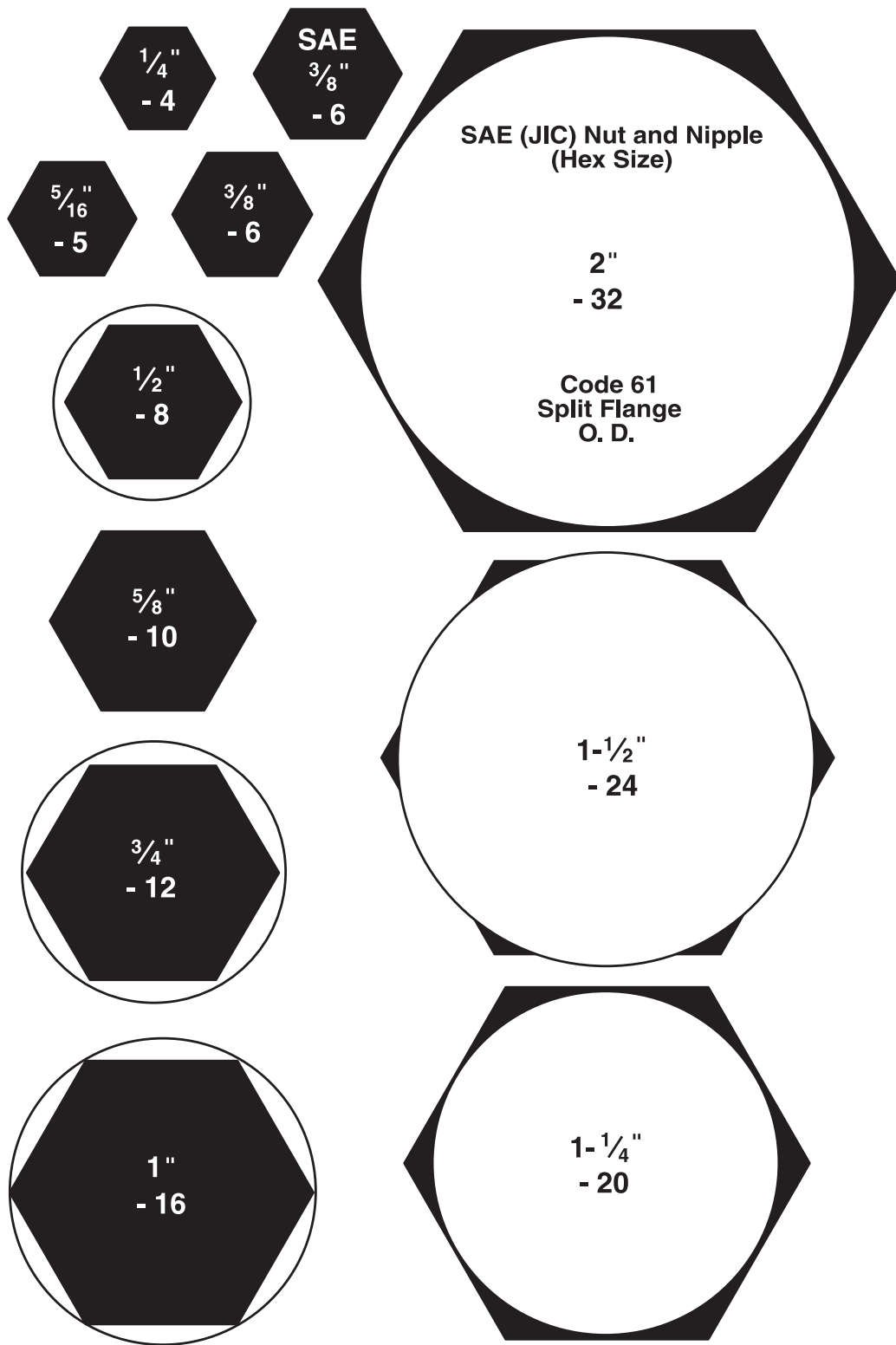
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Parker Safety Guide for Selecting and Using Hose, Tubing, Fittings, Connectors, Conductors, Valves and Related Accessories

Parker Publication No. 4400-B.1

WARNING: Failure or improper selection or improper use of hose, tubing, fittings, assemblies, valves, connectors, conductors 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.
- Tube or pipe burst.
- Weld joint fracture.
- 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. No product from any division in Parker Fluid Connectors Group is approved for in-flight aerospace applications. For hoses and fittings used in in-flight aerospace applications, please contact Parker Aerospace Group.

