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Seal-Lok for CNG

Catalog 4301-SL-CNG May 2020

Parker

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Tube Fittings Division
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Seal-Lok for CNG 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 (ORFS) type fitting that consists of a nut, a body, an O-ring and a sleeve (See Fig. 1). As shown in Fig. 2, the mating tube is flanged to 90°. 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 for CNG is an extension of the standard Seal-Lok product line and is equipped with an elastomeric seal compound that is specially designed to address the needs of the natural gas market. The CNG-approved compound is a HNBR which has very good ozone resistance and supports a wider temperature range.

Key features of Seal-Lok CNG:

- Available in inch sizes 1/4" – 3/4" OD and metric sizes 6 mm – 20 mm*
- Standard materials are stainless steel and XTR (zinc nickel) plated steel
- High resistance to over-tightening during assembly, and loosening due to system vibration
- CNG specific HNBR O-ring compound with sealing temperature capabilities -40°F to 300°F, ozone resistance, and excellent compatibility with natural gas

Seal-Lok CNG has been validated by TUV according to the following standards:

- ECE R110 regulation (Economic Commission for Europe)
- ANSI NGV 3.1-2014/CSA 12.3-2014 (Natural Gas Vehicles/ Canadian Standards Association)
- ISO 15500
- Bonfire tested in accordance with ANSI/CSA NGV 2

*Seal-Lok fittings for 1" to 2" tubes can also be used with HNBR O-rings, but were not part of the validations programs listed.

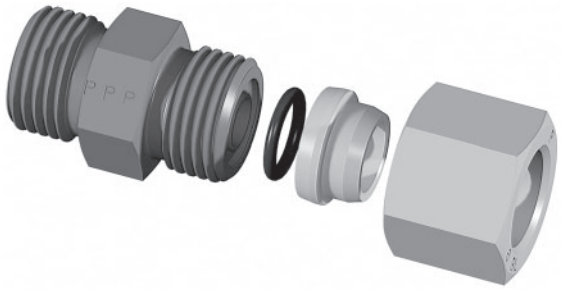

Fig. 1 — Seal-Lok Fitting Body, O-ring, Sleeve and Nut

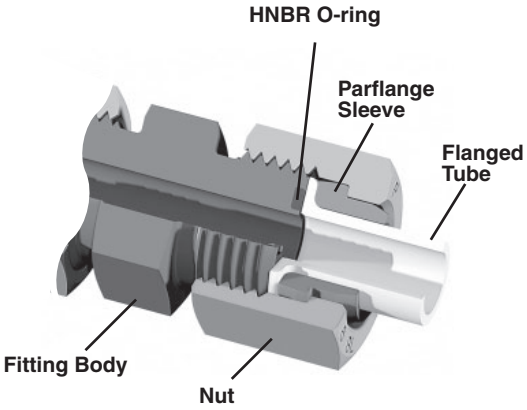

Fig. 2 — Seal-Lok Cutaway showing a flanged tube assembly

How Seal-Lok Fittings Work

The flat face of the Seal-Lok body contains the HNBR O-ring in a precision machined Captive O-ring Groove (CORG) as shown in Fig. 3. A flanged tube assembly or machined hose fitting swivel when connected to the body will compress the o-ring in the groove between the flat faces, forming a gas-tight seal as shown in Fig. 2.

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 to the recommended assembly torque, completes the assembly. The sharp torque rise gives a tactile feel to the user, providing a positive indication that the connection is properly assembled.

All load surfaces, including sealing faces are flat and perpendicular to the applied torque, reducing distortion. This gives Seal-Lok CNG practically unlimited reusability. The O-ring should be inspected at each disassembly and replaced when necessary.

When using Seal-Lok CNG with flanged tube, ensure the sealing face of the flanged tube is smooth, free of nicks, scratches, tool marks, splits, or weld seams. For specific tube type and wall thickness recommendations, please see Table 13 and Table 14 on page 48.

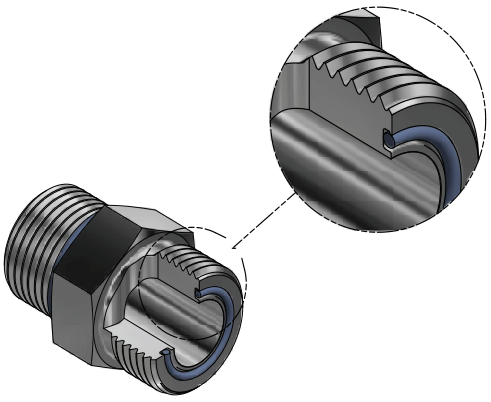

Fig. 3 — Captive O-ring Groove (CORG) Cutaway

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Available Styles, Sizes and Materials

Parker's Seal-Lok for CNG fittings are available in either 316 Stainless Steel or Zn-Ni (XTR) plated Carbon Steel.

The Seal-Lok for CNG product line includes a range of tube or hose connection styles to meet various system design needs in sizes 1/4" to 3/4". The CNG HNBR O-ring can be provided on larger sizes; however, these sizes have not been validated in accordance with the CNG standards (NGV/CSA, ECE, ISO). Standard configurations include straights, elbows, and tees, with port end styles NPT, BSPT, SAE J1926, BSPP ISO 1179, metric ISO 9974 and metric ISO 6149.

CNG Applications

Seal-Lok for CNG fittings are suitable for various applications throughout the CNG market. These fittings can be found at the:

- Infrastructure level
- Connecting underground coiled stainless steel tubing to priority panels
- Compressors or
- Dispensers

Seal-Lok for CNG fittings are also being specified at the OEM-level on natural gas vehicles, including but not limited to:

- Heavy-duty trucks
- Refuse vehicles
- Transit buses
- Fuel transport trailers

Seal-Lok is helping make reliable connections from the system regulator out to the storage tanks.

The Seal-Lok for CNG Advantage

- CNG validated and compatible HNBR O-ring, capable of -40°F to 300°F
- Fire rated, per CNG bonfire testing (for more information, see http://blog.parker.com/seal-lok-orfs-cng-fittings-pass-on-vehicle-fire-safety-test)
- Zero clearance interface for best in class tube assembly routing.
- Excellent resistance to over tightening
- Best in class vibration resistance
- Works with existing Parflange technology
- Field replaceable seal for easy maintenance
- Working pressures up to 6000 PSI
- Seals and fittings available in sizes 4 to 32

How to Order

The nomenclature for Seal-Lok for CNG fittings is similar to Seal-Lok, with the following changes:

Step 1: start with standard Parker part number, no material

Step 2: add material suffix

- use -SS for Stainless Steel
- use -S ZJ for XTR plated Steel

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.

Step 3: add seal call-out

- use -CNG for -4 to -12 sizes Seal-Lok
- use -NGO for all other sizes of Seal-Lok or for other products (i.e. Triple-Lok, Pipe Fittings/Adapters)

Example 1: 6 F5OLO-SS CNG
-6 size straight Seal-Lok fitting in stainless steel

Example 2: 8 C5OLO-S ZJ CNG
-8 size elbow Seal-Lok fitting in XTR plated steel

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.

Example 3: 16 F5OLO-SS NGO
-16 size straight Seal-Lok fitting in stainless steel

Example 4: 6 F5OX-SS NGO
-6 size straight Triple-Lok fitting in stainless steel

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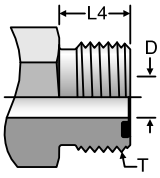
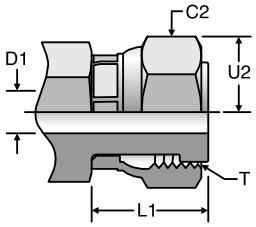
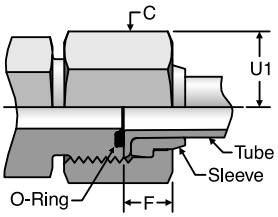
Seal-Lok for CNG O-Ring Face Seal Tube Ends



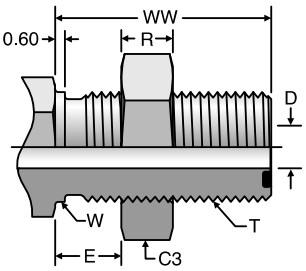
Seal-Lok Male Tube End



Seal-Lok Female Swivel



Seal-Lok Tube End Assembly



Seal-Lok Bulkhead

																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	**Tube O.D.**		**T**	**C**		**C2**		**C3**		**D[1)]**	**D1[1)]**	**E**	**Ref. F**	**L1**	**L4**	**R**	**W[2)]**	**WW**	**U1**	**U2**
Size	(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. Also D, for -4 metric based Seal-Lok may be D.197 (5mm) to satisfy ISO 8434-3 (1994 Edition). Contact the Tube Fittings Division if there are any questions.

2) Recommended clearance hole = W + 0.015.

Dimensions and pressures for reference only, subject to change.

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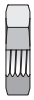
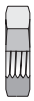
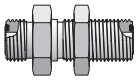
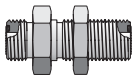
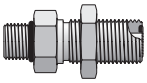
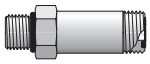
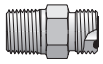
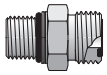
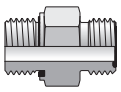
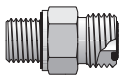
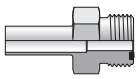
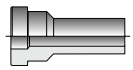
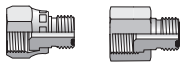
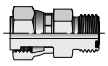
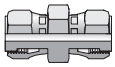
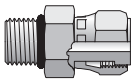
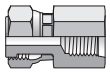
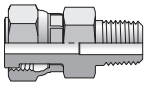
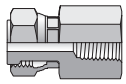
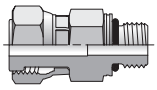
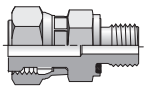
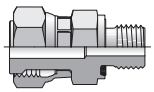
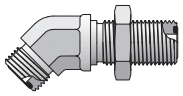
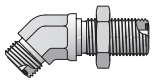
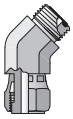
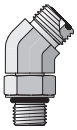
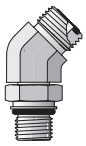
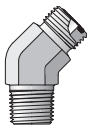
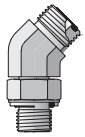
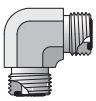
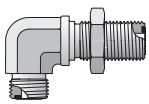
Nuts, Sleeves, Locknuts	**BL** Tube Nut  9	**BML** Tube Nut - mm Hex  9	**TPLS (Metric)** Parflange Sleeve  9	**TPL (Inch)** Parflange Sleeve  9	**WLNL** Bulkhead Locknut  10
WLNML Blkhd Locknut - mm Hex  10	**Straights**	**HLO** Union  10	**HMLO** Union - mm Hex  10	**WLO** Bulkhead Union  11	**WMLO** Bulkhead Union - mm Hex  11
WF5OLO ORFS Blkhd / SAE-ORB  12	**FF5OLO** ORFS - Long / SAE-ORB  12	**F5OLO** ORFS / SAE-ORB  13	**FLO** ORFS / NPTF  13	**GLO** ORFS / NPTF  14	**F87OMLO** ORFS / ISO 6149  14
F82EDMLO ORFS / Metric-ED  14	**F42EDMLO** ORFS / BSPP-ED  14	**LOHT3** ORFS / Tube Weld  15	**TLW1** Butt Weld / Sleeve  15	**Straight Swivels**	**TRLON** Tube End Reducer  15
LOHL6 Extender and Expander  16	**HL6** ORFS Swivel Union  16	**F65OL** ORFS Swivel / SAE-ORB  16	**G65L** ORFS Swivel / SAE-ORB  16	**F6L** ORFS Swivel / NPTF  17	**G6L** ORFS Swivel / NPTF  17
F687OML ORFS Swivel / ISO 6149  17	**F682EDML** ORFS Swivel / Metric-ED  17	**F642EDML** ORFS Swivel / BSPP-ED  18	**45° Elbows**	**WNLO** Bulkhead Union  18	**WNMLO** Bulkhead Union - mm Hex  19
V6LO ORFS Swivel Elbow  19	**V5OLO** ORFS / SAE-ORB  19	**V87OMLO** ORFS / ISO 6149  19	**VLO** ORFS / NPTF  20	**V4OMLO** ORFS / BSPP-ORR  20	**90° Elbows**
ELO Union Elbow  20	**EMLO** Union Elbow - mm Hex  20	**WELO** Bulkhead Union  21	**WEMLO** Bulkhead Union - mm Hex 21	**C6LO** ORFS Swivel Elbow 22	**C6MLO** Swivel Elbow - mm Hex 22

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

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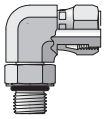
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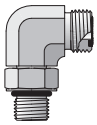
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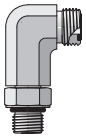
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ORFS / NPTF

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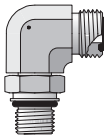
ORFS / ISO 6149

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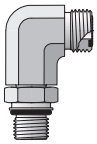
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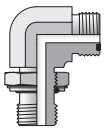
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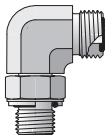
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Tees

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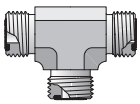
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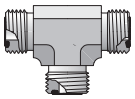
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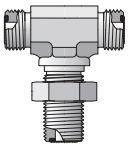
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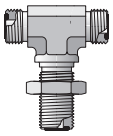
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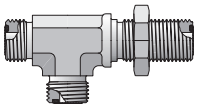
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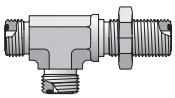
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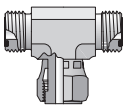
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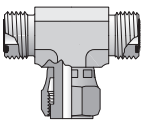
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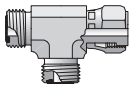
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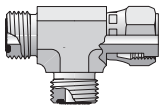
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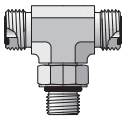
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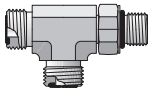
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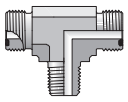
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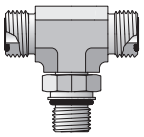
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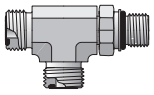
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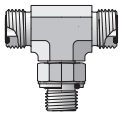
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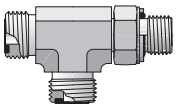
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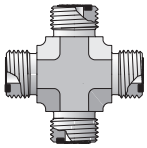
Crosses

KLO
Union Cross

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Plugs and Caps

PNLO
ORFS Plug

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PNMLO
ORFS Plug - mm Hex

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FNL
ORFS Cap

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FNML
ORFS Cap - mm Hex

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Parker Hannifin Corporation
Tube Fittings Division
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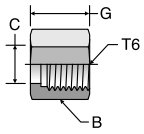
Tube Nut
ORFS

SAE 520110



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

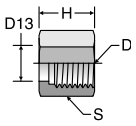
** These tube nuts should not be exposed to annealing temperatures, such as furnace brazing. Contact the Tube Fittings Division for information on special nuts.

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

BML

Tube Nut – mm Hex
ORFS

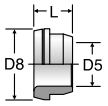
ISO 8434-3 NA
SAE 52M0110A



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

TPLS (Metric)

Parflange Sleeve for
Metric Tubing
ORFS Mechanically
Attachable Sleeve

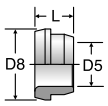


TUBE FITTING PART #	USED WITH FITTING SIZE	D5 END SIZE (mm)	D8 DIA (mm)	L (mm)
TPLSS6	-4	6	12.75	7.5
TPLSS8	-6	8	15.75	8.5
TPLSS10	-6	10	15.75	8.5
TPLSS12	-8	12	18.90	10.5
TPLSS14	-10	14	23.50	10.5
TPLSS15	-10	15	23.50	10.5
TPLSS16	-10	16	23.50	10.5
TPLSS18	-12	18	27.80	12.0
TPLSS20	-12	20	27.80	12.0
TPLSS25	-16	25	34.00	13.5
TPLSS30	-20	30	40.50	13.0
TPLSS32	-20	32	40.50	13.0
TPLSS35	-24	35	48.50	12.5
TPLSS38	-24	38	48.50	12.5

• Must be mechanically attached using Parflange system.

TPL (Inch)

Parflange Sleeve
for Inch Tubing
ORFS Mechanically
Attachable Sleeve



TUBE FITTING PART #	D5 END SIZE (in.)	D8 DIA (in.)	L (in.)
4 TPL-SS	1/4	0.50	0.30
6 TPL-SS	3/8	0.62	0.34
8 TPL-SS	1/2	0.74	0.42
10 TPL-SS	5/8	0.92	0.42
12 TPL-SS	3/4	1.09	0.47
16 TPL-SS	1	1.34	0.53
20 TPL-SS	1 1/4	1.59	0.51
24 TPL-SS	1 1/2	1.91	0.49
32 TPL-SS	2	2.39	0.54

• Must be mechanically attached using Parflange system.

Dimensions and pressures for reference only, subject to change.

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

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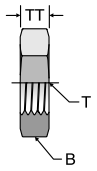
WLNL

Bulkhead Locknut

SAE 520118



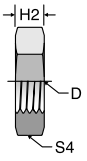
TUBE FITTING PART #	END SIZE (in.)	T TUBE END UN/UNF-2A	B HEX (in.)	TT (in.)
4 WLNL-SS	1/4	9/16 - 18	13/16	0.27
6 WLNL-SS	3/8	11/16 - 16	1	0.31
8 WLNL-SS	1/2	13/16 - 16	1 1/8	0.35
10 WLNL-SS	5/8	1 - 14	1 5/16	0.41
12 WLNL-SS	3/4	1 3/16 - 12	1 1/2	0.41
14 WLNL-SS*	7/8	1 5/16 - 12	1 5/8	0.41
16 WLNL-SS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

* Size 14 is not included in SAE J1453.

