Make fast ORFS tube connections anywhere without brazing or flanging

PARKER FASTSEAL™

TABLE OF CONTENTS

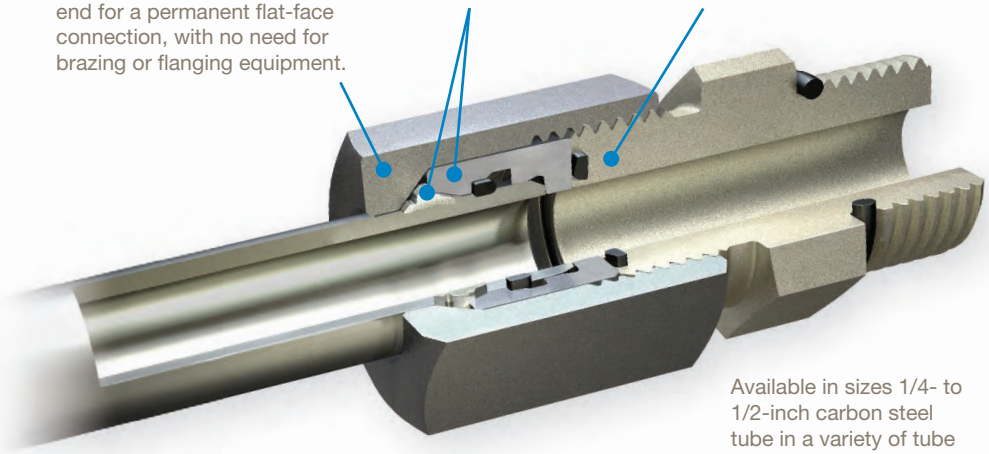
Faster connections for more uptime, speed, and cost savings

No one has time for downtime in the field. Every lost minute impacts productivity, and FastSeal is designed with uptime in mind. FastSeal eliminates the need for tube brazing and flanging equipment by utilizing Parker's proven flareless bite ring technology with an elastomeric seal to make strong, reliable tube connections that puts systems back on-line faster. There is no heavy equipment to buy, rent, or bring with you to the field; no extra storage space needed for equipment and tooling inventory; no messy or potentially unsafe brazing to perform; no leaving the work site for repairs; and no hassles.

Parker's patent-pending FastSeal ORFS connection allows assembly and maintenance teams to quickly preset the sleeve onto the tube end for a permanent flat-face connection, with no need for brazing or flanging equipment.

The FastSeal nut combines the bite-ring and sleeve with an integrated seal to make a simple, leak-free ORFS tube connection.

Works seamlessly with Parker Seal-Lok ORFS fittings, and can be used in the field regardless of connection type.



Available in sizes 1/4- to 1/2-inch carbon steel tube in a variety of tube wall thicknesses

FastSeal connections are fast and easy anywhere

1 Select, cut, and deburr the tube. Use the FastSeal marking tool to check tube OD and ovality, ensure adequate deburr, and mark the tube insertion depth.

2 Thread the FastSeal nut onto the fitting body hand tight. Then, insert the tube into the nut, past the integrated seal, until it bottoms out and the tube insertion mark is reached.

3 With the tube fully inserted to the depth mark, preset the bite ring by tightening the nut to the specified turns. After inspection, tighten to the required Seal-Lok torque value.

Mark. Insert. Tighten.

Scan for FastSeal assembly instructions.

Pairs with Seal-Lok ORFS fittings or easily converts existing connections to ORFS

Combining the leak-free reliability of a standard Seal-Lok™ ORFS connection and the simple assembly technology of a bite-type connection, FastSeal bridges the gap and provides the best of both worlds to assemblers and maintenance personnel. So, no matter what tube assembly technology was originally used—tube assemblies using Parker FastSeal connectors will mate seamlessly to your ORFS fittings. In fact, other fitting connection technologies can be easily converted to ORFS connections using our quick field attachable FastSeal tube assemblies.

TESTED. PROVEN. TRUSTED.

FastSeal™ has been tested in accordance with industry standards and meets/exceeds the same requirements as Parker's Seal-Lok™ ORFS product line.

Per SAE J1453 / ISO 19879

- Leak and burst
- Cyclic endurance (impulse)
- Vacuum
- Over torque
- Vibration (rotary flex)
- Remake

The unmatched alternative for alternative fuels

SEAL-LOK™ TECHNOLOGY

TABLE OF CONTENTS

ROBUST. RELIABLE. REUSABLE.

As the push for cleaner fuel alternatives intensifies, Parker continues leading the way with products engineered to optimize fuel conveyance. Parker Seal-Lok™ technology introduces an O-ring face seal (ORFS) design that performs with a variety of fuels to achieve the most robust, leak-free connection in the industry – period. Seal-Lok fittings boost your bottom line with:

Unlimited Reusability – The ORFS design allows for in-field troubleshooting and maintenance by simply replacing the O-ring.

Parflange® Technology – Provides high-quality, consistent flanges fast with an exclusive orbital spindle motion. Parflange machines are available to purchase or rent to meet all production needs.

Robust Port Stud™ – Features a longer locknut to cover the uppermost threads on adjustable port end fittings, eliminating the potential for backup washer damage and leaks.

Corrosion-Resistant Materials – All Seal-Lok product lines for alternative fuels are available in corrosion-resistant SAE/AISI 316/316L stainless steel, as well as carbon steel with zinc nickel plating.

SEAL-LOK SOLUTIONS FOR ALTERNATIVE FUELS

Seal-Lok for CNG

- Meets all requirements of NGV 3.1, ECE R110, ISO 15500
- CNG compatible HNBR O-ring compound
- Sealing temperatures from -40ºF to 300ºF (-40ºC to 149ºC)
- Suitable for on-vehicle and infrastructure applications

Seal-Lok XTREME for LNG

- Meets all requirements of ECE R110
- Uses patented metal seal for increased pressure capability in ORFS-design and SAE ORB fittings
- Sealing temperatures from -328°F to 1,200°F (-200°C to 649°C)
- Suitable for on-vehicle and infrastructure applications

Seal-Lok for LPG

- Meets all requirements of ECE R110, ISO 15500
- LPG compatible HNBR O-ring compound
- Stainless steel and carbon steel with Zn-Ni plating
- Suitable for on-vehicle and infrastructure applications

Seal-Lok for Hydrogen

- Meets all performance requirements of EC 79
- ORFS manufactured specifically for critical H_2 applications
- Custom port options for 700 bar (10,000 psi)
- Suitable for on-vehicle and infrastructure applications

INNOVATION IN ACTION

Faster commissioning for oil & gas applications

PHASTITE® FOR PIPE

TABLE OF CONTENTS

Permanent leak-free piping connections in minutes

Phastite is an innovative pipe connection technology that provides non-welded, stainless steel piping connections quickly and safely. The intuitive and fast fabrication process delivers permanent pipe connections in minutes, eliminating the time consuming steps required for welded piping connections.

A typical heavy-schedule pipe weld requires several hours to complete; and as pipe size and schedule increase, man-hours for welding dramatically grow.

Phastite fittings are available in common SAE 4-bolt hydraulic flanges (SAE J518/ISO 6162) and Dual Seal (seal-sub) subsea flanges.

SIGNIFICANT TIME SAVINGS

In contrast, Phastite connections provide real-world time savings, **enabling permanent, installation-ready connections to be fabricated in 15 minutes versus 180 minutes or longer for welded connections.**

In fact, a high-pressure welding project typically requiring several weeks to commission may be reduced to several days and require less manpower using Phastite.

Phastite fittings also deliver consistency to the scheduling and commissioning process as one machine and fitting series is used across all available sizes and schedules.

THE INSIDE STORY

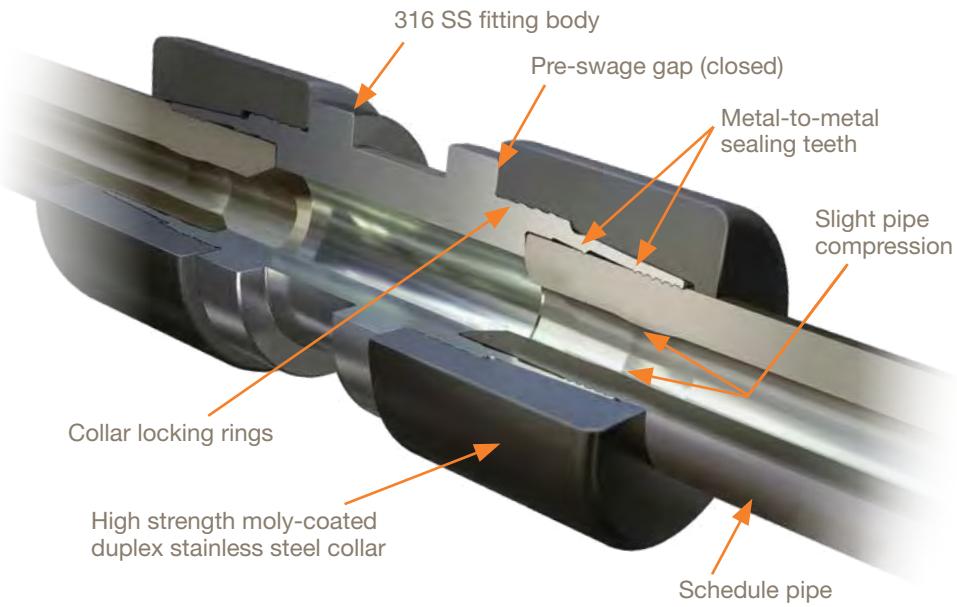


TABLE OF CONTENTS

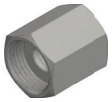
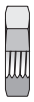
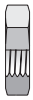
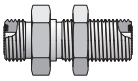
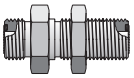
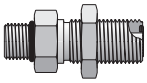
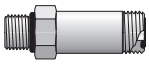
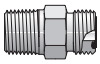
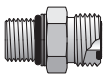
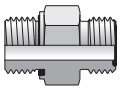
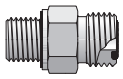
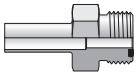
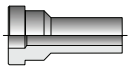
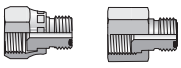
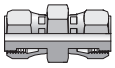
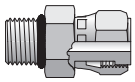
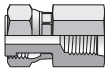
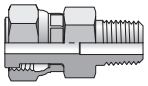
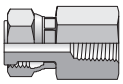
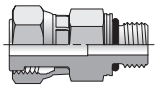
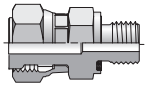
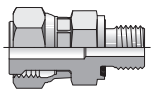
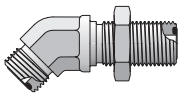
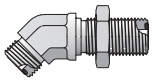
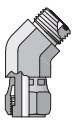
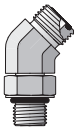
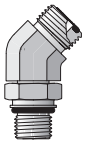
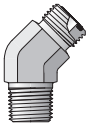
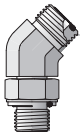
VISUAL INDEX

A

SEAL-LOK™

O-Ring Face Seal Tube Fittings

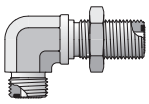
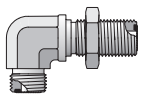
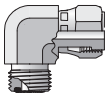
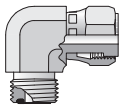
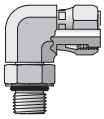
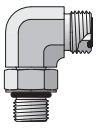
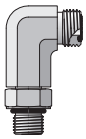
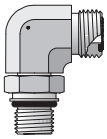
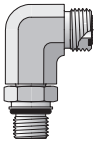
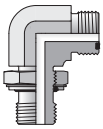
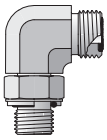
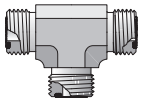
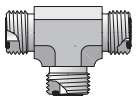
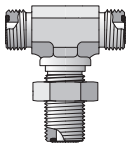
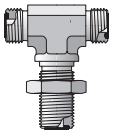
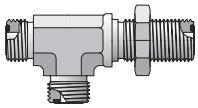
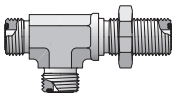
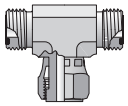
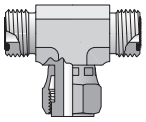
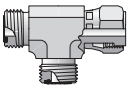
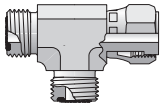
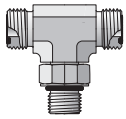
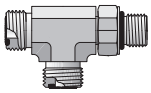
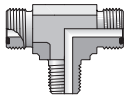
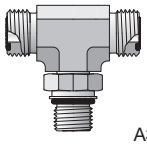
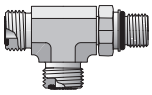
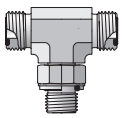
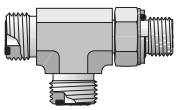
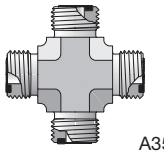
TABLE OF CONTENTS

FastSeal	**TLFA** FastSeal  A9	**Nuts, Sleeves, Locknuts**	**BL** Tube Nut  A9	**BML** Tube Nut - mm Hex  A9	**TPLS (Metric)** Parflange Sleeve  A10
TPL (Inch) Parflange Sleeve  A10	**TL (Inch)** Braze Reducer Sleeve  A11	**TLS (Metric)** Braze Reducer Sleeve  A11	**SBR (Inch and Metric)** Braze Ring  A12	**WLNL** Bulkhead Locknut  A12	**WLNML** Blkhd Locknut - mm Hex  A12
Straights	**HLO** Union  A13	**HMLO** Union - mm Hex  A13	**WLO** Bulkhead Union  A13	**WMLO** Bulkhead Union - mm Hex  A14	**WF5OLO** ORFS Blkhd / SAE-ORB  A14
F5OLO ORFS / SAE-ORB  A15	**FF5OLO** ORFS - Long / SAE-ORB  A15	**FLO** ORFS / NPTF  A15	**GLO** ORFS / NPTF  A16	**F87OMLO** ORFS / ISO 6149  A16	**F82EDMLO** ORFS / Metric-ED  A16
F42EDMLO ORFS / BSPP-ED  A16	**LOHB3** ORFS / Braze Socket  A17	**MMLOHB3** ORFS / Braze - mm Hex  A17	**LOHT3** ORFS / Tube Weld  A17	**TLW1** Butt Weld / Sleeve  A18	**Straight Swivels**
TRLON Tube End Reducer  A18	**LOHL6** Extender and Expander  A19	**HL6** ORFS Swivel Union  A19	**F65OL** ORFS Swivel / SAE-ORB  A19	**G65L** ORFS Swivel / SAE-ORB  A19	**F6L** ORFS Swivel / NPTF  A20
G6L ORFS Swivel / NPTF  A20	**F687OML** ORFS Swivel / ISO 6149  A20	**F682EDML** ORFS Swivel / Metric-ED  A20	**F642EDML** ORFS Swivel / BSPP-ED  A21	**45° Elbows**	**WNLO** Bulkhead Union  A21
WNMLO Bulkhead Union - mm Hex  A22	**V6LO** ORFS Swivel Elbow  A22	**V5OLO** ORFS / SAE-ORB  A22	**V87OMLO** ORFS / ISO 6149  A22	**VLO** ORFS / NPTF  A23	**V4OMLO** ORFS / BSPP-ORR  A23

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

A

TABLE OF CONTENTS

90° Elbows	**ELO** Union Elbow  A23	**EMLO** Union Elbow - mm Hex  A23	**WELO** Bulkhead Union  A24	**WEMLO** Bulkhead Union - mm Hex  A24	**C6LO** ORFS Swivel Elbow  A25
C6MLO Swivel Elbow - mm Hex  A25	**AOEL6** ORFS Swivel / SAE-ORB  A25	**C5OLO** ORFS / SAE-ORB  A25	**CC5OLO** ORFS / SAE-ORB - Long  A26	**CLO** ORFS / NPTF  A26	**C87OMLO** ORFS / ISO 6149  A26
CC87OMLO ORFS / ISO 6149 - Long  A27	**C8OMLO** ORFS / Metric-ORR  A27	**C4OMLO** ORFS / BSPP-ORR  A28	**Tees**	**JLO** Union Tee  A28	**JMLO** Union Tee - mm Hex  A29
WJLO Bulkhead Branch  A29	**WJMLO** Blkhd Branch - mm Hex  A29	**WJJLO** Bulkhead Run  A30	**WJJMLO** Bulkhead Run - mm Hex  A30	**S6LO** ORFS Swivel Branch  A31	**S6MLO** Swivel Branch - mm Hex  A31
R6LO ORFS Swivel Run  A31	**R6MLO** Swivel Run - mm Hex  A31	**S5OLO** SAE-ORB Branch Tee  A32	**R5OLO** SAE-ORB Run Tee  A32	**SLO** NPTF Branch Tee  A33	**S87OMLO** ISO 6149 Branch Tee  A33
R87OMLO ISO 6149 Run Tee  A34	**S4OMLO** BSPP-ORR Branch Tee  A34	**R4OMLO** BSPP-ORR Run Tee  A35	**Crosses**	**KLO** Union Cross  A35	**Plugs and Caps**
PNLO ORFS Plug  A36	**PNMLO** ORFS Plug - mm Hex  A36	**FNL** ORFS Cap  A36	**FNML** ORFS Cap - mm Hex  A36	**UPTC Nut Assembly**	**UPTC** Nut Assembly  A37

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Conversion Adapters (Shown in Section J)

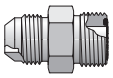
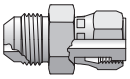
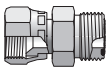
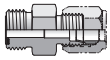
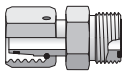
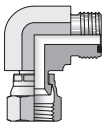
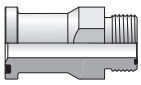
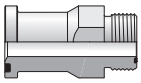
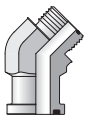
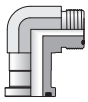
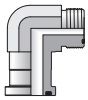
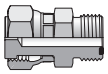
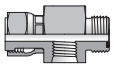
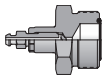
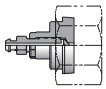
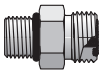
Conversion Adapters					
	XHLO 37° Flare / ORFS  J3	**XHL6** 37° Flare / ORFS Swivel  J3	**LOHX6** ORFS / 37° Swivel  J3	**BUHLO** ORFS / Flareless (inch)  J4	**LOHU86** Metric Swivel (EO)/ORFS  J4
LOEX6 ORFS / 37° Swivel  J3					

TABLE OF CONTENTS

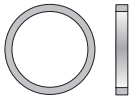
Flange Adapters (Shown in Section K)

SAE Flange Adapters					
	LOHQ1 Code 61 / ORFS  K12	**LOHQ2** Code 62 / ORFS  K12	**LOVQ1** Code 61 / ORFS  K32	**LOVQ2** Code 62 / ORFS  K32	**LOEQ1** Code 61 / ORFS  K33
LOEQ2 Code 62 / ORFS  K33					

Diagnostic, Bleed Adapters & Screen Fittings (Shown in Section L)

Diagnostic, Bleed Adapters & Screen Fittings					
	LOHL6 Orifice Orifice Swivel with Orifice / ORFS  L9	**LOHL6G5TP** Orifice Swivel / ORFS / SAE-ORB  L5	**PNLOBA** Bleed Screw / ORFS  L10	**FNLBA** Bleed Screw / SAE-ORB  L10	**Screen Fittings**  L11

O-Rings and Seals (Shown in Section M)

O-Rings and Seals					
	ORFS O-Ring  M4	**SAE O-Ring**  M4	**ISO 6149 O-Ring**  M5	**Metric O-Ring**  M5	**Metric Retaining Ring**  M5
BSPP O-Ring  M6	**BSPP Retaining O-Ring**  M6	**EOlastic Seal Ring**  M6			

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Seal-Lok Introduction

The Seal-Lok fitting meets or exceeds the strict requirements of SAE J1453 and ISO 8434-3. It is an O-ring face seal type fitting that consists of a nut, a body, an O-ring and a sleeve. As shown in Fig. A1, the tube is flanged to 90° (or the tube may be brazed instead to a braze-type sleeve). When the fitting is assembled, it compresses an O-ring in the precision machined groove of the fitting body to form a leak tight seal.

