Parker Legris & Nycoil: Connecting You to the Best in Technology

Catalog 3500LEG/NYC | August 2025

Parker legris Nycoil®

ENGINEERING YOUR SUCCESS.

Nycoil®

Tubing & Hose

Pneumatic Tubing Overview

Polyethylene (LLDPE)

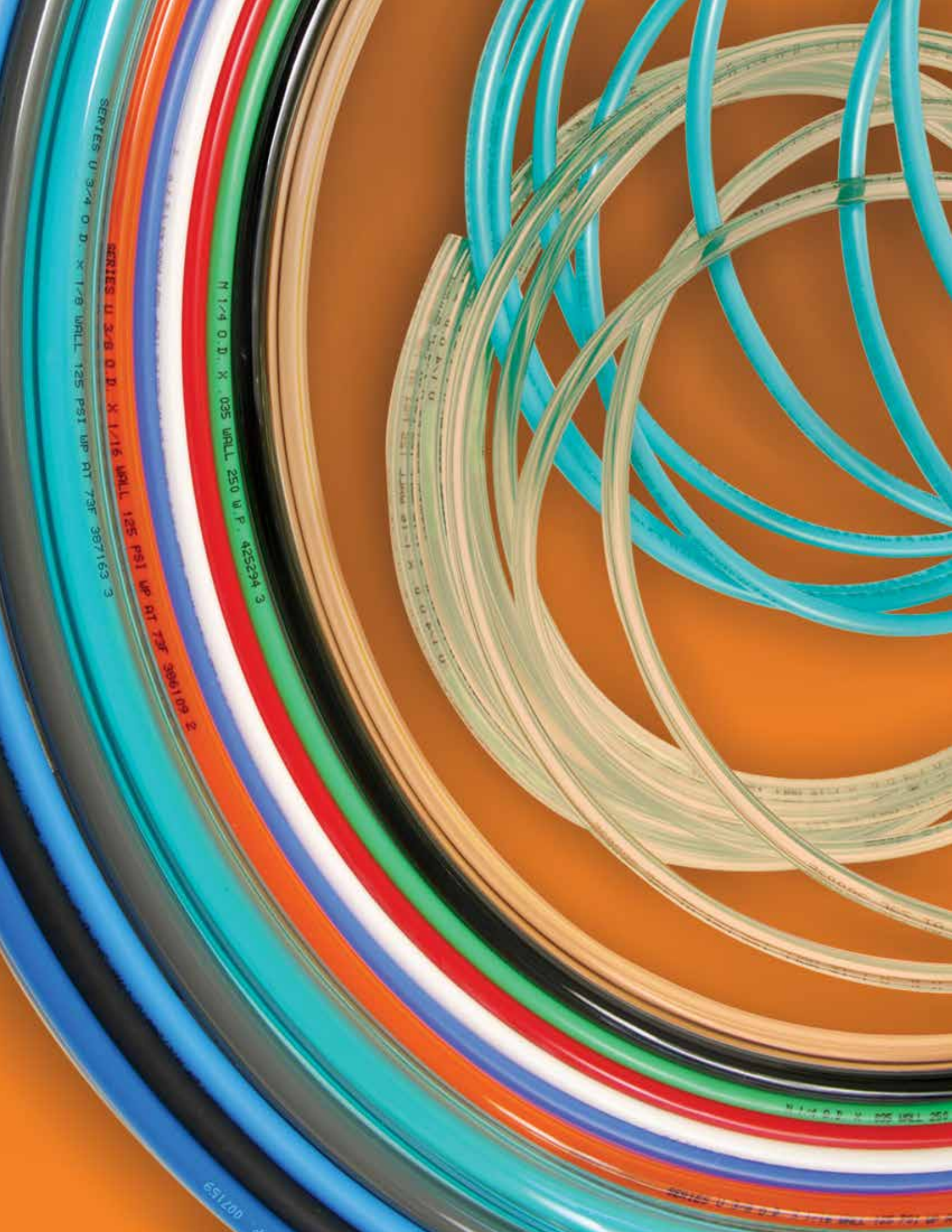
Nylon

Polyurethane 95A Durometer

Supercoil® Polyurethane Self Storing Air Hose

Nylon Self Storing Air Hose

Parker Hannifin Corporation | Parflex Division | Ravenna, OH | 08/25


SERIES U 3/4 O.D. X 1/8 WALL 125 PSI WP AT 73F 387163 3
SERIES U 3/8 O.D. X 1/16 WALL 125 PSI WP AT 73F 386109 2
N 1/4 O.D. X .035 WALL 250 W.P. 425294 3

Pneumatic Tubing Overview

There are three thermoplastic tubing compounds used for the majority of pneumatic lines: Nylon, Polyethylene and Polyurethane. All three offer distinct advantages. Selecting the one that best fits a particular job should be done only after all of the application requirements are carefully considered. For more information on selection, please refer to the Technical Section.

PE (Polyethylene)

Features
- Flexible
- Chemical resistant
- Economical system solution
- Resistant to environmental stress cracking

Compatible Fittings
- Push-To-Connect
- Compression
- Hose Barb

Working Temperature:
-80°F to 150°F (-62°C to 66°C)

Working Pressure
90 psi to 145 psi (6.2 bar to 10 bar)

Nylon

Features
- Abrasion resistant
- Heat and light stabilized
- Low moisture absorption
- Chemical resistant

Compatible Fittings
- Push-To-Connect
- Compression
- Hose Barb

Working Temperature:
-65°F to 200°F (-54°C to 93°C)

Working Pressure
159 psi to 500 psi (11 bar to 34.5 bar)

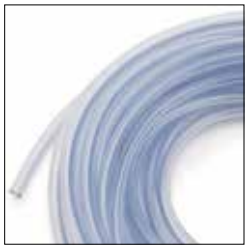
PU (Polyurethane)

Features
- Best flexibility
- 95 Shore A durometer
- Excellent abrasion and kink resistance
- Excellent moisture resistance
- UV resistant
- Exhibits the elongation and recovery characteristics of rubber and the chemical resistance of a thermoplastic

Compatible Fittings
- Push-To-Connect
- Hose Barb

Working Temperature:
-40°F to 180°F (-40°C to 82°C)

Working Pressure
110 psi to 250 psi (7.6 bar to 17.2 bar)



Note: Pressure ratings are determined by diameter of tubing and wall thickness. Actual performance may vary with media and working conditions.

WARNING These products can expose you to chemicals including LEAD which is known to the state of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Media to Plastic Material Compatibility Guide

MEDIA	PE	N	U
ACETONE	P	G	P
ACETYL BROMIDE	L	P	-
ACETYL CHLORIDE	L	P	-
AIR	G	G	G
ALCOHOLS	G	G	L
ALUMINUM SALTS	G	G	G
AMMONIA	G	G	G
AMYL ACETATE	G	G	L
ANILINE	L	P	P
ANIMAL OILS (6)	P	G	G
ARSENIC SALTS	G	G	G
AROMATIC HYDROCARBONS	P	G	L
BARIUM SALTS	G	G	G
BENZALDEHYDE	P	L	L
BENZENE	P	G	L
BENZYL ALCOHOL	P	L	L
BLEACHING LIQUORS	G	L	L
BORIC ACID SOLUTIONS	G	G	G
BROMINE	L	P	P
BUTANE (2)	L	G	P
BUTANOL	G	G	G
BUTYL ACETATE	G	G	L
CALCIUM HYPOCHLORITE	L	P	P
CALCIUM SALTS	G	G	G
CARBON DIOXIDE	G	G	G
CARBON DISULFIDE	L	L	L
CARBON TETRACHLORIDE	P	L	P
CAUSTIC POTASH	G	G	G
CAUSTIC SODA	G	G	G
CHLORACETIC ACID	L	L	P
CHLORINE (DRY)	L	P	P
CHLORINE (WET)	L	P	L
CHLOROBENZENE	P	L	L
CHLOROFORM	P	P	P
CHROMIC ACID	L	P	P
COPPER SALTS	G	G	G
CRESOL	P	P	P
CYCLOHEXANONE	L	L	P
ETHERS	L	G	P
ETHYL ACETATE	G	G	L
ETHYL ALCOHOL	G	L	G
ETHYLAMINE	L	L	L
ETHYL BROMIDE	P	L	-
ETHYL CHLORIDE	P	L	-
FATTY ACIDS	L	G	L
FERRIC SALTS	G	G	G
FORMALDEHYDE	G	L	P
FORMIC ACID	G	P	P
FREON	L	G	L
GASOLINE (2)	P	G	L
GLUCOSE	G	G	G
GLYCERIN	G	G	L
HYDRIODIC ACID	L	P	-
HYDROCHLORIC ACID. (CONC.)	L	L	P
HYDROCHLORIC ACID. (MED. CONC.)	L	L	P
HYDROFLUORIC ACID	L	P	P
HYDROGEN PEROXIDE (CONC.)	L	L	G
HYDROGEN PEROXIDE (DIL.)	L	G	G
HYDROGEN SULFIDE	G	G	P
IODINE	L	G	L
KEROSENE (2)	L	G	L
KETONES	G	G	P
LACQUER SOLVENTS	L	G	-
LACTIC ACID	G	G	G
LEAD ACETATE	G	G	G
LINSEED OIL	L	G	G
MAGNESIUM SALTS	G	G	G
NAPHTHA	L	G	L
NATURAL GAS	L	G	G
NICKEL SALTS	G	G	G
NITRIC ACID (CONC.)	P	P	P
NITRIC ACID (DIL.)	P	L	P
NITROBENZENE	P	L	P
NITROGEN OXIDES	L	L	-
NITROUS ACID	L	L	L
OILS (ANIMAL AND MINERAL)	L	G	G
OILS (VEGETABLE)	L	G	G
OXYGEN (5) (6)	G	G	G
PERCHLORIC ACID	P	P	P
PHENOLS	P	P	P
POTASSIUM SALTS	G	G	G
PYRIDINE	L	L	P
SILVER NITRATE	G	G	G
SOAP SOLUTIONS	G	G	G
SODIUM SALTS	G	G	G
STEARIC ACID	L	G	L
SULFUR CHLORIDE	L	L	-
SULFURIS ACID (CONC.)	P	P	P
SULFURIS ACID (DIL.)	P	L	L
SULFUROUS ACID	P	L	L
TANNIC ACID	G	G	P
TANNING EXTRACTS	G	G	P
TITANIUM SALTS	G	G	G
TOLUENE	P	G	L
TRICHLOROACETIC ACID	L	P	P
TRICHLOROETHYLENE	P	L	P
TURPENTINE	P	G	L
UREA	G	G	G
URIC ACID	G	G	G
WATER (6)	G	G	G
WATER / GLYCOL MIXTURE	G	G	G
XYLENE	P	G	P
ZINC CHLORIDE	G	G	G

Rating Code

G	GOOD TO EXCELLENT. LITTLE OR NO SWELLING, TENSILE OR SURFACE CHANGES. PREFERRED CHOICE.
L	MARGINAL OR CONDITIONAL. NOTICEABLE EFFECTS BUT NOT NECESSARILY INDICATING LACK OF SERVICEABILITY. FURTHER TESTING SUGGESTED FOR SPECIFIC APPLICATION. VERY LONG-TERM EFFECTS SUCH AS STIFFENING OR POTENTIAL FOR CRAZING SHOULD BE EVALUATED.
P	POOR OR UNSATISFACTORY. NOT RECOMMENDED WITHOUT EXTENSIVE AND REALISTIC TESTING.
–	INDICATES THAT THIS WAS NOT TESTED.
#	FOR FLUOROPOLYMER. INDICATES GOOD CHEMICAL RESISTANCE BUT POTENTIAL FOR EXCESSIVE PERMEATION.

Material Code For Thermoplastic Hose

N	FLEXIBLE NYLON
PE	LINEAR LOW DENSITY POLYETHYLENE
U	POLYURETHANE

Notes:

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

1. Tubing applications for these fluids must take into account legal and insurance regulations. This does not imply AGA or UL compliance.
2. Chemical compatibility does not imply low permeation rates. Consult the Parker factory for a suggestion for your specific requirement.
3. Does not imply NSF or FDA compliance.
4. Chemical compatibility does not imply acceptability for use in airless paint spray applications. These applications require a special conductive tube.

WARNING These products can expose you to chemicals including LEAD which is known to the state of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Tube Line Fabrication Guide for Leak Free Systems

Every hydraulic, pneumatic and lubrication system requires some form of tube line fabrication and fitting installation for completion. Proper fabrication and installation are essential for the overall efficiency, leak free performance, and general appearance of any system.

Start by planning ahead. After sizing the tube lines and selecting the appropriate style of fitting, consider the following in the design of your system:

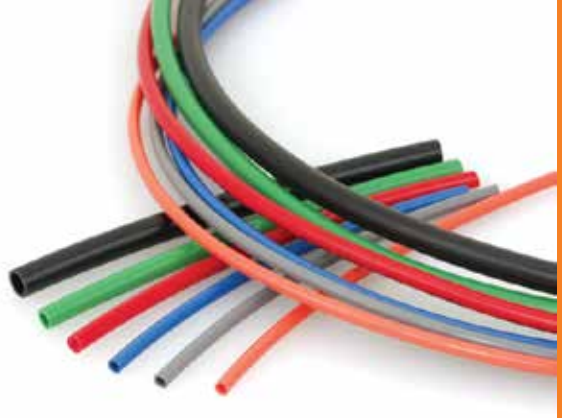
- Accessibility of joints
- Proper routing of lines
- Adequate tube line supports
- Available fabricating tools

ROUTING OF LINES

Routing of lines is probably the most difficult yet most significant of these system design considerations. Proper routing involves getting a connecting line from one point to another through the most logical path. Always try to leave fitting joints as accessible as possible. Hard to reach joints are hard to assemble and tighten properly. Inaccessible joints are also more difficult and time consuming to service.

The most logical path should have the following characteristics:

- Avoid excessive strain on joint — A strained joint will eventually leak.



Polyethylene (LLDPE)

Nycoil polyethylene (LLDPE) has a much higher resistance to stress cracking as compared to other Polyethylene compounds. It is chemically inert, meaning it forms a good barrier against moisture, vapors and gases which minimizes the possibility of leaks or contamination. Where prolonged exposure to sunlight or ultraviolet (UV) light is a concern, black tubing is recommended for extended life.

Features

- Flexible
- Chemically Inert
- UV Resistant (Black tube)
- **Temperature Range:**
  -80°F to 150°F (-62°C to 66°C)

Typical Applications

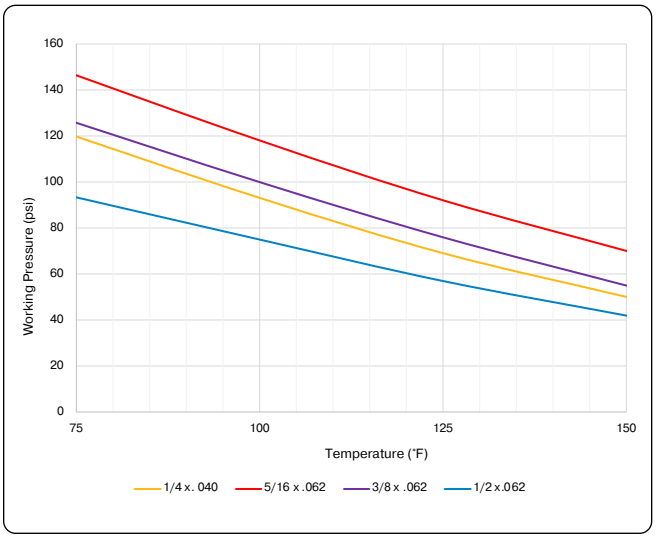
- Low Pressure Pneumatics
- Potable Water Feed/Drains
- Pneumatic or Signal Lines
- Liquid/Air Transfer

Fittings

- Push-To-Connect
- Compression
- Hose Barb

Note: Pressure ratings are determined by diameter of tubing and wall thickness. Actual performance may vary with media and working conditions.

Maximum Working Pressure (psi)



Polyethylene Fractional Inch Tubing

PART NO.	NOMINAL OD		NOMINAL ID		AVERAGE WALL THICKNESS		MAXIMUM WORKING PRESSURE 73°F/23°C		MINIMUM BURST PRESSURE		MINIMUM BEND RADIUS		WEIGHT		PACKAGE QUANTITY	COLOR						
	INCH	MM	INCH	MM	INCH	MM	PSI	BAR	PSI	BAR	INCH	MM	LBS/FT	KG/MTR		NAT	BLK	BLU	GRN	ORG	RED	YEL
6244_	1/4	6.4	.170	4.3	.040	1.0	120	8.3	480	33.1	1	26	.011	.016	100	0	1	3	4	6	2	5
6444_															500	0	1	3	-	6	2	5
6644_															1000	0	1	-	-	-	-	-
6255_	5/16	7.9	.187	4.8	.062	1.6	145	10.0	580	40.0	1-1/8	29	.020	.030	100	0	1	3	-	-	-	-
6455_															500	0	1	-	-	-	-	-
6266_	3/8	9.5	.250	6.4	.062	1.6	125	8.6	500	34.5	1-1/4	32	.025	.037	100	0	1	3	-	-	2	5
6466_															500	0	1	3	-	6	2	5
6666_															1000	0	1	-	-	-	-	-
6288_	1/2	12.7	.375	9.5	.062	1.6	90	6.2	360	24.8	2-1/2	64	.034	.051	100	0	1	3	-	-	-	-
6988_															500	0	1	3	-	-	2	-

Adding a Color Code Suffix to the part number is required. Additional package quantities and colors are available upon request. Contact Customer Service or consult Price List for availability.
Color Codes: Natural (0), BLK (1), BLU (3), GRA (7), GRN (4), ORG (6), RED (2), WHT (9), YEL (5)

Nylon

Nylon tubing is a popular choice for low pressure pneumatic applications because of its combination of flexibility and toughness. Nycoil uses a heat and light stabilized, very flexible compound that yields a quality tube.

Due to its physical properties, Nylon is the number one choice for reliable connections with all types of fittings. Nylon retains its performance integrity in elevated temperatures and generally, because of it's higher pressure and temperature characteristics, Nylon will have a greater flow passage than composite tubing made from other material with the same outside diameter. These factors should never be overlooked when designing pneumatic circuits.

Features

- Flexible
- Good Chemical Resistance
- Low Moisture Absorption
- Superior Dimensional Stability
- **Temperature Range:**
  -65°F to 200°F (-54°C to 93°C)

Typical Applications

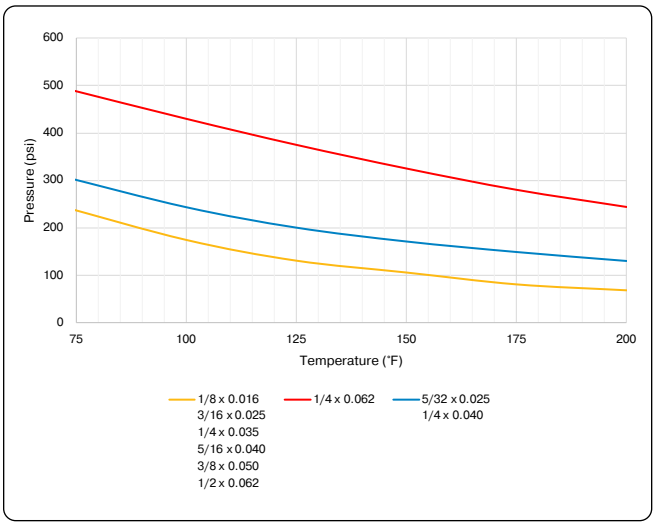
- Low Pressure Pneumatic
- Pneumatic Circuits
- Injection Lube Systems
- Hydro-Pneumatic Circuit

Fittings

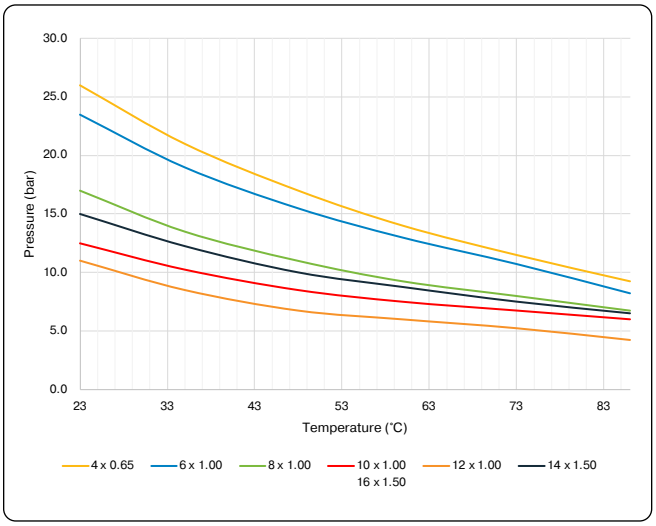
- Push-To-Connect
- Compression

Note: Pressure ratings are determined by diameter of tubing and wall thickness. Actual performance may vary with media and working conditions.