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. Metallic tube or pipe are called “tube”. All assemblies made with Hose are called “Hose Assemblies”. All assemblies made with Tube are called “Tube Assemblies”. All products commonly called “fittings”, “couplings” or “adapters” are called “Fittings”. Valves are fluid system components that control the passage of fluid. Related accessories are ancillary devices that enhance or monitor performance including crimping, flaring, flanging, presetting, bending, cutting, deburring, swaging machines, sensors, tags, lockout handles, spring guards and associated tooling. 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, and should be followed.

1.2 Fail-Safe: Hose, Hose Assemblies, Tube, Tube 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, Tube, Tube 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, Tube and Fitting products. Do not select or use Parker Hose, Tube 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, Tube and Fittings. Parker does not represent or warrant that any particular Hose, Tube 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.
- Following the safety guide for Related Accessories and being trained to operate Related Accessories.
- 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, TUBE AND FITTINGS 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, Tube and Fittings for these or any other applications in which electrical conductivity or nonconductivity is a factor.

The electrical conductivity or nonconductivity of Hose, Tube 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, Tube 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 or dense magnetic fields, 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, Tube 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. All hoses that convey fuels must be grounded.

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; CSA 12.52, “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 within the specified temperature range. Parker CNG Hose should not be used in confined spaces or unventilated areas or areas exceeding the specified temperature range. 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; CSA 12.52.

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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, Tube and Fitting selection must be made so that the published maximum working pressure of the Hose, Tube and Fittings are equal to or greater than the maximum system pressure. The maximum working pressure of a Hose, or Tube Assembly is the lower of the respective published maximum working pressures of the Hose, Tube and the Fittings used. Surge pressures or peak transient pressures in the system must be below the published maximum working pressure for the Hose, Tube and Fitting. 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, Tube, Fitting and Seals. Temperatures below and above the recommended limit can degrade Hose, Tube, Fittings and Seals to a point where a failure may occur and release fluid. Tube and Fittings performances are normally degraded at elevated temperature. Material compatibility can also change at temperatures outside of the rated range. 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, and Tube Assembly selection must assure compatibility of the Hose tube, cover, reinforcement, Tube, Plating and Seals 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, and Tube that is chemically compatible with a particular fluid must be assembled using Fittings and adapters containing likewise compatible seals. Flange or flare processes can change Tube material properties that may not be compatible with certain requirements such as NACE
- 2.6 Permeation:** Permeation (that is, seepage through the Hose or Seal) will occur from inside the Hose or Fitting to outside when Hose or Fitting 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 or Fitting 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 or Fitting even though the fluid compatibility is acceptable without considering the potential hazardous effects that can result from permeation through the Hose or Tube Assembly.
- Permeation of moisture from outside the Hose or Fitting to inside the Hose or Fitting will also occur in Hose or Tube 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. The sudden pressure release of highly pressurized gas could also result in Explosive Decompression failure of permeated Seals and Hoses.
- 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 should be installed in a manner that allows for ease of inspection and future replacement. Hose because of its relative short life, should not be used in residential and commercial buildings inside of inaccessible walls or floors, unless specifically allowed in the product literature. Always review all product literature for proper installation and routing instructions.
- 2.9 Environment:** Care must be taken to insure that the Hose, Tube 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, Tube and Fitting 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. Use of proper Hose or Tube clamps may also be required to reduce external mechanical loads. 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 than 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. Fittings with damages such as scratches on sealing surfaces and deformation should be replaced.
- 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 determining the proper Hose or Tube length of an assembly, be aware of Hose length change due to pressure, Tube length change due to thermal expansion or contraction, and Hose or Tube and machine tolerances and movement must be considered. When routing short hose assemblies, it is recommended that the minimum free hose length is always used. Consult the hose manufacturer for their minimum free hose length recommendations. Hose assemblies should be installed in such a way that any motion or flexing occurs within the same plane.
- 2.14 Specifications and Standards:** When selecting Hose, Tube and Fittings, government, industry, and Parker specifications and recommendations must be reviewed and followed as applicable.
- 2.15 Hose Cleanliness:** Hose and Tube components may vary in cleanliness levels. Care must be taken to insure that the Hose and Tube 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 or Tube require use of the same type of Hose or Tube as used with petroleum base fluids. Some such fluids require a special Hose, Tube, Fitting and Seal, while a few fluids will not work with any Hose at all. See instructions 2.5 and 1.5. The wrong Hose, Tube, Fitting or Seal 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 and Seals 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 or Seal. Performance of Tube and Fitting subjected to the heat could be degraded.
- 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 or Seal 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. Any elastomer seal on fittings shall be removed prior to welding or brazing, any metallic surfaces shall be protected after brazing or welding when necessary. Welding and brazing filler material shall be compatible with the Tube and Fitting that are joined.
- 2.19 Atomic Radiation:** Atomic radiation affects all materials used in Hose and Tube assemblies. Since the long-term effects may be unknown, do not expose Hose or Tube assemblies to atomic radiation. Nuclear applications may require special Tube and Fittings.
- 2.20 Aerospace Applications:** The only Hose, Tube 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