Seal-Lok fittings are suitable for a wide range of tube wall thicknesses and are readily adaptable to inch or metric tubing and hose. (Please refer to Table S14 located in the General Technical section for min./max. tube wall thickness). Seal-Lok's leak-free design and rugged construction make it suitable for a variety of applications where higher pressures, vibration and impulse are prevalent.

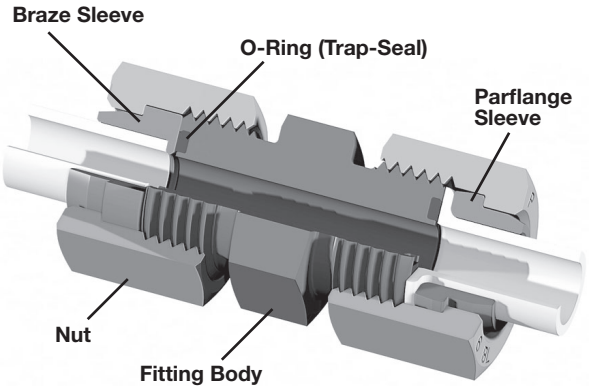


Fig. A1 — Seal-Lok Union cutaway with flanged and brazed assemblies

How Seal-Lok Fittings Work

The Seal-Lok fitting body face contains a high durometer Trap-Seal to maximize retention in a precision machined groove, known as a Captive O-ring Groove (CORG) referenced in Fig. A2. As the nut is tightened onto the fitting body, the Trap-Seal is compressed between the body and flat face of the tube flange or braze sleeve to form a tight, positive seal (see Fig. A1).

As the two faces come in contact, further tightening of the nut produces a sharp rise in assembly torque. A solid pull of the wrench at this point, to recommended assembly torque, com-pletes the assembly. The sharp torque rise gives a "solid feel" at assembly, minimizing the possibility of over tightening.

Because the sealing surfaces are flat and perpendicular to the assembly pull, they remain virtually free of distortion during assembly, giving Seal-Lok fittings practically unlimited remakeability. The seal should be inspected at each disassembly and replaced when necessary. **See the O-rings and Seals section for information on replacement ORFS O-rings.**

Because the tubing is a sealing surface, it must be smooth, free of any nicks, scratches, spiral tool marks, splits or weld beads. Seamless tube is recommended for Seal-Lok fittings for ease in flanging and bending. Certain types of harder tubes that are not fully annealed may not be suitable for flanging due to the potential for immediate or long-term cracking of the tube flange. For specific tube type and wall thickness recommendations, please see Table S14 and S15 in the General Technical Section.

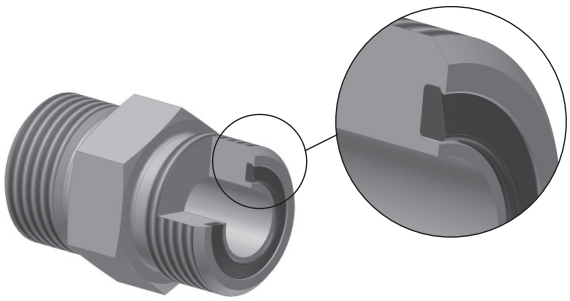


Fig. A2 — Captive O-ring Groove (CORG) Cutaway with Parker's Trap-Seal

Reference locations

Dynamic Pressure Ratings: Please refer to the last column of the part number tables located on the following pages of this section for the appropriate dynamic pressure ratings.

Recommended Tube Wall Thickness: Please refer to Table S14 located in the General Technical section.

Assembly and Installation: Please refer to Seal-Lok Assembly located within the Assembly/Installation section of this catalog.

Standard material specifications: Please refer to Table U1 located in the Appendix section.

Seal Material Selection: Please refer to Table S12 in the General Technical section of this catalog.

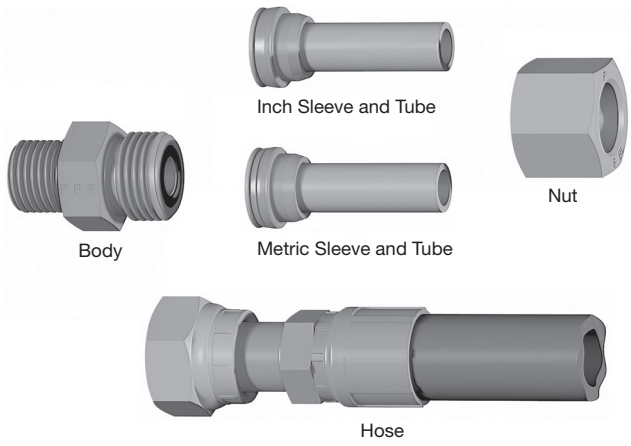


Fig. A3 — Seal-Lok Works with Inch or Metric Tube and Hose

International Acceptance

The tube/hose end connection for metric Seal-Lok is the same as standard (inch) Seal-Lok. It consists of a nut, a body, an O-ring, & a sleeve. The difference is at the port end of the fitting. Instead of the SAE straight thread connection for example, it features a similar connection with metric threads per ISO 6149-2 or ISO 9974-1. Additionally, the fitting body, tube nut and locknut are manufactured with metric hexes or wrench flats for shaped fittings. The metric Seal-Lok fittings meet or exceed all requirements of ISO 8434-3.

To identify the metric sleeves used for metric tubing, there is a groove machined into the TPLS & TLS sleeves.

TABLE OF CONTENTS

VISUAL INDEX

Universal Push-to-Connect (UPTC) Introduction

Traditionally, the fluid power industry has utilized threaded connectors to make a leak free connection. The speed of making connections is slow and the reliability of the connection is dependent on proper assembly procedures. Parker's UPTC connectors, on the other hand, rely on a mechanical retaining mechanism (other than threads) for holding power. No tools are required to assemble, and the reliability and speed of making connections with the UPTC design is greatly improved.

Design and Construction

UPTC Seal-Lok consists of a base Seal-Lok ORFS fitting, a UPTC nut (including internal sealing and retaining elements) and a UPTC hose assembly, as shown in figure A4. The base ORFS fitting is a highly reliable and widely available off-the-shelf standard SAE J1453 adapter. The sealing O-ring is supported by a pressure energized anti-extrusion ring that prevents O-ring extrusion and ensures tight sealing even under high pressure. Once fully engaged, the retaining element is positively trapped between the male and UPTC nut. The dust seal keeps contamination out as well as giving a visual indication that the male stud has been inserted all the way. There is also a clear tactile indicator at the end of the push indicating a proper connection. Once a proper connection is made, the dust seal is covered by the UPTC nut which provides proof of full engagement for easy inspection and quality control.

Fig. A4 — UPTC Seal-Lok is adaptable to a UPTC hydraulic or thermoplastic hose assembly. To be used with ET, EN, or EU hose ends.

Once connected, the UPTC nut is permanently attached to the UPTC hose end similar to a traditional swivel nut. To disconnect, just use a wrench to unscrew the UPTC nut from the base adapter. Re-connection is possible by tightening the UPTC nut back to the base adapter, if the connection is not damaged. If the hose is damaged, it can be replaced by installing a readily available standard Seal-Lok ORFS hose assembly, or a new UPTC assembly.

Features

- Available in sizes 1/4", 3/8", 1/2", 5/8", 3/4", and 1"
- Utilizes all Seal-Lok adapters for a wide variety of configurations, providing excellent field serviceability
- Meets or exceeds SAE 100R2 pressure ratings
- Includes visual and tactile installation indicators
- Self-aligning nipple eliminates hose twist during assembly
- No special tooling required for disassembly
- Utilizes elastomeric seals, including Parker's patented Trap-Seal

Reference Locations

Assembly and Installation: Please refer to Seal-Lok Assembly located within the Assembly/Installation of this catalog.

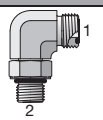
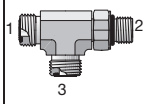
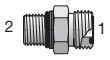
Dynamic Pressure Ratings: Please refer to the last column of the part number tables located on the following pages of this section for the appropriate dynamic pressure ratings.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

How to order examples

To order Seal-Lok UPTC, a couple key changes must be made to the standard Seal-Lok nomenclature:

1. "UR" must be inserted after the tube and port end sizes. This is the UPTC series callout.
2. A binary code is used to identify which fitting ends receive the UPTC subassembly. Specifically, a "1" denotes a UPTC end and a "0" denotes the standard ORFS or port end.

Base Seal-Lok Part		UPTC Part #	Explanation
	8 C5OLO-S	**8UR10 C5OLO-S**	Uniform size, UPTC subassembly on 1st end only
	8-10 C5OLO-S	**8-10UR10 C5OLO-S**	Jump size, UPTC subassembly on 1st end only
	8 R5OLO-S	**8UR101 R5OLO-S**	Uniform size, UPTC subassembly on 1st and 3rd end
	8-10-8 R5OLO-S	**8-10-8UR001 R5OLO-S**	Jump size, UPTC subassembly on 3rd end only
	8-10-8 R5OLO-S	**8-10-8UR100 R5OLO-S**	Jump size, UPTC subassembly on 1st end only
	8M14F87OMLOS	**8M14UR10F87OMLOS**	Compressed nomenclature, UPTC subassembly on 1st end only

The Parker Advantage

Trap Seal™: The patented trapezoidal seal of the Seal-Lok tube end allows for maximum O-ring retention in the CORG groove. This advantage over the competition increases the productivity of assembly as well as offers the maximum assurance for a leak free connection. Ultimately, operational and maintenance costs can be avoided.

Resistance to over-torque: The minimum requirement for a Seal-Lok connection is to withstand 200% torque above the rated value. This reduces the frequency of metal distortion and the potential of leaks. Seal-Lok reduces production assembly and maintenance costs by its resistance to over-torque.

Zero clearance: The flat face of Seal-Lok allow maintenance for easy and fast drop-in installation. This reduces rework costs from a design and assembly perspective.

High pressure rating: Seal-Lok offers a high pressure rating which can be used in a wide range of applications. This provides the opportunity to standardize across multiple product lines, saving procurement and inventory costs.

Superior Plating: Parker's Seal-Lok steel fittings come standard with ToughShield™ Plus zinc-nickel plating, giving them unmatched protection against red rust. In ASTM B117 / ISO 9227 neutral salt spray testing, fittings and adapters with ToughShield Plus plating remained rust free for up to 3,000 hours. This performance far exceeds the SAE industry requirement, even on post plating deformed parts like crimp nuts and back-up washers where SAE allows for large exceptions. Learn more and see the difference at toughshield.com.

Robust Port Stud: The adjustable port stud is manufactured with a longer locknut designed to cover the uppermost threads. Since the backup washer is never exposed to the upper threads, it cannot be damaged during assembly. During assembly, exposed upper threads, which are common with fittings from other fitting manufacturers, can lead to a deformed backup washer that can pinch the o-ring and create an o-ring extrusion gap that has the potential to leak. The longer locknut also provides a greater grip area for the wrench for easier assembly.

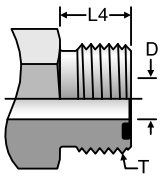
Unlimited reusability: When a Seal-Lok connection is completely assembled and disassembled, very little metal is distorting in the connection. Therefore, Seal-Lok allows for unlimited reusability in the field, reducing the component replacement and maintenance costs of the connection.

Universal Push to Connect (UPTC): Parker's UPTC offers a quick and easy way to assemble Seal-Lok configurations. UPTC is ideal for hard to reach applications or to speed up the process of assembly. The tangible operational and maintenance costs associated with each connection made will be reduced when using UPTC.

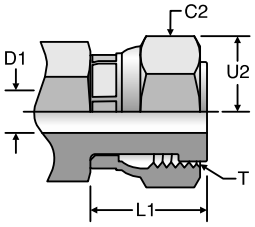
Dimensions and pressures for reference only, subject to change.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

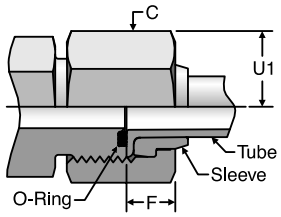
Seal-Lok O-Ring Face Seal Tube Ends



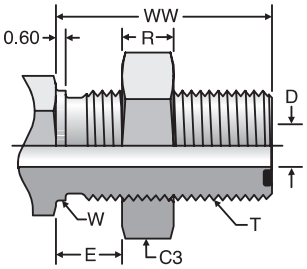
Seal-Lok Male Tube End



Seal-Lok Female Swivel



Seal-Lok Tube End Assembly



Seal-Lok Bulkhead

TABLE OF CONTENTS
VISUAL INDEX

															Bulkhead			Across Corners	
			Thread	Tube Nut Hex		Swivel Nut Hex		Bulhkead Locknut Hex		Nominal Drill Tube End	Nominal Drill Swivel End	Max Bulkhead Thickness	Tube Nut Assembled Allowance	Swivel Turn Back	Male Turn Back	Locknut Thickness	Pilot Dia	Length	Tube Nut Hex	Swivel Nut Hex
SAE Dash Size	**Tube O.D.**		**T**	**C**		**C2**		**C3**		**D[1)]**	**D1[1)]**	**E**	**Ref. F**	**L1**	**L4**	**R**	**W[2)]**	**WW**	**U1**	**U2**
	(in.)	(mm)	UN/UNF	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
4	1/4	6	9/16-18	11/16	17	11/16	17	13/16	22	0.177	0.157	0.55	0.270	0.650	0.394	0.27	0.563	1.24	0.80	0.80
6	3/8	8 10	11/16-16	13/16	22	13/16	22	1	27	0.256	0.256	0.55	0.340	0.715	0.443	0.32	0.688	1.34	0.94	0.94
8	1/2	12	13/16-16	15/16	24	15/16	24	1 1/8	30	0.374	0.354	0.55	0.400	0.865	0.512	0.35	0.813	1.44	1.08	1.08
10	5/8	14 15 16	1-14	1 1/8	30	1 1/8	30	1 5/16	36	0.492	0.453	0.55	0.455	0.980	0.610	0.41	1.000	1.60	1.30	1.30
12	3/4	18 20	1 3/16-12	1 3/8	36	1 3/8	36	1 1/2	41	0.610	0.551	0.55	0.510	1.110	0.677	0.41	1.188	1.64	1.58	1.58
14	7/8	—	1 5/16-12	1 1/2		1 1/2		1 5/8		0.709	0.709	0.55	0.512	1.145	0.697	0.41	1.313	1.66	1.74	1.74
16	1	22 25	1 7/16-12	1 5/8	41	1 5/8	41	1 3/4	46	0.807	0.787	0.55	0.596	1.190	0.697	0.41	1.438	1.66	1.88	1.88
20	1 1/4	28 30 32	1 11/16-12	1 7/8	50	1 7/8	50	2	50	1.024	1.024	0.55	0.566	1.251	0.697	0.41	1.688	1.66	2.16	2.12
24	1 1/2	35 38	2-12	2 1/4	60	2 1/4	60	2 3/8	60	1.260	1.260	0.55	0.545	1.330	0.697	0.41	2.000	1.66	2.60	2.60
32	2	42 50	2 1/2-12	2 7/8		2 7/8		2 3/4		1.772	1.732	0.50	0.606	1.690	0.874	0.55	2.500	1.83	3.32	3.32

1) D and D1 nominal may vary from the values shown in the chart by 0.004 to 0.008. Contact the Tube Fittings Division if there are any questions.

2) Recommended clearance hole = W + 0.015.

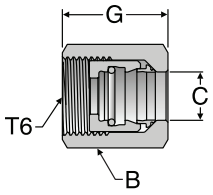
3) See page M4 for ORFS O-rings.

4) Note: For port and stud end dimensions reference section F: Pipe Fittings and Port Adapters.

Dimensions and pressures for reference only, subject to change.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

TLFA
FastSeal



TUBE FITTING PART #	TUBE OD (in)	T6 UN/UNF - 2B	B Hex (in)	C (in)	G (in)	Dynamic Pressure (psi)* Tube Wall OD (in)				
						0.035	0.049	0.065	0.083	0.095
4 TLFA-S	1/4	9/16-18	11/16	0.25	0.95	3,350	5,150	-	-	-
6 TLFA-S	3/8	11/16-16	13/16	0.38	1.04	-	3,300	4,500	-	-
8 TLFA-S	1/2	13/16-16	15/16	0.50	1.10	-	2,400	3,250	4,300	-
12 TLFA-S	3/4	1 3/16-12	1 3/8	0.75	1.29	-	-	2,100	2,750	3,150

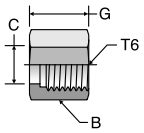
*NOTE: Pressure rating is based on tube wall OD for Carbon Steel Material. Consult Factory For Walls Outside Listed Range

Please see the Assembly and Installation section for FastSeal Assembly instructions and refer to the equipment section for FastSeal assembly tools.

Parker's patent-pending FastSeal creates quick leak-free permanent ORFS tube end connections with just a wrench. Get more details on this new technology now.

BL
Tube Nut
ORFS

SAE 520110



TUBE FITTING PART #	END SIZE (in.)	T6 UNF/UNF-2B	B HEX (in.)	C (in.)	G (in.)	Material -S	Material -SS
4 BL	1/4	9/16 - 18	11/16	0.410	0.59	•	•
5 BL	5/16	5/8 - 18	3/4	0.470	0.63	•	•
6 BL	3/8	11/16 - 16	13/16	0.530	0.67	•	•
8 BL	1/2	13/16 - 16	15/16	0.650	0.79	•	•
10 BL	5/8	1 - 14	1 1/8	0.830	0.94	•	•
12 BL	3/4	1 3/16 - 12	1 3/8	0.950	1.04	•	•
12-14 BL	7/8	1 3/16 - 12	1 3/8	0.990	1.20	•	•
14 BL	7/8	1 5/16 - 12	1 1/2	1.075	1.04	•	•
16 BL	1	1 7/16 - 12	1 5/8	1.150	1.08	•	•
20 BL	1 1/4	1 11/16 - 12	1 7/8	1.420	1.08	•	•
24 BL	1 1/2	2 - 12	2 1/4	1.730	1.08	•	•
32 BL	2	2 1/2 - 12	2 7/8	2.220	1.30	•	•

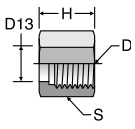
** These tube nuts should not be exposed to annealing temperatures, such as furnace brazing. Contact the Tube Fittings Division for information on special nuts.