Maximum Working Pressure (psig)



Maximum Working Pressure (bar)



Nylon Fractional Inch Tubing

PART NO.	NOMINAL OD		NOMINAL ID		AVERAGE WALL THICKNESS		MAXIMUM WORKING PRESSURE 73°F/23°C		MINIMUM BURST PRESSURE		MINIMUM BEND RADIUS		WEIGHT		PACKAGE QUANTITY	COLOR					
	INCH	MM	INCH	MM	INCH	MM	PSI	BAR	PSI	BAR	INCH	MM	LBS/FT	KG/MTR		NAT	BLK	BLU	GRN	RED	YEL
6122_	1/8	3.2	.093	2.4	.016	.4	250	17.2	1000	68.9	1/2	13	.003	.004	100	0	1	3	-	2	-
6522_															500	0	1	-	-	2	-
6123_	5/32	4.0	.106	2.7	.025	.6	300	20.7	1200	82.7	1/2	13	.005	.007	100	0	1	3	4	2	5
6523_															500	0	1	3	4	-	-
6133_	3/16	4.8	.138	3.5	.025	.6	250	17.2	1000	68.9	5/8	16	.006	.009	100	0	1	-	-	-	-
6144_	1/4	6.4	.180	4.6	.035	.9	250	17.2	1000	68.9	7/8	23	.011	.016	100	0	1	3	4	2	5
6544_															500	0	1	3	-	2	-
6044_															1000	0	1	-	-	2	-
6147_	1/4	6.4	.170	4.3	.040	1.0	310	21.4	1250	86.2	7/8	23	.012	.018	100	0	1	3	4	2	5
6547_															500	0	1	3	-	-	-
6146_	1/4	6.4	.125	3.2	.062	1.6	500	34.5	2000	137.9	1/2	13	.017	.025	100	0	1	-	-	-	-
6546_															500	0	1	-	-	-	-
6155_	5/16	7.9	.233	5.9	.040	1.0	250	17.2	1000	68.9	1-1/8	29	.016	.024	100	0	1	3	-	2	-
6555_															500	0	1	3	-	-	-
6055_															1000	-	1	-	-	-	-
6166_	3/8	9.5	.275	7.0	.050	1.3	250	17.2	1000	68.9	1-1/8	29	.023	.034	100	0	1	3	4	2	-
6566_															500	0	1	3	-	-	5
6188_	1/2	12.7	.375	9.5	.062	1.6	250	17.2	1000	68.9	1-1/4	32	.039	.058	100	0	1	3	4	2	-
6888_															500	0	1	-	-	-	-

Nylon Metric Tubing

PART NO.	NOMINAL OD		NOMINAL ID		AVERAGE WALL THICKNESS		MAXIMUM WORKING PRESSURE 73°F/23°C		MINIMUM BURST PRESSURE		MINIMUM BEND RADIUS		WEIGHT		PACKAGE QUANTITY	COLOR					
	MM	INCH	MM	INCH	MM	INCH	BAR	PSI	BAR	PSI	MM	INCH	KG/MTR	LBS/FT		NAT	BLK	BLU	GRN	RED	YEL
7104_	4.0	.157	2.7	.106	.65	.026	26.0	377	104.0	1508	14	9/16	.007	.005	100	0	1	3	-	-	-
7404_															500	0	1	3	-	-	-
7106_	6.0	.236	4.0	.157	1.00	.039	23.5	340	94.0	1363	22	7/8	.016	.011	100	0	1	3	4	2	5
7406_															500	0	1	3	4	2	-
7108_	8.0	.315	6.0	.236	1.00	.039	17.0	246	68.0	986	29	1-1/8	.024	.016	100	0	1	3	4	2	5
7408_															500	0	1	3	-	2	-
7708_															1000	0	-	-	-	-	-
7111_	10.0	.394	8.0	.315	1.00	.039	12.5	181	50.0	725	34	1-5/16	.030	.020	100	0	1	3	-	2	-
7411_															500	0	-	3	-	-	-
7109_	12.0	.472	10.0	.394	1.00	.039	11.0	159	44.0	638	45	1-3/4	.036	.024	100	0	1	3	-	-	-
7114_	14.0	.551	11.0	.433	1.50	.059	15.0	217	60.0	870	57	2-1/4	.063	.042	100	0	1	-	-	-	-
7119_	16.0	.630	13.0	.512	1.50	.059	12.5	181	50.0	725	74	2-15/16	.073	.048	100	0	-	-	-	-	-

Adding a Color Code Suffix to the part number is required. Additional package quantities and colors are available upon request. Contact Customer Service or consult Price List for availability.
Color Codes: Natural (0), BLK (1), BLU (3), GRA (7), GRN (4), ORG (6), RED (2), WHT (9), YEL (5)

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Polyurethane 95A Durometer

Polyurethane tubing is typically the best choice for applications requiring extensive flexing or where a tight bend radius is required. The Nycoil product is extremely flexible with a tighter bend radius than most other thermoplastic tubing products and is produced from compounds that resist moisture, fungus, abrasion and a broad range of chemicals

Being a naturally soft and flexible compound, polyurethane requires no plasticizers that can leach out over time. This material also offers superior resistance to grease, oils, fuels and abrasion, making it suitable for a wide variety of applications.

Nycoil's Push-To-Connect Fittings have the highest gripping "force" as compared to other brands. This assures that our tubing will always work with our fittings. However, when using Push-To-Connect Fittings from other manufacturers with any brand of Polyurethane tubing, testing for retention reliability is strongly recommended. Further, we recommend using only polyurethane tubing made from 95A durometer hardness compound with Push-To-Connect Fittings. In addition, compression type fittings should never be used with Polyurethane tubing of any hardness.

Features

- Extreme Flexibility
- Reduced Bend Radius
- Moisture Resistant
- Abrasion Resistant
- **Temperature Range:**
  -40°F to 180°F (-40°C to 82°C)

Fittings

- Push-To-Connect
- Hose Barb

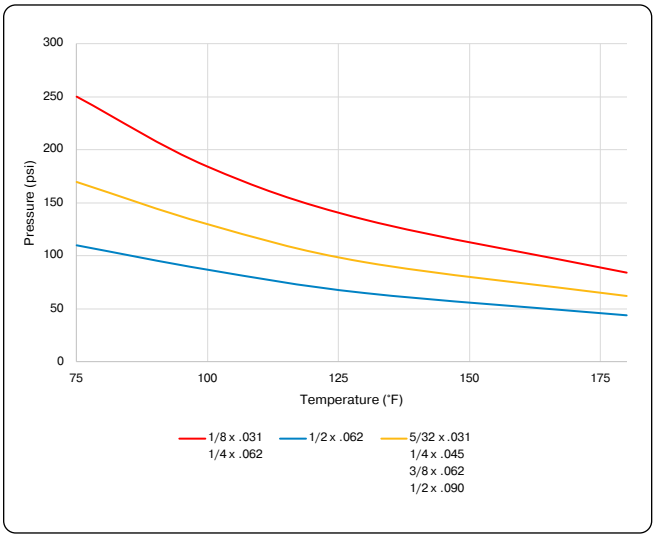
Note: Pressure ratings are determined by diameter of tubing and wall thickness. Actual performance may vary with media and working conditions.

Compression fittings should never be used with polyurethane tubing

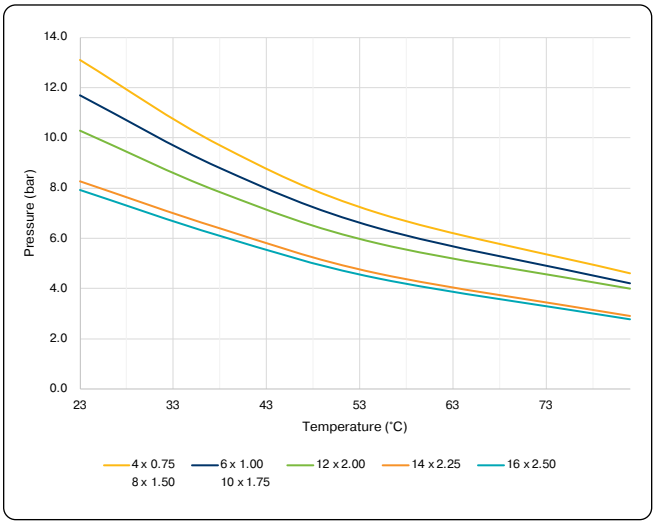
Typical Applications

- Water & Pneumatic Lines
- Machine Tool
- Pneumatic Plumbing
- Pick & Place Automation

Maximum Working Pressure (psi)



Maximum Working Pressure (bar)



95A Durometer Polyurethane Fractional Inch Tubing

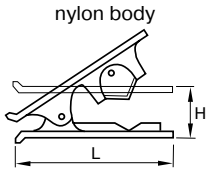
PART NO.	NOMINAL OD		NOMINAL ID		AVERAGE WALL THICKNESS		MAXIMUM WORKING PRESSURE 73°F/23°C		MINIMUM BURST PRESSURE		MINIMUM BEND RADIUS		WEIGHT		PACKAGE QUANTITY	COLOR						
	INCH	MM	INCH	MM	INCH	MM	PSI	BAR	PSI	BAR	INCH	MM	LBS/FT	KG/MTR		NAT	BLK	BLU	GRN	RED	YEL	TBL
6322_	1/8	3.2	.063	1.6	.031	.8	250	17.2	750	51.6	1/4	7	.005	.007	100	0	1	3	-	-	-	-
6722_															500	0	1	-	-	-	-	-
6325_	5/32	4.0	.094	2.4	.031	.8	170	11.7	510	35.1	3/8	10	.006	.009	100	0	1	3	4	2	-	-
6344_	1/4	6.4	.160	4.1	.045	1.1	170	11.7	510	35.1	1/2	13	.015	.023	100	0	1	3	4	2	5	13
6744_															500	0	1	3	-	2	-	13
6346_	1/4	6.4	.125	3.2	.062	1.6	250	17.2	750	51.6	3/4	20	.019	.028	100	0	1	3	4	2	5	-
6746_															500	0	1	3	4	2	5	-
6355_	5/16	7.9	.212	5.4	.050	1.3	120	8.3	360	24.8	7/8	23	.021	.032	100	0	1	3	-	-	-	-
6366_	3/8	9.5	.250	6.4	.062	1.6	170	11.7	510	35.1	1	26	.030	.045	100	0	1	3	4	2	5	13
6766_															500	0	1	3	4	2	5	13
6388_	1/2	12.7	.375	9.5	.062	1.6	110	7.6	330	22.8	1-1/4	32	.042	.063	100	0	1	3	-	-	-	-
6387_	1/2	12.7	.320	8.1	.090	2.3	170	11.7	510	35.1	2	51	.059	.089	100	0	1	3	4	2	5	13
6787_															500	0	1	-	-	-	-	-

95A Durometer Polyurethane Metric Tubing

PART NO.	NOMINAL OD		NOMINAL ID		AVERAGE WALL THICKNESS		MAXIMUM WORKING PRESSURE 73°F/23°C		MINIMUM BURST PRESSURE		MINIMUM BEND RADIUS		WEIGHT		PACKAGE QUANTITY	COLOR						
	MM	INCH	MM	INCH	MM	INCH	BAR	PSI	BAR	PSI	MM	INCH	KG/MTR	LBS/FT		NAT	BLK	BLU	GRN	RED	YEL	TBL
7301_	3.0	.118	1.8	.070	.60	.024	10.0	145	30.0	435	10	1/2	.005	.004	100	-	-	-	-	-	-	-
7601_															500	-	-	-	-	-	-	-
7303_	4.0	.157	2.5	.098	.75	.030	13.1	190	39.3	570	12	1/2	.009	.006	100	0	1	3	4	2	5	-
7306_	6.0	.236	4.0	.157	1.00	.039	11.7	170	35.1	510	18	7/8	.019	.013	100	0	1	3	4	2	5	-
7606_															500	0	1	3	4	2	5	-
7307_	8.0	.315	5.0	.196	1.50	.059	13.1	190	39.3	570	24	1.0	.036	.024	100	0	1	3	4	2	5	-
7607_															500	0	1	3	-	2	-	-
7310_	10.0	.393	6.5	.256	1.75	.069	11.7	170	35.1	510	25	1.0	.054	.036	100	0	1	3	4	-	5	-
7610_															500	-	1	3	-	-	-	-
7312_	12.0	.472	8.0	.315	2.00	.079	10.3	150	30.9	450	48	1-7/8	.074	.049	100	0	1	3	-	-	-	-
7318_	14.0	.551	9.5	.374	2.25	.089	8.3	120	24.8	360	45	1-3/4	.097	.065	100	-	1	-	-	-	-	-
7319_	16.0	.630	11.0	.433	2.50	.098	7.9	115	23.8	345	60	2-3/8	.124	.083	100	-	-	3	-	-	-	-

Adding a Color Code Suffix to the part number is required. Additional package quantities and colors are available upon request. Contact Customer Service or consult Price List for availability.
Color Codes: Natural (0), BLK (1), BLU (3), GRA (7), GRN (4), ORG (6), RED (2), WHT (9), YEL (5), TBL (13), TGN (14), TOR (16)

WARNING These products can expose you to chemicals including LEAD which is known to the state of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.



3000 71 00 – Tube Cutter

PART NO.	H IN	L IN	WEIGHT (LBS/1000FT)
3000 71 00	.98	3.11	1.09

This tool will cut all resilient plastic tube (e.g. nylon, fluoropolymer, polyurethane, braided PVC, soft rubber, etc.) from 1/8 to 1/2 and 3mm to 16mm diameter inclusive. It is designed to give a clean cut at right angles to the tube axis. A spring maintains the cutter in the closed position.

3000 71 11 – Tube Cutter for Tubing & Push-On Hose

PART NO.	WEIGHT (LBS/1000FT)
3000 71 11	1.09

For hoses up to 1" (25mm)
spare blade: 3000 71 11 05

3110/3330 – Caps/Manual Release Button Fractional Inch

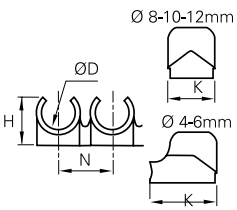
ØD TUBE IN	NATURAL	BLACK	GREEN	RED	BLUE	YELLOW	WEIGHT (LBS/1000FT)
1/8	3110 53 00	–	3110 53 02	3110 53 03	3110 53 04	3110 53 05	.04
5/32	3110 04 00	3330 04 01	3110 04 02	3110 04 03	3110 04 04	3110 04 05	.04
3/16	3330 55 00	3330 55 01	3330 55 02	3110 55 03	3330 55 04	3330 55 05	.04
1/4	3110 56 00	3330 56 01	3110 56 02	3110 56 03	3110 56 04	3110 56 05	.04
5/16	3110 08 00	–	3110 08 02	3110 08 03	3110 08 04	3110 08 05	.04
3/8	3110 60 00	–	3110 60 02	3110 60 03	3110 60 04	3110 60 05	.04
1/2	3110 62 00	3330 62 01	3110 62 02	3110 62 03	3110 62 04	3110 62 05	.04

Metric

ØD TUBE MM	NATURAL	BLACK	GREEN	RED	BLUE	YELLOW	WEIGHT (LBS/1000FT)
4	3110 04 00	3330 04 01	3110 04 02	3110 04 03	3110 04 04	3110 04 05	.001
6	3110 06 00	3330 06 01	3110 06 02	3110 06 03	3110 06 04	3110 06 05	.001
8	3110 08 00	–	3110 08 02	3110 08 03	3110 08 04	3110 08 05	.001
10	3110 10 00	–	3110 10 02	3110 10 03		3110 10 05	.001
12	3110 12 00	–	3110 12 02	3110 12 03	3110 12 04	3110 12 05	.001
14	3110 14 00	–	3110 14 02	3110 14 03		3110 14 05	.001

In all sizes of the LF3000 fittings, except 3/16, the push button is an integral part of the design which makes it non-removable, and comes standard in black. For identification of the circuits, colored caps (p/n 3110) fit over the black push button.

Clip Strips for Tubing and Fittings



ØD TUBE	Ø LF3000 TO BE CLIPPED	PART NO.	H MM	K MM	N MM	NUMBER OF CLIPS PER STRING	WEIGHT (LBS/1000FT)
5/32, 4MM		CLIP 04 00	9	13.5	10.5	8	.000
1/4, 3/16, 6MM		CLIP 06 00	10.5	13	10.5	8	.000
5/16, 8MM	5/32, 4MM	CLIP 08 00	12.5	10.5	12	7	.009
3/8, 10MM	1/4, 6MM	CLIP 10 00	14	12	15	6	.010
1/2, 12MM		CLIP 12 00	16.5	14	16.5	5	.011
14MM	5/16, 8MM	CLIP 14 00	18	16	20.5	4	.011

Clip strips come complete with screws of .375 inches in length.

Supercoil® Polyurethane Self Storing Air Hose

Supercoil® Self Storing Air Hoses are ideal for applications where kink and abrasion resistance are important considerations. Polyurethane's extreme flexibility and light weight combine to minimize user fatigue while its toughness and long lasting durability allow it to withstand rough handling.

Hoses are fitted with rugged brass swivel fittings, providing a long life with minimal flow restrictions. They also feature a state-of-the-art strain relief system which adds more hose protection and increases its maneuverability.

Features

- Extremely flexible –100% kink resistance
- Abrasion resistant
- Soft Polyurethane material will not mar finishes
- Low tension retractability – minimizes user fatigue
- Rugged brass swivel fittings provide long life & minimal flow restrictions
- State-of-the-art strain relief system protects and increases maneuverability
- Strong enough to repel most oils and chemicals
- 16" tail on the working (tool) end eliminates tangling of the tool with the coils
- 8" tail on the supply end makes the connection to the air source easy
- Temperature Range: -40°F to 180°F (-40°C to 82°C)
- Tight bend radius minimizes space requirements

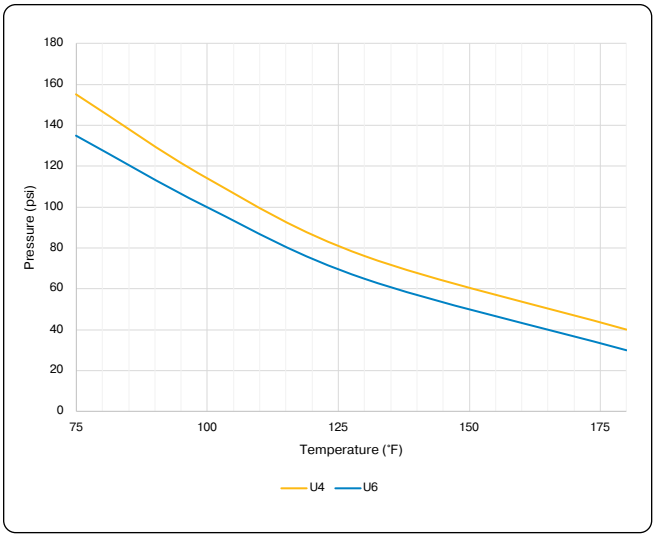
Fittings

- All swivel fittings include thread sealant pre-applied at the factory
- Field attachable compression fittings are available for quick and easy installation without the need of any special tools

Notes

- Maximum Recommended Working Length: 90% of Material Length
- Bulk coils, no fittings, also available with addition of -B at the end of the part number (i.e. U4105-B)

Maximum Working Pressure (psi)



WARNING These products can expose you to chemicals including LEAD which is known to the state of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Supercoil® Polyurethane Self Storing Air Hose Assemblies

Supercoil Hose Assemblies with Fittings

PART NO.	TUBE OD		TUBE ID		NOMINAL COIL OD		NOMINAL COIL ID		UNIT LENGTH		EXTENDED LENGTH		NOMINAL COMPACT LENGTH		MAXIMUM WORKING PRESSURE 73°F/23°C		MINIMUM BURST PRESSURE		END FITTINGS	COLOR				
	INCH	MM	INCH	MM	INCH	MM	INCH	MM	FT.	MTR	FT.	MTR	IN	MM	PSI	BAR	PSI	BAR		BLK	BLU	YEL	TBL	TOR
U410_	3/8	9.5	1/4	6.4	2-1/2	63.0	1-3/4	44.0	10	3.0	9.2	2.8	5-1/2	140	155	10.7	465	32.1	1/4" NPT SWIVEL	1	-	5	13	16
U415_									15	4.6	13.8	4.2	9	229						1	-	5	13	16
U420_									20	6.1	18.4	5.6	13	330						1	-	5	13	16
U425_									25	7.6	23.0	7.0	16	406						1	-	5	13	16
U430_									30	9.1	27.6	8.4	19-1/2	495						1	-	5	-	16
U610_	9/16	14.3	3/8	9.5	3-5/8	92.1	2-1/2	63.0	10	3.0	9.2	2.8	6	152	135	9.3	405	27.9	3/8" NPT SWIVEL	-	3	5	-	-
U620_									20	6.1	18.4	5.6	13-1/2	343						-	3	5	-	-
U625_									25	7.6	23.0	7.0	17	432						-	3	5	-	-
U630_									30	9.1	27.6	8.4	21	533						-	3	5	-	-
U650_									50	15.2	46.0	14.0	35	889						-	3	5	-	-

Color availability varies by Coil Length and Hose Size
Contact Customer Service or consult Price List for availability
Color Codes: BLK (1), BLU (3), YEL (5), TBL (13), TOR (16)
Bulk coils, no fittings, also available with addition of -B at the end of the part number (i.e. U4105-B)

Nylon Self Storing Air Hose

Nycoil invented the Nylon Self Storing Air Hose in 1958. It was developed as a means to transport air from overhead piping to pneumatic tools at assembly stations while keeping the work area neat and safe. Unlike straight hose, that lays on the floor or workbench and can easily become tangled, Self Storing Hose retracts to keep the area clutter free. This feature increases user safety by reducing trip hazards and allows the user to be more productive, giving the user more clear space and freedom of movement.