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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: (www.ansi.org) standard for heating cables recommends the use of GFEPDs with a nominal 30 milliamperere 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 TUBE AND FITTINGS ASSEMBLY AND INSTALLATION INSTRUCTIONS

4.1 Component Inspection: Prior to assembly, a careful examination of the Tube and Fittings must be performed. All components must be checked for correct style, size, material, seal, and length. Inspect the Fitting and sealing surfaces for burrs, nicks, corrosion, missing seal or other imperfections. Do NOT use any component that displays any signs of nonconformance.

4.2 Tube and Fitting Assembly: Do not assemble a Parker Fitting with a Tube 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. The Tube must meet the requirements specified to the Fitting.

The Parker published instructions must be followed for assembling the Fittings to a Tube. 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.

4.3 Related Accessories: Do not preset or flange Parker Fitting components using another manufacturer's equipment or procedures unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. Tube, Fitting component and tooling must be checked for correct style, size and material. Operation and maintenance of Related Accessories must be in accordance with the operation manual for the designated Accessory.

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

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

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

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

4.8 Routing: The Tube 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.

5.0 HOSE AND FITTING MAINTENANCE AND REPLACEMENT INSTRUCTIONS

5.1 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. Certain products require maintenance and inspection per industry requirements. Failure to adhere to these requirements may lead to premature failure. A maintenance program must be established and followed by the user and, at minimum, must include instructions 5.2 through 5.7

Parker Safety Guide, Parker Publication No. 4400-B.1 (continued)

- 5.2 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.
- 5.3 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.
- 5.4 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.
- 5.5 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.
- 5.6 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.

- 5.7 Elastomeric seals:** Elastomeric seals will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Elastomeric seals should be inspected and replaced.
- 5.8 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.
- 5.9 Compressed natural gas (CNG):** Parker CNG Hose Assemblies should be tested after installation and before use, and at least on a monthly basis per instructions provided on the Hose Assembly tag. The recommended procedure is to pressurize the Hose and check for leaks and to visually inspect the Hose for damage and to perform an electrical resistance test.
- 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.
- 6.0 HOSE STORAGE**
- 6.1 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. Unless otherwise specified by the manufacturer or defined by local laws and regulations:
- 6.1.1** The shelf life of rubber hose in bulk form or hose made from two or more materials is 28 quarters (7 years) from the date of manufacture, with an extension of 12 quarters (3 years), if stored in accordance with ISO 2230;
- 6.1.2** The shelf life of thermoplastic and polytetrafluoroethylene hose is considered to be unlimited;
- 6.1.3** Hose assemblies that pass visual inspection and proof test shall not be stored for longer than 2 years.
- 6.1.4 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.

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Issue Date	ECO Number:	Revision Letter:	Revision Date:	Specification
24-SEP-2015	XXXXXX	A	30-OCT-2015	FC-Safety Guide