• Stainless steel tube nuts are prelubricated for ease of assembly.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

BML
Tube Nut – mm Hex
ORFS

ISO 8434-3 NA
SAE 52M0110A



TUBE FITTING PART #	END SIZE (mm)	END SIZE (in.)	D THREAD UN/UNF-2B	D13 DRILL (mm)	H (mm)	S HEX (mm)	Material S
4BML	6	1/4	9/16 - 18	10.50	15.0	17	•
6BML	8,10	3/8	11/16 - 16	13.55	17.5	22	•
8BML	12	1/2	13/16 - 16	16.60	20.0	24	•
10BML	14,15,16	5/8	1 - 14	21.10	24.0	30	•
12BML	18,20	3/4	1 3/16 - 12	24.15	26.5	36	•
16BML	22,25	1	1 7/16 - 12	29.10	27.5	41	•
20BML	28,30,32	1 1/4	1 11/16 - 12	36.00	27.5	50	•
24BML	35,38	1 1/2	2 - 12	44.00	27.5	60	•

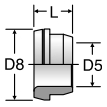
WARNING: This product can expose you to chemicals including Lead and Lead Compounds which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

TPLS (Metric)

Parflange Sleeve for Metric Tubing ORFS Mechanically Attachable Sleeve



TUBE FITTING PART #	USED WITH FITTING SIZE	D5 END SIZE (mm)	D8 DIA (mm)	L (mm)	Material S
TPLS6	-4	6	12.75	7.5	•
TPLS8	-6	8	15.75	8.5	•
TPLS10	-6	10	15.75	8.5	•
TPLS12	-8	12	18.90	10.5	•
TPLS14	-10	14	23.50	10.5	•
TPLS15	-10	15	23.50	10.5	•
TPLS16	-10	16	23.50	10.5	•
TPLS18	-12	18	27.80	12.0	•
TPLS20	-12	20	27.80	12.0	•
TPLS25	-16	25	34.00	13.5	•
TPLS30	-20	30	40.50	13.0	•
TPLS32	-20	32	40.50	13.0	•
TPLS35	-24	35	48.50	12.5	•
TPLS38	-24	38	48.50	12.5	•

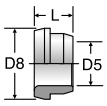
• Must be mechanically attached using Parflange system.

• Additional -S not required, TPLS6 is complete part number.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

TPL (Inch)

Parflange Sleeve for Inch Tubing ORFS Mechanically Attachable Sleeve



TUBE FITTING PART #	D5 END SIZE (in.)	D8 DIA (in.)	L (in.)	Material -S
4 TPL	1/4	0.50	0.30	•
6 TPL	3/8	0.62	0.34	•
8 TPL	1/2	0.74	0.42	•
10 TPL	5/8	0.92	0.42	•
12 TPL	3/4	1.09	0.47	•
16 TPL	1	1.34	0.53	•
20 TPL	1 1/4	1.59	0.51	•
24 TPL	1 1/2	1.91	0.49	•

• Must be mechanically attached using Parflange system.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Dimensions and pressures for reference only, subject to change.

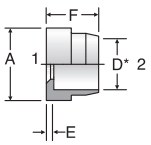
See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

TL (Inch)

Braze Sleeve for Inch Tubing
ORFS Silver Braze Sleeve Reducer



SAE 520115

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	A (in.)	D* (in.)	E (in.)	F (in.)	Material -S	Material -SS
4 TL	1/4		0.50	0.26	0.04	0.37	•	•
6 TL	3/8		0.62	0.38	0.04	0.37	•	•
6-4 TL	3/8	1/4	0.62	0.26	0.08	0.41	•	•
8 TL	1/2		0.75	0.51	0.04	0.37	•	•
8-4 TL	1/2	1/4	0.75	0.26	0.14	0.47	•	•
8-6 TL	1/2	3/8	0.75	0.38	0.14	0.47	•	•
10 TL	5/8		0.92	0.63	0.06	0.41	•	•
10-4 TL	5/8	1/4	0.92	0.26	0.20	0.53	•	•
10-6 TL	5/8	3/8	0.92	0.38	0.20	0.53	•	•
10-8 TL	5/8	1/2	0.92	0.51	0.20	0.53	•	•
12 TL	3/4		1.10	0.76	0.06	0.55	•	•
12-4 TL	3/4	1/4	1.10	0.26	0.24	0.57	•	•
12-6 TL	3/4	3/8	1.10	0.38	0.24	0.57	•	•
12-8 TL	3/4	1/2	1.10	0.51	0.24	0.57	•	•
12-10 TL	3/4	5/8	1.10	0.63	0.22	0.57	•	•
12-14 TL**	3/4	7/8	1.10	0.88	0.06	0.65	•	•
14 TL***	7/8		1.22	0.88	0.06	0.55	•	•
16 TL	1		1.35	1.01	0.06	0.61	•	•
16-8 TL	1	1/2	1.35	0.51	0.28	0.61	•	•
16-10 TL	1	5/8	1.35	0.63	0.26	0.61	•	•
16-12 TL	1	3/4	1.35	0.76	0.18	0.67	•	•
16-14 TL	1	7/8	1.35	0.88	0.18	0.67	•	•
20 TL	1 1/4		1.60	1.26	0.06	0.61	•	•
20-12 TL	1 1/4	3/4	1.60	0.76	0.28	0.77	•	•
20-16 TL	1 1/4	1	1.60	1.01	0.28	0.83	•	•
24 TL	1 1/2		1.91	1.51	0.06	0.61	•	•
24-16 TL	1 1/2	1	1.91	1.01	0.28	0.83	•	•
24-20 TL	1 1/2	1 1/4	1.91	1.26	0.28	0.83	•	•
32 TL	2		2.41	2.01	0.06	0.65	•	•

Unplated part, oil dipped for corrosion protection.

* D is for silver brazing.

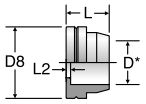
** 12-14 TL must be assembled with 12-14 BL.

• Uses SBR silver braze rings

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

TLS (Metric)

Braze Sleeve for Metric Tubing
ORFS Silver Braze Sleeve



ISO 8434-3 BRSL
SAE 5201M15

TUBE FITTING PART #	USED WITH FITTING SIZE	D* END SIZE (mm)	D8 DIA (mm)	L (mm)	L2 (mm)	Material S	Material SS
TLS6	-4	6	12.8	9.5	1.0	•	•
TLS8**	-6	8	15.8	9.5	1.0	•	•
TLS10	-6	10	15.8	9.5	1.0	•	•
TLS12	-8	12	18.9	9.5	1.0	•	•
TLS16	-10	16	23.5	10.5	1.5	•	•
TLS20	-12	20	27.9	14.0	1.5	•	•
TLS25	-16	25	34.2	15.5	1.5	•	•
TLS30	-20	30	40.6	15.5	1.5	•	•
TLS38	-24	38	48.5	15.5	1.5	•	•

Unplated part, oil dipped for corrosion protection.

* D is for silver brazing.

• Uses SBR (metric) silver braze rings

• Stainless steel part number example: TLSS10

**Different from SAE

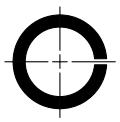
WARNING: This product can expose you to chemicals including Lead and Lead Compounds which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

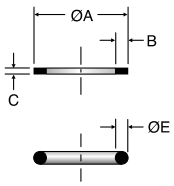
Click here for CADs, Support Resources or to Configure Parts Online

SBR (Inch)

Silver Braze Ring for Inch Tubing



TUBE FITTING PART #	END SIZE (in.)	A DIA (in.)	B (in.)	C (in.)	E (in.)
4 SBR	1/4	0.260	—	—	0.05
6 SBR	3/8	0.390	0.07	0.03	—
8 SBR	1/2	0.515	0.07	0.03	—
10 SBR	5/8	0.640	0.07	0.03	—
12 SBR	3/4	0.765	0.08	0.04	—
14 SBR	7/8	0.890	—	—	0.06
16 SBR	1	1.015	0.08	0.04	—
20 SBR	1 1/4	1.265	0.08	0.04	—
24 SBR	1 1/2	1.515	0.08	0.04	—
32 SBR	2	2.015	—	—	0.09



SBR recommended for steel or copper tubing. -S not required.

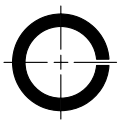
SBR-SS recommended for stainless tubing, but can be used on steel tubing.

Contact the Tube Fittings Division for braze rings used in marine or special applications.

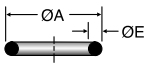
WARNING: This product can expose you to chemicals including Cadmium which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov.

SBR (Metric)

Silver Braze Ring for MetricTubing



TUBE FITTING PART #	END SIZE (mm)	A DIA (mm)	E (mm)
SBR 6mm	6	6.4	1.2
SBR 8mm	8	8.4	1.2
SBR 10mm	10	10.4	1.2
SBR 12mm	12	12.4	1.2
SBR 16mm	16	16.4	1.2
SBR 20mm	20	20.4	1.6
SBR 25mm	25	25.4	1.6
SBR 30mm	30	30.4	1.6
SBR 38mm	38	38.4	1.6



SBR recommended for steel or copper tubing.

SBR-SS recommended for stainless tubing, but can be used on steel tubing.

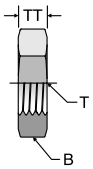
Contact the Tube Fittings Division for braze rings used in marine or special applications.

WARNING: This product can expose you to chemicals including Cadmium 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.

WLNL

Bulkhead Locknut

SAE 520118



TUBE FITTING PART #	END SIZE (in.)	T TUBE END UN/UNF-2A	B HEX (in.)	TT (in.)	Material -S
4 WLNL	1/4	9/16 - 18	13/16	0.27	•
6 WLNL	3/8	11/16 - 16	1	0.31	•
8 WLNL	1/2	13/16 - 16	1 1/8	0.35	•
10 WLNL	5/8	1 - 14	1 5/16	0.41	•
12 WLNL	3/4	1 3/16 - 12	1 1/2	0.41	•
14 WLNL*	7/8	1 5/16 - 12	1 5/8	0.41	•
16 WLNL	1	1 7/16 - 12	1 3/4	0.41	•
20 WLNL	1 1/4	1 11/16 - 12	2	0.41	•
24 WLNL	1 1/2	2 - 12	2 3/8	0.41	•

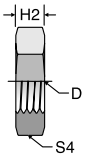
* Size 14 is not included in SAE J1453.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

WLNML

Bulkhead Locknut – mm Hex

ISO 8434-3 BHLN
SAE 52M0118



TUBE FITTING PART #	END SIZE (mm)	END SIZE (in.)	D TUBE END UN/UNF-2B	H2 (mm)	S4 HEX (mm)	Material S
4WLNML	6	1/4	9/16 - 18	7.0	22	•
6WLNML	8,10	3/8	11/16 - 16	8.0	27	•
8WLNML	12	1/2	13/16 - 16	9.0	30	•
10WLNML	14,15,16	5/8	1 - 14	10.5	36	•
12WLNML	18,20	3/4	1 3/16 - 12	10.5	41	•
16WLNML	22,25	1	1 7/16 - 12	10.5	46	•
20WLNML	28,30,32	1 1/4	1 11/16 - 12	10.5	50	•
24WLNML	35,38	1 1/2	2 - 12	10.5	60	•

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Dimensions and pressures for reference only, subject to change.

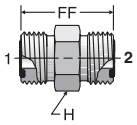
See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

HLO

Union
ORFS / ORFS



SAE 520101

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	FF (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 HLO	1/4	1/4	1.08	5/8	9.2	9.2
6 HLO	3/8	3/8	1.22	3/4	9.2	9.2
6-4 HLO	3/8	1/4	1.18	3/4	9.2	9.2
8 HLO	1/2	1/2	1.40	7/8	9.2	9.2
8-6 HLO	1/2	3/8	1.32	7/8	9.2	9.2
10 HLO	5/8	5/8	1.67	1 1/16	6.0	6.0
10-8 HLO	5/8	1/2	1.57	1 1/16	6.0	6.0
12 HLO	3/4	3/4	1.85	1 1/4	6.0	6.0
12-8 HLO	3/4	1/2	1.69	1 1/4	6.0	6.0
12-10 HLO	3/4	5/8	1.79	1 1/4	6.0	6.0
16 HLO	1	1	1.95	1 1/2	6.0	6.0
16-12 HLO	1	3/4	1.93	1 1/2	6.0	6.0
20 HLO	1 1/4	1 1/4	2.03	1 3/4	6.0	6.0
20-16 HLO	1 1/4	1	2.03	1 3/4	6.0	6.0
24 HLO	1 1/2	1 1/2	2.09	2 1/8	5.0	5.0
32 HLO*	2	2	2.48	2 3/4	3.0	3.0

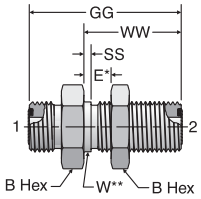
* Hex different from SAE

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

WLO

Bulkhead Union
ORFS / ORFS

SAE 520601
WLO-WLNL Body with Locknut
(See page A12 for WLNL)



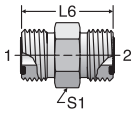
TUBE FITTING PART #	END SIZE (in.)	B HEX (in.)	E MAX (in.)	GG (in.)	SS	W DIA (in.)	WW (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 WLO	1/4	13/16	0.55	1.90	0.06	0.56	1.24	9.2	9.2
6 WLO	3/8	1	0.55	2.09	0.06	0.69	1.34	9.2	9.2
8 WLO	1/2	1 1/8	0.55	2.30	0.06	0.81	1.44	9.2	9.2
10 WLO	5/8	1 5/16	0.55	2.62	0.06	1.00	1.59	6.0	6.0
12 WLO	3/4	1 1/2	0.55	2.72	0.06	1.19	1.63	6.0	6.0
16 WLO	1	1 3/4	0.55	2.76	0.06	1.44	1.65	6.0	6.0
20 WLO	1 1/4	2	0.55	2.76	0.06	1.69	1.65	6.0	6.0
24 WLO	1 1/2	2 3/8	0.55	2.76	0.06	2.00	1.65	5.0	5.0

** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

HMLO

Union – mm Hex
ORFS / ORFS



ISO 8434-3 S
SAE 52M0101

TUBE FITTING PART #	END SIZE 1 & 2 (mm)	END SIZE 1 & 2 (in.)	L6 (mm)	S1 HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4HMLO	6	1/4	27.5	17	9.2	9.2
6HMLO	8,10	3/8	31.0	19	9.2	9.2
8HMLO	12	1/2	35.5	22	9.2	9.2
10HMLO	14,15,16	5/8	42.5	27	6.0	6.0
12HMLO	18,20	3/4	47.0	32	6.0	6.0
16HMLO	22,25	1	49.5	41	6.0	6.0
20HMLO	28,30,32	1 1/4	51.5	46	6.0	6.0
24HMLO	35,38	1 1/2	53.0	55	5.0	5.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

Dimensions and pressures for reference only, subject to change.

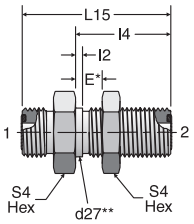
See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

WMLO

Bulkhead Union – mm Hex
ORFS / ORFS

ISO 8434-3 BHS
SAE 52M0601
WMLO-WLNML - Body with Locknut
(See page A12 for WLNML)



TUBE FITTING PART #	END SIZE 1 & 2 (mm)	END SIZE 1 & 2 (in.)	d27** (mm)	E (mm)	I4 (mm)	I2 (mm)	L15 (mm)	S4 HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4WMLO	6	1/4	14.3	14	31.5	1.5	48.0	22	9.2	9.2
6WMLO	8,10	3/8	17.5	14	34.0	1.5	53.0	27	9.2	9.2
8WMLO	12	1/2	20.6	14	36.5	1.5	58.5	30	9.2	9.2
10WMLO	14,15,16	5/8	25.4	14	40.5	1.5	66.5	36	6.0	6.0
12WMLO	18,20	3/4	30.2	14	41.5	1.5	69.0	41	6.0	6.0
16WMLO	22,25	1	36.5	14	42.0	1.5	70.0	46	6.0	6.0
20WMLO	28,30,32	1 1/4	42.9	14	42.0	1.5	70.0	50	6.0	6.0
24WMLO	35,38	1 1/2	50.8	14	42.0	1.5	70.0	60	5.0	5.0

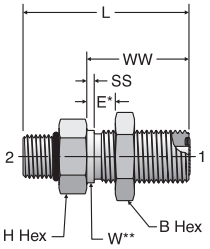
* E – Maximum bulkhead thickness.

**d27 – Bulkhead pilot diameter. Recommended clearance hole is d27 + 0.4 mm

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

WF5OLO

Straight Thread Bulkhead Connector
ORFS / SAE-ORB
WF5OLO-WLNL - Body with Locknut
(See page A12 for WLNL)



TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	B HEX (in.)	E MAX (in.)	H HEX (in.)	L (in.)	SS (in.)	W DIA (in.)	WW (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 WF5OLO	1/4	7/16 - 20	13/16	0.55	13/16	2.14	0.06	0.56	1.24	9.2	9.2
6 WF5OLO	3/8	9/16 - 18	1	0.55	1	2.31	0.06	0.69	1.34	9.2	9.2
8 WF5OLO	1/2	3/4 - 16	1 1/8	0.55	1 1/8	2.60	0.06	0.81	1.44	9.2	9.2
10 WF5OLO	5/8	7/8 - 14	1 5/16	0.55	1 5/16	2.69	0.06	1.00	1.59	6.0	6.0
12 WF5OLO	3/4	1 1/16 - 12	1 1/2	0.55	1 1/2	2.89	0.06	1.19	1.63	6.0	6.0
16 WF5OLO	1	1 5/16 - 12	1 3/4	0.55	1 3/4	2.95	0.06	1.44	1.65	6.0	6.0

* E – Maximum bulkhead thickness.

** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

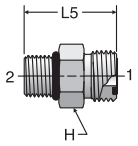
TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

F5OLO

Straight Thread Connector
ORFS / SAE-ORB



SAE 520120

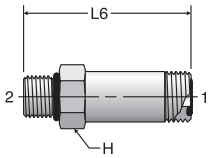
TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	H HEX (in.)	L5 (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 F5OLO	1/4	7/16 - 20	5/8	1.13	9.2	9.2
4-5 F5OLO*	1/4	1/2 - 20	5/8	1.16	9.2	9.2
4-6 F5OLO	1/4	9/16 - 18	3/4	1.20	9.2	9.2
4-8 F5OLO	1/4	3/4 - 16	7/8	1.32	9.2	9.2
6 F5OLO	3/8	9/16 - 18	3/4	1.26	9.2	9.2
6-4 F5OLO	3/8	7/16 - 20	3/4	1.34	9.2	9.2
6-5 F5OLO	3/8	1/2 - 20	3/4	1.22	9.2	9.2
6-8 F5OLO	3/8	3/4 - 16	7/8	1.38	9.2	9.2
6-10 F5OLO	3/8	7/8 - 14	1	1.52	6.0	6.0
6-12 F5OLO	3/8	1 1/16 - 12	1 1/4	1.67	6.0	6.0
8 F5OLO	1/2	3/4 - 16	7/8	1.44	9.2	9.2
8-4 F5OLO	1/2	7/16 - 20	7/8	1.44	9.2	9.2
8-6 F5OLO	1/2	9/16 - 18	7/8	1.48	9.2	9.2
8-10 F5OLO	1/2	7/8 - 14	1	1.59	6.0	6.0
8-12 F5OLO	1/2	1 1/16 - 12	1 1/4	1.75	6.0	6.0
8-16 F5OLO	1/2	1 5/16 - 12	1 1/2	1.79	6.0	6.0
10 F5OLO	5/8	7/8 - 14	1 1/16	1.69	6.0	6.0
10-6 F5OLO	5/8	9/16 - 18	1 1/16	1.63	6.0	6.0
10-8 F5OLO	5/8	3/4 - 16	1 1/16	1.77	6.0	6.0
10-12 F5OLO	5/8	1 1/16 - 12	1 1/4	1.85	6.0	6.0
10-16 F5OLO	5/8	1 5/16 - 12	1 1/2	1.89	6.0	6.0
12 F5OLO	3/4	1 1/16 - 12	1 1/4	1.91	6.0	6.0
12-6 F5OLO	3/4	9/16 - 16	1 1/4	1.77	6.0	6.0
12-8 F5OLO	3/4	3/4 - 16	1 1/4	1.91	6.0	6.0
12-10 F5OLO	3/4	7/8 - 14	1 1/4	1.99	6.0	6.0
12-16 F5OLO	3/4	1 5/16 - 12	1 1/2	1.95	6.0	6.0
14 F5OLO*	7/8	1 3/16 - 12	1 3/8	1.91	3.0	3.0
16 F5OLO	1	1 5/16 - 12	1 1/2	1.97	6.0	6.0
16-8 F5OLO	1	3/4 - 16	1 1/2	1.96	6.0	6.0
16-10 F5OLO	1	7/8 - 14	1 1/2	2.05	6.0	6.0
16-12 F5OLO	1	1 1/16 - 12	1 1/2	2.15	6.0	6.0
16-20 F5OLO	1	1 5/8 - 12	1 7/8	2.07	6.0	6.0
16-24 F5OLO	1	1 7/8 - 12	2 1/8	2.13	5.0	5.0
20 F5OLO	1 1/4	1 5/8 - 12	1 7/8	2.07	6.0	6.0
20-16 F5OLO	1 1/4	1 5/16 - 12	1 7/8	2.28	6.0	6.0
20-24 F5OLO	1 1/4	1 7/8 - 12	2 1/8	2.13	5.0	5.0
24 F5OLO	1 1/2	1 7/8 - 12	2 1/8	2.13	5.0	5.0
24-20 F5OLO	1 1/2	1 5/8 - 12	2 1/8	2.34	5.0	5.0
32 F5OLO*	2	2 1/2 - 12	2 3/4	2.32	3.0	3.0