WLNML

Bulkhead Locknut – mm Hex

ISO 8434-3 BHLN
SAE 52M0118

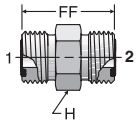


TUBE FITTING PART #	END SIZE (mm)	END SIZE (in.)	D TUBE END UN/UNF-2B	H2 (mm)	S4 HEX (mm)
4WLNML-SS	6	1/4	9/16 - 18	7.0	22
6WLNML-SS	8,10	3/8	11/16 - 16	8.0	27
8WLNML-SS	12	1/2	13/16 - 16	9.0	30
10WLNML-SS	14,15,16	5/8	1 - 14	10.5	36
12WLNML-SS	18,20	3/4	1 3/16 - 12	10.5	41
16WLNML-SS	22,25	1	1 7/16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

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)
4 HLO-SS CNG	1/4	1/4	1.08	5/8	9.2
6 HLO-SS CNG	3/8	3/8	1.22	3/4	9.2
6-4 HLO-SS CNG	3/8	1/4	1.18	3/4	9.2
8 HLO-SS CNG	1/2	1/2	1.40	7/8	9.2
8-6 HLO-SS CNG	1/2	3/8	1.32	7/8	9.2
10 HLO-SS CNG	5/8	5/8	1.67	1 1/16	6.0
10-8 HLO-SS CNG	5/8	1/2	1.57	1 1/16	6.0
12 HLO-SS CNG	3/4	3/4	1.85	1 1/4	6.0
12-8 HLO-SS CNG	3/4	1/2	1.69	1 1/4	6.0
12-10 HLO-SS CNG	3/4	5/8	1.79	1 1/4	6.0
16 HLO-SS NGO	1	1	1.95	1 1/2	6.0
16-12 HLO-SS NGO	1	3/4	1.93	1 1/2	6.0
20 HLO-SS NGO	1 1/4	1 1/4	2.03	1 3/4	6.0
20-16 HLO-SS NGO	1 1/4	1	2.03	1 3/4	6.0
24 HLO-SS NGO	1 1/2	1 1/2	2.09	2 1/8	5.0
32 HLO-SS NGO*	2	2	2.48	2 3/4	3.0

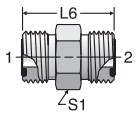
* Hex different from SAE
* Steel XTR

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4HMLO-SS CNG	6	1/4	27.5	17	9.2
6HMLO-SS CNG	8,10	3/8	31.0	19	9.2
8HMLO-SS CNG	12	1/2	35.5	22	9.2
10HMLO-SS CNG	14,15,16	5/8	42.5	27	6.0
12HMLO-SS CNG	18,20	3/4	47.0	32	6.0
16HMLO-SS NGO	22,25	1	49.5	41	6.0
20HMLO-SS NGO	28,30,32	1 1/4	51.5	46	6.0
24HMLO-SS NGO	35,38	1 1/2	53.0	55	5.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
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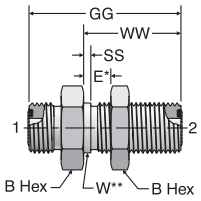
WLO

Bulkhead Union
ORFS / ORFS

SAE 520601
WLO-WLNL Body with Locknut
(See page 10 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)
4 WLO-SS CNG	1/4	13/16	0.55	1.90	0.06	0.56	1.24	9.2
6 WLO-SS CNG	3/8	1	0.55	2.09	0.06	0.69	1.34	9.2
8 WLO-SS CNG	1/2	1 1/8	0.55	2.30	0.06	0.81	1.44	9.2
10 WLO-SS CNG	5/8	1 5/16	0.55	2.62	0.06	1.00	1.59	6.0
12 WLO-SS CNG	3/4	1 1/2	0.55	2.72	0.06	1.19	1.63	6.0
16 WLO-SS NGO	1	1 3/4	0.55	2.76	0.06	1.44	1.65	6.0
20 WLO-SS NGO	1 1/4	2	0.55	2.76	0.06	1.69	1.65	6.0
24 WLO-SS NGO	1 1/2	2 3/8	0.55	2.76	0.06	2.00	1.65	5.0

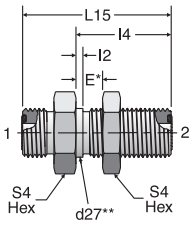
** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

WMLO

Bulkhead Union – mm Hex
ORFS / ORFS

ISO 8434-3 BHS
SAE 52M0601
WMLO-WLNML - Body with Locknut
(See page 10 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)
4WMLO-SS CNG	6	1/4	14.3	14	31.5	1.5	48.0	22	9.2
6WMLO-SS CNG	8,10	3/8	17.5	14	34.0	1.5	53.0	27	9.2
8WMLO-SS CNG	12	1/2	20.6	14	36.5	1.5	58.5	30	9.2
10WMLO-SS CNG	14,15,16	5/8	25.4	14	40.5	1.5	66.5	36	6.0
12WMLO-SS CNG	18,20	3/4	30.2	14	41.5	1.5	69.0	41	6.0
16WMLO-SS NGO	22,25	1	36.5	14	42.0	1.5	70.0	46	6.0
20WMLO-SS NGO	28,30,32	1 1/4	42.9	14	42.0	1.5	70.0	50	6.0
24WMLO-SS NGO	35,38	1 1/2	50.8	14	42.0	1.5	70.0	60	5.0

* E – Maximum bulkhead thickness.

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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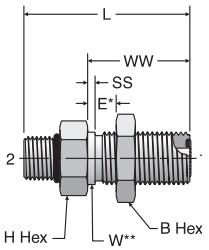
WF5OLO

Straight Thread Bulkhead Connector
ORFS / SAE-ORB
WF5OLO-WLNL - Body with Locknut
(See page 10 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)
4 WF5OLO-SS CNG	1/4	7/16 - 20	13/16	0.55	13/16	2.14	0.06	0.56	1.24	9.2
6 WF5OLO-SS CNG	3/8	9/16 - 18	1	0.55	1	2.31	0.06	0.69	1.34	9.2
8 WF5OLO-SS CNG	1/2	3/4 - 16	1 1/8	0.55	1 1/8	2.60	0.06	0.81	1.44	9.2
10 WF5OLO-SS CNG	5/8	7/8 - 14	1 5/16	0.55	1 5/16	2.69	0.06	1.00	1.59	6.0
12 WF5OLO-SS CNG	3/4	1 1/16 - 12	1 1/2	0.55	1 1/2	2.89	0.06	1.19	1.63	6.0
16 WF5OLO-SS CNG	1	1 5/16 - 12	1 3/4	0.55	1 3/4	2.95	0.06	1.44	1.65	6.0

* E – Maximum bulkhead thickness.

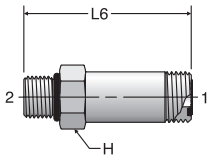
** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4 FF5OLO-SS CNG	1/4	7/16 - 20	5/8	2.07	9.2
6 FF5OLO-SS CNG	3/8	9/16 - 18	3/4	2.27	9.2
6-4 FF5OLO-SS CNG	3/8	7/16 - 20	3/4	2.39	9.2
8 FF5OLO-SS CNG	1/2	3/4 - 16	7/8	2.67	9.2
10 FF5OLO-SS CNG	5/8	7/8 - 14	1 1/16	3.14	6.0
12 FF5OLO-SS CNG	3/4	1 1/16 12	1 1/4	3.76	6.0
16 FF5OLO-SS NGO	1	1 5/16 - 12	1 1/2	4.14	6.0
20 FF5OLO-SS NGO	1 1/4	1 5/8 - 12	1 7/8	4.76	6.0
24 FF5OLO-SS NGO	1 1/2	1 7/8 - 12	2 1/8	5.26	5.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
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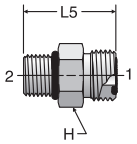
F5OLO

Straight Thread Connector
ORFS / SAE-ORB



SAE 520120

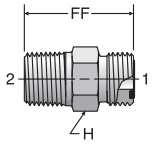
TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	H HEX (in.)	L5 (in.)	Dynamic Pressure (x 1,000 PSI)
4 F5OLO-SS CNG	1/4	7/16 - 20	5/8	1.13	9.2
4-5 F5OLO*-SS CNG	1/4	1/2 - 20	5/8	1.16	9.2
4-6 F5OLO-SS CNG	1/4	9/16 - 18	3/4	1.20	9.2
4-8 F5OLO-SS CNG	1/4	3/4 - 16	7/8	1.32	9.2
6 F5OLO-SS CNG	3/8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

*Different from SAE

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4 FLO-SS CNG	1/4	1/8 - 27	1.07	5/8	6.0
4-4 FLO-SS CNG	1/4	1/4 - 18	1.26	5/8	6.0
4-6 FLO-SS CNG	1/4	3/8 - 18	1.32	3/4	6.0
4-8 FLO-SS CNG	1/4	1/2 - 14	1.52	7/8	6.0
6 FLO-SS CNG	3/8	1/4 - 18	1.25	3/4	6.0
6-2 FLO-SS CNG	3/8	1/8 - 27	1.16	3/4	6.0
6-6 FLO-SS CNG	3/8	3/8 - 18	1.34	3/4	6.0
6-8 FLO-SS CNG	3/8	1/2 - 14	1.55	7/8	6.0
8 FLO-SS CNG	1/2	3/8 - 18	1.48	7/8	6.0
8-4 FLO-SS CNG	1/2	1/4 - 18	1.48	7/8	6.0
8-8 FLO-SS CNG	1/2	1/2 - 14	1.64	7/8	6.0
8-12 FLO-SS CNG	1/2	3/4 - 14	1.69	1 1/8	6.0
10 FLO-SS CNG	5/8	1/2 - 14	1.82	1 1/16	6.0
10-12 FLO-SS CNG	5/8	3/4 - 14	1.82	1 1/8	5.5
12 FLO-SS CNG	3/4	3/4 - 14	1.93	1 1/4	5.5
12-8 FLO-SS CNG	3/4	1/2 - 14	1.93	1 1/4	6.0
12-16 FLO-SS CNG	3/4	1 - 11 1/2	2.13	1 3/8	4.5
16 FLO-SS NGO	1	1 - 11 1/2	2.19	1 1/2	4.5
16-12 FLO-SS NGO	1	3/4 - 14	2.00	1 1/2	5.5
16-20 FLO-SS NGO	1	1 1/4 - 11 1/2	2.30	1 3/4	3.0
20 FLO-SS NGO	1 1/4	1 1/4 - 11 1/2	2.30	1 7/8	3.0
20-12 FLO-SS NGO	1 1/4	3/4 - 14	2.02	1 7/8	5.5
20-16 FLO-SS NGO	1 1/4	1 - 11 1/2	2.27	1 7/8	4.5
24 FLO-SS NGO	1 1/2	1 1/2 - 11 1/2	2.40	2 1/8	3.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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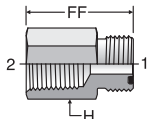
GLO

Female NPT
ORFS / Female Pipe

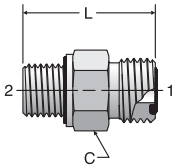


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	FF (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI)
4 GLO-SS CNG	1/4	1/8 - 27	1.03	5/8	6.0
4-4 GLO-SS CNG	1/4	1/4 - 18	1.25	3/4	6.0
6 GLO-SS CNG	3/8	1/4 - 18	1.30	3/4	6.0
6-6 GLO-SS CNG	3/8	3/8 - 18	1.34	7/8	6.0
8 GLO-SS CNG	1/2	3/8 - 18	1.34	7/8	6.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

F42EDMLO

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



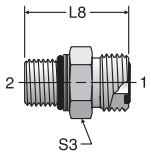
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 BSPP	C HEX (mm)	L (mm)	Dynamic Pressure (x 1,000 PSI)
4F42EDMLO-SS CNG	6	1/4	1/8 - 28	17	25.7	9.2
4-4F42EDMLO-SS CNG	6	1/4	1/4 - 19	19	30.5	9.2
4-6F42EDMLO-SS CNG	6	1/4	3/8 - 19	22	31.6	9.2
4-8F42EDMLO-SS CNG	6	1/4	1/2 - 14	27	35.4	6.0
6F42EDMLO-SS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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

F87OMLO

Metric Straight Thread Connector
ORFS / ISO 6149

ISO 8434-3 SDS
SAE 52M0187



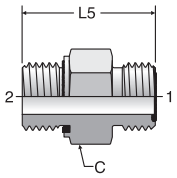
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 ISO 261	L8 (mm)	S3 HEX (mm)	Dynamic Pressure (x 1,000 PSI)
4M12F87OMLO-SS CNG	6	1/4	M12X1.5	28.5	17	9.2
4M14F87OMLO-SS CNG	6	1/4	M14X1.5	29.5	19	9.2
6M12F87OMLO-SS CNG	8,10	3/8	M12X1.5	32.0	22	9.2
6M14F87OMLO-SS CNG	8,10	3/8	M14X1.5	32.0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

* M38X2 is not included in ISO 6149.

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4M12F82EDMLO-SS CNG	6	1/4	M12X1.5	17	29.7	9.2
4M14F82EDMLO-SS CNG	6	1/4	M14X1.5	19	30.5	9.2
6M14F82EDMLO-SS CNG	8,10	3/8	M14X1.5	19	31.9	9.2
6M16F82EDMLO-SS CNG	8,10	3/8	M16X1.5	22	31.9	9.2
8M16F82EDMLO-SS CNG	12	1/2	M16X1.5	22	32.0	9.2
8M18F82EDMLO-SS CNG	12	1/2	M18X1.5	24	34.6	9.2
10M22F82EDMLO-SS CNG	14,15,16	5/8	M22X1.5	27	41.1	6.0
12M22F82EDMLO-SS CNG	18,20	3/4	M22X1.5	32	42.7	6.0
12M27F82EDMLO-SS CNG	18,20	3/4	M27X2	32	46.1	6.0
16M33F82EDMLO-SS NGO	22,25	1	M33X2	41	49.8	6.0
20M42F82EDMLO-SS NGO	28,30,32	1 1/4	M42X2	50	54.0	5.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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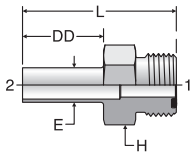
LOHT3

Tube Stub Connector
ORFS / Tube Weld

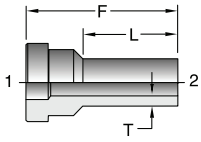


TUBE FITTING PART #	END SIZE 1 & 2 (in.)	DD (in.)	E DIA (in.)	H HEX (in.)	L (in.)	Dynamic Pressure (x 1,000 PSI)
4-4X035 LOHT3-SS CNG	1/4	0.88	0.25	5/8	1.58	5.9
6-6X035 LOHT3-SS CNG	3/8	0.88	0.38	3/4	1.67	3.8
8-8X065 LOHT3-SS CNG	1/2	1.00	0.50	7/8	1.89	5.5
12-12X065 LOHT3-SS CNG	3/4	1.16	0.75	1 1/4	2.35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

* Contact Tube Fittings Division for pressure ratings.
To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

TLW1

Butt Weld
Sleeve



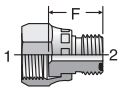
TUBE FITTING PART #	END SIZE 1 (in.)	2 (in.)	F (in.)	L (in.)	T (in.)	Dynamic Pressure (x 1,000 PSI)
4-4X035 TLW1-SS	1/4	1/4	1.20	0.75	0.035	5.9
6-4X035 TLW1-SS	3/8	1/4	1.26	0.75	0.035	5.9
6-4X049 TLW1-SS	3/8	1/4	1.26	0.75	0.049	8.6
6-6X035 TLW1-SS	3/8	3/8	1.20	0.75	0.035	3.8
6-6X049 TLW1-SS	3/8	3/8	1.20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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

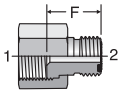
TRLON

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 (in.)	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.)		
6-4 TRLON-SS CNG	—	—	3/8	1/4	0.77	9.2
—	**8-4 TRLON-SS CNG**	**8-4 TRLO-SS CNG**	1/2	1/4	0.87	9.2
8-6 TRLON-SS CNG	—	—	1/2	3/8	0.89	9.2
—	**10-4 TRLON-SS CNG**	**10-4 TRLO-SS CNG**	5/8	1/4	0.91	6.0
—	**10-6 TRLON-SS CNG**	**10-6 TRLO-SS CNG**	5/8	3/8	0.94	6.0
—	**10-8 TRLON-SS CNG**	**10-8 TRLO-SS CNG**	5/8	1/2	1.00	6.0
—	**12-4 TRLON-SS CNG**	**12-4 TRLO-SS CNG**	3/4	1/4	0.98	6.0
—	**12-6 TRLON-SS CNG**	**12-6 TRLO-SS CNG**	3/4	3/8	1.02	6.0
—	**12-8 TRLON-SS CNG**	**12-8 TRLO-SS CNG**	3/4	1/2	1.08	6.0
12-10 TRLON-SS CNG	—	—	3/4	5/8	1.16	6.0
—	**16-8 TRLON-SS NGO**	**16-8 TRLO-SS NGO**	1	1/2	1.14	6.0
—	**16-10 TRLON-SS NGO**	**16-10 TRLO-SS NGO**	1	5/8	1.26	6.0
16-12 TRLON-SS NGO	—	—	1	3/4	1.30	6.0
—	**20-12 TRLON-SS NGO**	**20-12 TRLO-SS NGO**	1 1/4	3/4	1.32	5.0
20-16 TRLON-SS NGO	—	—	1 1/4	1	1.34	5.0
—	**24-12 TRLON-SS NGO**	—	1 1/2	3/4	1.32	4.0
—	**24-16 TRLON-SS NGO**	**24-16 TRLO-SS NGO**	1 1/2	1	1.34	4.0
—	**24-20 TRLON-SS NGO**	**24-20 TRLO-SS NGO**	1 1/2	1 1/4	1.34	4.0
—	**32-20 TRLON-SS NGO**	**32-20 TRLO-SS NGO**	2	1 1/4	1.42	3.0
—	**32-24 TRLON-SS NGO**	**32-24 TRLO-SS NGO**	2	1 1/2	1.42	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).
To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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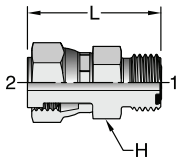
LOHL6

Tube End Extender / Expander
ORFS / ORFS Swivel

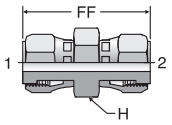


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	L (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI)
4 LOHL6-SS CNG	1/4	1/4	1.33	5/8	9.2
6 LOHL6-SS CNG	3/8	3/8	1.44	3/4	9.2
6-4 LOHL6-SS CNG	3/8	1/4	1.37	3/4	9.2
8 LOHL6-SS CNG	1/2	1/2	1.67	7/8	9.2
8-6 LOHL6-SS CNG	1/2	3/8	1.62	7/8	9.2
10-8 LOHL6-SS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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

HL6

Swivel Nut Union
ORFS Swivel / ORFS Swivel



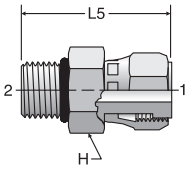
TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	FF (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI)
4 HL6-SS	1/4	1/4	1.59	5/8	9.2
6 HL6-SS	3/8	3/8	1.77	3/4	9.2
8 HL6-SS	1/2	1/2	2.12	7/8	9.2
10 HL6-SS	5/8	5/8	2.42	1 1/16	6.0
12 HL6-SS	3/4	3/4	2.74	1 1/4	6.0
16 HL6-SS	1	1	2.95	1 7/16	6.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