Nylon is resistant to a wide variety of chemicals making it a good choice for most industrial environments. For more information on the properties of Nylon, please view the Technical Section.

Features

- **Extremely light weight** – considerably lighter than traditional rubber hoses
- **Economizes on space** – retracts to a fraction of its working length
- **Highly flexible** – doesn't impede tool maneuverability
- **Excellent memory** – continues to retract after repeated stretching
- Resistant to many chemicals & petroleum based products
- Less than 1% moisture absorption
- Brass field attachable fittings – No ferrules or inserts needed.
- Temperature Range: -40°F to +200°F (-40°C to +93°C)

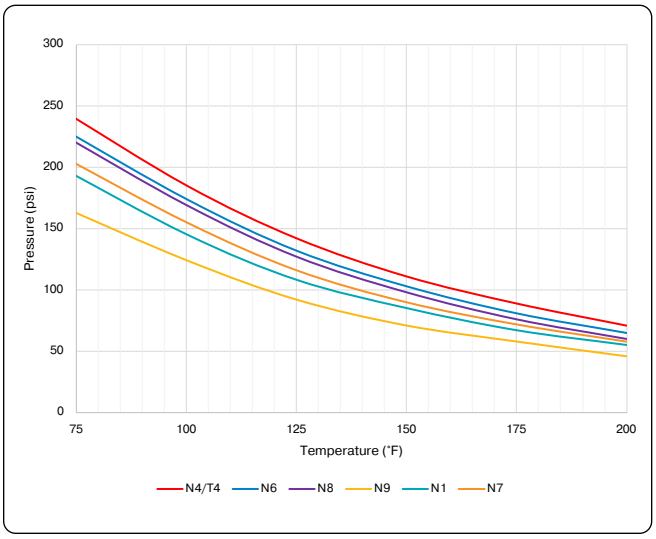
Fittings

- All swivel fittings include thread sealant pre-applied at the factory
- Field attachable compression fittings are available for quick and easy installation without the need of any special tools

Notes

- Recommended working length: up to 75% of material length (50% for 1" & 1-1/4" Hose)
- *3/4" & 1" Hose Assemblies do not require Spring Guards

Maximum Working Pressure (psi)



Nylon Self Storing Air Hose – Bulk

PART NO.	TUBE OD		TUBE ID		NOMINAL COIL OD		NOMINAL COIL ID		UNIT LENGTH		EXTENDED LENGTH		NOMINAL COMPACT LENGTH		MAXIMUM WORKING PRESSURE 73°F/23°C		MINIMUM BURST PRESSURE		END FITTINGS	COLOR			
	INCH	MM	INCH	MM	INCH	MM	INCH	MM	FT.	MTR	FT.	MTR	IN	MM	PSI	BAR	PSI	BAR		BLK	BLU	RED	YEL
N4XX_-25	5/16	8.0	1/4	6.4	3-1/2	89.0	3	76.2	25	7.6	18-3/4	5.7	9	229	240	16.5	720	49.6	–	-	-	2	5
N4XX_-50									50	15.2	37-1/2	11.4	18	457					–	-	-	2	5
N4XX_-100									100	30.5	75	22.9	38	965					–	-	-	2	5
T4XX_-100	5/16	8.0	1/4	6.4	3	76.2	2-1/2	63.5	100	30.5	75	22.9	45	1143	240	16.5	720	49.6	--	-	-	2	-
N6XX_-25	15/32	12.0	3/8	9.5	5-1/2	140.0	4-1/2	114.3	25	7.6	18-3/4	5.7	9	229	225	15.5	675	46.5	–	-	-	2	5
N6XX_-50									50	15.2	37-1/2	11.4	18	457					–	-	-	2	5
N6XX_-100									100	30.5	75	22.9	37	940					–	-	3	2	5
N8XX_-25	5/8	16.0	1/2	12.7	8	203.2	6-1/2	165.1	25	7.6	18-3/4	5.7	8	203	220	15.2	660	45.5	–	-	-	2	5
N8XX_-50									50	15.2	37-1/2	11.4	17	431					–	-	-	2	5
N8XX_-100									100	30.5	75	22.9	36	914					–	-	3	2	5
N9XX_-25	7/8	22.2	3/4	19.0	13	330.2	11	279.4	25	7.6	18-3/4	5.7	8	203	160	11.0	480	33.1	–	-	-	2	-
N9XX_-50									50	15.2	37-1/2	11.4	16	406					–	-	-	2	-
N9XX_-100									100	30.5	75	22.9	32	813					–	1	-	2	-
N1XX_-25	1-3/16	30.4	1	25.4	16-1/2	419.1	14	355.6	25	7.6	18-3/4	5.7	9	229	190	13.1	570	39.3	–	1	-	2	-
N1XX_-50									50	15.2	37-1/2	11.4	18	457					–	1	-	2	-
N1XX_-80									80	24.4	60	18.3	27	686					–	1	-	2	-
N1XX_-100									100	30.5	75	22.9	32	813					–	1	-	2	-
N7XX_-100	1-9/16	39.7	1-1/4	31.8	21-1/2	546.1	18	457.2	100	30.5	75	22.9	32	813	200	13.8	600	41.4	–	1	-	-	-

Nylon Self Storing Air Hose Assemblies

PART NO.	TUBE OD		TUBE ID		NOMINAL COIL OD		NOMINAL COIL ID		UNIT LENGTH		EXTENDED LENGTH		NOMINAL COMPACT LENGTH		MAXIMUM WORKING PRESSURE 73°F/23°C		MINIMUM BURST PRESSURE		END FITTINGS	COLOR			
	INCH	MM	INCH	MM	INCH	MM	INCH	MM	FT.	MTR	FT.	MTR	IN	MM	PSI	BAR	PSI	BAR		BLK	BLU	RED	YEL
N4AS_-12	5/16	8.0	1/4	6.4	3-1/2	89.0	3	76.2	12	3.7	9	2.7	4-1/2	114	240	16.5	720	49.6	1/4" NPT SWIVEL	-	-	2	5
N4AS_-25									25	7.6	18-3/4	5.7	9	229						-	-	2	5
N4AS_-50									50	15.2	37-1/2	11.4	18	457						-	-	2	5
T4AS_-12	5/16	8.0	1/4	6.4	3	76.2	2-1/2	63.5	12	3.7	9	2.7	6	152	240	16.5	720	49.6	1/4" NPT SWIVEL	-	-	2	-
T4AS_-25									25	7.6	18-3/4	5.7	12	305						-	-	2	-
T4AS_-50									50	15.2	37-1/2	11.4	22	559						-	-	2	-
N6AS_-12	15/32	12.0	3/8	9.5	5-1/2	140.0	4-1/2	114.3	12	3.7	9	2.7	4-1/2	114	225	15.5	675	46.5	1/4" NPT SWIVEL	-	3	2	5
N6AS_-25									25	7.6	18-3/4	5.7	9	229						-	3	2	5
N6AS_-50									50	15.2	37-1/2	11.4	18	457						-	3	2	5
N6BS_-12	15/32	12.0	3/8	9.5	5-1/2	140.0	4-1/2	114.3	12	3.7	9	2.7	4-1/2	114	225	15.5	675	46.5	3/8" NPT SWIVEL	-	3	2	5
N6BS_-25									25	7.6	18-3/4	5.7	9	229						-	3	2	5
N6BS_-50									50	15.2	37-1/2	11.4	18	457						-	3	2	5
N8CS_-12	5/8	16.0	1/2	12.7	8	203.2	6-1/2	165.1	12	3.7	9	2.7	4-1/2	114	220	15.2	660	45.5	1/2" NPT SWIVEL	-	-	2	5
N8CS_-25									25	7.6	18-3/4	5.7	8	203						-	-	2	5
N8CS_-50									50	15.2	37-1/2	11.4	17	431						-	-	2	5
N9DS_-25	7/8	22.2	3/4	19.0	13	330.2	11	279.4	25	7.6	18-3/4	5.7	8	203	160	11.0	480	33.1	3/4" NPT SWIVEL	1	-	2	-
N9DS_-50									50	15.2	37-1/2	11.4	16	406						1	-	2	-

Color availability varies by Coil Length and Hose Size
Contact Customer Service or consult Price List for availability
Color Codes: BLK (1), RED (2), BLU (3), YEL (5)

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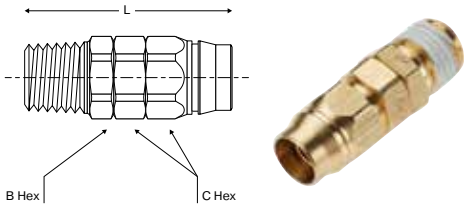
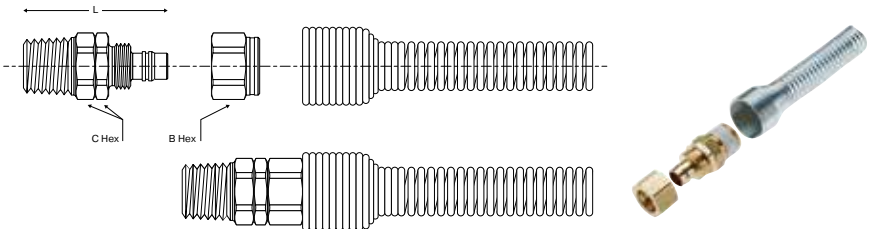
Hose Accesssories



Field Attachable Fittings (Polyurethane Hose)

PART NO.	THD SIZE (NPT)	HOSE SIZE (IN)	B HEX (IN)	C HEX (IN)	L (IN)
06167*	1/4	3/16	9/16	9/16	1.43
07244S**	1/4	1/4	9/16	9/16	4.97
06244S	1/4	1/4	9/16	9/16	1.60
06254S	1/4	5/16	5/8	9/16	1.74
06256S	3/8	5/16	5/8	5/8	1.65
06264S	1/4	3/8	3/4	9/16	1.88
06266S	3/8	3/8	3/4	11/16	1.93
06172	1/2	1/2	1	7/8	2.23

* Compression Fitting (includes fitting, nut ferrule, & insert)
** For use on XX only (includes spring guard)



Field Attachable Fittings (Nylon Hose)

PART NO.	THD SIZE (NPT)	HOSE SIZE (IN)	B HEX (IN)	C HEX (IN)	L (IN)
01400-XX	1/4	1/4	9/16	9/16	1.37
01640	1/4	3/8	9/16	11/16	1.48
01600	3/8	3/8	11/16	11/16	1.53
01700	1/2	1/2	15/16	15/16	1.93
01802*	3/4	3/4	1 1/4	1 1/4	2.98

Includes Nut & Spring Guard

*Spring Guard Not Required

General Technical

Tubing Compatibility Chart

Manufacturing Techniques

Tube Line Fabrication Guide for Leak Free Systems

Thread Specifications

Flaring Instructions

Thread Designations and Standards for Threads Used in Fluid Connectors

Straight Thread Size Comparison Chart

S.A.E. Part Index

SAE Standards

U.L. Listed Fittings

Flare and Thread Profiles

Pressure Conversions

English/Metric Conversions

Assembly Guides

Fluid Compatibility Guide


Parker
45°
25 SEAT
2X

Tubing Compatibility Chart

Nomenclature

- PS Plastic Sleeve & Tube Support Recommended
- TS Tube Support Is Recommended
- BS Brass Sleeve Recommended
- CL Clamp Required
- MG Metal Gripper Collet Recommended
- Tube/Fitting Combination Compatible
- Tube/Fitting Combination Not Compatible

	Product Sizes (inch)	Soft Metal Tubing			Parflex Thermoplastic Tubing										
					Industrial Tubing Series (Outside Diameter Shown)										
		Copper	Aluminum	Steel	Polyethylene E & EB Inch (4,5,6,8,10) Metric (6,8,10,12)	Polyethylene PEFR Inch (2.5,4,6,8)	Polyethylene HDPE Inch (4,6)	Nylon N Inch (2,2.5,3,4,5,6,8) Metric (4mm - 20mm)	Nylon PAT Inch (2,4,6,8,10,12)	Nylon NR Inch (2,3,4,5,6,8)	Nylon NTNA Inch (2,2.5,3,4,5,6,8)	Polypropylene PP & PPB Inch (2,3,4,5,6,8,10)	95U/95UM Series Inch (2,2.5,4,6,8,12) Metric (4,6,8,10,12)	Polyurethane HUFR (Weld Tubing) Inch (4,6,8)	Clear Vinyl Inch (1/8" - 2 1/2")
Compression & Flare	Compression Inch (2,3,4,5,6,7,8,10,12)	BS	BS		PS TS	PS TS	PS TS	PS TS	PS TS	PS TS		PS TS			
	Compress-Align Inch (2,3,4,5,6,8,10,12,14,16)				TS	TS	TS	TS	TS	TS		TS			
	Metric Compression Metric (4,5,6,8,10,12,14,16,18,20,22,25,28)				TS			TS		TS		TS	TS		
	Poly-Tite Inch (4,5,6,8)	BS						BS				BS			
	Hi-Duty Inch (2,3,4,5,6,8,10)				TS	TS	TS	TS	TS	TS		TS			
	45 degree flare Inch (2,3,4,5,6,8,10,12,14)														
	Inverted Flare Inch (2,3,4,5,6,8,10,12)														
	Fast & Tite Inch (4,5,6,8,10)												TS		TS
Push-to-Connect	Flow Controls Inch (2,2.5,4,5,6,8) Metric (4,6,8,10,12)												TS		
	Prestolok PLP Metal Inch (2,2.5,3,4,5,6,8)														
	LF3000 / Prestolok PLP Composite Inch (2,2.5,3,4,5,6,8,10) Metric (3,4,6,8,10,12,14,16)												TS		
	LF3600 / Prestolok PLM Metal Inch (2.5,4,5,6,8) Metric (4,6,8,10,12,14)														
	LF3800 / Prestolok PLS Stainless Steel Inch (2.5,3,4,5,6,8) Metric (4,6,8,10,12)														
	Liquifit Inch (2.5,4,6,8) Metric (4,6,8,10,12)														
	TrueSeal Inch (4,5,6,8)	MG								MG		MG	TS		TS
Barb	Par-Barb Inch (2,3,4,5,6,8,10,12,16,20,24) Inside Diameter														CL
	Dubl-Barb Inch (2.5,4,6,8)														
	Hose Barb Inch (2,3,4,5,6,8,10,12,16) Inside Diameter														CL
	Garden Hose														CL
DOT Transportation	NTA Inch (3,4,6,8,10,12)														
	Transmission Fittings Inch (2,2.5)														
	Air Brake Inch (4,6,8,10,12,16)														
	Air Brake Hose Inch (6,8)														
	Vibra-Lok Inch (2,3,4,5,6,8,10,12)														
	Prestomatic Inch (4,6,8,10) Metric (6,8,10,12,16)														
	Brass PTC / Metric Prestomatic Inch (2.5,3,4,6,8,10,12)														
	Composite PTCR Inch (4,6,8,10,12)														
	SAE Cartridges Inch (4,6,8,10)														

Tubing Compatibility Chart

Parflex Thermoplastic Tubing								IHP/HPD Hose			
Transportation Tubing				Fluoropolymer Tubing							
PFT Air Brake (SAE J844) Inch (2,2.5,3,4,5,6,8,10,12)	Air Brake DIN 74324 (Nylon 12) Metric (4,6,8,10,12,15,16,18)	PFT Diesel Fuel Sizes 4,6,8,10,12	HTFL Diesel Fuel Sizes 4,6,8,10,12	PFA Inch (3/32" - 1") Metric (4mm - 12mm)	FEP Inch (1/8" - 1") Metric (3mm - 12mm)	PTFE Inch (3/32" - 1.1") Metric (3mm - 16mm)	PVDF Inch (2,3,4,5,6,8,10,12,16)	GPH General Purpose Inch (3,4,6,8,12) Inside Diameter	Parker 271 hose (SAE J1402) Inch (6.8) Inside Diameter	Product Sizes (inch)	
				PS TS	PS TS	PS TS	PS TS			Compression Inch (2,3,4,5,6,7,8,10,12)	Compression & Flare
				TS	TS	TS	TS			Compress-Align Inch (2,3,4,5,6,8,10,12,14,16)	
				TS	TS	TS	TS			Metric Compression Metric (4,5,6,8,10,12,14,16,18,20,22,25,28)	
										Poly-Tite Inch (4,5,6,8)	
										Hi-Duty Inch (2,3,4,5,6,8,10)	
										45 degree flare Inch (2,3,4,5,6,8,10,12,14)	
										Inverted Flare Inch (2,3,4,5,6,8,10,12)	
										Fast & Tite Inch (4,5,6,8,10)	
										Flow Controls Inch (2,2.5,4,5,6,8) Metric (4,6,8,10,12)	Push-to-Connect
										Prestolok PLP Metal Inch (2,2.5,3,4,5,6,8)	
										Prestolok PLP Composite Inch (2,2.5,3,4,5,6,8,10) Metric (3,4,6,8,10,12,14,16)	
										Prestolok PLM Metal Inch (2.5,4,5,6,8) Metric (4,6,8,10,12,14)	
										Prestolok PLS Stainless Steel Inch (2.5,3,4,5,6,8) Metric (4,6,8,10,12)	
										Liquifit Inch (2.5,4,6,8) Metric (4,6,8,10,12)	
				MG	MG	MG	MG			TrueSeal Inch (4,5,6,8)	
								CL		Par-Barb Inch (2,3,4,5,6,8,10,12,16,20,24) Inside Diameter	Barb
										Dubl-Barb Inch (2.5,4,6,8)	
								CL		Hose Barb Inch (2,3,4,5,6,8,10,12,16) Inside Diameter	
								CL		Garden Hose	
										NTA Inch (3,4,6,8,10,12)	DOT Transportation
										Transmission Fittings Inch (2,2.5)	
										Air Brake Inch (4,6,8,10,12,16)	
										Air Brake Hose Inch (6,8)	
										Vibra-Lok Inch (2,3,4,5,6,8,10,12)	
										Prestomatic Inch (4,6,8,10) Metric (6,8,10,12,16)	
										PTC Inch (2.5,3,4,6,8,10,12)	
										SAE Cartridges Inch (4,6,8,10)	

Nomenclature

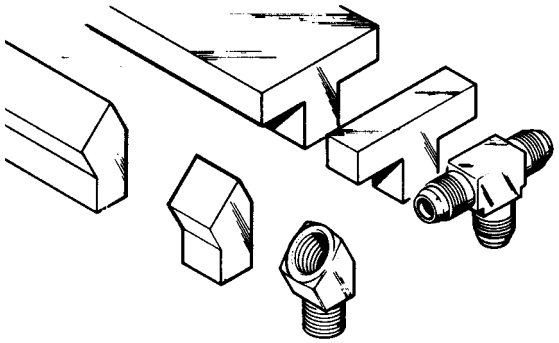
- PS Plastic Sleeve & Tube Support Recommended
- TS Tube Support Is Recommended
- BS Brass Sleeve Recommended
- CL Clamp Required
- MG Metal Gripper Collet Recommended
- Tube/Fitting Combination Compatible
- Tube/Fitting Combination Not Compatible

Manufacturing Techniques

Parker Extruded fittings

Hexagon, round and shaped bars are extruded in the configuration required, drawn to size, cut to length and straightened. First a solid round billet (8 to 12 inches in diameter) is heated to the pliable state and forced by pressure of approximately 80,000 pounds per square inch through a die. The resulting continuous length of bar is cooled and then drawn through dies to the desired external size. (The drawing process also controls the temper.) After straightening, the bar is ready for machining.