*Different from SAE

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

FF5OLO

Long Straight Thread Connector
ORFS-Long / SAE-ORB



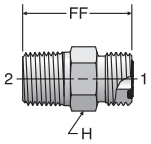
SAE 521720 (previously 520122)

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	H HEX (in.)	L6 (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 FF5OLO	1/4	7/16 - 20	5/8	2.07	9.2	9.2
6 FF5OLO	3/8	9/16 - 18	3/4	2.27	9.2	9.2
6-4 FF5OLO	3/8	7/16 - 20	3/4	2.39	9.2	9.2
8 FF5OLO	1/2	3/4 - 16	7/8	2.67	9.2	9.2
10 FF5OLO	5/8	7/8 - 14	1 1/16	3.14	6.0	6.0
12 FF5OLO	3/4	1 1/16 12	1 1/4	3.76	6.0	6.0
16 FF5OLO	1	1 5/16 - 12	1 1/2	4.14	6.0	6.0
20 FF5OLO	1 1/4	1 5/8 - 12	1 7/8	4.76	6.0	6.0
24 FF5OLO	1 1/2	1 7/8 - 12	2 1/8	5.26	5.0	5.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

FLO

Male Pipe Connector
ORFS / NPTF



TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	FF (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 FLO	1/4	1/8 - 27	1.07	5/8	6.0	6.0
4-4 FLO	1/4	1/4 - 18	1.26	5/8	6.0	6.0
4-6 FLO	1/4	3/8 - 18	1.32	3/4	6.0	6.0
4-8 FLO	1/4	1/2 - 14	1.52	7/8	6.0	6.0
6 FLO	3/8	1/4 - 18	1.25	3/4	6.0	6.0
6-2 FLO	3/8	1/8 - 27	1.16	3/4	6.0	6.0
6-6 FLO	3/8	3/8 - 18	1.34	3/4	6.0	6.0
6-8 FLO	3/8	1/2 - 14	1.55	7/8	6.0	6.0
8 FLO	1/2	3/8 - 18	1.48	7/8	6.0	6.0
8-4 FLO	1/2	1/4 - 18	1.48	7/8	6.0	6.0
8-8 FLO	1/2	1/2 - 14	1.64	7/8	6.0	6.0
8-12 FLO	1/2	3/4 - 14	1.69	1 1/8	6.0	6.0
10 FLO	5/8	1/2 - 14	1.82	1 1/16	6.0	6.0
10-12 FLO	5/8	3/4 - 14	1.82	1 1/8	5.5	5.5
12 FLO	3/4	3/4 - 14	1.93	1 1/4	5.5	5.5
12-8 FLO	3/4	1/2 - 14	1.93	1 1/4	6.0	6.0
12-16 FLO	3/4	1 - 11 1/2	2.13	1 3/8	4.5	4.5
16 FLO	1	1 - 11 1/2	2.19	1 1/2	4.5	4.5
16-12 FLO	1	3/4 - 14	2.00	1 1/2	5.5	5.5
16-20 FLO	1	1 1/4 - 11 1/2	2.30	1 3/4	3.0	3.0
20 FLO	1 1/4	1 1/4 - 11 1/2	2.30	1 7/8	3.0	3.0
20-12 FLO	1 1/4	3/4 - 14	2.02	1 7/8	5.5	5.5
20-16 FLO	1 1/4	1 - 11 1/2	2.27	1 7/8	4.5	4.5
24 FLO	1 1/2	1 1/2 - 11 1/2	2.40	2 1/8	3.0	3.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

Dimensions and pressures for reference only, subject to change.

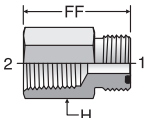
See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

GLO

Female NPT
ORFS / Female Pipe

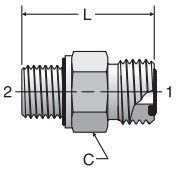


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	FF (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 GLO	1/4	1/8 - 27	1.03	5/8	6.0	6.0
4-4 GLO	1/4	1/4 - 18	1.25	3/4	6.0	6.0
6 GLO	3/8	1/4 - 18	1.30	3/4	6.0	6.0
6-6 GLO	3/8	3/8 - 18	1.34	7/8	6.0	6.0
8 GLO	1/2	3/8 - 18	1.34	7/8	6.0	6.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

F42EDMLO

Male Connector – BSPP
(for ISO 1179-1 Port)
ORFS / BSPP-ED



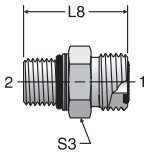
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 BSPP	C HEX (mm)	L (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4F42EDMLO	6	1/4	1/8 - 28	17	25.7	9.2	9.2
4-4F42EDMLO	6	1/4	1/4 - 19	19	30.5	9.2	9.2
4-6F42EDMLO	6	1/4	3/8 - 19	22	31.6	9.2	9.2
4-8F42EDMLO	6	1/4	1/2 - 14	27	35.4	6.0	6.0
6F42EDMLO	8,10	3/8	1/4 - 19	19	31.9	9.2	9.2
6-2F42EDMLO	8,10	3/8	1/8 - 28	19	31.1	9.2	9.2
6-6F42EDMLO	8,10	3/8	3/8 - 19	22	33.0	9.2	9.2
6-8F42EDMLO	8,10	3/8	1/2 - 14	27	36.5	6.0	6.0
6-12F42EDMLO	8,10	3/8	3/4 - 14	32	40.3	6.0	6.0
8F42EDMLO	12	1/2	3/8 - 19	22	34.6	9.2	9.2
8-4F42EDMLO	12	1/2	1/4 - 19	22	37.5	9.2	9.2
8-8F42EDMLO	12	1/2	1/2 - 14	27	38.4	6.0	6.0
8-12F42EDMLO	12	1/2	3/4 - 14	32	41.9	6.0	6.0
10F42EDMLO	14,15,16	5/8	1/2 - 14	27	41.1	6.0	6.0
10-6F42EDMLO	14,15,16	5/8	3/8 - 19	27	42.4	6.0	6.0
10-12F42EDMLO	14,15,16	5/8	3/4 - 14	32	44.3	6.0	6.0
12F42EDMLO	18,20	3/4	3/4 - 14	32	46.1	6.0	6.0
12-8F42EDMLO	18,20	3/4	1/2 - 14	32	48.5	6.0	6.0
12-16F42EDMLO	18,20	3/4	1 - 11	41	47.5	6.0	6.0
12-20F42EDMLO	18,20	3/4	1 1/4 - 11	50	53.0	6.0	6.0
16F42EDMLO	22,25	1	1 - 11	41	49.8	6.0	6.0
16-12F42EDMLO	22,25	1	3/4 - 14	38	50.3	6.0	6.0
16-20F42EDMLO	22,25	1	1 1/4 - 11	50	53.8	6.0	6.0
16-24F42EDMLO	22,25	1	1 1/2 - 11	55	57.5	5.0	5.0
20F42EDMLO	28,30,32	1 1/4	1 1/4 - 11	50	53.8	6.0	6.0
20-16F42EDMLO	28,30,32	1 1/4	1 - 11	48	55.9	6.0	6.0
20-24F42EDMLO	28,30,32	1 1/4	1 1/2 - 11	55	57.6	5.0	5.0
24F42EDMLO	38	1 1/2	1 1/2 - 11	55	57.6	5.0	5.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

F87OMLO

Metric Straight Thread Connector
ORFS / ISO 6149

ISO 8434-3 SDS
SAE 52M0187

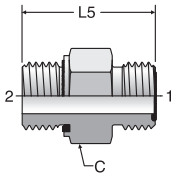


TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 ISO 261	L8 (mm)	S3 HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4M12F87OMLO	6	1/4	M12X1.5	28.5	17	9.2	9.2
4M14F87OMLO	6	1/4	M14X1.5	29.5	19	9.2	9.2
6M12F87OMLO	8,10	3/8	M12X1.5	32.0	22	9.2	9.2
6M14F87OMLO	8,10	3/8	M14X1.5	32.0	22	9.2	9.2
6M16F87OMLO	8,10	3/8	M16X1.5	33.5	22	9.2	9.2
6M18F87OMLO	8,10	3/8	M18X1.5	36.1	24	9.2	9.2
8M14F87OMLO	12	1/2	M14X1.5	35.1	24	9.2	9.2
8M16F87OMLO	12	1/2	M16X1.5	36.6	24	9.2	9.2
8M18F87OMLO	12	1/2	M18X1.5	38.0	24	9.2	9.2
8M22F87OMLO	12	1/2	M22X1.5	39.6	27	6.0	6.0
8M27F87OMLO	12	1/2	M27X2.0	44.2	32	6.0	6.0
10M18F87OMLO	14,15,16	5/8	M18X1.5	41.0	27	6.0	6.0
10M22F87OMLO	14,15,16	5/8	M22X1.5	42.0	27	6.0	6.0
10M27F87OMLO	14,15,16	5/8	M27x2.0	47.0	32	6.0	6.0
12M22F87OMLO	18,20	3/4	M22X1.5	45.0	32	6.0	6.0
12M27F87OMLO	18,20	3/4	M27X2.0	48.5	32	6.0	6.0
12M33F87OMLO	18,20	3/4	M33X2.0	51.5	41	6.0	6.0
16M27F87OMLO	22,26	1	M27X2.0	33.6	41	6.0	6.0
16M33F87OMLO	22,25	1	M33X2.0	52.0	41	6.0	6.0
20M33F87OMLO	28,30,32	1 1/4	M33x2.0	35.1	46	6.0	6.0
20M42F87OMLO	28,30,32	1 1/4	M42X2.0	54.5	50	5.0	5.0
24M48F87OMLO	35,38	1 1/2	M48X2.0	57.0	55	5.0	5.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

F82EDMLO

Male Connector – Metric
(for ISO 9974-1 Port)
ORFS / Metric-ED



TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 Metric	C HEX (mm)	L5 (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4M12F82EDMLO	6	1/4	M12X1.5	17	29.7	9.2	9.2
4M14F82EDMLO	6	1/4	M14X1.5	19	30.5	9.2	9.2
6M14F82EDMLO	8,10	3/8	M14X1.5	19	31.9	9.2	9.2
6M16F82EDMLO	8,10	3/8	M16X1.5	22	31.9	9.2	9.2
8M16F82EDMLO	12	1/2	M16X1.5	22	32.0	9.2	9.2
8M18F82EDMLO	12	1/2	M18X1.5	24	34.6	9.2	9.2
10M22F82EDMLO	14,15,16	5/8	M22X1.5	27	41.1	6.0	6.0
12M22F82EDMLO	18,20	3/4	M22X1.5	32	42.7	6.0	6.0
12M27F82EDMLO	18,20	3/4	M27X2	32	46.1	6.0	6.0
16M33F82EDMLO	22,25	1	M33X2	41	49.8	6.0	6.0
20M42F82EDMLO	28,30,32	1 1/4	M42X2	50	54.0	5.0	5.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

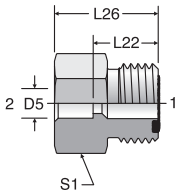
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

MMLOHB3

Braze Connector
ORFS / Braze Socket

ISO 8434-3 BRS
SAE 52M01M04



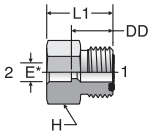
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 (mm)	D5* DIA TUBE SOCKET	L22 (mm)	L26 (mm)	S1 HEX	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4-6MMLOHB3	6	1/4	6	6.15	13.5	22.0	17	9.2	9.2
4-8MMLOHB3	6	1/4	8	8.15	13.5	22.0	17	9.2	9.2
6-10MMLOHB3	8, 10	3/8	10	10.15	14.5	23.0	19	9.2	9.2
8-12MMLOHB3	12	1/2	12	12.15	16.0	24.5	22	9.2	9.2
10-16MMLOHB3	14, 15, 16	5/8	16	16.15	19.0	27.5	27	6.0	6.0
12-20MMLOHB3	18, 20	3/4	20	20.18	21.0	33.5	32	6.0	6.0
16-25MMLOHB3	22, 25	1	25	25.18	24.5	38.5	41	6.0	6.0
20-30MMLOHB3	28, 30, 32	1 1/4	30	30.20	24.5	38.5	46	6.0	6.0
24-38MMLOHB3	35, 38	1 1/2	38	38.20	24.5	38.5	55	5.0	5.0

* D5 is for silver brazing. Standard steel parts are not recommended for welding.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

LOHB3

Braze Connector
ORFS / Braze Socket



SAE 520104

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	DD (in.)	E* DIA (in.)	H HEX (in.)	L1 (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 LOHB3	1/4	1/4	0.53	0.26	5/8	0.86	9.2	9.2
4-6 LOHB3	1/4	3/8	0.53	0.38	5/8	0.86	9.2	9.2
6 LOHB3	3/8	3/8	0.57	0.38	3/4	0.90	9.2	9.2
6-4 LOHB3	3/8	1/4	0.57	0.26	3/4	0.90	9.2	9.2
6-8 LOHB3	3/8	1/2	0.57	0.51	3/4	0.90	9.2	9.2
8 LOHB3	1/2	1/2	0.63	0.51	7/8	0.97	9.2	9.2
8-4 LOHB3**	1/2	1/4	0.64	0.26	7/8	0.97	9.2	9.2
8-6 LOHB3	1/2	3/8	0.63	0.38	7/8	0.97	9.2	9.2
8-10 LOHB3	1/2	5/8	0.63	0.63	7/8	0.97	6.0	6.0
8-12 LOHB3**	1/2	3/4	0.67	0.76	1 1/16	1.16	6.0	6.0
10 LOHB3	5/8	5/8	0.74	0.63	1 1/16	1.07	6.0	6.0
10-6 LOHB3	5/8	3/8	0.74	0.38	1 1/16	1.07	6.0	6.0
10-8 LOHB3	5/8	1/2	0.74	0.51	1 1/16	1.07	6.0	6.0
10-12 LOHB3	5/8	3/4	0.74	0.76	1 1/16	1.23	6.0	6.0
12 LOHB3	3/4	3/4	0.83	0.76	1 1/4	1.32	6.0	6.0
12-8 LOHB3	3/4	1/2	0.83	0.51	1 1/4	1.16	6.0	6.0
12-10 LOHB3	3/4	5/8	0.83	0.63	1 1/4	1.16	6.0	6.0
12-16 LOHB3	3/4	1	0.83	1.01	1 1/2	1.38	6.0	6.0
16 LOHB3	1	1	0.97	1.01	1 1/2	1.52	6.0	6.0
16-8 LOHB3**	1	1/2	0.97	0.51	1 1/2	1.30	6.0	6.0
16-12 LOHB3	1	3/4	0.97	0.76	1 1/2	1.46	6.0	6.0
16-20 LOHB3	1	1 1/4	0.96	1.26	1 3/4	1.52	6.0	6.0
20 LOHB3	1 1/4	1 1/4	0.97	1.26	1 3/4	1.52	6.0	6.0
20-16 LOHB3	1 1/4	1	0.97	1.01	1 3/4	1.52	6.0	6.0
20-24 LOHB3	1 1/4	1 1/2	0.97	1.51	2 1/8	1.52	5.0	5.0
24 LOHB3	1 1/2	1 1/2	0.97	1.51	2 1/8	1.52	5.0	5.0
24-20 LOHB3	1 1/2	1 1/4	0.97	1.26	2 1/8	1.52	5.0	5.0

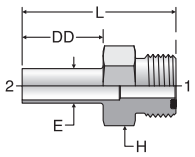
* E is for silver brazing. Standard steel parts are not recommended for welding.

** Size 14 is not included in SAE J1453.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

LOHT3

Tube Stub Connector
ORFS / Tube Weld



TUBE FITTING PART #	END SIZE 1 & 2 (in.)	DD (in.)	E DIA (in.)	H HEX (in.)	L (in.)	Dynamic Pressure (x 1,000 PSI) -SS
4-4X035 LOHT3	1/4	0.88	0.25	5/8	1.58	5.9
6-6X035 LOHT3	3/8	0.88	0.38	3/4	1.67	3.8
8-8X065 LOHT3	1/2	1.00	0.50	7/8	1.89	5.5
12-12X065 LOHT3	3/4	1.16	0.75	1 1/4	2.35	3.5
12-16X065 LOHT3	1	1.13	1.00	1 1/4	2.32	2.6
16-16X065 LOHT3	1	1.13	1.00	1 1/2	2.40	2.6

* Contact Tube Fittings Division for pressure ratings.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

Dimensions and pressures for reference only, subject to change.

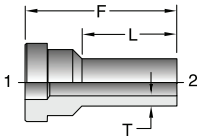
See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

TLW1

Butt Weld
Sleeve

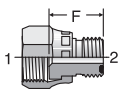


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	F (in.)	L (in.)	T (in.)	Dynamic Pressure (x 1,000 PSI) -SS
4-4X035 TLW1	1/4	1/4	1.20	0.75	0.035	5.9
6-4X035 TLW1	3/8	1/4	1.26	0.75	0.035	5.9
6-4X049 TLW1	3/8	1/4	1.26	0.75	0.049	8.6
6-6X035 TLW1	3/8	3/8	1.20	0.75	0.035	3.8
6-6X049 TLW1	3/8	3/8	1.20	0.75	0.049	5.5
6-6X065 TLW1	3/8	3/8	1.20	0.75	0.065	7.5
8-8X049 TLW1	1/2	1/2	1.20	0.75	0.049	4.0
8-8X065 TLW1	1/2	1/2	1.20	0.75	0.065	5.5
12-12X065 TLW1	3/4	3/4	1.39	0.75	0.065	3.5
12-12X083 TLW1	3/4	3/4	1.39	0.75	0.083	4.6
12-12X095 TLW1	3/4	3/4	1.39	0.75	0.095	5.3
12-8X049 TLW1	3/4	1/2	1.52	0.75	0.049	4.0
16-16X083 TLW1	1	1	1.43	0.75	0.083	3.4
16-16X095 TLW1	1	1	1.43	0.75	0.095	3.9

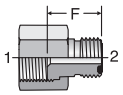
TRLON

Tube End Reducer
ORFS Swivel / ORFS Tube End

SAE 520123 (body only)
SAE 520123A (body with large nut)



* Assembled with Crimp Nut



** Assembled with Large BL Nut

TUBE FITTING PART #			END SIZE		F	Dynamic Pressure (x 1,000 PSI)	
TRLON	TRLON	TRLO					
*One Piece Design (With Crimp Nut)	**Two Piece Design (With Large Nut)	***Body Only (For Two-Piece Design Only)	1 (in.)	2 (in.)	(in.)	-S	-SS
6-4 TRLON	—	—	3/8	1/4	0.77	9.2	9.2
—	8-4 TRLON	8-4 TRLO	1/2	1/4	0.87	9.2	9.2
8-6 TRLON	—	—	1/2	3/8	0.89	9.2	9.2
—	10-4 TRLON	10-4 TRLO	5/8	1/4	0.91	6.0	6.0
—	10-6 TRLON	10-6 TRLO	5/8	3/8	0.94	6.0	6.0
—	10-8 TRLON	10-8 TRLO	5/8	1/2	1.00	6.0	6.0
—	12-4 TRLON	12-4 TRLO	3/4	1/4	0.98	6.0	6.0
—	12-6 TRLON	12-6 TRLO	3/4	3/8	1.02	6.0	6.0
—	12-8 TRLON	12-8 TRLO	3/4	1/2	1.08	6.0	6.0
12-10 TRLON	—	—	3/4	5/8	1.16	6.0	6.0
—	16-8 TRLON	16-8 TRLO	1	1/2	1.14	6.0	6.0
—	16-10 TRLON	16-10 TRLO	1	5/8	1.26	6.0	6.0
16-12 TRLON	—	—	1	3/4	1.30	6.0	6.0
—	20-12 TRLON	20-12 TRLO	1 1/4	3/4	1.32	5.0	5.0
20-16 TRLON	—	—	1 1/4	1	1.34	5.0	5.0
—	24-12 TRLON-S	—	1 1/2	3/4	1.32	4.0	4.0
—	24-16 TRLON	24-16 TRLO	1 1/2	1	1.34	4.0	4.0
—	24-20 TRLON	24-20 TRLO	1 1/2	1 1/4	1.34	4.0	4.0
—	32-20 TRLON	32-20 TRLO	2	1 1/4	1.42	3.0	3.0
—	32-24 TRLON	32-24 TRLO	2	1 1/2	1.42	3.0	3.0

* Assembled with crimp nut.
** Assembled with large BL nut.
***To order reducer without large nut (body only) remove the "N" from the part number (i.e., TRLO).