F65OL

Straight Thread Swivel Connector
ORFS Swivel / SAE-ORB

SAE 520181

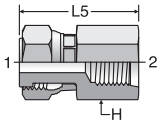


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	H HEX (in.)	L5 (in.)	Dynamic Pressure (x 1,000 PSI)
4 F65OL-SS CNG	1/4	7/16 - 20	5/8	1.46	9.2
6 F65OL-SS CNG	3/8	9/16 - 18	3/4	1.57	9.2
8 F65OL-SS CNG	1/2	3/4 - 16	7/8	1.95	9.2
10 F65OL-SS CNG	5/8	7/8 - 14	1 1/16	2.13	6.0
12 F65OL-SS CNG	3/4	1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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4 G65L-SS	1/4	7/16 - 20	3/4	1.38	6.0
4-6 G65L-SS	1/4	9/16 - 18	13/16	1.45	6.0
6-4 G65L-SS	3/8	7/16 - 20	3/4	1.51	6.0
8-4 G65L-SS	1/2	7/16 - 20	7/8	1.57	6.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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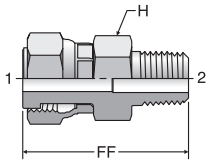
F6L

Pipe Thread Swivel Connector
ORFS Swivel / NPTF

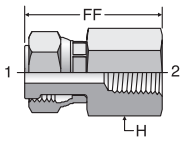


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	FF (in.)	H HEX (in.)	Dynamic Pressure (x 1,000 PSI)
4 F6L-SS	1/4	1/8 - 27	1.33	5/8	6.0
4-4 F6L-SS	1/4	1/4 - 18	1.52	5/8	6.0
6 F6L-SS	3/8	1/4 - 18	1.69	3/4	6.0
6-6 F6L-SS	3/8	3/8 - 18	1.67	3/4	6.0
8 F6L-SS	1/2	3/8 - 18	1.95	3/4	6.0
8-8 F6L-SS	1/2	1/2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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

G6L

Female Pipe Thread Swivel Connector
ORFS Swivel / NPTF

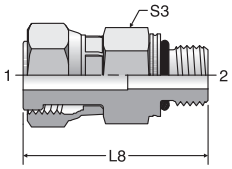


TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 NPTF	FF (in.)	H (in.)	Dynamic Pressure (x 1,000 PSI)
4-4 G6L-SS	1/4	1/4 - 18	1.48	3/4	6.0
6 G6L-SS	3/8	1/4 - 18	1.60	7/8	6.0
8-4 G6L-SS	1/2	1/4 - 18	1.75	7/8	6.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

F687OML

Swivel ISO 6149 Connector
ORFS Swivel / ISO 6149

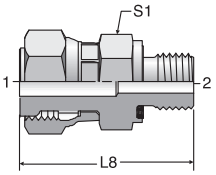


TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 ISO 261	L8 (mm)	S3 HEX (mm)	Dynamic Pressure (x 1,000 PSI)
4M12F687OML-SS CNG	6	1/4	M12x1.5	37.0	17	9.2
6M12F687OML-SS CNG	8,10	3/8	M12x1.5	39.0	17	9.2
6M14F687OML-SS CNG	8,10	3/8	M14x1.5	38.0	19	9.2
6M16F687OML-SS CNG	8,10	3/8	M16x1.5	43.5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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4M12F682EDML-SS CNG	6	1/4	M12x1.5	38.2	17	9.2
6M14F682EDML-SS CNG	8,10	3/8	M14x1.5	40.2	19	9.2
8M16F682EDML-SS CNG	12	1/2	M16x1.5	47.3	22	9.2
10M22F682EDML-SS CNG	14,15,16	5/8	M22X1.5	51.8	27	6.0
12M27F682EDML-SS CNG	18,20	3/4	M27X2	57.2	32	6.0
16M33F682EDML-SS NGO	22,25	1	M33X2	67.0	41	6.0

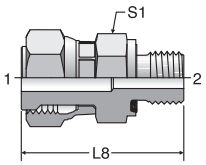
To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

F642EDML

Swivel BSPP Connector
ORFS Swivel / BSPP-ED



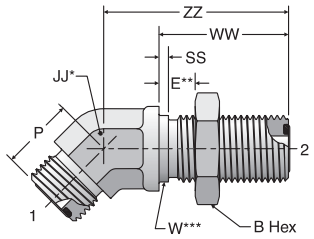
TUBE FITTING PART #	END SIZE 1 (mm)	1 (in.)	2 BSPP	L8 (mm)	S1 HEX (mm)	Dynamic Pressure (x 1,000 PSI)
4F642EDML-SS CNG	6	1/4	1/8	34.0	14	7.2
6F642EDML-SS CNG	8, 10	3/8	1/4	40.2	19	9.2
8F642EDML-SS CNG	12	1/2	3/8	47.3	22	9.2
10F642EDML-SS CNG	14, 15, 16	5/8	1/2	51.8	27	6.0
12F642EDML-SS CNG	18, 20	3/4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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

WNLO

45° Bulkhead Union Elbow
ORFS / ORFS

SAE 520801
WNLO-WLNL - Body with Locknut
(See page 10 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)
4 WNLO-SS CNG	1/4	1/4	13/16	0.55	9/16	0.63	0.06	0.56	1.24	1.73	9.2
6 WNLO-SS CNG	3/8	3/8	1	0.55	3/4	0.75	0.06	0.69	1.34	1.91	9.2
8 WNLO-SS CNG	1/2	1/2	1 1/8	0.55	3/4	0.81	0.06	0.81	1.44	2.01	9.2
10 WNLO-SS CNG	5/8	5/8	1 5/16	0.55	1 1/16	0.93	0.06	1.00	1.59	2.22	6.0
12 WNLO-SS CNG	3/4	3/4	1 1/2	0.55	1 3/16	1.02	0.06	1.19	1.63	2.38	6.0
16 WNLO-SS NGO	1	1	1 3/4	0.55	1 7/16	1.18	0.06	1.44	1.65	2.56	6.0
20 WNLO-SS NGO	1 1/4	1 1/4	2	0.55	1 5/8	1.26	0.06	1.69	1.65	2.64	5.0
24 WNLO-SS NGO	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

* JJ – Across wrench flats.

** E – Maximum bulkhead thickness.

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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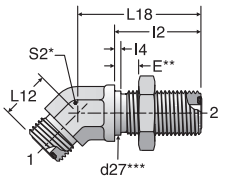
WNMLO

45° Bulkhead Union Elbow – mm Hex
ORFS / ORFS

ISO 8434-3 BHE45
SAE 52M0801
WNMLO-WLNML - Body with Locknut
(See page 10 for WLNML)



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

* S2 – Across Wrench Flats.

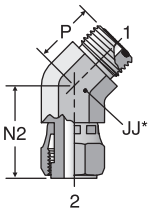
** E – Maximum bulkhead thickness.

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

V6LO

45° Swivel Nut Elbow
ORFS / ORFS Swivel



* JJ – Across Wrench Flats

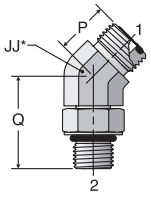
TUBE FITTING PART #	END SIZE 1 & 2 (in.)	JJ (in.)	N2 (in.)	P (in.)	Dynamic Pressure (x 1,000 PSI)
4 V6LO-SS CNG	1/4	9/16	0.99	0.63	9.2
6 V6LO-SS CNG	3/8	3/4	1.12	0.74	9.2
8 V6LO-SS CNG	1/2	3/4	1.49	0.80	9.2
10 V6LO-SS CNG	5/8	1 1/16	1.53	0.92	6.0
12 V6LO-SS CNG	3/4	1 3/16	1.73	1.02	6.0
16 V6LO-SS NGO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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

V5OLO

45° Straight Thread Elbow
ORFS / SAE-ORB

SAE 520320



* JJ – Across Hex Flats

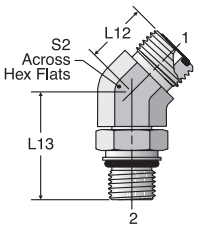
TUBE FITTING PART #	END SIZE 1 (in.)	2 UN/UNF-2A	JJ (in.)	P (in.)	Q (in.)	Dynamic Pressure (x 1,000 PSI)
4 V5OLO-SS CNG	1/4	7/16 - 20	9/16	0.63	1.18	6.0
4-6 V5OLO-SS CNG	1/4	9/16 - 18	3/4	0.69	1.30	6.0
6 V5OLO-SS CNG	3/8	9/16 - 18	3/4	0.75	1.30	6.0
6-4 V5OLO-SS CNG	3/8	7/16 - 20	3/4	0.75	1.22	6.0
6-8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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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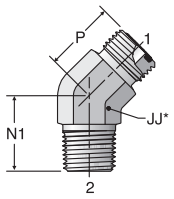
VLO

45° Male Elbow
ORFS / NPTF



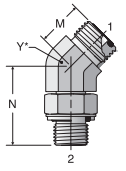
* JJ – Across Wrench Flats

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

V4OMLO

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



* Y – Across Hex Flats

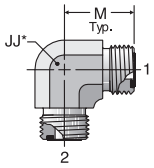
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 BSPP	M (mm)	N (mm)	Y (mm)	Dynamic Pressure (x 1,000 PSI)
4V4OMLO-SS CNG	6	1/4	1/8 - 28	16.0	27.5	14	4.0
4-4V4OMLO-SS CNG	6	1/4	1/4 - 19	17.5	32.0	19	4.0
6V4OMLO-SS CNG	8,10	3/8	1/4 - 19	19.0	32.0	19	4.0
6-6V4OMLO-SS CNG	8,10	3/8	3/8 - 19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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

ELO

Union Elbow
ORFS / ORFS

SAE 520201



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

* JJ – Across Wrench Flats

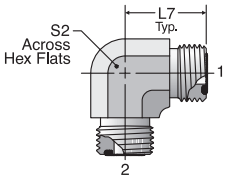
** Size 32 is not included in SAE J1453.

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4EMLO-SS CNG	6	1/4	21.5	14	9.2
6EMLO-SS CNG	8,10	3/8	25.0	19	9.2
8EMLO-SS CNG	12	1/2	28.0	19	9.2
10EMLO-SS CNG	14,15,16	5/8	33.5	27	6.0
12EMLO-SS CNG	18,20	3/4	37.5	30	6.0
16EMLO-SS NGO	22,25	1	41.5	36	6.0
20EMLO-SS NGO	28,30,32	1 1/4	44.5	41	5.0
24EMLO-SS NGO	35,38	1 1/2	49.0	50	4.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
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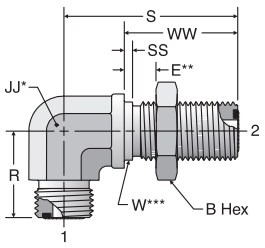
WELO

Bulkhead Union Elbow
ORFS / ORFS

SAE 520701
WELO-WLNL - Body with Locknut
(See page 10 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)
4 WELO-SS CNG	1/4	1/4	13/16	0.55	9/16	0.89	1.85	0.06	0.56	1.24	9.2
6 WELO-SS CNG	3/8	3/8	1	0.55	3/4	1.02	2.05	0.06	0.69	1.34	9.2
8 WELO-SS CNG	1/2	1/2	1 1/8	0.55	3/4	1.14	2.19	0.06	0.81	1.44	9.2
10 WELO-SS CNG	5/8	5/8	1 5/16	0.55	1 1/16	1.36	2.48	0.06	1.00	1.59	6.0
12 WELO-SS CNG	3/4	3/4	1 1/2	0.55	1 3/16	1.52	2.64	0.06	1.19	1.63	6.0
16 WELO-SS NGO	1	1	1 3/4	0.55	1 7/16	1.67	2.80	0.06	1.44	1.65	6.0
20 WELO-SS NGO	1 1/4	1 1/4	2	0.55	1 5/8	1.79	2.97	0.06	1.69	1.65	5.0
24 WELO-SS NGO	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

* JJ – Across wrench flats.

** E – Maximum bulkhead thickness.

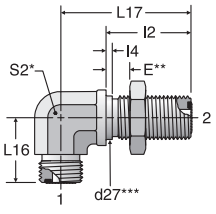
*** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

WEMLO

Bulkhead Union Elbow – mm Hex
ORFS / ORFS

ISO 8434-3 BHE
SAE 52M0701
WEMLOWLNML - Body with Locknut
(See page 10 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)
4WEMLO-SS CNG	6	1/4	14.3	14	31.5	1.5	22.5	47.0	14	9.2
6WEMLO-SS CNG	8,10	3/8	17.5	14	34.0	1.5	26.0	52.0	19	9.2
8WEMLO-SS CNG	12	1/2	20.6	14	36.5	2.5	29.0	55.5	19	9.2
10WEMLO-SS CNG	14,15,16	5/8	25.4	14	40.5	2.5	34.5	63.0	27	6.0
12WEMLO-SS CNG	18,20	3/4	30.2	14	41.5	3.0	38.5	67.0	30	6.0
16WEMLO-SS NGO	22,25	1	36.5	14	42.0	3.0	42.5	71.0	36	6.0
20WEMLO-SS NGO	28,30,32	1 1/4	42.9	14	42.0	3.0	45.5	75.5	41	5.0
24WEMLO-SS NGO	35,38	1 1/2	50.8	14	42.0	3.0	49.5	79.5	50	4.0

* S2 – Across wrench flats.

** E – Maximum bulkhead thickness.

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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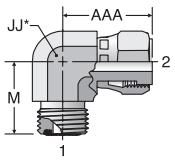
C6LO

Swivel Nut Elbow
ORFS / ORFS Swivel

SAE 520221



* JJ – Across Wrench Flats

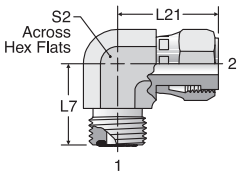
TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 (in.)	AAA (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI)
4 C6LO-SS CNG	1/4	1/4	1.07	9/16	0.85	9.2
6 C6LO-SS CNG	3/8	3/8	1.17	3/4	0.98	9.2
8 C6LO-SS CNG	1/2	1/2	1.50	3/4	1.10	9.2
10 C6LO-SS CNG	5/8	5/8	1.61	1 1/16	1.32	6.0
12 C6LO-SS CNG	3/4	3/4	1.83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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

C6MLO

Swivel Nut Elbow – mm Hex
ORFS / ORFS Swivel

ISO 8434-3 SWE
SAE 52M0221



* S2 – Across Hex Flats

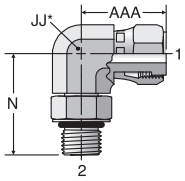
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 2 (in.)	L7 (mm)	L21 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI)
4C6MLO-SS CNG	6	1/4	21.5	27.2	14	9.2
6C6MLO-SS CNG	8,10	3/8	25.0	29.7	19	9.2
8C6MLO-SS CNG	12	1/2	28.0	38.0	19	9.2
10C6MLO-SS CNG	14,15,16	5/8	33.5	41.0	27	6.0
12C6MLO-SS CNG	18,20	3/4	37.5	46.5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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

AOEL6

Straight Thread Swivel Elbow
ORFS Swivel / SAE-ORB

SAE 520281



* JJ – Across Wrench Flats

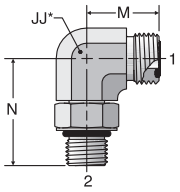
TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN/UNF-2A	AAA (in.)	JJ (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI)
4 AOEL6-SS CNG	1/4	7/16 - 20	1.04	9/16	1.30	6.0
6 AOEL6-SS CNG	3/8	9/16 - 18	1.17	3/4	1.46	6.0
8 AOEL6-SS CNG	1/2	3/4 - 16	1.50	3/4	1.59	6.0
10 AOEL6-SS CNG	5/8	7/8 - 14	1.65	1 1/16	1.97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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4 C5OLO-SS CNG	1/4	7/16 - 20	9/16	0.85	1.30	6.0
4-6 C5OLO-SS CNG	1/4	9/16 - 18	9/16	0.93	1.46	6.0
4-8 C5OLO-SS CNG	1/4	3/4 - 16	3/4	0.98	1.59	6.0
6 C5OLO-SS CNG	3/8	9/16 - 18	3/4	0.98	1.46	6.0
6-4 C5OLO-SS CNG	3/8	7/16 - 20	3/4	0.98	1.38	6.0
6-5 C5OLO-SS CNG	3/8	1/2 - 20	3/4	0.98	1.38	6.0
6-8 C5OLO-SS CNG	3/8	3/4 - 16	3/4	1.04	1.59	6.0
6-10 C5OLO-SS CNG	3/8	7/8 - 14	7/8	1.15	1.97	6.0
6-12 C5OLO-SS CNG	3/8	1 1/16 - 12	1 1/16	1.28	2.17	6.0
8 C5OLO-SS CNG	1/2	3/4 - 16	3/4	1.10	1.59	6.0
8-6 C5OLO-SS CNG	1/2	9/16 - 18	3/4	1.10	1.44	6.0
8-10 C5OLO-SS CNG	1/2	7/8 - 14	7/8	1.21	1.97	6.0
8-12 C5OLO-SS CNG	1/2	1 1/16 - 12	1 3/16	1.32	2.17	6.0
10 C5OLO-SS CNG	5/8	7/8 - 14	1 1/16	1.32	1.97	6.0
10-8 C5OLO-SS CNG	5/8	3/4 - 16	1 1/16	1.32	1.81	6.0
10-12 C5OLO-SS CNG	5/8	1 1/16 - 12	1 3/16	1.42	2.17	6.0
12 C5OLO-SS CNG	3/4	1 1/16 - 12	1 3/16	1.48	2.17	6.0
12-8 C5OLO-SS CNG	3/4	3/4 - 16	1 3/16	1.48	1.83	6.0
12-10 C5OLO-SS CNG	3/4	7/8 - 14	1 3/16	1.48	2.01	6.0
12-16 C5OLO-SS CNG	3/4	1 5/16 - 12	1 7/16	1.61	2.34	5.5
16 C5OLO-SS NGO	1	1 5/16 - 12	1 7/16	1.63	2.34	5.5
16-12 C5OLO-SS NGO	1	1 1/16 - 12	1 7/16	1.63	2.30	6.0
16-20 C5OLO-SS NGO	1	1 5/8 - 12	1 5/8	1.75	2.44	4.0
20 C5OLO-SS NGO	1 1/4	1 5/8 - 12	1 5/8	1.75	2.44	4.0
20-16 C5OLO-SS NGO	1 1/4	1 5/16 - 12	1 5/8	1.75	2.44	5.0
20-24 C5OLO-SS NGO	1 1/4	1 7/8 - 12	1 7/8	1.93	2.60	4.0
24 C5OLO-SS NGO	1 1/2	1 7/8 - 12	1 7/8	1.93	2.60	4.0
24-20 C5OLO-SS NGO	1 1/2	1 5/8 - 12	1 7/8	1.93	2.60	4.0
32 C5OLO-SS NGO	2	2 1/2 - 12	2 1/2	2.76	3.07	2.5