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Offer of Sale

- A**
1. **Definitions.** As used herein, the following terms have the meanings indicated.
- Buyer: means any customer receiving a Quote for Products from Seller.
- Goods: means any tangible part, system or component to be supplied by the Seller.
- Products: means the Goods, Services and/or Software as described in a Quote provided by the Seller.
- Quote: means the offer or proposal made by Seller to Buyer for the supply of Products.
- Seller: means Parker-Hannifin Corporation, including all divisions and businesses thereof.
- Services: means any services to be supplied by the Seller.
- Software: means any software related to the Products, whether embedded or separately downloaded.
- Terms: means the terms and conditions of this Offer of Sale or any newer version of the same as published by Seller electronically at www.parker.com/saleterms.
- B**
2. **Terms.** All sales of Products by Seller are contingent upon, and will be governed by, these Terms and, these Terms are incorporated into any Quote provided by Seller to any Buyer. Buyer's order for any Products whether communicated to Seller verbally, in writing, by electronic data interface or other electronic commerce, shall constitute acceptance of these Terms. Seller objects to any contrary or additional terms or conditions of Buyer. Reference in Seller's order acknowledgement to Buyer's purchase order or purchase order number shall in no way constitute an acceptance of any of Buyer's terms of purchase. No modification to these Terms will be binding on Seller unless agreed to in writing and signed by an authorized representative of Seller.
- C**
3. **Price; Payment.** The Products set forth in Seller's Quote are offered for sale at the prices indicated in Seller's Quote. Unless otherwise specifically stated in Seller's Quote, prices are valid for thirty (30) days and do not include any sales, use, or other taxes or duties. Seller reserves the right to modify prices at any time to adjust for any raw material price fluctuations. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). All sales are contingent upon credit approval and payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law.
- D**
4. **Shipment; Delivery; Title and Risk of Loss.** All delivery dates are approximate. Seller is not responsible for damages resulting from any delay. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage pass to Buyer, upon placement of the Products with the shipment carrier at Seller's facility. Unless otherwise agreed, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective indicated shipping date will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.
- E**
5. **Warranty.** The warranty related to the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of twelve (12) months from the date of delivery or 2,000 hours of use, whichever occurs first; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the completion of the Services by Seller; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end-user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer:
DISCLAIMER OF WARRANTY: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED. BUYER AGREES AND ACKNOWLEDGES THAT UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".
6. **Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to the Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.
7. **LIMITATION OF LIABILITY.** IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCT, RE-PERFORM THE SERVICES, OR REFUND THE PURCHASE PRICE PAID WITHIN A REASONABLE PERIOD OF TIME. **IN NO EVENT IS SELLER LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, NON-COMPLETION OF SERVICES, USE, LOSS OF USE OF, OR INABILITY TO USE THE PRODUCTS OR ANY PART THEREOF, LOSS OF DATA, IDENTITY, PRIVACY, OR CONFIDENTIALITY, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, WHETHER BASED IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCTS.**
8. **Loss to Buyer's Property.** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which are or become Buyer's property, will be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer ordering the Products 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. **Special Tooling.** Special Tooling includes but is not limited to tooling, jigs, fixtures and associated manufacturing equipment acquired or necessary to manufacture Products. A tooling charge may be imposed for any Special Tooling. 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 Special Tooling belonging to Seller that is utilized in the manufacture of the Products, even if such Special Tooling has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property in its sole discretion at any time.
10. **Security Interest.** To secure payment of all sums due, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.
11. **User Responsibility.** The Buyer through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. The Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and other technical information provided with the Product. If Seller provides Product options based upon data or specifications provided by the Buyer, the Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event the Buyer is not the end-user, Buyer will ensure such end-user complies with this paragraph.
12. **Use of Products, Indemnity by Buyer.** Buyer shall comply with all instructions, guides and specifications provided by Seller with the Products. **Unauthorized Uses.** If Buyer uses or resells the Products for any uses prohibited in Seller's instructions, guides or specifications, or Buyer otherwise fails to comply with Seller's instructions, guides and specifications, Buyer acknowledges that any such use, resale, or non-compliance is at Buyer's sole risk. Buyer shall indemnify, defend, and hold Seller harmless from any losses, claims, liabilities, damages, lawsuits, judgments and costs (including attorney fees and defense costs), whether for personal injury, property damage, intellectual property infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, application, design, specification or other misuse of Products provided by Seller; (b) any act or omission, negligent or otherwise,

of Buyer; (c) Seller's use of patterns, tooling, equipment, plans, drawings, designs or specifications or other information or things furnished by Buyer; (d) damage to the Products from an external cause, repair or attempted repair by anyone other than Seller, failure to follow instructions, guides and specifications provided by Seller, use with goods not provided by Seller, or opening, modifying, deconstructing or tampering with the Products for any reason; or (e) Buyer's failure to comply with these Terms. Seller shall not indemnify Buyer under any circumstance except as otherwise provided in these Terms.