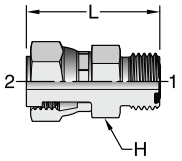
WARNING: This product can expose you to chemicals including Lead and Lead Compounds which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov.

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Click here for CADs, Support Resources or to Configure Parts Online

LOHL6

Tube End Extender / Expander
ORFS / ORFS Swivel

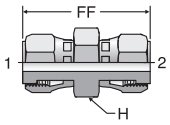


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	L (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 LOHL6	1/4	1/4	1.33	5/8	9.2	9.2
6 LOHL6	3/8	3/8	1.44	3/4	9.2	9.2
6-4 LOHL6	3/8	1/4	1.37	3/4	9.2	9.2
8 LOHL6	1/2	1/2	1.67	7/8	9.2	9.2
8-6 LOHL6	1/2	3/8	1.62	7/8	9.2	9.2
10-8 LOHL6	5/8	1/2	1.81	1 1/16	6.0	6.0
12-10 LOHL6	3/4	5/8	1.99	1 1/4	6.0	6.0
16-12 LOHL6	1	3/4	2.16	1 1/2	6.0	6.0
20-16 LOHL6	1 1/4	1	2.28	1 3/4	6.0	6.0
24-20 LOHL6	1 1/2	1 1/4	2.35	2 1/8	5.0	5.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

HL6

Swivel Nut Union
ORFS Swivel / ORFS Swivel



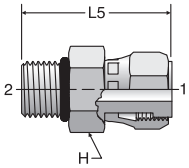
TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	FF (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 HL6	1/4	1/4	1.59	5/8	9.2	9.2
6 HL6	3/8	3/8	1.77	3/4	9.2	9.2
8 HL6	1/2	1/2	2.12	7/8	9.2	9.2
10 HL6	5/8	5/8	2.42	1 1/16	6.0	6.0
12 HL6	3/4	3/4	2.74	1 1/4	6.0	6.0
16 HL6	1	1	2.95	1 7/16	6.0	6.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

F65OL

Straight Thread Swivel Connector
ORFS Swivel / SAE-ORB

SAE 520181

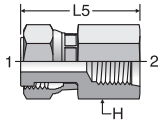


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	H HEX (in.)	L5 (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 F65OL	1/4	7/16 - 20	5/8	1.46	9.2	9.2
6 F65OL	3/8	9/16 - 18	3/4	1.57	9.2	9.2
8 F65OL	1/2	3/4 - 16	7/8	1.95	9.2	9.2
10 F65OL	5/8	7/8 - 14	1 1/16	2.13	6.0	6.0
12 F65OL	3/4	1 1/16 - 12	1 1/4	2.34	6.0	6.0
16 F65OL	1	1 5/16 - 12	1 1/2	2.66	6.0	6.0
20 F65OL	1 1/4	1 5/8 - 12	1 7/8	2.66	5.0	5.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

G65L

Straight Thread Swivel
Female Connector
ORFS Swivel / SAE-ORB



TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2B	H HEX (in.)	L5 (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 G65L	1/4	7/16 - 20	3/4	1.38	6.0	6.0
4-6 G65L	1/4	9/16 - 18	13/16	1.45	6.0	6.0
6-4 G65L	3/8	7/16 - 20	3/4	1.51	6.0	6.0
8-4 G65L	1/2	7/16 - 20	7/8	1.57	6.0	6.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

Dimensions and pressures for reference only, subject to change.

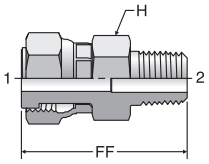
See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

F6L

Pipe Thread Swivel Connector
ORFS Swivel / NPTF

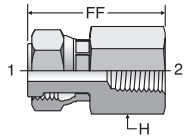


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	FF (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 F6L	1/4	1/8 - 27	1.33	5/8	6.0	6.0
4-4 F6L	1/4	1/4 - 18	1.52	5/8	6.0	6.0
6 F6L	3/8	1/4 - 18	1.69	3/4	6.0	6.0
6-6 F6L	3/8	3/8 - 18	1.67	3/4	6.0	6.0
8 F6L	1/2	3/8 - 18	1.95	3/4	6.0	6.0
8-8 F6L	1/2	1/2 - 14	2.14	7/8	6.0	6.0
10 F6L	5/8	1/2 - 14	2.29	1 1/16	6.0	6.0
12 F6L	3/4	3/4 - 14	2.37	1 1/4	5.5	5.5
16 F6L	1	1 - 11 1/2	2.87	1 1/2	4.5	4.5

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

G6L

Female Pipe Thread Swivel Connector
ORFS Swivel / NPTF

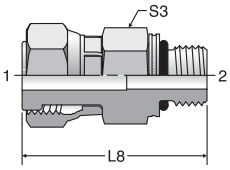


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	FF (in.)	H (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4-4 G6L	1/4	1/4 - 18	1.48	3/4	6.0	6.0
6 G6L	3/8	1/4 - 18	1.60	7/8	6.0	6.0
8-4 G6L	1/2	1/4 - 18	1.75	7/8	6.0	6.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

F687OML

Swivel ISO 6149 Connector
ORFS Swivel / ISO 6149

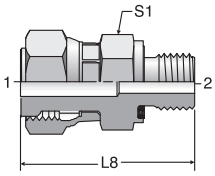


TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 ISO 261	L8 (mm)	S3 HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4M12F687OML	6	1/4	M12x1.5	37.0	17	9.2	9.2
6M12F687OML	8, 10	3/8	M12x1.5	39.0	17	9.2	9.2
6M14F687OML	8, 10	3/8	M14x1.5	38.0	19	9.2	9.2
6M16F687OML	8, 10	3/8	M16x1.5	43.5	22	9.2	9.2
8M16F687OML	12	1/2	M16x1.5	48.0	22	9.2	9.2
10M22F687OML	14, 15, 16	5/8	M22x1.5	53.0	27	6.0	6.0
10M27F687OML	14, 15, 16	5/8	M27x2	57.0	32	6.0	6.0
12M27F687OML	18, 20	3/4	M27x2	59.5	32	6.0	6.0
16M33F687OML	22, 25	1	M33x2	67.5	41	6.0	6.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

F682EDML

Swivel Metric Connector
ORFS Swivel / Metric-ED



TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 Metric	L8 (mm)	S1 HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4M12F682EDML	6	1/4	M12x1.5	38.2	17	9.2	9.2
6M14F682EDML	8, 10	3/8	M14x1.5	40.2	19	9.2	9.2
8M16F682EDML	12	1/2	M16x1.5	47.3	22	9.2	9.2
10M22F682EDML	14, 15, 16	5/8	M22X1.5	51.8	27	6.0	6.0
12M27F682EDML	18, 20	3/4	M27X2	57.2	32	6.0	6.0
16M33F682EDML	22, 25	1	M33X2	67.0	41	6.0	6.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

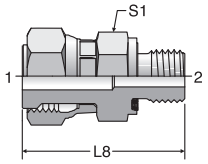
Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

F642EDML

Swivel BSPP Connector
ORFS Swivel / BSPP-ED



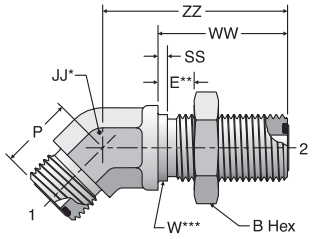
TUBE FITTING PART #	END SIZE 1 (mm)	1 (in.)	2 BSPP	L8 (mm)	S1 HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4F642EDML	6	1/4	1/8	34.0	14	7.2	7.2
6F642EDML	8, 10	3/8	1/4	40.2	19	9.2	9.2
8F642EDML	12	1/2	3/8	47.3	22	9.2	9.2
10F642EDML	14, 15, 16	5/8	1/2	51.8	27	6.0	6.0
12F642EDML	18, 20	3/4	3/4	57.2	32	6.0	6.0
16F642EDML	22, 25	1	1	67.0	46	6.0	6.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

WNLO

45° Bulkhead Union Elbow
ORFS / ORFS

SAE 520801
WNLO-WLNL - Body with Locknut
(See page A12 for WLNL)



TUBE FITTING PART #	END SIZE 1 (in.)	2 (in.)	B HEX (in.)	E MAX (in.)	JJ (in.)	P (in.)	SS (in.)	W DIA (in.)	WW (in.)	ZZ (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 WNLO	1/4	1/4	13/16	0.55	9/16	0.63	0.06	0.56	1.24	1.73	9.2	9.2
6 WNLO	3/8	3/8	1	0.55	3/4	0.75	0.06	0.69	1.34	1.91	9.2	9.2
8 WNLO	1/2	1/2	1 1/8	0.55	3/4	0.81	0.06	0.81	1.44	2.01	9.2	9.2
10 WNLO	5/8	5/8	1 5/16	0.55	1 1/16	0.93	0.06	1.00	1.59	2.22	6.0	6.0
12 WNLO	3/4	3/4	1 1/2	0.55	1 3/16	1.02	0.06	1.19	1.63	2.38	6.0	6.0
16 WNLO	1	1	1 3/4	0.55	1 7/16	1.18	0.06	1.44	1.65	2.56	6.0	6.0
20 WNLO	1 1/4	1 1/4	2	0.55	1 5/8	1.26	0.06	1.69	1.65	2.64	5.0	5.0
24 WNLO	1 1/2	1 1/2	2 3/8	0.55	1 7/8	1.46	0.06	2.00	1.65	2.64	4.0	4.0

* JJ – Across wrench flats.

** E – Maximum bulkhead thickness.

*** W – Bulkhead pilot diameter. Recommended clearnace hole is W + 0.015".

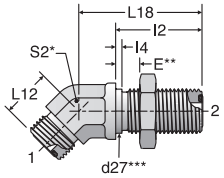
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

WNMLO

45° Bulkhead Union Elbow – mm Hex
ORFS / ORFS

ISO 8434-3 BHE45
SAE 52M0801
WNMLO-WLNML - Body with Locknut
(See page A12 for WLNML)



TUBE FITTING PART #	END SIZE 1 & 2 (mm)	END SIZE 1 & 2 (in.)	d27*** (mm)	E (mm)	I2 (mm)	I4 (mm)	L12 (mm)	L18 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4WNMLO	6	1/4	14.3	14	31.5	1.5	16.0	44.0	14	9.2	9.2
6WNMLO	8,10	3/8	17.5	14	34.0	1.5	19.0	48.5	19	9.2	9.2
8WNMLO	12	1/2	20.6	14	36.5	1.5	20.5	51.0	19	9.2	9.2
10WNMLO	14,15,16	5/8	25.4	14	40.5	1.5	23.5	56.5	27	6.0	6.0
12WNMLO	18,20	3/4	30.2	14	41.5	1.5	26.0	60.5	30	6.0	6.0
16WNMLO	22,25	1	36.5	14	42.0	1.5	30.0	65.0	36	6.0	6.0
20WNMLO	28,30,32	1 1/4	42.9	14	42.0	1.5	32.0	67.0	41	5.0	5.0
24WNMLO	35,38	1 1/2	50.8	14	42.0	1.5	37.0	67.0	50	4.0	4.0

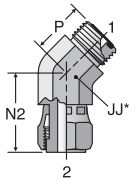
* S2 – Across Wrench Flats.

** E – Maximum bulkhead thickness.

***d27 – Bulkhead pilot diameter. Recommended clearance hole is d27 + 0.4 mm.

V6LO

45° Swivel Nut Elbow
ORFS / ORFS Swivel



* JJ – Across Wrench Flats

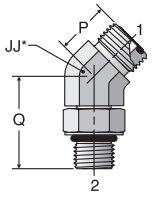
TUBE FITTING PART #	END SIZE 1 & 2 (in.)	JJ (in.)	N2 (in.)	P (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 V6LO	1/4	9/16	0.99	0.63	9.2	9.2
6 V6LO	3/8	3/4	1.12	0.74	9.2	9.2
8 V6LO	1/2	3/4	1.49	0.80	9.2	9.2
10 V6LO	5/8	1 1/16	1.53	0.92	6.0	6.0
12 V6LO	3/4	1 3/16	1.73	1.02	6.0	6.0
16 V6LO	1	1 7/16	1.87	1.18	6.0	6.0
20 V6LO	1 1/4	1 5/8	1.98	1.26	5.0	5.0
24 V6LO	1 1/2	1 7/8	2.06	1.45	4.0	4.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

V5OLO

45° Straight Thread Elbow
ORFS / SAE-ORB

SAE 520320



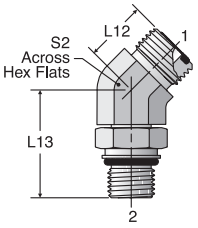
* JJ – Across Hex Flats

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	JJ (in.)	P (in.)	Q (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 V5OLO	1/4	7/16 - 20	9/16	0.63	1.18	6.0	6.0
4-6 V5OLO	1/4	9/16 - 18	3/4	0.69	1.30	6.0	6.0
6 V5OLO	3/8	9/16 - 18	3/4	0.75	1.30	6.0	6.0
6-4 V5OLO	3/8	7/16 - 20	3/4	0.75	1.22	6.0	6.0
6-8 V5OLO	3/8	3/4 - 16	3/4	0.75	1.44	6.0	6.0
8 V5OLO	1/2	3/4 - 16	3/4	0.81	1.44	6.0	6.0
8-6 V5OLO	1/2	9/16 - 18	3/4	0.81	1.28	6.0	6.0
8-10 V5OLO	1/2	7/8 - 14	3/4	0.85	1.75	6.0	6.0
10 V5OLO	5/8	7/8 - 14	1 1/16	0.93	1.75	6.0	6.0
10-8 V5OLO	5/8	3/4 - 16	1 1/16	0.93	1.57	6.0	6.0
10-12 V5OLO	5/8	1 1/16 - 12	1 3/16	0.96	1.97	6.0	6.0
12 V5OLO	3/4	1 1/16 - 12	1 3/16	1.02	1.97	6.0	6.0
12-10 V5OLO	3/4	7/8 - 14	1 3/16	1.02	1.81	6.0	6.0
12-16 V5OLO	3/4	1 5/16 - 12	1 7/16	1.16	2.07	5.5	5.5
16 V5OLO	1	1 5/16 - 12	1 7/16	1.18	2.07	5.5	5.5
16-10 V5OLO	1	7/8 - 14	1 7/16	1.18	2.03	6.0	6.0
16-12 V5OLO	1	1 1/16 - 12	1 7/16	1.18	2.03	6.0	6.0
16-20 V5OLO	1	1 5/8 - 12	1 5/8	1.26	2.11	4.0	4.0
20 V5OLO	1 1/4	1 5/8 - 12	1 5/8	1.26	2.11	4.0	4.0
24 V5OLO	1 1/2	1 7/8 - 12	1 7/8	1.46	2.11	4.0	4.0

V87OMLO

45° Metric Straight Thread Elbow
ORFS / ISO 6149

ISO 8434-3 SDE45
SAE 52M0387



* S2 – Across Hex Flats

TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 ISO 261	L12 (mm)	L13 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4M12V87OMLO	6	1/4	M12X1.5	16.0	30.0	14	6.0	6.0
4M14V87OMLO	6	1/4	M14X1.5	17.5	31.5	17	6.0	6.0
6M16V87OMLO	8,10	3/8	M16X1.5	19.0	33.5	19	6.0	6.0
8M18V87OMLO	12	1/2	M18X1.5	20.5	37.0	19	6.0	6.0
10M22V87OMLO	14,15,16	5/8	M22X1.5	23.5	44.0	27	6.0	6.0
12M27V87OMLO	18,20	3/4	M27X2	26.0	50.5	27	6.0	6.0
16M33V87OMLO	22,25	1	M33X2	30.0	52.5	36	5.0	5.0
20M42V87OMLO	28,30,32	1 1/4	M42X2	32.0	54.0	41	4.0	4.0
24M48V87OMLO	35,38	1 1/2	M48X2	37.0	56.5	50	4.0	4.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

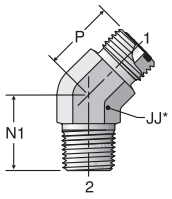
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

A
TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

VLO

45° Male Elbow
ORFS / NPTF

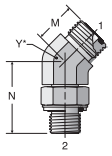


* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	JJ (in.)	N1 (in.)	P (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 VLO	1/4	1/8 - 27	9/16	0.64	0.63	6.0	6.0
4-4 VLO	1/4	1/4 - 18	9/16	0.86	0.68	6.0	6.0
6 VLO	3/8	1/4 - 18	3/4	0.87	0.74	6.0	6.0
6-6 VLO	3/8	3/8 - 18	3/4	0.87	0.74	6.0	6.0
8 VLO	1/2	3/8 - 18	3/4	0.95	0.80	6.0	6.0
8-8 VLO	1/2	1/2 - 14	7/8	1.17	0.86	6.0	6.0
10 VLO	5/8	1/2 - 14	1 1/16	1.17	0.92	6.0	6.0
12 VLO	3/4	3/4 - 14	1 5/16	1.30	1.02	4.0	4.0
16 VLO	1	1 - 11 1/2	1 7/16	1.48	1.18	3.0	3.0
20 VLO	1 1/4	1 1/4 - 11 1/2	1 5/8	1.67	1.26	2.5	2.5

V4OMLO

Male 45° Elbow – BSPP
(for ISO 1179-1 Port)
ORFS / BSPP-ORR



* Y – Across Hex Flats

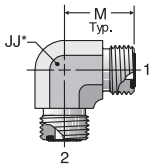
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 BSPP	M (mm)	N (mm)	Y (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4V4OMLO	6	1/4	1/8 - 28	16.0	27.5	14	4.0	4.0
4-4V4OMLO	6	1/4	1/4 - 19	17.5	32.0	19	4.0	4.0
6V4OMLO	8,10	3/8	1/4 - 19	19.0	32.0	19	4.0	4.0
6-6V4OMLO	8,10	3/8	3/8 - 19	19.0	33.5	19	4.0	4.0
6-8V4OMLO	8,10	3/8	1/2 - 14	19.5	43.5	27	4.0	4.0
8V4OMLO	12	1/2	3/8 - 19	20.5	33.5	19	4.0	4.0
8-8V4OMLO	12	1/2	1/2 - 14	21.0	43.5	27	4.0	4.0
10V4OMLO	14,15,16	5/8	1/2 - 14	23.5	43.5	27	4.0	4.0
10-12V4OMLO	14,15,16	5/8	3/4 - 14	24.5	46.5	30	4.0	4.0
12V4OMLO	18,20	3/4	3/4 - 14	26.0	46.5	30	4.0	4.0
12-16V4OMLO	18,20	3/4	1 - 11	26.0	51.0	37	4.0	4.0
16V4OMLO	22,25	1	1 - 11	30.0	51.0	37	4.0	4.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