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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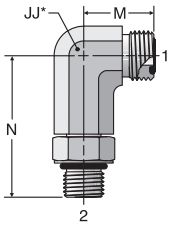
CC5OLO

Long Straight Thread Elbow
ORFS-Long / SAE-ORB

SAE 521520



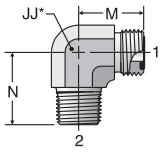
TUBE FITTING PART #	END SIZE 1 (in.)	END SIZE 2 UN-UNF-2A	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI)
4 CC5OLO-SS CNG	1/4	7/16 - 20	9/16	0.85	2.22	6.0
6 CC5OLO-SS CNG	3/8	9/16 - 18	3/4	0.98	2.62	6.0
8 CC5OLO-SS CNG	1/2	3/4 - 16	3/4	1.10	2.95	6.0
10 CC5OLO-SS CNG	5/8	7/8 - 14	1 1/16	1.32	3.50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

* JJ – Across Wrench Flats

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

CLO

Male Pipe Elbow
ORFS / NPTF



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

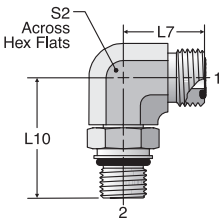
* JJ – Across Wrench Flats

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4M12C87OMLO-SS CNG	6	1/4	M12X1.5	21.5	33.0	14	6.0
4M14C87OMLO-SS CNG	6	1/4	M14X1.5	23.5	35.5	14	6.0
6M12C87OMLO-SS CNG	8,10	3/8	M12X1.5	25.0	35.5	19	6.0
6M14C87OMLO-SS CNG	8,10	3/8	M14X1.5	25.0	35.5	19	6.0
6M16C87OMLO-SS CNG	8,10	3/8	M16X1.5	25.0	37.5	19	6.0
8M14C87OMLO-SS CNG	12	1/2	M14X1.5	28.0	36.0	19	6.0
8M18C87OMLO-SS CNG	12	1/2	M18X1.5	28.0	41.0	19	6.0
8M22C87OMLO-SS CNG	12	1/2	M22X1.5	31.0	49.0	27	6.0
10M18C87OMLO-SS CNG	14,15,16	5/8	M18X1.5	33.5	47.5	27	6.0
10M22C87OMLO-SS CNG	14,15,16	5/8	M22X1.5	33.5	49.0	27	6.0
12M22C87OMLO-SS CNG	18,20	3/4	M22X1.5	37.5	49.0	27	6.0
12M27C87OMLO-SS CNG	18,20	3/4	M27X2	37.5	55.5	27	6.0
16M33C87OMLO-SS NGO	22,25	1	M33X2	41.5	59.5	36	5.0
20M38C87OMLO-SS NGO*	28,30,32	1 1/4	M38X2	44.5	62.0	41	4.0
20M42C87OMLO-SS NGO	28,30,32	1 1/4	M42X2	44.5	63.0	41	4.0
24M48C87OMLO-SS NGO	35,38	1 1/2	M48X2	49.0	71.5	50	4.0

* For special M38x2 (ISO 6149-1 style) port. The current ISO 6149 does not include the M38 size.
To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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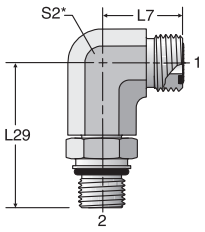
CC87OMLO

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

ISO 8434-3 SDEL
SAE 52M1587



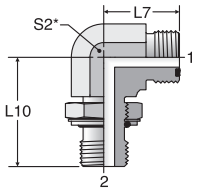
* S2 – Across Hex Flats

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4M12C8OMLO-SS CNG	6	1/4	M12X1.5	21.5	33.0	14	3.6
6M12C8OMLO-SS CNG	8, 10	3/8	M12X1.5	25.0	35.5	19	3.6
6M14C8OMLO-SS CNG	8, 10	3/8	M14X1.5	25.0	35.5	19	3.6
6M16C8OMLO-SS CNG	8, 10	3/8	M16X1.5	25.0	37.5	19	3.6
8M14C8OMLO-SS CNG	12	1/2	M14X1.5	28.0	36.0	19	3.6
8M18C8OMLO-SS CNG	12	1/2	M18X1.5	28.0	41.0	19	3.6
8M22C8OMLO-SS CNG	12	1/2	M22X1.5	31.5	49.0	27	3.6
10M22C8OMLO-SS CNG	14, 15, 16	5/8	M22X1.5	33.5	49.0	27	3.6
12M27C8OMLO-SS CNG	18, 20	3/4	M27X2	37.5	55.5	30	3.6
16M33C8OMLO-SS NGO	22, 25	1	M33X2	41.5	59.5	36	2.5
20M38C8OMLO-SS NGO	28, 30, 32	1 1/4	M38X2	44.5	62.0	41	2.5
20M42C8OMLO-SS NGO	28, 30, 32	1 1/4	M42X2	44.5	63.0	41	2.5

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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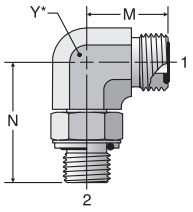
C4OMLO

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



* Y – Across Wrench Flats

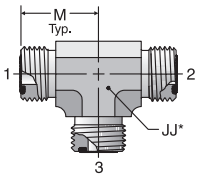
TUBE FITTING PART #	END SIZE 1 (mm)	END SIZE 1 (in.)	END SIZE 2 BSPP	M (mm)	N (mm)	Y (mm)	Dynamic Pressure (x 1,000 PSI)
4C4OMLO-SS CNG	6	1/4	1/8 - 28	21.5	30.0	14	4.0
4-4C4OMLO-SS CNG	6	1/4	1/4 - 19	23.5	36.0	19	4.0
4-6C4OMLO-SS CNG	6	1/4	3/8 - 19	24.5	38.0	19	4.0
6C4OMLO-SS CNG	8,10	3/8	1/4 - 19	25.0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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

JLO

Union Tee
ORFS (all three ends)

SAE 520401



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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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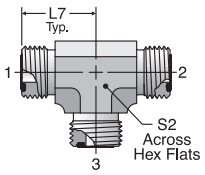
JMLO

Union Tee – mm Hex
ORFS (all three ends)

ISO 8434-3 T
SAE 52M0401



* S2 – Across Hex Flats

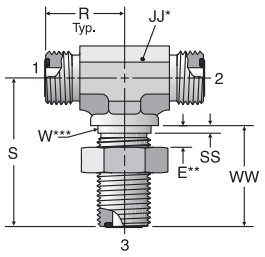
TUBE FITTING PART #	END SIZE 1-3 (mm)	END SIZE 1-3 (in.)	L7 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI)
4JMLO-SS CNG	6	1/4	21.5	14	9.2
6JMLO-SS CNG	8,10	3/8	25.0	19	9.2
8JMLO-SS CNG	12	1/2	28.0	19	9.2
10JMLO-SS CNG	14,15,16	5/8	33.5	27	6.0
12JMLO-SS CNG	18,20	3/4	37.5	30	6.0
16JMLO-SS NGO	22,25	1	41.5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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

WJLO

Bulkhead Branch Tee
ORFS (all three ends)

SAE 520959
WJLO-WLNL - Body with Locknut
(See page 10 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)
4 WJLO-SS CNG	1/4	0.55	9/16	0.89	1.85	0.06	0.56	1.24	9.2
6 WJLO-SS CNG	3/8	0.55	3/4	1.02	2.05	0.06	0.69	1.34	9.2
8 WJLO-SS CNG	1/2	0.55	3/4	1.14	2.19	0.06	0.81	1.44	9.2
10 WJLO-SS CNG	5/8	0.55	1 1/16	1.36	2.48	0.06	1.00	1.59	6.0
12 WJLO-SS CNG	3/4	0.55	1 3/16	1.52	2.64	0.06	1.19	1.63	6.0
16 WJLO-SS NGO	1	0.55	1 7/16	1.67	2.80	0.06	1.44	1.65	6.0

* JJ – Across wrench flats.

** E – Maximum bulkhead thickness.

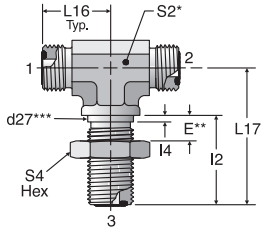
*** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

WJMLO

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

ISO 8434-3 BHBT
SAE 52M0959
WJMLOWLNML - Body with Locknut
(See page 10 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)
4WJMLO-SS CNG	6	1/4	14.3	14	31.5	1.5	22.5	47.0	14	22	9.2
6WJMLO-SS CNG	8,10	3/8	17.5	14	34.0	1.5	26.0	52.0	19	27	9.2
8WJMLO-SS CNG	12	1/2	20.6	14	36.5	2.5	29.0	55.5	19	30	9.2
10WJMLO-SS CNG	14,15,16	5/8	25.4	14	40.5	2.5	34.5	63.0	27	36	6.0
12WJMLO-SS CNG	18,20	3/4	30.2	14	41.5	3.0	38.5	67.0	30	41	6.0
16WJMLO-SS NGO	22,25	1	36.5	14	42.0	3.0	42.5	71.0	36	46	6.0
20WJMLO-SS NGO	28,30,32	1 1/4	42.9	14	42.0	3.0	45.5	75.5	41	50	5.0
24WJMLO-SS NGO	35,38	1 1/2	50.8	14	42.0	3.0	49.5	79.5	50	60	4.0

* S2 – Across wrench flats.

** E – Maximum bulkhead thickness.

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
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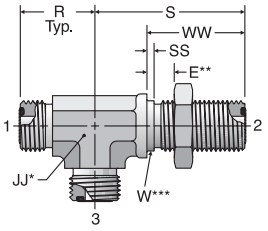
WJJLO

Bulkhead Run Tee
ORFS (all three ends)

SAE 520958
WJJLOWLNML - Body with Locknut
(See page 10 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)
4 WJJLO-SS CNG	1/4	0.55	9/16	0.89	1.85	0.06	0.56	1.24	9.2
6 WJJLO-SS CNG	3/8	0.55	3/4	1.02	2.05	0.06	0.69	1.34	9.2
8 WJJLO-SS CNG	1/2	0.55	3/4	1.14	2.19	0.06	0.81	1.44	9.2
10 WJJLO-SS CNG	5/8	0.55	1 1/16	1.36	2.48	0.06	1.00	1.59	6.0
12 WJJLO-SS CNG	3/4	0.55	1 3/16	1.52	2.64	0.06	1.19	1.63	6.0
16 WJJLO-SS NGO	1	0.55	1 7/16	1.67	2.80	0.06	1.44	1.65	6.0
20 WJJLO-SS NGO	1 1/4	0.55	1 5/8	1.79	2.79	0.06	1.69	1.65	5.0
24 WJJLO-SS NGO	1 1/2	0.55	1 7/8	1.95	3.13	0.06	2.00	1.65	4.0

* JJ – Across wrench flats.

** E – Maximum bulkhead thickness.

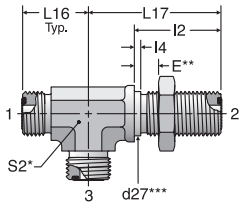
*** W – Bulkhead pilot diameter. Recommended clearance hole is W + 0.015".

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

WJJMLO

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

ISO 8434-3 BHRT
SAE 52M0958
WJJMLOWLNML - Body with Locknut
(See page 10 for WLNML)



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

* S2 – Across wrench flats.

** E – Maximum bulkhead thickness.

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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
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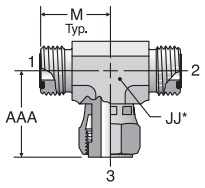
S6LO

Swivel Nut Branch Tee
ORFS / ORFS / ORFS Swivel

SAE 520433



* JJ – Across Wrench Flats

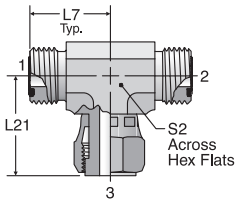
TUBE FITTING PART #	END SIZE 1-3 (in.)	AAA (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI)
4 S6LO-SS CNG	1/4	1.07	9/16	0.85	9.2
6 S6LO-SS CNG	3/8	1.17	3/4	0.98	9.2
8 S6LO-SS CNG	1/2	1.50	3/4	1.10	9.2
10 S6LO-SS CNG	5/8	1.61	1 1/16	1.32	6.0
12 S6LO-SS CNG	3/4	1.83	1 3/16	1.48	6.0
16 S6LO-SS NGO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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

S6MLO

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

ISO 8434-3 SWBT
SAE 52M0433



* S2 – Across Wrench Flats

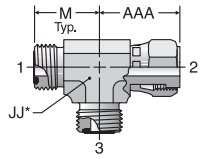
TUBE FITTING PART #	END SIZE 1-3 (mm)	(in.)	L7 (mm)	L21 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI)
4S6MLO-SS CNG	6	1/4	21.5	27.2	14	
6S6MLO-SS CNG	8,10	3/8	25.0	29.7	19	9.2
8S6MLO-SS CNG	12	1/2	28.0	38.0	19	9.2
10S6MLO-SS CNG	14,15,16	5/8	33.5	41.0	27	6.0
12S6MLO-SS CNG	18,20	3/4	37.5	46.5	30	6.0
16S6MLO-SS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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

R6LO

Swivel Nut Run Tee
ORFS / ORFS Swivel / ORFS

SAE 520432



* JJ – Across Wrench Flats

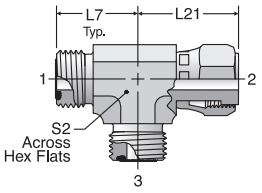
TUBE FITTING PART #	END SIZE 1-3 (in.)	AAA (in.)	JJ (in.)	M (in.)	Dynamic Pressure (x 1,000 PSI)
4 R6LO-SS CNG	1/4	1.07	9/16	0.85	9.2
6 R6LO-SS CNG	3/8	1.17	3/4	0.98	9.2
8 R6LO-SS CNG	1/2	1.50	3/4	1.10	9.2
10 R6LO-SS CNG	5/8	1.61	1 1/16	1.32	6.0
12 R6LO-SS CNG	3/4	1.83	1 3/16	1.48	6.0
16 R6LO-SS NGO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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4R6MLO-SS CNG	6	1/4	21.5	27.2	14	9.2
6R6MLO-SS CNG	8,10	3/8	25.0	29.7	19	9.2
8R6MLO-SS CNG	12	1/2	28.0	38.0	19	9.2
10R6MLO-SS CNG	14,15,16	5/8	33.5	41.0	27	6.0
12R6MLO-SS CNG	18,20	3/4	37.5	46.5	30	6.0
16R6MLO-SS NGO	22,25	1	41.5	53.5	36	6.0
20R6MLO-SS NGO	28,30,32	1 1/4	44.5	58.0	41	5.0
24R6MLO-SS NGO	35,38	1 1/2	49.0	61.0	50	4.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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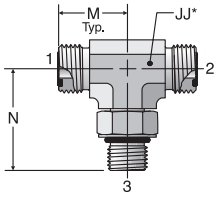
S5OLO

Straight Thread Branch Tee
ORFS / ORFS / SAE-ORB

SAE 520429



* JJ – Across Wrench Flats

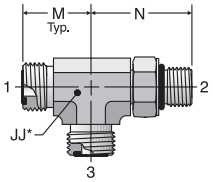
TUBE FITTING PART #	END SIZE 1 (in.)	2 (in.)	3 UN/UNF-2A	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI)
4 S5OLO-SS CNG	1/4	1/4	7/16 - 20	9/16	0.85	1.30	6.0
4-4-6 S5OLO-SS CNG	1/4	1/4	9/16 - 18	9/16	0.93	1.46	6.0
6 S5OLO-SS CNG	3/8	3/8	9/16 - 18	3/4	0.98	1.46	6.0
6-6-4 S5OLO-SS CNG	3/8	3/8	7/16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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4 R5OLO-SS CNG	1/4	7/16 - 20	1/4	9/16	0.85	1.30	6.0
4-6-4 R5OLO-SS CNG	1/4	9/16 - 18	1/4	3/4	0.92	1.46	6.0
6 R5OLO-SS CNG	3/8	9/16 - 18	3/8	3/4	0.98	1.46	6.0
6-8-6 R5OLO-SS CNG	3/8	3/4 - 16	3/8	3/4	1.04	1.59	6.0
8 R5OLO-SS CNG	1/2	3/4 - 16	1/2	3/4	1.10	1.59	6.0
8-10-8 R5OLO-SS CNG	1/2	7/8 - 14	1/2	1 1/16	1.24	1.97	6.0
10 R5OLO-SS CNG	5/8	7/8 - 14	5/8	1 1/16	1.32	1.97	6.0
10-12-10 R5OLO-SS CNG	5/8	1 1/16 - 12	5/8	1 3/16	1.42	2.17	6.0
12 R5OLO-SS CNG	3/4	1 1/16 - 12	3/4	1 3/16	1.48	2.17	6.0
12-16-12 R5OLO-SS CNG	3/4	1 5/16 - 12	3/4	1 7/16	1.61	2.34	5.5
16 R5OLO-SS NGO	1	1 5/16 - 12	1	1 7/16	1.63	2.34	5.5
16-20-16 R5OLO-SS NGO	1	1 5/8 - 12	1	1 5/8	1.75	2.44	4.0
20 R5OLO-SS NGO	1 1/4	1 5/8 - 12	1 1/4	1 5/8	1.75	2.44	4.0
24 R5OLO-SS NGO	1 1/2	1 7/8 - 12	1 1/2	1 7/8	1.93	2.60	4.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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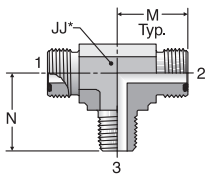
SLO