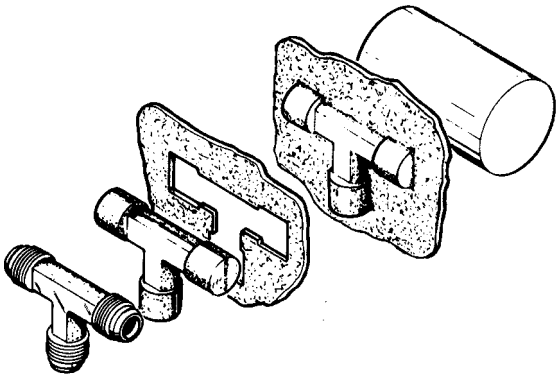
The process produces a dense, nonporous material somewhat stronger in the longitudinal direction due to an orientated flow of the grain.



Material used for Parker Brass Fittings

(Reference SAE J461)

Straight bodies:	barstock CA 360 or CA 345
Shape bodies:	extruded barstock CA 360
Shape bodies:	forged CA 377
Nuts:	barstock CA 360
Nuts:	forged CA 377



Parker Forged Fittings

Material for forgings is extruded in round bars, cut to length and straightened. (At this point in the process, forging rod differs from round extruded machinable bars only in temper and chemical properties.) After straightening, the bars are cut again into slugs (short lengths), reheated to the pliable state and pressed under a pressure of approximately 25,000 pounds per square inch between upper and lower die cavities. After cooling the flash is trimmed away and the forging blank is ready for machining.

This process of forming under extreme pressure produces a uniformly dense material of exceptional strength. Because grain flow follows the contour, the fitting has high impact strength and is more resistant to mechanical shock and vibration.

Of the major brass fittings producers, only Parker offers elbows and tees machined from both extruded and forged shapes.

Tube Line Fabrication Guide for Leak Free Systems

Every hydraulic, pneumatic and lubrication system requires some form of tube line fabrication and fitting installation for completion. Proper fabrication and installation are essential for the overall efficiency, leak free performance, and general appearance of any system.

Start by planning ahead. After sizing the tube lines and selecting the appropriate style of fitting, consider the following in the design of your system:

1. Accessibility of joints
2. Proper routing of lines
3. Adequate tube line supports
4. Available fabricating tools

Routing of Lines

Routing of lines is probably the most difficult yet most significant of these system design considerations. Proper routing involves getting a connecting line from one point to another through the most logical path.

Always try to leave fitting joints as accessible as possible. Hard to reach joints are hard to assemble and tighten properly. Inaccessible joints are also more difficult and time consuming to service.

The most logical path should have the following characteristics:

- **Avoid excessive strain on joint** — A strained joint will eventually leak. (See Figures A14 through A21.)
- **Allow for expansion and contraction** — Use a “U” bend or a hose in long lines to allow for expansion and contraction. (See Figure A22.)
- **Allow for motion under load** — Even some apparently rigid systems do move under load. (See Figure A23.)
- **Get around obstructions without using excessive amount of 90˚ bends** — Pressure drop due to one 90˚ bend is greater than that due to two 45˚ bends. (See Figures A24 and A25.)
- Keep tube lines away from components that require regular maintenance. (See Figures A26 and A27.)
- Have a neat appearance and allow for easy troubleshooting, maintenance and repair. (See Figures A28 and A29.)

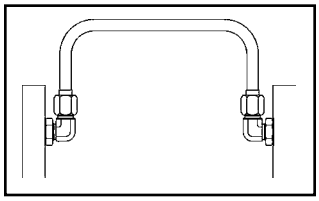


Fig. A14 — Correct Routing

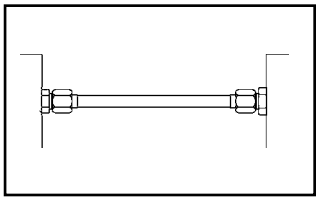


Fig. A15 — Incorrect Routing

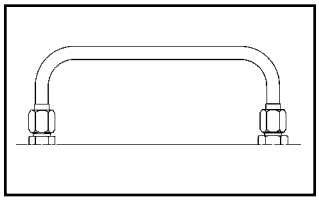


Fig. A18 — Correct Routing

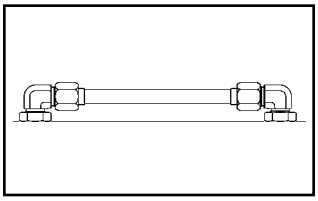


Fig. A19 — Incorrect Routing

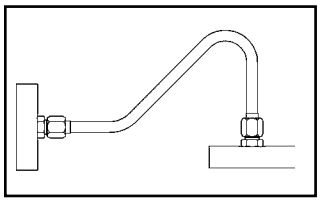


Fig. A16 — Correct Routing

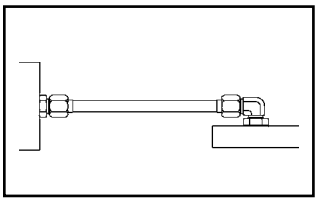


Fig. A17 — Incorrect Routing

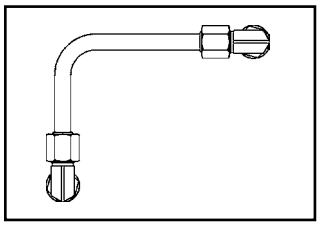


Fig. A20 — Correct Routing

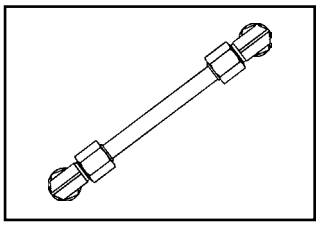


Fig. A21 — Incorrect Routing

(continued next page)

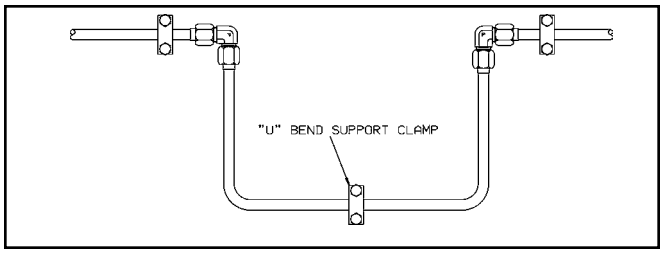


Fig. A22 — U-Bend Allowing Expansion and Contraction

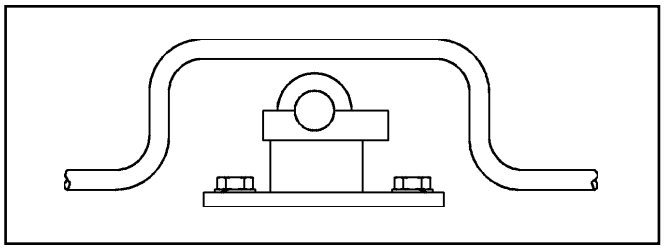


Fig. A25 — Incorrect

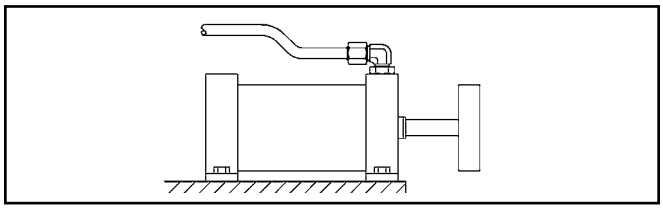


Fig. A23 — Bent Tube Allowing for Motion Under Load

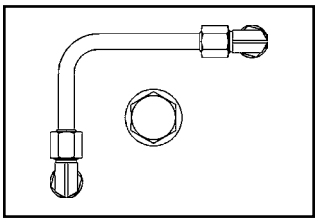


Fig. A26 — Correct

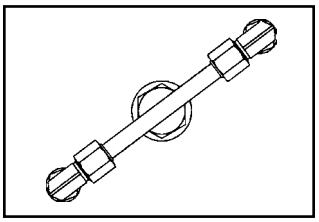


Fig. A27 — Incorrect

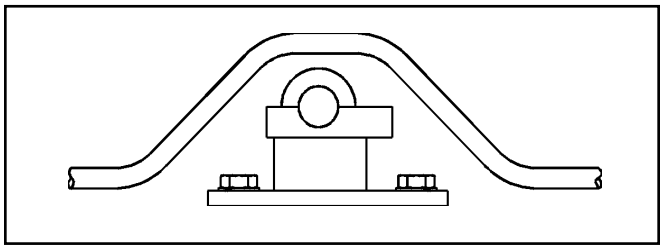


Fig. 24 — Correct

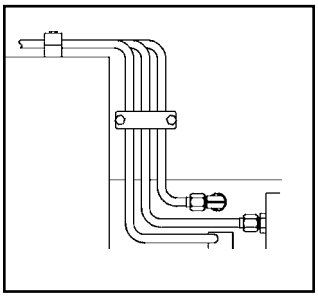


Fig. A28 — Correct

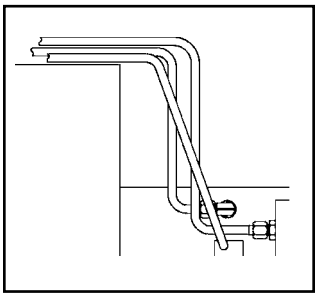


Fig. A29 — Incorrect

Thread Specifications

Dryseal Pipe Threads
All dryseal pipe threads are manufactured in accordance with the American National Standards Institute (ANSI) B1.20.3 specification and designed to seal pressure tight joints. The threads may incorporate the NPTF (National Standard Pipe Taper Fuel and Oil), PTF-SAE Short, PTF-SPL Short or PTF-SPL Extra Short form. Dryseal threads are used on brass products found within this catalog. Use of a thread sealant is recommended.

Non-Dryseal Pipe Threads
All non-dryseal pipe threads are manufactured in accordance with the American National Standards Institute (ANSI) B1.20.1 specification. These tapered pipe threads are used on our carbon and stainless steel products. Use of a thread sealant is recommended.

Nickel Plating
Nickel Plating is optional on standard product. Specifications for plating are not considered when standard product is manufactured. Since plating will alter thread pitch diameters, all plated threads should be qualified by functional fit with mating parts and not by standard thread gauging. Consult factory on plated product that will be qualified by standard thread gauging. These should be ordered as non-standards so product can be machined to pre-plated specifications.

Nickel plating provides a corrosion resistant coating which is desirable in many applications. Electrolytic nickel plating is the standard plating supplied unless otherwise specified. This will provide a uniform coverage of external surfaces; however, internal surfaces may be uncoated.

Unified Threads
All threads in the columns headed “Straight Thread” found within this catalog are manufactured in accordance with the American National Standards Institute (ANSI) B1.1 specification.

British Standard Pipe Threads BSPT and BSPP

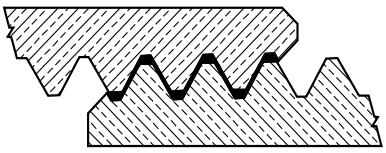
Pressure Tight
The British pipe threaded products found within this catalog intended for use where pressure tight joints are made on the threads are manufactured in accordance with British Standard (BS) 21 and International Standards Organization (ISO) 7-1. The threads are designated as follows:

Rp: Internal parallel
Rc: Internal taper
Rs: Special external parallel
R: External taper

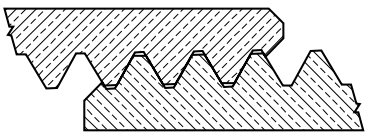
Use of a thread sealant is recommended with the R series thread. An elastomeric peripheral seal should be used with the Rs thread.

Non-Pressure Tight
All British Standard parallel pipe threads manufactured in this catalog according to BS2779 and ISO 228-1 are intended for use where pressure tight joints are not made on the threads. An elastomeric peripheral seal should be used. These threads are designated as follows:

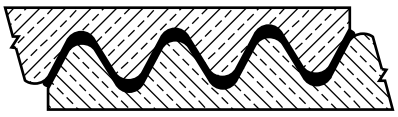
G: Internal Thread
GA, External thread, tight tolerance classification
GB, External thread, general purpose and assumed if no classification designation is given



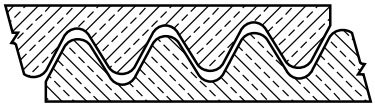
Dryseal Pipe Thread
Metal to metal contact. Crests of thread are crushed by the roots when wrench-tightened to form seal.



Non-Dryseal Pipe Thread
Flanks are in contact with possible clearance between the roots and crests. Will not prevent spiral leakage



BS21 British Standard Pipe Thread for Pressure Tight Joints
Metal to metal contact provides seal as tapered thread is wrench-tightened.



BS2779 British Standard Pipe Thread for Non-Pressure Tight Joints
Thread tolerances allow for possible clearance between threads. Will not prevent leakage paths.

Pipe Thread Assembly

The two British Standard pipe thread forms used for Parker's standard product are manufactured in a tighter tolerance range than required by the standards in order to facilitate the assembly and mating of fittings produced by the two different standards. In general, BS21 threads do not necessarily mate with BS2779 threads at tolerance overlap conditions, but fittings located within this catalog can be assembled as follows:

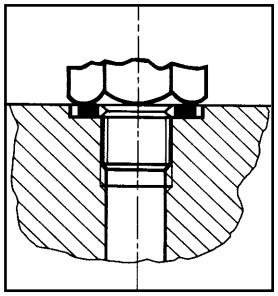
External Thread	Mating Internal Thread
G-BS2779 (parallel)	G-BS2779 (parallel) Rp-BS21* (parallel)
Rs-BS21 (parallel)	Rp-BS21 (parallel) G-BS2779 (parallel)
R-BS21 (taper)	Rp-BS21 (parallel) Rc-BS21 (taper) G-BS2779 (parallel)

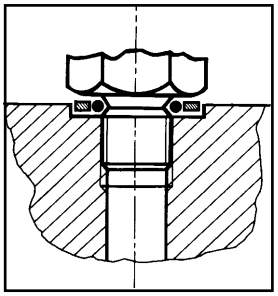
*This thread must be manufactured within a reduced tolerance range to always assemble with the G series external thread.

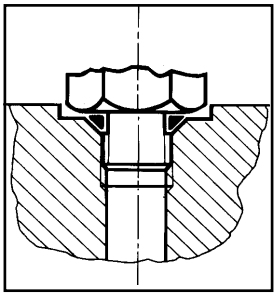
British Standard ISO Metric Screw Threads

They are commonly used in miniature pneumatic applications because of the availability of small thread diameters and are also used extensively in the automotive industry. There are two forms of sealing on metric screw threads.

- O-ring sealing into a profiled port in accordance with ISO 6149.
- Peripheral sealing with a copper or bonded washer in accordance with ISO 261 and 262.







Peripheral sealing of parallel threads

Pressure-tight joints of screwed connections with parallel threads are achieved by placing a seal between the two machined faces

Flat seals

Washers and rings are manufactured in many different materials including copper, aluminium, fiber, plastics, etc.

The tightening torque at assembly must be carefully selected so as to avoid compressing the seal to the point of extrusion. As a general rule, the fitting should be tightened with an additional 1/4 wrench turn from the fingertight position.

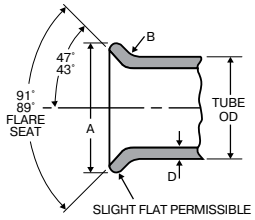
O-rings

Depending upon the configuration of the female port or male thread, O-Ring seals are fitted with or without back-up washers, and can be fully retained in a captive seal.

Flaring Instructions

In order to properly flare copping tubing for use with Parker 45˚ Flared Fittings and Inverted Flared Fittings, the following procedures and specifications should be met in preparation and make-up of flares.

1. **Cut tube with tube cutter:** To minimize the burr and workhardening, use a light feed on the cutting wheel and make several revolutions.
2. **Ream the tubing:** Cutting with a tube cutter will always create a burr. The burr must be removed to obtain maximum sealing surface. Remove only the burr, do not remove material from the original wall thickness. Also clean the tube end thoroughly to remove burrs.
3. **Flare tubing:** Flare with a compression or generating type flaring tool. Follow tool manufacturer's instructions for: (a) positioning the tube in tool and (b) for the correct number of turns on the feed handle.
4. **Inspect tubing:** The flare cone should be checked for a smooth surface on the i.D. Of the cone and measure with micrometer over largest o.D. For proper size. (See dimensions below for flare size for each tubing size.)



NOMINAL TUBE	A SINGLE FLARE DIAMETER		B SINGLE FLARE RADIUS	D SINGLE FLARE WALL THICKNESS
IN	MAX. IN	MIN. IN	+/- 0.01 IN	MAX. IN
1/8	.181	.171	.02	.035
3/16	.249	.239	.02	.035
1/4	.325	.315	.02	.049
5/16	.404	.388	.02	.049
3/8	.487	.471	.02	.065
7/16	.561	.545	.02	.065
1/2	.623	.607	.02	.083
9/16	.676	.660	.02	.083
5/8	.748	.732	.02	.095
3/4	.916	.900	.02	.109
7/8	1.041	1.025	.02	.109
1	1.157	1.141	.02	.120

Thread Designations and Standards for Threads Used in Fluid Connectors

	ABBREVIATION	DESCRIPTION	APPLICABLE STD.
STRAIGHT PIPE	NPSC	AMERICAN STANDARD STRAIGHT PIPE THREADS IN PIPE COUPLINGS	ANSI B1.20.1 FED-STD-H28/7
	NPSF	DRYSEAL AMERICAN STANDARD FUEL INTERNAL STRAIGHT PIPE THREADS (GENERALLY SED IN SOFT OR DUCTILE MATERIALS TO MATE WITH NPTF EXTERNAL TAPER THREADS)	SAEJ476 ANSI B1.20.3 FED-STD-H28/8
	NPSI	DRYSEAL AMERICAN INTERMEDIATE INTERNAL STRAIGHT PIPE THREADS (FOR BRITTLE OR HARD MATERIALS; INTENDED TO MATE WITH PTF-SAE SHORT EXTERNAL TAPER THREADS)	SAE J476 ANSI B1.20.3 FED-STD-H28/8
	NPSM	AMERICAN STANDARD STRAIGHT PIPE THREADS FOR FREE-FITTING MECHANICAL JOINTS FOR FIXTURES (THESE THREADS FIT FREELY OVER NPTF THREADS. THEY ARE USED IN SWIVEL NUTS OF 07 ADAPTERS)	ANSI B1.20.1 FED-STD-H28/7
TAPER PIPE	ANPT	AERONAUTICAL NATIONAL TAPER PIPE THREADS (SIMILAR TO NPT WITH VARIOUS ADDITIONAL REQUIREMENTS IN GAGING)	MIL-P-7105
	NPT	AMERICAN STANDARD TAPER PIPE THREADS FOR GENERAL USE	ANSI B1.20.1 FED-STD-H28/7
	NPTF	DRYSEAL AMERICAN STANDARD TAPER PIPE THREADS (USED IN ALL OF OUR STEEL AND BRASS FITTINGS)	SAE J476 ANSI B1.20.3 FED-STD-H28/8
	PTF - SAE SHORT	DRYSEAL SAE SHORT TAPER PIPE THREADS (MAINLY USED IN LOW PRESSURE PNEUMATIC AND FUEL APPLICATIONS)	SAE J476 ANSI B1.20.3 FED-STD-H28/8
	PTF - SPL SHORT[1]	DRYSEAL SPECIAL SHORT TAPER PIPE THREADS	ANSI B1.20.3
	PTF - SPL EXTRA SHORT[1]	DRYSEAL SPECIAL EXTRA SHORT TAPER PIPE THREADS	ANSI B1.20.3

Continued next page

	ABBREVIATION	DESCRIPTION	APPLICABLE STD.
UNIFIED THREADS	UN	UNIFIED CONSTANT PITCH THREADS (STANDARD SERIES: 4, 6, 8, 12, 16, 20, 28, 32)	ANSI B1.1 ED-STD-H28/2
	UNC	UNIFIED COARSE THREADS	ANSI B1.1 FED-STD-H28/2
	UNEF	UNIFED EXTRA FINE THREADS	ANSI B1.1 FED-STD-H28/2
	UNF	UNIFIED FINE THREADS	ANSI B1.1 FED-STD-H28/2
	UNS	UNIFIED SPECIAL PITCH THREADS	ANSI B1.1 FED-STD-H28/3
	UNJ	UNIFIED CONTROLLED ROOT RADIUS THREADS	ANSI B1.15 FED-STD-H28/4
METRIC THREADS	M	METRIC SCREW THREADS — M PROFILE	ISO 261 ANSI B1.13M FED-STD-H28/21
	M — KEG	METRIC TAPER THREADS (MAINLY USED IN GERMANY)	DIN 158
BRITISH STANDARD	R (BSPT)	BRITISH STANDARD TAPER PIPE THREADS, EXTERNAL	BS 21 ISO 7/1
	RC (BSPT)	BRITISH STANDARD TAPER PIPE THREADS, INTERNAL	BS 21 ISO 7/1
	RP OR G (BSPP)	BRITISH STANDARD PIPE (PARALLEL) THREADS	BS 2779 ISO 228/1
JAPANESE STANDARD	PF[2]	JIS PARALLEL PIPE THREADS	JIS B202 ISO 228/1
	PT[2]	JIS TAPER PIPE THREADS	JIS B203 ISO 7/1
	PS	JIS PARALLEL INTERNAL PIPE THREADS (TO MATE WITH PT THREADS)	JIS B203

Table A48 — Thread Designations and Standards for Threads Used in Fluid Connectors

1. Used in some pneumatic components where shortened thread depth is required because of lack of enough material due to component size limitations.
2. PF and PT threads are functionally interchangeable with BSPP and BSPT threads, respectively.
   These are old designations. They are being replaced with G (for PF) and R and Rc (for PT) as documents are revised.