ELO

Union Elbow
ORFS / ORFS

SAE 520201



* JJ – Across Wrench Flats

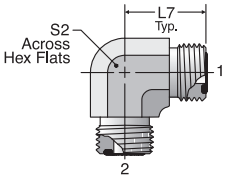
TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 ELO	1/4	1/4	9/16	0.85	9.2	9.2
6 ELO	3/8	3/8	3/4	0.98	9.2	9.2
8 ELO	1/2	1/2	3/4	1.10	9.2	9.2
10 ELO	5/8	5/8	1 1/16	1.32	6.0	6.0
12 ELO	3/4	3/4	1 3/16	1.48	6.0	6.0
16 ELO	1	1	1 7/16	1.63	6.0	6.0
20 ELO	1 1/4	1 1/4	1 5/8	1.75	5.0	5.0
24 ELO	1 1/2	1 1/2	1 7/8	1.93	4.0	4.0
32 ELO*	2	2	2 1/2	2.76	3.0	3.0

** Size 32 is not included in SAE J1453.

EMLO

Union Elbow – mm Hex
ORFS / ORFS

ISO 8434-3 E
SAE 52M0201



TUBE FITTING PART #	END SIZE 1 & 2 (mm)	END SIZE 1 & 2 (in.)	L7 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4EMLO	6	1/4	21.5	14	9.2	9.2
6EMLO	8,10	3/8	25.0	19	9.2	9.2
8EMLO	12	1/2	28.0	19	9.2	9.2
10EMLO	14,15,16	5/8	33.5	27	6.0	6.0
12EMLO	18,20	3/4	37.5	30	6.0	6.0
16EMLO	22,25	1	41.5	36	6.0	6.0
20EMLO	28,30,32	1 1/4	44.5	41	5.0	5.0
24EMLO	35,38	1 1/2	49.0	50	4.0	4.0

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

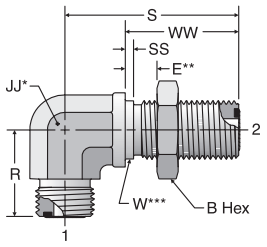
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

WELO

Bulkhead Union Elbow
ORFS / ORFS

SAE 520701
WELO-WLNL - Body with Locknut
(See page A12 for WLNL)



TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	B HEX (in.)	E MAX (in.)	JJ (in.)	R (in.)	S (in.)	SS (in.)	W (in.)	WW (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 WELO	1/4	1/4	13/16	0.55	9/16	0.89	1.85	0.06	0.56	1.24	9.2	9.2
6 WELO	3/8	3/8	1	0.55	3/4	1.02	2.05	0.06	0.69	1.34	9.2	9.2
8 WELO	1/2	1/2	1 1/8	0.55	3/4	1.14	2.19	0.06	0.81	1.44	9.2	9.2
10 WELO	5/8	5/8	1 5/16	0.55	1 1/16	1.36	2.48	0.06	1.00	1.59	6.0	6.0
12 WELO	3/4	3/4	1 1/2	0.55	1 3/16	1.52	2.64	0.06	1.19	1.63	6.0	6.0
16 WELO	1	1	1 3/4	0.55	1 7/16	1.67	2.80	0.06	1.44	1.65	6.0	6.0
20 WELO	1 1/4	1 1/4	2	0.55	1 5/8	1.79	2.97	0.06	1.69	1.65	5.0	5.0
24 WELO	1 1/2	1 1/2	2 3/8	0.55	1 7/8	1.95	3.13	0.06	2.00	1.65	4.0	4.0

* JJ – Across wrench flats.

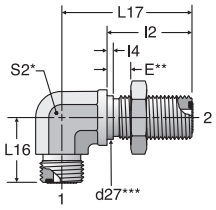
** E – Maximum bulkhead thickness.

*** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

WEMLO

Bulkhead Union Elbow – mm Hex
ORFS / ORFS

ISO 8434-3 BHE
SAE 52M0701
WEMLOWLNML - Body with Locknut
(See page A12 for WLNML)



TUBE FITTING PART #	END SIZE 1 & 2 (mm)	END SIZE 1 & 2 (in.)	d27*** (mm)	E (mm)	l2 (mm)	l4 (mm)	L16 (mm)	L17 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4WEMLO	6	1/4	14.3	14	31.5	1.5	22.5	47.0	14	9.2	9.2
6WEMLO	8,10	3/8	17.5	14	34.0	1.5	26.0	52.0	19	9.2	9.2
8WEMLO	12	1/2	20.6	14	36.5	2.5	29.0	55.5	19	9.2	9.2
10WEMLO	14,15,16	5/8	25.4	14	40.5	2.5	34.5	63.0	27	6.0	6.0
12WEMLO	18,20	3/4	30.2	14	41.5	3.0	38.5	67.0	30	6.0	6.0
16WEMLO	22,25	1	36.5	14	42.0	3.0	42.5	71.0	36	6.0	6.0
20WEMLO	28,30,32	1 1/4	42.9	14	42.0	3.0	45.5	75.5	41	5.0	5.0
24WEMLO	35,38	1 1/2	50.8	14	42.0	3.0	49.5	79.5	50	4.0	4.0

* S2 – Across wrench flats.

** E – Maximum bulkhead thickness.

***d27 - Bulkhead pilot diameter. Recommended clearance is d27 + 0.4 mm.

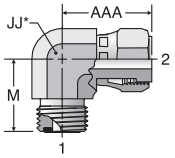
TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Click here for CADs, Support Resources or to Configure Parts Online

C6LO

Swivel Nut Elbow
ORFS / ORFS Swivel

SAE 520221



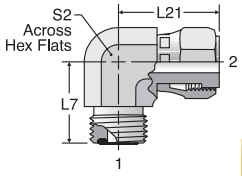
* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	AAA (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 C6LO	1/4	1/4	1.07	9/16	0.85	9.2	9.2
6 C6LO	3/8	3/8	1.17	3/4	0.98	9.2	9.2
8 C6LO	1/2	1/2	1.50	3/4	1.10	9.2	9.2
10 C6LO	5/8	5/8	1.61	1 1/16	1.32	6.0	6.0
12 C6LO	3/4	3/4	1.83	1 3/16	1.48	6.0	6.0
16 C6LO	1	1	2.11	1 7/16	1.64	6.0	6.0
20 C6LO	1 1/4	1 1/4	2.28	1 5/8	1.75	5.0	5.0
24 C6LO	1 1/2	1 1/2	2.41	1 7/8	1.92	4.0	4.0

C6MLO

Swivel Nut Elbow – mm Hex
ORFS / ORFS Swivel

ISO 8434-3 SWE
SAE 52M0221



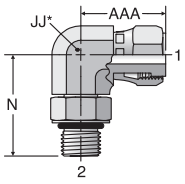
* S2 – Across Hex Flats

TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 2 (in.)	L7 (mm)	L21 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4C6MLO	6	1/4	21.5	27.2	14	9.2	9.2
6C6MLO	8,10	3/8	25.0	29.7	19	9.2	9.2
8C6MLO	12	1/2	28.0	38.0	19	9.2	9.2
10C6MLO	14,15,16	5/8	33.5	41.0	27	6.0	6.0
12C6MLO	18,20	3/4	37.5	46.5	30	6.0	6.0
16C6MLO	22,25	1	41.6	53.5	36	6.0	6.0
20C6MLO	28,30,32	1 1/4	44.5	58.0	41	5.0	5.0
24C6MLO	35,38	1 1/2	48.8	61.0	50	4.0	4.0

AOEL6

Straight Thread Swivel Elbow
ORFS Swivel / SAE-ORB

SAE 520281



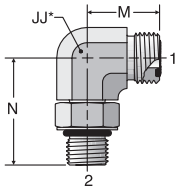
* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	AAA (in.)	JJ (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 AOEL6	1/4	7/16 - 20	1.04	9/16	1.30	6.0	6.0
6 AOEL6	3/8	9/16 - 18	1.17	3/4	1.46	6.0	6.0
8 AOEL6	1/2	3/4 - 16	1.50	3/4	1.59	6.0	6.0
10 AOEL6	5/8	7/8 - 14	1.65	1 1/16	1.97	6.0	6.0
12 AOEL6	3/4	1 1/16 - 12	1.79	1 1/16	2.17	6.0	6.0
16 AOEL6	1	1 5/16 - 12	2.07	1 5/16	2.34	5.5	5.5
20 AOEL6	1 1/4	1 5/8 - 12	2.28	1 5/8	2.44	4.0	4.0
24 AOEL6	1 1/2	1 7/8 - 12	2.40	1 7/8	2.60	4.0	4.0

C5OLO

Straight Thread Elbow
ORFS / SAE-ORB

SAE 520220



* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 C5OLO	1/4	7/16 - 20	9/16	0.85	1.30	6.0	6.0
4-6 C5OLO* **	1/4	9/16 - 18	9/16	0.93	1.46	6.0	6.0
4-8 C5OLO	1/4	3/4 - 16	3/4	0.98	1.59	6.0	6.0
6 C5OLO	3/8	9/16 - 18	3/4	0.98	1.46	6.0	6.0
6-4 C5OLO	3/8	7/16 - 20	3/4	0.98	1.38	6.0	6.0
6-5 C5OLO	3/8	1/2 - 20	3/4	0.98	1.38	6.0	6.0
6-8 C5OLO	3/8	3/4 - 16	3/4	1.04	1.59	6.0	6.0
6-10 C5OLO* **	3/8	7/8 - 14	7/8	1.15	1.97	6.0	6.0
6-12 C5OLO	3/8	1 1/16 - 12	1 1/16	1.28	2.17	6.0	6.0
8 C5OLO	1/2	3/4 - 16	3/4	1.10	1.59	6.0	6.0
8-6 C5OLO	1/2	9/16 - 18	3/4	1.10	1.44	6.0	6.0
8-10 C5OLO* **	1/2	7/8 - 14	7/8	1.21	1.97	6.0	6.0
8-12 C5OLO	1/2	1 1/16 - 12	1 3/16	1.32	2.17	6.0	6.0
10 C5OLO	5/8	7/8 - 14	1 1/16	1.32	1.97	6.0	6.0
10-8 C5OLO	5/8	3/4 - 16	1 1/16	1.32	1.81	6.0	6.0
10-12 C5OLO	5/8	1 1/16 - 12	1 3/16	1.42	2.17	6.0	6.0
12 C5OLO	3/4	1 1/16 - 12	1 3/16	1.48	2.17	6.0	6.0
12-8 C5OLO	3/4	3/4 - 16	1 3/16	1.48	1.83	6.0	6.0
12-10 C5OLO	3/4	7/8 - 14	1 3/16	1.48	2.01	6.0	6.0
12-16 C5OLO	3/4	1 5/16 - 12	1 7/16	1.61	2.34	5.5	5.5
16 C5OLO	1	1 5/16 - 12	1 7/16	1.63	2.34	5.5	5.5
16-12 C5OLO	1	1 1/16 - 12	1 7/16	1.63	2.30	6.0	6.0
16-20 C5OLO	1	1 5/8 - 12	1 5/8	1.75	2.44	4.0	4.0
20 C5OLO	1 1/4	1 5/8 - 12	1 5/8	1.75	2.44	4.0	4.0
20-16 C5OLO	1 1/4	1 5/16 - 12	1 5/8	1.75	2.44	5.0	5.0
20-24 C5OLO	1 1/4	1 7/8 - 12	1 7/8	1.93	2.60	4.0	4.0
24 C5OLO	1 1/2	1 7/8 - 12	1 7/8	1.93	2.60	4.0	4.0
24-20 C5OLO	1 1/2	1 5/8 - 12	1 7/8	1.93	2.60	4.0	4.0
32 C5OLO	2	2 1/2 - 12	2 1/2	2.76	3.07	2.5	2.5

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

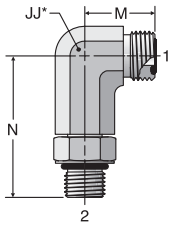
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

CC5OLO

Long Straight Thread Elbow
ORFS-Long / SAE-ORB

SAE 521520

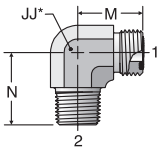


* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN-UNF-2A	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 CC5OLO	1/4	7/16 - 20	3/4	0.85	2.22	6.0	6.0
6 CC5OLO	3/8	9/16 - 18	7/8	0.98	2.62	6.0	6.0
8 CC5OLO	1/2	3/4 - 16	7/8	1.10	2.95	6.0	6.0
10 CC5OLO	5/8	7/8 - 14	1 1/16	1.32	3.50	6.0	6.0
12 CC5OLO	3/4	1 1/16 - 12	1 5/16	1.48	3.98	6.0	6.0
16 CC5OLO	1	1 5/16 - 12	1 5/8	1.63	4.49	5.5	5.5

CLO

Male Pipe Elbow
ORFS / NPTF



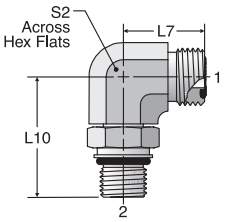
* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 CLO	1/4	1/8 - 27	9/16	0.85	0.80	6.0	6.0
4-4 CLO	1/4	1/4 - 18	9/16	0.85	1.12	6.0	6.0
4-6 CLO	1/4	3/8 - 18	3/4	0.97	1.22	6.0	6.0
4-8 CLO	1/4	1/2 - 14	7/8	1.07	1.47	6.0	6.0
6 CLO	3/8	1/4 - 18	3/4	0.98	1.09	6.0	6.0
6-6 CLO	3/8	3/8 - 18	3/4	0.98	1.22	6.0	6.0
6-8 CLO	3/8	1/2 - 14	7/8	1.15	1.47	6.0	6.0
8 CLO	1/2	3/8 - 18	3/4	1.10	1.22	6.0	6.0
8-4 CLO	1/2	1/4 - 18	3/4	1.10	1.22	6.0	6.0
8-8 CLO	1/2	1/2 - 14	7/8	1.10	1.47	6.0	6.0
8-12 CLO	1/2	3/4 - 14	1 1/16	1.32	1.59	4.0	4.0
10 CLO	5/8	1/2 - 14	1 1/16	1.31	1.47	6.0	6.0
10-6 CLO	5/8	3/8 - 18	1 1/16	1.31	1.28	6.0	6.0
10-12 CLO	5/8	3/4 - 14	1 3/16	1.41	1.59	4.0	4.0
12 CLO	3/4	3/4 - 14	1 3/16	1.47	1.59	4.0	4.0
12-8 CLO	3/4	1/2 - 14	1 3/16	1.47	1.59	6.0	6.0
12-16 CLO	3/4	1 - 11 1/2	1 5/16	1.62	1.97	3.0	3.0
16 CLO	1	1 - 11 1/2	1 7/16	1.64	1.97	3.0	3.0
16-12 CLO	1	3/4 - 14	1 7/16	1.64	1.78	4.0	4.0
20 CLO	1 1/4	1 1/4 - 11 1/2	1 5/8	1.76	2.38	2.5	2.5
24 CLO	1 1/2	1 1/2 - 11 1/2	1 7/8	1.92	2.64	2.5	2.5
24-20 CLO	1 1/2	1 1/4 - 11 1/2	1 7/8	1.92	2.61	2.5	2.5

C87OMLO

90° Metric Straight Thread Elbow
ORFS / ISO 6149

ISO 8434-3 SDE
SAE 52M0287



TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 ISO 261	L7 (mm)	L10 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4M12C87OMLO	6	1/4	M12X1.5	21.5	33.0	14	6.0	6.0
4M14C87OMLO	6	1/4	M14X1.5	23.5	35.5	14	6.0	6.0
6M12C87OMLO	8,10	3/8	M12X1.5	25.0	35.5	19	6.0	6.0
6M14C87OMLO	8,10	3/8	M14X1.5	25.0	35.5	19	6.0	6.0
6M16C87OMLO	8,10	3/8	M16X1.5	25.0	37.5	19	6.0	6.0
8M14C87OMLO	12	1/2	M14X1.5	28.0	36.0	19	6.0	6.0
8M18C87OMLO	12	1/2	M18X1.5	28.0	41.0	19	6.0	6.0
8M22C87OMLO	12	1/2	M22X1.5	31.0	49.0	27	6.0	6.0
10M18C87OMLO	14,15,16	5/8	M18X1.5	33.5	47.5	27	6.0	6.0
10M22C87OMLO	14,15,16	5/8	M22X1.5	33.5	49.0	27	6.0	6.0
12M22C87OMLO	18,20	3/4	M22X1.5	37.5	49.0	27	6.0	6.0
12M27C87OMLO	18,20	3/4	M27X2	37.5	55.5	27	6.0	6.0
16M33C87OMLO	22,25	1	M33X2	41.5	59.5	36	5.0	5.0
20M38C87OMLO*	28,30,32	1 1/4	M38X2	44.5	62.0	41	4.0	4.0
20M42C87OMLO	28,30,32	1 1/4	M42X2	44.5	63.0	41	4.0	4.0
24M48C87OMLO	35,38	1 1/2	M48X2	49.0	71.5	50	4.0	4.0

* For special M38x2 (ISO 6149-1 style) port. The current ISO 6149 does not include the M38 size.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

*** JJ for these parts does not conform to SAE.

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

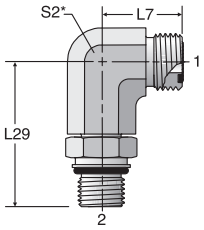
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

CC87OMLO

Long 90° Metric Straight Thread Elbow
ORFS-Long / ISO 6149

ISO 8434-3 SDEL
SAE 52M1587



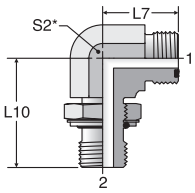
* S2 – Across Hex Flats

TUBE FITTING PART #	END SIZE 1 (mm)	1 (in.)	2 ISO 261	L7 (mm)	L29 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4M12CC87OMLO	6	1/4	M12X1.5	21.5	56.5	14	6.0	6.0
6M14CC87OMLO	8,10	3/8	M14X1.5	25.0	56.5	17	6.0	6.0
6M16CC87OMLO	8,10	3/8	M16X1.5	25.0	66.5	17	6.0	6.0
8M18CC87OMLO	12	1/2	M18X1.5	28.0	75.0	19	6.0	6.0
8M22CC87OMLO	12	1/2	M22X1.5	31.5	88.0	27	6.0	6.0
10M22CC87OMLO	14,15,16	5/8	M22X1.5	33.5	88.0	27	6.0	6.0
12M27CC87OMLO	18,20	3/4	M27X2	37.5	100.5	27	6.0	6.0
16M33CC87OMLO	22,25	1	M33X2	41.5	114.5	36	5.0	5.0
20M42CC87OMLO	28,30,32	1 1/4	M42X2	44.5	126.5	41	4.0	4.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