Male Pipe Tee
ORFS / ORFS / NPTF

SAE 520425



* JJ – Across Wrench Flats

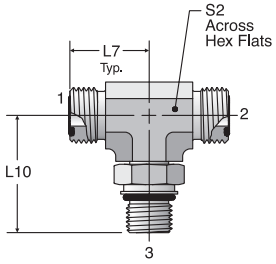
TUBE FITTING PART #	END SIZE 1 & 2 (in.)	END SIZE 3 NPTF	JJ (in.)	M (in.)	N (in.)	Dynamic Pressure (x 1,000 PSI)
4-4-4 SLO-SS CNG	1/4	1/4 - 18	9/16	0.85	1.12	6.0
6 SLO-SS CNG	3/8	1/4 - 18	3/4	0.98	1.09	6.0
6-6-6 SLO-SS CNG	3/8	3/8 - 18	3/4	0.98	1.22	6.0
8 SLO-SS CNG	1/2	3/8 - 18	3/4	1.10	1.22	6.0
8-8-8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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4M12S87OMLO-SS CNG	6	1/4	M12X1.5	21.5	33.0	14	6.0
4M14S87OMLO-SS CNG	6	1/4	M14X1.5	23.5	35.5	19	6.0
6M14S87OMLO-SS CNG	8,10	3/8	M14X1.5	25.0	35.5	19	6.0
6M16S87OMLO-SS CNG	8,10	3/8	M16X1.5	25.0	37.5	19	6.0
8M14S87OMLO-SS CNG	12	1/2	M14X1.5	28.0	36.0	19	6.0
8M18S87OMLO-SS CNG	12	1/2	M18X1.5	28.0	41.0	19	6.0
8M22S87OMLO-SS CNG	12	1/2	M22X1.5	31.0	49.0	27	6.0
10M22S87OMLO-SS CNG	14,15,16	5/8	M22X1.5	33.5	49.0	27	6.0
12M27S87OMLO-SS CNG	18,20	3/4	M27X2	37.5	55.5	30	6.0
16M33S87OMLO-SS NGO	22,25	1	M33X2	41.5	59.5	36	5.1
20M42S87OMLO-SS NGO	28,30,32	1 1/4	M42X2	44.5	63.0	41	4.0
24M48S87OMLO-SS NGO	35,38	1 1/2	M48X2	49.0	71.5	50	4.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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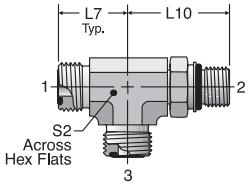
R87OMLO

Metric Straight Thread Run Tee
ORFS / ISO 6149 / ORFS

ISO 8434-3 SDRT
SAE 52M0488

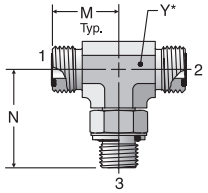


TUBE FITTING PART #	END SIZE 1 & 3 (mm)	END SIZE 1 & 3 (in.)	END SIZE 2 ISO 261	L7 (mm)	L10 (mm)	S2 (mm)	Dynamic Pressure (x 1,000 PSI)
4M12R87OMLO-SS CNG	6	1/4	M12X1.5	21.5	33.0	14	6.0
4M14R87OMLO-SS CNG	6	1/4	M14X1.5	23.5	35.5	19	6.0
6M14R87OMLO-SS CNG	8,10	3/8	M14X1.5	25.0	35.5	19	6.0
6M16R87OMLO-SS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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4S4OMLO-SS CNG	6	1/4	1/8 - 28	21.5	30.0	14	4.0
4-4-4S4OMLO-SS CNG	6	1/4	1/4 - 19	23.5	36.0	19	4.0
6S4OMLO-SS CNG	8,10	3/8	1/4 - 19	25.0	36.0	19	4.0
6-6-6S4OMLO-SS CNG	8,10	3/8	3/8 - 19	26.5	38.0	19	4.0
8S4OMLO-SS CNG	12	1/2	3/8 - 19	28.0	38.0	19	4.0
8-8-8S4OMLO-SS CNG	12	1/2	1/2 - 14	31.0	48.5	27	4.0
10S4OMLO-SS CNG	14,15,16	5/8	1/2 - 14	33.5	48.5	27	4.0
12S4OMLO-SS CNG	18,20	3/4	3/4 - 14	37.5	51.5	30	4.0
16S4OMLO-SS NGO	22,25	1	1 - 11	41.5	58.5	36	4.0

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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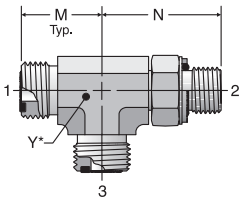
R4OMLO

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



* Y – Across
Wrench Flats

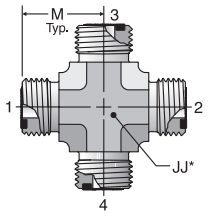
TUBE FITTING PART #	END SIZE 1 & 3 (mm)	END SIZE 1 & 3 (in.)	END SIZE 2 BSPP	M (mm)	N (mm)	Y (mm)	Dynamic Pressure (x 1,000 PSI)
4R4OMLO-SS CNG	6	1/4	1/8 - 28	21.5	30.0	14	4.0
4-4-4R4OMLO-SS CNG	6	1/4	1/4 - 19	23.5	36.0	19	4.0
6R4OMLO-SS CNG	8,10	3/8	1/4 - 19	25.0	36.0	19	4.0
6-6-6R4OMLO-SS CNG	8,10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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

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)
4 KLO-SS CNG	1/4	9/16	0.85	9.2
6 KLO-SS CNG	3/8	3/4	0.98	9.2
8 KLO-SS CNG	1/2	3/4	1.10	9.2
10 KLO-SS CNG	5/8	1 1/16	1.32	6.0
12 KLO-SS CNG	3/4	1 3/16	1.48	6.0
16 KLO-SS NGO	1	1 5/8	1.63	6.0
20 KLO-SS NGO	1 1/4	1 5/8	1.75	5.0
24 KLO-SS NGO				

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

Parker Hannifin Corporation
Tube Fittings Division
Columbus, Ohio
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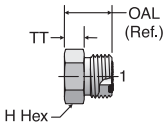
PNLO

Plug
ORFS

SAE 520109



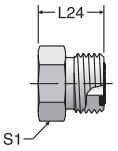
TUBE FITTING PART #	END SIZE 1 (in.)	H HEX (in.)	OAL (REF) (in.)	TT (in.)	Dynamic Pressure (x 1,000 PSI)
4 PNLO-SS CNG	1/4	5/8	0.65	0.20	9.2
6 PNLO-SS CNG	3/8	3/4	0.75	0.32	9.2
8 PNLO-SS CNG	1/2	7/8	0.87	0.35	9.2
10 PNLO-SS CNG	5/8	1 1/16	1.02	0.41	6.0
12 PNLO-SS CNG	3/4	1 1/4	1.08	0.41	6.0
14 PNLO-SS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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

PNMLO

Plug – mm Hex
ORFS

ISO 8434-3 PL
SAE 52M0109



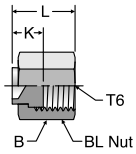
TUBE FITTING PART #	ORFS TUBE O.D. (mm)	ORFS TUBE O.D. (in.)	L24 (mm)	S1 HEX (mm)	Dynamic Pressure (x 1,000 PSI)
4PNMLOSS CNG	6	1/4	16.5	17	9.2
6PNMLOSS CNG	8,10	3/8	19.0	19	9.2
8PNMLOSS CNG	12	1/2	22.0	22	9.2
10PNMLOSS CNG	14,15,16	5/8	26.0	27	6.0
12PNMLOSS CNG	18,20	3/4	27.5	32	6.0
16PNMLOSS NGO	22,25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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

FNL

Cap
ORFS

SAE 520112

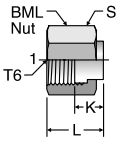


TUBE FITTING PART #	TUBE O.D. (in.)	T6 SWIVEL UN/UNF-2B	B HEX (in.)	K (in.)	L (in.)	Dynamic Pressure (x 1,000 PSI)
4 FNL-SS	1/4	9/16 - 18	11/16	0.35	0.66	9.2
6 FNL-SS	3/8	11/16 - 16	13/16	0.41	0.74	9.2
8 FNL-SS	1/2	13/16 - 16	15/16	0.47	0.87	9.2
10 FNL-SS	5/8	1 - 14	1 1/8	0.53	1.02	6.0
12 FNL-SS	3/4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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

FNML

Cap
ORFS



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

To order fittings in steel with zinc nickel coating, see page 5 for part numbers.

Dimensions and pressures for reference only, subject to change.

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

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Equipment and Tooling
Parflange Comparison

	ECO 25	1025	PRO 50
	Best machine for coiled tubing and other CNG infrastructure projects	**Best machine for low volume CNG tube assemblies**	**Best machine for on-vehicle CNG tube assemblies for OEMs**
			
	Intermittent usage best suited for small jobs and project work	Very easy to use with minimal setup time	Production grade machine for higher volume tube assemblies
Dimensions	21" x 15" x 21"	18" x 15" x 26"	33" x 28" x 41"
Weight	190 lbs. (86 kg.)	175 lbs. (80 kg.)	836 lbs. (380 kg.)
Overall Cycle Time	100 sec.	60 sec.	15 sec.
Tube Size Capabilities - Flanging	**Steel Tubing** 1/4" O.D. - 1-1/2" O.D.	**Steel Tubing** 1/4" O.D. - 1-1/2" O.D.	**Steel Tubing** 1/4" O.D. - 1-1/2" O.D.
	Stainless Steel Tubing 1/4" O.D. - 1-1/2" O.D.	**Stainless Steel Tubing** 1/4" O.D. - 1" O.D.	**Stainless Steel Tubing** 1/4" O.D. - 1-1/2" O.D.
Tube Size Capabilities - Flaring	**Steel Tubing** 1/4" O.D. - 1-1/2" O.D.	**Steel Tubing** 1/4" O.D. - 1-1/2" O.D.	**Steel Tubing** 1/4" O.D. - 1-1/2" O.D.
	Stainless Steel Tubing 1/4" O.D. - 1-1/2" O.D.	**Stainless Steel Tubing** 1/4" O.D. - 1-1/2" O.D.	**Stainless Steel Tubing** 1/4" O.D. - 1-1/2" O.D.
Max Number of Flares/Flanges per Day Recommended	50	100	500
Die Type	**Different Die Required For:** Each Tube O.D. (each die capable of flaring and flanging every wall thickness of Steel and Stainless Steel tubing)	**Different Die Required For:** Each Tube O.D., Each Wall Thickness, Flare vs. Flange, Each Tube Material	**Different Die Required For:** Each Tube O.D., Each Wall Thickness, Flare vs. Flange, Each Tube Material
Pin Type*	**Different Pin Required For:** Each Tube O.D., Each Wall Thickness, Flare vs. Flange, Each Tube Material	**Different Pin Required For:** Each Tube O.D., Each Wall Thickness, Flare vs. Flange, Each Tube Material	**Different Pin Required For:** Each Tube O.D., Each Wall Thickness, Flare vs. Flange, Each Tube Material
Electric Power Required	110V Single-Phase	110V Single-Phase or 440V 3-Phase	440V 3-Phase
Hydraulic Power Options	External Hydraulic Pump Sold Separately	No Pump Option (internal to machine)	No Pump Option (internal to machine

*Same pin came be used on all three machines.
†Dies are interchangeable on the 1025 and PRO 50.

CNG Coiled Tubing

For stainless-steel coiled tubing, Parker Tube Fittings Division has developed specific Parflange pins for the following sizes (OD and wall thickness):

- 3/4" x 0.104
- 1" x 0.139

These pins were developed specifically for CNG coiled tubing and incorporates a solid one piece design, upgraded pin material and a new coating to reduce galling and extend life.

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.

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

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Parflange® 1025

Bench-Top 90° Flanging and 37° Flaring System

Tooling must be ordered separately

- Eliminates braze joint
- Compact, lightweight design
- Bench mountable
- Easy to operate
- Available in 110-volt single-phase or 440-volt 3-phase (please specify by ordering 1025/110 or 1025/440)
- Flanges or flares tube in less than 20 seconds
- For tube sizes 1/4" O.D. thru 1-1/2" O.D. (steel); and 1/4" O.D. thru 1" O.D. (stainless steel) – Flanging/flaring of tube sizes 1" & greater results in heavy machine vibration. Therefore, this machine is only recommended for occasional use for preparing tube ends 1" or larger.

  Tooling is also available for comparable metric tube sizes.

Electrical Power: 110V/20A single-phase, or 440V/3-phase/2.1A

Power Cable Length: 8 feet long (2.5 meters)

Dimensions: Height: 18 1/8 inches (460mm)
Width: 15 3/8 inches (390mm)
Depth: 26 3/8 inches (670mm)

Weight: Basic Unit: 175 lbs. (80 kg.)
Each Die (typical): 4 lbs. (1.8 kg.)

Flanging Pin Lubrication Fluid: **LB2000**

See Bulletin 4390-1025A or 4390-1025 for more details.

View instructional video for the Parflange 1025 on https://discover.parker.com/TFDTubeFabEquipment

Fig. 4 — Parflange® 1025 Machine

CAUTION: Extension cords are ***not*** recommended and could cause damage to the machine due to a lack of power supply.

Fig. 5 — Flanging Pin

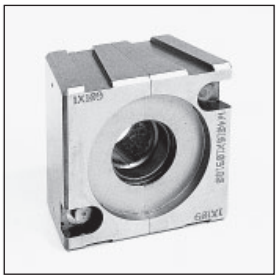

Fig. 6 — Flanging Die Set

Fig. 7 — LB 2000

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.

COMPONENTS REQUIRED

Part Name	Part No.
Parflange 1025 (110 volt)	**1025/110**
Parflange 1025 (440 volt)	**1025/440**
Flanging Pin	See Tables 1 & 2 on page 36
Flanging Die Set	See Tables 1 & 2 on page 36
Lubrication Fluid	**LB 2000**
Die Adjustment Shims (Old Style Dies Only)	**Shim Kit**

REPLACEMENT PART

Part Name	Part No.
Tube Stop	**1025/0281014**

Dimensions and pressures for reference only, subject to change.

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

Inch and Metric Flanging Tooling for 1025

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Tube Size O.D. x Wall Thickness (in.)	Tooling for 90°/180° Tube Flanging			Available Flanging Tooling	
	Flange Pin and Die Set Part Number	Pin Part Number	Die Part Number	1025 -S	1025 -SS
1/4 x .028	4004X028180	B4004X028180	M4004X028180	•	
1/4 x .035	4004X035180	B4004X035180	M4004X035180	•	•
1/4 x .049	4004X049180	B4004X049180	M4004X049180	•	
3/8 x .035	4006X035180	B4006X035180	M4006X035180	•	•
3/8 x .049	4006X049180	B4006X049180	M4006X049180	•	•
3/8 x .065	4006X065180	B4006X065180	M4006X065180	•	•
1/2 x .035	4008X035180	B4008X035180	M4008X035180	•	•
1/2 x .049	4008X049180	B4008X049180	M4008X049180	•	•
1/2 x .065	4008X065180	B4008X065180	M4008X065180	•	•
1/2 x .083	4008X083180	B4008X083180	M4008X083180	•	•
5/8 x .049	4010X049180	B4010X049180	M4010X049180	•	•
5/8 x .065	4010X065180	B4010X065180	M4010X065180	•	•
5/8 x .083	4010X083180	B4010X083180	M4010X083180	•	•
5/8 x .095	4010X095180	B4010X095180	M4010X095180	•	•
5/8 x .109	4010X109180	B4010X109180	M4010X109180	•	
5/8 x .120	4010X120180	B4010X120180	M4010X120180	•	
3/4 x .049	4012X049180	B4012X049180	M4012X049180	•	•
3/4 x .065	4012X065180	B4012X065180	M4012X065180	•	•
3/4 x .083	4012X083180	B4012X083180	M4012X083180	•	•
3/4 x .095	4012X095180	B4012X095180	M4012X095180	•	•
3/4 x .109	4012X109180	B4012X109180	M4012X109180	•	•
3/4 x .120	4012X120180	B4012X120180	M4012X120180	•	
1 x .065	4016X065180	B4016X065180	M4016X065180	•	•
1 x .083	4016X083180	B4016X083180	M4016X083180	•	•
1 x .095	4016X095180	B4016X095180	M4016X095180	•	
1 x .109	4016X109180	B4016X109180	M4016X109180	•	
1 x .120	4016X120180	B4016X120180	M4016X120180	•	
1 x .134	4016X134180	B4016X134180	M4016X134180	•	
1 x .148	4016X148180	B4016X148180	M4016X148180		
1 x .156	4016X156180	B4016X156180	M4016X156180		
1 x .188	4016X188180	B4016X188180	M4016X188180		
1 1/4 x .065	4020X065180	B4020X065180	M4020X065180	•	
1 1/4 x .083	4020X083180	B4020X083180	M4020X083180	•	
1 1/4 x .095	4020X095180	B4020X095180	M4020X095180	•	
1 1/4 x .109	4020X109180	B4020X109180	M4020X109180	•	
1 1/4 x .120	4020X120180	B4020X120180	M4020X120180	•	
1 1/4 x .134	4020X134180	B4020X134180	M4020X134180		
1 1/4 x .148	4020X148180	B4020X148180	M4020X148180		
1 1/4 x .156	4020X156180	B4020X156180	M4020X156180		
1 1/4 x .188	4020X188180	B4020X188180	M4020X188180		
1 1/2 x .065	4024X065180	B4024X065180	M4024X065180	•	
1 1/2 x .083	4024X083180	B4024X083180	M4024X083180	•	
1 1/2 x .095	4024X095180	B4024X095180	M4024X095180	•	
1 1/2 x .109	4024X109180	B4024X109180	M4024X109180		
1 1/2 x .120	4024X120180	B4024X120180	M4024X120180		
1 1/2 x .134	4024X134180	B4024X134180	M4024X134180		
1 1/2 x .148	4024X148180	B4024X148180	M4024X148180		
1 1/2 x .156	4024X156180	B4024X156180	M4024X156180		
1 1/2 x .188	4024X188180	B4024X188180	M4024X188180		

Note: Use "-SS" suffix after part number for flanging tools for stainless steel tube. Contact the Tube Fittings Division for sizes and/or materials not listed, or for additional SS sizes released for limited use.