Straight Thread Size Comparison Chart

	TUBE O.D.										
	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
SAE 45°FLARED	5/16 -24	3/8 -24	7/16 -20	1/2 -20	5/8 -18	11/16 -16	3/4 -16	7/8 -14	1-1/16 -14	1-1/4 -12	-
INVERTED FLARED	5/16 -28	3/8 -24	7/16 -24	1/2 -20	5/8 -18	11/16 -18	3/4 -18	7/8 -18	1-1/16 -16	1-3/16 -16	-
AIR BRAKE/NTA	-	-	7/16 -24	-	17/32 -24	-	11/16 -20	13/16 -18	1 -18	-	1-1/4 -16
STANDARD. COMPRESSION / COMPRESS-ALIGN	5/16 -24	3/8 -24	7/16 -24	1/2 -24	9/16 -24	5/8 -24	11/16 -20	13/16 -18	1 -18	1-1/8 -18	1-1/4 -18
POLY-TITE			3/8 -24	7/16 -24	1/2 -24	-	11/16 -20	-	-	-	-
VIBRA-LOK	3/8 -24	-	1/2 -24	9/16 -24	5/8 -24	-	13/16 -18	1 -18	1-1/8 -18	-	-
V510 BALL VALVES	-	-	7/16 -20	-	9/16 -18	-	3/4 -16	7/8 -14	1-1/16 -12	-	1-5/16 -12
HI-DUTY FLARELESS TUBE FITTINGS	5/16 -24	3/8 -24	7/16 -20	1/2 -20	9/16 -20	-	11/16 -16	7/8 -18	-	-	-

S.A.E. Part Index

SAE Standards

(Current)

J246: Spherical and Flanged Sleeve (Compression) Tube Fittings
Tubing: Copper and J844 Nylon
Fittings: NTA and Air Brake

J476: Dryseal Pipe Threads

J512: Automotive Tube Fittings
Tubing: Copper and Nylon
Fittings: 45° Flare, Inverted Flare, Compression

J513: Refrigeration Tube Fittings
Tubing: Annealed Copper
Fittings: 45° Flare

J530: Automotive Pipe Fittings
Fittings: Pipe

J531: Automotive Pipe, Filler and Drain Plugs
Fittings: Pipe Plugs

J844: Nonmetallic Air Brake System Tubing
Tubing: Non-reinforced Type A, reinforced Type B

J1131: Performance Requirements for SAE J844 Nonmetallic Tubing and Fitting Assemblies Used in Automotive Air Brake Systems
Tubing: J844 Nylon
Fittings: NTA and Prestomatic

J1615: Thread Sealants

J2494: Brass Body Push-to-Connect Fittings
Tubing: J844 Nylon
Fittings: Prestomatic

U.L. Listed Fittings

Many of the Fluid System Connectors Division's fittings have been listed by the Underwriter's Laboratory. The listings fall under 1 of 3 categories, depending upon application. Underwriter's requires that the smallest unit package carry the U.L. symbol and each carton be printed in accordance with the specification of each category.

List of U.L. Fittings

FITTINGS, FLAMMABLE LIQUID

1F	62C	168CA	252IFHD
2GF	62CA	169C	256IF
3GF	62CABH	169CA	259IFHD
14FL	62CBH	170C	264C
14FSV	66C	170CA	264CA
14FSX	66CA	171C	265C
41FL	68C	171CA	265CA
41FS	68CA	172C	269C
41FX	144F	172CA	269CA
41IF	145F	176C	270C
41IFS	147F	176CA	270CA
42F	149F	177C	639C
42IFHD	150F	177CA	639CA
46F	151F	244F	639F
46IFHD	155F	244IFHD	640F
48F	159F	245IFHD	660FHD
48IFHD	164C	249F	661FHD
60C	164CA	249IF	664FHD
61C	165C	249IFHD	
61CA	165CA	250IFHD	
61CL	168C	251IFHD	

FITTINGS, FUEL EQUIPMENT, MARINE

2GF	144F	155F	664FHD
3GF	145F	159F	
14FL	147F	639F	
42F	149F	640F	
46F	150F	660FHD	
48F	151F	661FHD	

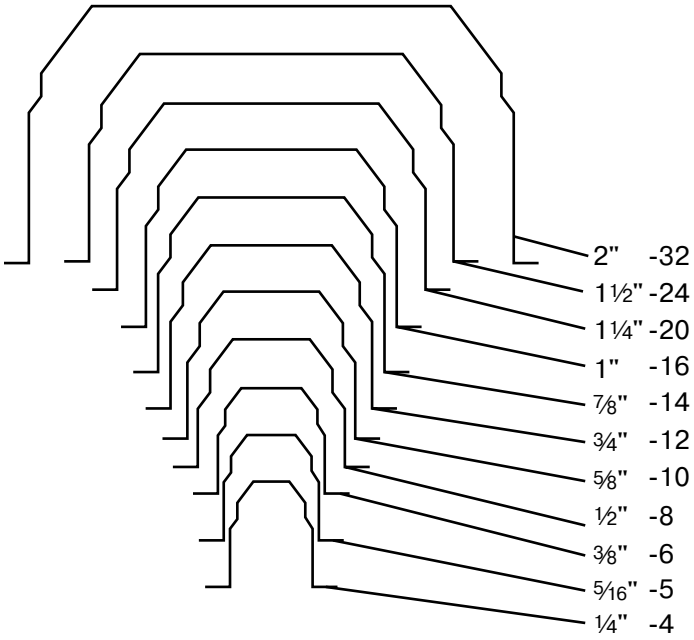
SHUT-OFF VALVES, FLAMMABLE LIQUIDS, LP GAS AND COMPRESS GAS

XV520P-4	XV520P-20	XV500P-20
XV520P-6	XV520P-24	XV500P-24
XV520P-8	XV520P-32	XV500P-32
XV520P-12	XV520P-40	
XV520P-16	XV520P-48	

Flare and Thread Profiles

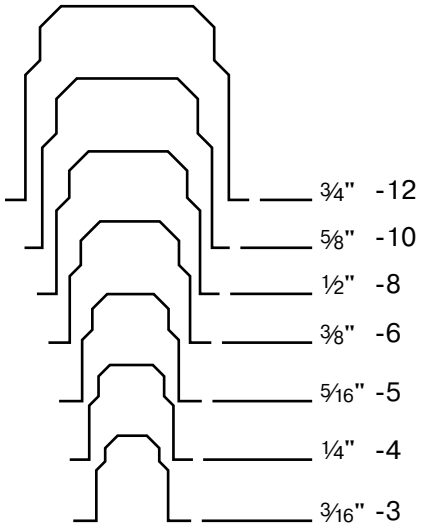
SAE (JIC) 37° Flare Nose Sizes

Actual Size

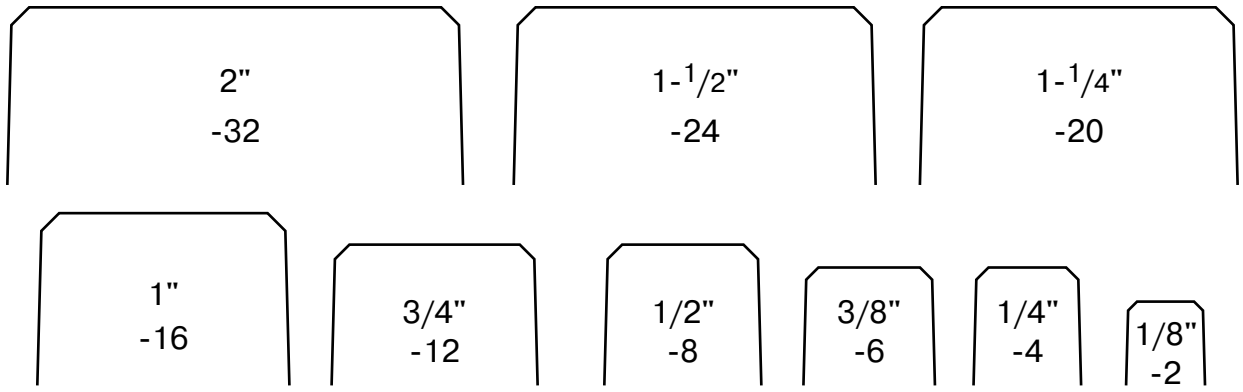


SAE 45° Flare Nose Sizes

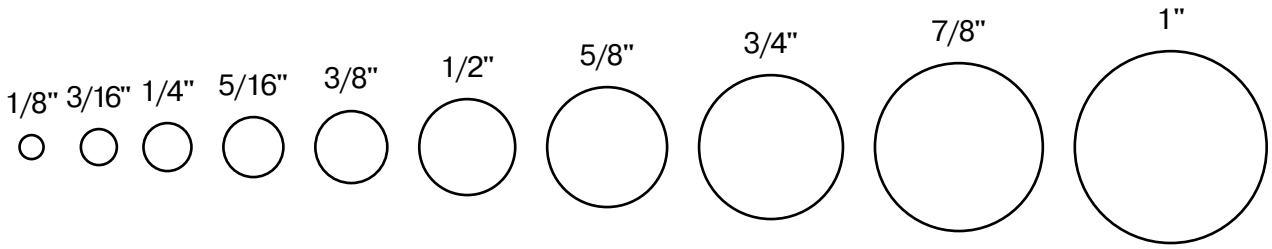
Actual Size



Male Pipe Thread Sizes



Actual Outside Diameters of Tubing



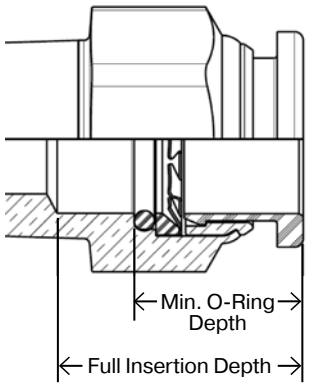
Pressure Conversions

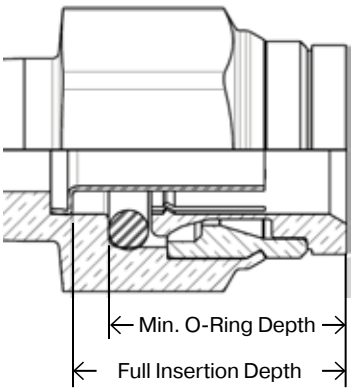
KILOPASCALS (KPA)	MEGAPASCALS (MPA)	BAR (bar)	KILOGRAMS PER SQUARE CENTIMETER (KGF/CM2)	POUNDS PER SQUARE INCH(PSI)
100	1.0	1	1.02	14.50
200	.2	2	2.04	29.00
300	.3	3	3.06	43.50
400	.4	4	4.08	58.00
500	.5	5	5.10	72.50
600	.6	6	6.12	87.00
700	.7	7	7.14	101.50
800	.8	8	8.16	116.00
900	.9	9	9.18	130.50
1000	1.0	10	10.20	145.00
2000	2.0	20	20.40	290.10
3000	3.0	30	30.60	435.10
4000	4.0	40	40.80	580.20
5000	5.0	50	51.00	725.20
6000	6.0	60	61.20	870.20
7000	7.0	70	71.40	1015.30
8000	8.0	80	81.60	1160.30
9000	9.0	90	91.80	1305.30
10000	10.0	100	102.00	1450.00
20000	20.0	200	204.00	2901.00
30000	30.0	300	306.00	4351.00
40000	40.0	400	408.00	5802.00
50000	50.0	500	510.00	7252.00
60000	60.0	600	612.00	8702.00
70000	70.0	700	714.00	10153.00
80000	80.0	800	816.00	11603.00
90000	90.0	900	918.00	13053.00
100000	100.0	1000	1020.00	14504.00
200000	100.0	2000	2040.00	29008.00
300000	300.0	3000	3060.00	43511.00

POUNDS PER SQUARE INCH(PSI)	KILOPASCALS (KPA)	MEGAPASCALS (MPA)	BAR (bar)	KILOGRAMS PER SQUARE CENTIMETER (KGF/CM2)
10	68.90	.07	.70	.70
20	137.90	.14	1.41	1.41
30	206.80	.21	2.10	2.11
40	275.80	.28	2.80	2.81
50	344.70	.34	3.40	3.52
60	413.70	.41	4.10	4.22
70	482.60	.48	4.80	4.92
80	551.60	.55	5.50	5.63
90	620.50	.62	6.20	6.33
100	689.00	.70	6.90	7.00
200	1379.00	1.40	13.80	14.10
300	2068.00	2.10	20.70	21.10
400	2758.00	2.80	27.60	28.10
500	3447.00	3.40	34.50	35.20
600	4137.00	4.10	41.40	42.20
700	4826.00	4.80	48.30	49.20
800	5516.00	5.50	55.20	56.30
900	6205.00	6.20	62.10	63.30
1000	6895.00	6.90	68.90	70.30
2000	13790.00	13.80	137.90	140.70
3000	20684.00	20.70	206.80	211.00
4000	27579.00	27.60	275.80	281.30
5000	34474.00	34.50	344.70	351.60
6000	41369.00	41.40	413.70	421.90
7000	48263.00	48.30	482.60	492.30
8000	55158.00	55.20	551.60	562.60
9000	62053.00	62.10	620.50	632.90
10000	68948.00	68.90	689.00	703.00
20000	137895.00	137.90	1379.00	1406.00
30000	206843.00	206.80	2068.00	2110.00
40000	275790.00	275.80	2758.00	2813.00

Tube Insertion Depths

This engineering standard covers the tube insertion depths and minimum depths to pass thru the o-ring. The depths are used for conveying information to customers and are meant to be used only as a guideline.





PLP Metal

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/8"	.64	.48
5/32"	.64	.48
3/16"	.67	.48
1/4"	.67	.49
5/16"	.77	.51
3/8"	.78	.51
1/2"	.85	.58

LF3600 (PLM)

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/4"	.66	.55
3/8"	.88	.73
1/2"	.89	.74
4MM	.57	.49
6MM	.68	.57
8MM	.71	.62
10MM	.90	.75
12MM	.96	.78
14MM	1.00	.82

LF3000 (PLP Composite) & LIQUIfit

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/8"	.46	.38
3/16"	.65	.56
1/4"	.58	.44
3/8"	.81	.62
1/2"	1.09	.84
4MM	.51	.39
6MM	.58	.45
8MM	.73	.55
10MM	.81	.62
12MM	.97	.73
14MM	1.08	.83
16MM	1.15	.89

Carstick

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/8"	.46	.38
1/4"	.75	.55
3/8"	.86	.68
1/2"	1.16	.92
4MM	.49	.41
6MM	.58	.49
8MM	.71	.60
10MM	.85	.67
12MM	1.00	.79

Composite PTC / PTCR

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/4"	.58	.47
3/8"	.70	.53
1/2"	.80	.61
5/8"	.99	.72
3/4"	1.04	.83

PTCCE

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/4"	.65	.54
3/8"	.81	.72
1/2"	.94	.72
5/8"	1.00	.75
3/4"	1.00	.75

Brass PTC

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
5/32"	.64	.44
3/16"	.62	.44
1/4"	.59	.49
3/8"	.78	.56
1/2"	.85	.63
5/8"	1.02	.80
3/4"	1.03	.82

TrueSeal – Acetal & Kynar

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/4"	.71	.52
5/16"	.80	.55
3/8"	.80	.55
1/2"	.90	.63

TrueSeal - PolyPropylene

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/4"	.74	.55
3/8"	.83	.59
1/2"	.93	.66

Metric Prestomatic

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
6MM	.78	
8MM	.80	
10MM	.91	
12MM	.91	
16MM	.89	

LF3800 (PLS)

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/4"	.69	.58
3/16"	.57	.49
3/8"	.90	.75
1/2"	.93	.78
4MM	.57	.49
6MM	.67	.56
8MM	.74	.65
10MM	.91	.76
12MM	.96	.79

Prestomatic

TUBE SIZE	FULL INSERTION DEPTH (IN.)	MINIMUM O-RING DEPTH (IN.)
1/4"	.63	.54
3/8"	.81	.72
1/2"	.94	.72
5/8"	1.12	.75
3/4"	1.12	.92

English/Metric Conversions

Inches x 25.4 = Millimeters (mm)
Inches x 2.54 = Centimeters (cm)
Inches x .254 = Decimeters (dm)
Feet x .3048 = Meters (m)
Yards x .9144 = Meters (m)
PSI x .0689 = Bars (bar)
Bars x 100 = Kilopascals (kPa)
PSI x .0069 = Megapascals (MPa)
Pound Inches x .113 = Newton Meters (N•m)

Pound Feet x 1.356 = Newton Meters (N•m)
Millimeters x .0394 = Inches
Centimeters x .3937 = Inches
Meters x 3.281 = Feet
Meters x 1.0936 = Yards
Bars x 14.5 = PSI Megapascals x 145 = PSI
Newton Meters x 8.85 = Pound Inches
Newton Meters x .737 = Pound Feet

Millimeters to Fractions to Decimals

MM	INCHES	
	FRACTION	DECIMAL
.3969	1/64	.0156
.7938	1/32	.0312
1.1906	3/64	.0468
1.5875	1/16	.0625
1.9844	5/64	.0781
2.3812	3/32	.0937
2.7781	7/64	.1093
3.1750	1/8	.1250
3.5719	9/64	.1406
3.9688	5/32	.1562
4.3656	11/64	.1718
4.7625	3/16	.1875
5.1594	13/64	.2031
5.5562	7/32	.2187
5.9531	15/64	.2343
6.3500	1/4	.2500

MM	INCHES	
	FRACTION	DECIMAL
6.7469	17/64	.2656
7.1438	9/32	.2812
7.5406	19/64	.2968
7.9375	5/16	.3125
8.3344	21/64	.3281
8.7312	11/32	.3437
9.1281	23/64	.3593
9.5250	3/8	.3750
9.9219	25/64	.3906
10.3188	13/32	.4062
10.7156	27/64	.4218
11.1125	7/16	.4375
11.5094	29/64	.4531
11.9062	15/32	.4687
12.3031	31/64	.4843
12.7000	1/2	.5000

MM	INCH	
	FRACTION	DECIMAL
13.0969	33/64	.5156
13.4938	17/32	.5312
13.8906	35/61	.5468
14.2875	9/16	.5625
14.6844	37/64	.5781
15.0812	19/32	.5937
14.4781	39/64	.6093
15.8750	5/8	.6250
16.2719	41/64	.6406
16.6688	21/32	.6562
17.0656	43/64	.6718
17.4625	11/16	.6875
17.8594	45/64	.7031
18.2562	23/32	.7187
18.6531	47/64	.7343
19.0500	3/4	.7500

MM	INCH	
	FRACTION	DECIMAL
19.4469	49/64	.7656
19.8438	25/32	.7812
20.2406	51/64	.7968
20.2375	13/16	.8125
21.0344	53/64	.8281
21.4312	27/32	.8437
21.8281	55/64	.8593
22.2250	7/8	.8750
22.6219	57/64	.8906
23.0188	29/32	.9062
23.4156	59/64	.9218
23.8125	15/16	.9375
24.2094	61/64	.9531
24.6062	31/32	.9687
25.0031	63/64	.9843
25.4000	1	1.0000

Assembly Guides

Push-to-Connect Fittings

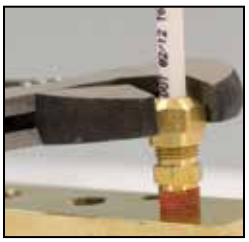
- PLP Metal
- LF3000 / Prestolok PLP Composite
- LF3600 / Prestolok PLM
- LF3800 / Prestolok PLS
- Oscillating Elbows
- LIQUIFit
- TrueSeal
- Flow Controls
- Prestomatic
- PTC
- Metric Prestomatic
- PMH
- Polypropylene Ball Valves

1. Cut tubing squarely – maximum of 15˚ angle allowable.
2. Check that port or mating part is clean and free of debris.
3. Mark tubing to appropriate tube insertion length. (see Tube Insertion Chart on page N22)
4. Insert tubing until it bottoms
5. Pull on tubing to verify it is fully inserted
6. To disassemble, simply press release button, hold against body and pull tubing out of fitting.

Transportation Compression Style NTA

1. Cut tubing squarely – maximum of 15˚ angle allowable.
2. Check that port or mating part is clean and free of debris.
3. Insert tubing until it bottoms on seat.
4. Tighten nut with wrench until one thread remains visible on the fitting body; (this will allow for a number of remakes) or, the nut should be screwed down finger tight, then wrench-tightened as indicated in the following table.