C8OMLO

Metric Straight Thread Elbow
ORFS / Metric-ORR



* S2 – Across Hex Flats

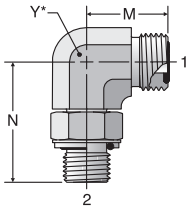
TUBE FITTING PART #	END SIZE 1 (mm)	1 (in.)	2 ISO 261	L7 (mm)	L10 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4M12C8OMLO	6	1/4	M12X1.5	21.5	33.0	14	3.6	3.6
6M12C8OMLO	8, 10	3/8	M12X1.5	25.0	35.5	19	3.6	3.6
6M14C8OMLO	8, 10	3/8	M14X1.5	25.0	35.5	19	3.6	3.6
6M16C8OMLO	8, 10	3/8	M16X1.5	25.0	37.5	19	3.6	3.6
8M14C8OMLO	12	1/2	M14X1.5	28.0	36.0	19	3.6	3.6
8M18C8OMLO	12	1/2	M18X1.5	28.0	41.0	19	3.6	3.6
8M22C8OMLO	12	1/2	M22X1.5	31.5	49.0	27	3.6	3.6
10M22C8OMLO	14, 15, 16	5/8	M22X1.5	33.5	49.0	27	3.6	3.6
12M27C8OMLO	18, 20	3/4	M27X2	37.5	55.5	30	3.6	3.6
16M33C8OMLO	22, 25	1	M33X2	41.5	59.5	36	2.5	2.5
20M38C8OMLO	28, 30, 32	1 1/4	M38X2	44.5	62.0	41	2.5	2.5
20M42C8OMLO	28, 30, 32	1 1/4	M42X2	44.5	63.0	41	2.5	2.5

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

Click here for CADs, Support Resources or to Configure Parts Online

C4OMLO

Male Elbow – BSPP
(for ISO 1179-1 Port)
ORFS / BSPP-ORR



* Y – Across Wrench Flats

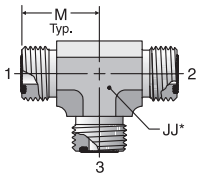
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 BSPP	M (mm)	N (mm)	Y (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4C4OMLO	6	1/4	1/8 - 28	21.5	30.0	14	4.0	4.0
4-4C4OMLO	6	1/4	1/4 - 19	23.5	36.0	19	4.0	4.0
4-6C4OMLO	6	1/4	3/8 - 19	24.5	38.0	19	4.0	4.0
6C4OMLO	8,10	3/8	1/4 - 19	25.0	36.0	19	4.0	4.0
6-6C4OMLO	8,10	3/8	3/8 - 19	26.5	38.0	19	4.0	4.0
8-4C4OMLO	12	1/2	1/4 - 19	28.0	35.5	19	4.0	4.0
8C4OMLO	12	1/2	3/8 - 19	28.0	38.0	19	4.0	4.0
8-8C4OMLO	12	1/2	1/2 - 14	31.0	48.5	27	4.0	4.0
8-12C4OMLO	12	1/2	3/4 - 14	33.5	51.5	30	4.0	4.0
10-6C4OMLO	14,15,16	5/8	3/8 - 19	33.5	40.5	27	4.0	4.0
10C4OMLO	14,15,16	5/8	1/2 - 14	33.5	48.5	27	4.0	4.0
10-12C4OMLO	14,15,16	5/8	3/4 - 14	36.0	51.5	30	4.0	4.0
10-16C4OMLO	14,15,16	5/8	1 - 11	39.5	58.5	36	4.0	4.0
12-8C4OMLO	18,20	3/4	1/2 - 14	37.5	49.5	30	4.0	4.0
12C4OMLO	18,20	3/4	3/4 - 14	37.5	51.5	30	4.0	4.0
12-16C4OMLO	18,20	3/4	1 - 11	41.0	58.5	36	4.0	4.0
16-12C4OMLO	22,25	1	3/4 - 14	41.5	56.0	36	4.0	4.0
16C4OMLO	22,25	1	1 - 11	41.5	58.5	36	4.0	4.0
16-20C4OMLO	22,25	1	1 1/4 - 11	44.5	61.0	41	3.0	3.0
20-16C4OMLO	28,30,32	1 1/4	1 - 11	44.5	61.0	41	4.0	4.0
20C4OMLO	28,30,32	1 1/4	1 1/4 - 11	44.5	61.0	41	2.0	2.0
20-24C4OMLO	28,30,32	1 1/4	1 1/2 - 11	49.0	64.5	50	2.0	2.0
24C4OMLO	35,38	1 1/2	1 1/2 - 11	49.0	64.5	50	2.0	2.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

JLO

Union Tee
ORFS (all three ends)

SAE 520401



* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1-3 (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 JLO	1/4	9/16	0.85	9.2	9.2
6 JLO	3/8	3/4	0.98	9.2	9.2
8 JLO	1/2	3/4	1.10	9.2	9.2
10 JLO	5/8	1 1/16	1.32	6.0	6.0
12 JLO	3/4	1 3/16	1.48	6.0	6.0
16 JLO	1	1 7/16	1.63	6.0	6.0
20 JLO	1 1/4	1 5/8	1.75	5.0	5.0
24 JLO	1 1/2	1 7/8	1.93	4.0	4.0
32 JLO	2	2 1/2	2.76	3.0	3.0

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

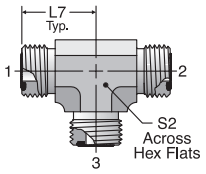
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

JMLO

Union Tee – mm Hex
ORFS (all three ends)

ISO 8434-3 T
SAE 52M0401



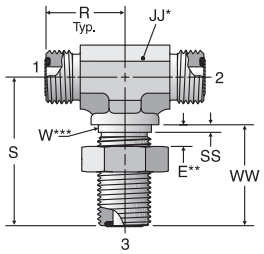
* S2 – Across Hex Flats

TUBE FITTING PART #	END SIZE 1-3 (mm)	END SIZE 1-3 (in.)	L7 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4JMLO	6	1/4	21.5	14	9.2	9.2
6JMLO	8,10	3/8	25.0	19	9.2	9.2
8JMLO	12	1/2	28.0	19	9.2	9.2
10JMLO	14,15,16	5/8	33.5	27	6.0	6.0
12JMLO	18,20	3/4	37.5	30	6.0	6.0
16JMLO	22,25	1	41.5	36	6.0	6.0
20JMLO	28,30,32	1 1/4	44.5	41	5.0	5.0
24JMLO	35,38	1 1/2	49.0	50	4.0	4.0

WJLO

Bulkhead Branch Tee
ORFS (all three ends)

SAE 520959
WJLO-WLNL - Body with Locknut
(See page A12 for WLNL)



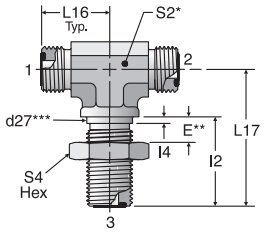
TUBE FITTING PART #	END SIZE 1-3 (in.)	E MAX (in.)	JJ (in.)	R (in.)	S (in.)	SS (in.)	W DIA (in.)	WW (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 WJLO	1/4	0.55	9/16	0.89	1.85	0.06	0.56	1.24	9.2	9.2
6 WJLO	3/8	0.55	3/4	1.02	2.05	0.06	0.69	1.34	9.2	9.2
8 WJLO	1/2	0.55	3/4	1.14	2.19	0.06	0.81	1.44	9.2	9.2
10 WJLO	5/8	0.55	1 1/16	1.36	2.48	0.06	1.00	1.59	6.0	6.0
12 WJLO	3/4	0.55	1 3/16	1.52	2.64	0.06	1.19	1.63	6.0	6.0
16 WJLO	1	0.55	1 7/16	1.67	2.80	0.06	1.44	1.65	6.0	6.0

* JJ – Across wrench flats.
** E – Maximum bulkhead thickness.
*** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

WJMLO

Bulkhead Union Tee – mm Hex
ORFS (all three ends)

ISO 8434-3 BHBT
SAE 52M0959
WJMLOWLNML - Body with Locknut
(See page A12 for WLNML)



TUBE FITTING PART #	END SIZE 1-3 (mm)	END SIZE 1-3 (in.)	d27*** (mm)	E (mm)	I2 (mm)	I4 (mm)	L16 (mm)	L17 (mm)	S2 (mm)	S4 HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4WJMLO	6	1/4	14.3	14	31.5	1.5	22.5	47.0	14	22	9.2	9.2
6WJMLO	8,10	3/8	17.5	14	34.0	1.5	26.0	52.0	19	27	9.2	9.2
8WJMLO	12	1/2	20.6	14	36.5	2.5	29.0	55.5	19	30	9.2	9.2
10WJMLO	14,15,16	5/8	25.4	14	40.5	2.5	34.5	63.0	27	36	6.0	6.0
12WJMLO	18,20	3/4	30.2	14	41.5	3.0	38.5	67.0	30	41	6.0	6.0
16WJMLO	22,25	1	36.5	14	42.0	3.0	42.5	71.0	36	46	6.0	6.0
20WJMLO	28,30,32	1 1/4	42.9	14	42.0	3.0	45.5	75.5	41	50	5.0	5.0
24WJMLO	35,38	1 1/2	50.8	14	42.0	3.0	49.5	79.5	50	60	4.0	4.0

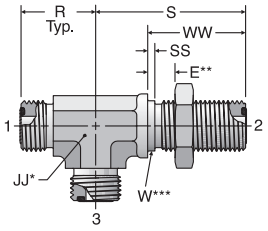
* S2 – Across wrench flats.
** E – Maximum bulkhead thickness.
***d27 - Bulkhead pilot diameter. Recommended clearance hole is d27 + 0.4 mm.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

WJJLO

Bulkhead Run Tee
ORFS (all three ends)

SAE 520958
WJJLOWLNML - Body with Locknut
(See page A12 for WLNL)



TUBE FITTING PART #	END SIZE 1-3 (in.)	E MAX (in.)	JJ (in.)	R (in.)	S (in.)	SS (in.)	W DIA (in.)	WW (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 WJJLO	1/4	0.55	9/16	0.89	1.85	0.06	0.56	1.24	9.2	9.2
6 WJJLO	3/8	0.55	3/4	1.02	2.05	0.06	0.69	1.34	9.2	9.2
8 WJJLO	1/2	0.55	3/4	1.14	2.19	0.06	0.81	1.44	9.2	9.2
10 WJJLO	5/8	0.55	1 1/16	1.36	2.48	0.06	1.00	1.59	6.0	6.0
12 WJJLO	3/4	0.55	1 3/16	1.52	2.64	0.06	1.19	1.63	6.0	6.0
16 WJJLO	1	0.55	1 7/16	1.67	2.80	0.06	1.44	1.65	6.0	6.0
20 WJJLO	1 1/4	0.55	1 5/8	1.79	2.79	0.06	1.69	1.65	5.0	5.0
24 WJJLO	1 1/2	0.55	1 7/8	1.95	3.13	0.06	2.00	1.65	4.0	4.0

* JJ – Across wrench flats.

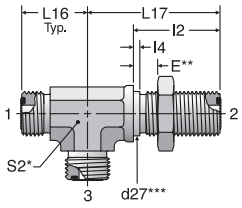
** E – Maximum bulkhead thickness.

*** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

WJJMLO

Bulkhead Run Tee – mm Hex
ORFS (all three ends)

ISO 8434-3 BHRT
SAE 52M0958
WJJMLOWLNML - Body with Locknut
(See page A12 for WLNML)



TUBE FITTING PART #	END SIZE 1-3 (mm)	END SIZE 1-3 (in.)	d27*** (mm)	E (mm)	I2 (mm)	I4 (mm)	L16 (mm)	L17 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4WJJMLO	6	1/4	14.3	14	31.5	1.5	22.5	47.0	14	9.2	9.2
6WJJMLO	8,10	3/8	17.5	14	34.0	1.5	26.0	52.0	19	9.2	9.2
8WJJMLO	12	1/2	20.6	14	36.5	2.5	29.0	55.5	19	9.2	9.2
10WJJMLO	14,15,16	5/8	25.4	14	40.5	2.5	34.5	63.0	27	6.0	6.0
12WJJMLO	18,20	3/4	30.2	14	41.5	3.0	38.5	67.0	30	6.0	6.0
16WJJMLO	22,25	1	36.5	14	42.0	3.0	42.5	71.0	36	6.0	6.0
20WJJMLO	28,30,32	1 1/4	42.9	14	42.0	3.0	45.5	71.0	41	5.0	5.0
24WJJMLO	35,38	1 1/2	50.8	14	42.0	3.0	49.5	79.5	50	4.0	4.0

* S2 – Across wrench flats.

** E – Maximum bulkhead thickness.

***d27 - Bulkhead pilot diameter. Recommended clearance hole is d27 + 0.4 mm.

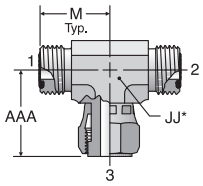
TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Click here for CADs, Support Resources or to Configure Parts Online

S6LO

Swivel Nut Branch Tee
ORFS / ORFS / ORFS Swivel

SAE 520433



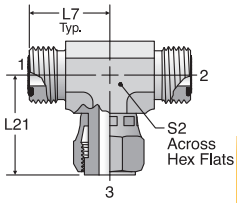
* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1-3 (in.)	AAA (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 S6LO	1/4	1.07	9/16	0.85	9.2	9.2
6 S6LO	3/8	1.17	3/4	0.98	9.2	9.2
8 S6LO	1/2	1.50	3/4	1.10	9.2	9.2
10 S6LO	5/8	1.61	1 1/16	1.32	6.0	6.0
12 S6LO	3/4	1.83	1 3/16	1.48	6.0	6.0
16 S6LO	1	2.11	1 7/16	1.63	6.0	6.0
20 S6LO	1 1/4	2.28	1 5/8	1.75	5.0	5.0
24 S6LO	1 1/2	2.40	1 7/8	1.93	4.0	4.0

S6MLO

Swivel Nut Branch Tee – mm Hex
ORFS / ORFS / ORFS Swivel

ISO 8434-3 SWBT
SAE 52M0433



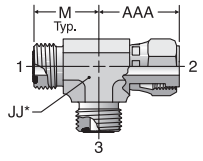
* S2 – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1-3 (mm)	(in.)	L7 (mm)	L21 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4S6MLO	6	1/4	21.5	27.2	14		
6S6MLO	8,10	3/8	25.0	29.7	19	9.2	9.2
8S6MLO	12	1/2	28.0	38.0	19	9.2	9.2
10S6MLO	14,15,16	5/8	33.5	41.0	27	6.0	6.0
12S6MLO	18,20	3/4	37.5	46.5	30	6.0	6.0
16S6MLO	22,25	1	41.5	53.5	36	6.0	6.0
20S6MLO	28,30,32	1 1/4	44.5	58.0	41	5.0	5.0
24S6MLO	35,38	1 1/2	49.0	61.0	50	4.0	4.0

R6LO

Swivel Nut Run Tee
ORFS / ORFS Swivel / ORFS

SAE 520432



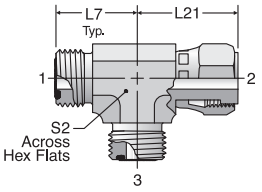
* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1-3 (in.)	AAA (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 R6LO	1/4	1.07	9/16	0.85	9.2	9.2
6 R6LO	3/8	1.17	3/4	0.98	9.2	9.2
8 R6LO	1/2	1.50	3/4	1.10	9.2	9.2
10 R6LO	5/8	1.61	1 1/16	1.32	6.0	6.0
12 R6LO	3/4	1.83	1 3/16	1.48	6.0	6.0
16 R6LO	1	2.11	1 7/16	1.63	6.0	6.0
20 R6LO	1 1/4	2.28	1 5/8	1.75	5.0	5.0
24 R6LO	1 1/2	2.40	1 7/8	1.93	4.0	4.0

R6MLO

Swivel Nut Run Tee – mm Hex
ORFS / ORFS Swivel / ORFS

ISO 8434-3 SWRT
SAE 52M0432



TUBE FITTING PART #	END SIZE 1-3 (mm)	(in.)	L7 (mm)	L21 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4R6MLO	6	1/4	21.5	27.2	14	9.2	9.2
6R6MLO	8,10	3/8	25.0	29.7	19	9.2	9.2
8R6MLO	12	1/2	28.0	38.0	19	9.2	9.2
10R6MLO	14,15,16	5/8	33.5	41.0	27	6.0	6.0
12R6MLO	18,20	3/4	37.5	46.5	30	6.0	6.0
16R6MLO	22,25	1	41.5	53.5	36	6.0	6.0
20R6MLO	28,30,32	1 1/4	44.5	58.0	41	5.0	5.0
24R6MLO	35,38	1 1/2	49.0	61.0	50	4.0	4.0

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

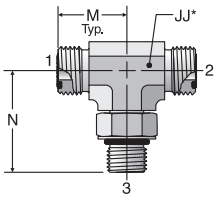
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

S5OLO

Straight Thread Branch Tee
ORFS / ORFS / SAE-ORB

SAE 520429



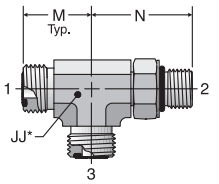
* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 (in.)	2 (in.)	3 UN/UNF-2A	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 S5OLO	1/4	1/4	7/16 - 20	9/16	0.85	1.30	6.0	6.0
4-4-6 S5OLO	1/4	1/4	9/16 - 18	9/16	0.93	1.46	6.0	6.0
6 S5OLO	3/8	3/8	9/16 - 18	3/4	0.98	1.46	6.0	6.0
6-6-4 S5OLO	3/8	3/8	7/16 - 20	3/4	0.98	1.38	6.0	6.0
6-6-8 S5OLO	3/8	3/8	3/4 - 16	3/4	1.04	1.59	6.0	6.0
8 S5OLO	1/2	1/2	3/4 - 16	3/4	1.10	1.59	6.0	6.0
8-8-10 S5OLO	1/2	1/2	7/8 - 14	1 1/16	1.24	1.97	6.0	6.0
8-8-12 S5OLO	1/2	1/2	1 1/16 - 12	1 3/16	1.34	2.17	6.0	6.0
10 S5OLO	5/8	5/8	7/8 - 14	1 1/16	1.32	1.97	6.0	6.0
10-10-12 S5OLO	5/8	5/8	1 1/16 - 12	1 3/16	1.42	2.17	6.0	6.0
12 S5OLO	3/4	3/4	1 1/16 - 12	1 3/16	1.48	2.17	6.0	6.0
12-12-16 S5OLO	3/4	3/4	1 5/16 - 12	1 7/16	1.61	2.34	5.5	5.5
16 S5OLO	1	1	1 5/16 - 12	1 7/16	1.63	2.34	5.5	5.5
16-16-20 S5OLO	1	1	1 5/8 - 12	1 5/8	1.75	2.44	4.0	4.0
20 S5OLO	1 1/4	1 1/4	1 5/8 - 12	1 5/8	1.75	2.44	4.0	4.0
24 S5OLO	1 1/2	1 1/2	1 7/8 - 12	1 7/8	1.93	2.60	4.0	4.0