Table 1— Pin & Die Part Numbers for Inch Sizes

Tube Size O.D. x Wall Thickness (mm)	Tooling for 90°/180° Tube Flanging		Available Flanging Tooling	
	Pin Part Number	Die Part Number	1025 S	1025 SS
6 x 1	B3018006X1M	M4018006X1M	•	
6 x 1.5	B3018006X1.5M	M4018006X1.5M	•	
8 x 1	B3018008X1M	M4018008X1M	•	
8 x 1.5	B3018008X1.5M	M4018008X1.5M	•	
10 x 1	B3018010X1M	M4018010X1M	•	
10 x 1.5	B3018010X1.5M	M4018010X1.5M	•	
10 x 2	B3018010X2M	M4018010X2M	•	
12 x 1	B3018012X1M	M4018012X1M	•	
12 x 1.5	B3018012X1.5M	M4018012X1.5M	•	•
12 x 2	B3018012X2M	M4018012X2M	•	
15 x 1.5	B3018015X1.5M	M4018015X1.5M	•	
15 x 2	B3018015X2M	M4018015X2M	•	
16 x 1	B3018016X1M	M4018016X1M	•	
16 x 1.5	B3018016X1.5M	M4018016X1.5M	•	
16 x 2	B3018016X2M	M4018016X2M	•	•
16 x 2.5	B3018016X2.5M	M4018016X2.5M	•	
18 x 1	B3018018X1M	M4018018X1M	•	
18 x 1.5	B3018018X1.5M	M4018018X1.5M	•	
18 x 2	B3018018X2M	M4018018X2M	•	
20 x 2	B3018020X2M	M4018020X2M	•	•
20 x 2.5	B3018020X2.5M	M4018020X2.5M	•	
20 x 3	B3018020X3M	M4018020X3M	•	
22 x 1.5	B3018022X1.5M	M4018022X1.5M	•	
22 x 2	B3018022X2M	M4018022X2M	•	
22 x 2.5	B3018022X2.5M	M4018022X2.5M	•	
22 x 3	B3018022X3M	M4018022X3M	•	
25 x 2	B3018025X2M	M4018025X2M	•	
25 x 2.5	B3018028X2.5M	M4018028X2.5M	•	
25 x 3	B3018030X2M	M4018030X2M	•	
25 x 3.5	B3018025X3.5M	M4018025X3.5M	•	
25 x 4	B3018025X4M	M4018025X4M		
28 x 2	B3018028X2M	M4018028X2M	•	
28 x 2.5	B3018028X2.5M	M4018028X2.5M	•	
30 x 2	B3018030X2M	M4018030X2M	•	
30 x 3	B3018030X3M	M4018030X3M	•	
30 x 3.5	B3018030X3.5M	M4018030X3.5M		
30 x 4	B3018030X4M	M4018030X4M		
32 x 3	B3018032X3M	M4018032X3M	•	
32 x 4	B3018032X4M	M4018032X4M		
35 x 3	B3018035X3M	M4018035X3M	•	
38 x 3	B3018038X3M	M4018038X3M		
38 x 4	B3018038X4M	M4018038X4M		
38 x 5	B3018038X5M	M4018038X5M		

Note: Use "-SS" suffix after part number for flanging tools for stainless steel tube. Contact the Tube Fittings Division for sizes and/or materials not listed, or for additional SS sizes released for limited use.

Table 2 — Pin & Die Part Numbers for Metric Sizes

All tooling info also available on www.TFDTOOLSPEC.com

Dimensions and pressures for reference only, subject to change.

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

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Parflange® ECO 25

Bench-Top 90° Flanging and 37° Flaring System

Tooling and Hydraulic Pump must be ordered separately

- Eliminates braze joints
- More efficient than traditional flaring methods
- Only requires one die per tube size for both flanging and flaring
- For tube sizes 1/4" O.D. through 1-1/2" O.D. in both Steel and Stainless Steel
- Dies not dependent on wall thickness or tube material
- Uses same Parflange pins as 1025 and PRO 50 models
- Utilizes proven Parflange orbital process for consistent flanges and flares
- Burnishes flanges and flares for superior surface finish
- Compact, lightweight design
- Easy to operate
- Used with hand hydraulic pump
- 110-volt single-phase power
- Tooling also available in comparable metric sizes

Electrical Power: 110V/20A single-phase

Power Cable Length: 8 feet long (2.5 meters)

Dimensions: Height: 20.5 inches (520mm)
Width: 15 inches (381mm)
Depth: 20.5 (520mm)

Weight: 190 lbs. (86.4 kg.)

View instructional video for the Parflange-ECO 25 on https://discover.parker.com/TFDTubeFabEquipment

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.

Fig. 8 — Parflange ECO 25, shown with hand pump

CAUTION: Extension cords are ***not*** recommended and could cause damage to the machine due to a lack of power supply.

Fig. 9 — Hydraulic Hand Pump

COMPONENTS REQUIRED

Part Name	Part No.
*ECO 25 Basic Unit	**ECO 25**
*Hydraulic Hand Pump	**900086**
Flanging Pin	See Tables 3 & 4 on page 38
Flanging/Flaring Dual Function Die Set	See Tables 3 & 4 on page 38
*Lubrication Fluid	**LB 2000**
*Hose Assembly (for hand or electric pump)	**910133**
*Pressure gauge (0 - 10,000 psi)	**900044**
*Hydraulic Pump Adapter	**6-6 FLO-S**
*Hydraulic Pump Tee	**6 R6LO-S**
*Pressure Gauge Adapter	**6 G6L-S**
*Hose Conversion Adapter (#1)	**6 G6L-S**
*Hose Conversion Adapter (#2)	**6-6 G6L-S**

*Included in ECO 25 kit (Part Number ECO 25 KIT)

ECO 25 Kit

Part Name	Part No.
ECO 25 Kit (includes hand pump)	**ECO 25 KIT**

(Kit includes basic unit, hand hydraulic pump, hose assembly, pressure gauge, hydraulic pump adapter, hydraulic pump tee, pressure gauge adapter, hose conversion adapters #1 & #2, Lubrication fluid, and operation manual.)

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Inch Flanging Tooling for ECO25

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Tube O.D. (in.)	Die Set Part Number
1/4	M2504
3/8	M2506
1/2	M2508
5/8	M2510
3/4	M2512
1	M2516
1 1/4	M2520
1 1/2	M2524

Table 3 — Flanging Die Set, Inch Sizes

Tube O.D. (in.)	Wall Thickness (in.)	Flanging Pin Steel Tube	Flanging Pin Stainless Tube
1/4	0.028	B4004X028180	-
1/4	0.035	B4004X035180	B4004X035180SS
1/4	0.049	B4004X049180	B4004X049180SS
3/8	0.035	B4006X035180	B4006X035180SS
3/8	0.049	B4006X049180	B4006X049180SS
3/8	0.065	B4006X065180	B4006X065180SS
1/2	0.035	B4008X035180	B4008X035180SS
1/2	0.049	B4008X049180	B4008X049180SS
1/2	0.065	B4008X065180	B4008X065180SS
1/2	0.083	B4008X083180	B4008X083180SS
1/2	0.095	B4008X095181	B4008X095180SS
5/8	0.049	B4010X049180	B4010X049180SS
5/8	0.065	B4010X065180	B4010X065180SS
5/8	0.083	B4010X083180	B4010X083180SS
5/8	0.095	B4010X095180	B4010X095180SS
5/8	0.120	B4010X120180	-
3/4	0.049	B4012X049180	B4012X049180SS
3/4	0.065	B4012X065180	B4012X065180SS
3/4	0.083	B4012X083180	B4012X083180SS
3/4	0.095	B4012X095180	B4012X095180SS
3/4	0.104	-	B4012X104180SS
3/4	0.109	B4012X109180	B4012X109180SS
3/4	0.120	B4012X120180	B4012X120180SS
1	0.065	B4016X065180	B4016X065180SS
1	0.083	B4016X083180	B4016X083180SS
1	0.095	B4016X095180	B4016X095180SS
1	0.109	B4016X109180	B4016X109180SS
1	0.120	B4016X120180	B4016X120180SS
1	0.134	B4016X134180	B4016X134180SS
1	0.139	-	B4016X139180SS
1 1/4	0.065	B4020X065180	-
1 1/4	0.083	B4020X083180	B4020X083180SS
1 1/4	0.095	B4020X095180	B4020X095180SS
1 1/4	0.109	B4020X109180	B4020X109180SS
1 1/4	0.120	B4020X120180	B4020X120180SS
1 1/4	0.134	B4020X134180	-
1 1/2	0.065	B4024X065180	-
1 1/2	0.083	B4024X083180	-
1 1/2	0.095	B4024X095180	B4024X095180SS
1 1/2	0.109	B4024X109180	B4024X109180SS
1 1/2	0.120	B4024X120180	B4024X120180SS

Table 4 — Flanging Pin, Inch Sizes

Fig. 10 — Flanging Pin

Fig. 11 — Dual Function Die Set (Flaring and Flanging)

All tooling info also available on www.TFDTOOLSPEC.com

Dimensions and pressures for reference only, subject to change.

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Parflange® Pro 50

The Parflange® Pro 50 is a production WorkCenter for orbital flaring and flanging of high pressure tube connections. The unique feature of the Parflange® process is that the deformation of the tube end is achieved by rolling rather than by just pushing a tool into the tube end.

The Parflange® machine smoothly compresses the tube material and achieves a high strength joint with a polished surface of the tube end. Seal-Lok and SAE flange sleeves are firmly fixed onto the tube end, resulting in a very rigid high-pressure tube connection.

The Pro 50 is the heavy-duty mass production WorkCenter of the Parflange® machine program. It is recommended for industrial production of all sizes Triple-Lok® and required Seal-Lok tube connections. Maximum tube capacity is 2" tube O.D / 50 mm.

The powerful drive and the fast, automatic process allow short cycle times for efficient production. Its advantage is the quick and easy change of tooling and the simple operation without manual adjustments or programming. Tube clamping and tool lubrication are done automatically.

The Pro 50 comes ready to be used. Parflange® tools have to be purchased separately. For each tube dimension, special clamping dies and Parflange® pins are required. The machine can be moved on wheels, by forklift truck and crane. For basic use, just an electric power supply is required.

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.

Fig. 12 — Parflange Pro 50

Pro 50 Machine Specification

Purpose:	180˚ Flanging for Seal-Lok and 37˚ Flaring for Triple-Lok®
Process:	Orbital flaring and flanging according to Parflange® process
Design:	WorkCenter for industrial production
Tube material:	Steel and stainless steel tube
Tube diameter:	Inch: 1/4" to 2" Metric: 6 to 50 mm
Min. U-bend:	4.72 mm
Maximum capacity:	Steel tube (ST 37, ST52,...) Inch: 2" x 0.120 (tube O.D. x wall thickness) Metric: 38 x 5 / 50 x 3 mm Stainless steel tube (1.4571, 316, ...) Inch: 1-1/2" x 0.156 Metric: 38 x 4 mm
Tube specification:	Fully annealed seamless cold drawn or welded and redrawn precision tube
Operation:	Automatic clamping, automatic flanging/flaring
Speed:	5-8 sec. flanging time / 15-20 sec. total cycle time

Economic production quantity:	max. 500 flarings per day
Tools:	See Tables 5 & 6 on page 42
Tool compartments:	10 die sets, 10 pins
Tool clamping:	Automatic
Tool lubrication:	Automatic lubrication device
Lubricant:	EO-NIROMONT (filled when delivered)
Hydraulic oil:	HLP 46 (filled when delivered)
Installation:	Electrical power
Dimensions:	27.6 in x 33 in x 40.7 in
Platform for bins:	2 platforms, 11.8 x 19.7 in, max. 11 lbs each
Weight:	838 lbs
Electrical power:	400 V, 3 Phase, 50 Hz, 4.5 kW
Transport options:	On wheels, by forklift truck, lifting attachments

Dimensions and pressures for reference only, subject to change.

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Parflange® Pro 50 with Feeder

For industrial mass production of Seal-Lok tube end connections, the Parflange Pro 50 with sleeve feed is available. This sleeve feeding device increases the productivity, particularly of high volume - single tube dimension jobs.

In “Feeder ON - mode”, Seal-Lok sleeves just need to be inserted into feeder rails. First cycle start is initiated by manually closing the safety cover. Then, all following cycles are started by pushing the tube into the pre-clamped dies. All other machine activities, like tube clamping, flanging, tube release, insertion of Seal-Lok sleeves into dies, pre-clamping of dies and the operation of safety cover run fully automatic. The operator just is handling the tubes and refilling the sleeve-feeder from times to times with Seal-Lok sleeves.

In “Feeder OFF - mode”, the Parflange® PRO 50 operates like the Parflange® PRO 50 without Seal-Lok sleeve feeder. This mode is useful for maximum size flexibility and Triple-Lok® assembly. For quick changeover and safety reasons, the Seal-Lok sleeve feeder is just switched OFF but not be removed from the Parflange® PRO 50 WorkCenter.

For operation of Parflange Pro 50, compressed air supply is required.

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.

Fig. 13 — Parflange Pro 50 w/Feeder

Pro 50 Machine Specification

Specific differences of PRO 50 versus PRO 50 with Feeder	
Design:	Parflange® PRO 50 with additional Seal-Lok sleeve feeder
Normal Operation:	Same as Parflange® 50 when feeder is switched off
Feeder Operation:	Work-cycle initiated by inserting tube end Automatic clamping, automatic flanging/flaring Automatic insertion of Seal-Lok sleeves into dies Automatic operation of safety cover Automatic pre-clamping of dies
Manual operation:	Like Parflange® PRO 50
Cycle time:	5-8 sec. flanging time / approx. 15 to 20 sec. total cycle time
Tools:	Same tools as Parflange® PRO 50 without feeder
Feeder:	Feeder is delivered in separate box and must be firmly attached to machine. Feeder can be switched ON and OFF but must not be removed.
Feeder rails:	Feeder rail kits must be ordered separately for each Seal-Lok sleeve size
Feeder setup:	Installation of matching rail kit by knurled nuts and adjustment of scale wheel according to chart
Installation:	Electrical power, for feeder type machines: compressed air supply (6 bar)
Dimensions:	2.30 ft x 2.76 ft x 6.66 ft
Weight:	904 lbs

Dimensions and pressures for reference only, subject to change.

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Ordering

Type	Order code
Parflange® 50 machine Ready to use, including operation manual, filled with hydraulic oil and lubricant Without Parflange® tools Basic machine Europe version (not prepared for Seal-Lok sleeve feeder)	
Purchase:	PRO 50
Rent (monthly)	e-mail TFDrental@parker.com for availability

Parflange® PRO 50

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.

Type	Order code
Parflange® 50 PRO machine Europe version including Seal-Lok sleeve feeder without feeder rails	
Purchase:	PRO 50 with Feeder
Rent (monthly)	e-mail TFDrental@parker.com for availability

Parflange® PRO 50 with Feeder for mass production of Seal-Lok assemblies

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.

Sleeve feeder rails for Parflange® 50 PRO	Tube OD	Order code
Seal-Lok sleeve feeding rail	6mm / 1/4"	1050RAIL04
Seal-Lok sleeve feeding rail	8, 10mm / 3/8"	1050/RAIL06
Seal-Lok sleeve feeding rail	12mm / 1/2"	1050/RAIL08
Seal-Lok sleeve feeding rail	14,15,16mm / 5/8"	1050/RAIL10
Seal-Lok sleeve feeding rail	18,20mm / 3/4"	1050/RAIL12
Seal-Lok sleeve feeding rail	22,25 / 1"	1050/RAIL16
Seal-Lok sleeve feeding rail	28,30,32 / 1-1/4"	1050/RAIL20
Seal-Lok sleeve feeding rail	35,38 / 1-1/2"	1050/RAIL24

Parflange® machines and feeders are shipped in special containers which should be kept for future transports to avoid damage. Please don't dispose of the transport boxes!

View instructional video for the Parflange Pro 50 on https://discover.parker.com/TFDTubeFabEquipment

Dimensions and pressures for reference only, subject to change.

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Inch and Metric Flanging Tooling for PRO 50

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Tube Size O.D. x Wall Thickness (in.)	Tooling for 90°/180° Tube Flanging			Available Flanging Tooling	
	Flange Pin and Die Set Part Number	Pin Part Number	Die Part Number	1025 -S	1025 -SS
1/4 x .028	4004X028180	B4004X028180	M4004X028180	•	
1/4 x .035	4004X035180	B4004X035180	M4004X035180	•	•
1/4 x .049	4004X049180	B4004X049180	M4004X049180	•	
3/8 x .035	4006X035180	B4006X035180	M4006X035180	•	•
3/8 x .049	4006X049180	B4006X049180	M4006X049180	•	•
3/8 x .065	4006X065180	B4006X065180	M4006X065180	•	•
1/2 x .035	4008X035180	B4008X035180	M4008X035180	•	•
1/2 x .049	4008X049180	B4008X049180	M4008X049180	•	•
1/2 x .065	4008X065180	B4008X065180	M4008X065180	•	•
1/2 x .083	4008X083180	B4008X083180	M4008X083180	•	•
5/8 x .049	4010X049180	B4010X049180	M4010X049180	•	•
5/8 x .065	4010X065180	B4010X065180	M4010X065180	•	•
5/8 x .083	4010X083180	B4010X083180	M4010X083180	•	•
5/8 x .095	4010X095180	B4010X095180	M4010X095180	•	•
5/8 x .109	4010X109180	B4010X109180	M4010X109180	•	
5/8 x .120	4010X120180	B4010X120180	M4010X120180	•	
3/4 x .049	4012X049180	B4012X049180	M4012X049180	•	•
3/4 x .065	4012X065180	B4012X065180	M4012X065180	•	•
3/4 x .083	4012X083180	B4012X083180	M4012X083180	•	•
3/4 x .095	4012X095180	B4012X095180	M4012X095180	•	•
3/4 x .109	4012X109180	B4012X109180	M4012X109180	•	•
3/4 x .120	4012X120180	B4012X120180	M4012X120180	•	•
1 x .065	4016X065180	B4016X065180	M4016X065180	•	•
1 x .083	4016X083180	B4016X083180	M4016X083180	•	•
1 x .095	4016X095180	B4016X095180	M4016X095180	•	•
1 x .109	4016X109180	B4016X109180	M4016X109180	•	•
1 x .120	4016X120180	B4016X120180	M4016X120180	•	•
1 x .134	4016X134180	B4016X134180	M4016X134180	•	•
1 x .148	4016X148180	B4016X148180	M4016X148180	•	
1 x .156	4016X156180	B4016X156180	M4016X156180	•	
1 x .188	4016X188180	B4016X188180	M4016X188180	•	
1 1/4 x .065	4020X065180	B4020X065180	M4020X065180	•	
1 1/4 x .083	4020X083180	B4020X083180	M4020X083180	•	•
1 1/4 x .095	4020X095180	B4020X095180	M4020X095180	•	•
1 1/4 x .109	4020X109180	B4020X109180	M4020X109180	•	•
1 1/4 x .120	4020X120180	B4020X120180	M4020X120180	•	•
1 1/4 x .134	4020X134180	B4020X134180	M4020X134180	•	
1 1/4 x .148	4020X148180	B4020X148180	M4020X148180	•	
1 1/4 x .156	4020X156180	B4020X156180	M4020X156180	•	
1 1/4 x .188	4020X188180	B4020X188180	M4020X188180	•	
1 1/2 x .065	4024X065180	B4024X065180	M4024X065180	•	
1 1/2 x .083	4024X083180	B4024X083180	M4024X083180	•	
1 1/2 x .095	4024X095180	B4024X095180	M4024X095180	•	•
1 1/2 x .109	4024X109180	B4024X109180	M4024X109180	•	
1 1/2 x .120	4024X120180	B4024X120180	M4024X120180	•	•
1 1/2 x .134	4024X134180	B4024X134180	M4024X134180	•	
1 1/2 x .148	4024X148180	B4024X148180	M4024X148180	•	
1 1/2 x .156	4024X156180	B4024X156180	M4024X156180	•	
1 1/2 x .188	4024X188180	B4024X188180	M4024X188180	•	

Note: Use "-SS" suffix after part number for flanging tools for stainless steel tube. Contact the Tube Fittings Division for sizes and/or materials not listed, or for additional SS sizes released for limited use.