TUBE SIZE	ADDITIONAL NUMBER OF TURNS FROM HAND-TIGHT
3/16	2-1/2
1/4	3
3/8 &1/2	4
5/8 &3/4	3-1/2



Air Brake – AB Fittings

1. Cut tubing squarely and remove burrs
2. Slide nut and sleeve onto tubing.
3. Insert tubing into fitting until bottomed on seat. The nut should be screwed down finger tight, then wrench tightened as indicated in the chart

TUBE SIZE	TURNS REQUIRED TO SEAL FROM HAND-TIGHT
1/4, 3/8, 1/2	2
5/8, 3/4	3

Transmission Fittings

1. Cut tubing squarely and remove burrs
2. Insert tubing into fitting until bottomed
3. Tighten nut 1 1/2 turns from finger tight

Vibra-Lok

1. Cut the tubing squarely removing burrs
2. Slip nut and sleeve over tube
3. Bottom tubing into fitting and tighten nut until stop is reached. The elastic sleeve ordinarily will extrude slightly around the tube at the end of the nut. This extrusion further aids in isolating the tube from the nut.

For Higher Pressure applications

4. Consult pressure chart to determine if tubing should be belled
5. Slip nut and sleeve over tube. The sleeve should be positioned near end of tubing just behind the surface to be belled
6. Bell tubing with standard 45˚ flaring tool or 90˚ punch. The size of bell should be approximately that shown.

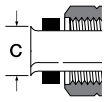
Air Brake Hose Ends

1. Slide nut onto hose
2. Slide sleeve onto hose with tapered edge toward fitting body
3. Bottom hose into fitting
4. Tighten nut until it contacts body hex

Note: When reassembling fitting, body and nut should be inspected. Only reuse if parts are in proper condition. Sleeves should never be Reused.

Recommended Size of Bell

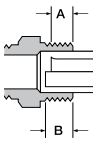
TUBE O.D.	BELL DIA. C
1/8	.190-.160
3/16	.255-.225
1/4	.318-.288
5/16	.381-.351
3/8	.444-.414
1/2	.569-.539
5/8	.694-.664
3/4	.819-.789
7/8	.944-.914



Tube Length Calculator

This table shows distance tube extends beyond face of Vibra-Lok fitting body on installation with bell on tubing and without bell on tubing.

O.D. OF TUBE	A WITH BELL	B WITHOUT BELL
1/8	3/16	3/16
3/16	3/16	7/32
1/4	3/16	1/4
5/16	3/16	1/4
3/8	3/16	1/4
1/2	3/16	11/32
5/8	3/16	TUBING SHOULD BE BELLED
3/4	3/16	
7/8	1/4	



45° Flare Fittings

1. Cut tubing squarely and clean tube end thoroughly to remove burrs.
2. Place nut onto tube. Place threaded end of nut toward end of tube.
3. Flare tube end with flaring tool to provide 45˚ flare.
4. Clamp tube flare between nut and nose of fitting body by screwing nut on finger-tight. Tighten with a wrench an additional 1/4 to 1/2 turn past finger-tight for a metal-to-metal seal.

Inverted Flare

1. Cut tubing squarely and clean to remove burrs
2. Place nut onto tube. Place threaded end of nut toward end of tube.
3. Flare tube end with flaring tool to provide 45˚ flare
4. On thin wall copper, welded or brazed tubing, use double flare to prevent pinch-off or cracked flares
5. Clamp tube flare between nut and nose of fitting body by screwing nut on finger tight. Tighten nut with a wrench an additional 1/4 to 1/2 turn past finger tight for a metal-to-metal seal.

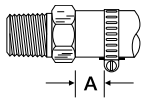
Dubl-Barb

Cut tube squarely and simply push tube over the two barbs

Hose Barbs

1. Cut hose cleanly and squarely to length.
2. Slide clamp on hose.
3. Lubricate hose. Push hose on fitting until bottomed against stop ring or hex.
4. Position hose clamp as shown and secure with a screwdriver or wrench. Maintain “A” dimension for proper clamp positioning.

HOSE SIZE	HOSE CLAMP	A
3/16	97 HC-3	1/4
1/4	97 HC-3	1/4
5/16	97 HC-6	1/4
3/8	97 HC-6	1/8
1/2	97 HC-8	1/8
5/8	97 HC-12	1/8
3/4	97 HC-12	1/8



Fluid Compatibility Guide

The following pages list general recommendations for the selection of valve materials. For specific cases, and for those not included in the Fluid Compatibility Chart, it is advisable to check with your Parker representative.

There are many specific environmental factors which might affect corrosion rate such as temperature, solution, concentration and presence of impurities. Therefore, we suggest that the information be used as a rough guide to material selection. If any questions exist regarding the expected performance of a material in a given application, actual tests should be performed to determine the suitability of the materials in question.

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
ACETALDEHYDE	P	G	E	P	G	G	P	E	U	
ACETAMINE	G	G	G	E	G			E		
ACETATE SOLVENTS	E	E	E	P			U	E	U	
ACETIC ACID VAPORS	U		U	U				E		
ACETIC ACID (10%)	P	P	E	U	P	G	U	E	U	U
ACETIC ACID (80%)	P	P	E	U	U	P	U	E	U	U
ACETIC ACID (AERATED)	P	P	E	G	G		P	E	U	
ACETIC ACID (AIR FREE)	P	P	E	G	G		U	E	U	
ACETIC ACID (CRUDE)	P	P	E	U	U		U	E	U	
ACETIC ACID (GLACIAL)			U	U	P	G	P	E		U
ACETIC ACID (PURE)	P	U	E	U	U		U	E	U	
ACETIC ANHYDRIDE	U	U	G	U	P	P	U	E	U	U
ACETONE	E	E	E	U	U	E	U	E	E	E
ACETOPHENONE	G	G	G	U	U	E	U			
ACETYL CHLORIDE	E	G	P	U	U	U	U	E		
ACETYLENE	G	E	E	G	P	E	E	E	E	
ACID FUMES	U	U	G	P	G			E		
ACRYLONITE	E	E	E	U	U	U	P	E		
AIR	E	E	E	E	E	E	E	E	E	
ALCOHOL, AMYL	G	G	E	P	P	E	G	E	E	
ALCOHOL, BUTYL	G	G	E	G	G	P	E	E	E	
ALCOHOL, DIACETONE	E	E	E	U	P	G	U	E		
ALCOHOL, ETHYL	G	G	G	E	G	E	E	E	E	
ALCOHOL, ISOPROPYL	G	G	G	P	G	E	E	E	E	
ALCOHOL, METHYL	E	G	E	G	E	E	P	E	E	
ALCOHOL, PROPYL	E	G	E	G	G	E	E	E		
ALCOHOLS, FATTY	G	G	E	G	G			E		
ALUM	U		G	G	G		G	E		
ALUMINA	U		E	E	E	E		E		
ALUMINUM ACETATE	G		E	U	U	E	U	E		
ALUMINUM BROMIDE				E	E	E	E			
ALUMINUM CHLORIDE DRY	U	P	P	G	G	E	E	E	E	
ALUMINUM CHLORIDE SOLUTION			U	G	G		E	E		U
ALUMINUM FLUORIDE	U	U	P	E	E	E	E	E		U
ALUMINUM HYDROXIDE	E	U	E	E	E	E	E	E		
ALUMINUM NITRATE	U	U	P	G	G	G	U	E		
ALUMINUM OXALATE			U					E		
ALUMINUM SALTS				E	E	E	E			
ALUMINUM SULFATE	P	U	G	E	E	E	E	E	E	P
AMINES	G	G	E	U	U	P	U	E	E	

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
AMLY CHLORIDE	G		E	U	P	U	U	E		
AMMOMIUM BICARBONATE	G	P	G	G	E	E	E	E	E	
AMMONIA, ALUM			E	G	G			E		
AMMONIA, ANHYDROUS LIQUID	U	E	E	G	P	G	U	E		
AMMONIA, AQUEOUS	U	E	E	G	G		E	E		
AMMONIA, GAS, HOT	U	G	E	P	E	E	U	E		
AMMONIA LIQUOR			E					E		
AMMONIA SOLUTIONS	U	G	E	G	G	G	U	E		
AMMONIUM ACETATE	U		G	G	G	E	U	E		
AMMONIUM BROMIDE 5%			G					E		
AMMONIUM CARBONATE	G	G	G	P	E	E	G	E	E	
AMMONIUM CHLORIDE	U	U	P	G	E	E	E	E	E	U
AMMONIUM HYDROXIDE 28%	U	P	G	G	E	G	E	E		
AMMONIUM HYDROXIDE CONC.	U	P	G	P	E	E	E	E	E	
AMMONIUM MONOSULFATE			E					E		
AMMONIUM NITRATE	U	U	E	E	E	E	E	E	E	U
AMMONIUM OXALATE 5%			E					E		
AMMONIUM PERSULFATE	P	U	E	U	P	G	G	E		U
AMMONIUM PHOSPHATE	U	U	G	E	E	E	E	E	G	P
AMMONIUM PHOSPHATE DI-BASIC	P	U	G	E	E		E	E	E	
AMMONIUM PHOSPHATE TRI-BASIC	P	U	G	E	E		E	E	E	
AMMONIUM SULFATE	P	P	G	E	E	E	G	E	E	U
AMMONIUM SULFIDE	U	U	G	E	G	E	U	E		
AMMONIUM SULFITE	P	P	E	G	E	G	E	E	E	
AMYL ACETATE	G	P	G	U	U	G	U	E	G	P
AMYL BORATE				E	E	U	E			
AMYL CHLORONAPHTHALENE				U	U	U	E			
AMYL NAPTHHALENE				U	U	U	E			
ANILINE	U	P	G	U	U	P	P	E	E	P
ANILINE DYES	P	P	E	P	P	P	G	E	E	
ANIMAL OIL	G	G	G	E	G	G	E			
ANTIMONY TRICHLORIDE	U	U	U	P			G	E		
APPLE JUICE	P	U	G	E	E	G	E	E		
AQUA REGIA (STRONG ACID)	U	U	G	U	U	U	U	E		U
AROCLOR 1248	G	U	U	U	U	G	E			
AROCLOR 1254	G	U	U	U	U	G	E			
AROCLOR 1260	G	U	U	E	E		E			
AROMATIC SOLVENTS	E	P	E	U	U	U		E		
ARSENIC ACID	U	U	G	E	E	G	E	E	E	U
ASPHALT EMULSION	E	G	E	U	P	U	E	E	E	
ASPHALT LIQUID	E	G	E	P	P	U	E	E	E	
ASTM OIL, NO. 1	E	E	E	E	E	U	E			
ASTM OIL, NO. 2	E	E	E	E	G	U	E			
ASTM OIL, NO. 3	E	E	E	E	U	U	E			
ASTM OIL, NO. 4	E	E	E	G	U	U	E			
ASTM REFERENCE FUEL A	U	G	E	E	G	U	E			
ASTM REFERENCE FUEL B	U	G	E	E	U	U	E			
ASTM REFERENCE FUEL C	U	G	E	G	U	U	E			
BARIUM CARBONATE	G	G	G	G	E	E	E	E	E	
BARIUM CHLORIDE	G	P	G	E	E	E	E	E	E	E
BARIUM CYANIDE	P		G	G	G	G	G	E		
BARIUM HYDRATE	U		E					E		
BARIUM HYDROXIDE	P	P	G	E	E	G	E	E	E	
BARIUM NITRARE			E		G			E		
BARIUM SALTS				E	E	E	E			

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
BARIUM SULFATE	P	P	E	E	E	G	E	E	E	E
BARIUM SULFIDE	U	P	G	E	G	E	E	E	E	
BEER	G	U	E	G	G	G	E	E	E	U
BEET SUGAR LIQUORS	E	G	E	E	E	G	E	E	E	
BENZALDEHYDE	E	E	E	U	U	E	U	E	E	E
BENZENE	G	G	G	U	U	U	G	E		E
BENZENESULFONIC ACID, 10%	U	U	U	U	G	U	E			
BENZLY CHLORIDE	U	U	G	U	U	U	E			
BENZOIC ACID	G	U	G	P	P	U	G	E		P
BENZYL ALCOHOL		U	E	U	G	G	E			
BERRYLLIUM	G		G	G	G	G	G	E		
BLEACH LIQUOR				U	G	E	E			
BLEACHING POWDER WET	G		P	U	E	G	G	E		
BLOOD	G		E	G	G	G	G	E		
BORAX	U	P	E	G	U	E	E	E	E	E
BORAX LIQUORS	E	P	G		P	E	E	E	E	
BORDEAUX MIXTURE			E					E		
BORIC ACID	P	U	G	G	G	G	E	E	E	G
BRAKE FLUID	G		G	U	P	G	U	E		
BRINES, SATURATED	G	U	G	E	G	E	E	E	E	
BROMINE, DRY	G	U	U	U	U	U	G	E		
BROMINE, WET	U	U	U	U	U		G	E		
BUNKER OILS (FUEL)	G	G	E	G	G		E	E	E	
BUTADIENE	P	G	E	P	P	P	G	U		
BUTANE	E	G	E	G	G	U	E	E	E	
BUTTER	G	U	E	G	G			E		
BUTTERMILK	U	U	E	E	E	G	E	E	E	
BUTYL ACETATE	G		G	U	U	U	U	E		E
BUTYL ALCOHOL	E	P	E	G	G		G	E		
BUTYL AMINE	G	G	E	U	U		U	E		
BUTYL BUTYRATE				U	U	E	E			
BUTYL CARBITOL	E	P	E	U	U		U	E		
BUTYL CELLOSOLVE	E	P	E	U	U		G	E		
BUTYL STEARATE				G	U	U	E			
BUTYLENE	E	E	E	U	U	U	U	E		
BUTYRIC ACID	P	U	G	P	P	P	P	E	E	U
CALCINE LIQUORS				E		E	E			
CALCIUM ACETATE				G	G	E	U			
CALCIUM BISULFITE	P	U	G	E	E	U	E	E	E	
CALCIUM CARBONATE	P	U	G	E	E	G	E	E	E	
CALCIUM CHLORATE	U		G	G	G	G	G	E		
CALCIUM CHLORIDE	G	P	G	E	E	G	E	E	E	U
CALCIUM HYDROXIDE	P	P	G	E	G	E	E	E	E	
CALCIUM HYPOCHLORITE	U	U	P	P	P		E	E		U
CALCIUM NITRATE			G	G	G	G		E		
CALCIUM PHOSPHATE	P		G	G	G	G	G	E		
CALCIUM SALTS				E	E	E	E			
CALCIUM SILICATE	P		G	G	G	G	G	E		
CALCIUM SULFATE	P	P	G	E	E	G	E	E	E	U
CALCIUM SULFIDE	U	U	G	E	E	E	E			
CALICHE LIQUOR		G	E	G	G			E		
CAMPHOR	P		G	G	G	G	G	E		
CANE SUGAR LIQUORS	G	G	E	G	G	G	G	E		
CARBOLIC ACID	U	U	G	G	G	G	E	E	U	
CARBON BISULFIDE	P	G	G	U	U	U	E	E	E	

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
CARBON DIOXIDE, DRY	E	E	E	P	G	G	G	E		
CARBON DISULFIDE	U	P	E	U	U		E	E		
CARBON MONOXIDE	E	E	E	G	U	G	G	E		
CARBON TETRACHLORIDE, DRY	P	G	E	U	U	U	G	E	E	
CARBON TETRACHLORIDE, WET	U	U	G	U	U	U	G	E	E	
CARBONATED BEVERAGE	G	U	G	G	G	G	G	G	E	
CARBONATED WATER	G	G	E	E	E	E	E	E	E	
CASEIN	P			G	G	G	G	G	E	
CASTER OIL	E	G	E	E	G	G	E	E	E	
CAUSTIC POTASH			E	G	G			E		
CAUSTIC SODA		G	E	P		G	G	E		
CELLULOSE ACETATE	G		G	U	U	G	U	E		
CELLULUBE	E	P	E	U	U		U	E		
CHINA WOOD OIL	P	P	E	E	G	U	E	E	E	
CHLORACETIC ACID	P	U	U	U	P		P	E		U
CHLORINATED SOLVENTS	P	P	E	U	U	U	P	E	E	
CHLORINATED WATER	U	P	G	E		E	E	E	U	U
CHLORINE, WET	U	U	U	U	U			E		
CHLORINE GAS	P	G	G	P	U	U	G	E	E	
CHLORO BROMO METHANE	G	U	G	U	U		G	E		
CHLOROBENZENE, DRY	G	G	E	U	U	U	E	E	E	E
CHLOROBUTADIENE				U	U	U	E			
CHLOROFORM, DRY	G	G	E	U	U	U	G	E	E	U
CHLOROPHYLL, DRY	G		G	G	G	G	G	E		
CHLOROSULFONIC ACID, DRY	P	G	G	U	U	U	U	E		U
CHLOROSULFONIC ACID, WET	U	U	U	U	U		P	E		
CHLORPHENOL				U	U	U	E			
CHROME ALUM	P	G	E	G	G	G	G	E		
CHROMIC ACID <50%	U	U	P	U	U	P	P	E	U	U
CHROMIC ACID >50%	U	U	P	U	U	P	P	E	U	
CHROMIUM SULFATE	P		G	G	G	G	G	E		
CIDER			E					E		
CITRIC ACID	P	U	G	G	E	G	E	E		P
CITRUS JUICES	G	U	G	E	E		E	E	E	
COCA-COLA SYRUP			E	G	G		G	E		
COCONUT OIL	G	P	G	E	P	E	E	E	E	
COFFEE	E		E	E	E	E	E	G		
COFFEE EXTRACTS, HOT	G	P	E					E		
COKE OVEN GAS	P	G	E	P	U	U	G	E		
COOKING OIL	G	G	E	E	G	U	E	E	E	
COPPER ACETATE	U	U	E	P	P	G	U	E		
COPPER CARBONATE			E					E		
COPPER CHLORIDE	U	U	P	G	G		E	E		U
COPPER CYANIDE	U		E	E	E	G	G	E		E
COPPER NITRATE	U	U	G	E	E	G	E	E	E	U
COPPER SALTS					E	E	E	E		
COPPER SULFATE	U	U	G	E	E	E	E	E	E	P
CORN OIL	G	P	G	E	P	P	E	E	E	
COTTONSEED OIL	G	P	G	E	G	P	G	E	E	
CREOSOTE OIL	G	G	G	P	U	U	E	E	U	
CREOSOLS	U	G	G	U	U	U	U	E		
CRESYLIC ACID	P	P	G	U	U	U	G	E	U	U
CRUDE OIL, SOUR	P	G	E	E	G	U	E	E		
CRUDE OIL, SWEET	G	G	E	E	G		E	E		
CUPRIC NITRATE			E					E		

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
CUTTING OILS, WATER EMULSIONS	E	G	E	E	G		E	E	E	
CYANIDE PLATING SOLUTION	U		G	G	G	G	G	E		
CYCLOHEXANE	E	E	E	P	U	U	E	E	E	
CYCLOHEXANONE	G		E	U	U			E		
DECANE				E	U	U	E			
DENATURED ALCOHOL				E	E	E	E			
DETERGENTS, SYNTHETIC	G	U	G	G	G	G	E	E		
DEXTRIN	G		G	G	G	G	G	E		
DIACETONE ALCOHOL	E	E	E	U	P			E		
DICHLOROETHANE			P	U	U	U		E		
DICHLOROETHYL ETHER	G		G	U	U	U	U	E		
DIESEL OIL FUELS	E	E	E	E	P	U	E	E		
DIETHYL BENZENE			G	U	U	U		E		
DIETHYL SULFATE	G		G	P	P	P	G	E		
DIETHYLAMINE	G	E	E	G	P	P	U	E		
DIETHYLENE GLYCOL	G	E	E	E	E	E	G	E		
DIMETHLY FORMAMIDE	G		E	G	U	U	U	E		
DIMETHYL PHTHALATE			U	G	G		U	E		
DIOCTYL PHTHALATE	E		E	P	U		P	E		
DIOXANE	G		G	U	U	P	U	E		
DIPENTANE	E		E	G	U	U	G	E		
DISODIUM PHOSPHATE			G	G	G		G	E		
DOW CHEMICAL HD50-4					G	E	U			
DOW CORNING 200, 510, 550				G	E	E	E			
DOWTHERM	E	G	E	U	U	U	E	E	E	
DRILLING MUD	G	G	E	E	P	E	E	E	E	
DRY CLEANING FLUIDS	P	G	E	U	U		G	E	E	
DRYING OIL	P	P	G	E	G			E	E	
ENAMEL	E		E	G	G	U		E		
EPSOM SALTS	G	P	G	E	E		E	E	E	
ETHANE	G	P	G	E	G	U	E	E	E	
ETHANOL	E	U	U	U	E	E	U			
ETHANOLAMINE	U	G	E	G	P		U	E		
ETHERS	G	E	E	U	U	P	P	E	P	
ETHYL ACETATE	P	G	G	U	U	P	U	E	E	E
ETHYL ACRYLATE	G	P	E	U	U	P	U	E		
ETHYL ALCOHOL	G	G	G	E	E		E	E		
ETHYL BENZENE			G	P	U	U		E	E	
ETHYL BROMIDE	E		G	G	G	G	G	E		
ETHYL CHLORIDE, DRY	G	G	E	P	P	P	G	G	E	E
ETHYL CHLORIDE, WET	P	U	G	P	P	G	G	E		
ETHYL ETHER	G		E	U	U	U	U	E		
ETHYL HEXANOL				E	E	E	E			
ETHYL SILICATE	G		G	G	P	G	G	E		
ETHYL SULFATE			G	G	G	P	E	E	E	
ETHYLENE CHLORIDE			E	U	E		U	E		
ETHYLENE DICHLORIDE	U	U	G	U	U	U	U	E		
ETHYLENE GLYCOL	G	G	G	E	G	E	E	E		
ETHYLENE OXIDE	P	G	G	U	U	U	U	E		
FATTY ACIDS	P	U	E	G	G	U	E	E	E	U
FERRIC CHLORIDE	U	U	U	E	U		E	E		U
FERRIC HYDROXIDE			E	G				E		
FERRIC NITRATE	U	U	P	E	E	E	E	E	E	U
FERRIC SULFATE	U	U	G	E	E	E	E	E	E	U