R5OLO

Straight Thread Run Tee
ORFS / SAE-ORB / ORFS

SAE 520428



* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 (in.)	2 UN/UNF-2A	3 (in.)	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 R5OLO	1/4	7/16 - 20	1/4	9/16	0.85	1.30	6.0	6.0
4-6-4 R5OLO	1/4	9/16 - 18	1/4	3/4	0.92	1.46	6.0	6.0
6 R5OLO	3/8	9/16 - 18	3/8	3/4	0.98	1.46	6.0	6.0
6-8-6 R5OLO	3/8	3/4 - 16	3/8	3/4	1.04	1.59	6.0	6.0
8 R5OLO	1/2	3/4 - 16	1/2	3/4	1.10	1.59	6.0	6.0
8-10-8 R5OLO	1/2	7/8 - 14	1/2	1 1/16	1.24	1.97	6.0	6.0
10 R5OLO	5/8	7/8 - 14	5/8	1 1/16	1.32	1.97	6.0	6.0
10-12-10 R5OLO	5/8	1 1/16 - 12	5/8	1 3/16	1.42	2.17	6.0	6.0
12 R5OLO	3/4	1 1/16 - 12	3/4	1 3/16	1.48	2.17	6.0	6.0
12-16-12 R5OLO	3/4	1 5/16 - 12	3/4	1 7/16	1.61	2.34	5.5	5.5
16 R5OLO	1	1 5/16 - 12	1	1 7/16	1.63	2.34	5.5	5.5
16-20-16 R5OLO	1	1 5/8 - 12	1	1 5/8	1.75	2.44	4.0	4.0
20 R5OLO	1 1/4	1 5/8 - 12	1 1/4	1 5/8	1.75	2.44	4.0	4.0
24 R5OLO	1 1/2	1 7/8 - 12	1 1/2	1 7/8	1.93	2.60	4.0	4.0

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

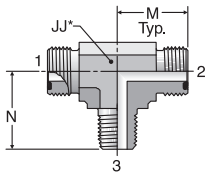
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

SLO

Male Pipe Tee
ORFS / ORFS / NPTF

SAE 520425



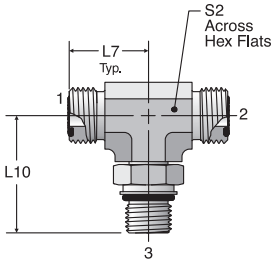
* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1 & 2 (in.)	END SIZE 3 NPTF	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4-4-4 SLO	1/4	1/4 - 18	9/16	0.85	1.12	6.0	6.0
6 SLO	3/8	1/4 - 18	3/4	0.98	1.09	6.0	6.0
6-6-6 SLO	3/8	3/8 - 18	3/4	0.98	1.22	6.0	6.0
8 SLO	1/2	3/8 - 18	3/4	1.10	1.22	6.0	6.0
8-8-8 SLO	1/2	1/2 - 14	7/8	1.10	1.47	6.0	6.0
10 SLO	5/8	1/2 - 14	1 1/16	1.31	1.47	6.0	6.0
12 SLO	3/4	3/4 - 14	1 3/16	1.47	1.59	4.0	4.0
16 SLO	1	1 - 11 1/2	1 7/16	1.64	1.97	3.0	3.0
20 SLO	1 1/4	1 1/4 - 11 1/2	1 5/8	1.76	2.38	2.5	2.5

S87OMLO

Metric Straight Thread Branch Tee
ORFS / ORFS / ISO 6149

ISO 8434-3 SDBT
SAE 52M0489



* S2 – Across Hex Flats

TUBE FITTING PART #	END SIZE 1 & 2 (mm)	END SIZE 1 & 2 (in.)	END SIZE 3 ISO 261	L7 (mm)	L10 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4M12S87OMLO	6	1/4	M12X1.5	21.5	33.0	14	6.0	6.0
4M14S87OMLO	6	1/4	M14X1.5	23.5	35.5	19	6.0	6.0
6M14S87OMLO	8,10	3/8	M14X1.5	25.0	35.5	19	6.0	6.0
6M16S87OMLO	8,10	3/8	M16X1.5	25.0	37.5	19	6.0	6.0
8M14S87OMLO	12	1/2	M14X1.5	28.0	36.0	19	6.0	6.0
8M18S87OMLO	12	1/2	M18X1.5	28.0	41.0	19	6.0	6.0
8M22S87OMLO	12	1/2	M22X1.5	31.0	49.0	27	6.0	6.0
10M22S87OMLO	14,15,16	5/8	M22X1.5	33.5	49.0	27	6.0	6.0
12M27S87OMLO	18,20	3/4	M27X2	37.5	55.5	30	6.0	6.0
16M33S87OMLO	22,25	1	M33X2	41.5	59.5	36	5.1	5.1
20M42S87OMLO	28,30,32	1 1/4	M42X2	44.5	63.0	41	4.0	4.0
24M48S87OMLO	35,38	1 1/2	M48X2	49.0	71.5	50	4.0	4.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

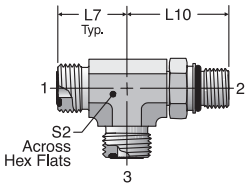
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

R87OMLO

Metric Straight Thread Run Tee
ORFS / ISO 6149 / ORFS

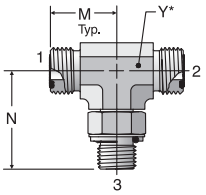
ISO 8434-3 SDRT
SAE 52M0488



TUBE FITTING PART #	END SIZE 1 & 3 (mm)	END SIZE 1 & 3 (in.)	END SIZE 2 ISO 261	L7 (mm)	L10 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4M12R87OMLO	6	1/4	M12X1.5	21.5	33.0	14	6.0	6.0
4M14R87OMLO	6	1/4	M14X1.5	23.5	35.5	19	6.0	6.0
6M14R87OMLO	8,10	3/8	M14X1.5	25.0	35.5	19	6.0	6.0
6M16R87OMLO	8,10	3/8	M16X1.5	25.0	37.5	19	6.0	6.0
8M14R87OMLO	12	1/2	M14X1.5	28.0	36.0	19	6.0	6.0
8M18R87OMLO	12	1/2	M18X1.5	28.0	41.0	19	6.0	6.0
8M22R87OMLO	12	1/2	M22X1.5	31.0	49.0	27	6.0	6.0
10M22R87OMLO	14,15,16	5/8	M22X1.5	33.5	49.0	27	6.0	6.0
12M27R87OMLO	18,20	3/4	M27X2	37.5	55.5	30	6.0	6.0
16M33R87OMLO	22,25	1	M33X2	41.5	59.5	36	5.0	5.0
20M42R87OMLO	28,30,32	1 1/4	M42X2	44.5	63.0	41	4.0	4.0
24M48R87OMLO	35,38	1 1/2	M48X2	49.0	71.5	50	4.0	4.0

S4OMLO

Branch Tee – BSPP
(for ISO 1179-1 Port)
ORFS / ORFS / BSPP-ORR



* Y – Across
Wrench Flats

TUBE FITTING PART #	END SIZE 1 & 2 (mm)	END SIZE 1 & 2 (in.)	END SIZE 3 BSPP	M (mm)	N (mm)	Y (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4S4OMLO	6	1/4	1/8 - 28	21.5	30.0	14	4.0	4.0
4-4-4S4OMLO	6	1/4	1/4 - 19	23.5	36.0	19	4.0	4.0
6S4OMLO	8,10	3/8	1/4 - 19	25.0	36.0	19	4.0	4.0
6-6-6S4OMLO	8,10	3/8	3/8 - 19	26.5	38.0	19	4.0	4.0
8S4OMLO	12	1/2	3/8 - 19	28.0	38.0	19	4.0	4.0
8-8-8S4OMLO	12	1/2	1/2 - 14	31.0	48.5	27	4.0	4.0
10S4OMLO	14,15,16	5/8	1/2 - 14	33.5	48.5	27	4.0	4.0
12S4OMLO	18,20	3/4	3/4 - 14	37.5	51.5	30	4.0	4.0
16S4OMLO	22,25	1	1 - 11	41.5	58.5	36	4.0	4.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

Dimensions and pressures for reference only, subject to change.

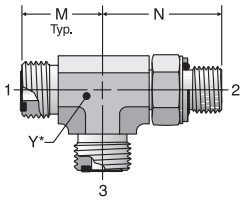
See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

R4OMLO

Run Tee – BSPP
(for ISO 1179-1 Port)
ORFS / BSPP-ORR / ORFS



* Y – Across Wrench Flats

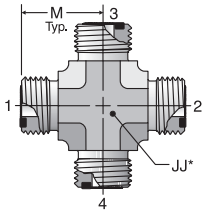
TUBE FITTING PART #	END SIZE 1 & 3 (mm)	END SIZE 1 & 3 (in.)	END SIZE 2 BSPP	M (mm)	N (mm)	Y (mm)	Dynamic Pressure (x 1,000 PSI) S	Dynamic Pressure (x 1,000 PSI) SS
4R4OMLO	6	1/4	1/8 - 28	21.5	30.0	14	4.0	4.0
4-4-4R4OMLO	6	1/4	1/4 - 19	23.5	36.0	19	4.0	4.0
6R4OMLO	8,10	3/8	1/4 - 19	25.0	36.0	19	4.0	4.0
6-6-6R4OMLO	8,10	3/8	3/8 - 19	26.5	38.0	19	4.0	4.0
8R4OMLO	12	1/2	3/8 - 19	28.0	38.0	19	4.0	4.0
8-8-8R4OMLO	12	1/2	1/2 - 14	31.0	48.5	27	4.0	4.0
10R4OMLO	14,15,16	5/8	1/2 - 14	33.5	45.2	27	4.0	4.0
12R4OMLO	18,20	3/4	3/4 - 14	37.5	51.5	30	4.0	4.0
16R4OMLO	22,25	1	1 - 11	41.5	58.5	37	4.0	4.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

KLO

Union Cross
ORFS (all four ends)

SAE 520501



* JJ – Across Wrench Flats

TUBE FITTING PART #	END SIZE 1-4 (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI) -S	Dynamic Pressure (x 1,000 PSI) -SS
4 KLO	1/4	9/16	0.85	9.2	9.2
6 KLO	3/8	3/4	0.98	9.2	9.2
8 KLO	1/2	3/4	1.10	9.2	9.2
10 KLO	5/8	1 1/16	1.32	6.0	6.0
12 KLO	3/4	1 3/16	1.48	6.0	6.0
16 KLO	1	1 5/8	1.63	6.0	6.0
20 KLO	1 1/4	1 5/8	1.75	5.0	5.0
24 KLO					

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

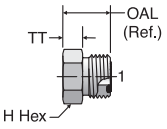
Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Click here for CADs, Support Resources or to Configure Parts Online

PNLO

Plug
ORFS

SAE 520109



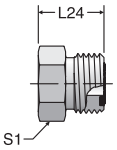
TUBE FITTING PART #	END SIZE 1 (in.)	H HEX (in.)	OAL (REF) (in.)	TT (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 PNLO	1/4	5/8	0.65	0.20	9.2	9.2
6 PNLO	3/8	3/4	0.75	0.32	9.2	9.2
8 PNLO	1/2	7/8	0.87	0.35	9.2	9.2
10 PNLO	5/8	1 1/16	1.02	0.41	6.0	6.0
12 PNLO	3/4	1 1/4	1.08	0.41	6.0	6.0
14 PNLO	7/8	1 3/8	1.10	0.49	6.0	6.0
16 PNLO	1	1 1/2	1.10	0.41	6.0	6.0
20 PNLO	1 1/4	1 3/4	1.10	0.41	6.0	6.0
24 PNLO	1 1/2	2 1/8	1.10	0.41	5.0	5.0
32 PNLO	2	2 3/4	1.40	0.50	3.0	3.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

PNMLO

Plug – mm Hex
ORFS

ISO 8434-3 PL
SAE 52M0109



TUBE FITTING PART #	ORFS TUBE O.D. (mm)	(in.)	L24 (mm)	S1 HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4PNMLO	6	1/4	16.5	17	9.2	9.2
6PNMLO	8,10	3/8	19.0	19	9.2	9.2
8PNMLO	12	1/2	22.0	22	9.2	9.2
10PNMLO	14,15,16	5/8	26.0	27	6.0	6.0
12PNMLO	18,20	3/4	27.5	32	6.0	6.0
16PNMLO	22,25	1	28.0	41	6.0	6.0
20PNMLO	28,30,32	1 1/4	28.0	46	6.0	6.0
24PNMLO	38	1 1/2	28.0	55	5.0	5.0

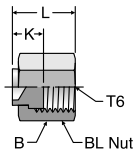
WARNING: This product can expose you to chemicals including Lead and Lead Compounds which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov.

TABLE OF CONTENTS
VISUAL INDEX
FAQs
ASSEMBLY
TUBE FAB EQUIP
GEN TECH

FNL

Cap
ORFS

SAE 520112

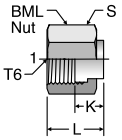


TUBE FITTING PART #	TUBE O.D. (in.)	T6 SWIVEL UN/UNF-2B	B HEX (in.)	K (in.)	L (in.)	Dynamic Pressure (x 1,000 PSI) -S	-SS
4 FNL	1/4	9/16 - 18	11/16	0.35	0.66	9.2	9.2
6 FNL	3/8	11/16 - 16	13/16	0.41	0.74	9.2	9.2
8 FNL	1/2	13/16 - 16	15/16	0.47	0.87	9.2	9.2
10 FNL	5/8	1 - 14	1 1/8	0.53	1.02	6.0	6.0
12 FNL	3/4	1 3/16 - 12	1 3/8	0.59	1.12	6.0	6.0
14 FNL	7/8	1 5/16 - 12	1 1/2	0.59	1.12	6.0	6.0
16 FNL	1	1 7/16 - 12	1 5/8	0.63	1.16	6.0	6.0
20 FNL	1 1/4	1 11/16 - 12	1 7/8	0.63	1.16	6.0	6.0
24 FNL	1 1/2	2 - 12	2 1/4	0.63	1.16	5.0	5.0
32 FNL	2	2 1/2 - 12	2 7/8	0.79	1.46	3.0	3.0

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

FNML

Cap
ORFS



TUBE FITTING PART #	TUBE O.D. (mm)	(in.)	T6 SWIVEL UN/UNF-2B	K (mm)	L (mm)	S HEX (mm)	Dynamic Pressure (x 1,000 PSI) S	SS
4FNML	6	1/4	9/16 - 18	9.0	16.8	17	9.2	9.2
6FNML	8, 10	3/8	11/16 - 16	10.5	18.8	22	9.2	9.2
8FNML	12	1/2	13/16 - 16	12.0	22.0	24	9.2	9.2
10FNML	14, 15, 16	5/8	1 - 14	13.5	26.0	30	6.0	6.0
12FNML	18, 20	3/4	1 3/16 - 12	15.0	28.6	36	6.0	6.0
16FNML	22, 25	1	1 7/16 - 12	16.0	29.5	41	6.0	6.0
20FNML	28, 30, 32	1 1/4	1 11/16 - 12	16.0	29.5	50	6.0	6.0
24FNML	35, 38	1 1/2	2 - 12	16.0	29.5	60	5.0	5.0

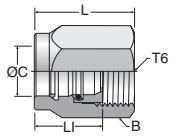
WARNING: This product can expose you to chemicals including Lead and Lead Compounds which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov.

Dimensions and pressures for reference only, subject to change.

See Seal-Lok Xtreme for extreme temperature applications

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

UPTC Nut Assembly



TUBE FITTING PART #	END SIZE (in.)	T6 UN/UNF-2B	B HEX (in.)	L (in.)	L1 (in.)	C Nominal Nipple Size (in.)	C Nominal Nipple Size (mm)	Dynamic Pressure (x 1,000 PSI) S
4 UPTCL	1/4	9/16-18	11/16	0.97	0.68	0.31	8	5.8
6 UPTCL	3/8	11/16-16	13/16	1.06	0.74	0.47	12	5.0
8 UPTCL	1/2	13/16-16	15/16	1.19	0.81	0.59	15	4.2
10 UPTCL	5/8	1-14	1 1/8	1.34	0.87	0.71	18	4.0
12 UPTCL	3/4	1 3/16-12	1 3/8	1.38	0.86	0.87	22	3.1
16 UPTCL	1	1 7/16-12	1 5/8	1.48	0.94	0.98	25	3.1

To order as pre-torqued assembly on standard Seal-Lok adapters, see page A7.

WARNING: This product can expose you to chemicals including Lead and Lead Compounds 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.

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

Parker Publication No. 4400-B.1

TABLE OF CONTENTS

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

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

Before selecting or using any of these Products, it is important that you read and follow the instructions below. No product from any division in Parker Fluid Connectors Group is approved for in-flight aerospace applications. For hoses and fittings used in in-flight aerospace applications, please contact Parker Aerospace Group.

1.0 GENERAL INSTRUCTIONS

1.1 Scope: This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) these Products. For convenience, all rubber and/or thermoplastic products commonly called "hose" or "tubing" are called "Hose" in this safety guide. Metallic tube or pipe are called "tube". All assemblies made with Hose are called "Hose Assemblies". All assemblies made with Tube are called "Tube Assemblies". All products commonly called "fittings", "couplings" or "adapters" are called "Fittings". Valves are fluid system components that control the passage of fluid. Related accessories are ancillary devices that enhance or monitor performance including crimping, flaring, flanging, presetting, bending, cutting, deburring, swaging machines, sensors, tags, lockout handles, spring guards and associated tooling. This safety guide is a supplement to and is to be used with the specific Parker publications for the specific Hose, Fittings and Related Accessories that are being considered for use. Parker publications are available at www.parker.com. SAE J1273 (www.sae.org) and ISO 17165-2 (www.ansi.org) also provide recommended practices for hydraulic Hose Assemblies, and should be followed.

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

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

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

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

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

2.0 HOSE, TUBE AND FITTINGS SELECTION INSTRUCTIONS

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

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

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

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

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

Parker manufactures a special Hose for certain compressed natural gas ("CNG") applications where static electricity buildup may occur. Parker CNG Hose assemblies comply with the requirements of ANSI/IAS NGV 4.2; CSA 12.52, "Hoses for Natural Gas Vehicles and Dispensing Systems" (www.ansi.org). This Hose is labeled "Electrically Conductive for CNG Use" on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in, for example, high velocity CNG dispensing or transfer. Do not use any other Hose for CNG applications where static charge buildup may occur, even if electrically conductive. Use of other Hoses in CNG applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. Care must also be taken to protect against CNG permeation through the Hose wall. See section 2.6, Permeation, for more information. Parker CNG Hose is intended for dispenser and vehicle use

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

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

TABLE OF CONTENTS

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

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

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

TABLE OF CONTENTS

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

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

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

TABLE OF CONTENTS

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.

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

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

PARKER-HANNIFIN CORPORATION
OFFER OF SALE

TABLE OF CONTENTS

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.

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

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

TABLE OF CONTENTS

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.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.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
http://www.parker.com/tfd

Parker's Motion & Control Technologies

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

For further info, call 1 800 C-Parker (1 800 272 7537).

Aerospace

Key Markets

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

Key Products

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

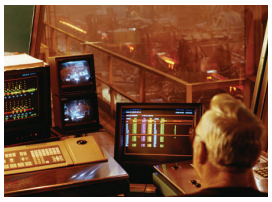
Climate Control

Key Markets

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

Key Products

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



Electromechanical

Key Markets

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

Key Products

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

Filtration

Key Markets

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

Key Products

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

TABLE OF CONTENTS

Fluid & Gas Handling

Key Markets

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

Key Products

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

Hydraulics

Key Markets

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

Key Products

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

Pneumatics

Key Markets

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

Key Products

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

Process Control

Key Markets

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

Key Products

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

Sealing & Shielding

Key Markets

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

Key Products

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

ENGINEERING YOUR SUCCESS.

Parker Fluid Connectors Group
North American Divisions & Distribution Service Centers

TABLE OF CONTENTS

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

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

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

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

For information, call toll free...

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

North American Divisions

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

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

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

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

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

Distribution Service Centers

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

Louisville, KY
phone 502 937 1322
fax 502 937 4180

Portland, OR
phone 503 283 1020
fax 503 283 2201

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

Canada
Milton, ONT
phone 905 693 3000
fax 905 876 1958
(Contact Milton for other Service Center locations.)

Mexico
Toluca, MEX
phone (52) 722 2754 200
fax (52) 722 2722 168

Parker Hannifin Corporation
Tube Fittings Division
3885 Gateway Blvd.
Columbus, OH 43228
phone 614 279 7070
fax 614 279 7868
www.parker.com/tfd