Table 5 — Pin & Die Part Numbers for Inch Sizes

Tube Size O.D. x Wall Thickness (mm)	Tooling for 90°/180° Tube Flanging		Available Flanging Tooling	
	Pin Part Number	Die Part Number	1025 S	1025 SS
6 x 1	B3018006X1M	M4018006X1M	•	
6 x 1.5	B3018006X1.5M	M4018006X1.5M	•	
8 x 1	B3018008X1M	M4018008X1M	•	
8 x 1.5	B3018008X1.5M	M4018008X1.5M	•	
10 x 1	B3018010X1M	M4018010X1M	•	
10 x 1.5	B3018010X1.5M	M4018010X1.5M	•	
10 x 2	B3018010X2M	M4018010X2M	•	
12 x 1	B3018012X1M	M4018012X1M	•	
12 x 1.5	B3018012X1.5M	M4018012X1.5M	•	•
12 x 2	B3018012X2M	M4018012X2M	•	
15 x 1.5	B3018015X1.5M	M4018015X1.5M	•	
15 x 2	B3018015X2M	M4018015X2M	•	
16 x 1	B3018016X1M	M4018016X1M	•	
16 x 1.5	B3018016X1.5M	M4018016X1.5M	•	
16 x 2	B3018016X2M	M4018016X2M	•	•
16 x 2.5	B3018016X2.5M	M4018016X2.5M	•	
18 x 1	B3018018X1M	M4018018X1M	•	
18 x 1.5	B3018018X1.5M	M4018018X1.5M	•	
18 x 2	B3018018X2M	M4018018X2M	•	
20 x 2	B3018020X2M	M4018020X2M	•	•
20 x 2.5	B3018020X2.5M	M4018020X2.5M	•	
20 x 3	B3018020X3M	M4018020X3M	•	
22 x 1.5	B3018022X1.5M	M4018022X1.5M	•	
22 x 2	B3018022X2M	M4018022X2M	•	
22 x 2.5	B3018022X2.5M	M4018022X2.5M	•	
22 x 3	B3018022X3M	M4018022X3M	•	
25 x 2	B3018025X2M	M4018025X2M	•	
25 x 2.5	B3018028X2.5M	M4018028X2.5M	•	
25 x 3	B3018030X2M	M4018030X2M	•	
25 x 3.5	B3018025X3.5M	M4018025X3.5M	•	
25 x 4	B3018025X4M	M4018025X4M		
28 x 2	B3018028X2M	M4018028X2M	•	
28 x 2.5	B3018028X2.5M	M4018028X2.5M	•	
30 x 2	B3018030X2M	M4018030X2M	•	
30 x 3	B3018030X3M	M4018030X3M	•	
30 x 3.5	B3018030X3.5M	M4018030X3.5M		
30 x 4	B3018030X4M	M4018030X4M		
32 x 3	B3018032X3M	M4018032X3M	•	
32 x 4	B3018032X4M	M4018032X4M		
35 x 3	B3018035X3M	M4018035X3M	•	
38 x 3	B3018038X3M	M4018038X3M		
38 x 4	B3018038X4M	M4018038X4M		
38 x 5	B3018038X5M	M4018038X5M		

Note: Use "-SS" suffix after part number for flanging tools for stainless steel tube. Contact the Tube Fittings Division for sizes and/or materials not listed, or for additional SS sizes released for limited use.

Table 6 — Pin & Die Part Numbers for Metric Sizes

All tooling info also available on www.TFDTOOLSPEC.com

Dimensions and pressures for reference only, subject to change.

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Seal-Lok CNG Assembly and Installation

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The proper assembly of Seal-Lok for CNG fittings requires several steps, each important in guaranteeing a leak free connection and long service life:

1. Tube selection and preparation
2. Sleeve Attachment - flanging or welded
3. Inspection of sleeve attachment
4. Final installation

Tube Selection and Preparation

Tube prep is extremely important to ensure robust connections. Seal-Lok for CNG works with most hydraulic tube materials that can be flanged or welded. Standard stainless-steel materials, such as 304 or 316, are widely available and a good solution for CNG applications. The sleeve material must match the tubing material to ensure a robust and proper flanged or welded tube end. In addition, seamless tube is recommended for ease in flanging.

Cutting

Cut tube reasonably square (within +/-1°) using a circular toothed cut-off saw (see Fig. 13), or a hacksaw with a fine-tooth blade guided by a Tru-Kut Saw Guide (shown in Fig. 14) or other mitre-type saw guide.

A tube cutter is not recommended for steel and stainless-steel tube because it creates a large burr on the I.D., which is difficult to remove and creates flow restriction. Furthermore, if the tube needs to be flared or flanged, the buildup on the ID can compromise the sealing surface.

Deburring

Lightly deburr the I.D. and O.D. of the tube end to remove burrs and sharp edges. Use the In-Ex deburring tool or power deburring tool (shown in Parker catalog 4300).

Note: Point tube end downward during deburring to keep chips from entering the tube.

Cleaning

Remove metal chips from I.D. with a brush or compressed air. Wipe the I.D. and the O.D. of the deburred tube end with a clean rag. Debris present in the tube end can result in system contamination or can get embedded into the flange causing imperfections that are potential leak paths.

Sleeve Attachment

Attaching the sleeve to the tube end is the next assembly step. This can be accomplished by two methods: flanging or welding.

Flanging

The flanging method requires the use of an appropriate forming machine to create the flange or flat face on the tube end. Since the flat face of the flanged tube seals against the O-ring within the fitting groove, it is important that this surface be relatively smooth. Proper tube end preparation (cutting, deburring and cleaning) will help accomplish this goal.

The Parker Parflange® machines utilize an orbital cold forming process to produce a flat, smooth, rigidly supported 90° sealing surface on the tube end. For additional information on available Parflange equipment and tooling, see Equipment & Tooling section (page 34).

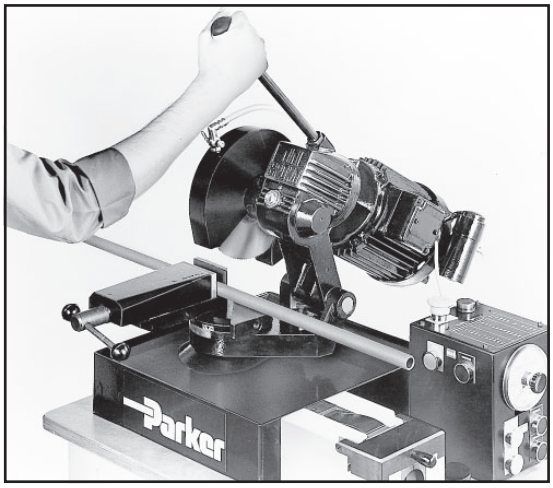

Fig. 14 – Cut-off Saw

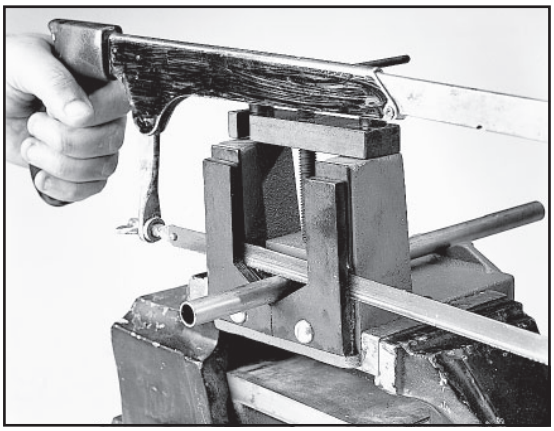

Fig. 15 – Parker's Tru-Kut Sawing Vise used with hacksaw

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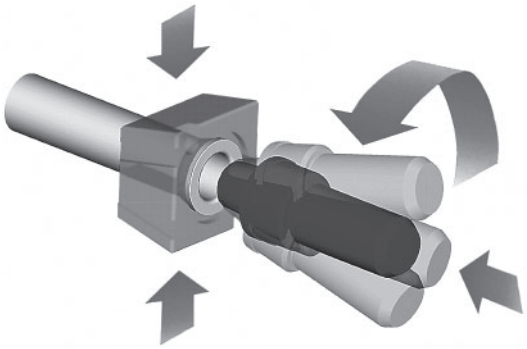

Fig. 16 – Parker's exclusive orbital spindle motion produces a perfect flange every time

Advantages of Parflange Process

There are numerous advantages to using the Parflange process over the braze or weld process:

- The Parflange process is several times faster than the brazing or welding methods. For instance, the 1025 model produce flanges at a rate of 9 to 12 times the speed of comparable brazing.
- The Parflange process does not require any special pre- or post-flange cleaning of the tube and sleeve.
- The Parflange, unlike brazing process, does not require any flux, braze alloy, post braze cleaner or rust inhibitor. An environmentally safe lubricant applied to the flanging pin is the only additive associated with the Parflange.
- The Parflange process is inherently safe. It does not require open flame or any form of heating. Additionally, there is no emission of hazardous fumes, as is typical with welding and brazing.
- The Parflange process uses only a fraction of the energy needed for welding or brazing.
- The Parflange process accommodates the use of plated steel components (i.e., tube and sleeve), thus eliminating the need to electroplate assemblies after fabrication.
- The Parflange process eliminates the potential for leaks due to braze or weld joints.
- The Parflange process produces a burnished sealing surface, better for sealing high pressure gasses.

Flanging Steps:

1. Determine the extra cut-off length required for the Parflange process by referring to Tables 7 and 8. (Each table is only a guide. Variations in tube wall thickness and inconsistency in quality of tube cut-off may affect actual dimensions. User should verify actual extra tube cut-off length with one or two flanges prior to flanging.)
2. Select the proper tooling for the tube size. The tube OD, wall thickness and material must be known for proper selection. Refer to earlier section on Equipment & Tooling for more detailed information on available sizes.
3. With the sleeve properly positioned within the die set, place the die set into the die holder of the machine.
4. Insert the tube through the die opening until it comes in contact with the tube stop. Do not forget to position the tube nut over the tube in the proper orientation, especially if the other tube end has already been flanged, or the tube has sharp bends.
5. Flange the tube according to the operational guidelines of specific Parflange machine being used.
6. Inspection of flange OD and Face. See inspection section for additional inspection criteria.

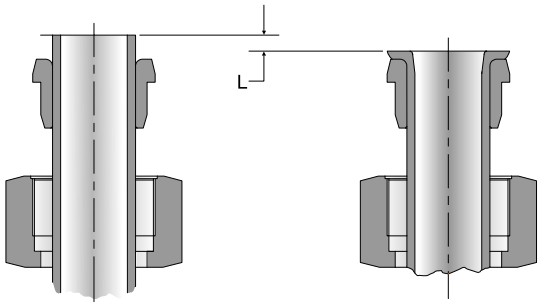

Fig. 17 – Extra cut-off length

Tube O.D. (in.)	Tube Wall Thickness – Inch										
	.028	.035	.049	.065	.083	.095	.109	.120	.134	.156	.188
1/4	3/16	13/64	7/32								
3/8		5/32	3/16	13/64	15/64	1/4					
1/2		9/64	9/64	3/16	13/64	9/32	19/64	19/64			
5/8			11/64	3/16	13/64	1/4	17/64	17/64			
3/4			11/64	3/16	7/32	7/32	1/4	17/64	9/32		
1				3/16	3/16	13/64	15/64	1/4	19/64		
1 1/4				11/64	3/16	13/64	15/64	1/4	19/64	19/64	21/64
1 1/2				13/64	15/64	15/64	1/4	17/64	19/64	23/64	3/8

Table 7 – Extra tube cut-off length guide for inch tube

Tube O.D. (in.)	Metric Tube Outside Diameter – (mm)								
	6	8	10	12	16	20	25	30	38
1.0	3/16 5.2	7/32 5.7	1/8 3.1	5/32 4.1	9/64 3.6				
1.5	17/64 6.7	15/64 5.9	13/64 5.1	7/32 5.4	11/64 4.2				
2.0			13/64 5.3	15/64 6.1	3/16 4.9	7/32 5.4	15/64 6.1	17/64 6.6	9/32 7.2
2.5				17/64 6.7	7/32 5.5	15/64 6.1	1/4 6.4	19/64 7.6	
3.0					15/64 5.8	17/64 6.7	9/32 7.2	5/16 7.9	19/64 7.7
3.5						17/64 6.9	19/64 7.5	21/64 8.5	
4.0						9/32 7.2	5/16 8.0	11/32 8.6	11/32 8.7
5.0							11/32 8.8		3/8 9.4

Table 8 – Extra tube cut-off length guide for metric tube

Dimensions and pressures for reference only, subject to change.

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Another consideration prior to flanging is the minimum straight length to the start of a 90° bend. Table 9 provides this information.

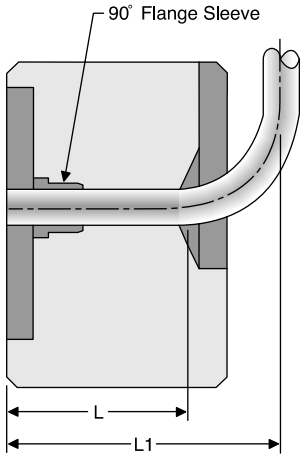

Fig. 18 – Minimum straight length to start of bend for 90° flanging

Tube O.D. Inch Sizes	Tube O.D. Metric Sizes	L* (in.)	L* (mm)	L1** (in.)	L1** (mm)
1/4”	6	1 5/16	35	3 1/8	79
5/16”	8	1 5/16	35	3 5/32	80
3/8”	10	1 5/16	40	3 3/16	81
1/2”	12	1 3/8	40	3 1/4	82
	15	1 3/8	40	3 5/16	84
5/8”	16	1 1/2	41	3 5/16	84
	18	1 5/8	42	3 11/32	85
3/4”	20	1 3/4	50	3 3/8	86
	22	1 7/8	50	3 7/16	87
	25	1 7/8	50	3 1/2	89
1”	28	1 7/8	50	3 9/16	90
	30	1 7/8	50	3 19/32	91
1 1/4”	32	1 7/8	50	3 5/8	92
	35	2	50	3 11/16	94
1 1/2”	38	2	50	3 3/4	95

Table 9 – Minimum straight length to start of bend for 90° flanging

Notes:

* L is the minimum straight length to the start of tube bend.

** L1 is the minimum centerline dimension necessary for 90° bent tube to clear the frame of the Parflange machine.
In bending of the tubes, use radius blocks which will ensure that L1 dimensions are met or exceeded.

Flange Inspection

The flange should be inspected for proper diameter and sealing surface quality. Table 10 provides the flange diameters for the different sizes. The sleeve can also be used as a quick gauge of the flange diameter. Visually compare the flange diameter to the tapered surface located at the front end of the sleeve (right behind the flange). The large diameter and small diameters at each end of this surface serve as the maximum and minimum flange diameter limits, respectively.

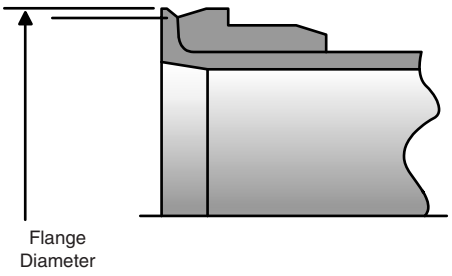

Fig. 19 — Flange diameter

Inch Tube O.D. (in.)	Metric Tube O.D. (mm)	Flange Diameter (in.)
1/4	6	.476 / .502
3/8	10	.585 / .620
1/2	12	.709 / .744
5/8	14, 15, 16	.874 / .923
3/4	18, 20	1.047 / 1.096
1	22, 25	1.297 / 1.346
1-1/4	28, 30, 32	1.549 / 1.596
1-1/2	38	1.860 / 1.909

Table 10 – Flange dimensions

Over-flanging will result in tube nut interference, as well as thinning of the flange tube end. Under-flanging reduces the contact area for sealing against the O-ring in the fitting.

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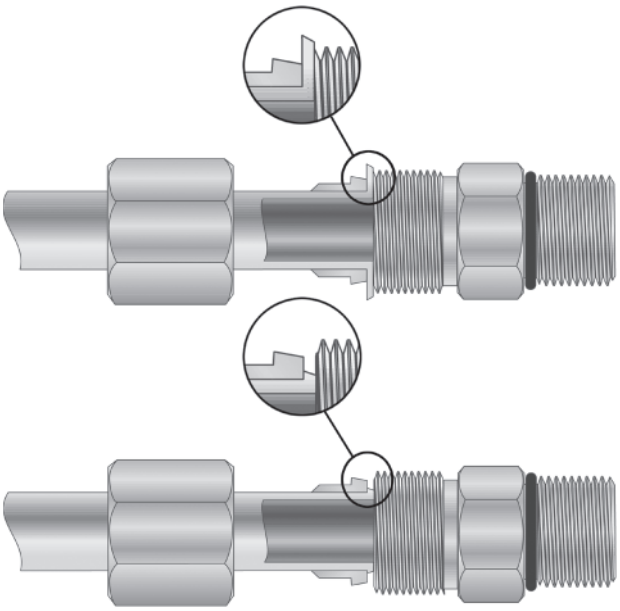

Fig. 20 – Overflanging and Underflanging

Final Installation

The following steps are required for final installation of the Seal-Lok fitting:

1. Ensure that the seal is properly installed in the groove of the face seal. If replacing an o-ring, it is recommended that a CORG assembly tool be utilized, as shown in Fig. 21. To properly use the assembly tool, follow these steps
   a. Position the O-ring inside the CORG assembly tool against the pusher.
   b. Position the tool over the Seal-Lok tube end until the end is bottomed in the tool.
   c. Push the plunger of the tool until the O-ring is inserted and seated into the groove.