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
FERROUS AMMONIUM CITRATE			G					E		
FERROUS CHLORIDE	G	U	U	E	E	E	E	E	E	U
FERROUS SULFATE	G	U	G	E	E	E	E	E	E	U
FERROUS SULFATE, SATURATED	P	P	E	P	P	G	G	E		
FERTILIZER SOLUTIONS	P	G	G	G	G			E	G	
FISH OILS	G	G	E	E	G	U	E	E	G	
FLUE GASES	G		E	P	P	U	P	E	P	
FLUOBORIC ACID			G	E	G			E		U
FLUOROSILICIC ACID	G	U	G	P	P	P	P	E		U
FLUORINE, DRY	U		U	U					E	
FOOD FLUIDS & PASTES	G	P	E	G	E			E		
FORMALDEHYDE, COLD	E	E	E	G	P	G	U	E	E	U
FORMALDEHYDE, HOT	G	U	P	G	G			E	E	U
FORMIC ACID, COLD	G	U	G	U	G		G	E	U	E
FORMIC ACID, HOT	G	U	G	U	E		E	E	U	
FRUIT JUICES	G	U	E	E	E	E	E	E	E	
FUEL OIL	G	G	E	E	P	U	E	E	E	
FUMARIC ACID				G	G			E		
FURFURAL	E	E	E	U	P	P	U	E	E	E
GALIC ACID 5%	P	U	G	G	G	P	E	E	E	
GAS, NATURAL	G	G	E	E	E	U	E	E	E	
GAS, ODORIZERS	E	G	G	G	G		E	E	E	
GAS MFG.	G	G	G	E			E	E	E	
GASOLINE, AVIATION	E	E	E	P	U		E	E	E	
GASOLINE, LEADED	E	E	E	P	U		E	E	E	
GASOLINE, MOTOR	E	E	E	P	U	U	E	E	E	
GASOLINE, REFINED	G	G	E	P	P	U	E	E		
GASOLINE, SOUR	G	G	E	P	U	U	E	E	E	
GASOLINE, UNLEADED	E	E	E	P	U		E	E	E	E
GELATIN	E	U	E	E	E	E	E	E	E	
GLUCOSE	E	G	E	E	E	E	E	E	E	
GLUG	E	G	E	E	G	E	E			
GLYCERINE	G	P	E	P	U	E	G	E	P	E
GLYCOL	G	P	G	G	E	E	E	E	P	
GLYCOL AMINE	U		G	E		U	U			
GRAPHITE	G		G	G	G	G	G	E		
GREASE	P	E	E	E	G	U	E	E		
GULF-FR FLUID, EMULSION				E	G	U	E			
GULF-FR FLUID G				E	E	E	E			
GULF-FR FLUID P				U	U	G	G			
HELIUM GAS	G	E	E	G	G	G	G	E		
HEPTANE	E	G	E	E	G	U	E	E	E	
HEXANE	G	G	E	E	P	U	E	E	E	E
HEXANOL, TERTIARY	E	E	E	E	P	U	G	E		
HEXYL ALCOHOL	E	P	E	U	P		E	E		
HYDRAULIC OIL, PETROLEUM BASE	G	E	E	E	G	U	E	E	E	
HYDRAZINE	U	U	G	P	P	G	U	E		
HYDRIGEN SULFIDE, DRY	P	G	E	P	E	E	E	E		
HYDROCHLORIC ACID, AIR FREE	U	U	U	G	P		E	E		U
HYDROCYANIC ACID	U	U	E	G	G	G	E	E	U	
HYDROFLUORIC ACID	U	U	U		G					U
HYDROFLUOSILICIC ACID	E	U	P	G	G	G	E	E		U
HYDROGEN GAS, COLD	G	G	E	G	G	G	E	E		
HYDROGEN GAS, HOT	G	G	G	G	G		E			
HYDROGEN PEROXIDE,	U	U	G	U	U	G	G	E		U

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
CONCENTRATED										
HYDROGEN PEROXIDE, DILUTE	P	U	G	E	G	G	E	E	G	U
HYDROGEN SULFIDE, WET	U	P	G	P	G	G	E	E	E	
HYDROLUBE				E	G	E	E			
HYPO (SODIUM THIOSULFATE)	P	U	G	E	E	E	E	E	E	
HYPOCHLORITES, SODIUM	U	U	P	P			E	E		
ILLUMINATING GAS	E	E	E	P	P	U	E	E		
INK, NEWSPRINT	P	U	E	E	G	G	E	E	E	
IODINE, WET	U	U	U	G			E	E		
IODOFORM	P	G	E				E	E	E	
ISOPROPYL ACETATE			G	U	U	U		E		
ISOPROPYL ALCOHOL	G	G	G	P	G		E	E		
ISOPROPYL ETHER	E	E	E	P	P	U	U	E		
ISO-BUTANE			G	G	U	U		E		
ISO-OCTANE	E	E	E	E	P	U	E	E	E	
J P-4 FUEL	E	E	E	E	P		E	E	E	
J P-5 FUEL	E	E	E	G	P		E	E	E	
J P-6 FUEL	E	E	E	E	P		E	E	E	
KEROSENE	E	G	E	E	P	U	E	E	E	
KETCHUP	U	U	E	E	E		E	E	E	
KETONES	E	E	E	U	U	U	U	E	E	
LACTIC ACID, CONC. COLD	U	U	E	G	E	G	E	E	U	U
LACTIC ACID, CONC. HOT	U	U	G	P	P	G	G	E	U	U
LACTIC ACID, DILUTE COLD	U	U	E	G	E	G	E	E	U	U
LACTIC ACID, DILUTE HOT	U	U	E	P	U		U	E	U	U
LACTOSE	G		G	G	P	G	G	E		
LAQUER	E	P	E	U	U	U	U	E	E	E
LARD	G	E	E	G	P	P		E		
LARD OIL	G	P	G	E	G	G	E	E	E	
LEAD ACETATE	P	U	G	E	G	G	G	E	E	E
LEAD SULFATE	P		G	G	G	G	G	E		
LECITHIN	P		G	U	U	U	G	E		
LINOLEIC ACID	G	G	E	G	G	U	G	E	E	
LINSEED OIL	G	E	E	E	P	U	E	E	E	
LITHIUM CHLORIDE	G		G	G	G	G	G	E		
LPG	E	G	G	E	G	U	E	E	E	
LUBRICATING OIL	G	E	E	E	G	U	E	E	E	
LUDOX	U		G	G	G	G	G	E		
MAGNESIUM BISULFATE	G	G	E	G	G	G	G	E		
MAGNESIUM BISULFIDE	U		G	G	G	G	G	E		
MAGNESIUM CARBONATE	G		E	G	G	G	G	E		
MAGNESIUM CHLORIDE	G	P	G	E	E	E	E	E	E	E
MAGNESIUM HYDROXIDE	G	G	E	E	E	E	E	E	E	
MAGNESIUM HYDROXIDE HOT	U	G	E	G	G		E	E	E	
MAGNESIUM NITRATE			E	G	E		G	E		E
MAGNESIUM SALTS				E	E	E	E			
MAGNESIUM SULFATE	G	G	E	E	E	E	E	E	E	E
MALEIC ACID	G	G	G	G	G	U	E	E	E	
MALEIC ANHYDRIDE	G		G	U	U	U	G	E		
MALIC ACID	G	U	G	E	G		E	E	E	
MALT BEVERAGES			E	E	E	G	E	E		
MANGANESE CARBONATE			G	G				E		
MANGANESE SULFATE	G		E	G	G	G	G	E		
MAYONNAISE	U	U	E	E	E		E	E	E	
MEAT JUICES	U		E	G	G			E		

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
MELAMINE RESINS			P	G	G			E		
MERCURIC CHLORIDE	U	U	G	E	G	E	E	E		
MERCURIC CYANIDE	U	U	E	E	G	E	E	E		
MERCUROUS NITRATE	U		E				G	E		
MERCURY	U	E	E	E	E	E	E	E	E	
METHANE	E	G	E	E	G		E	E	E	
METHANOL	E	E		E	E	E	U			
METHANOL	G		E	G	G	U	G	E		
METHYL ACETATE	E	G	E	U	U	G	U	E		
METHYL ACETONE	E	E	E	U	U	E	U	E		
METHYL ALCOHOL	G	G	G	E	G		P	E		E
METHYL BROMIDE 100%	P	G	G	G	U	U	G	E		
METHYL CELLOSOLVE	E	G	E	P	U	G	U	E		
METHYL CELLULOSE			E	U	U			E		
METHYL CHLORIDE	G	G	E	U	U	U	G	E	E	
METHYL ETHER				E	U	U	E			
METHYL ETHYL KETONE	E	E	E	U	U	G	U	E	E	E
METHYL FORMATE	E	P	G	U	G	G	U	E		
METHYL ISOBUTYLE KETONE			E	U	U			E		
METHYLAMINE	U	G	E	U	U	G	U	E		
METHYLENE CHLORIDE	E	G	E	U	U	U	P	E		U
MILK & MILK PRODUCTS	G	U	E	E	E	E	E	E	E	
MIL-F-81912, JP-9	E	E	E	U	U	U	E			
MIL-H-5606	E	E	E	E	G	U	E			
MIL-H-6083	E	E	E	E	E	U	E			
MIL-H-7083	E	E	E	E	G	E	G			
MIL-H-8446	G	E	E	G	E	U	E			
MIL-L-2104 &2104B	E	E	E	E	G	U	E			
MIL-L-7808	U	G	E	G	U	U	E			
MINE WATERS, ACID	P	U	P	E			E	E		
MINERAL OILS	G	G	E	E	G	U	E	E	E	
MINERAL SPIRITS	G	G	G	E	P		E	E	E	
MIXED ACIDS, COLD	U	P	G	U	U	U	G	E	U	
MLO-7277 & MLO-7557	G	E	E	U	U	U	E			
MOBILE HF	E	E	E	E	G	U	E			
MOLASSES, CRUDE	E	E	E	E	E		E	E	E	
MOLASSES, EDIBLE	E	P	E	E	E		E	E	E	
MOLYBDIC ACID			E					E		
MONOCHLORO BENZENE DRY			G	U	U			E		
MONOMETHYL HYDRAZINE				G	G	E				
MORPHOLINE	G		E	U	U	G	U	E		
MURIATIC ACID	U	U	U	G			E	E		
MUSTARD	E	G	E	E	E		E	E	E	
NAPHTHENIC ACID	G	E	G	G	U	U	E			
NAPTHA	G	G	G	G	P	U	E	E	E	
NAPTHALENE	G	G	G	U	U	U	E	E	E	
NATURAL GAS, SOUR	G	G	E	E	E	U	E	E		
NEATSFOOT OIL				E	U	G	E			
NICKEL ACETATE	U	G	E	G	G	E	U			
NICKEL AMMONIUM SULFATE	U	U	E	E	G	G	U	E		
NICKEL CHLORIDE	U	U	G	E	E	G	E	E	E	E
NICKEL NITRATE	U	U	G	E	E	E	E	E	E	
NICKEL SALTS				E	G	E	E			
NICKEL SULFATE	U	U	G	E	E	G	E	E	E	E
NITRIC ACID 100%	U	U	E	U	U	U	G	E	U	U

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
NITRIC ACID 10%	U	U	E	P	G		E	E	U	U
NITRIC ACID 30%	U	U	E	P	P	G	E	E	U	U
NITRIC ACID 80%	U	U	P	U	U	U	G	E	U	U
NITRIC ACID ANHYDROUS	U	U	E	U	U	U	E	E		
NITROBENZENE	U	G	E	U	U	P	P	E		E
NITROGEN	E	E	E	E	E	G	E	E	E	
NITROUS ACID 10%	U	U	G	P	E		E	E		
NITROUS GASES	U	G	E					E		
NITROUS OXIDE	G	G	G	G	G		E	E		
NOCOTINIC ACID	E	G	E	U	U	U	G	E		
OCTYL ALCOHOL	E	E	E	G	G	U	E			
OILS, ANIMAL	E	E	E	E	G	G	G	E		
OILS, PETROLEUM REFINED	G	E	E	E	G	U	E	E	E	
OILS, PETROLEUM SOUR	P	G	E	G	G	U	E	E		
OILS, WATER MIXTURE	E	G	E	E	G		E	E	E	
OILS & FATS			E	G		U		E		
OLAIC ACID			G	U	U		P	E		
OLEIC ACID	G	P	G	G	P	U	E	E	E	
OLEUM	P	G	G	U	U	U	P	E	U	
OLEUM SPIRITS	U		G	P	U	U	E	E		
OLIVE OIL	P	G	E	E	G	G	E	E	E	
ORTHO-DICHLOROBENZENE	G	G	G	U	U	U	E			
OTHER KETONES	E	E	E	U	U	U	U	E		
OXALIC ACID	G	U	G	P	G	G	E	E	P	U
OXYGEN	E	G	E	G	G	E	E	E	U	
OZONE, DRY	E	E	E	U	U	E	G	E		
OZONE, WET	G	P	E	U	U	G	G	E		
PAINTS & SOLVENTS	E	E	E	U	U	U	G	E		
PALM OIL	G	P	G	G	G	U	E	E	E	
PALMITIC ACID	G	P	G	G	G	G	E	E	E	
PAPER PULP	G		E	G	G	G	G	E		
PARAFFIN	E	G	E	E	P	U	E	E	E	
PARAFORMALDEHYDE	G	G	G	G	G	U		E	E	
PARALDEHYDE			G	G	G	U		E		
PARA-DICHLOROBENZENE	G	E	E	U	U	U	E			
PARKER O LUBE	E	E	E	E	E	U	E			
PEANUT OIL	G	E	E	E	U	U	E			
PENTANE	E	G	E	E	G	U	E	E	E	
PERCHLORETHYLENE, DRY	P	G	E	U	U	U	E	E		
PERCHLORIC ACID-2N	U	U	G	U	G	G	E			
PETROLATUM (PETROLEUM JELLY)	G	P	G	E	G		E	E	E	
PHENOL	G	U	E	U	U	U	G	E	U	E
PHOSPHATE ESTER	U	E	E	U		E		E		
PHOSPHORIC ACID 10%	U	U	U	G	E	G	E	E	U	U
PHOSPHORIC ACID 50% COLD	U	U	G	G	G	G	E	E	U	U
PHOSPHORIC ACID 50% HOT	U	U	U	G	G	G	E	E	U	U
PHOSPHORIC ACID 85% COLD	G	G	E	P	P		G	E	U	U
PHOSPHORIC ACID 85% HOT	P	P	G	P	P			E	U	U
PHOSPHORIC ANHYDRIDE			E	U	U		G	E	G	
PHOSPHOROUS TRICHLORIDE	U	G	E	U	U	G	G	E		
PHTHALIC ACID	G	P	G	P	P		E	E	E	
PHTHALIC ANHYDRIDE	G	P	G	P	P		E	E	E	
PICRIC ACID	P	U	G	P	E	G	G	E		
PINE OIL	G	G	E	E	U	U	E	E	E	
PINEAPPLE JUICE	P	P	E	E	E		E	E	E	

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
PITCH			E	P	P	U		E		
PLATING SOLUTIONS, CHROME	E	U	E		U	E	E			
PLATING SOLUTIONS, OTHER		E	E	E	U	E	E			
PNEUMATIC SERVICE	E	E	E	E	E	E	E	E		
POLYSULFIDE LIQUOR	U		G	G	G	G	G	E		
POLYVINYL ACETATE	G		G		P	G		E		
POLYVINYL CHLORIDE	G		G		P	G		E		
POTASSIUM ACETATE	G	E	G	G	G	E	U			
POTASSIUM BICARBONATE			E	G				E		E
POTASSIUM BICHROMATE			E	G	G		G	E	G	
POTASSIUM BISULFATE			E	G	G		E	E		
POTASSIUM BISULFITE	P	U	G	E	E	G	E	E	E	
POTASSIUM BROMIDE	P	U	E	E	E	G	E	E	E	P
POTASSIUM CARBONATE	G	G	G	E	E	G	E	E	E	E
POTASSIUM CHLORATE	G	G	G	E	E	G	E	E	E	P
POTASSIUM CHLORIDE	P	P	G	E	E	E	E	E	E	P
POTASSIUM CHROMATE	G		G	G	E	G	G	E		
POTASSIUM CYANIDE	U	G	G	E	E	E	E	E	E	E
POTASSIUM DICHROMATE	U	P	G	E	E	G	E	E	E	U
POTASSIUM DIPHOSPHATE	G	E	E	E			E	E		
POTASSIUM FERRICYANIDE	U	P	E	E	E	G	E	E	E	
POTASSIUM FERROCYANIDE	G	P	G	E	E		E	E	E	
POTASSIUM HYDROXIDEDILUTE COLD	U	E	G	E	G		U	E		E
POTASSIUM HYDROXIDE DILUTE HOT	U	G	G	G	G			E		
POTASSIUM HYDROXIDE TO 70% COLD										
POTASSIUM HYDROXIDE TO 70% HOT	U	E	G	P	G	E		E		
POTASSIUM HYDROXIDE TO 70% HOT	U	E	G	P	G	E		E		
POTASSIUM IODIDE	U	P	G	E	E	G	E	E	E	
POTASSIUM NITRATE	G	G	G	E	E	G	E	E	E	P
POTASSIUM OXALATE			E					E		
POTASSIUM PERMANGANATE	G	G	G	E	E	G	E	E	E	U
POTASSIUM PHOSOHATE	P		G	E	E	E	E	E		
POTASSIUM PHOSPHATE DI-BASIC	G	E	E	E	E	G	E	E	E	
POTASSIUM PHOSPHATE TRI-BASIC		E	G	G	G	G		E		
POTASSIUM SALTS				E	E	E	E			
POTASSIUM SULFATE	G	G	E	E	E	E	E	E	E	P
POTASSIUM SULFIDE	G	G	E	E	G	G	G	E		
POTASSIUM SULFITE	G	G	E	G	G	E	G	E		
PRODUCER GAS	G	G	G	E	G	U	E	E	E	
PROPANE GAS	E	G	G	E	G	U	E	E	E	
PROPYL ACETATE	U	E	E	U	U	G	U			
PROPYL ALCOHOL	E	G	G	E	E		E	E		
PROPYL BROMIDE	G		G	G	G	G	G	E		
PROPYLENE	E	E	E	U	U	U	E			
PROPYLENE GLYCOL	G	G	G	E	E	G	E	E	P	
PYDRAUL	E	P	E	U	U		G	E		
PYRIDINE			G	U	U		U	E		
PYROGARD 42, 43, 53, 55				U	U	E	E			
PYROGARD D				E	G	E	E			
PYROLGALIC ACID	G	G	G	E	E		E	E	E	
QUENCH OIL	G	G	E	E	G		E	E	E	
QUININE, SULFATE, DRY			E					E		
R P-1 FUEL	E	E	E	G	P		E	E	E	
RESINS & ROSINS	E	P	E	P	P		E	E		
RESORCINOL			G					E		