13. **Cancellations and Changes.** Buyer may not cancel or modify any order for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller, at any time, may change Product features, specifications, designs and availability.
14. **Limitation on Assignment.** Buyer may not assign its rights or obligations without the prior written consent of Seller.
15. **Force Majeure.** Seller does not assume the risk and is not liable for delay or failure to perform any of Seller's obligations by reason of events or circumstances beyond its reasonable control ("Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.
16. **Waiver and Severability.** Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of these Terms by legislation or other rule of law shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.
17. **Termination.** Seller may terminate any agreement governed by or arising from these Terms for any reason and at any time by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms (b) appoints a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or one if filed by a third party (d) makes an assignment for the benefit of creditors; or (e) dissolves its business or liquidates all or a majority of its assets.
18. **Ownership of Software.** Seller retains ownership of all Software supplied to Buyer hereunder. In no event shall Buyer obtain any greater right in and to the Software than a right in the nature of a license limited to the use thereof and subject to compliance with any other terms provided with the Software.
19. **Indemnity for Infringement of Intellectual Property Rights.** Seller is not liable for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights ("Intellectual Property Rights") except as provided in this Section. 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 a third party claim that one or more of the Products sold hereunder infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by the Seller to the Buyer. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of any such claim, and Seller having sole control over the defense of the claim including all negotiations for settlement or compromise. If one or more Products sold hereunder is subject to such a claim, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Products, replace or modify the Products so as to render them non-infringing, or offer to accept return of the Products and refund the purchase price less a reasonable allowance for depreciation. Seller has no obligation or liability for any claim of infringement: (i) arising from information provided by Buyer; or (ii) directed to any Products provided hereunder for which the designs are specified in whole or part by Buyer; or (iii) resulting from the modification, combination or use in a system of any Products provided hereunder. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for such claims of infringement of Intellectual Property Rights.
20. **Governing Law.** These Terms and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.
21. **Entire Agreement.** These Terms, along with the terms set forth in the main body of any Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. In the event of a conflict between any term set forth in the main body of a

Quote and these Terms, the terms set forth in the main body of the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. These Terms may not be modified unless in writing and signed by an authorized representative of Seller.

22. **Compliance with Laws.** Buyer agrees to comply with all applicable laws, regulations, and industry and professional standards, including those of the United States of America, and the country or countries in which Buyer may operate, including without limitation the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti-Kickback Act"), U.S. and E.U. export control and sanctions laws ("Export Laws"), the U.S. Food Drug and Cosmetic Act ("FDCA"), and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), each as currently amended. Buyer agrees to indemnify, defend, and hold harmless Seller from the consequences of any violation of such laws, regulations and standards by Buyer, its employees or agents. Buyer acknowledges that it is familiar with all applicable provisions of the FCPA, the Anti-Kickback Act, Export Laws, the FDCA and the FDA and certifies that Buyer will adhere to the requirements thereof and not take any action that would make Seller violate such requirements. Buyer represents and agrees that Buyer will not make any payment or give anything of value, directly or indirectly, to any governmental official, foreign political party or official thereof, candidate for foreign political office, or commercial entity or person, for any improper purpose, including the purpose of influencing such person to purchase Products or otherwise benefit the business of Seller. Buyer further represents and agrees that it will not receive, use, service, transfer or ship any Product from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws.

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Parker's Motion & Control Technologies

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



Climate Control

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
CO₂ 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



Electromechanical

Key Markets

Aerospace
Factory automation
Life science & medical
Machine tools
Packaging machinery
Paper machinery
Plastics machinery & converting
Primary metals
Semiconductor & electronics
Textile
Wire & cable

Key Products

AC/DC drives & systems
Electric actuators, gantry robots & slides
Electrohydraulic actuation systems
Electromechanical actuation systems
Human machine interface
Linear motors
Stepper motors, servo motors, drives & controls
Structural extrusions



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 & Gas Handling

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



Pneumatics

Key Markets

Aerospace
Conveyor & material handling
Factory automation
Life science & medical
Machine tools
Packaging machinery
Transportation & automotive

Key Products

Air preparation
Brass fittings & valves
Manifolds
Pneumatic accessories
Pneumatic actuators & grippers
Pneumatic valves & controls
Quick disconnects
Rotary actuators
Rubber & thermoplastic hose & couplings
Structural extrusions
Thermoplastic tubing & fittings
Vacuum generators, cups & sensors



Process Control

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



Sealing & Shielding

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

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

Louisville, KY

phone 502 937 1322
fax 502 937 4180

Portland, OR

phone 503 283 1020
fax 503 283 2201

Toledo, OH

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