   Place the tube assembly against the fitting body so that the flat face of the tube flange (or braze sleeve) comes in full contact with the O-ring. Thread the nut onto the fitting body by hand and tighten it to the recommended torque represented in Table 12.
2. Seal-Lok for CNG assemblies can tolerate several remakes prior to placing in service. However, it is always recommended that seals be replaced if the joint is disassembled for maintenance and repair.

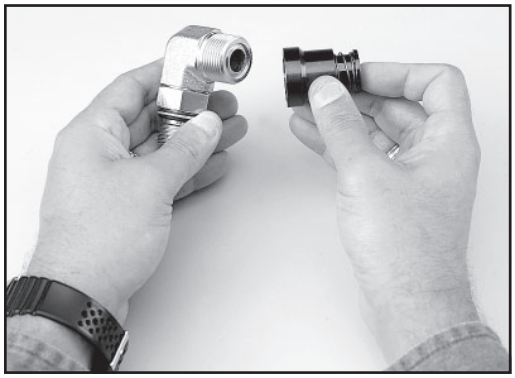

Fig. 21 – O-Ring installation using the CORG assembly tool

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O.D.		SAE Dash Size	Tube Side Thread Size (UN/UNF)	Tube Side Assembly Torque (+10% -0%)		
(in.)	(mm)			in.-lb.	ft.-lb.	N-m
1/4	6	-4	9/16-18	220	18	25
3/8	8, 10	-6	11/16-16	360	30	40
1/2	12	-8	13/16-16	480	40	55
5/8	14, 15, 16	-10	1-14	—	60	80
3/4	18, 20	-12	1 3/16-12	—	85	115
1	22, 25	-16	1 7/16-12	—	110	150
1 1/4	28, 30, 32	-20	1 11/16-12	—	150	205
1 1/2	35, 38	-24	2-12	—	230	315
2	50	-32	2 1/2-12	—	375	510

Table 12 – Seal-Lok for CNG assembly torque

Caution: The torque method of assembly is the preferred method of assembly for Seal-Lok fittings. It reduces the risk of human error during assembly that is more prevalent in the Flats From Wrench Resistance (F.F.W.R.) method. To ensure the most accurate assembly of the Seal-Lok fitting, it is strongly recommended that the torque method be utilized. If torque wrenches are not available, an alternate method of assembly is the Flats From Wrench Resistance (F.F.W.R.) method. Wrench tighten the nut onto the fitting body until light wrench resistance is reached. Tighten further to the appropriate F.F.W.R. value.

Tube Thickness Recommendations

Fitting Dash Size	Product Type		
	Tube O.D. (inch)	Recommended Wall Thickness (Inch) Seal-Lok CNG	
		Min.	Max.
-2	1/8	-	-
-3	3/16	-	-
-4	1/4	0.020	0.083
-5	5/16	-	-
-6	3/8	0.020	0.109
-8	1/2	0.028	0.148
-10	5/8	0.035	0.134
-12	3/4	0.035	0.148
-14	7/8	0.035	0.156
-16	1	0.035	0.188
-20	1 1/4	0.049	0.220
-24	1 1/2	0.049	0.250
-32	2	0.058	0.250

Table 13 — Recommended Inch Tube Wall Thickness

For available tooling and tube walls for flanging, see Tables 1, 4 and 5.

Metric Tube			
Tube O.D. (mm)	Recommended Wall Thickness (mm) Seal-Lok CNG		
	Fitting Size	Min.	Max.
6	-4	0.5	2.25
8	-6	1.0	2.5
10	-6	1.0	3.0
12	-8	1.0	3.5
14	-10	1.0	4.0
15	-10	1.0	3.0
16	-10	1.0	3.0
18	-12	1.0	3.0
20	-12	1.5	4.0
22	-16	1.0	3.0
25	-16	2.0	5.0
28	-20	1.5	5.0
30	-20	2.0	5.0
32	-20	2.0	2.5
35	-24	2.0	6.0
38	-24	2.5	7.0
50	-	-	-

Table 14 — Recommended Metric Tube Wall Thickness

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Seal-Lok Troubleshooting Guide

O-Ring Face Seal

CONDITION	PROBABLE CAUSE(S)	RECOMMENDATION
Immediate leakage when system is pressurized	• Improper tightening of joint	• Check for O-ring damage and re-tighten connection to the recommended torque value
Under-flanged assembly	• Undersized tube diameter resulting in tube slippage during flanging • Die gripping surface is worn or dirty	• Verify that the O.D. is correct; if undersized, replace tube. • Inspect die gripping surface; if clogged or excessively worn, clean or replace.
Over-flanged assembly	• Sleeve is positioned incorrectly in die	• Check for proper positioning of sleeve in die; if over-flanged, replace tubing
Flange out-of-round	Tubing was not cut properly • Tube was not properly supported during flanging • Tubing is eccentric	• Cut tubing within 90° ±1° • Support tubing so that tube end is perpendicular to tube stop during flanging • Replace with quality tubing • Replace out-of-round flanges
Cracked flange	• Tubing too hard	• Replace tubing using recommended quality tube
Scored, pitted flange	• Improper deburring and cleaning of tube prior to flanging • Flange pin not cleaned and lubricated properly	• Replace flange using proper deburring and cleaning recommendations • Keep flanging pin clean and working surfaces well lubricated.
Leakage at face-seal end	• Misalignment or improper fit • Damaged, pinched, improper, or missing O-ring • Extruded O-ring • Damaged fitting	• Align tube end and connecting fitting properly before tightening tube nut, holding the flat face of the mating fitting against O-ring while tightening • Replace O-ring, properly installing it in the face seal groove • Replace O-ring and check for proper alignment and pressure surges exceeding rated pressure of fitting; tighten the nut to recommended torque or replace fitting if threads or sealing surface is grossly damaged.

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

Parker Publication No. 4400-B.1

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

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

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

1.0 GENERAL INSTRUCTIONS

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

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

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

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

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

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

2.0 HOSE, TUBE AND FITTINGS SELECTION INSTRUCTIONS

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

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

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

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

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

Parker manufactures a special Hose for certain compressed natural gas ("CNG") applications where static electricity buildup may occur. Parker CNG Hose assemblies comply with the requirements of ANSI/IAS NGV 4.2; CSA 12.52, "Hoses for Natural Gas Vehicles and Dispensing Systems" (www.ansi.org). This Hose is labeled "Electrically Conductive for CNG Use"

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on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in, for example, high velocity CNG dispensing or transfer. Do not use any other Hose for CNG applications where static charge buildup may occur, even if electrically conductive. Use of other Hoses in CNG applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. Care must also be taken to protect against CNG permeation through the Hose wall. See section 2.6, Permeation, for more information. Parker CNG Hose is intended for dispenser and vehicle use within the specified temperature range. Parker CNG Hose should not be used in confined spaces or unventilated areas or areas exceeding the specified temperature range. Final assemblies must be tested for leaks. CNG Hose Assemblies should be tested on a monthly basis for conductivity per ANSI/IAS NGV 4.2; CSA 12.52.

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

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

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

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

2.5 **Fluid Compatibility:** Hose, and Tube Assembly selection must assure compatibility of the Hose tube, cover, reinforcement, Tube, Plating and Seals with the fluid media used. See the fluid compatibility chart in the Parker publication for the product being considered or used. This information is offered only as a guide. Actual service life can only be determined by the end user by testing under all extreme conditions and other analysis.

Hose, and Tube that is chemically compatible with a particular fluid must be assembled using Fittings and adapters containing likewise compatible seals. Flange or flare processes can change Tube material properties that may not be compatible with certain requirements such as NACE

2.6 **Permeation:** Permeation (that is, seepage through the Hose or Seal) will occur from inside the Hose or Fitting to outside when Hose or Fitting is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials as helium, diesel fuel, gasoline, natural gas, phosphate esters, Skydrol, 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.

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

2.18 **Welding or Brazing:** When using a torch or arc welder in close proximity to hydraulic lines, the hydraulic lines should be removed or shielded with appropriate fire resistant materials. Flame or weld spatter could burn through the Hose or Seal and possibly ignite escaping fluid resulting in a catastrophic failure. Heating of plated parts, including Hose Fittings and adapters, above 450°F (232°C) such as during welding, brazing or soldering may emit deadly gases. Any elastomer seal on fittings shall be removed prior to welding or brazing, any metallic surfaces shall be protected after brazing or welding when necessary. Welding and brazing filler material shall be compatible with the Tube and Fitting that are joined.

2.19 **Atomic Radiation:** Atomic radiation affects all materials used in Hose and Tube assemblies. Since the long-term effects may be unknown, do not expose Hose or Tube assemblies to atomic radiation. Nuclear applications may require special Tube and Fittings.

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

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

3.0 HOSE AND FITTINGS ASSEMBLY AND INSTALLATION INSTRUCTIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.0 TUBE AND FITTINGS ASSEMBLY AND INSTALLATION INSTRUCTIONS

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

4.2 **Tube and Fitting Assembly:** Do not assemble a Parker Fitting with a Tube that is not specifically listed by Parker for that Fitting, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. The Tube must meet the requirements specified to the Fitting.

The Parker published instructions must be followed for assembling the Fittings to a Tube. These instructions are provided in the Parker Fitting catalog for the specific Parker Fitting being used, or by calling 1-800-CPARKER, or at www.parker.com.

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

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

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

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

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

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

5.0 **HOSE AND FITTING MAINTENANCE AND REPLACEMENT INSTRUCTIONS**

5.1 Even with proper selection and installation, Hose life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a possible Hose failure, and experience with any Hose failures in the application or in similar applications should determine the frequency of the inspection and the replacement for the Products so that Products are replaced before any failure occurs. Certain products require maintenance and inspection per industry requirements. Failure to adhere to these requirements may lead to premature failure. A maintenance program must be established and followed by the user and, at minimum, must include instructions 5.2 through 5.7

5.2 **Visual Inspection Hose/Fitting:** Any of the following conditions require immediate shut down and replacement of the Hose Assembly:
- Fitting slippage on Hose;
- Damaged, cracked, cut or abraded cover (any reinforcement exposed);
- Hard, stiff, heat cracked, or charred Hose;
- Cracked, damaged, or badly corroded Fittings;
- Leaks at Fitting or in Hose;
- Kinked, crushed, flattened or twisted Hose; and
- Blistered, soft, degraded, or loose cover.

5.3 **Visual Inspection All Other:** The following items must be tightened, repaired, corrected or replaced as required:
- Leaking port conditions;
- Excess dirt buildup;/
- Worn clamps, guards or shields; and
- System fluid level, fluid type, and any air entrapment.

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

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

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

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

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

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

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

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

5.9 **Compressed natural gas (CNG):** Parker CNG Hose Assemblies should be tested after installation and before use, and at least on a monthly basis per instructions provided on the Hose Assembly tag. The recommended procedure is to pressurize the Hose and check for leaks and to visually inspect the Hose for damage and to perform an electrical resistance test.

Caution: Matches, candles, open flame or other sources of ignition shall not be used for Hose inspection. Leak check solutions should be rinsed off after use.

6.0 **HOSE STORAGE**

6.1 **Age Control:** Hose and Hose Assemblies must be stored in a manner that facilitates age control and first-in and first-out usage based on manufacturing date of the Hose and Hose Assemblies. Unless otherwise specified by the manufacturer or defined by local laws and regulations:

6.1.1 The shelf life of rubber hose in bulk form or hose made from two or more materials is 28 quarters (7 years) from the date of manufacture, with an extension of 12 quarters (3 years), if stored in accordance with ISO 2230;

6.1.2 The shelf life of thermoplastic and polytetrafluoroethylene hose is considered to be unlimited;

6.1.3 Hose assemblies that pass visual inspection and proof test shall not be stored for longer than 2 years.

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

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Offer of Sale

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1. **Definitions.** As used herein, the following terms have the meanings indicated.
   - Buyer: means any customer receiving a Quote for Products from Seller.
   - Goods: means any tangible part, system or component to be supplied by the Seller.
   - Products: means the Goods, Services and/or Software as described in a Quote provided by the Seller.
   - Quote: means the offer or proposal made by Seller to Buyer for the supply of Products.
   - Seller: means Parker-Hannifin Corporation, including all divisions and businesses thereof.
   - Services: means any services to be supplied by the Seller.
   - Software: means any software related to the Products, whether embedded or separately downloaded.
   - Terms: means the terms and conditions of this Offer of Sale or any newer version of the same as published by Seller electronically at www.parker.com/saleterms.

2. **Terms.** All sales of Products by Seller are contingent upon, and will be governed by, these Terms and, these Terms are incorporated into any Quote provided by Seller to any Buyer. Buyer's order for any Products whether communicated to Seller verbally, in writing, by electronic date interface or other electronic commerce, shall constitute acceptance of these Terms. Seller objects to any contrary or additional terms or conditions of Buyer. Reference in Seller's order acknowledgement to Buyer's purchase order or purchase order number shall in no way constitute an acceptance of any of Buyer's terms of purchase. No modification to these Terms will be binding on Seller unless agreed to in writing and signed by an authorized representative of Seller.

3. **Price; Payment.** The Products set forth in Seller's Quote are offered for sale at the prices indicated in Seller's Quote. Unless otherwise specifically stated in Seller's Quote, prices are valid for thirty (30) days and do not include any sales, use, or other taxes or duties. Seller reserves the right to modify prices at any time to adjust for any raw material price fluctuations. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). All sales are contingent upon credit approval and payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law.

4. **Shipment; Delivery; Title and Risk of Loss.** All delivery dates are approximate. Seller is not responsible for damages resulting from any delay. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage pass to Buyer, upon placement of the Products with the shipment carrier at Seller's facility. Unless otherwise agreed, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective indicated shipping date will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

5. **Warranty.** The warranty related to the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of twelve (12) months from the date of delivery or 2,000 hours of use, whichever occurs first; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the completion of the Services by Seller; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end-user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer:
   DISCLAIMER OF WARRANTY: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED. BUYER AGREES AND ACKNOWLEDGES THAT UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".

6. **Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to the Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

7. **LIMITATION OF LIABILITY.** IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCT, RE-PERFORM THE SERVICES, OR REFUND THE PURCHASE PRICE PAID WITHIN A REASONABLE PERIOD OF TIME. **IN NO EVENT IS SELLER LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, NON-COMPLETION OF SERVICES, USE, LOSS OF USE OF, OR INABILITY TO USE THE PRODUCTS OR ANY PART THEREOF, LOSS OF DATA, IDENTITY, PRIVACY, OR CONFIDENTIALITY, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, WHETHER BASED IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCTS.**

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

9. **Special Tooling.** Special Tooling includes but is not limited to tooling, jigs, fixtures and associated manufacturing equipment acquired or necessary to manufacture Products. A tooling charge may be imposed for any Special Tooling. Such Special Tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in Special Tooling belonging to Seller that is utilized in the manufacture of the Products, even if such Special Tooling has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property in its sole discretion at any time.

10. **Security Interest.** To secure payment of all sums due, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. **User Responsibility.** The Buyer through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. The Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and other technical information provided with the Product. If Seller provides Product options based upon data or specifications provided by the Buyer, the Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event the Buyer is not the end-user, Buyer will ensure such end-user complies with this paragraph.

12. **Use of Products. Indemnity by Buyer.** Buyer shall comply with all instructions, guides and specifications provided by Seller with the Products. **Unauthorized Uses.** If Buyer uses or resells the Products for any uses prohibited in Seller's instructions, guides or specifications, or Buyer otherwise fails to comply with Seller's instructions, guides and specifications, Buyer acknowledges that any such use, resale, or non-compliance is at Buyer's sole risk. Buyer shall indemnify, defend, and hold Seller harmless from any losses, claims, liabilities, damages, lawsuits, judgments and costs (including attorney fees and defense costs), whether for personal injury, property damage, intellectual property infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, application, design, specification or other misuse of Products provided by Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, tooling, equipment, plans,

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

13. **Cancellations and Changes.** Buyer may not cancel or modify any order for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller, at any time, may change Product features, specifications, designs and availability.

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

15. **Force Majeure.** Seller does not assume the risk and is not liable for delay or failure to perform any of Seller's obligations by reason of events or circumstances beyond its reasonable control ("Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

16. **Waiver and Severability.** Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of these Terms by legislation or other rule of law shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.

17. **Termination.** Seller may terminate any agreement governed by or arising from these Terms for any reason and at any time by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms (b) appoints a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or one if filed by a third party (d) makes an assignment for the benefit of creditors; or (e) dissolves its business or liquidates all or a majority of its assets.

18. **Ownership of Software.** Seller retains ownership of all Software supplied to Buyer hereunder. In no event shall Buyer obtain any greater right in and to the Software than a right in the nature of a license limited to the use thereof and subject to compliance with any other terms provided with the Software.

19. **Indemnity for Infringement of Intellectual Property Rights.** Seller is not liable for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights ("Intellectual Property Rights") except as provided in this Section. Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on a third party claim that one or more of the Products sold hereunder infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by the Seller to the Buyer. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of any such claim, and Seller having sole control over the defense of the claim including all negotiations for settlement or compromise. If one or more Products sold hereunder is subject to such a claim, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Products, replace or modify the Products so as to render them non-infringing, or offer to accept return of the Products and refund the purchase price less a reasonable allowance for depreciation. Seller has no obligation or liability for any claim of infringement: (i) arising from information provided by Buyer; or (ii) directed to any Products provided hereunder for which the designs are specified in whole or part by Buyer; or (iii) resulting from the modification, combination or use in a system of any Products provided hereunder. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for such claims of infringement of Intellectual Property Rights.

20. **Governing Law.** These Terms and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.

21. **Entire Agreement.** These Terms, along with the terms set forth in the main body of any Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. In the event of a conflict between any term set forth in the main body of a Quote and these Terms, the terms set forth in the main body of the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. These Terms may not be modified unless in writing and signed by an authorized representative of Seller.

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

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