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
ROAD TAR	E	E	E	G	P	U	E	E	E	
ROOF PITCH	E	E	E	G	P		E	E	E	
ROSIN EMULSION	G	P	E	U	P		G	E		
RUBBER LATEX EMULSIONS	E	G	E				E	E	E	
RUBBER SOLVENTS	E	E	E	U	P		U	E	P	
SALAD OIL	G	P	G	E	E	G	E	E	E	
SALICYLIC ACID	P	U	E	E	E	G	E	E	E	
SALT	G	P	G	E	E		E	E	E	
SALT BRINE	G		G	E	U	G	G	E		
SAUERKRAUT ARINE			G					E		
SEA WATER	P	U	G	E	E	E	E	E	E	
SEWAGE	P	P	G	E	P	G	G	E		
SHELL IRUS 905				E	G	U	E			
SHELLAC	E	E	E	E	E			E		
SILICONE FLUIDS	G		G	G	G		G	E		
SILVER BROMIDE										
SILVER CYANIDE	U		E	G	G		G	E		
SILVER NITRATE	U	U	E	P	P	E	E	E	E	
SILVER PLATING SOL.			E		G			E		
SKYDROL 500	E	G	E	U	U		U	E		
SKYDROL 7000, TYPE 2	U	E	E	U	U	E	G			
SOAP SOLUTIONS	E	E	E	E	G	E	E	E		
SODIUM ACETATE	G	P	G	G	G	G	E	E	E	E
SODIUM ALUMINATE	G	P	E	E	E	G	E	E	E	
SODIUM BENZOATE			G					E		
SODIUM BICARBONATE	G	P	G	E	E	E	E	E	E	E
SODIUM BICHROMATE			G	U				E		
SODIUM BISULFATE 10%	G	U	E	E	E	G	E	E	E	P
SODIUM BISULFITE 10%	G	U	E	E	E	G	E	E	E	P
SODIUM BORATE	G	P	G	E	E	G	E	E	E	
SODIUM BROMIDE 10%	G	P	G	E	E	G	E	E	E	
SODIUM CARBONATE	G	G	E	E	E	G	E	E	E	E
SODIUM CHLORATE	G	P	G	E	E	G	E	E	E	P
SODIUM CHLORIDE	G	P	G	E	E	G	E	E	E	E
SODIUM CHROMATE	P	G	E	E	E	G	E	E	E	
SODIUM CITRATE			G					E		
SODIUM CYANIDE	U	G	E	E	E	G	E	E	E	E
SODIUM FERRICYANIDE			E					E		
SODIUM FLUORIDE	P	U	G	E	E	G	E	E	E	
SODIUM HYDROXIDE 20% COLD	E	E	E	E	E	G	G	E		E
SODIUM HYDROXIDE 20% HOT	E	G	E	G	G	G	P	E		
SODIUM HYDROXIDE 50% COLD	E	E	E	E	E	G	P	E		E
SODIUM HYDROXIDE 50% HOT	E	G	E	G	G		P	E		
SODIUM HYDROXIDE 70% COLD	E	E	E	G	P	G	P	E		
SODIUM HYDROXIDE 70% HOT	G	G	E	U	U	G	P	E		
SODIUM HYPOCHLORITE (BLEACH)	U	U	U				E	E		U
SODIUM HYPOSULFITE			G					E		
SODIUM LACTATE			E					E		
SODIUM METAPHOSPHATE	P	G	G	E	E	G		E		
SODIUM METASILICATE COLD	G	P	E	G	E		G	E		
SODIUM METASILICATE HOT	G	U	E					E		
SODIUM NITRATE	G	G	E	P	G	G	E	E	E	E
SODIUM NITRITE			G	P	U	E	G	E	G	
SODIUM PERBORATE	G	G	G	P	G	E	E	E	E	
SODIUM PEROXIDE	U	P	G	P	G	E	E	E	E	

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
SODIUM PHOSPHATE	P	P	G	G	P	E	E	E	G	
SODIUM PHOSPHATE DI-BASIC	P	P	G	E	E	E	E	E	E	
SODIUM PHOSPHATE TRI-BASIC	P	P	G	G	G	E	E	E	E	
SODIUM POLYPHOSPHATE			G	G	G	E		E		
SODIUM SALICYLATE			E					E		
SODIUM SALTS										
SODIUM SILICATE	G	G	G	E	E	G	E	E	E	E
SODIUM SILICATE, HOT	P	P	G			G		E		
SODIUM SULFATE	G	G	E	E	E	E	E	E		E
SODIUM SULFIDE	U	G	G	E	E	G	E	E	E	E
SODIUM SULFITE	P		E	E	E	G	G	E		
SODIUM TETRABORATE			E	E	E	G		E		
SODIUM THIOSULFATE	P	G	G	E	E	E	E	E	E	
SOYBEAN	G	P	E	E	G	G	E	E	E	
STANNIC CHLORIDE	P	U	U	E	E		E	E		
STARCH	G	P	G	E	E	P	E	E	E	
STEAM (212 F)	E	E	E	U	U	G	P	E	U	
STEARIC ACID	P	P	G	E	P	G	E	E	E	
STODDARD SOLVENT	G	E	E	E	G	U	E			
STYRENE	E	E	E	U	U	U	G	E		
SUCROSE SOLUTIONS	E	E	E	E	G	E	E			
SUGAR, SYRUPS & JAM	G		E		G			E		
SUGAR LIQUIDS	E	G	E	E	E	G	E	E	E	
SULFATE, BLACK LIQUOR	P	P	G	P	G	G	P	E	E	
SULFATE, GREEN LIQUOR	P	P	G	P	G		P	E	E	
SULFATE, WHITE LIQUOR	P	P	G	P	G		P	E	E	
SULFUR	U	P	G	U	P	G	G	E	E	
SULFUR, MOLTEN	U	P	G	U	P	G	G	E		
SULFUR CHLORIDES	G	U	U	U	U	P	E	E	E	
SULFUR DIOXIDE, DRY	G	G	E	U	U	E	E	E	E	
SULFUR DIOXIDE, WET	U		E	U	U	G		E		
SULFUR HEXAFLUORIDE	G		E		G			E		
SULFUR TRIOXIDE	G	G	G	U	U		G	E		
SULFUR TRIOXIDE, DRY	G	G	G	U	U	G	E	E		
SULFURIC ACID 0 TO 77%	P	U	P	G	G		E	E	P	U
SULFURIC ACID 100%	P	P	E	U	U	P	G	E	U	U
SULFUROUS ACID	U	U	G	P	P	P	E	E	P	
SUNSAFE	U	E	E	E	G	U	E			
TALL OIL	G	G	G	G	G	U	E	E		
TANNIC ACID	G	P	G	G	G	G	E	E	E	U
TANNING LIQUORS			G	G	U			E		
TAR & TAR OILS	E	E	E	P	U	U	E	E		
TARTARIC ACID	G	U	E	P	G	G	E	E	E	
TERPINEOL				G	U	U	E			
TERTIARY BUTYL ALCOHOL	E	E	E	G	G	G	E			
TETRACHLOROETHANE		G	E	U	U	U	E			
TETRACHLOROETHYLENE	U	G	U	U	U	E				
TETRAETHYL LEAD	G	P	G					E	E	
TITANIUM TETRACHLORIDE	G	E	G	G	U	U	E			
TOLUOL (TOLUENE)	E	E	E	U	U	U	G	E	E	E
TOMATO JUICE	P	P	E	E	E		E	E	E	
TRANSFORMER OIL	G	E	E	E	G		E	E	E	
TRANSMISSION FLUID, TYPE A	E	E	E	E	G	U	E			
TRIBUTYL PHOSPHATE	E	E	E	U	U	G	U	E		
TRICHLORETHYLENE	G	G	G	U	U	U	G	E	E	U

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

FLUID	BRASS	CARBON STEEL	216 S.S.	BUNA N (NILTRILE)	NEO-PRENE	EPR	FLUORO-CARBON	PTFE	ACETAL	NYLON
TRICHLOROACETIC ACID	G		U	P	U		U	E		
TRICHLOROETHANE		G	E	U	U	U	E			
TRICRESYL PHOSPHATE		E	G	U	U	E	G			
TRIETHANOLAMINE			G	P	G	G		E		
TRIETHYLAMINE	G		G	G	G			E		
TRISODIUM PHOSPHATE			G	E	E	G	G	E		
TUNG OIL	G	G	E	E	G	U	E	E	E	
TURBINE OIL #15		G	E	G	U	U	E			
TURPENTINE	G	G	G	G	U	U	E	E	E	E
UREA	U	P	G	P	G	G	U	E	E	
URIC ACID			E					E		
VARNISH	E	P	E	P	G	U	G	E	E	
VEGETABLE OILS	G	G	E	E	G	U	E	E	E	
VINEGAR	G	U	E	U	U	E	U	E		E
VINYL ACETATE	G		G		G	E		E		
WATER, ACID MINE	U	U	G	G	E	E	U	E		
WATER, DISTILLED	U	U	E	P	G	G	E	E	E	
WATER, FRESH	P	P	E	P	G	G	E	E	E	
WAXES	E	E	E	E	G	P	E	E	E	
WHISKEY & WINES	G	U	E	G	G	E	E	E	E	
XYLENE (XYLOL), DRY	E	G	E	U	U	U	G	E	E	E
ZINC BROMIDE	G		G	G	G	G	G	E		
ZINC CHLORIDE	U	U	U	G	G		E	E		U
ZINC HYDROSULFITE	P	E	E	E	E	E	E	E	E	
ZINC SULFATE	G	U	G	E	E	E	E	E	E	P

E-EXCELLENT **G-GOOD** **P-POOR** **U-UNSATISFACTORY**

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 Fluid Connector Group is approved for in-flight aerospace applications. For hoses and fittings used in in-flight aerospace applications, please contact Parker Aerospace Group

GENERAL INSTRUCTIONS

1.0 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.

1.1 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.

1.2 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.

1.3 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.**

1.4 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. 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 that minimum bend radius and cutting, any of which can cause premature Hose failure. Any Hose that has been kinked or bent to a radius smaller than the minimum bend radius, and any Hose that has been cut or is cracked or is otherwise damaged should be removed and discarded. 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 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 milliampere trip level for "piping systems in classified areas, those areas requiring a high degree of maintenance, or which may be exposed to physical abuse or corrosive atmospheres".

4.0 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 check 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

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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PARKER-HANNIFIN CORPORATION
OFFER OF SALE

1. **Definitions**. As used herein, the following terms have the meanings indicated.
"Buyer" means any customer receiving a Quote for Products.
"Buyer's Property" means any tools, patterns, plans, drawings, designs, specifications materials, equipment, or information furnished by Buyer, or which are or become Buyer's property.
"Confidential Information" means any technical, commercial, or other proprietary information of Seller, including, without limitation, pricing, technical drawings or prints and/or part lists, which has been or will be disclosed, delivered, or made available, whether directly or indirectly, to Buyer.
"Goods" means any tangible part, system or component to be supplied by Seller.
"Intellectual Property Rights" means any patents, trademarks, copyrights, trade dress, trade secrets or similar rights.
"Products" means the Goods, Services and/or Software as described in a Quote.
"Quote" means the offer or proposal made by Seller to Buyer for the supply of Products.
"Seller" means Parker-Hannifin Corporation, including all divisions, subsidiaries and businesses selling Products under these Terms.
"Seller's IP" means patents, trademarks, copyrights, or other intellectual property rights relating to the Products, including without limitation, names, designs, images, drawings, models, software, templates, information, any improvements or creations or other intellectual property developed prior to or during the relationship contemplated herein.
"Services" means any services to be provided by Seller.
"Software" means any software related to the Goods, whether embedded or separately downloaded.
"Special Tooling" means equipment acquired by Seller or otherwise owned by Seller necessary to manufacture Goods, including but not limited to tools, jigs, and fixtures.
"Terms" means the terms and conditions of this Offer of Sale.

2. **Terms**. All sales of Products by Seller will be governed by, and are expressly conditioned upon Buyer's assent to, these Terms. These Terms are incorporated into any Quote provided by Seller to 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 or conditions of purchase. Any Quote made by Seller to Buyer shall be considered a firm and definite offer and shall not be deemed to be otherwise despite any language on the face of the Quote. Seller reserves all rights to accept or reject any purported acceptance by Buyer to Seller's Quote if such purported acceptance attempts to vary the terms of the Quote. If Seller ships Products after Buyer issues an acceptance to the Quote, any additional or different terms proposed by Buyer will not become part of the parties' business relationship unless agreed to in a writing that is signed by an authorized representative of Seller, excluding email correspondence. If the transaction proceeds without such agreement on the part of Seller, the business relationship will be governed solely by these Terms and the specific terms in Seller's Quote.

3. **Price; Payment**. The Products set forth in the Quote are offered for sale at the prices indicated in the Quote. Unless otherwise specifically stated in the 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 for any reason and at any time by giving ten (10) days prior written notice. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2020). All sales are contingent upon credit approval and full payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Under any circumstances, Buyer may not withhold or suspend payment of any amounts due and payable as a deduction, set-off or recoupment of any amount, claim or dispute with Seller. 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. Seller reserves the right to require advance payment or provision of securities for first and subsequent deliveries if there is any doubt, in Seller's sole determination, regarding the Buyer's creditworthiness or for other business reasons. If the requested advance payment or securities are not provided to Seller's satisfaction, Seller reserves the right to suspend performance or reject the purchase order, in whole or in part, without prejudice to Seller's other rights or remedies, including the right to full compensation. Seller may revoke or shorten any payment periods previously granted in Seller's sole determination. The rights and remedies herein reserved to Seller are cumulative and in addition to any other or further rights and remedies available at law or in equity. No waiver by Seller of any breach by Buyer of any provision of these terms will constitute a waiver by Seller of any other breach of such provision.

4. **Shipment; Delivery; Title and Risk of Loss**. All delivery dates are approximate, and Seller is not responsible for damages or additional costs resulting from any delay. All deliveries are subject to our ability to procure materials from our suppliers. 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 carrier at Seller's facility. Unless otherwise agreed prior to shipment and for domestic delivery locations only, Seller will select and arrange, at Buyer's sole expense, the carrier and means of delivery. When Seller selects and arranges the carrier and means of delivery, freight and insurance costs for shipment to the designated delivery location will be prepaid by Seller and added as a separate line item to the invoice. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions. Buyer shall not return or repackage any Products without the prior written authorization from Seller, and any return shall be at the sole cost and expense of Buyer.

5. **Warranty**. The warranty for 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 date of completion of the Services; 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: **EXEMPTION CLAUSE; DISCLAIMER OF WARRANTY, CONDITIONS, REPRESENTATIONS: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY, CONDITION, AND REPRESENTATION, PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, CONDITIONS, AND REPRESENTATIONS, WHETHER STATUTORY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THOSE RELATING TO 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, 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 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.

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7. **LIMITATION OF LIABILITY**. **IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCTS, 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 INCLUDING ANY LOSS OF REVENUE OR PROFITS, 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. **Confidential Information**. Buyer acknowledges and agrees that Confidential Information has been and will be received in confidence and will remain the property of Seller. Buyer further agrees that it will not use Seller's Confidential Information for any purpose other than for the benefit of Seller and shall return all such Confidential Information to Seller within thirty (30) days upon request.

9. **Loss to Buyer's Property**. 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 Buyer's Property.

Also, Seller shall not be responsible for any loss or damage to Buyer's Property while it is in Seller's possession or control.

10. **Special Tooling**. Seller may impose a tooling charge for any Special Tooling. Special Tooling shall be and remain Seller's property. In no event will Buyer acquire any interest in the Special Tooling, even if such Special Tooling has been specially converted or adapted for manufacture of Goods for Buyer 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 owned by Seller in its sole determination at any time.

11. **Security Interest**. To secure payment of all sums due from Buyer, 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 Seller's security interest.

12. **User Responsibility**. 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. Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and any technical information provided with the Quote or the Products, such as Seller's instructions, guides and specifications. If Seller provides options of or for Products based upon data or specifications provided by Buyer, 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 Buyer is not the end-user of the Products, Buyer will ensure such end-user complies with this paragraph.

13. **Use of Products, Indemnity by Buyer**. Buyer shall comply with all instructions, guides and specifications provided by Seller with the Quote or the Products. If Buyer uses or resells the Products in any way prohibited by 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. Further, 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, arising out of or in connection with: (a) improper selection, design, specification, application, or any misuse of Products; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of Buyer's Property; (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, tampering with or repackaging the Products; or (e) Buyer's failure to comply with these Terms, including any legal or administrative proceedings, collection efforts, or other actions arising from or relating to such failure to comply. Seller shall not indemnify Buyer under any circumstance except as otherwise provided in these Terms.

14. **Cancellations and Changes**. Buyer may not cancel or modify, including but not limited to movement of delivery dates for the Products, 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 and any additional expense. Seller, at any time, may change features, specifications, designs and availability of Products.

15. **Assignment**. Buyer may not assign its rights or obligations without the prior written consent of Seller.

16. **Force Majeure**. Seller is not liable for delay or failure to perform any of its obligations by reason of any events or circumstances beyond its reasonable control. Such circumstances include without limitation: accidents, labor disputes or stoppages, government acts or orders, acts of nature, pandemics, epidemics, other widespread illness, or public health emergency, cyber related disruptions, cyber-attacks, ransomware sabotage, delays or failures in delivery from carriers or suppliers, shortages of materials, sudden increases in the price of raw material or components, shutdowns or slowdowns affecting the supply of raw materials or components, or the transportation thereof, oil shortages or oil price increases, energy crisis, energy or fuel interruption, war (whether declared or not) or the serious threat of same, riots, rebellions, acts of terrorism, embargoes, fire or any reason whether similar to the foregoing or otherwise. Seller will resume performance as soon as practicable after the event of force majeure has been removed. All delivery dates affected by an event of force majeure shall be tolled for the duration of such event of force majeure and rescheduled for mutually agreed dates as soon as practicable after the event of force majeure ceases to exist. The right to allocate capacity is in the Seller's sole discretion. An event of force majeure shall not include financial distress, insolvency, bankruptcy, or other similar conditions affecting one of the parties, affiliates and/or subcontractors. An event of force majeure in the meaning of these Terms means any circumstances beyond Seller's control that permanently or temporarily hinders performance, even where that circumstance was already foreseen. Buyer shall not be entitled to cancel any orders following its claim of an event of force majeure.

17. **Waiver and Severability**. Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice either party's right to enforce that provision in the future. Invalidation of any provision of these Terms shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.

18. **Duration**. Unless otherwise stated in the Quote, any agreement governed by or arising from these Terms shall: (a) be for an initial duration of one (1) year; and (b) shall automatically renew for successive one-year terms unless terminated by Buyer with at least 180-days written notice to Seller or if Seller terminates the agreement pursuant to Section 19 of these Terms.

19. **Termination**. Seller may, without liability to Buyer, 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) becomes or is deemed insolvent, (c) appoints or has appointed a trustee, receiver or custodian for all or any part of Buyer's property,(d) files a petition for relief in bankruptcy on its own behalf, or one is filed against Buyer by a third party, (e) makes an assignment for the benefit of creditors; or (f) dissolves its business or liquidates all or a majority of its assets.

20. **Ownership of Rights**. Buyer agrees that (a) Seller (and/or its affiliates) owns or is the valid licensee of Seller's IP and (b) the furnishing of information, related documents or other materials by Seller to Buyer does not grant or transfer any ownership interest or license in or to Seller's IP to Buyer, unless expressly agreed in writing. Without limiting the foregoing, Seller retains ownership of all Software supplied to Buyer. In no event shall Buyer obtain any greater right in and to the Software than a right in a license limited to the use thereof and subject to compliance

with any other terms provided with the Software. Buyer further agrees that it will not, directly or through intermediaries, reverse engineer, decompile, or disassemble any Software (including firmware) comprising or contained within a Product, except and only to the extent that such activity may be expressly permitted, either by applicable law or, in the case of open source software, the applicable open source license.

21. **Indemnity for Infringement of Intellectual Property Rights**. Seller is not liable for infringement of any 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 infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by Seller to 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 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 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 (including Seller's use of Buyer's Property); or (ii) directed to any Products 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. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for claims of infringement of Intellectual Property Rights.

22. **Governing Law**. These Terms, the terms of any Quote, 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.

23. **Entire Agreement**. These Terms, along with the terms set forth in the Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale and purchase. In the event of a conflict between any term set forth in the Quote and these Terms, the terms set forth in the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. No modification to these Terms will be binding on Seller unless agreed to in a writing that is signed by an authorized representative of Seller, excluding email correspondence, 'clickwrap' or other purported electronic assent to different or additional terms. Sections 2-25 of these Terms shall survive termination or cancellation of any agreement governed by or arising from these Terms.

24. **No 'Wrap' Agreements/No Authority to Bind**. Seller's clicking any buttons or any similar action, such as clicking "I Agree" or "Confirm," to utilize Buyer's software or webpage for the placement of orders, is NOT an agreement to Buyer's Terms and Conditions. **NO EMPLOYEE, AGENT OR REPRESENTATIVE OF SELLER HAS THE AUTHORITY TO BIND SELLER BY THE ACT OF CLICKING ANY BUTTON OR SIMILAR ACTION ON BUYER'S WEBSITE OR PORTAL.**

25. **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 represents 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 Products from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws. Buyer agrees to promptly and reliably provide Seller all requested information or documents, including end-user statements and other written assurances, concerning Buyer's ongoing compliance with Export Law.

09/22